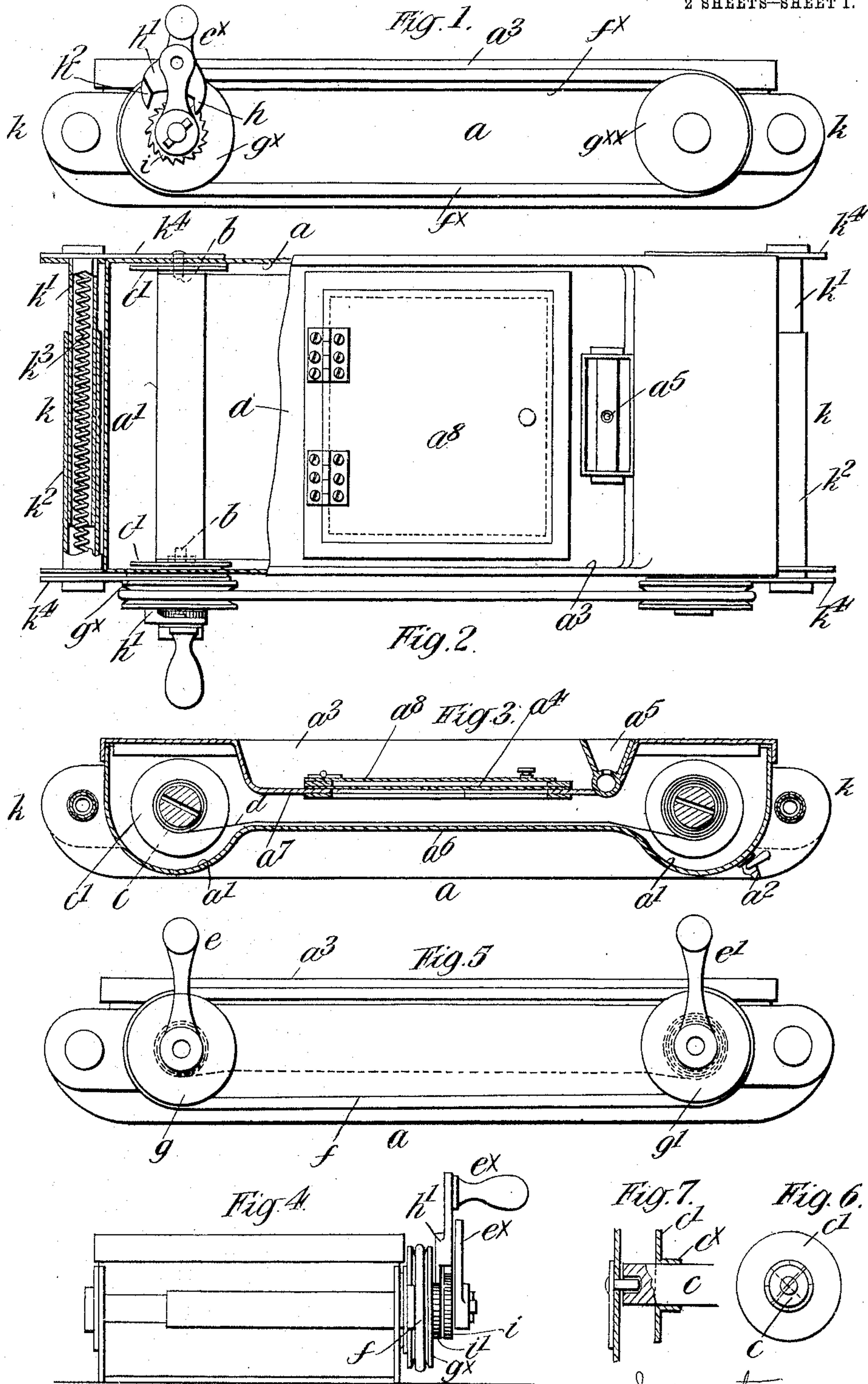


W. F. C. KELLY & T. BOLAS.  
 APPARATUS FOR DEVELOPING PHOTOGRAPHIC FILMS.  
 APPLICATION FILED DEC. 12, 1906.

976,810.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.



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Fig. 8.

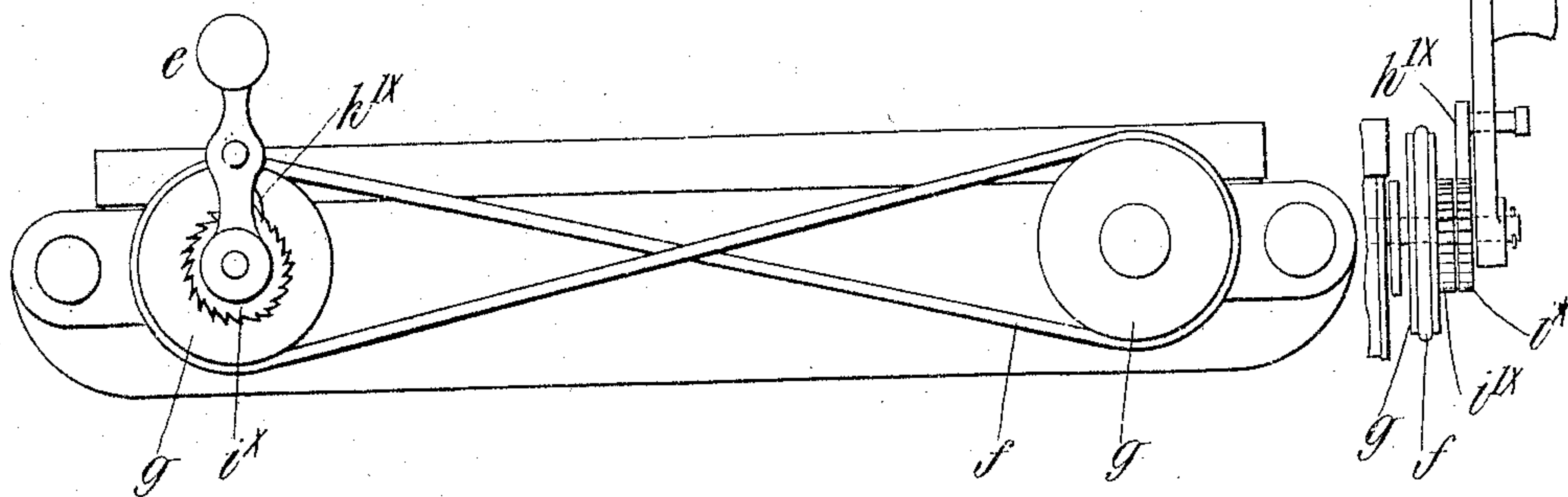


Fig. 9.

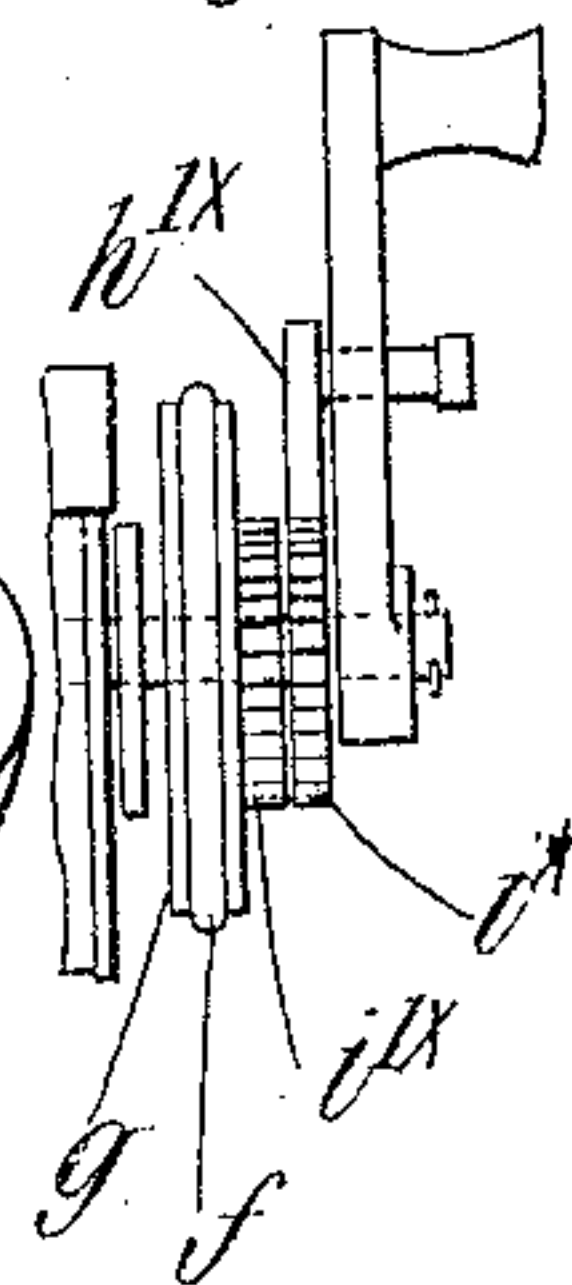


Fig. 10.

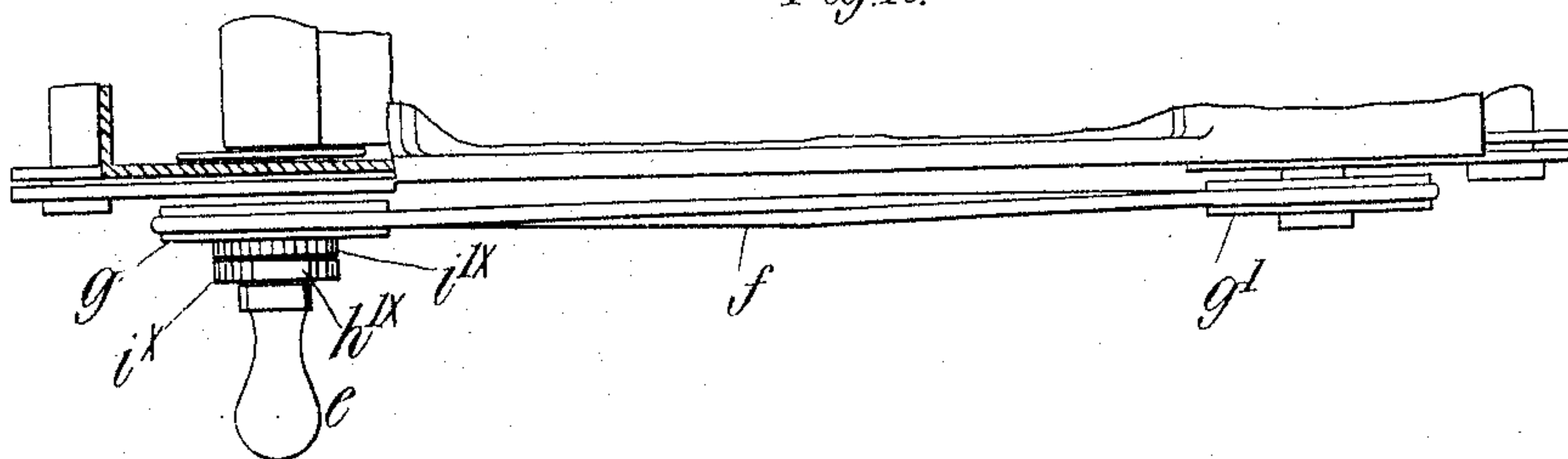


Fig. 11.

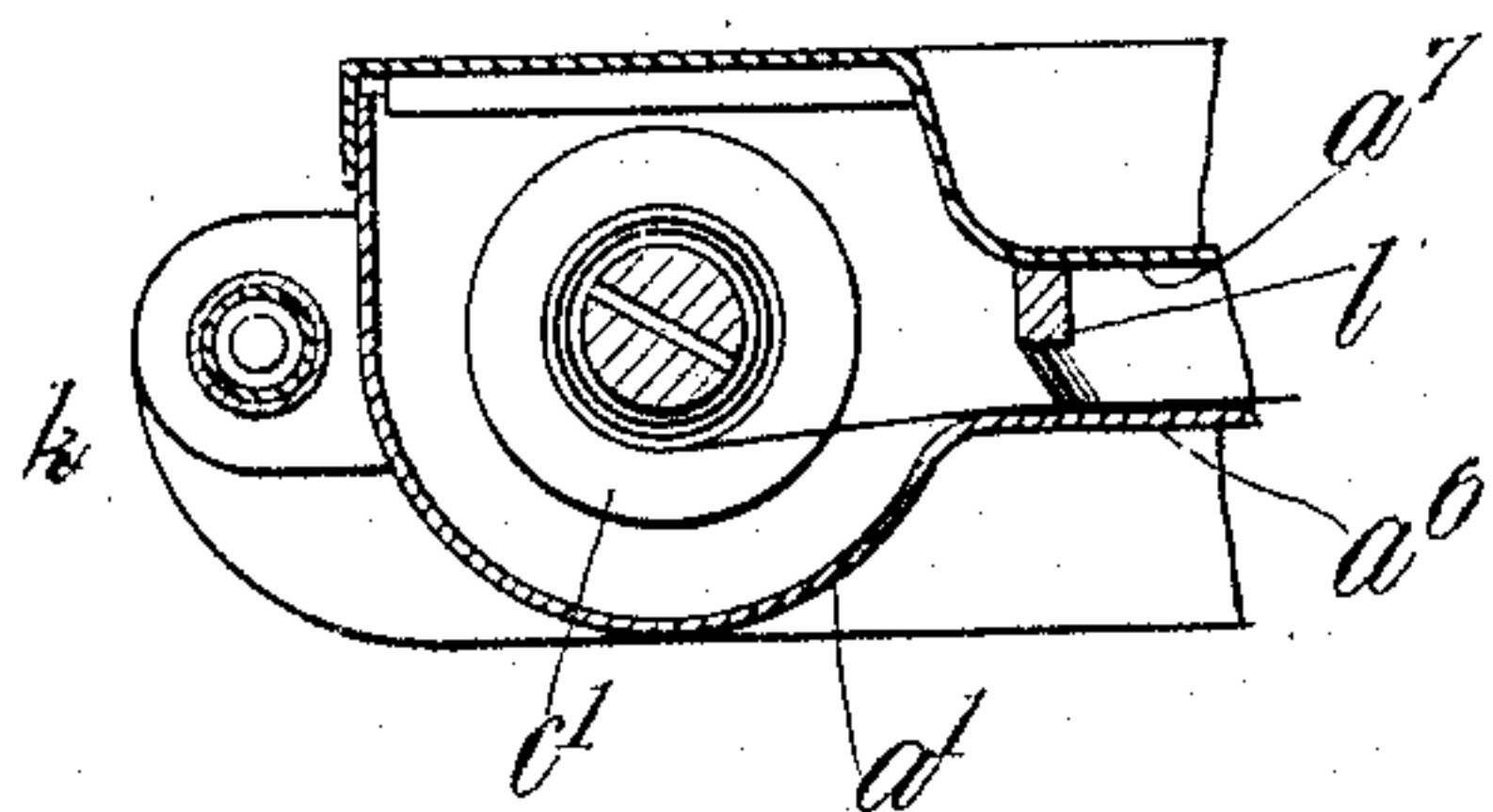
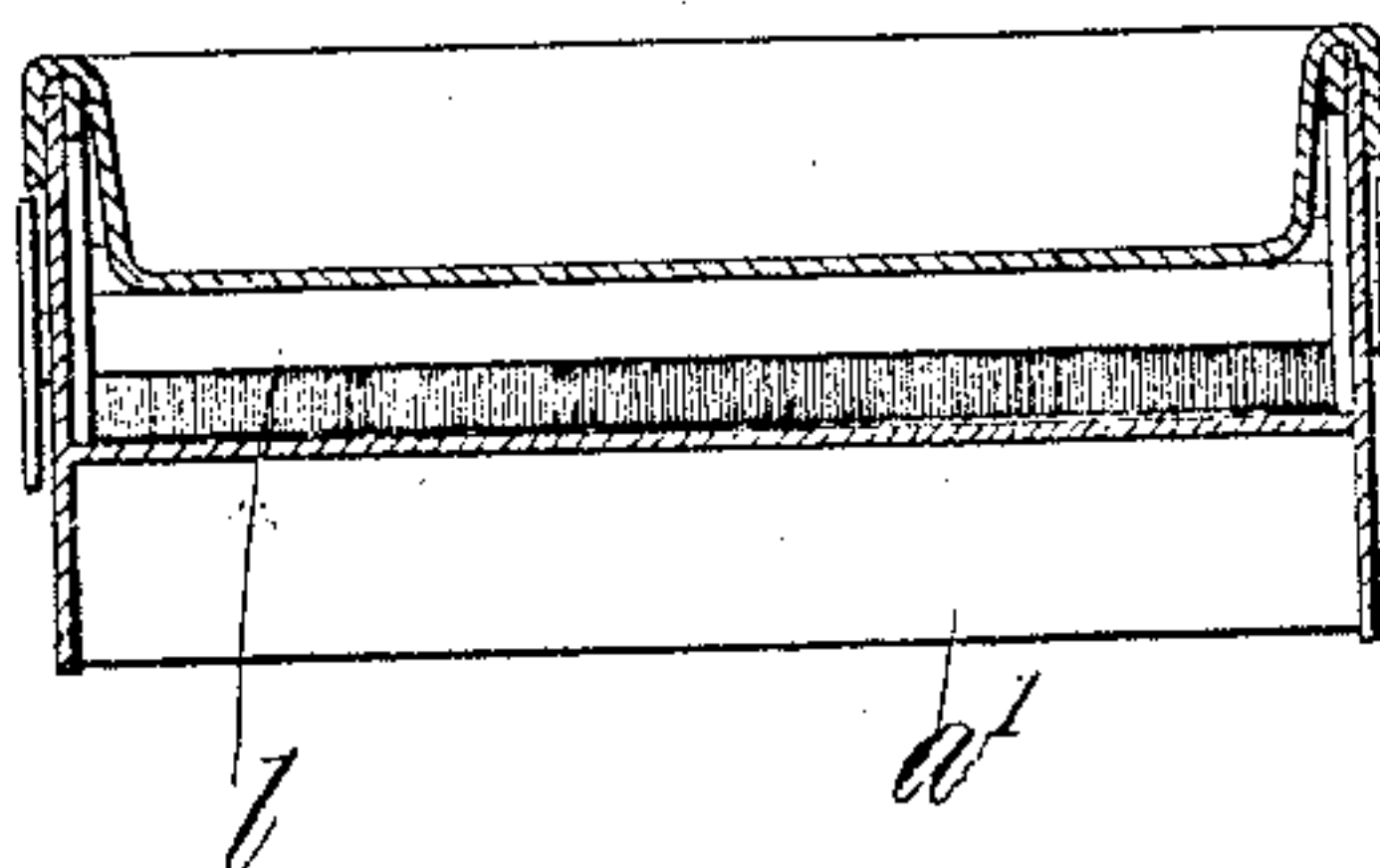


Fig. 12.



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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR DEVELOPING PHOTOGRAPHIC FILMS.

976,810.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed December 12, 1906. Serial No. 347,519.

To all whom it may concern:

Be it known that we, WILLIAM FRASER CLAUGHTON KELLY, barrister-at-law, and THOMAS BOLAS, analytical chemist, subjects  
5 of the King of Great Britain, residing, respectively, at 8 Perham road, Kensington, in the county of London, England, and 60 Grove Park Terrace, Chiswick, in the county of Middlesex, England, have invented certain new and useful Improvements in Apparatus for Developing Photographic Films, of which the following is a specification.

This invention relates to an improved method of and apparatus for developing  
15 photographic "films."

According to our improved method the film is caused by mechanical means to traverse a specially formed trough or developing dish; the spool bearing the exposed film  
20 and black backing paper being mounted in one end of the said dish; the said black backing paper being connected with an empty spool at the other end of the dish. Upon rotating the one or the other of the  
25 spools in a certain direction the backing paper together with the film is caused to traverse the trough or dish; the latter being provided with the necessary developing solution or if the developer be carried by the  
30 film with water only.

To enable our invention to be clearly understood and readily carried into effect we will proceed to describe the same with reference to the accompanying drawings, in  
35 which:—

Figure 1 is a side elevation of developing apparatus adapted for carrying out our invention. Fig. 2 is a corresponding plan and partial horizontal section. Fig. 3 is a longitudinal section. Fig. 4 is an end view looking toward the left-hand end of Fig. 1. Fig. 5 is a side elevation of alternative means for relieving the strain on the black backing paper. Figs. 6 and 7 are respectively a face  
45 view and a section of a portion of a spool furnished with an adjustable flange. Figs. 8, 9 and 10 are respectively a side view, a fragmentary end view and a fragmentary plan of a modified arrangement in which the driving band is crossed and the direction of rotation is always the same. Figs. 11 and 12 are fragmentary views in longitudinal and transverse section respectively showing the brush or flap for insuring immediate  
50

and thorough wetting of the surface of the  
film. 55

According to our improved method we employ a device comprising a dish or trough  $a$  resembling in its proportions of length to breadth and in its general features the back  
60 part of an ordinary folding roll-film camera of the usual type. The open top of this trough corresponds to an aspect viewed from the inside of the camera. At each end of the trough centers or pins  $b, b$  are provided, on  
65 which the usual spools  $c$  as employed for roll-films can turn, but for each spool there is a turning or driving device associated with one of the said centers or pins. The ends of the trough or dish in which the  
70 spools are mounted are formed with wells  $a', a'$ ; a valved aperture  $a^2$  being provided for use when emptying the trough.

The spool bearing an exposed film having been placed on the centers or pins at one  
75 end of the trough, an uncharged spool is placed on the centers or pins at the other end of the trough. A sufficient length of the protective black band  $d$  is then unrolled to enable the end thereof to be passed into  
80 or through the slot (not shown) in the core or spindle of the uncharged spool; or we otherwise attach the loose end of the band to the core of the spool so that the loose end of the band can be easily detached from  
85 the core or so that it will itself effect its detachment therefrom.

Water or developing solution having been poured into the trough  $a$  the band of protective backing is wound on the uncharged  
90 spool, and with this band the sensitive film also travels. At this stage or a little later, the fluid first poured in may be suitably modified. If the operation has been commenced with plain water a powder contain-  
95 ing suitable developing chemicals may be sprinkled in or added; or a strong solution of such chemicals may be added. In the case of a roll film provided with its own developing chemicals water alone is neces-  
100 sary.

In order to develop the film evenly it must be wound from end to end of the trough several times, and it is often convenient to maintain a slow winding from  
105 end to end during the whole period of development.

Although in carrying out this method of



development the ordinary protective band  $d$  of black paper is used to support the strain or tension of winding, such black paper may be replaced by a textile material similarly prepared or by a parchmentized or mercerized paper or fabric or other specially toughened material such as celluloid, pegamoid or the like. In other cases the black backing paper may be supplemented by a separate band of textile material, or of one of the above specified tough materials. When the main or supplementary band is of hardened gelatin, celluloid or the like, it may be strengthened longitudinally by embedded threads. The secure attachment of the ends of the sensitive film to the protective band and in a manner impervious to water is essential to the carrying out of the invention, and the use of a strip of surgical spread plaster at each end of the sensitive film is found to be a convenient and successful method. The protective band or its supplement, may however be perforated in one transverse slot or in transverse slots to allow of an end of the sensitive film or a toothing on the end thereof being passed through and keyed in position.

By the method described above, and assisted by the peculiar shape of our trough also by the brush or flap described subsequently, a film of liquid is induced and retained by capillarity in the convolutions of the roll thereby obviating the necessity of introducing what is known as an "apron" or separator between the convolutions during the process of development.

The developing trough being constructed to the dimensions of the back of a roll film camera may actually be a part of the camera as a complete instrument but easily separable from the part which carries the lens and bellows. In this case exposures will be made in the trough, or as used now the back of the camera, and the back must obviously in this case be charged with an unexposed roll of film and must be furnished with the usual inspection window for viewing the numbers. When separated from the fore part of the camera the back can be used as already described. We ordinarily cover the separated trough or the trough when it forms a distinct instrument, with a closely fitting lid  $a^3$  carrying one or more red windows  $a^4$  for viewing the progress of development, and we provide means such as indicated at  $a^5$  for pouring in any required liquid without exposing the film to daylight. That portion of the trough between the well portions  $a'$ ,  $a'$  and across which the film travels may be made with a raised bottom or be less deep as shown at  $a^6$ , and the cover  $a^3$  may be recessed over this raised portion  $a^6$  as indicated at  $a^7$ . By arranging the bottom of the tank in this manner a great saving in the amount of developer used is effected and even wetting by

the wells which hold the water or developer is caused to take place. Moreover, the film is enabled to be raised from the liquid and is exposed to the action of the air. This, as is well known, has the effect of expediting the action of development. In the case of a film of the self developing type being employed, where it would only be necessary to place water in the developing tank, it is very important to restrict the quantity of water used, for the reason that a self-developing film can only carry a certain amount of developer for solution. The recessed portion of the cover is found to be a convenient position for the non-actinic inspection window  $a^4$ , but a hinged flap  $a^8$  should cover this window. On one side of this recess we attach the inflow funnel  $a^5$  and at a convenient point in the bottom of the well or wells a tapped outflow  $a^2$  is provided.

The end plates  $c'$  of our spools may be made slightly saucer shape, the concavity being outward; the running of the band being hereby facilitated. To enable films of varying width to be treated, the end flanges or one of them may be made adjustable along the core as illustrated in Figs. 6 and 7; the flange  $c'$  being formed with a sleeve portion  $c^x$  for facilitating the passage of the flange on to the said core.

From the above description it will be obvious that if our film is over wound in either direction, the detached end may be readjusted safely after the light-tight cover has been removed, and, similarly, the sensitive film will be safe-guarded against light when entirely wound on either spool, so at such points the cover may with safety be removed for inspection, or any other purpose. In the simple form hereinbefore referred to wherein it is assumed two handles are employed that handle which is not being turned would be revolved by strain or pull transmitted through the roll film and its backing or backings. To relieve this strain any suitable mechanical device may be employed, such, for example, as one of the following:—  
(a) Adjacent to the handles  $e$ ,  $e'$  and, either inside or outside the trough  $a$  two grooved wheels are provided, the depth of groove corresponding to the flanges of the spools. In the grooves of these wheels a narrow band is arranged which may be of plaited metal or other convenient material; the length and thickness thereof approximately corresponding to the roll-film and its belongings. Such an arrangement is illustrated in Fig. 5 in which  $f$  is the band and  $g$ ,  $g'$  the grooved wheels disposed one at each end of the apparatus. The said band is so rolled on the wheels or sheaves  $g$ ,  $g'$  that it is parallel to the film at all times. It will suffice if the above-mentioned system of grooved wheels and band instead of approximately corresponding in radial magnitude to



the spool ends and the rolling material, is homologous or proportional. (b) The unwinding spool is arranged to "free wheel" or "ratchet," so that it does not drag its own handle after itself, the ratchet device being in the head of the spool or on the axis of the winch or handle.

According to the arrangement illustrated in Figs. 1 to 4 an arrangement may be employed wherein the ratchet is adapted to permit of one handle  $e^x$  serving the purpose of driving each spool alternately. The said handle is mounted loosely on a pin (b) on one of the driving spindles pertaining to the spools  $c$ , one limb  $h$  of an anchor pawl  $h'$  carried by the winch handle  $e^x$  engaging in a ratchet wheel  $i$  which is rigid with the spool axis (b). When the anchor pawl  $h'$  is shot over the limb  $h^2$  thereof engages in a second ratchet wheel  $i'$  which is attached to the side of a loose driving drum  $g^x$  on the same arbor as the handle and by means of a band  $f^x$  or other like means this driving drum is geared to a similar driving drum  $g^{xx}$  at the other end of the trough; this second driving drum taking the place of a second handle.

In connection with the above described device it may be remarked that the arrangement may be as illustrated in Figs. 8, 9, and 10 in which both the ratchet wheels of  $i^x$ ,  $i'^x$  are of similar kind or hand, and the anchor or pawl may be replaced by a laterally shifting pawl  $h'^x$  in which case the band  $f$  which connects the two drums  $g$ ,  $g'$ , must cross; or there must be an equivalent change should other gearing be employed. This last described device serves to avoid any reversal of the direction in which the handle is turned.

In order to insure an immediate and thorough wetting of the surface of the film a suitable adjustable or detachable brush or soft flap  $l$  is supported above the horizontally running part of the band  $d$ , the said brush or flap bearing gently on the film, see Figs. 11 and 12. The driving or supporting pins that pass through the sides of the trough may be arranged to work in suitable "stuffing boxes" or the equivalent.

For convenience in loading or unloading the spools, one center or supporting pin or both at each end should be so mounted as to be easily advanced or drawn back through a limited range, say, about one sixth of an inch. In the drawings the centers are coupled by yielding connections  $k$  consisting of sliding portions or sleeves  $k'$ ,  $k^2$  connected by means of a spring  $k^3$ . By laterally displacing the pins  $b$  by pulling the plate  $k^4$  sidewise the spool may be readily removed from the mounting in the trough.

What we claim and desire to secure by Letters Patent of the United States is:—

1. Apparatus for developing roll films com-

prising a casing having means for pouring developing fluid therein without exposing the film to light, a well at each end of the casing adapted to receive a spool containing the film and the developing liquid, and an intervening raised portion upon which the film is adapted to travel when wound backward and forward, the liquid in the said wells serving to wet the film while the raised portion enables the film to be lifted from the liquid and exposed to the air whereby the action of development is expedited.

2. In a developing apparatus for roll films, the combination of a casing having a well at each end, an intervening raised portion covering substantially the entire length between said wells, means for supporting a pair of film spools in said wells of the casing, means for imparting movement to the film by causing said spools to rotate, and means for pouring developing liquid into said casing without exposing the film to light.

3. In a developing apparatus for roll films, the combination of a casing having a well at each end adapted to contain developing fluid, means for admitting the developing fluid therein without exposing the film to light, a raised portion intermediate of and extending substantially the entire length between said wells, film spools journaled within the wells, one of said spools having a resilient connecting means exteriorly of the developer casing whereby the spool may be readily disconnected for removal, a gearing connection between the spools, and a mechanism on one of the spools adapted to effect the rotation of both spools in either direction.

4. In a developing apparatus for roll films, the combination of a casing having a well at each end adapted to contain developing fluid, means for admitting the developing fluid therein without exposing the film to light, a raised portion intermediate of and extending substantially the entire length between said wells, film spools mounted in said wells, the mounting of one of said spools comprising trunnion bearing members having telescoping sleeves, and a spring within and connecting said sleeves, said sleeves adapted to have relative movement whereby to disconnect the trunnions from the spool, a gearing connection between the spools, and a double pawl and ratchet mechanism on one of the spools adapted to effect the rotation of said spools.

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

WILLIAM FRASER CLAUGHTON KELLY.  
THOMAS BOLAS.

Witnesses:

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