

No. 670,510.

Patented Mar. 26, 1901.

W. FRIESE-GREENE.

PROCESS OF PRINTING AND PRODUCT THEREOF.

(Application filed June 18, 1898.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2.

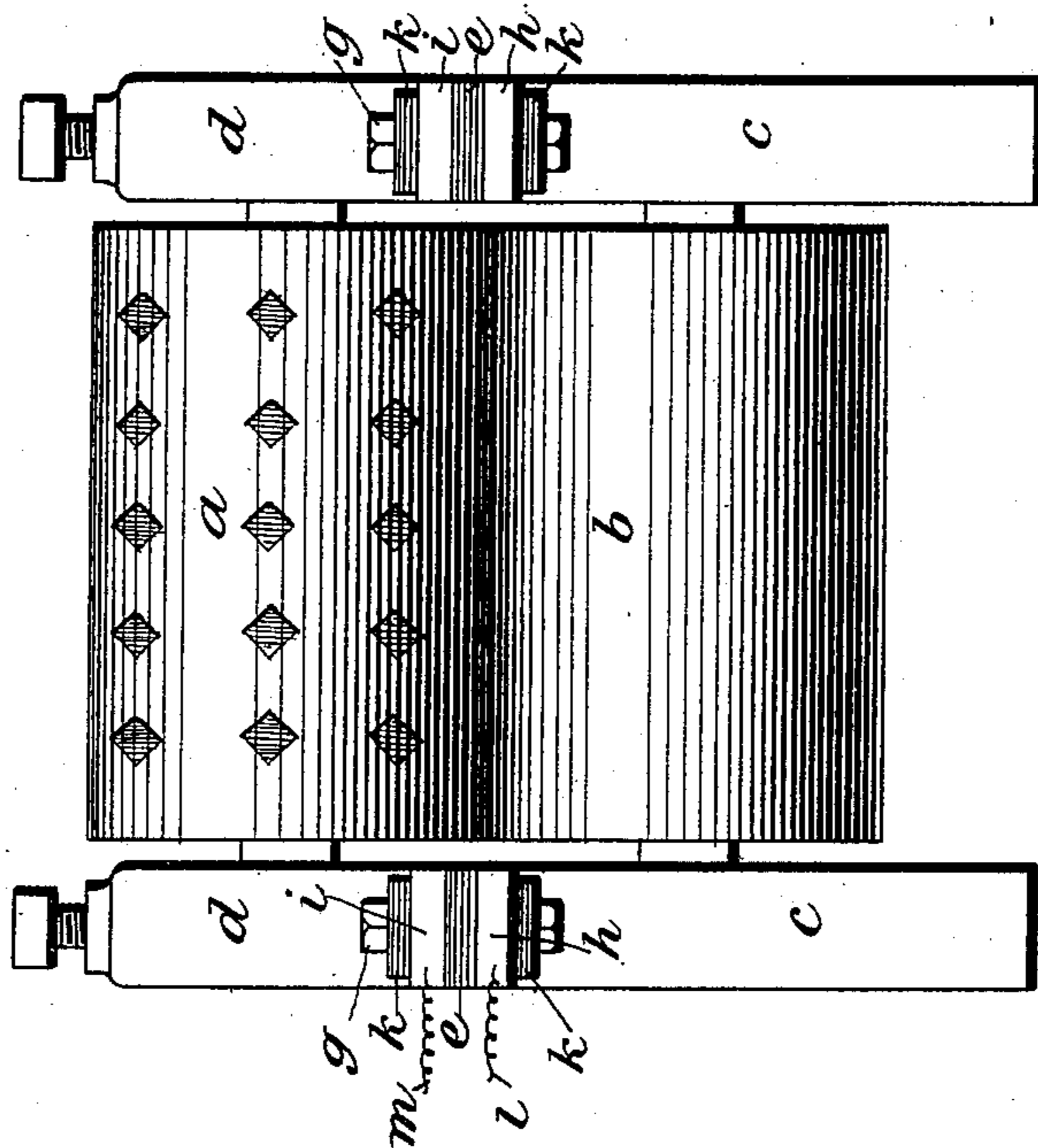
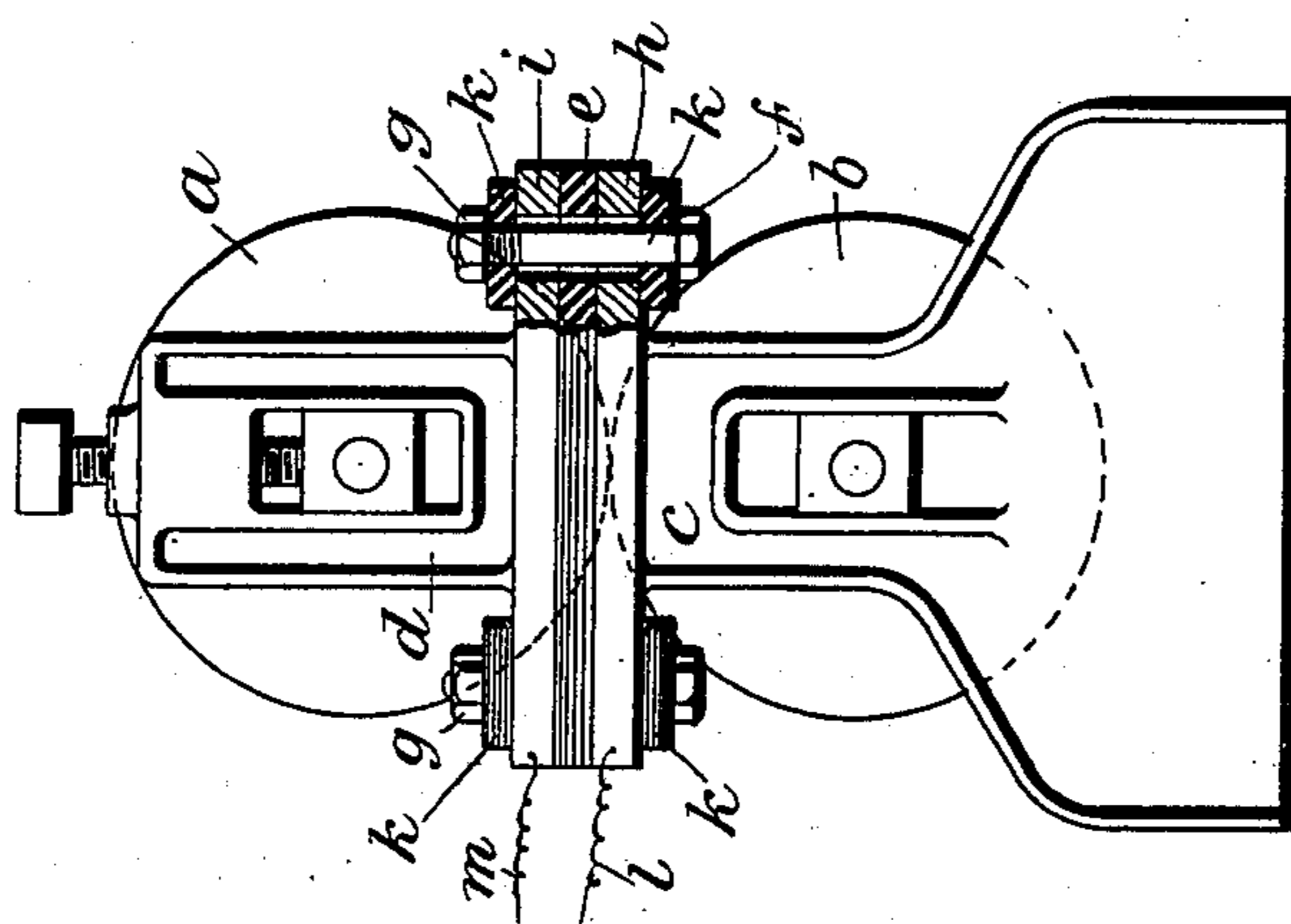


Fig. 1.



Witnesses:  
Theo. T. Snell.  
Chas. J. Emick

Inventor:  
William Friesen-Greene,  
by Nathan C. Fraser & Co.,  
his Attorneys

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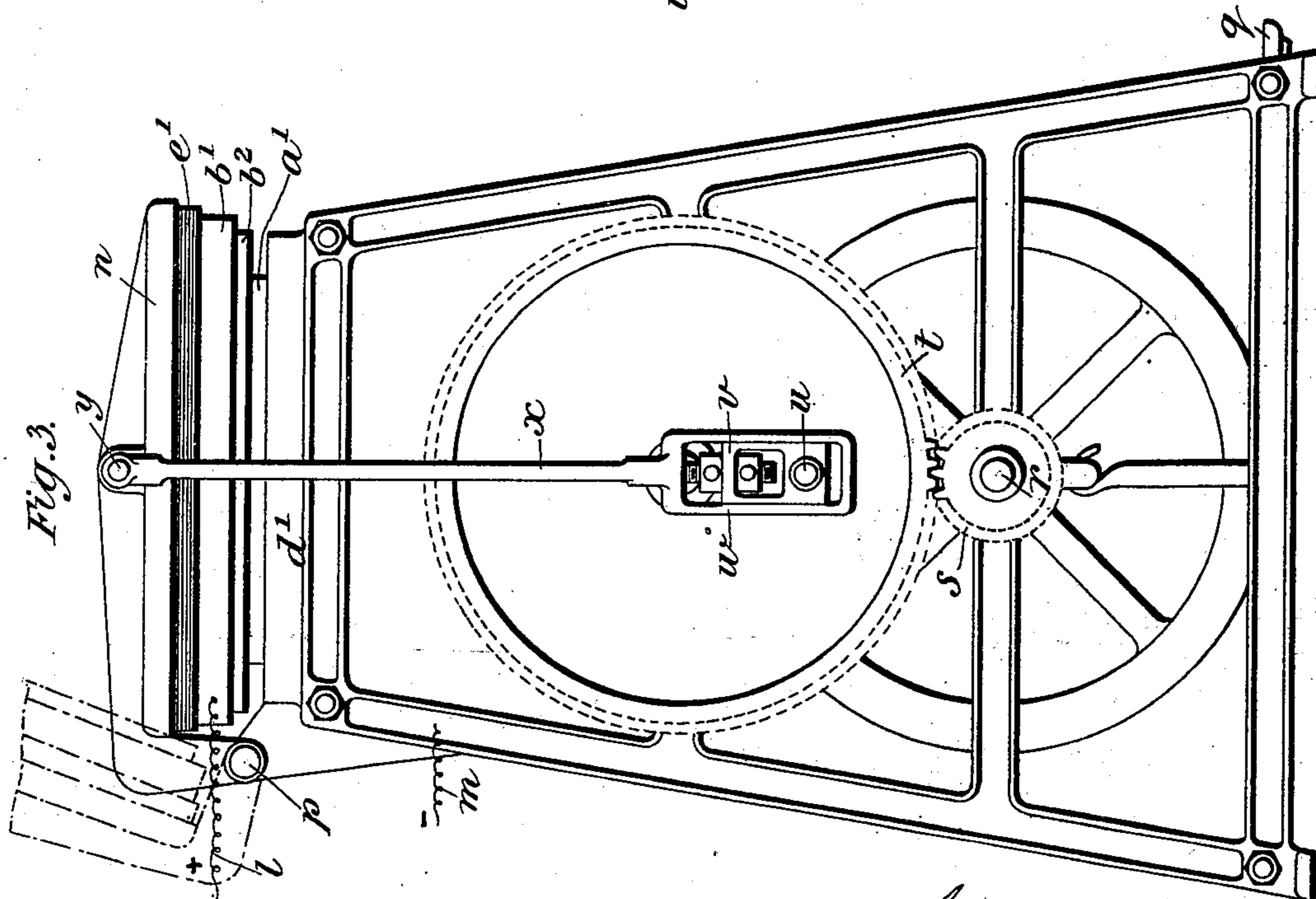
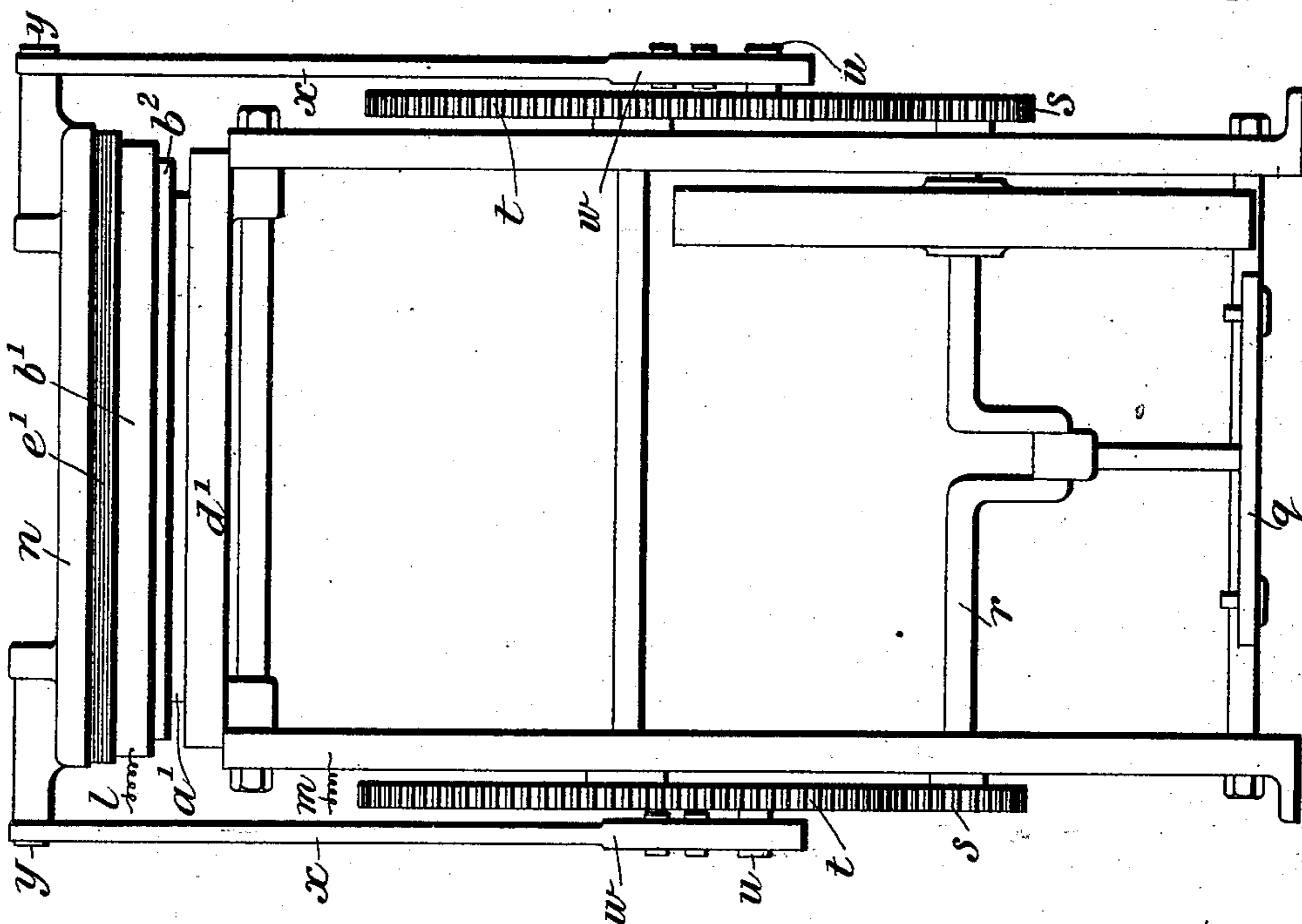
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**2 Sheets—Sheet 2.**



Witnesses,  
Theo. T. Snell.  
Chas. G. Emsick

Inventor:  
William Friese Greene,  
by Arthur C. Frazer <sup>and</sup> Jas.  
his Attorneys

# UNITED STATES PATENT OFFICE.

WILLIAM FRIESE-GREENE, OF LONDON, ENGLAND, ASSIGNOR TO THE ELECTRICAL INKLESS PRINTING SYNDICATE, LIMITED, OF SAME PLACE.

## PROCESS OF PRINTING AND PRODUCT THEREOF.

SPECIFICATION forming part of Letters Patent No. 670,510, dated March 26, 1901.

Application filed June 18, 1898. Serial No. 683,827. (No specimens.)

*To all whom it may concern:*

Be it known that I, WILLIAM FRIESE-GREENE, of London, England, have invented a certain new and useful Improved Process of Printing and Product Thereof, of which the following is a specification.

This invention has reference to the printing or reproduction of words, figures, designs, or the like upon paper, textile fabrics, or other surfaces and to the product thereof, and is more particularly intended to replace the ordinary process of typographic printing and the ordinary process of printing on textile fabrics by a process or method which dispenses with the use of inks or colors and to replace the ordinary printed fabric by a cheaper and more durable one.

According to my invention I effect the reproduction of words, figures, designs, or the like upon paper, textile fabrics, or other surfaces by an electric method of impression. By the process of my invention when the words, figures, or the like to be reproduced to form the product are in the form of electrical conductors a clear reproduction or impression is obtained. It is possible by the invention to work at a high rate of speed, the rapidity of reproduction being only limited by the speed of the machine.

I have discovered that if a material impregnated or incorporated with an oxy derivative of benzene which will reduce a haloid salt of silver be traversed by an electric current in the presence of slight moisture an exact reproduction of the portions of the electrical conductor in contact therewith is instantaneously produced thereon, such reproduction being, as hereinafter described, independent of the material of which said conductor consists and of the direction of current. As a matter of fact it is essential for practical typographic printing that the type-form or printing-plate shall be connected to the negative pole of the circuit, since in practical printing the printing-plate, type, or the like is of attackable metal, which would be rapidly destroyed were it connected to the positive pole. Now the class of electrographic sensitizing-bodies herein referred to will give an instantaneous and permanent print in whichever direction the current be sent—i. e.,

whether the printing-plate is the anode or cathode, this print appearing on that side only of the paper or fabric upon which the printing-plate is impressed. In practice, therefore, I prefer to connect the printing-plate with the negative pole of the circuit. I do not know what is the chemical change which takes place in the oxybenzene derivative of the kind in question on the passage of the electric current through the material containing same, nor what is the exact nature of the decomposition product which becomes visible on the passage of the current; but such oxybenzene derivatives as a class behave in the manner above described when used for electric printing. When I connect the plate bearing the design or the like with the negative pole of the source of electricity, and thus cause the current to traverse the paper before passing to the printing-plate, the printing-plate is not attacked, and consequently takes no part beyond that of a conductor in the production of the impression, yet it will be obvious that the current may be sent in the reverse direction and the printing-plate be connected with the positive pole of the source of electricity. In this case the printing-plate would be attacked and deposited in the paper, thereby influencing the color of the impressions on the paper. I do not, however, claim such utilization of the substance of the printing-plate apart from the characteristic feature of my invention as above described.

In carrying the process of my invention into effect I prefer to prepare the paper, textile fabric, or other surface by coating or impregnating it with or incorporating with it a photographic developer of the oxybenzene series—such as, for example, amidol, metol, or hydroquinon. In practice I have found that amidol applied to the paper or other material in any suitable way (for example, it may be added to the paper-pulp in the process of forming) gives a good result. I place the prepared paper or fabric upon or cause it to travel over a conducting medium—such, for example, as carbon or zinc and preferably with an interposed pad or layer of more or less moist material, such as cloth or blotting paper—and I connect the said medium with

one pole (which in ordinary circumstances will, as above described, preferably be the positive pole) of a continuous current of electricity. I bring in contact with the prepared  
 5 paper or fabric the words, figures, designs, or the like to be reproduced, these being connected with the other pole of the circuit. An ordinary stereotype or electrotpe plate such as is used in typographic printing will  
 10 answer the purpose when it is desired to reproduce the words, &c., so as to resemble ordinary typographic printing. The connections with the current being coupled up, the current will pass through the prepared paper  
 15 or fabric and at once reproduce thereon upon that face of the paper upon which the stereotype, &c., is impressed a clear black or colored facsimile of the words, &c., that are in contact therewith, the color depending upon  
 20 the particular substances employed in the paper. The reproduction can be effected, for example, by feeding in and taking out sheets of prepared paper or fabric in succession, as in printing, by means of a platen or other  
 25 machine that prints on the flat, in which case the electric circuit should be made and broken for every sheet, or the reproduction can be effected by a machine like an ordinary cylindrical printing-machine, the stereotype-cylinders being connected with the negative pole  
 30 and the impression or "blanket" cylinders being made of, say, zinc and being connected with the positive pole, the blanket itself when employed forming a pad between the zinc and the prepared paper. The prepared  
 35 paper can then be run through the machine from a reel like the web in a web-printing machine, with the result that "repeats" of the stereotype are reproduced upon the paper  
 40 corresponding with the repeats printed in a web-printing machine.

In practice I find that a continuous current of four amperes at a voltage of one hundred is sufficient to carry out the invention.

45 A variety of colors can be produced by means of the process of my invention, the color varying according to the substance with which the paper is prepared and, when the printing-plate is connected to the positive  
 50 pole, according to the material that constitutes the face of the words, designs, &c.

In preparing paper for the purpose of the invention I prefer in most cases to incorporate the desired chemical substance with the  
 55 paper-pulp or to apply it to the paper itself in the process of "forming" or immediately after forming, while the paper is still moist.

In applying the process of the invention to the reproduction of designs, &c., on textile  
 60 fabrics it may be found convenient to run the unprepared fabric through a bath of the preparing liquid and thence after passing between one or more pairs of squeezing-rollers to the place where the design will be re-  
 65 produced thereon. This bath, in addition to containing the preparing liquid, may contain

a dye or color which will give any desired color to the fabric. This color will form the ground upon which the designs are repro-  
 70 duced. Where amidol is used, the print should be washed in running water to remove the residual unchanged amidol. Where a web is printed, for example, it may be run through a bath of water.

I have been enabled to electrically print  
 75 twenty-five thousand pamphlets per hour by adapting my invention to a printing-machine, and I will now proceed to describe the adaptation of the invention to a cylindrical print-  
 80 ing-machine and a flat printing-machine, respectively.

In the accompanying drawings, Figure 1 is a side elevation with part of the framing in section, and Fig. 2 a front elevation, illus-  
 85 trating the manner in which my invention can be carried out by means of a cylindrical machine. Fig. 3 is a side elevation, and Fig. 4 a front elevation, illustrating the manner in which my invention can be carried out by  
 90 means of flat surfaces.

Referring first to Figs. 1 and 2, *a* represents a stereotype-cylinder, which may be driven in any suitable manner. *b* represents the impression or blanket cylinder, which for the purpose of my invention is preferably  
 95 made of zinc or carbon covered or not with a pad or blanket or cloth or the like. The paper to be printed travels between the cylinders *a* and *b*, as in an ordinary typographic-printing machine. The cylinders *a* and *b*  
 100 can be driven in any ordinary manner. They are carried in bearings in upper and lower end frames *c c* and *d d*, respectively, and the said upper and lower frames are insulated from each other by means of slabs or blocks  
 105 *e e*, of any suitable insulating material. Each upper frame *c* is secured to the corresponding lower frame *d* by means of bolts *f* and nuts *g*, the bolts passing not only through the parts *h* and *i* of the respective frames *c c*  
 110 and *d d* and through the insulating-slab *e*, but also through blocks *k k*, of insulating material. The bolt-holes in the parts *h* and *i* are sufficiently large to allow the bolts to pass through without touching, so that the  
 115 insulation between these parts remains intact. *l* is the wire from the positive pole, and *m* that leading to the negative pole of the source of electricity. The wire *l* is connected with the part *h* and the wire *m* with the part  
 120 *i*. The part *h* is in electrical connection with the cylinder *b* and the part *i* with the cylinder *a*. Therefore the current from *l* passes from *h* to the cylinder *b*, thence through the paper, which travels between the two cylin-  
 125 ders, to the cylinder *a*, and thence through the part *i* to the negative wire *m*, back to the source of electricity. Consequently as the paper travels continuously between the two cylinders *a* and *b* the current is continuously  
 130 passing through the paper, which for the time being is between the meeting-points of the

two cylinders, and the design carried by the cylinder *a* at this point is reproduced or printed upon the paper.

Referring now to Figs. 3 and 4, *a'* represents the flat stereotype or form, secured to the top of the metallic frame *d'*. *b'* represents a slab of carbon, zinc, or other conducting material faced with a pad or blanket *b<sup>2</sup>*. The said slab *b'* and pad *b<sup>2</sup>* are carried by a frame *n*, but are insulated therefrom by a slab *e'*, of insulating material. The frame *n* is hinged at *p* to the frame *d'*, so that it can be moved from its printing position (shown in full lines) to the position shown in dotted lines in Fig. 3. The wire *l* from the positive pole is connected with the carbon or zinc slab *b'*, and the wire *m*, leading to the negative pole, is connected to the frame *d'*. When the frame *n* is in the position seen in full lines, the current can pass from the slab *b'* through the paper and the form *a'* to the frame *d'*. When, on the other hand, the frame *n* is raised, as seen in dotted lines, the circuit is broken. When the frame *n* is raised and the circuit broken, a sheet of paper to be printed is laid on the form *a'*, and then when the frame *n* is lowered and the circuit is therefore complete the current passes through the paper and reproduces thereon the design represented by the form *a'*. The alternate raising and lowering of the frame *n* can be effected in various ways. In the figures these motions are shown as effected by means of a treadle *q*, which works a crank-shaft *r*. On the ends of this shaft are pinions *s*, gearing with wheels *t*. These wheels have crank-pins *u*, engaging with slide-blocks *v* in stirrups *w* on the lower ends of vertical rods *x*, whose upper ends are pivoted at *y y* to the frame *n*. As the wheels are caused to rotate by the crank-shaft *r* and pinions *s* the crank-pins *u* give up-and-down motion to the rods *x*, and therefore raise and lower the frame *n*. The printed sheet of paper is taken off the form *a'* when the frame *n* is raised, and a fresh

sheet is laid on the form before the said frame is again lowered.

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

1. The herein-described process of printing or reproducing words, figures, designs or the like upon paper, textile fabrics or other material, which consists in passing a current of electricity through said paper or other material, and through two conducting media on opposite sides respectively of said paper or material and in contact therewith, one of said media bearing the words, designs or the like to be reproduced, said paper or material being impregnated with a photographic developer being an oxy derivative of benzene which will reduce a haloid salt of silver.

2. The herein-described process of printing or reproducing words, figures, designs or the like upon paper, textile fabric or other material, which consists in passing a current of electricity through said paper or other material and through two conducting media on opposite sides respectively of said paper or material, and in contact therewith, one of said media bearing the words, designs or the like to be reproduced, said paper or material being impregnated with amidol.

3. The herein-described product consisting of a fabric containing an oxy derivative of benzene which will reduce a haloid salt of silver, said fabric having thereon a design of which the visible matter is a decomposition product of such oxy derivative.

4. The herein-described product consisting of a fabric containing amidol, said fabric having thereon a design of which the visible matter is a decomposition product of such amidol.

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.