Aug. 16, 1932. C. W. HOUGH 1,871,794

SYSTEM FOR PROJECTING LIGHT IN VARIANT COLORS

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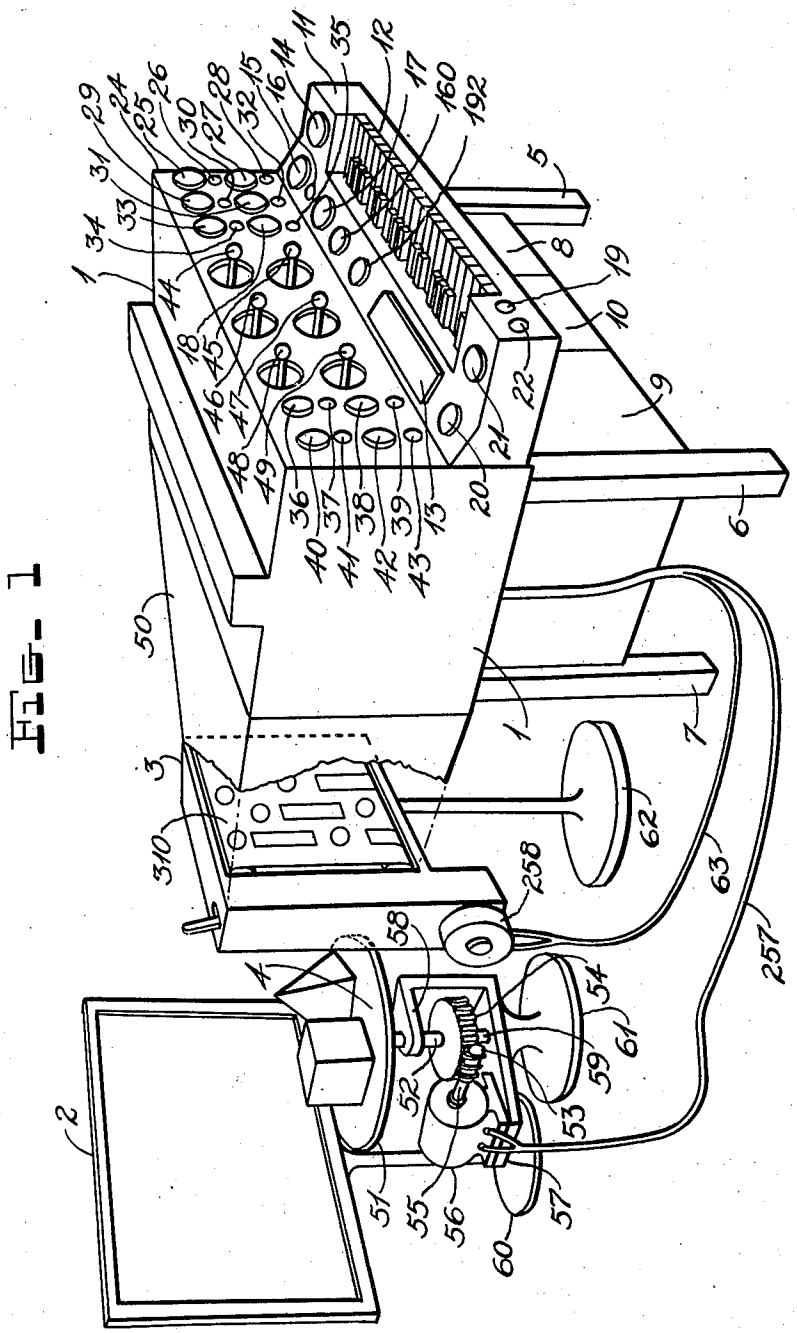

Fig. 1

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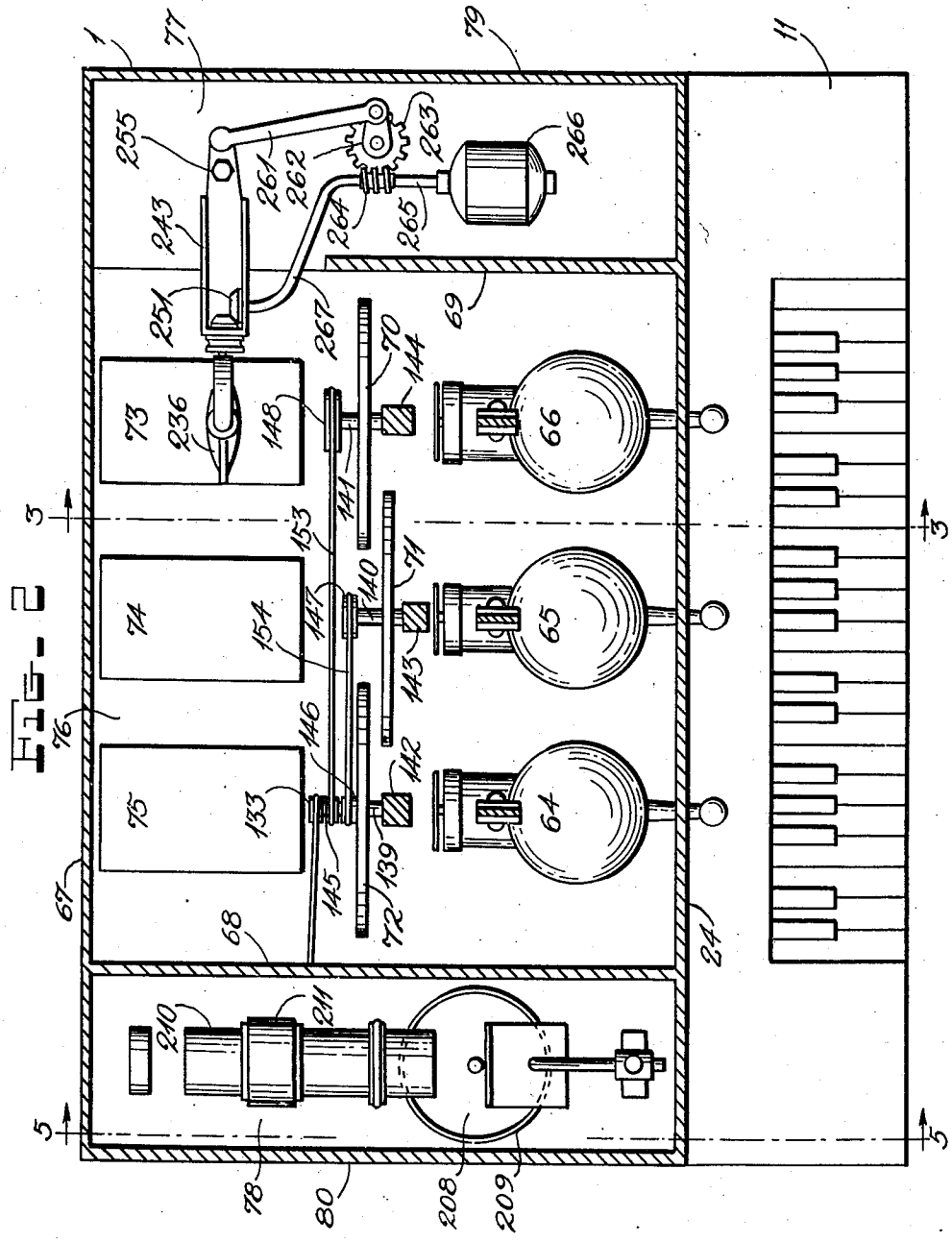

FIG. 2

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SYSTEM FOR PROJECTING LIGHT IN VARIANT COLORS

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Fig. 3

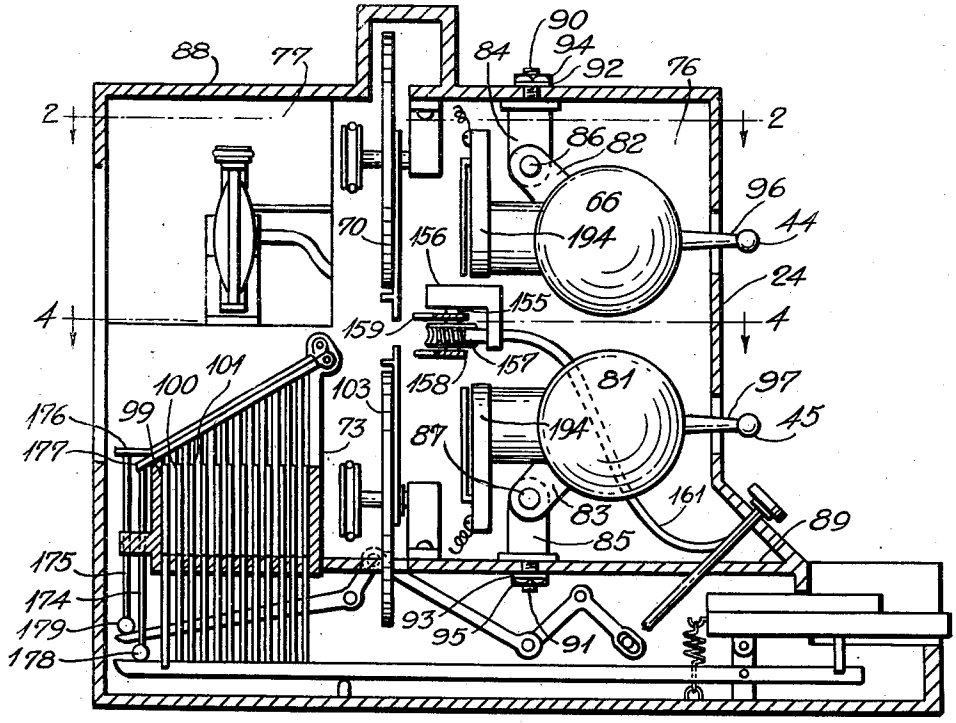

Fig. 11

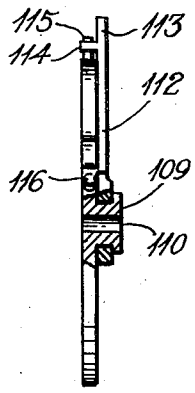

Fig. 10

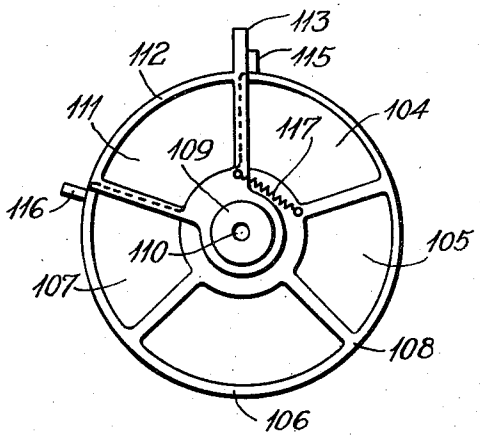

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Fig. 4

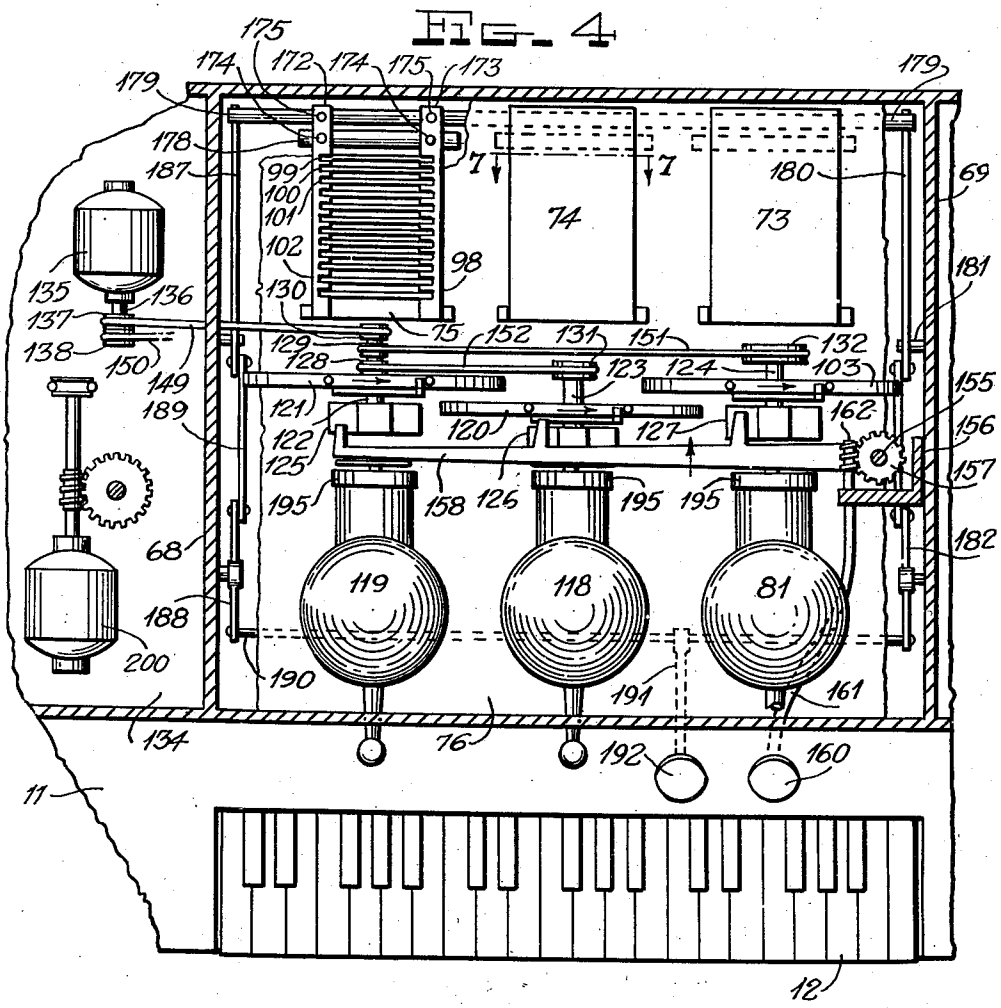

Fig. 12

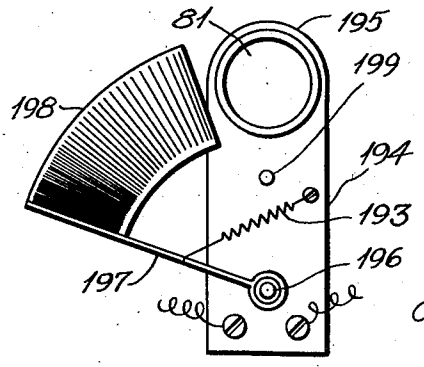

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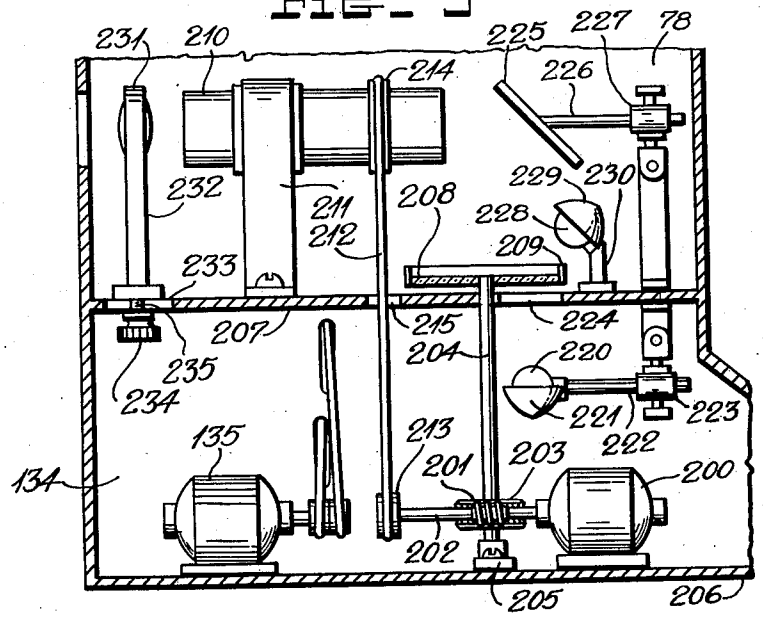
Fig. 5



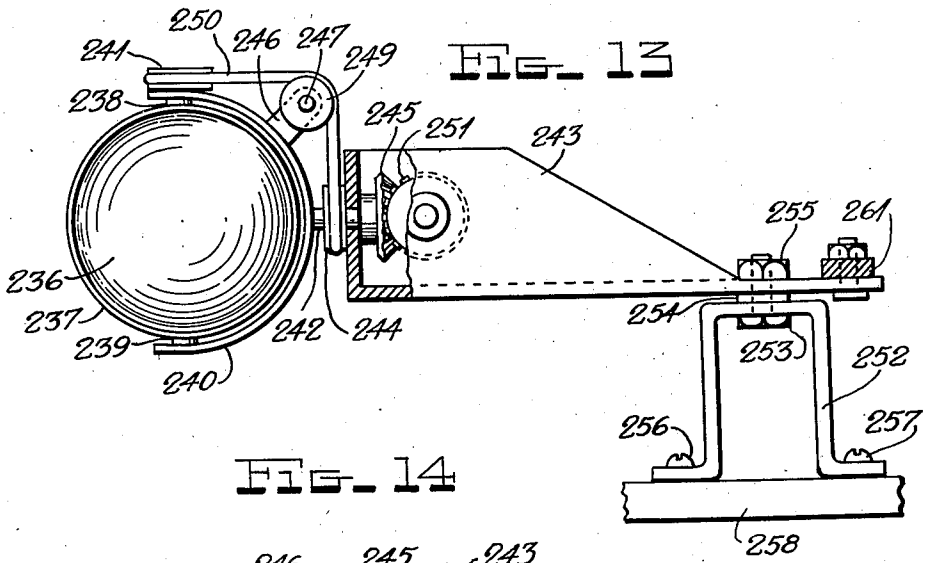
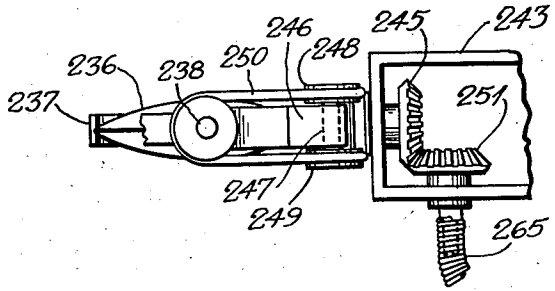


Fig. 13

Fig. 14



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SYSTEM FOR PROJECTING LIGHT IN VARIANT COLORS

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Fig. 6

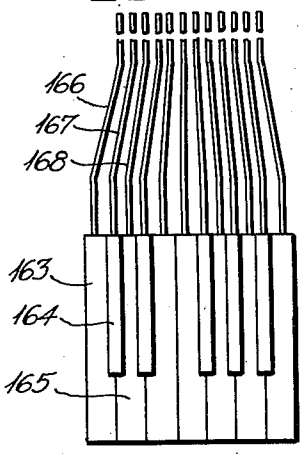


Fig. 7

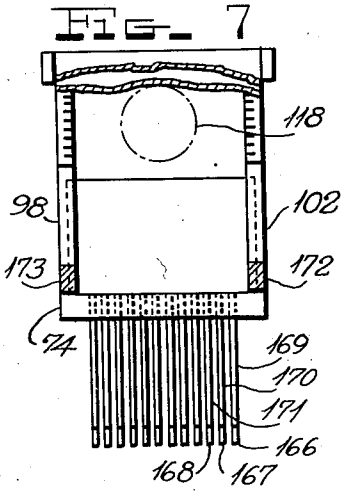


Fig. 8

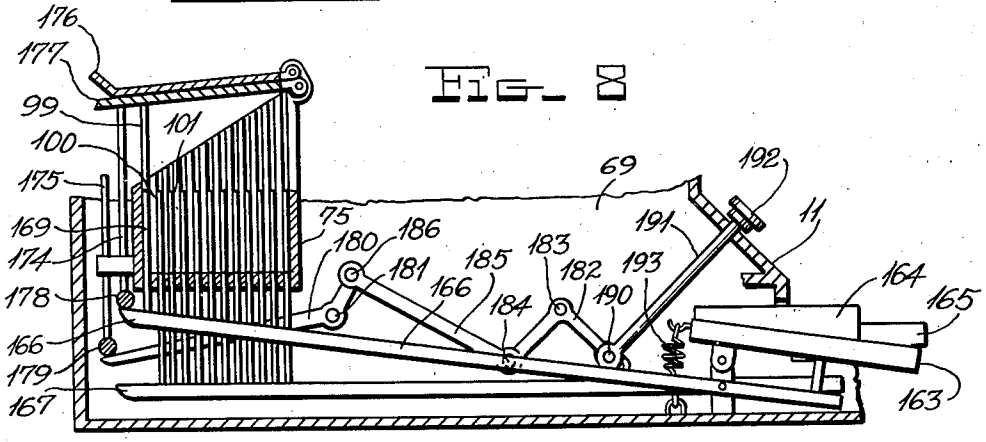
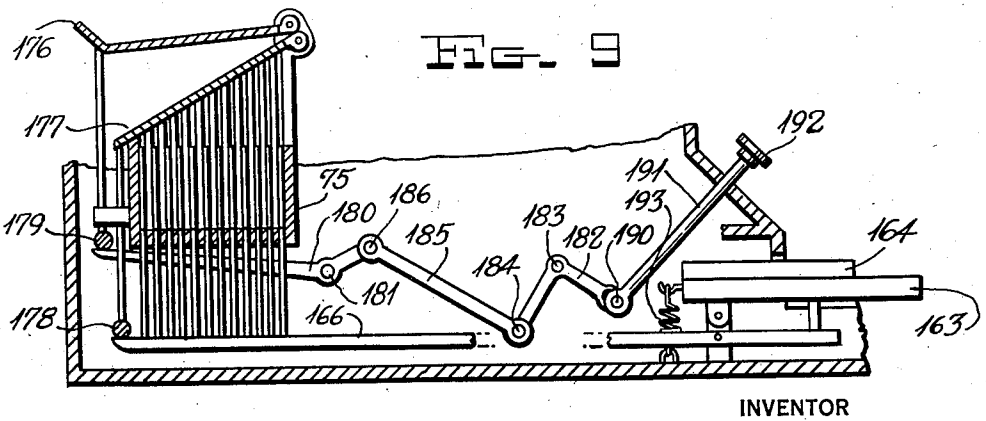


Fig. 9



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SYSTEM FOR PROJECTING LIGHT IN VARIANT COLORS

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Fig. 17

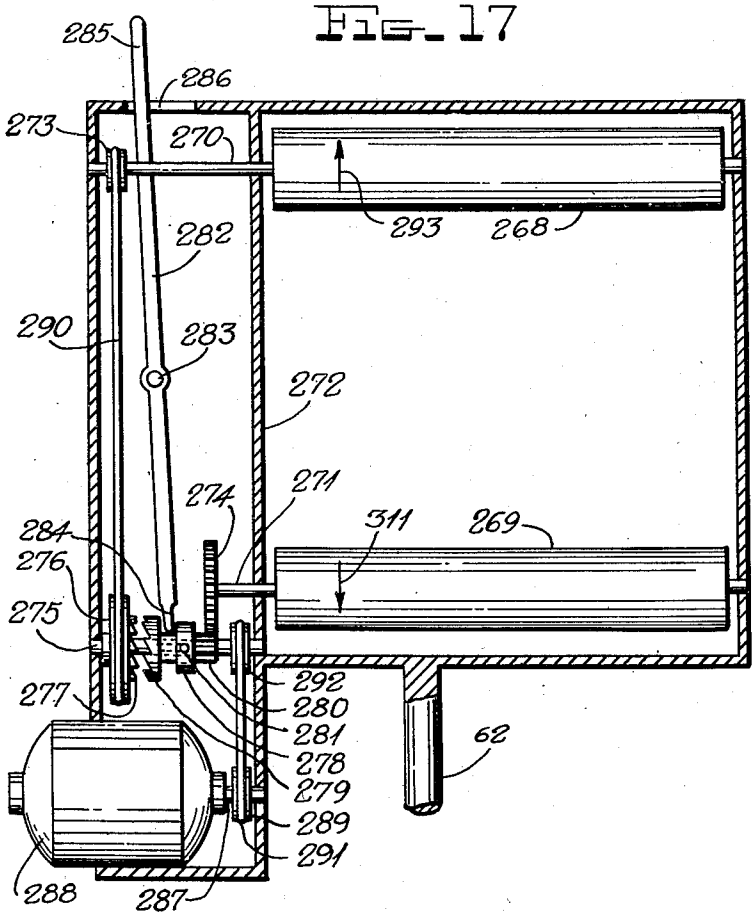


Fig. 16

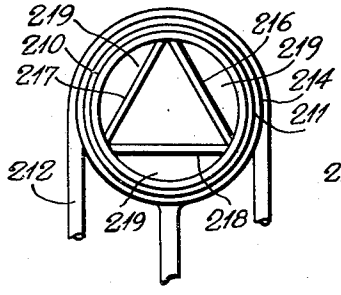
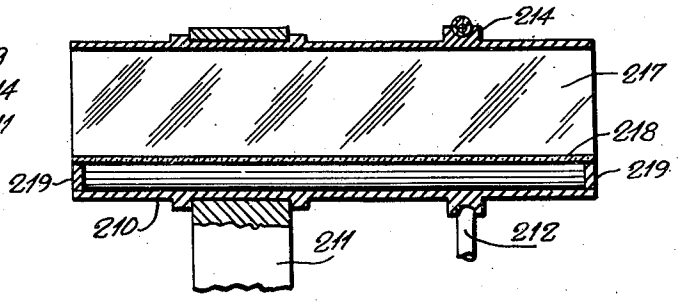


Fig. 15



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SYSTEM FOR PROJECTING LIGHT IN VARIANT COLORS

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Fig. 18

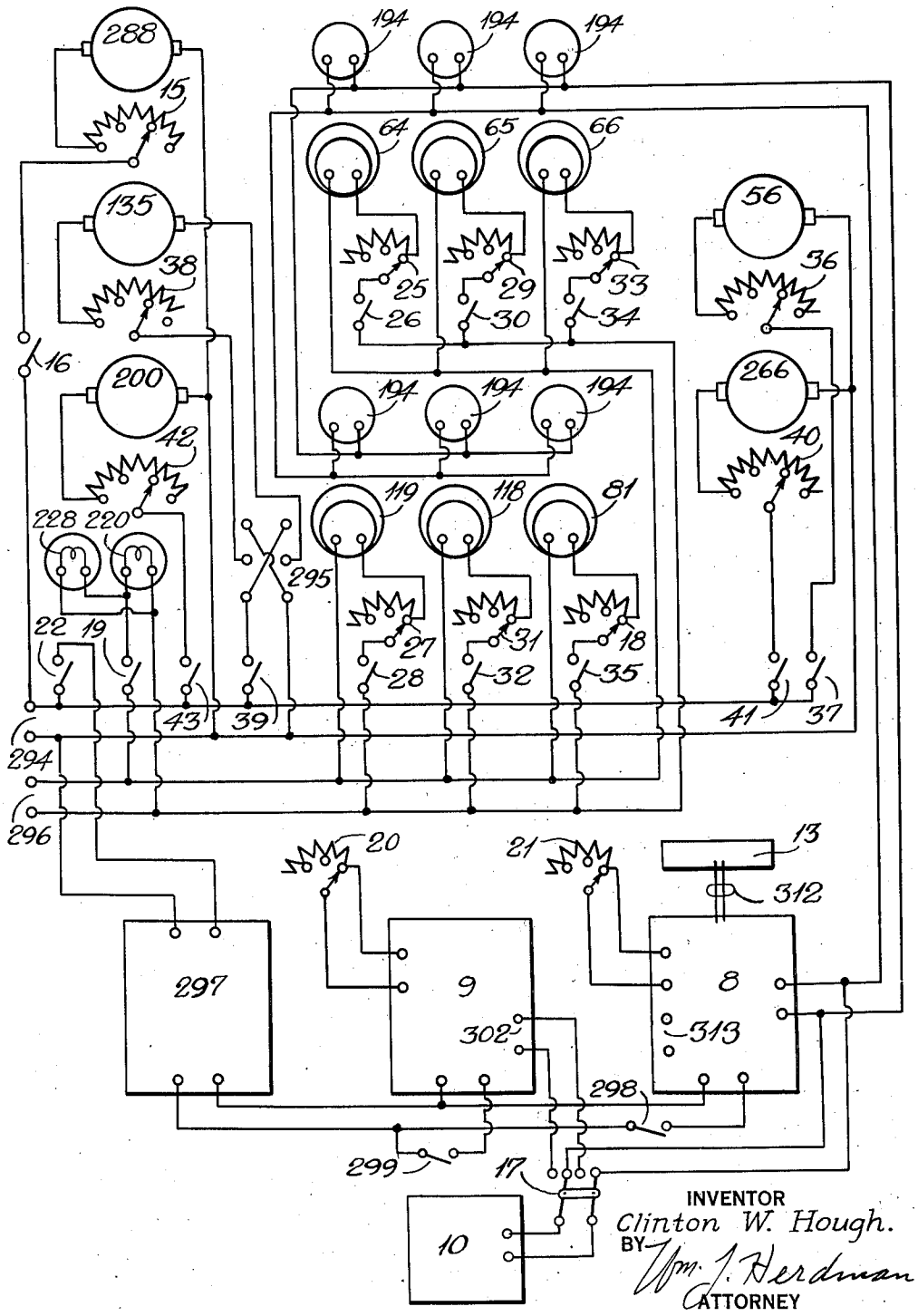

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Fig. 19

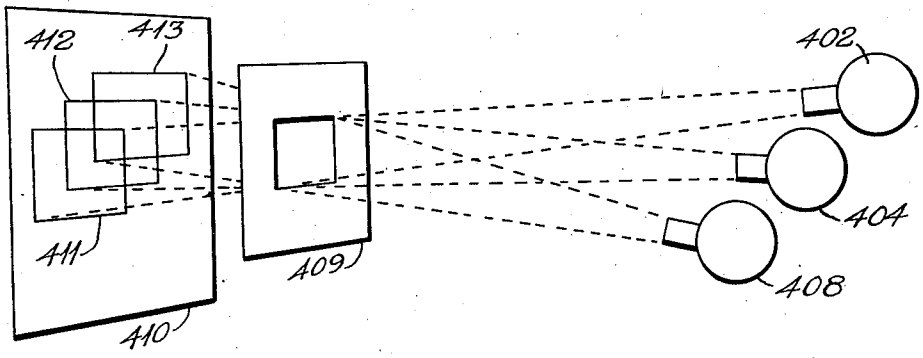
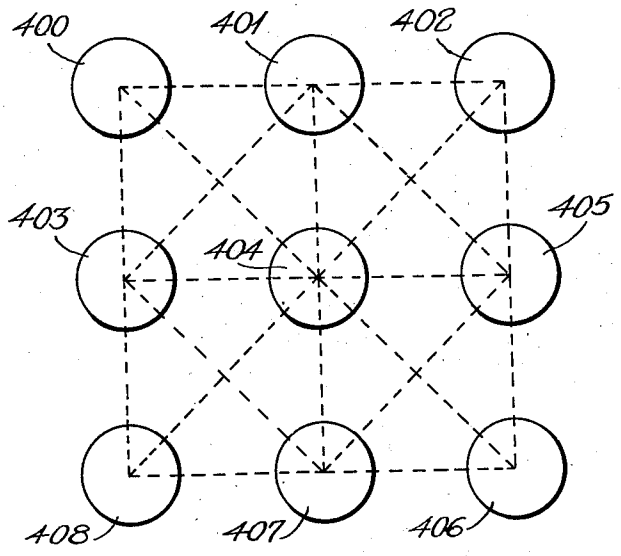


Fig. 20



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Patented Aug. 16, 1932 1,871,794

UNITED STATES PATENT OFFICE

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SYSTEM FOR PROJECTING LIGHT IN VARIANT COLORS

Application filed January 24, 1930. Serial No. 423,004.

My invention pertains in general to devices for projecting light in variant colors and intensities and specifically relates to a manual and automatic multi-color projector system.

One of the objects of my invention consists in providing a projector system adapted to be manually controlled to project overlapping beams of light of variant colors upon a screen or upon stationary or moving objects to produce color and form combinations for educational and entertainment purposes.

Another object comprises, producing a projector system in which the colors of a plurality of overlapping beams of light are automatically varied to produce upon a screen or objects either stationary or moving a great variety of color combinations.

Another object contemplated by my invention consists in providing a projector system which may be both manually and automatically controlled to project overlapping beams of light of variant colors to produce through manual and automatic control a very great variety of color combinations.

Another object consists in providing a projector system in which overlapping beams of light of variant colors are transmitted through one or more pattern screens in motion or stationary to produce colored patterns of an infinite variety of color, form, and relative intensities, which may serve as design for fabrics, wall paper, and the like.

I accomplish the above desirable features and effects by a novel projector system in which a plurality of light projectors are individually controlled, either manually or automatically, or in combination, to control the colors and intensity of the light projected by each of such projectors in such manner as to produce beams of variant colored light overlapping in one of a plurality, or in a plurality of planes to produce an infinite variety of color and form combinations and effects, and to give the effect of motion to the multi-colored shadows of pattern screens or objects interposed between the projectors and a screen upon which the light is projected.

In the drawings accompanying and forming a part of the specification and in which like reference numerals designate corresponding parts throughout:

Fig. 1 is a perspective view of the general arrangement of the apparatus employed in an embodiment of my invention, comprising, a projection machine, a pattern machine, an object supporting turntable, and a screen.

Fig. 2 is a horizontal sectional view along the line 2—2 of Fig. 3 of the said projection machine.

Fig. 3 is a vertical sectional view along the line 3—3 of Fig. 2.

Fig. 4 is a partial horizontal sectional view along line 4—4 of Fig. 3.

Fig. 5 is a partial vertical sectional view along the line 5—5 of Fig. 2.

Fig. 6 is a top plan view of an arrangement of keys and key levers employed in the said projection machine.

Fig. 7 is a longitudinal sectional view along the line 7—7 of Fig. 4.

Fig. 8 is a vertical sectional view of an arrangement of certain mechanical elements of the said projection machine.

Fig. 9 is a vertical sectional view corresponding to the view shown in Fig. 8 but illustrating the same mechanical elements in different relative positions.

Fig. 10 is a front elevation of a rotary color screen employed in the before mentioned projection machine.

Fig. 11 is a side elevation and partial sectional view of the rotary color screen shown in Fig. 10.

Fig. 12 is a front elevation of a light intercepting device employed in the said projection machine.

Fig. 13 is an elevation of a distorting lens also employed in the said projecting machine.

Fig. 14 is a partial top plan view of the distorting lens shown in Fig. 13.

Fig. 15 is a longitudinal sectional view of a kaleidoscopic tube employed in the said projection machine.

Fig. 16 is an end elevation of the kaleidoscopic tube shown in Fig. 15.

Fig. 17 is a sectional view of the pattern machine before mentioned and shown in Fig. 1.

Fig. 18 is a diagrammatic representation of

the electrical circuits and electrical apparatus as used in the embodiment of my invention described herewith.

Fig. 19 is a schematic representation of a method of light projection employed in my invention.

Fig. 20 is a schematic representation of an arrangement of projectors which is a part of my invention.

Referring to the drawings in detail, and particularly to Fig. 1, in the housing 1, which is a part of the projection machine, means are disposed for projecting a plurality of varient colored beams of light on a screen 2. Interposed in the path of these beams there is provided a pattern machine 3, and an object supporting turntable 4, either, or both, of which may be used, at the option of the operator, to define and affect the variant colored light beams in a way such as to cause a great variety of different shapes and shadows to be cast upon the screen 2.

The housing 1 is mounted upon supporting members, there being four in all, one at each corner of the housing, three of these supporting members 5, 6, and 7 being shown in Fig. 1. Centrally disposed between these supporting members, and beneath the housing 1, are three compartments 8, 9, and 10, which form a component part of the projection machine, and which contain, respectively, a complete radio receiving set with auxiliary stages of audio frequency amplification, a complete reproducing phonograph of the type which employs an electrical pick-up device for reproducing sound recordings through the agency of a loud speaker, and a loud speaker which is common to both of the foregoing. These sound reproducing devices are provided for the purpose of furnishing sound effects, principally music, to accompany sympathetic visual effects which are cast upon the screen 2, and also for the purpose of altering these visual effects in accordance with the rhythm and intensity of the sound effects in a manner hereinafter described.

An extended part 11 of the housing 1 is provided on that side of the housing 1 which normally faces the operator. Positioned in this extended part 11 of the housing 1 is a keyboard 12 outwardly similar in construction to the keyboard to be found in an ordinary piapoforte. Positioned on the extended part 11 of the housing 1, and above the keyboard 12, is a remote control panel 13 for operating and controlling the radio broadcast receiver contained in the compartment 8. Also positioned upon the extended part 11 of the housing 1 are knobs 14, 15, 16, 17, 18, 19, 20, 21, 22, 160, and 192 operating controlling elements more fully described later. Additional knobs 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, and 43 for operating controlling elements are positioned upon the panel 24. Extending through apertures in the panel 24 are knobs 44, 45, 46, 47, 48, and 49 which are associated with light beam projectors to be described later.

A shielding 50 is provided between the housing 1 and the pattern machine 3 and is constructed so as to completely enclose the path of the variant colored light beams and prevent extraneous light from being reflected from the pattern machine 3. Such extraneous reflected light has a tendency to dilate the irises of the observer's eye and is therefore undesirable.

The object supporting turntable 4 essentially comprises a platform 51, a shaft 52, a worm 53, a worm gear 54, a shaft 55, a driving motor 56, and a mounting structure 57. The platform 51 is rigidly secured to one end of the shaft 52 as shown. The shaft 52 is mounted in a bearing member 58 of the mounting structure 57, and also in a depression 59 in the mounting structure 57 so that the shaft 52 is free to rotate therein. The worm gear 54 is rigidly secured to the shaft 52 in a position to engage with the worm 53 which is rigidly mounted upon the shaft 55 extending from the driving motor 56. The driving motor 56 is secured to the mounting structure 57. Rotation of the shaft 55 will cause the worm 53 to rotate the shaft 52 by means of the worm gear 54, whereby the platform 51 will be caused to rotate. Objects placed upon the platform 51, in the path of the variant colored light beams, will revolve with the said platform and will therefore intercept the light beams at variant angles and cause corresponding changes in the visual effects which are cast upon the screen 2.

The screen 2 is substantially a plane surface suitable for showing light projections to best advantage, and is similar to screens employed in cinematographic projection. Supporting standards 60, 61, and 62 are provided for the screen 2, the object supporting turntable 4, and the pattern machine 3, respectively. Cables 63 and 257 are provided between the housing 1 and a driving motor 258 in the pattern machine 3, and between the housing 1 and the driving motor 56 in the object supporting turntable 4, respectively, so that the electrical circuits of the same may be controlled from the housing 1.

In Fig. 2, disposed within a compartment 76 enclosed by four panels 67, 68, 69, and 24, of the housing 1, are three rows of projectors positioned in parallel planes; projectors 66, 65, and 64 being the top projectors of each row, respectively, there being six projectors in all. However, it is intended in my invention that at least nine projectors be provided and arranged as hereinafter described, three of the projectors being here omitted for simplicity of description. These projectors are substantially devices for providing a source

of relatively strong white light, from an electric current, and projecting the same in directed beams to points distant from the source. Positioned in front of projectors 66, 65, and 64 are rotary color screens 70, 71, and 72, respectively, which revolve in the path of the light beam from each projector. Also disposed within the compartment 76 are three housings 73, 74, and 75 associated with manually operated color screens.

In compartment 77, enclosed by the panels 67, 69, 24, and 79, are positioned means for actuating a distorting lens, more fully described later.

In compartment 78, enclosed by the panels 67, 68, 24, and 80, are positioned members associated with a kaleidoscopic projection arrangement more fully described later.

In Fig. 3, disposed within the compartment 76 are two projectors 66 and 81 which are the end projectors, respectively, of two rows of projectors in parallel planes. The members 82 and 83, which are extended parts of projectors 66 and 81, respectively, are forked and pivotally mounted upon members 84 and 85 by means of rivets 86 and 87, in a manner such that there will always be sufficient tension between the members 82 and 84, and the members 83 and 85, to hold the same, by friction, in any relative position in which they may be set. (See Fig. 2.) The members 84 and 85 are also pivotally secured to the panels 88 and 89, by means of studs 90 and 91, washers 92 and 93, and nuts 94 and 95, respectively, so that the members 84 and 85 may be partially rotated in parallel planes perpendicular to the plane of movement of the members 82 and 83. Such an arrangement, permitting adjustment of the projectors and corresponding adjustment of the direction of the light beams, is provided for each projector. Adjusting rods 96 and 97 are rigidly secured to the projectors 66 and 81, respectively, and have knobs 44 and 45 secured to their upward extremities. These adjusting rods 96 and 97 extend through apertures in the panel 24 so that the projectors may be adjusted, for direction of beam projection, from without the housing 1. Similar adjusting rods are provided for each projector.

Positioned in front of projector 81, in Fig. 3, and intercepting the path of the light beam projected from the same, is a housing 73 shown in section, which is one of three similar housings 73, 74, and 75, and which contains an arrangement of manually controlled color screens. The housing 73 is mounted in an aperture in the panel 89, so that the bottom of the housing 73 is open to mechanical elements beneath the panel 89. Viewed from the top in Fig. 4, it will be seen that the housing 75 has two side members 98 and 102 which are slotted, as shown, to accommodate a series of color screens 99, 100, and 101, similar mechanical elements being associated with each of the three housings 73, 74, and 75, more fully described later.

In Fig. 3, positioned in front of projectors 66 and 81, are rotary color screens 70 and 103, respectively. These rotary color screens are substantially discs comprising sectors of transparent material, such as glass, which have been variantly colored to act as filters which will, in effect, pass only light of the same color as the filter. When a beam of white light is projected through one of the colored sectors of the rotary color screen, and the rotary color screen is rotated in a manner such that successive colored sectors will intercept the light beam, the light beam, upon passing through the colored sectors, will be substantially of a series of colors corresponding to those in the rotary color screen. In Fig. 10, the variantly colored sectors 104, 105, 106, and 107, of the rotary color screen 103, are radially positioned about the hub 109 of a circular mounting frame 108. A hole 110 is provided in the center of the hub 109 for mounting upon a shaft. An additional colored sector 111 is positioned in a mounting sector 112 which is adapted to be rotated about an annular channel in the periphery of the hub 109, as shown in Fig. 11. An arm 114 is provided to one side of the member 113 which is an extension of the mounting sector 112, and will describe, in rotation upon the hub 109, a circular path concentric with the hub 109. However, the mounting sector 112 is restricted in its movement by two pins 115 and 116 which are positioned upon the periphery of the mounting frame 108, on either side of the arm 114, and engage therewith. A small helical tension spring 117 is provided between the mounting sector 112 and the mounting frame 108 and normally holds the mounting sector 112 in a position such that the arm 114 is in engagement with stop pin 115. If the mounting frame 108 is rotated clockwise, the mounting sector 112, will also be rotated in the same direction. A stopping member, if moved into the path of the projection 113 so that it comes into engagement therewith as the same is rotated, will stop mounting sector 112, but, due to the construction of the mounting sector 112 with reference to the hub 109, will permit the mounting frame 108 to continue to rotate until the arm 114 comes into engagement with the stop pin 116 when the mounting frame 108 will also come to a stop. However, the mounting sector 112 will now be in a position over the colored sector 107, and will be superimposed thereon, whereas there will be an opening in the mounting frame 108, indicated by the dotted lines in Fig. 10, and consequently, a beam of white light which is directed through this opening will not be intercepted by a color sector and will show white. All of the rotary color screens employed are of the same construction.

In Fig. 4, disposed within the compartment 76 are three projectors 81, 118, and 119, which are the bottom projectors of three rows of projectors in parallel planes, respectively, of which the projectors 66, 65, and 64, in Fig. 2, are the top projectors. Positioned in front of projectors 119, 118, and 81, are rotary color screens 121, 120, and 103, respectively. Shafts 122, 123, and 124, upon which the rotary color screens 121, 120, and 103, are rigidly mounted, are positioned in bearing members 125, 126, and 127, respectively, and are free to rotate therein. Rigidly mounted upon the shaft 122 are three pulley wheels 128, 129, 130, of the same size. A pulley wheel 131, which is somewhat larger in diameter than pulley wheels 128, 129, and 130, is rigidly mounted upon the shaft 123. Another pulley wheel 132, somewhat larger in diameter than pulley wheel 131, is rigidly mounted upon shaft 124. The rotary color screens 72, 71, and 70, shown in Fig. 2, have shafts 139, 140, 141, bearing mountings 142, 143, 144, and pulleys 145 and 146, 147, and 148, respectively, similarly associated therewith; pulley wheel 133, in Fig. 2, corresponding to pulley wheel 130 in Fig. 4. Positioned in compartment 134, which is disposed directly beneath compartment 78, shown in Fig. 4, is a driving motor 135. Rigidly mounted upon the shaft 136 extending from the driving motor 135, are two pulley wheels 137 and 138. Belts 149, 150, 151, 152, 153, 154 are provided between the pulleys 137 and 130, 138 and 133, 129 and 132, 128 and 131, 145 and 148, 146 and 147, respectively. These belts are preferably composed of helically wound wire which, in transmitting power from one pulley to another, will engage the peripheral channel of the pulley only when the coefficient of friction of the belt is sufficient to overcome the inertia of the pulley. Rotation of pulley wheels 137 and 138 by the driving motor 135 will cause a corresponding rotation of the pulley wheels 130 and 133, respectively, by means of the belts 149 and 150. Pulley wheels 129 and 128, and pulley wheels 145 and 146, being rigidly mounted on the same shafts which carry pulley wheels 130 and 133, respectively, will also rotate so as to cause pulley wheels 132 and 131, and pulley wheels 148 and 147, to rotate by means of the belts 151 and 152, and 153 and 154, respectively. Such rotation of the pulley wheels mounted upon the shafts 122, 123, 124, 139, 140, and 141 will cause a corresponding rotation of their respective rotary color screens, so that the color sectors of the same will intercept the light beams from their associated projectors and cause a sequence of variant colored light beams to be projected. However, difference in the size of the pulley wheels associated with the rotary color screens will cause a variation in the speed at which they will rotate, and a corresponding variation in the time which each rotary color screen will require for one rotation in the path of the light beams.

A shaft 155, in Fig. 3, is mounted in the bearing member 156 and is free to rotate therein. Rigidly secured to the shaft 155 is a worm gear 157 (see Fig. 4). Two stopping arms 158 and 159 are rigidly secured to the shaft 155 on either side of the worm gear 157 and positioned so that partial rotation of the shaft 155 will bring the stopping arms 158 and 159 into engagement with the member 113 of the mounting sector 112 associated with each of the rotary color screens 70, 71, 72, 103, 120, and 121 as the same are rotated. However, the stopping arms 158 and 159 are so shaped that upon being partially rotated by the shaft 155, they will come into engagement first, with members 113 associated with rotary color screens 71 and 120, second, with members 113 associated with rotary color screens 70 and 103, and third, with members 113 associated with rotary color screens 72 and 121. A knob 160, in Fig. 4, mounted in the extended part 11 of the housing 1 so that it is free to rotate therein, is coupled to a flexible shaft 161 which is in turn coupled to an extended part of a worm 162 which is mounted in the bearing member 156 so that it is free to rotate therein. Rotation of the knob 160 will cause the worm 162 to rotate, by means of the flexible shaft 161, and the worm 162, being in engagement with the worm gear 157, will cause the same to move the stopping arms 158 and 159 in or out of engagement with the members 113 associated with the rotary color screens as the same are rotated.

Inasmuch as the stopping arm 158 is positioned so that it is accessible to the top of rotary color screens 103, 120 and 121, and the stopping arm 159 is positioned so that it is accessible to the bottom of rotary color screen 70, 71, and 72, it is evident that the members 113 (see Fig. 10) associated with the said rotary color screens will be accessible for engagement with the stopping members 158 and 159 in the same relative positions.

If, while the rotary color screens are being normally rotated in a clock-wise direction by the driving motor 135 and periodically changing the color of light beams from their respective projectors, it is desired to project beams of substantially white light, the knob 160 is rotated. Such rotation of the knob 160 will cause the stopping arms 158 and 159 to be slowly moved so that they will come into engagement with first, the members 113 associated with the rotary color screens 70 and 103, second, with members 113 associated with the rotary color screens 71 and 120, and third, with the members 113 associated with the rotary color screens 72 and 121, as the same are rotated. Such engagement of the members 113 associated with the said rotary color screens will cause the mounting sectors 112, associated with each of the said rotary color

screens, and upon which the members 113 are positioned, to stop rotating. As these sector mountings 112 are stopped, the rotary color screens will also be stopped, in the order before mentioned, as the stop pins 116 associated with each rotary color screen are rotated into engagement with the arms 114 associated with the now stationary mounting sectors 112, and an opening in each color screen, shown in Fig. 10, by dotted lines, will be presented before each projector, while light beams originating from each projector will pass through without being intercepted by a color sector. When the rotary color screens are stopped, the belts, which normally frictionally engage with the pulleys associated with the color screens, will slip, but due to the order in which the rotary color screens are stopped, the shafts 139 and 122 and associated pulleys, which intermediately drive the rotary color screens 70, 71, 103, and 120, will be the last to be stopped and will consequently serve as driving means for the rotary color screens 70, 71, 103, and 120, until they are stopped. When, as the stopping arms 158 and 159 finally stop the rotation of the rotary color screens 72 and 121 as above described, the shafts 139 and 122 and associated pulleys will be brought to rest and the belts 149 and 150 will slip thereon as they are driven by the driving motor 135. The driving motor 135 may then be shut down, if desired, as hereinafter provided for. Starting the motor 135, and bringing the arms 158 and 159 out of engagement with the members 113 associated with the rotary color screens, by rotating the knob 160, will cause the rotary color screens to resume their normal rotation in the path of the projectors.

In Fig. 6, the keys 163, 164, and 165, of a group which forms a part of the keyboard 12, are shown as they are positioned with reference to their respective key levers 166, 167, and 168. The entire keyboard 12, which is of the commonly used pianoforte type, is arranged into three groups of twelve keys corresponding to the twelve keys comprising an octave on the pianoforte, each group being arranged similarly to Fig. 6 so that the twelve keys of each group have twelve corresponding key levers for actuating, respectively, mechanical elements, hereinafter described, associated with each of the color screen housings 73, 74, and 75.

In Fig. 7, a series of push rods 169, 170, and 171, are slidably positioned in the bottom of the housing 74, which is similar in construction to housing 73 in Fig. 3, so that they transmit motion from the key levers 166, 167, and 168 to corresponding color screens slidably positioned in slots in the side members 98 and 102 of the housing 74. These color screens are substantially flat rectangular shaped pieces of transparent material, such as glass, which have been variantly colored to act as filters which will, in effect, pass only light of the same color as the filter.

In Fig. 8, it will be seen that the color screens 99, 100, and 101, are part of a series of color screens in the housing 75. These color screens are slidably positioned in the housing 75 in a manner such that, when actuated by their respective key levers by means of their corresponding push rods, they will be raised into a position intercepting the path of the light beam from their associated projector, as illustrated in Fig. 8 by color screen 99 which is shown in such raised position. The push rod 169, the key lever 166, and the key 163, which are associated with the color screen 99, are shown in their actuated position. When any one of the group of keys of the keyboard 12 which are associated with the housing 75, is depressed, a corresponding color screen will be raised so as to intercept the light beam from its associated projector and affect the color of the said beam. The housings 73, 74, and 75 are all similar in construction, each housing containing twelve color screens and associated mechanical elements to be operated by the three groups, or octaves, of keys of the keyboard 12, in a manner such as to intercept the light beams from the three projectors 119, 118, and 81, respectively. It is evident, then, that the light beams projected from the projectors 119, 118, and 81 will be intercepted by their respective rotary color screens and, at the option of the operator, by one or more of the series of manually operated color screens disposed in front of each of the said projectors.

In Fig. 3, a shutter 176 and a color screen 177, which are associated with each color screen housing, are shown pivotally mounted to the top of the housing 73 between the side members 98 and 102, which are a part of each color screen housing. The shutter 176 is substantially a flat rectangular shaped piece of an opaque material, such as sheet metal, while the color screen 177 is a flat rectangular shaped piece of a transparent material, such as glass, which has been colored to act as a filter, which will, in effect, pass only light of the same color as the filter. (See Fig. 4.) The shutter 176 and the color screen 177 are mounted in a manner such that in a normal position at rest upon the top surface of the housing 73, they will intercept the path of the light beam from the associated projector.

In Fig. 4, positioned in front of the housing 75, and on the side members 98 and 102, are two bearing members 172 and 173, respectively. Slidably positioned in the bearing members 172 and 173 are push rods 174 and 175, respectively. Referring to Fig. 3, it will be seen that the push rods 175 and 174 are positioned adjacent to the projecting ends of the shutter 176 and the color screen 177, respectively. Similar bearing members and

push rods are associated with each of the three color screen housings 73, 74, and 75. Referring to Fig. 8, it will be seen that the push rod 174, which is positioned adjacent to the color screen 177, when actuated so as to be moved into an upward position, as shown, will correspondingly move the color screen 177 and the shutter 176 which is pivotally mounted superimposed upon the color screen 177, so that they will be in a position such that they will not intercept the path of the light beam from the associated projector. Rigidly secured to the lower extremity of the push rods 174 associated with each of the color screen housings, and beneath the bearing members 172 and 173 are the transverse lift rods 178, which, upon being moved upwardly, will correspondingly move the two push rods 174 associated with each of the color screen housings 73, 74 and 75. Extending beneath the transverse lift rods 178, and adjacent thereto, are the projecting ends of the key levers, of which the key levers 166 and 167 form a part of a group of key levers associated with the housing 75 in Fig. 8. As a transverse lift rod 178 is similarly associated with each of the housings 73, 74, and 75, it is evident then, that if any one, or more, of the keys of the keyboard 12, which are associated in groups of twelve keys with their respective color screen housings, be depressed, the transverse lift rod corresponding to the color screen housing with which the key depressed is associated will be moved upwardly with a corresponding movement of the shutter 176 and the color screen 177 associated therewith. It is evident then, that when a color screen disposed within any particular housing, such as color screen 99 in Fig. 8, be raised upwardly by a key lever, such as key lever 166, by means of the depressing of a key, such as key 163, that the shutter 176 and the color screen 177 will also be simultaneously raised into an upward position so that the same will not interfere with the movement of the said color screen 99, and will not intercept the path of the light beam from the associated projector.

Rigidly secured to the lower extremity of the push rods 175, associated with each of the housings 73, 74, and 75, is a transverse lift rod 179 which extends across the front of the compartment 76, as shown in Fig. 4, and will, upon being moved upwardly, correspondingly move all of the push rods 175 simultaneously. In Fig. 8, extending beneath the transverse lift rod 179, and adjacent thereto, is the projecting end of an arm 180 pivotally mounted upon the panel 69, by means of the pivot member 181, so that, upon being moved, it will raise the transverse lift rod 179. Another arm 182 is pivotally mounted upon the panel 69, by means of the pivot members 183, as shown. One side of the arm 182 is pivotally secured, by means of a coupling pin 184, to a coupling link 185, which is pivotally secured to one part of the arm 180 by means of the coupling pin 186. A similar arrangement of mechanical elements is positioned on panel 68, in Fig. 4; arm 187, arm 188, and coupling link 189 corresponding to arm 180, arm 182, and coupling link 185, respectively. Disposed between the arm 182 and the arm 188, and pivotally secured to both, is a coupling rod 190 which, when moved, will cause the arms 182 and 188 to move accordingly. Rigidly secured to the coupling rod 190, at a point between the projectors 118 and 81, is a rod 191 which extends through the extended part 11 of the housing 1, in which it is slidably positioned, and terminates in a knob 192. In Fig. 8, these mechanical elements are shown in a normal unactuated position. When the knob 192 and the rod 191 are pulled into an extended position, the coupling rod 190 will be correspondingly moved so as to make the intermediate mechanical elements move the transverse lift rod 179 into an upward position thereby raising the shutters 176 associated with each of the color screen housings as shown in Fig. 9. It is therefore evident that when the transverse lift rod 179 has raised all of the shutters 176, the color screens 177 will remain in a normal position upon the top of the color screen housings, as shown, and intercept the path of the light beams from the associated projectors. However, when any of the color screens 99, 100, 101, which are disposed within the housings 73, 74, and 75 are raised by their respective key levers, the associated color screens 177 will also be simultaneously raised by the transverse lift rods 178, which are adjacent to the said key levers, so that the said color screens 177 will not interfere with the movement of the color screens 99, 100, and 101. The rod 191 and associated mechanical elements are arranged so that when the knob 192 is extended, the said mechanical elements will remain in the position in which they are set, it being necessary to manually depress the knob 192 to return them to a normal position and lower the shutters 176. The manual key-levers 166, 167, and 168, and associated members will return to their normal positions by gravity, and the keys 163, 164, and 165 will return to their normal positions through tension of associated helical springs indicated by the spring 193 in Fig. 8 and Fig. 9.

It will now be evident that, in addition to the color changes obtainable by rotating the rotary color screens 103, 120, and 121 in the path of the light beams from the projectors 81, 118, and 119, other color changes are to be obtained by using the keyboard 12 to manipulate the manually controlled color screens contained in the housings 73, 74, and 75. While the rotary color screens 103, 120, and 121, in Fig. 4, are rotating in the

path of the light beams from the said projectors and producing a sequence of color changes, it will usually be desirable to have the knob 192 in an extended position so that the intermediate mechanical elements will cause the transverse lift rod 179 to raise the shutters 176, (see Fig. 9) associated with the manually operated color screen housings, so that the light beams may pass through the color screen housings. The color screens 177, still being in a position to intercept the light beams, will filter the said beams in accordance with the colors of the said screens. The three color screens 177, associated with the three color screen housings 73, 74, and 75, are colored, respectively, light red, green, and blue-violet, which, being the three primary colors, will change the light beams accordingly, and, when the said light beams are originally white, will change them in a manner such that, upon convergence after leaving the said color screens, they will again produce white light. The manually operated color screens 99, 100, and 101 may be arranged, with reference to colors, in spectrum sequence, or any other colors, or order of colors, which may be desired.

Adjustment of rheostats controlling the electric current supply to the respective projectors, more fully described later, will cause a corresponding change in the intensities of the respective component primary colors of the said converged white light. Consequently, such adjustment can be utilized to bring the said component primary colors to proper intensities to produce the converging white light, or can be utilized to disproportion the intensities of the component primary colors, so that effects other than pure white light will be produced.

However, it is evident that when the rotary color screens are revolving in the path of the light beams between the said projectors and the manual color screens, the beams of light reaching the manually operated color screens will not be white, due to the filtering effect of the colored sectors of the rotary color screens. The light beams will therefore be additionally filtered, and of a great variety and complexity of colors, which is desirable for certain purposes. However, for certain other purposes, to project white light through the manually operated color screen housings, it will be necessary to stop the rotation of the associated rotary color screens, and open the moveable mounting sectors 112, associated with the same, so that the white light beams can pass through the said rotary color screens without being intercepted thereby. The said rotary color screens are stopped and their associated mounting sectors 112 opened by rotating the knob 160, in Fig. 4, as before described.

At any time while light beams are being projected through the manually operated color screen housings, whether intercepted by rotary color screens or not, the keyboard 12 may be used to manipulate the manually operated color screens so that they intercept the said light beams thereby producing other and additional color effects which are entirely manually controlled by the operator.

It is intended in my invention that similar manually controlled color screens, and associated housings and mechanical elements, be provided for all of the projectors, the same being here omitted for simplicity of description.

Referring to Fig. 12, a housing 194 is suspended to a projector by means of an encircling band 195. Mounted upon a shaft 196 extending from the housing 194, is an arm 197. Mounted upon the arm 197 is a sector 198 composed of a transparent material, such as glass, upon which opaque radial lines, of varying spacing, have been ruled. Positioned between the housing 194 and the arm 197, and connecting the same, is a small helically wound tension spring 193 which normally holds the arm 197 against the pin 199 in the housing 194 so that the part of the sector 198 whereon the opaque lines are ruled closest will intercept the path of the light beam from the projector 81. Disposed within the housing 194 are means, such as a moving coil ammeter or measuring instrument, for exerting a torque upon the shaft 196 in accordance with the intensity and rhythm of an alternating electric current at audio frequencies. Relative high intensities of the current will move the arm 197 in a manner such that the sector 198 will be entirely out of the path of the projected light beam, or will intercept it only at that end of the sector where the opaque lines are more widely spaced; whereas, relatively low intensities will only slightly move the arm 197, and the sector 198 will intercept the projector light beam where the opaque lines are closely spaced. Inasmuch as the opaque lines on the sector 198 cut off the light which they intercept, it is evident that the most light will be cut off where the opaque lines are more closely spaced. Consequently, the intensity of the light beam will vary in proportion to the intensity of the current controlling the movement of the sector 198. Rhythmic modulations of the said current will produce corresponding oscillations of the sector 198. A device similar to the foregoing is mounted upon each projector, so that all of the light beams will be affected in the manner described. (See Fig. 3.)

In Fig. 5, disposed within compartments 78 and 134 is apparatus comprising a kaleidoscopic projection arrangement. A driving motor 200, in the compartment 134, is positioned so that a worm 201, rigidly mounted on the shaft 202 extending from the driving motor 200, engages a worm gear 203. The

worm gear 203 is rigidly mounted upon a shaft 204. The shaft 204 is mounted in a bearing 205 situated on the bottom panel 206 of the compartment 134, and extends through the bottom panel 207 of the compartment 78, and is free to rotate therein. A turntable, comprising, a platform 208 composed of a transparent material, such as glass, and a peripheral retaining ring 209, is rigidly mounted upon the shaft 204. (See Fig. 2.) Positioned above the platform 208, in the compartment 78, is a kaleidoscopic tube 210 mounted in the supporting member 211 and free to rotate therein. A belt 212 extends from a pulley 213 rigidly mounted upon the shaft 202, through an aperture 215 in the panel 207 to a pulley 214 integral with the kaleidoscopic tube 210. Rotation of the shaft 202 by the driving motor 200 will cause a corresponding rotation of the transparent platform 208 and the kaleidoscopic tube 210.

In Fig. 15 and Fig. 16, the said kaleidoscopic tube is shown in more detail. Disposed within the tube 210 are three rectangular shaped reflecting mirrors 216, 217, and 218 arranged in the form of an elongated hollow prism, and mounted upon members 219, as shown, with their reflecting surfaces turned towards the center of the tube 210. Both ends of the prism shaped arrangement of mirrors are open so that light reflected from variant shaped objects and directed through the tube will be reflected from more than one side and give an effect of geometrical patterns. Such an arrangement is commonly used in ordinary kaleidoscopes.

Referring again to Fig. 5, an electric lamp 220 and reflector 221 are rigidly secured to a rod 222 which is mounted in a universal mounting 223 which can be adjusted in several planes. The said electric lamp 220 and reflector 221 are positioned so that light rays from the electric lamp 220 will be directed through an aperture 224 in the panel 207, and through the transparent platform 208. A reflecting mirror 225 is rigidly secured to a rod 226 mounted in a universal mounting 227 which can be adjusted in several planes. The reflecting mirror 225, intercepting the path of the light directed through the transparent platform 208 at an angle of approximately forty-five degrees, will reflect the same through the kaleidoscopic tube 210 which is positioned approximately ninety degrees from the axis of the path of the light directed through the transparent platform 208. An auxiliary electric lamp 228 and reflector 229 are mounted upon the mounting 230 and positioned so that the surface of the transparent platform 208 will be illuminated. It is evident, then, that if small objects, such as fragments of colored glass, or colored beads, be placed upon the transparent platform 208, their illuminated images will be reflected through the kaleidoscopic tube 210, and, when the transparent platform 208 and the kaleidoscopic tube 210 are rotated by the driving motor 200, will form a great variety of variant shaped and variant colored moving geometric patterns. A bi-convex lens 231 is mounted in the member 232, which is positioned in front of the kaleidoscopic tube 210 so that the images reflected through the same can be projected upon the screen 2 situated some distance away. A stud 235, which is integral with the member 232, extends through an elongated hole 233 in the panel 207. A hand nut 234 is provided for the stud 235 so that the member 232 can be secured in any position in the elongated hole 233, and the lens 231 correspondingly focused with reference to the kaleidoscopic tube 210 and the screen 2.

In Fig. 13 and Fig. 14, a bi-convex lens 236 is positioned in a mounting ring 237. The mounting ring is pivotally mounted, by means of the pivot members 238 and 239, in a semi-circular yoke 240, the pivot member 238 extending through the yoke 240 and terminating in a pulley wheel 241 to which it is rigidly secured. Rotation of the pulley wheel 241 will cause a corresponding rotation of the mounting ring 237 and lens 236 with reference to the yoke 240. The yoke 240 is rigidly secured to a spindle 242 which extends through a pulley wheel 244 and a frame 243, and is free to rotate therein. The pulley wheel 244 is rigidly secured to the frame 243. Rigidly secured to the spindle 242 is a miter gear 245, positioned as shown. Mounted upon the yoke 240, midway between the pulley wheels 241 and 244 is a bearing block 246 in which a spindle 247 is rigidly secured. Mounted upon the spindle 247, and free to independently rotate thereon, are two idler pulley wheels 248 and 249. A belt 250 is provided between the pulley wheels 241 and 244 over the idler pulley wheels 248 and 249. When the yoke 240 is turned upon the axes of the spindle 242, the pulley wheel 244, being secured to the frame 243, will remain stationary and hold the belt 250 in frictional engagement therewith, whereby the pulley wheel 241 will be made to revolve once for every revolution of the spindle 242. Consequently, the lens 236 will be simultaneously rotated about two axes which intersect at right angles. A miter gear 251 is mounted in the frame 243, so that it is free to rotate therein, and engages the corresponding miter gear 245.

The frame 243 is pivotally mounted upon the support 252 by means of a bolt 253, washer 254, and nut 255. The support 252 is secured, by means of screws 256 and 257, to the panel 258 which is the bottom panel of compartment 77. Referring to Fig. 2, it will be seen that the frame 243 is positioned in the compartment 77 and extends through an aperture

in the panel 69 so that the lens 236 intercepts the path of the light beam from the projector 66. (See Fig. 3.) A coupling link 261 is pivotally secured to the frame 243 and to an arm 262 which is rigidly secured to the worm gear 263. The worm gear 263 is mounted so that it rotates in engagement with a worm 264 which is mounted upon shaft 265 extended from a driving motor 266. A flexible shaft 267 is connected between the shaft 265 and the miter gear 251 in the frame 243 so that rotation of the shaft 265 will cause a corresponding rotation of the gear 251. When the driving motor 266 rotates the worm gear 263 and the arm 262 by means of the worm 264, the coupling link 261, in following the rotation of the arm 262, will oscillate the frame 243 in a manner such that the lens 236 will move back and forth in the path of the light beam from the projector 66. Simultaneous with such oscillating movement, the lens 236 will be rotated, as before described, in two planes by the miter gears 245 and 251, which are mechanically connected to the shaft 265 by means of the flexible shaft 267. It is evident, then, that the lens 236 will intercept the light beam from the projector 66 at a great variety of angles at varying positions with reference to the projector 66. Consequently, the said light beam will be, in effect, continually distorted, and will produce a great variety of unusual effects. A similar distorting lens arrangement may be provided for each of the other projectors so that similar distorted effects can be produced with all of the variant colored light beams, when so desired.

In Fig. 17, which is a construction detail of the pattern machine 3, two rollers 268 and 269 are rigidly mounted upon spindles 270 and 271, respectively, which are mounted in a housing 272, as shown, and are free to rotate therein. A pulley wheel 273 is rigidly mounted upon the spindle 270, and a spur gear 274 is rigidly mounted upon the spindle 271. A shaft 275 is positioned below the spindle 271 in the housing 272 and is free to rotate therein. Rigidly mounted upon the shaft 275 is a pulley wheel 276, somewhat larger in diameter than pulley wheel 273, to one face of which there is rigidly secured the driven member 277 of a ratchet tooth clutch. Slidably positioned on the shaft 275 is a collar 278 to one face of which there is rigidly secured the driving member 279 of a ratchet tooth clutch, positioned for engagement with the driven member 277. A spur gear 280, considerably smaller than the spur gear 274, is rigidly secured to the opposite face of the collar 278. A pin 281, rigidly secured to the collar 278, extends through an elongated hole in the shaft 275 so that the collar 278, the spur gear 280 and the clutch member 279, associated therewith, may be moved lengthwise on the shaft 275 and yet remain in engagement with the same with respect to rotation. A pulley wheel 292 is rigidly mounted upon the end of the shaft 275 opposite from the pulley wheel 276. A lever 282, pivotally mounted upon the housing 272 by means of a pivot member 283, is positioned so that one end 284 of the lever 282 will engage in a peripheral channel in the collar 278. When the other end 285 of the lever 282, which extends through an aperture 286 in the housing 272, is moved, the collar 278 will be slid lengthwise on the shaft 275 and the spur gear 280 associated therewith, will be disengaged from the spur gear 274, and the clutch member 279 will engage with the clutch member 277, or vice versa according to the direction of the movement of the lever 282. A shaft 287, extending from a driving motor 288 positioned in the lower part of the housing 272, is mounted in the housing 272, as shown, and is free to rotate therein. Rigidly secured to the shaft 287 is a pulley wheel 289. Belts 290 and 291 are provided between the pulley wheels 273 and 276, and 289 and 292.

It is intended that patterns, such as pattern 310 in Fig. 1, be secured to the rollers 268 and 269 so that the same may be wound from one roller to the other. These patterns are substantially long pieces of flexible opaque material, which has been cut out in variant shapes, or long pieces of flexible transparent material upon which variant opaque shapes have been secured.

In starting position, the major part of the pattern will be reeled upon the roller 268, and the mechanical elements of the pattern machine will be in the same relative position as shown in Fig. 17. The motor 288, then, when started, will rotate the shaft 275 by means of the belt 291 and the pulleys 289 and 292, so that the spur gear 280, being in engagement with the spur 274, will rotate the roller 269 in the direction indicated by the arrow 311, winding the pattern thereon from the roller 268 across the intervening space and intercepting the path of the variant colored light beams so as to form corresponding shapes and patterns.

When the pattern has been wound as far as possible on the roller 269, the lever 282 may then be shifted so that the spur gears 274 and 280 will be disengaged, and the clutch members 277 and 279 engaged, thereby rotating roller 268 in the direction indicated by the arrow 293, by means of the pulleys 273 and 276, and belt 290 associated therewith, while the roller 269 idles. The pattern, then, will be wound back on to roller 268. When the pattern has been wound as far as possible on the roller 268, the lever 282 can again be shifted, and the entire winding process repeated as before. However, due to differences in size of the rotating driving elements, it is evident that the pattern will be slowly wound

upon the roller 269, whereas it will be comparatively quickly wound upon the roller 268. Inasmuch as it is generally desirable, in projecting light beams through the pattern machine, to have the pattern always moving slowly in one direction, this difference in speed of winding directions makes it possible to quickly re-wind the pattern after it has slowly run through in one direction.

In Fig. 18, the driving motors 56, 266, 135, 200 and 288 are connected in parallel to a suitable source of current supply having an input at the terminals 294. The motors 56, 266, 135, 200 and 288, are controlled by switches 37, 41, 39, 43, and 16, and by the rheostats 36, 40, 38, 42, and 15, respectively, so that the said motors can be selectively stopped and started and regulated as to speed. A reversing switch 295 is shunted across the current supply line of the motor 135 so that the direction of rotation of the said motor can be reversed. The projectors 64, 65, 66, 119, 118, and 81, are connected in parallel to a suitable source of current supply having an input at the terminals 296. The projectors 64, 65, 66, 119, 118, and 81 are controlled by switches 26, 30, 34, 28, 32, and 35, and by the rheostats 25, 29, 33, 27, 31 and 18, respectively, so that the light source in each projector may be selectively turned off and on, and regulated as to intensity. The kaleidoscopic lamps 220 and 228 are connected in parallel to the source of current supply having an input at the terminals 296, and controlled by the switch 19 so that the said lamps can be turned on and off.

A motor generator set 297, provided as a source of electrical supply for operation of the radio receiving set 8 and electric phonograph 9, is connected in parallel, on the input side, to the source of current supply having an input at the terminals 294, and is controlled by the switch 22 so that the motor generator set may be stopped and started. The radio receiving set 8 and the electric phonograph 9 are connected in parallel to the output current supply of the motor generator set 297. Switches 298 and 299 are provided for selectively opening and closing the said current supply circuit to the radio receiving set 8 and the electric phonograph 9. The radio receiving set 8 comprises a selective tuning arrangement, several stages of radio frequency amplification, a detector, and several auxiliary stages of audio frequency amplification. The remote control panel 13 is electrically connected to the radio receiving set 8 by the remote control cable 312, so that the selective tuning arrangement in the radio receiving set can be operated from the housing 1 of the projection machine. (See Fig. 1.) A wired radio carrier line, a space radio antennæ system, or other source of radio frequency signals, is connected to the input terminals 313 of the radio receiving set. The light intercepting devices 194 associated with the projectors 64, 65, 66, 119, 118, and 81, and which are actuated by audio frequency currents, are connected in parallel to the audio frequency output terminals 301 of the radio receiving set 8. A loud speaker 10 is connected to a double pole switch 17 which is, in turn, connected to the output terminals 302 of the electrical phonograph 9, and to the audio frequency output of the radio receiving set 8, so that the loud speaker 10 can be alternately used for the reproduction of sound from either source. Rheostats 20 and 21 are provided for controlling the output volume of the electric phonograph 9 and the radio receiving set 8, respectively.

The operation of the embodiment of my invention, further than has been described in the foregoing, is given in what follows:

The person who operates the projection machine positions himself in front of the housing 1, so that he has access to the keyboard 12 and the controlling elements adjacent thereto.

Referring to Fig. 1, the projectors 64, 65, 66, 119, 118 and 81 in the housing 1 are adjusted with reference to direction, by means of the knobs 48, 46, 44, 49, 47, and 45, respectively, so that overlapping light beams are projected upon the screen 2. The rotary color screens, then, intercepting the path of these light beams at different rotating speeds, will cause these beams to be of variant colors which change at a rate which is not uniform, the overlapping portions of the beams being of colors which are resultants of the superimposed colors. The projectors may be individually turned on and off, and regulated as to intensity of light beam projection, by the associated rheostats. To project these beams upon the screen 2, it is necessary to raise the shutters 176 associated with each of the manual color screen housings, by means of the knob 192, so that the light beams can be projected through the same. In addition to the variant colors obtainable by intercepting the light beams with the rotary color screens, further effects can be obtained by manipulating the manual color screens by means of the keyboard 12 so as to selectively choose any one or more of the said color screens and intercept the light beams therewith.

To project, upon the screen 2, light beams the colors of which are entirely determined by manual operation, it is necessary to stop the rotation of the rotary color screens, by turning the knob 160, and open the moveable color sector in each of the same so that white light can pass through without being filtered. At the same time, the shutters 176 associated with each of the manual color screen housings should be lowered, by means of th knob 192. The shutters 176 will then prevent light from passing through the color screen housings except when a manual color screen is raised

to intercept the light. The operator can then control the color effects entirely by manipulation of the keyboard 12.

Inasmuch as more than one color screen may simultaneously intercept the light beam from one projector, it is thereby possible to obtain other superimposed color combinations, in addition to those produced by the overlapping colored light beams.

When white light beams are being projected through the manual color screen housings, the shutters 176 may be raised, by means of the knob 192, and special color effects obtained, without employing either the rotary color screens or manual color screens, by regulating the rheostats associated with each projector so as to vary the intensity of the light beams projected through the color screens 177. (See Fig. 8.) Inasmuch as the color screens 177 associated with the several manual color screens housings are primary colors which are intended to filter the white light beams in a manner such that upon convergence they will again form white light, it is evident that if the intensities of these white light beams be varied, the component primary colors will be unbalanced so as to decrease or increase one or more of the colors to produce delicate tints and fine gradations and variations of color shading.

To produce unusual and extremely varied color shapes upon the screen 2, the distorting lens, in compartment 77 in Fig. 2, may be set in motion by starting the associated driving motor. The variant colored light beams intercepted thereby will then be continually distorted.

The kaleidoscopic projection arrangement in compartment 78 may also be brought into use by closing the circuits to the associated lamps and driving motor. A great variety of moving geometric patterns, corresponding in shape and color to the objects placed upon the kaleidoscopic transparent platform, will be projected upon the screen 2.

The pattern machine 3 and the associated shielding 50, in Fig. 1, are adapted to be readily positioned for operation when desired by the operator. The pattern may then be used in a stationary position, or the associated driving motor may be started so as to move the pattern across the path of the variant colored light beams, intercepting the same in accordance with the design of the pattern. It is obvious that two or more of these pattern machines can be used simultaneously to intercept and define the variant colored light beams, the patterns running in the same direction, or in opposite directions, at the same, or different relative speeds.

The object supporting turntable 4 is also adapted to be readily positioned for operation when desired by the operator. Objects of any shape or form may then be placed upon the said turntable and used in a stationary position, or rotated by the associated driving motor, to intercept the variant colored light beams, at variant angles, to form a great variety of shapes and shadows upon the screen 2.

All of the driving motors are selectively controlled so that they may be started and stopped at will and varied as to speed of rotation. Consequently, any of the elements which are driven by motors may be individually and selectively controlled as to relative speed, or used stationary. In the event that an especially desirable color or pattern is cast upon the screen, the driving motors can be immediately stopped so as to retain that particular color or pattern. The driving motor which revolves the rotary color screens is provided with a reversing switch, and the driving mechanism of the pattern machine 3 is provided with a direction reversing clutch, by means of which it is possible to reverse the order of formation of colors and patterns, thereby making it possible to cause the immediate return of any especially desirable color or pattern which has been replaced by other formations before it has been possible to stop the driving motors.

Simultaneous with the formation of color effects and patterns on the screen 2, it is possible to produce accompanying sound effects, which may be of a nature sympathetic to the color effects, through the agency of the loud speaker 10 which can be selectively connected to either the electrical phonograph 9, or the radio receiving set 8. At the same time, the variant colored light beams will be rhythmically affected as to intensity by light intercepting devices, positioned upon each projector, which are actuated in accordance with the modulated audio frequency currents from the radio receiving set.

The embodiment of applicant's invention hereinbefore described respecting sound accompanying effects and varying the intensity of light by audio frequency currents obtained from a radio receiver, involving features as disclosed in Figs. 2, 3, 4 and 12 and a portion of Fig. 18, is claimed in applicant's co-pending divisional application Serial No. 533,940, filed April 30, 1931.

Permanent records of the color effects and patterns may be made by the employment of any of the commonly used methods of color photography. For recording occasional color formations, the moving elements may be stopped, as hereinbefore provided, and a color photograph made of the screen 2, whereas, if a continuous record of all of the effects presented to the eye is desired, a color motion picture may be made of the same.

In Fig. 19, a diagonal row of projectors 402, 404, 408, of a group of nine projectors 400, 401, 402, 403, 404, 405, 406, 407, 408, in Fig. 20, which is the normal arrangement of the projectors in a preferred embodiment

of my invention, are shown, schematically, in their relation to light beams projected through a pattern 409 upon a screen 410. The light beams are directed upon the screen 410 in a manner such that they overlap at an angle corresponding to the angle of the diagonal row of projectors. The light beams are defined by the pattern 409 so as to project these variant colored overlapping light beams in the form of squares 411, 412, 413, upon the screen 410. The squares 411, 412, and 413 are projected by the projectors 402, 404, and 408, respectively.

The pattern 409 is substantially any means for defining light, and corresponds to pattern 310, in Fig. 1, or to the objects on the object supporting turntable 4. It is evident, now, that any pattern or object which intercepts the paths of the variant colored light beams will cause corresponding shapes and shadows of variant colors, overlapping in variant planes, to be cast upon the screen 410. Inasmuch as the projectors are selectively controlled, it is evident that any one projector, any row of projectors, or any group of projectors, such as are defined by the dotted lines in Fig. 20, may be used, as desired, with varying intensities of light, and with variant light defining and intercepting devices, to produce by beams of light overlapping in one or selected planes an almost infinite variety of different colored shapes, forms and patterns.

While in the description of my invention I have referred to certain details of mechanical construction and arrangement of parts as well as to electrical circuits, I do not limit myself thereto except as may be pointed out in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A projector system comprising, a plurality of projectors, a plurality of manually controlled variant color screens adjacent each of said projectors, a plurality of automatically controlled variant color screens adjacent each of said projectors, a screen common to all of said projectors, means for supporting between said common screen and said projectors, a plurality of objects and means for manually and automatically controlling said screens and said projectors to produce on said common screen overlapping shadows in variant colors of said interposed objects.

2. A projector system comprising, a plurality of projectors for producing light beams, a common housing means therefor a keyboard carried by said housing, a plurality of screens of variant colors adjacent each of said projectors and controlled by said keyboard, a motor, a control means therefor carried by said housing, a variant color screen adjacent each of said projectors, each of said screens adapted to be rotated by said motor, a motor driven object supporting turntable for supporting objects interposed in the path of said light beams, and control means therefor mounted adjacent said keyboard.

3. A projector system comprising, a plurality of projectors, a common housing means therefor, means for individually controlling the intensity of light from each of said projectors mounted on said housing, a keyboard carried by said housing, a plurality of screens of different colors adjacent each of said projectors and adapted to be controlled individually and manually by said keyboard, a motor, control means therefor carried by said housing, a color screen comprising sectors of different colors adjacent each of said projectors and each adapted to be rotated individually by said motor, a motor driven object supporting turntable for supporting pattern forming objects in the light paths of said projectors, and control means therefor mounted adjacent said keyboard.

4. A projector system comprising, a plurality of projectors, a common housing means therefor, means for individually controlling the intensity of light from each of said projectors mounted on said housing, a keyboard carried by said housing, a plurality of screens of different colors adjacent each of said projectors adapted to be controlled individually by said keyboard, a motor, control means therefor carried by said housing, a color screen comprising sectors of different colors adjacent each of said projectors and each adapted to be rotated individually by said motor, a motor driven pattern screen adjacent said projectors and common to all of said projectors, and means mounted adjacent said keyboard for controlling the operation of said pattern screen.

5. A projector system comprising, a plurality of projectors, a common housing means therefor, means for individually controlling the intensity of light from each of said projectors mounted on said housing, a keyboard carried by said housing, a plurality of screens of different colors adjacent each of said projectors and adapted to be controlled individually by said keyboard, a motor, control means therefor carried by said housing, a color screen comprising sectors of different colors adjacent each of said projectors and each adapted to be rotated individually by said motor, a second motor, a kaleidoscope projector system mounted in said housing and comprising, in part, an object supporting turn-table adapted to be driven by said second motor and control means for said second motor carried by said housing.

6. A projector system comprising, a common projection screen, a plurality of projectors for producing light beams which overlap on said screen, a common housing means therefor, means for individually controlling the intensity of light from each of said pro-

jectors mounted on said housing pattern forms interposed in the path of said light beams, a keyboard carried by said housing, a plurality of screens of different colors adjacent each of said projectors and adapted to be controlled individually by said keyboard, a motor, control means therefor carried by said housing, a color screen comprising sectors of different colors adjacent each of said projectors and each adapted to be rotated individually by said motor, a motor driven distorting lens adjacent each of said projectors, and means mounted adjacent said keyboard for controlling the operation of said distorting lenses to produce on said common screen distorted overlapping shadows of said pattern forms.

7. A light projection system comprising, a projection screen, a plurality of light projectors for projecting beams of light, pattern forming means interposed between said light projectors and said projection screen, said light projectors being positioned at different angles with respect to said pattern forming means whereby said light beams produce on said screen a composite pattern having a plurality of overlapping areas of light determined as to configuration by said pattern forming means, and means for individually producing a predetermined sequence of color changes in the light beam projected from each projector whereby the color of said overlapping areas of light are altered to produce a sequence of color variations of said composite pattern.

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