June 16, 1931. L. J. RIGGLE 1,810,790

APPARATUS FOR DEVELOPING PHOTOGRAPHIC NEGATIVES

Filed May 9, 1928 2 Sheets-Sheet 1

Fig. 1.

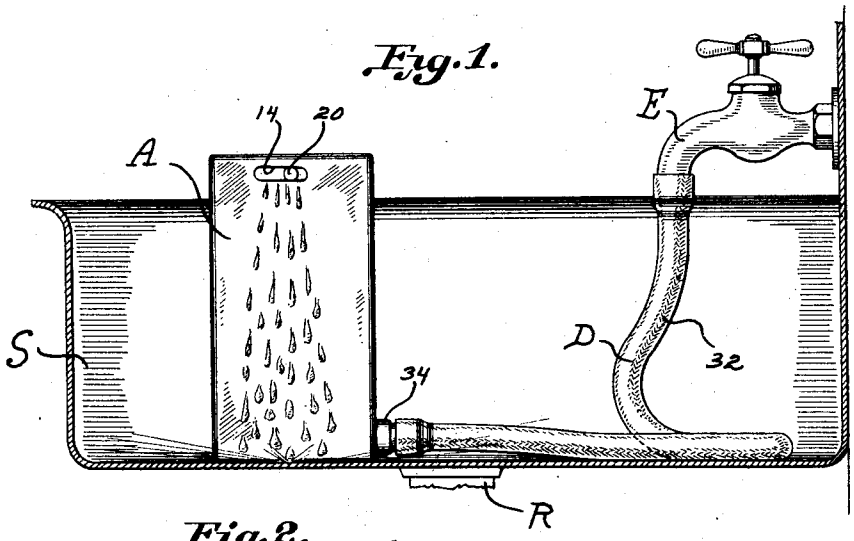


Fig. 2.

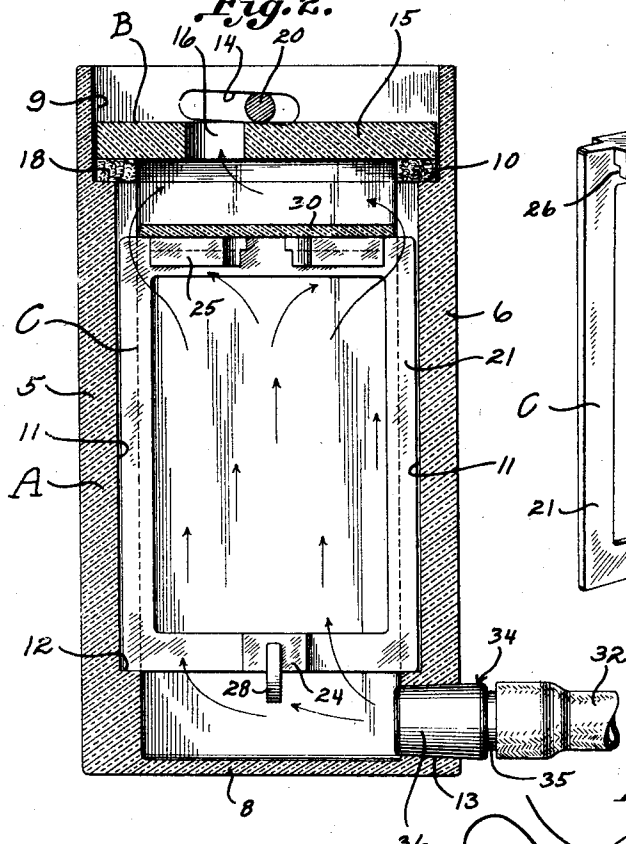
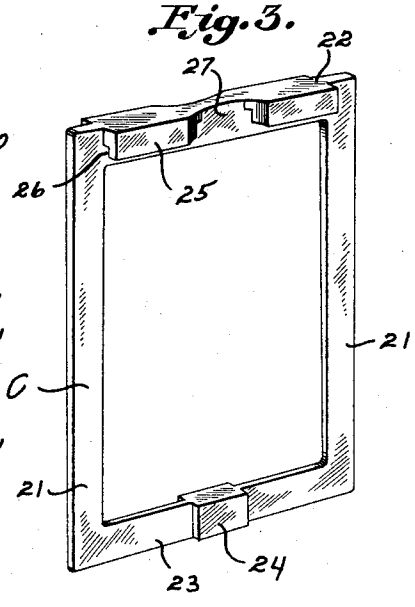


Fig. 3.



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Fig. 4.

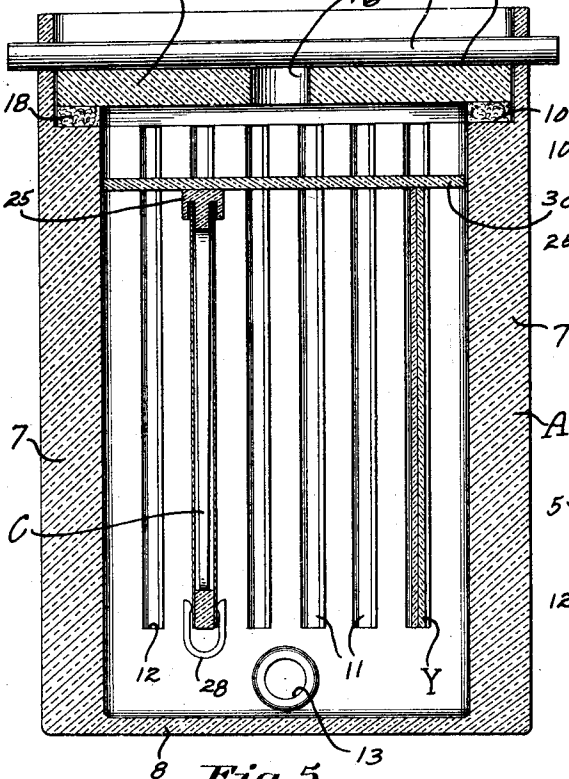


Fig. 6.

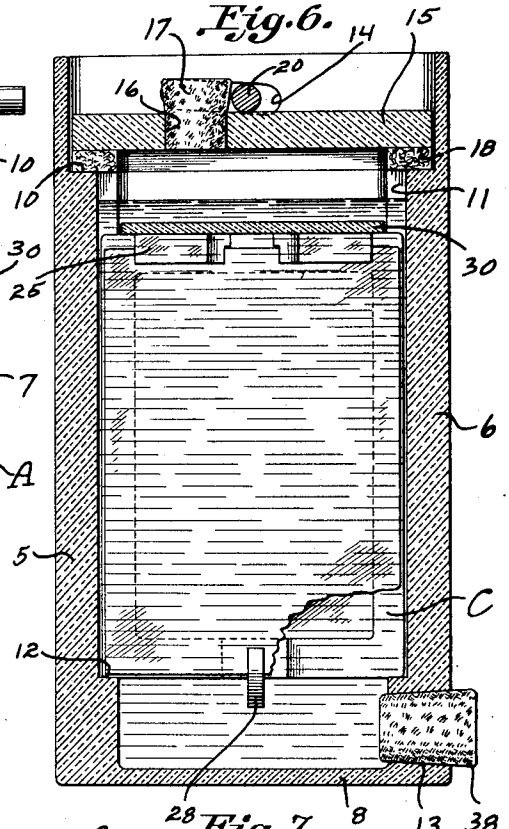


Fig. 5.

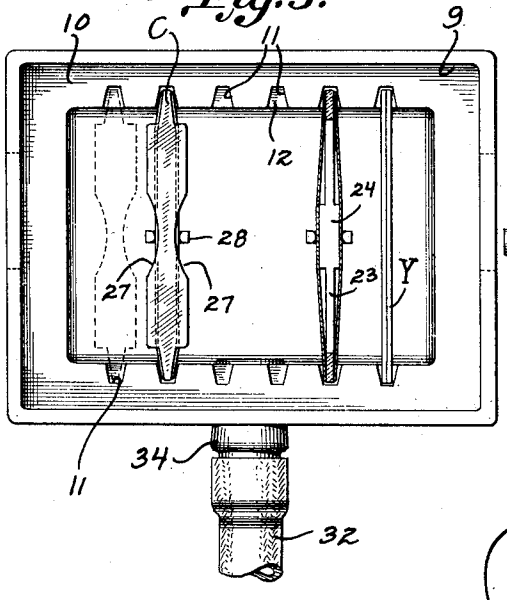
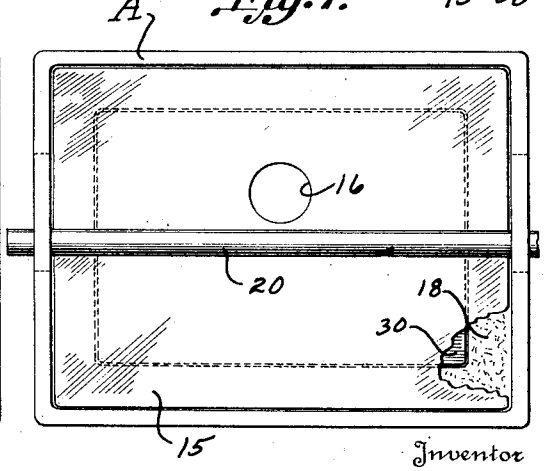


Fig. 7.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR DEVELOPING PHOTOGRAPHIC NEGATIVES

Application filed May 9, 1928. Serial No. 276,364.

The present invention relates to apparatus for developing photographic negatives, and the primary object of the invention is to provide improved apparatus of this nature adapted for use by amateurs, advanced amateurs, and professional photographers in developing photographic emulsions such as professional cut-films, film pack films, and glass photographic plates.

A further object of the invention is to provide an improved apparatus for developing photographic negatives of various descriptions in a manner for producing negatives which will be free of finger marks and scratches and thus materially reducing the amount of retouching required upon the pictures printed from the negatives.

A further object of the invention is to provide apparatus of this character wherein the plates or films after being placed in the container are allowed to remain therein without further handling thru either of the developing, fixing and washing processes.

A further object of the invention is to provide a developing tank of novel construction whereby the plates or films may be supported in the tank out of contacting engagement with either end of the tank so as to allow for ready and proper circulation of water about the plates or films during the washing operation.

A still further object of the invention is to provide an improved device of this character embodying an arrangement whereby ample space is provided between the plates or films to allow ready circulation of liquids therebetween during the developing, mixing and washing processes.

A still further object of the invention resides in the provision of a novel type of holder adapted to receive two films in a manner so as to allow for ready circulation of liquid along each face of the film so as to prevent the films from sticking to the holders and to one another.

Other objects and advantages of the invention will be apparent during the course of the following detailed description, taken in connection with the accompanying drawings, forming a part of this specification and in which drawings:

Figure 1 is an end view of the receiving tank and showing the manner in which the apparatus may be used to perform the washing process.

Figure 2 is an enlarged vertical section thru the tank showing the manner in which the holders are fitted in the tank.

Figure 3 is a perspective view of one of the film holders or carriers.

Figure 4 is a vertical section thru the tank taken at a right angle from that shown in Figure 2 and showing the manner in which films and photographic plates may be developed in the tank.

Figure 5 is a top plan view of the tank showing the cover structure removed and showing one of the film holders in section.

Figure 6 is a vertical section thru the tank and showing the manner in which the tank is closed at its upper and lower ends during the developing and fixing processes.

Figure 7 is a top plan view of the tank and showing the cover structure in position for sealing the upper end of the tank.

Referring to the drawings in detail, and wherein similar reference characters designate corresponding parts thruout the several views, the letter A designates the receiving tank, B the closure or cover structure for the tank A, C the film holders or carriers for positioning in the tank A, and D flexible conductor means for detachable connection with the tank A for admitting water to the tank during the washing processes. In the example illustrated in Figure 1, the apparatus has been shown placed in a sink S having the usual drain R, with the tubing of the conductor D connected with the spigot E.

The tank A and which may be formed of hard moulded rubber, or any other suitable material not effected by the developing solutions, is of rectangular shape in plan and of greater height than length, providing straight parallel spaced apart side walls 5 and 6, end walls 7, and a flat bottom 8. The upper end of each of the tank walls 5, 6 and 7 is cut away at its inner side for a suitable distance downwardly along the walls providing

an enlarged upper end portion 9 for the tank and forming a continuous internal shoulder 10. Provided in the inner wall of each of the side walls 5 and 6 is a series of vertically extending grooves 11 of tapering formation as clearly shown in Figure 5, and which grooves extend from the shoulder 10 to a point in spaced relation above the bottom wall 8 so that each groove at its lower end provides a seat 12 spaced above the upper surface of the bottom wall. These grooves 11 are arranged in pairs aligning transversely of the tank and are of a depth substantially equal to one-half the thickness of the shoulder 10. Provided in one of the side walls of the tank, and in the example shown in the lower end of the side wall 6, is a tapering opening 13, and which opening as will be observed from Figures 2 and 4 is arranged at the vertical center of the side wall 6 and below the seat 12 formed at the lower end of the grooves 11. Formed in the upper reduced portions of each of the end walls 7 is an elongated inclined cam slot 14 and which slots as will be observed in Figure 2 are arranged substantially midway between the side walls of the tank and are slightly inclined upwardly from the wall 6 toward the wall 5. These inclined slots 14 aside from providing drain openings spaced below the upper end of the tank also cooperate with the closure means B in a manner to be subsequently explained.

The cover structure or closure B for the upper end of the tank A includes a flat rectangular shaped cover plate 15 which may be formed of suitable material and of a dimension in outline to freely and slidably fit in the enlarged upper end portion 9 of the tank. This cover plate 15 is provided with a circular shaped opening 16 which is arranged at a location midway the ends of the plate and offset slightly to one side of the longitudinal center of the plate as clearly illustrated in Figure 7. This opening 16 is intended to receive a cork or other suitable closure plug 17 which is of a length substantially greater than the thickness of the plate as shown in Figure 6. A yieldable rectangular shaped gasket 18 is intended to rest upon the shoulder 10 and be engaged by the marginal edges of the plate 15 for forming a leak proof seal for the cover and also excluding light from entering the tank at the marginal portions of the cover plate. This gasket 18 is of a width substantially equal to the width of the shoulder 10 and thus it will be seen that the gasket projects over the upper ends of the grooves 11 and forms stops or abutments at the upper end of each groove. Retaining means is provided for securing the cover plate 15 in position, and this means consists of a cylindrical retaining rod 20 which is of equal diameter throughout and of a diameter substantially equal to the height of the slot 14. This cylindrical retaining slot 20 is intended to be positioned with its end portions arranged in the slots 14 at the higher ends of the slots so that upon movement of the rods toward the side wall 6 the rod will engage the upper flat surface of the cover plate 15 and force the same downwardly for compressing the gasket 18. Thus it will be seen that the rod and inclined slots provide means for retaining the cover plate in position and also acting upon the plate in a manner to compress the gasket 18 into leak proof engagement upon the shoulder 10. The rod 20 is of a length slightly greater than the length of the tank so that the ends of the rod project slightly past the end walls 7 and provide finger grips to allow for ready and easy movement of the rod in the slots 14. With the opening 16 in the cover plate 15 arranged to one side of the longitudinal center of the plate and the cam slots 14 inclined as shown, it will be seen that when the retaining rod 20 is in engagement with the plate 15 as in Figure 6 that the rod moves to a position beyond the opening 16 so as to not interfere with ready placing and removing of the plug 17. It will further be noted in Figure 6 that by so having the plug 17 project above the upper surface of the cover plate that the same will act to prevent movement of the retaining rod longitudinally in the cam slot and out of holding engagement with the cover plate.

Referring now to the holder or carrier C, and one of which may be provided for each set of grooves 11, these carriers are in the form of open rectangular shaped frames forming side rails 21, a top rail 22, and a bottom rail 23. These open frames are of a width slightly less than the distance between the confronting bases of the grooves 11 so as to prevent possible binding of the frames when position in the tank, and of a height less than the height of the grooves. The side and bottom rails 21 and 23 respectively are substantially flat altho it is preferred that the side rails 21 taper slightly toward their lower ends as clearly shown in Figure 4 so as to permit of ready and easy placing of the carriers in to the upper ends of the grooves 11. Provided at the center of the bottom rail 23 and projecting from each side thereof is a spacer block or enlargement 24 which acts for retaining the lower edges of the films spaced from the bottom rail as shown in Figure 5. Provided at each side face of the top rail 22 are substantially L-shaped flanges 25 providing retaining grooves or channels 26 intended to receive one end edge of the films when positioned one at each side of the carrier. The central portions of the retaining flanges 25 are cut away at each side of the frame as at 27 so as to form finger gripping portions to allow for ready placing and removing of the closely related carriers from the grooves

in the tank. By observing Figure 5 it will be seen how these recessed portions 27 will allow ample room between adjacent upper ends or head portions of the carriers to allow the thumb and forefinger to be inserted between adjacent carriers for placing or removing the carriers from the frame. These retaining flanges 25 also provide sufficient thickness to the upper ends of the carriers whereby the carriers may be stood on end when placing or removing the films from the carrier and thus prevent possible contact of the films with an object liable to scratch the films. The side rails 21 are of a thickness less than the width of the grooves 11, and the retaining flanges 25 terminate short of the outer edges of the side rails and preferably at a location in alignment with the inner edges of the side rails as clearly shown in Figure 2.

Each carrier is intended to serve as a support for two negatives which may either of the film pack type or professional cut-films, and these films are intended to be placed one at each side of the carrier frame with one end edge engaging in the retaining channels 26. After so placing the films at opposite sides of the carrier frame a suitable spring clip 28 may be slipped over the films for clamping the films at their central portions to the block 24. These clips 28 are of U-shape in formation and are preferably provided with rounded projections at the free ends of their arms so that the clamps have but very little contact with the films. When two films are thus applied to the carriers and the carriers inserted in the grooves of the tank A, the spacer block 24 acts to retain the lower ends of the films out of contact with the bottom rail 23 so as to allow for ready circulation of liquid between the films. The side edges of the films engage in the grooves 11 and thus the films of one carrier are held against curling and engaging the confronting film carried by the adjacent carrier. When the carriers are placed in the grooves 11 and come to rest on the seats 12 it will be seen that the films will be held in an elevated position above the bottom tank wall 8. It will also be apparent that when the carriers are in position and resting on the seats 12 that the upper ends of the carriers are spaced well below the shoulder 10 so that open chambers will be formed both above and below the films or plates being developed.

At Y in Figures 4 and 5 it will be seen how two photographic plates may be positioned in the grooves 11 so that their lower edges rest upon the seat 12.

A flat, rectangular shaped light excluding plate 30 is intended to be placed in the upper open end of the tank and rests upon the upper ends of the carriers C for preventing direct light rays entering thru the opening 16 from striking the plates or films during certain steps in the developing process. It is not altogether essential that the plate 30 be placed across the upper ends of the carriers, but this plate will be found to be extremely helpful when developing extremely fast negative materials and also color sensitive or panchromatic films and plates. This plate 30 is of a dimension slightly less than the internal dimensions of the tank below the shoulder 10.

The means D of the apparatus for washing the plates or films in the tank A preferably consists of a suitable length of flexible tubing 32 one end of which may be connected with the spout of the spigot E. Adapted for detachable connection with the opposite end of the tubing 32 is a tubular nozzle 34 embodying a sleeve portion 35 for connection with the tubing and a conical head portion 36 for fitting in the tapering opening 13 provided in the lower end of the tank side wall 6 below the bottoms of the grooves 11. This nozzle may be formed of any suitable material and is preferably formed of hard rubber or a suitable composition. A cork or suitable closure plug 38 as shown in Figure 6 is provided for closing the opening 13 during the developing and fixing processes.

In using the improved apparatus for developing either films or photographic plates, the cork 38 is placed in the lower portion of the tank for sealing the opening 13 and a suitable quantity of developing solution placed in the tank. The tank of developing solution may then be carried into the photographic dark room and if films are to be developed the films are secured to the carriers C and the carriers inserted in the grooves 11. If photographic plates are to be developed, two of the plates are placed back to back in each groove so that the developing solution may act upon the sensitized faces of the plates. The protecting plate 30 may then be placed in the tank over the film carriers or plates as the case may be and then the gasket 18 and cover plate 15 placed in position and secured by the retaining rod 20. The cork 17 may then be inserted into the opening 16 for excluding light from the tank and also acting to retain the rod 20 against upward movement in the inclined guide slot 14. The tank and films or plates contained therein may then be carried into the light and the films or plates allowed to develop for the proper length of time. During the developing process the operator may shake the tank from time to time or even invert the tank to insure even development of the pictures. After the negatives have been in the developing solution for the proper length of time the tank may be placed in a sink as shown and the plug 38 removed for allowing the developer to drain from the tank. The head of the nozzle 34 may then be inserted into the opening 13 and after removing the plug 17 from the cover plate 15 the spigot E may be turned on for washing the negatives for a

very short period. During this first washing operation it may be found desirable to place an object over the top of the tank to prevent light rays from passing directly thru the opening 16. The water entering the lower end of the tank thru the nozzle 34 will pass upwardly between the films or plates as shown by the arrows in Figure 2 and out thru the opening 16 and allowed to drain over the sides of the tank thru the elongated guide slots 14. After a short period of washing the nozzle 34 may be removed and the water allowed to drain from the tank and then the plug 38 again inserted in the opening 13. The tank may then be filled thru the opening 16 with a fixing solution and the plug 17 again inserted for closing the opening 16. The fixing solution is allowed to remain in the tank for a set time for clearing and hardening the emulsion on the films or plates and after which the plugs 17 and 38 are again removed for allowing the fixing solution to drain from the tank. The nozzle 34 may again be placed in the opening 13 and water again allowed to enter the tank and pass upwardly thru the films or plates for thorough washing of the fixing solution from the plates or films and after which the cover B may be removed and the films or plates removed from the tank and prepared for drying. As the negatives are being washed it will be seen that the water passes upwardly thru the tank and is directed to the sides of the plate 30 and passes above the plates thru the grooves 11.

As will be apparent, the films or plates after once placed in the tank need not be handled again thru either of the developing, fixing or washing processes and thus there is little likelihood of the negatives becoming scratched or finger marred.

From the foregoing description it will be apparent that a novel and improved apparatus of this character has been provided which will be found especially well adapted for use by professional and advanced amateur photographers in developing profession cut-films and glass plates, and which apparatus also affords means for use by amateur photographers in successfully developing film pack negatives.

Changes in detail may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In apparatus for developing photographic negatives, the combination of a tank having an opening at its lower end provided with a removable closure plug and having an internal shoulder provided adjacent the upper end of the tank, a cover plate having a flat upper side, removably fitting in the upper end of the tank above said shoulder and having an opening provided with a removable closure plug, and securing means for the cover plate embodying a cylindrical retaining rod having its ends movable with a cam action in the end walls of the tank and laterally across the cover plate into engagement with the upper flat face of the cover plate at one side of the opening provided therein.

2. In apparatus for developing photographic negatives, the combination of a rectangular shaped tank having an opening at its lower end provided with a removable closure plug and having an internal shoulder provided adjacent its upper end, said tank also having provided in the end walls thereof above said shoulder elongated inclined slots, a yieldable gasket resting upon said shoulder, a flat cover plate resting at its marginal portions on said gasket and having an opening provided with a removable closure plug and a cylindrical retaining rod having its ends extending thru said inclined slots and beyond the end walls for engagement with the upper face of the cover plate whereby the gasket will be compressed thru lateral movement of the rod.

3. In apparatus for developing photographic negatives, the combination of a rectangular shaped tank having an internal shoulder provided adjacent its upper end and having an opening at its lower end provided with a removable closure plug, said tank having provided in the end walls thereof and above said shoulder, elongated inclined slots, a yieldable gasket for seating on said shoulder, a flat cover plate for engaging the gasket with the plane of its flat upper face intersecting the inclined slots and provided with an opening, a cylindrical retaining rod having the ends thereof movable in said slots and having the intermediate portion thereof engageable with the upper face of the cover plate at one side of the opening provided therein, and a removable closure plug fitting in the opening in the cover plate and projecting upwardly therefrom at one side of the retaining rod.

4. In apparatus for developing photographic negatives, the combination of a rectangular shaped tank being internally enlarged adjacent its upper end to provide an internal shoulder and having an opening at its lower end provided with a removable closure plug, said tank also being provided at the inner faces of its plain side walls with a series of vertically extending tapered grooves extending from said shoulder to a location above the opening at the lower end of the tank, said grooves serving to receive negatives arranged vertically in the tank, and closure means for the upper end of the tank including a cover plate resting upon said shoulder and having an opening provided with a removable closure plug.

5. In apparatus for developing photographic negatives, the combination of a tank having vertically extending grooves provided at the inner sides of its side walls and being enlarged above the grooves providing an internal shoulder, said grooves serving to support a series of film holders vertically in the tank, a yieldable gasket seating on said shoulder and extending over the upper ends of the grooves a flat light excluding plate for resting upon the upper ends of the holders and being of less thickness than said gasket, and closure means for the upper end of the tank including a flat cover plate fitting into the enlarged upper end of the tank and resting upon said gasket.

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