No. 654,777. Patented July 31, 1900.

F. BENJAMIN.

PHOTOGRAPHIC CAMERA.

(Application filed Jan. 16, 1900.)

(No Model.) 5 Sheets—Sheet 1

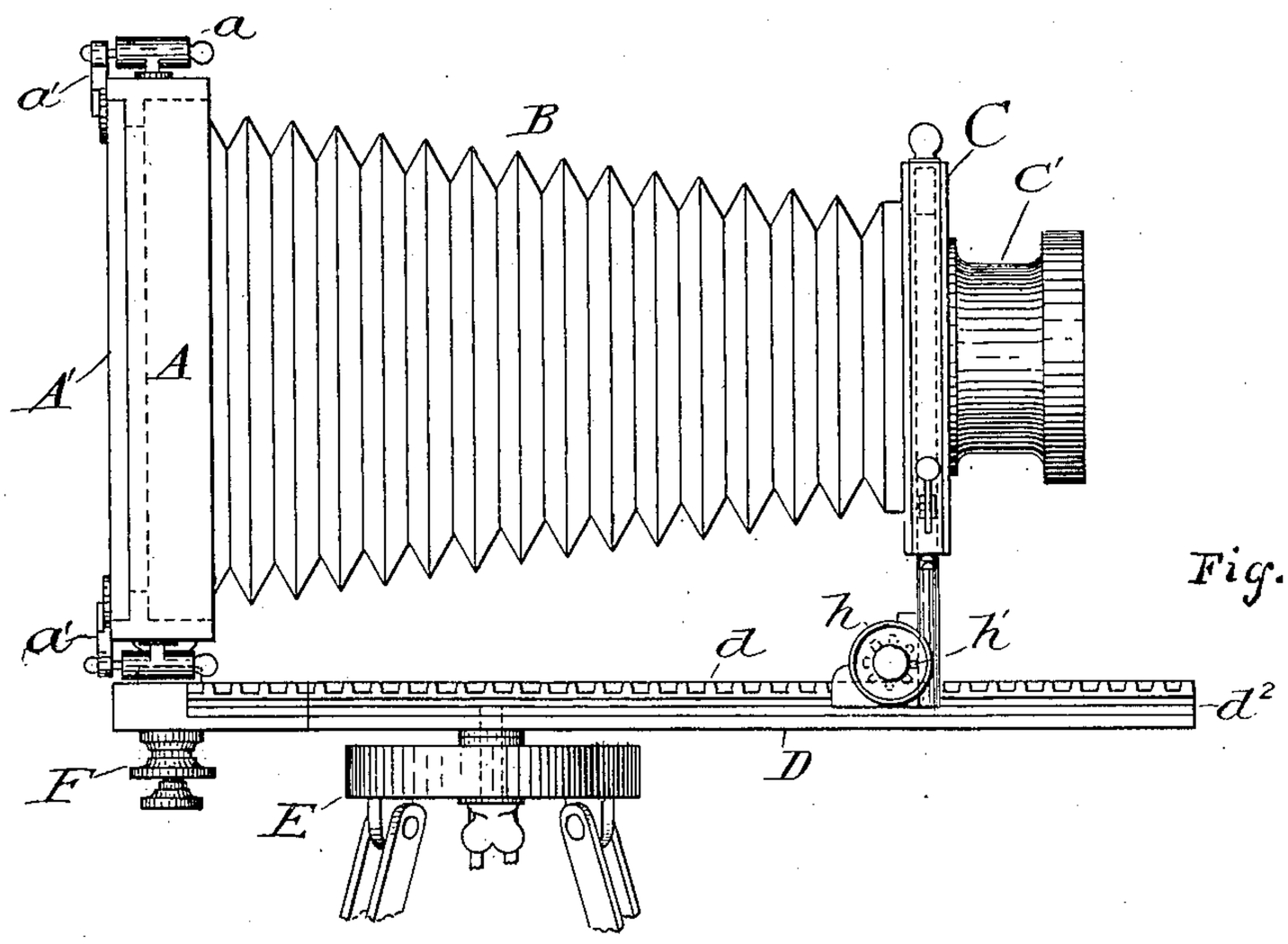

Fig. 1.

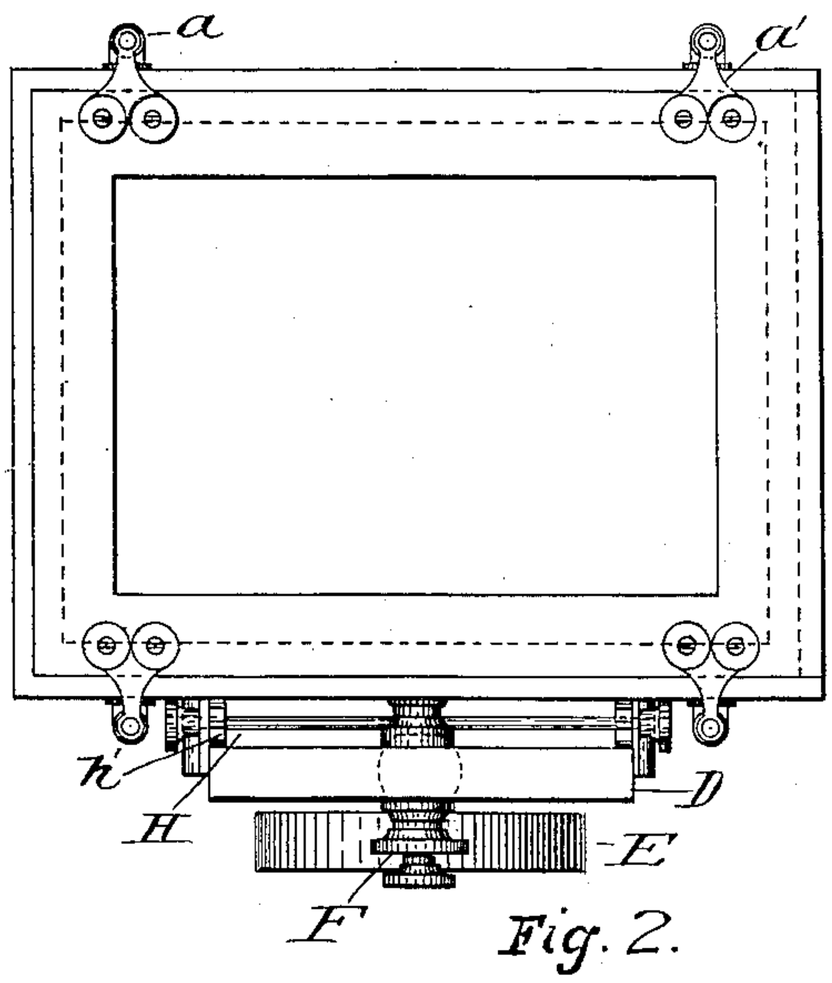

Fig. 2.

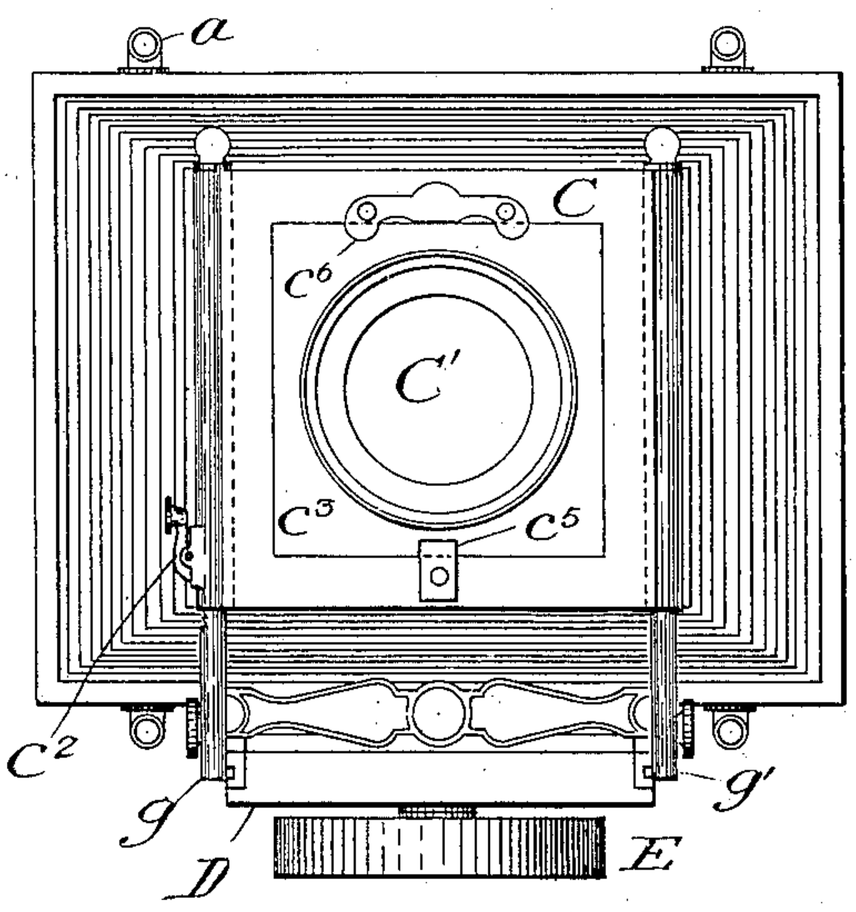

Fig. 3.

Witnesses.
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Atty

No. 654,777. Patented July 31, 1900.

F. BENJAMIN.

PHOTOGRAPHIC CAMERA.

(Application filed Jan. 16, 1900.)

(No Model.) 5 Sheets—Sheet 2.

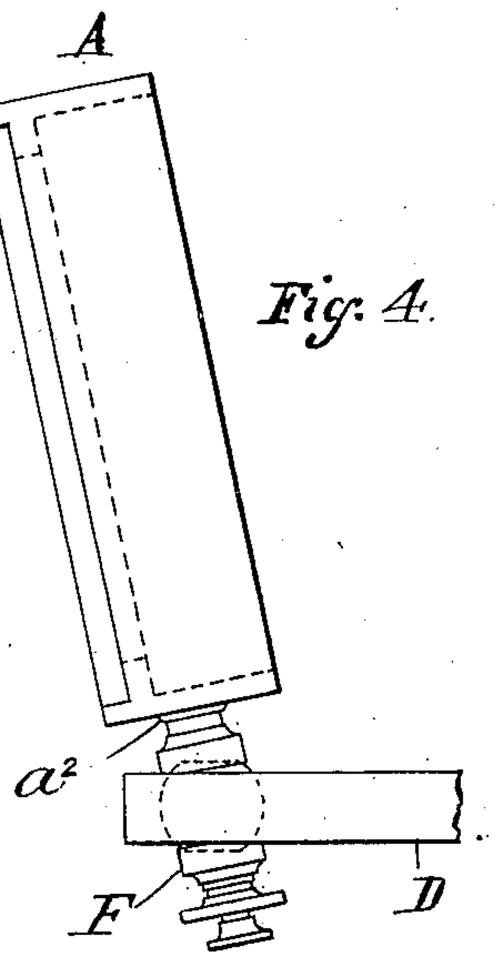

Fig. 4.

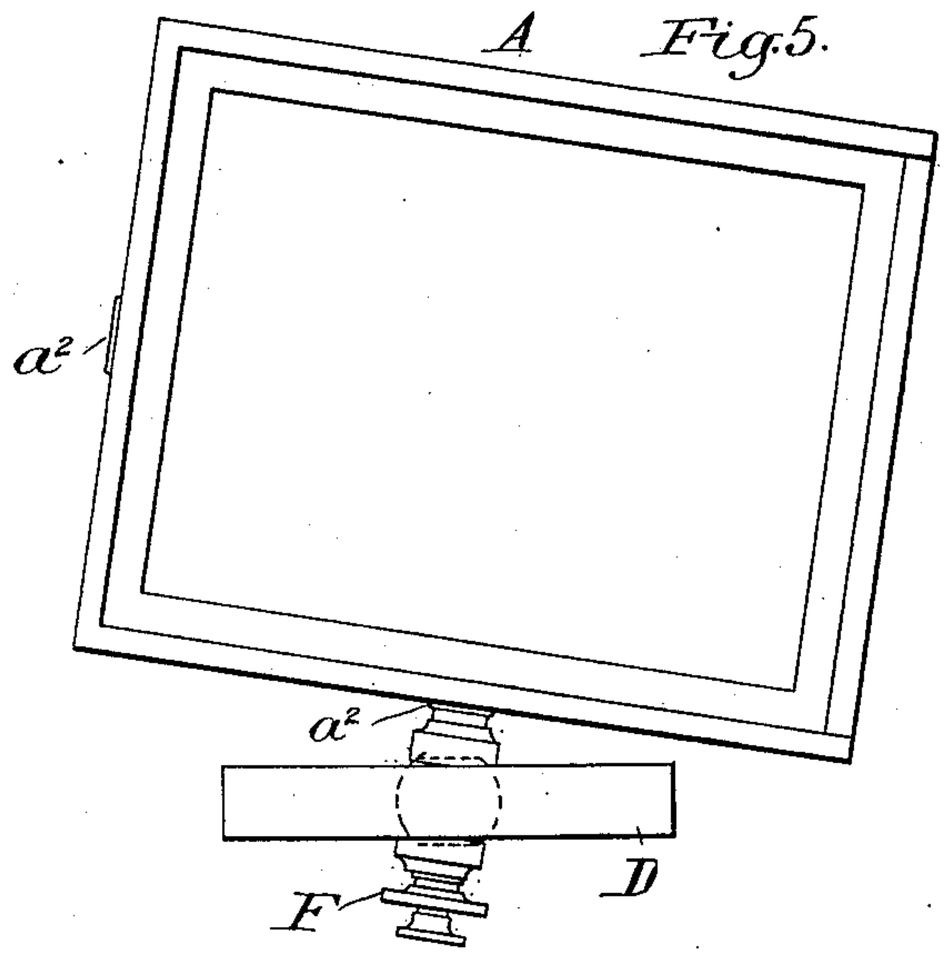

Fig. 5.

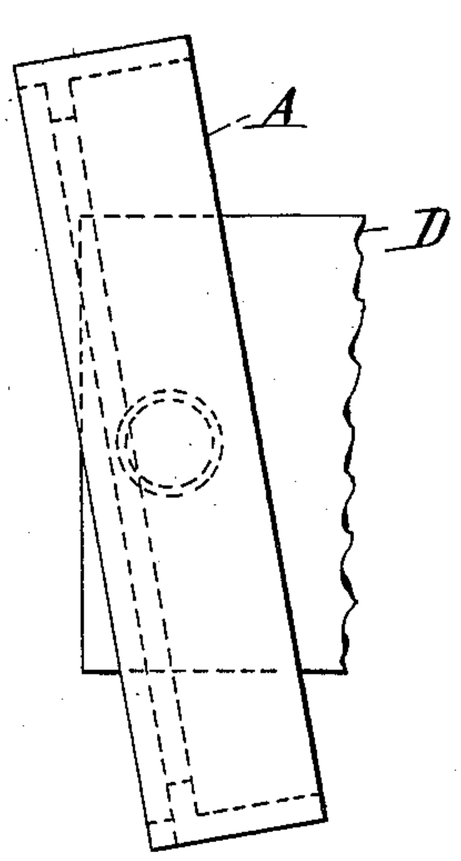

Fig. 6.

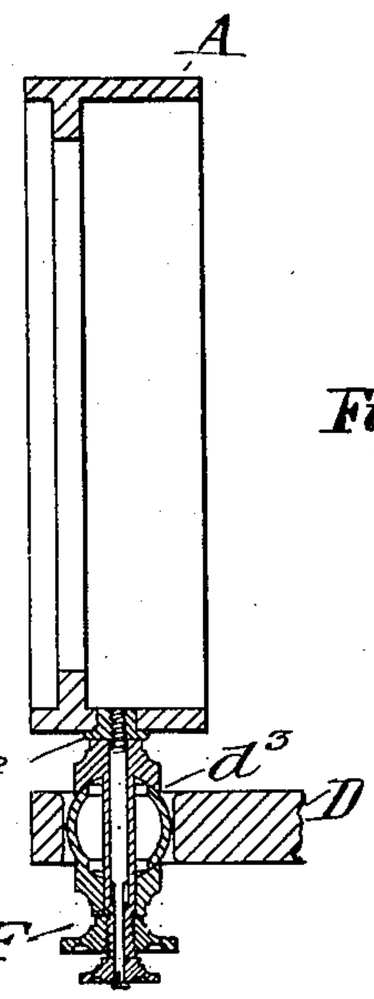

Fig. 7.

Witnesses.
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No. 654,777. Patented July 31, 1900.

F. BENJAMIN.

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(Application filed Jan. 16, 1900.)

(No Model.) 5 Sheets—Sheet 3.

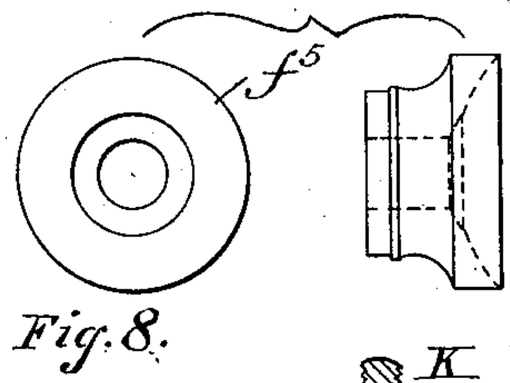

Fig. 8.

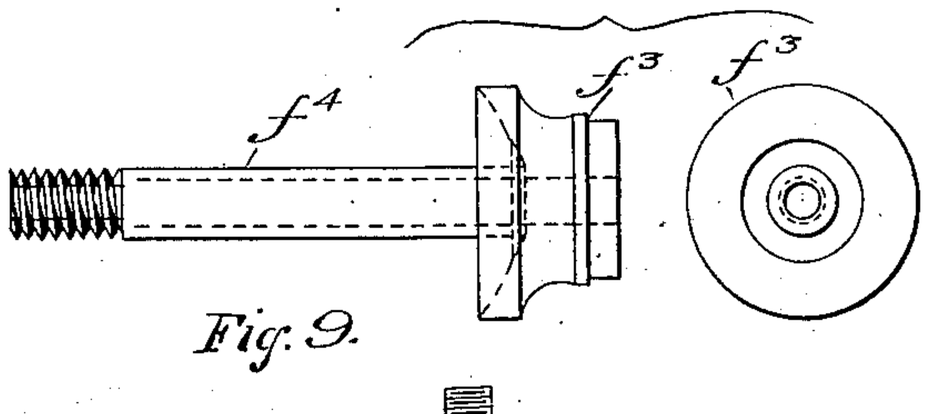

Fig. 9.

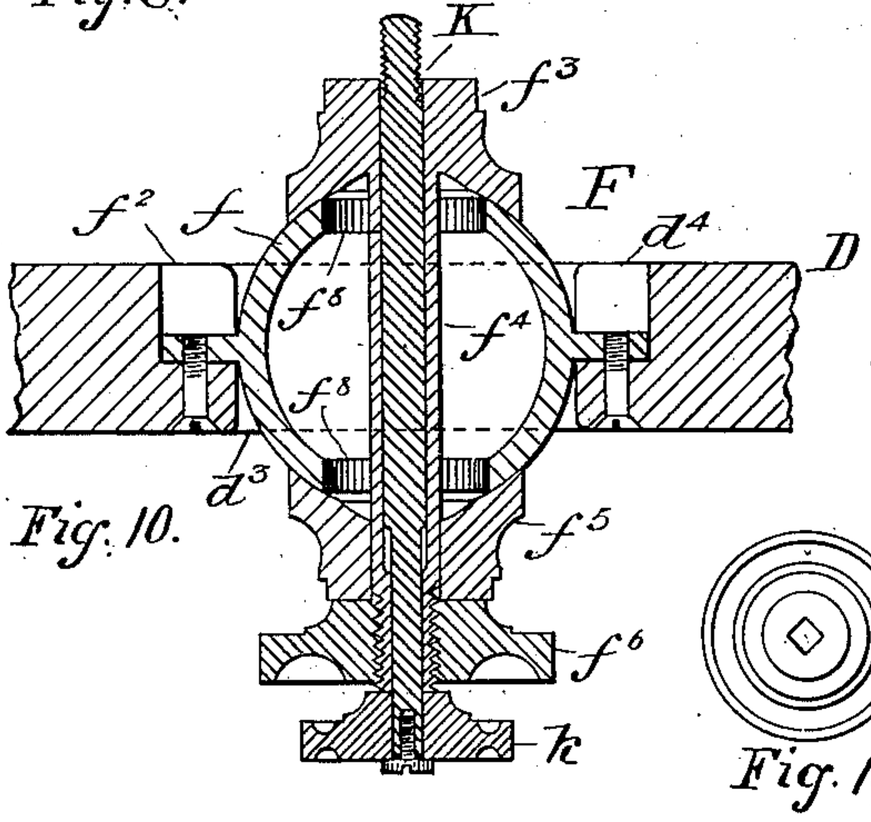

Fig. 10.

Fig. 13.

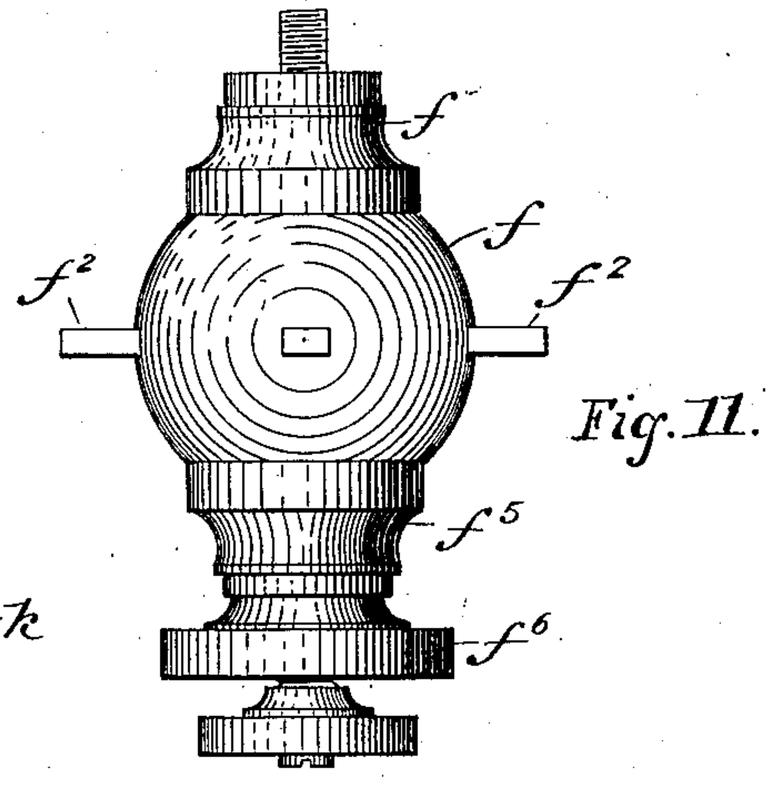

Fig. 11.

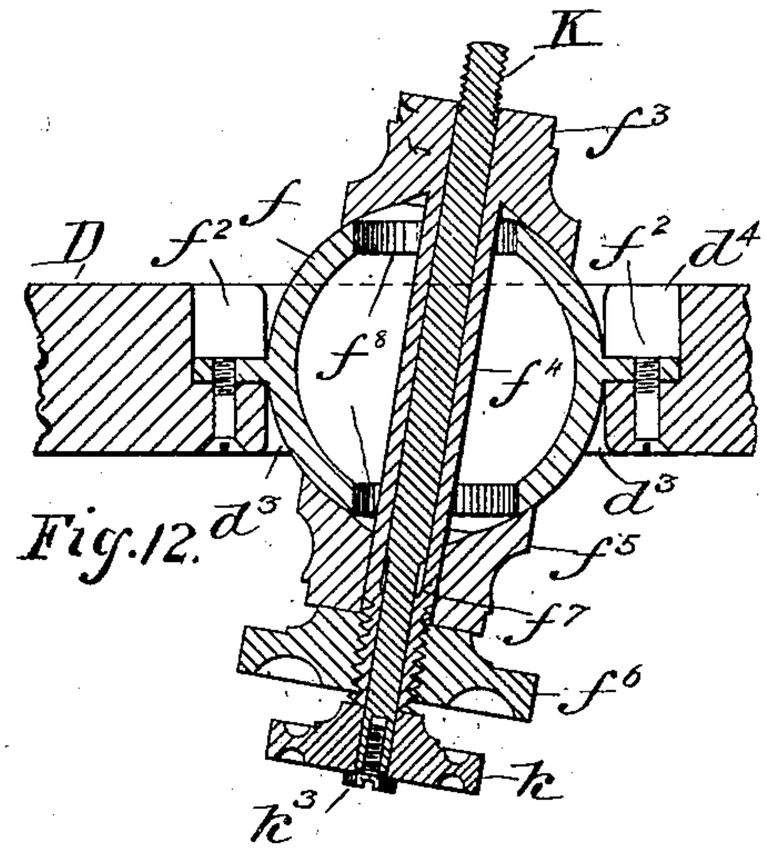

Fig. 12.

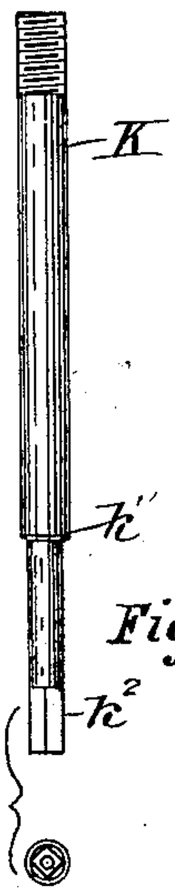

Fig. 14.

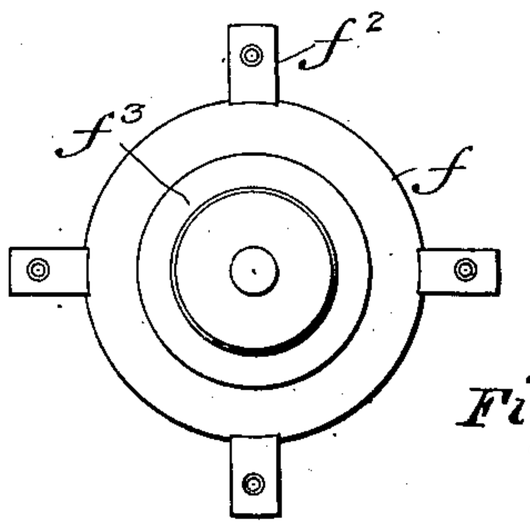

Fig. 15.

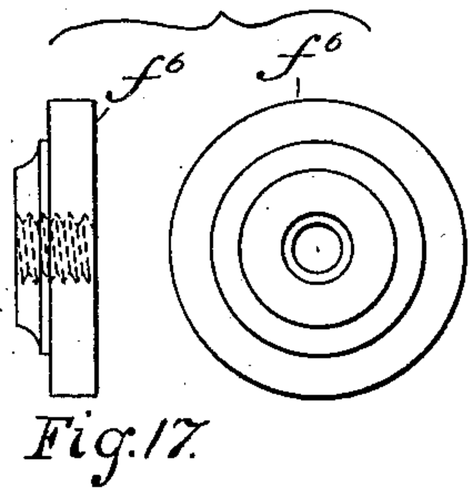

Fig. 17.

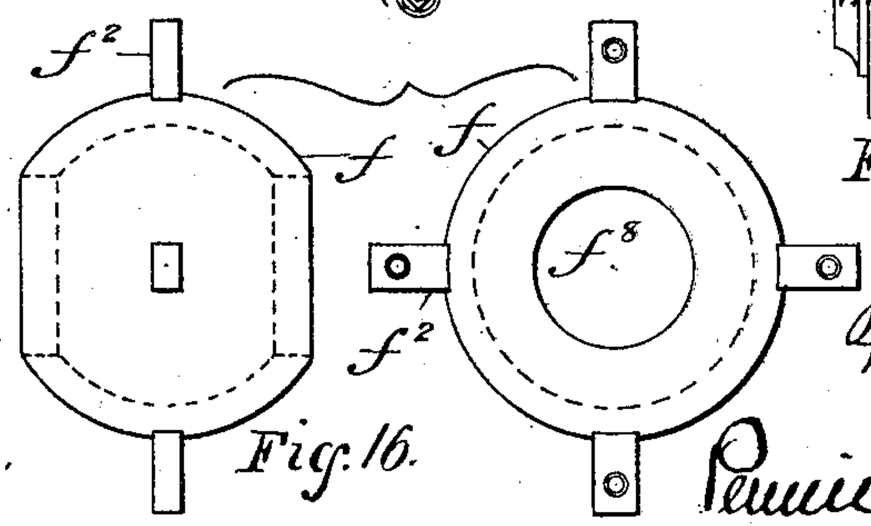

Fig. 16.

Witnesses.
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No. 654,777. Patented July 31, 1900.

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PHOTOGRAPHIC CAMERA.

(Application filed Jan. 16, 1900.)

(No Model.) 5 Sheets—Sheet 4.

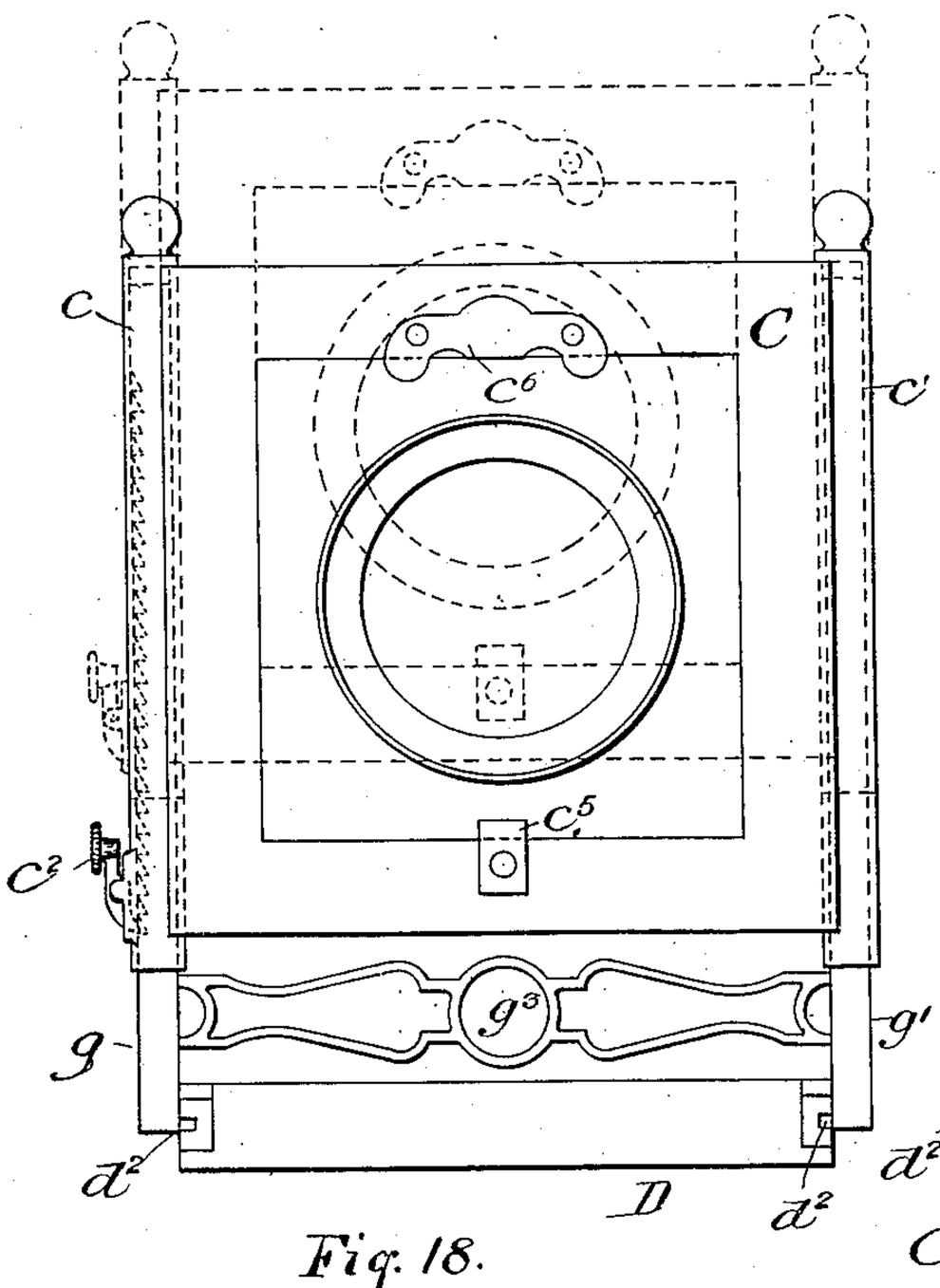

Fig. 18.

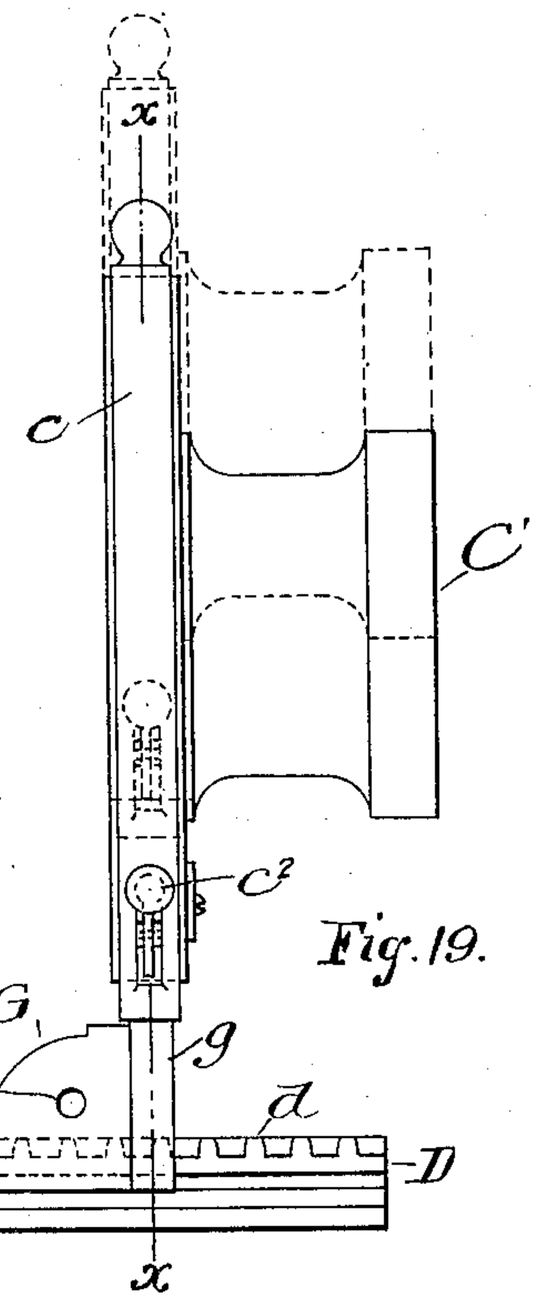

Fig. 19.

Fig. 22.

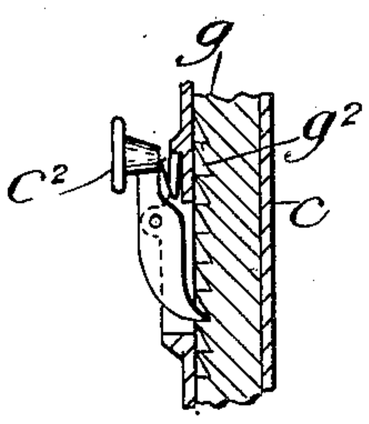

Fig. 23.

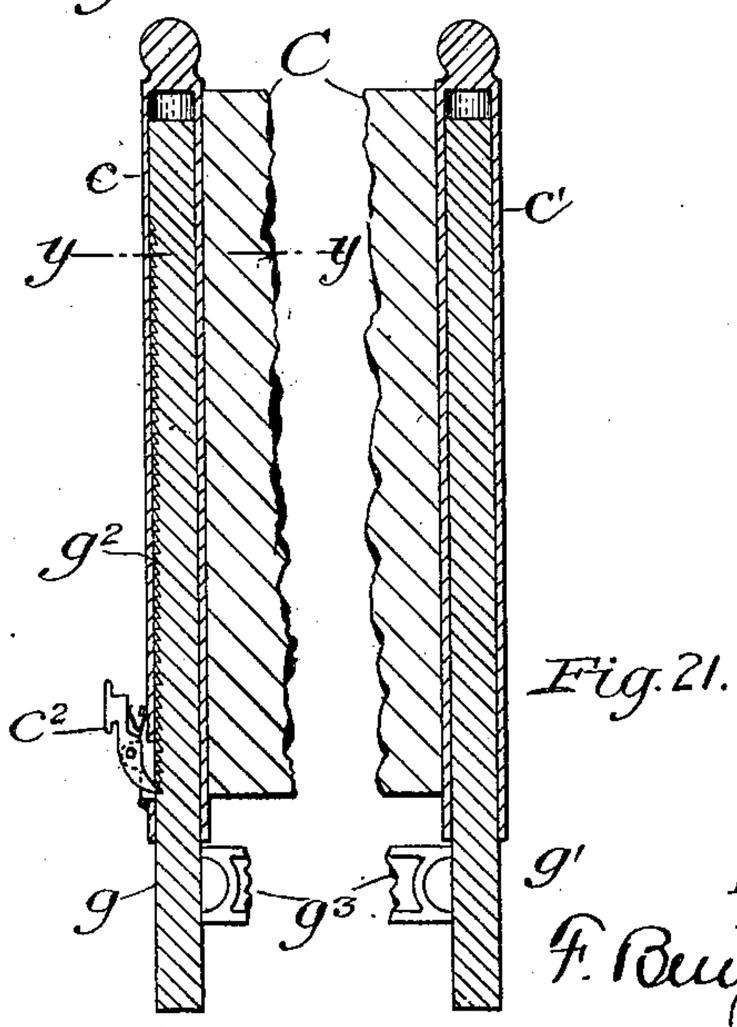

Fig. 20. Fig. 21.

Witnesses
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No. 654,777. Patented July 31, 1900.

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PHOTOGRAPHIC CAMERA.

(Application filed Jan. 16, 1900.)

(No Model.) 5 Sheets—Sheet 5.

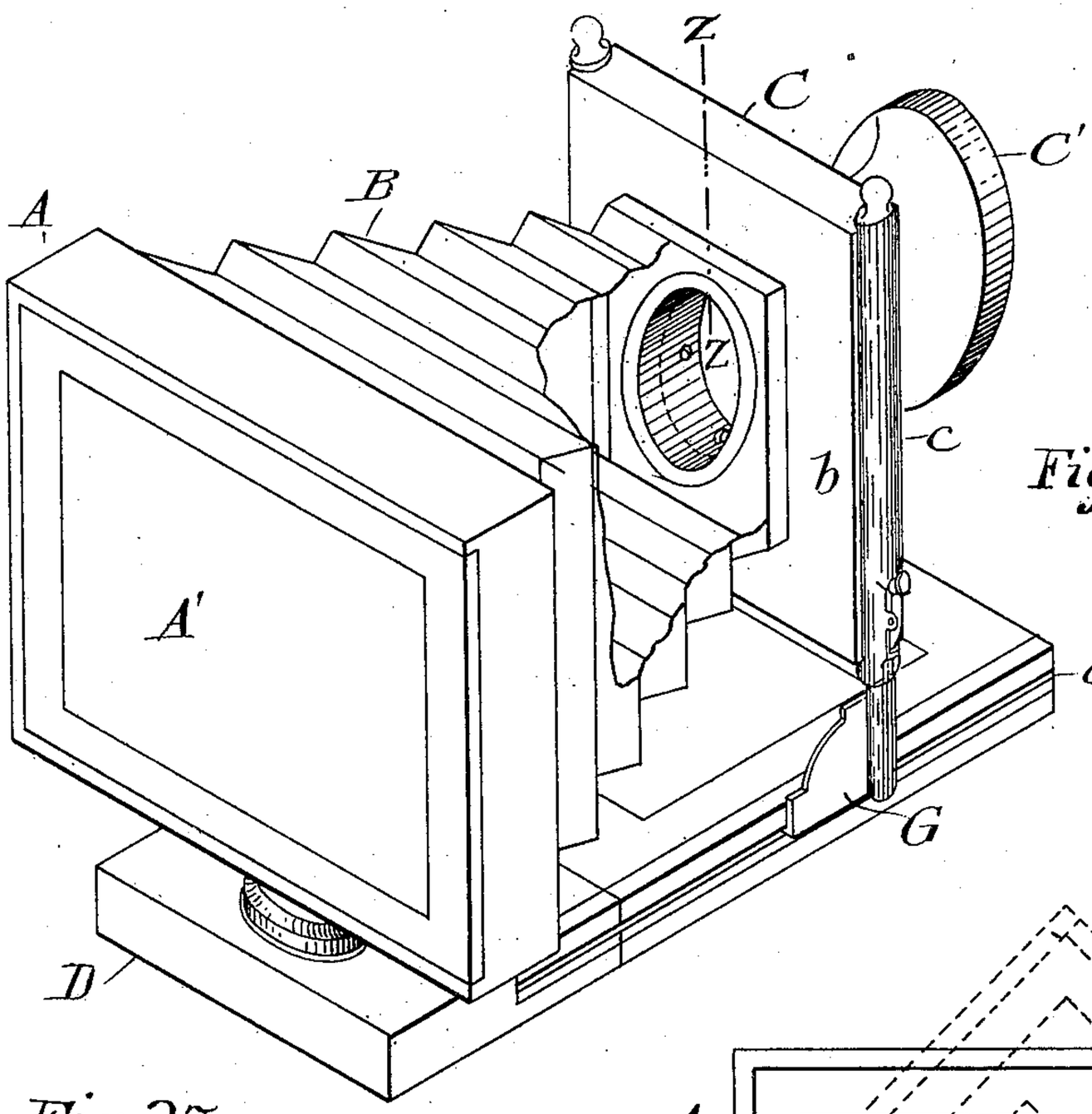

Fig. 24.

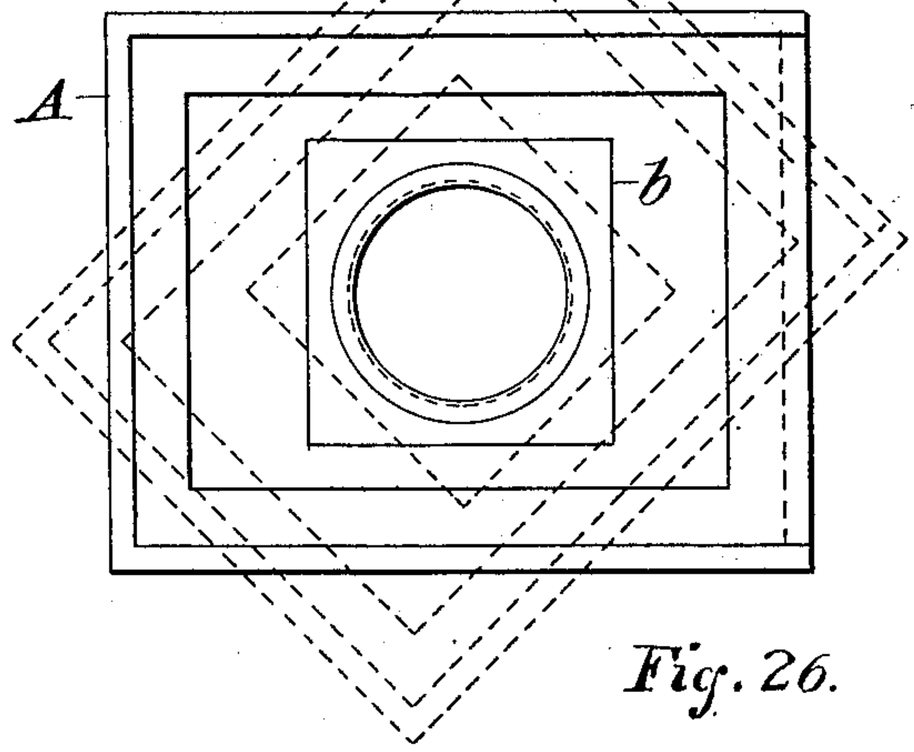

Fig. 26.

Fig. 27.

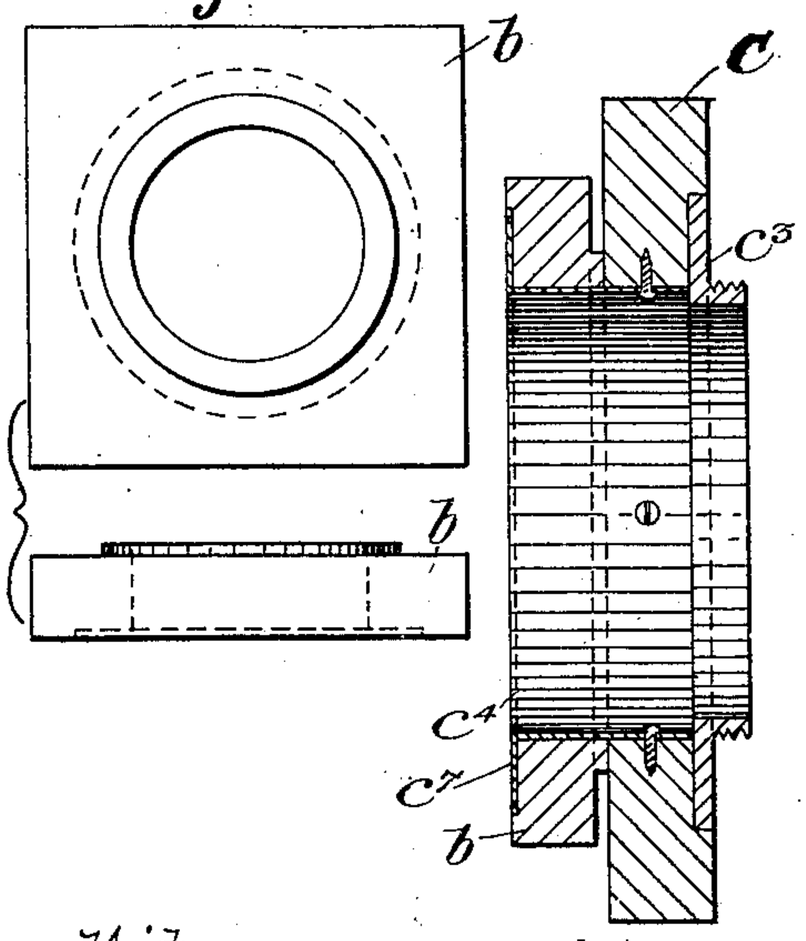

Fig. 25.

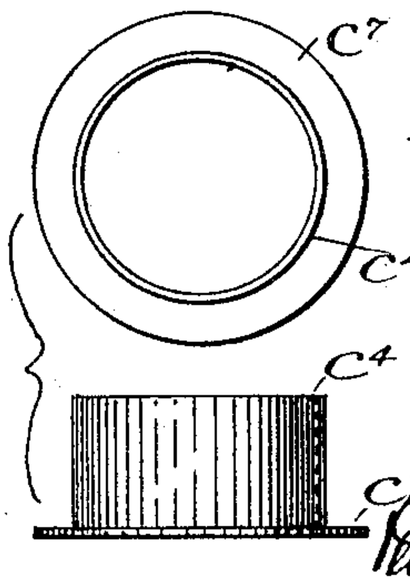

Fig. 28.

Witnesses.
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UNITED STATES PATENT OFFICE.

FRANK BENJAMIN, OF LANSINGBURG, NEW YORK.

PHOTOGRAPHIC CAMERA.

SPECIFICATION forming part of Letters Patent No. 654,777, dated July 31, 1900.

Application filed January 16, 1900. Serial No. 1,652. (No model.)

To all whom it may concern:

Be it known that I, FRANK BENJAMIN, a citizen of the United States, residing at Lansingburg, county of Rensselaer, State of New York, have invented certain new and useful Improvements in Cameras; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to cameras, and more particularly to that type known as "bellows-cameras."

The objects of my invention are to provide means whereby the lines of the picture on the ground-glass plate shall be accurate undistorted representations of the object, to provide devices whereby the center of the picture shall be made to coincide with the center of the ground-glass plate by adjustment of the lens-frame, to secure desirable rotatable axial adjustment of the ground-glass-plate frame and bellows without disturbance of the lens-frame, and to secure such separate adjustability of the parts that while the ground-glass-plate frame may be rotated the lens-frame may be given separate vertical adjustment to bring the picture into the center of the ground-glass plate; and my invention consists of the parts and combinations, all as will hereinafter be fully described, and definitely pointed out in the claims.

In the drawings, Figure 1 is a side elevational view of my improved camera. Fig. 2 is an end elevation looking toward the rear or plate-supporting position of the camera. Fig. 3 is an end elevation looking toward the opposite or lens end of the camera. Figs. 4, 5, 6, and 7 illustrate the plate-supporting frame in various adjusted positions. Figs. 8 to 17, inclusive, are detail views of the universal joint and its component parts. Figs. 18 and 19 are side and end elevational views, respectively, of the lens-supporting frame, an adjusted position thereof being indicated in dotted lines. Figs 20 and 21 are vertical sectional views of the guides at either side of the lens-frame, taken on line *x x*, Fig. 20. Fig. 22 is a cross-section taken on line *y y* of Fig. 20. Fig. 23 is an enlarged detail view of the spring-actuated pawl for holding the plate-frame in its various adjusted positions. Fig. 24 is a perspective view of the camera, part of the bellows being broken away. Fig. 25 is a vertical section taken on line *z z*, Fig. 24. Fig. 26 is a diagrammatic view illustrating in dotted lines the plate-frame and block for supporting the front end of the bellows in an adjusted position. Fig. 27 is an elevational and plan view, respectively, of the block for adjustably supporting the front end of the bellows upon the lens-frame. Fig. 28 is an elevational and plan view, respectively, of the cylindrical support for the bellows-block detached from the lens-frame.

It is sometimes desirable in using a camera to have the plate occupy positions intermediate to those in which its largest axis is either vertical or horizontal in order that the object may be projected upon the plate in the most advantageous position. Such intermediate positions of the plate are possible in my improved camera, as the plate-frame is connected to the base-frame, so that it may swing in a plane transverse to that of the camera and to either side of its vertical axis, or perpendicular to the base-frame. The means for supporting the plate-frame above the base-frame which I employ permits the plate being brought to a level position without changing the feet of the tripod from the irregular positions which they may occupy. In order that the proper relation between the lens and plate may be secured when the location of the object necessitates the vertical adjustment of the lens-frame and at the same time to permit the plate-frame to swing transversely, I preferably employ such a connection between the plate-frame and base-frame that the former may be inclined with respect to the lens-frame and may also be slightly rotated about its vertical axis.

Referring to the accompanying drawings, which show one embodiment of my invention, A designates the frame forming the rear end of the camera to which the plate-holder is removably attached and will hereinafter be referred to as the "plate-frame."

A′ indicates the usual ground-glass plate, which is adapted to be placed in a seat formed in the plate-frame and is held therein by suitable fastening devices *a a′*.

B designates the usual telescoping bellows, secured at one end to the plate-frame A and

projecting forwardly to the lens-supporting frame C. A rectangular plate c^3, Figs. 3 and 25, is located flush with the outer surface of the lens-frame C and is provided with a screw-threaded tubular projection, upon which the lens-holder C′ is secured. Suitable fastening devices c^5 c^6, Fig. 3, retain the plate c^3 in position upon the frame C. Within the circular opening through the frame C in alinement with the lens-holder is secured one end of a cylinder c^4, Fig. 25, which projects inwardly beyond the surface of the frame C and is provided with an outwardly-extending flange c^7. A block b, to which the front end of the bellows B is secured, is provided with a circular opening, through which the cylinder c^4 extends. The block b may rotate upon the cylinder c^4, being retained thereon between the flange c^7 and the inner surface of the frame C, Fig. 25. Suitable tubular guides c c', Figs. 20 and 21, are secured to the side edges of frame C, one of said guides being provided with an opening, within which a spring-pawl c^2 is located.

The plate-frame A and lens-frame C are supported upon a base or under frame D, preferably consisting of a rectangular base of a width substantially equal to that of the lens-frame, but less than that of the plate-frame, to permit the latter being swung transversely a greater distance without contacting with the base-frame. Grooves d^2 are provided along the side edges of the under frame D, and a series of teeth constituting a rack d are provided at each side of the upper face thereof.

A carriage G, Figs. 19 and 24, is supported upon the base-frame D, so as to move backward and forward thereon. This carriage G comprises side brackets, each having a flange to engage one of the grooves d^2 in the base-frame D, and an opening g^4. A brace g^3 of a width substantially equal to that of the base-frame D rigidly secures said brackets together, so that they may move in unison, one on each side of the frame D, without binding. Rods g g' are fixed at their lower ends to the side brackets of the carriage G and extend upwardly within the tubular guides c c' of the lens-frame C. The rod g is provided with ratchet-teeth, which are engaged by the spring-pawl c^2 of the guide c in order to securely hold the lens-frame in any adjusted position.

A rod H, Fig. 2, is journaled near its ends in the openings g^4 of the side brackets of the carriage G. Gear-wheels h' are fastened upon the side rod H, one adjacent the inner face of each of said brackets and engage the teeth d, forming the racks in the base-frame D. On the ends of the rod H, outside of the carriage G, are fixed circular heads h, preferably milled, so that they may be readily rotated by the operator when he desires to regulate the focus.

The plate-frame A is so supported upon the base-frame D that it may swing about its vertical axis, also transversely to either side of its vertical axis, and also longitudinally of the camera to vary its inclination relative to the lens-frame. The means which I deem preferable for so connecting the plate-frame to the base-frame as to permit these desired adjustments consists of a universal joint of novel construction now to be described.

An opening d^3, Figs. 10 and 12, is provided through the base-frame D near the rear end and at approximately its transverse center. Recesses d^4 extend downwardly below the upper surface of the base-frame D and communicate with the opening d^3. A spherical segment f is located within the opening d^3 and is provided with lugs f^2, projecting from its outer surface, which are seated in the recesses d^4 and there secured by any suitable means. The special segment f is hollow and is provided with openings f^8 through its surface, preferably at the ends of its vertical diameter. Caps f^3 f^5 of greater diameter than the openings f^8 and of substantially the same curvature on their inner faces as the outer surface of the spherical segment f are placed over the openings f^8. The cap f^3 is provided with a tubular stem f^4, depending from its curved face and of a length slightly greater than the diameter of the segment f. The cap f^5 has a central opening, through which the stem f^4 of the cap f^3 projects. A thumb-nut f^6 engages the screw-threaded end of the stem f^4 and bears against the outer face of the cap f^5. A rod K, screw-threaded at one end and squared at its other, fits within the tubular stem f^4 and is supported thereby. This rod K is reduced in diameter to form a shoulder k', which coöperates with a corresponding shoulder f^7, formed in the stem f^4 near its end to prevent the rod K when detached from the plate-frame A from dropping out of the stem. A circular thumb-nut k, having a square central opening, is fitted upon the squared end k^2 of the rod K and is retained thereon by any suitable means—as, for instance, the screw k^3. The rotation of the thumb-nut k effects an engagement between the screw-threaded end of the rod K and a socket a^2, Figs. 5 and 7, in the center of one of the long or short sides of the plate-frame A, thereby securely supporting the plate-frame.

A tripod E of ordinary construction supports the base-frame D.

The operation of my invention is as follows: The various parts of the camera being properly assembled, the ground-glass plate A′ is placed in position upon the plate-frame A for determining the proper focus. The thumb-nut f^6 is then rotated upon the stem f^4 to relieve the clamping action with which the caps f^3 f^5 engage the spherical segment f. The caps may then move upon the segment, thereby permitting the position of the rod K and the plate-frame A, supported thereon, to be adjusted to any desired position. The plate-frame may then be retained in the adjusted position by setting up the thumb-nut. If the

tripod is not level, the plate-frame may be swung transversely relative to the base-frame D to a level position without rearranging the tripod. The plate-frame may be similarly swung to either side of its vertical axis when necessary to better the position of the object upon the plate. The vertical position of the lens-frame may be adjusted to suit the object by means of the spring-pawl c^2 and coöperating teeth g^2, and when so adjusted the plate-frame may be inclined longitudinally of the camera, as indicated in Figs. 4 and 7, to secure the proper relation between the plate and lens. The plate-frame may also be rotated about its vertical axis, as illustrated in Fig. 6, when necessary. The rotatable connection between the front end of the bellows B and the lens-frame C permits the bellows to swing bodily with the plate-frame A when it is adjusted transversely. The proper focus may be effected by moving the carriage G, and consequently the lens-frame C, supported thereon, to and from the plate-frame. The carriage is readily adjusted by turning one of the heads h on the ends of the rod H, which causes the teeth on the gear-wheels h' to successively engage the teeth on the racks d, thereby propelling the carriage and regulating the focus of the camera.

Although I have described with some detail the above as my preferred construction, I do not intend to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts and, the substitution of equivalents as circumstances may suggest or render expedient and without departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a camera, the combination with a lens-frame, of a plate-frame, and means for transversely swinging said plate-frame to either side of the perpendicular to the base-frame.

2. In a camera, the combination with a lens-frame, of a plate-frame, a base-frame, means for supporting said plate-frame upon said base-frame, and provisions for swinging said plate-frame longitudinally of the base-frame and transversely of the perpendicular to the base-frame.

3. In a camera, the combination with a lens-frame, of a plate-frame, a support for said plate-frame, and a universal connection between said plate-frame and its support.

4. In a camera, the combination with a lens-frame, of a bellows connected thereto, and a plate-frame adjustable to swing about its vertical axis to either side of the perpendicular to the base-frame, independent of the lens-frame, and to which the other end of said bellows is secured.

5. In a camera, the combination with a lens-frame, of a bellows, one end of which is adjustably connected to said lens-frame, a plate-frame to which the other end of said bellows is secured, and means for swinging said plate-frame transversely to either side of the perpendicular to the base-frame.

6. In a camera, the combination with a vertically-adjustable lens-frame, of a bellows, one end of which is adjustably connected to said lens-frame, a plate-frame to which the other end of said bellows is connected, and means for swinging said plate-frame longitudinally of the base-frame and transversely of the perpendicular to the base-frame.

7. In a camera, the combination with a vertically-adjustable lens-frame, of a universally-adjustable plate-frame A, bellows connected to said frames, a base-frame supporting said lens and plate-frames, a rack located at each side of said base-frame, gear-wheels engaging said racks, and means for simultaneously rotating said gear-wheels to regulate the focus of the camera.

8. In a camera, the combination with a lens-frame, of a plate-frame, a support for said frames, rods projecting above said support, one of which is provided with ratchet-teeth, and guides engaging said rod secured to said lens-frame, one of said guides having a pawl coöperating with said ratchet-teeth, whereby the lens-frame is vertically adjusted.

9. In a camera, the combination with a vertically and longitudinally adjustable lens-frame, of a plate-frame, and means for swinging said plate-frame transversely and longitudinally of the base-frame.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK BENJAMIN.

Witnesses:
CHARLES H. CHAPMAN,
THEODORE A. FRANK.