(No Model.) 4 Sheets—Sheet 1.

T. A. EDISON.

APPARATUS FOR EXHIBITING PHOTOGRAPHS OF MOVING OBJECTS.

No. 493,426. Patented Mar. 14, 1893.

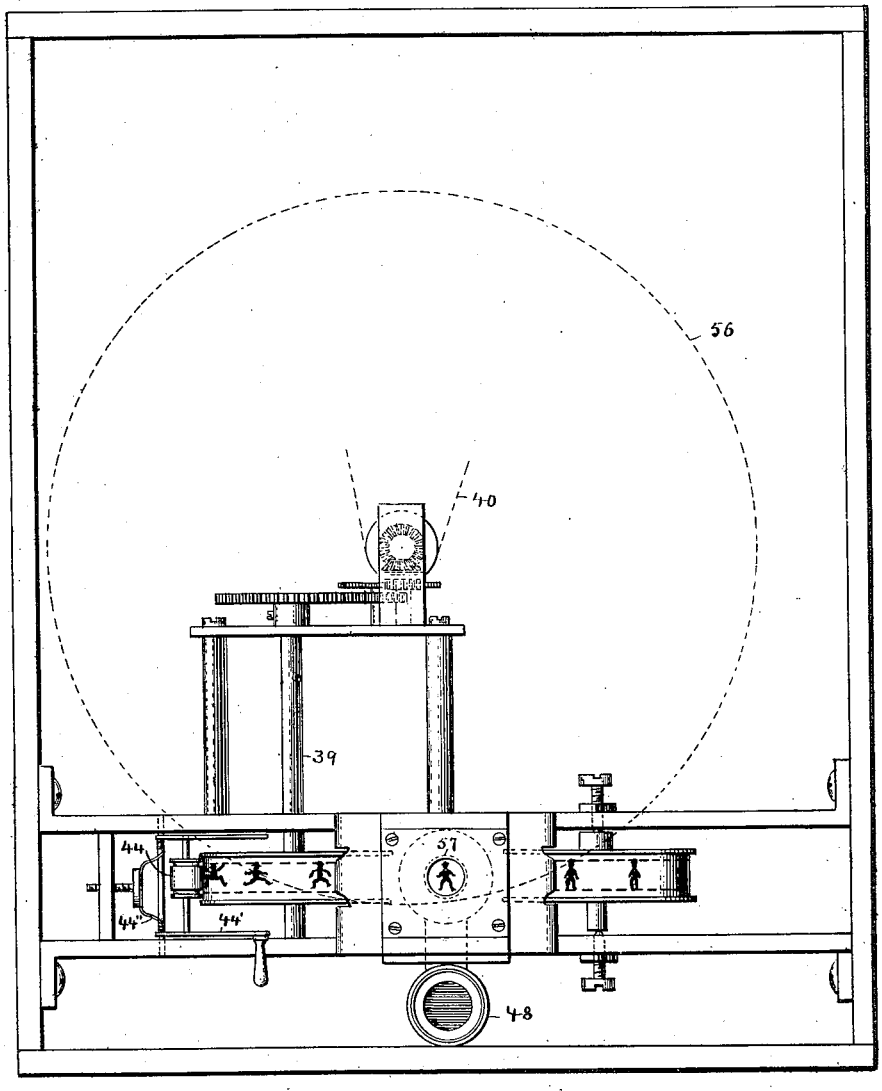

Fig. 1.

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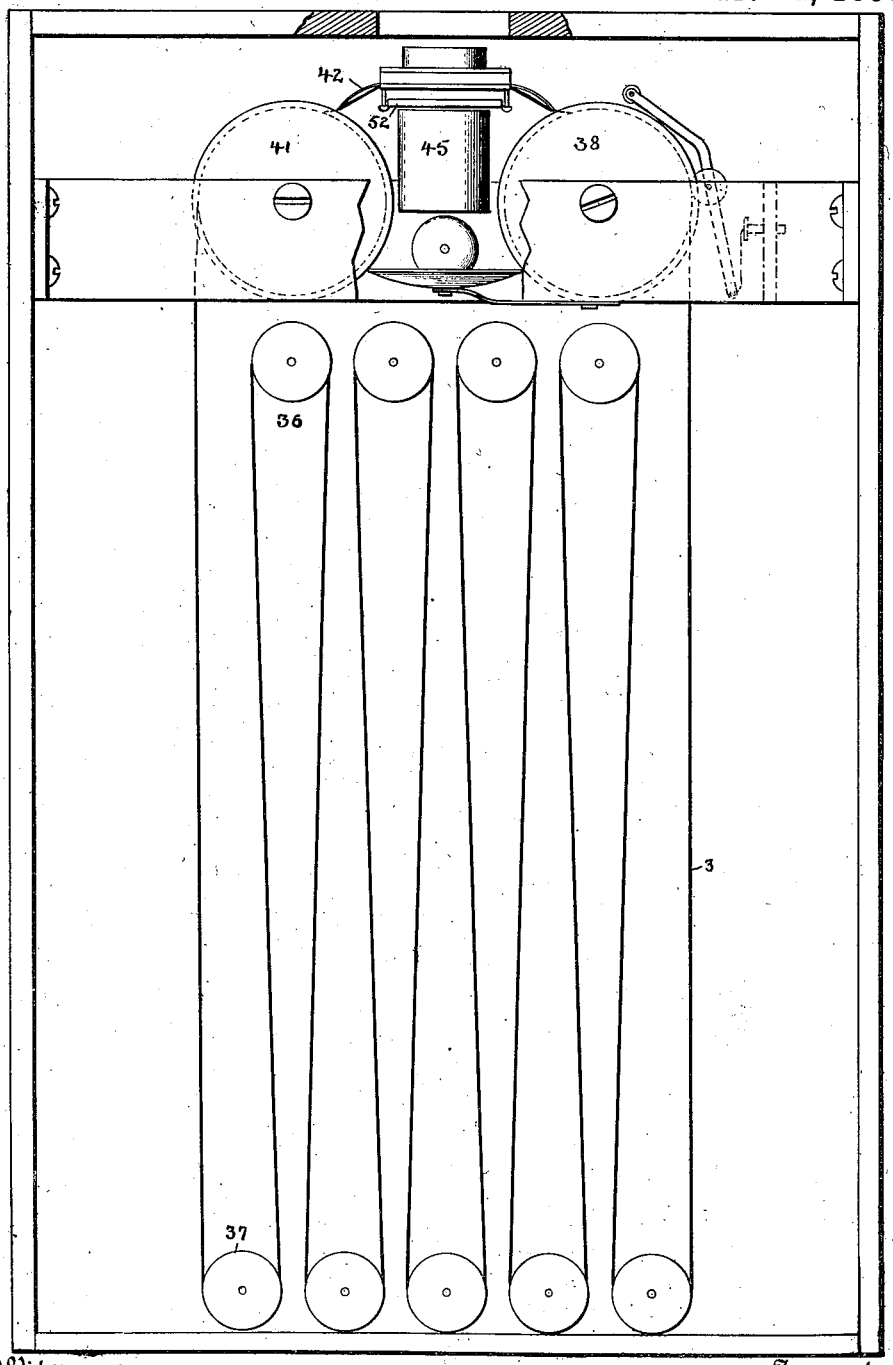

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Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

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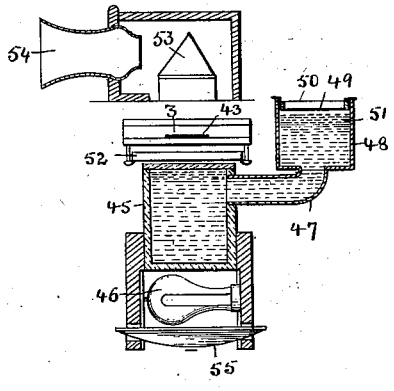
APPARATUS FOR EXHIBITING PHOTOGRAPHS OF MOVING OBJECTS.

No. 493,426. Patented Mar. 14, 1893.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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APPARATUS FOR EXHIBITING PHOTOGRAPHS OF MOVING OBJECTS.

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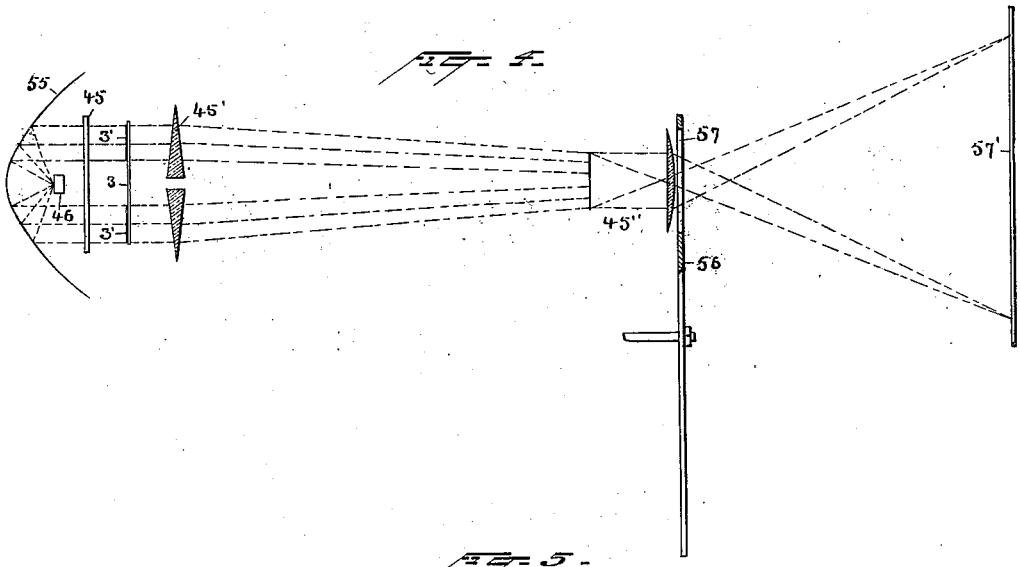

Fig. 4.

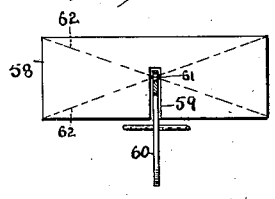

Fig. 5.

Witnesses
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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

APPARATUS FOR EXHIBITING PHOTOGRAPHS OF MOVING OBJECTS.

SPECIFICATION forming part of Letters Patent No. 493,426, dated March 14, 1893.

Application filed August 24, 1891. Serial No. 403,536. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Apparatus for Exhibiting Photographs of Moving Objects, (Case No. 930,) of which the following is a specification.

The present invention relates to apparatus for using photographs which have been taken in rapid succession of an object in motion, by means of which a single composite picture is seen by the eye, said picture giving the impression that the object photographed is in actual and natural motion.

The object of the invention is to provide an efficient apparatus adapted to pass a large number of pictures rapidly before the eye of the beholder in regular order, and the invention consists in the several combinations forming the apparatus, or definite parts thereof, hereinafter fully described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a plan view of the reproducing apparatus, the top of the inclosing case being removed. Fig. 2 is a rear view of the apparatus, the back of the case and the motor being removed and the frame being broken away to show some of the parts behind it. Fig. 3 is a sectional view showing the arrangement of reflector, light, film, &c. Fig. 4 is a view illustrating the reproduction of stereoscopic pictures; and Fig. 5 shows a modified form of lens and shutter.

The film 3, on which a large number of photographs of a moving object have been taken in such manner that any two successive pictures are almost identical in appearance as set forth in my application, Serial No. 403,534, filed August 24, 1891, is passed back and forth over rollers 36, 37 at the top and bottom of the inclosing case respectively, the ends of the film being connected so that the film forms an endless band or belt. This band is advanced at the proper rapid speed by the reel 38 on the shaft 39 driven through the belt 40 by any suitable motor. The film passes over the pulley 41, under the light spring 42, through the slit 43, and over the reel 38. In order to get a sufficiently long strip or tape—say several hundreds or thousands of feet—the rollers 36, 37 may be multiplied to any desired extent.

44 is a brake-roller, carried by the crank-arm 44′, provided with a suitable handle and thrown forward by a spring 44″.

Below the passage through which the film is led is a glass cell 45 containing alum water for the purpose of absorbing heat-rays from the electric or other light 46. This is shown as an incandescent lamp, which, when the apparatus is in use, is continuously lighted, but it is only essential that the light should exist when an opening in the shutter comes over a picture. The cell 45 has a branch 47 terminating in a reservoir or tank 48, which is tightly closed by a rubber diaphragm 49 held in place by the clamping ring 50. On the surface of the alum water is a surface 51 of oil to still further prevent evaporation. Above the cell 45 is a ground-glass plate 52 for still further absorbing the heat-rays and protecting the film. This plate may be tinted to give the picture the appearance of a colored picture, the plate being all of one tint, or partially of one tint and partially of another tint, according to the subject and arrangement of the picture. Above the film are suitable lenses or prisms 53, and a sight opening 54 through which an observer can look to see the reproduced picture.

55 is a reflector below the lamp to throw the light upward to the film.

In the reproducing apparatus a shutter is used for covering and exposing the pictures successively in much the same manner as the sensitive film is exposed in taking the photographs. The position of such a shutter is indicated in dotted lines at 56, Fig. 1. This shutter has one or more openings 57 near its edge, the single opening shown being directly over one of the pictures on the film. This shutter is continuously revolved through the belt 40 with a speed sufficient to bring the opening centrally over a picture at intervals practically equal to the intervals between exposures in taking the pictures. The means for advancing the film and for operating the shutter to expose the pictures may be the same in all particulars as in the apparatus for taking pictures described in my application, Serial No. 403,535, filed August 24, 1891. When the brake 44 is released by means of the han-

dle, the film is pulled forward between the lamp and the prisms at a regulated speed, corresponding to the speed at which the pictures were taken, when the observer at the sight opening will seem to see a single picture, the object represented being in easy and natural motion, owing to the fact that the successive pictures are so nearly alike that at a glance they cannot be clearly distinguished from each other, although they do in fact represent positions of the object at different moments.

I propose in some cases to use a film on which pictures have been taken stereoscopically, that is, in which pictures have been taken in pairs side by side on the film, as fully described in my application, Serial No. 403,535. This arrangement is indicated in Fig. 4, in which 3 is the film, which is supposed to be movable in a line at right-angles to the paper. On the film at regular intervals are the pictures arranged in pairs. These pictures are indicated by the two heavy lines 3'.

46 is the electric lamp.

55 is a parabolic reflector, and 45 the alum cell between the lamp and the film.

45' are prisms for deflecting the rays from the two pictures and superposing them on the projecting lens 45''. 56 is the shutter, which is rotated at a constant speed and which is provided with an opening 57 adapted to uncover the lens at regular intervals.

57' is a screen on which the picture is projected. This screen may be white or, preferably, may be colored to give the picture the appearance of a colored picture; for example, if the picture shows sky and earth, the upper part of the screen may be colored blue and the lower part brown, and it may be otherwise colored for other objects. The reproduction of stereoscopic photographs of moving objects gives a very vivid impression of movement, and the coloring just described adds to the realistic effect.

Instead of using a large shutter such as above described, I may use a very small shutter with a small opening by placing it near the center of the lens through which the rays pass, the shutter being placed in a slit in the body of the lens, and the opening in the shutter passing across the line where the converging rays intersect. 58 indicates a lens, 59 a slit therein, 60 a small shutter adapted to rotate in the slit, 61 an opening in the shutter, 62 the light-rays which intersect and pass through the opening 61.

I am aware that a heat absorbent, such as alum water, has been used in connection with microscopes between the objects being examined and the lens to protect said object from the effect of heat concentrated thereon by said lens. I do not, therefore, claim broadly the use of such heat absorbent, but only the use thereof in combination with the moving film having pictures thereon and certain elements of my apparatus, as hereinafter defined in the claims.

What I claim is—

1. The combination, in a picture exhibiting apparatus, of a series of rollers, a tape in the form of an endless belt on which are a large number of pictures of a moving object, said tape being passed back and forth over said rollers, suitable means whereby the tape may be fed forward, and a light for illuminating said pictures as they pass over it, substantially as described.

2. The combination, in a picture exhibiting apparatus, of a series of rollers, a tape on which are a large number of pictures of a moving object passed back and forth over said rolls, suitable means whereby the tape may be fed forward, a light for illuminating said pictures as they pass over it, a sight opening, and prisms for directing the beams to said sight opening, substantially as described.

3. The combination, in a picture exhibiting apparatus, of a film in the form of a tape and having a large number of pictures on it representing an object in motion, means of supporting and moving said film, a light for illuminating each picture as it passes before the eye, and a transparent heat absorbent between the light and the film, substantially as described.

4. The combination, in a picture exhibiting apparatus, of a film in the form of a tape and having a large number of pictures on it representing an object in motion, means for supporting and moving said film, a light for illuminating each picture as it passes before the eye, and a glass cell containing alum water between the light and the film, substantially as described.

5. The combination, in a picture exhibiting apparatus, of a film or surface having a large number of pictures on it representing an object in motion, means of supporting and moving said film, a light for illuminating each picture as it passes before the eye, and a ground glass plate between the light and the film, substantially as described.

6. The combination, in a picture exhibiting apparatus, of a long endless tape on which are a large number of pictures of an object in motion, a support for said tape, means for advancing the tape, and a shutter having an opening in it for exposing the pictures one after another, said shutter being driven so that an opening comes directly over the film at the same moment that a picture is moved along into position to be seen, substantially as described.

7. The combination of an endless tape with pictures representing an object in motion and being so nearly alike as not to be readily distinguishable arranged at regular intervals thereon, means for supporting said tape and for moving it along at a regulated speed, and a light for illuminating each picture as it comes into position to be seen, substantially as described.

8. The combination of a photograph, means for throwing the same onto a suitable lens or

prism, and a shutter provided with an opening and movable across the lens in a slit at or near the center thereof, substantially as described.

9. The combination of a film or surface having on it pictures of a moving object taken stereoscopically side by side, means for moving said film or surface rapidly forward at a regulated speed, a projecting lens or prism, and means for superposing said pictures on said lens or prism, substantially as described.

10. The combination of a film or surface having on it pictures taken stereoscopically side by side, means for moving said film or surface forward at a regulated speed, a projecting lens or prism, means for superposing said pictures on said lens or prism, and a screen onto which the pictures are thrown, substantially as described.

11. The combination of a film or surface having on it pictures taken stereoscopically side by side, means for moving said film or surface forward at a regulated speed, means for superposing said pictures, and a screen colored to correspond with the subject of the photograph onto which the superposed pictures are thrown, substantially as described.

12. The combination of the film having pictures taken stereoscopically on it in pairs side by side, means for moving said film, the light and reflector for illuminating the pictures, the heat absorbent between said light and film, and means for superposing the pictures and rendering them visible as a single picture, substantially as described.

13. The combination, in a picture-exhibiting apparatus, of a transparent flexible band or tape having a large number of pictures on it representing an object in motion, means for supporting and moving said tape forward to bring the pictures into view in rapid succession and regular order, and a sight opening at a point along the tape through which the pictures can be seen, substantially as described.

This specification signed and witnessed this 31st day of July, 1891.

THOS. A. EDISON.

Witnesses:

JOHN F. RANDOLPH,

FREDERICK OTT.