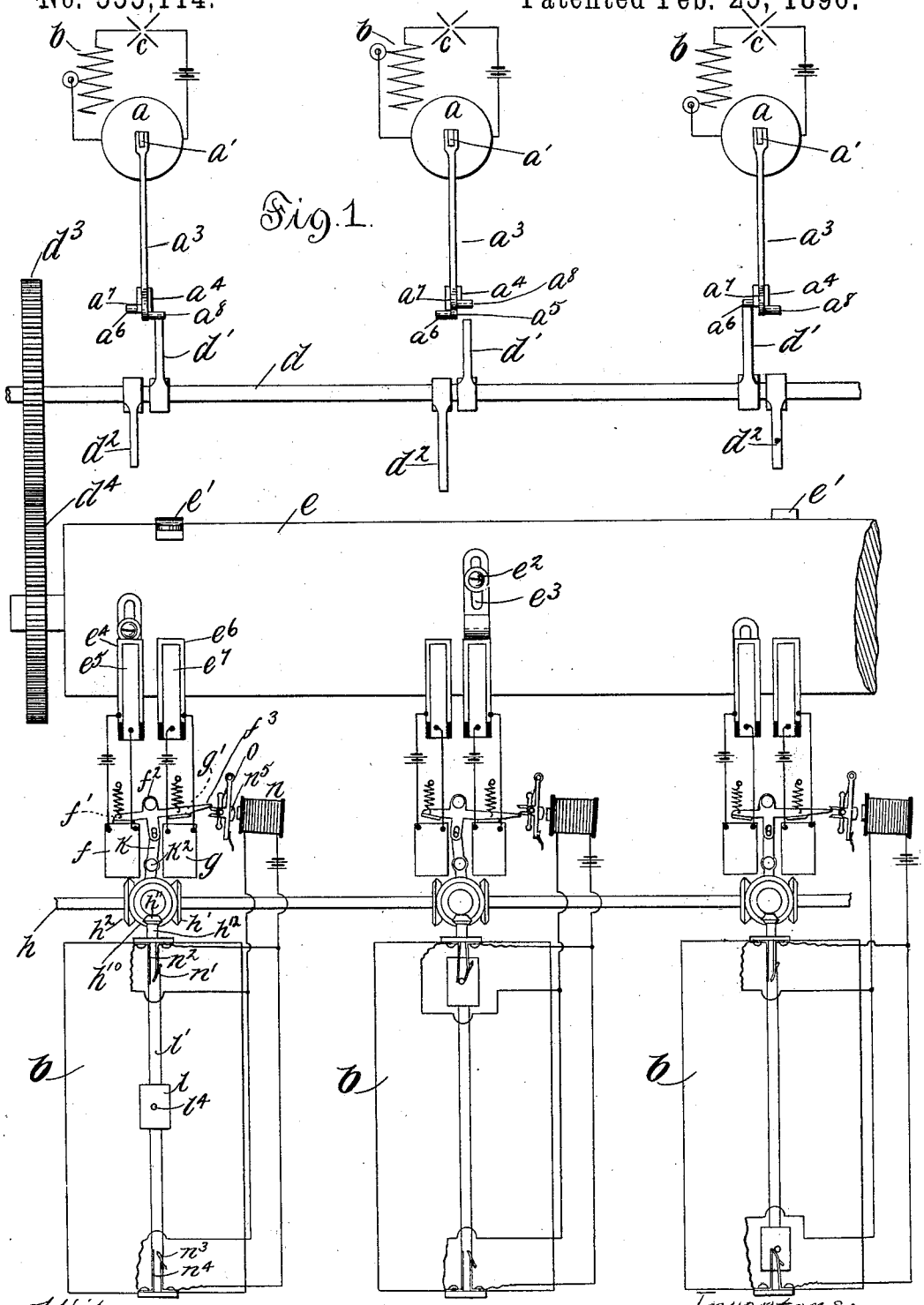
(No Model.) 4 Sheets—Sheet 1.

A. J. OEHRING & A. L. TUCKER.

CIRCUIT CONTROLLING APPARATUS FOR SCENIC THEATERS.

No. 555,114. Patented Feb. 25, 1896.

Fig. 1.



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Attorneys.

(No Model.) 4 Sheets—Sheet 2.

A. J. OEHRING & A. L. TUCKER.

CIRCUIT CONTROLLING APPARATUS FOR SCENIC THEATERS.

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Fig. 6.

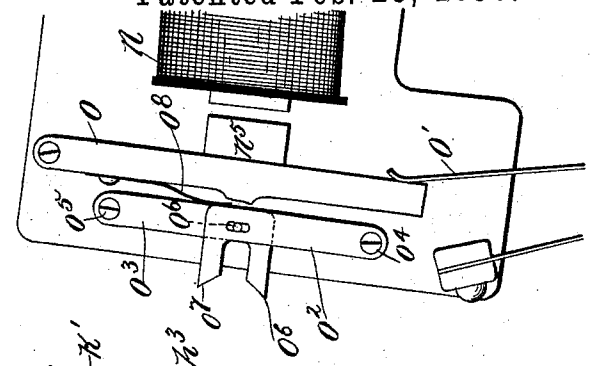


Fig. 3.

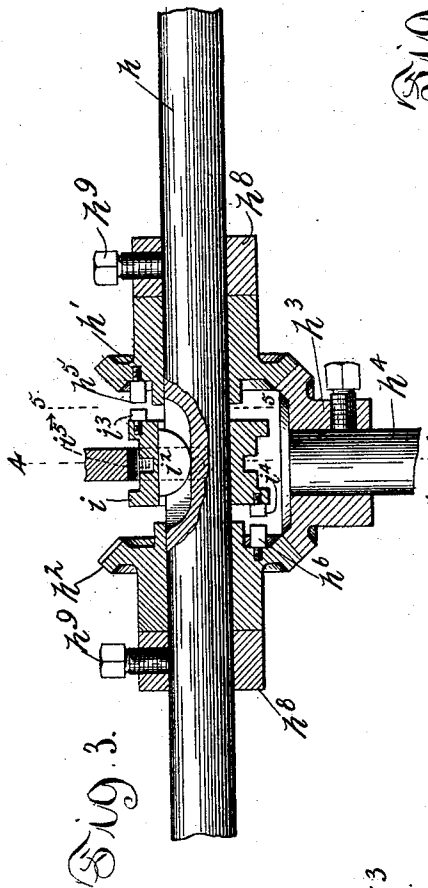


Fig. 4.

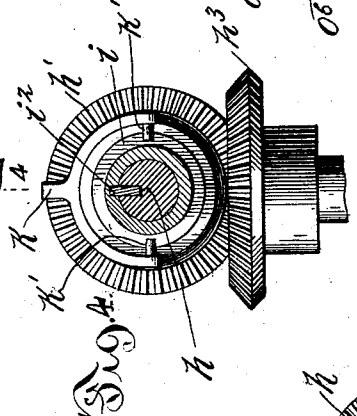


Fig. 5.

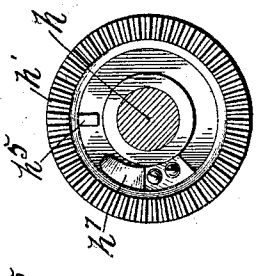
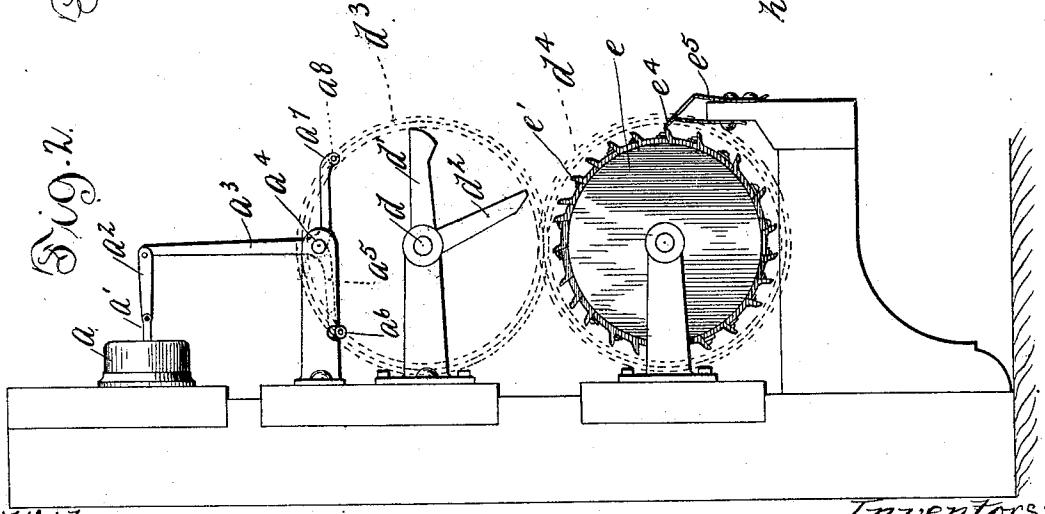


Fig. 7.



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(No Model.) 4 Sheets—Sheet 3.

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CIRCUIT CONTROLLING APPARATUS FOR SCENIC THEATERS.

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Fig. 8.

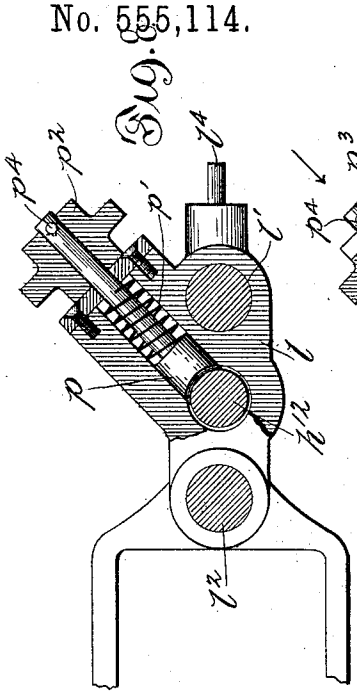


Fig. 9.

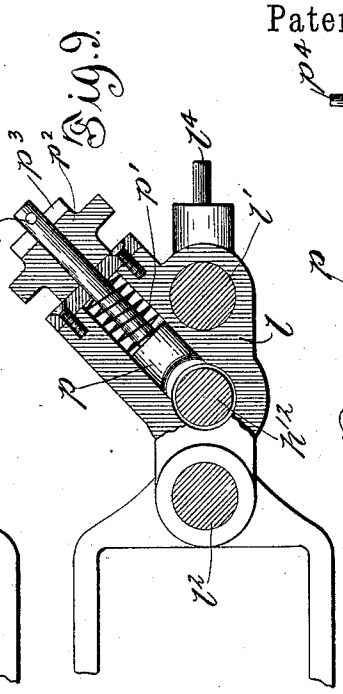


Fig. 10.

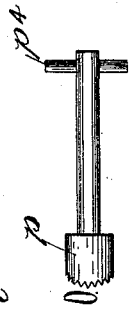


Fig. 11.

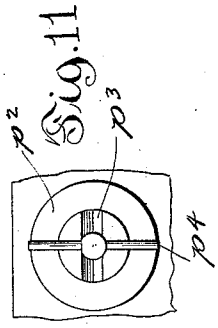
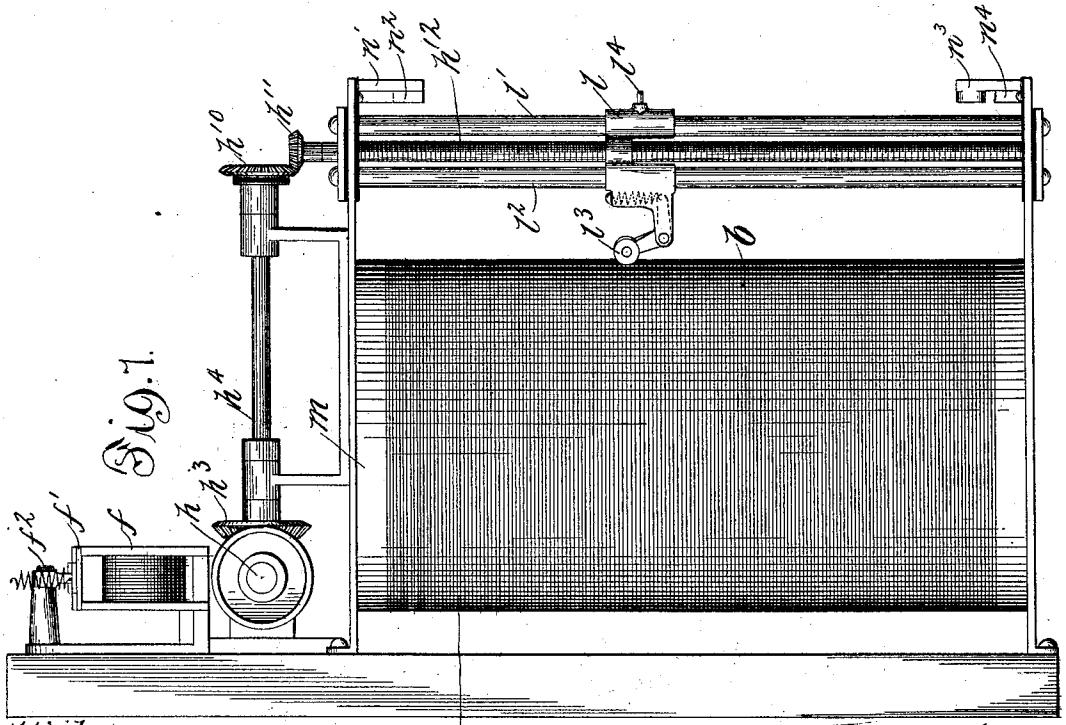


Fig. 1.



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(No Model.) 4 Sheets—Sheet 4.

A. J. OEHRING & A. L. TUCKER.

CIRCUIT CONTROLLING APPARATUS FOR SCENIC THEATERS.

No. 555,114. Patented Feb. 25, 1896.

Fig. 12.

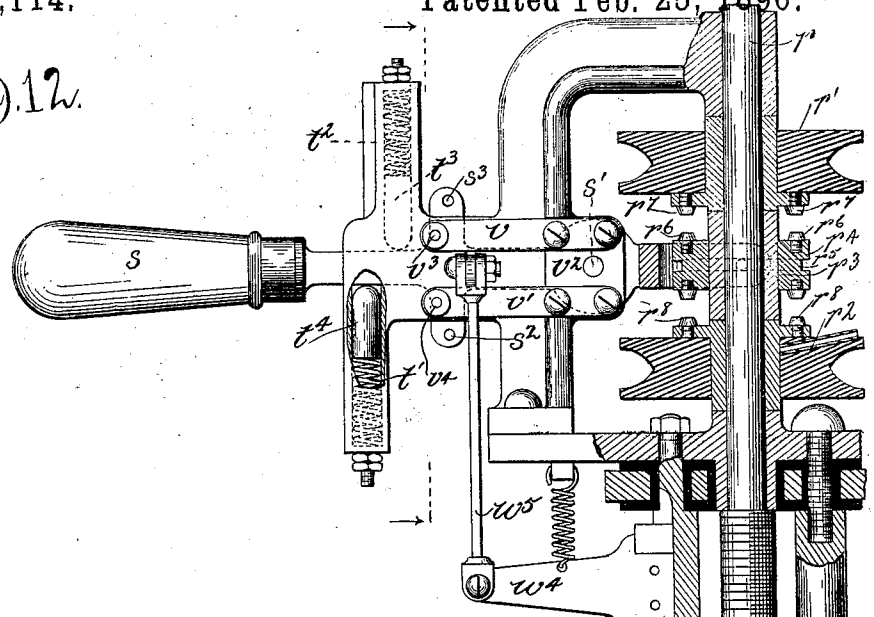


Fig. 13.

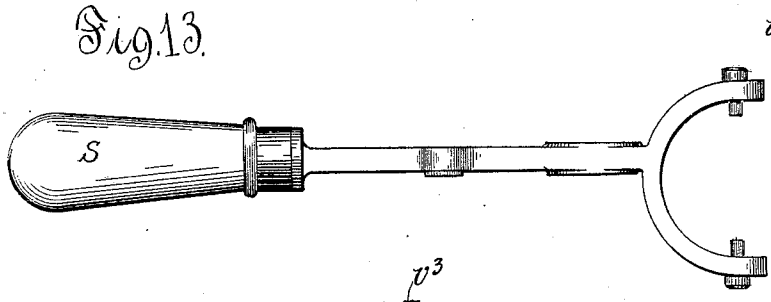
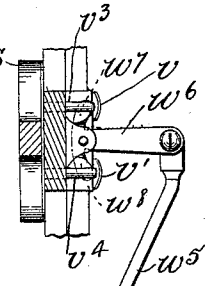


Fig. 14.



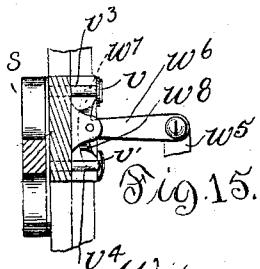
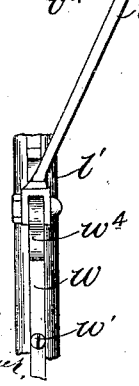


Fig. 15.



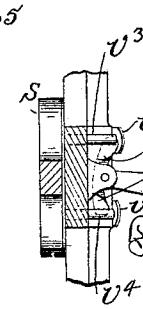


Fig. 16.

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UNITED STATES PATENT OFFICE.

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CIRCUIT-CONTROLLING APPARATUS FOR SCENIC THEATERS.

SPECIFICATION forming part of Letters Patent No. 555,114, dated February 25, 1896.

Application filed May 13, 1895. Serial No. 549,136. (No model.)

To all whom it may concern:

Be it known that we, AUGUST J. OEHRING and ALBERT L. TUCKER, citizens 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-Controlling Apparatus for Scenic Theaters, (Oehring Case No. 10, Tucker Case No. 3,) 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.

Our invention relates to circuit-controlling apparatus more particularly designed for use in connection with scenic theaters.

The object of our invention is to provide automatically-actuated devices for controlling the circuits through the several series of translating devices employed in lighting and otherwise producing the scenic effects, so that the several circuits may be closed and opened at the proper times and the strength of the current controlled as desired.

In the preferred form of our invention we provide a shaft adapted to be rotated once during the continuance of the performance of the scenic theater, radial arms being provided upon the rotating shaft adapted to engage intermediate mechanism to operate a series of switches placed respectively in the several circuits to be controlled. The radial arms are so adjusted angularly upon the shaft that a switch will be thrown at the proper time by one of the arms to close the circuit which it controls, and later, at the expiration of a predetermined time, a second arm will act to open the circuit through the switch. A drum is also provided adapted to be rotated once during the continuance of the performance. Upon its surface are provided a series of lugs or projections which as the drum rotates are adapted to engage and close together pairs of contact-points. The pairs of contact-terminals are connected, respectively, through a series of electromagnets, each two of which control a clutch, which when moved in one direction causes the traveling contact of a rheostat to move in one direction to cut out resistance, and which when moved in the opposite direction causes a cutting in of resistance. One electromagnet of each pair serves to move the clutch in one direction, while the other magnet moves the clutch in the opposite direction. The clutch has a middle or neutral position, and when it occupies this position the traveling contact of the rheostat remains at rest. A third electromagnet is provided in connection with each pair of electromagnets, and is connected in circuit with two pairs of normally-separated contact-points adapted to be closed together by the traveling contact of the rheostat as it reaches either end of its travel to actuate said third electromagnet and bring the spring to its neutral position, thus causing the traveling contact to come to rest.

The projections on the drum are so arranged relatively to the arms of the rotating shaft that first the switch of a circuit is thrown to close circuit therethrough, then a drum projection engages its pair of contact-points to close circuit through the electromagnet that effects the movement of the traveling contact in a direction to cut out resistance. When the traveling contact of the rheostat reaches the end of its travel it effects the closing of the circuit through the third electromagnet to thereby bring the traveling contact to rest. As the drum continues to rotate a second projection thereon closes together the members of the pair of contacts that control the circuit through the electromagnet that effects movement of the traveling contact of the rheostat in a direction to cut in resistance. When the traveling contact of the rheostat reaches the end of its travel, circuit is closed through the third electromagnet to again bring the traveling contact of the rheostat to rest. Immediately after an arm upon the rotating shaft engages the intermediate mechanism connected with the switch to open the circuit.

We will describe our invention more in detail in connection with the accompanying drawings, in which—

Figure 1 represents diagrammatically the apparatus of our invention. Fig. 2 is a view in elevation of a portion of the apparatus illustrating the relative positions of the circuit-controlling switches, the rotating shaft, and the rotating drum. Fig. 3 is a detail view of the clutch mechanism for controlling

the movement of the traveling contact of the rheostat. Fig. 4 is a sectional view on line 4 4, Fig. 3. Fig. 5 is a sectional view on line 5 5, Fig. 3. Fig. 6 is a detail view of the releasing mechanism operated by the electromagnet, the circuit through which is controlled by the traveling contact of the rheostat. Fig. 7 is a view in elevation of a rheostat and the mechanism for operating the same. Fig. 8 is a detail view of an attachment for throwing the traveling contact into or out of operation. Fig. 9 is a similar detail view showing the traveling contact thrown out of gear. Fig. 10 is a detached view of the plunger of the above attachment. Fig. 11 is a view looking in the direction of the arrow in Fig. 9. Fig. 12 is a view partially in section of a semiautomatic device for controlling the movement of the traveling contact of the rheostat. Fig. 13 is a detail view of the manual lever employed therein. Fig. 14 is a detached view of the clutch-releasing mechanism. Figs. 15 and 16 are similar views showing the elements in the different positions which they may occupy.

Like letters refer to like parts in the several figures.

Referring to Figs. 1 and 2, a series of switches a a a are provided, each switch being connected in circuit with a rheostat b and the translating devices c. The switch may be of any preferred construction, but we preferably employ a switch, as illustrated, in which the circuit is closed when a plunger a' is thrust inward and opened when the plunger is withdrawn. A link a^2 connects the plunger a' with a lever a^3 pivoted at a^4. The lever a^3 is bifurcated at the lower end and carries upon one of its members, a^5, a roller a^6 extending horizontally in one direction, while upon the other member, a^7, is provided a roller a^8 extending in the opposite direction. Below the lever a^3 is provided a shaft d, adapted to be rotated once during the continuance of the scenic-theater performance. Upon the shaft d are provided a series of arms, two arms being provided in connection with each of the levers a^3. One of the arms, d', of each pair is mounted upon the shaft so that at the proper time in the rotation of the shaft d it will engage the roller a^8, thrusting the same upward and moving the upper end of the lever a^3 to the left, as seen in Fig. 2, to close the circuit. The second arm, d^2, of the pair is mounted upon the shaft in such an angular position relatively to the arm d' that at the end of the predetermined time it will engage the roller a^6, thrusting the same upward to move the upper end of the lever a^3 to the right and thus open the circuit through the switch. Upon the end of shaft d is provided a gear-wheel d^3 adapted to mesh with a gear-wheel d^4 mounted to rotate with a drum e.

Upon the periphery of the drum are provided a series of lugs or projections e', which may be adjusted for a short distance around the circumference of the drum through the agency of the screws e^2 and slots e^3. In the plane of travel of each lug is provided a pair of contact-springs e^4 e^5, normally out of contact. For each switch there are provided two pairs of contacts and two lugs upon the drum, adapted respectively to engage the pairs of contacts. One pair of contacts, e^4 e^5, is connected through an electromagnet f, which, when energized, acts upon an armature f' carried upon the end of a pivoted lever f^2. The other pair of contacts, e^6 e^7, is connected through an electromagnet g adapted to act upon its armature g' mounted upon the opposite end of the pivoted lever f^2.

Mounted loosely upon a continuously-rotating shaft h are provided bevel-gears h' h^2, (illustrated in detail in Figs. 3, 4 and 5,) said gear-wheels being adapted to engage a bevel-gear h^3, mounted upon a shaft h^4. Between the bevel-gears h' and h^2 is provided a clutch-collar i, adapted to slide longitudinally upon the shaft h, being feathered to the shaft by a key i^2, whereby it is caused to continuously rotate with the shaft. Pins or lugs i^3 i^4 extend from the opposite face of the clutch-collar i and engage alternately with pins or lugs h^5 h^6, provided, respectively, upon the faces of the bevel-gears h' h^2. When, therefore, the clutch-collar i is moved in one direction, the pin i^3 engages pin h^5, and the bevel-gear h' is driven in the direction of rotation of the shaft to thereby impart rotation to the shaft h^4 in one direction. When the clutch-collar i is moved in the opposite direction, pin i^4 engages pin h^6 upon bevel-gear h^2 to rotate said bevel-gear h^2 with the shaft, thus causing the shaft h^4 to be rotated in the opposite direction. A peripheral groove i^5 is provided in the clutch-collar i, in which are adapted to rest pins k' provided upon the members of the bifurcated end of a lever k, pivoted to rotate at k^2 and linked at its upper end with the armature-lever f^2. Upon the face of each of the bevel-gears h' h^2 is provided a spring h^7, which reacts, when the clutch-collar is released, to assist in moving the same to its neutral position. Upon the shaft h are secured collars h^8 by means of screws h^9, which maintain the bevel-gears h' h^2 in engagement with the bevel-gear h^3. When magnet f is energized, the armature-lever f^2 is rotated upon its axis to rotate the lever k to bring the clutch-collar i into engagement with bevel-gear h^2, thus causing the shaft h^4 to rotate in one direction. When the electromagnet g is energized, armature-lever f^2 is rotated in the opposite direction to bring the clutch-collar i into engagement with bevel-gear h', thus rotating the shaft h^4 in the opposite direction.

As shown more clearly in Fig. 7, the shaft h^4 is provided upon its end with a bevel-gear h^{10}, adapted to engage a bevel-gear h^{11}, mounted to rotate with a screw h^{12}. A carriage l, sliding upon the vertical rods l' l^2, is provided with threads adapted to engage the screw h^{12}, so that as the screw is rotated in

one direction or the other the carriage l is raised or lowered. Upon the carriage l is carried the contact-making device l^3 of the rheostat. The rheostat which we preferably employ is that in which a vertical drum m has wound helically about its periphery a resistance-wire m', one end of the wire m'—as, for instance, the upper end—being connected with one side of the circuit, while the opposite side of the circuit is connected with the contact-making device l^3. As the contact device l^3 is moved upward, less of the coil of wire m' is included in the circuit, thus gradually decreasing the resistance. As the contact-making device l^3 is moved downward, the resistance of the circuit is gradually increased.

Upon the carriage l is provided a pin l^4, which, when the carriage reaches the upper end of its stroke, closes together the contacts n' n^2, thus completing the circuit through an electromagnet n. When the carriage reaches the lower end of its travel, it engages the contacts n^3 n^4 to likewise complete the circuit through the electromagnet n. The armature n^5 of the electromagnet n is provided upon a pivoted lever o, normally held outward by a spring o', as is shown in detail in Fig. 6. A pair of L-shaped levers o^2 o^3 are pivoted at o^4 and o^5, respectively, and are connected with the pivoted lever o by means of a pin o^6 carried thereon, which passes through slots provided in said levers o^2 o^3. When the armature of the electromagnet n is attracted, the levers o^2 o^3 are rotated upon their axes to thus move the ends o^6 o^7 thereof inward. When the magnet n is de-energized, the spring o' returns the lever o, and in consequence the levers o^2 o^3, to their normal positions. A spring o^8 is provided between the lever o and the levers o^2 o^3 to maintain the same in their proper positions.

The extended end f^3 of the armature-lever f^2 normally rests between the ends o^6 o^7 of said levers o^2 o^3, as shown in the illustration upon the right in Fig. 1. When the magnet f is energized the end f^3 of the armature-lever f^2 is moved upward, the yielding mounting of the lever o^2 permitting the movement of the lever past its end o^7, the end o^7 moving outward again when the end f^3 of the lever f^2 has passed to maintain the armature-lever f^2 in its new position, as shown in the illustration on the left in Fig. 1, so that, although the rotation of the drum e may again open the circuit through magnet f, the armature-lever f^2 will continue in its new position, thus causing the clutch-collar i to engage the bevel-gear h^2 and cause the movement of the traveling contact l^3 of the rheostat in an upward direction to cut out resistance. When the traveling contact l^3 reaches the upper end of its travel the pin l^4 brings the contacts n' n^2 together, thus completing circuit through the magnet n to cause the same to attract its armature n^5, thus moving the end o^7 of the lever o^2 out of engagement with the end f^3 of the armature-lever f^2 and permitting said armature-lever f^2 to return to its normal position, as indicated in the illustration on the right in Fig. 1, to thereby disengage the clutch from bevel h^2 and bring the traveling contact of the rheostat to rest.

When the magnet g is energized the end f^3 of the armature-lever f^2 is moved downward from its middle or neutral position to rest beneath the end o^6 of the lever o^3, as shown in the central illustration of Fig. 1, thus maintaining the clutch-collar i in engagement with the bevel-gear h' to cause the rheostat-contact l^3 to move downward and cut in resistance. When the contact device l^3 reaches the lower end of its travel the pin l^4 closes the contacts n^3 n^4 together, thus energizing the magnet n and withdrawing the end o^6 of lever o^3 out of engagement with the end f^3 of the armature-lever, thus bringing said armature-lever f^2 to its middle position and moving the clutch-collar i to its neutral position to bring the moving contact l^3 to rest.

In the operation of the apparatus as above described the contact-arm d' first engages roller a^8 to effect the closing of the circuit through the switch a, all of the resistance of the rheostat b being included in circuit. Shortly thereafter one of the lugs upon the rotating drum e engages contacts e^4 e^5, thus closing circuit through electromagnet f to bring the clutch-collar i into engagement with bevel-gear h^2 to thereby effect the upward travel of the moving contact l^3 to gradually cut out resistance. When the moving contact l^3 reaches the upper end of its travel, contacts n' n^2 are brought together to energize the electromagnet n, thus releasing the armature-lever f^2 and permitting it to return to its middle position to thereby move the clutch-collar to its neutral position to bring the moving contact l^3 to rest, all of the resistance being now cut out of circuit. At the end of the predetermined time a lug upon the rotating drum e engages the contacts e^6 e^7, thus closing circuit through the magnet g and effecting the movement of the clutch-collar i in a direction to engage the gear h', thus causing the travel of the moving contact l^3 downward to cut in resistance. When the contact l^3 reaches the end of its downward travel it closes together contacts n^3 n^4, thus completing circuit through electromagnet n to energize the same, and thereby release the armature-lever f^2 to permit the same to return to its middle position and thereby move the clutch-collar i to its neutral position to bring said moving contact l^3 to rest, all of the resistance being now thrown into circuit. Shortly thereafter the second arm, d^2, engages the roller a^6, carried upon the lever a^3, to open the circuit through the switch.

The apparatus as above described is duplicated for each circuit which it is desired to control.

In the diagram of Fig. 1 a battery is conventionally indicated in each of the circuits;

but it will be understood that in practice the several circuits will be supplied with current from a common source.

It is sometimes desired to throw the traveling contact of the rheostat out of operation, and for this purpose we provide on the carriage l a plunger p, provided upon its end with threads adapted to engage the threads upon the screw h^{12}, the screw passing loosely through the bore provided in the carriage. The plunger p is normally held in engagement with the screw h^{12} by means of a spring p'. A thumb-piece p^2 is provided, having upon its end a V-shaped groove p^3, in which a pin p^4, provided on the end of the plunger p, is adapted to rest when the plunger is in engagement with the screw h^{12}. When the thumb-piece is turned through ninety degrees, as shown in Fig. 9, the pin p^4 is raised out of the groove, the plunger p being thereby drawn back against the tension of the spring p' to disengage the same from the screw h^{12}. When the plunger occupies this latter position the screw h^{12} will rotate without imparting movement to the carriage l.

In Figs. 12, 13, 14, 15, and 16 we have illustrated a semiautomatic device, by means of which the traveling contact of the rheostat may be brought to rest at the end of its travel automatically, or it may be brought to rest at any point manually. The carriage l slides on vertical rods l' l^2, the upper end of the screw h^{12} being connected with a shaft r, upon which are loosely mounted the wheels r' and r^2, adapted to be driven in opposite directions. To the shaft r is keyed a collar r^3, and a clutch-collar r^4 is feathered upon the collar r^3, so that it may be moved longitudinally while rotating with the shaft r. A manual lever s, pivoted at s', is provided with a bifurcated end carrying pins adapted to engage the groove r^5 in the clutch-collar r^4 to impart a longitudinal movement to said clutch-collar to cause the pins r^6 provided thereon to engage the pins r^7 provided upon the wheel r', or pins r^8 provided upon the wheel r^2. The manual lever s is normally held in its middle position with the clutch-collar out of engagement with the wheels r' r^2 by means of springs t' t^2 acting upon plungers t^3 t^4, the plungers resting against the opposite sides of the manual lever s. A pair of springs v v' are mounted upon the standard v^2 and are provided upon their ends with pins v^3 v^4. The manual lever s is provided with holes s^2 s^3, the hole s^2 being adapted to be engaged by pin v^4 of the spring v when said manual lever s is moved downward, the lever thus being locked in its downward position. When the manual lever s is moved upward the hole s^3 is engaged by pin v^3 in the spring v', thus locking the lever in its upward position. When the manual lever s is maintained in its upper position the clutch r^4 engages the wheel r^2 to cause the carriage l to travel downward, and when the manual lever s is maintained in its lower position the clutch r^4 engages the wheel r' to cause the carriage l to travel upward.

On the rod l' is provided a bar w, adapted to slide longitudinally, pins w' w^2 being provided thereon adapted to be engaged by the projection w^3 carried upon the carriage l. Upon the bar w is mounted an arm w^4, connected by means of a link w^5 with a pivoted lever w^6 carrying two arms w^7 w^8, adapted to engage, respectively, with the under surfaces of the springs v and v'. The manual lever s occupying its upper position and the carriage l moving downward, the projection w^3 comes in contact with the pin w^2, thus moving the bar w downward, and, through the intermediate mechanism, rotating the lever w^6 to cause the arm w^7 thereof to engage the under side of the spring v to move the same outward, so that pin v^3 provided upon the end thereof is moved out of engagement with the hole s^3 provided in said manual lever s. The manual lever being first raised the spring l^2 reacts to move the lever to its neutral position, thus throwing the clutch out of action and bringing the carriage l to rest. When the manual lever s occupies its lower position the carriage l is moving upward, and when the projection w^3 comes in contact with the pin w' the bar w is moved upward, thus rotating the lever w^6 and causing the arm w^8 thereof to engage the under surface of the spring v' to move the pin v^4, carried upon the end thereof, out of engagement with the hole s^3 provided in the manual lever s. The spring t' then reacts to move the manual lever s upward to its neutral position to thereby bring the carriage l to rest.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with an electric switch, of a pivoted lever bifurcated at the lower end, and connected at the upper end with the movable element of said switch, a continuously-rotating shaft, a pair of arms mounted upon said shaft, one of said arms being adapted to engage one member of the bifurcated end of said lever to rotate said lever and close said switch, and the other arm being adapted to engage the other member to open said switch, substantially as described.

2. In a circuit-controller for scenic theaters, the combination with a number of electric circuits, of a variable rheostat included in circuit in each, a drum or part adapted to rotate once during the continuance of the performance and carrying upon its surface lugs or projections, and intermediate mechanism thrown into operation at predetermined times through the agency of said lugs to effect the movement of the traveling contacts of said rheostats, substantially as described.

3. The combination with a continuously-rotating drum carrying lugs or projections upon its surface, of two pairs of contacts adapted to be closed together by said lugs, an electromagnet in circuit with each of said

pairs of contacts, a clutch controlled by said electromagnets, and the traveling contact of a rheostat controlled by said clutch, substantially as described.

4. The combination with a continuously-rotating drum carrying upon its surface lugs or projections, of switches controlled by said lugs, an electromagnet in circuit with each of said switches, the traveling contact of a rheostat, a clutch controlled by said electromagnets for effecting the movement of said traveling contact, and a third electromagnet adapted to be actuated when said traveling contact reaches the end of its travel to move said clutch to a neutral position and bring said traveling contact to rest, substantially as described.

5. The combination with the traveling contact of a rheostat, of a clutch adapted to occupy one position to move said contact in one direction, and a second position to move said contact in the opposite direction, a pair of electromagnets for controlling said clutch, locking mechanism for maintaining said clutch in either of its two positions, and a third electromagnet adapted to actuate said locking mechanism to release said clutch and permit the same to occupy a neutral position, said third electromagnet being adapted to be actuated when said traveling contact reaches the end of its travel, substantially as described.

6. The combination with the drum e provided upon its surface with lugs e', of the contacts e^4 e^5, and e^6 e^7, the electromagnets f and g in circuit therewith, respectively, the armature-lever f^2, the clutch i connected thereto, the revolving shaft h, the bevel-gears h' h^2 mounted on said shaft, the bevel-gear h^3, the rotating screw h^7 connected to rotate with said bevel-gear h^3, the carriage l carrying the traveling contact of the rheostat, contacts n' n^2 and n^3 n^4 adapted to be closed together by said carriage l, the electromagnet n in circuit with said contacts n' n^2 and n^3 n^4, and the mechanism controlled by said electromagnet n for locking said armature-lever f^2 in position, substantially as described.

7. The combination with a carriage carrying the traveling contact of a rheostat, of a screw engaging a thread therein and adapted to be rotated to advance said carriage, a longitudinally-movable bar adapted to be engaged and moved by said carriage, a clutch, a manual lever for throwing said clutch into position to produce rotation of said screw in either direction, locking mechanism for maintaining said clutch in its operative positions, and means actuated by said longitudinally-movable bar for actuating said locking mechanism to permit said clutch to return to its neutral position, substantially as described.

8. The combination with the carriage l carrying the traveling contact of a rheostat, of the rotating screw h^{12}, the longitudinally-movable bar w adapted to be engaged and moved by said carriage, clutch r^4, manual lever s for operating the same, springs v v' carrying upon their ends pins v^3 v^4 adapted to engage holes s^2 s^3 provided in said lever s to lock said lever in position, the pivoted lever w^6 provided with arms w^7 w^8 adapted to engage springs v v', respectively, to release manual lever s, said lever w^6 being connected with said longitudinally-movable bar w, substantially as described.

In witness whereof we hereunto subscribe our names this 22d day of September, A. D. 1894.

AUGUST J. OEHRING.
ALBERT L. TUCKER.

Witnesses:
W. CLYDE JONES,
GEORGE L. CRAGG.