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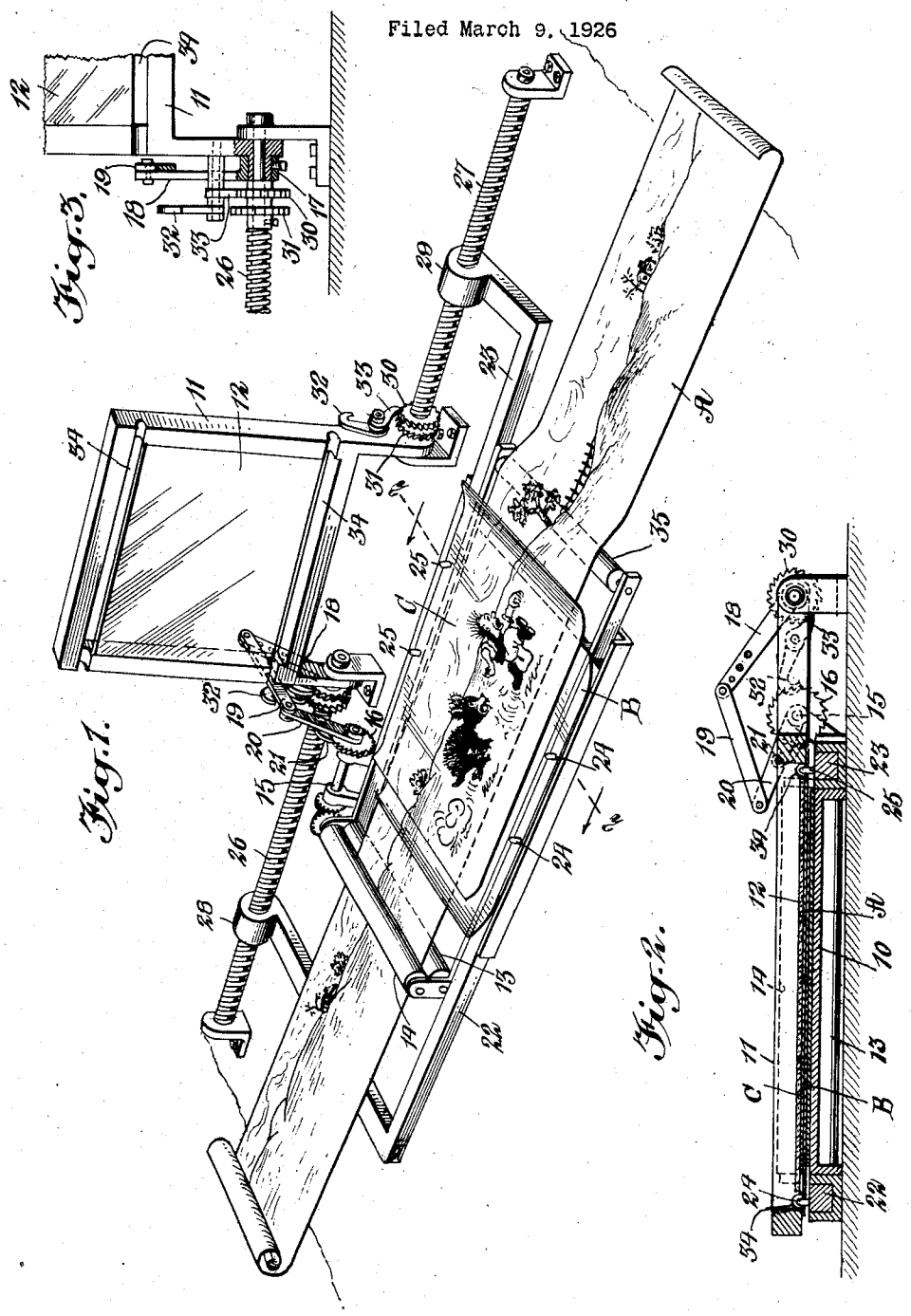

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APPARATUS FOR PRODUCING ANIMATED DRAWINGS.

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This invention relates to the production of animated drawings of the general type described in my prior Patent No. 1,143,542, issued June 15th, 1915. More particularly my invention relates to the type in which the illustrated action is represented as progressing in respect to the background. The background is drawn or painted on a strip of a length many times greater than the width of the picture to be projected, this strip being advanced a slight amount for each exposure or series of exposures of the film. Thus the action which is drawn on sheets separate from the background, is represented as progressing along the scene shown in the background.

The objects which are to be represented as moving are drawn on a series of sheets of translucent material, such for instance as celluloid, and the reverse side of each sheet within the outline of the object, is preferably rendered opaque so that the background does not show through the movable object.

It will be understood that a series of drawings are made showing the movable object in the successive positions which it occupies in a cycle of movement, and these are photographed in succession in superposed relationship to the background. By advancing the background each time one of said series of pictures is substituted for another, it will be seen that the same cycle of movement may be repeated indefinitely, but in respect to successive portions of the background. For instance, a person or animal may be represented as running for a long distance, represented by the scene shown in the background, and the number of pictures required is only that necessary in representing a single cycle of movement of the running object.

As one important feature of my invention I automatically advance the background sheet each time a substitution is made of the pictures showing the object in motion. The effect on the screen after the film is developed and projected, is that the characters are moving at rapid speed over endless expanses of territory, and have been photographed en route by a motion picture camera which was moving at the same speed as the objects.

As a further important feature of my invention I provide means for effecting a relative movement of the normal positions of sheets of two series, whereby each series may show a separate moving object, and one of these objects may appear to approach or recede from the other object, without the necessity of making separate drawings for the objects in their different relative positions.

By means of this feature of my invention two objects may appear to be moving at rapid speed over an expanse of territory, and one may appear to gain on the other although only a single series of pictures is used for the repeated cycles of movement of each object.

As the drawings on celluloid must be absolutely flat while they are being photographed, to prevent halation, I employ a frame having a glass which may rest on the sheets to hold them flat during the photographing action, and as it is necessary to raise this frame each time a change of drawings is made for a new exposure, I employ such movement of the frame to actuate the parts which effect the relative movement of the separate sheets and the background.

In the accompanying drawings I have illustrated one form of apparatus which may be employed in carrying out my invention. It will of course be evident that other forms may be designed without departing from the spirit or scope of my invention.

In these drawings:

Fig. 1 is a perspective view with the frame in raised position.

Fig. 2 is a section on the line 2—2 of Fig. 1, but showing the frame in lowered or photographing position, and

Fig. 3 is a sectional detail of certain of the actuating parts.

In the form illustrated there is provided a support 10 on which the sheets to be photographed are placed, and at one side of this support there is pivotally mounted a frame 11 having a glass body portion 12 for pressing the sheets on to the support and holding them flat. For making animated drawings of the panorama type, there is provided a strip A which may be of paper or any other suitable material of the proper width, and of any desired length. This has drawn, painted, printed, or otherwise formed thereon, the scene which is to be represented on the screen. The strip may be several feet long, depending upon the extent of the ex-

panses of territory to be shown in the panorama.

The movable object is drawn on a series of sheets, preferably of celluloid, and superposed on the background strip A. There may be a very large number of these drawings and successive drawings of a series may show the same movable object in successive poses or positions in a cycle of movement. For instance, if it is desired to represent a man as running, there may be a series of a dozen or more drawings made showing the successive positions of the man while taking two steps and completing a cycle of running motion. This same series of pictures may be photographed a large number of times in succession as the man is represented as taking a large number of running steps while the panorama is being advanced.

If it is desired to represent a second moving object, this may be shown on a separate series of celluloid sheets and the sheet of each series exchanged for the next sheet of the same series between successive exposures or group of exposures.

In the drawing I have shown two superposed celluloid sheets B and C. The sheet B may have a picture of an animal thereon and there will be provided a series of sheets B showing this animal in the successive poses or positions going to make up a cycle of movement. The sheet C has a picture of a man thereon, and there will be a series of these sheets C showing successive positions or poses in a cycle of running movement by the man. In photographing, one of the sheets B and one of the sheets C, are placed in superposed position on the strip A, and are pressed down and held flat by the glass 12 of the frame 11.

As one important feature I provide means for automatically advancing the panorama strip A each time the frame 11 is moved into and out of photographing position. This means is illustrated as a pair of rollers 13 and 14 between which the strip A passes. One of the rollers is driven by suitable gearing from a shaft 15, and the latter has a ratchet wheel 16. Any suitable mechanism is provided for turning the ratchet wheel upon swinging the frame 11. As shown, the frame 11 has a hub 17 connected to an arm 18 which latter is connected by a link 19 to a lever 20 pivoted on the shaft 15. The arm 20 has a pawl 21 engaging the ratchet wheel 16. Thus as the frame is raised, the pawl 21 moves over the ratchet wheel, while the lowering of the frame rotates the ratchet wheel and turns the rollers to move the strip A endwise. By connecting the link 19 to the lever 18, at various distances from the pivotal center of said lever, the extent of movement of the strip A for each swinging movement of the frame, may be varied. I have shown the lever 18 as provided with a series of holes, into any one of which the pivot pin of the link 19 may be inserted.

As another important feature, I provide means for effecting the relative movement of the registering means which control the positions of the sheets B and C. As shown, there are provided a pair of bars 22 and 23 upon opposite sides of the support 10. The bar 22 has a pair of pins 24 adapted to enter apertures in the edge of the sheet B so as to control the position of the latter, and the bar 23 has a similar pair of pins 25 to enter apertures in the opposite side of the sheet C to control the position of this sheet. By effecting a relative endwise movement of the bars 22 and 23, the position of the movable object on the sheet B may be varied in respect to the position of the movable object on the sheet C. Thus, if these objects be represented as running, flying, swimming, jumping, or otherwise progressing at a rapid rate, either object may be represented as gaining on the other. The means illustrated for accomplishing this relative movement of the bars 22 and 23 is illustrated as a pair of threaded shafts 26 and 27 which extends in opposite directions from the supports to the frame 11, and adapted to be rotated in either direction by the swinging of said frame. The shaft 26 has threaded engagement with an arm 28 on the bar 22, while the shaft 27 has threaded engagement with an arm 29 on the bar 23.

Each shaft has a pair of oppositely facing ratchet wheels 30 and 31 and the frame adjacent to its pivotal support has a pair of pawls 32 and 33 for engaging with these ratchets. One of the pawls is of the push type, and the other of the pull type, and either may be moved into operative position, or both may be held in inoperative position. Thus the swinging of the frame 11 may rotate either the shaft 26 or the shaft 27 in either direction, or may rotate the shafts in the same or in opposite directions. The rotation of the shafts causes a relative movement of the pins 24 and 25 so that each time a new sheet of the series B and a new sheet of the series C are placed in position, the movable object illustrated on the sheet will be in a different position in respect to the frame 11 which defines the sight or field of the camera. By moving the two bars 22 and 23 in the same direction, the two movable objects will be progressing across the field of vision of the camera, while by effecting a relative movement of the bars, one object may be caused to appear to gain on the other.

The frame is so constructed that it may be closed with the pins 24 and 25 in any position. As shown, the frame has grooves 34 to receive these pins. The mechanism illustrated may be employed to move the panorama strip 11 in either direction. For in-

stance, with the strip threaded up as shown, it will be advanced toward the left each time the frame 11 is moved to closed position, but by passing the strip over the upper roller 14, thence across the support 10 and around the roller 35, the end of the strip may be passed back between the rollers 13 and 14, so that the portion of the strip which is superposed on the support 10 will move toward the right, instead of toward the left, each time the frame 11 is swung down.

It will of course be evident that if the picture to be projected on the screen is to show only a single movable object, the series of sheets B or the series of sheets C, may be omitted. It will also be apparent that even if only a single moving object is to be shown, a portion of the object may be drawn on a sheet B, and other portions on a sheet C, and the bars 22 and 23 permitted to remain at rest or move simultaneously in the same direction. This making of a portion of the movable object on one sheet and another portion on another sheet, results in a very great economy in the amount of drawing required, as is pointed out in my prior Patent No. 1,143,542, above referred to.

Although the whole of the movable object may be drawn on each of the series of sheets B, and only a single sheet be placed on the pins 24 at one time, it will of course be evident that I may employ the same method claimed in my previous patent above referred to, and mount on the pins 24 a plurality of superposed sheets, one of which may show the portion of the movable object which remains relatively stationary, such for instance as the body of an aeroplane, and another of which would form one of a series showing the aeroplane propeller, a passenger, or other object moving relatively to the body of the aeroplane. The same would apply to the sheet C mounted on the pins 25.

In photographing, there may be two or more exposures for each setup of sheets, or there may be a change of one or more sheets between each successive exposure. I change the relative positions of the strip A, and if desired of the sheets B and C, only between successive movements of the frame 11, even though there may be a plurality of exposures on the film between successive frame movements.

In referring to the sheets B and C, as being translucent, I mean to include only such substantially complete translucency as will permit the picture on one sheet to be seen through a superposed sheet. The translucency should be such that the sheets are nearly, if not completely, transparent. The preferred material for the sheets B and C is substantially clear celluloid from which the ink may be washed after the negative film has been made up, so that the sheets may be reused for another series of pictures.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An apparatus for use in making animated drawings, including a pair of rollers adapted to engage with and advance a panoroma strip or background, means for determining the position of a series of pictures adapted to be superposed thereon, and showing a movable object in successive positions, a frame adapted to hold the picture and panorama strip flat during photographing, and means for connecting said frame and said rollers for actuating the latter upon movement of said frame.

2. An apparatus for use in making animated drawings, including feeding means for a panorama strip or background, a member having means for engaging with each of a series of pictures showing a movable object in successive positions and in superposed relationship to said panorama strip, a pivoted member, and means for actuating said feeding means upon the swinging of said member.

3. An apparatus for use in making animated drawings, including feeding means for a panorama strip or background, a member having means for engaging with each of a series of pictures showing a movable object in successive positions and in superposed relationship to said panorama strip, a pivoted member, and means for sliding said first mentioned member upon the swinging of said second mentioned member.

4. An apparatus for use in making animated drawings, including feeding means for a background strip, a member adapted for registry with each of a series of pictures showing a movable object in successive positions, a frame having a glass plate adapted to press said sheet on to said background strip, and means for actuating said feeding mechanism upon the swinging of said frame.

5. An apparatus for use in making animated drawings, including feeding means for a background strip, a member adapted for registry with each of a series of pictures showing a movable object in successive positions, a frame having a glass plate adapted to press said sheet on to said background strip, means for actuating said feeding mechanism upon the swinging of said frame, and means for moving said member laterally in respect to said frame upon the swinging of said frame.

6. An apparatus for use in making animated drawings, including a pair of spaced, longitudinally movable members, one having means for engaging with each of a series of drawings, and the other having means for engaging with each of a second series of drawings, with the drawing of one series in superposed relationship to the drawing of the other series, a frame for holding the

drawings flat during photographing, and means for moving one of said members in either direction upon the swinging of said frame.

7. An apparatus for use in making animated drawings, including a pair of spaced, longitudinally movable members, one having means for engaging with each of a series of drawings and the other having means for engaging with each of a second series of drawings, with the drawing of one series in superposed relationship to the drawing of the other series, a frame for holding the drawings flat during photographing, means for moving one of said members in either direction upon the swinging of said frame, and separate means for moving the other member in either direction upon the swinging of the frame.

8. An apparatus for use in making animated drawings, including feeding means for a panorama strip or background, a member having means for engaging with each of a series of pictures showing a movable object in successive positions and in superposed relationship to said panorama strip, a movable member for holding one of said pictures and said background together for photographing, and means for automatically sliding said first mentioned member a predetermined distance in one direction upon movement of said second mentioned member.

9. An apparatus for use in making animated drawings, including feeding means for a panorama strip or background, a member having means for engaging with each of a series of pictures showing a movable object in successive positions and in superposed relationship to said panorama strip, a movable member for holding one of said pictures and said background together for photographing, means for automatically sliding said first mentioned member a predetermined distance in one direction upon movement of said second mentioned member, and means for controlling the direction of movement of the first mentioned member.

10. An apparatus for use in making animated drawings, including a support for a background strip, a member adapted for registry with each of a series of pictures showing a movable object in successive positions, a frame having a glass plate adapted to press said sheet on to said background strip, and means for moving said member laterally in respect to said frame upon the swinging of said frame.

11. An apparatus for use in making animated drawings, including a support for a background strip, a member adapted for registry with each of a series of pictures showing a movable object in successive positions, a frame having a glass plate adapted to press said sheet on to said background strip, means for moving said member laterally in respect to said frame upon the swinging of said frame, and means for reversing the direction of movement of said first mentioned means.

Signed at New York in the county of New York and State of New York this 5th day of March, A. D. 1926.

EARL HURD.