No. 777,801. PATENTED DEC. 20, 1904.

W. J. MURRAY.

ELECTRIC SWITCH.

APPLICATION FILED MAY 2, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

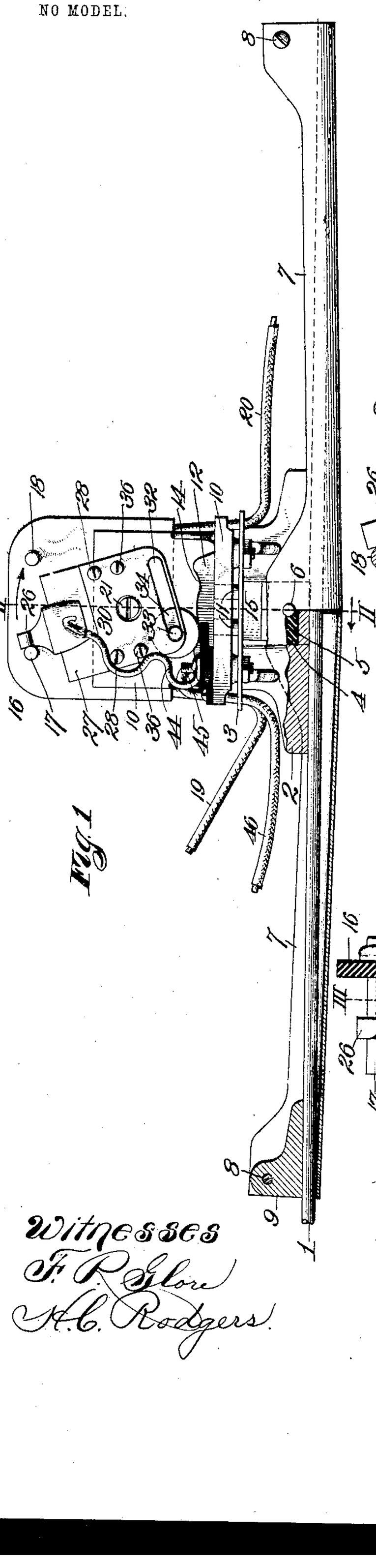

Fig. 1

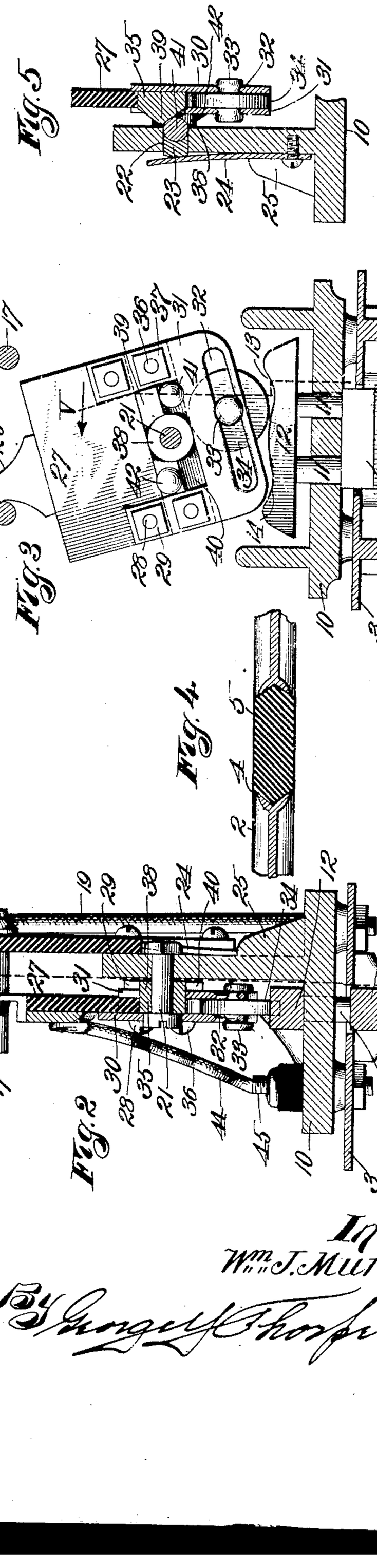

Fig. 3

Fig. 4.

Fig. 2

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 6

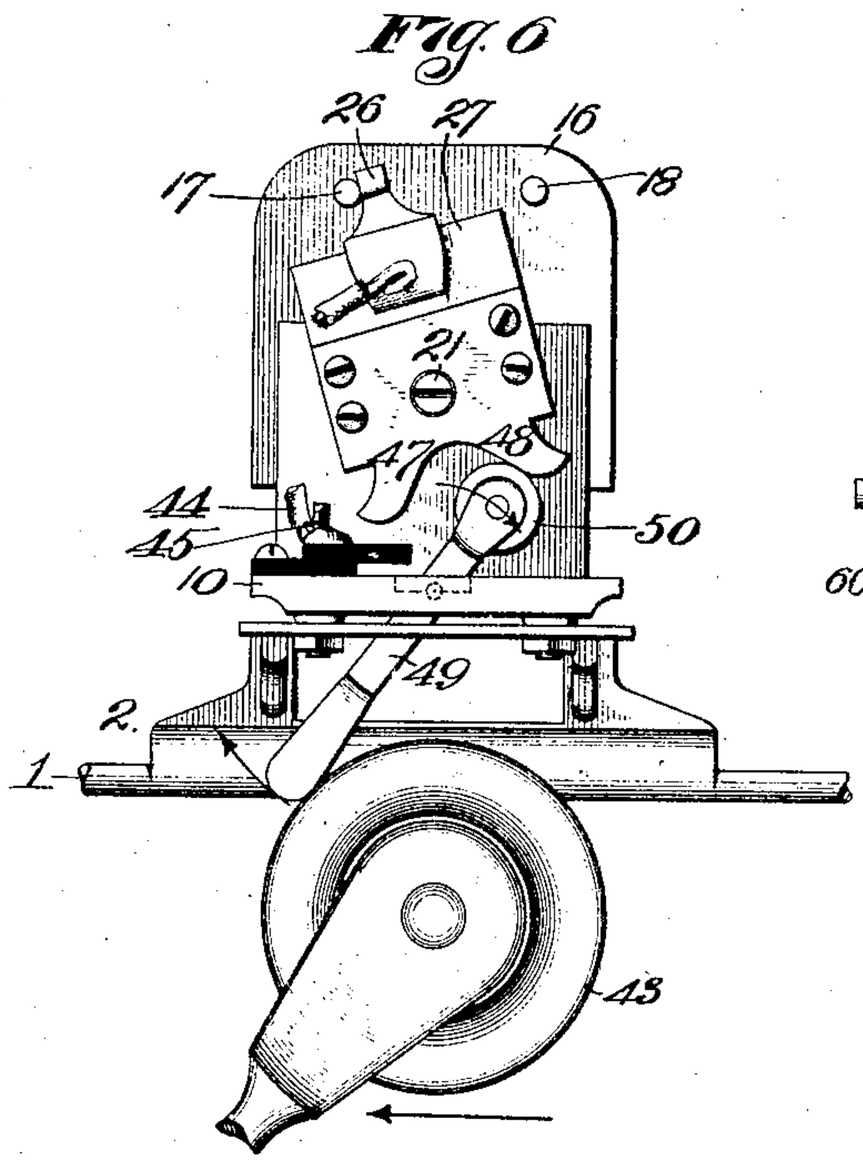


Fig. 7

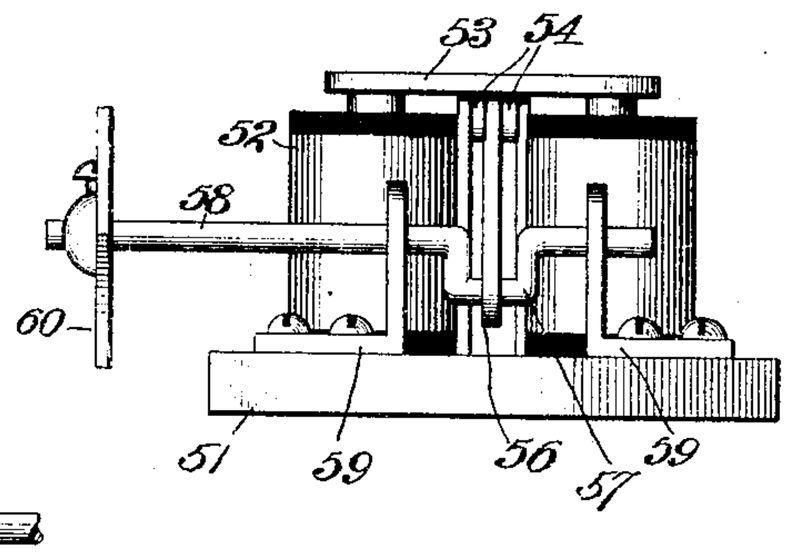


Fig. 8.

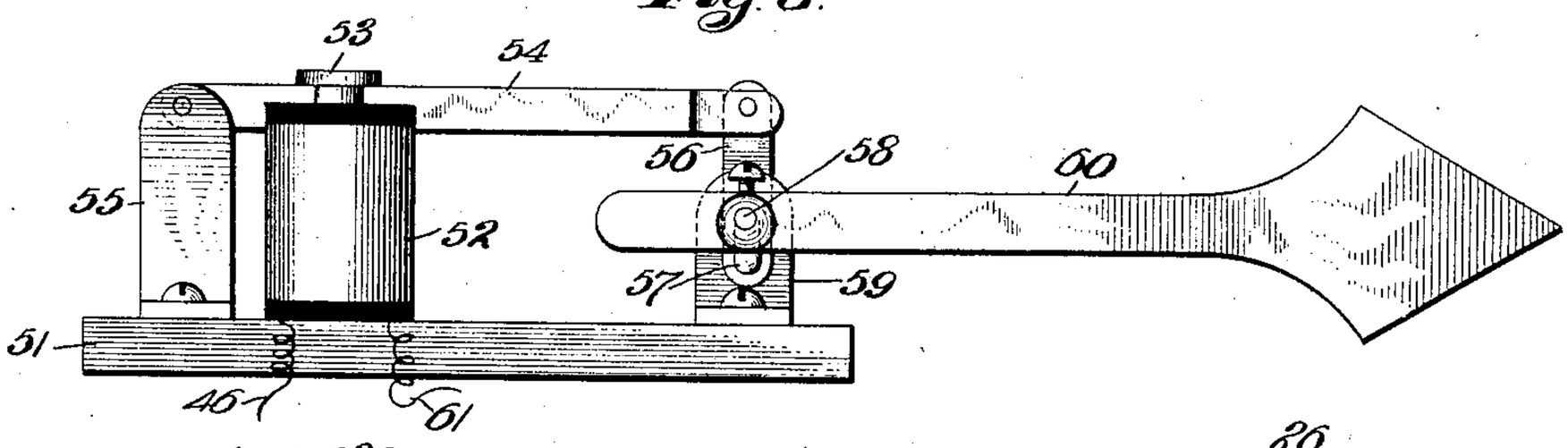
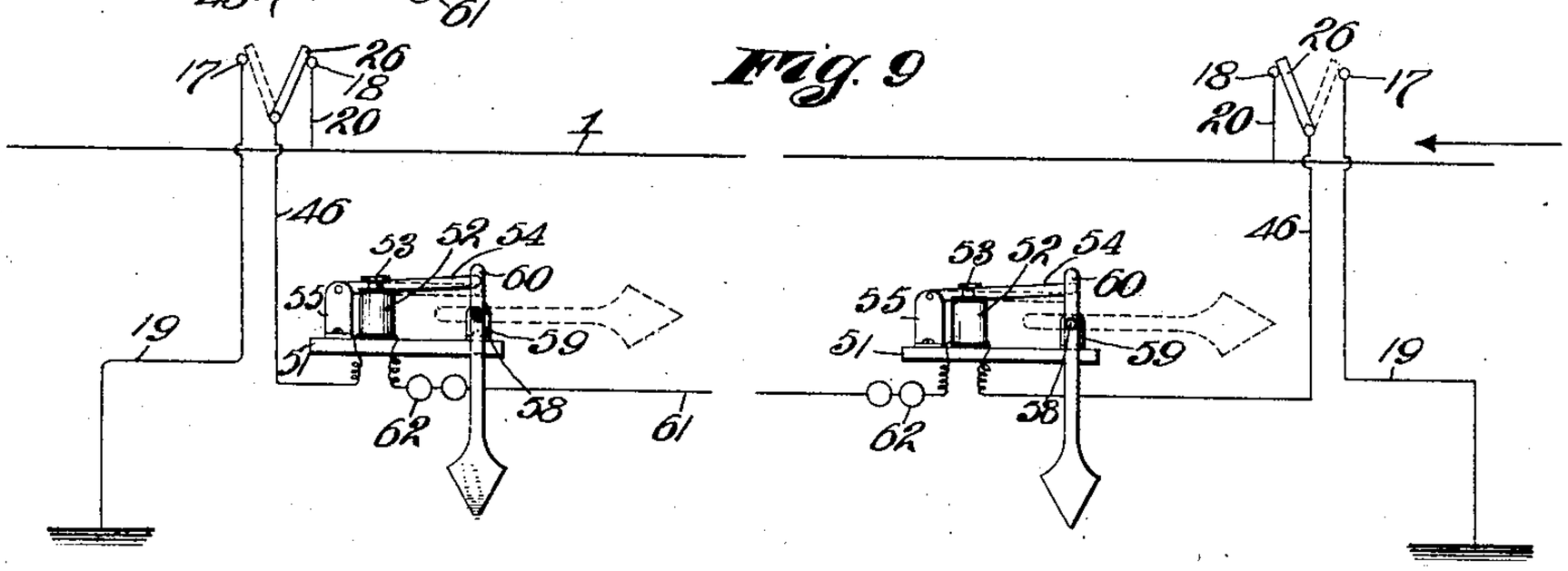


Fig. 9



Witnesses
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No. 777,801. Patented December 20, 1904.

UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 777,801, dated December 20, 1904.

Application filed May 2, 1904. Serial No. 205,913.

To all whom it may concern:

Be it known that I, WILLIAM J. MURRAY, a citizen of the United States, residing at Leavenworth, in the county of Leavenworth and State of Kansas, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

This invention relates to electric switches, and has for its object to produce a thoroughly reliable and efficient switch of simple, compact, durable, and inexpensive construction which can be used in numerous connections, but is peculiarly adapted for use in block-signal systems for street-railways.

To this end the invention consists in certain novel and peculiar features of construction and organization, as hereinafter described and claimed, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 is a front view, partly in central longitudinal section, of an electric switch embodying my invention. Fig. 2 is an enlarged vertical section taken on the line II II of Fig. 1. Fig. 3 is a vertical section on the line III III of Fig. 2, the shoe and trolley-wire shown in Fig. 2 being omitted, showing the switch in the opposite position to that shown in Fig. 1. Fig. 4 is a horizontal section on the line IV IV of Fig. 3. Fig. 5 is a vertical section taken on the dotted line V of Fig. 3. Fig. 6 is a face view of a modified form of switch. Fig. 7 is a front view of an electromagnet and the semaphore operated thereby. Fig. 8 is a side view of the same. Fig. 9 is a diagrammatic view to show the flow of the electric current when the signal mechanism occupies its operative or inoperative position.

Referring now to the drawings, 1 designates the trolley-wire, and 2 the chair supporting the same in the customary or any preferred manner, said chair being provided with a horizontal or seat portion 3 and with an opening 4, equipped with a vertically-movable insulatory block 5, provided with a cross-bolt 6, forming a pivotal connection for the trough-like sections 7, said sections conjointly forming a shoe, which is pivoted at its outer ends on bolts 8, carrying blocks 9, which fit snugly down upon the trolley-wire extending longitudinally through the shoe, the arrangement being such that the weight of the shoe-sections normally hold them in the position shown—that is, sagged downward at their meeting ends—and also hold the insulatory block depressed.

10 designates a substantially L-shaped bracket bolted, as shown, or otherwise secured upon the seat of the chair, and extending vertically through said bracket are stems 11 of a lift-plate 12, disposed above the horizontal arm of the bracket and formed at opposite sides of its center with concave recesses 13 and 14, respectively. The stems are connected at their lower ends by the cross-piece 15, occupying an opening in chair-seat 3 and resting upon the movable block 5, mounted in the chair.

Secured to the back of the upright arm or bracket 10 is an insulatory plate 16, equipped at opposite sides of its vertical center and near its upper edge with contact-posts 17 and 18, a conductor 19 being connected to post 17 and a conductor 20 to post 18.

21 is a pivot-bolt secured in bracket 10 below and at equal distances from posts 17 and 18 and provided in the same horizontal plane and at opposite sides of its pivot-bolt with holes 22, containing concaved-face sliding blocks 23, pressed forward by springs 24, secured to the rear side of the bracket at opposite sides of the strengthening-rib 25.

26 designates a contact-arm projecting from insulatory plate 27, secured by bolts 28 and nuts 29 between the upper ends of metallic plates 30 and 31, respectively, said plates differing from each other only in the fact that plate 30 is substantially square, while plate 31 is substantially U shape, as will be seen by reference to Figs. 1 and 3, respectively, the plates being provided with parallel slots 32 to receive and provide a trackway for the trunnions 33 of a roller 34, which is adapted to alternately occupy opposite ends of slots 32, as hereinafter described.

35 designates a bar which fits against the lower edge of plate 27 and parallel with slots 32 and is secured rigidly between plates 30

and 31 by bolts 36 and nuts 37. Said bar is provided at its front side with an enlargement which projects rearwardly through the bifurcation of the U-shaped plate 31, said enlargement comprising a hub portion 38 and the V-shaped or double cam-surfaces 39 and 40, respectively, and engaging said cam-surfaces at diametrically opposite points from the pivot-bolt 21, and in the same horizontal planes are balls 41 and 42, respectively, said balls fitting in the openings 22 of the bracket and in the concave faces of the spring-pressed blocks 23. (See Fig. 5.) The arrangement is such that the spring-pressure of the balls on the cams of the bar hold the latter at an angle, and therefore hold contact-arms 26 reliably against contact-post 17 or post 18. When the contact-arm engages post 17, balls 41 and 42 respectively engage the upper and lower surfaces of their respective cams 39 and 40, being held reliably in such position by the yielding pressure applied on said balls. When the contact-arm 26 is in engagement with post 18, the balls 41 and 42 respectively engage the lower and upper surfaces of their respective cams 39 and 40, being held reliably in such position by the spring-pressure applied on the balls. When the shoe-sections sag, as shown in Fig. 1, and the lift-plate 12 is depressed by gravitative action to the position shown in Figs. 1 and 2, it will be apparent that the spring-pressed balls hold the slots 32 pitched at about the angle shown and that in consequence the roller 34 occupies the lowest point of said slot and is vertically over one of the lift-plate cavities—cavity 13, for instance—as in Fig. 1. Now as the trolley-wheel 43 enters the block hereinafter referred to it pushes up the sagged or middle portion of the shoe and by such action raises block 5 and seat-plate 12, the elevation of the latter forcing it against roller 34, and thereby causing the "rock-frame," as the parts pivotally carried by the bracket are hereinafter termed, to rock in the direction indicated by the arrow, Fig. 1, overcoming in such action the resistance offered by the spring-pressed balls. The pressure of the lift-frame continues until the rock-frame has passed the center between the contact-posts, the balls at the same time riding over the ridges of the cams and by pressure against the opposite surfaces of the latter from those previously engaged continuing the movement of the rock-frame after the upward movement of the lift-plate ceases until such rocking movement terminates by the engagement of the contact-arm with the contact-post 18, as shown in Fig. 3. At the instant the rock-frame has passed the center the trolley-wheel passes from beneath the chair and permits the shoe to settle or sag back toward its original position, this movement obviously being accompanied by the gravitative action of the lift-plate 12 from the elevated position shown in Fig. 3 to its normal position, as shown in Figs. 1 and 2. It attains its normal position by the time the trolley-wheel has passed from engagement with the shoe. At the same time roller 34 rolls from the elevated to the depressed end of slots 32 to be ready for the next elevation of the lift-plate. With the passage of the next trolley-wheel in the same direction or in the opposite direction the lift-plate is again raised and the contact-arm thrown in the opposite direction or into reëngagement with the post 17, the lift-plate of course again dropping back to its original position after the passage of the trolley-wheel. It will thus be seen that the arm 26 makes contact alternately with posts 17 and 18 with each passage of a car without regard to the direction of their travel. A flexible conductor 44 connects contact-arm 26 with a bolt 45, insulated from the chair and bracket, and electrically connected to said bolt is a conductor 46.

In Fig. 6 I show a construction whereby the first car passing in a certain direction will operate the switch, but cars following in the same direction and before the passage in the opposite direction of another car will pass such switch inoperatively. The object of this relation of parts is hereinafter explained.

In Fig 6 the rock-frame instead of being provided with slots 32 and rollers 34 is provided with downwardly-diverging arms 47 and 48 instead of the lift-plate and shoe for lifting the same. By the action of the trolley-wheel I provide a lever 49, carried by the bracket 10, and so weighted as to normally hang in a vertical position, being equipped with a roller 50 at its upper end, which is adapted to alternately engage arms 47 and 48 for the purpose of closing or opening the switch. In Fig. 6 the parts are arranged in the position they occupy as the trolley-wheel passes in the direction indicated by the contiguous arrow. In such passage the wheel strikes the lower end of the lever and swings it in the direction indicated by the contiguous arrows to the position shown, and thereby causes it by pressure of roller 50 on arm 48 to throw the rock-frame until arm 26 is in engagement with post 17. After the trolley has passed the lever swings back to approximately a vertical position, and in such position it is obvious that any number of cars may pass in the direction indicated without affecting the position of the rock-frame. It will be seen, however, that the passage of a trolley-wheel in the opposite direction will instantly cause the lever to reverse the switch.

The signal mechanism is constructed as follows: 51 is an insulatory base-plate equipped with an electromagnet 52, having its armature 53 carried by lever 54, mounted on bracket 55. The opposite end of the lever is pivotally connected by a link 56 to the crank 57 of a shaft 58, journaled in brackets 59, the outer end of said shaft carrying rigidly a

semaphore 60. The arrangement is such that the deënergization of the magnet is followed by the downward swing of the semaphore to a vertically-pendent position. When the magnet is energized, it attracts its armature and operates lever 54, which through the link 56 and crank-shaft 57 raises the semaphore to operative position, as shown in Fig. 8 and dotted lines, Fig. 9.

By reference to the diagrammatic view, Fig. 9, which represents a block equipped at each end with a switch of the character illustrated on Sheet 1, for instance, and the signal mechanism of the character described, it will be seen that conductors 19 of the switches are grounded, that conductors 20 are connected to the trolley-wire, and that conductors 46, leading to contact-arms 26, as described, are connected to the electromagnets 52, said magnets in turn being connected by conductor 61, upon which and contiguous to their respective semaphores are incandescent lamps 62. This signal mechanism in practice is inclosed within a casing, (not shown,) from which the semaphores project when occupying their operative position.

In a block equipped with the switch shown in Sheet 1 and with both switch-arms in contact with posts 17, as shown in dotted lines, Fig. 9, it will be seen that the circuit through the signal mechanism is broken, which will signify to the motorman of the car approaching the block that the block is open. As such car enters the block when traveling in the direction indicated by the arrow, Fig. 9, the trolley-wheel throws the contact-arm from post 17 to post 18 and instantly establishes a circuit, as follows: from the trolley-wire through conductor 20 to said post 18, then through the contacting arm 26 and conductor 46 to the contiguous magnet, and from the latter through the lamps and to the companion magnet, and from the latter through the other conductor, 46, to the other contact-arm, 26, then through post 17 and conductor 19 to the ground, thus establishing a circuit through the latter to the ground connection of the trolley-wire. (Not shown.) The energization of the magnets instantly raises the semaphores to operative position and flashes light from the lamps, the semaphores being for day and the lamps for night signaling, it being understood, of course, that any other signal, such as a constantly-ringing bell, may be employed in lieu of or in conjunction with the signal mechanism shown. The signal continues in operative relation, so as to notify cars approaching the block from either end that a car is upon the block. As said car passes out of the opposite end of the block its trolley throws the other contact-arm from post 17 to post 18, and thus short-circuits the current from the signal mechanism through the wire 1. This short-circuiting action results in the demagnetization of the magnets, and therefore in the extinguishing of light from the lamps and in permitting the semaphores to drop to their inoperative positions to signal to cars approaching either end of the block that the block is open for the passage of the next car. As the next car enters the block it throws the first switch-arm back to contact-post 17, and thus opens up a circuit through the signal mechanism and the ground to reënergize the magnets and operate the signal mechanisms, as before.

With the switch shown in Fig. 6 it will be apparent that the passage of the first car will dispose the signal mechanism in operative position, but that all cars following in the same direction before the passage of a car in the opposite direction will not affect the signals, as hereinbefore explained. In certain connections switches of the character shown in Fig. 6 will be found preferable to the switch shown in Sheet 1.

The apparatus shown and described relates to a two-point switch; but it is to be understood that it can be used in connection with a three-point or other multiple-point switch and that it can be used in conjunction with a metallic circuit instead of a ground and, furthermore, in conjunction with a signal-circuit which receives its current from a source of supply independent of the trolley-wires.

From the above description it will be apparent that I have produced an electric switch which embodies the features of advantage enumerated as desirable and which is obviously susceptible of modification in various particulars without departing from the essential spirit and scope or sacrificing any of its advantages.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. An electric switch, comprising a pair of contact-posts, a contact-arm pivoted at a point between the vertical planes containing the axes of said posts, a lift-plate to oscillate said arm from one post toward the other, and means for yieldingly resisting the first part of the movement of said arm and then for continuing such movement until the arm contacts with the other post.

2. An electric switch, comprising a pair of contact-posts, a contact-arm pivoted at a point between the planes containing the axes of said posts, a trolley-operated lift-plate to oscillate said arm from one post toward the other, and means for yieldingly resisting the first part of said movement and then for continuing such movement of the arm until it contacts with the said other post.

3. An electric switch, comprising a pair of contact-posts, a contact-arm, pivoted at a point between the vertical planes containing the axes of said posts, a lift-plate to oscillate said arm from one post toward the other, and a spring for resisting the first part of the move-

ment of said arm and then for continuing such movement until the arm contacts with the other post.

4. An electric switch, comprising a pair of contact-posts, a movable contact-arm to alternately engage said posts, a shoe consisting of two sections arranged endwise together and pivoted at their remote or outer ends, and means whereby upward movement of the proximate ends of said section shall throw said contact-arm away from one of the contact-posts and toward the other.

5. An electric switch, comprising a pair of contact-posts, a movable contact-arm to alternately engage said posts, a shoe consisting of two sections arranged endwise together and pivoted at their remote or outer ends, means whereby upward movement of the proximate ends of said sections shall throw said contact-arm away from one of the contact-posts and toward the other, and means for yieldingly resisting movement of the contact-arm from engagement with either post.

6. An electric switch, comprising a pair of contact-posts, a rock-frame provided with a contact-arm for alternate engagement with said posts, a roller carried by and movable transversely of said frame, a lift-plate provided with a pair of cavities in its upper side for alternate engagement with said roller, means to raise the lift-plate to cause it to press against said roller, with the latter engaging one of said cavities, and thereby move the contact-arm from one contact-post toward the other, and means to hold said rock-frame yieldingly in the position to which it was shifted by the lift-frame.

7. An electric switch, comprising a pair of contact-posts, a rock-frame provided with a contact-arm for alternate engagement with said posts, a roller carried by and movable transversely of said frame, a lift-plate provided with a pair of cavities in its upper side for alternate engagement with said roller, means to raise the lift-plate to cause it to press against said roller, with the latter engaging one of said cavities, and thereby move the contact-arm from one contact-post toward the other, means to hold said rock-frame yieldingly in the position to which it was shifted by the lift-frame, and a shoe consisting of two sections in longitudinal alinement and pivoted at their outer or remote ends and loosely together at their contiguous ends to permit of a limited up-and-down movement, and underlying the lift-plate to raise the same in their upward movement, and permit it to reverse such operation in their descending movement.

8. An electric switch, comprising a pair of contact-posts, a slotted rock-frame, a roller movable in the slot of said frame, a contact-arm carried by said frame, a lift-plate to rise and engage said frame to move the contact-arm from one post toward the other, and means for yieldingly resisting the first part of such movement and then for continuing such movement of the rock-frame until its said arm contacts with said other post.

9. An electric switch, comprising a pair of contact-posts, a contact-arm for alternate engagement with said posts, a movable shoe, and instrumentalities whereby movement of said shoe in one direction causes the contact-arm to move from one post toward the other, and means for yieldingly resisting the first part of such movement, and then for continuing such movement of the arm until it contacts with said other post.

10. An electric switch, comprising a suitable support or bracket, a pair of contact-posts supported from said bracket, a spring-actuated block carried by said bracket, a rock-frame carried by said bracket and provided with a contact-arm to alternately engage the posts, a bar carried by said frame, and provided at opposite sides of the pivotal point of the frame with double cam-surfaces, balls held by said spring-actuated blocks against diagonally opposite sides of said cam-surfaces, and means for overcoming the resistance of said springs and rocking said frame until said balls ride over the ridges of said double cam-surfaces and engage the opposite sides of the latter.

11. The combination of a trolley-wire, a pair of contact-posts electrically connected to the same, a second pair of contact-posts electrically connected to the ground, a contact-arm to operate between each pair of posts connected to the ground and to the trolley-wire, a conductor connecting said contact-arms, a pair of electromagnets in circuit with said conductor, sets of incandescent lamps in circuit with said conductor, levers equipped with armatures for said magnets, pivoted semaphores weighted to normally occupy inoperative positions, and connections between said levers and semaphores whereby the passage of the current through the electromagnets and lamps shall light the latter and dispose the semaphores in operative position.

In testimony whereof I affix my signature in the presence of two witnesses.

WILLIAM J. MURRAY.

Witnesses:
H. C. RODGERS,
G. Y. THORPE.