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METHOD OF PRODUCING MUSICAL COMPOSITIONS THROUGH THE MEDIUM OF COLOR.

APPLICATION FILED JAN. 7, 1916.

Patented Dec. 2, 1919.

1,323,943.

3 SHEETS—SHEET 1.

Fig. 1.

My coun-try 'tis of thee Sweetland of lib-er-ty
Of thee I sing-Land where my fa-thers died! Land of the
pilgrim's pride! From every moun-tain side Let free-dom ring!

Fig. 2.

C' B' C' D B' F' E' D' C'
D' B' C' G' F' E' D'
E' D' E' F' E' D' E' F' G' A G' E' D' C'

WITNESSES:

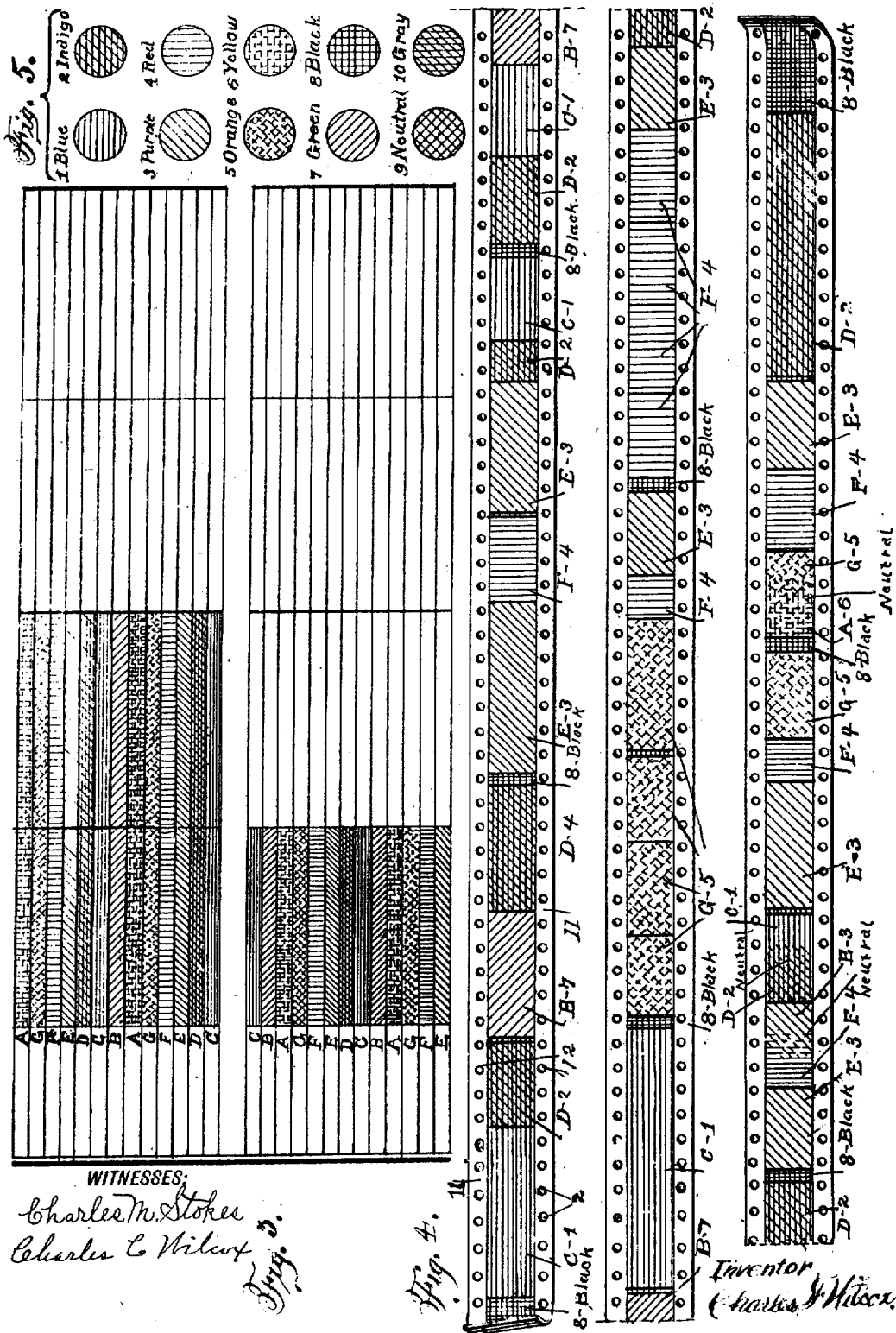
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3 SHEETS—SHEET 2.



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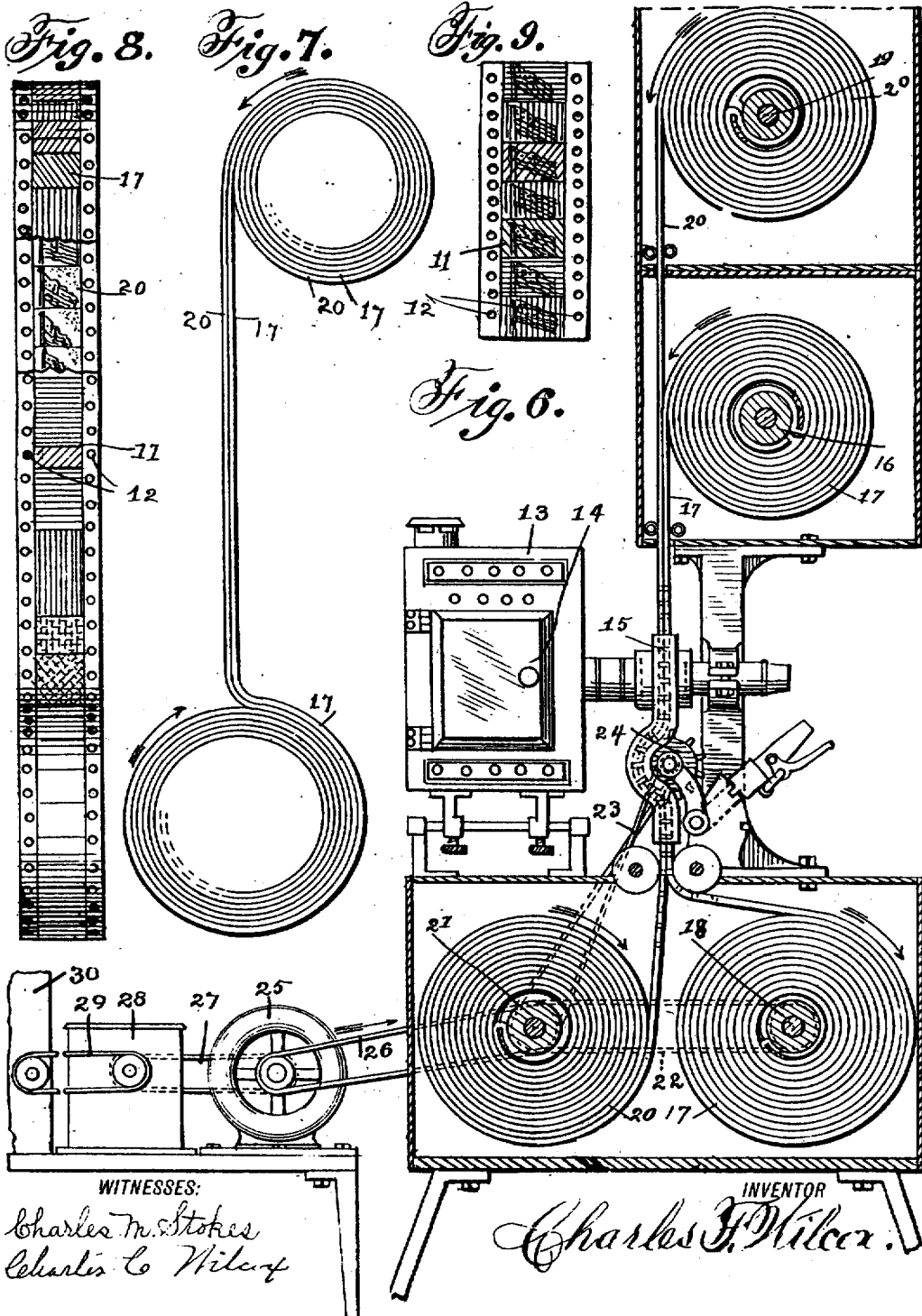
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3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

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METHOD OF PRODUCING MUSICAL COMPOSITIONS THROUGH THE MEDIUM OF COLOR.

1,323,943.

Specification of Letters Patent.

Patented Dec. 2, 1919.

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To all whom it may concern:

Be it known that I, CHARLES F. WILCOX, a citizen of the United States, residing in the borough of Brooklyn, in the city of New York, in the county of Kings and State of New York, and whose post-office address is Box 271, Brooklyn, New York, have invented certain new and useful Improvements in Methods of Producing Musical Compositions Through the Medium of Color, of which the following is a specification.

This invention relates to the method of producing musical compositions, or accompaniments for musical compositions, or other rhythmical effects, auricular or spectacular, essentially for entertainment, as instrumental music, singing, marching, dancing or dramatic action, by and through the medium of color which is presented to the eye as a changing rhythmical light of different colors projected upon a screen a stage or other object or it may be so contrived and arranged that the effect will be projected directly to the eye from the source of light.

My invention is based upon the scientific theory of the relation between sound vibrations and vibrations of light, the varying rapidity of vibrations of each causing the phenomena of color perception in the case of light and of the perception of pitch or tone in the case of sound.

The correlation or analogy between color and sound as I prefer to designate the phenomena of effects upon sight and hearing respectively, is evidenced by the fact that the rays of light revealed by the spectrum are broadly divided into seven degrees or colors of light, as; indigo, blue, violet, or purple, red, orange, yellow and green, which through the organ of sight the eye through the retina and the optic nerve affect the consciousness, subconsciousness and the subjective sense of the observer; and similarly the gamut or musical scale is likewise broadly divided into seven degrees or subdivisions of tones, as C, D, E, F, G, A, B, the seven tones in the octave in the key of middle C. It should be noted that while there are eight tones in each octave, yet the eighth tone of the octave is a repetition of the first tone in a higher key, and the first tone in the next octave above the lower octave.

Thus the broad division of the spectrum

and the gamut are identical in number and therefore the varying effects that can be produced upon the eye and ear respectively by different arrangements and combination may be facilitated by the similar division of both into seven parts. The nice adaptation of the colors of the spectrum to synchronous presentment with the tones of the gamut or musical scale, is further illustrated by the arrangement and presentment of the colors of the spectrum to the eye in the sequence or order in which they may be disposed, as indigo, blue, purple, red, orange, yellow, green, making seven, and then repeating the first of the seven making the eighth, the color being repeated in a higher key, similarly to the manner of repeating the first tone of an octave to complete the octave, so that the first tone repeated in a higher key stands as the eighth tone of the first octave and the first tone of the second octave. By this it is seen that the colors of the spectrum may be disposed in octaves of color, precisely in the same manner as the gamut or musical scale is divided, by repeating the first color of the color octave in a higher key, that is, a lighter tone or tint, as the last or eighth color of the first octave and the first color of the second octave.

I do not limit myself to any particular code for the arrangement of the colors as corresponding identically with certain tones of the musical scale, and have only suggested the order above given as a convenient mode of defining the principle and theory of my invention. Should it be assumed that the above arrangement or order might be adopted as either a correct or arbitrary code of correspondence, it will be perceived that by following the code in the interpretation of a musical composition that only effects of consonance or concord between the musical tones and the colors would be produced in the interpretation; whereas it is often desirable in esthetic effects to produce effects of dissonance or contrasted effects approaching a discord. In view of this principle, I have provided for arranging the code of corresponding colors and tones arbitrarily for variation. In all cases however it should be remembered that whether an effect of consonance or dissonance between colors and tones be desired, that both colors and tones are subordinated to the law of rhythm

and meter, with as much fidelity as the musical tones of instruments playing in concert, which is made possible by the method I employ by subordinating various colors to voluntary control for the purposes set forth and in the manner described.

While I have described in the foregoing only a correspondence between the tones in middle C and the primary tones of the spectrum, making no allusion to the adaptation of colors for correspondences with the tones of the scale in other keys than the natural or middle C and higher and lower octaves, and have only illustrated the correspondence between the colors and the tones of middle C, yet this is for expedience only and for the purpose of rendering the specification more simple and intelligible than would be possible if the drawings and specification were involved with a detailed illustration and description of all the various keys and the varying tones in each scale of a different key and an attempt to illustrate the correspondence of all the various colors with each musical tone of whatever scale or key.

Therefore while I have not attempted and will not attempt in this specification to define and explain in detail the exact correspondence of each particular musical tone in the gamut, with any particular color I will state that the correspondence of the colors with semitones, as sharps and flats is determined by a code which is prearranged so that the corresponding tones and colors may be produced in the keys in which sharps and flats occur as well as in the natural key as illustrated in the drawings and described in the specification. This is accomplished by blending two colors corresponding with two musical tones between which a sharp or flat may occur, so as to produce a neutral tone or tint of color which will correspond with the sharp or flat between the two musical tones with which the two original colors thus blended are assumed to correspond; and to make the prismatic colors and the blended colors correspond with the tones in the higher and lower octaves or scales.

I am aware that other persons have promulgated theories of correspondence between color and sound and have proposed to produce colors as an interpretation of music or as an accompaniment to music, but I do not concede to their assumed basis of correlation or the code of correspondence proposed by them as being accurate and absolute and believe that in every case the persons have assumed an arbitrary code which they allege to be absolute and based upon physical law. I am prepared to admit that there may be a correspondence that is absolute based upon the rapidity of vibrations of light waves and of sound waves, and do not doubt that some pleasing effects could be produced by synchronously producing such

corresponding colors and tones in a rhythmical harmony, but I cannot concede that the production of other colors and tones synchronously would produce any less pleasing effect, or that it might not produce a more pleasing effect. This I base upon the fact that a different motive in esthetic effects justifies different treatment. As an illustration of this I will assume that for one thoroughly educated in physics and knowing the exact degree of rapidity of vibration of light for each particular color, and the degree of rapidity of vibration of sound waves in each musical tone as nearly as scientific investigation may determine the same, might find great pleasure in hearing a musical composition produced synchronously with light effects arranged according to a code of correspondence based upon the comparative rapidity of vibration of light and sound waves respectively, as in this case the motive would be to note the effect upon the objective or even the subjective sense of the colors and sounds corresponding according to the code of correspondence based solely upon the rapidity of vibrations of light and sound waves.

But to assume another motive a much more pleasing effect might be obtained. For example, assuming as a basis for a code of correspondence between colors and tones, that the tone most universally sounded by the human voice, or that most universally sounded by the musical voice common to both sexes, or to men or women only, should be assumed as the predominating tone in a code and given the first place in the natural key or middle C, if such it proved to be; it is believed that this would be a fair criterion for ascertaining the basis for a code of musical tones with which to marshal or class by analogy or similitude the colors of the spectrum; this much having been established and disregarding any and all abstruse and didactic theories of physical relationship based upon rapidity of vibrations, it would seem quite consistent to assume as a basis for determining the corresponding colors of the spectrum for the tones in the scale, an analogous rule to that adopted in determining the basis for determining the predominating color in the chromatic scale, namely the law of universality or frequency with which the color is seen in general, or in particular pleasing and beautiful scenes or surroundings as in landscapes natural scenery, or in certain fields of art. Based upon the principle of universality, or frequency, the prevailing or predominating color to correspond might be said to be the ultramarine blue of the ocean or the cerulean blue of the sky, or perchance the emerald green of the verdure; or seeking for a color in the rainbow, or in the field of art red might be selected as the predominating color

and therefore the correlative, analogous or corresponding color to middle C. The correspondent for the first musical tone in the scale being ascertained I assume that ordinarily the relative position of the colors as seen in the rainbow, or spectrum should be followed in the ascending scale the first color being repeated as the eighth in an octave and the semitones, or sharps and flats being indicated by a blending of the colors corresponding with the tones above and below the sharp or flat as before described.

The octaves or scales above middle C in accordance with my method are represented by the same colors as the tones of middle C and the semitones or sharps and flats in that octave, with the exception that the color is diluted to a tint of the color which represents the corresponding tone in the lower octave; and correspondingly the octaves or scales below middle C are represented by the same colors as the tones in the middle C, with the exception that the colors are more dense or are mixed with black or other pigment, or more nearly approach black or darkness where all color perception is dissolved.

More specifically my invention relates to the method of producing musical compositions, or accompaniments for musical productions or other rhythmical auricular or spectacular effects essentially designed for entertainment, as instrumental music, singing, marching dancing or dramatic action, by and through the medium of changing color effects presented to the eye by means of filaments of different colors disposed in the path of rays of light projected from a source of light, in accordance with a code of correspondence between the colors and the tones of a musical scale or the gamut, each color or combination of color being successively presented to the view in rhythmical succession and for an interval corresponding with the time of the musical tone or chord with which it is assumed to correspond in the musical production.

My invention consists in the method employed for producing the rhythmical changing color effects desired, inexpensively and with accuracy by means of machinery now in common use thus obviating the necessity of constructing special machinery for the purpose of controlling color effects for interpreting musical compositions or as accompaniment for music or other rhythmical productions.

I attain this object by the method illustrated in the accompanying drawings and more fully described hereinafter.

Referring to the accompanying drawings. Figure 1 is a verse of the national song America, set to music and written in the natural key or middle C:

Fig. 2, is a diagrammatic view illustrat-

ing the comparative length of the time of the notes by an elongated space between two lines, the beginning and end of the tones being indicated by a vertical line across the space between the two lines said inclosed elongated spaces being disposed upon the staff in the same relative position as the notes in Fig. 1;

Fig. 3, represents an assumed color scale in which the tones are each represented by shading or hatching in accordance with the code or key shown in Fig. 5, instead of the usual system of notation in which the tones of the scale are written upon the lines and in the spaces between the lines;

Fig. 4 represents a film adapted for being conveyed through a projecting lamp such as is commonly employed for projecting motion pictures upon a screen, and is charged with colors in accordance with my assumed code of correspondence between colors and musical tones, for interpreting in color the tune America, as illustrated in Fig. 1 in the key of middle C;

Fig. 5 is a plurality of roundels taken collectively as one figure and shaded or hatched substantially in accordance with the rules laid down in the Rules of Practice of the United States Patent Office to indicate colors in drawings and serves as a key or code for interpreting the coloring of the spaces in the drawings;

Fig. 6, illustrates one method of employing my specially colored films for projection upon a screen in conjunction with a motion picture film; wherein each film is wound upon a separate delivery reel and conveyed through the machine simultaneously and then wound upon a separate receiving reel, also showing one method of connecting the projecting apparatus with other instruments as a phonograph and a mechanical piano player;

Fig. 7 is a view illustrating another method of using my specially colored film in conjunction with another film wherein both films are wound upon the same delivery reel in superposed relation and after being transmitted are rewound in the same manner upon a receiving reel;

Fig. 8 is a front view of the films and fragmentary rolls shown in Fig. 7; and

Fig. 9 represents a section of a film charged with impressions for moving picture effects and also charged with colors in accordance with my special method for the purpose of interpreting a musical composition in color as set forth.

The scale or code represented in the drawings and employed in the representation of the method herein described is not presented as being technically correct or complete, but is arbitrarily assumed and embraces or illustrates only tones on the natural scale or that of C. The drawings are made to em-

brace only these tones for the sake of simplicity and clearness, for the reason that middle C is the natural key and no sharps or flats occur in the octave, so it is only necessary with this scale to represent the true colors of the spectrum as given in my assumed code, as they are assumed to correspond with the tones in middle C, so it is unnecessary to represent in these drawings any sharps or flats, as would be necessary if another scale were used.

It is assumed for the purpose of illustration of the method that blue corresponds with middle C, indigo with D, purple with E, red with F, orange with G, yellow with A, green with B, and lighter blue with second C.

To produce these notes in the higher octaves a lighter shade of the same colors are employed, and to produce the tone in the octaves below middle C the tones are deepened or darkened by shading toward black or darkness where all color effects are dissolved and lost.

To express the sharp and flat tones the two colors representing the natural tones first above and below the semi-tone are blended in suitable proportions so as to make a neutral color or tint which represents the sharp or flat to be denoted.

In Fig. 2, I have omitted the notes of the ordinary system of musical notation and in the place thereof have drawn parallel lines with cross lines which represent the tones of the scale and also represent the time or interval of each respective tone; in this figure however the exact proportional length of the notes is not assumed to be expressed in the comparative length of the spaces but it is assumed that they are proportionally of the proper length to express the comparative intervals of time of the notes they represent. I adopt this mode of illustrating the tones and time to illustrate in a simple manner how an elongated strip or space may be employed to represent time in notation, and assuming that the position or tone of each note for its proper interval may be indicated by the color with which the portion of a strip of film or space is charged, it is apparent that by varying the lengths into which a film is divided the time of music may be determined, and by the color of the different portions or sections thereof the various tones of music may be denoted in accordance with a predetermined code of correspondence.

In Fig. 2, I have not colored the spaces to indicate the tones they represent as they occupy a position upon the staff to denote their tone, and for the further reason that the spaces are too small to admit of hatching successfully. As blank spaces it will be assumed that they represent varying lengths of a continuous film such as is used for mo-

tion pictures, the variations in length being in exact proportion on the film with the variation in the length of the time of the tones in the musical tones they represent.

Referring to Fig. 3, it will be obvious that by coloring these subdivisions of the film in accordance with the scale or code there represented in accordance with the key shown in Fig. 5 of the drawings that the film will be susceptible of denoting the tones of the musical composition through the medium of their color, and the time by the length of the portion of film charged with the color. In Fig. 3 I have represented the treble clef as extending over two bars on the staff which is to indicate that the colors may be extended entirely across the staff and the notes of music indicated thereon as a method of notation, and in the bass clef I have shown the colors as extending only to one bar, which indicates that the color code may be placed at the beginning of each staff only and the musical notation written upon the plain paper across the page the length of the staff as is now customary.

The difference in the depth of the color that expresses the higher or lower octaves is suggested by the strength of the shade lines and the comparative depth of shading or hatching which denotes the colors.

By reference to Fig. 4, a practical illustration of the method I employ will be seen. In the figure, the numeral 11 represents a continuous film of transparent material and having parallel perforated edges 12, whereby it may be transmitted through the ordinary projecting machines used in motion picture work. The film may be assumed to be drawn to a scale of one half the actual width and one eighth of its lineal length per foot as subdivided in the drawing.

Further assuming that the film will be usually transmitted through the projector at an average speed of 1 foot per second and assuming also that the usual time for a whole musical note is one second it will be seen that the film moving at one foot per second would travel one foot in the time of one whole note of music, one half a foot in the time of a one half note and one fourth of a foot in the time of a one fourth note, &c.

In the drawing one and one half inches lineal length represents one foot of the film and accordingly in indicating the coloring by the shading or hatching one and one half inches represents one foot or the length of film which will be transmitted through the projector in one second of time, and shorter or longer spaces in like proportion, as one second, one second and one half, one half a second and one fourth of one second, &c.

The tune America transposed to the key of middle C is indicated upon the film shown in Fig. 4. For simplicity only the air is given.

The first tone is middle C and accordingly the color of the first subdivision of the film must correspond with middle C which according to the code given in Fig. 3, is blue, and as there are two half notes in the tone of C the time of both notes is equal to one whole note and therefore the length of film which will be transmitted through the projector in one second of time or the time of two half notes is colored blue, the color here shown as representing middle C. The next tone is D, a half note, and that portion of the film which will be transmitted in one half a second should be colored indigo blue, which is the color here represented as corresponding with D.

To denote the pauses or rests in the music a suitable length of the film is colored black or some other color distinguishable from the colors representing the musical tone, so that the pause will be denoted by the time it requires for the portion so colored to be transmitted through the projector.

In the last line of the song there are glides or slurs or notes tied together as at the word "every" and "let". The first slur or glide is from F to E and from E to D. The film is charged at the beginning of the portion denoting the time of the beginning of the tone, with the color representing F, which is red, the latter portion is charged with the color representing E, which is purple, and a part of the film between the beginning and latter portion of this section of the film is colored a shade of color neutral between red and purple so that the change from the red to purple will be graduated and will resemble the glide of the tone from F to E. Like treatment is given to the film to simulate the glide from E to D, excepting that the colors are indigo and blue and likewise in the last bar, where the tone of the word "let" begins on A and glides to E, the colors representing these tones according to our assumed code being orange and yellow and a neutral color between them.

In practicing the method herein described I not only charge transparent films with colors to express musical compositions, but films charged with impressions for projection upon screens, whereby illustrated songs and other compositions, dramatic or rhythmic productions or effects may be presented synchronously with the color interpretations of a musical composition as an accompaniment to music or as a color interpretation independently of other musical expression.

When it is desired to present my color interpretation of music simultaneously with pictures I employ several modes one of which is shown in Fig. 6 of the drawings, in which the numeral 13 indicates a projecting machine shown partly in section, having a lamp within a casing 14, guides for a film

15, a delivery reel 16 above the guides and supported by the frame on which the reel is wound a picture film 17, said film being adapted to be transmitted through the guides 15 of the projector, a receiving reel 18 on which the film is wound after being transmitted through the projector and a second delivery reel 19 is superposed upon the frame above the delivery reel 16, and on which is wound one of my color films 20 which is transmitted through the same guides as the picture film simultaneously therewith and then wound upon a separate receiving reel 21 mounted on the frame contiguous to the receiving reel 18.

By this method I can transmit one film at a higher rate of speed than the other by regulating the speed of the transmitting gearing of the projector and the reels, which is an advantage in certain cases. It is also possible by this method to transmit the two films simultaneously for a time and stop one of them or unthread one from the guides and project the colors or impressions charged upon one only for a period of time.

By connecting the driving mechanism of the projector with the mechanism of a phonograph, a mechanical piano player, or with both or with other similar instruments I have found that musical tones from the instrument, and the color of the films projected upon a screen or stage or other object may be presented synchronously without error or defect as the speed of the projector, the phonograph and instrument may be exactly regulated so as to operate in unison. A simple and practicable means of connecting the mechanisms of the devices is illustrated in Fig. 6. The receiving reels 18 and 21 are connected by a belt 22 indicated in dotted lines, and the reel 19 is connected by a belt 23 with a sprocket 24 which conveys the film through the guides 15 of the projector. A motor 25 is provided which is connected by a belt 26 with the receiving reels 21 and 19 and serves to drive the mechanism of the projector 13 to convey the film through the machine so that the film will move across the path of rays of light emitted from the light. The belt 27 connects the motor with the phonograph 28 and in a similar manner the belt 29 connects the mechanical piano player 30 with the motor, whereby all the mechanism of the various devices so connected may be operated in unison so that synchronous phonographic records, piano music, motion pictures and color accompaniment or interpretation of music may be produced.

It is contemplated that when it is desired to present synchronously the records taken by a phonograph, and motion pictures with instrumental music and my color interpretation of music as described that a camera will be substituted in the place of the

projector shown in the drawings and the film taken while the music of the instrumental player is being produced, or while a phonographic record is being made to synchronize with the scenes of the motion picture or while both such phonographic record and piano or instrumental music are being produced. The film for the color effects may then be made to correspond with the musical composition by any process found most desirable and projected with the picture and phonographic record and other musical effects as desired.

By this means the speed of the phonograph and the speed of the camera may be regulated and when the pictures are exposed or projected the mechanism running at the same relative speed will insure perfect synchronism of phonographic records and picture projections. The use of the mechanical piano player will also enable the operators to time the picture and phonographic record while preparing them so that there will be a perfect rhythm and synchronous effect throughout.

I do not deem it necessary to multiply views in the drawings in order to show a camera in operation in the place of the projecting machine as the mechanism is so designed that the one can be substituted for the other in the system of machinery, and the speed of the mechanism is regulated by means commonly employed in such mechanism.

In presenting the color interpretation of a musical composition simultaneously with the impressions upon a motion picture film, I prefer to place the color film between the source of light and the picture film so that a filament will pass between the picture film and the screen or other object upon which the projection is thrown, which might tend to obscure the clearness of the pictorial effects of the film and prevent a perfect production of the delicate impressions registered on the picture film by the camera. This is avoided by placing the color film between the source of light and the picture film for although the colors of the color film will modify the strength and color of the light passing through the picture film, the light as so modified after reaching the picture film has an unobstructed path from the picture to the screen, and clear sharp definition of picture impressions upon the screen will result.

In Fig. 9 I have shown a portion of a picture film charged with colors denoting a musical composition, as well as picture impressions. It will be seen that where the picture film is thus charged with color and where a color film only is employed for projection that no unusual provision need be made for projection, but the film is transmitted

in the ordinary manner through the projector.

As a code of correspondence between colors and musical tones I propose to employ and present them as follows: middle C=indigo, D=blue, E=purple, F=red, G=orange, A=yellow, B=green, C 2nd=light blue, C sharp=neutral between indigo and blue, D sharp=neutral between blue and purple, F sharp=neutral between red and orange, G sharp=neutral between orange and yellow, A sharp=neutral between yellow and green, and B sharp=neutral between green and indigo.

To produce the corresponding tones in higher octaves I produce lighter tints or shades of the same colors as those employed in the key of middle C; and to produce the corresponding colors in the lower octaves I employ darker shades of color the same as those used in middle C, merging toward black or utter darkness.

As a secondary code of correspondence between colors and musical tones, I substitute blue for indigo in the above and foregoing code, and indigo for blue.

As a third code of correspondence for color and musical tones I present them as follows: middle C=green, D=indigo, E=blue, F=purple, G=red, A=orange, B=yellow and C 2nd=green lighter in shade. The sharp and flat or semi-tones are produced by blending these colors as assumed to represent their corresponding tones, to produce a color to correspond with the sharp or flat or semi-tone between the colors represented by the corresponding prismatic colors.

The same treatment is employed as above described to produce colors to correspond with the tones of the higher and lower octaves or scales than middle C.

While I have described certain mechanical means for producing the effects sought to be produced through my invention and while I have at length described certain details in explaining my method of producing color interpretations of music or color accompaniments for musical or other rhythmical productions, I do not wish to limit myself to any of the specific means or methods employed for producing these novel and beautiful effects but claim as my invention all the slight modifications and variations which reasonably fall within the scope of my invention as more specifically pointed out in the annexed claims.

I claim—

1. The herein described method of producing a color harmony as an accompaniment for music or other rhythmical optical or other form of entertainment, comprising the fixing upon a continuous movable medium adapted to be employed in conjunction with a lamp, of a color scale, whereby the light

from the lamp may be modified so as to produce a rhythmical and harmonious changing color effect in the rays of light from the lamp, substantially as and for the purposes set forth.

2. The method of producing a color harmony as an accompaniment for music or other form of entertainment, auditory or spectacular, comprising the fixing upon a transparency adapted to be employed in conjunction with a lamp of a color scale, whereby the light may be modified so as to produce a rhythmical and harmonious changing color effect in the rays of light emitted from the lamp or projected upon a screen, a stage or other object, as an interpretation of music through the medium of color substantially as and for the purposes set forth.

3. The method of producing a color accompaniment for music or other form of entertainment, auditory or spectacular, by fixing upon a continuous film adapted to be conveyed through guides provided upon a lamp, of a color scale, whereby the light from the lamp may be modified so as to produce a rhythmical and harmonious changing color effect, substantially as and for the purposes set forth.

4. The method of producing color music synchronously with other forms of entertainment, auditory or spectacular; comprising the fixing upon a medium adapted to be employed in conjunction with a light, of a color scale whereby the rays of light may be modified by the colors of the scale in metrical and rhythmical succession by the continuous and regular movement of the medium, so as to produce a rhythmical and harmonious changing effect through the changing colors of the rays of light and the intervals of duration of the respective color effects, substantially as and for the purposes set forth.

5. The method of producing color music synchronously with other forms of auditory or spectacular entertainment; comprising the fixing upon a transparency adapted to be employed in conjunction with a light, of a color scale, whereby the rays from the light may be modified by the colors of the scale in metrical and rhythmical succession, by the continuous and regular movement of the transparency, so as to produce a rhythmical and harmonious color effect on the rays of light.

6. The method of producing color music synchronously with other forms of auditory or spectacular entertainment; comprising the fixing upon a continuous film adapted to be conveyed through guides provided upon a lamp of a color scale, whereby the rays of light emitted from the lamp may be modified by the colors of the scale, in metrical and rhythmical succession, by the continuous and regular movement of the film

through the guides, so as to produce a metrical, rhythmical and harmonious changing color effect upon the rays of light emitted from the lamp or projected upon a screen, a stage or other object, substantially as and for the purposes set forth.

7. The herein described method of translating a musical composition through the medium of color; comprising the fixing upon a medium adapted to be disposed in the path of the rays of light from a lamp or other source of light of a color scale corresponding with the musical tones in a scale of music, said medium being adapted to be conveyed continuously across the path of the rays of light so as to produce a rhythmical and harmonious changing color effect upon the rays emitted from the light or projected upon a screen, a stage or other object, substantially as and for the purposes set forth.

8. In a method of translating music through the medium of color, the mode of producing the desired changes in color and rhythmical succession, by fixing upon a continuous film adapted to be conveyed across the path of rays from a light at a given speed, a color scale, in which each musical tone is represented by a certain color as determined by a prearranged code of corresponding colors and musical tones, and in which the time of each musical tone is represented by the extent of the film of the color representing the tone upon the film so that the prolonged time of any tone will be represented by a greater length of time of exposure of light through the portion of film being charged with such color and the shorter tones by a shorter exposure of light through a less extent of the film being charged with such color as corresponds with the musical tone, substantially as and for the purposes set forth.

9. In a method of translating music through the medium of color; the mode of producing the required changes in color and the rhythmical variations in time, by fixing upon a film adapted to be conveyed through guides provided upon a lamp and across the path of the rays of light from the lamp at a given speed, of a color scale, in which each color represents a tone in a musical composition and the extent of the film charged with the color relatively corresponds with the interval of time which the tone should be held, whereby the rays of light will be modified as to color, and the rhythmical succession of time will be regulated by the transmission of the movable film across the path of the rays of light at an even rate of speed, substantially as and for the purposes set forth.

10. In a method of translating a musical composition through the medium of color, as an accompaniment to instrumental music,

singing, dancing, marching or dramatic action, or pictures projected upon a screen, a stage or other object, the mode of producing the requisite changes in color and rhythmical succession by fixing upon a continuous film, adapted to be conveyed continuously across the path of rays of light from a projecting lamp or other source of light, of a color scale as determined by a code of correspondence between colors and musical tones, in which each color represents a certain tone in a musical composition and in which the time or intervals of the music is represented by varying exposure of light through varying length of film charged with a given color, so that the time of a one fourth note will be represented by exposure of light through an extent of film one fourth that which would represent a whole note; whereby a translation of music through the medium of color may be produced by modifying the rays of light and regulating the duration of each color effect produced to correspond with the changes of pitch and time in a musical composition.

11. In the herein described method of producing a rhythmical and harmonious color accompaniment for music; the mode of dividing a continuous film which is adapted to be conveyed across the path of rays of light from a lamp or other source of light; whereby each subdivision of the film is made to correspond in length with the interval of time of the corresponding tones in a musical composition in accordance with a code, so that a given length of film represents a full note, and a fractional part of such length represents an equivalent fractional part of a whole note, and another certain extent of the film represents a pause or rest of a certain duration, each subdivision of the film being charged with a certain color corresponding with the tone of music with which it corresponds in time, in pitch in accordance with the code.

12. In the herein described method of producing music through the medium of color; means for varying the pitch and time; comprising a continuous transparent film, adapted to be transmitted through a projecting machine for motion pictures, said film being charged with colors in accordance with a code of correspondence between colors and musical tones, the extent of the film charged with each color corresponding relatively in length, to the extent of time of each note of the musical composition, whereby a rhythmical and harmonious color effect is produced for projection upon a screen, a stage or other object, substantially as and for the purposes set forth.

13. In the herein described method of producing a musical composition through the medium of color; means for successively emitting rays from a constant source of

light through successive portions of a continuous transparent film charged with different colors, in accordance with a code of corresponding colors and musical tones, in rhythmical succession, substantially as and for the purposes set forth.

14. The herein described method of interpreting a musical composition through the medium of color, in accordance with a code of corresponding colors and musical tones, in which; middle C equals indigo blue, D equals blue, E equals violet, F equals red, G equals orange, A equals yellow, B equals green, and C 2nd equals indigo reduced in intensity; and the semi-tones are represented by a color produced by blending the colors representing the two tones next above and below the semi-tone; the same colors being employed in varying degrees of density brilliancy, depth and clearness to represent the scale above and below the scale of middle C, whereby the higher scales are denoted by lighter tints of color and the lower scale by darker shades of color.

15. The herein described method of interpreting a musical composition through the medium of color by successively emitting rays of light from a constant source of light through transparencies of different colors in accordance with a code of correspondence between colors and musical tones, in which middle C equals green, D equals indigo, B equals blue, F equals violet, G equals red, A equals orange, B equals yellow and C 2nd equals lighter green; C-sharp equals neutral between green and indigo, D-sharp equals neutral between indigo and blue, F-sharp equals neutral between violet and red, G-sharp equals neutral between red and orange, A-sharp equals neutral between orange and yellow; and the tones in the scales or octave above middle C are represented by lighter tints of the same colors as those representing the tones in the scale or octave of middle C; and the tones in the scales or octaves below middle C are represented by deeper or darker shades of the same colors as those representing the tones in middle C, the higher tones being graduated into white or white light and the lower tones being graduated in the black or darkness or absence of all light.

16. In a method of translating music through the medium of color by a rhythmical successive presentment to view, by projection upon a screen or other object, of variously colored lights in accordance with a scale of corresponding colors and musical tones, in which middle C equals blue, D equals indigo, E equals violet, F equals red, G equals orange, A equals yellow, B equals green and C 2nd equals lighter blue; the semi-tones are simulated by blending the colors which represent the next tone above and below the semitone; and the tones of the

scales or octaves above middle C are represented by lighter tints of the colors representing the tones in middle C, graduated toward white or white light, and the tones in the scales or octaves below middle C are represented by deeper or darker shade of the colors representing the tone in middle C graduated toward black or darkness or absence of all light.

17. In the herein described method of interpreting a musical composition through the medium of color comprising the system of exposing or projecting a light through a variously colored continuous film in rhythmical succession in accordance with a prearranged arbitrary code of correspondence between colors and musical tones; means for denoting a glide or slur comprising the mode of coloring a section of the film of a given extent or length corresponding with the tones of the glide or slur so that a part of such section will be charged with the color denoting the first note of the slur or glide and another section slightly removed therefrom will be charged with the color representing the succeeding note, and the section of film between the two sections will be charged with a color gradually blended from the first color to the second color, *ad seriatim* through all the notes embraced in the glide or slur, whereby there will be no abrupt cessation of one color but a gradual merging or transition from the first to the second color by the blending of the colors together in the interval of space between the two.

18. In the herein described method of interpreting a musical composition through the medium of color in accordance with a code of corresponding colors and musical tones the mode of denoting a pause in a staff of music by changing a section of a continuous color film prepared in conformity with the code, with a color darker than the colors denoting the tones in the music immediately preceding or succeeding the

pause the length of the section so colored to denote the pause being regulated in proportion to the length of the pause or rest in the music, substantially as and for the purposes set forth.

19. The herein described method of interpreting a musical composition through the medium of color by successively exposing a light through a continuous transparent film of different colors, of a continuous transparent film, said film being colored in accordance with a prearranged code, defining a natural law of harmony between colors and musical tones, the intervals of time being denoted by the relative extent of film of a given color and the time of exposure of the light through each color corresponding with its correlative tone, while such part of the film is passing at a given speed across the path of the rays of light from the projector to be projected upon a screen, a stage or other object.

20. The method of producing a harmonious color accompaniment to songs, instrumental music, motion pictures and phonographic records, in rhythmical time, by means of a continuous transparent color film charged with colors in accordance with a prearranged code of corresponding colors and musical tones, synchronously by operating the mechanism of the projector, the phonograph and mechanically played instrumental music, at the same relative speed in unison by a common motor or motor generator, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this thirtieth day of December, one thousand nine hundred and fifteen.

CHARLES F. WILCOX.

Witnesses:

CHARLES M. STOKES,
CHARLES C. WILCOX.