No. 860,532. PATENTED JULY 16, 1907.

R. C. CRAM & C. L. GRAVES.

CIRCUIT CLOSING DEVICE.

APPLICATION FILED AUG. 2, 1906.

2 SHEETS—SHEET 1.

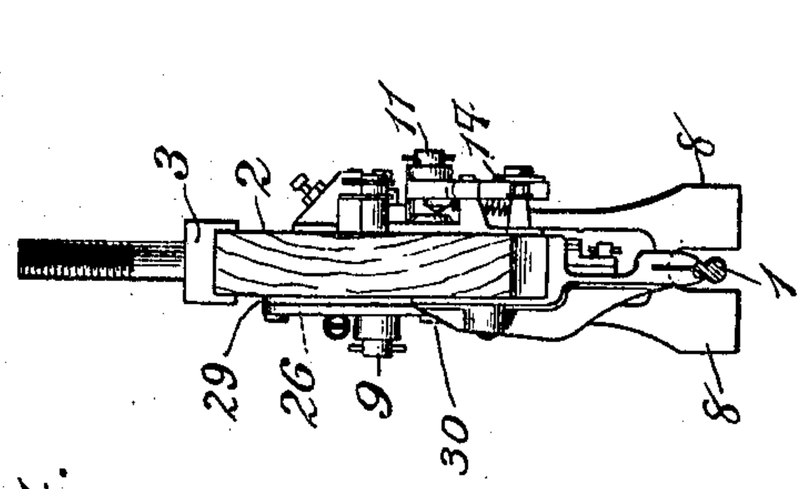

Fig. 4.

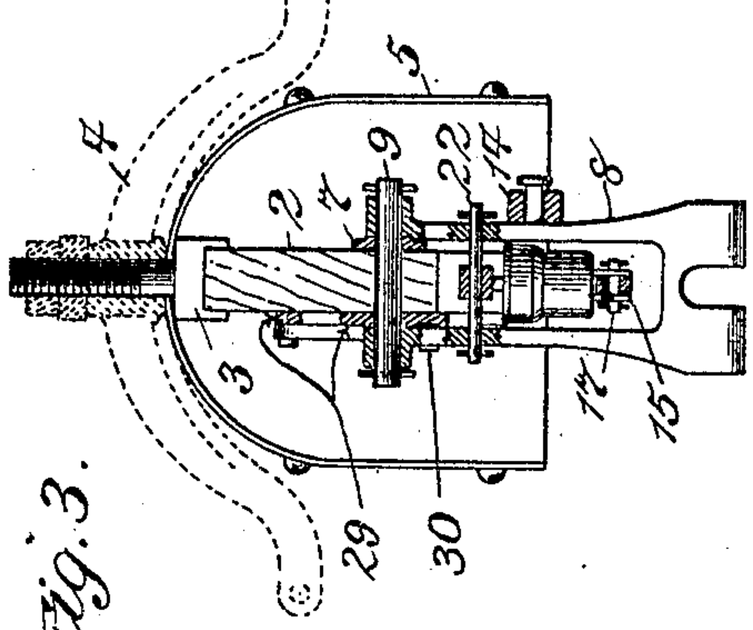

Fig. 3.

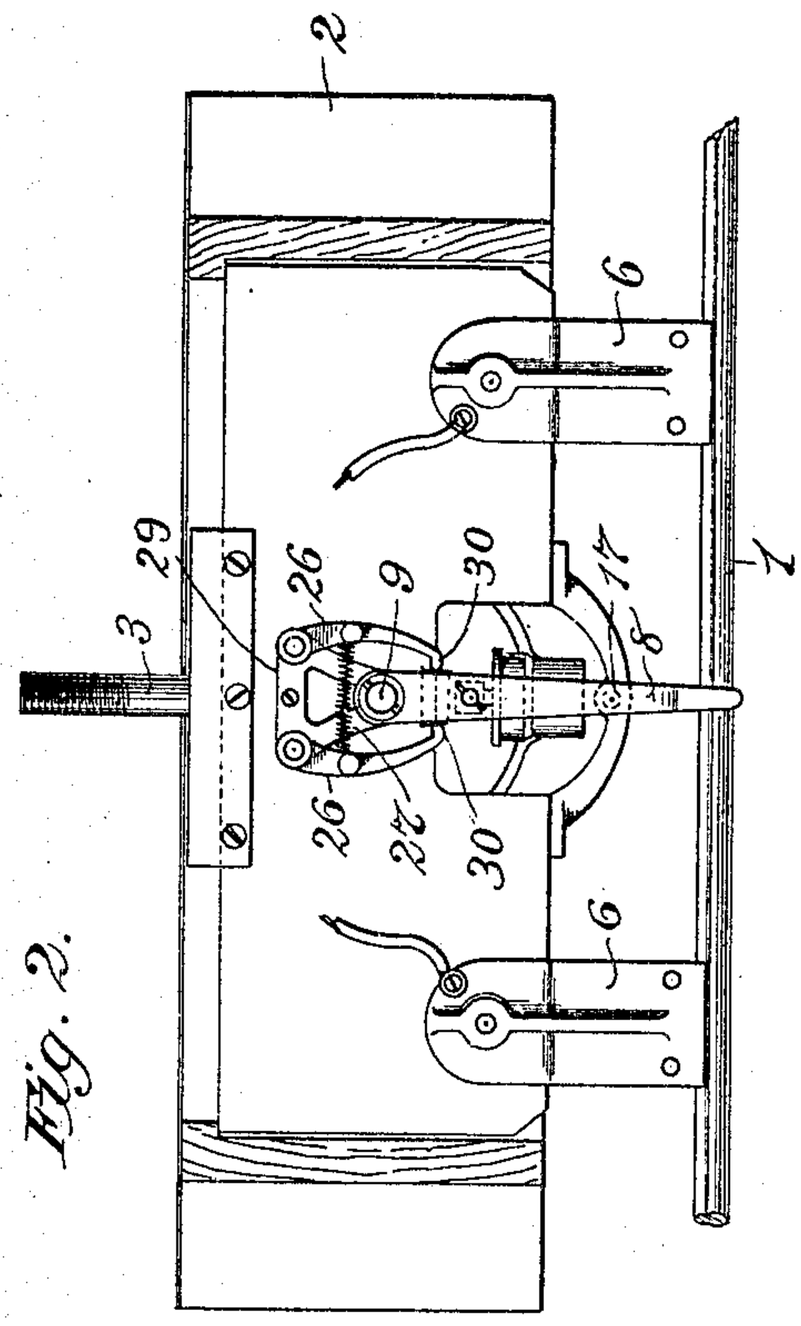

Fig. 2.

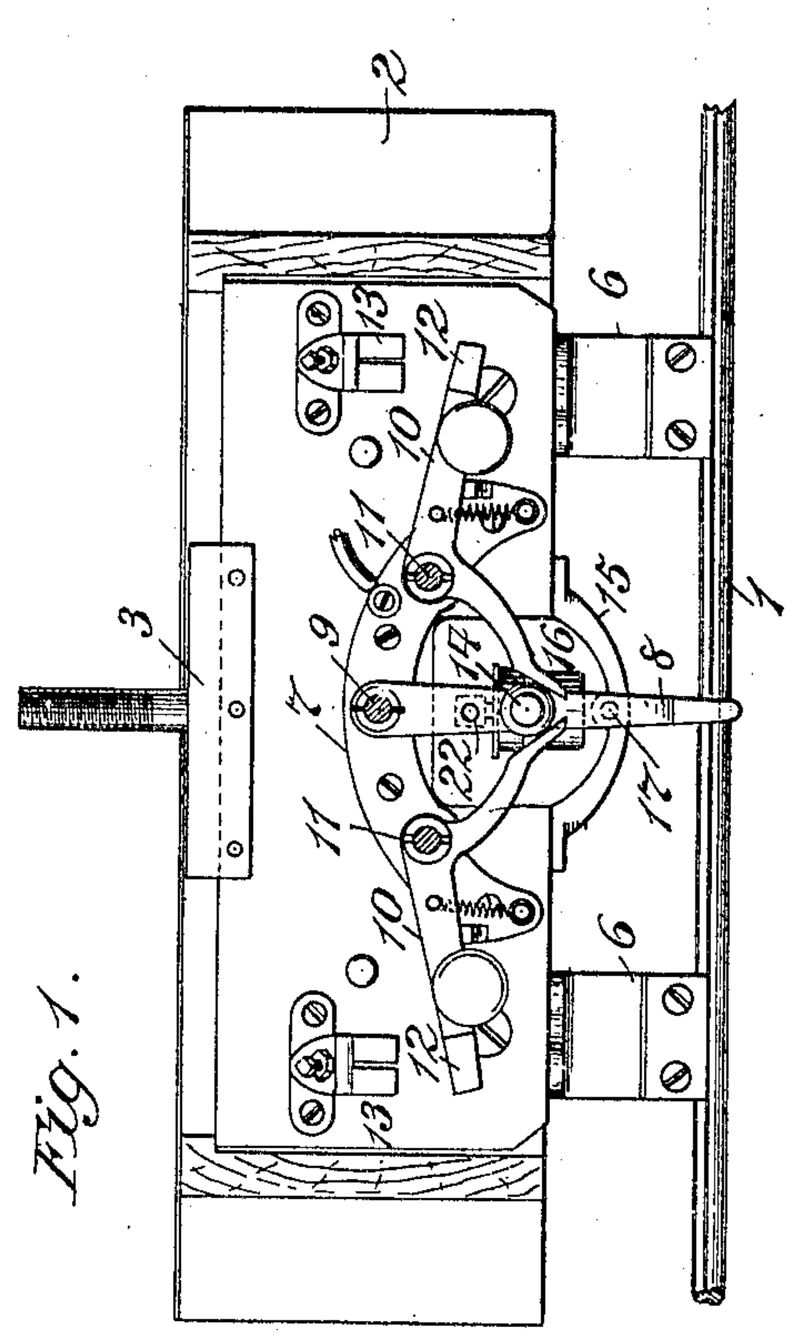

Fig. 1.

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2 SHEETS—SHEET 2.

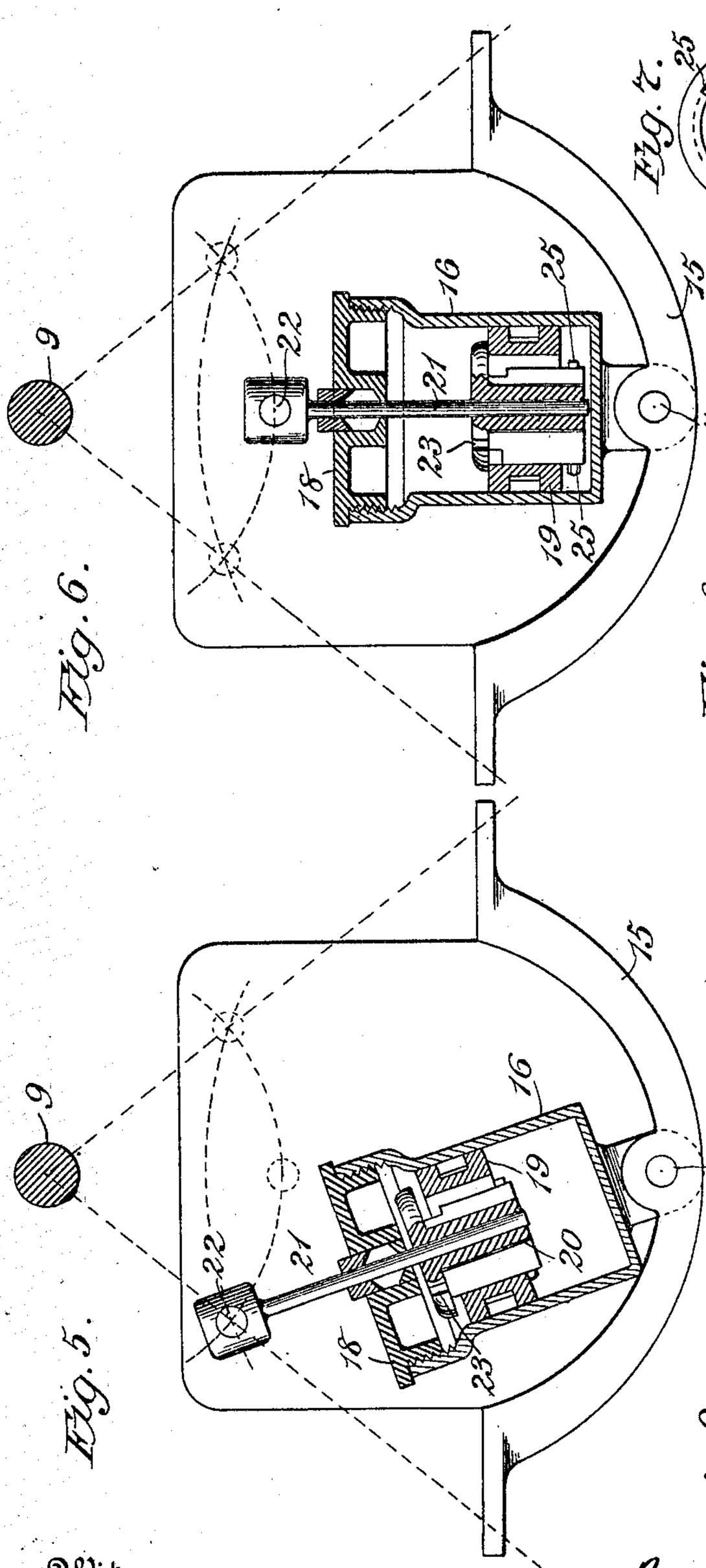

Fig. 6.

Fig. 5.

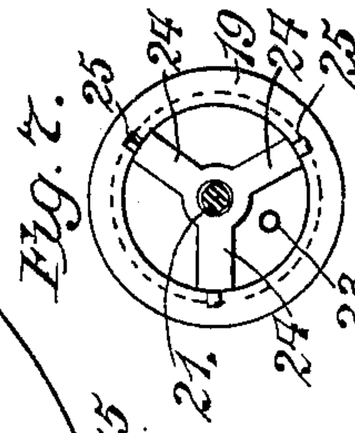

Fig. 7.

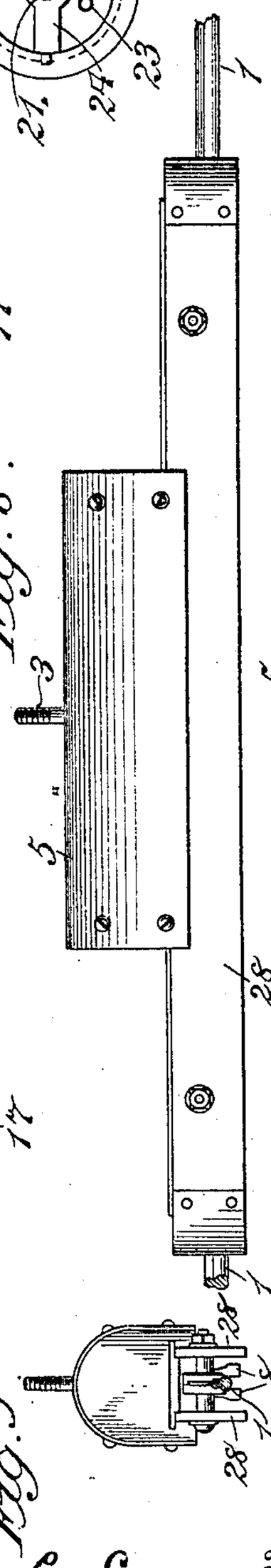

Fig. 8.

Fig. 9

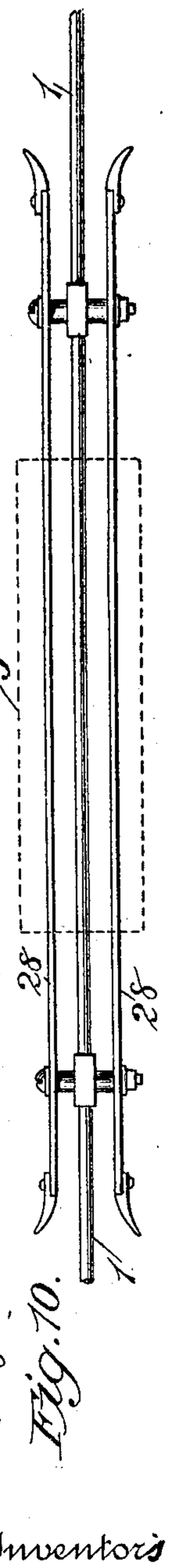

Fig. 10.

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UNITED STATES PATENT OFFICE.

ROY C. CRAM, OF BRIDGEPORT, AND CHARLES L. GRAVES, OF MILFORD, CONNECTICUT, ASSIGNORS TO WILLIAM GRUNOW, JR., OF BRIDGEPORT, CONNECTICUT.

CIRCUIT-CLOSING DEVICE.

No. 860,532. Specification of Letters Patent. Patented July 16, 1907.

Application filed August 2, 1906. Serial No. 328,971.

To all whom it may concern:

Be it known that we, ROY C. CRAM and CHARLES L. GRAVES, citizens of the United States, and residents of Bridgeport, Fairfield county, State of Connecticut, and Milford, New Haven county, State of Connecticut, respectively, have made a new and useful Invention in Circuit-Closing Devices or Switches for Use in Connection with Electric and other Railways, of which the following is a specification.

Our invention is directed particularly to an automatic circuit closing device or switch adapted to be used in connection with signal systems for electric and steam railways and in which it is desired to automatically close a circuit, either to a signal, an indicator, or other electric translating device, when a car passes a given point and in such manner as to be operative no matter in which direction and at what speed the car may be moving.

Our invention has for its objects, first, to provide a circuit closing device or switch which will maintain an electric circuit closed for a definite interval of time, such as will be sufficient to enable the current flow to operate the signal or other translating device included in the circuit therewith, said switch automatically interrupting the circuit after the predetermined expiration of time; second, to provide such an operating switch in connection with railway systems, the same being so constructed as to enable the switch to be effectively closed as a car passes a given point in either direction, no matter what the speed of the car may be. Third, to provide such a switch for the purpose of effecting the closure of the circuit in the manner described to independent translating devices, such as railway signals or the like. Fourth, to provide a switch of the nature referred to which shall be of the pendulum or vibratory type and so constructed and arranged that it will be free from damaging effects of a swaying trolley wire or the wind. Fifth, to provide, in connection with such a switch, guiding means for effectually guiding the trolley as it passes the switch into operative contact therewith so that by no possibility can there be a failure of the operation of the switch. Sixth, to provide a switch of the nature referred to which shall be equally applicable when inverted or turned over, to conduit or third rail electric railway systems, also steam railways, its operation then being effected by a projecting stud or the shoe of the motor car. Seventh, to provide a switch of the nature referred to which shall be held closed for a definite time interval and locked in such closed position against means for restoring it to its normal or open position when unlocked; eighth, to provide a switch of the nature referred to which shall be adapted to be operated in opposite directions by a passing car and shall remain closed for a definite time interval, due to the presence of liquid retarding or controlling means.

Our invention will be fully understood by referring to the accompanying drawings, in which

Figure 1 is a longitudinal sectional view taken through the body of the protecting hood or cover and illustrating in side elevational view the essential operative parts of the switch, showing also the manner of connecting the conducting parts thereof to a trolley wire. Fig. 2 is a similar sectional view as seen in elevation from the opposite side of that upon which Fig. 1 is illustrated. Fig. 3 is a vertical sectional view taken through the center of Fig. 1 and as seen looking thereat from left to right. Fig. 4 is an end elevational view as seen looking at Fig. 1 from left to right, the hood or cover not being shown. Fig. 5 is an enlarged part side elevational, part sectional view of the retarding device and its means of support, showing the retarding means in that position which it maintains when the switch contacts are closed. Fig. 6 is a similar sectional view showing the like parts in normal or vertical position, or when the switch contacts are open. Fig. 7 is a detail plan view of the movable part of the dash-pot portion of the retarding mechanism. Fig. 8 is a side elevational view illustrating the protecting hood for the apparatus and one of the guide-ways which prevent the trolley-wheel from jumping, or failing to actuate the switch as it passes the same. Fig. 9 is an end elevational view as seen looking at Fig. 8 from left to right; and Fig. 10 is a plan view illustrating the relation of the guide-ways to the trolley and the switch, a portion of the protecting hood being shown in dotted lines.

It is a well known fact that when it becomes necessary to operate electromagnetically controlled devices, such as railway signals or similar translating devices, or electromagnetic devices generally, a definite time interval is required to magnetize the cores of the operating magnets, so that in the operation of such devices when it becomes necessary to effect such operation for a definite time only, it is important that a circuit closing device be utilized which will establish a time element.

Our invention has this special point of utility in view, in order that when used in connection with electric and other railway signals where it becomes necessary to operate the signals there shall be a sufficient time element to effect the closure of the circuit through the controlling magnets, no matter what may be the speed of the car which mechanically operates the switch.

To this end we have devised a novel form of switch which will be fully understood by referring to the accompanying drawings in detail, referring first to Figs. 1 to 4 inclusive.

1 represents the trolley wire and 2 a wooden, slate or

other insulating base or support for the operative parts of the switch, 3 being a metallic hanger secured by screws to the base and adapted to be sustained by nuts from a curved hanger arm 4, as shown in dotted lines Fig. 3.

5 is a metallic hood which covers the entire switching apparatus.

6, 6, are metallic parts connecting the trolley wire directly to the operative parts of the switch, said parts being secured by screws to the insulating base 2.

7 is a metallic frame secured to the insulating base and 8 is a bifurcated switching arm pivotally supported to the frame 7 by a pin 9, the bifurcated portion of the switch straddling the trolley wire in the manner shown.

10, 10 are switching levers pivotally supported upon the metallic frame by pivot pins 11, 11, said switching levers having the curvilinear shape shown at their adjoining ends with knife like contacting portions 12, 12 at their other ends adapted to make good electrical contact between the conducting fingers 13, 13 which are connected by conductors to independent translating devices located at any desired distance. The switching levers 10, 10 are provided with retractile springs and weights, as shown, for holding them in their lower positions and out of contact with the fingers 13, 13.

14 is a friction roller carried by the arm 8 and resting normally between the inclined faces of the curvilinear portions of the switching levers 10. The relation of the friction roller 14 to the inclined surfaces of the curvilinear arms and the interior curvilinear portions of such arms is such that when the arm 10 is moved by the roller it will first close the switch and said roller, as the arm is carried forward, will constitute a locking element for locking the switch closed a definite time, dependent upon the operation of the retarding device, as will be more particularly described hereinafter.

15 is a supporting yoke secured by screws to the bottom of the insulating base 2, said yoke constituting the support of the cylindrical part of a dash-pot 16, which is secured to the yoke by a pivot pin 17.

18 is a detachable cylindrical head of the dash-pot and 19 constitutes the movable part or piston of said dash-pot, the same being in the nature of a metallic ring provided with an exterior groove for a packing or frictional expanding ring; 20 is a vertical movable part having three radial arms 24 and check pins 25, 25, at its bottom and a valve or hood at its top provided with a vent opening 23; 21 being a piston rod rigidly connected to the part 20 and pivotally connected by a pin 22 to the two sides of the bifurcated switching arm 8, as clearly shown in Fig. 3, the arrangement being such that when the arm 8 is moved in opposite directions the movable part of the dash-pot will be drawn to its upper position, as shown in Fig. 5, and when remaining stationary will assume the position shown in Fig. 6, said dash-pot being filled with mercury or any oil or other liquid which will not gum or freeze.

26, 26 are levers pivoted at their upper ends and held together with their lower ends or toes 30, 30 resting against the opposite stop faces of their frame plate 29, also against the opposite faces of the bifurcated switching arm 8 by a spring 27, the function of each lever and the spring being to force the switching arm back to its normal vertical position from either direction, and to there hold it against any possible movement due to the swaying of the trolley wire or wind (see Figs. 2, 3 and 4).

28, 28 are guide-ways of metal or wood secured on opposite sides of the trolley wire for the purpose of guiding the trolley wheel so that it will certainly come into operative contact with the bifurcated end of the switching arm 8.

The operation is as follows—Normally the circuit is open between the contacting portions 12, 12 of the switching levers 10, 10, and the fingers 13, 13 electrically connected to the signals or other translating devices, and the movable part of the retarding device or dash-pot is in the lower position shown in detail in Fig. 6; the bifurcated switching arm being held in its vertical position by the levers 26, 26 and spring 27. Should a car pass in either direction the trolley wheel enters between the guide-ways 28 at either end, say from the left, and instantly causes the lower end of the arm 8 to be moved from left to right. This action causes the roller 14 to move up on the inclined portion of the switching lever 10 on the right, a sufficient distance to close the circuit between the contact points 12 and 13. During the further continued movement of the arm 8, after the roller 14 has assumed a position upon the curvilinear part of the switch arm 10 said roller acts as a locking device for locking the switch closed during the time that the arm is moving through the rest of its phase and during its return movement for a like time. As the arm 8 moved to the right an upward motion was simultaneously imparted to the central movable part of the retarding device, lifting the cap off the movable piston and thereby allowing the mercury, oil, or liquid in the upper portion of the retarding device to flow rapidly to the lower portion thereof. As soon, however, as the arm 8 assumed its extreme angular position and was released, one of the levers 26 and spring 27, together with the action of the weight and retractile spring of the switching arm 8, began to exert a return movement to all of the parts; consequently, the interior movable part of the retarding device was seated with the cap over the open part of the part 19 and mercury, oil, or liquid was allowed to return to the upper chamber only through the small vent 23, which necessarily precludes the speedy movement of the parts; therefore, the switching contacts were held together for a definite interval dependent upon the size of the vent opening 23, the tension of spring 27 and the action of the weight and retractile spring of the switching arm 8, the switch being locked in its closed position during the time that the roller 14 was passing upward over the curvilinear portion of the switching arm 10 and returning to its normal position.

It will be understood, of course, that the movement of the trolley in a reverse direction will operate the other switching lever and close the circuit on the other side as the car passes, locking the parts in such a closed position. With such a device we are enabled to effect the closure of a circuit to a translating device for such a time interval as may be deemed necessary to be effective.

We are aware that it has heretofore been proposed to provide a circuit closing switch for use in connection with the trolley-wire, third rail, or other power con-

ductor of an electric railway system adapted to be actuated by a moving trolley, and to maintain the circuit closed for a predetermined time and also to lock the switch in such closed position, one such device being in the nature of a trolley actuated switch electrically and mechanically connected with a controlling electromagnet in such manner that after the trolley actuates the switch the circuit is maintained closed through the direct action of the electromagnet, due to a portion of the operating current passing through such magnet.

We are also aware that it has been proposed to utilize a switch of this general nature in connection with electric systems of the character referred to, in which the circuit is closed when a car is moving in either direction by the mechanical operation of a trolley-wheel as it passes the switch and maintained closed for a definite interval of time through the agency of an escapement which retards the return of the parts to their normal or open circuit position, the arrangement being such also that the switch is held in a locked closed position during such interval of time.

With circuit closing devices of the first-named character in which the operation is controlled by an electromagnet utilizing a part of the working current, it is possible that after a car has passed the switch and set the controlling parts thereof, a discontinuance of the power house current would demagnetize the magnet and, therefore, render the device ineffective by restoring the signal or other translating device to its normal or non-danger position; while with a device of the second-named character, in which the retarded movement is effected by an escapement and interconnected mechanical parts, it is possible that the parts will not effectually operate should the trolley pass the switch at abnormally high speed, thereby imparting a too sudden blow to the operating parts of said switch. In other words, with a device of such a nature a rapid or high speed movement of the trolley wheel puts upon the operative parts of the escapement an undue strain so that the parts thereof are liable to become disarranged or ineffective, while with our device, owing to the flexibility or yielding nature of the retarding portion of the apparatus due to the structural arrangement of the movable part of the dash-pot, we are enabled to cause the retarding liquid to be moved from one part of the chamber thereof to the other, either quickly or slowly, in direct accordance with the impact or blow action of the trolley-wheel upon the switch controlling arm or part; that is to say, it is immaterial what may be the speed of the car, the low speeds transferring the liquid at relatively slow velocities without undue strain upon the parts and the high speeds quickly opening wide the venting means in such manner as to transfer the liquid in relatively larger volumes.

We are also aware that a retarded circuit closing device adapted to be actuated by the trolley-wheel of an electrically propelled car has heretofore been devised in which there is utilized an air controlled dash-pot for retarding the opening of the circuit after it has been once closed by the passage of a car, the construction also being adapted to utilize two independent dash-pots for the retarding mechanism adapting it for use with cars traveling in either direction, and we make no claim hereinafter broad enough to include such a structural device, our most generic claim in this particular being directed to a single liquid controlled retarding device operatively connected with two sets of circuit closing devices adapted to be operated in opposite directions by a passing car.

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

1. A circuit closing switch for use in connection with the power conductor of a railway system, embracing a pivoted switching arm having its free end closely adjacent to said conductor; in combination with two switching levers and pairs of movable and fixed contacts therefor; together with means for normally holding the switching arm so that the circuit is open, and a single liquid controlled retarding device operatively connected with the pivoted switching arm, the arrangement being such as to retard the restoration of the arm to normal position after it has been moved aside by a car passing in either direction, substantially as described.

2. In a railway system a pivoted switch arm adapted to be moved in either direction by a passing car; in combination with two switching levers and circuits and circuit connections; together with a single liquid controlled retarding device for maintaining the circuit closed a definite time after the car has passed either way, substantially as described.

3. A switch embracing two fixed contacts adapted each to be connected to an independent circuit, and movable contacts or bridges, one for each fixed contact, said movable contacts or bridges being operatively controlled by a pivoted switching arm adapted to be moved in opposite directions; in combination with a single liquid controlled retarding device operatively connected with the pivoted switching arm for restoring the movable contacts to normal or open poistion after a predetermined time, substantially as described.

4. A switch embracing a pivoted switching arm; a pair of switching levers adapted to be operated one only at a time, according as the switching arm is rotated in either direction, and a single liquid controlled retarding device connected to the switching arm and adapted to restore it to normal, substantially as described.

5. A switch embracing two switching levers each provided with a movable contact at one end; independent fixed contacts for each lever; an operating switching arm pivotally supported between the ends of the switching levers, and a single liquid controlled retarding device operatively connected to the switching arm, substantially as described.

6. A switch embracing a pivoted switching arm; a single dash-pot retarding device having its movable part connected to said switching arm; in combination with two switching levers adapted to be operated alternately by the switching arm, and circuits and circuit connections whereby the circuit may be closed in opposite directions and maintained closed for a definite time by the retarding effect of the dash-pot, substantially as described.

7. A switch embracing a pivoted switching arm vertically sustained and provided with means for yieldingly holding it in such position; a pair of switching levers adapted to be actuated alternately by the switching arm; a liquid retarding device having its movable part attached to the switching arm and its fixed part pivotally sustained by the frame of the switch; circuits and circuit connections, substantially as described.

8. In a switch for an electric circuit a pivoted switching arm operatively connected to a liquid controlled retarding device; in combination with a weighted switch lever and yielding means, as a spring, all so interconnected that by the joint action of the weight and the spring the switching arm is restored to normal position, substantially as described.

9. A switch having a pivoted switching arm adapted to hang vertically, and normally so held by yielding means; in combination with one or more switch levers weighted at one end only, and liquid controlled retarding means all acting substantially as described.

10. A switch provided with means for normally holding it in an open position; means for effecting its closure, and means for locking it in such closed position; together with liquid controlled retarding means for restoring the locking means to its normal or released position after a definite interval of time, substantially as described.

11. A switch provided with a fixed and a movable contact; yielding means for normally holding the movable contact in its open position; means for moving the movable contact into its closed position, and simultaneously locking it in such closed position; together with liquid controlled retarding means for restoring the locking means to its normal position and releasing the switch after a definite interval of time, substantially as described.

12. A switch provided with two sets of fixed and movable contacts; means for moving either of said movable sets, said means lying in the path of a trolley-wheel in an electric railway system and being adapted to close the circuit in either direction; means for locking the parts closed and liquid retarding means in combination with additional means for assuring the operation of the trolley-wheel upon the parts of the switch, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ROY C. CRAM.
CHARLES L. GRAVES.

Witnesses:
WM. C. BENEDICT,
I. F. NOBLE.