C. L. SUDMANN.

PROCESS OF AND MEANS FOR PHOTOGRAPHING FILMS.

APPLICATION FILED MAY 29, 1916.

1,198,600.

Patented Sept. 19, 1916.

4 SHEETS—SHEET 1.

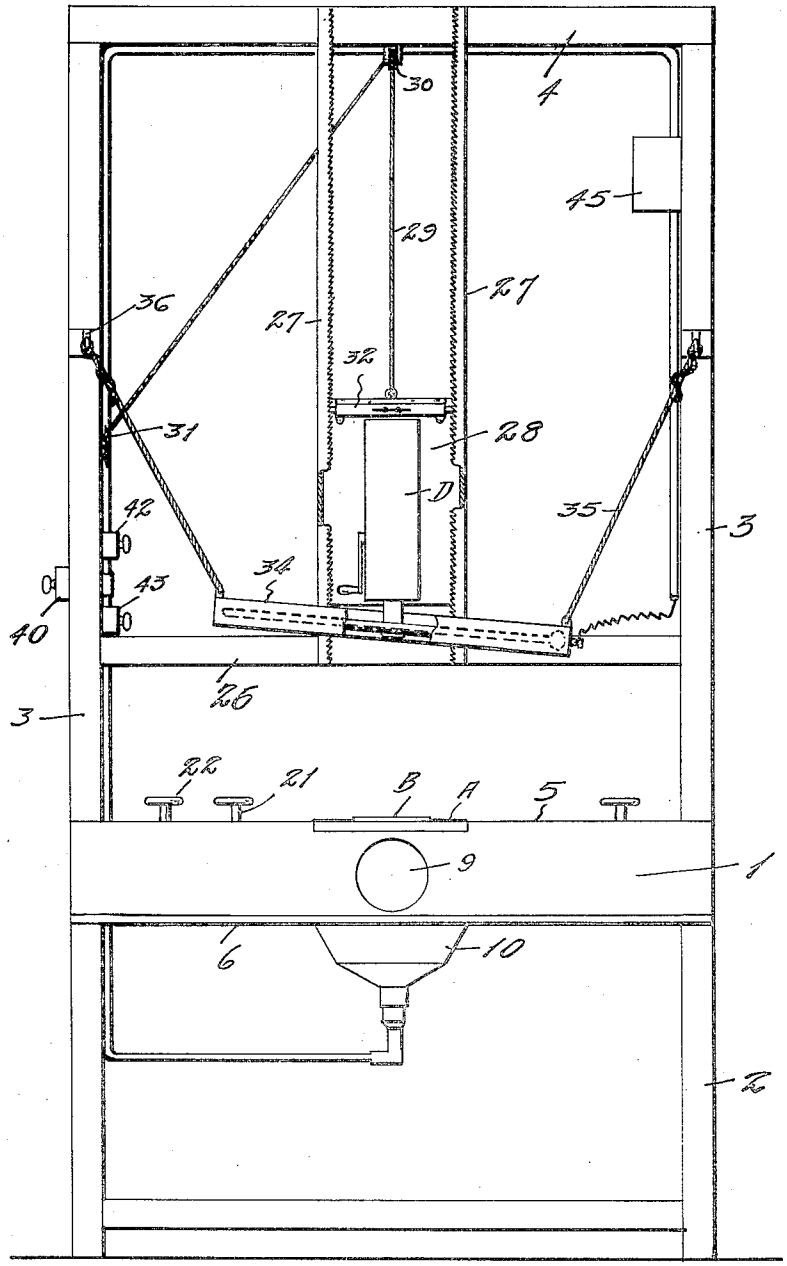


Fig. 1.

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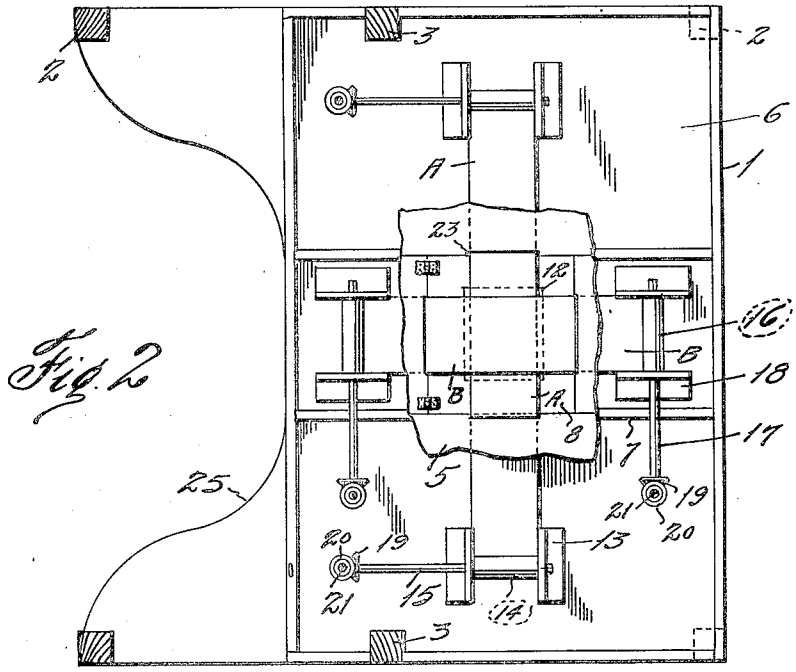


Fig. 2.

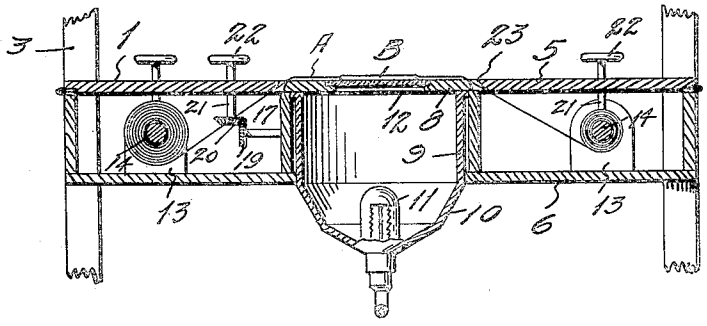


Fig. 3.

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4 SHEETS—SHEET 3.

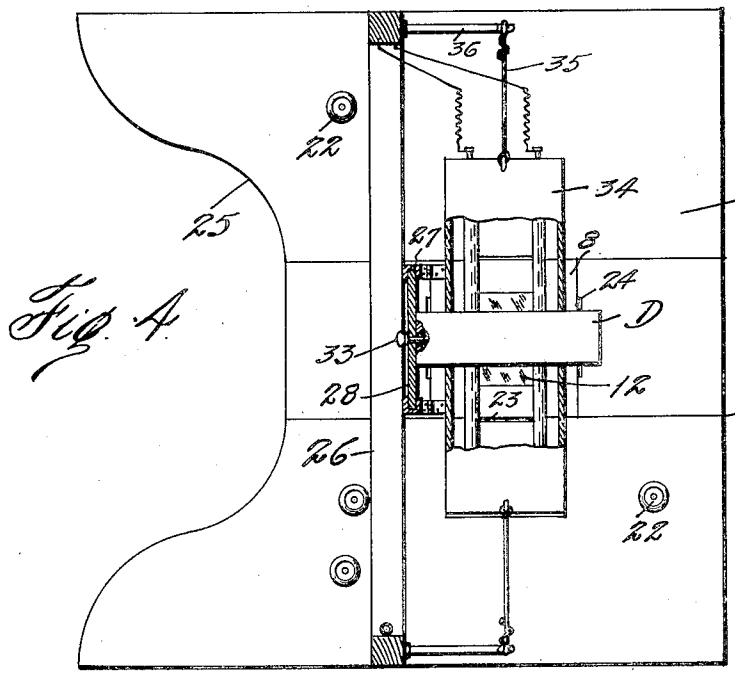


Fig. 4.

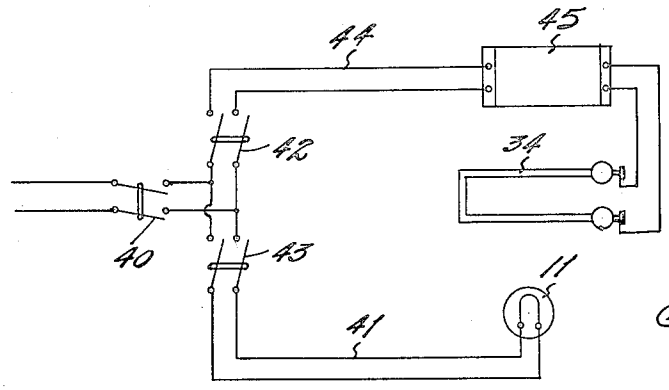


Fig. 5.

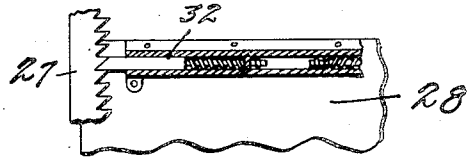


Fig. 6.

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4 SHEETS—SHEET 4.

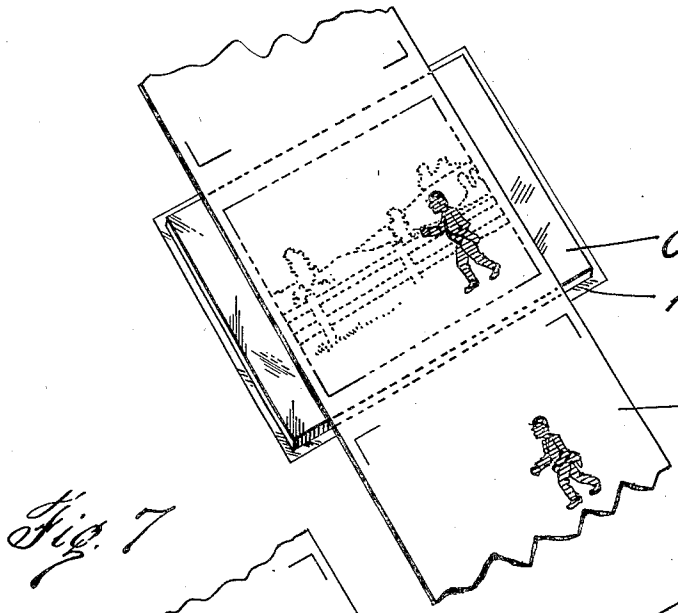


Fig. 7.

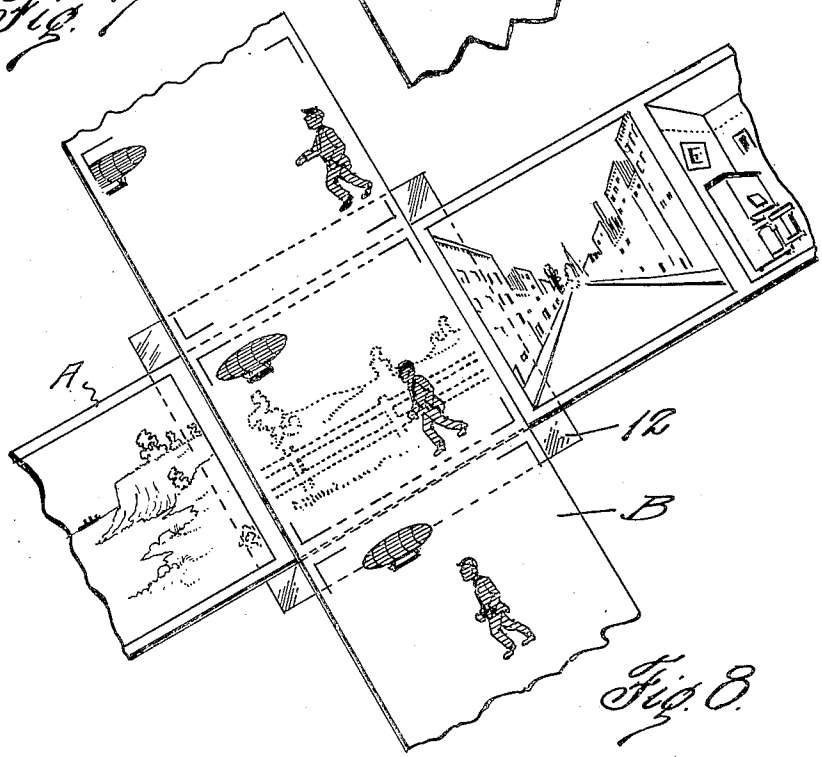


Fig. 8.

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UNITED STATES PATENT OFFICE.

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PROCESS OF AND MEANS FOR PHOTOGRAPHING FILMS.

1,198,600. Specification of Letters Patent. Patented Sept. 19, 1916.

Application filed May 29, 1916. Serial No. 100,743.

To all whom it may concern:

Be it known that I, CHARLES L. SUDMANN, a citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented certain new and useful Improvements in Processes of and Means for Photographing Films, of which the following is a specification.

In photographing drawings for producing animated cartoon moving picture films the element of light plays a very important part.

In taking moving pictures on a cinematograph film from drawings, I have found that a transparent background placed over or in front of a light, produces a very pleasing effect when combined with a separate drawing on a transparent medium and a second light; the separate drawing being superimposed on the transparent background drawing and both drawings being interposed between the lights. Where it is desired to depict the background in subdued tones and shades and show the animated or moving objects in contrast thereto, without making numerous drawings and underlays, the result may be readily and efficiently attained by the proper disposition of the rays of light with relation to the drawings and the cinematograph camera; however proper drawings are essential.

My invention contemplates cinematographic photography in which a substantially transparent background is used in conjunction with a transparent medium on which movable objects are portrayed, the latter being positioned on or in front of the former. The background drawings and the drawings of the movable objects are interposed between two lights so that the rays from one light are cast upon the rear side of the background drawing and the rays of the other light are cast upon the object bearing medium so as to penetrate the same, said lights being arranged so as not to interfere with the photographing lens.

It is highly important that the under or rear light which illuminates the background be diffused so that the illumination of the background will be uniform. It is apparent that this may be accomplished in various manners, as for instance by placing a ground glass over the source of the under light whereby the rays of the latter will be spread and the glass uniformly illuminated over its entire area. Another embodiment would include the making of the background on translucent or semi-opaque material which would diffuse the light.

The pictures thus produced show the movable objects in strong contrast to the background and stand out in bas-relief. By painting and drawing the parts of the background in various shades and tones it is not necessary to use underlays or separate sheets of tone or shade producing materials.

From a mechanical standpoint much time can be saved and better registration obtained by drawing or painting the backgrounds in their successive order on a strip of transparent or translucent material, and drawing or painting the movable objects in their successive order on a separate strip in such a manner that the two strips may be moved across each other at right angles; the panel at their intersection producing the complete picture or scene to be photographed and the successive pictures or scenes being produced by moving one of the strips across the other, as the case may be. A negative, positive or glass plate bearing the background may be used in lieu of the background strip.

As an example, in carrying out the invention, a positive plate bearing in appearance a wash drawing depicting a rural background scene is provided. An apparatus comprising a table with an opening and a light under the opening is arranged with a second light above the opening. A camera support is included in the apparatus and arranged above the second light. The positive plate is placed over the opening so that the under or first light will project its rays against and through the plate, while the upper or second light will also cast its rays upon and through the plate. The camera is adjusted at the proper focal distance from the plate and a strip of transparent material on which the movable objects are portrayed is drawn over the plate. For instance a man may be drawn on the strip, first drawing showing him walking with the right foot in advance, the next drawing showing him with the left foot in advance. With these two drawings on the upper strip and the background plate the man may be photographed in all the successive positions assumed in walking entirely across the background scene.

The strip is positioned over the plate with

the drawing of the man with his right foot in advance and the scene photographed. The strip is next moved forward to bring the drawing with the left foot in advance over the plate, but in an advanced position in accordance with a register mark previously made on the strip, and the photographing carried out. The strip is now moved backward to bring the first drawing over the plate in an advanced position, whereby the man is photographed taking a step with the right foot in advance. This may be continued by moving the strip back and forth until all the positions are photographed. However the successive positions of the object may be depicted in a number of sequent drawings on the strip and the latter moved forward only.

The rays of light from the under light will illuminate the background plate and the upper light co-acting therewith will render the strip clearly transparent and furnish the light for photographing, whereby the background will be photographed through the strip and will not be as strong or as prominent as the object shown on the strip, but the shades and tones of the background will contrast one with the other, according to its particular density and the degree to which it opaques the rays from the under light. Of course instead of using the positive plate a transparent strip or other medium could be used.

The drawings being interposed between the lights will be more clearly photographed and while the background will be presented in subdued tones it will be defined and in no way obscured as the upper light will obliterate the weave of the upper drawing bearing medium as well as any false shadows. In fact the effect obtained by interposing the drawings between the lights is substantially suspending the lines and washes of the actual drawings before the camera and entirely eliminating any visible support, such as the cloth or paper on which the drawings are supported or drawn; and at the same time neutralizing the under light so that it does not project its rays into the lens of the camera.

For carrying out this method of photography I have designed an apparatus comprising a table with an upright support rising from the same. In the central portion of the table an opening is provided and covered with a piece of translucent material, as ground glass; an electric lamp being arranged under the glass. Drums and shafts are mounted under the table which is provided with slots through which the strips may be fed from the drums and drawn over the glass. Over the table a second electric lamp is supported so as to cast its rays down upon the strips or drawing bearing mediums. On the support an adjustable camera carrier is mounted so that the camera may be fastened thereon with its lens and shutter over the glass. By adjusting the carrier and the upper lamp the camera may be brought to the proper focal point; said upper lamp must not cast its ray into the lens. It is to be understood that various other structures may be evolved for carrying out this process.

Other features of the invention will be apparent from a perusal of the following specification and the invention may be more readily understood by reference to the accompanying drawings, wherein:

Figure 1 is a front elevation of the apparatus for photographing the drawings, Fig. 2 is a plan view, portions being illustrated in section and others as partially omitted, Fig. 3 is a transverse sectional view through the table. Fig. 4 is a plan view of the apparatus showing the camera and upper light in position, Fig. 5 is a diagrammatical view of the electrical circuit employed, Fig. 6 is a sectional detail of the carrier latch, Fig. 7 is a detail in perspective showing the transparent strip imposed on the positive plate, and Fig. 8 is a similar view showing the two strips crossed and producing a scene at their intersection.

In the drawings the numeral 1 designates a table which is supported on leg 2. At each side of the central portion of the table uprights 3 rise and are connected at their upper ends by a cross bar 4, forming therewith a vertical frame. The table has a top 5 and a bottom 6, a cabinet being formed therebetween. Vertical division plates 7 extend from front to rear of the table on each side of the center and between the top and bottom. The top is divided into sections separated by a central panel which has a central hinged section or door 8. The sections of the top may be suitably hinged and the panel has its longitudinal edges contiguous to the plates 7.

Between the plates and under the door a cylindrical lamp casing 9 is arranged and provided with a reflector bottom 10 in the center of which an incandescent lamp 11 is mounted. The door has a central opening in which a piece of ground glass or other translucent material 12 is mounted; this plate becoming the field on which the pictures are exposed. It will be seen that the rays from the lamp 11 are directed upward through the glass. On each side of the division plates and under the top sections, drums 14 are mounted in brackets 13 on shafts 15; while between the plates and transversely of the table similar drums 16 are carried on shafts 17 mounted in brackets 18. Each shaft has a bevel gear 19 on one end in position to mesh with a similar gear 20 on the end of a vertical shaft 21 carrying a hand wheel 22 on its upper end which

projects above the top 5. A shaft 21 is provided for each shaft and drum and these shafts 21 are disposed as shown in Figs. 2 and 4.

On each side of the door 8 slots 23 are provided and extend at right angles to slots 24 at the front and rear sides of the door and transversely of the table. In the drawings I have shown a strip A wound on one of the drums 14, and passed up through adjacent slot 23, across the glass 12, down through the other slot 23 and wound around the other drum 14. A strip B wound on the forward drum 16 is passed up through the adjacent slot 24, across to door and over the strip A, then down through the other slot 24 and wound around the rear drum 16. The rear side of the table is recessed at 25 to permit the operator to occupy a position close to his work.

As illustrated in Figs. 7 and 8 the movable objects are drawn on the top strip B and as shown in Fig. 8 the backgrounds are drawn on the under strip A. In Fig. 7 a glass plate C is shown instead of the strip A. In the other figures of the drawings I have not shown any scenes on the strips as the same would be confusing, but it is to be understood that the strips are the same through-out the drawings. In winding the strips on the drums it is more convenient for the operator that they be so wound and threaded through the slots that the strip A is moved from front to rear and the strip B from left to right by the operator when making the registrations.

Some distance above the table top 5 a transverse bar 26 extends between the uprights 3 and from this bar a pair of channel members 27 extend vertically to the top bar 4. These members are spaced apart and placed at the center of the vertical frame and receive a slidable carrier 28 connected to one end of a flexible connection 29. The connection 29 is passed up over a pulley 30 suspended from the bar 4 and fastened about a cleat 31 on one of the uprights. The carrier may be raised and lowered by this connection. The front inner edge of each member 27 is provided with teeth and a double spring latch 32 is mounted on the upper end of the carrier so as to engage said teeth and support the carrier at the different elevations to which it is adjusted, a detail of the latch being given in Fig. 6. The carrier is designed to support a cinematograph camera D which may be fastened thereto in any suitable manner as by screw clamps like that shown at 33 in Fig. 4. The parts are so arranged that the camera will be supported with its lenses downward and their centers directly over the center of the glass plate 12.

By adjusting the carrier vertically the camera may be positioned at the proper focal distance to photograph only the panel formed by the intersection of the two strips. The under or lower lamp 11 will illuminate the strips from the under sides, but the glass being translucent will prevent the casting of rays into the lenses of the camera. A second or upper lamp 34 is mounted over the table. I have found that a lamp of the mercury-vapor type which gives off ultra-violet rays, is the most satisfactory for the upper light, although it is not essential. The lamp 34 is of this type and is supported by flexible connections 35 from brackets 36 fastened on the uprights 3. It is important that the rays from this lamp do not reflect or project directly into the lenses of the camera and therefore the lens barrel is projected between and below the elements of the lamp 34 as shown in Fig. 1.

For supplying current to the electrical elements a main switch 40 is mounted on one of the uprights and has electrical connection with a circuit switch 42 for the circuit of the upper lamp and also with a switch 43 for the circuit of the lower lamp. A diagram of the circuits is shown in Fig. 5. Wires 44 lead from the switch 42 to the lamp 34, an auxiliary for said lamp being connected in series with said wires. Wires 41 lead from the switch 43 to the lamp 11. In Fig. 1 the wires are not shown, but a conduit in which the same are carried is indicated.

In photographing or exposing the drawings before the camera the under strip A bearing the background drawings is positioned by turning one of the hand-wheels 22, so as to bring a background into register with the field formed by the glass 12. The strip B is now manipulated to bring the first object drawing over the background, the panel formed at the intersection of the two strips producing the picture or scene to be photographed. The strips may be moved ahead or back and forth according to the scene desired. Where the glass plate back-ground C is used it is to be understood that other plates bearing different backgrounds are substituted instead of a continuous plate or strip.

In Figs. 7 and 8 two methods of producing the scenes or pictures are shown. In Fig. 7 the background is produced on a positive plate C and the strip B is placed thereover. A rural scene is depicted by the backgroud and the figure of a man walking is shown in two positions on the strip B. The strip is adjusted so that the first drawing will register with the background, the man being shown with the right foot in advance. The panel thus formed by the intersection of the plate and the strip is photographed, several exposures being necessary to give the scene visibility when the film is projected on the screen. The strip is next advanced to bring the next drawing over

the plate and the exposures made. By providing sufficient slack in the strip and using the proper register marks, said strip may now be moved back to the first drawing and adjusted to show the man in the next succeeding position of walking. After the exposures are made the strip can be moved to again bring the second drawing over the plate and so on until the picture is completed.

The rays of light from the under lamp will be subdued by the ground glass 12 and while sufficient light will be furnished to penetrate and illuminate the background, no reflection will be cast into the lenses of the camera. The rays from the upper lamp will blend with the illumination furnished with the under lamp, but said upper rays while penetrating the strip B and plate C will be absorbed by the ground glass plate 12. The under lamp will illuminate the background and give the different tone and shade effects to the different portions of the background; while the upper light will render both the strip and the positive plate C highly transparent. However the drawings of the objects being on the upper surface of the strip, will photograph more clearly and distinctly than the background and will thus stand out in contrast thereto. It is necessary of course to opaque that portion of the strip within the outline of each object drawing and this may be done either on the top side or under side of the strip, both methods being common knowledge in the photoengraving art.

In Fig. 8 I have shown a strip A depicting several backgrounds and the strip B showing the figure of a man and an air ship. It is quite obvious how the different backgrounds may be brought over the glass 12. The strip B has been moved to bring the second drawing into register with the background, the drawing being also shown. It is apparent that the objects or figures to be used with the other background scenes may be drawn in their proper successive order on the strip B.—In this form the strip B is moved in one direction only unless it is desired to duplicate a scene, when the strip may be moved back to produce said scene. As an illustration of the tone and shade effects it is pointed out that in Fig. 8 the trees in the rural scene may be made less transparent than the hills and therefore the under light will not illuminate the trees to the same degree as the hills, as the rays of light will not penetrate the trees as readily as the hills.

What I claim, is:

1. The process of photographing moving picture drawings which includes supporting a background drawing and a superimposed transparent member bearing a complementary drawing before a camera, illuminating said drawings from the rear by a uniformly diffused light, and photographing said drawings.

2. The process of photographing moving picture drawings which consists in supporting a background drawing and a superimposed transparent member bearing a complementary drawing before a camera, illuminating said drawings from the rear by a uniformly diffused light, also illuminating said drawings by a light from the front, and photographing said drawings.

3. The process of photographing moving picture drawings which consists in supporting a background representation and a superimposed translucent member bearing a complementary drawing before a camera, illuminating said background representation and translucent member by a uniformly diffused light from the rear, illuminating the translucent member from the front to render it transparent, and photographing said background representation and its complementary drawing.

4. In a device for photographing on cinematograph films, means for supporting drawings in front of a camera, and a source of uniformly diffused light positioned to illuminate drawings from the rear of the latter.

5. In a device for photographing on cinematograph films, means for supporting drawings in front of a camera, a source of uniformly diffused light positioned to illuminate drawings from the rear side of the latter, and another source of light opposed to the diffused light positioned to illuminate the front side of drawings.

6. In a device for photographing on cinematograph films, a drawing support having a light diffusing member.

7. In a device for photographing, a drawing support having a light diffusing member, a source of light under said member, and a lamp mounted over said member.

8. In a device for photographing, a drawing support, an under lamp, an upper lamp, and means interposed between the lamps for uniformly diffusing the rays of the light from the under lamp.

9. In a device for photographing, a support, a table mounted on the support and having an opening therein, a translucent plate covering the opening of the table, a lamp mounted under the plate and illuminating the same, a source of light over said plate, and a camera carrier mounted on the support.

In testimony whereof I affix my signature.

CHARLES L. SUDMANN.