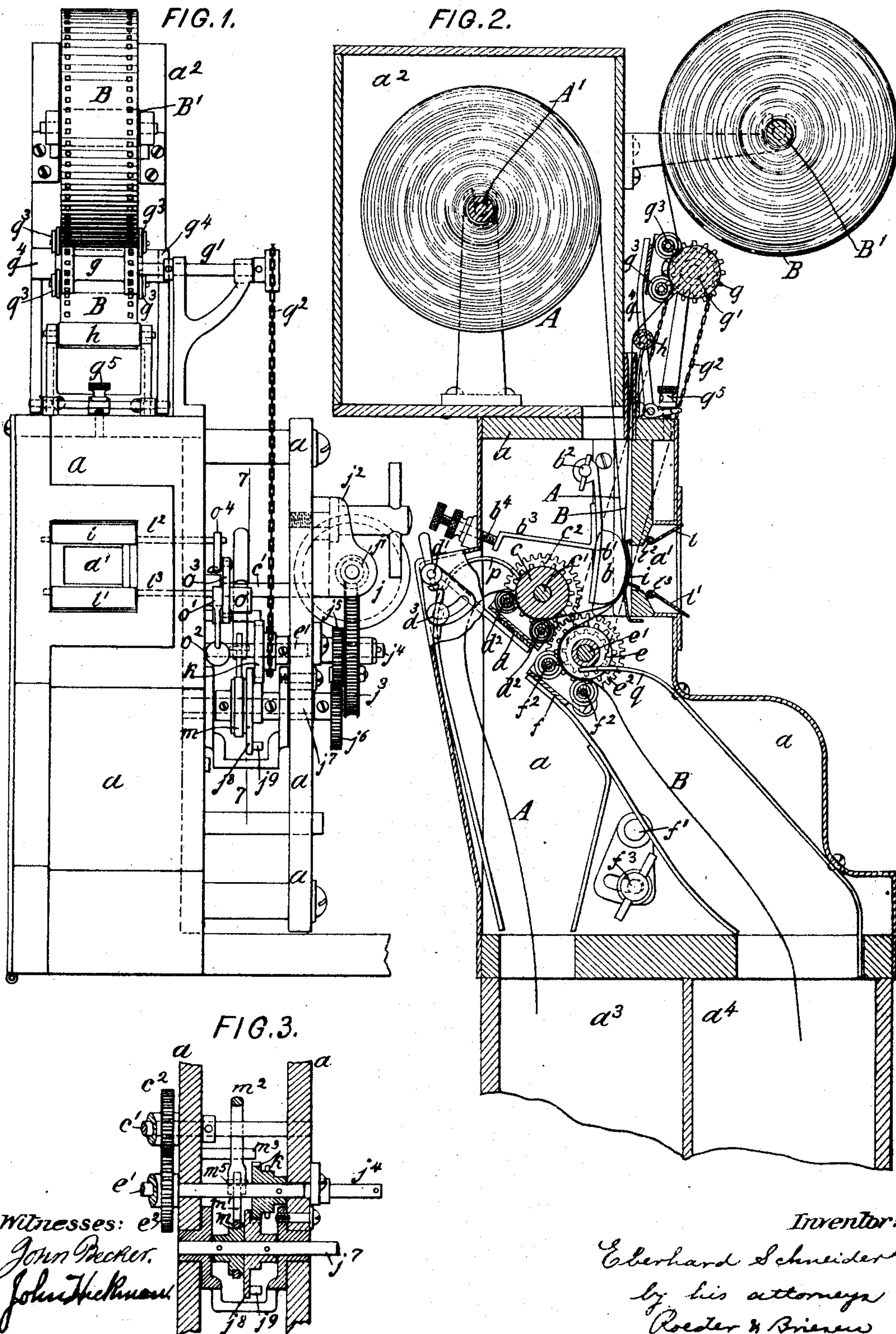


E. SCHNEIDER.
PHOTOGRAPHIC PRINTING MACHINE.

(Application filed Sept. 29, 1900.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses: *John Pecker.*
John Hickman.

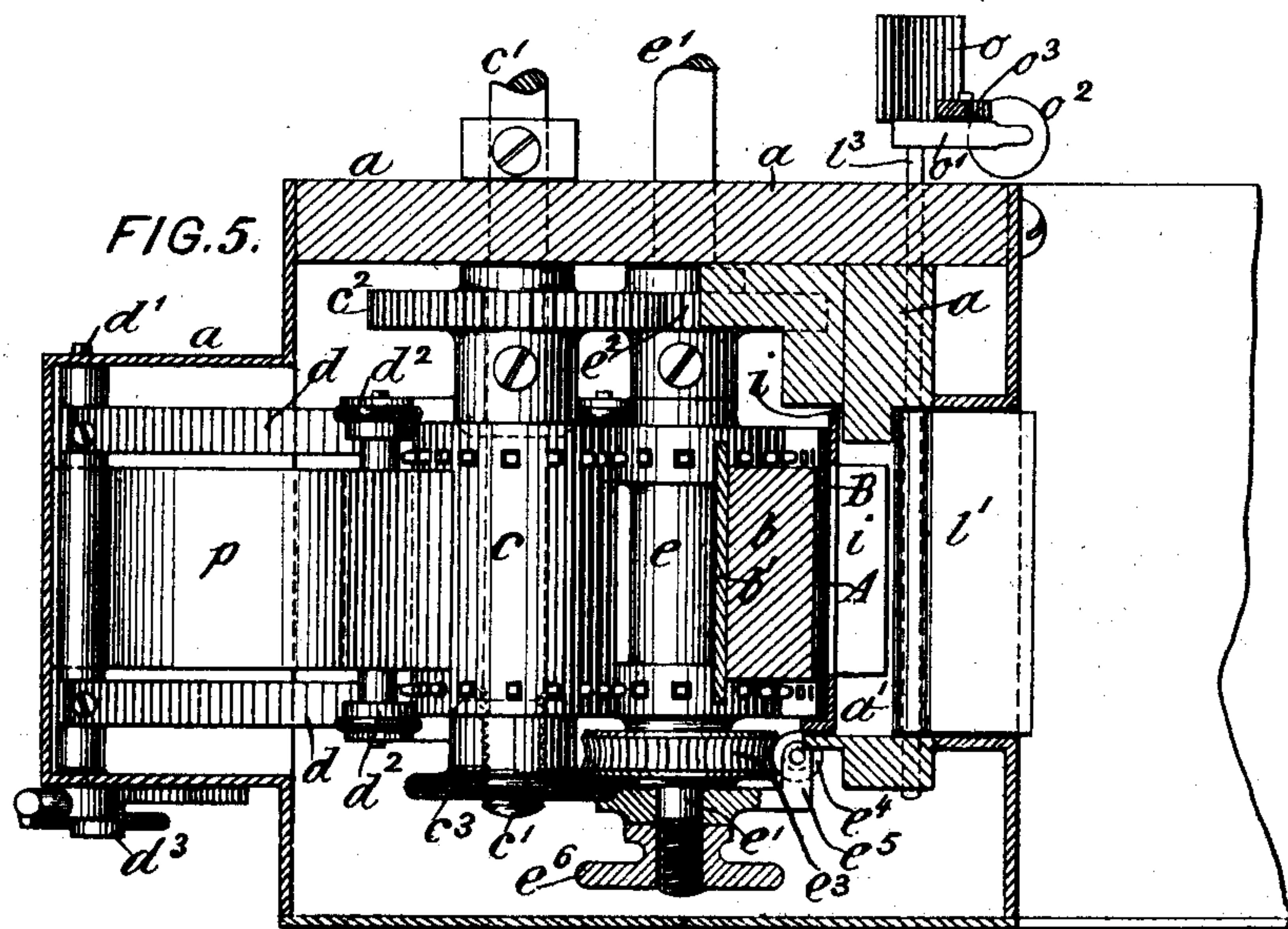
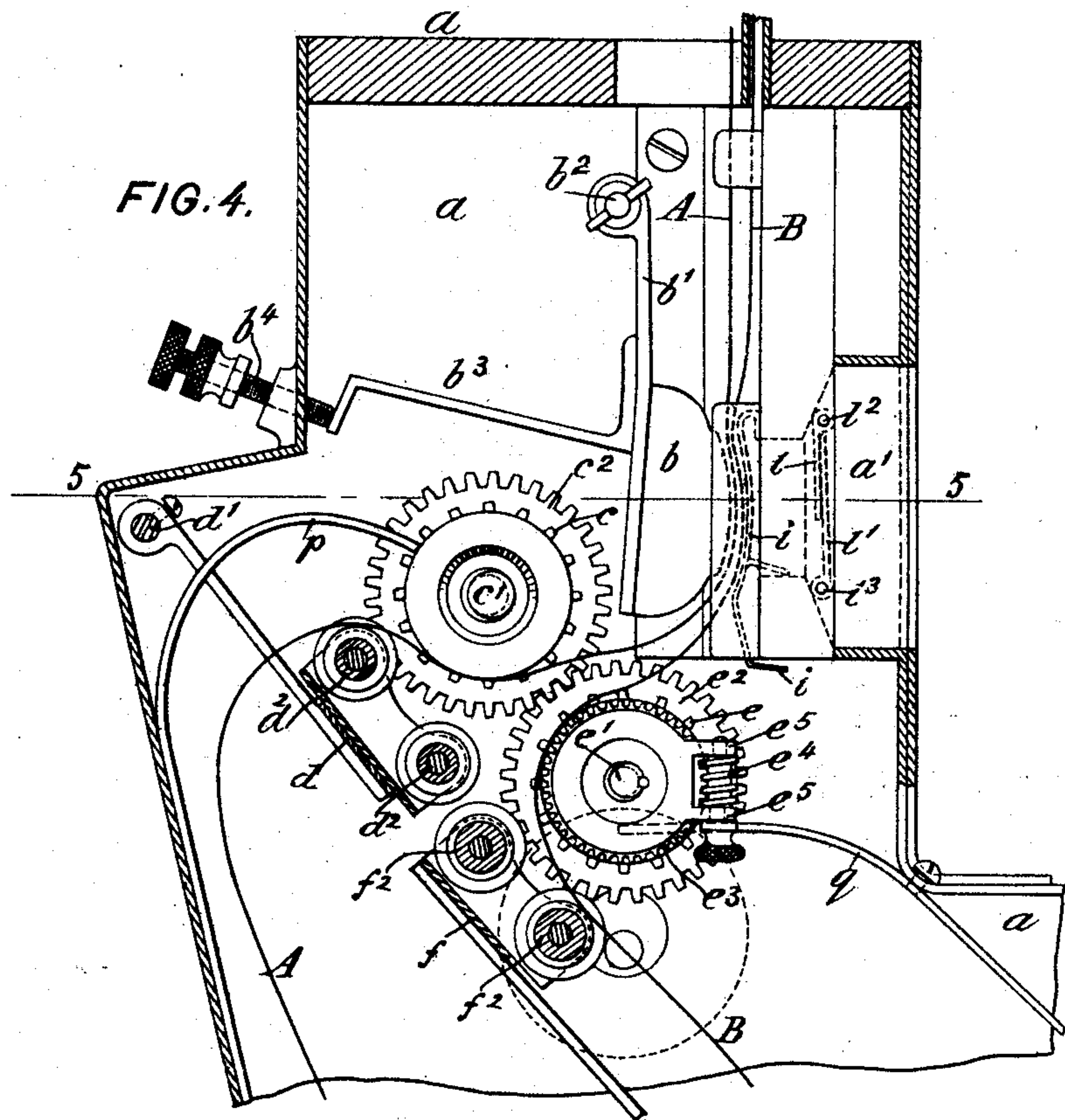
Inventor:
Eberhard Schneider
by his attorneys
Roeder & Bienen

E. SCHNEIDER.
PHOTOGRAPHIC PRINTING MACHINE.

(Application filed Sept. 29, 1900.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses:

John Becker.
John Hickman.

Inventor

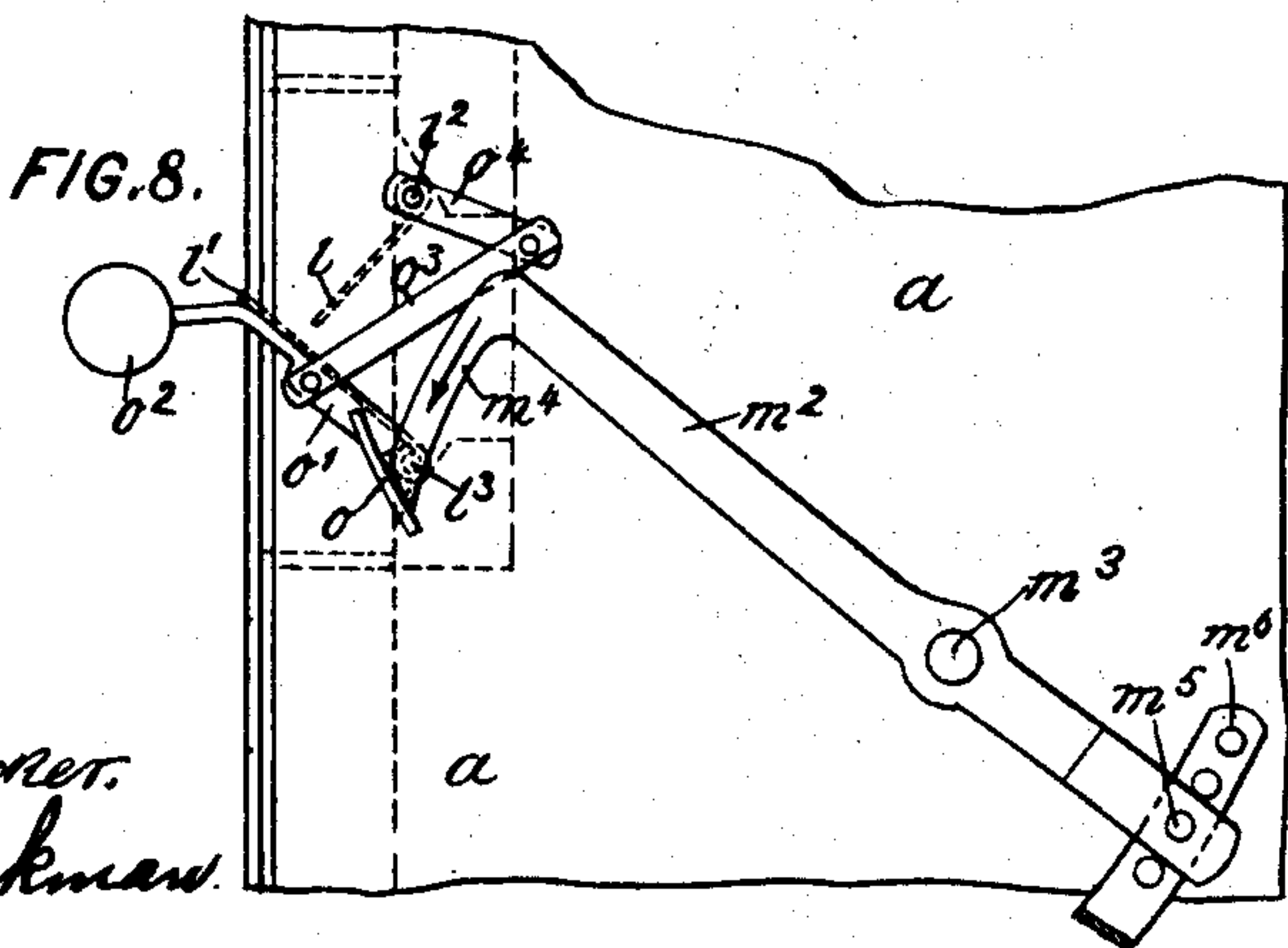
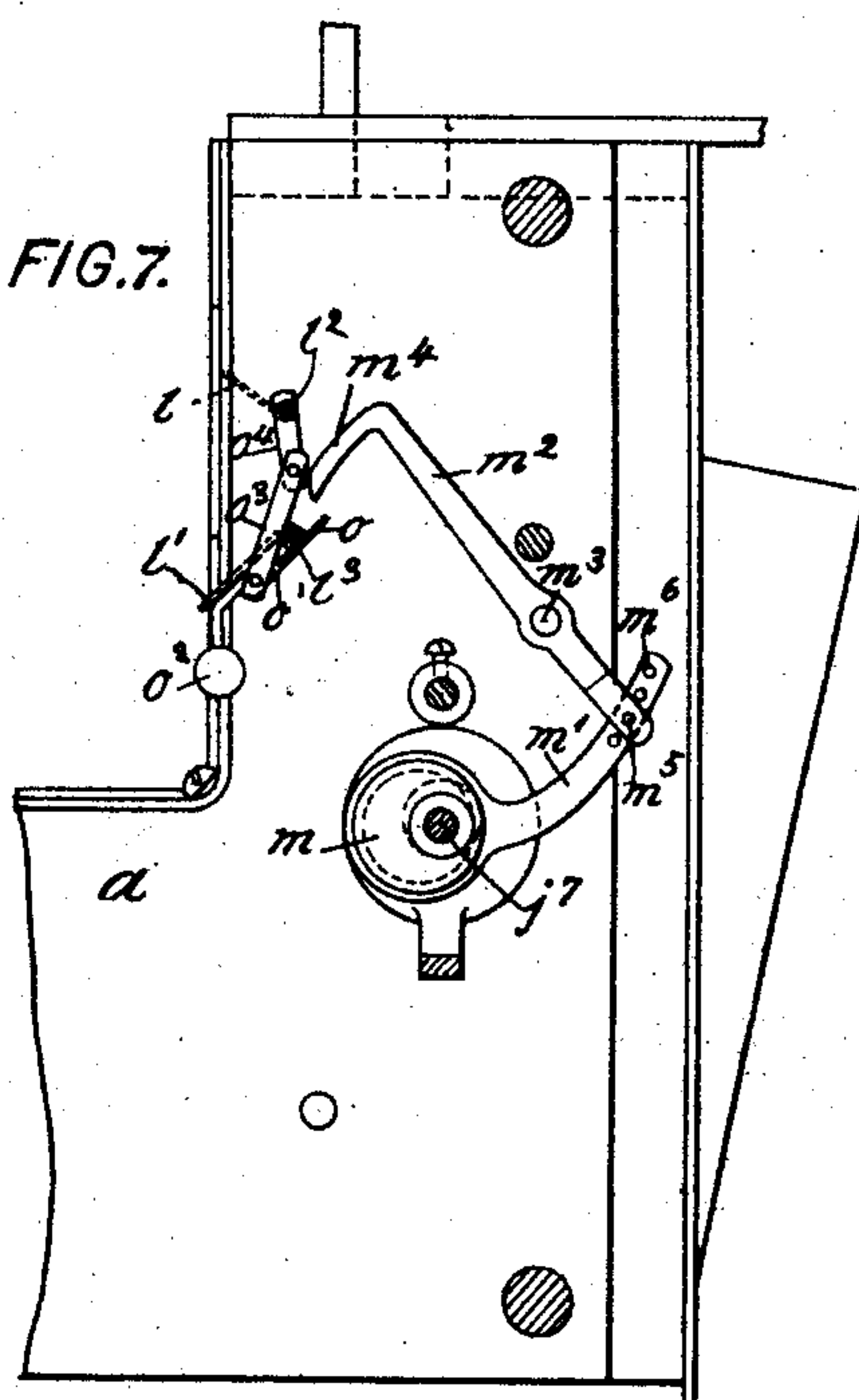
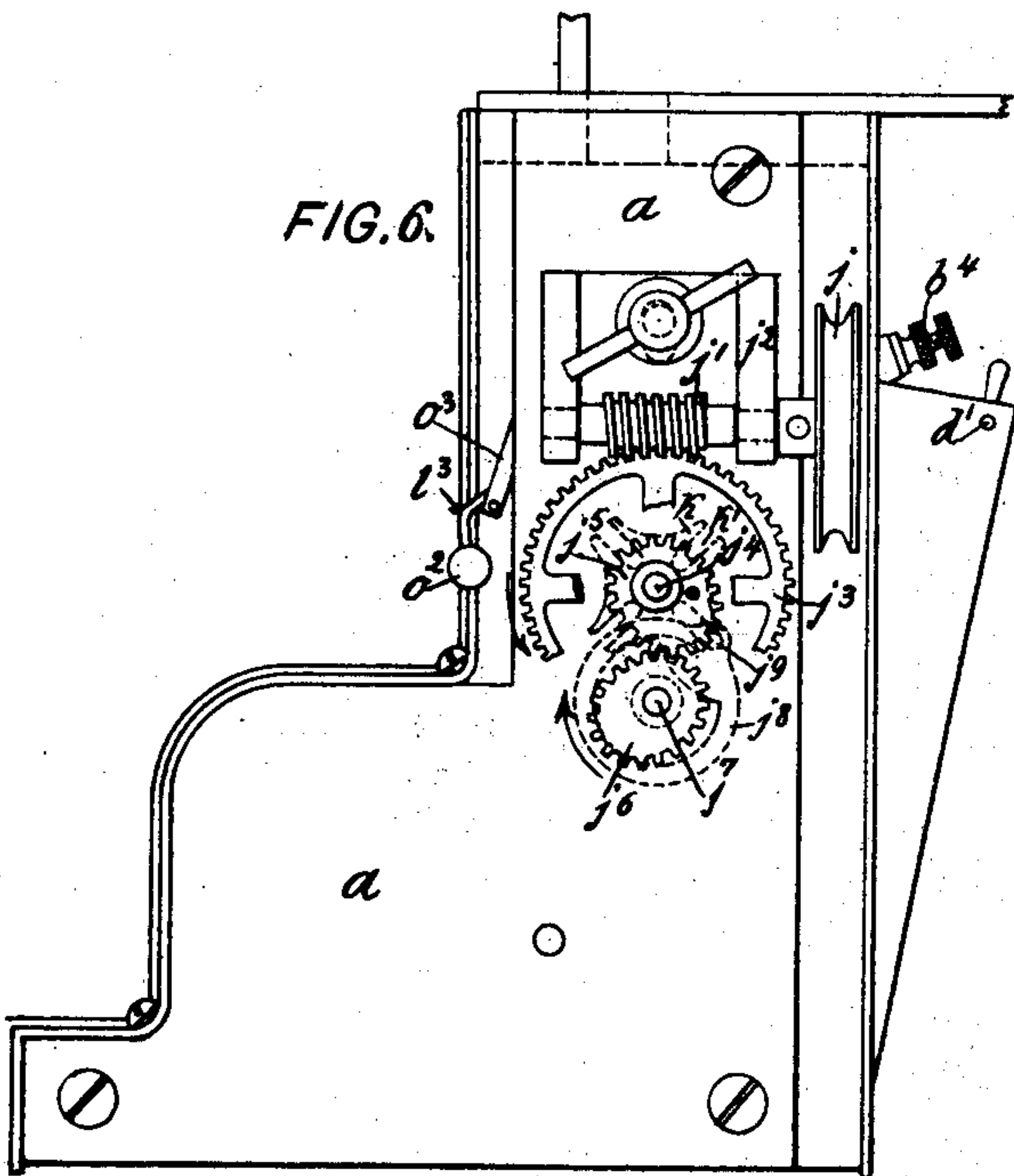
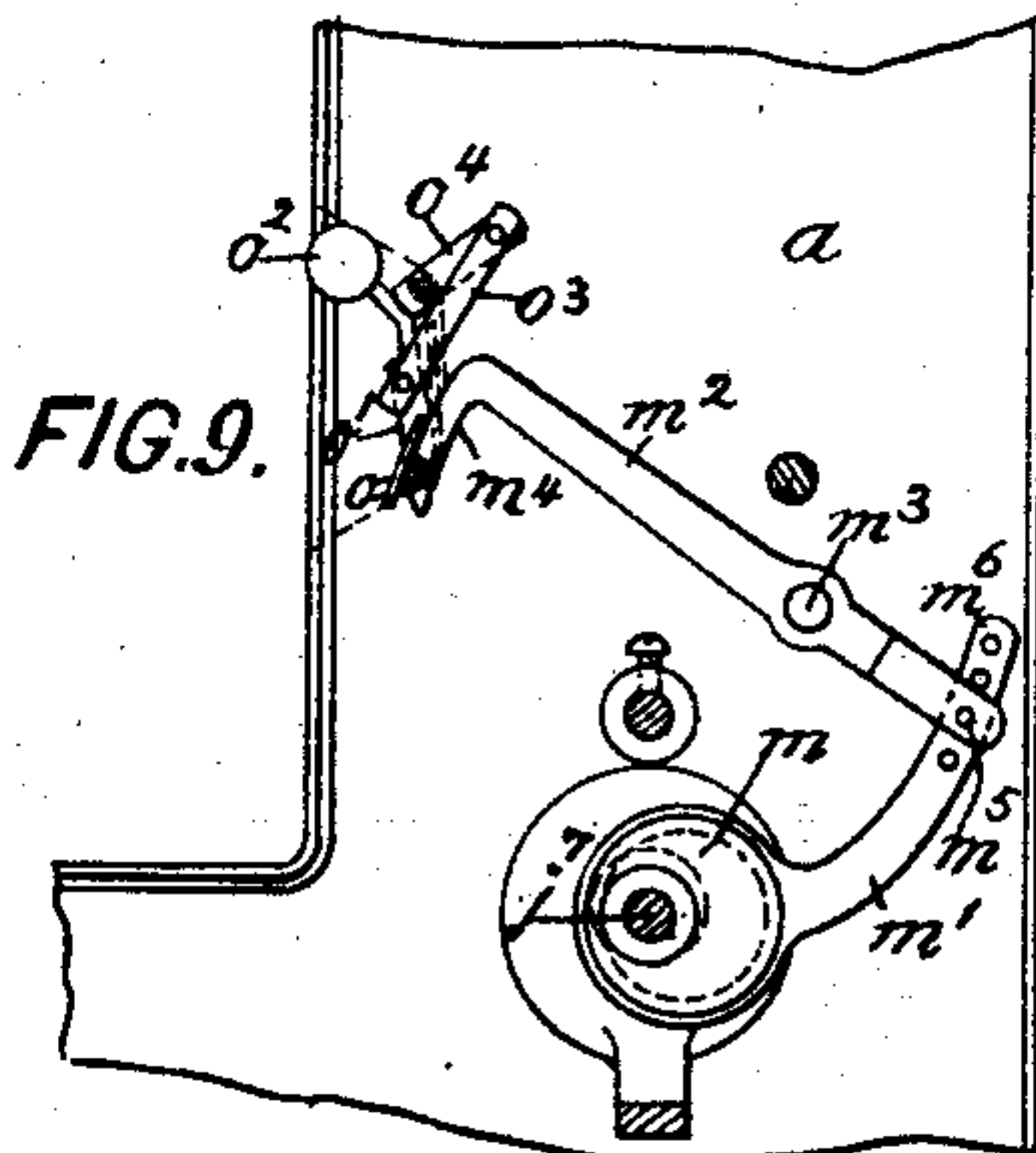
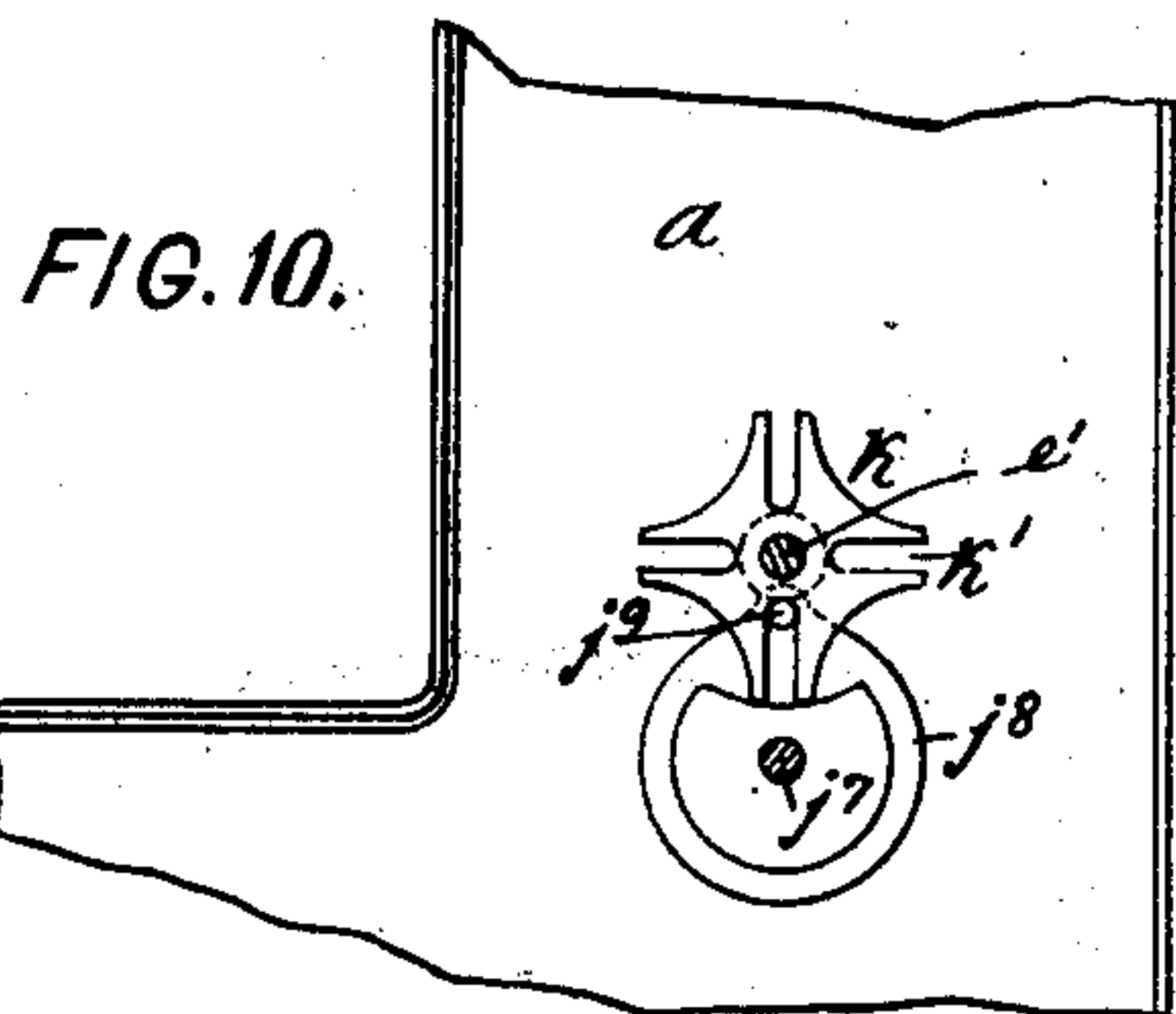
Eberhard Schneider
by his attorneys
Boeder & Briceau

E. SCHNEIDER.
PHOTOGRAPHIC PRINTING MACHINE.

(Application filed Sept. 29, 1900.)

(No Model.)

3 Sheets—Sheet 3.



Witnesses:
John Reeder.
John Hickman.

Inventor:
Eberhard Schneider
by his attorneys
Reeder & Bienen

UNITED STATES PATENT OFFICE.

EBERHARD SCHNEIDER, OF NEW YORK, N. Y.

PHOTOGRAPHIC-PRINTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 666,396, dated January 22, 1901.

Application filed September 29, 1900. Serial No. 31,498. (No model.)

To all whom it may concern:

Be it known that I, EBERHARD SCHNEIDER, a citizen of Germany, and a resident of New York city, county and State of New York, have
5 invented certain new and useful Improvements in Photographic-Printing Machines, of which the following is a specification.

This invention relates to an improved machine for printing photographs, the machine
10 being particularly adapted to print successively the pictures formed on a long and narrow negative such as used, for example, in moving-picture exhibitions. By my machine the positive and negative films are fed with
15 a like speed intermittently through the machine. When the films are in motion, the light-opening will be closed by a shutter, and when the films are at rest the shutter will be opened to admit the light and effect the print-
20 ing. Thus the printing of the pictures will be automatically performed in an accurate and rapid manner and blurring will be prevented.

The invention consists in the various features of construction pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved film-printing machine; Fig. 2, a side elevation, partly
30 in section, of the same; Fig. 3, a detail section through part of the film and shutter driving mechanism; Fig. 4, a detail of the mechanism for feeding the films; Fig. 5, a horizontal section on line 5 5, Fig. 4; Fig. 6,
35 a side elevation, partly broken away, of the machine, showing the side opposite to that shown in Fig. 2; Fig. 7, a section on line 7 7, Fig. 1. Figs. 8 and 9 are similar sections with some of the parts omitted and showing the
40 shutters in consecutive positions, and Fig. 10 is a detail of the Geneva movement.

The letter *a* represents the frame of the machine, having the opening *a'*, through which the light is admitted to effect the printing.

45 A is the sensitized or positive strip or film, and B is the superposed negative transparent strip or film, which contains a row of the pictures to be printed upon the positive film. These films are fed simultaneously back of the opening *a'* by an intermittent motion, so
50 that they are exposed for the time necessary to effect the printing of one picture and are

then advanced rapidly to expose and print the next picture. The positive film A, wound upon a reel A' in a dark chamber *a*², passes 55 over a curved block, rest, or roller *b*, arranged back of the opening *a'*. Thence the film passes over a sprocket-drum *c*, having two rows of teeth which engage the usual perforations formed along the edges of the film. 60 The drum *c* is mounted upon a shaft *c'*, to which it is held by a nut *c*³, Fig. 5, so that it may be readily exchanged. A frame *d*, swinging on shaft *d'* and carrying a pair of guide-rollers *d*², serves to hold the sprocket-drum 65 in engagement with the perforations of the film A. This frame may be fixed in any desired position by a clamp-screw *d*³. From the drum *c*, which is provided with a stripper *p*, the film A passes over the rear roller *d*² 70 into a rear dark chamber *a*³.

The negative film B passes from reel B' also over the block *b*, and thence to the sprocket-drum *e*, mounted upon shaft *e'*, which is adapted to be driven intermittently, in man- 75 ner hereinafter specified, and which imparts a corresponding intermittent motion to shaft *c'* by toothed wheels *e*² *c*².

In order to adjust the sprocket-drum *e* upon its shaft *e'* in such a manner that the nega- 80 tive film may be accurately centered opposite the opening *a'*, I provide the drum *e* with a worm-wheel *e*³. This wheel is engaged by a worm *e*⁴, turning in a bracket *e*⁵, which is connected to the shaft *e'* in such a manner that 85 it will rotate together with the same, but may be readily slipped off if it is desired to exchange the sprocket-drum. A nut *e*⁶ prevents the bracket and drum from slipping off. By turning the worm *e*⁴ the drum *e* will be 90 slightly rotated upon its shaft to draw the film B downward and center the picture accurately within the opening *a'*.

A frame *f*, turning on shaft *f'* and having guide-rollers *f*², serves to hold the drum *e* in 95 engagement with the perforations of the film B. This frame may be set and clamped similar to frame *d* by the clamp-screw *f*³. From the drum *e*, which is provided with a stripper *q*, the film B passes over front roller *f*² into 100 a front dark chamber *a*⁴.

I prefer to provide an additional upper feed for the negative film B, which consists of a sprocket-drum *g*, hung in bearings *g'* and

driven from shaft e' by chain g^2 . The film is held against drum g by rollers g^3 , hung in adjustable frame g^4 , which can be set by means of screw g^5 . Between the drums e and g is arranged a spring-tension roller h , which bears against the film and serves to take up any slack.

The opening a' is provided at its inner side with a yielding frame i , that bears against the film B and presses it, together with film A, against the block b . This frame is of a size to inclose the portion of the film to be exposed and to exclude the light from the remainder of the film. The block b I provide with a curved face that forms a curved back-rest for the films and bulges the portions of the films under exposure outwardly or toward the light-opening. To this curved face I attach importance, as the films while being drawn over it will be pressed into intimate contact and will be so tightly seated that all folds or imperfections are straightened out. Thus all the light will be forced to pass through the film B, and any lateral diffusion of light which might cause a blurred print is prevented.

The block b is secured to a plate b' , hung upon a pintle b^2 and provided with an arm b^3 , which is engaged by a set-screw b^4 . By turning this screw the block b may be set to accommodate different thicknesses of films and to permit the films to be removed and replaced.

The mechanism for imparting intermittent rotary motion to the shaft e' , and consequently to the shaft c' , is as follows: j is a pulley driven by a suitable power and mounted upon a worm-shaft j' , which is hung in an adjustable bearing j^2 . The worm j' engages a worm-wheel j^3 , turning on a stud j^4 and connected to an elliptical gear-wheel j^5 . The wheel j^5 meshes into a corresponding elliptical gear-wheel j^6 , fast on shaft j^7 , to which is also secured the driving-disk j^8 of a Geneva movement. The disk j^8 is provided with a driving pin or pins j^9 , that engage successively the radial grooves k' of the Maltese-cross-shaped gear k , which forms the second part of the Geneva movement.

The wheel k is mounted upon the shaft e' , and thus it will be seen that the rotating movement of pulley j is converted into an intermittent rotating movement of shaft e' , and consequently of shaft c' .

The advantage of driving each of the films A and B by a separate sprocket-drum c and e is that films having differently-gaged holes may be drawn evenly through the machine. So, also, films having equally-gaged holes must be fed by two sprocket-drums, because the curvature of both films is different. It may, however, happen that the holes in both films can be engaged by either the front or rear sprocket-drum alone, in which case the other sprocket-drum is superfluous. The rear sprocket alone is used when the holes in the rear film are nearer together,

while the front sprocket alone is used when the holes in the front film are nearer together, as will be readily understood.

As thus far described a section of the superposed films is exposed for a certain length of time to the light entering opening a' , and then the films are fed downward to expose a new section. Thus the pictures on the negative film are successively printed upon the positive film.

During the time the films are moved—i. e., between the exposures—the light must be shut off from the films, and this is accomplished by a pair of overlapping shutters l and l' , fast on the shafts l^2 l^3 , respectively. The lower shutter l' should be of a length to cover the entire sight-opening, so that the upper shutter l may be removed. This is done when the top of a film-section is to be exposed for a greater length of time than the bottom of such section, as the top of shutter l' will open before and close after the bottom of such shutter.

The mechanism for operating the shutters is as follows: Upon the shaft j^7 is mounted an eccentric m , which reciprocates a rod m' , that is adjustably connected to an oscillating lever m^2 , turning on stud m^3 and having a nose or hooked-shaped end m^4 . The adjustment between lever m^2 and rod m' is effected by a pin m^5 entering one of a series of holes m^6 of rod m' and having for its object to shorten or lengthen the time of exposure. The hook m^4 engages and tilts a plate or projection o , fast on shaft l^3 of lower shutter l' and set slightly back from said shaft. The plate o is provided with an arm o' , carrying a counterweight o^2 , which has a tendency to throw the shutter l' into its open position against the action of the hook m^4 , which tends to close the shutter and hold it in its closed position. Motion is transmitted from arm o' to the upper shutter l by means of a link o^3 , pivoted to arm o' and also to an arm o^4 of shaft l^2 , so that both shutters swing simultaneously outwardly or inwardly. If desired, the motion may be transmitted from one shutter to the other by a pair of gears. The rotation of shaft j^7 will cause an oscillation of the lever m^2 , and when the hook m^4 of such lever moves down, Fig. 7, it will cause the plate o to swing out of its way, Fig. 8, and to thereby rock the shaft l^3 and close both shutters. After the shutters are thus closed the hook m^4 will continue its downward movement, and by impinging against the plate o will hold the shutters in their closed position during its entire downstroke, Fig. 9. During this closing of the shutters the films A B will be fed downward by their sprockets c e , and when they are again arrested the hook m^4 will swing upwardly to release plate o and permit the weight o^2 to throw the shutters rapidly into their open position. When the shutters are thus opened, the arrested films will be exposed to the light to print the next picture, after which the shutters are again closed and the

films fed downward. The mechanisms for moving the shutters and films coact in such a manner that the shutters are first closed, the films then fed downward and arrested, and the shutters are then again opened to effect the next exposure. In this way it will be seen that a succession of clean prints will be obtained.

The object of the elliptic gears $j^5 j^6$ is to shorten the time of closing the shutters and drawing down the films and to lengthen the time of exposure. If these objects are not desired, concentric gears may be substituted for the elliptic gears.

What I claim is—

1. In a photographic-printing machine, the combination of a sprocket-drum adapted to engage a positive film, with a second sprocket-drum adapted to engage a negative film, means for driving said drums intermittently, and with a dark chamber for inclosing the positive film, substantially as specified.

2. In a photographic-printing machine, the combination of a sprocket-drum adapted to engage a positive film, with a second sprocket-drum adapted to engage a negative film, means for driving said drums intermittently, a shutter, and means for alternately opening and closing the shutter, substantially as specified.

3. In a photographic-printing machine, the combination of a dark chamber for enclosing the positive film, with a sprocket-drum adapted to intermittently feed said film, a second sprocket-drum adapted to intermittently feed the negative film, in unison with the positive film, and a shutter adapted to alternately expose and cover the films, substantially as specified.

4. In a photographic-printing machine, the combination of a sprocket-drum for feeding a film, with a swinging frame having rollers that are adapted to hold the film against the drum, and with means for clamping said frame in position, substantially as specified.

5. In a photographic-printing machine, the combination of a pair of intergeared shafts with sprocket-drums movably mounted upon said shafts, and with means for imparting an intermittent rotary movement to one of said shafts, substantially as specified.

6. In a photographic-printing machine, the combination of an intermittently-driven shaft, with a sprocket-drum mounted thereon, and with means for setting said drum adjustably upon said shaft, substantially as specified.

7. In a photographic-printing machine, the combination of an intermittently-driven shaft with a sprocket-drum mounted thereon, a worm-wheel secured to the drum, a worm engaging the same, and a bracket on the shaft for supporting the worm, substantially as specified.

8. In a photographic-printing machine, the combination of an intermittently-driven sprocket-drum adapted to engage the negative film, with a second sprocket-drum that

also engages said film, and with a tension-roller that bears against the film between the drums, substantially as specified.

9. In a photographic-printing machine, the combination of a sprocket-drum adapted to engage the negative film, with a second sprocket-drum that also engages said film, means for intermittently driving said drums, means for holding the film against the drums, and a spring-tensioned roller between the drums, substantially as specified.

10. In a photographic-printing machine having a light-opening, a film-rest having a curved face arranged back of said opening and adapted to bulge the films toward the opening, substantially as specified.

11. In a photographic-printing machine having a light-opening, the combination of a film-rest having a curved face, with means for intermittently feeding a pair of superposed films over said curved face and back of the light-opening, substantially as specified.

12. In a photographic-printing machine having a light-opening, the combination of a film-rest having a curved face and arranged back of said opening, with a pivoted plate that carries said rest, and means for adjusting said plate, substantially as specified.

13. In a photographic-printing machine having a light-opening, the combination of a film-rest having a curved face and arranged back of said opening, with a yielding frame adapted to press a pair of superposed films against the rest, substantially as specified.

14. In a photographic-printing machine having a light-opening, the combination of a film-rest having a curved face and arranged back of said opening, with means for intermittently feeding a pair of superposed films over said curved face, and a yielding frame for pressing the films against said face, substantially as specified.

15. In a photographic-printing machine, the combination of a power-shaft with a sprocket-drum adapted to engage a positive film, a second sprocket-drum adapted to engage a negative film, means for intermittently driving said drums from said shaft, a shutter, and means for alternately opening and closing said shutter, all being so arranged that the shutter is closed when the sprocket-drums are in motion, and that the shutter is open when the sprocket-drums are at rest, substantially as specified.

16. In a photographic-printing machine, the combination of a driving-shaft with a Geneva movement actuated thereby, a sprocket-drum having a shaft that is intermittently driven by said movement, a lever also operated by the driving-shaft, and a pair of shutters operated by said lever, substantially as specified.

17. In a photographic-printing machine, the combination of a driving-shaft with a pair of elliptical gear-wheels actuated thereby, a shaft rotated by one of said gear-wheels, a shutter, means for operatively connecting

said shutter to said shaft, a sprocket-drum, and a Geneva movement for transforming the rotating movement of said shaft into an intermittent rotary movement of the drum,
5 substantially as specified.

18. In a photographic-printing machine, the combination of a worm and worm-wheel, with a shaft actuated thereby, a Geneva movement actuated by said shaft, a sprocket-
10 drum actuated by the Geneva movement, a lever also actuated by said shaft, and a shutter actuated by the lever, substantially as specified.

19. In a photographic-printing machine,
15 the combination of the following elements: a

worm and worm-wheel, a pair of intergeared elliptic wheels actuated thereby, a shaft actuated by one of the elliptical wheels, a sprocket-drum, a Geneva movement between the shaft and sprocket-drum, a shutter, and
20 a lever actuated by the shaft and adapted to actuate the shutter, substantially as specified.

Signed by me at New York city, county and State of New York, this 28th day of September, 1900.

EBERHARD SCHNEIDER.

Witnesses:

WILLIAM SCHULZ,
F. V. BRIESEN.