Feb. 19, 1935. J. H. KLIEGL 1,991,615

DISAPPEARING FOOTLIGHT

Filed July 16, 1930 4 Sheets-Sheet 1

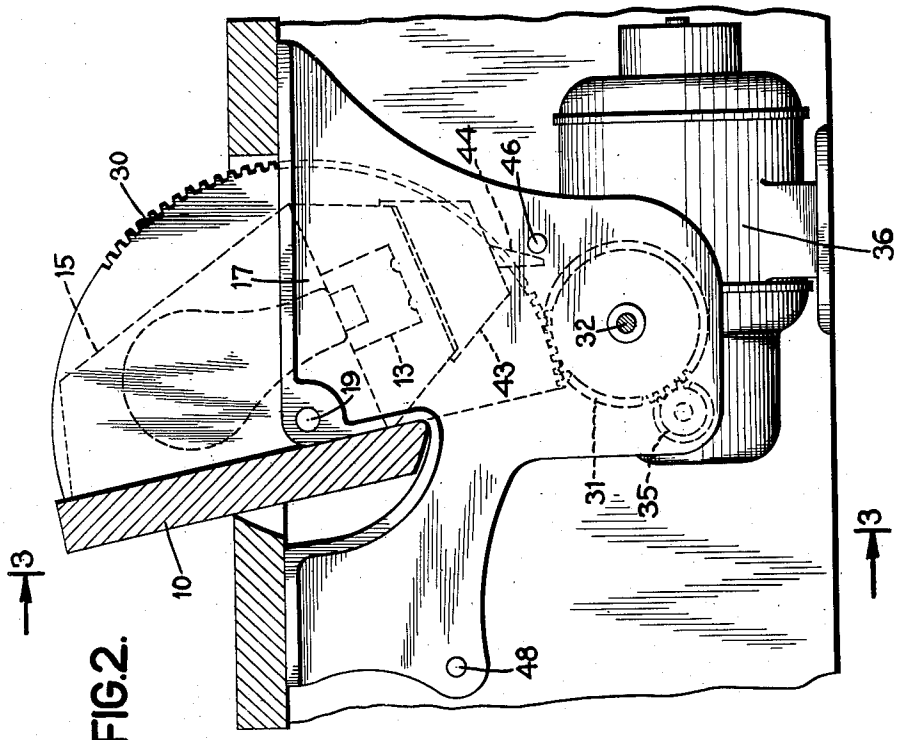

FIG.2.

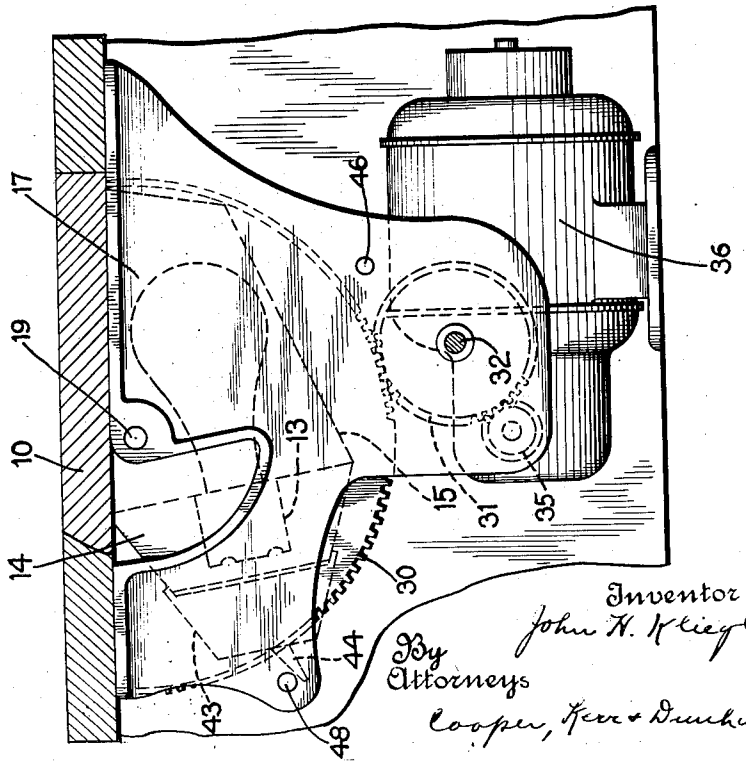

FIG.1.

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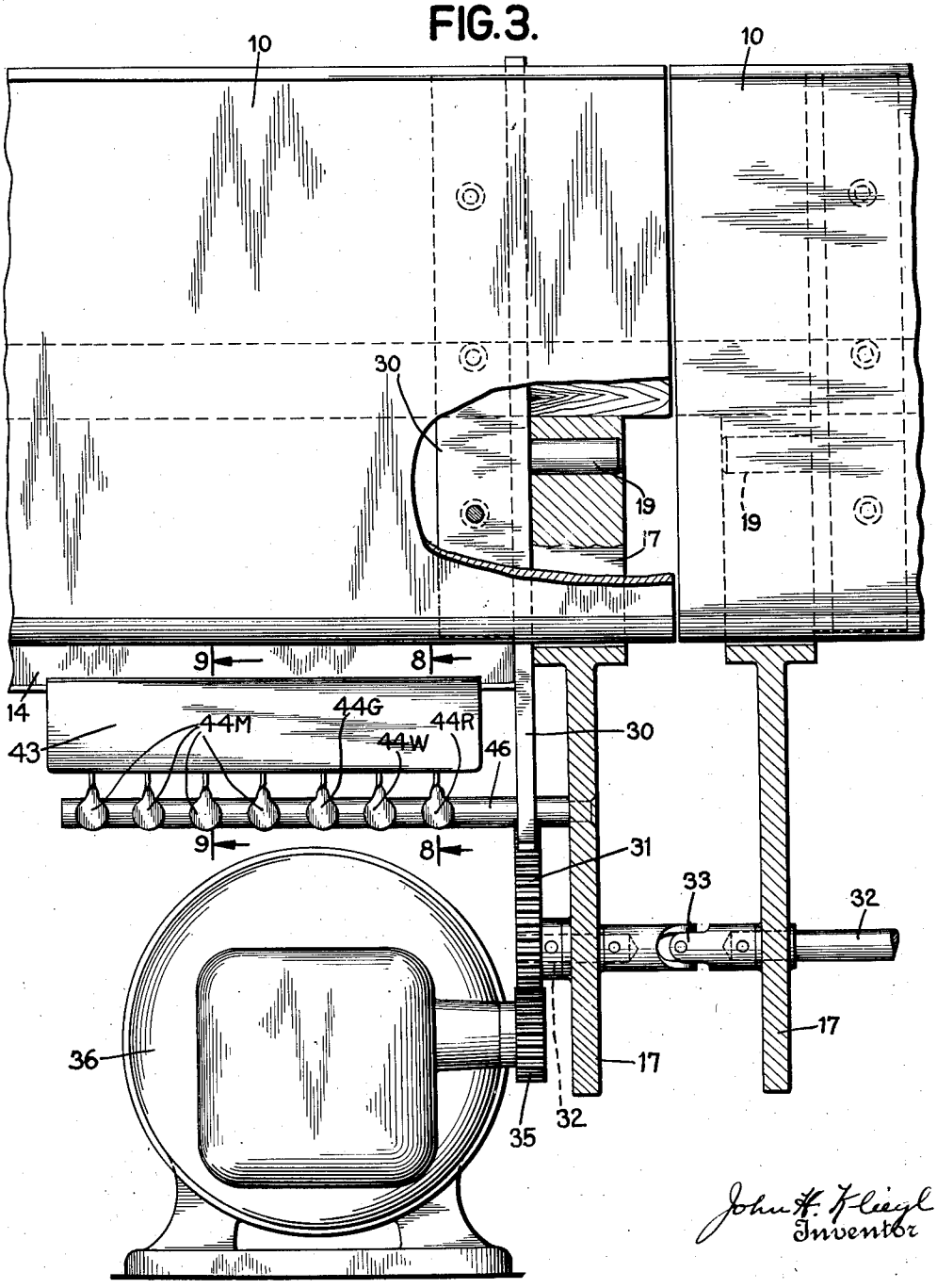
Feb. 19, 1935. J. H. KLIEGL 1,991,615

DISAPPEARING FOOTLIGHT

Filed July 16, 1930 4 Sheets-Sheet 2

FIG. 3.



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DISAPPEARING FOOTLIGHT

Filed July 16, 1930 4 Sheets-Sheet 3

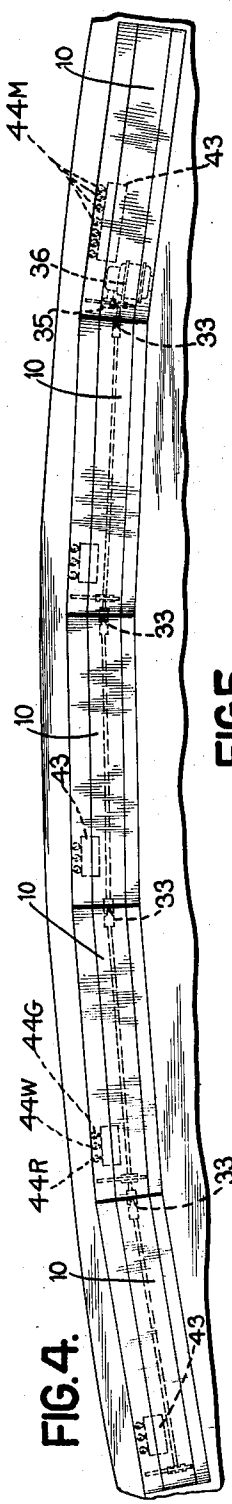

FIG.4.

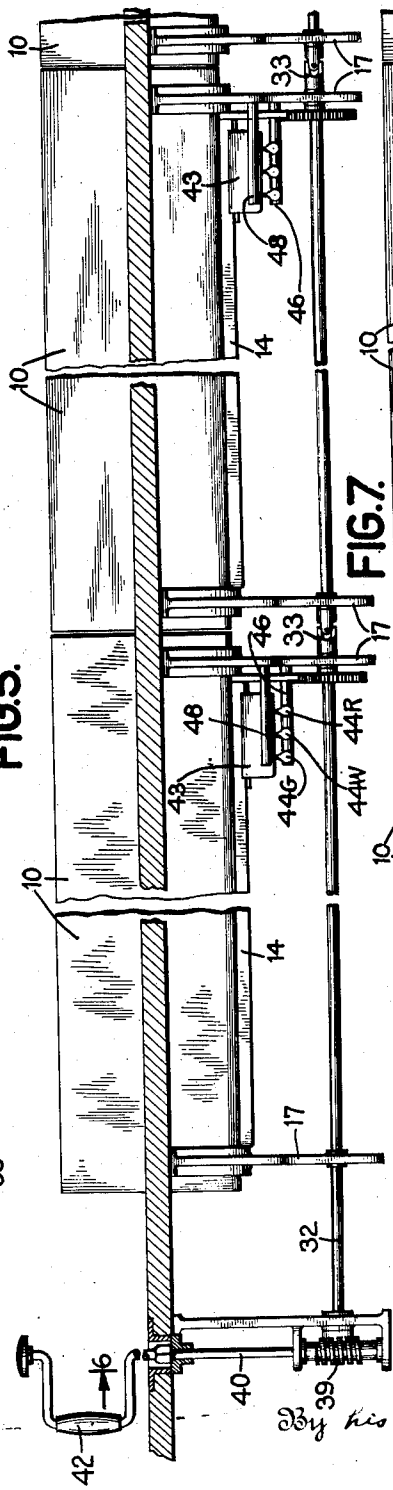

FIG.5.

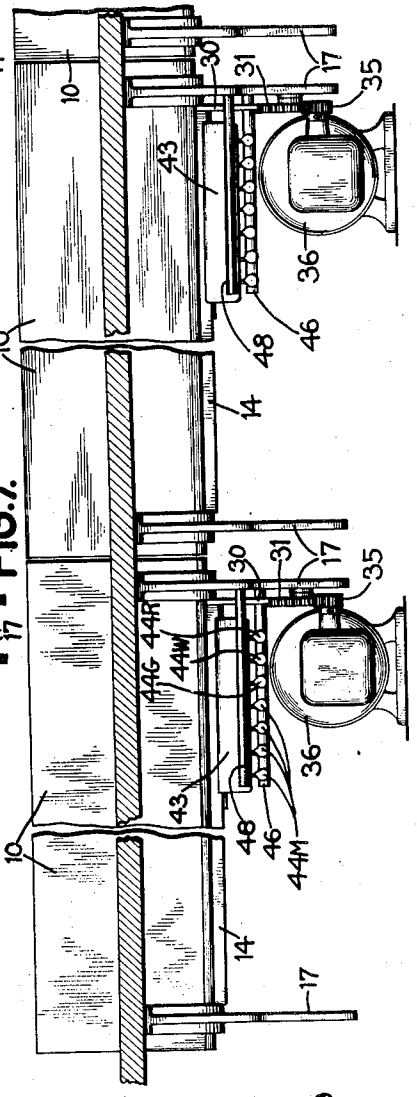

FIG.7.

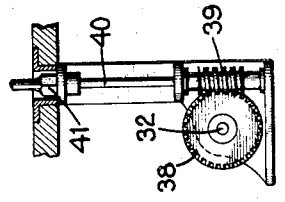

FIG.6.

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DISAPPEARING FOOTLIGHT

Filed July 16, 1930 4 Sheets-Sheet 4

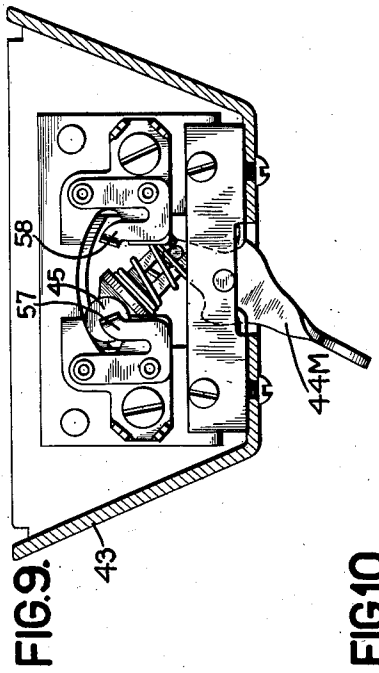

FIG.9.

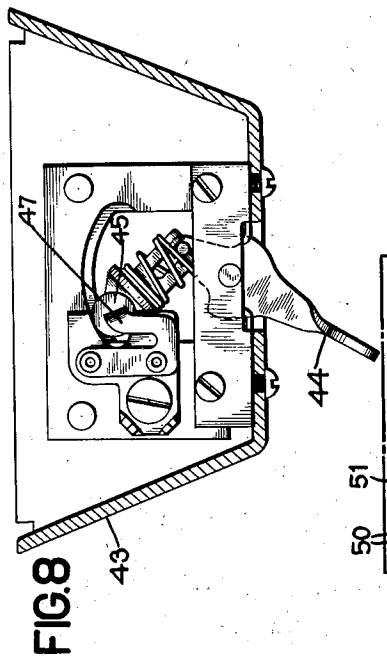

FIG.8

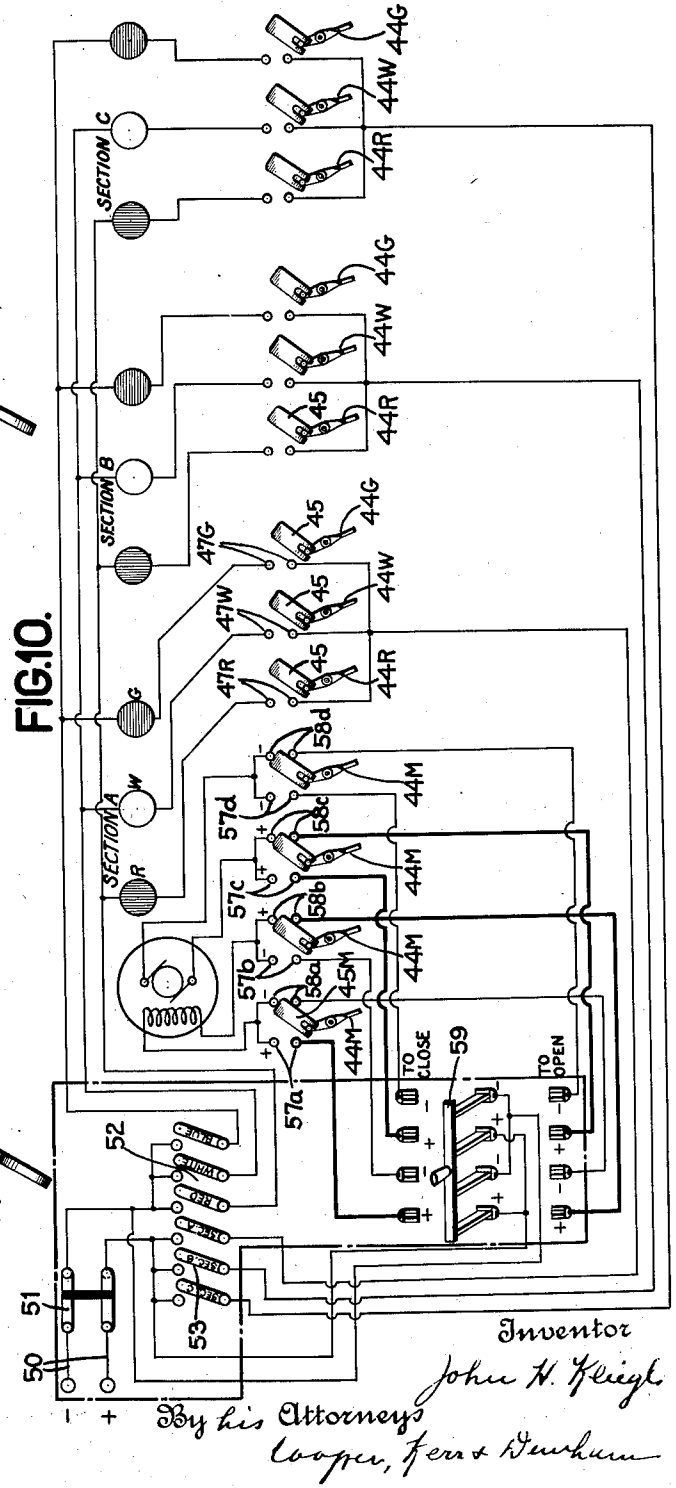

FIG.10.

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UNITED STATES PATENT OFFICE

1,991,615

DISAPPEARING FOOTLIGHT

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Application July 16, 1930, Serial No. 468,226

15 Claims. (Cl. 240—3)

This invention relates to improvements in stage footlights. The chief object of the invention is to provide improved means for controlling footlights of the disappearing or concealed type.

One object of the present invention resides in the provision for controlling current supply to the lamps in such a way that current supply will be cut and the lights turned off when the footlights are in concealed position and so that supply of current is automatically resumed when the footlights are displaced to the "in use" or open position.

A further object of the present invention resides in the provision of footlights which may be displaced to concealed position or to "in use" position by suitable power devices which are adapted for control remote from the footlights.

A further object of the present invention resides in the provision of novel control and operating means for disappearing footlights and for the lamps of such footlights.

A further object of the present invention resides in the provision of novel control means for disappearing footlights which are adapted when the footlights are displaced to the "in use" position to suspend further displacement and movement of the footlights and furthermore to provide means so that when the footlights are "in use" position other control circuits are established to permit the subsequent shifting of the footlights to concealed position.

A further object of the present invention resides in the provision of novel control means for disappearing footlights which are adapted when the footlights reach concealed position to shut off current supply to the motor or motors so that no further displacement of the carriers takes place and furthermore to provide means so that when the footlights reach the concealed position, other control circuits are established to permit the subsequent shifting of the footlights to open position.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings which by way of illustration show what I now consider to be preferred embodiments of the invention.

In the drawings:

Figure 1 is a fragmentary sectional view of one of the improved footlights showing a footlight displaced in concealed position;

Fig. 2 is a view similar to Fig. 1 but with the footlight in open or "in use" position;

Fig. 3 is a detail view shown partly in section, the view being taken substantially on line 3—3 of Fig. 2;

Fig. 4 shows a top plan view of the group of footlight sections, all of the sections being adapted for concurrent operation by a single operating motor;

Fig. 5 is a detailed view of a modification in which a manually operable means is provided for actuating the various footlight sections;

Fig. 6 is a detail view taken substantially on line 6—6 of Fig. 5;

Fig. 7 is a detail view of another modification in which independent motors are provided for each footlight section;

Figs. 8 and 9 are detail views of certain switching appliances used in connection with the footlights; and

Fig. 10 is a circuit diagram of the various control circuits.

The disappearing footlight sections themselves are substantially of the construction disclosed in Kliegl United States Patent No. 1,141,122 and accordingly, require no detailed description. It is sufficient to state that each section comprises a carrier generally designated 10 pivotally mounted at 19 upon a frame 17 suitably supported below the level of the stage. The lamp sockets 13 as heretofore, are mounted in a lamp box 14 and the usual lamp case 15 is provided. In contradistinction to having the ends of the covering plates or boards of the carrier spaced apart at the section ends, such parts abut each other at the ends as clearly shown in Figs. 3 and 4.

Operating mechanism

Suitably fixed to each carrier 10 there is a gear sector 30. Meshing with each gear sector 30 is a spur gear 31 which in turn is fixed to a shaft section 32 journalled suitably in frame 17. One shaft section 32 is provided for each footlight section and to provide for the relative curvature of an assemblage of footlight sections to conform with the curved front of the stage the various sections 32 are preferably coupled together by universal joints 33 (see Figs. 4 and 5). According to the embodiment of the invention shown in Fig. 4, one of the sections 32 has its spur gear 31 disposed to mesh with and be driven by a motor driven gear 35 driven by a suitable motor 36. It may be explained that the embodiment shown in Fig. 4 discloses a construction in which all sections are adapted for concurrent displacement under drive from a single motor 36. Conditions may arise, however, where separate motor drives may be desirable for the different footlight sections. In

such cases (see Fig. 7) the universal joint connections 33 are dispensed with and each footlight section is provided with an individual spur gear 31 co-acting with motor driving gears 35. Furthermore, there is provided an individual motor 36 for each footlight section. This construction with independent motors for the different sections provides for selective displacement of the various sections independently of the other sections as will well be understood. It is only necessary to supply the current to the motors individually and in this way selective operation of the sections may be attained.

In certain installations, motor drive may be dispensed with or with motor driven and operated footlights it may be desirable to provide for manual operation of the sections in emergencies. In such cases one of the shaft sections 32 is provided with a worm wheel 38 (see Fig. 6) coacting with a worm gear 39 driven by a vertical shaft 40 having its upper end suitably shaped to receive the socket portion 41 of a brace and bit 42 or other manually operable device. This brace and bit 42 can be introduced through an opening in the stage floor as shown in Figs. 5 and 6.

In disappearing footlights of this class, it is not only objectionable, but there is some fire hazard in permitting the lamps to continue burning when the footlights are in concealed or closed position (see Fig. 1). Accordingly, switching devices are provided which are arranged to close circuits to the lamps when the footlight sections are in open position and which switching devices interrupt current supply to the lamps when the footlights are in closed position.

Provision is made for utilizing the motion of the carriers 10 for bringing about operation of the switching devices. As will be hereinafter explained, there are certain switching devices which are provided for lamp control and other switching devices which are provided for motor control. Both of the switching devices in question are located in switch boxes 43, fixed to the carriers below the lamp boxes. The switching devices themselves may be of any conventional type, but as here shown are of the snap-throw-over toggle type. Fig. 8 shows the type of switch which is used for controlling the lamp circuits and Fig. 9 shows the type of switch which is used for controlling the motor circuits. Each lamp circuit switch is provided with an operating lever generally designated 44 in Fig. 8 and designated 44W, 44R and 44G in Figs. 4, 5 and 7, which levers individually shift the circuit closing members 45. It may be here explained that the various footlight sections contain varied colored lamps marked "Red", "White" and "Green". The levers generally marked 44 and individually marked 44R, 44W and 44G project downwardly from the switch boxes 43 and are in such position that upon the carrier being swung towards open position (Fig. 2) such operating levers will be engaged by a stud 46 carried by the frame 17 and displaced in clockwise direction to close the switch contacts for the lamps. This closure of the contacts occurs just before the carriers reach the fully open position. To cut off current supply to the lamps, another stud 48 is provided (see Fig. 1) which stud is adapted to rock the levers in reverse or counterclockwise direction to open up the contacts and cut off current supply to the lamps when the carriers are in closed position as shown in Fig. 1. The switch contacts for the lamp circuits are generally designated 47 in Fig. 8 and are individually designated 47R, 47W and 47G in the circuit diagram of Fig. 10. It will be understood that these lamp switch contacts are in open position when the carrier is in the position of Fig. 1 and in closed position when the carrier is in the position of Fig. 2.

Lamp control circuits

Referring to the circuit diagram, 50 designates the supply mains for the current. 51 designates a main line switch having suitable leads extending to the switch points of two groups of individual switches 52 and 53. The switches 52 can be individually opened or closed to turn on or off either the red lamps, the white lamps or the green lamps and switches 53 are provided for shutting off and turning on current supply to the individual footlight sections. From the switches 53, individual supply lines lead to the switch contacts and individual return lines lead back from the lamps to switches 52.

With this arrangement of circuits it is accordingly possible to optionally turn on or off the lights in various sections and to optionally turn off or on lights of different color in the various footlight sections. Also it is possible to turn on all of the lamps in all these sections and selection can be made as to color which is turned on in the various sections.

Motor control circuits

Where motor drive is provided, provision should be made to change the setting of the motor circuits in accordance with the position of the footlight sections. The various controlling conditions which must be taken into consideration may be explained as follows.

First when the footlights are closed, provision should be made to set up motor controlling circuits which upon the closing of a switch at a distant control point will cause the motor or motors to operate to displace the motors towards open position. Then when the footlights and carriers have reached their full open position this opening circuit should be automatically interrupted to terminate the motor operation and stop further displacement of the carriers. At the same time other controlling circuits should be closed so that upon a subsequent further manipulation of the switches at the distant point the carriers will be caused to move under the influence of the motor or motors towards closed position. Then again when the carriers reach their closed position this motor circuit or circuits should again be interrupted and the previously mentioned motor opening circuits set up.

Preferably snap-over toggle switches are used for controlling the motor circuits and insofar as their operation is concerned, such switches are operated in the same way as the lamp switches, i. e. by the cooperation of studs 48 and 46 with the motor switch operating levers 44M. In lieu of having single pairs of contacts such as 47 which are provided for the lamp circuits, each motor switch lever 44M is adapted to displace a circuit closing member 45M alternatively into contact with either of a pair of contacts generally designated 57 and 58 in Fig. 9 and designated 57*a*, 57*b*, 57*c*, 57*d* and 58*a*, 58*b*, 58*c* and 58*d* in the circuit diagram, Fig. 10. The upper of the contacts 57*a* and 58*a* are joined in common and connect to one end of field of the motor. The other end of the motor field is connected in common to contacts 57*b* and 58*b*. One end of the armature circuit is connected to 57*c* and 58*c* and the other end of the armature circuit is connect-

ed to 57*d* and the upper contact 58*d*. From the lower contacts 57*a* to *d* inclusive and 58*a* to *d* inclusive, circuits extend to the switch points of a double throw reversing switch generally designated 59 on the circuit diagram. As shown, this switch is of the usual double throw type with an upper set of switch points and a lower set. The switch blades of the switch 59 are suitably connected by conductors to the main switch 51 as shown. It will be understood that the reversing switch is placed remote from the footlights themselves, for example, at the side of the stage. In the circuit diagram (Fig. 10) the switching devices for both of the lamps and the motor control circuits are shown in the footlights "closed" position. Accordingly, all of the lamp switch contacts 47R, 47W, 47G are open. If it is now desired to open the footlights, the switch 59 will be thrown to cooperate with the lower set of footlights labelled on the diagram "to open". Current will now flow into the field of the motor through contacts 58*b* and back to negative side of line through contacts 58*a*. Similarly, current to the armature will flow in through contacts 58*c* and out through contacts 58*d*. The motor will then be energized and will rotate and displace the footlights towards open position. When the footlights reach open position all the contacts 58*a* to *d* inclusive will be opened and contacts 57*a* to *d* will be closed. The opening of contacts 58*a* to 58*d* will shut off current supply to the motor and thus terminate further displacement of the footlights leaving them in open position. The establishment of contacts 57*a* to 57*d* will set up motor control circuits to the upper set of switch points. Accordingly, when the operator desires to again close the footlights it is only necessary to throw the switch 59 from the lower set of switch points to the upper set of switch points marked "to close" on the circuit diagram and current will then flow to the motor through various of the contacts 57*a* to 57*d*. The arrangement of the circuits and the relation of the switching devices is such that the relative relation of the motor and armature circuits will be altered so that the motor will operate in reverse direction and thus displace the footlights and lamp carriers towards closed position. Again when the footlights and carriers reach closed position, the motor control circuits will again be interrupted by the automatic opening of contacts 57*a* to *d*. The motor control circuits are now in proper relation to again bring about an open movement of the footlights when the double throw switch 59 is thrown to lower position.

While the circuit diagram is shown with only one set of motor control circuits and one double throw switch for a single motor, it is obvious that the same arrangement of circuits and switches will be used when multiple motors are provided as show in Fig. 7. In this case it will be necessary to provide individual switches for each motor and individual double throw switches for each motor when independent motor operation of sections is desired. For simplicity in the diagram as stated above, only one set of motor controlling circuits are shown.

What I claim is—

1. A disappearing footlight including a lamp carrier, lamps thereon having positive-acting switching devices associated therewith for opening and closing lamp circuits in accordance with the position of the footlights, lamp control circuits extending to said switching devices, and switches for said control circuits for selecting which lamps are to be lighted and which are to remain unlighted.

2. The invention set forth in claim 1 in which the lamp control circuits and switches provide for selectively controlling the lamps both by sets as related to each carrier and by the color of the lamps upon the carriers.

3. A disappearing footlight including a carrier adapted to move to closed or open position and including in combination switching devices for the footlight lamps, said devices having members inherently displaceable for circuit-controlling operation independently of movement of the carrier; and means for operating the devices to close circuits to the lamps when the carriers are in footlight open position and to open said circuits when the carriers are in the footlight closed position, said operating means being adapted to exert direct abutting pressure against said displaceable members for positive displacement of the same.

4. A motor driven footlight of the disappearing type including a displaceable lamp carrier, positive-acting switching devices for establishing or interrupting current supply to the lamps, positive-acting switching devices for interrupting motor circuits and altering the circuit relations of other motor circuits for reversed drive of the motor, and common means for concurrently operating both the first mentioned switching devices and the second mentioned switching devices in accordance with displacement of the carrier into either the open or closed position.

5. A motor driven disappearing footlight for a stage floor, including a carrier for a row of lamps displaceable to and from a predetermined position, positive-acting switching devices for interrupting motor circuits to arrest the motor and for concurrently altering the circuit relations of other motor circuits to condition the motor for drive in a reverse direction, and means for automatically operating said switching devices in accordance with the displacement of the carrier into said predetermined position.

6. A motor driven disappearing footlight including a lamp carrier displaceable to and from a predetermined position, and means for reversing the motor, comprising motor controlling circuits, positive-acting switching devices connected in said circuits for control thereof and shiftable, independently of the carrier, to arrest operation of the motor in one direction and condition the motor for drive in a reverse direction, said devices being shiftable into and out of said motor arresting and reversing relation only on application of positive shifting action thereto, and means for positively shifting said devices into said relation when the carrier moves into said predetermined position.

7. A motor driven disappearing footlight for a stage floor including a carrier for a row of lamps adapted to be displaced into open or closed position, and means for reversing the motor on movement of the carrier into either of said positions, comprising motor controlling circuits, positive-acting switching devices mounted on the carrier and connected in said circuits for control thereof, said devices being shiftable into alternative relations each for arresting drive of the motor in one of corresponding alternative opposite directions and conditioning the motor for drive in the other direction only, and means for automatically shifting said devices into proper reversing relation in accordance with the position of the carrier.

8. A motor driven disappearing footlight in-

cluding a lamp carrier displaceable into open or closed position, positive-acting switching devices shiftable for opening or closing current supply circuits to the lamps, correspondingly operable positive-acting switching devices shiftable for interrupting current supply to the motor on completion of drive of the latter in footlight-opening or footlight-closing direction, and common means for concurrently and positively shifting both the first- and second-mentioned switching devices in accordance with displacement of the carrier into the open or closed position.

9. A disappearing footlight including a lamp carrier movable to closed or open position, a motor for driving said carrier in one direction to close the footlights and in the opposite direction to open the footlights, switch operating means and cooperating switching means for the motor, arranged to condition motor circuits for subsequent drive of the motor to close the footlights when the carrier reaches open position upon opening movement of the footlights and also to condition motor circuits for subsequent drive of the motor to open the footlights when the carrier reaches closed position upon closing movement of the footlights, said switching means and cooperating means therefor including provisions for effecting a snap interruption of previously established motor circuits for terminating motor drive of the footlights.

10. A disappearing footlight including a lamp carrier movable to closed or open position when the footlights are to be in closed or open condition, a bank of lamps carried by the carrier, a motor for driving said carrier from open to closed position and from closed to open position, switching means and operating means therefor cooperatively associated with the carrier, said last two mentioned means including provisions for concurrently interrupting the lamp and motor circuits when the carrier reaches closed position and for concurrently closing the lamp circuits and interrupting other motor circuits when the carrier reaches open position.

11. A disappearing footlight including a lamp carrier movable to closed or open position when the footlights are to be in closed or open condition, a bank of lamps carried by the carrier, a motor for driving said carrier from open to closed position and from closed to open position, switching means and operating means therefor cooperatively associated with the carrier, said last two mentioned means including provisions for concurrently interrupting the lamp and motor circuits when the carrier reaches closed position and for concurrently closing the lamp circuits and interrupting other motor circuits when the carrier reaches open position, said switching means and the operating means therefor also including provisions for conditioning motor circuits for subsequent drive of the motor in the reverse direction upon aforesaid interruption of the motor circuits and lamp circuits, and upon the aforesaid closing of the lamp circuits and interruption of the other motor circuits.

12. A disappearing footlight including a lamp carrier movable to closed or open position in a stage floor when the footlights are closed or open, a switching means for the footlight lamps with both contacts of said means carried by and bodily movable with the carrier, and switch operating means disposed independently of the carrier and wholly out of cooperation with the switching means carried by the carrier when the carrier is in intermediate position, and arranged for coaction with the switching means to operate the same when the carrier approaches open or closed position, for respectively closing or opening circuits to the footlight lamps.

13. A disappearing footlight including a lamp carrier movable to closed or open position in the stage floor when the footlights are closed or open, a switching means for the footlight lamps with both contacts therefor carried by the carrier and bodily movable therewith, switch operating means disposed independently of the carrier and wholly out of cooperation with the switching means carried by the carrier when the carrier is in intermediate position and arranged for coaction with the switching means to operate the same when the carrier approaches fully open or fully closed position, for respectively closing or opening circuits to the footlight lamps, said switching means including contact means cooperatively controlled by the operating means so that a quick opening movement of the switch contacts is effected which is irrespective of the rate of opening or closing movement of the carrier.

14. A disappearing footlight including a lamp carrier adapted to move to closed or open position, switching devices for controlling circuits to the footlight lamps, driving means including a motor for displacing the carrier from either of the aforesaid positions to the other, controlling means adapted to arrest the driving means, and means controlled by the position of the carrier for operating the switching devices to close circuits to the lamps when the carrier is in open position and to open said circuits when the carrier is in closed position and for operating the aforesaid controlling means on arrival of the carrier at either of said positions.

15. A disappearing footlight including a lamp carrier, switching devices for the footlight lamps for opening and closing circuits to said lamps, driving means including a motor for displacing said carrier to and from a predetermined position, controlling means adapted to arrest the driving means and to condition the latter for drive in a reversed direction only, and means for automatically operating both the switching devices and the controlling means when the carrier is in said predetermined position.

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