(No Model.)

E. E. KELLER.

HAND REGULATOR OR SWITCH FOR MOTORS.

No. 519,715. Patented May 15, 1894.

Fig 1.

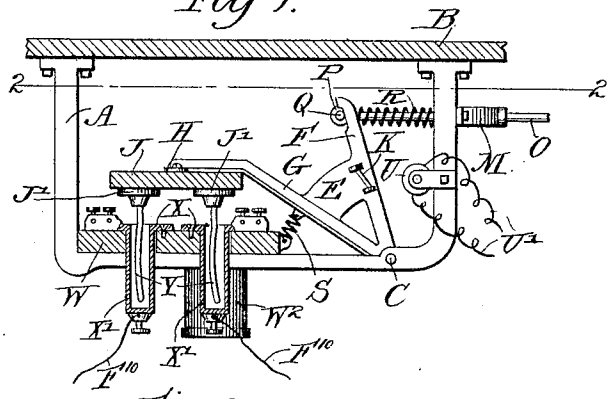


Fig 6.

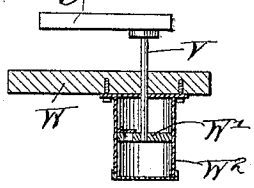


Fig 2

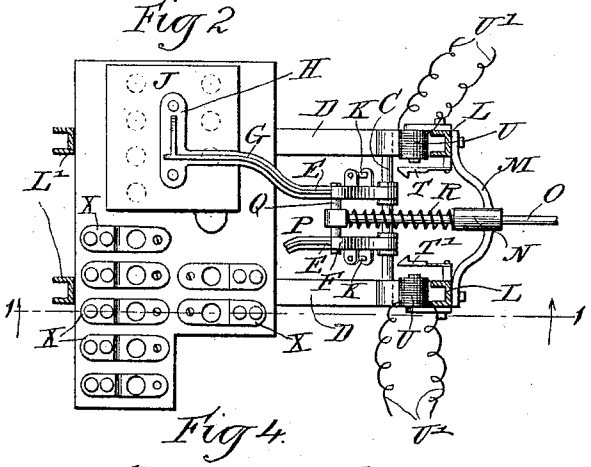


Fig 7

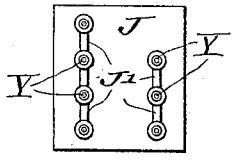


Fig 4.

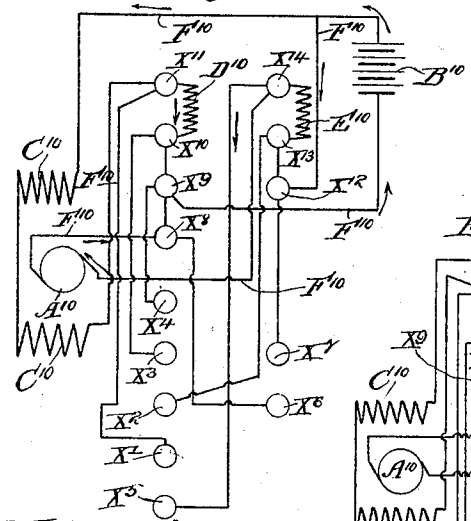


Fig 5.

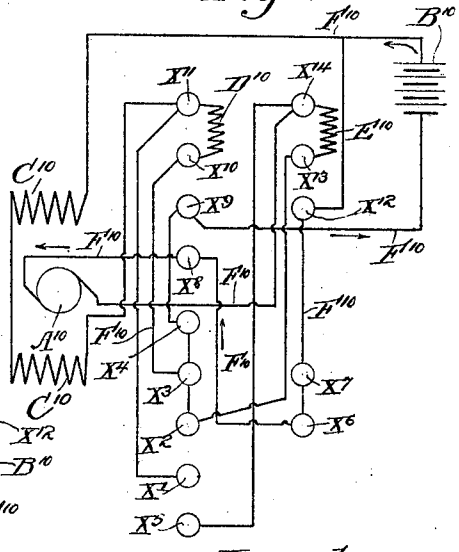
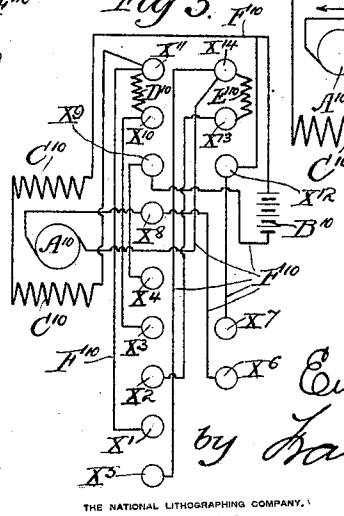


Fig 3.



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EMIL E. KELLER, OF CHICAGO, ILLINOIS.

HAND REGULATOR OR SWITCH FOR MOTORS.

SPECIFICATION forming part of Letters Patent No. 519,715, dated May 15, 1894.

Application filed July 12, 1893. Serial No. 480,226. (No model.)

To all whom it may concern:

Be it known that I, EMIL E. KELLER, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented a new and useful Improvement in Hand Regulators or Switches for Motors, of which the following is a specification.

My invention relates to electric switches or regulators for applying a current to motors, and has for its object to provide certain new and useful improvements which are illustrated in the accompanying drawings, wherein—

Figure 1 is a cross section on the line 1, 1. Fig. 2 is a plan view with parts in cross section and other parts broken away, taken on the line 2, 2. Fig. 3 is a diagrammatic view of the permanent connections between the mercury cups, armature and field coils. Fig. 4 is a diagrammatic view of the cups and permanent connections, and in addition, the connections made between the cups by the depending pieces and bars J′ on plate J. Fig. 5 is a diagrammatic view of the mercury cups and permanent connections, and in addition, the connections made by the other plate J^0. Fig. 6 is a detailed view of the dash pot. Fig. 7 is a view of plate J from beneath.

Like parts are indicated by the same letters in all the figures.

The device which I have here illustrated, is particularly adapted for use in connection with the motors applied to perambulators and other such vehicles; and A is a box frame preferably secured beneath the floor or cover B, and having the cross shaft C at the bottom thereof, supported upon the frame pieces D, D. Pivoted to this cross shaft are the two pieces E, E, shaped as shown, each having the upwardly projecting arm F, and the forwardly projecting arm G, which is provided with a foot H, secured to the plates J, J^0. On the exterior of each of the pieces E, is the rod K, suitably supported in any desired manner. The frame plates D, D, are upwardly turned and preferably channel shaped at each end, as indicated at L, L and L′, L′. They are connected at one end by the yoke piece M, which carries the long tubular bearing N, through which passes the rod O. This rod carries at its outer end the block P, and the short cross bar Q. R is a spiral spring between the block P, and the tubular bearing N. Each of these pieces E, is normally downwardly drawn by means of the spiral spring S, and by gravity. T, T, are spring catches which serve as armatures to the magnets U, U, and are adapted to engage the pieces E, E. Beneath the plate J, J, is the rod V, which passes through the plate W, and carries the piston W′, in the dash pot W^2. X, X, are a series of plates with suitable terminals, each carrying one of the mercury cups X′, X^2, X^3, X^4, X^5, X^6, X^7, X^8, X^9, X^{10}, X^{11}, X^{12}, X^{13}, X^{14}, there being fourteen in all, which cups project through and depend from the plate W. Y, Y, are a series of circuit closing devices which depend from transverse bars J′, J′ on the plates J, J^0, and pass into mercury cups X′, to X^{14}. These depending devices are of various lengths, with a uniform depth of mercury in the cups, or they may be of uniform lengths with varying depths of mercury in the cups. There are two sets of these, one set on each side, and associated with one of the bars J′, J′.

Each of the mercury cups is electrically independent of the others, except as connected by the conductors F^{10} (Fig. 3) or through the circuit closers Y, Y, and strips J′, J′, and each is mounted upon the insulation base W. A^{10} is the armature; B^{10} the storage battery or other source of electricity; C^{10} the field magnet winding; D^{10} and E^{10} resistances; F^{10}, F^{10} are conductors secured by suitable binding posts to the ends of the mercury cups, and to the various devices, so as to form a series of circuits substantially as shown.

In considering the use and operation of the invention, first examine Fig. 3, which will show the permanent connections. It will be found that no circuit can be made through them as they stand. Next examine Fig. 4, which will show the connections as made in the event of the current being directed through the motor in one direction, and Fig. 5 in like manner shows the current directed through the motor in the opposite direction.

The use and operation of my invention are as follows: Having reference, first, to Fig. 3, assume that the motor is idle, and that the armature is to be started in a certain direction, so as to propel the machine forward. It

must, equally, be assumed that the circuit closers Y, Y are all of them out of contact with the mercury in their respective cups. They and their supporting parts are held in an elevated position by means of the spring catches T, T, engaging the rods K, K. If, now, a push button or other circuit closer, connected with the conductors U′, be operated so as to close a local circuit, the proper magnet U, will be energized and its armature T, be withdrawn, so as to release the plate J, associated therewith, and permit the same to drop, under the influence of gravity and the action of the spring S. By reason of the diversity of lengths of circuit closers, or diversity in the quantities of mercury in the several cups, certain circuit closers will touch the mercury in their opposed cups at a given moment, and at such moment two circuits, one through the armature and one through field coils will be formed, (or one could be formed slightly in advance of other.) In Fig. 4, these circuits may be traced as indicated by the arrows, as follows, (it being understood that X^8, X^9, X^{10}, X^{12} and X^{13}, are mercury cups associated with long circuit closers:) from the battery B^{10}, to mercury cup X^{12}, thence along the circuit closer Y and the bar or conductor J′, to cup X^{13}; thence through the resistance coil E^{10}; thence through the conductor F^{10}, leading from said cup to the armature A^{10}; thence in the direction indicated by the arrow to the cup X^8; thence through the mercury in such cup into the long circuit closer Y; thence across the associate strip or conducting rod J′, to the mercury cup X^9, and thence as indicated by the arrow, along the conductor F^{10}, to the other terminal of the battery B^{10}. Thus the armature is placed in the circuit but in series with the resistance E^{10}. At the same time, the other circuit formed leads as follows: from the battery through the field magnets C^{10}; thence along conductor F^{10} to the mercury cup X^{11}; thence through the resistance D^{10} to the mercury cup X^{10}; thence on the long circuit closer to the strip J′, thence along conductor F^{10}, to the mercury cup X^9, and thence to the other terminal of the battery, thus placing the field magnet in circuit, but in series with its resistance D^{10}. If the motion be continued further, as of course it will be by the further descent of the plate J, until all of the circuit closers are in contact with the mercury in their respective opposed mercury cups, the two resistances will be cut out of circuit, for the cups X^{10} and X^{11}, will now be directly connected through the conducting strip J′, resting upon their upper extremities, and in like manner the cups X^{13} and X^{14} will be connected together. By pulling upon the rod O, which of course would be associated with a suitable handle or controlling lever (not here shown), the plate J will be raised until it is locked in an elevated position by the re-engagement of its associated rod K, with the spring catch T. This, of course, takes the motor out of circuit, but does so by first throwing into circuit the resistance coils, as the circuit closers rise gradually from the mercury, the shorter ones first disengaging. According to the peculiarities of the construction of the cups and circuit closers, it is evident that the two resistance coils may thus be thrown in or out of circuit simultaneously or either in advance of the other, or one may be dispensed with. To reverse the machine, the other plate J^0, is in like manner operated so as to descend, whereupon the following circuits will be established, (see Fig. 5,) (it being understood that X^7, X^6, X^2, X^3, X^4, are the mercury cups associated with the long circuit closers): from the battery B^{10}, to the mercury cup X^{12}; thence along the conductor F^{10}, to the mercury cup X^7; thence along the strip J′ to the mercury cup X^6; thence along the conductor F^{10} to the mercury cup X^8; thence along conductor F^{10} to the armature, in the opposite direction from that in which the current traversed the armature in the previous case; thence along conductor F^{10} to mercury cup X^{14}; thence through resistance E^{10} to mercury cup X^{13}; thence to mercury cup X^2; thence along strip J to mercury cups X^3 and X^4; thence along conductor F^{10} to mercury cup X^9, and thence along conductor F^{10} to the other terminal of battery, B^{10}, thus placing the resistance E^{10} in series with the armature. At the same time the circuit through the field magnet is as follows: from battery B^{10}, through field magnet coils C^{10}; thence along conductor F^{10} to mercury cup X^{11}; thence through resistance D^{10}, to mercury cup X^{10}; thence along conductor F^{10} to mercury cup X^8; thence along strip J to mercury cup X^4; thence along conductor F^{10} to mercury cup X^9; thence to the other terminal of the battery B^{10}; thus placing the resistance D^{10} in series with the field coils. If the motion be continued further, which will happen as air is gradually forced out of the dash pot W^2, until all the circuit closers are in contact with the mercury in their respective opposed mercury cups, the two resistances will be cut out, for the cups X^5, X′, X^2 will now also be electrically connected by strip J′, and the armature circuit will then be traced as follows: from battery B^{10} to cup X^{12}; thence along conductor F^{10} to mercury cup X^7; thence along strip J′ to mercury cup X^6; thence along conductor F^{10} to mercury cup X^8; thence to armature; thence along conductor F^{10} to mercury cup X^{14}; thence along conductor F^{10} to mercury cup X^9; thence to the other terminal of battery B^{10}. The field magnet current will be traced as follows: from battery B^{10}, through field magnet coils C^{10}; thence along conductor F^{10} to mercury cup X^{11}; thence along conductor F^{10} to mercury cup X′; thence along strip J′ to mercury cups X^2, X^3 and X^4; thence along conductor F^{10} to mercury cup X^9; thence to the other terminal of battery B^{10}. It will be readily seen that these mercury cups are capable of wide variation with regard to their

number and positions and relative arrangements. I simply suggest here one form of arrangement of cups and connections. The connections also are capable of wide variations. I do not wish to limit myself to the precise form, number or relations of the said mercury cups, or to their precise construction or method of supports.

I claim as my invention—

1. A controlling switch for a motor, consisting of a series of two sets of terminals and opposed circuit closers therefor, adapted when one set of circuit closers is depressed to send the motor in one direction, and when the other is depressed to send the motor in the opposite direction each set of circuit closers before being fully depressed completing the circuit through resistances, said resistances being cut out of circuit when the said circuit closers have reached the limit of their motion.

2. A controlling switch for a motor, consisting of a series of two sets of terminals and opposed circuit closers therefor, adapted when one set of circuit closers is depressed to send the motor in one direction, and when the other is depressed to send the motor in the opposite direction, each set of circuit closers before being fully depressed completing the circuit through resistances, said resistances being cut out of circuit when the said circuit closers have reached the limit of their motion and electrically actuated means for controlling the application of said sets of circuit closers.

3. A controlling switch containing a series of terminals with a series of opposed movable circuit closers adapted to engage such terminals successively when the switch is operated, and suitable resistances and circuit connections so that when the first terminals are engaged the circuit is closed through the armature and field magnets of the motor including the resistance in each circuit, and when all of such terminals are engaged, the resistance is cut out.

4. A controlling switch for motors containing a series of terminals with a series of opposed movable circuit closers adapted to engage such terminals successively when the switch is operated, and suitable resistances and circuit connections so that when the first terminals are engaged the circuit is closed through the armature and field magnets of the motor including the resistance in each circuit, and when all of such terminals are engaged, the resistance is cut out, said terminals consisting of mercury cups with mercury of different levels therein.

EMIL E. KELLER.

Witnesses:
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EDITH M. BLACK.