

April 17, 1934.

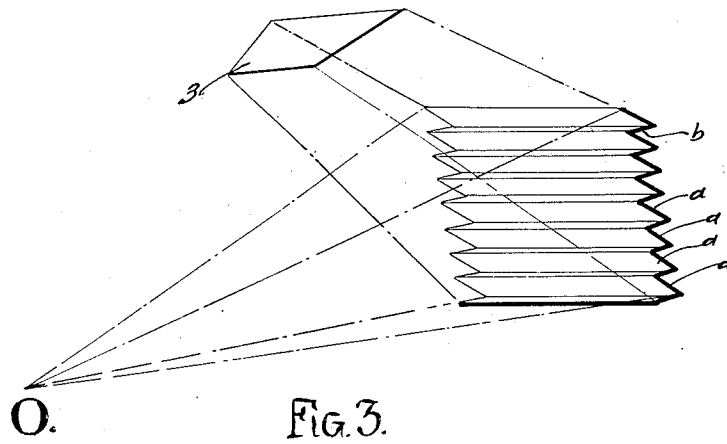
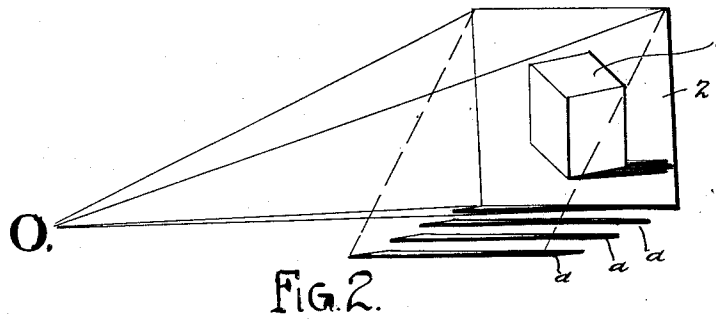
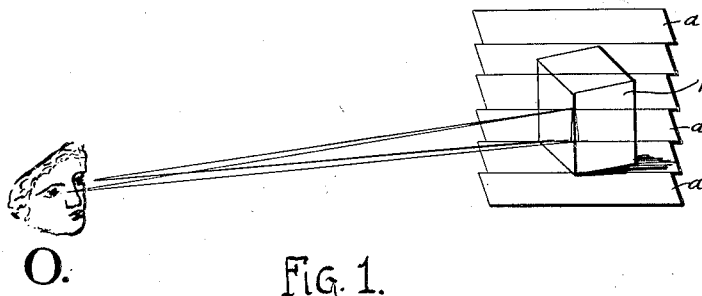
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1,955,273

METHOD OF SECURING STEREOSCOPIC EFFECTS AND DEVICE FOR THIS PURPOSE

Filed Dec. 2, 1929

2 Sheets-Sheet 1



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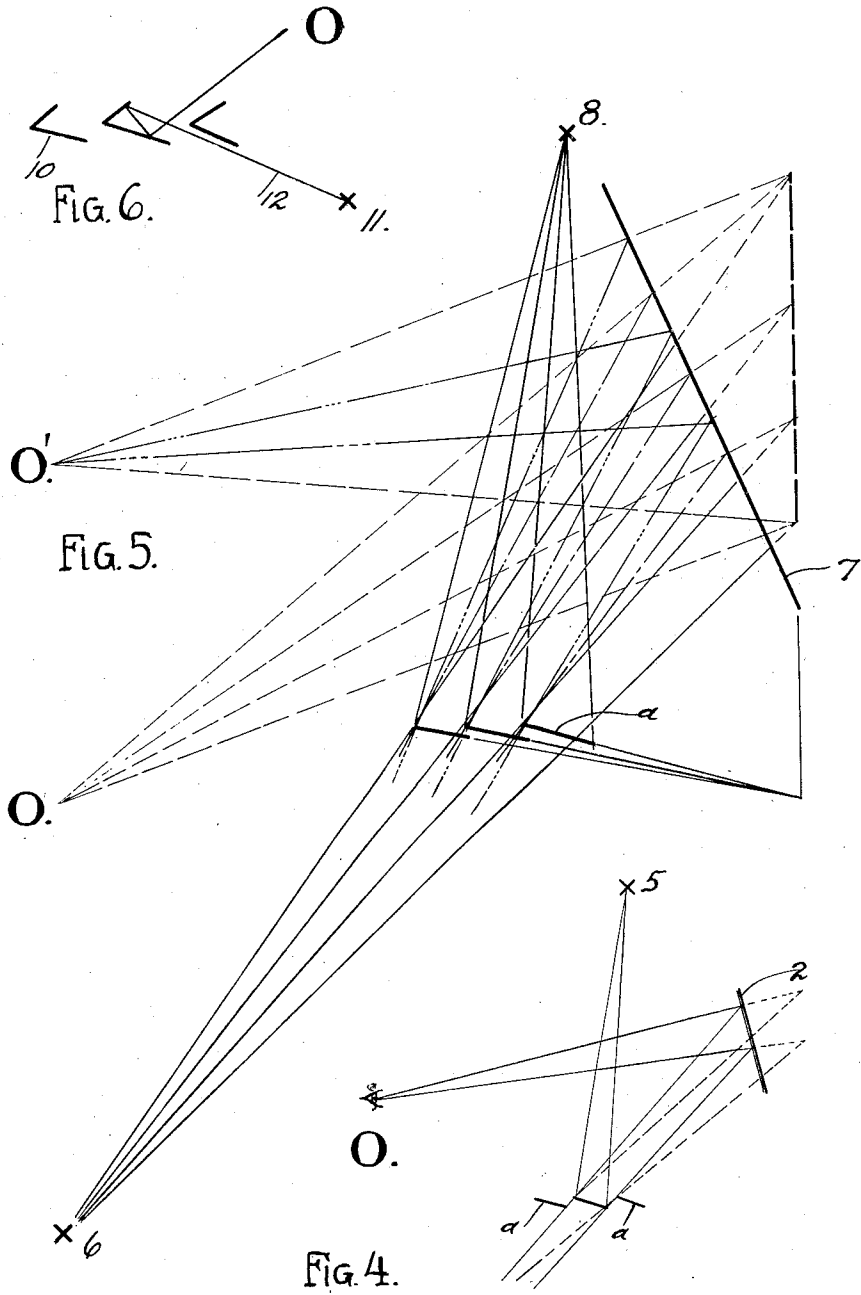
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METHOD OF SECURING STEREOSCOPIC EFFECTS AND DEVICE FOR THIS PURPOSE

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UNITED STATES PATENT OFFICE

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METHOD OF SECURING STEREOSCOPIC
EFFECTS AND DEVICE FOR THIS PURPOSE

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4 Claims. (Cl. 88—29)

My invention relates to a new and improved method of securing relief effects and a new and improved device for this purpose.

One of the objects of my invention is to provide a method whereby an ordinary two-dimensional drawing, picture, or the like, can be viewed so as to produce a relief effect.

Another object of my invention is to provide a method of projecting an ordinary drawing, picture or the like, so as to provide a relief effect.

Another object of my invention is to provide projecting means whereby an ordinary two-dimensional picture, drawing, or the like, can produce a relief effect.

Another object of my invention is to provide a method of taking a photograph, or making a drawing to produce a relief effect.

Other objects of my invention will be set forth in the following description and drawings which illustrate a preferred embodiment thereof, it being understood that the above general statement of the objects of my invention is intended merely to generally explain the same and not to limit it in any manner.

Fig. 1 is a diagrammatic view illustrating how a two-dimensional conventional representation of a cube or other object can be divided and arranged so as to produce a three-dimensional effect, when directly viewed by the observer.

Fig. 2 is a diagrammatic view showing how a mirror can be utilized for observing a two-dimensional representation of an object, divided and arranged according to my invention.

Fig. 3 is a diagrammatic representation of an apparatus intended to give colored effects.

Fig. 4 is a view similar to Fig. 2 but illustrating the relationship of the parts more clearly.

Fig. 5 is a diagrammatic illustration showing the projection of a picture for producing relief effects.

Fig. 6 is a diagrammatic view of a series of mirrors intended to produce a projection effect.

In the illustration depicted in Fig. 1, it is assumed that a drawing or photograph is made of a cube 1 in the ordinary manner, upon a flat or planar sheet of paper. This flat sheet of paper is cut into a series of strips *a*, each of which is preferably made as narrow as possible. However, I do not wish to limit myself to any particular width or number of the strips *a*. Likewise, said strips *a* could be planar, concave, convex, or have any other contour or combination of contours. Assuming that these strips *a* are planar, they are now held so that they are either parallel to each other as shown in Fig. 1, or they may have any

desired angle with each other. For example, the respective strips *a* may all be directed towards a common point or line.

When the observer, who is located at the observation station O, views the assembled strips *a*, said strips are preferably held substantially perpendicular to the line of vision between the eyes of the observer and the central strip *a*. For this purpose, the strips *a* could be connected to a suitable frame. For example, the strips *a* could be mounted on strips of metal connected at their ends to a frame so that the assembled strips *a* could be manipulated so as to be held at the proper angle. By holding the strips *a* so that they are perpendicular to said line of vision, the lines of separation between said strips *a* become substantially invisible. Since the picture or representation is not in a single plane but is in a plurality of planes, each of said planes corresponding to one of the strips *a*, a relief effect is produced without any additional means. In order to minimize the line effect produced by the parallel ends of the strips *a*, said strips could be made as narrow as desired. It is likewise clear that if said strips *a* are made sufficiently narrow, that the tilt of the assembled elements can be varied. That is, assuming that the head of the observer is held vertical, it may be assumed that the ordinary flat picture would be viewed while it was in the vertical position. If the picture is divided amongst the elements *a*, and it is held above the eye of the observer so that the spaces between the elements *a* are not visible, then a relief effect is produced. Likewise, if the picture is tilted backwards while it is at the level of the eye of the observer, or while it is held below said level, a uniform relief effect is produced when the picture has been sufficiently tilted. In some cases it may be necessary to hold the picture a sufficient distance away from the eye of the observer in order to eliminate the broken effect which is produced by the use of the separate strips *a*.

In the embodiment shown in Fig. 2, the strips *a* are held adjacent a mirror or reflector 2, the eye of the observer being at the station O. This reflector 2 is preferably a metal reflector so as to eliminate the two reflection surfaces which are present when an ordinary glass mirror is utilized. Likewise, if desired, the representation 1 may be on an ordinary flat sheet of paper 2, and the elements *a*, arranged as previously described, may consist of reflecting surfaces. In this event, the observation station O is changed so as to view the reflections of the respective parts of the repre-

sensation 1 through said mirrors *a*. The relief effect is the same.

In the embodiment shown in Fig. 3, the elements *a* are combined with reflectors *b*. The light which emanates from the zone 3 falls upon the mirrors *b* and it is then reflected to the elements *a*, and then to the eyes of the observer located at the station O. Instead of projecting a white light from the zone 3, this may consist of zones of different colored lights of any suitable mixture or arrangement, in order to produce colored effects in the representations of the members *a*.

In the embodiment shown in Fig. 4, the picture is located upon the sections *a*, and light emanating from the point 5 falls upon the picture sections *a*, is then reflected to the reflector 2, and the light is then reflected to the observation point O, so that the image is seen at the observation point O. Of course, the point 5 and O could be interchanged. Likewise, the flat picture could be on the surface 2 and the sections *a* could be reflectors.

In the embodiment shown in Fig. 5, the picture sections *a* could be made transparent or translucent as by forming them on celluloid, for example, and light from the point 6 could be passed through the picture sections *a* to the reflector or screen 7, and the picture can then be viewed at either of the observation sections O or O'. If the picture sections *a* are not transparent, then light could be projected from the point 8 producing the same effect.

In the embodiment shown in Fig. 6, the point 11 represents one point of the pictures to be viewed. Beams of light 12 are sent through this picture which is transparent. The parallel beams of light are reflected from the angular reflectors 10 to the observation point O. Assuming that the picture to be viewed is an ordinary flat film having an infinite number of points 11, each of these points 11 is reflected from the proper reflector 10 so that the entire picture is analyzed according to the method shown in Fig. 1, and the observer at the point O views the picture which has been both analyzed and assembled, so as to give exactly the same effect as though the observer directly viewed a picture mounted on the assembled elements *a* shown in Fig. 1.

The essential theory of the invention is as follows:

An ordinary photograph has the near object or objects located at the bottom thereof, while the remote object or objects are at the top thereof. Assume that an ordinary photograph is held vertically. Assume that this photograph is now cut into a series of horizontal strips. The number of these horizontal strips could be varied, but said number could be made very large. Instead of having these strips in the same vertical plane, assume that each successive strip is moved backwards or away from the observer for a short distance. Each strip will then be further away from the observer than the preceding strip. The picture now consists of a series of vertical strips, each strip above the bottom strip being further away from the observer. The top strip which contains the representation of the most remote object or objects is furthest away from the observer.

If the rearward spacing of these strips is not too great, and these strips are made sufficiently narrow, the observer will not notice the discontinuities in the picture, but he will get the effect

of varying distance, so as to secure a relief effect. It may be necessary in some cases to view the picture while it is held a sufficient distance from the observer, in order to minimize the discontinuous effect produced by the rearward spacing of the strips.

If any ordinary planar picture, produced on an opaque or transparent base, is projected on a series of mirrors which are held as above mentioned, and the light is then reflected on a planar strip, then the image upon the screen consists of a series of areas which correspond to images which are horizontally spaced from each other. That is, if the projected beam of light from a stereoscopic or motion picture projector is allowed to fall upon a planar mirror, and the light is reflected upon a screen, the same effect is secured as though the image were directly projected upon the screen, save for the slight loss in light which may result from the reflection. If the mirror (which may be assumed to be held vertically), is divided into a number of strips, each of which is rearwardly spaced with respect to the preceding lower strip, then the image produced upon the screen has the same effect as though the original picture were directly projected, and said original picture consisted of a number of strips each of which was spaced from the preceding lower strip. A relief effect is thus secured. Instead of having the picture strips (or the mirror strips) in parallel vertical planes, they could be in inclined parallel planes, or in non-parallel planes. The irregularity of the picture or of the projected image could be produced in any suitable manner to produce the relief effect.

For convenience, the lower edge of each elemental strip as shown in Fig. 1 for example, may be defined as the first edge of said strip, and the top edge of said strip may be defined as the second edge thereof. Hence, the second edge of each strip is closely adjacent the first edge of the preceding strip. Likewise, each strip extends beyond the preceding strip. For example, in the illustration shown in Fig. 1, each strip is located above the preceding strip.

The projection method is preferable for many purposes because since the entire picture is projected on a screen in a single plane, the discontinuities in the picture or in the images of its portions are not discernible.

Likewise, if the reflection of a planar picture is viewed through a reflector comprising a series of strips or parts which are not in the same plane, a relief effect is secured. My invention therefore makes it possible to secure a relief counterpart of a planar representation without expensive optical equipment. It is not necessary to have the strips at varying distances from the observer. For example in Fig. 1, it may be assumed that corresponding edges of the strips are in the same plane, each said strip being inclined to said plane.

Another feature of my invention is the manner in which a vertical line is viewed or projected. As shown in Fig. 1, it may be assumed that the picture occupies a plane parallel to the eyes of the observer. It may also be assumed that the strips *a* have their front edges in the same plane and that they have their rear edges in a second plane, both said planes being parallel to each other. Hence, a vertical line is divided into a series of short lines, each of said lines being located one above the other, and each of said short lines being inclined rearwardly from the observer. If a vertical line which is near the observer is

viewed while the ciliary muscles are relaxed, as though the observer were looking at a distant object, then the effect of "double vision" is secured and the observer sees two vertical lines, instead of a single vertical line. If the vertical line is inclined rearwardly from the observer, and the double vision effect is secured, then two separated lines are apparently seen which converge downwardly towards each other. This causes the upper portion of the line to appear to stand out or towards the observer.

A similar effect is secured according to my invention, because since the two eyes of the observer view the rearwardly inclined lines from different positions, these vertical lines appear to stand out of the picture or projection.

The same effect applies more or less to any line which is inclined to the horizontal plane. Hence, when a picture or its projection is viewed, each line of said picture or projection gives the same visual effect as a series of lines each of which is rearwardly inclined, said series of lines generally following the contour of the line which is being considered.

I have shown a preferred embodiment of my invention, but it is clear that numerous changes and omissions could be made without departing from the spirit of my invention.

I claim:

1. A method of producing a relief image of the planar perspective representation of a solid ob-

ject or objects, which consists in producing stationary sub-images of sub-areas of said picture, said sub-areas in succession corresponding to consecutive areas of said planar perspective representation, said sub-images being visually equivalent to said sub-areas, and holding the sub-areas so that the sub-images are produced in different planes and have closely adjacent and overlapping edges.

2. In combination, a planar perspective representation of a solid object divided into strips, consecutive strips corresponding to consecutive portions of said representation, said strips being in different planes, and being closely adjacent each other, and a planar reflector positioned to reflect images of said strips to a designated point.

3. In combination, a series of mirrors arranged in different and substantially parallel planes, and a series of strips located intermediate said mirrors and inclined thereto, said strips being consecutive portions of the planar perspective representation of a solid object.

4. In combination, a planar perspective representation of a solid object, and a series of separated reflectors positioned to reflect the light from said representation which passes between said reflectors, in a designated direction, said reflectors being shaped to reflect the light a plurality of times.

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