

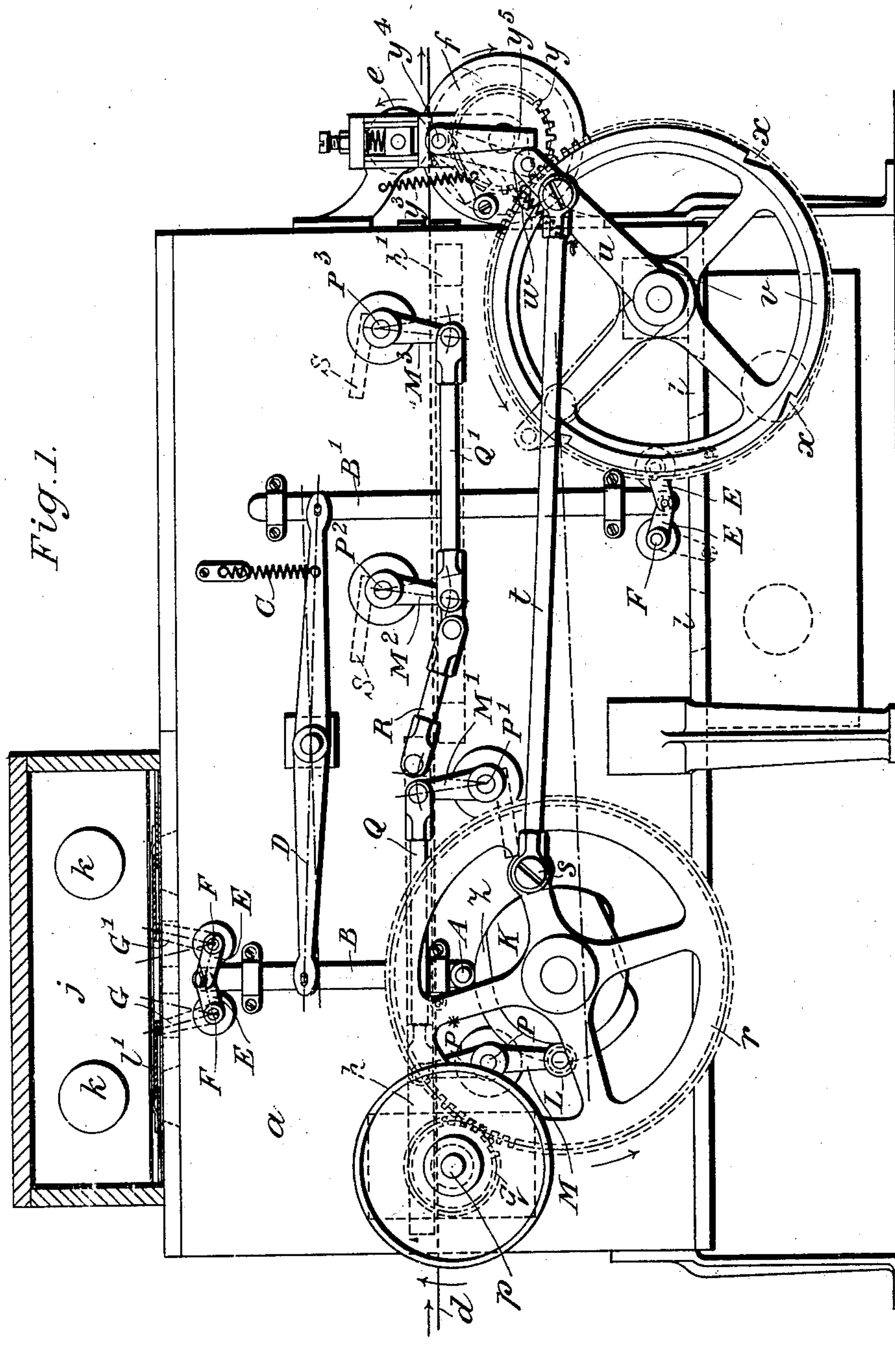
(No Model.)

6 Sheets—Sheet 1.

W. FRIESE-GREENE.
APPARATUS FOR PHOTOGRAPHIC PRINTING.

No. 557,119.

Patented Mar. 31, 1896.



WITNESSES:

Fred White

Thomas F. Wallace

INVENTOR:

William Friese-Greene,

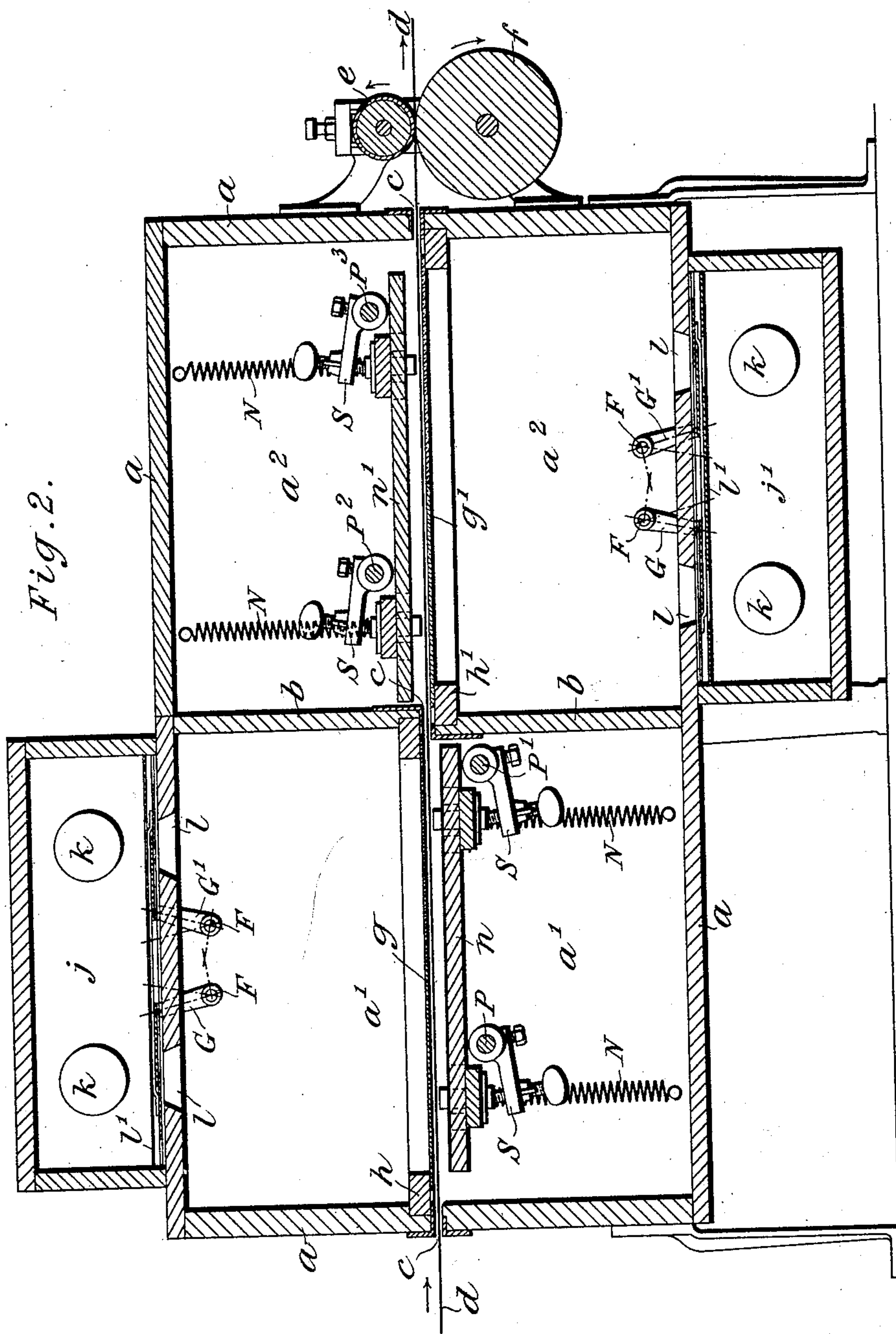
By his Attorneys:

Arthur C. Fraser & Co.

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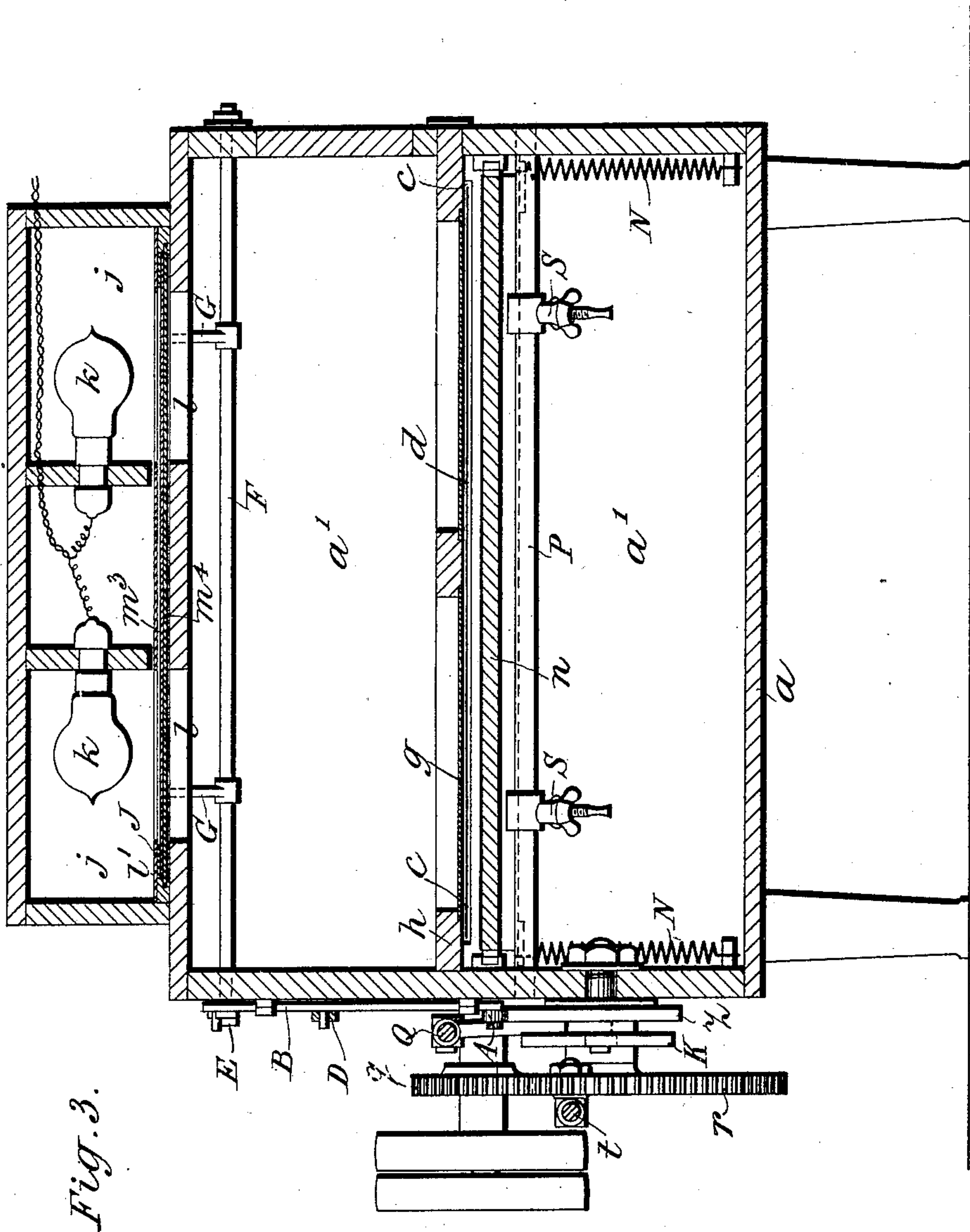


Fig. 3.

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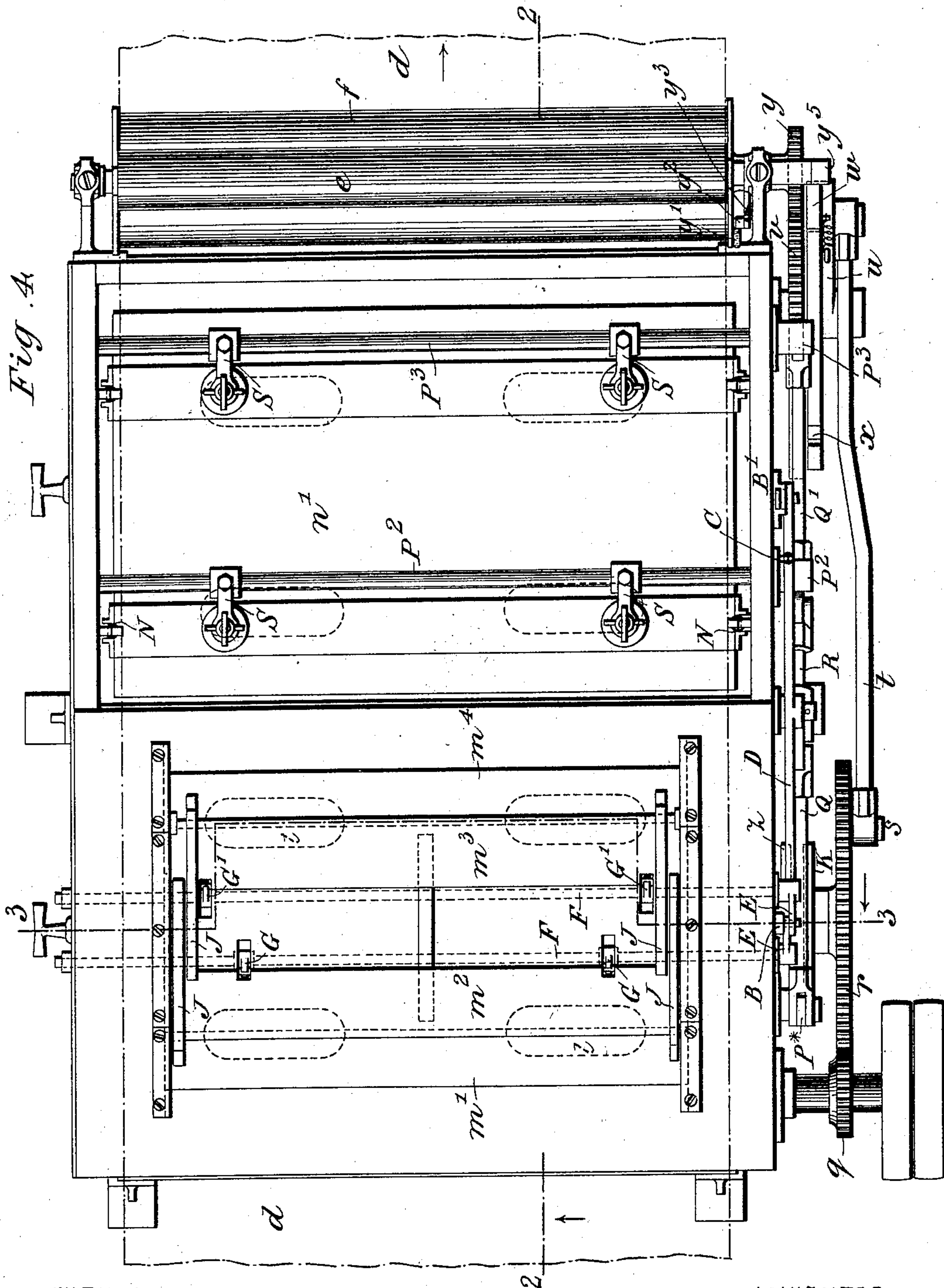
(No Model.)

6 Sheets—Sheet 4.

W. FRIESE-GREENE.
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(No Model.)

6 Sheets—Sheet 5.

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Fig. 8.

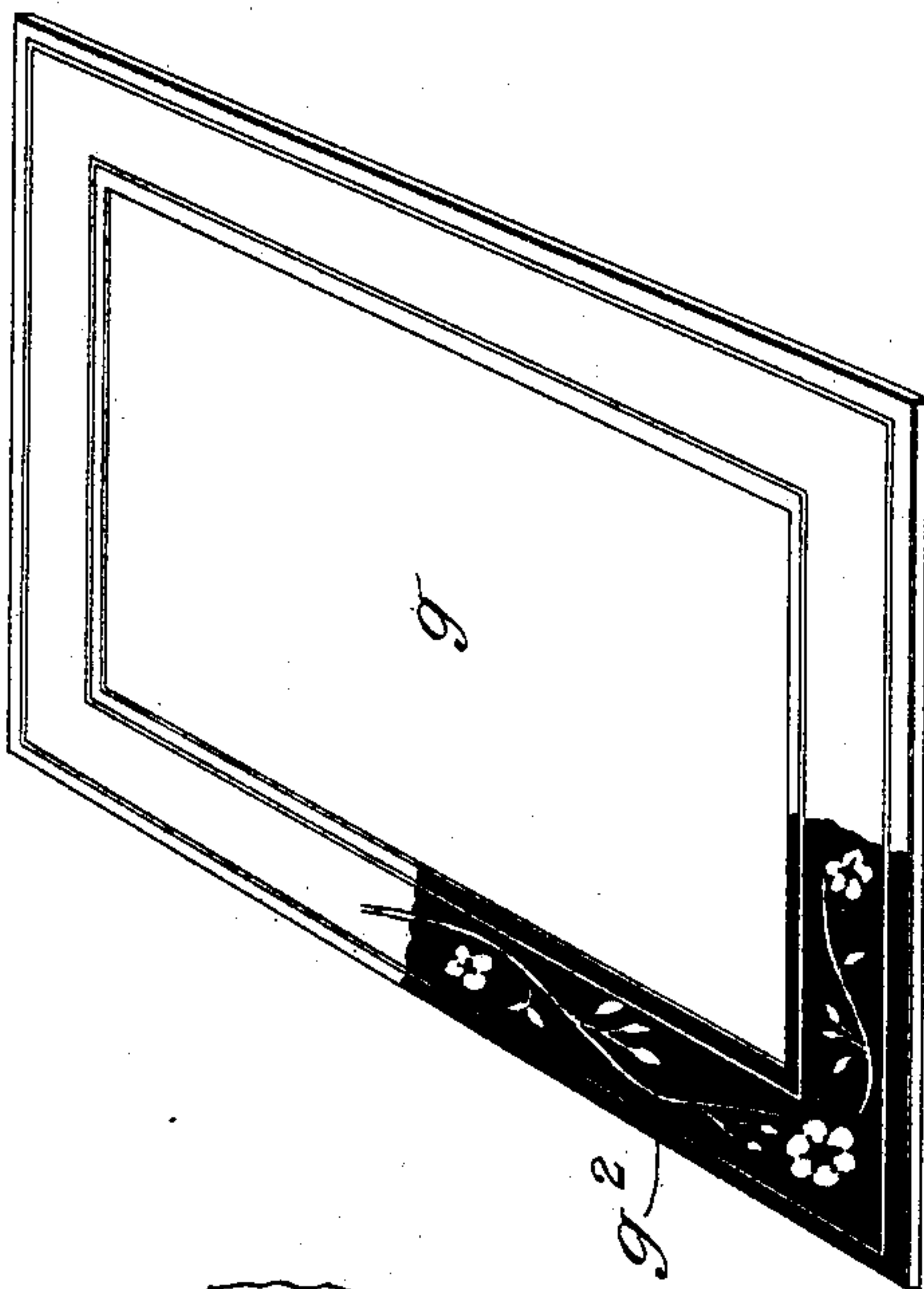
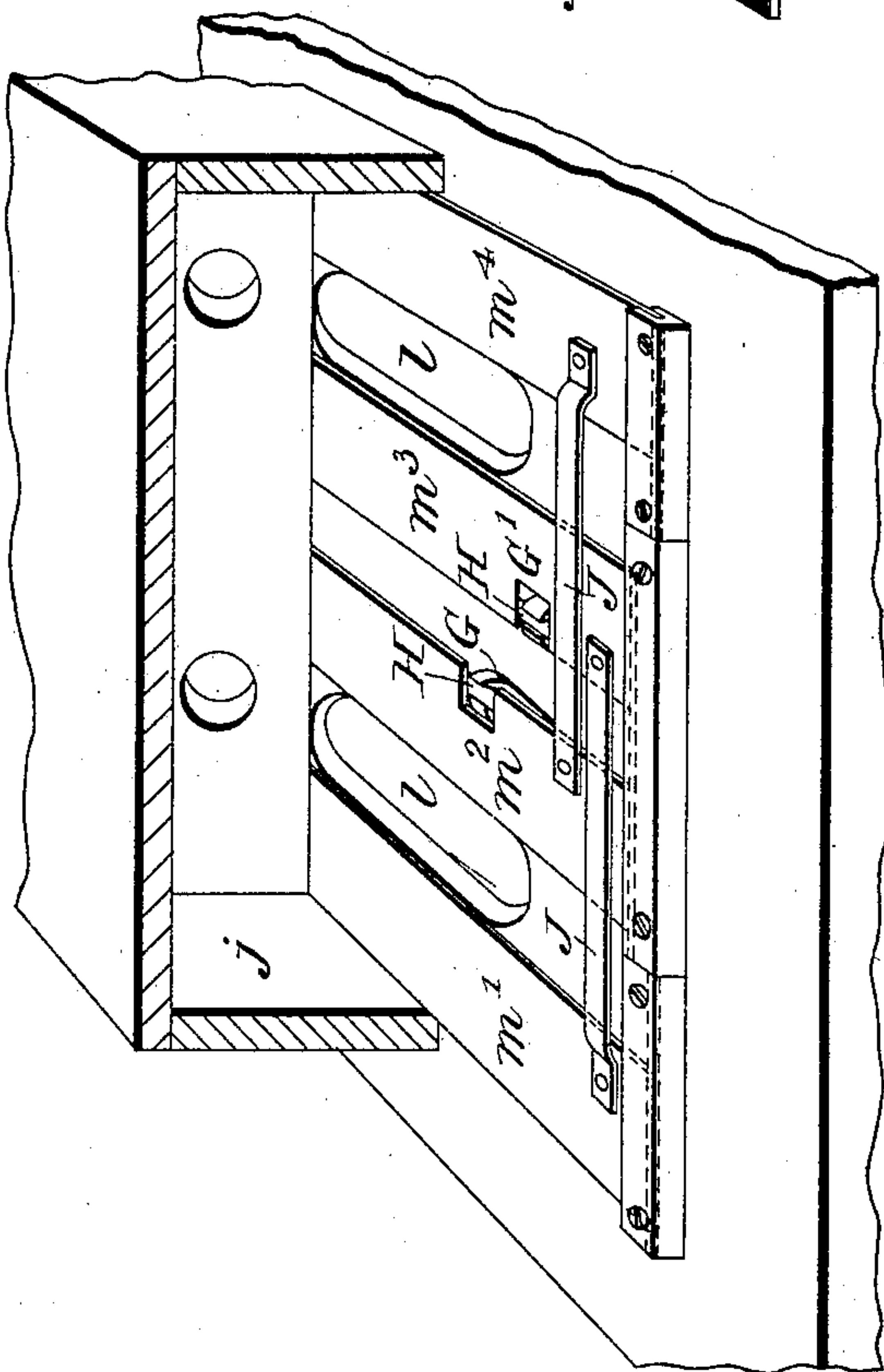


Fig. 5.



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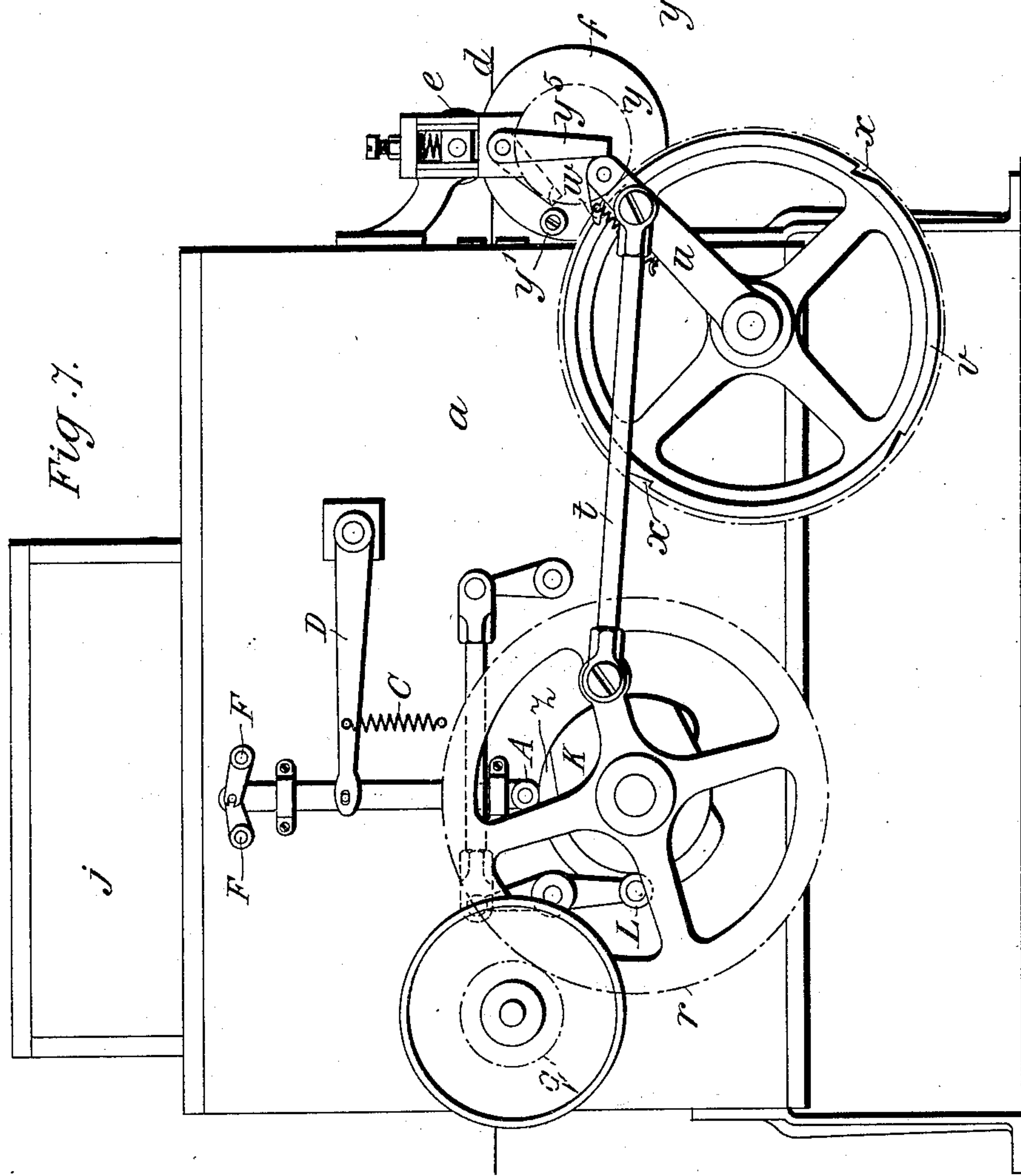
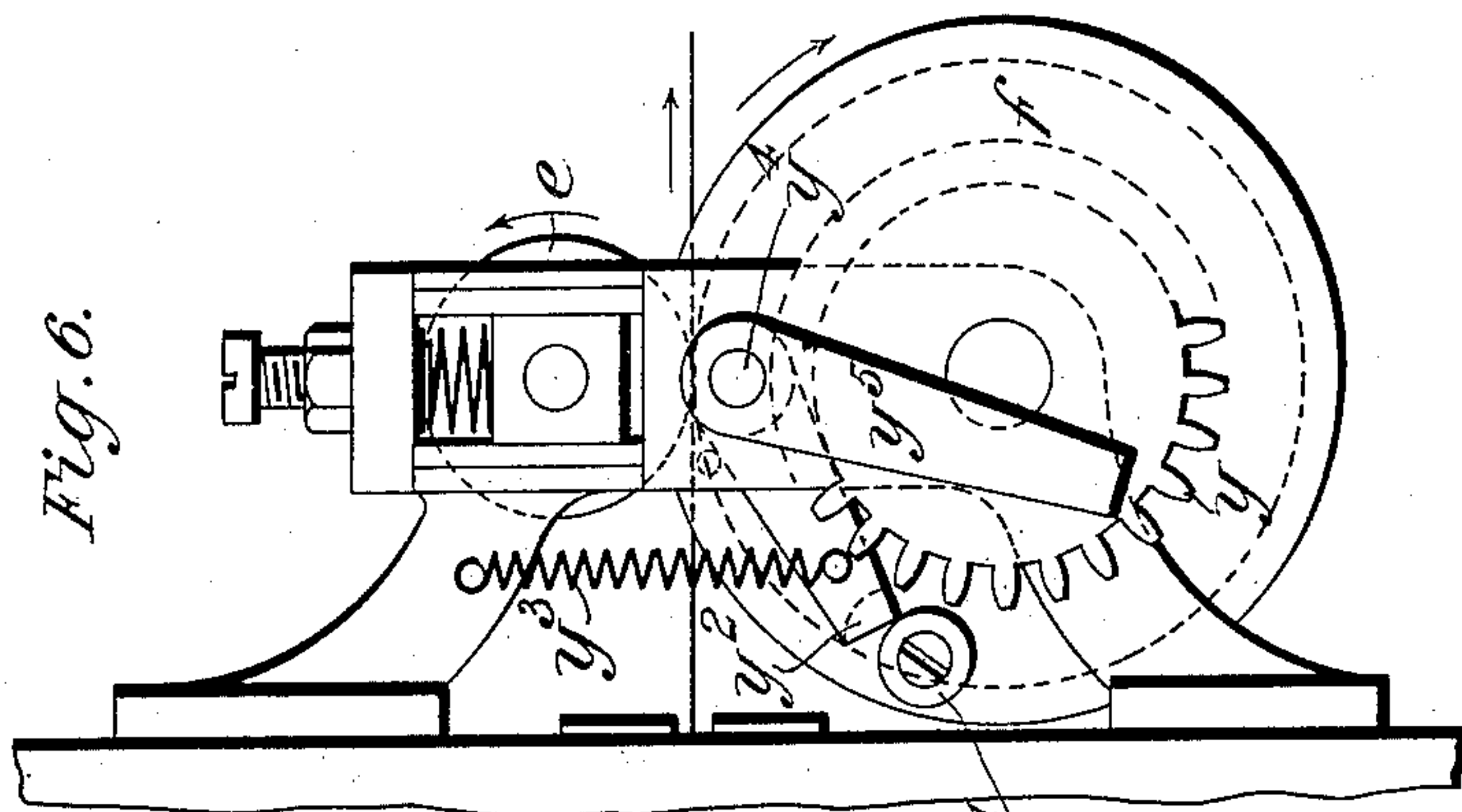
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UNITED STATES PATENT OFFICE.

WILLIAM FRIESE-GREENE, OF LONDON, ENGLAND.

APPARATUS FOR PHOTOGRAPHIC PRINTING.

SPECIFICATION forming part of Letters Patent No. 557,119, dated March 31, 1896.

Application filed May 21, 1895. Serial No. 550,039. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FRIESE-GREENE, of London, England, have invented certain new and useful Improvements in Apparatus for Photographic Printing, 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 required.

The invention is particularly applicable to the printing of illustrated newspapers, catalogues, wall-papers, and the like. In applying it, for example, to the printing of newspaper the usual heavy initial expense of printing machinery is saved, the use of type or stereos is dispensed with, and the expense of printing-ink is also obviated.

The invention primarily consists of a mode of rapidly printing by photography a number of copies from the same negative or negatives, which mode consists in causing a band or strip of sensitized paper or other sensitized material to travel intermittently through a chamber in which a negative or negatives are placed and in temporarily exposing a fresh section of the said sensitized material and the negative or negatives to the light in the said chamber after each intermittence in the movement of the band, whereby the negative or negatives become photographed upon the said section. The negative or negatives are, in fact, employed, according to this invention, for commercial and other machine printing in lieu of the ordinary stereos, blocks or type, and in combination with sensitized material, the printing being effected upon the paper by means of light passing through the negative. The paper is not necessarily in the form of a band or strip, as it may be fed into the machine in separate sheets, as in some typographic printing-machines.

The invention also consists in the combination, in a photographic-printing machine, of means for giving intermittent motion through the machine to a band or strip of sensitized paper or other sensitized material, means for temporarily exposing to light after each intermittent movement of the said band a fresh section of this band and the negative from

which the print is to be taken, and means for steadying the section of sensitized material during the exposure.

The invention also comprises a mode of making up negatives, for use in the machine, by combining with a central or main photographic or other negative or negatives one or more surrounding or supplementary photographic or other negatives.

The invention also includes various arrangements of the parts and details of the machine, which are hereinafter described and represented in the drawings.

In the accompanying drawings, Figure 1 is a side elevation, with the upper light-box in section, of a photographic-printing machine constructed in accordance with my invention in the preferred form and adapted for producing prints upon both sides of the paper or other sensitized material. Fig. 2 is a section of the machine on the line 2 2 of Fig. 4. Fig. 3 is a section on the line 3 3 of Fig. 4. Fig. 4 is a plan of the machine with the upper light-box j and the top of the compartment a^2 removed. Fig. 5 is a detail view in perspective on a larger scale, showing more particularly the arrangement of the shutters. Fig. 6 is a detail view, also on a larger scale, showing more particularly the stop device for the feed-rollers. Fig. 7 is a side elevation of the machine in its preferred form for producing prints upon only one side of the sensitized band. Fig. 8 is a perspective view of a compound negative.

Referring first to Figs. 1 to 6, a a represent the outer casing of the machine. It is divided by a vertical partition b into two chambers a' a^2 , in which, respectively, the sensitized band is printed on its upper and lower faces. The casing a and partition b have narrow slots c c to give passage to the sensitized band. d is the sensitized band. It enters the casing a by the slot c at the left hand of Fig. 2, passes horizontally through the chambers a' a^2 , then between the feed or drawing rollers e f , from which it preferably goes direct to the necessary tanks for developing and fixing. The band d is preferably sensitized in a bath immediately preceding the point where it enters the machine, or a roll or reel of paper previously sensitized may be employed. The rollers e f receive an intermittent rotary motion,

as hereinafter described, so as to give an intermittent feed to the sensitized band.

g g' are the two negatives from which the prints are to be obtained by means of light. They are carried, respectively, in frames h h' , which fit into guides, as shown in the sides of the chambers a' a^2 . The first negative g is above the sensitized band d , so as to become reproduced upon the upper face of same, and the second negative g' is below the band, so as to become reproduced upon the under face.

j and j' are respectively upper and lower inclosed light-boxes for lighting up intermittently the chambers a' a^2 , respectively, as hereinafter described. In these boxes are incandescent electric lamps k k' . In the top of the chamber a' and in the bottom of the chamber a^2 are apertures l l' opening into the corresponding light-boxes j j' , and in each of the boxes j j' is a plate l' having apertures corresponding with the apertures l , but the plates l' may be dispensed with.

m' m^2 m^3 m^4 are two pairs of time-shutters in each light-box for alternately opening and shutting the apertures l l' in the box, as hereinafter described.

n n' are pressing plates or boards in the chambers a' a^2 , respectively. They are preferably faced with felt or other like material. They receive an up-and-down movement, as hereinafter described, so as to press against and steady the band d during its exposure to the light.

The construction and operation of the machine are based upon the proper timing relatively of each other of the intermittent movement of the rollers e f that feed the sensitized band, the opening and closing of the time-shutters m' m^2 m^3 m^4 , and the up-and-down movement of the pressing or steadying plates n n' . The action is that the rollers e f first give the band an intermittent feed, then, while the band is stationary, the plates n n' move against and steady it, and then the time-shutters open, after which the shutters close, the steadying plates recede, and the feed-rollers give another feed, and so on. The manner in which these movements are given will now be described. The figures (except Fig. 5) show the various parts in the positions they respectively occupy when the feed is about to take place.

p is the driving-shaft, which may derive its motion from an electromotor or otherwise.

q is a pinion on the shaft p , gearing with a wheel r . On the wheel r is a crank-pin s , connected by a rod t to an arm u , mounted loosely on the axis of a toothed wheel v . The arm u carries a pawl w to engage with notches x x in the wheel v . As the wheel r rotates, the crank-pin s and rod t impart a swinging or oscillating motion to the arm u and its pawl w , so that the pawl alternately imparts a partial rotary motion to the wheel v by means of one of the notches x , and then recedes and engages with the next notch x , ready for giving

the next intermittent motion. The wheel v gears with a pinion y , fixed on the shaft of the feed-roller f . The pinion y has as many teeth as are comprised between two notches x x of the wheel v , so that it receives one complete revolution for one intermittent partial revolution of the wheel v . The feed-roller f therefore receives one complete revolution, and in conjunction with the roller e , which it drives by friction, feeds the sensitized band an equivalent distance. The circumference of the roller f should therefore be equal to the amount of feed required at each intermittent movement.

In order to prevent the wheel y and roller f from traveling too far at each intermittent movement, the following device is adopted: On the end of the roller f is a projection y' , which, at the end of each revolution of the roller, comes against a stop-piece y^2 , as seen in Fig. 6, which shows these parts on a larger scale. The piece y^2 is moved to this position by the spring y^3 . The piece y^2 is pivoted to a fixed part at y^4 and has a tail y^5 , which is pushed back to the position shown in full lines in Fig. 2 by the pawl w every time the arm u moves back, ready to give another movement to the wheel v . The pushing back of the tail y^5 draws down the piece y^2 clear of the projection y' , so that the latter can pass it, and the wheels y and roller f rotate. As the pawl w in its return or driving motion is moving clear of the tail y^5 , the spring y^3 returns the piece y^2 to position for meeting the projection y' .

The opening and closing of the time-shutters is effected by means of a cam z , fixed on the shaft of the wheel r . A roller A on the lower end of a bar B runs on the cam z and is kept pressed in contact therewith by a spring C . The bar B therefore receives an up-and-down movement from the cam. This movement is transmitted by a lever D to another bar B' , which is thus caused to move down and up as the bar B moves up and down. The upper end of the bar B and the lower end of the bar B' are each connected by two links E E to spindles F F , extending across the chambers a' a^2 , and as the bars B B' move up and down the spindles are consequently caused to rock. Each of the spindles carries arms G G' , forked at the ends, so as to engage with pins II II (see Fig. 5) on the shutters m^2 m^3 , respectively, in the corresponding light-box. The pins on the arms G engage with the shutters m^2 and the pins on the arms G' with the shutters m^3 . The shutter m' in each box is connected to the shutter m^3 by a strap J , Fig. 5, and the shutter m^2 to the shutter m^4 by a similar strap J . It will be readily understood that as the spindles F F rock the shutters m' and m^2 in each box will first close up over the corresponding aperture l and the shutters m^3 and m^4 over the other aperture, and then open, so as to allow the light to pass through the said apertures.

The up-and-down motion of the pressing or

steadying plates $n n'$ is effected by means of a cam K fixed on the shaft of the wheel r . A roller L on the end of an arm M runs on the cam K, and is kept pressed against same by the action of the springs N N, Fig. 2. The arm M is fixed to a transverse shaft P, and this is connected by an arm P* and a rod Q to an arm M' on another transverse shaft P'. The transverse shafts P P' pass through the chamber a' . The rod Q is connected by a link R to an arm M² on a transverse shaft P², and also by a rod Q' to an arm M³ on a transverse shaft P³. The shafts P² P³ pass through the chamber a^2 . The shafts P P' P² P³ carry fingers S S adjustably situated at the back of the plates $n n'$, respectively. It will readily be understood that as the arm M is moved in and out by the action of the cam K and springs N N all the shafts P P' P² P³ will be caused to rock, and that in their rocking movement the fingers S S will first come against the plates $n n'$ and push them against the band d , so as to press this against the negatives $g g'$, respectively, and then draw the plates $n n'$ away from band, and thereby release the latter.

From the description hereinbefore given it will be understood that every section of the band d , equivalent in length to one intermittent feed, is first printed on the upper face from the negative g and then on the lower face from the negative g' , and that while one section is being printed from the negative g' the next following section is being printed from the negative g . When with the machine above described it is required to print on only one side of the sensitized strip, one or other of the chambers a' is not supplied with a negative, or alternatively the electric lamps in the light-box of one of the chambers are switched off.

If it be required to construct a machine capable of printing only on one side of the sensitized band, the machine is made single instead of double, as hereinbefore described.

Fig. 7 is a side elevation illustrating the single machine. It will be understood without further explanation.

The negatives employed in the machines may either be negatives obtained by photography, or negatives otherwise produced, with opaque and translucent parts representing the design or picture to be reproduced, or vice versa; or a negative may consist partly of a photographic negative and partly of a negative or negatives otherwise produced. For example, the main or central part of the negative may be a photographic negative, while the outer parts may consist of portions having translucent parts to represent ornamental or other borders, letter-press, or other desired matter, so that the photographic prints produced by the machine would each consist of the central picture and the surrounding matter.

Referring to Fig. 8, which will serve to illustrate the manner in which a compound negative is made up, as above explained, let g rep-

resent the central or main negative—say, for example, a negative photographic picture—and g^2 a supplementary negative not photographic, in the form of an ornamental border with opaque and translucent parts. The pictures produced in the machine by means of this compound negative will each consist of the central main picture and a border corresponding with the translucent parts of the negative g^2 .

A good way of producing negatives otherwise than by photography for use in the machine above described is to prepare paper with sulfate of iron, to write or print the desired matter with citric or other acid—hydrochloric, for example—on the paper when dry, and to then immerse the paper when dry in pyrogalllic acid or other material which will make all parts of the paper black except those to which the acid has been applied.

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

1. In photographic - printing apparatus, means for feeding a strip of sensitized material over a predetermined path, in combination with a casing for inclosing said material having ingress and egress slots c for the passage of the latter, having reverse photographic chambers, one at one side of the path of movement of said material, and another at the other side of such path, disposed at the side of, and staggered in position relatively to, said first chamber, and opposite another part of the path of said material than that which said first chamber is opposite, and means for holding negatives in said chambers adjacent to and at opposite sides of the path of said material, means for intermittently driving such material through such path in said casing to an extent equaling the width of one of said chambers at each movement, and means for simultaneously interrupting in both said chambers the flow of light to said negatives during the movements of such material, and for simultaneously permitting such flow of light during the interval between such movements, substantially as and for the purpose set forth.

2. In photographic - printing apparatus, means for feeding a strip of sensitized material over a predetermined path, in combination with a casing for inclosing said material having ingress and egress slots c for the passage of the latter, having reverse photographic chambers, one at one side of the path of movement of said material, and another at the other side of such path, disposed at the side of, and staggered in position relatively to, said first chamber, and opposite another part of the path of said material than that which said first chamber is opposite, means for holding negatives in said chambers adjacent to and at opposite sides of the path of said material, means for intermittently driving such material through such path in said casing to an extent equaling the width of one of said chambers at each movement, and means for simul-

taneously interrupting in both said chambers the flow of light to said negatives during the movements of such material, and for simultaneously permitting such flow of light during the interval between such movements, reverse pressers, one opposite each such negative at the side of such path remote from the adjacent negative, in line with the latter, each movable against such material to hold it against the adjacent negative during the stationary periods of, and movable away from such material precedent to movement of the latter, and means intermittently shifting said pressers, substantially as and for the purpose set forth.

3. In photographic - printing apparatus, mechanism for intermittently feeding a sensitized material predetermined distances through a predetermined path, and a photographic apparatus opposite such path for acting on such material, in combination with an automatically-acting stop locking said feed mechanism at the point for termination of its periodical feed, and consisting of a revolving projection connected to said mechanism, a stop-piece moving into the path of said projection, engaging and arresting the latter, and carried by a fixed part, and means automatically freeing said projection and piece when feed is desired, substantially as and for the purpose set forth.

4. In photographic - printing apparatus, mechanism for intermittently feeding a sensitized material predetermined distances through a predetermined path, and a photographic apparatus opposite such path for acting on such material, in combination with an automatically-acting stop locking said feed mechanism at the point for termination of its periodical feeds, and holding it locked throughout its stationary period, and consisting of a revolving projection connected to said mechanism, a stop-piece moving into the path of said projection, engaging and arresting the latter, and carried by a fixed part, and means automatically moving and holding said piece in engagement with said projection during the stationary periods and freeing said projection and piece when feed is desired, substantially as and for the purpose set forth.

5. In photographic - printing apparatus, mechanism intermittently feeding a sensitized material predetermined distances through a predetermined path, and a photographic apparatus opposite such path for acting on such material, in combination with an automatically-acting stop locking said feed mechanism at the point for termination of its periodical feeds, consisting of a projection y' , a stop-piece y^2 and an arm y^5 , driving devices for said feed mechanism, and a releaser for said stop, actuated by the driving mechanism

prior to the operation of said feed mechanism, and then moving said arm and thereby releasing said stop and permitting operation of the feed mechanism, substantially as and for the purpose set forth.

6. In a photographic - printing machine, means for moving a strip of sensitized material through a predetermined path, and a camera having a negative opposite said path, in combination with a presser N beyond said negative and at the farther side of said path, movable toward and from said negative to press such material against it, fingers S moving said presser, pivoted shafts P and P' carrying said fingers, and means simultaneously turning said shafts at intermittent periods and operating said feeding mechanism at other periods.

7. In photographic - printing apparatus, feed mechanism for intermittently moving a sensitized material through a predetermined path, and a photographic chamber having a negative opposite said path, in combination with sliding shutters m^1, m^2, m^3, m^4 , for controlling flow of light to the negative, oppositely-moving arms G G' connected to said shutters m^2, m^3 , straps J, the one connecting said shutters m^1 and m^3 and moving them together in one direction, and the other connecting said shutters m^2 and m^4 and moving them together in another direction, shafts F' carrying said arms, and driving mechanism simultaneously moving said arms in opposite directions at predetermined intervals, and intermittently driving said feed mechanism at other intervals.

8. In a photographic-printing machine, the combination with a camera having a negative, time-shutters controlling the flow of light thereto, and mechanism for feeding a strip of sensitized paper past said negative, in combination with a driving-shaft having a crank-pin s, a cam K, and a cam z, a ratchet-wheel v, an arm u having pawl w engaging the teeth of said ratchet, a connecting-rod t between said crank-pin and arm moving the latter, a driving connection between said ratchet-wheel and said feed mechanism operating the latter as the ratchet-wheel is moved, a roller A operated by said cam z and opening said shutters, a presser opposite said negative and adapted to press said strip of material thereagainst, and a roller L engaging said cam K and operating said presser, all 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. MEWBURN,
GEORGE C. BACON.