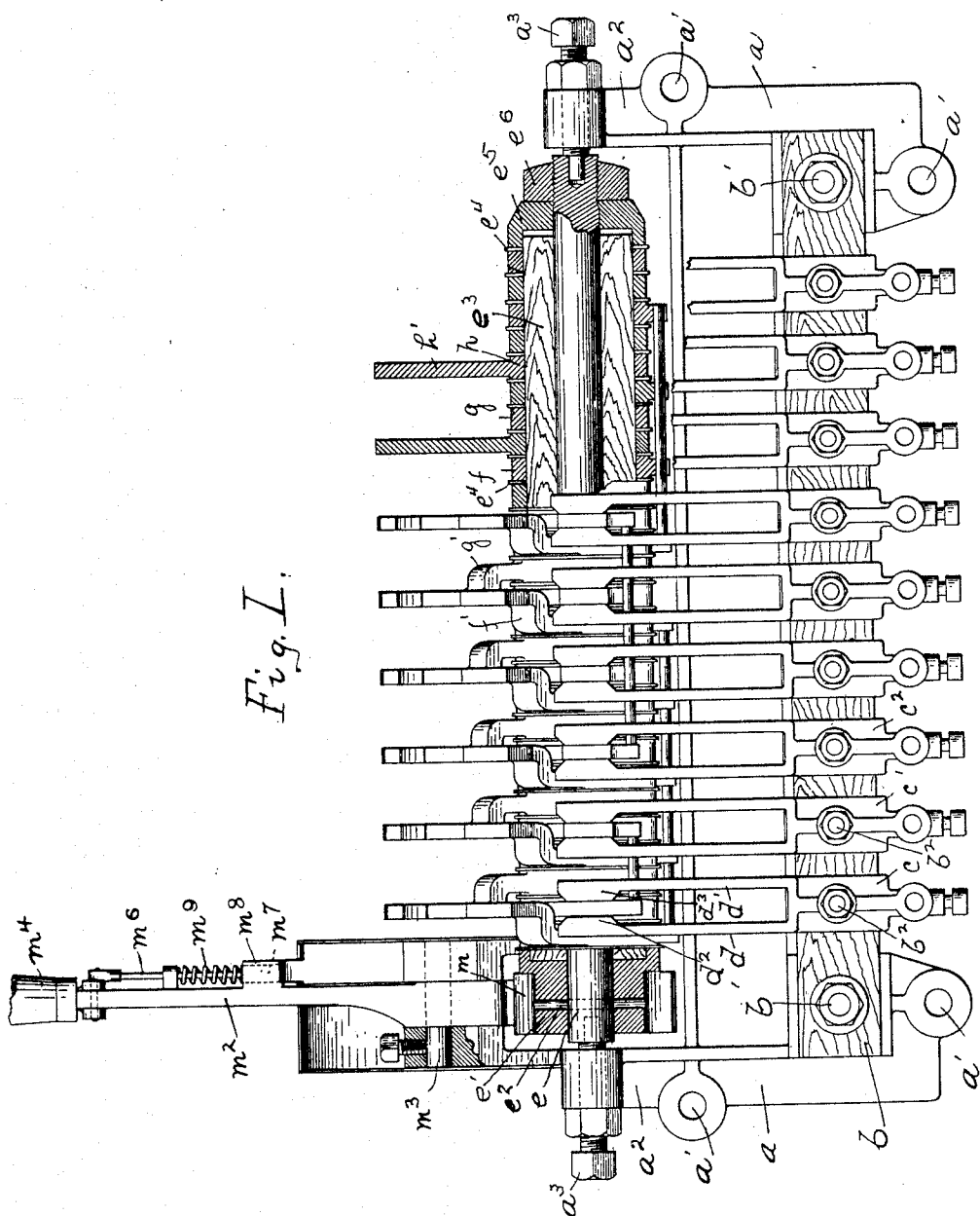


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CIRCUIT CONTROLLER FOR ELECTRIC VEHICLES.

No. 586,606.

Patented July 20, 1897.



WITNESSES:

Edward E. Pion.

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INVENTOR

Karsten Knudsen.

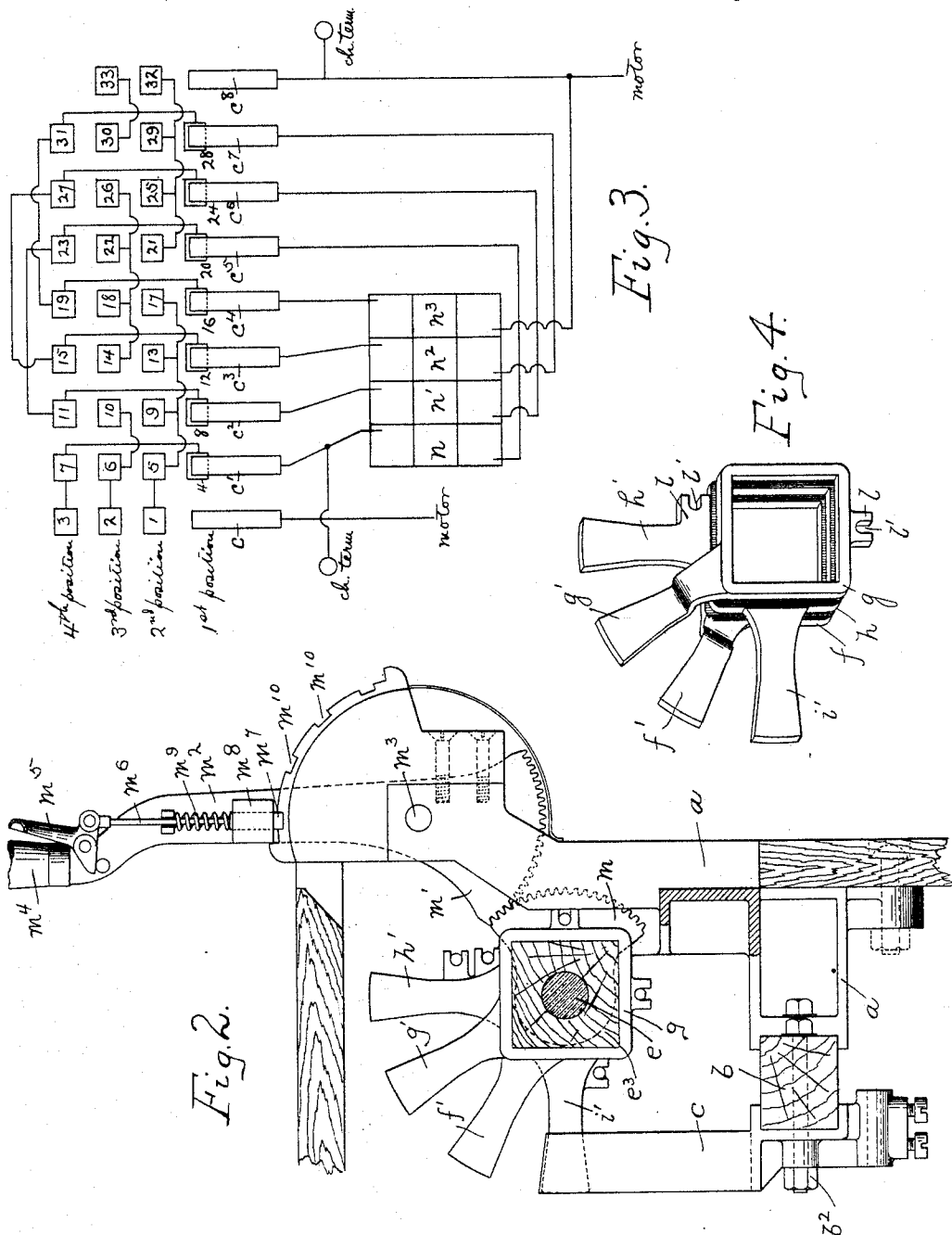
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UNITED STATES PATENT OFFICE.

KARSTEN KNUDSEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE AMERICAN ELECTRIC VEHICLE COMPANY, OF SAME PLACE.

CIRCUIT-CONTROLLER FOR ELECTRIC VEHICLES.

SPECIFICATION forming part of Letters Patent No. 586,606, dated July 20, 1897.

Application filed October 21, 1896. Serial No. 609,535. (No model.)

To all whom it may concern:

Be it known that I, KARSTEN KNUDSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Circuit-Controllers for Electric Vehicles, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an improved form of circuit-controlling switch for electric vehicles more particularly applicable to electric carriages.

My object is to provide a switch that shall be effective in operation and that can be constructed at small cost.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 is a view in elevation, partially in section, of the controller of my invention. Fig. 2 is an end view thereof. Fig. 3 is a diagram of the circuit connections. Fig. 4 is a detached view of the contact-arms.

Like letters and numerals refer to like parts in the several figures.

A casting or frame *a* is provided, which may be secured in any convenient position by means of screws or bolts passing through the holes *a' a'*. When applied to electric carriages, the frame is mounted beneath the seat, as illustrated in Fig. 2, so that the operating handle or lever may extend in convenient position to be grasped by the rider sitting on the seat. Upon the casting is mounted a wooden bar or beam *b*, secured at the ends to the frame by bolts *b' b'*. The contact-fingers *c c' c'*, &c., are secured to the face of the bar *b* by means of bolts *b² b²*. The contact-finger is in form like a tuning-fork, having two resilient members *d d'*, carrying on the inner faces at the ends projecting contact-surfaces *d² d³*, tapered at the edges to permit the contact-arms to readily pass between the same when moving in either direction. The contact-faces normally rest at a distance apart less than the thickness of the contact-arm, so that the members of the fork are pressed apart when the contact-arm passes between the members of the fork to press with consider-

able force against the contact-arm to effect a perfect electrical contact.

Upon the frame *a* are provided standards *a² a²*, in which fit bolts *a³ a³*, the ends of which extend into and serve as bearings for the rod or bar *e*. Upon one end of the rod *e* a casting *e'* is secured by means of a pin *e²*, passing through the cap and the rod. The rod *e* passes through a bore in a bar of wood *e³* of square cross-section, and upon the bar of wood the collars *f* and *g*, carrying the contact-arms *f' g'*, and the collar *h*, carrying the contacts *h' i'*, are placed, thin strips of insulating material *e⁴* being placed between the collars. Upon the end of the rod *e* is placed a cap *e⁵*, resting against but insulated from the series of collars on the bar of wood. A nut *e⁶* screws upon the threaded end of the rod *e* and against the cap *e⁵* to clamp the collars between the caps *e'* and *e⁵*. As illustrated in Fig. 4, the contact-arms and collars are made in two general forms, one having two arms *h' i'*, extending perpendicularly from the sides of the collar and at right angles to each other, the other having the arms extending obliquely from one corner of the collar and having the end offset to lie in a different plane from that of the collar. One of the first form and two of the second form are laid together, as illustrated, to form the series of contact-arms lying in a common plane, two of the arms being electrically connected, the other arms being relatively insulated from each other and from the two connected arms. Projections or lugs *l l* are provided, having recesses *l' l'* to receive the ends of the conducting-wires, which may be soldered therein.

Upon the cap *e'* is provided a segmental gear *m*, with which meshes a segmental gear *m'*, carried on the end of the operating-lever *m²*, pivoted at *m³* upon the frame *a*. Near the handle *m⁴* of the operating-lever is pivoted the finger-lever *m⁵*, to which is journaled the rod *m⁶*, carrying the plunger *m⁷*, moving in a bore in the lug *m⁸*, the plunger being depressed by a spring *m⁹* to engage one of the series of notches *m¹⁰ m¹⁰*, whereby the operating-lever may be locked in position to maintain any one of the four contact-arms in contact with the contact-fingers.

The circuit connections are illustrated diagrammatically in Fig. 3, in which $n\ n'\ n^2\ n^3$ are four series of secondary batteries, of three cells each in the present instance, which it is desired to connect in different parallel-series, and parallel-series arrangement to change the speed and power of the motor driving the carriage.

In the diagram the contacts in each vertical row represent one of the series of contact-arms lying in a common plane, the contacts being developed into a plane for clearness. The contact-fingers $c\ c'$, &c., are illustrated in engagement with the first horizontal row of arms that is in engagement with arms i' , which engage the fingers when the operating-lever occupies its vertical or first position. The positions indicated in the diagram as second, third, and fourth positions are those in which the fingers engage the contact-arms $f'\ g'\ h'$, respectively.

The negative poles of the cells are connected, respectively, with the contact-fingers $c'\ c^2\ c^3\ c^4$, while the positive poles are connected with the fingers $c^5\ c^6\ c^7\ c^8$. The finger c^5 is connected with one side of the motor and with a terminal for charging the cells, while the opposite charging-terminal is connected with the finger c' . The opposite side of the motor is connected with the finger c . In the first position the motor is disconnected from the circuit, while the cells are connected in series and are on open circuit. The cells may be charged in this position. The circuit through the cells may be traced from the charging-terminal and cell n to finger c^5 , contacts 20 23 11 8, finger c^2 , cell n' , finger c^6 , contacts 24 27 15 12, finger c^3 , cell n^2 , finger c^7 , contacts 28 31 19 16, finger c^4 , cell n^3 , to the charging-terminal. When the second row of contact-arms engages the fingers, as in the second position, the motor-circuit is closed and the four sets of cells are included in circuit in parallel branches. The circuit may be traced from the motor to finger c , contact 1, thence to contacts 5 9 13 17 and to the fingers $c'\ c^2\ c^3\ c^4$, through the cells $n\ n'\ n^2\ n^3$ in parallel, thence from cell n^3 to the motor and from the other cells to fingers $c^5\ c^6\ c^7$ to contacts 21 25 29, thence to contact 32, finger c^8 , to the motor. In the third position the four sets of cells are arranged in series parallel, cells $n\ n'$ being in parallel with each other, as are also cells $n^2\ n^3$, the two groups being included in series. The circuit may be traced from the motor by finger c to contact 2, thence to contacts 6 and 10, fingers $c'\ c^2$, through cells $n\ n'$ in parallel to fingers $c^5\ c^6$, contacts 22 26, contacts 14 18, fingers $c^3\ c^4$, cells $n^2\ n^3$, from cell n^3 to motor and from cell n^2 to finger c^7 , contacts 30 33, to finger c^8 , to motor. In the fourth position the cells are connected in series, the circuit being traced from the motor through finger c to contacts 3 and 7, finger c' , cell n , finger c^5 , contacts 23 11, finger c^2 , cell n' , finger c^6 , contacts 27 15, finger c^3 ,

cell n^2 , finger c^7 , contacts 31 19, finger c^4 , cell n^3 , to the motor.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a number of collars mounted side by side upon a rotatable support, of contact-arms carried upon said collars, the ends or contact portions of certain of said contact-arms being laterally displaced to bring the ends of all the contact-arms in a common plane perpendicular to the axis of rotation, and a contact with which said arms severally engage as the support is rotated, substantially as described.

2. The combination with a number of collars mounted side by side upon a rotatable support, of contact-arms carried upon said collars, the ends or contact portions of the contact-arms of the several collars lying in a common plane perpendicular to the axis of rotation of the support, and a contact with which said arms severally engage as the support is rotated, substantially as described.

3. The combination with three collars mounted side by side upon a rotatable part, of a pair of contact-arms mounted upon the middle collar and occupying positions at right angle to each other, contact-arms mounted upon the other collars, lying between the above-mentioned contact-arms and having the ends laterally displaced to lie in a common plane with the contact-arms on the middle collar, and a contact-finger comprising two members of spring metal having opposed contact-surfaces at the ends, between which surfaces the contact-arms are adapted to be passed, the contact-surfaces normally resting at a distance apart less than the thickness of the contact-arms to cause the members of the contact-finger to resiliently press against the contact-arms, substantially as described.

4. The combination with three collars mounted side by side upon a rotatable part, of a pair of contact-arms mounted upon the middle collar and occupying positions at right angle to each other, contact-arms mounted upon the other collars lying between the above-mentioned contact-arms and having the ends laterally displaced to lie in a common plane with the contact-arms on the middle collar, and a contact with which said contact-arms individually engage as the contact-arms are rotated, substantially as described.

5. As a new article of manufacture, a contact-finger for circuit-controllers formed from a single piece of metal and comprising two parallel members carrying at the ends inwardly-projecting contact-faces extending throughout a portion only of the length of the member the outer and inner edges of each of said projecting faces being oblique, whereby a contact-arm may be passed between said resilient members, substantially as described.

6. As a new article of manufacture, a contact-finger for circuit-controllers comprising

two parallel members carrying at the ends inwardly-projecting contact-faces extending throughout a portion only of the length of the member, whereby a contact-arm may be passed between said resilient members to make and break contact with said projecting contact-faces, substantially as described.

7. The combination with a contact-finger comprising two resilient members, each member carrying at the end on the inner face an inwardly-projecting contact-face extending throughout a portion only of the length of the member, of a contact-arm moving in an axial direction between the resilient members of said contact-fingers and making and breaking contact with said finger by passing into and out of contact with the projecting contact-faces on the resilient members, substantially as described.

8. In a circuit-controller, the combination with the bar e^3 of insulating material of the collars f, g, h , mounted thereon and carrying contact-arms lying in a series of parallel

planes and angularly arranged, the insulating-pieces e^4 between said collars, the rod e passing through a bore in said bar e^3 and journaled at the ends, the caps e and e^5 and the nut e^6 screwing upon the end of said rod e and clamping the collars between the caps e and e^5 , substantially as described.

9. The combination with a rotatable support of a number of collars mounted thereon side by side, contact-arms carried upon said collars and arranged in groups the ends of certain of the contact-arms being laterally displaced to bring the contact portions of the arms of each group in a plane perpendicular to the axis of rotation of the support, substantially as described.

In witness whereof I hereunto subscribe my name in the presence of two witnesses.

KARSTEN KNUDSEN.

Witnesses:

CHARLES E. CORRIGAN,
W. CLYDE JONES.