

1,348,957.

Patented Aug. 10, 1920.  
2 SHEETS—SHEET 1.

*Fig. 2.*

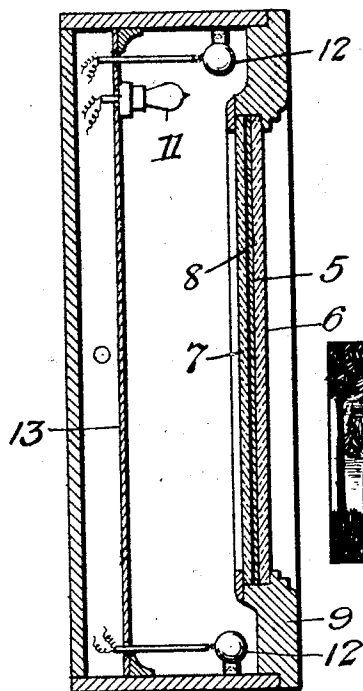
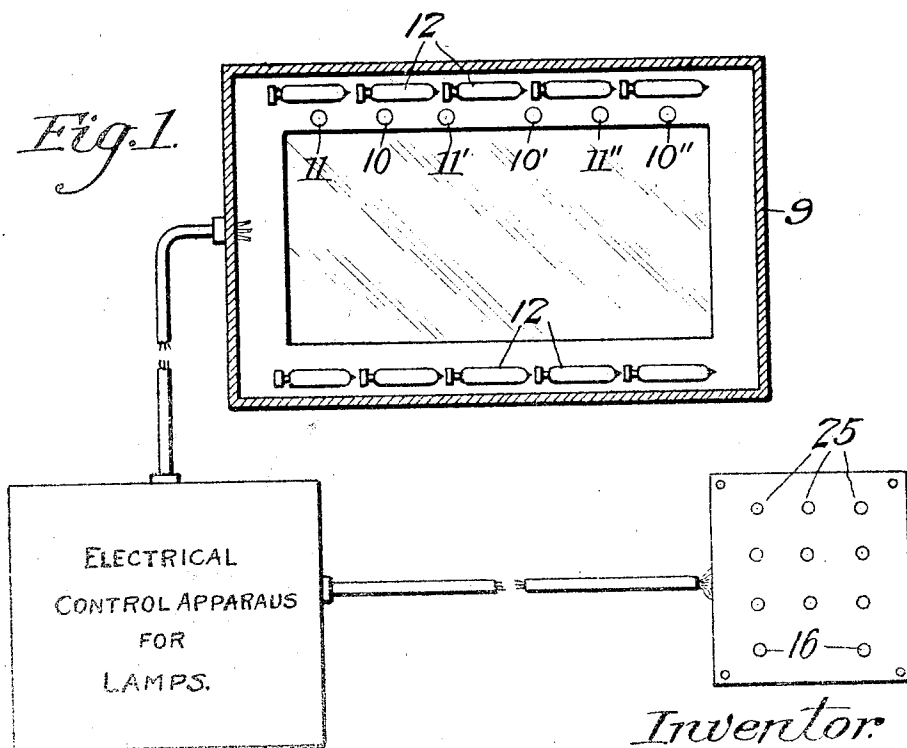


*Fig. 4.*



*Fig. 1.*



*Inventor.*

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by  
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his attys.

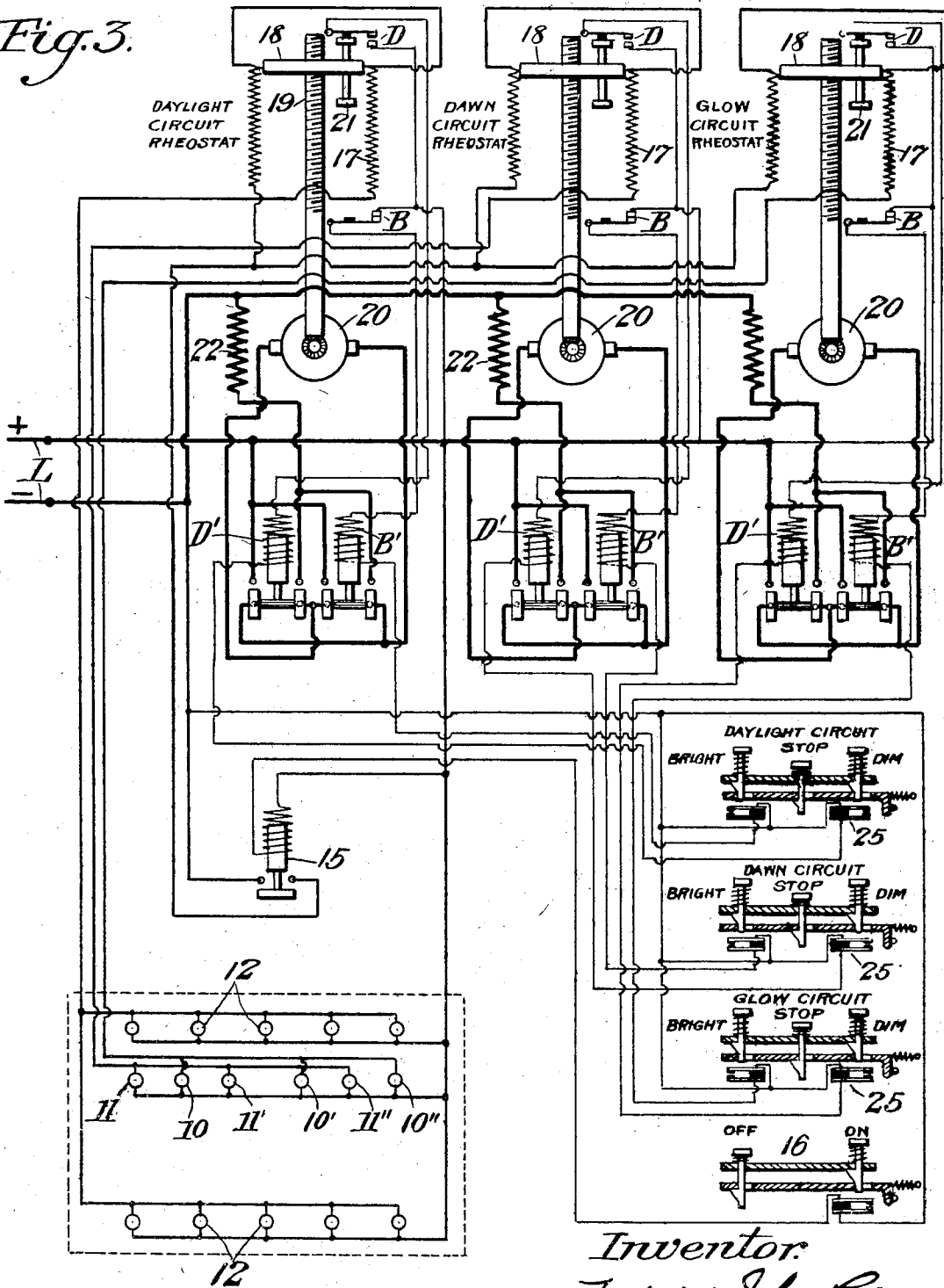
F. J. POPE.  
ILLUMINATION OF PICTURES.  
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2 SHEETS—SHEET 2.

Fig. 3.



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# UNITED STATES PATENT OFFICE.

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## ILLUMINATION OF PICTURES.

1,348,957.

Specification of Letters Patent. Patented Aug. 10, 1920.

Application filed July 15, 1918. Serial No. 245,061.

*To all whom it may concern:*

Be it known that I, FREDERICK JOHN POPE, a citizen of the Dominion of Canada, residing at New Rochelle, in the county of Westchester, State of New York, have invented certain new and useful Improvements in the Illumination of Pictures; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the illumination of transparent pictorial landscapes, and has for its object the provision of apparatus for simulating natural light effects over a period or periods of the day during which such effects undergo pronounced changes. Thus, for example, the particular aim of the invention is the provision of a method of and means for illuminating a transparent pictorial landscape so as to simulate the dawn, and the gradual transition of the advancing day, through full noon and sunset, into the night period.

The invention involves the association with the transparent pictorial landscape to be illuminated, of a plurality of incandescent electric lamps having bulbs of different colors, together with suitable instrumentalities for varying the color effect and intensity of the illumination in accordance with the variation of the natural lighting effect to be simulated. The incandescent electric lamps are grouped in a plurality of units, each unit containing one or more lamps with suitably colored bulbs. The different lamp units are arranged for individual electrical control, so that the degree of incandescence of the filaments in each unit can be varied over a predetermined range. This variation in the degree of incandescence of the lamp filaments not only produces a variation in the intensity of the illumination, but also produces a variation in the color effect, because the color of the incandescent filament itself varies from a dull glow to a brilliant white.

The incandescent electric lamps are placed behind the pictorial landscape so as to illuminate it from the rear. It has been found, in practice, that such a pictorial landscape can be effectively illuminated to simulate advancing sunrise by employing three units

of electric lamps. One unit consists of three lamps, blue, green and red, and by varying the degree of incandescence of the filaments of these three lamps from a faint dull glow to a brilliant whiteness, and first blush and growing red of light characteristic of the dawn is simulated. The second unit consists of three lamps, blue, yellow, and yellowish white, and by similarly varying the incandescence of the filaments of these lamps, in conjunction with the full illumination of the lamps of the first unit, the period of the glow of advancing morning is simulated. The third unit consists of lamps designed ultimately to simulate daylight as close as possible. To this end the bulbs of these lamps may have a faint bluish tint in order to neutralize the effects of any red or yellow rays of light coming from their own incandescent filaments or from the colored bulbs of the glow and dawn lamps. The incandescence of the daylight lamps is gradually increased as in the case of the two preceding units, until the illumination produced by all of the lamps simulates the effect of broad daylight. The decline of the day through the afternoon hours and into and beyond the sunset period, is simulated by reversing the course of the illumination, and a cut-out switch permits the lamps to be entirely or substantially extinguished so as to produce a night effect from whatever small amount of diffused light may be present behind the picture.

The variation in the degree of incandescence of the various lamp units is obtained by varying the voltage impressed on these lamps, and this can be conveniently accomplished by means of a suitable rheostat included in the electric circuit of each unit. The adjustment of these rheostats to automatically produce the desired gradual variation in the degree of illumination of the lamps is preferably effected by electric motor operated means, whose operation can be started interrupted or renewed at will for the purpose of maintaining for any desired period of time any particularly pleasing or interesting illuminating effect. Suitable switches are provided for the convenient control of these electrical instrumentalities.

The foregoing and other arrangements contemplated by the invention will be better understood from the following descrip-

tion taken in conjunction with the accompanying drawings, in which:

Figure 1 is a diagrammatic view, partly in section, of an illuminating apparatus, embodying the present invention;

Fig. 2 is a vertical sectional view taken through the picture and the chamber in the rear thereof for the accommodation of the electric lamps; and

Fig. 3 diagrammatically illustrates an arrangement of electrical devices adapted for carrying out the invention.

Fig. 4 represents, merely for the purposes of illustration, a characteristic pictorial landscape embodied in the illuminating apparatus.

The pictorial landscape or picture to be illuminated is designated in Figs. 2 and 4 of the drawings by reference character 5.

This picture is produced on a transparent material, such, for example, as the usual photographic film, and may be colored in any suitable manner. Fig. 4 of the drawings is a front view of the pictorial landscape and is intended merely to illustrate a typical picture or scene adapted to be illuminated in accordance with the present invention. The picture is secured between two transparent plates of glass 6 and 7.

The front plate of glass 6 is clear so as to provide an unimpaired view of the picture from this side. The inner face of the back plate of glass 7 is preferably ground, as indicated by reference character 8 in Fig. 2 of the drawings, for the purpose of diffusing the light from the illuminating means behind the picture. The plates of glass 6 and 7 with the picture therebetween may be mounted in a suitable frame 9, and positioned where desired for exhibition purposes, as for instance, so as to extend along the upper portion of the wall or walls of a darkened room, in which the spectators are assembled.

Behind the picture and in a suitable chamber provided therefor, are mounted the incandescent electric lamps for illuminating the picture in accordance with the present invention. In the accompanying drawings, the incandescent lamps have been illustrated as divided into three different units, each unit being in a separate electric circuit. These three units are designed to simulate the effects of three successively advancing periods from dawn to full daylight, and three successively reverting periods from full daylight to twilight.

The first illuminating unit comprises the three lamps 10, 10' and 10''. The second illuminating unit comprises the three lamps 11, 11' and 11''; while the third unit comprises the ten lamps 12. The lamps 12 are arranged in two sets of five each, one set of these lamps being in the upper part of the chamber, behind the picture, while the

second set of five lamps is positioned in the lower part of this chamber. All of the lamps 12 are arranged so that no direct rays of light pass through the picture. The three lamps 10, 10' and 10'' are alternately arranged in the same horizontal row with the three lamps 11, 11' and 11'', as clearly indicated in Fig. 1 of the drawings. These six lamps may be secured to a screen 13, near the top thereof, and so that the picture is illuminated by direct rays therefrom as well as by such rays as are reflected from the screen and walls of the chamber. The screen 13 and the walls of the chamber are whitened in order to reflect as much light as possible.

For the purpose of simulating the effect of advancing sunrise or approaching sunset, it has been found satisfactory to make the lamp 10 blue, the lamp 10' green and the lamp 10'' red. This combination of colors, in conjunction with a gradually increasing brightness of the degree of incandescence of the lamp filaments, has been found to satisfactorily simulate the first blush or glow of dawn. Similarly, it has been found satisfactory to make lamp 11 blue, 11' yellow, and 11'' a light yellow, in fact almost white. The ten lamps 12 are designed to give a light as nearly approaching daylight as possible. The bulbs of the lamps may be colored in any suitable manner, as by flashing, by staining, etc. Preferably, the daylight lamps have a faint blue color in order to better simulate the effect of natural sunlight.

Referring to Fig. 3 of the drawings, it will be obvious that the three illuminating units are arranged in three separate and independent electric circuits. Thus, the three lamps 10, 10' and 10'' are in one circuit, hereinafter called the glow-circuit, the three lamps 11, 11' and 11'' are in a second circuit, hereinafter called the dawn circuit, and the ten lamps 12 are in a third circuit, consisting of two parallel circuits of five lamps each, hereinafter called the daylight circuit. These three electric circuits are adapted to be simultaneously connected to the source of electric energy supply L by means of a suitable switch 15. In Fig. 3, the switch 15 is represented as of the electromagnetic type and is energized by an "off" and "on" switch 16.

A rheostat 17 is included in each of the three lamp circuits. The rheostat 17 is composed of two sections adapted to be electrically connected together by a movable contactor 18. The contactor 18 is mounted on a worm screw 19 driven by the rotor or armature 20 of an electric motor. The contactor 18 carries a switch actuating pin 21 which is designed to open the switch contacts D when the contactor arrives at the upper limit of its travel, and to open the

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switch contacts B when it arrives at the lower limit of its travel. The contacts D and B are normally biased to their circuit closing positions, and are only opened by the actuating pin 21 when the contactor 18 occupies one or the other of the extreme positions in its path of movement. The electric motor driving the worm-screw 19 is of the series type, and consist of an armature or rotor 20 and series field winding 22. These motor windings are adapted to be connected to the electric energy source L by means of one or the other of the electromagnetic switches D' and B'. When the electromagnetic switch B' is energized the electric motor is connected to the mains L for one direction of rotation, say clockwise, and when the electromagnetic switch D' is energized, the motor is connected to the mains for the reverse direction of rotation, say counter-clockwise. The switches B' and D' are controlled by a three unit push button switch 25. The switch is only diagrammatically indicated in the accompanying drawings, but it will, of course, be understood that it is of the well known type in which the pushing of one button inwardly, to effect a desired electrical connection, automatically insures the location of the other two buttons in their outer or switch-opening positions. In other words, only one of the three push buttons can make electrical contact at any one time.

The remaining features of the arrangement of the illuminating apparatus illustrated in the accompanying drawings will be best understood from a description of the method of operation. Assuming the various elements of the apparatus to occupy the relative positions indicated in Fig. 3 of the drawings, it will be evident that all electric circuits are open. The "off" and "on" switch 16 is first closed by pressing the "on" button. This energizes the actuating coil of the lamp circuit switch 15, thereby connecting, through the switch 15, each of the three independent lamp circuits to the mains L. It will be observed, however, that the maximum amount of resistance of the rheostats 17 is included in each lamp circuit so that at most only a very faint dull glow of the lamp filaments is produced.

The button designated "Bright" of the glow-circuit control switch 25 is next pushed in. This serves to energize the actuating coil of the electromagnetic switch B' of the glow-circuit motor operating means, which in Fig. 3 of the drawings is the right hand motor operating means. The rotor 20 thereupon begins to rotate, say clockwise, and moves the contactor 18, say downwardly, thereby gradually cutting out the resistance in the glow-circuit and increasing the voltage impressed on the lamps 10, 10' and 10''. The degree of incandescence of the filaments

of these lamps accordingly varies from a dull glow to a brilliant whiteness as the contactor 18 travels to its lower limit.

When the contactor has been moved to its lower limit, the pin 21 engages and opens the switch B, thereby deenergizing the electromagnetic switch B' and disconnecting the motor from the mains L. It will, of course, be observed that the manipulation of the control switch 25 and consequent operation of the switch B' or D' and B or D does not affect the main lamp switch 15, which remains permanently closed until the switch 16 is pushed to its "off" position. In other words the lamp circuits are electrically independent of the motor operating means and control equipment therefor.

The button designated "Bright" of the dawn circuit control switch 25 is next pushed in, causing the operation of the intermediate motor-operating means, with an increase in the degree of incandescence of the dawn lamps 11, 11' and 11''. When these lamps are burning at their maximum brilliancy, in other words, when the motor-operating means of the dawn circuit has moved its contactor 18 to its lower limit, the switch B thereof is opened by the pin 21, with the subsequent opening of the motor switch B' and stopping of the motor. Both the glow and dawn circuits comprising the incandescent lamps 10, 10' and 10'', 11, 11' and 11'' are now burning with their full brilliancy.

The button designated "Bright" of the daylight circuit is then pushed in and the voltage impressed on the lamps 12 is increased from a predetermined minimum to a predetermined maximum by the motor-operating means shown at the left in Fig. 3 of the drawings. The duration of the variation in voltage impressed on the different lamp circuits may be determined as desired. It has been found that about forty seconds for the variations in voltage impressed on the glow and daylight circuits and about fifty seconds for the variation in voltage impressed on the dawn circuit give very effective results. It will, of course, be understood, however, that the invention is not limited to such periods, and moreover that more than three lamp circuits, representing successive periods of sunrise, may be employed.

The operation of any motor-operating means can be interrupted by pushing in the button designated "Stop" of the control switch 25 corresponding thereto. Thus, whenever it is desired to maintain a particular illuminating effect the stop button of the motor-operating means, then operating, is pushed in. It will also be observed that any contactor 18 can be moved backwardly by pushing in the button designated "Dim" of the corresponding control switch 25. Thus,

whenever any particularly pleasing illuminating effect has been passed by, it can be picked up again by pushing in the buttons "Stop" and "Dim", in sequence, and running the motor-operating means backward until the desired effect has been reached, and then pushing in the "Stop" button to maintain the effect. The operation may then proceed by pushing in the "Bright" button.

When the condition of daylight has been obtained, resistance may be simultaneously inserted in all three lamp circuits, if desired, by simultaneously pushing in all three push buttons, designated "Dim", or, if desired, the effect of sunset may be simulated by consecutively pushing in the three push buttons designated "Dim" of the daylight, dawn and glow-circuits, respectively.

It will, of course, be understood, that combinations of colors other than those specifically mentioned herein may be used to produce the desired color effects, and that more or less lamps may be used in the various circuits. It should be noted, however, that the increasing brilliancy of the incandescent filaments from a dull glow to a white heat is of particular advantage in simulating sunrise, since the change in light rays emitted by the filament during such a variation in its incandescence is generally of the character desired to produce this particular effect.

The lamps of the glow and dawn circuits are positioned so that the rays of light therefrom may pass directly through the pictorial landscape. These direct rays of light are effectively diffused by the ground surface 8 of the back plate of glass 7. The rays of light from the daylight lamps 12 are very intense, and it is therefore desirable to place these lamps so that no rays therefrom pass directly through the transparent picture. The illumination of the picture by the daylight lamps is thus indirect or by reflection.

The variation in incandescence of the lamp filaments should be gradual or progressive, in order to effectively simulate the varying natural light effect.

The character of the variation in incandescence of the lamp filaments of any unit or group can be suitably controlled by a proper design of the rheostats 17. Thus, the rate of variation in incandescence may be uniform throughout the entire range, or the rate may be greater at the beginning of the range, or vice versa, and so on. The rate of variation in incandescence of the lamp filaments depends upon the rate of change in the resistance of the rheostat, and this rate of change in resistance may be made non-uniform with respect to time, by designing similar mechanical units of the rheostat with different electrical resistance values. In other words, the design of the rheostat may be such that equal amounts of resistance are cut out, or in, during each revolution of the

armature 20, or different, such as gradually increasing, or decreasing, amounts of resistance may be cut out, or in, during each revolution of the armature, depending upon the particular character of variation in incandescence desired.

The division of the varying natural light effect to be simulated into a plurality of successively different periods is one of the particular advantages of the method of operation of the present invention. By such a procedure, a blending of a constant or uniform color effect with a varying color effect can be utilized to more effectively simulate the desired effect than is possible without such a blending. In the case of sunrise, the first period of glow is very effectively simulated by gradually varying the incandescence of all the lamps, since this period starts with darkness. Even the colors of the light rays emitted by the incandescent filament itself are of particular advantage during this period, since they vary in color from a dull red to a brilliant whiteness. The second period is a blending of the first period at its maximum brilliancy with the gradually increasing brilliancy of the lamps in the dawn or second group, and the third or final period is a blending of the two preceding periods at their maximum brilliancy with the gradually increasing, and finally predominating, brilliancy of the daylight lamps.

Another prominent characteristic of the invention is that the operator may at any stage of the illumination vary the effect according to his fancy by suitably manipulating the switches. For instance, after interrupting the motor-operating means of the dawn-circuit at any desired time, he may then start the motor operating means of the daylight-circuit thereby varying the illuminating effect accordingly; and after obtaining the desired effect from this combination, he may reverse either, or both, of the motors corresponding to said circuits, or he may stop one or the other of the motors while reversing the other,—in any of these cases obtaining a corresponding variation in the character, color, and quality of the illumination. Indeed, in this regard, the invention permits the operator to exercise a widely-extended choice in color effects, so that by suitable manipulation of the starting, stopping, and reversing buttons of the several circuits, in such order as may suit his choice, he can impart to the landscape to be illuminated tints and colors only limited by the many possible combinations of the lighting circuits within his control. In other words, it may fairly be said that as the painter may combine and apply physical colors from his palette to change the hue or tint of a picture upon which he is working, so the operator in the present instance may even much more subtly and effectively vary

the hue or tint of the landscape illuminated by appropriately pushing the switch buttons at his command.

Finally, it will, of course, be understood that I do not restrict myself to the employment of any particular number or grouping of lamps for producing the several effects herein contemplated, nor even to any specific assemblage of colors for producing such effects. Those arrangements and groupings that I have specified are, therefore, to be regarded as typical exemplifications of a wide variety open to the choice of the constructor and suitable for different kinds of landscapes, and for the varying quality, tone, and coloring of the illumination which he may desire to bring about.

I claim:

1. In the illumination of a transparent pictorial landscape to simulate a varying natural lighting effect, the combination with the pictorial landscape, of a plurality of incandescent electric lamps arranged to illuminate the picture from the rear, said lamps being arranged in a plurality of different electric circuits, the lamps in each of said circuits producing in combination a lighting effect of a different color than the lamps in any other circuit, and means whereby the degree of incandescence of the lamps in each circuit may be independently and successively varied, the different colors produced by the lamps in each of said circuits and the range of variation of the incandescence of the lamps being such that said several circuits combine to simulate successively different periods of a varying natural lighting effect; substantially as described.

2. In the illumination of a transparent pictorial landscape to simulate sunrise, the combination with the pictorial landscape, of a plurality of incandescent electric lamps arranged in three groups, one of said groups having a blue, a green and a red lamp to simulate the effect of glow, the second of said groups having a green and a yellow lamp to simulate the effect of dawn, and the third of said groups having a plurality of white lamps to simulate the effect of daylight, and means for independently varying the voltage impressed on each of said groups from a predetermined minimum to a predetermined maximum; substantially as described.

3. In the illumination of a transparent pictorial landscape to simulate a varying natural light effect, the combination with the pictorial landscape, of a plurality of incandescent electric lamps arranged to illuminate the pictorial landscape from the rear, said lamps being arranged in a plurality of different electric circuits, the lamps in each of said circuits producing in combination a lighting effect of a different color

than the lamps in any other circuit, means whereby the voltage impressed on each of said groups of lamps may be varied independently and successively from a predetermined minimum to a predetermined maximum, and means for interrupting the variation in voltage impressed on any of said groups for the purpose of maintaining any particular illuminating effect; substantially as described.

4. In the illumination of a transparent pictorial landscape to simulate a varying natural light effect, the combination with the pictorial landscape, of a plurality of incandescent electric lamp units each of which is adapted to emit light rays of a different color, and means whereby the degree of incandescence of the lamps in each of said units may be varied independently and successively, the different colors of said lamp units and the range of variation in the incandescence thereof being such that said units combine to simulate the effects of successively different periods of the complete varying natural lighting effect to be simulated; substantially as described.

5. In the illumination of a transparent pictorial landscape to simulate a varying natural lighting effect, the combination with the pictorial landscape, of a plurality of incandescent electric lamp units, each of which is adapted to emit light rays of a different color, means for independently varying the degree of incandescence of the lamps of each of said units, the different colors of said lamp units and the range of variation in the incandescence thereof being such that said units combine to simulate the effects of successively different periods of the complete varying natural lighting effect to be simulated, and means whereby the variation in incandescence of the lamps of any unit may be interrupted at will for the purpose of maintaining any particular illuminating effect; substantially as described.

6. In the illumination of a transparent pictorial landscape to simulate a varying natural light effect, the combination with the pictorial landscape, of a pair of transparent plates of glass between which the pictorial landscape is mounted, one of said plates of glass having a ground surface to diffuse the light passing therethrough, a plurality of incandescent electric lamp units arranged to illuminate the pictorial landscape from the rear, each of said units being adapted to produce an illumination of the pictorial landscape of a different color effect, and means for independently varying the degree of incandescence of the lamp filaments of each of said units, the different color effect of said units and the range of variation in the incandescence of the lamp filaments being such that said units combine

to simulate the effects of successively different periods of the complete varying natural light effect to be simulated; substantially as described.

- 5 7. In the illumination of a transparent pictorial landscape to simulate a varying natural lighting effect, the combination with the pictorial landscape, of a plurality of incandescent electric lamps arranged to  
10 illuminate the picture from the rear, said lamps being arranged in a plurality of different electric circuits, the lamps in each of said circuits producing in combination a lighting effect of a different color than the  
15 lamps in any other circuit, and means in each circuit whereby the color emitted by the lamps in that circuit may be varied, independently of the color emitted by the lamps in the other circuits, all of said means  
20 being successively operable; substantially as described.

8. In the illumination of a transparent

pictorial landscape to simulate a varying natural lighting effect, the combination with the pictorial landscape, of a plurality 25 of incandescent electric lamps arranged to illuminate the picture from the rear, said lamps being arranged in a plurality of different electric circuits, the lamps in each of said circuits producing in combination 30 a lighting effect of a different color than the lamps in any other circuit, and means in each circuit for gradually and at will raising, temporarily fixing, and lowering the voltage impressed on the lamps in said 35 circuit, independently of like means in the other circuits, all of said means being successively operable to vary the voltage in the circuits successively; substantially as described. 40

In testimony whereof I affix my signature.

FREDERICK JOHN POPE.