(No Model.) 4 Sheets—Sheet 1.

W. FRIESE-GREENE.

PHOTOGRAPHIC PRINTING APPARATUS.

No. 563,853. Patented July 14, 1896.

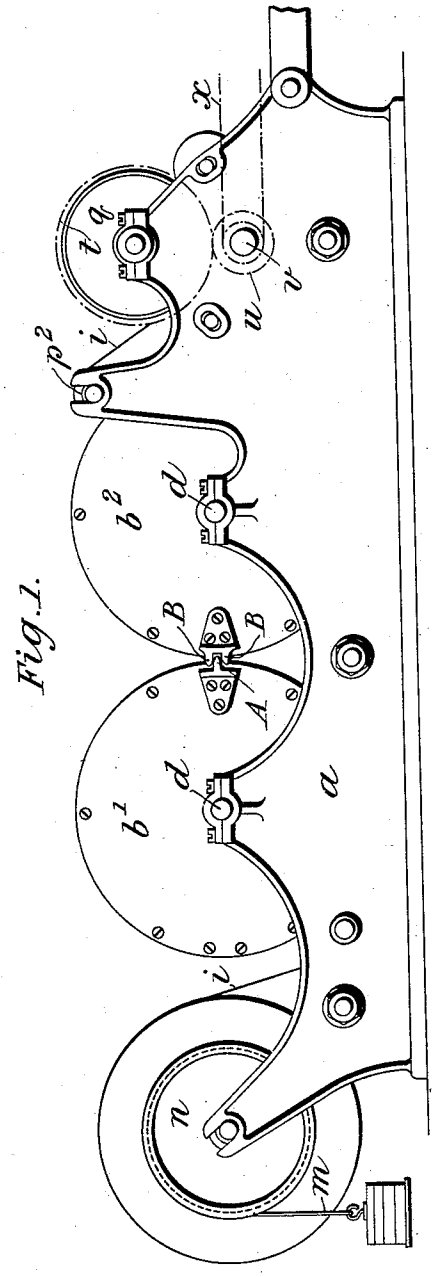

Fig. 1.

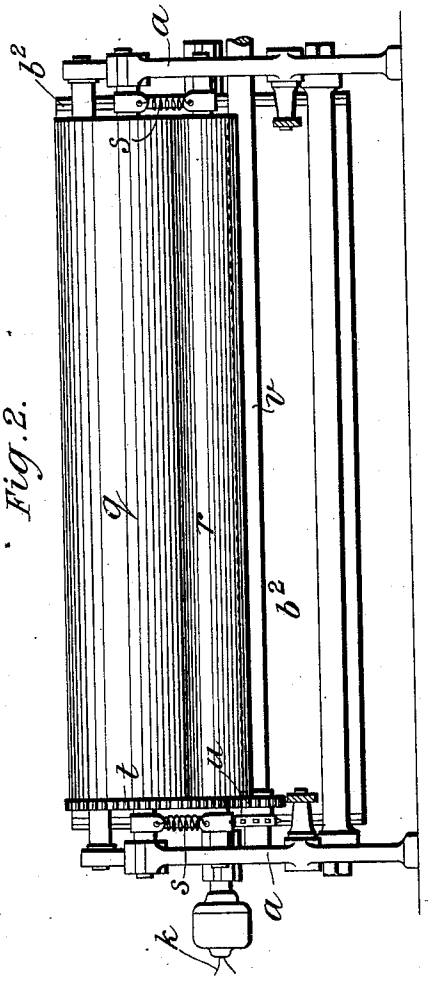

Fig. 2.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 2.

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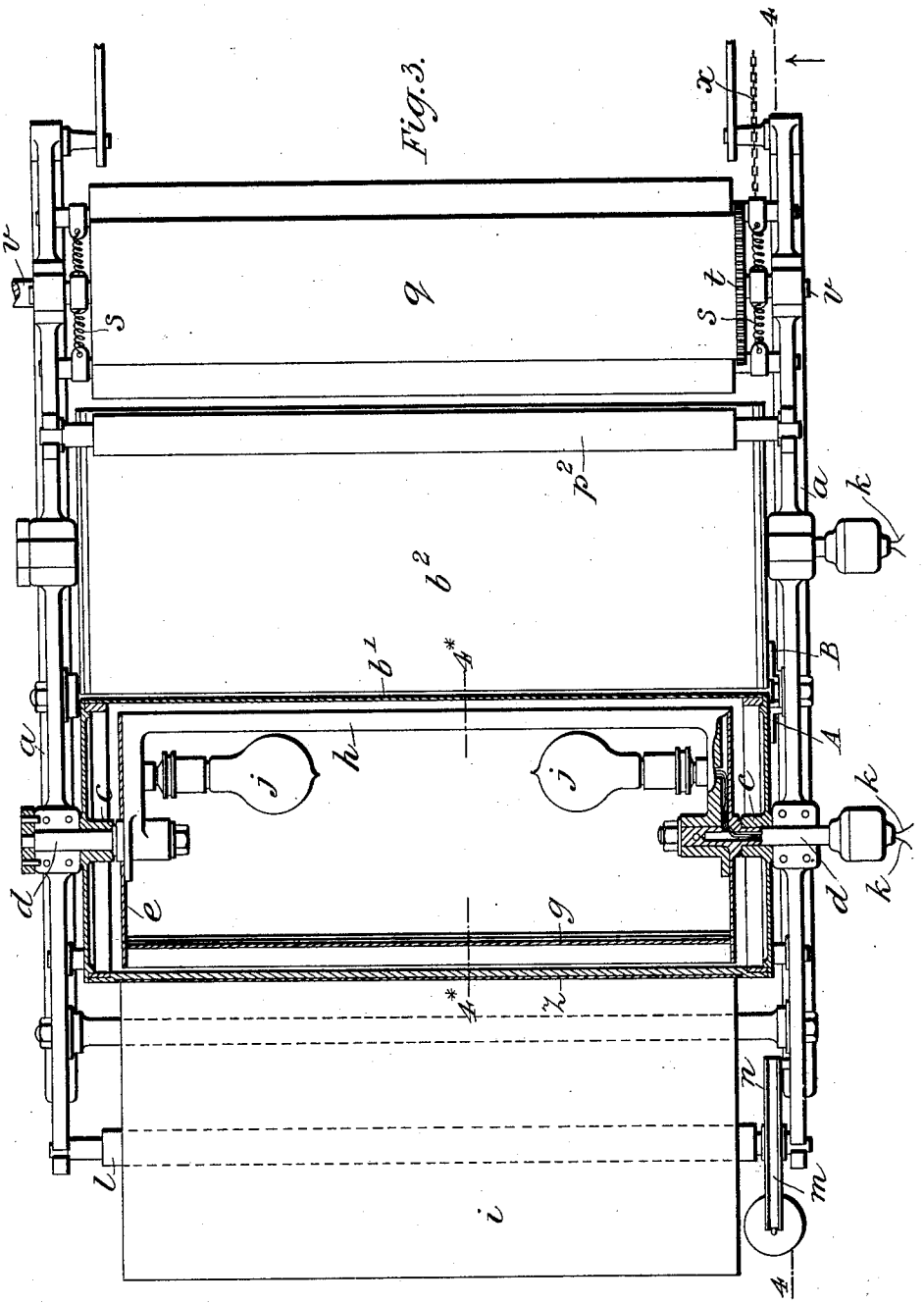
Fig. 3.



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(No Model.) 4 Sheets—Sheet 3.

W. FRIESE-GREENE.

PHOTOGRAPHIC PRINTING APPARATUS.

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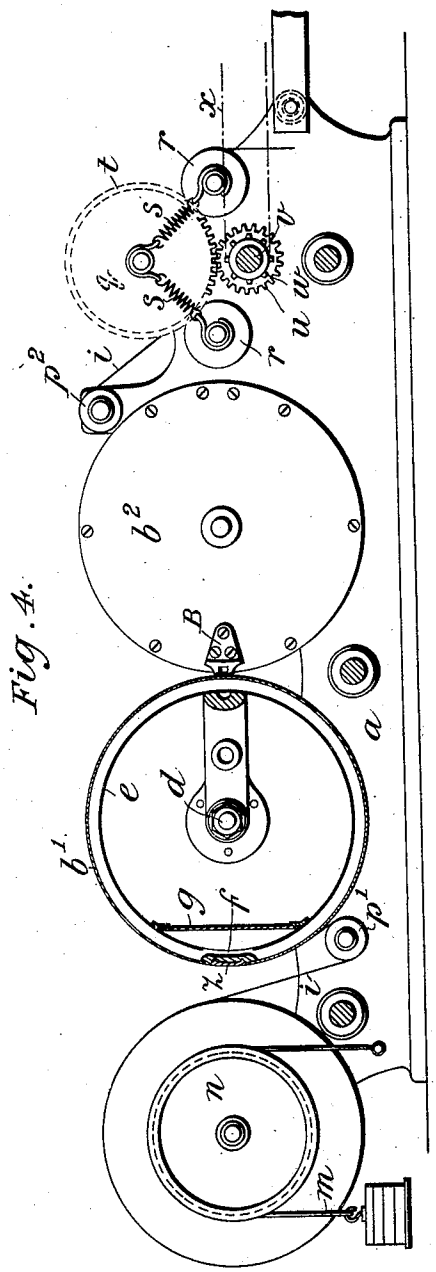

Fig. 4.

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(No Model.) 4 Sheets—Sheet 4.

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PHOTOGRAPHIC PRINTING APPARATUS.

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Fig. 8.

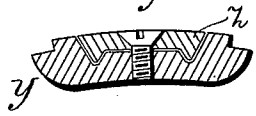


Fig. 6.

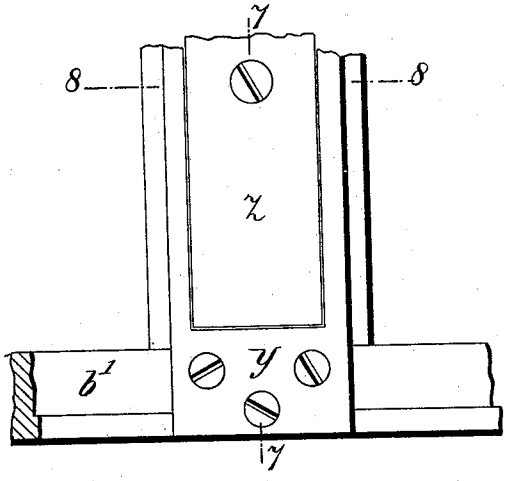


Fig. 7.

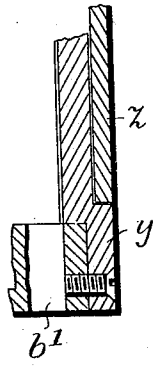
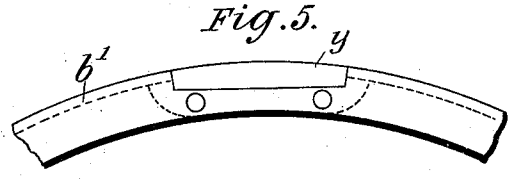


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM FRIESE-GREENE, OF LONDON, ENGLAND.

PHOTOGRAPHIC-PRINTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 563,853, dated July 14, 1896.

Application filed January 20, 1896. Serial No. 576,246. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FRIESE-GREENE, of 39 King's Road, Chelsea, London, England, have invented certain new and useful Improvements in the Production of Prints by Photography and in Apparatus for the Purpose, of which the following is a specification.

This invention has reference to the production of prints by photography, and its chief object is to effect a very rapid production where a large number of copies of the same picture, design, letter-press, or other object is desired.

The invention is particularly applicable to the printing of illustrated newspapers, catalogues, wall-papers, and the like.

The invention consists in printing successively and continuously by means of photography a number of impressions from the same photographic or other negative or from the same series of negatives upon a continuous band of sensitized paper or other sensitized material as this is caused to travel continuously in contact with a translucent cylinder which bears or carries the negative or negatives, the said cylinder being lighted internally and preferably by one or more incandescent electric lamps.

The invention also consists in the combination, for the purpose of carrying out the method or process of printing above described, of a translucent cylinder for carrying circumferentially the negative or negatives, means for lighting this cylinder internally, a device for holding and continuously delivering to the cylinder a sensitized band of paper or other material, guides for conducting this band so that it comes in contact with the required extent of the surface of the negative or negatives which surround the cylinder, and means for imparting rotary motion to the cylinder and forward motion at the same surface speed to the band.

The invention also comprises other improvements, which will be understood by the description hereinafter given.

In the accompanying drawings, Figure 1 is a side elevation of an apparatus in which my improvements are embodied, and Fig. 2 an elevation of the front or leading end thereof. Fig. 3 is a plan view, one of the negative-carrying translucent cylinders being shown in mid-section. Fig. 4 is a section on the line 4 4 of Fig. 3, one of the translucent cylinders being, however, shown in section on the line 4* 4* of Fig. 3. Figs. 5 to 8 are detail views, on a larger scale, illustrating the means of securing the ends of the negative-sheet to the translucent cylinder, Fig. 5 being an end view, and Fig. 6 a face view, of a fragment of the cylinder; Fig. 7, a section on the line 7 7 of Fig. 6, and Fig. 8 a section on the line 8 8 of Fig. 6.

The apparatus shown is provided with two negative-carrying translucent cylinders and is adapted for printing upon both sides of the sensitized band.

a a are side frames, which carry the rest of the apparatus.

b' b^2 are two translucent cylinders, preferably of glass. They are closed at the ends and have sockets or bearings *c c*, which turn on fixed axles or pins *d d*. Within each cylinder b' b^2 is an opaque cylinder *e*, of brass or other material, fixed to the axles *d d*. The cylinder *e* has a longitudinal opening *f*, extending from end to end, and the width of which is determined by the length of time it is desired to expose each particular part of the negative to the light.

g is a sheet of glass fixed in the cylinder *e* opposite the opening *f*.

h is a framé or bent bar fixed to the axles *d d* and carrying two incandescent electric lamps *j j*, the number of which is optional. The conducting-wires *k k* for these lamps are led in through one of the axles *d*, which is made hollow for the purpose.

l is a roller carrying the sensitized band *i*, Figs. 1 and 4.

m is a brake applied to a pulley *n* on the shaft of the roller *l*.

p' p^2 are guide-rollers for the sensitized band.

q is a drawing or feed roller for the band.

r r are pressure-rollers which are forced against the roller *q* by springs *s s*.

t is a toothed wheel on the shaft of the roller *q*. This wheel *t* gears with a pinion *u* on the driving-shaft *v*. On this same shaft is a sprocket-wheel *w*, over which passes a chain *x* for driving the rotating parts of the fixing and developing apparatus. This apparatus does not constitute any part of my present invention and is not shown in the drawings.

When the negatives employed are photo-

graphic negatives, they should be those that have been taken upon flexible translucent material, such as thin sheets of celluloid. The negative sheets are placed around the cylinders b' b^2 and secured thereto. This is preferably effected by the means illustrated in Figs. 5 to 8, that is to say, a longitudinal opening is made in the cylinder b' or b^2 and a strip of metal y is fixed therein having a groove with inclined sides to form a bed to a bar z. The negative sheet, which is cut to the required length, is passed round the cylinder, and its ends are then turned down against the inclined sides of the groove, the sheet being pulled taut. The bar z is then fitted into the groove and fastened by screws, as shown, so as to hold the ends of the sheet securely.

The operation of the apparatus is as follows: The negatives having been secured around the cylinders b' b^2 and the sensitized band i from the roller l having been led under the guide-roller p', then over the cylinder b', then under the cylinder b^2, then over the guide-roller p^2, and then under the drawing-roller q and over the pressure-rollers r r, and the lamps j j being lighted, the driving-shaft v is rotated. The pinion u and wheel t transmit the motion to the drawing-roller q, which consequently draws the sensitized band forward continuously at a uniform speed, while the hand itself as it travels forward imparts rotary motion to the cylinders b' b^2 at the same surface speed. Consequently every section of the sensitized band equal in length to the circumference of one of the cylinders b' b^2 travels around a large part of the cylinder b' in contact with the negative or negatives on that cylinder and has printed on one of its faces by means of the light that passes through the opening f a positive impression of such negative or negatives, the same picture or pictures being produced upon every successive section of the band. On leaving the cylinder b' the band i passes under the cylinder b^2 and then over the guide-roller p^2, and while passing under the cylinder b^2 it has printed upon its other face a successive series of positive impressions from the negative or negatives on the cylinder b^2. The band i goes from the roller p^2 under the roller q and then to the fixing and developing baths. In order to insure that the two cylinders b' b^2 may move at the same speed and to obtain "register" between the printings on the two sides of the band i, I provide one of the cylinders with a tooth or projection A to engage at the end of every rotation between two teeth or projections B B on the other cylinder.

When with the apparatus shown in the drawings it is required to print on only one side of the band i, one of the cylinders b' b^2 is left unlighted.

It is obvious that the apparatus may be constructed to print upon only one side of the band. In this case the second cylinder b^2 will be dispensed with and the band will pass direct from the cylinder b' to a suitably-situated guide-roller and thence to the drawing-roller q.

When the negatives employed are not photographic negatives, they may, for example, be transparencies or sheets having all the parts that do not constitute the design in black, red, or other non-actinic color and the other parts, that is to say, the design, transparent, or vice versa.

If the sheets that bear the negative or negatives are strong enough to be self-supporting, they will themselves constitute the cylinders b' b^2.

What I claim, and desire to secure by Letters Patent, is—

1. In apparatus for producing prints by photography, the combination of a negative-carrying internally-lighted translucent cylinder, a sensitized-band holder continuously delivering the band to the said cylinder, guides compelling the band to travel in contact with part of the circumference of the cylinder, and means for imparting continuous forward motion to the band and rotary motion at the same surface speed to the cylinder, substantially as and for the purpose set forth.

2. In apparatus for producing prints by photography, the combination of two negative-carrying internally-lighted translucent cylinders, a sensitized-band holder continuously delivering the band to the said cylinders, guides compelling the band to travel first with one of its faces in contact with part of the circumference of one of the said cylinders and then with its other face in contact with part of the circumference of the other of the said cylinders, and means for imparting continuous forward motion to the band and rotary motion at the same surface speed to the cylinders, substantially as and for the purpose set forth.

3. The combination with the rotating translucent negative-carrying cylinder b' of the fixed opaque cylinder e having an opening f and lighted internally, substantially as and for the purpose set forth.

4. The combination with two rotating photographic cylinders, means compelling a sensitized band to travel with said cylinders, and means producing photographic impressions on such band while thus traveling, in combination with means connected to said cylinders and preserving them in correct relative position during their rotation, substantially as and for the purpose set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM FRIESE-GREENE.

Witnesses:
JOHN C. NEWBURN,
ROBERT M. SPEARPOINT.