

March 6, 1928.

F. M. CARROLL

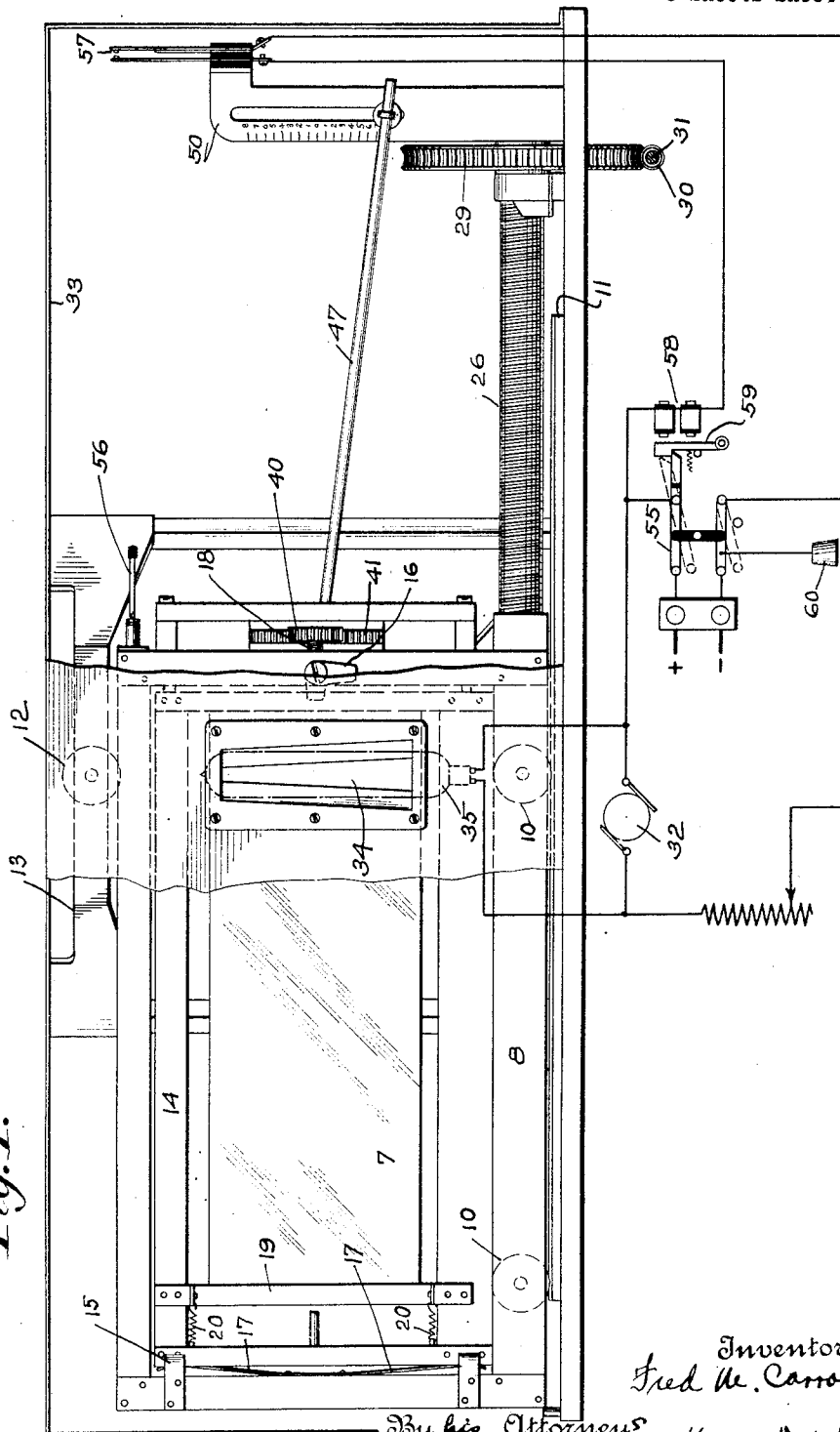
1,661,560

MACHINE FOR PHOTOGRAPHICALLY PRINTING ON CYLINDERS

Filed Dec. 12, 1924

5 Sheets-Sheet 1

Fig. 1.



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5 Sheets-Sheet 2

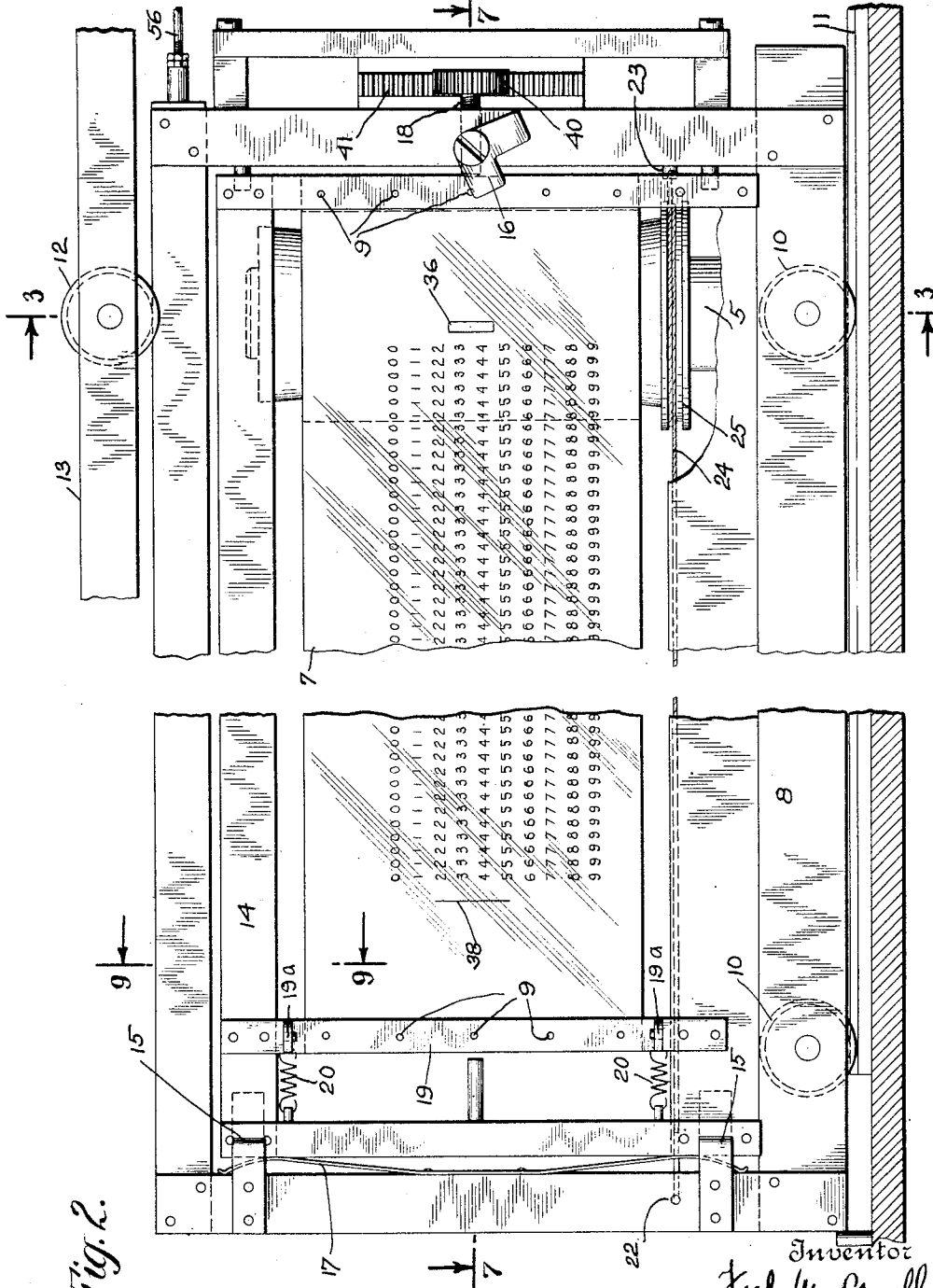


Fig. 2.

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5 Sheets-Sheet 3

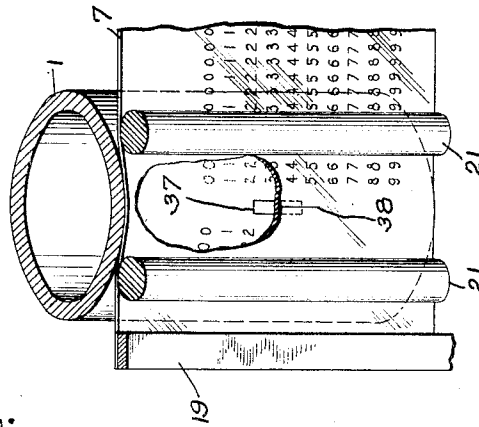


Fig. 4.

35a

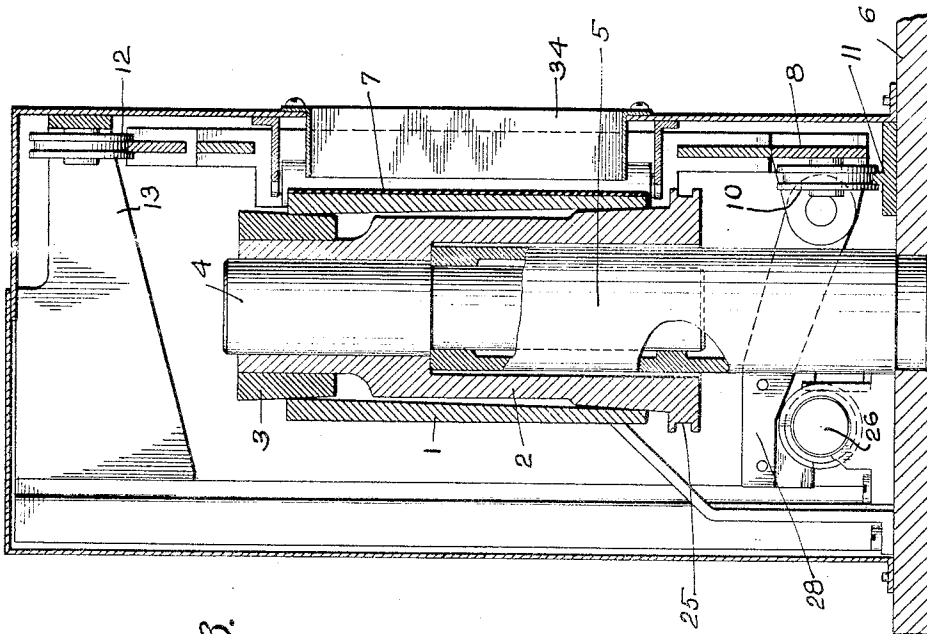


Fig. 3.

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Fig. 5.

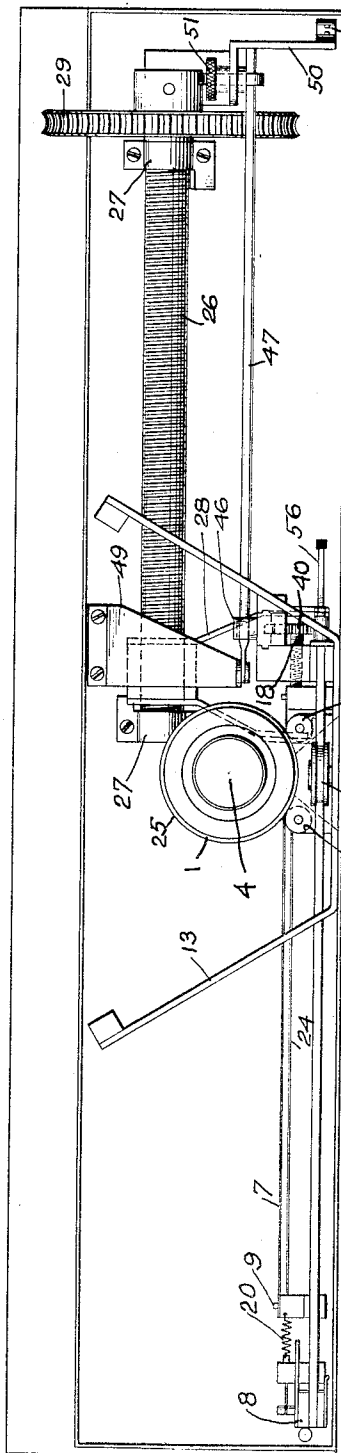
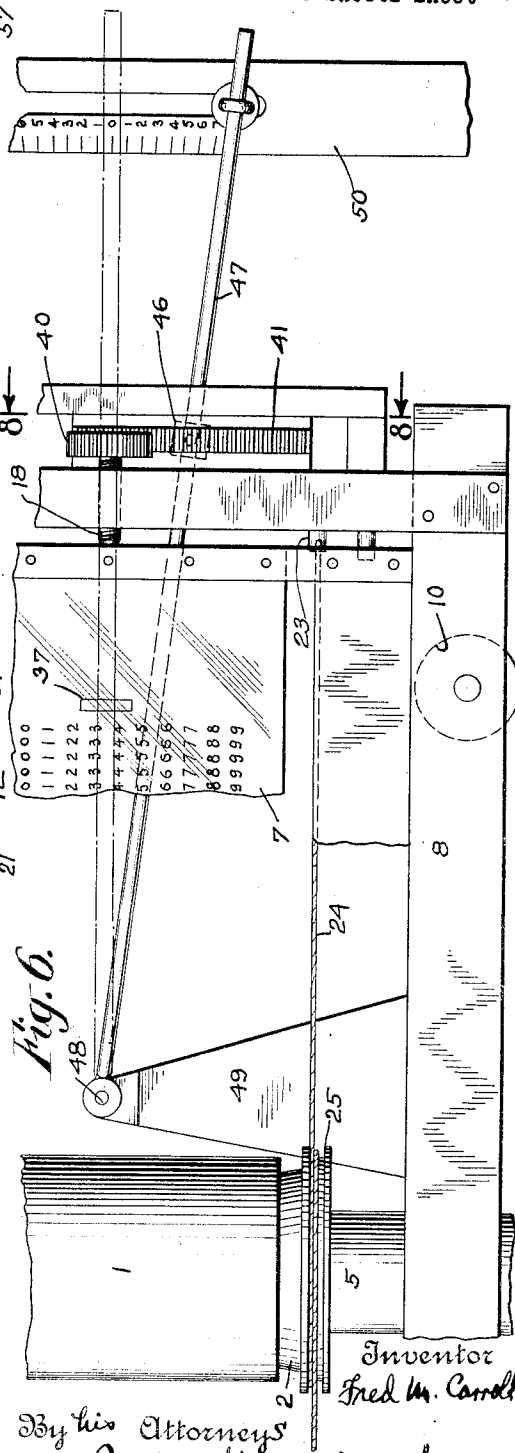


Fig. 6.



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5 Sheets-Sheet 5

Fig. 7.

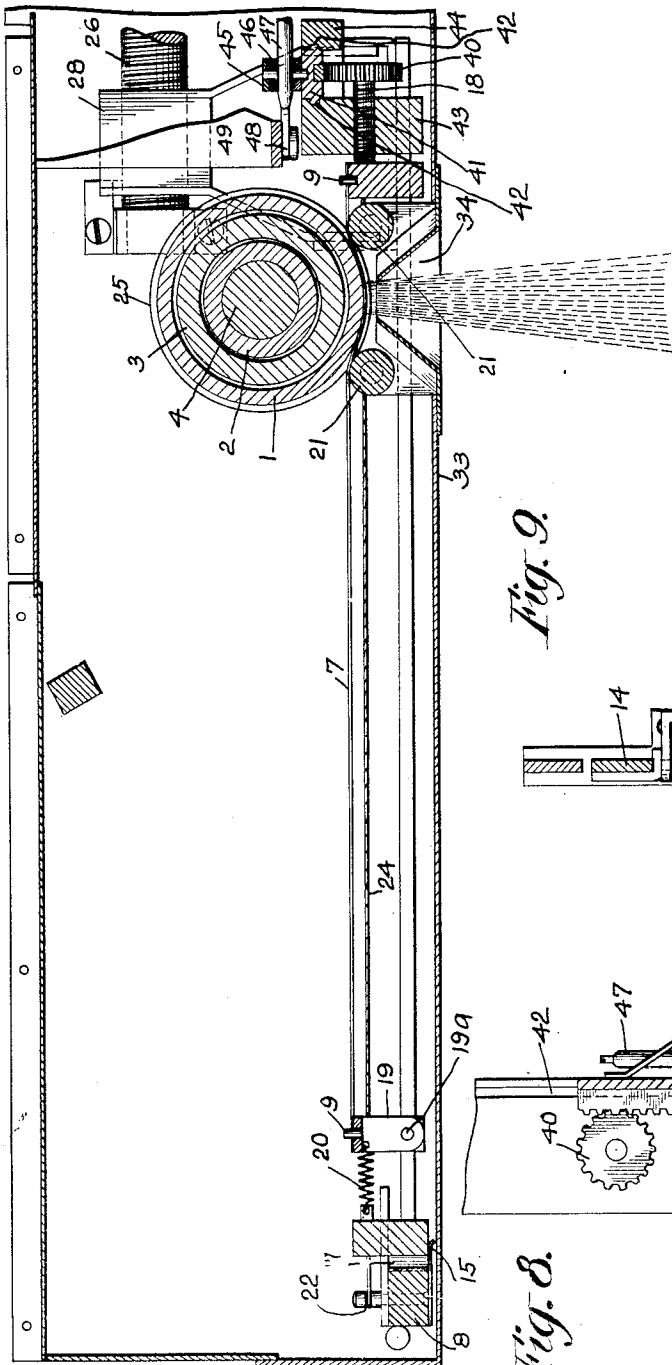


Fig. 9.

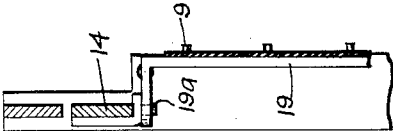
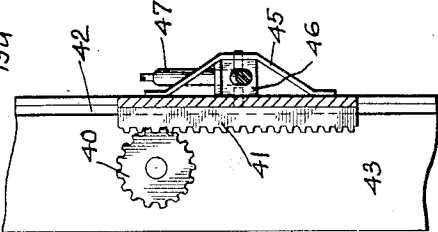


Fig. 8.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR PHOTOGRAPHICALLY PRINTING ON CYLINDERS.

Application filed December 12, 1924. Serial No. 755,372.

This invention relates to negative transfer or photograph printing machines. More specifically, it relates to machines for transferring images or characters from a photographic film to a cylinder which is to be etched for printing purposes.

Ordinarily it is possible to produce the engraving on a flat piece of metal and to curve the latter into a self supporting cylinder, or to wrap it about a cylindrically shaped supporting member. Where a high degree of accuracy is desired, however, it has been found to be more practicable to do the etching directly upon a well finished cylinder.

The object of the present invention is to devise a method and means for transferring the images or characters with a high degree of exactness to an accurately proportioned cylinder.

In illustrating the invention, I have shown a cylinder as being prepared for an etching with which to print record cards for use in tabulating machines. In this instance the circumference of the cylinder is equal to the length of the card which is to be printed, and the characters must be accurately placed on the card.

Referring to the drawings wherein I have shown what I now consider to be the preferred form of my invention:—

Fig. 1 is a front elevation of the machine with the covering partly broken away to show the interior. The view also includes an electric wiring diagram.

Fig. 2 is an enlarged view of the left hand end of the machine seen in Fig. 1, showing the interior.

Fig. 3 is a section taken on line 3—3 of Fig. 2, showing the mounting of the cylinder to be etched.

Fig. 4 is a fragmentary detail showing the film from which the transfer is being made, and the cylinder to which it is being made.

Fig. 5 is a plan view of the machine.

Fig. 6 is a fragmentary detail of the right-hand end of the machine as seen in Fig. 1, showing adjusting mechanism for regulating the relative speeds of movement of the cylinder and the film while the transfer is being effected.

Fig. 7 is a section taken on line 7—7 of Fig. 2.

Fig. 8 is a sectional detail of the speed regulating mechanism, taken on line 8—8 of Fig. 6.

Fig. 9 is a sectional detail of the film carriage, taken on line 9—9 of Fig. 2.

In the drawings, the cylinder 1, which has been coated with a light-sensitive substance, is mounted on a rotatable member 2, and is centrally and securely held thereon by a tapered sleeve 3. The member 2 is fixed on a spindle 4 reaching into a hollow post 5 fixed to the base 6 of the machine. The member 2 is thus adapted to rotate about a vertical axis.

The transparent film 7, from which the transfer is to be made, is produced by photographing a form made up in accordance with the form of card desired. The film is made as near as possible to the exact size of the card to be printed. The film is mounted in a carriage 8; holes along the ends of the film adapting it to be hooked over pins 9 on the carriage. The carriage is provided with flanged wheels 10 mounted on a track 11 for movement across the machine. The upper frame work of the carriage is guided between the flanges of a trolley wheel 12 mounted on a fixed bracket 13. Removably mounted in the carriage 8 is the film frame 14, held in position by projections 15 and latch 16 on the carriage frame. The left-hand end of the film frame presses against a leaf spring 17, and the right-hand end butts against an adjusting screw 18. The pins 9 at the right-hand end of the film frame are fixed directly to said frame, while those in the left-hand end are fixed to a bar 19, pivotally mounted on the film frame as at 19^a (Fig. 9), pulled toward the left by springs 20. This causes the film to be pulled taut irrespective of slight variations in the length of the film. It also permits the film support to yield when the film is pressed into contact with the cylinder to conform to the curvature thereof for a short distance as seen in Figs. 4 and 7. The film is held against the cylinder in this manner by upright rollers 21 carried by a removable cover 22 doweled to the machine base so as to be removable therefrom.

Attached to the carriage 8 at 22 and 23 is a cord 24. This cord is wrapped around a grooved portion 25 of the cylinder-supporting member 2, and is tightly drawn. Thus, as the film carriage is moved across the machine, the cylinder is caused to rotate, to maintain a rolling contact with the film.

The movement of the film carriage is ef-

fectured by means of a screw 26 mounted in bearings 27 fixed with respect to the machine. The screw cooperates with a threaded bracket 28 fixed to the carriage. The screw 26 has fixed to one end thereof, a work wheel 29, meshing with a worm 30 on the shaft 31 of an electric motor 32.

The parts are enclosed within a casing 33, having a window 34 adapted to permit the rays of light from a source 35 to penetrate the film where the latter is in contact with the cylinder. As shown in Fig. 1, the window may be wider at the bottom than at the top. The reason for this is that after coating the cylinder with the light-sensitive emulsion, it is stood on one end while drying, and this permits the emulsion to flow downwardly so that when dried, the coating is slightly thicker and denser at the lower end than at the top. The wider opening will expose the lower end of the cylinder to the light for a greater length of time, and the effect of the exposure is uniform throughout the width of the cylinder.

In Fig. 1, the light 35 is shown as of the bulb type; narrow and long enough to cover the full width of the film, and may have a concentrated filament and be filled with nitrogen. Such a light may be placed in front of the window in the relationship indicated in dotted lines in Fig. 1. Where a point source of light is used, however, the light is preferably placed low with respect to the window 34, as indicated at 35^a, so that the light will be more intense where the emulsion is thicker on the cylinder.

In setting up the machine the film carriage is placed at the extreme left-hand of the machine, with the right-hand portion of the film in contact with the cylinder, as in Figs. 2 and 7. In this position, a rectangular hole 36 through the film, rests over the cylinder. Through this hole, the operator traces a rectangular scratch or mark upon the cylinder as seen at 37 (Fig. 4). The film is then caused to feed to the right until the cylinder has turned one complete revolution. If the photographic reduction upon the film has been exact in dimensions, a line 38 on the left-hand portion of the film will bisect the rectangle 37 as in Fig. 4. The film carriage will then be set back to the starting position, and caused to travel once more across the machine while the light is turned on so as to effect the photographic transfer of the characters from the film to the cylinder. If, however, the film is slightly short or slightly long the line 38 will not reach the middle of the rectangular mark or will pass beyond it. If the line 38 falls short, then all of the characters on the film are too close together, and if the line passes beyond the middle of the rectangle, then all of the characters are too far apart on the film. Either of these conditions may be remedied,

by causing the film to feed faster than the cylinder rotates on the one hand, or slower on the other. This may be done by causing a relative movement of the film frame and carriage in one direction or the other as the carriage is feeding. This relative movement is progressive, and occupies the entire time that feeding is taking place, and causes all of the characters to be transferred to the cylinder correctly spaced laterally.

The mechanism for effecting this adjustment will now be described.

As has been pointed out, the film frame 14 presses at one end against the spring 17, and rests at the other end against the adjusting screw 18. By turning the adjusting screw one way, the film frame may be moved to the left with respect to the film carriage, compressing spring 17. If the screw is turned the other way, the spring, pressing against the frame, moves it in the other direction, following the screw. Integral with the screw 18 is a gear 40 meshing with a rack 41, mounted to slide endwise in grooves 42 in members 43, 44, forming part of the film carriage 8. A bracket 45 is fixed to the back of the rack, and a block 46 is pivotally mounted between this bracket and the rack. A rod 47 pivotally attached at 48 to a bracket 49 fixed to the machine base, passes through a hole in the block 46, and cooperates at the end opposite its pivoted end with a fixed member 50. The rod may be adjusted up and down the scale marked on this member, and may be fixed in position by a setting nut 51. If the rod is set at zero as indicated in dotted lines in Fig. 6, no effect is produced upon the relative feeding speeds of the cylinder and film, but if the rod is set to one side of zero position as shown in full lines in Fig. 6, then as the film carriage moves from left to right, the block 46 is constrained to follow along the rod 47 as its path. This causes a constant movement of the rack 41 in its supporting grooves 42, and this in turn causes a slow and constant rotation of the gear 40 and set screw 18. Thus, the film frame is caused to move constantly to the left or to be moved constantly to the right by spring 17, with respect to the film carriage. If the rod 47 is set to the other side of the zero position, the relative movement of the film frame will be in the opposite direction. As the cylinder is turned by the cord 24 fastened directly to the film carriage, its speed remains constant irrespective of the changes in the rate of feed of the film.

When the operator has adjusted the rod 47 to effect the proper relative rates of feed for the film and cylinder, he sets the carriage to its starting position at the left of the machine as in Fig. 1. He then closes the switch 55, which is held closed by spring-pressed armature latch 59. This supplies

current to the light 35, and at the same time starts the motor 32. The exposure and the feeding then commence. When the carriage reaches the end of its journey, and the photographic transfer has been completed, a projection 56 on the film carriage 8 engages and closes contacts 57, closing a circuit through electro-magnets 58, attracting armature 59, and releasing the switch 55 which is then opened by the downward pull of the weight 60. This shuts off the light and the motor.

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

1. In a photographic transfer device, a film carriage, means for supporting a light-sensitive member adjacent to said carriage, means for actuating said carriage and said supporting means in synchronism, and means for adjusting a film carried by said carriage relatively to the carriage while the latter is being actuated.

2. In a photographic transfer device, a film carriage adapted to adjustably support a film, means for supporting a light-sensitized element adjacent to said carriage, means for actuating said carriage and said supporting means at corresponding speeds, and means for adjusting a film in said carriage during said actuating.

3. In a photographic transfer device, a light source, means for feeding a film past said source, means for feeding a light-sensitized member in accordance with the feeding of such film, and means for adjusting the relative rate of feeding of such film with respect to the rate of feeding of such member.

4. In a photographic transfer device, a light-proof shield having an opening therein to admit light, means for feeding a film past such opening, means for feeding a light-sensitized member in accordance with the feeding of such film adjacent to said opening, and means for varying the rate of feed of the film with respect to the rate of feed of such member.

5. In a photographic transfer device, a light source, means for feeding a film past said source, means for rotating a sensitized cylinder in contact with such film adjacent to said source, and means for varying the rate of feed of the film with respect to the rate of rotation of the cylinder while both are in operation.

6. In a photographic transfer device, a carriage, a film holder adjustably mounted in said carriage, a rotatable sensitized cylinder holder adjacent to said carriage, means for actuating said carriage and rotating said cylinder holder at corresponding speeds, and means for variably adjusting said film holder with respect to said carriage during said actuation.

7. In a photographic transfer machine, a

carriage, means for moving said carriage, a film frame supported thereby, an adjusting screw for adjusting said frame with respect to said carriage, and means operable by the machine during movement of said carriage for actuating said adjusting screw.

8. In a device for transferring photographs to an initially sensitized cylinder including a carriage supporting a film, a member supporting the sensitized cylinder in contact with the film, and a cable attached to said carriage and wrapped around said member whereby movement of said carriage progressively causes contact of said film and the said cylinder.

9. In a photographic machine in combination, a cylinder, and means for supporting a film in proximity thereto, means for rotating the cylinder and for moving the aforesaid means for displacing the film endwise to the cylinder while the latter is rotating, means associated with the aforesaid means for affording variable and positive rates of drive intermediate the cylinder and the film supporting means whereby variable lengths of film can be coordinated to be completely and exactly exposed upon exactly rotating the cylinder to the extent for one revolution thereof.

10. In a photographic transfer machine, in combination, a cylinder, means supporting a film in proximity thereto, means for rotating the cylinder and for also moving the aforesaid means for displacing the film endwise to the cylinder while the latter is rotating, and means for variably coordinating the driving relations intermediate the cylinder and the film supporting means to provide for traversing variable lengths of film past said cylinder for a fixed and determined extent for circumferential travel of said cylinder.

11. The invention set forth in claim 10 in which means is provided for causing the supplementary progressive movement of the film relatively to the cylinder, which means includes instrumentalities for providing a progression which is uniform throughout the travel of the film.

12. The invention set forth in claim 10 in which means is provided for affording a progressive rearward creep of the film relative to the advancing cylinder and in which means is provided for maintaining the aforesaid progressive rearward creep of the film uniform throughout the travel.

13. In a photographic transferring machine wherein an image from a film is projected upon a sensitized cylinder by traversing the film past the cylinder while the latter is rotated and during exposure of light through the film, in combination with means for permitting preliminary checking of a check point upon the cylinder relatively to a locus upon an end of the film, means for ro-

tating said cylinder and for moving said film at such relative rates that said definite locus shall appear opposite said check upon one complete revolution of said cylinder irrespective of the amount of relative movement between the surface of the cylinder and the film.

14. The method of reproducing the whole image from the film of definite length upon an initially sensitized cylinder, which comprises first contacting one end of said film with the surface of said cylinder and indicating the relative relation of said end of said film upon the surface of said cylinder,

then rotating said cylinder and moving said film committantly to the other end of said film, then noting the relative registration of the other end of said film with the previously made indication and repeating the aforementioned steps under different relative rates of travel until such rate of travel capable of bringing said last mentioned end into juxtaposition with the said indication is obtained, and then exposing the film at such last obtained rate.

In testimony whereof I hereto affix my signature.

FRED M. CARROLL.