No. 787,548. PATENTED APR. 18, 1905.

N. D. WYMAN & P. G. FLEMING.

PHOTOGRAPHIC PRINTING APPARATUS.

APPLICATION FILED MAY 5, 1904.

5 SHEETS—SHEET 1.

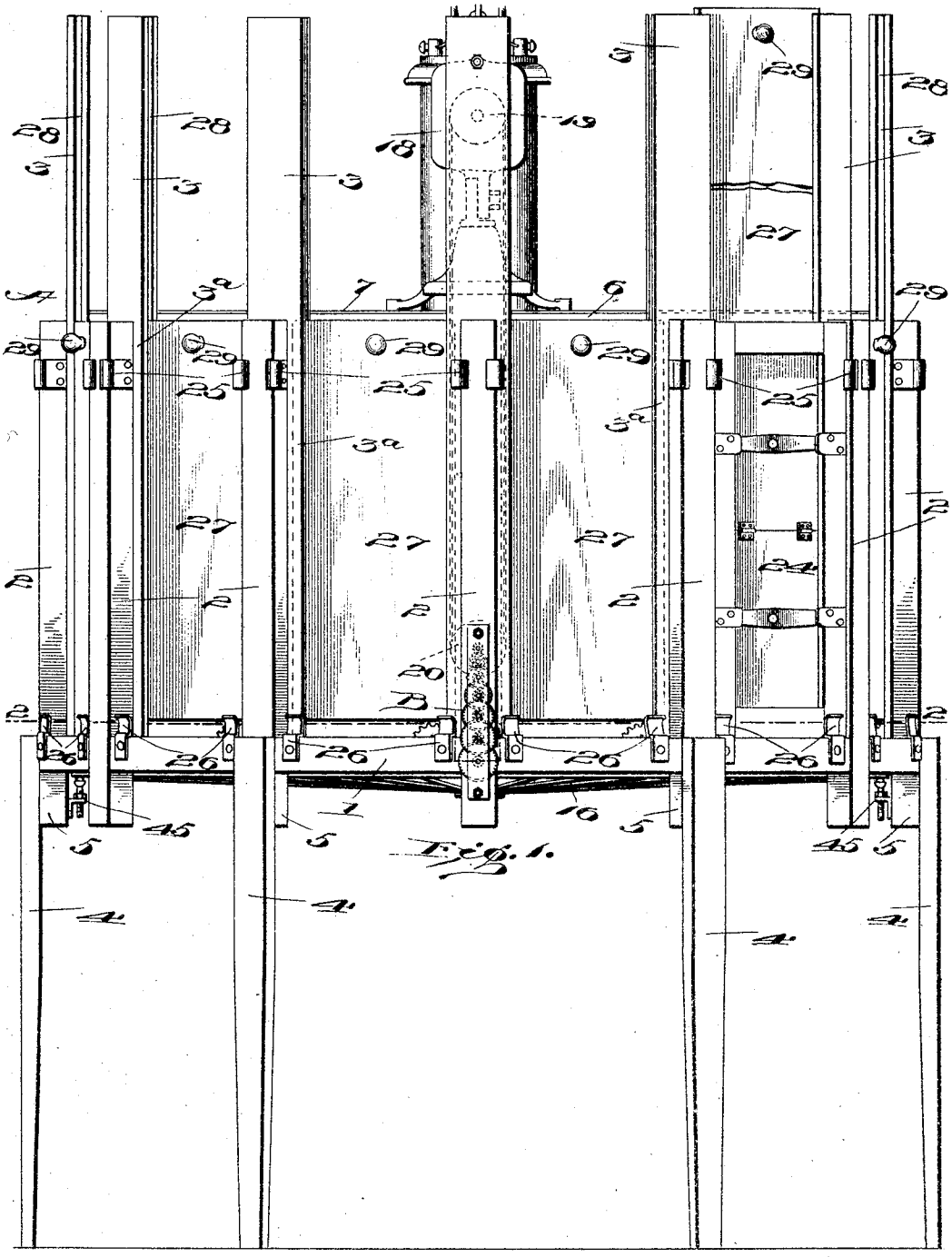


Fig. 1.

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5 SHEETS—SHEET 2.

Fig. 2.

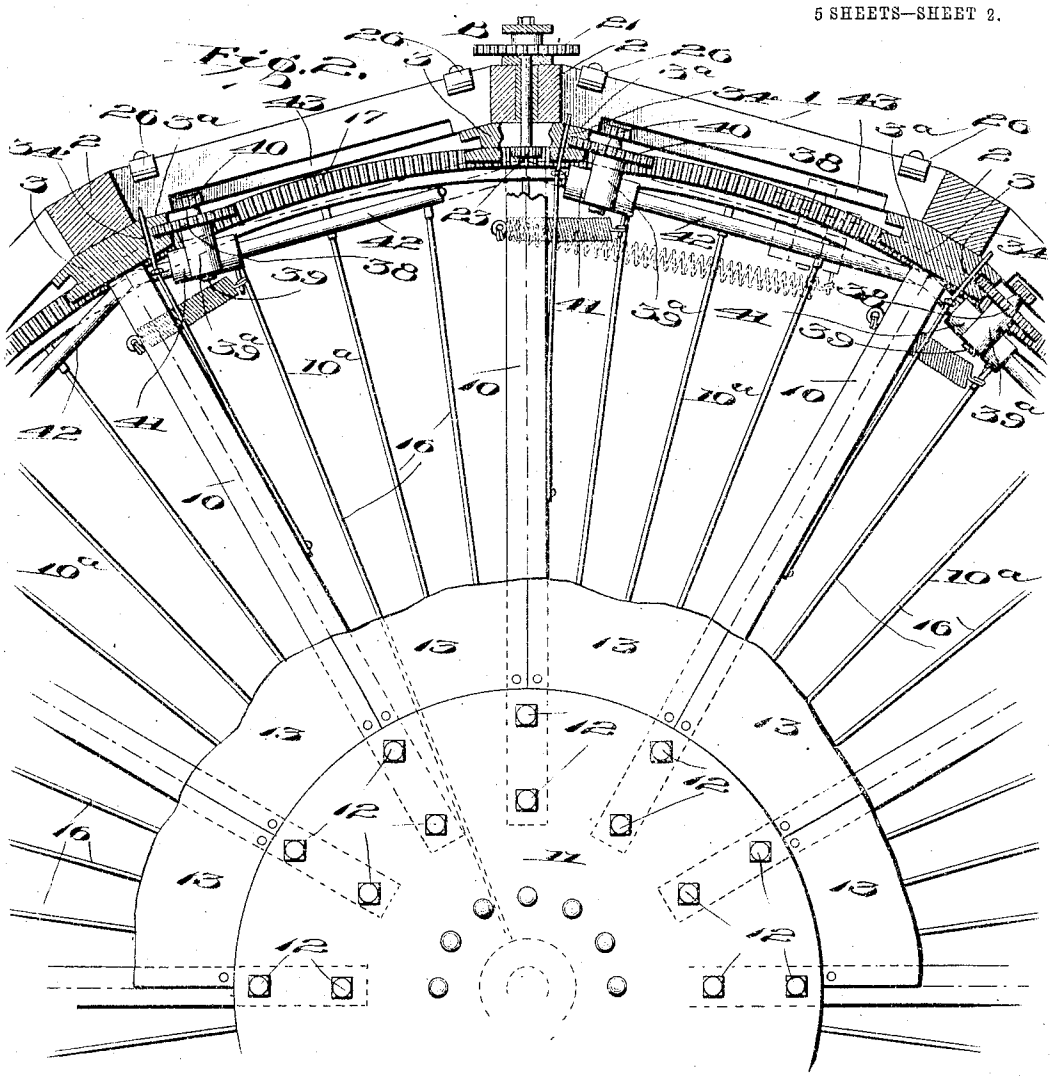
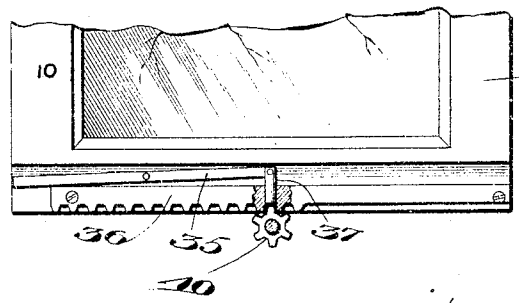


Fig. 7.



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5 SHEETS—SHEET 3.

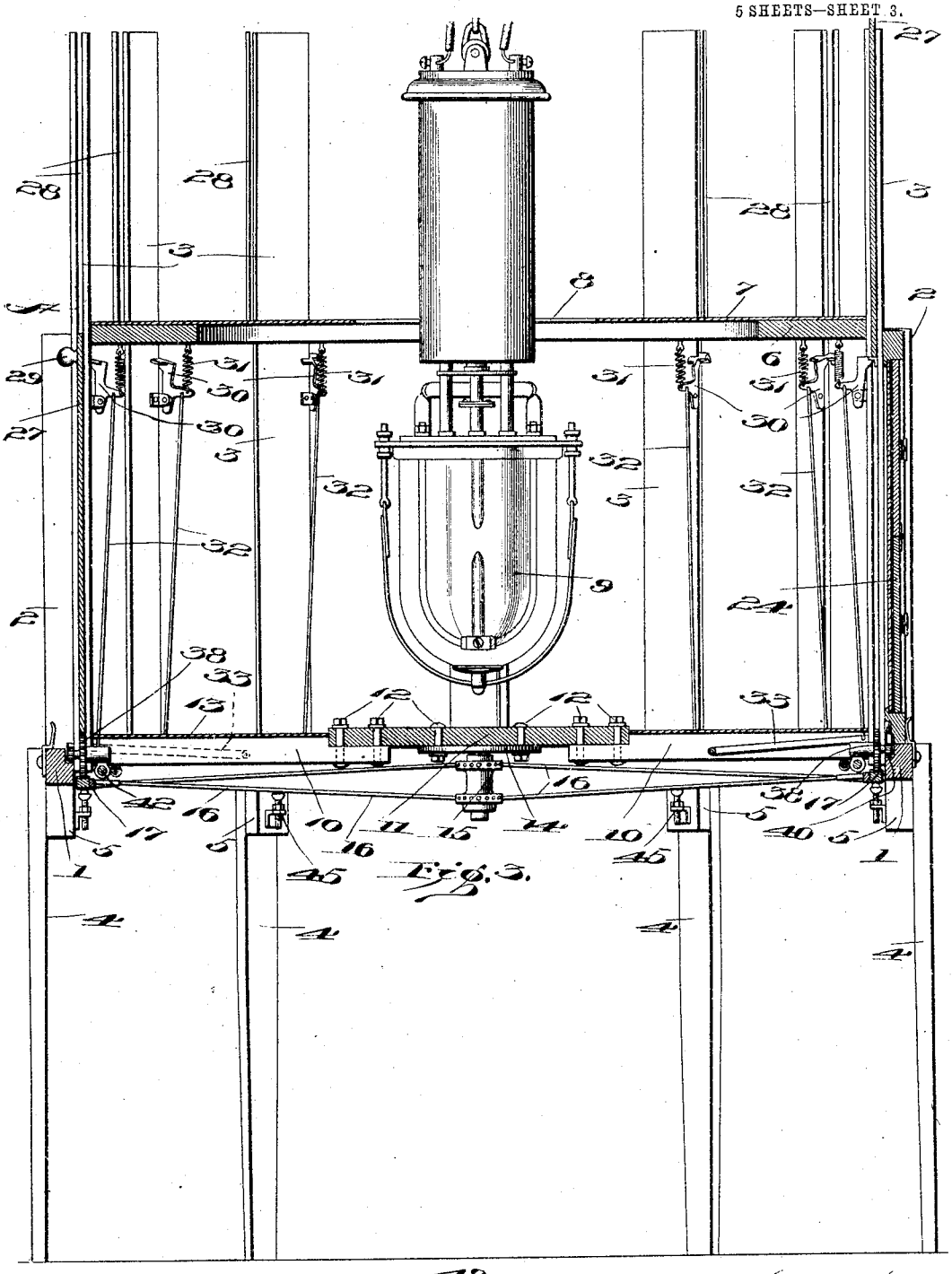


Fig. 3.

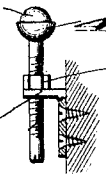


Fig. 8.

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PHOTO LITHOGRAPHED BY SACKETT & WILHELMS LITHO. & PTG. CO. NEW YORK.

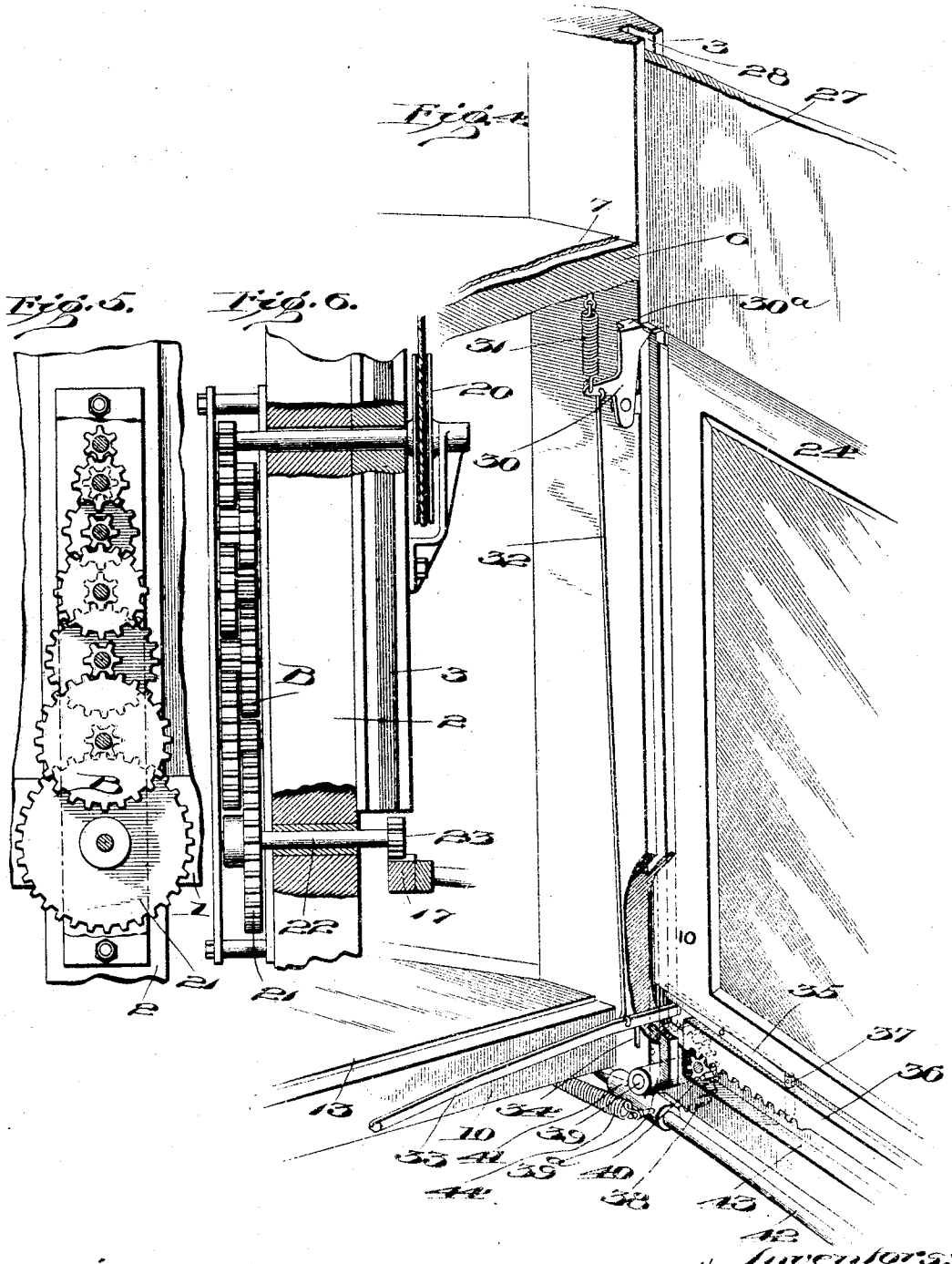
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5 SHEETS—SHEET 4.



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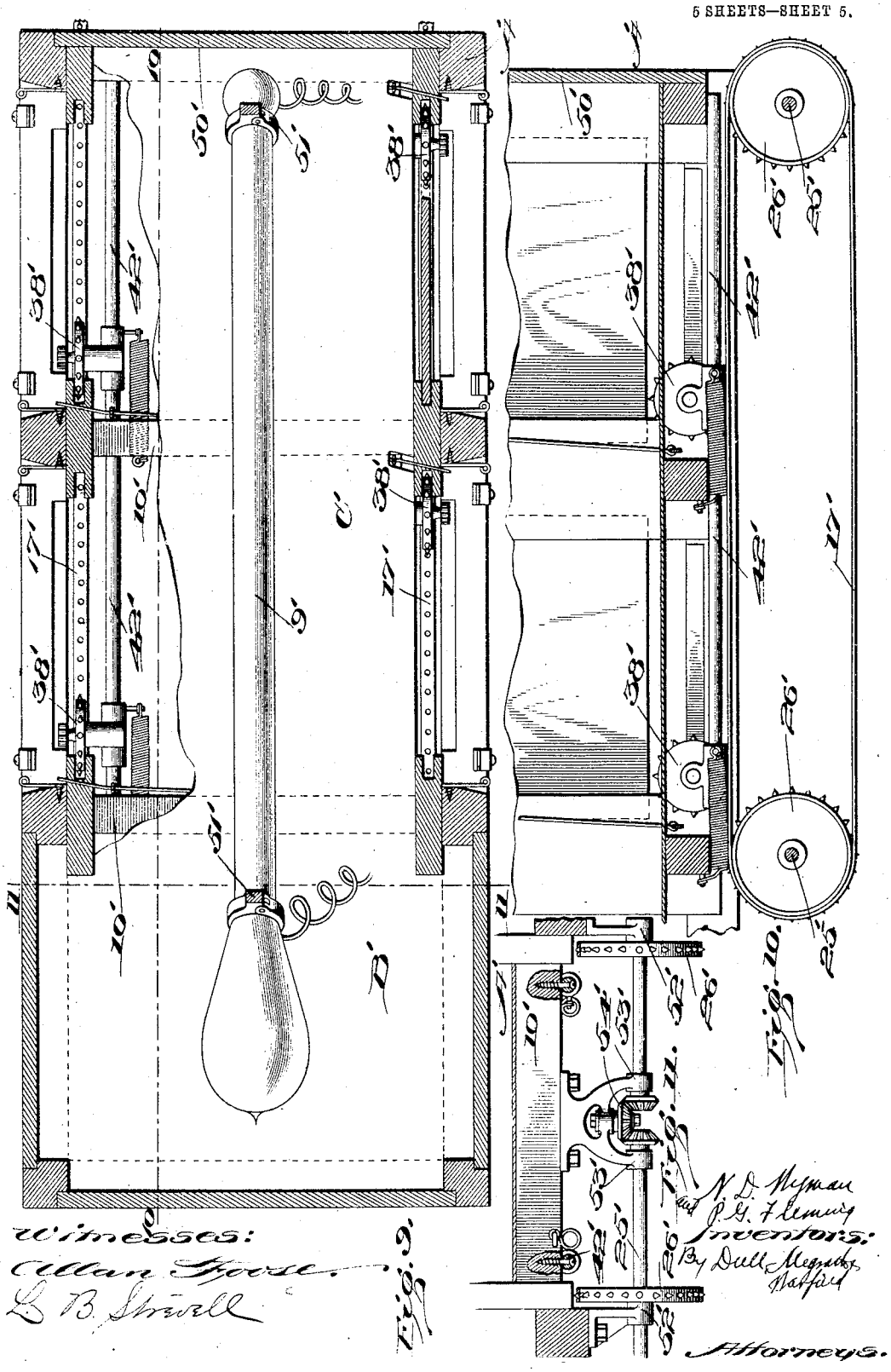
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5 SHEETS—SHEET 5.



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Fig. 9.

Fig. 10.

Fig. 11.

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FROM LITHOGRAPHED BY SCHEFFEL WILHELMS LITHO & PTG CO. NEW YORK.

No. 787,548. Patented April 18, 1905.

UNITED STATES PATENT OFFICE.

NEHEMIAH D. WYMAN, OF ARLINGTON, AND PETER G. FLEMING, OF ELIZABETH, NEW JERSEY, ASSIGNORS TO UNDERWOOD AND UNDERWOOD, OF ARLINGTON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHOTOGRAPHIC-PRINTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 787,548, dated April 18, 1905.

Application filed May 5, 1904. Serial No. 206,442.

To all whom it may concern:

Be it known that we, NEHEMIAH DWIGHT WYMAN, residing at Arlington, in the county of Hudson, and PETER G. FLEMING, residing at Elizabeth, in the county of Union, State of New Jersey, have invented certain new and useful Improvements in Photographic-Printing Apparatus, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to multiple photographic-printing devices.

One of the objects thereof is to provide a device by means of which a plurality of photographic prints may be made simultaneously from an artificial source of light.

Another object is the provision of automatic means whereby the length of exposure of the frames and the time at which such exposure shall terminate may be accurately predetermined.

Other objects will be in part obvious and in part pointed out hereinafter.

This invention proposes, broadly, the arrangement of a plurality of printing-frames about a source of light, each frame being provided with a slide and each slide provided with means adapted to release the same at a time determined by the peculiar construction of means carried by the corresponding frame adapted to coact with other means upon the framework supporting the same.

The invention consists in the combinations of elements, arrangement of parts, and features of construction, which are herein set forth and the scope of the application thereof indicated in the claims.

In the accompanying drawings, wherein are illustrated two embodiments of our invention, various others of which will be readily suggested, Figure 1 is an elevation of a multiple printing device embodying our invention. Fig. 2 is a horizontal section of a portion of the same, taken on line 2 2 of Fig. 1. Fig. 3 is a vertical section through the center of the device. Fig. 4 is an enlarged detail view showing automatic means for releasing the slide. Fig. 5 is an end elevation of reduced gearing interposed between the main driving member and the source of power. Fig. 6 is a side elevation of the same. Fig. 7 is an enlarged detail view of the lower portion of a printing-frame adapted for use with this device, showing part of the automatic releasing mechanism. Fig. 8 is a detail view of a supporting device. Fig. 9 is a horizontal section of another embodiment of our invention. Fig. 10 is a longitudinal vertical section taken on the line 10 10 of Fig. 9. Fig. 11 is a cross-section taken on line 11 11 of Fig. 9.

Similar reference characters denote similar parts throughout the several views.

A represents, broadly, a framework comprising the following parts: The sill 1 is arranged in this embodiment in the shape of an equilateral polygon corresponding in number of sides to the number of printing-frames which it is desired to accommodate simultaneously. Sill 1 is provided with uprights 2, arranged at the vertices of the polygon, and with each upright is associated a vertical guide-post 3, secured to the inner faces thereof for a purpose hereinafter explained. This sill is preferably supported upon legs 4 by means of blocks 5, suitably secured thereto. Fitting within the polygon outlined by uprights 2 and substantially corresponding in contour with sill 1 is a frame 6. This frame is secured to the several guide-posts 3 at a distance above the sill substantially equal to the height of the printing-frames which it is desired to use. Frame 6 supports a covering 7, preferably of sheet metal or other similar material, which entirely covers the inclosed area with the exception of an opening 8 at the center, through which a lamp 9 is adapted to be inserted. Any desired source of artificial light may be used in this embodiment; but an electric-arc lamp has been found well adapted for this purpose on account of the intensity of the light therefrom and ease of insertion and removal.

Projecting inwardly in a radial direction from guides 3 and substantially in the plane

of sill 1 are arms 10, secured at their inner ends to plate 11 by bolts 12 or other retaining means. The openings 10ª, bounded by two adjacent arms 10, are covered by plates 13, preferably of sheet metal or similar material secured thereto.

Vertically journaled upon the under side of plate 11 by means of a collar 14 is a hub 15. Secured to this hub, by means of adjustable spokes 16, is a crown-gear 17. This gear may be driven by any desired means; but the following has been found peculiarly adapted to accomplish this object.

Secured to one of the guide-posts 3 and supported upon frame 6 is an electric motor 18, which may, if an electric light is used, conveniently derive current from the same mains. Pulley 19 upon the motor-shaft is connected by a cord or belt with a similar pulley 20. (Shown in Fig. 6.) The latter pulley is connected to a common form of reducing-gearing B, located outside the upright 2. Gear 21 at the lower end of this train of gearing is upon a shaft 22, passing through the upright and having secured to its inner end pinion 23, meshing with crown-gear 17. The functions of the crown-gear will be hereinafter explained.

The printing-frames 24 are adapted to be slidably inserted between uprights 2, being retained in vertical position by the outer faces 3ª of guides 3 and lugs 25, secured to the uprights, so as to be flush with the lateral surfaces thereof. Attached to sill 1 are spring-clips 26 in such manner that the lower edge of the printing-frame forces them slightly outward and will be retained in its lowermost positions by the pressure thereof. Slides 27 are adapted to rise and fall freely in grooves 28 in guides 3 and are provided with pins or handles 29 for use in raising the same. As the automatic retaining and releasing mechanism is identical for all of the frames, that for only one will be described. The slide is retained in an elevated position by dog 30, pivoted to the guide adjacent the edge thereof, as shown in Fig. 4. This dog is normally forced into the path of the slide by spring 31 and is provided with a shoulder 30ª, adapted to coact with the guide to limit its inward movement. Pivotally connected to arm 10 beneath the dog and connected therewith by a link 32 is a lever 33. The outer end of this lever passes through a slot 34 in guide 3 and is adapted to be engaged by a lever 35, mounted upon the printing-frame. The general construction of these frames may be of any desired type; but they have the following peculiar features: The above-mentioned lever 35 is pivotally connected to the lower part of the frame in such manner as to engage lever 33. A rack 36 is secured to the lower edge of the frame, and the free end of lever 35 has pivotally connected to it a pin 37, adapted to reciprocate within an opening in said rack and projecting between two adjacent teeth thereof. Pin 37 may project between any desired teeth of the rack, and, as hereinafter explained, the length of exposure will be determined by the position of this pin. Spur-gear 38 is adapted to mesh with and be driven by crown-gear 17. Fixed upon the shaft 39 of spur-gear 38 is a pinion 40, adapted to mesh with rack 36 when the printing-frame carrying this rack is in its lowermost position, as shown in Fig. 4. The shaft 39 is journaled in the sleeve 39ª, which is rigidly mounted transversely of a second sleeve 41, adapted to reciprocate upon a guide-rod 42. Sleeve 41 is free to travel between two adjacent guide-posts 3, and the gear 38, driven by crown-gear 17, drives pinion 40. The latter meshes with rack 36 and travels in a recess 43 in sill 1. A spring 44 normally holds sleeve 41 at one extreme of its path of travel, as shown in Fig. 4.

Although crown-gear 17 may readily be supported by the spokes 16 thereof, it is preferred to relieve the stress upon the same by means of the supports shown secured to blocks 5. These supports comprise the bracket 45, secured to block 5 by means of screws or other retaining means, and a cup-headed member 46, vertically positioned therein. This member is preferably screw-threaded, as shown, and is provided with a nut 47, adapted to rest upon bracket 45, by means of which its position may be vertically adjusted. In the concave upper extremity of this member is preferably inserted some "antifriction" device in the nature of a ball 48 or other rolling body. By means of the vertical adjustment each supporting member can be adjusted so as to bear its share of the weight of the crown-gear and associated parts.

The operation of the above-described embodiment of our invention is as follows: The lamp 9 is inserted through opening 8, so as to be suspended about midway between frame 6 and the arms 10. In this position it is at a substantially equal distance from all of the slides, and the sheets 7 and 13 serve to confine or economize the light. The printing-frames in condition for exposure are then slidably inserted between uprights 2 and the slides 27 raised in a position supported by dogs 30. Upon the engagement of racks 36 with pinions 40 the latter, driven by crown-gear 17, as previously explained, travel in these racks at a uniform speed against the tension of springs 44, and at a time determined by the teeth of the rack between which pin 37 projects the corresponding pinion will engage with pins and force the same inwardly, thus through levers 35 and 33 and link 32 releasing dog 30 and allowing the slide to fall, terminating the exposure. The length of the exposure can in this manner be predetermined, as all the pinions travel at the same rate, by the selection of a printing-frame having a pin projecting between the proper teeth of the rack. For example, if a short exposure

is desired the pinion of the frame selected projects between teeth of the rack near the end adjacent lever 33, and lever 35 is correspondingly short. If a longer exposure is desired, a frame must be used in which the pinion must travel a greater distance before reaching 37. The time of exposure which would result with a given frame may conveniently be indicated by stamping the same upon the frame, as shown in Figs. 4 and 7. The teeth of the rack are cut away beyond the opening, as shown at 49, so as to permit the pinion to roll idly at this point until the rack is removed, whereupon spring 44 will quickly draw sleeve 41, with its associated parts, back to their normal position.

In Figs. 9, 10, and 11 of the drawings is illustrated another embodiment of our invention which is peculiarly adapted for use with certain recent types of electric lamps. A′ represents, broadly, a framework rectangular in plan, but having the general characteristics of framework A, previously described. Framework A′ is preferably oblong in shape and may be roughly considered as comprising two chambers B′ and C′. B′ is a mere box-like inclosure opening into C′ and adapted to house non-radiant parts of the lamp 9′. C′ is preferably oblong in plan, terminating at one end in an opaque panel 50′ and opening at the other end into B′. Along the sides of C′ and preferably arranged facing one another in pairs are the printing-frame receptacles, which are identical with those in the previously-described embodiment. The chamber C′ is preferably covered at the top and bottom, so as prevent loss of light, and the lamp 9′ may be inserted through B′ and supported by the clamps (indicated at 51′) at the center of C′. The slides are held elevated by dogs in the same manner as in the previous embodiment, and the rack-and-pinion mechanism and releasing-levers are also identical with the corresponding parts thereof. The actuating mechanism, however, is changed in this embodiment, so as to be adapted to the changed arrangement of the printing-frames. At each side of chamber C′ perforated belts 17′, of steel tape or other desired material, pass over spur-wheels 26′, the projections upon the wheels corresponding in size and distance apart with the perforations in the belt. It is obvious that the ordinary sprocket wheels and chain could be here used, if desired. One of spur-wheels 26′ is mounted upon a shaft 25′, which is driven by any desired source of power. The outer end of this shaft is journaled in bearing 52′, and the inner end is journaled in bearing 53′, supported from the cross-bar 10′ of framework A′. The opposite spur-wheel is similarly journaled, and the two shafts are operatively connected through idle bevel-gear 54′, vertically journaled in the support of bearing 53′, as shown in Fig. 10. By this means belts 17′ are driven in opposite directions upon the opposite sides of chamber C′. Coacting with the upper sides of said belts are spur-wheels 38′, similar in character to wheel 26′ and identical in function with spur-gears 38 of the previously-described embodiment. The straight guide-rods 42′ are secured to the lower surfaces of cross-bars 10′ by screws or other retaining means and perform the same function as their equivalent guide-rods 42 in the first-described embodiment. As the belts travel in opposite directions upon the two sides of chamber C′, it is readily seen that the printing-frames may be used indiscriminately upon either side thereof.

The manner of using both of the above-described embodiments is identical.

It will thus be seen that we have provided a simple, efficient, and inexpensive device for printing a plurality of photographs, blue prints, or other reproductions of that nature at the same time. Also the time of exposure may be accurately predetermined without adjustment by merely selecting the appropriate frame. Moreover, as the frames may remain in the slides indefinitely after the termination of the exposure without harm no personal supervision of the apparatus is required.

Various modifications of the above embodiments will be readily suggested and many apparently widely-different embodiments may be constructed without departing from the scope of this invention. For example, the timing mechanism may be readily adapted to be used with natural instead of artificial light. Again, the peculiar relative arrangement of light and frames could be used with other timing mechanism. For these reasons we intend that all statements made in this description and all views shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim—

1. In a device of the class described, a printing-frame, a source of light, a slide adapted to move between said frame and said source of light, a dog adapted to prevent said sliding movement, and automatic means for releasing said dog.

2. In a device of the class described, a printing-frame, a source of light, a slide adapted to move between said source of light and said frame, a dog adapted to prevent such sliding movement, a lever operatively connected to said dog, and automatic means adapted to depress said lever and release said dog from holding position.

3. In a device of the class described, a printing-frame, a source of light, a slide adapted to move between said frame and said source of light, a spring-pressed dog adapted to prevent such sliding movement, a lever operatively connected to said dog, and means adapted to depress said lever and release said dog from holding position.

4. In a device of the class described, a print-

ing-frame, a source of light, an opaque body adapted to move between said frame and said source of light, a spring-pressed dog adapted to prevent such movement, a lever operatively connected to said dog, and automatic means adapted to depress said dog from holding position.

5. In a device of the class described, a printing-frame, a source of light, a slide adapted to move between said frame and said source of light, a dog adapted to prevent such sliding movement, a spring adapted to force said dog into engagement with said slide, and a shoulder upon said dog adapted to limit the action of said spring.

6. In a device of the class described, a source of light, a printing-frame adapted to be exposed to the same, means carried by said frame adapted to determine the time at which such exposure shall be terminated, and automatic means adapted to terminate such exposure at the end of a predetermined time.

7. In a device of the class described, a source of light, a printing-frame adapted to be exposed to the same, means carried by said frame adapted to determine the time at which such exposure shall be terminated, and means adapted to terminate such exposure at the end of a predetermined time.

8. In a device of the class described, a horizontal movable member, a cup, and a rolling member supported in said cup and adapted to contact with said horizontal member.

9. In a device of the class described, a horizontal movable member, a cup supported beneath the same, and a rolling member supported in said cup and adapted to contact with said horizontal member.

10. In a device of the class described, a horizontal movable member, a cup adjustably supported beneath the same, and a rolling member in said cup adapted to contact with said horizontal member.

11. In a device of the class described, a rotatable member, a vertically-adjustable member located beneath the same and provided with a cup-shaped upper extremity and a ball located in said cup and adapted to support said rotating member.

12. In a device of the class described, a rotatable member, a plurality of vertical adjustable members located beneath the same and provided with cup-shaped extremities and adapted to support said rotating member.

13. In a device of the class described, a rotatable member, a bracket located beneath the same, a screw-threaded member provided with a cup-shaped head vertically disposed in said bracket, a nut upon said screw-threaded member adapted to adjust the vertical position thereof within said bracket, and a ball within said cup-shaped head adapted to contact with said rotating member.

14. In a device of the class described, a rotating member, a plurality of brackets located beneath the same, screw-threaded members provided with cup-shaped heads vertically positioned in said brackets, nuts upon said screw-threaded members adapted to adjust the vertical position thereof within said brackets, and balls within said cup-shaped heads adapted to contact with said rotatable member and support the same.

15. In a device of the class described, a source of light, a plurality of printing-frames facing said source of light, a slide adapted to be interposed between each of said frames and said source of light, and automatic means regulating the interposition of said slides.

16. In a device of the class described, a plurality of printing-frames facing a common line, a source of light upon said line, a slide adapted to be interposed between each of said frames and said source of light, and automatic means regulating the interposition of said slides.

17. In a device of the class described, a plurality of printing-frames facing a common point, a source of light located at said point, a slide adapted to be interposed between each of said frames and said source of light, and automatic means regulating the interposition of said slides.

18. In a device of the class described, a plurality of printing-frames arranged inwardly facing upon the sides of a polygon, a source of light at the center of said polygon, a slide adapted to be interposed between each of said frames and said source of light, and automatic means regulating the interposition of said slides.

19. In a device of the class described, a plurality of printing-frames facing a common line, a source of light upon said line, a slide adapted to fall between each of said printing-frames and said source of light, a spring-pressed dog adapted to hold said slide, and automatic means for releasing said dog.

20. In a device of the class described, a plurality of printing-frames facing a common point, a source of light located at said point, a slide adapted to move between each of said printing-frames and said source of light, a spring-pressed dog adapted to hold said slide, and automatic means for releasing said dog.

21. In a device of the class described, a plurality of printing-frames arranged inwardly facing upon the sides of a polygon, a source of light at the center of said polygon, a slide adapted to move between each of said printing-frames and said source of light, a spring-pressed dog adapted to hold said slides, and automatic means for releasing said dog.

22. In a device of the class described, a plurality of printing-frames, a framework adapted to hold said frames facing a common line, a source of light located upon said line, an opaque body adapted to be interposed between each of said frames and said source of

light, and automatic means adapted to interpose said body at the end of a predetermined time.

23. In a device of the class described, a source of light located upon a line, a plurality of printing-frames adapted to be arranged facing said source of light and exposed to the same, and automatic means for terminating such exposure at the end of a predetermined time.

24. In a device of the class described, a source of light located upon a line, a plurality of printing-frames adapted to be arranged facing said line and exposed to said source of light, and means carried by said frames adapted to determine the time at which said exposure shall be terminated.

25. In a device of the class described, a source of light located at a point, a plurality of frames adapted to be arranged facing said point and exposed to said source of light, means for automatically terminating such exposure, and means carried by said frame adapted to determine the time at which such exposure shall be terminated.

26. In a device of the class described, a printing-frame, a source of light to which said frame is adapted to be exposed, a slide adapted to be interposed between said source of light and said frame, and means carried by said frame adapted to determine the time at which said slide shall be interposed.

27. In a device of the class described, a printing-frame, a source of light to which said frame is adapted to be exposed, a slide adapted to fall between said source of light and said frame, a dog adapted to support said slide, and means carried by said frame adapted to determine the time at which said dog shall be released.

28. In a device of the class described, a printing-frame, a source of light to which said frame is adapted to be exposed, a slide adapted to fall between said source of light and said frame, a spring-pressed dog adapted to support said slide, a lever connected to said dog, and means carried by said frame adapted to determine the time at which said lever shall be depressed and said dog released.

29. In a device of the class described, a printing-frame, a source of light to which said frame is adapted to be exposed, a slide adapted to fall between said source of light and said frame, a spring-pressed dog adapted to support said slide, a lever carried by said frame and adapted to coact with said first-mentioned lever, a rack carried by said frame, a pin pivotally connected with said second-mentioned lever and adapted to project between two adjacent teeth of said rack, and a pinion adapted to travel in said rack and press said pin and allow said slide to fall.

30. In a device of the class described, a plurality of printing-frames, a source of light to which said frames are adapted to be exposed, a slide adapted to fall between said source of light and each of said frames, spring-pressed dogs adapted to support said slides, levers operatively connected to said dogs, levers carried by said frames and adapted to coact with said first-mentioned levers, racks carried by said frames, pins pivotally connected with said second-mentioned levers and adapted to project between two adjacent teeth of said racks, pinions adapted to travel in said racks, and common means adapted to drive said pinions in said racks and adapted upon the contact of a pinion with its coacting-pin to release the corresponding slide.

31. In a device of the class described, a plurality of printing-frames, a source of light to which said frames are adapted to be exposed, slides adapted to fall between said source of light and said frames, dogs adapted to support said slides, levers operatively connected to said dogs, levers carried by said frames and adapted to coact with said first-mentioned levers, racks carried by said frames, pins pivotally connected with said second-mentioned levers and adapted to project between two adjacent teeth of said racks, common means adapted to drive said pinions in said racks and adapted upon the contact of a pinion with its coacting pin to release the corresponding slide, and means adapted upon the removal of said frames to return the coacting parts to normal position.

32. In a device of the class described, a plurality of printing-frames, a source of light to which said frames are adapted to be exposed, slides adapted to fall between said source of light and said frames, dogs adapted to support said slides, levers operatively connected to said dogs, levers carried by said frames and adapted to coact with said first-mentioned levers, racks carried by said frames, pins pivotally connected with said second-mentioned levers and adapted to project between two adjacent teeth of said racks, common means adapted to drive said pinions in said racks and adapted upon the contact of a pinion with its coacting pin to release the corresponding slide, shafts, sleeves adapted to run thereon and guide said pinions, and springs adapted upon the removal of said frames to return the coacting parts to normal position.

33. In a device of the class described, a source of light upon a line, a plurality of printing-frames arranged facing said line, opaque bodies adapted to be interposed between said source of light and said frames, and means carried by said frames adapted to determine the time at which said opaque bodies shall be interposed.

34. In a device of the class described, a source of light upon a line, a plurality of printing-frames arranged facing said line, a slide adapted to be interposed between said source of light and each of said frames; and means

carried by said frames adapted to determine the time at which said slides shall be interposed.

35. In a device of the class described, a source of light at a point, a plurality of printing-frames arranged facing said point, opaque bodies adapted to be interposed between said source of light and said frames, and means carried by said frames adapted to determine the time at which said opaque bodies shall be interposed.

36. In a device of the class described, a plurality of printing-frames facing a common point, a source of light located at said point, a slide adapted to fall between said source of light and each of said frames, and means carried by said frames adapted to determine the time at which each slide shall fall.

37. In a device of the class described, a plurality of printing-frames facing a common point, a source of light located at said point, a slide adapted to fall between said source of light and each of said frames, spring-pressed dogs adapted to support said slides, levers operatively connected to said dogs, and means carried by said frames adapted to determine the several times at which said dogs shall be released.

38. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to fall between said source of light and said frames, spring-pressed dogs supporting said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers, and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, and pinions adapted to run in said racks and actuate said pins.

39. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to move between said source of light and said frames, spring-pressed dogs retaining said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, and pinions driven from a common source of power adapted to travel in said racks and actuate said pins.

40. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to move between said source of light and said frames, spring-pressed dogs retaining said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions driven from a common source of power adapted to run in said racks and actuate said pins, and gears rigidly mounted upon the shafts of said pinions and adapted to be driven by a common driving member.

41. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to fall between said source of light and said frames, spring-pressed dogs supporting said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to run in said racks and actuate said pins, shafts to which said pinions are secured, sleeves upon which said shafts are mounted, and guides for said sleeves.

42. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to move between said source of light and said frames, spring-pressed dogs retaining said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to run in said racks and actuate said pins, shafts to which said pinions are secured, sleeves upon which said shafts are mounted, guides for said sleeves, and springs adapted to return said sleeves to a normal position upon the removal of said racks from said pinions.

43. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to fall between said source of light and said frames, spring-pressed dogs supporting said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to run in said racks and actuate said pins, spur-gears rigidly mounted upon the shafts of said pinions, and a crown-gear adapted to drive said spur-gears.

44. In a device of the class described, a plurality of printing-frames, a framework adapted to removably support said frames about the sides of a polygon, a source of light located at the center of said polygon, slides adapted to fall between said frames and said source of light, spring-pressed dogs adapted to support said slides, shoulders upon said dogs coacting with said framework to limit the action of said spring-pressing means, levers operatively connected to said dogs, levers upon said frames adapted to coact with said first-mentioned levers and release said slides, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to travel in said racks and actuate said pins, shafts to which said pinions are rigidly secured mounted upon sleeves, guides upon which said sleeves are adapted to run, springs adapted to return said sleeves to a normal position upon the separation of said racks and said pinions, and a common driving member for said pinions.

45. In a device of the class described, a plurality of printing-frames, a framework adapted to removably support said frames about the sides of a polygon, a source of light located at the center of said polygon, slides adapted to fall between said frames and said source of light, spring-pressed dogs adapted to support said slides, shoulders upon said dogs coacting with said framework to limit the action of said spring-pressing means, levers operatively connected to said dogs, levers upon said frames adapted to coact with said first-mentioned levers and release said slides, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to travel in said racks and actuate said pins, shafts to which said pinions are rigidly secured mounted upon sleeves, guides upon which said sleeves are adapted to run, springs adapted to return said sleeves to a normal position upon the separation of said racks and said pinions, spur-gears upon the shafts of said pinions, and a crown-gear adapted to drive said several spur-gears.

46. In a device of the class described, a plurality of printing-frames, slides adapted to cover the same, automatic means for determining the time at which said slides shall operate, a crown-gear adapted to drive said automatic means, and a cup-shaped supporting member located below said crown-gear containing a ball adapted to contact with and partially support the same.

47. In a device of the class described, a plurality of printing-frames, slides adapted to cover the same, automatic means determining the time at which said slides shall operate, a crown-gear adapted to drive said automatic means and a vertically-adjustable cup-shaped supporting member located below said crown-gear containing a ball adapted to contact with and partially support the same.

48. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to fall between said source of light and said frames, spring-pressed dogs supporting said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to run in said racks, and gears rigidly mounted upon the shafts of said pinions and adapted to be driven by a common driving member, said member being supported upon a plurality of cup-shaped members through balls interposed therebetween.

49. In a device of the class described, a plurality of printing-frames, a framework adapted to support said frames facing a common point, a source of light located at said point, slides adapted to fall between said source of light and said frames, spring-pressed dogs supporting said slides, levers operatively connected to said dogs, levers carried by said frames adapted to coact with said first-mentioned levers and release said dogs, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to run in said racks, and gears rigidly mounted upon the shafts of said pinions and adapted to be driven from a common driving member, said member being supported upon a plurality of vertically-adjustable cup-shaped members through balls interposed therebetween.

50. In a device of the class described, a plurality of printing-frames, a framework adapted removably to support said frames about the sides of a polygon, slides adapted to fall between said frames and said source of light, dogs adapted to support said slides, levers operatively connected to said dogs, levers upon said frames adapted to coact with said first-mentioned levers and release said slides, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to travel in said racks and actuate said pins, shafts to which said pinions are rigidly secured, spur-gears upon the shafts of said pinions, and a crown-gear adapted to drive said several spur-gears, said crown-gear being supported upon a plurality of cup-shaped members through the intermediation of balls interposed therebetween.

51. In a device of the class described, a plurality of printing-frames, a framework adapted removably to support said frames about the sides of a polygon, a source of light located at

the center of said polygon, slides adapted to fall between said frames and said source of light, dogs adapted to support said slides, levers operatively connected to said dogs, levers upon said frames adapted to coact with said first-mentioned levers and release said slides, racks carried by said frames, pins pivotally connected to said second-mentioned levers and projecting between adjacent teeth of said racks, pinions adapted to travel in said racks and actuate said pins, shafts to which said pinions are rigidly secured, spur-gears upon the shafts of said pinions, and a crown-gear adapted to drive said several spur-gears, said crown-gear being supported upon a plurality of vertically-adjustable cup-shaped members through the intermediation of balls interposed therebetween.

52. In a device of the class described, a plurality of printing-frames, a framework adapted to support the same facing a common line, a source of light adapted to be placed upon said line, and a covering over said framework adapted to prevent a waste of light, said covering extending to the upright portions of said framework and resting upon the same.

53. In a device of the class described, a printing-frame, a source of light and means carried by said frame adapted to determine the time of exposure of said frame to said source of light.

54. In a device of the class described, a printing-frame, a source of light, means adapted to expose said frame to said source of light and means carried by said frame adapted to coact with said first-mentioned means and adapted to determine the duration of such exposure.

55. In a device of the class described, a printing-frame, a source of light, means adapted to expose said frame to said source of light, a rack carried by said frame, a lever pivoted upon said frame, and a pin pivotally connected to said lever and projecting between adjacent teeth of said rack, said rack, pin and lever being adapted to coact with said first-mentioned means and determine the duration of said exposure.

56. In a device of the class described, a printing-frame, a source of light and a rack carried by said frame adapted to coact with mechanism adjacent said source of light and to determine the time of exposure of said frame to said source of light.

In testimony whereof we affix our signatures in the presence of two witnesses.

NEHEMIAH D. WYMAN.
PETER G. FLEMING.

Witnesses to N. D. Wyman:
H. S. DUELL,
L. B. STREVELL.

Witnesses to Peter G. Fleming:
AUSTIN F. KNOWLES,
IDA M. B. FLEMING.