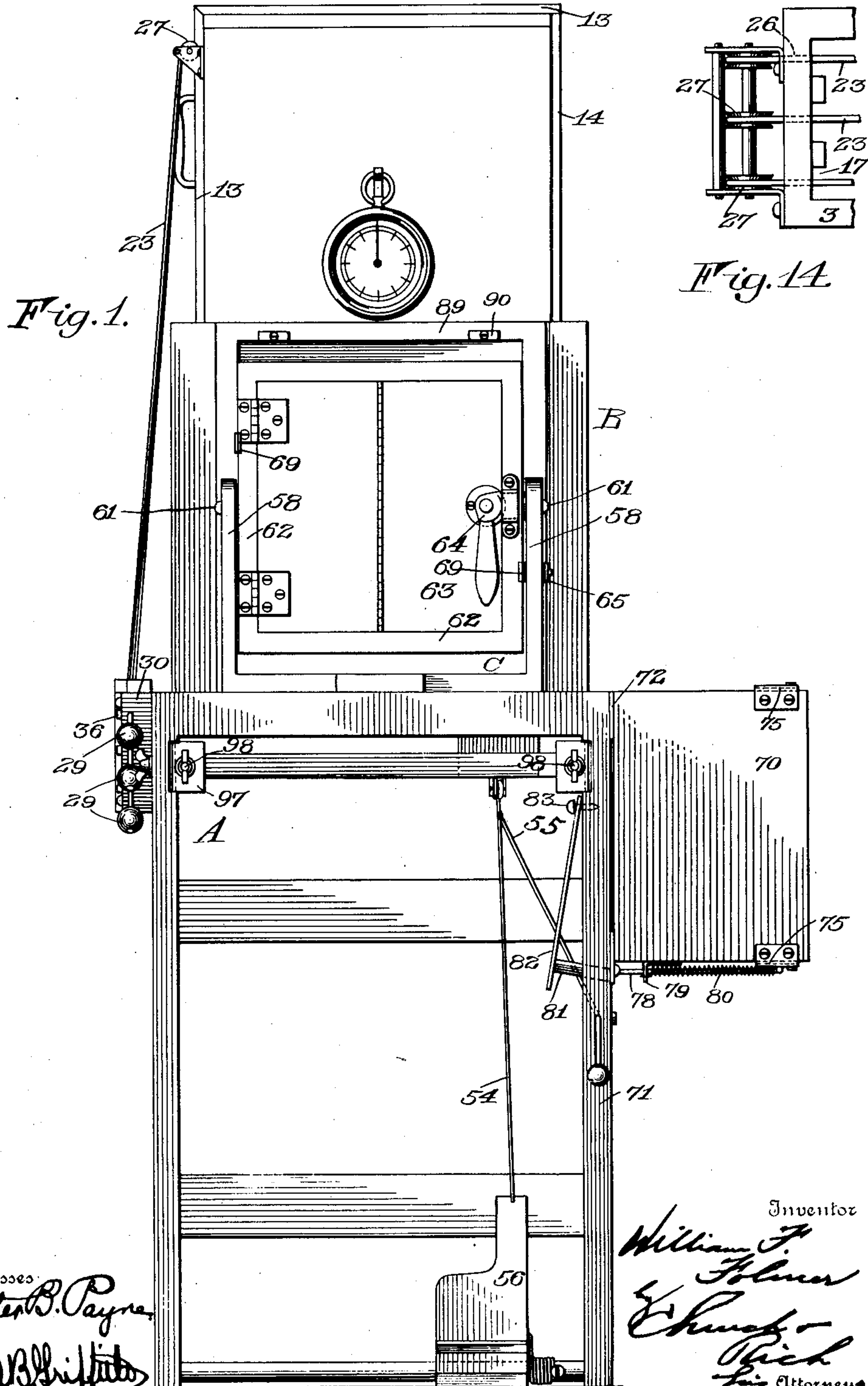


W. F. FOLMER.
 PHOTOGRAPHIC PRINTING APPARATUS.
 APPLICATION FILED APR. 10, 1909.

999,216.

Patented Aug. 1, 1911.

7 SHEETS—SHEET 1.



Witnesses
 Walter B. Payne
 Russell B. Griffiths

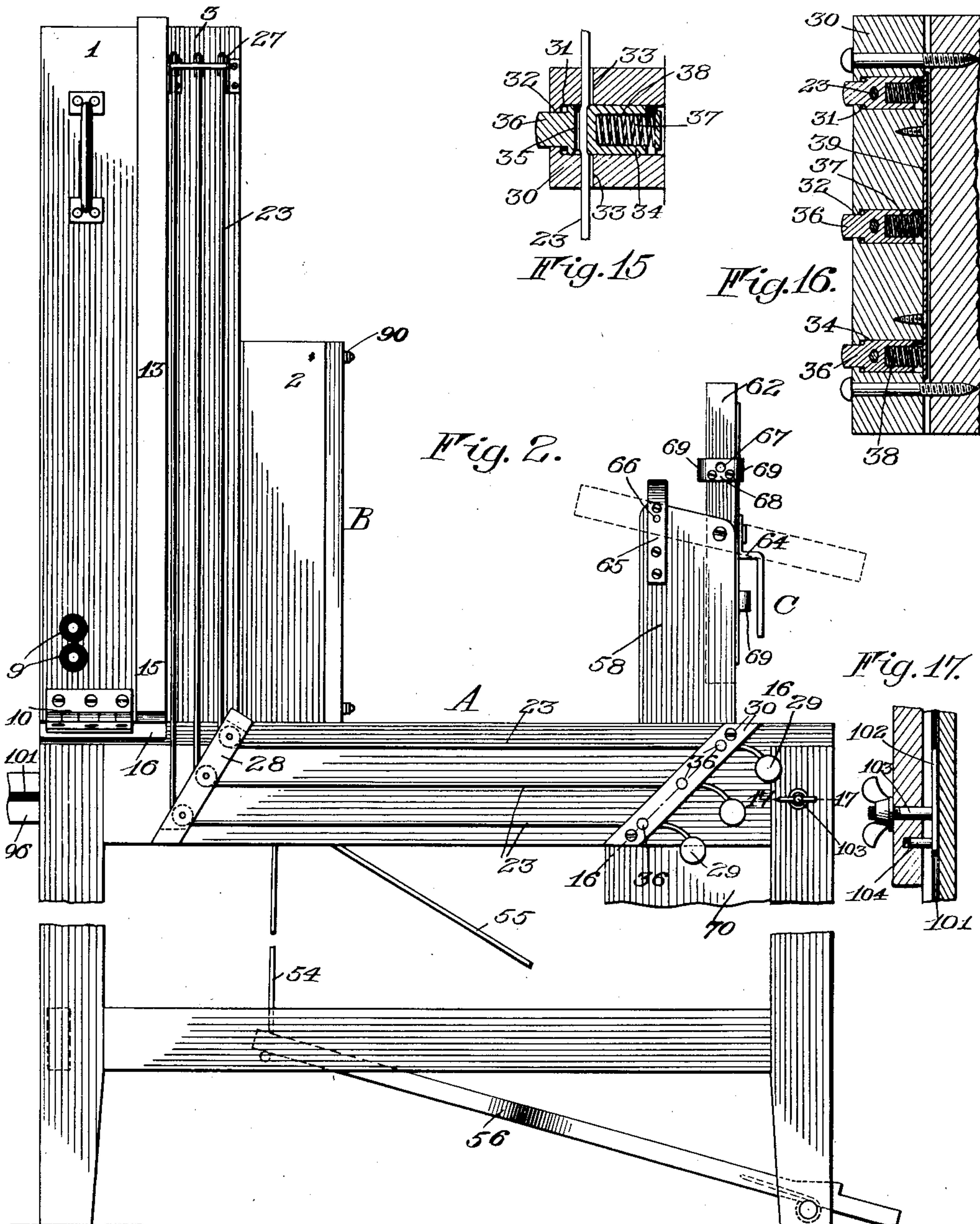
Inventor
 William F. Folmer
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7 SHEETS—SHEET 2.



Inventor

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Witnesses

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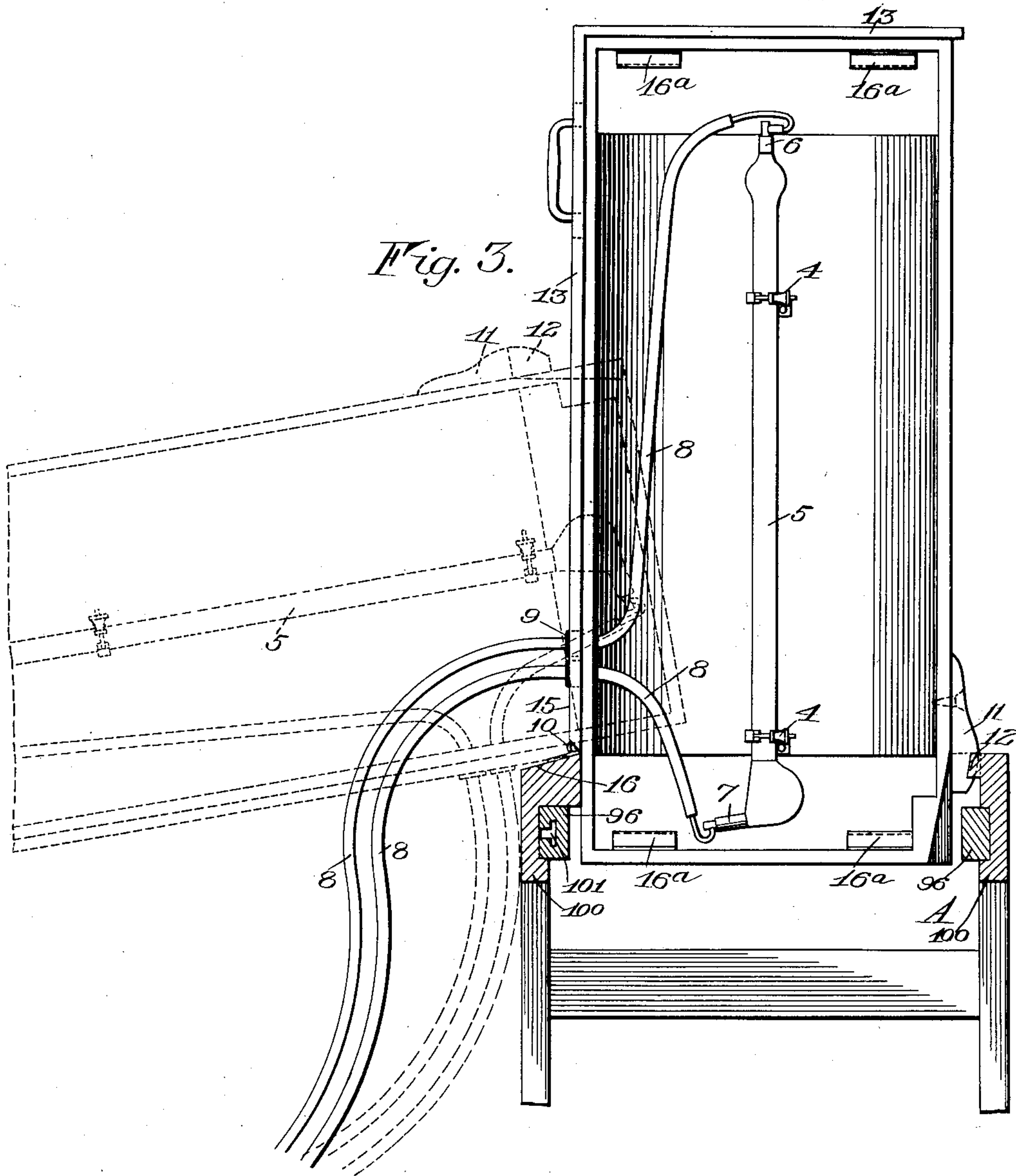
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Patented Aug. 1, 1911.

7 SHEETS—SHEET 3.



Witnesses

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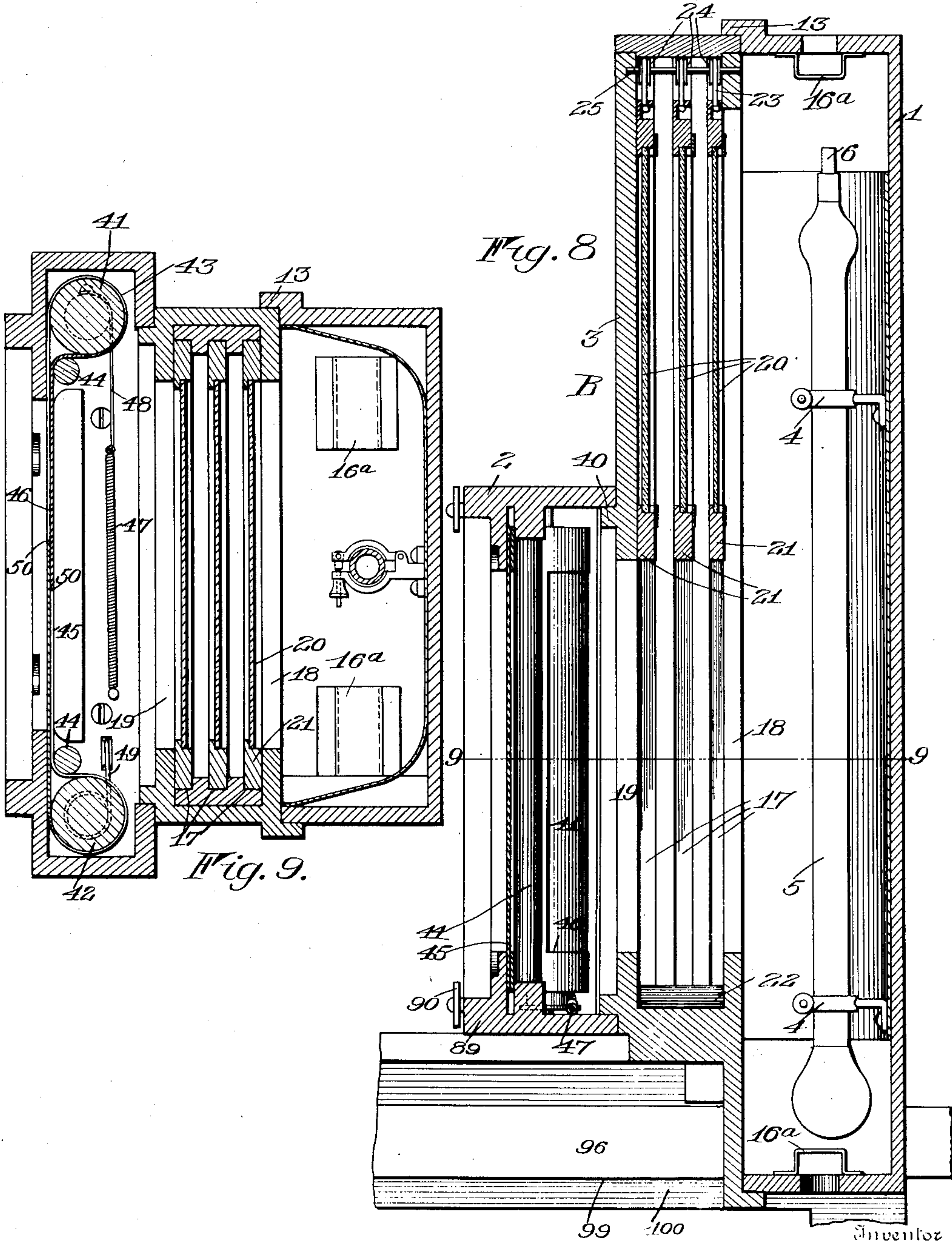
Attorney

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7 SHEETS—SHEET 5.



Witnesses

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 APPLICATION FILED APR. 10, 1909.

999,216.

Patented Aug. 1, 1911.

7 SHEETS—SHEET 6.

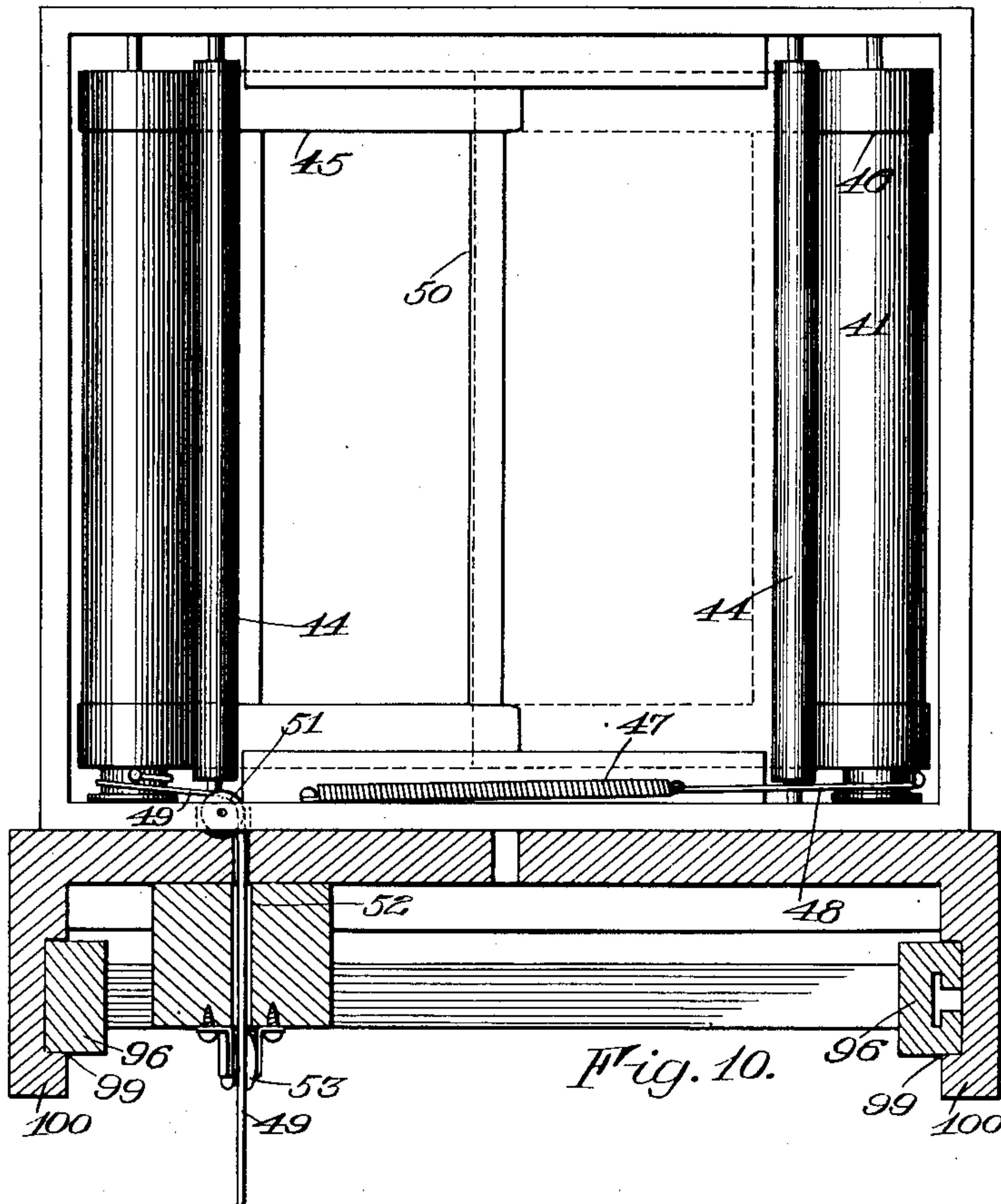


Fig. 10.

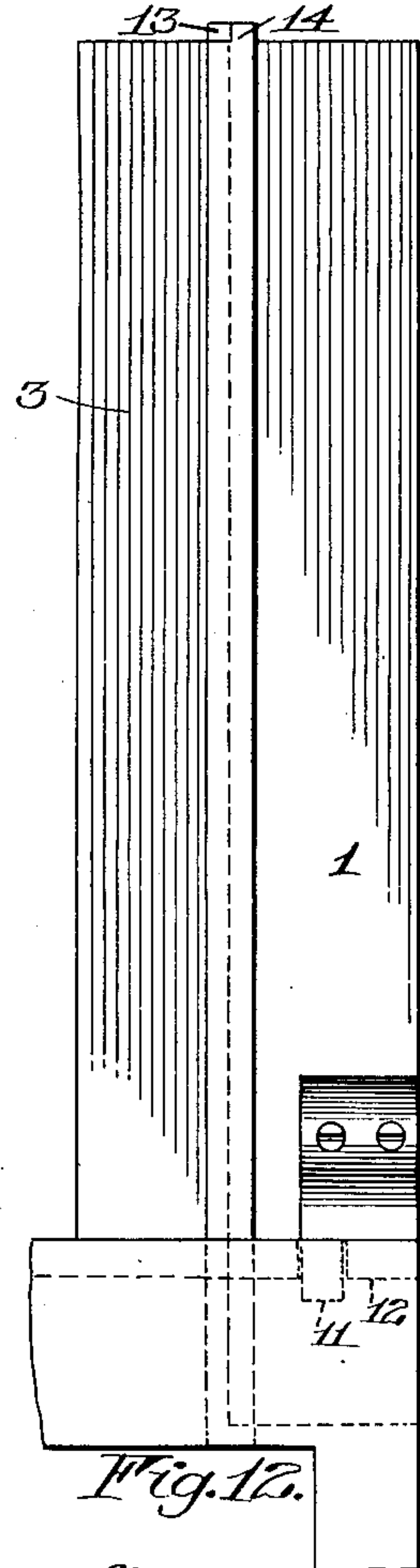


Fig. 12.

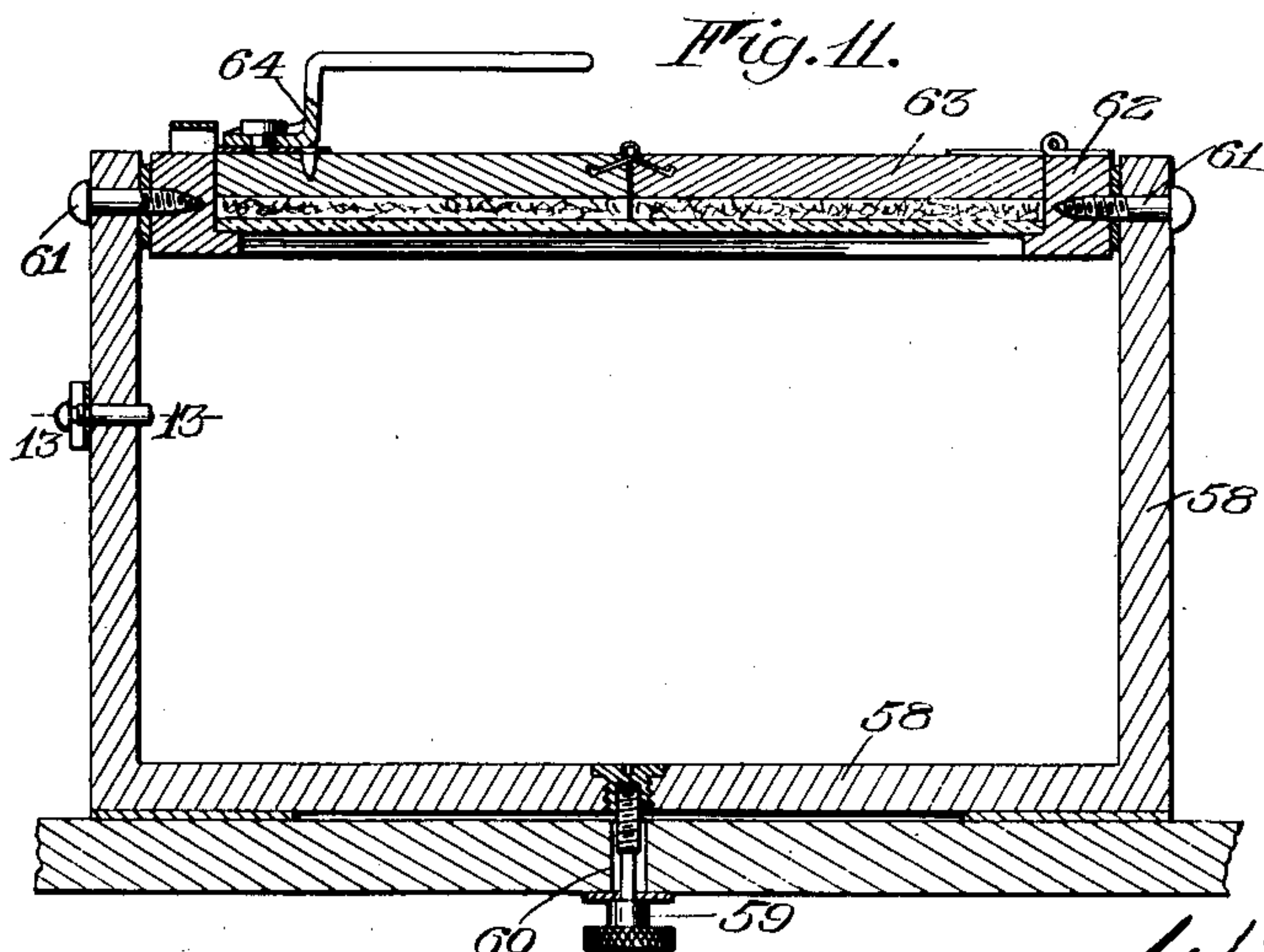


Fig. 11.

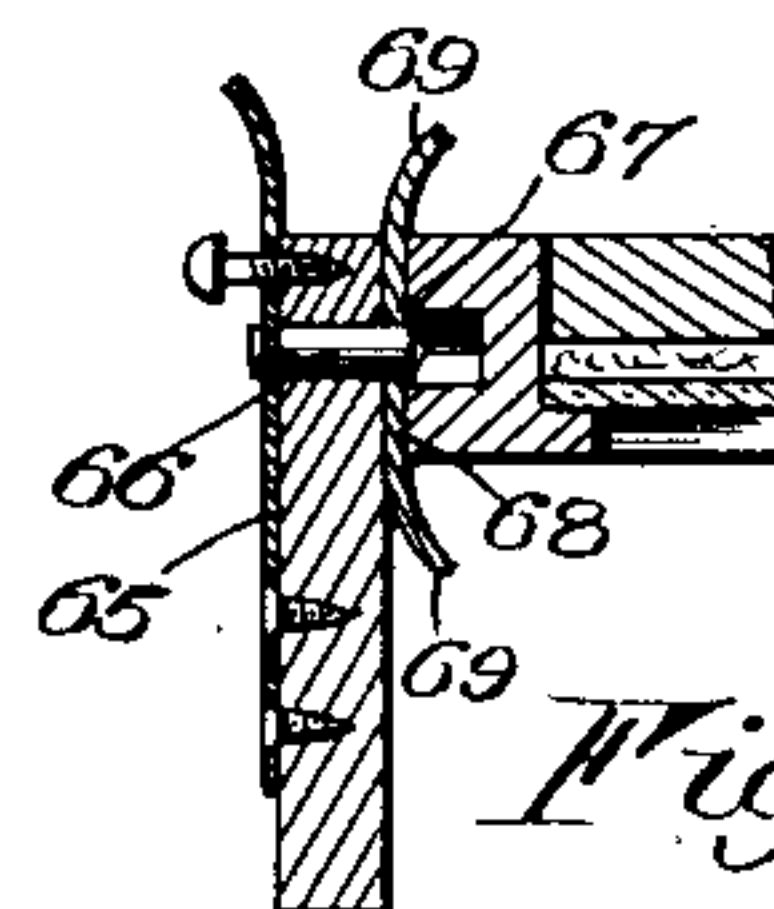


Fig. 13.

Witnesses
 Walter B. Payne.
 Russell B. Shifflett

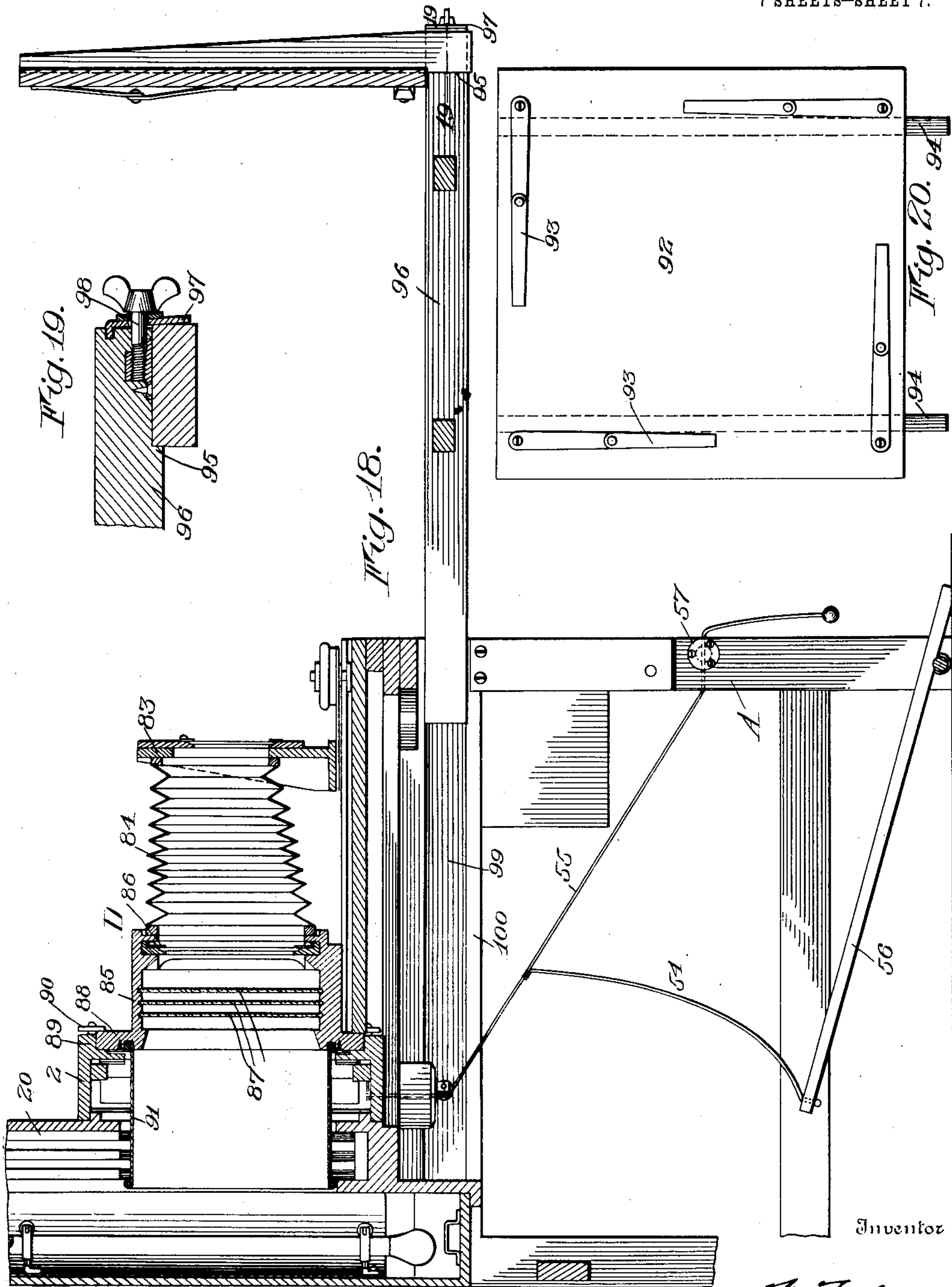
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 APPLICATION FILED APR. 10, 1909.

999,216.

Patented Aug. 1, 1911.

7 SHEETS—SHEET 7.



Witnesses

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UNITED STATES PATENT OFFICE.

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PHOTOGRAPHIC-PRINTING APPARATUS.

999,216.

Specification of Letters Patent.

Patented Aug. 1, 1911.

Application filed April 10, 1909. Serial No. 489,088.

To all whom it may concern:

Be it known that I, WILLIAM F. FOLMER, of Rochester, in the county of Monroe and State of New York, have invented certain
5 new and useful Improvements in Photographic-Printing Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying
10 drawings, forming a part of the specification, and to the reference-numerals marked thereon.

My present invention relates to photography and it has for one of its objects to
15 provide a simple exposure apparatus for producing photographic prints which apparatus will offer, in use, greater conveniences to the operator than heretofore and in various ways promote rapid printing and
20 the production of satisfactory work.

My improvements are further directed toward providing means for obtaining enlarged as well as prints of normal size.

To these and other ends the invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

30 In the drawings: Figure 1 is a front elevation of an apparatus constructed in accordance with and illustrating one embodiment of my present invention. Fig. 2 is a side elevation thereof. Fig. 3 is a vertical
35 section through the table or support taken in the plane of division between the screen casing and lamp casing, the latter being shown in front elevation. Fig. 4 is a top plan view. Fig. 5 is an enlarged front elevation of the paper receptacle and adjoining parts with its closure in open position.
40 Fig. 6 is an elevation of the attaching side of the receptacle showing the interlocking devices carried thereby. Fig. 7 is a fragmentary bottom plan view of the part shown in Fig. 5 disclosing the closure actuating devices. Fig. 8 is a vertical central section of the lamp, screen, and shutter inclosing cabinet taken substantially on the line 8—8
45 of Fig. 4. Fig. 9 is a horizontal section of the same taken substantially on the line 9—9 of Fig. 8. Fig. 10 is a transverse sec-

tion through the supporting table taken in a plane in front of the shutter casing and showing the latter in enlarged front elevation. Fig. 11 is a vertical section through
55 the printing frame and its support taken in the plane of its axis and showing the frame in the position in which the materials are inserted. Fig. 12 is a detail of the locking
60 means for the lamp casing being a fragmentary side elevation of the latter. Fig. 13 is a detail section of the means for retaining the printing frame in its different positions on its support. Fig. 14 is a top plan view
65 in detail of one of the pulley arrangements for the cords that control the screens. Fig. 15 is a detail section of the devices for fastening the shutter and screen controlling cords in adjusted positions. Fig. 16 is a
70 similar view in a different plane of the devices retaining the screen actuating cords. Fig. 17 is a detail of the clamping device for the easel supporting extension. Fig. 18 is a central longitudinal sectional view of
75 the apparatus as a whole with the parts in position for producing an enlarged print. Fig. 19 is a detail section through the means for clamping the easel in place, and, Fig. 20 is an elevation of the paper retaining
80 face of the easel.

Similar reference numerals throughout the figures indicate the same parts.

The improvements forming the present invention are particularly adaptable to
85 printing machines for the use of professional photographers or others who require a considerable number of prints from the same or different negatives and I have therefore illustrated and will describe an ex-
90 emplary embodiment of the invention in a machine designed primarily for such use.

Referring, therefore, more particularly to the drawings, and first to Figs. 1, 2, 3 and 4 thereof, A indicates generally a supporting
95 frame or table having arranged thereon at one end a cabinet B containing the exposure and exposure controlling parts and at the other or forward end devices C for holding the sensitized paper and, in most cases the negative. 100
As it is desirable that the holder C and the exposing medium B be adjustable relatively toward and from each other to regulate in this way the intensity of the light, I prefer

in the present instance to make the former adjustable on the table and the latter substantially fixed as will hereinafter appear.

The cabinet B is divided into three parts, 1, 2 and 3 constituting a rearward lamp casing, a forward shutter casing and an intermediate casing for the movable diffusion screens, respectively. The lamp casing (Figs. 2 and 3) is preferably closed at the back and open at the front as shown and is provided interiorly with suitable brackets 4 which support, in a normally vertical position, the tube 5 of an electric, mercury vapor-lamp having upper and lower electrodes 6 and 7 with the terminals of which are connected the circuit wires 8 leading at 9 through one side of the casing, preferably the hereinafter mentioned hinged side. Near its lower end on one side, this casing is hinged to the support A, as at 10, whereas at the opposite lower portion it is held in normal position by cooperating projections 11 and 12 formed on it and on the table respectively (Figs. 3 and 12). The casing is free to rotate in a vertical plane but is prevented from movement laterally of said plane by the devices 11 and 12 and also by overlapping strips 13 and 14 on the open side thereof and on the screen casing 3 which automatically interlock as shown in Fig. 4 and also produce a light tight joint between the members mentioned.

With the well known operation of such lamps in mind; it will be seen that the casing can be rotated transversely of the direction of the exposing rays of light from a normal upright position in which the electrodes 6 and 7 of the lamp are one above the other to a position such as that indicated in dotted lines in Fig. 3 wherein the electrodes are in substantially horizontal relation to allow the mercury to flow between the terminals and close the circuit. To define this position or to limit the tilting movement at a point at which the circuit will surely be closed I provide suitably formed cooperating abutting surfaces 15 and 16 on the casing and its support, preferably at points adjacent the hinge. Suitably protected vents 16^a in the lamp casing prevent overheating thereof.

The successful operation of the rest of the apparatus is not wholly dependent upon the use of this particular form of lamp as a source of light but I believe that the best results can be obtained when the vapor-lamp is employed.

Referring now additionally to Figs. 8 and 9, the intermediate section 3 of the cabinet is provided interiorly on its lateral walls with vertical guides 17 and with exposure openings 18 and 19 in its front and rear walls at the base of the guides, the rear opening 18 being extended if desired to the top of the casing as shown leaving the latter open on that side as is the adjacent side

of the lamp casing. Sliding in the guides are preferably gravity operated diffusion screens 20 of any desired kind, those in the present embodiment being composed of one opal and two ground glass plates set in frames 21, the opal screen, which is the strongest in its effect, being in the rearward position nearest the lamp. The screens and casing are so proportioned that when the screens are dropped to their lower position upon a suitable shock absorbing buffer 22, they will intercept the rays of light journeying through the exposure openings 18 and 19 while in the raised or inoperative position shown in Fig. 8 they will be housed within the upper part of the casing.

The means that I prefer to employ for elevating or operating each of the screens in one direction embody flexible cords 23 attached to the frames 21 and passing over pulleys 24 on a shaft 25 at the top of the casing, thence laterally through a side wall of the latter as at 26 (Fig. 14), over similarly rigged pulleys 27 on the outer side, thence downwardly through pulley blocks 28 on the support A and from there forwardly to terminate in knobs or buttons 29 at the front of the apparatus. All of the pulleys 24 and 27 are preferably loose on their respective shafts and so spaced as to be permitted a suitable sliding axial movement longitudinally thereof so that they will automatically adjust themselves in vertical alinement with the screens and thus reduce friction and prevent the cords from riding from the grooves. As an equal diffusion of the rays of the exposing cone of light is not always desirable or conducive to the best results, it is desirable in an apparatus of the kind that the rays on one side of the cone be diffused to a greater extent than those on the other so that they will have an effect of graduated value across the field of the negative and print. Negatives that are somewhat over exposed on one side and oppositely under exposed on the other may, by thus influencing the transmitted rays, be cured of their defects, so far as their appearance in the print is concerned, during the printing operation. To bring about this result with the present device, the screens 20 have only to be set at different relative elevations so that they are overlapped at their lower edges or banked, as it is called, opposite the exposure openings 18 and 19 as shown in dotted lines in Fig. 8. The different rays taken progressively in section through the light cone are therefore diffused in graduated proportion accordingly as they pass through one, two or three of the screens. While the screens are thus banked the lower rails of the frames on the more elevated ones do not tend to cast shadows to any appreciable extent even when made as wide as herein shown owing

to the high degree of diffusion and the distance traveled by the rays between the screens and the sensitized recording surface when the banking is practiced. To support the screens in this banked or overlapped relation I run the operating cords 23 through a retaining device shown in Figs. 2, 15 and 16 that comprises a fixed member 30 on the support or table A having recesses 31 therein provided with openings 32 and with apertures 33 extending transversely of the recesses. Arranged to reciprocate within the recesses are movable members 34 having transverse apertures 35 movable into and out of alinement with the apertures 33 and terminating in a reduced portion 36 projecting through the opening 31 to form a push button. The cords 23 pass through the apertures 33 and 35 and springs 37 also located in the recesses 31 as well as in recesses 38 in the members 34 tend to move the members 34 to bring the apertures out of alinement and to clamp the cords with a shearing grip. To release the cords the apertures are brought into alinement against the tensions of the springs 37 by means of the push buttons 36. The springs 37 are in the present instance centered on projections carried by a plate 39. The securing means also mentioned as being shown in Fig. 15 is for the operating cord of another part to be later described but it is the same in principle as the device of Fig. 16 for the cords 23 except that it is arranged for a single cord.

Arranged on the forward wall of the screen casing 3 to surround the exposure opening 19 therein is a frame 40 (Figs. 8 and 9) with which coöperates the detachable shutter casing 2 open on its rear side and also on its front side in continuation of the openings 18 and 19. Housed within the casing are curtain rollers 41 and 42 around which is passed a continuous shutter curtain 43, the intermediate parallel portions thereof being guided in substantially the same plane by guide rollers 44 and these intermediate portions are provided with apertures 45 and 46 that are normally held out of register by the rotating influence on the roller 41 of an extensible spring 47 connected thereto by a flexible member 48. The apertures 45 and 46 are brought into partial or total register by means of a flexible cord 49 wound about the roller 42. The relatively opposite edges 50 of these apertures are therefore made to define the shutter opening and I prefer to arrange the rollers 41 and 42 upon vertical axes so that the edges 50 of the curtain will extend substantially at right angles to the overlapping edges of the diffusing screens 20 when in banked relation as before described. The object of so doing is as follows: It will be seen that as the shutter is under the direct

control of the cord 49 it is opened and produces an aperture of a size proportional to the distance that the cord 49 is pulled and closes immediately when the cord is released. The operator can therefore control at will and directly both the extent and the time of the exposure so that he may work with an aperture that is a mere slit if desired. If this slit were produced horizontally it would transmit perhaps only rays of light diffused to the same degree and that had passed through but one graduation of the diffusion bank whereas with the opening slit disposed vertically an equal amount of the rays of each graduation are allowed to travel to the print or in other words the beam of light transmitted to the print has a graduated diffusion whether the shutter be opened to a greater or less degree.

Another object of arranging the curtain rollers on vertical axes is to bring the relatively movable edges 50 in parallelism with the lamp tube 5 so that no matter how narrow the slit of the shutter opening it will be illuminated equally throughout its extent.

The shutter operating cord 49 is led over a pulley 51 (Fig. 10) at the bottom of the casing 2 and down through an opening 52 in the table and over a second pulley 53. From thence, it is divided into two branches 54 and 55 (Fig. 18), the former being attached to a treadle 56 and the latter through the securing device 57 similar to that shown in Fig. 15 and previously described. The shutter is opened and closed for each exposure by the treadle 56 and when it is desired to retain it in open position against the tension of spring 47 for any considerable length of time the device 57 is brought into use.

The holder C for the sensitized material and negative before referred to comprises in the present instance a supporting yoke 58 (Figs. 2 and 11) which is rendered adjustable longitudinally of the table A by a clamping bolt 59 operating in a slotted guide or way 60. Pivoted at 61 to the yoke on a horizontal axis is a plate holder 62 of the usual or any preferred form, the hinged back 63 thereof being secured against the printing paper and superposed negative by a latch 64. The frame is movable between a vertical printing position shown in full lines in Fig. 2 to a substantially horizontal position shown in dotted lines in Fig. 2 and in full lines in Fig. 11 for the convenience of the operator in removing or inserting the printing paper or negative and I prefer to provide interlocking devices on the frame and its supporting yoke for temporarily retaining the former in either position which devices comprise in the present instance laterally yielding spring plates 65 on the yoke having pins 66 thereon that automatically engage within recesses 67 on the plates 68 secured to the

sides of the printing frame. The pins snap into place by reason of deflected advance edges 69 on the plates 65 and are released by an outward pressure on the latter, (Fig. 5 13). The bolt 59 allows the printing frame and its support to be rotated to advance or retract its lateral edges relatively to the light for well understood purposes and the frame may be tilted relatively to its support on the horizontal axis 61 to similarly position its top and bottom edges.

A detachable receptacle 70 (Figs. 4, 5, 6 and 7) is secured, preferably on the outer side of the table A and of a leg 71 thereof as by the slotted plates 72 and headed projections 73 on the respective members, the receptacle being held in a substantially fixed relation when in place and released by an upward movement. The receptacle is provided with a closure 74 having hinged plates 75 pivoted at 76. Pivoted to one of the hinge plates 75 at 77 is a push rod 78 arranged to reciprocate in the guide plate 79 secured to the bottom of the receptacle, which push rod when operated outwardly opens the closure or door 74 while the latter is normally held closed by a spring 80 attached to the rod and to the guide plate 79. A second push rod 81 is carried by a plate 82 pivoted at 83 to the inner side of the leg 71 and operates through an opening in the latter in alinement with the actuating rod 78 to operate the same when the receptacle is in position on the supports. This receptacle is intended to be utilized as a container for the sheets of printing paper that are being used with the machine, and the door prevents the access of light thereto. The shutter controlling treadle 56 is arranged at the base of the leg 71 while the operating member and its plate 82 are arranged above it. The operator, sitting before the apparatus, is assumed to be busy with his hands inserting and removing prints in the frame 62 while his foot is kept on the treadle 56 to operate the shutter but when he wishes to gain access to the receptacle 70 for a new sheet of paper (which occurs every few seconds) he can open the closure 74 for an instant with a lateral movement of his knee against the plate 82 and it then automatically closes.

To adapt the apparatus for making enlarged prints as well as those of normal size, I provide a detachable enlarging camera D (Fig. 18) that rests upon the table A and preferably comprises the usual adjustable front 83, bellows 84 and body 85. The latter contains the negative holder 86 and, if desired, a plurality of auxiliary diffusion elements 87. A back board 88 coöperates with the shutter casing 2 and fits within a rabbet 89 in the forward portion thereof where it is detachably held as by the buttons 90. When the camera is brought into use, the screens

20 are raised to their inoperative position and secured by the devices 30 and the shutter is opened to its greatest extent and held there with its apertures 45 and 46 in register by securing the cord 55 in a retaining device 57 identical with that previously described as being provided for the screen cords 23. This permits a reflecting or other hood 91 on the rear board 88 of the camera to project through the shutter and its casing, and through the screen casing 3 beneath the screens into close proximity to the lamp 5.

For enlargements, the printing paper is preferably held upon an easel 92 (Fig. 20) as by the pivoted fingers 93. Downwardly projecting legs 94 on the easel are removably clamped within sockets 95 in extensible supports 96 by plates 97 on the latter that are pressed against the legs 94 by threaded bolts 98 (Fig. 19). The supports 96 travel in ways 99 in the table rails 100 below the table top and are provided with slots 101 (Figs. 3 and 17) in which ride clamping plates 102 attached to bolts 103 projecting exteriorly through one of the table legs the plates 102 being preferably provided with centering pins 104. By these means the extensions can be secured in different positions of adjustment resulting from the movements of the easel 92 in bringing it in focus with the camera D. The supports 96 are preferably so proportioned that when the easel 92 is removed therefrom and they are thrust back in their ways beneath the table, the bolt heads 98 for fastening the easel will not protrude beyond the front edge of the table.

It is pointed out that the particular form of shutter illustrated and described is not necessary in all instances to the production of good results from the use of other parts of the apparatus but it is eminently suitable and particularly useful for the purposes specifically mentioned. One of the screens 20 may if desired be made opaque or of a translucent material having non-actinic properties and be utilized as a shutter. The shutter described however always produces the shutter opening centrally of the exposure openings 18 etc.

Mention should also be made of the fact that the machine is suggestive of the application of the principles of the invention to printing by solar as well as artificial light or by a source of light not so intimately connected with the rest of the structure. The lamp casing could be removed for this purpose.

Other similar substitutions or modifications herein suggested or otherwise might be made without departing from the spirit of the several parts of my invention.

I claim as my invention:

1. In a photographic exposure apparatus,

the combination with a supporting table and a holder mounted thereon to receive the sensitized material in a substantially erect position for exposure, of a lamp casing normally occupying an upright position on the table opposite to the holder and hinged to the table at its lower end.

2. In a photographic exposure apparatus, the combination with a support adapted to receive the sensitized material in position for exposure, of a lamp casing normally occupying an upright position on the support and hinged thereto to permit a laterally tilting movement thereof said casing being arranged to screen the lamp on all sides except that which is turned toward the exposing position of the sensitized material.

3. In a photographic exposure apparatus, the combination with a screen casing having an opening therein and a movable screen operating in the casing to control the passage of light through the opening, of a lamp casing arranged in rear of the lateral screen casing and of the opening therein, said lamp casing being provided with a hinged bearing permitting it to be rotated laterally to a position at the side of the screen casing.

4. In a photographic exposure apparatus, the combination with a screen casing open on opposite sides and a screen within the casing to control the passage of light through the openings, of a lamp casing movable transversely relatively to the screen casing and having an open side cooperating to form a tight joint with the open side of the screen casing to prevent the escape of light rays between the latter and the lamp casing.

5. In a photographic exposure apparatus, the combination with a table or support adapted to receive the sensitized material in position for exposure, of a lamp casing pivotally mounted thereon to swing on a horizontal axis, an electric mercury vapor lamp arranged in the casing to assume an upright position with its electrodes arranged one above the other when the casing is in normal position on the support and cooperating stops on the support and casing for terminating a tilting movement of the latter and the lamp in which the electrodes are brought into substantially horizontal relation at a point permitting the mercury to flow between the electrodes.

6. In a photographic exposure apparatus, the combination with a cabinet divided into two communicating casings or sections, one being provided with an exposure opening and the other being movable relatively to the first, of a screen arranged in the open section to control the passage of light from the movable section through the exposure opening therein and an electric mercury vapor lamp located in the movable section to assume an upright position with its electrodes arranged one above the other when the casing is in

normal position relatively to the other and adapted to be tilted with the casing to a position in which the electrodes are brought into substantially horizontal relation to permit the mercury to flow between the electrodes.

7. In a photographic exposure apparatus, the combination with a supporting table and means mounted thereon for holding the sensitized material, of a lamp casing mounted on the table, an electric mercury vapor lamp arranged in the casing to assume an upright position with its electrodes arranged one above the other when the casing is in normal position on the table and pivotal connections between the casing and table permitting the casing to be rotated in a plane transverse to the rays of light passing between the lamp and sensitized material to a position in which the electrodes are brought into substantially horizontal relation to permit the mercury to flow between the electrodes.

8. A photographic exposure apparatus embodying a plurality of gravity operated diffusion screens movable transversely of the path of the exposing cone of light and means for supporting them at different relative elevations and in overlapping positions to obtain a graduated diffusion whereby actinic power of certain of the rays is reduced below that of the others.

9. In a photographic exposure apparatus the combination with a plurality of diffusion screens movable transversely of the path of the exposing cone of light and means for adjusting them in overlapping positions to obtain a graduated diffusion whereby the actinic power of certain of the rays is reduced below that of the others, of a shutter for controlling the exposing cone of light comprising relatively movable members defining the shutter opening said members being movable transversely of the cone in a path at right angles to the overlapping edges of the screens.

10. In a photographic exposure apparatus, the combination with a movable screen for controlling the exposure, of an operating cord therefor and a gripping device for holding the cord against movement comprising relatively movable members having apertures movable into and out of alignment through which the cord passes and a spring normally tending to move one of the members to a position in which its aperture is out of alignment with that of the other

11. In a photographic exposure apparatus, the combination with a support and a movable screen mounted thereon for controlling the exposure, of an operating cord therefor and a gripping device for holding the cord against movement comprising a fixed member on the support having a recess therein provided with an opening leading from the recess and with apertures through which the

cord passes, a movable member in the recess having an aperture movable into and out of alinement with the apertures in the fixed member and through which the cord is also
 5 passed, a spring in the recess for normally holding the apertures out of alinement and an extension on the movable member projecting through the opening in the fixed member to constitute a push button for re-
 10 storing the alinement of the apertures against the tension of the spring.

12. In a photographic exposure apparatus, the combination with a casing having an exposure opening therein, of a guide on the
 15 casing, a movable screen operating in the guide to control the passage of light through the opening, a shaft, a pulley rotatable loosely on the shaft and also free to move axially thereon and an operating cord con-
 20 nected with the screen and passing over the pulley.

13. In a photographic exposure apparatus, the combination with a cabinet provided with a guide and with a forward opening
 25 at one end of the guide, of a diffusing screen movable in the guide between an operative position opposite the opening and an inoperative position at the opposite end of the cabinet and a shutter arranged at the
 30 end of the guide adjacent the opening to control the passage of light through the latter.

14. In a photographic exposure apparatus, the combination with a cabinet provided with a guide and with a forward opening at
 35 one end of the guide, said cabinet being adapted to contain a lamp in rear of the guide and opening, of a diffusing screen movable in the guide between an operative position opposite the opening and an in-
 40 operative position at the opposite end of the cabinet and a shutter arranged at the end of

the guide adjacent to the opening to control the passage of light from the lamp through the latter.

15. In a photographic exposure apparatus, 45 the combination with a cabinet provided with a guide and with a forward opening at one end of the guide, of a diffusing screen movable in the guide between an operative position opposite the opening and an inop- 50 erative position at the opposite end of the cabinet and a detachable shutter casing applied to the cabinet to surround the opening having a shutter therein for controlling the passage of light through the latter. 55

16. In a photographic exposure apparatus, the combination with a table or support, a lamp cabinet at the rear end thereof having an opening in a forward wall, a shutter casing surrounding the opening exteriorly of 60 the cabinet, and relatively movable shutter members in the shutter casing for defining the shutter opening, of an enlarging camera supported on the table having a rear board coöperating with the shutter casing. 65

17. In a photographic exposure apparatus, the combination with a table or support, a lamp cabinet at the rear thereof having an opening in a forward wall, a shutter casing surrounding the opening exteriorly of the 70 cabinet, and relatively movable shutter members in the shutter casing for defining the shutter opening, of an enlarging camera supported on the table having a rear board coöperating with the shutter casing and 75 means for detachably securing said co-operating members together to form a light tight joint.

WILLIAM F. FOLMER.

Witnesses:

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 HAROLD H. SIMMS.