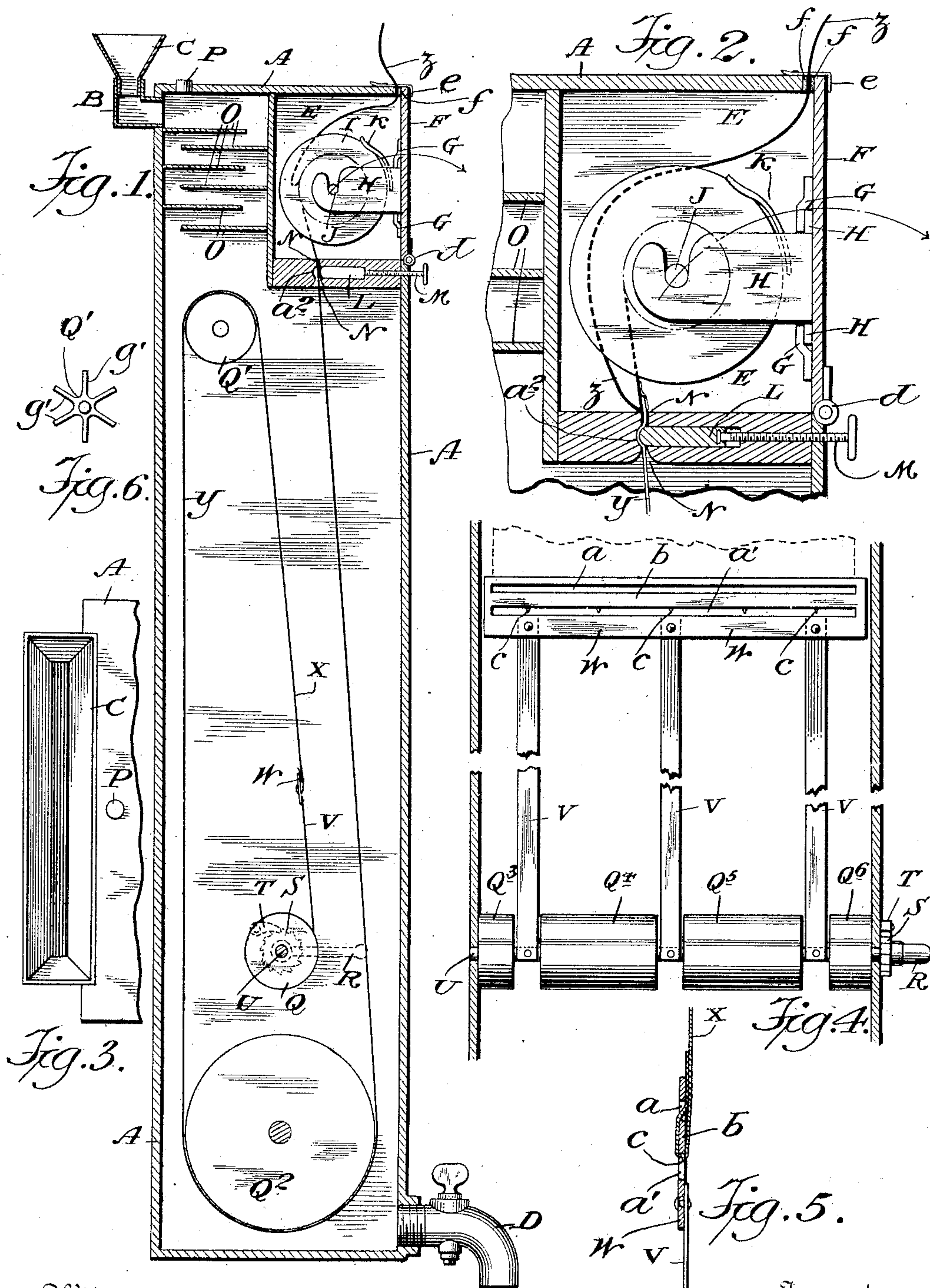


P. ABBOTT.
DEVELOPING BOX FOR PHOTOGRAPHIC FILM CARTRIDGES.
APPLICATION FILED FEB. 14, 1907.

899,495.

Patented Sept. 29, 1908.

2 SHEETS—SHEET 1.



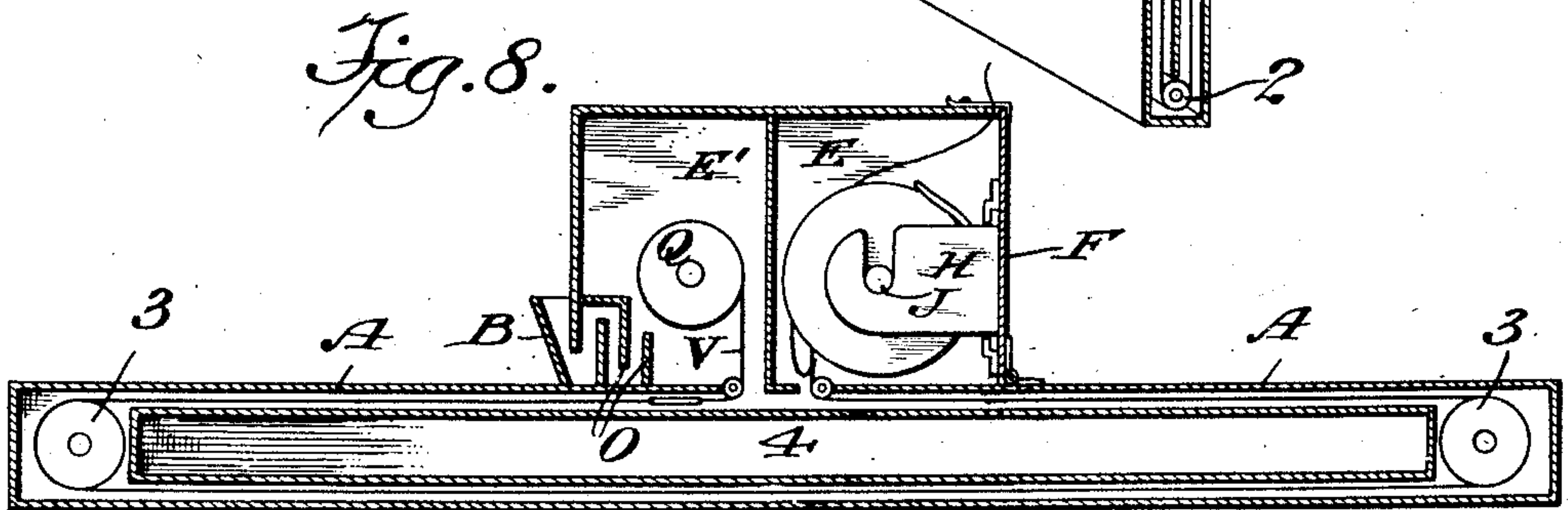
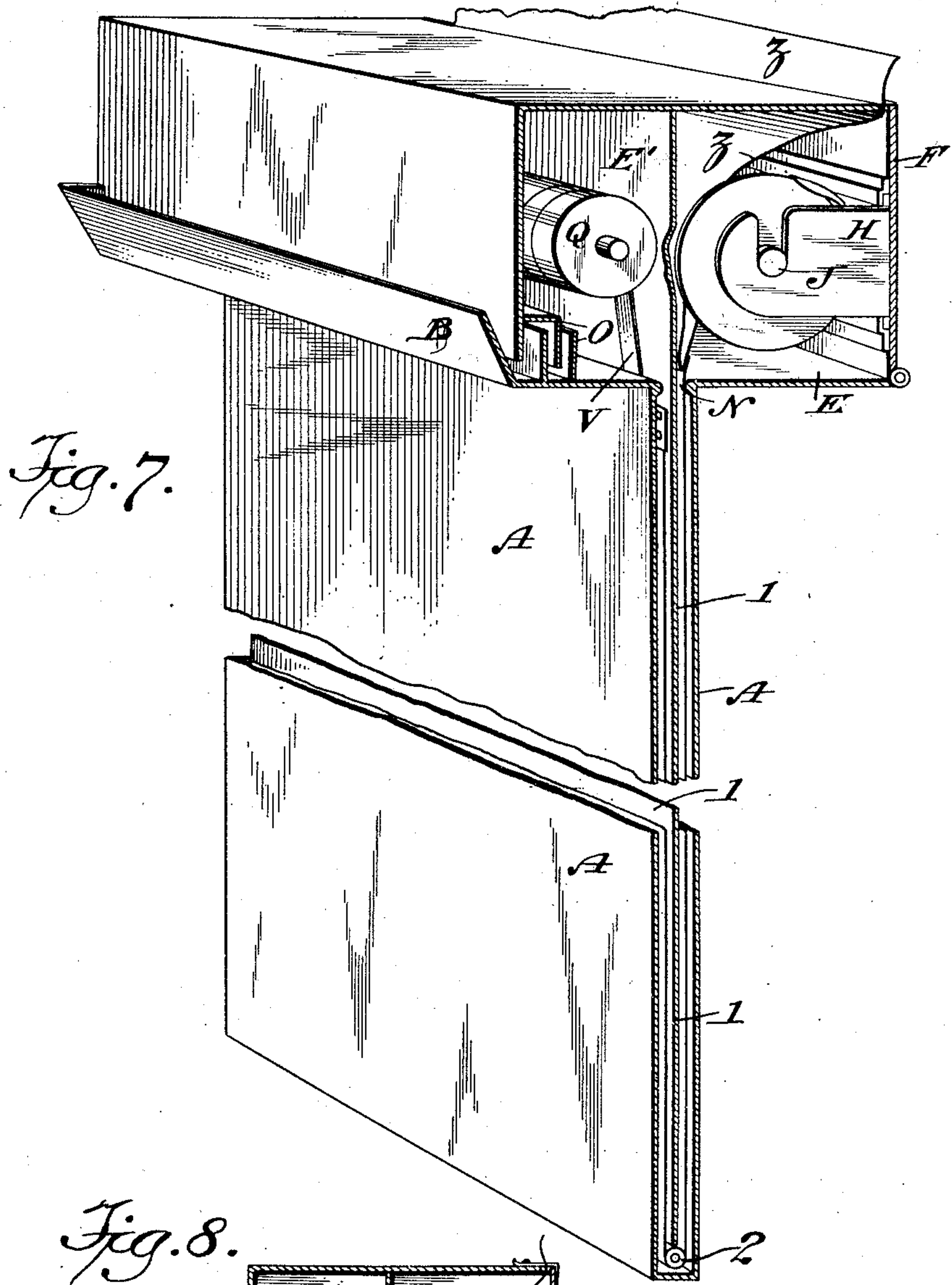
Witnesses
A. R. Appleman
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Inventor
Phillips Abbott

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A. R. Appelman
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UNITED STATES PATENT OFFICE.

PHILLIPS ABBOTT, OF OYSTER BAY, NEW YORK.

DEVELOPING-BOX FOR PHOTOGRAPHIC-FILM CARTRIDGES.

No. 899,495.

Specification of Letters Patent.

Patented Sept. 29, 1908.

Application filed February 14, 1907. Serial No. 357,321.

To all whom it may concern:

Be it known that I, PHILLIPS ABBOTT, a citizen of the United States, and a resident in the town of Oyster Bay, Nassau county, State of New York, have invented a new and useful Improvement in Developing-Boxes for Photographic-Film Cartridges, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 illustrates a vertical longitudinal section of the device, certain of the parts being shown in elevation; Fig. 2 illustrates a detail of the cartridge holding chamber and co-acting parts, enlarged to better illustrate the construction; Fig. 3 illustrates a plan view of the filling funnel through which the photographic liquids are introduced; Fig. 4 illustrates a detail of the device for leading the film from the cartridge spool through the apparatus; Fig. 5 illustrates a detail of construction of one form of device for engaging the end of the leading strip of film; Fig. 6 illustrates a modified construction of the guiding and supporting rollers. Figs. 7 and 8 illustrate special constructions of the apparatus adapted to effect the development, etc., of the film with the employment of a small amount of the photographic liquids.

As is well known, flexible and sensitized photographic films adapted to receive a series of exposures and wound upon flanged spools, are known as photographic film cartridges and will hereinafter be so called.

The developing, and fixing, of exposed film cartridges has, until recent years, been carried on in the usual photographic dark room. The exposed film alone was subjected to the chemical baths, it having been theretofore separated from the opaque material. In recent years, however, so-called daylight developing machines for film cartridges have been introduced and quite largely used, in the operation of which the opaque material in conjunction with the film has been subjected to the developing and fixing baths. This method is attended with some serious disadvantages, among them that the opaque material absorbs and thus wastes a large percentage of the baths; likewise the washings from it injuriously affect the quality of the baths, so that they soon become unsuited for further use. Also the opaque material and the film are apt at times to stick together. Furthermore daylight developing machines, as heretofore

made, have been quite expensive and cumbersome in operation.

Recently United States Letters Patent, No. 832,460 dated October 2, 1906, have been granted for an improvement in film cartridges, in which a leading strip of considerable length, which may be colorless and chemically neutral to the photographic baths, has been attached to the free end of the film, whereby to lead the film through the baths in daylight developing machines instead of using the opaque material for the purpose.

This present invention, therefore, relates to a daylight developing machine adapted to accomplish the developing and fixing of a cartridge film in such manner as to avoid all of the objectionable incidents above referred to and is as follows:

A represents a water-tight box or casing which I prefer to make of non-corrosive metal or of hard rubber. The box is provided with an inlet B near its top, preferably of oblong shape, as shown best in Fig. 3, as to have large capacity. It is preferably provided with a removable funnel C, for convenience in introducing the chemical baths.

D is a faucet at the lower end of the box. It is also preferably made of large capacity, so that the introduction and removal of the liquids may be as speedy as possible, that the time the film is exposed thereto may be more accurately regulated.

E is a chamber in one corner of the box provided with a hinged door F. Upon the door are slideways G, G, which support laterally adjustable brackets H adapted to receive the film cartridge spool I, whatever its length may be and to rotatably support the same upon journals J, J. These journals may be of such construction as will co-act with different cartridge spools now upon the market; that is to say, there may be a single rod or axis, as shown in the drawing at J, which will pass through a continuous hole made in the spool centers, or they may be mere pin bearings to engage in the recesses frequently found in the ends of the spool centers. Any suitable devices to act as journals for the spool may be employed.

K is a spring brake which is fastened to one of the brackets H. It is preferably made concave near its end where it engages the edge of one of the flanges of the spool. The bottom of the chamber E is preferably made somewhat thick, as shown, and is provided

with a sliding gate L, actuated by a threaded spindle M, which extends to the outside of the box as shown. An opening or slot N is made through the bottom of this chamber, through which the leading strip and sensitized film may pass.

O, O, O, are a series of light-excluding baffle plates, so that such light as may enter through the inlet B will be intercepted before it can penetrate to the interior of the box.

P is a vent which may beneficially be closed by a large cork.

Q, Q', Q², are three rollers, suitably supported upon shafts as shown. That of the roller Q extends to the outside of the box and is provided with a crank and handle R. It also has a ratchet S and pawl T. The roller Q² is larger than the other rollers so as to effect the separation of the different lengths of film within the box, if it be desired to maintain them free from contact with surrounding surfaces. The winding roller Q, as seen in Fig. 4, is made up of a series of sections, Q³, Q⁴, Q⁵ and Q⁶, respectively, having open spaces between them which may extend down to the axis U and to the axis is firmly riveted or otherwise attached a series of strips of material, such as thin and exceedingly flexible metal V, V, V. Tapes or a ribbon of suitable material may be used instead of these strips of metal, which I prefer, however, because if they be used, expansion and contraction is not likely to occur to any considerable extent, and also there will be no absorption by them of the photographic liquids or baths. The other end of the strips V, V, V, are riveted or otherwise fastened to what I call a locking strip W. This device is preferably a thin strip of non-corrosive metal, rubber, or other suitable material, having two slots, *a*, *a'*, made in it; the cross-bar *b* between them may have its lower edge provided with sharp prick points *c* adapted to penetrate the material of the leading strip.

The door F of the chamber E is hinged at *d* and is provided with locking hasps *e* at its upper edge. The top of the box A adjacent to the upper edge of the cover is cut away somewhat so as to leave an open space between the edge of the top and the upper part of the door and these surfaces are made light-tight by felt, lamb's wool, plush, or equivalent light-excluding material, *f*, *f*. Any suitable light-excluding material will answer the purpose, as is now well understood.

In order that the photographic liquids may come in contact with the back side of the film as well as its sensitized face, I sometimes make the supporting rollers Q', Q², of a series of longitudinally extending ribs instead of in cylindrical form, the ribs being open-ended so that the liquids can freely circulate between them, thus coming in contact with the back side of the film, which is supported upon the outer extremities of the ribs.

This construction I show in Fig. 6, in which *g'* illustrates the longitudinally extending ribs.

The operation is as follows: The exposed cartridge duly wound upon the receiving spool is taken from the camera protected from the light by the flanges of the spool and the wrappings of opaque material, as is well understood. The door of the chamber E is now opened, swinging outwardly in the direction of the arrow, as shown in Figs. 1 and 2, thus conveniently exposing the brackets H and coacting parts for the reception of the spool, which is suitably journaled between the brackets H by their lateral adjustment, if necessary, to coincide with the length of the spool, and during this adjustment, the spring brake K is properly engaged over the edge of one of the flanges of the spool, so that it will be held somewhat rigidly against rotation. The opaque material and the leading strip of the film are now unwound from the spool, but not to such an extent as to expose the film. This operation is facilitated because the spool is prevented from undesirable unwinding by the spring brake K, which exerts restraining pressure upon it. The opaque material is now turned backwardly and upwardly, as shown in Fig. 1, resting across the edge of the top of the box A, and the end of the leading strip is then engaged with the locking strip W, which at this time has been drawn upwardly through the opening N in the bottom of the chamber E and is conveniently accessible either within the chamber E or outside of it adjacent to the cartridge.

The engagement between the leading strip of the film and the locking strip W may be effected as shown in Fig. 5, that is to say, the end of the leading strip is first passed through the lower slot *a'* of the locking strip, thence upwardly and through the other slot *a*. When in this position, a little strain applied to the leading strip will cause the prick points *c*, if they be used, to puncture it, as illustrated in Fig. 5, thus securely connecting the parts together. The gate L is now retracted from its position as shown in Fig. 2, to that shown in Fig. 1, so that the opening N through the bottom of the chamber E is unobstructed. The door F is now closed, whereby the spool and co-acting parts are swung upwardly into the chamber E, as shown in Figs. 1 and 2, and the hasps *e* engaging with the edge of the door hold it tightly closed, so that the slit through which the opaque material passes from the inside to the outside of the chamber E will be rendered light-tight by the presence of the light-excluding felt or equivalent material, *f*. The crank R of the winding roller Q is now turned, whereupon the strips or tapes V, are wound up upon the shaft U of the roller, and the locking strip W carrying the leading strip X of the cartridge with it is drawn down through the opening N in the bottom of the

chamber E and thence still downwardly beneath the roller Q^2 upwardly over the roller Q' , and so in turn wound up upon the roller Q . Meantime of course the film pulled by the leading strip is unwound from the cartridge spool and also the opaque material which from time to time is pulled out from the chamber E, by taking hold of its projecting part. The movement of the apparatus is made smooth and even because of the pressure exerted at one end by the crank R, and the holding pawl and ratchet S, T, and at the other end by the retarding action of the spring brake K upon the flange of the cartridge. In this way all of the film will be unwound from the cartridge and passed through the opening N until the point of connection between the film and opaque material is reached, at which point the parts will be substantially in the position illustrated in Fig. 2, that is to say; the point of connection between the opaque material z and the film y will be presented at the upper edge of the opening N in the bottom of the chamber E, which is preferably made so narrow that the stated accumulation of material will form a substantial closure of the opening against the passage of liquid through it. In order, however, that this closure may be absolute and also for another purpose to be referred to later, I now screw up the gate L, so that it presses the terminal part of the sensitized material y into a longitudinally extending recess a^2 on the opposite side of the opening N. In this way the escape of the liquid through the opening N is prevented.

It will be noted that the accumulation of material above referred to will have much greater bulk than that of the bar W, and therefore the substantial closure of the opening N will be effected, yet the bar W permitted free passage through said opening. The stated accumulation of material at the opening N likewise serves another important function, that is to say, it prevents the further unwinding of the film cartridge, since the attachment of the black paper to the film is of such strength that severance is impossible without the exercise of unwarranted force upon the winding device. Consequently, when the entire film, as stated, has been unwound within the box, this accumulation of material at the opening N affords a definite stop to further unwinding and thus prevents the terminal protecting strip from being drawn into the box and likewise affords means to withdraw the developed film, as herein explained. It will be noted that at this stage of the operation the sensitized film is stretched with sufficient tension from the cartridge spool about the rollers described, so that all parts of it are free from contact with anything except the rollers and that its sensitized side is free from contact with anything. The developing liquid is now poured

into the funnel C, the area of which, as stated above, is such as to permit the rapid filling of the box, so that all parts of the film are subjected to its action at about the same time and in its introduction, it flows over the baffle plates O, O, O, which freely permit its entrance, yet exclude the light. The vent P should be opened to permit the escape of air, thus expediting the filling operation. The box may be filled up to the bottom of the chamber E, thus submerging all parts of the film and may be shaken during the developing operation, thus bringing fresh liquid in contact with the sensitized surface. After the development is completed, the faucet D may be opened, and the liquid drawn off into a suitable vessel for re-use. Then the washing water may be introduced through the funnel and the film thoroughly washed by agitation of the device and renewal of the water, if necessary, in a manner well understood, and then in turn the fixing baths may be introduced and the fixing accomplished. After these processes have been completed, the door F will again be opened, the gate L moved back and the ratchet S released from the pawl T. Then the spool being released from its supports H, the film will first be drawn backwardly through the opening N and out of the chamber E, followed by the leading strip X and in due time by the locking strip W, which will pass upwardly through the opening N, whereupon the leading strip will be disengaged from it and the operation will thus be completed.

In order to prevent the locking strip from accidentally dropping back through the opening N into the interior of the box, the gate L should be closed before the leading strip is disengaged from the locking strip, so as to grip the tapes V below the locking strip. The entire apparatus will then be in position for second use.

In Figs. 7 and 8 I show modified constructions of the invention in which a small amount only of the developing and fixing liquids will be required to treat a long strip of exposed film. In these two figures I have not shown the details of construction of all the parts so fully as in the others. It will be understood, however, that such parts may by appropriate and obvious modification, if required, be used in conjunction with the modified constructions about to be described.

Referring first to Fig. 7, the parts so far as shown are represented by the same reference letters as heretofore. The box or casing, however, in which the exposed film is subjected to the action of the developing and fixing liquids instead of being wide and having considerable interior capacity, is made very narrow, it need not be more than from one quarter to one half an inch in width and down through its center there is arranged a partition indicated by the numeral 1, and at

the bottom of this partition, there is a roller 2, and the film which is drawn off from the cartridge spool by the strips or tapes and other elements as before described, passes
 5 downwardly through the narrow space between the partition and the opposed side of the casing, around the roller at the bottom thereof and up again through the opposite narrow space, at the top of which there is a
 10 chamber marked E', within which is located a receiving or winding up roller Q, and the photographic liquids are introduced into the apparatus by a supply chute B, arranged
 15 along the side of this chamber E', which may be provided with light-obstructing baffle plates, O, O, the same as already described. The liquids in this case, as indeed in the apparatus shown in Fig. 1, may be withdrawn
 20 from the developing and fixing casing through the inlet passages above described, or this apparatus may be provided with a draw-off cock, not shown, as preferred.

In Fig. 8 substantially the same construction as that shown in Fig. 7, is illustrated,
 25 except that the chambers E, E', are arranged midway between the length of the apparatus and also that large rollers 3, 3, are provided, over which the film passes, and the space between the rollers is filled up by a suitably
 30 supported hollow structure 4, which almost entirely fills the interior of the casing, thus reducing the amount of photographic liquids to the minimum. The constructions of these
 35 two figures have the advantage of requiring a small amount only of the photographic liquids, thus being economical and convenient in use, but lack the advantage present in the construction illustrated in Figs. 1-6, that
 40 the films are free from contact with surrounding surfaces during the developing operation. This, however, may not be an important consideration in many cases, particularly since the back of the film and not its sensitized surface comes in contact with the
 45 dividing partition 1 of Fig. 7, or the interior structure 4 of Fig. 8, as the case may be, and the extreme edges only of the other or sensitized side engage with the outer walls of the developing casing and these only throughout
 50 a part of their length.

Obviously the partition need not be a solid structure and it may be omitted altogether, but I prefer its presence, because otherwise there is danger that certain qualities of film
 55 might stick together back to back.

It is also obvious that the filling structure 4 of Fig. 8 may be a solid block of wood, instead of a hollow affair, as illustrated. In short, anything which will occupy the space
 60 within the interior of the developing casing, thus reducing the amount of photographic liquids necessary, will serve the purpose.

It will also be obvious to those who are familiar with this art that various modifica-
 65 tions may be made in the details of construc-

tion of the apparatus without departing from the essentials thereof. In many details the constructions above described and illustrated may be departed from and yet the essentials of the invention be retained. I
 70 therefore do not limit myself to such details, which illustrate certain forms only in which my invention may be embodied, except as specified in the claims hereof.

Having described my invention, I claim: 75

1. A photographic developing apparatus embodying a light tight and water tight casing, means within the casing to rotatably support a film cartridge, means to separate
 the opaque material from the film, means to
 80 lead the film from the cartridge through the interior of the casing substantially from end to end thereof, means supported by the casing near its ends to guide and change the direction of travel of the film and which sup-
 85 port it at the points of change only, means whereby the photographic liquids may be poured into the casing and drawn therefrom.

2. A photographic developing apparatus embodying a light tight and water tight cas-
 ing, a chamber connecting therewith, means
 90 to make said chamber light tight, means to introduce a film cartridge into said chamber, means to rotatably support the cartridge within said chamber, means to separate the
 95 opaque material from the film whereby it may be withdrawn from said chamber, means to lead the film from the cartridge through the interior of the casing substantially from end to end thereof, means supported by the
 100 casing near its ends to guide and change the direction of travel of the film and which support it at the points of change only, means whereby the photographic liquids may be
 105 poured into the casing and drawn therefrom.

3. A photographic developing apparatus embodying a light tight and water tight casing, means to rotatably support a film cartridge, means to retard the rotation of the
 film cartridge, means to separate the opaque
 110 material from the film, means to lead the entire film continuously from the cartridge through the interior of the casing, means supported by the casing near the ends thereof which guide and support the film, means
 115 whereby the photographic liquids may be poured into the casing and drawn therefrom.

4. A photographic developing apparatus embodying a light tight casing, a chamber connecting therewith, means to support a
 film cartridge within the chamber, means to
 120 obstruct the passage of liquid from the casing into the chamber, means to introduce the photographic liquids into the casing and to draw the same therefrom.

5. A photographic developing apparatus embodying a light tight and water tight casing, means to rotatably support a film cartridge, means to retard the rotation of the
 film cartridge, means to lead the film under
 130

tension from the cartridge through the interior of the casing substantially from end to end thereof, means supported by the casing near its ends for the support of the film, means whereby the photographic liquids may be poured into the casing and drawn therefrom.

6. A photographic developing apparatus embodying a light tight and water tight casing, a chamber connecting therewith, means to rotatably support a film cartridge within the chamber, means to separate the opaque material from the film and to withdraw it from the chamber, means to retard the rotation of the cartridge, means to lead the film from the cartridge through the interior of the casing, means supported by the casing near its ends around which the film is led and by which it is supported, means to obstruct the passage of liquid from the casing to the chamber, means whereby the photographic liquids may be poured into the casing and drawn therefrom.

7. A photographic developing apparatus embodying a light tight and water tight casing, means to rotatably support a film cartridge, means to lead the film from the cartridge through the interior of the casing, means supported by the casing near its ends to guide and change the direction of travel of the film and to support it at the points of change only, means whereby the photographic liquids may be poured into the casing and drawn therefrom.

8. A photographic developing apparatus embodying a light tight and water tight casing, means to rotatably support a film cartridge, means to separate the opaque material from the film, means supported by the casing near its ends to guide the film from the cartridge through the interior of the casing and to discontinuously support the same and means whereby the photographic liquids may be poured into the casing.

9. A photographic developing apparatus embodying a light tight and water tight casing, a chamber connecting therewith, means to make said chamber light tight, an outwardly swinging door for said chamber, means to rotatably support a film cartridge mounted upon the inside of said door, means to unwind the film from the cartridge and lead it from the chamber into the casing, means to discontinuously support the film within the casing and means to supply the photographic liquids to the casing.

10. A photographic developing apparatus embodying a light tight and water tight casing, a chamber connecting therewith, means to make said chamber light tight, means to rotatably support a film cartridge within said chamber, means to unwind the film and opaque material from the cartridge, means whereby the opaque material may be removed from the said chamber, means to lead

the film from the chamber into the casing, means supported by the casing near its ends about which the film is led and which discontinuously support the film within the casing, and means whereby the photographic liquids may be poured into the casing and drawn therefrom.

11. A photographic developing apparatus embodying a light tight casing, a chamber connecting therewith, means to make said chamber light tight, means to obstruct the passage of liquid from the casing into the chamber, means to rotatably support a film cartridge within said chamber, means to unwind the film from the cartridge and to lead it from the chamber into the casing, means to discontinuously support the film within the casing, means to introduce the photographic liquids into the casing and to draw the same therefrom.

12. A photographic developing apparatus embodying a light tight and water tight casing, a space within the casing for a photographic film cartridge, a door adjacent to said space, means to rotatably support the cartridge attached to the door, means to unwind the sensitive film from the cartridge and to lead it through the casing, means supported by the casing near its ends about which the film is led and by which it is supported and means to apply tension to the film.

13. A photographic developing apparatus embodying a light tight and water tight casing, means within the casing to rotatably support a film cartridge, means to retard the rotation of the cartridge, means to separate the opaque material from the film, means to lead the film under tension from the cartridge through the casing and means supported by the casing near its ends which discontinuously support the film.

14. A photographic developing apparatus embodying a light tight and water tight casing provided with an opening through which the opaque material of the cartridge may be withdrawn from the interior of the casing, a door opening into the casing, supports for a film cartridge carried by the door and means on the door whereby the opening through which the opaque material is withdrawn will be made light tight on closing the door.

15. A photographic developing apparatus embodying a light tight and water tight casing, a chamber connecting with said casing, a door in the side of the casing opening into said chamber, means to make said chamber light tight, means to rotatably support a film cartridge located on the inside of the said door, means to retard the rotation of the cartridge, means to lead the film under tension from the cartridge into the casing, and light excluding means through which the photographic liquids may be poured into the casing.

16. In a photographic developing apparatus

tus, a light tight and water tight casing having much greater length than width, means located near the ends of the casing for discontinuously supporting the film and means
 5 actuated from the exterior of the casing whereby the film is unwound from the cartridge and carried by the said supports.

17. A photographic developing apparatus embodying a light tight and water tight casing, means to rotatably support a film cartridge, means to discontinuously support the film located near the ends of the casing and supported by it, means to unwind the film from the cartridge and to lead it through the
 10 interior of the casing and around said supporting devices and means to supply the photographic liquids to the casing.

18. A photographic developing apparatus embodying a light tight and water tight casing, means to rotatably support a film cartridge located near the ends of the casing and supported by it, means to put the film under tension, means to lead it under tension from the cartridge through the interior of the casing and about said fixed supporting devices
 15 and means to supply photographic liquids to the casing.

19. A photographic developing apparatus embodying a light tight and water tight casing, means to lead the sensitive film into the casing, means to guide and discontinuously

support the same therein located near the ends of the casing and supported by it and means to supply photographic liquids to the casing. 35

20. A photographic developing apparatus embodying a receptacle adapted to protect light tight a film cartridge, a receiving roller adjacent to the cartridge, a narrow casing connecting with the receptacle and having a
 40 roller near its end adapted to serve as a guide and support for the sensitive film, means to lead the film from the spool into the casing and means to supply photographic liquids to the casing. 45.

21. A photographic developing apparatus embodying a receptacle adapted to protect light-tight a film cartridge, a casing connecting with said receptacle, guiding and supporting devices for the film within the casing, means to fill the central portions of the casing, a receiving roller, means to lead the film from the cartridge through the casing and means to supply photographic liquids to the casing. 50 55

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PHILLIPS ABBOTT.

Witnesses:

WALTER H. CRITTENDEN,
 F. M. DOUSBACH.