

Feb. 9, 1932.

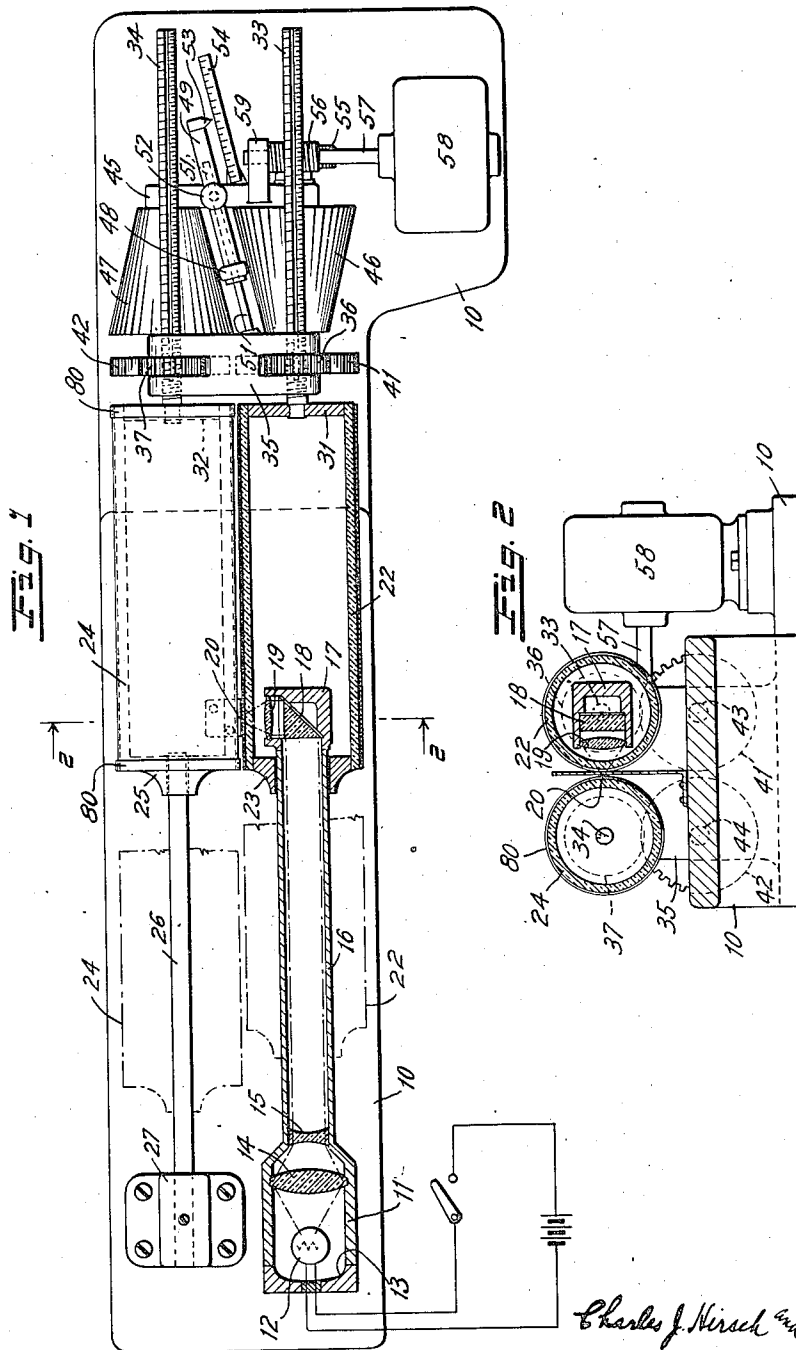
C. J. HIRSCH ET AL

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PICTURE DISTORTING APPARATUS

Filed June 13, 1928

3 Sheets-Sheet 1



INVENTORS
Charles J. Hirsch and Albert D. Jensen
BY *Albert M. Austin*
ATTORNEY

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C. J. HIRSCH ET AL

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3 Sheets-Sheet 2

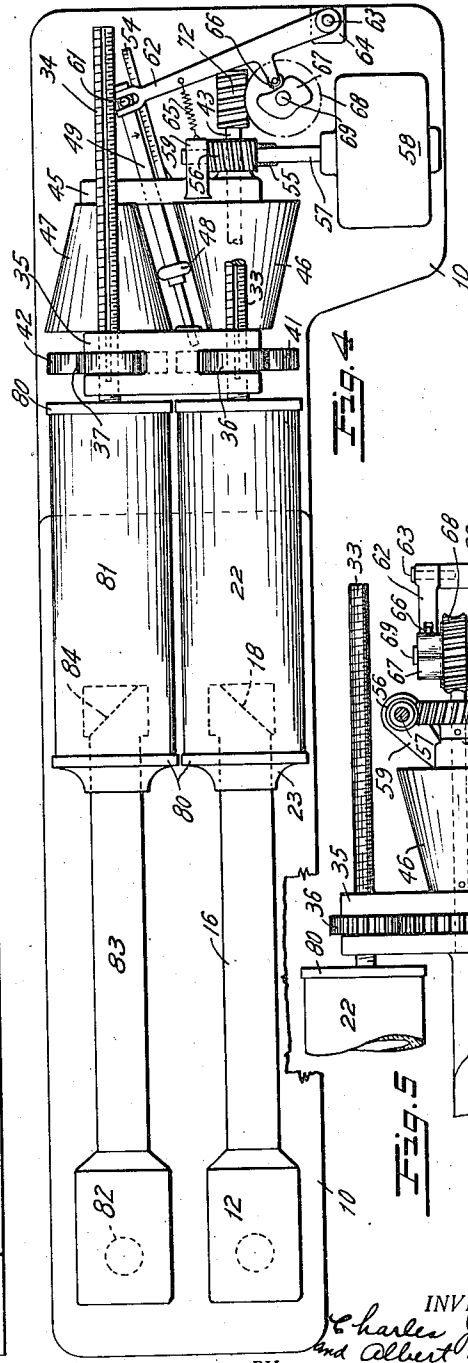
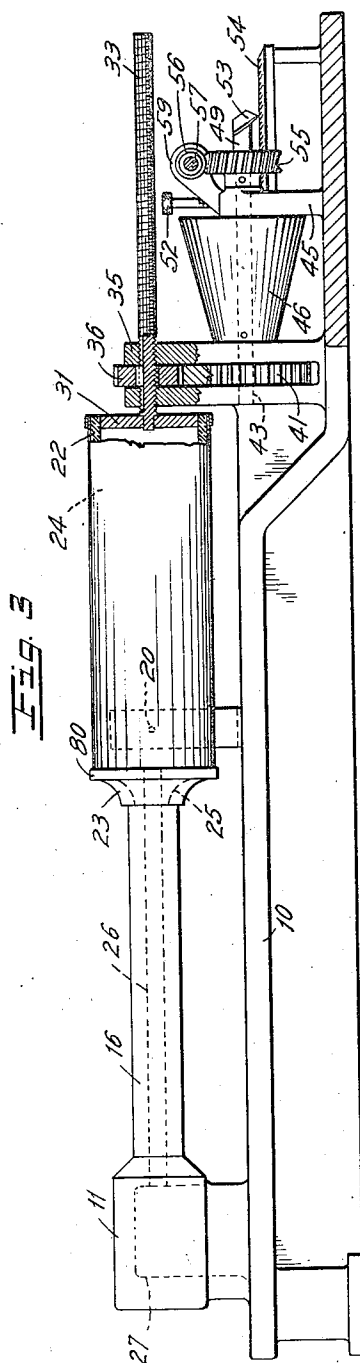


Fig. 4

Fig. 5

INVENTORS.
Charles J. Hirsch
and Albert D. Trevor
BY
Albert M. Questin
ATTORNEY

Feb. 9, 1932.

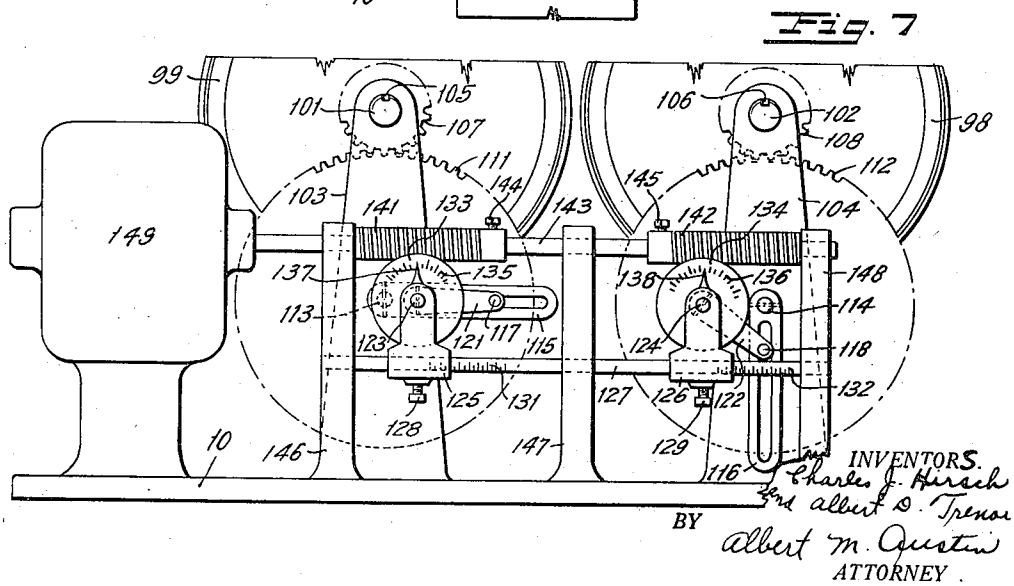
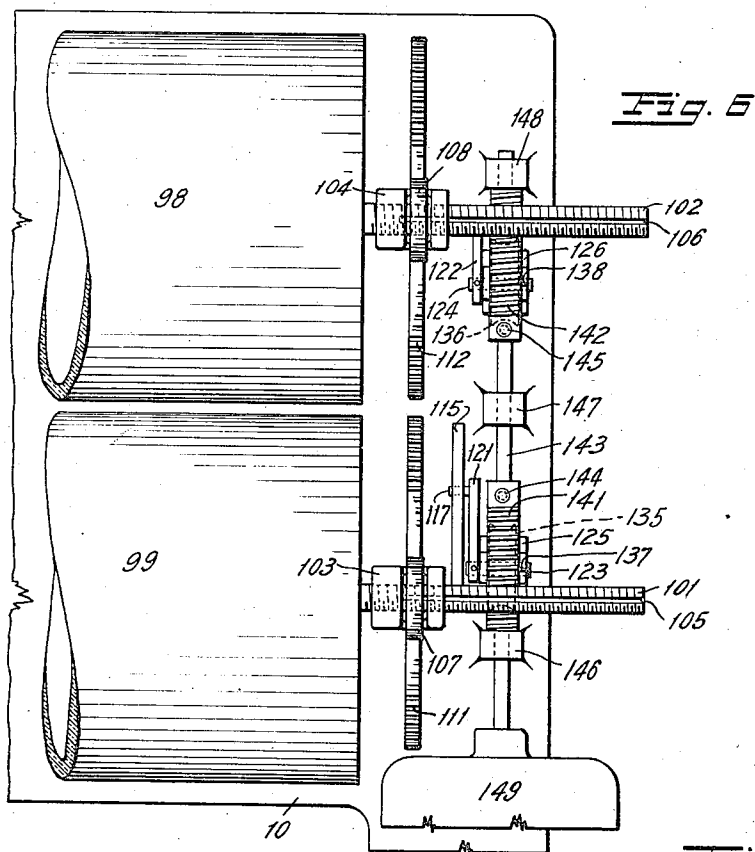
C. J. HIRSCH ET AL

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PICTURE DISTORTING APPARATUS

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3 Sheets-Sheet 3



INVENTORS.
Charles J. Hirsch
and Albert S. Trenor
BY
Albert M. Austin
ATTORNEY.

UNITED STATES PATENT OFFICE

CHARLES J. HIRSCH AND ALBERT D. TRENOR, OF GLOUCESTER, MASSACHUSETTS, ASSIGNORS TO JOHN HAYS HAMMOND, JR., OF GLOUCESTER, MASSACHUSETTS

PICTURE DISTORTING APPARATUS

Application filed June 13, 1928. Serial No. 284,912.

This invention relates to image distortion apparatus and more particularly to an improved means for transferring a given image into an unintelligible form, whereby it may be secretly transmitted to a distant point.

This system may be applied to simple facsimile such as pictures, letters and maps; or to television apparatus or to phonograph records of conversation and to various other uses as will be apparent from the following description:

The invention provides for scanning an image by a light ray at a given speed and differentially transferring the image at some different speed so that adjacent portions of the picture will be transposed and appear on the negative in different relative positions. This is accomplished by placing the positive of the image around a transparent cylinder and causing a light ray to pass helically around the periphery thereof. The light ray passes through the cylinder and is impressed upon the negative which is secured to a similar cylinder. The relative speed of rotation of the two cylinders is varied through predetermined limits, while the image transfer is taking place, whereby the finished negative bears no apparent resemblance to the original image.

The negative may be removed from the apparatus and transmitted in any desired manner without fear of detection. At the receiving end it is placed upon an apparatus similar to the above and again translated into the desired positive. Obviously, the relative speeds of rotation of the two cylinders must be known at the receiving end.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection

with the accompanying drawings forming a part thereof, in which

Fig. 1 is a top plan view of a mechanism constructed in accordance with this invention.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is a side elevation, partly in section of the mechanism shown in Fig. 1.

Fig. 4 is a top plan view of a modified form of the invention.

Fig. 5 is a side elevation, partly in section, of a portion of the mechanism shown in Fig. 4.

Fig. 6 is a broken plan view of a modified form of driving apparatus; and

Fig. 7 is an end elevation thereof.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

The mechanism shown in Figs. 1, 2 and 3 consists of a base 10 upon which is mounted a light housing 11 containing a powerful projector light 12. The beam from this is reflected from a reflector 13 and passes through two lenses 14 and 15 and thence as a parallel beam of light through a hollow cylindrical tube 16 at the end of which is mounted a casing 17. In this casing is secured a mirror 18 which reflects the beam of light so that it will pass through a lens 19 and be focused at 20 on a point on the circumference of a glass cylinder 22.

Mounted in the end of the glass cylinder 22 is a circular disc 23 which is slidably and rotatably mounted on the tube 16. Located adjacent to the cylinder 22 and with its axis parallel thereto is a second cylinder 24, the end of which is closed by a disc 25 which is slidably and rotatably mounted upon a rod 26, this latter being rigidly supported by a bracket 27 secured to the base 10. Located between the two cylinders 22 and 24 is a diaphragm 28 which is provided with a hole at focusing point 20 of the beam of light. Mounted in the other ends of the cylinders

22 and 24 are two discs 31 and 32 to which are secured two threaded shafts 33 and 34 which are threaded in a bracket 35. Carried on the shafts 33 and 34 are two gears 36 and 37 which are keyed to said shafts and adapted to drive the same but may freely slide longitudinally thereof.

Meshing with the gears 36 and 37 are two gears 41 and 42 which are rigidly mounted on two shafts 43 and 44 which have bearings in the bracket 35 and a second bracket 45. Also secured to these shafts are two cones 46 and 47 between which is mounted a roller 48. This roller is rotatably mounted upon the end of a tubular member 49 which is slidably mounted in the bracket 45. The member 49 slides upon a shaft 51 which is secured in the bracket 35 and a thumb screw 52 is threaded into the bracket 45 and may be used to clamp the member 49 in any desired position. The end of the member 49 is provided with a pointer 53 which registers with a graduated scale 54.

Secured to the end of the shaft 43 is a worm wheel 55 which meshes with a worm 56. This worm is mounted on a shaft 57 of a motor 58 which is mounted on the base 10. This shaft is journaled in a bracket 59.

In the operation of this form of the invention a negative or transparent facsimile is secured by any suitable means to the periphery of the cylinder 22. A sensitive film or a sensitized paper is used which is secured to the periphery of the drum 24 by any suitable means, such as spring clips 80. The roller 48 is then set in any desired position as indicated by the pointer 53 of the scale 54 and is clamped in this position by tightening up the thumb nut 52. The light 12 is then turned on and the motor 58 started. This will cause a fairly rapid rotation of the shaft 43 which will drive the cone 46 at the same speed. This, by means of the roller 48, will drive the cone 47 at some other predetermined speed, preferably faster, this speed being determined by the location of the roller 48. The two gears 41 and 42 will then be rotated at the same speeds as the two cones 46 and 47 respectively. These gears, driving through the gears 36 and 37, will cause the cylinders 22 and 24 to be rotated at the same relative speeds.

The light beam which is focused at the point 20 on the circumference of the cylinder 22 will pass through the negative mounted on this drum and cause the sensitized film or paper on the drum 24 to be effected according to the intensity of the light passing through the film on the cylinder 22. As the cylinders 22 and 24 are rotating they will also be moved to the left due to the gears 36 and 37 rotating the shafts 33 and 34 which are threaded in the bracket 35. The speeds or motions to the left of these two drums will be proportional to their speeds or revolution

and therefore determined by the position of the roller 48.

It is seen therefore that there is impressed on the film mounted on the cylinder 24 an image which is similar to that on the film on the drum 22 but the elements of which are spread out over a larger surface and are so changed in their respective positions that this film when developed shows no resemblance to the original film mounted on the drum 22. In other words, the picture on the film of the drum 22 has been so distorted in its transmission to the sensitive film on the drum 24 that it is entirely unrecognizable.

This negative may then be sent by mail or transmitted by a picture machine or by wire or by wireless to any desired destination. At the receiving station is a similar apparatus to that just described and the receiving film is then placed upon the drum 22 and a sensitive film is placed on the drum 24. The roller 48 is then moved in the opposite direction from that in which it was moved in the transmitting apparatus so that the pointer 53 now points to the same number on the other side of the scale, that is to the left of the center.

The light 12 is then switched on and the motor 58 started. The cone 46 will then rotate at a fairly fast rate driving the cone 47 through the roller 48 at a slower rate so that the relative rates of rotation of the cones 46 and 47 at the receiving instrument will be the same relative rates as the cones 47 and 46 at the transmitting station.

The light beam will then pass through the film on the drum 22 and strike the sensitized film on the drum 24. The two drums will be moved to the left as previously described only in this instance the drum 22 will move faster than the drum 24 in exactly the same ratio as the drum 24 moves faster than the drum 22 in the transmitter. When the sensitized film on the drum 24 is developed it will be found that it reproduces exactly the picture which was put on the drum 22 at the transmitter.

In the modified form of the invention shown in Figures 4 and 5, cylinder 22, light source 12, together with a driving mechanism including cones 46 and 47, and driving roller 48 are identical with those above described and have been given corresponding reference numerals. In this modification cylinder 81 is identical in construction with cylinder 22 being formed of a transparent material and provided with a light source 82, from which light is passed through tube 83 and reflected by mirror 84 to the periphery of cylinder 81. The light source and mechanism associated therewith are similar to that described in connection with Figure 1 and consequently are not shown in detail.

The member 49 in this modification is provided with a pin 61 which is engaged by a slotted arm 62. This arm is pivoted at 63 to a bracket 64 which is secured to the base 10.

The arm 62 is held to the left by means of a spring 65. The arm 62 is provided with a roller 66 which engages a cam 67. The cam 67 is provided with two lugs or pins in its under surface (not shown) which fit into corresponding openings in a worm wheel 68. Both the cam and worm wheel are mounted for rotation on a shaft 69 which is supported by a bracket 71. The worm wheel 68 meshes with a worm 72 which is secured to the shaft 43.

In the operation of the modified form of the invention the apparatus is started as already described in connection with Figs. 1, 2, and 3. As soon as the motor 58 starts to rotate it not only drives the two cylinders 22 and 81 in a manner already described but it also causes the worm wheel 68 and the cam 67 to be rotated at a relatively slow speed. This causes the arm 62 to be oscillated about the pivot 63 in a manner dependent upon the shape of the cam 67, this causing the member 49 and roller 48 to be moved back and forth in a pre-determined manner, for varying the ratio of speed between the drums 22 and 81 and also their rate of motion to the left. This causes the distorting of the picture to be carried out at an uneven rate so that the picture is even more unintelligible than in the previous form of the invention.

This picture is then transmitted in any suitable way and when received at the receiving station is this time placed on the drum 81 instead of 22. The sensitive film is then placed on the drum 22 and a cam similar to 67 or if desired the same one, which could have been sent by mail is placed on the worm gear 68 of the receiver, the apparatus set at a zero position and the motor 58 started. The cylinders 81 and 22 will then repeat the relative motions of the cylinders in the transmitter so that the picture produced on the sensitive film will be identical with the picture on the film on the drum 22 at the transmitter. In this way a much more secret method of transmitting information may be accomplished as it is possible to give any desired configuration to the cam 67 so that it would be impossible for a third party to reproduce this exact shape without having access to the original cam.

In the modification shown in Figures 6 and 7, cylinders 98 and 99 correspond to cylinders 22 and 81, shown in Figure 4, and are operated in a similar manner. The driving means, however, comprises positive links which may be set by means of a scale for any given ratio between the speeds of the two cylinders. In this modification cylinders 98 and 99 are mounted on threaded shafts 101 and 102, which pass through threaded bearings 103 and 104 respectively. The shafts are provided with keyways 105 and 106 which are adapted to engage corresponding keys in pin-

ions 107 and 108 and which are slidably mounted on said shafts.

Gear wheels 111 and 112 engage said pinions and are secured to shafts 113 and 114 respectively. Pinned to the ends of these shafts are two slotted arms 115 and 116 which are adapted to receive pins 117 and 118, said pins being freely slidable in said slots. Pins 117 and 118 are carried near the two ends of arms 121 and 122 which are secured to shafts 123 and 124.

These shafts are rotatably mounted in brackets 125 and 126 which are adapted to slide on a square rod 127. Thumb screws 128 and 129 may be used for securing these brackets in any desired position on rod 127, graduations 131 and 132 being provided for indicating the selected position thereof.

Worm wheels 133 and 134 are secured to shafts 123 and 124 and are provided with graduations 135 and 136 which register with corresponding pointers 137 and 138 carried by the brackets 125 and 126. Meshing with the worm wheels 133 and 134 are worms 141 and 142 which are mounted upon a shaft 143 and are secured thereto by means of set screws 144 and 145. Shaft 143 is rotatably mounted in bearings 146, 147 and 148 and may be rotated by any suitable means, such as motor 149.

In the operation of this form of the invention, brackets 125 and 126 are set in any desired position, as indicated by the scales 131 and 132, and are then clamped in this position by means of thumb screws 128 and 129. Worms 141 and 142 are then rotated on shaft 143 to bring arms 121 and 122 into the desired angular position, as indicated by dials 135 and 136.

The picture is placed upon a drum 98 and a sensitive film is placed on drum 99, in a manner similar to that already described in connection with the foregoing figures. Motor 149 is then started, causing the rotation of the worms 141 and 142 which drive worm wheels 133 and 134 at a slower rate. Arms 121 and 122 are thus rotated at the same angular rate by means of pins 117 and 118, to cause rotation of slotted arms 115 and 116 at a variable rate which is dependent upon the setting of the brackets 125 and 126, and the angular relation between the arms 121 and 122. This variable motion of rotation is transmitted through shafts 113 and 114 to gears 111 and 112, which rotate the pinions 107 and 108, and cylinders 98 and 99 at a corresponding variable rate. At the same time these cylinders are moved to the left by shafts 101 and 102 turning in threaded bearings 103 and 104.

It is thus seen that the two drums will be rotated at variable rates, thus causing the picture on drum 98 to be greatly distorted when it is received by the sensitive film on drum 99.

The film containing the distorted picture

may be used at the receiving end for reproducing the original picture, by placing the same and another sensitized film on drums corresponding to drums 99 and 98, already described.

Brackets 125 and 126 of the receiving apparatus are then set in the same position as those on the transmitter, as indicated by the scales 131 and 132, and arms 121 and 122 are set in the same relative positions, as indicated by pointers 137 and 138 and dials 135 and 136.

The particular settings for the above mentioned elements may be indicated at the receiving stations by any desired means or may be placed directly on the transmitted film, since the numbers would be meaningless to any person intercepting the film and desiring to reproduce the same.

The apparatus is then operated in a manner similar to that described in connection with the transmitter, and the distorted picture is transferred from the film to the sensitized paper and reproduced in its original form. In placing the film on the cylinders it is essential that the films be started from exactly the same position on both the transmitter and receiver. This may be insured by providing a zero mark on the cylinders and inserting the films in line therewith.

It is obvious that the modification just described is capable of producing a variably distorted picture which may be reproduced at the receiving end by setting certain pointers at predetermined graduations on their co-operating scales.

It is thus unnecessary to separately transmit a cam or other information between the stations. The key may be contained in a series of numbers which represent the various scale settings and may be included directly on the transmitted picture.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. An image distortion apparatus comprising a pair of rotatable cylinders having parallel axes, means for securing an image about one of said cylinders, means for securing a sensitized film to the other of said cylinders, means for passing a scanning ray through adjacent portions of the periphery of said cylinders, and means for rotating and advancing said cylinders at different speeds, whereby a distorted negative is produced.

2. An image distortion apparatus comprising a pair of rotatable cylinders having parallel axes, means for securing an image

about one of said cylinders, means for securing a sensitized film to the other of said cylinders, means for passing a scanning ray through adjacent portions of the periphery of said cylinders, and means for rotating and advancing said cylinders at different speeds, and causing said light ray to traverse the peripheries of said cylinders in helices of the same pitch.

3. An image distortion apparatus comprising a pair of rotatable cylinders having parallel axes, means for securing an image about one of said cylinders, means for securing the sensitized film to the other of said cylinders, means for passing a scanning ray through adjacent portions of the periphery of said cylinders, means for rotating and advancing said cylinders at different speeds, and means for varying the relative speeds of said cylinders during the scanning operation.

4. In an image distortion apparatus, a pair of cylinders having parallel axes, a source of light mounted in a fixed position in one of said cylinders, means for simultaneously rotating and advancing said cylinders, and means for varying the relative rates of movement thereof.

5. An image distortion apparatus comprising a pair of adjacent cylinders, threaded rods secured thereto, means for rotating said rods for causing rotational and lateral movement of said cylinders, and means for varying the relative speeds of rotation of said rods.

6. An image transfer apparatus comprising a transparent cylinder mounted for rotational and lateral movement, a stationary scanning light directing upon the periphery thereof, means for causing said scanning light to helically traverse said periphery, a second cylinder disposed adjacent the first cylinder and adapted to receive said scanning light, means for rotating and advancing said second cylinder for causing said scanning light to helically traverse the same, and means for rotating said cylinders at different speeds.

7. An image transfer apparatus comprising a transparent cylinder mounted for rotational and lateral movement, a stationary scanning light directing upon the periphery thereof, and means for causing said scanning light to helically traverse said periphery, a second cylinder disposed adjacent the first cylinder and adapted to receive said scanning light, means for rotating and advancing said second cylinder for causing said scanning light to helically traverse the same means for rotating said cylinders at different speeds, and means for varying the relative speeds of rotation during the operation of said light.

8. In an image distortion apparatus, a pair of cylinders having parallel axes, a source of light mounted in a fixed position in one of said cylinders, means for simultaneously rotating and advancing said cylinders and

means for varying the relative rates thereof comprising a slotted arm operatively associated with one of said cylinders and a driving pin cooperating therewith and rotatable about a different center.

9. In an image distortion apparatus, a pair of cylinders having parallel axes, a source of light mounted in a fixed position in one of said cylinders, means for simultaneously rotating and advancing said cylinders, means for varying the relative rates thereof comprising slotted arms operatively associated with said cylinders and driving pins cooperating therewith and rotatable about different centers, and means for varying the initial angular position of said arms, whereby the two cylinders are displaced in phase with respect to each other.

10. In an image distortion apparatus, a pair of cylinders having parallel axes, a source of light mounted in a fixed position in one of said cylinders, means for simultaneously rotating and advancing said cylinders, means for varying the relative rates thereof comprising slotted arms operatively associated with said cylinders and driving pins cooperating therewith and rotatable about different centers, and scales for indicating the relative angular positions of said arms.

11. In an image distortion apparatus, a pair of cylinders having parallel axes, a source of light mounted in a fixed position in one of said cylinders, means for simultaneously rotating and advancing said cylinders, means for varying the relative rates thereof comprising slotted arms operatively associated with said cylinders and driving pins cooperating therewith and rotatable about different centers, means for varying the initial angle of positions of said arms, whereby the two cylinders are displaced in phase with respect to each other, and means for varying the initial position of said pins in said slotted arms, whereby the differential movement of said cylinders may be controlled.

12. In an image distortion apparatus, a pair of cylinders having parallel axes, a source of light mounted in a fixed position in one of said cylinders, means for simultaneously rotating and advancing said cylinders, means for varying the relative rates thereof comprising slotted arms operatively associated with said cylinders and driving pins cooperating therewith and rotatable about different centers, means for varying the initial angles of positions of said arms, whereby the two cylinders are displaced in phase with respect to each other, and means for varying the initial position of said pins in said slotted arms, whereby the differential movement of said cylinders may be controlled, and scales for indicating the setting of said pins.

13. An image distortion apparatus comprising a pair of rotatable cylinders, means for securing an image about one of said cyl-

inders, means for securing a sensitized film to the other of said cylinders, means for passing a scanning ray through adjacent portions of the periphery of said cylinders and means for rotating said cylinders at different speeds and for causing relative longitudinal movement of said cylinders and said ray whereby a distorted negative is produced.

14. An apparatus for transferring an image to a sensitized film in distorted relationship comprising means for maintaining said image and said film in cylindrical form, means for passing a scanning ray through adjacent portions thereof and means for causing different peripheral movements of said image and said film and for causing relative longitudinal movement between said image and film and said ray whereby said image is traced onto said film in a distorted position.

15. An apparatus for transferring an image to a sensitized film in distorted relationship comprising means for maintaining said image and said film in cylindrical form, means for passing a scanning ray through adjacent portions of the periphery thereof and means for causing different peripheral movements of said image and said film with respect to said scanning ray.

16. An apparatus for transferring an image to a sensitized film in distorted relationship comprising means for maintaining said image and said film in cylindrical form, means for passing a scanning ray through adjacent portions of the periphery thereof, means for causing different peripheral movements of said image and said film with respect to said scanning ray and means for setting the speeds of movement of said image and said film to a predetermined ratio.

In testimony whereof we have hereunto set our hands and seals.

CHARLES J. HIRSCH.
ALBERT D. TRENOR.