

(No Model.)

2 Sheets—Sheet 1.

G. VALLEY.
REVERSING AND CUT-OUT SWITCH USED IN ELECTRIC STREET CARS, &c.
No. 561,839.
Patented June 9, 1896.

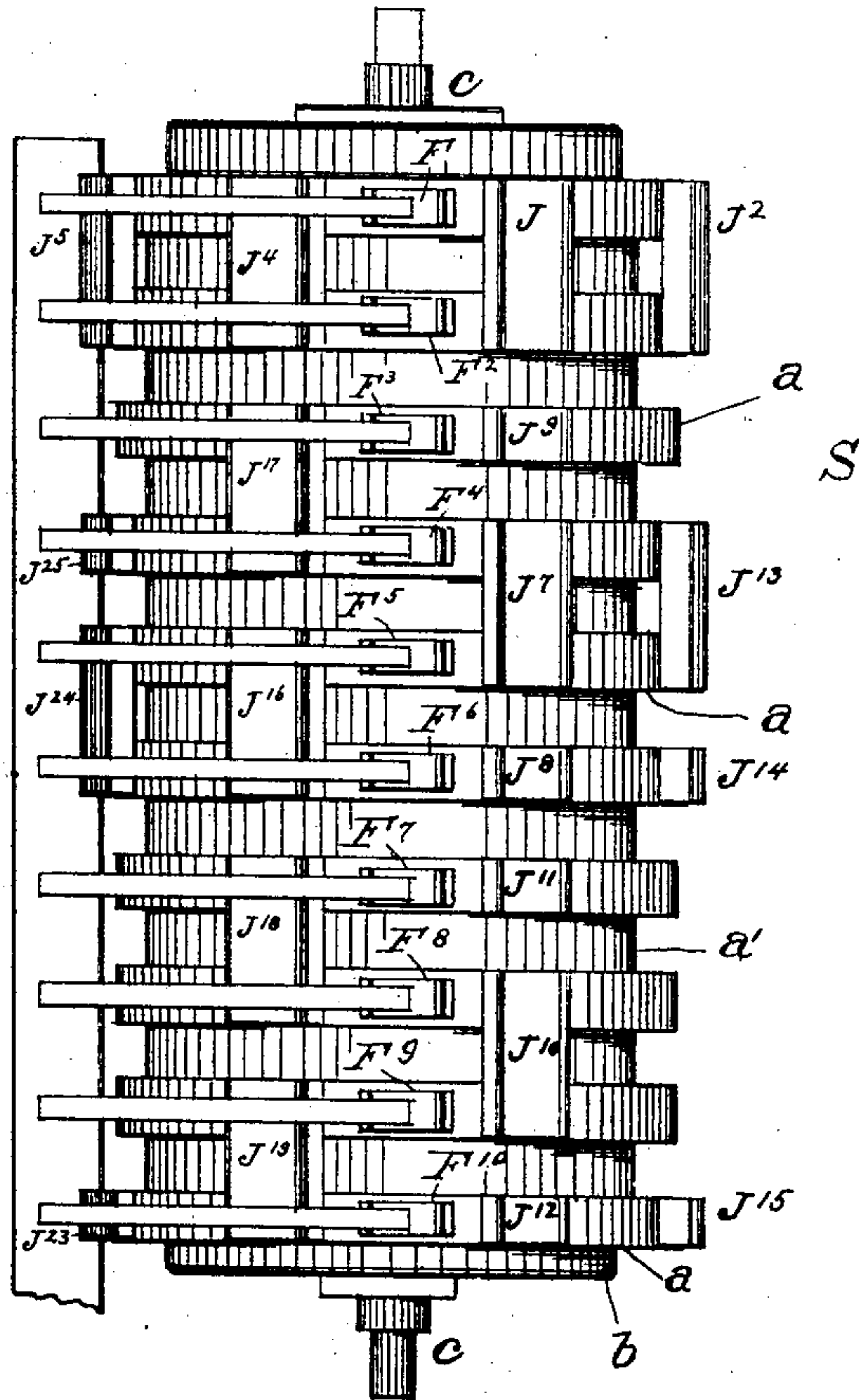


Fig. 1

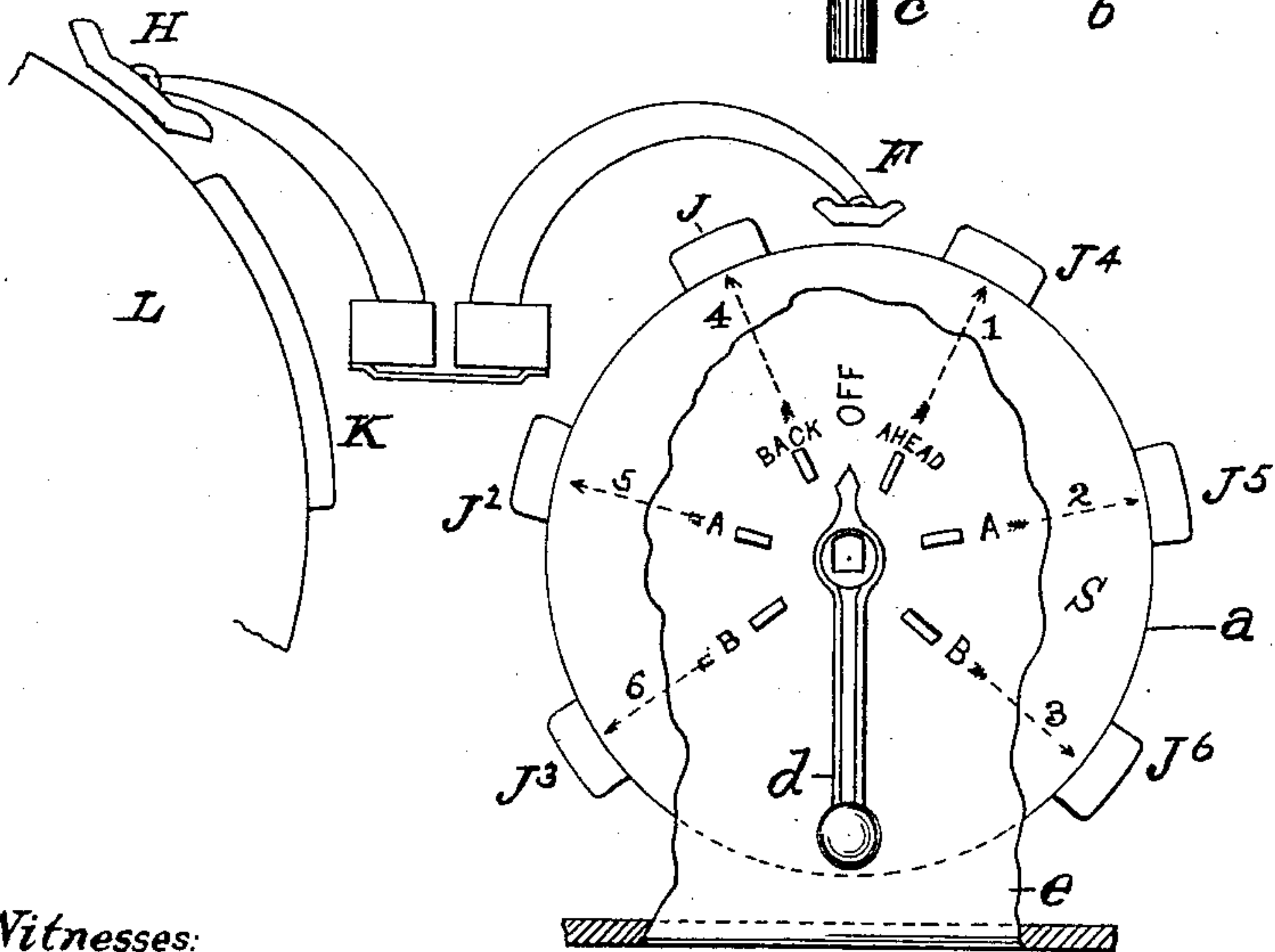


Fig. 2

Witnesses:

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John A. Ryder.

Inventor:

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by *C. M. Vorce*
Attorney.

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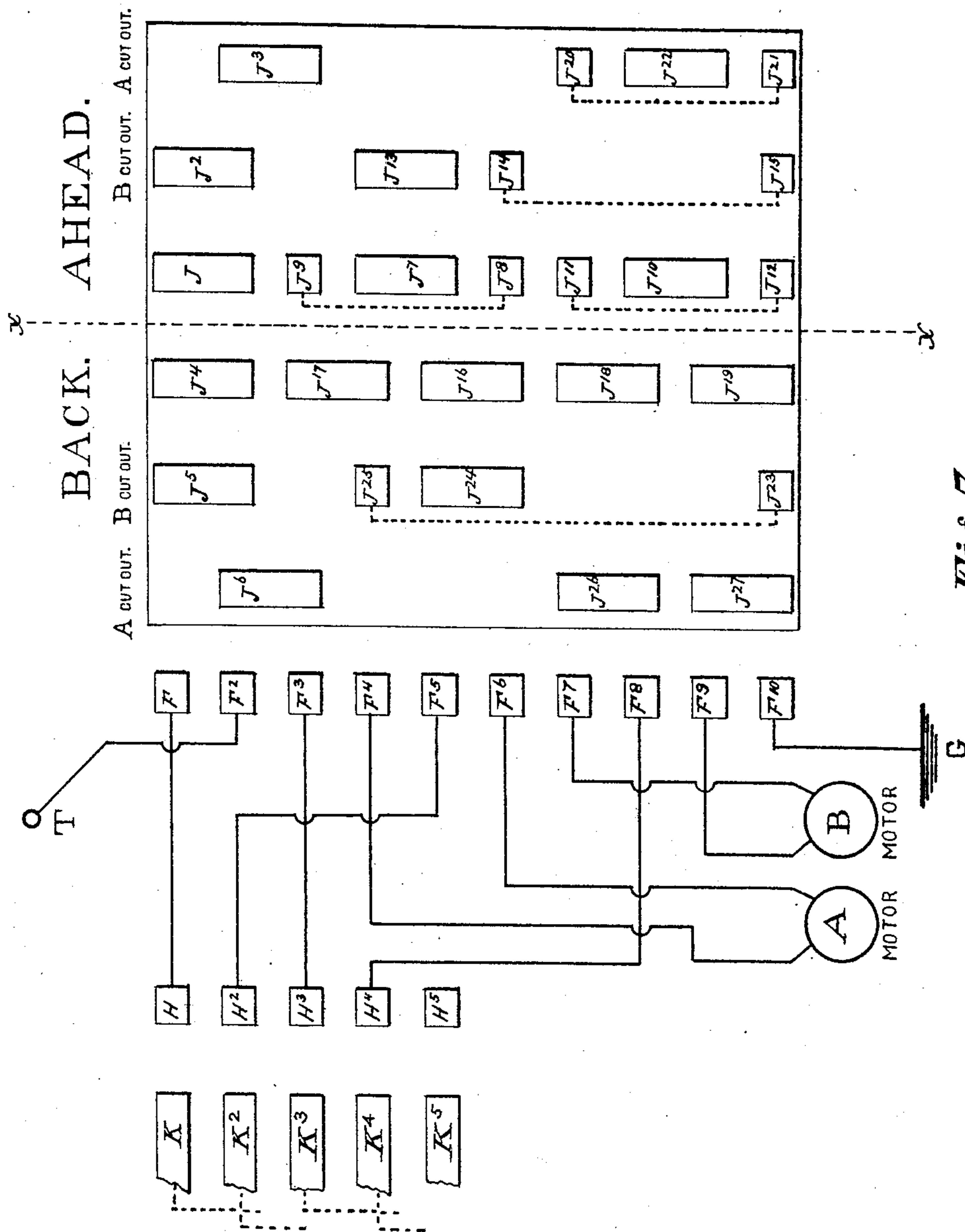


Fig. 3

Witnesses:

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John R. Ryder

Inventor:

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UNITED STATES PATENT OFFICE.

GUSTAF VALLEY, OF CLEVELAND, OHIO, ASSIGNOR TO THE STEEL MOTOR COMPANY.

REVERSING AND CUT-OUT SWITCH USED IN ELECTRIC STREET-CARS, &c.

SPECIFICATION forming part of Letters Patent No. 561,839, dated June 9, 1896.

Application filed February 26, 1896. Serial No. 580,887. (No model.)

To all whom it may concern:

Be it known that I, GUSTAF VALLEY, of Cleveland, Ohio, have invented a new and useful Improvement in Reversing and Cut-Out Switches for Use in Electric Street-Cars, &c., of which the following is a full, clear, and exact specification.

This invention relates to improvements in the reversing and cut-out switches used in electric street-cars, the object being to provide a switch by which the reversing of the motors as well as the cutting out of either motor, whether forward or reverse acting, may be effected by a single switch, and the usual separate reversing-switch and separate cut-outs may be dispensed with. This object is effected by the novel construction, combination, and arrangement of parts hereinafter fully described, and pointed out in the claims.

The essential feature of the invention is a series of fixed contacts—such, for instance, as the spring-actuated “fingers” used in connection with electric switches like the ordinary street-car controller, which fingers are provided with suitable electrical connections to the operating-circuit, and a number of conducting-contacts arranged upon a surface capable of being so moved as to bring the contacts thereon into contact with the fingers or fixed contacts, and thus bridge across between certain of the fixed contacts and pass the current through the same in predetermined courses, the moving contacts being arranged in various sets and series and electrically connected together relative to the fixed contacts and their connections in such manner as to effect the desired results. The moving surface may be plane or cylindrical; but the latter form is regarded as somewhat the more compact and to that extent preferable. For this reason the cylindrical form is shown and described, but without intending to limit the invention thereto.

In the drawings hereto annexed, Figure 1 represents in side elevation the barrel or drum of a reversing and cut-out switch constructed according to my invention. Fig. 2 is a plan view of the top thereof, and Fig. 3 is a diagram showing the development of the drum.

S represents the drum, composed of disks or sections *a*, preferably annular, which are preferably arranged alternately with insulating-disks *a'*, the whole being rigidly fastened together and firmly secured between the end plates *b*, which, being rigidly affixed to the shaft *c*, bind the whole into a rigid cylinder actuated by the handle *d*, fitting upon the angular upper end of the shaft *c*, which protrudes above the case *e*, by which the controller and switch are inclosed. For the sake of clearness the case is omitted in Fig. 1.

J J² J³, &c., are contact-bars of conducting material affixed to and projecting from the periphery of the disks *a*, and which bars are located and arranged as shown in Fig. 3. The dotted lines connecting certain of the bars *J*, &c., of Fig. 3 indicate electrical connection between the bars so joined within the drum

F F² F³, &c., are a series of spring-actuated contacts or fingers of the usual or any preferred construction, and are arranged and adapted to make contact with the conducting-bars *J*, &c., as the drum is rotated. *H H² H³*, &c., are similar contact-fingers so located as to make contact with the conducting-bars *K K² K³*, &c., of the controller-drum *L* as the same is rotated.

The rheostat and field connections are omitted, as they are of the ordinary type and are made, through fingers of the *H* series and the controller-contacts, in the manner familiar to all electricians.

T represents the trolley, *G* the ground connection, and *A* and *B* the motors. Shown in Fig. 3 to represent the armatures of the respective motors.

The fingers of the *F* series are connected, respectively, as follows: *F* to the finger *H*, *F²* to the trolley, *F³* to the finger *H³*, *F⁴* to the forward-acting side of one of the motors, (designated as motor *A*,) *F⁵* to finger *H²*, *F⁶* to the reverse side of motor *A*, *F⁷* to the reverse side of motor *B*, *F⁸* to finger *H⁴*, *F⁹* to the forward-acting side of motor *B*, and *F¹⁰* to the ground connection.

The contact-fingers of the *H* series, so far as concern this invention, are connected as follows: *H* and *H²* are connected, through the controller-contacts and other fingers of the *H* series, (not shown,) with the rheostat, &c.,

interposed, and H^3 and H^4 are similarly connected.

As the connections of the resistance, &c., through the controller-drum are as usual, the contact-fingers H H^2 may be considered, so far as the reversing and cut-out switch is concerned, as directly connected, and the contacts H^3 and H^4 the same, and they will be so described. H is also directly connected with F , H^2 with F^5 , H^3 with F^3 , and H^4 with F^8 .

Referring to Fig. 2, it will be seen that the handle d , as there shown, stands at the "off" position, in which none of the fingers of the F series rest upon any of the contact-bars J , &c., and the current is cut off, and also that the handle stands midway between the forward-moving and backward-moving positions. (Indicated in Fig. 3 by the line x x .) Turning the handle d to point in the direction of the dotted arrow 1 on Fig. 2 will bring the contact J and all the contacts in the same vertical line into contact with their respective fingers of the F series, &c., and the current will pass as follows, (see Fig. 3:) from the trolley through F^2 , J , F , H , H^2 , F^5 , J^7 , and F^4 to the armature of motor A on its forward-acting side, and from its opposite or reverse side through F^6 , J^8 , J^9 , F^3 , H^3 , H^4 , F^8 , J^{10} , F^9 to the forward side of the motor B , and from its reverse side through F^7 , J^{11} , J^{12} , and F^{10} to the ground, thus moving the car ahead with both motors. To cut out motor B and go ahead with motor A only, the handle d will be turned to the position indicated by the dotted arrow 2 of Fig. 2, which would bring the contacts J^2 , J^{13} , J^{14} , J^{15} under the fingers F , &c., and cause the current to pass from the trolley through F^2 , J^2 , F , H , H^2 , F^5 , J^{13} , F^4 , motor A , F^6 , J^{14} , J^{15} , and F^{10} to the ground, avoiding motor B , which would thus be cut out. In a similar manner it will be seen turning the handle d to the position indicated by arrow 3 in Fig. 2 would cut out motor A and go forward with motor B only, and turning it to arrow 4 would reverse both motors, the current passing through F^2 , J^4 , F , H , H^2 , F^5 , J^{16} , and F^6 to motor A in the reverse or backward-acting direction, then through F^4 , J^{17} , F^3 , H^3 , H^4 , F^8 , J^{18} , and F^7 to motor B in reverse direction, and through F^9 , J^{19} , and F^{10} to the ground, backing the car with both motors. Turning the handle to arrow 5 would cut out motor B and back with motor A only, while at arrow 6 it would cut out motor A and back with B only.

The positions indicated by arrows on Fig. 2 are to be marked by suitable lugs, ribs, or letters on top of the controller-case—as, for instance, by the words and letters shown in Fig. 2—and it will be seen by Fig. 3 that whenever the handle d is at a point intermediate between any of the positions indicated by the dotted arrows the fingers F , &c., are between the bars J , &c., and the current is cut off. By this means the cutting out can be done in a fraction of the time required to throw a separate cut-out switch, as the motion of the handle, already in hand, is very slight, and there

is no possibility of any change in the action of the reversing-switch in cutting out, as all positions on one side of the off line are forward-acting and all on the other side are reversed. Further, the attention of the motor-neer need not be diverted, even for an instant, from the track or road in front to cut out or reverse the motors, and no other or additional parts have to be handled by him than the usual two handles operating, respectively, the controller and the reversing-switch.

What I claim, and desire to secure by Letters Patent, is—

1. A combined reversing and cut-out switch for electric street-cars, comprising in combination a moving surface having projecting therefrom a plurality of bridging-contacts arranged in two sets of series, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed contacts arranged in the path traversed by the moving contacts and having electrical connections with the circuit in which the motors are operated, substantially as described.

2. A combined reversing and cut-out switch for electric street-cars, comprising in combination a moving surface having projecting therefrom a plurality of bridging-contacts arranged in two sets of three series each, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed contacts arranged in the path traversed by the moving contacts and having electrical connections with the circuit in which the motors are operated, substantially as described.

3. A combined reversing and cut-out switch for electric street-cars, comprising in combination a rotatable drum having upon its periphery and projecting therefrom a plurality of bridging-contacts arranged in two sets of series, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed contacts arranged in the path traversed by the contacts of the drum and having electrical connections with the circuit in which the motors are operated, substantially as described.

4. A combined reversing and cut-out switch for electric street-cars, comprising in combination a rotatable drum having upon its periphery and projecting therefrom a plurality of lengthwise bridging-contacts arranged in two sets of series, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed contacts arranged in the path traversed by the contacts of the drum

and having electrical connections with the circuit in which the motors are operated, substantially as described.

5. A combined reversing and cut-out switch for electric street-cars, comprising in combination a rotatable drum having upon its periphery and projecting therefrom a plurality of bridging-contacts arranged in two sets of longitudinal series, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed contacts arranged in the path traversed by the contacts of the drum and having electrical connections with the circuit in which the motors are operated, substantially as described.

6. A combined reversing and cut-out switch for electric street-cars, comprising in combination a rotatable drum having upon its periphery and projecting therefrom a plurality of bridging-contacts arranged in two sets of three longitudinal series, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed contacts arranged in the path traversed by the contacts of the drum and having electrical connections with the circuit in which the motors are operated, substantially as described.

7. A combined reversing and cut-out switch for electric street-cars, comprising in combination a rotatable drum having upon its periphery and projecting therefrom a plurality of bridging-contacts arranged in two sets of three longitudinal series each separated by non-conducting spaces, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively,

and a series of fixed contacts arranged in the path traversed by the contacts of the drum and having electrical connections with the circuit in which the motors are operated, substantially as described.

8. A combined reversing and cut-out switch for electric street-cars, comprising in combination a rotatable drum having upon its periphery and projecting therefrom a plurality of bridging-contacts arranged in two sets of three longitudinal series each, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed contacts arranged in the path traversed by the contacts of the drum and having electrical connections with the circuit in which the motors and controller are operated, substantially as described.

9. A combined reversing and cut-out switch for electric street-cars, comprising in combination a rotatable drum having upon its periphery and projecting therefrom a plurality of bridging-contacts arranged in two sets of three longitudinal series each, one set arranged to pass the current in the forward direction and the other to pass it in the reverse direction and different series of each set operating to cut out one or the other motor respectively, and a series of fixed spring-actuated contacts arranged in the path traversed by the contacts of the drum and having electrical connections with the circuit in which the motors and controller are operated, substantially as described.

In testimony whereof I hereunto set my hand, in presence of two witnesses, this 25th day of January, A. D. 1896.

GUSTAF VALLEY.

In presence of—

JOHN N. WYLER,
LORNE PRENTISS.