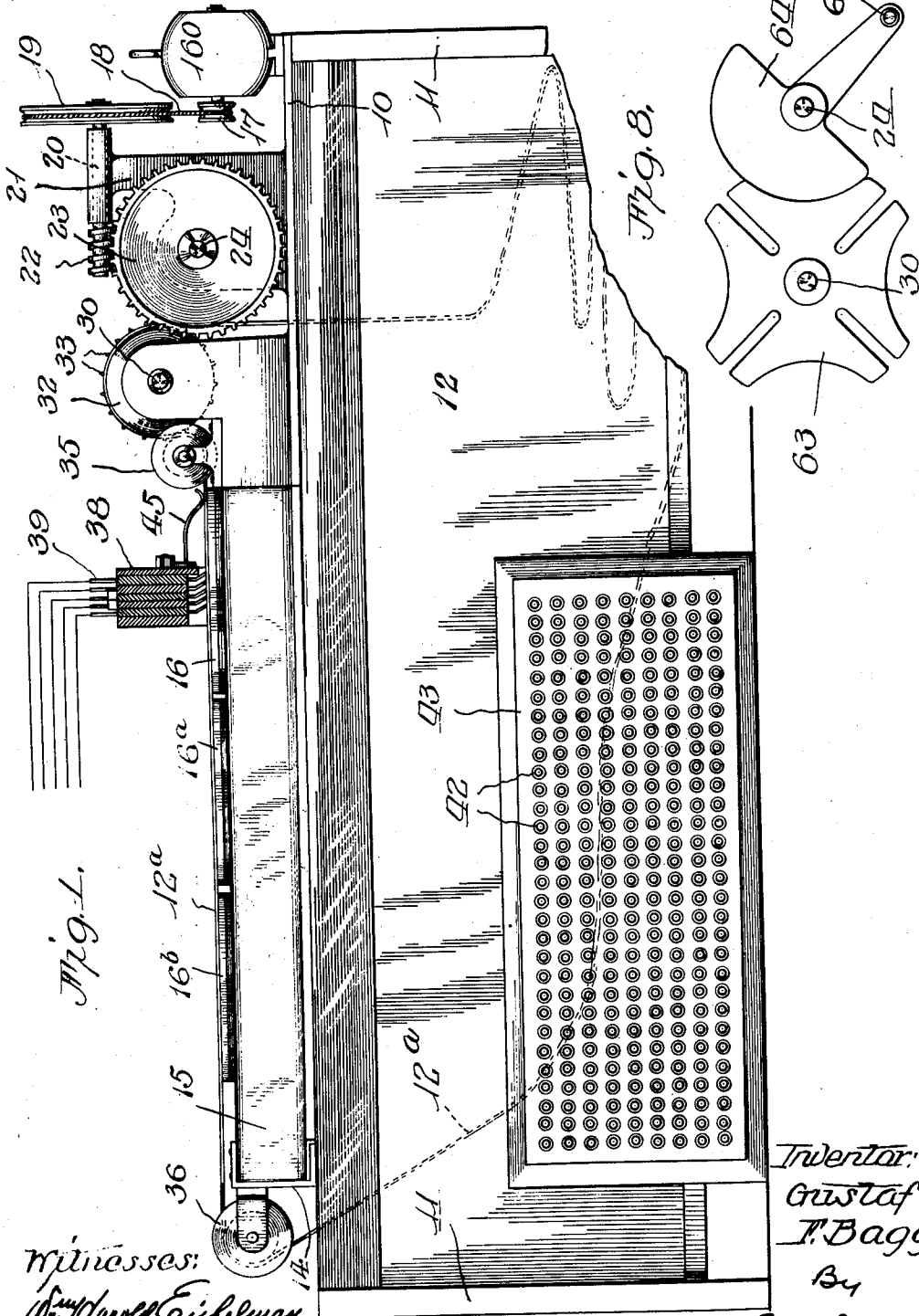


G. F. BAGGE.
 APPARATUS FOR CONTROLLING ELECTRIC CIRCUITS.
 APPLICATION FILED MAY 15, 1915. RENEWED APR. 16, 1920.

1,362,553.

Patented Dec. 14, 1920.

4 SHEETS—SHEET 1.



Witnesses:
Wm. J. Eichelmay
Chas. E. Uehrmann

Benjamin, Root & Sons, Inc.
 attys

Inventor:
Gustaf
F. Bagge
 By

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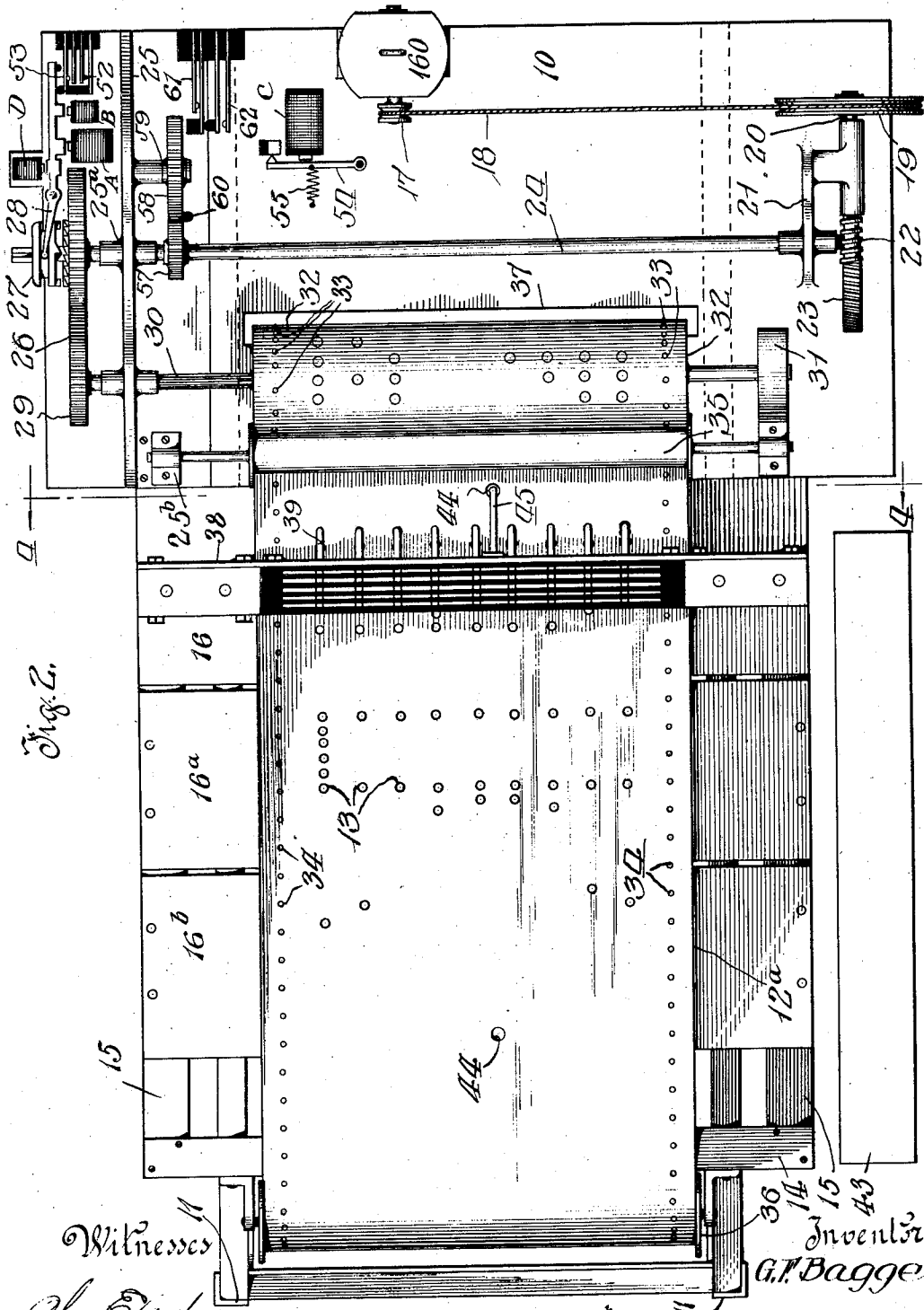


Fig. 2.

Witnesses
 Charles Eickmann
 Wilhelm Eickmann

Inventor
 G. F. Bagge
 Benjamin Roodhouse & Sons

G. F. BAGGE.
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4 SHEETS—SHEET 3.

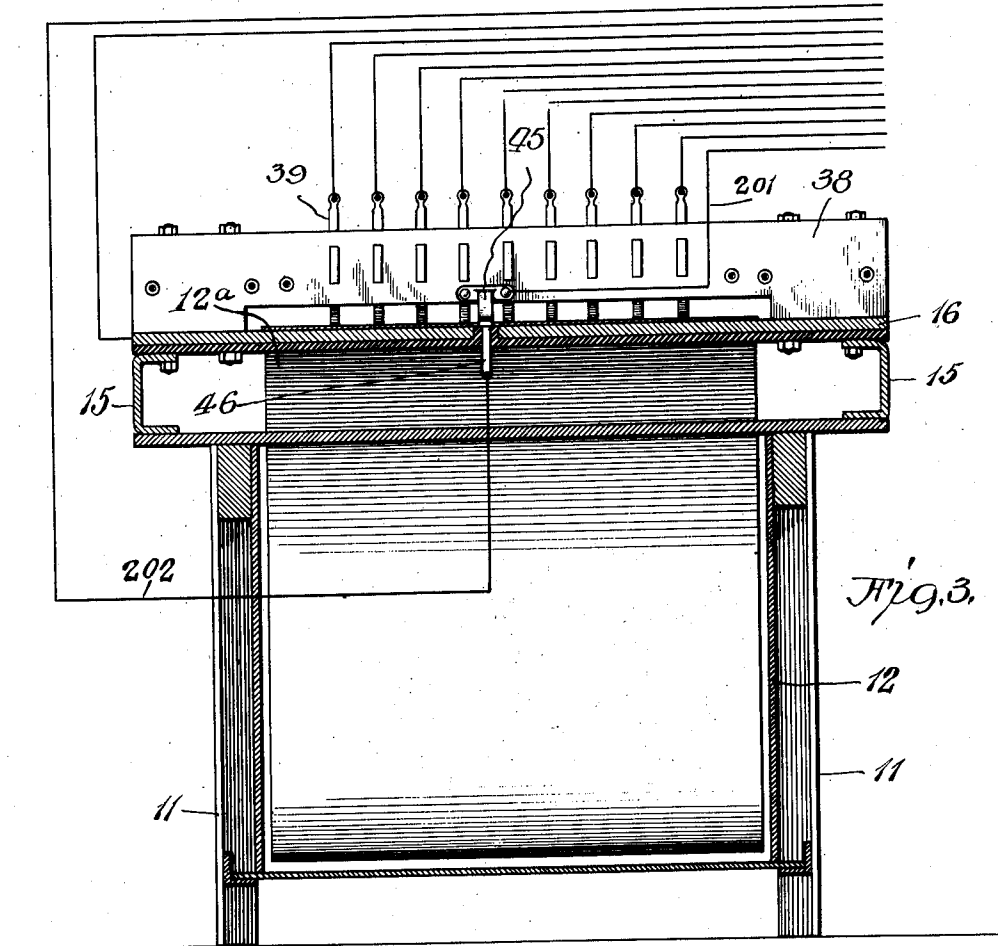
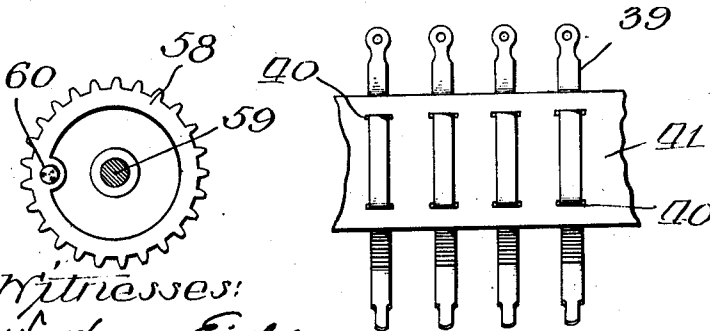


Fig. 3.

Fig. 6.

Fig. 7.

Fig. 5.



Witnesses:
Wm. Darby Eidehman
Chas. E. Achermann

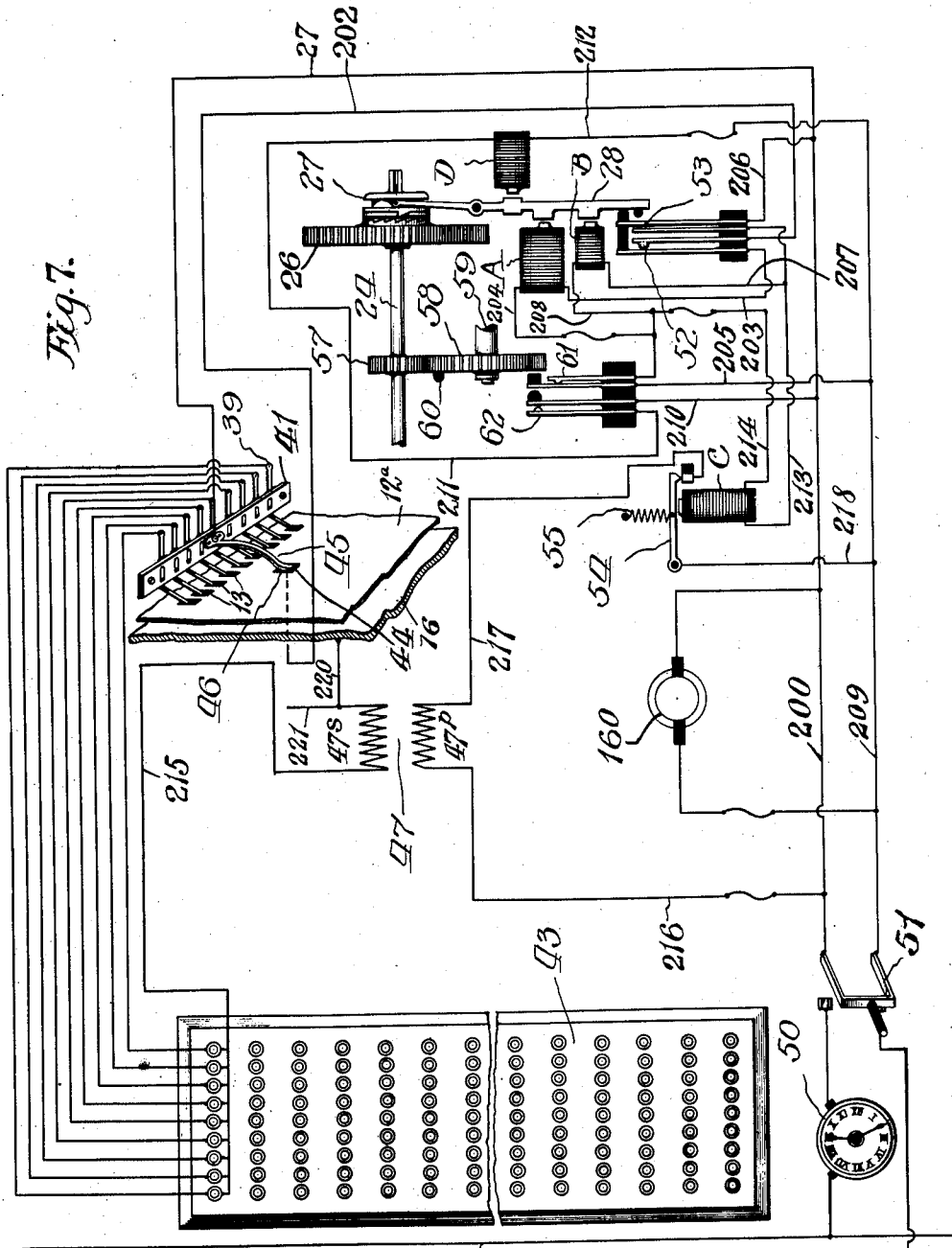
Inventor
Gustaf F. Bagge
 By *Benjamin Rodhouse & Lundy*
 attys.

G. F. BAGGE.
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4 SHEETS—SHEET 4.



Witnesses
Benjamin E. Eidlman
Chas. O. Ackermann
 By *48* *Benjamin E. Eidlman*
49 *Chas. O. Ackermann*
 Inventor
Gustaf F. Bagge
Benjamin E. Eidlman & Chas. O. Ackermann, Attys

UNITED STATES PATENT OFFICE.

GUSTAF F. BAGGE, OF NEW YORK, N. Y.

APPARATUS FOR CONTROLLING ELECTRIC CIRCUITS.

1,362,553.

Specification of Letters Patent. Patented Dec. 14, 1920.

Application filed May 15, 1915, Serial No. 28,280. Renewed April 16, 1920. Serial No. 374,493.

To all whom it may concern:

Be it known that I, GUSTAF F. BAGGE, a subject of the King of Sweden, and a resident of the city of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Apparatus for Controlling Electric Circuits, of which the following is a specification.

My invention relates to electric signs and more particularly to signs wherein the letters or words are flashed periodically and in which the words may be changed and displayed in successive order to form sentences. One of the objects of my invention is the provision of a sign apparatus wherein a sheet of perforated material, or a continuous ribbon of perforated material, may be fed through the machine for the purpose of flashing the desired letters or words in their respective order. Another object of my invention is the provision of a sign apparatus wherein the "record" employed may be readily changed or substituted for others at will and without special adjustment of the mechanism. A still further object of my invention is the provision of what is commercially known as a "talking" sign that is compact in construction so as to be readily transportable from one location to another. Other objects of my invention are to construct the device in as simple a manner as possible so as not to require the employment of special labor to operate and to provide a device that is effective in its operation, and comparatively inexpensive to manufacture. Another object of my invention is to provide means for closing and opening the lighting circuit other than the perforated strip so that the device will not depend upon the insulation of the strip at the moment the circuit is closed or opened. In other words, the necessarily slow motion of the perforated strip is not well adapted to open and close the lighting circuit but is entirely suitable for the prevention of the passage of the current through the lamps which are not required in forming the characters of the sign.

I prefer to accomplish the objects of my invention by the means and in the manner hereinafter fully described and as more particularly pointed out in the claims, reference being had to the accompanying drawings forming a part hereof wherein,

Figure 1 is a longitudinal side elevation of the mechanism employed in connection with my electric sign.

Fig. 2 is a plan thereof.

Fig. 3 is a transverse sectional view thereof taken in a plane in front of the brushes.

Fig. 4 is an enlarged detail view of the brushes and rack for supporting the same.

Fig. 5 is a transverse sectional view of the rack and one of the brushes illustrating the preferred manner of mounting the latter.

Fig. 6 is a detail view of one of the operating gears of the mechanism.

Fig. 7 is a schematic view of the circuits and mechanism controlled thereby of my improved electric sign.

Fig. 8 is a detail of a modification of the device for moving the perforated strip or record intermittently.

Referring to the drawings 10 represents a suitable substantially rectangular shaped platform upon which the operating mechanism of my device is mounted said platform being supported by legs or standards 11 that elevate the same a distance above the floor suitable to accommodate a compartment 12 for the loose portion of the perforated record ribbon 12^a. This ribbon is preferably of paper and is perforated similar to the music sheets employed in player-pianos excepting that its ends may be secured together to provide an endless ribbon, and the perforations 13 therein are all of the same dimensions and disposed in transverse rows. Secured on the top of one end portion of table 10 is an angle iron cross piece 14 to the vertical flange of which is connected the adjacent end of longitudinally disposed parallel side-pieces 15 also of angle metal with the horizontal flanges uppermost. Cross contact plates 16, 16^a, 16^b are secured upon these horizontal flanges of the side pieces 15 to provide a suitable insulated platform on top of the table over which the perforated ribbon 12^a is adapted to be moved intermittently for the purpose of bringing the transverse rows of perforations under and into coöperative relation with a plurality of circuit closing members hereinafter to be described.

Mounted upon a convenient portion of the table preferably adjacent one end of the platform just mentioned is a motor 160 the pulley 17 whereof is connected by a belt 18 with a large pulley or sheave 19 fast on the

extended end of a spindle 20 that is journaled in suitable horizontal bearings in a bracket 21 secured to the table 10. The opposite end of spindle 20 is provided with a worm 22 in mesh with and driving a large worm gear 23 fast on the adjacent end of a shaft 24 that is journaled at one end in bearings in bracket 21 and which extends transversely across the table where its opposite end is journaled in bearings 25^a in a vertically disposed bracket 25 on the opposite edge of the table. Beyond its bearings in bracket 25 shaft 24 has a gear 26 loosely mounted thereon and adapted to be thrown into and out of operative relation with said shaft 24 by a clutch mechanism 27 operated by an electrically controlled lever 28.

Gear 26 is in mesh with and drives a gear 29 upon the extended end of a horizontally disposed shaft 30 having bearings at one end in the bracket 25 and its opposite end journaled in bearings in a bracket 31 mounted adjacent the end of platform 10. Intermediate its bearings this shaft 30 has secured thereto a roller or drum 32 provided with spurs or picks 33 upon its opposite ends that are adapted to engage marginal perforations 34 in the edge portions of the perforated record sheet for the purpose of moving the latter.

Between roller 32 and the adjacent edge of the platform the record sheet passes under a flanged idle roller 35 the ends of the spindle whereof are journaled in bearings made in brackets 31 and 25^b. At the opposite end of the platform is a flanged roller 36 over which the record sheet travels up from the compartment or receptacle below the table, and adjacent the driving roller or drum 32 the table is provided with an elongated slot 37 through which the record sheet passes to the compartment after leaving the said driving roller.

Bridging the space on the platform occupied by the record sheet is a transverse bridge bar 38 adapted to carry a plurality of circuit closing brushes 39 that preferably consist of relatively thin elongated strips of elastic conductive metal that are each laced through vertically alining slots 40 made in the upper and lower portions of transverse insulation plates 41 as shown in Figs. 4 and 5 and which have their contact portions deflected in the direction of travel of the record sheet to prevent tearing or mutilating the sheet and to provide spring-like circuit closing members. There are preferably as many insulating plates as there are transverse rows of lamps in the sign board, and said plates are placed face to face and bolted together on the bridge bar 38. For the purpose of convenience and clearness in illustrating the apparatus I have shown five insulating plates, although it will be understood any number

of the same may be employed. Below the path of travel of the perforated record strip, and so as to register with the depending ends of the circuit closing members 39 are the cross plates 16, 16^a, 16^b forming electric terminals for closing circuits through said circuit closing members with individual lamps 42 arranged in longitudinal and transverse alinement to form a "bank" or sign-board 43. It will now be perceived that when perforations in the record permit the closing of the circuit by means of a member 39 the particular lamp in circuit with the particular circuit closing member will be illuminated. It is my intention to bring the perforated record into proper position to cause the illumination of the desired lamps before passing a current through the lamp circuit, and for this purpose I provide in the perforated record circuit control apertures 44 which cooperate with a circuit closing arm 45 secured to the bar 38 and below the depending end of the circuit closing arm 45 an insulated contact plate 46 is arranged.

In order to avoid the excessive generation of heat in the lamp bank which would occur in the intermittent lighting of so many lamps of line voltage located in such a limited area with the ordinary service currents obtainable, I employ a transformer 47 for furnishing current to the circuit of the lamp bank.

By this means any desired voltage may be impressed on the lamp circuit by properly designing the transformer and depending upon the size and voltage lamps it is desired to use in the sign.

I have illustrated the electrical arrangement of my device in Fig. 7 in which the service conductors are designated 48 and 49. A time circuit control device 50 is interposed in the service circuit so that the sign may be put into and out of operation at the desired time without manual attention. A hand switch 51 is also interposed in the service circuit for interrupting the circuit for the purpose of making repairs and adjustments. In Fig. 7 the perforated record is shown at rest in a position in which the circuit is closed between the arm 45 and contact plate 46. This closes the circuit through electromagnet "A" through the following circuit: feed wire 48, time switch 50, switch 51, wire 200, wire 201, contact 45, plate 46, wire 202, switch springs 52, wire 203, winding of magnet "A," wire 204, switch springs 61, wire 205, wire 209, switch 51, to feed wire 49. The magnet "A" being thus energized, acts upon pivoted clutch arm 28 to disconnect the clutch 27 and to break the circuit through switch 52 and at the same time to make a circuit through switch 53 as follows: feed wire 48, time switch 50, switch 51, wire 200, wire 206, switch springs 53, 1

wire 207, winding of holding magnet "B," wire 208, switch springs 61, wire 205, wire 209, switch 51 to feed wire 49. The circuit made through switch 53 energizes the electromagnet "B" which serves to hold the clutch arm 28 in the position which is assumed as the result of the action of electromagnet "A," the latter being now deenergized as a result of the opening of the switch springs 52. The closing of the switch 53 also closes the circuit through electromagnet "C" since the winding of the magnet "C" is connected by wires 213 and 214 with wires 207 and 208, respectively, thus causing current to flow in parallel through the magnets "B" and "C," which closes the switch 54, normally held open by the spring 55 thereby closing the primary circuit of the transformer 47 through wires 216, 217 and 218 and sending current from the secondary winding of the transformer through the circuits of the lamp bank which may be closed by the circuit closing members 39.

The closing of the main switch, 51, causes continuous operation of the motor 160 which, through the instrumentalities heretofore described, rotates the shaft 24 upon which, intermediate its bearings, is a fixed gear 57 which meshes with the gear 58 rotating upon an arbor 59 extending from the bracket 25. On a lateral face of the gear 58 is a knob 60 which operates at intervals to open the switch 61 and close the switch 62. The closing of the switch 62 energizes the electromagnet "D" through wires 210, 211 and 212 connecting the winding of said magnet "D" with the wires 200 and 209, but just before the switch 62 is closed the switch 61 is opened which breaks the circuits of the clutch arm holding magnet "B" and the magnet "C" which controls the primary of the transformer. The magnet "D" moves the arm 28 so as to throw in the clutch, close switch 52 and open switch 53.

The function of switch 61 is to keep the electromagnet "A" out of operation at the instant of the operation of the electromagnet "D." After the operation of the knob 60 and the energizing of the electromagnet "D," switch 61 again closes and switch 62 opens as a result of the movement of the knob 60 from engagement with the switches 61 and 62. It will be understood that the knob 60 is in said engagement for a sufficient interval after the energization of magnet "D" for the record strip 12^a to lift the contact 45 from the plate 46, as a result of which when the switch 61 closes, the circuit of the magnet "A" is open at the record strip and is not again closed until the next aperture 44 is brought under the contact 45.

Switch 52 is closed and switch 53 is opened by the movement of the clutch arm 28 and remains in this position until contact is again made through a control aperture 44 in

the perforated record sheet between the circuit closing arm 45 and the contact plate 46. when the cycle of operations is repeated.

From the above, it will be observed, that the shaft 24, runs continuously when the main switch 51 is closed and causes continuous rotation of the gears 57 and 58 and of the clutch 27; also that, since the gear 26 is loosely mounted on the shaft 24, the gears 26 and 29, and therefore the roller 32 and the strip 12^a, will be operated or not, depending on whether the clutch 27 engages or is disengaged from the gear 26.

Intermittent and recurring operation of the clutch 27 is effected as follows: Assuming that the strip 12^a is just reaching its position indicated in Fig. 7, to bring contact 45 into engagement with contact 46, through an aperture 44, and contacts 39 into engagement with the contact plate 16 through apertures 13, to begin an interval of illumination of the lamps 42, the electromagnet A is energized through spring contacts 61, spring contacts 52 and contacts 45, 46. This moves the clutch 27 from engagement with the gear 26 and interrupts the advance of the strip 12^a. The lever 28 is operated at the same time and closes spring contacts 53, and opens spring contacts 52. The closing of spring contacts 53 energizes the holding electromagnet B through contacts 61, and also energizes electromagnet C through the same contacts. This operates switch 54 which closes the circuit of the primary winding 47^p and energizes the secondary winding 47^s to send current through the circuits of the lamps 42 closed through the apertures 13. This condition continues until the knob 60, carried by gear 58, engages and opens springs 61 and closes springs 62. The opening of springs 61 deenergizes magnet C, and switch 54 opens the primary side of the lighting circuit immediately before the closing of the springs 62. The opening of the springs 61 also deenergizes magnet B. The closing of the springs 62 energizes the electromagnet D which moves the clutch 27 into engagement with the gear 26 and starts the strip 12^a in motion again. The knob 60 remains in engagement with the springs 61 and 62 an appreciable interval during which the strip 12^a advances sufficiently to separate the contacts 45 and 46 through which no current is flowing at that time, because the contacts 61 are open, although the contacts 52 have been closed by their spring action when the lever 28 and clutch 27 were operated by the magnet D. The advance of the strip 12^a separates the contacts 39 from the plate 16, but no current is then flowing through said contacts because of the prior opening of the lighting circuit at the switch 54.

After the knob 60 passes the springs 61, the closing of the springs 61 causes no action of the devices controlled by them at another

portion of the cycle since the strip 12^a, separates the contacts 39 and 45 from their corresponding contacts. The opening of the contacts 62 at this time, deenergizes the magnet D which, however, produces no change in conditions on account of the form of the clutch 27 indicated in the drawings having no tendency to release itself from driving engagement with the gear 26. The strip 12^a continues to advance until the next aperture 44 comes into registry with the contacts 45 and 46 when the cycle above described is repeated.

It will be seen that the throwing in and out of the clutch 27 in the above described arrangement is controlled jointly through the record sheet and the action of the knob 60. It is possible, however, to cause intermittent movement of the record sheet independently of control apertures therein by eliminating the clutch 27 and driving the record sheet intermittently and at regularly recurring intervals by means of the modified gearing between the shafts 24 and 30 shown in Fig. 8, which comprises a Geneva star wheel 63 mounted on the shaft 30 and a cooperating cam 64 mounted on the shaft 24, there being an operating pin 64' carried by the cam 64 for engaging and operating the star wheel 63.

This latter arrangement secures a positive intermittent movement of the perforated record sheet and eliminates the necessity for the clutch 27, but the pivoted arm 28 would still be necessary in order to secure the positive interruption of the lighting circuits independently of the insulating and circuit-breaking action of the perforated record strip.

As pointed out above, one strip of contact closing members is provided for each of the transverse rows of lamps 42 of the lamp bank. In Figs. 1 and 2 but five of these strips are shown in order to not unnecessarily complicate the drawings showing the mechanical construction of the apparatus. To control all of the transverse rows of lamps shown in the complete lamp bank and illustrated in Fig. 1, thirty strips of contact members are therefore required, but five of which, comprising a part of a first group of ten strips, are shown associated with the supporting bar 38 in Figs. 1 and 2, while the remaining twenty strips are preferably divided into two groups of ten each associated with the contact plates 16^a and 16^b and similarly supported by transverse bars identical with the bar 38. The three contact plates 16, 16^a and 16^b which, as indicated in Figs. 1 and 2, are separate from and insulated from each other and the framework of the machine, divide the circuit connections extending to the lamps into three groups, the lamps of the lamp bank being similarly divided. As illustrated in Fig. 7,

the first or left hand contact strip 41 has its contact members 39 connected directly by suitable wires with one terminal of the first or left hand transverse row of lamps 42, the upper contact member 39 being connected with the upper lamp 42 of the row and the other contact members being connected, one after another, with the corresponding lamps of the row, so that the lowermost contact member of the strip is connected with the lowermost lamp of the transverse row. The wires referred to are shown in Fig. 7 diagrammatically as extending directly to the lamps 42, although it will be understood that in practice any convenient form of terminals is employed to facilitate connecting the wires. The other terminals of the lamps are connected by wire 215 with one terminal of the secondary winding 47^a of the transformer 47, the other terminal of which secondary winding is connected by wire 220 with the contact plate 16, and the contact members of each of the remaining contact strips 41 are connected in order with corresponding ones of the transverse rows of lamps 42 in the same manner described for the first transverse row, all of the common conductors from these rows of lamps being connected with the wire 215.

It will thus be seen that all of the common conductors from the lamps are connected together and to one terminal of the secondary winding 47^a and that the contact plates 16, 16^a and 16^b are connected together and to the other terminals of said secondary winding, as a result of which, when the circuit through the primary winding 47^b of the transformer 47 is closed in the manner above described, by the engagement of the contact 45 with the contact plate 46, current is sent from the secondary winding of the transformer through any of the lamps whose contact members 39, rest in the apertures 13 formed through the record strip 12^a. The division of the lamps of the lamp bank into sections by the construction and mounting of the contact plates 16, 16^a and 16^b in the manner above shown and described, facilitates limiting the number of lamps in each circuit to meet the underwriters' requirements.

In practice the lamp bank may be located at any desired distance from the switching mechanism, although it is, of course, desirable to have the lamps as near the switching mechanism as convenient, to reduce current loss due to resistance of the conductors.

It will be understood that the division of the lamp bank into sections, as above described, is but one possible embodiment of my invention and that in practice any division of the lamp bank into sections may be made as desired, to meet the particular requirements of any case, depending upon the number of lamps employed in the sign and their arrangement.

It will be observed that the division of the sign into sections or groups of lamps as described above, each having its own switching mechanism, does not necessitate a corresponding division between the words or characters displayed on the lamp bank, since a part of lamps required to display a letter or word may be controlled by one section of the contact members as, for example, for the showing of the letter "K" of the word "TALK," as indicated in Fig. 7.

It will thus be seen that by my invention I have provided a practical form of controlling mechanism for a talking sign by which the circuit connections may be simply and effectively made and by which the parts of the system, consisting of the operating mechanism, the connecting wiring and the operated sign, may be readily connected together or disconnected, as desired, to facilitate setting up the apparatus or shipping the same and, furthermore, it will be observed that by my operating mechanism I provide a construction in which none of the electric circuits controlled by the record sheet are broken at the record sheet while current is flowing through said circuits, for, as pointed out above, the contact members enter the apertures 13 and engage the contact plates before the lighting circuit is closed as a result of the contact 45 engaging the contact plate 46, and that subsequently the circuit containing the contact 45 is opened before the contact 45 is removed from its engagement with contact plate 46 and that at the time the contact members are removed by the record strip from engagement with the contact plates the circuit through the primary winding 47^a is open. It will further be observed that in the operation of the clutch 27 no strain whatever is placed upon the record strip to either throw the clutch from or into driving engagement, but that the mechanical operation of the clutch is effected electro-magnetically through a circuit controlled by the record strip.

What I claim is:—

1. An electric sign comprising a plurality of electric lamps, a terminal plate, circuits connecting the lamps with said terminal plate, separate circuit-closing members mounted above and adapted to contact said terminal plate and establish circuits through said lamps, a perforated insulating member interposed between said terminal plate and said circuit-closing members, means for intermittently moving said perforated insulating member and a transformer for supplying said lighting circuit, and means controlled by said perforated insulating member for opening and closing the primary circuit of said transformer synchronously with the periods of movement and rest of said perforated insulating member.

2. In combination, an electric sign com-

prising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes and said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, and electromagnetic mechanism in circuit with said auxiliary circuit closer for disconnecting the motive means of said record strip.

3. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, and a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said lamps.

4. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated

record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electro-magnet, and a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said lamps.

5. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said lamps, and means for opening said switch before the opening of said auxiliary circuit closer.

6. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, a main switch electromagnetically controlled by said

switching mechanism for controlling the flow of current through said lamps, and means for opening said switch before the opening of said auxiliary circuit closer,

7. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said lamps, and a transformer having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current thereto.

8. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said lamps, and a transformer having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary

winding being connected in circuit with said lamps to supply current thereto.

9. In combination, an electric sign comprising a plurality of lamps arranged in
5 evenly spaced rows and connected in groups, and switching mechanism for controlling the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups,
10 a common conductor extending from each terminal plate to one terminal of each lamp in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps
15 and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said
20 brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary
25 circuit closer for controlling the flow of current through said lamps, means for opening said switch before the opening of said auxiliary circuit closer, and a trans-
30 former having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current
35 thereto.

10. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling
40 the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp
45 in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said
50 brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving
55 said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said elec-
60 tromagnet, a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said lamps, means for opening said switch before the opening of said auxiliary circuit closer, and a transformer having pri-

mary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current thereto.

11. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling
70 the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp
75 in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said
80 brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, a main switch for
85 controlling the flow of current through said lamps, and devices operated by said record strip for controlling the operation of said switch.

12. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling
95 the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp
100 in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said
105 brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, a main switch for
110 controlling the flow of current through said lamps, devices operated by said record strip for controlling the operation of said switch, and a transformer having primary and secondary
115 windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current
120 thereto.

13. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows and connected in groups, and switching mechanism for controlling
125 the lighting of said lamps, said switching mechanism comprising a plurality of terminal plates, one for each of said groups, a common conductor extending from each terminal plate to one terminal of each lamp
130

in the corresponding group, a group of brushes for each terminal plate arranged in rows corresponding to said rows of lamps and tending to make engagement with said plate, individual connections between said brushes and the other terminals of the lamps of the corresponding group, a perforated record strip of insulating material for controlling the engagement of all of said brushes with said plates, means for moving said record strip between said brushes and said plates, an auxiliary circuit closer operated by said record strip, electromagnetic mechanism in circuit with said auxiliary circuit closer for stopping the motion of said record strip, and devices operated by said moving means for reestablishing a driving relation for said strip.

14. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, means for moving said strip, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said strip, and electromagnetic mechanism in circuit with said auxiliary circuit closer for controlling the motive means of said strip.

15. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, and a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said lamps.

16. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, and a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said lamps.

17. In combination, an electric sign comprising a plurality of lamps arranged in

evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said lamps, and means for opening said switch before the opening of said auxiliary circuit closer.

18. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said lamps, and means for opening said switch before the opening of said auxiliary circuit closer.

19. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said lamps, and a transformer having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current thereto.

20. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, a main switch electromagnetically controlled

by said switching mechanism for controlling the flow of current through said lamps, and a transformer having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current thereto.

21. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said lamps, means for opening said switch before the opening of said auxiliary circuit closer, and a transformer having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current thereto.

22. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said lamps, means for opening said switch before the opening of said auxiliary circuit closer, and a transformer having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current thereto.

23. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, a main switch for controlling the flow of current through said lamps, devices operated by said record strip for controlling the operation of

said switch, and a transformer having primary and secondary windings, said primary winding being connected in circuit with said switch and said secondary winding being connected in circuit with said lamps to supply current thereto.

24. In combination, an electric sign comprising a plurality of lamps arranged in evenly spaced rows, a brush for each lamp connected with one terminal thereof, a terminal plate, a perforated record strip between said brushes and said plate, mechanism for effecting engagement between said brushes and said plate in combinations determined by the perforations in said strip, an auxiliary circuit closer operated by said strip, means for moving said strip, electromagnetic mechanism in circuit with said auxiliary circuit closer for controlling the motion of said strip, and devices operated by said moving means for reestablishing a driving relation for said strip.

25. In a switching mechanism, the combination of a terminal plate, a perforated record strip upon said plate, brushes resting upon said record strip for controlling the closure of individual circuits, means for moving said record strip upon said plate, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said brushes, means for opening said switch before the opening of said auxiliary circuit closer, and a transformer having primary and secondary windings, said secondary winding being connected with said terminal plate, said switch being connected with said primary winding to control the flow of current therethrough.

26. In a switching mechanism, the combination of a terminal plate, a perforated record strip upon said plate, brushes resting upon said record strip for controlling the closure of individual circuits, means for moving said record strip upon said plate, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said brushes, means for opening said switch before the opening of said auxiliary circuit closer, and a transformer having primary and secondary windings, said secondary winding being connected with said terminal plate, said switch being connected with said primary winding to control the flow of current there- through.

27. In a switching mechanism, the combination of a terminal plate, a perforated record strip upon said plate, brushes resting upon said record strip for controlling the

closure of individual circuits, means for moving said record strip upon said plate, an auxiliary circuit closer operated by said record strip, and electromagnetic mechanism in circuit with said auxiliary circuit closer for controlling the motion of said record strip.

28. In a switching mechanism, the combination of a terminal plate, a perforated record strip upon said plate, brushes resting upon said record strip for controlling the closure of individual circuits, means for moving said record strip upon said plate, an auxiliary circuit closer operated by said record strip, and a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said brushes.

29. In a switching mechanism, the combination of a terminal plate, a perforated record strip upon said plate, brushes resting upon said record strip for controlling the closure of individual circuits, means for moving said record strip upon said plate, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, and a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said brushes.

30. In a switching mechanism, the combination of a terminal plate, a perforated

record strip upon said plate, brushes resting upon said record strip for controlling the closure of individual circuits, means for moving said record strip upon said plate, an auxiliary circuit closer operated by said record strip, a switch controlled by the operation of said auxiliary circuit closer for controlling the flow of current through said brushes, and means for opening said switch before the opening of said auxiliary circuit closer.

31. In a switching mechanism, the combination of a terminal plate, a perforated record strip upon said plate, brushes resting upon said record strip for controlling the closure of individual circuits, means for moving said record strip upon said plate, an auxiliary circuit closer operated by said record strip, an electromagnet in circuit with said auxiliary circuit closer, switching mechanism operated by said electromagnet, a main switch electromagnetically controlled by said switching mechanism for controlling the flow of current through said brushes, and means for opening said switch before the opening of said auxiliary circuit closer.

Signed at Chicago, Cook county, Illinois, this 6 day of May, 1915.

GUSTAF F. BAGGE.

Witnesses:

E. K. LUNDY, Jr.,

WM. CAROLD EUELMAN.