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ELECTRIC SIGN CHANGING DEVICE.

No. 535,865. Patented Mar. 19, 1895.

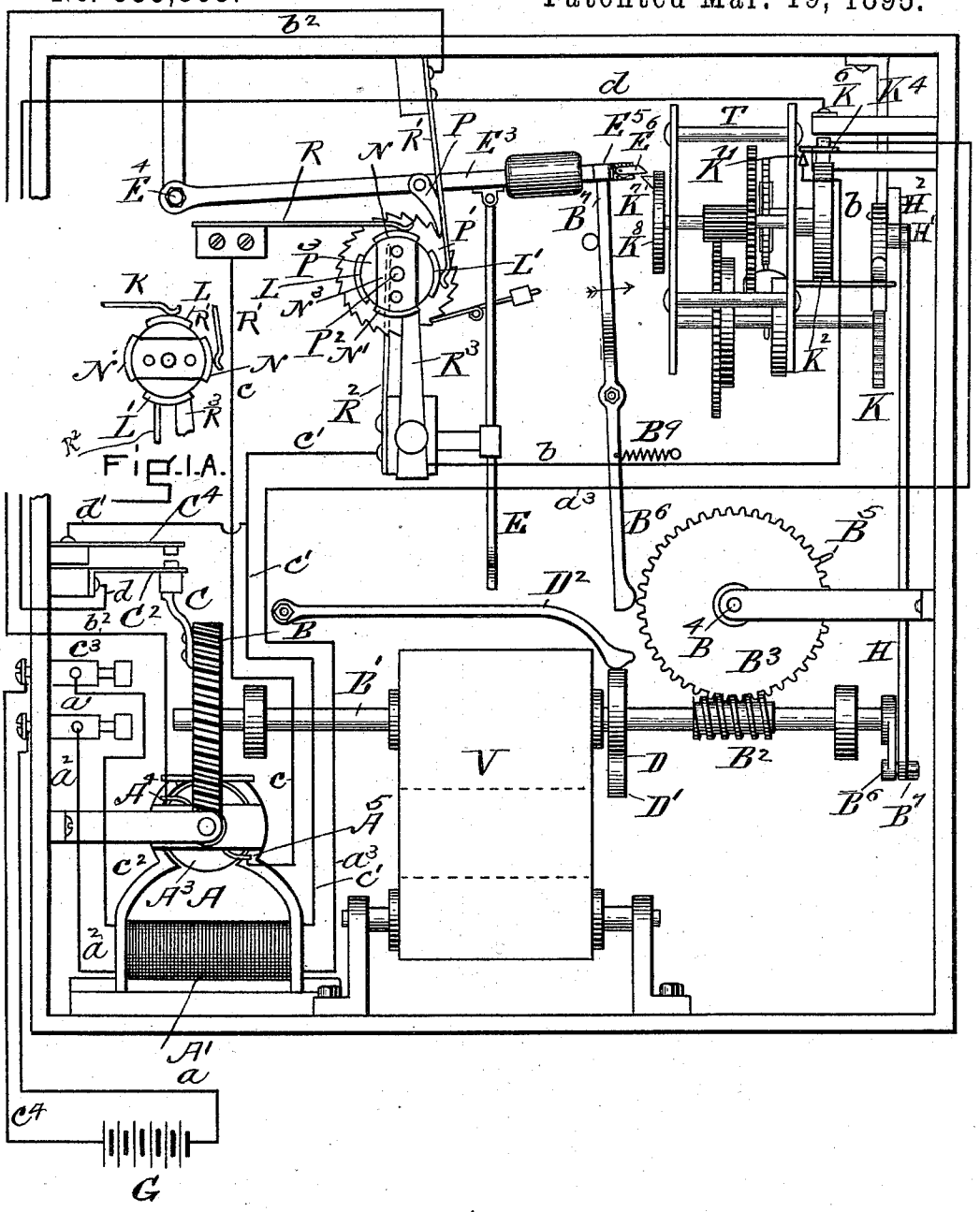

Fig. 1A.

Fig. 1.

WITNESSES

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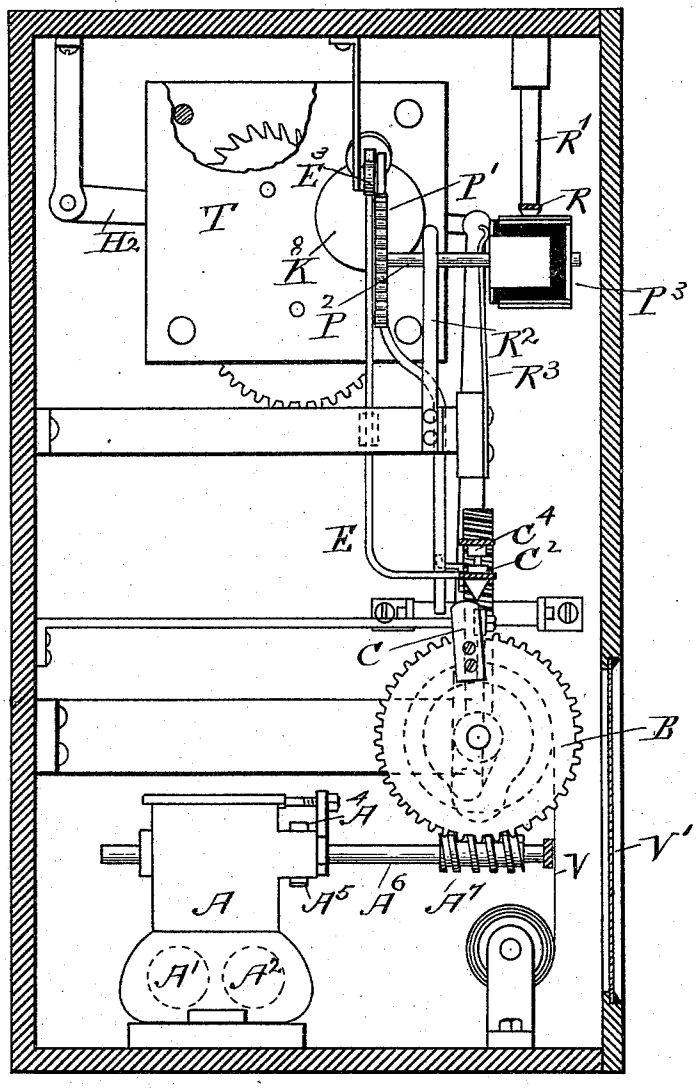

Fig. 2.

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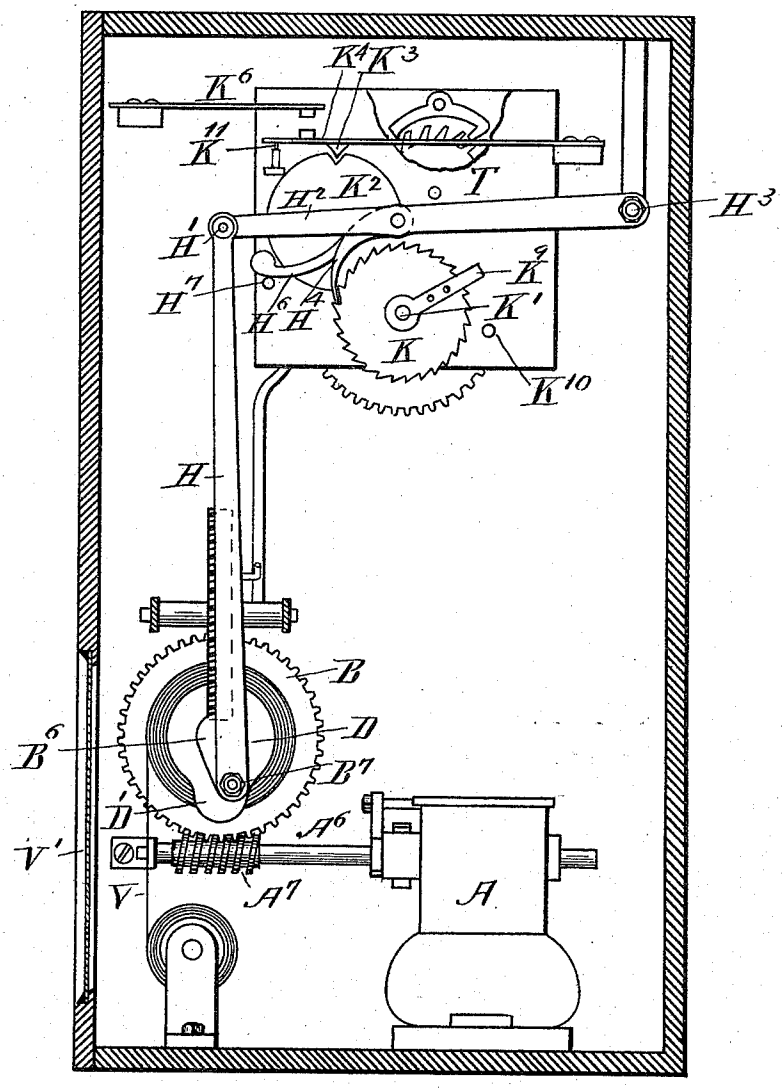

Fig. 3.

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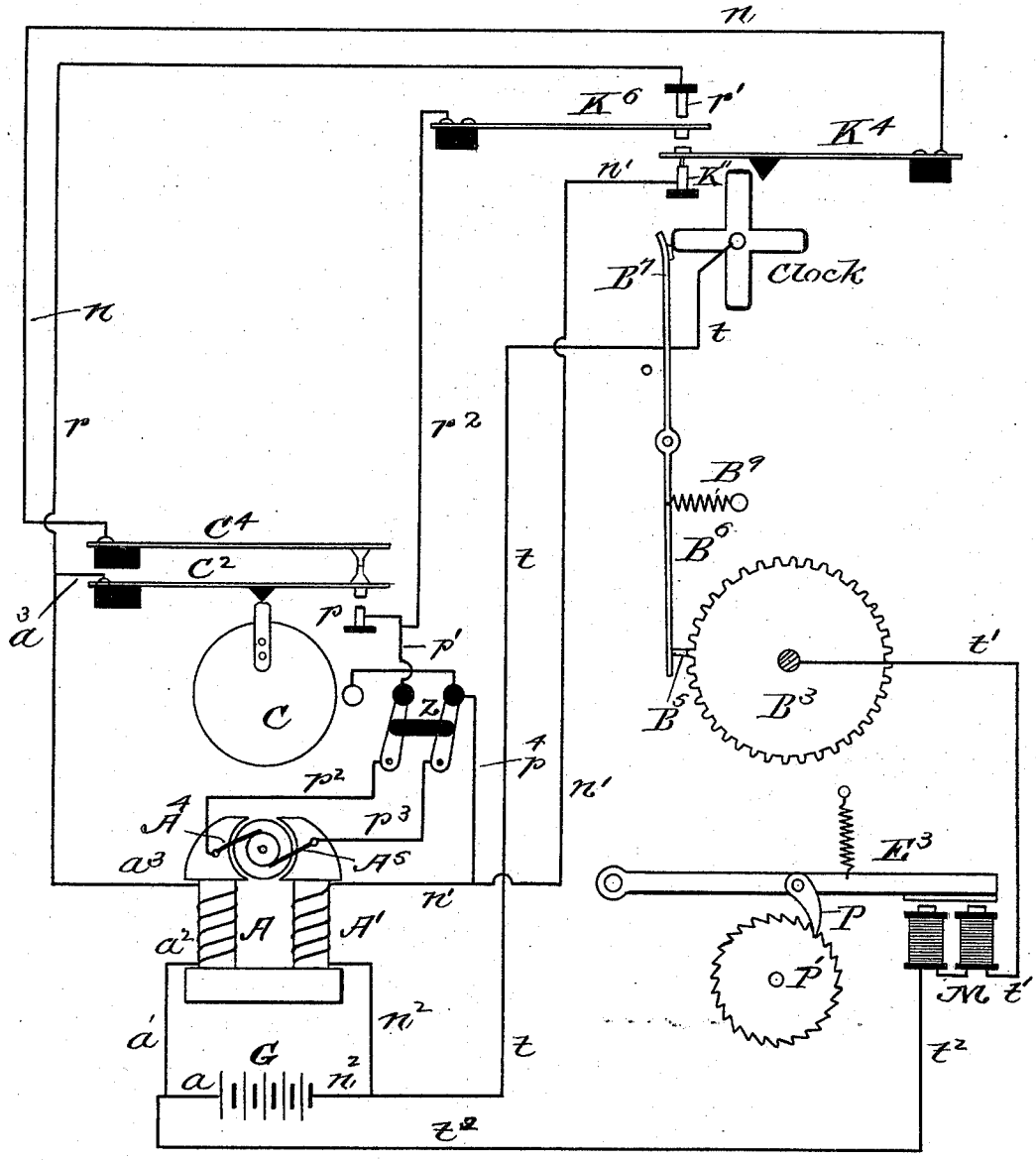

Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM SEARS, OF BOSTON, MASSACHUSETTS.

ELECTRIC SIGN-CHANGING DEVICE.

SPECIFICATION forming part of Letters Patent No. 535,865, dated March 19, 1895.

Application filed February 19, 1894. Serial No. 500,755. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SEARS, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Electric Sign-Changing Devices, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to an apparatus in which mechanical and electrical features are combined to effect the movements of a series of signs or advertising cards, the object being to make an automatic mechanism by which an intermittent motion may be given to a series of signs or cards, and after a certain number have been successively displayed in a certain order, the motion will be reversed and the same signs or cards will be successively displayed but in a reverse order. This object I attain by the mechanism shown in the accompanying drawings, in which—

Figure 1 is a view showing most of the parts in elevation. Fig. 1^{A}, shows pole changer rotated one quarter. Fig. 2 is a view in side elevation looking from the left of Fig. 1. Fig. 3 is a view in side elevation looking from the right of Fig. 1. Fig. 4 is a diagrammatical sketch showing the method of wiring to suit a slight mechanical change.

In the drawings an electric motor is shown and is designated by A.

The motor used should be of the class known as pole-armature motors, that is, in which the armature is of iron and has poles or projections of iron extending through the winding so as to reach nearly to the faces of the field magnets so that in case the current is cut off from either the armature or the fields alone the motor will be abruptly stopped.

The motor used in this case has two field coils A′ and A^{2}. (See Fig. 2). The armature A^{3} is mounted upon a shaft A^{6} and has commutator branches A^{4} A^{5}. The armature shaft A^{6} has a worm A^{7} which communicates motion to the wheel B mounted on the shaft B′. The shaft B′ has upon it a suitable roller for carrying a long strip of suitable fabric V, the lower end of the said fabric being wound upon a spring roller that will wind upon itself the fabric as it is unwound from the roller on the shaft B′.

The apparatus is so arranged that when all of the fabric has been unrolled from the upper roller and wound upon the lower one the motion will be reversed and the fabric will be rewound upon the upper roller.

The strip of fabric V has painted or printed upon it a series of signs or advertisements, and the casing in which the apparatus is placed is provided with an opening at V′, (Fig. 2) through which the signs or advertising cards are successively exhibited. The shaft B′ (see Fig. 1) also has upon it a cam D D′, a worm B^{2}, and a crank B^{6}, as shown. The cam D D′ as it rotates, lifts the lever D^{2}, and acting through the said lever D^{2} gives an upward movement to the hanging rod E which in turn acts upon the weighted lever E^{3}, said lever E^{3} being pivoted at E^{4}, and has upon it a pawl P which engages with a ratchet wheel P′ to which a cylindrical pole changer P^{3} is connected. The worm B^{2} on the shaft B′ rotates a gear wheel B^{3} hung at B^{4}. This wheel has upon it a cam arm B^{5} which is adapted to come in contact with the lever B^{6} and throw its upper end B^{7} in the direction of the arrow, that is, out from under the arm E^{5} on the lever E^{3} and allow the lever to drop so as to be supported only by the projection K^{7} on the wheel K^{8}, and the latch E^{6}.

The crank arm B^{6} on the shaft B′, has attached to it by a crank pin B^{7} a link H (see Figs. 1 and 3), said link being connected by a pin H′ to a lever H^{2}, said lever being pivoted at H^{3} and having upon it a pawl H^{4}, said pawl H^{4} serving to rotate the wheel K on the winding arbor K′ of a clock train T. The wheel K has upon it an arm K^{9}, which is adapted to come in contact with the pin K^{10}, and thus stop the motion of the train wheels. The pawl H^{4} has an arm H^{6} which is adapted to come in contact with the pin H^{7}, and thus to throw the pawl H^{4} out of contact with the wheel K, so that although the lever H^{2} may still continue to move downward the pawl will no longer cause the wheel K to rotate, as it will be thrown out of engagement with it. The wheel K^{2} (Figs. 1 and 3) is connected with the clock train, so that its movement is timed. This wheel K^{2} has a notch in its periphery, as shown in Fig. 3, in which a projection K^{3} on the electrode K^{4} may drop, so that when the wheel K^{2} moves from the position shown in Fig. 3, it will cause the electrode K^{4} to be

raised up from the electrode K^{11}, and be brought in electrical contact with the electrode K^6. The wheel K^8 (Figs. 1 and 2) is also connected with the clock train, and is rotated and timed by the train. This wheel K^8 has upon it, a projection K^7 (see Fig. 1) which, when the wheel is in the position as shown in Fig. 1, supports the latch E^6 and through it the lever E^3. This supporting of the lever E^3 by the projection K^7 takes place only when the lever E^3 is not supported by the lever B^6 B^7 as has already been stated.

The wheel B on the shaft B′ has attached to it a cam arm C, said arm being adapted to raise up at intervals, the electrode C^2, and thus cause it to form an electrical contact with the electrode C^4.

I will now describe my pole changer. It is designated by P^3 (Figs. 1 and 2). This pole changer is mounted on the shaft P^2 and has upon it four commutators bars. Two of the bars, N and N′, are electrically connected to each other and to the shaft P^2 by a cross bar N^3. The other two commutator bars L and L′, are connected to each other, but insulated from the shaft P^2 by a cross bar, not shown in the drawings. The commutator bars N and N′ are thoroughly insulated from the commutator bars L and L′. As the commutator now stands, an electric current coming through the electrode R would pass out through the electrode R^2, and a current coming through the electrode R′ would pass out through the electrode R^3; but if the pole changer is to be turned a quarter way round, as shown in Fig. 1^A, then a current coming through the electrode R would pass out through the electrode R^3, and the current coming through electrode R′ would pass out through the electrode R^2; that is, the current would be reversed.

I will now give the action of the apparatus, referring to Fig. 1, in which the motor is just on the point of stopping, and the clock train about to start. In this condition the motor has, (acting through the crank B^6 B^7 link H, lever H^2, pawl H^4, and ratchet wheel K) wound up the clock train T, a continued motion of the lever H^2 will cause the arm H^6 to come in contact with the pin H^7. This will throw off the pawl H^4 from the wheel K and thus allow the train to start, which in turn will cause the wheel K^2 (see also Fig. 3) to lift the electrode K^4 out of electrical contact with the terminal K^{11} which action will open the motor circuit, *i. e.*, (see Fig. 1) the terminal K^{11}, wire *b*, electrode R^3, commutator bar L′, electrode R′, wire b^2, brush A^4, coil of armature A^3, brush A^5, wire *c*, electrode R, commutator bar N, plate N^3, shaft P^2, electrode R^2, and wire *c*′ to field coil A^2, wire c^2, binding post c^3, wire c^4, electric generator G, wire *a*, binding post *a*′, wire a^2, field coil A′, wire a^3, electrode K^4, back to terminal K^{11}, so that the motor is no longer energized, but the armature will still rotate by its own momentum sufficiently to bring the arm C on the wheel B up to the electrode C^2 and lift it up so as to make an electrical contact between it and the electrode C^4. While this is taking place, the wheel K^2 (see also Fig. 3) has raised the electrode K^4 to contact with K^6. These two actions will restore an energizing current to the field coils A′ A^2, but not to the armature A^3. The circuit by which this is accomplished I will call the "break" circuit and it is as follows: Starting from electrode K^4, through electrode K^6, wire *d*, electrode C^2, electrode C^4, wire *d*; wire *c*′, field coil A^2, wire c^2, binding post c^3, and wire c^4, generator G, wire *a*, binding post *a*′, wire a^2, field coil A′, wire a^3, to starting point. This act of energizing the field magnets and not the armature will cause the field magnets to abruptly stop the rotation of the armature. This stopping of the motor allows the sign strip V to stop, exhibiting a sign at the opening V′, until the following described action takes place:

The wheel K^2 will be rotated by the clock train in a certain definite required time; that is, the time required for exhibiting a single sign. Upon the wheel having made a complete rotation it is stopped by the arm K^9 coming in contact with the pin K^{10} in such a position that the notch on the wheel K^2 will be directly under the cam piece K^3, and the said cam piece K^3 on the electrode K^4 is allowed to drop into the notch in the said wheel and thus allow the electrode K^4 to separate from K^6 opening the break circuit and at the same time closing the circuit through K^4 K^{11}, that is, the motor circuit. Now the motor will start and the wheel B will make a complete rotation and the arm C comes almost in contact with the electrode C^2; that is, the parts are restored to the position from which they started. The above described action of the parts relates to the movement required to exhibit a single sign. This action is to be repeated until all the signs on the sign-strip have been exhibited. Now the signs having all been exhibited, the motion of the sign-strip is to be reversed, and to do this the motion of the motor must be reversed. This action will now be explained. The frequency of reversing will depend upon the number of signs on the sign-strip V. For instance, suppose there are one hundred and eighty signs, I arrange the transmitting mechanism between the shaft B′ and the pole-changing cylinder P^3, so that the shaft B′ must make sixty rotations to cause the wheel B^3 to make one, and the wheel B^3 must make three rotations to cause the pole changer to reverse the current. The number of one hundred and eighty is not arbitrary,—any number desired may be used,—the mechanism being suitably modified for it.

The pole-changing is effected as follows: The wheel B^3 has upon it a cam arm B^5 adapted to come in contact with the lever B^6 and by forcing its lower end outwardly, cause its upper end B^7 to pass out from under the projection E^5 on the weighted lever E^3 and allows it to drop on to the projection K^7 on the wheel

K^8 where it will remain until the motor circuit is opened by the clock train T (as has been set forth). Then the movement of the wheel K^8 will cause the projection K^7 to pass out from under the latch E^6 and the lever E^3 will drop, and acting through the pawl P will cause the pole changer P^3 to make one twelfth of a turn or one third of the motion required to make the pole changer reverse the current. The fall of the lever E^3 will be stopped by the link E, the lower end of which then rests upon the lever D^2 which in turn rests upon the cam wheel D D'. Now the next rotation of the shaft B' will rewind the clock train T as already set forth, (the wheel K^8 and its projection K^7 having resumed their normal position) and acting through the cam wheel D D' throw up the lever D^2, link E, and lever E^3, which will be retained in its upper and normal position by the lever B^6 B^7 which will have been brought back by the spring B^9, the cam arm B^5 on the wheel B^3 having passed away from the lower end of the said lever B^6 B^7. When the lever E^3 has been dropped three times by the three rotations of the wheel B^3 (involving one hundred and eighty turns of the shaft B') then the pawl P will have turned the pole changing cylinder P^3 one quarter of a rotation; that is, will have reversed the current and the motor armature will rotate in the opposite direction and the signs on the sign strip V will be intermittently exhibited in the reverse order; all of the motions of the apparatus as above described being repeated.

The diagram, Fig. 4, shows substantially the same arrangement as that shown in Fig. 1, but in some respects is simpler. In this diagram, G represents the generator, A A' the motor, and Z a pole changer to be actuated by hand or electrically by mechanism driven by the ratchet wheel P' which is operated by the electro magnet M acting through the lever E^3 and pawl P.

C is a wheel driven by the motor A A' and adapted to act upon the electrodes C^2 C^4. B^3 is a wheel also driven by the motor A A' and adapted to operate the lever B^6 B^7 in connection with the "clock" which acts upon the electrode K^4. In this arrangement, the clock is not wound up at intervals by the action of the motor, but is wound by hand and is supposed to go continuously for a day or more.

The circuits may be briefly described as follow: Starting from the generator G the wire a a' a^2 connects with the field coil A of the motor, thence by the wire a^3 to the electrode C^2, thence to electrode C^4 and by wire n to electrode K^4, thence through electrode and wire n' to the field coil A' of the motor, and thence through the wire n^2 to generator. With this condition of the circuit, the armature of the motor will be held fixed so no action will take place. Now if we suppose the clock in its movement throws electrode K^4 up, contact will be broken with n' and made with electrode K^6 (and also with terminal r^1 for a shunt current). Then the current will pass through the wire r^2, one branch of the pole changer Z, wire p^2, commutator brush A^4, armature coil, commutator brush A^5, wire p^3, other branch of pole changer Z, wire p^4, wire n^1, to field coil A', wire n^2 to generator G. This condition of the circuit will cause the motor to start. The object of the shunt circuit through wire r terminal r', electrode K^6, wire r^2 is to keep the motor circuit closed while the electrode C^2 is passing from electrode C^4 to terminal p. In practice this shunt circuit is not needed as the momentum of the armature will continue the motion of the motor until the circuit is closed.

The series of clock contacts with K^4 is so timed that the wheel C shall make a complete rotation between each successive contact.

The magnet M and its connected mechanism and circuits is intended to take the place of the weight on the lever E^3 and the operating mechanism of the lever E^3 as shown in Fig. 1; and operates as follows: As the wheel B^3 rotates, it brings the arm B^5 in contact with the lever B^6 (now an electrode instead of mere lever) and cause its upper end to be in position to make an electrical contact with an arm of the "clock." Now a circuit will be established from the generator G through the wire a, wire t^2, magnet M, wire t', wheel B^3, arm B^5, lever (electrode) B^6 B^7, clock, wire t, wire n^2, back to generator; thus energizing the magnet M and cause the lever E^3 and pawl P to act on the wheel P', the same manner as the weighted lever E^3 acts upon the wheel P' as has been explained in connection with Fig. 1.

I claim—

1. In an apparatus for operating a series of connected signs, an electric motor having a pole armature, a mechanism for transmitting motion from said motor to a fabric V containing a series of signs, a revolving arm C, operated by said motor and adapted to operate at intervals the electrode C^2, and thus close the electric "stop circuit,"—through electrodes K^4 K^6 wire d electrodes C^2 C^4, wire d' c', field coil A^2, wire c^2, post c^3, wire c^4, to generator G, wire a, post a', wire a^2, field coil A', wire a^3, back to electrode K^4,—and said stop circuit, substantially as and for the purpose set forth.

2. In an apparatus for operating a series of connected signs, an electric motor and mechanism for transmitting motion from said motor to a fabric V containing a series of signs, a revolving cam arm B^5 operated by said motor, the lever B^6, the weighted lever E^3, clock train T, link E, lever D^2 and cam D' as described and adapted to operate the pole changing cylinder p^3 by which the current through the motor is reversed, substantially as and for the purpose set forth.

3. In an apparatus for operating a series of connected signs, an electric motor having a pole armature, a mechanism for transmitting motion from said motor to a fabric V containing a series of signs, a mechanism oper-

ated by said motor for opening the motor circuit and closing the "stop-circuit," a mechanism operated by a clock train for opening the "stop-circuit" and closing the motor circuit and said "stop-circuit" and motor circuit, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 17th day of February, A. D. 1894.

WILLIAM SEARS.

Witnesses:
FRANK G. PARKER,
WILLIAM EASON.