Aug. 7, 1934. H. A. ADAMS 1,968,979

TELEVISION TRANSMITTER

Filed Nov. 4, 1931 5 Sheets-Sheet 1

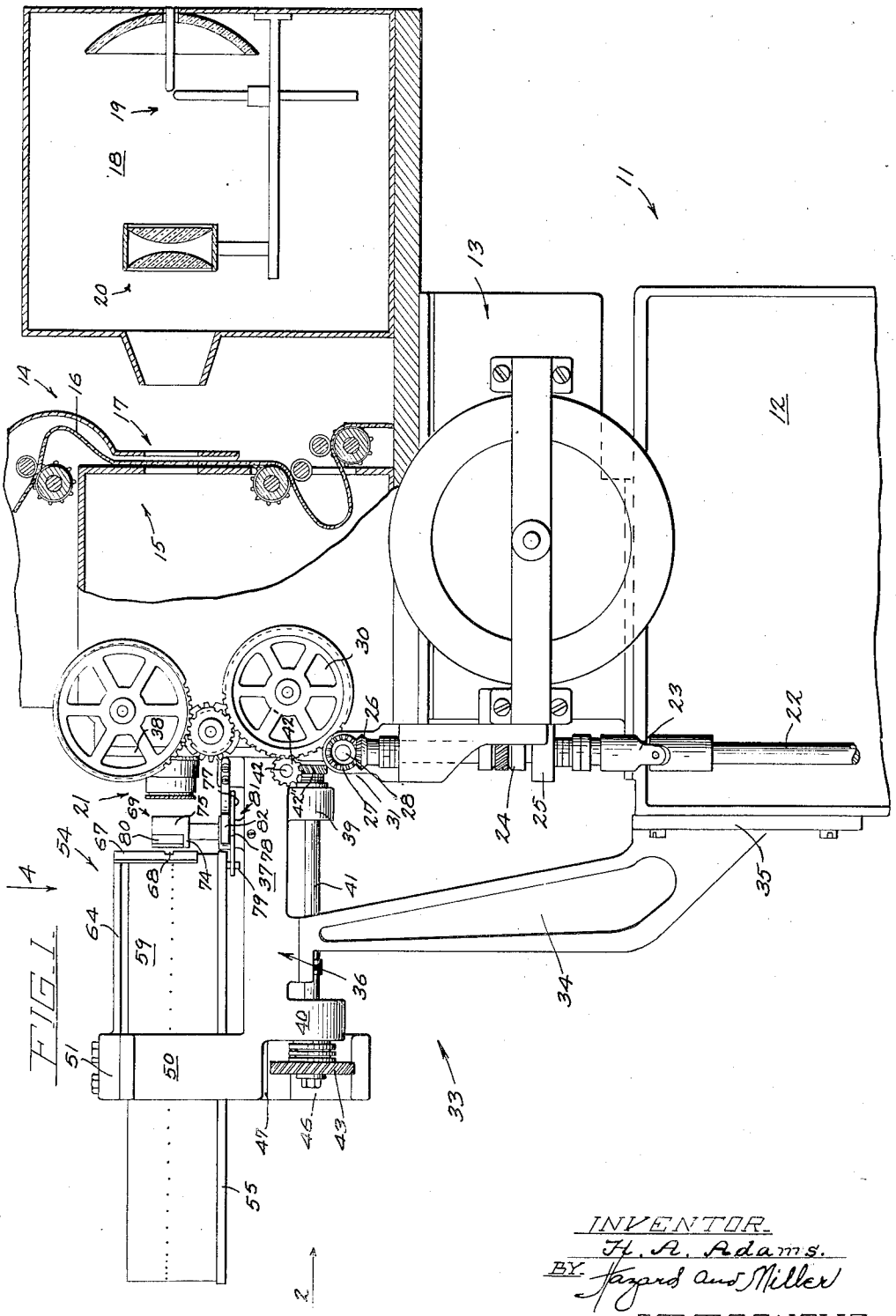


FIG. 1.

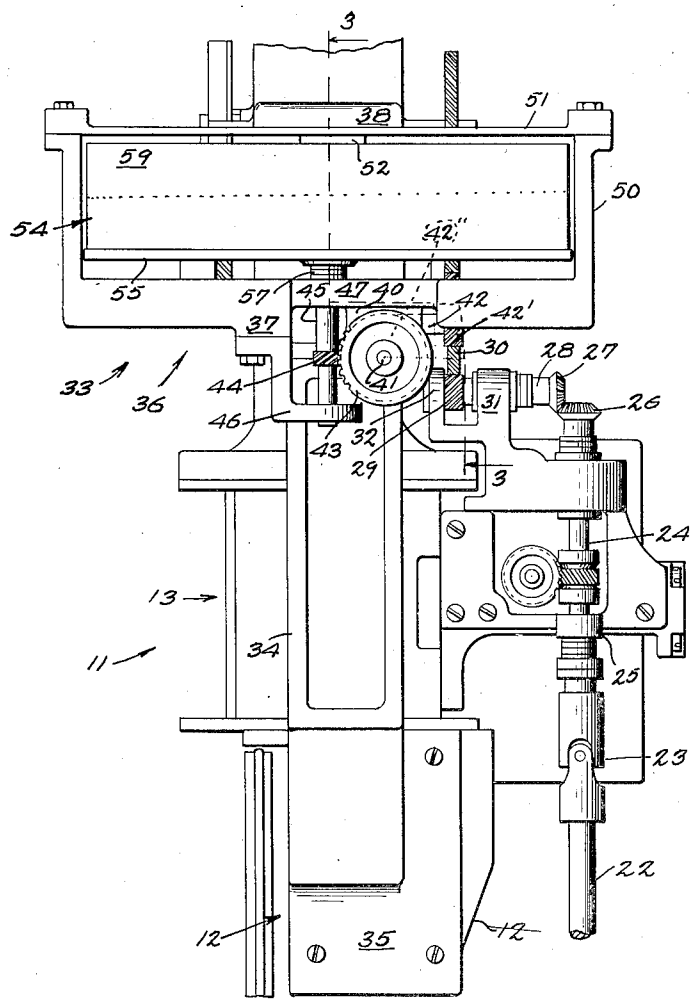
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FIG. 2.



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TELEVISION TRANSMITTER

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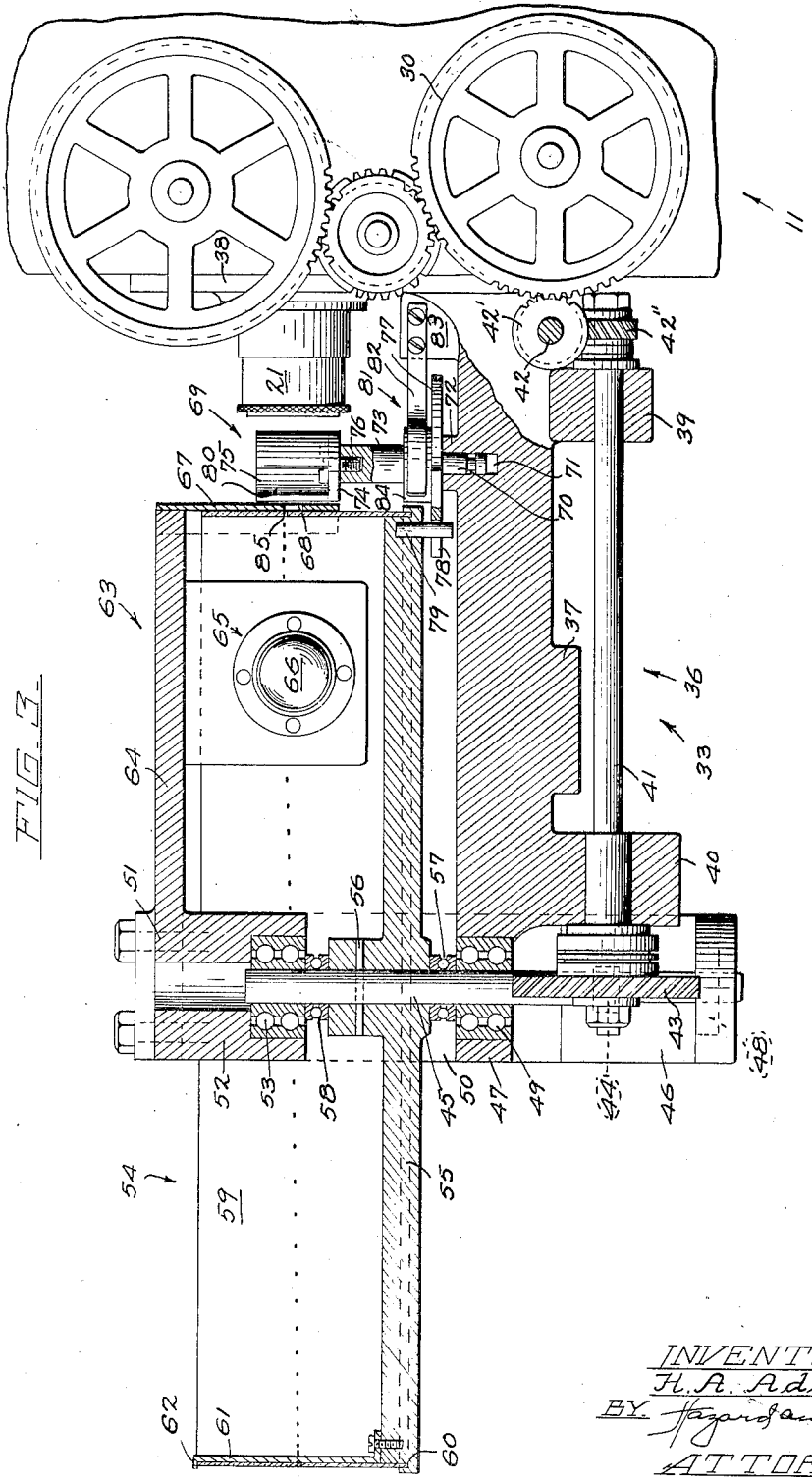


FIG. 3.

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TELEVISION TRANSMITTER

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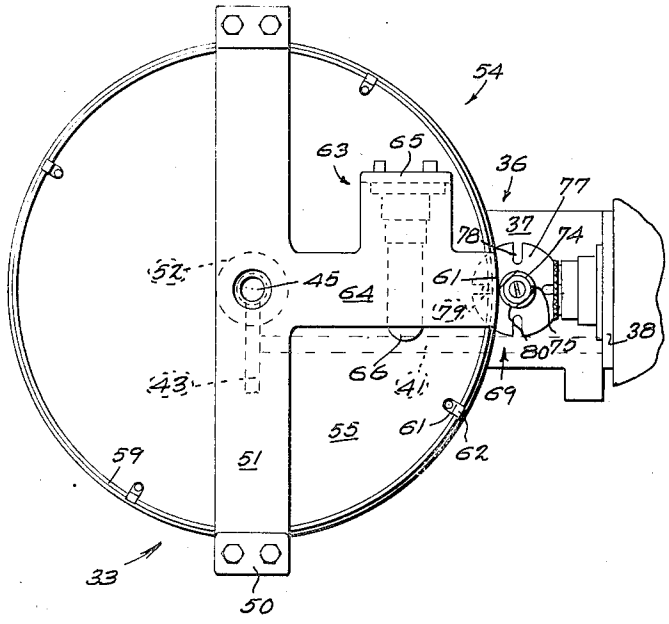


FIG. 4.

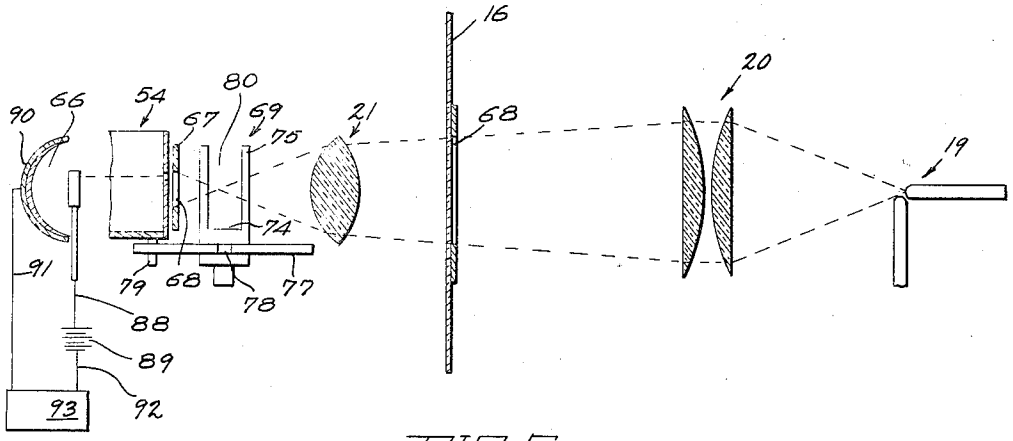


FIG. 5.

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TELEVISION TRANSMITTER

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FIG. 6.

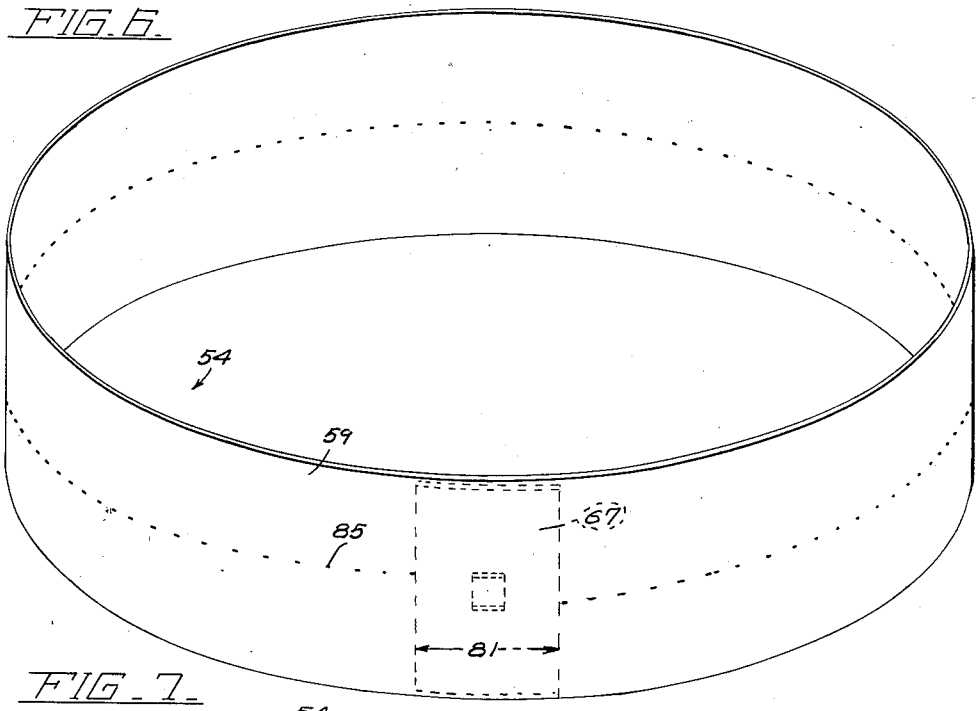
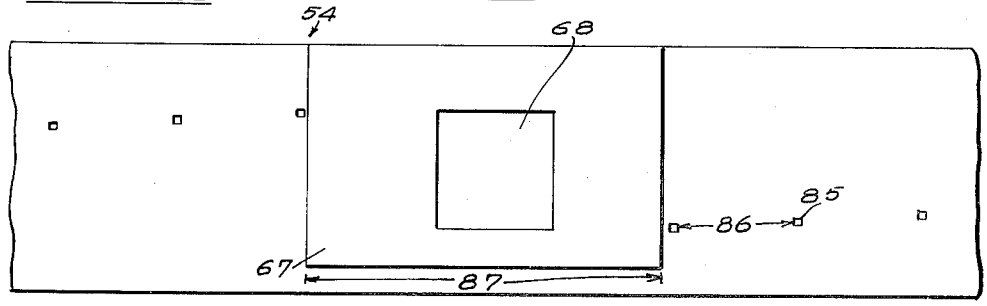


FIG. 7.



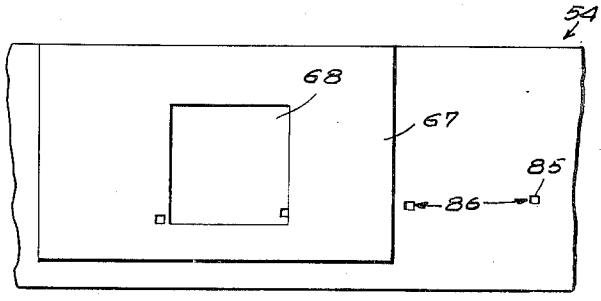


FIG. 8.

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1,968,979

UNITED STATES PATENT OFFICE

1,968,979

TELEVISION TRANSMITTER

Harold A. Adams, Bakersfield, Calif.

Application November 4, 1931, Serial No. 572,973

10 Claims. (Cl. 178—6)

My invention has to do with a type of television transmitter especially adapted for transmitting moving pictures, and in which an object of my invention is to use a standard motion picture projector and to interconnect therewith a television transmitter by which during the stationary periods of the intermittently moved film the image of an individual picture or frame is scanned and the electrical impulses corresponding to the variations of light transmitted, and while the film is being moved from one frame to another the photo-electric cell is darkened and thereby does not give any record of the changes of light through the rapidly moving film.

Another object and feature of my invention is to combine a moving picture projector of the intermittent type with a television transmitter in which the scanning element of the transmitter is operated continuously at a suitable rate of speed, and the light to the photo-electric cell to the transmitter and transmitted through the scanning device is interrupted periodically to allow transmission of light only while the film is stationary and to obscure the light while the film is in movement.

Another object and feature of my invention is to combine a motion picture projector whereby a small image of the individual frames of the motion picture may be projected on to a mat and form an aerial image, which image is is scanned by continuously rotating the scanning device and the projected light through the film forming the image and through the scanning device changes the energizing of a photo-electric cell. In this connection, a further feature of my invention is employing a scanning device to operate an intermittently acting shutter, such shutter allowing transmission of light while the film is stationary but obscuring the light during the period the film is in movement, shifting from one frame to the next.

In the mechanical features of my invention, another detailed object is the construction of attaching mechanism for the television portion of the machine which may be secured to standard motion picture projectors and in which the power for driving the scanner and the intermittently operated shutter is derived from the power drive for the film and the reel movement of the motion picture projector.

Another feature of my invention relates to the type of scanner and the method of making. The scanning device of my invention is in the form of a cylinder and preferably made of thin quartz glass. This cylinder has transparencies photographed thereon, these being preferably rectangular and positioned around the cylinder and also stepped longitudinally thereof to scan the small image of the projected picture. The transparencies are spaced the correct distance apart so that as one transparency leaves the image on one side another transparency stepped laterally is over the image and receives light therethrough. Thus only one transparency travels across the image at a time.

My invention is illustrated in connection with the accompanying drawings, in which:

Fig. 1 is a side elevation partly broken away of a motion picture projector with my television apparatus connected thereto, such figure being taken in the direction of the arrow 1 of Fig. 2;

Fig. 2 is a front elevation taken in the direction of the arrow 2 of Fig. 1;

Fig. 3 is a partial vertical section on the line 3—3 of Fig. 2 in the direction of the arrows;

Fig. 4 is a partial plan of the television portion of the instrument taken in the direction of the arrow 4 of Fig. 1;

Fig. 5 is a diagram illustrating the optical systems of the projector and television transmitter;

Fig. 6 is a perspective view of the scanning cylinder;

Fig. 7 is an enlarged elevation of a section of the scanning cylinder illustrating the scanning of the image at the mat;

Fig. 8 is an elevation similar to Fig. 7 showing the scanning disk in another position.

Referring first to the general set up of the machine, a portion of a motion picture projector is indicated by the numeral 11. In this case the lower part 12 supports a sound reproducing mechanism 13 which is not detailed in this present application as it pertains to another invention in reproducing the sound from the film. The upper part 14 has a film moving mechanism designated generally at 15. This is of a standard type having an intermittent feed for the film. The film is illustrated by the numeral 16 and it passes through the film holder 17, these all being old mechanisms. The lamp box 18 is also standard construction and is indicated as having an arc lamp 19 as a source of light. The light from the arc passes through standard lenses 20 and a suitable condensing lens 21 described more fully in the detailed features of the invention.

It is not believed necessary to describe in full the manner of driving the mechanism for the

standard projector except to state that the vertical shaft 22 is used to transmit power from a motor or other suitable machanism. This has a universal joint 23 therein. The upper part 24 of this shaft is mounted in journals 25. A beveled pinion 26 at the top of the shaft drives through another beveled pinion 27 of a transverse shaft 28. (Note Figs. 1, 2, 3.) This latter shaft has a gear 29 which drives part of the gear train 30 of the standard projector. The shaft 28 is mounted in suitable journals 31 and 32 being standard parts of the motion picture projector.

My invention embodies attaching to and using with the standard motion picture projector a suitable scanning device which assembly is designated by the numeral 33 and employs a bracket 34 having a plate 35 secured to the front of the lower part 12 of the projector. On the top of this bracket there is a frame structure 36 having a base 37 with flanges 38 secured to the upper part of the projector. This base has journals 39 and 40 in which is journaled a drive shaft 41 which is driven from a countershaft 42 having a driven gear 42′ driven by the gear 30. This shaft is suitably journaled in the frame 36 and drives the shaft 41 through the medium of a gear 42″. At the front of this shaft 41 there is a helical gear 43 which, through the medium of a small helical gear 44, drives a vertical shaft 45. This shaft is journaled in a bottom journal bracket 46 which is secured to the base 37 of the frame 36 and has an upper journal 47. These journals have anti-friction bearings 48 and 49 shown as ball bearings.

A pair of side arms 50 extend upwardly from the base of the frame at opposite sides and are joined by a cross strap 51. This strap has a journal hub 52 secured thereto which carries an upper anti-friction bearing 53 for the top of the shaft 45.

The scanning cylinder designated generally at 54 employs a disk 55 which is secured to the shaft 45 by pins 56 or the like, there being a lower thrust bearing 57 below the disk and an upper thrust bearing 58 above the disk. This disk has a cylinder 59 mounted thereon, the disk having an annular slot 60 in which this thin glass cylinder may have its lower edge fitted. Spaced around the disk there are a series of vertical supporting arms 61, having a bead 62 at the top, which engage the upper edges of the scanning cylinder. Details of this cylinder are described hereinunder.

The photo-electric cell assembly designated generally 63 employs an arm 64 which extends from the strap 51 and has a lamp housing 65 depending therefrom. In this lamp housing there is a photo-electric cell 66 of a suitable type. This is arranged adjustable so that it may be properly positioned to receive the light through the film.

The optical system employs a mat plate 67 which is attached to the front end of the arm 64 and depends outside of the cylinder and close thereto. This mat has a rectangular opening 68. In this opening the aerial image is formed, the optical system to form this image employing the lens 20 and the condensing lens 21. Manifestly, these lenses are indicated as diagrammatic and will include the usual assembly to secure a proper short focusing of the image, this system being designed to form a clear, sharp, aerial image close to the periphery of the rotating scanning cylinder.

The shutter assembly indicated generally by the numeral 69 employs a vertical shaft 70, the lower end of this shaft being mounted in a socket 71 in a boss 72 extending upwardly from the base 37 of the frame 36. The upper portion of this shaft 73 carries a small disk 74 to which are secured a pair of arcuate obscuring shutters 75, the attachment illustrated being by a screw 76.

In order to give intermittent motion to these shutters I employ a Geneva movement, this having a so-called star gear 77. This gear is keyed or otherwise secured to the shaft 70 and has radial slots 78. These slots are engaged by a pin 79 which is secured to the disk 55 of the scanner and thus for each rotation of the scanning disk and cylinder the shutter is rotated one-quarter of a turn. The shutter has the open space 80 between the arcuate shutters 75 through which light may be transmitted. A friction brake 81 employs a brake spring 82 which is secured to a stud 83 extending upwardly from the base 37 of the frame 36 and bears on a cylinder brake drum 84 on the shaft 70 and prevents this from spinning so that it may only turn one-quarter of a turn when urged by the pin 79. It will thus be seen that at each rotation of the scanning cylinder the shutter is rotated one-quarter of a turn and that this alternately allows the transmission and obscuring of the light alternately for each revolution of the scanning cylinder. Therefore, the photo-electric cell is illuminated and darkened alternately.

The scanning cylinder and the aperture in the mat for the image are shown in diagrams in Figs. 6, 7, and 8. The scanning cylinder 59 is preferably made of glass and has photographed thereon transparencies 85, the rest of the cylinder being opaque. In the design which I am using these transparencies are square and .002 of an inch on a side. The opening 68 in the mat plate 67 is made also square and one-quarter of an inch on the side. The scanning transparencies are arranged in a helical curve around the cylinder. The circumferential edge of one transparency is on the same line as a marginal edge of the adjacent transparency so that all of the image will be scanned. These transparencies between the measurements 86 are five-sixteenths of an inch. They do not pass completely around the glass cylinder but there is a space 87 at the two ends equal to the width of the mat plate 67 and this measurement 87 is such that the scanning cylinder turns the distance 87 while the shutter 69 is being rotated one-quarter turn.

I have designed the machine using a system of gearing and speeds whereby the picture is projected by the projecting machine at the rate of twenty four frames or individual pictures per second and the scanning disk is arranged to rotate at a speed of forty eight revolutions per second. Although usually in motion picture projectors the picture is stationary for a greater length of time than it is actually moving I do not use the full time the picture is stationary in scanning but while the picture is being exposed the scanning disk rotates once with the space 80 of the shutter or timer in alignment with the beam of light through the film, thus energizing the photo-electric cell. The shutter is then operated to give it one-quarter of a turn, placing the shutter 75 in the path of the light,

thereby obscuring the photo-electric cell, and during this time the scanner rotates another revolution. Thus the scanner rotates once while the film is being exposed to the light and alternately with this when the film is being moved and during the moving time of the film the light is obscured from the photo-electric cell. The times of exposure of the photo-electric cell are evenly divided. Therefore, by the ratio as chosen there is no chance of having the photo-electric cell exposed to the light while the film is traveling but only while this is stationary. The individual transparencies on the glass cylinder are spaced slightly wider apart than the size of the aperture 68 so that only one transparency at a time can scan the image.

It is believed unnecessary to show a detail of the electrical mechanism. However, it may be stated that the positive electrode 88 of the photo-electric cell is connected to a source of power 89. The negative side 90 has a lead 91. There is also another lead 92 from a source of power, which leads connect to an amplifying system designated generally at 93. This may be any type of amplifying system suitable for television operation to give sufficient current and current variation for transmission either by radio transmission or by wire. While the invention described here is limited to the transmitter for television transmission, I am developing a receiver for use with this. By transmitting through a television medium the image of moving picture films I will be able to dispense with the use of a number of films in moving picture theatres and have a series of theatres connected either by wireless or by ordinary radio reception to receive and to project the pictures from a master film which may be operated from a studio. Thus one film could be utilized for the reproduction of a large number of pictures transmitted by television from one film.

With my construction of television transmitter and manner of operating the scanner combined with the shutter operated by the scanner, the light is obscured from the scanner during part of the time that the film is stationary and light is being projected through such film, for as I only use part of a motion picture projector and do not use the shutter, light is constantly projected through the film and either forms an image on the scanner within the aperture plate by the light shining through the channel through the space 80 of the shutter, or the light falls on the obscuring side walls of the shutter. Therefore, the scanner omits transmitting the scanning light for a portion of the time that the film is stationary and transmits light for less than the total time the film is stationary. The purpose of this is that it is extremely difficult to obtain an adjustment of the scanner apertures and the timing of a film in its intermittent motion and the projection of light therethrough so that at the instant the film becomes stationary the scanner will begin its function of scanning the picture and also so that the instant the film again starts to move to bring another frame into position that the last hole of the scanner will clear the picture. Therefore, a simple procedure is to entirely omit scanning the picture the full time that the film is stationary and light is being projected therethrough and forming an image. The blank space 87 on the scanner between the ends of the scanning transparencies 85 is for the purpose of obscuring the photo-electric cell while the shutter is being rotated one-quarter turn. From the time the shutter starts to turn one-quarter turn until it is turned another quarter the scanning cylinder makes one revolution.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. In a device as described, a motion picture projector having an intermittently moving film, a source of light to illuminate the film combined with a television transmitter having a rotatable scanner with a series of transparencies to transmit light, a photo-electric cell positioned to receive the light projected through the film and through the transparencies of the scanner, means to transmit electrical impulses from the cell, and a shutter or timer with an interconnecting drive through the scanner to transmit the light while the film is stationary and to obscure the light while the film is moving, the speed of the timer and of the scanner being adjusted whereby the scanner makes one rotation while the film is moving and at least one rotation while the film is stationary, the scanner having an opaque section between the ends of the scanning transparencies, and the rotation of the scanner and movement of the shutter being adjusted to turn the shutter from an exposing to an obscuring position or vice versa while the opaque section of the scanner passes between the illuminated film and the photo-electric cell.

2. In a device as described, a motion picture projector having an intermittently moving film, a source of light illuminating such film, combined with a television transmitter having a rotatable cylindrical scanner having an opaque surface with a plurality of spaced transparencies arranged in a helix, a photo-electric cell positioned to receive light through the film and through the transparencies, means to transmit electrical impulses from the cell, and a shutter or timer interconnected with the scanner to transmit light while the film is stationary and to obscure the light from the cell while the film is moving, and said scanner having an opaque section between the ends of the helix and timed to pass the shutter while the shutter is changing from a transmitting to an obscuring position and vice versa.

3. In a device as described, a motion picture projector having means to intermittently move a film, a light source, an optical system to form an image combined with a television transmitter having a rotating scanner with an opaque surface with a series of transparencies arranged to scan the image, a mat plate positioned adjacent the scanner and having an opening, said opening defining the extent of the image, and a rotatable shutter positioned between the mat plate and the source of light and interconnected with the scanner to transmit the light while the film is stationary and to obscure the light while the film is moving, the scanner being timed to make at least one complete rotation while the film is stationary and one complete rotation while the film is moving, and a photo-electric cell with means to transmit electrical impulses positioned to receive light through the scanning transparencies, the scanner being in the form of a glass cylinder with an opaque surface and the transparencies being in the form of a helix, the ends of the helix being spaced apart by an

opaque surface, and the cylinder and shutter being timed whereby said opaque space moves past the image while the shutter is rotating from a light transmitting to a light obscuring position or vice versa.

4. In a device as described, the combination of a moving picture projector having means to move a film intermittently and project light through the film, a television transmitter having a continuously moving scanning means to scan the picture of the film, a photo-electric cell illuminated by the projected light through the scanning means, said scanning means having an opaque section, an intermittently rotatable shutter, an interconnection between the scanning means and the shutter to rotate the shutter while the opaque section of the scanning means intercepts the light to the cell, said shutter having an intermittent movement, and having means in one position to intercept the light to a cell and in another position to transmit the light.

5. In a device as described in claim 4, said shutter having a pair of obscuring elements with passage for light therebetween, and being mounted on a pivot to align the passage with the light from the projector to the cell or to position the obscuring means transverse to such light.

6. In a device as described, the combination of a moving picture projector having means to intermittently move a film and means to project a beam of light through the moving and stationary film, a photo-electric cell having means to receive the beam of light projected through the film, a continuously moving scanning means having an opaque section between the ends of the scanning elements of said scanning means, a shutter mounted on a pivot and having two parallel opaque sections with an open channel therebetween, a Geneva movement connection between the scanning means and the shutter to rotate the shutter one-quarter turn at each rotation of the scanning means, the one-quarter turn of the shutter being timed to take place when the opaque section of the scanning means intercepts the beam of light.

7. In a device as described in claim 6, the moving picture projector having an optical system to form an image, the television transmitter having a mat plate positioned between the scanner and the film, the image being formed at the mat plate, and the shutter being between the mat plate and the optical system.

8. In a device as described, having a moving picture projector with a drive shaft and means to intermittently move a film, a source of light projecting a beam of light, an optical system to form an image combined with a rotatable scanning cylinder having a series of scanning elements and an opaque space between said elements, a photo-electric cell mounted within the cylinder, a mat plate having an opening in which the image is formed adjacent the scanning cylinder, an intermittently rotatable shutter positioned between the mat plate and the optical system having a pair of parallel opaque sections with an open channel therebetween, means to rotate the scanning cylinder from the drift shaft of the moving picture projector, and a driving connection between the cylinder and the shutter to rotate the shutter one-quarter turn during the period that the opaque section of the scanner intercepts the beam of light.

9. In a television transmitter, a base support, a scanning cylinder rotatably mounted thereon and having scanning transparencies, means to continuously rotate the cylinder, said cylinder having an obscuring section between the ends of the scanning transparencies, a photo-electric cell supported within the cylinder, a shutter, an interconnection between the scanner and the shutter to rotate the shutter intermittently and while the obscuring section is adjacent the shutter during the continuous rotation of the scanner.

10. In a television transmitter, a base, side arms extending above the base, a cross strap connected to the arms, a radial arm connected to the cross strap, a scanning cylinder mounted on a shaft extending through the base and engaging a bearing supported from the cross strap, said scanning cylinder having a helical row of transparencies with an obscuring space between the ends of the transparencies, a photo-electric cell supported from the radial arm, a shutter having a shaft journaled in the base, said shutter having two side opaque sections and a light channel therebetween, means to project light through the light channel of the shutter on to the scanning cylinder, means to intermittently rotate the shutter one-quarter rotation for each complete rotation of the scanning cylinder, and means to continuously rotate said cylinder, said radial arm supporting a matte plate between the shutter and the scanning cylinder, said matte plate having an opening for formation of an aerial image therein, the means to intermittently rotate the shutter comprising a Geneva type of movement timed to rotate the shutter one-quarter turn while the obscuring section of the scanning cylinder passes the opening in the aperture plate.

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