

April 6, 1937.

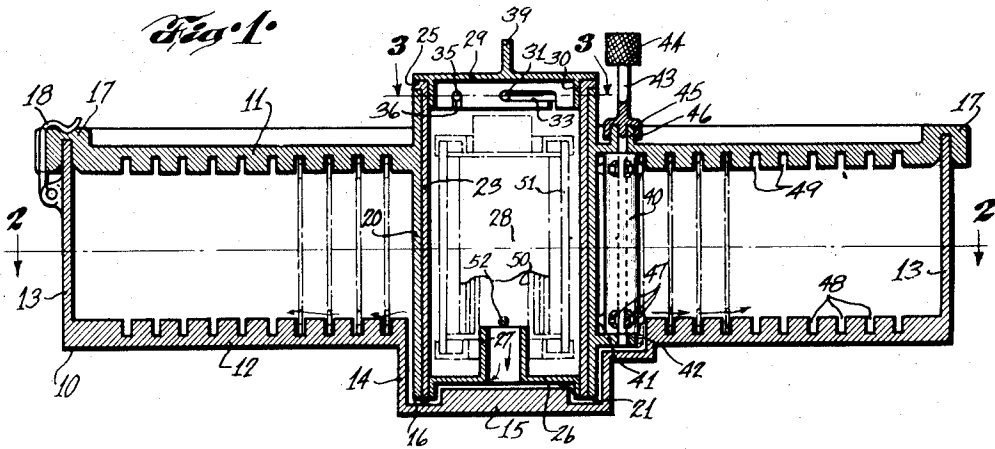
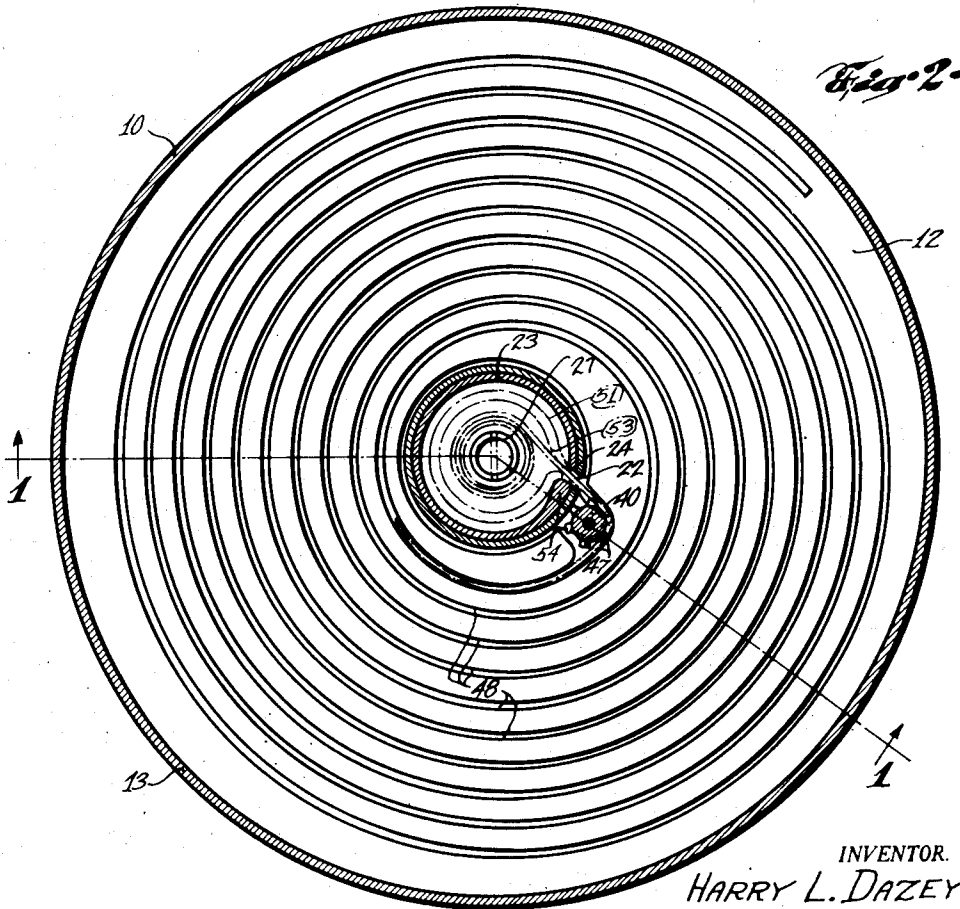
H. L. DAZEY

2,076,070

MEANS FOR DEVELOPING PHOTOGRAPHIC FILM

Filed April 1, 1935

2 Sheets-Sheet 1



INVENTOR.
HARRY L. DAZEY
BY *Lawrence H. Cohn*
ATTORNEY

April 6, 1937.

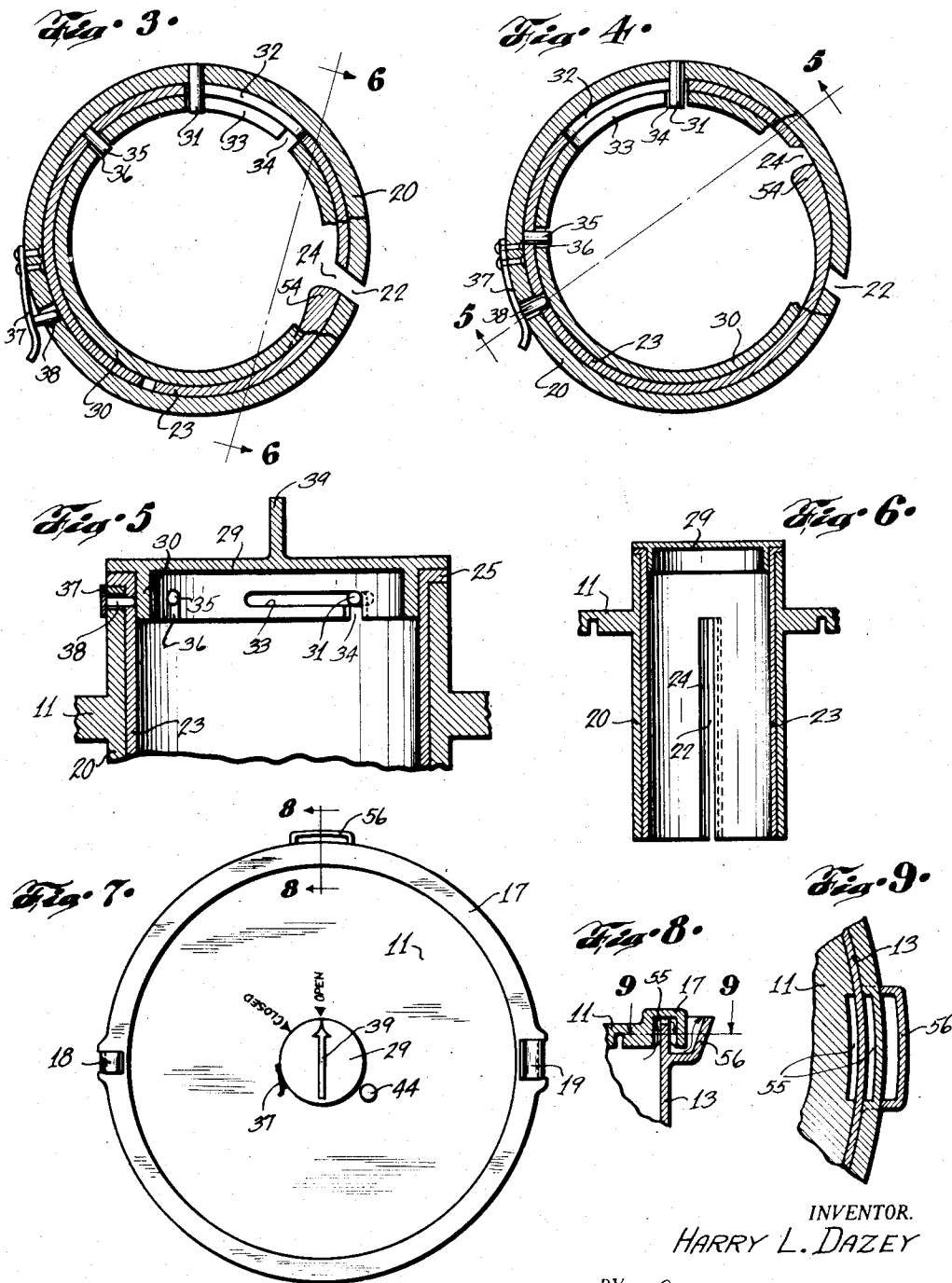
H. L. DAZEY

2,076,070

MEANS FOR DEVELOPING PHOTOGRAPHIC FILM

Filed April 1, 1935

2 Sheets-Sheet 2



INVENTOR.

HARRY L. DAZEY

BY

Lawrence H. Cohn
ATTORNEY.

UNITED STATES PATENT OFFICE

2,076,070

MEANS FOR DEVELOPING PHOTOGRAPHIC FILM

Harry L. Dazey, Clayton, Mo.

Application April 1, 1935, Serial No. 14,053

32 Claims. (Cl. 95—90.5)

My invention relates to devices for developing photographic film and more particularly to an improved developing tank which is especially adapted for film of the type wherein a series of images are produced on a single strip of film. This application is in part a continuation of my prior application, Serial No. 740,861, filed August 22, 1934.

The device of my invention is designed to overcome a distinct disadvantage attached to developing tanks of the kind now commonly employed by amateur photographers, and that is the necessity of using a so-called changing bag or dark room to prevent the film from becoming light struck while performing some one or more of the numerous operations attending the developing of a film strip. This requirement, by reason of the particular care which must be exercised to effect a proper loading and subsequent developing, greatly complicates and renders tedious and difficult the loading and developing operations.

One of the principal objects is to provide a device of the character described which avoids entirely the necessity of utilizing a changing bag or dark room when developing photographic film. With my improved tank the loading thereof as well as all subsequent operations may be performed in daylight.

Another object of my invention is to provide a developing tank which is extremely simple to load and unload.

Yet another object of my invention lies in the provision of an improved developing tank wherein the amount of developing solution required is reduced to a minimum.

Other objects are directed to the provision of an improved developing tank of simple and economical construction, and incorporating means which render "fool-proof" the operation thereof.

The foregoing objects are attained by providing a receptacle, which, when closed by a removable cover plate, has its interior partitioned into two light-proof chambers. The one chamber is adapted to receive a roll of undeveloped film, and means operable from a point externally of the enclosure are provided for transferring the film from this receiving or loading chamber to the developing chamber, while both of such chambers are sealed to exclude light. Additional seals are provided to prevent light from entering the developing chamber through the loading chamber, hence when the film is established in the developing chamber, the loading chamber may be opened without exposing the undeveloped images. Accordingly, a cap, normally closing the loading

chamber, may be removed to permit the withdrawal of the empty film spool and the introduction, in proper sequence, of developing and fixing solutions and washing waters, all of which flow from the loading chamber into the developing chamber through a tortuous, light-proof passage. Special precautionary means are provided for preventing a careless operator from removing the cap on the loading chamber until the developing chamber is rendered fully light-proof. A light-proof drain passage is provided whereby the developing chamber may be relieved of any of the liquids for subsequent introduction of other liquids employed in the developing operation.

Other objects and advantages will appear from the description which follows, and from the accompanying drawings in which:

Fig. 1 is a sectional view, the section being taken at the line 1—1 of Fig. 2;

Fig. 2 is a sectional plan view, the section being taken at the line 2—2 of Fig. 1;

Fig. 3 is a sectional plan view, the section being taken at the line 3—3 of Fig. 1, illustrating the film passage in open condition;

Fig. 4 is a view similar to Fig. 3, showing the film passage in closed condition;

Fig. 5 is a vertical section as viewed from line 5—5 of Fig. 4;

Fig. 6 is a vertical section taken along line 6—6 of Fig. 3;

Fig. 7 is a top plan view of the device;

Fig. 8 is a sectional view taken at line 8—8 of Fig. 7, showing the fluid drain passage, and

Fig. 9 is a sectional view taken at line 9—9 of Fig. 8.

Referring now by characters of reference to the drawings, the body portions of the device, which comprises a container or receptacle 10, and a cover plate 11, may be formed of hard rubber, phenolic or other molded plastic. The container 10 is preferably cylindrical in form, embodying a bottom 12 and an annular side wall 13. The bottom 12 is provided at its center with a hollow, outwardly protruding portion 14 forming a well which opens into the interior of the main body of the container. Bordering the inner surface of the bottom wall 15 of the well is an annular channel 16, the purpose of which will hereinafter appear.

The cover 11 preferably comprises a discoidal plate having a circumferential flange 17 provided with an annular groove designed to receive the upper marginal portion of the container wall 13, as illustrated in Fig. 1. Suitable means, such

as the spring clips 18 and 19, serve to secure the cover to the container, and for a purpose to be subsequently explained the cover must be brought into a definite predetermined position relative to the container before proper securement of these members can be effected. Such purpose may be accomplished by producing the spring clips 18 and 19 of unequal width, each of which is adapted to fit snugly within a recess of corresponding width in the cover plate, as best appears in Fig. 7.

Formed integrally with the cover plate and projecting axially therethrough is a tubular portion 20, which, when the cover is seated on the container, partitions the interior of the container into inner and outer concentric compartments, or chambers. The inwardly projecting part of the tubular portion 20 extends from the cover plate through the bottom 12 of the container, into the well formed therein, and into the annular channel 16, terminating short of the bottom of such channel. The outer diameter of the tubular portion 20 is slightly less than the inner diameter of the well, the space surrounding the inner or lower end of the tube providing a tortuous avenue 21 which permits the passage of fluids, but prevents the passage of light therethrough, between the chambers.

That portion of the tube 20 located internally of the container is provided with a longitudinal slot 22 which, as best appears from Fig. 6, extends from the cover plate to the lower extremity of the tube. The slot 22 provides a passage through which film is adapted to be transferred from the inner to the outer chamber. Since, at certain stages in the operation of the device, it is desirable to gain access to the interior of the inner chamber without permitting light to pass therefrom into the outer chamber, the film passage between the chambers may be so formed as to prevent light from passing therethrough. In lieu of, or in addition to such means for obstructing light, I prefer to provide an adjustable shutter element for the slot or passage 22. Such element preferably consists of a sleeve 23 which lines the entire inner surface of the tube 20, the sleeve being rotatable in the tube and having a slot 24 which is registrable with the slot 22 in the tube. An annular flange or rim 25 formed on the outer end of the shutter sleeve overlies the outer end face of the tube.

At the lower or inner end of tube 20 is a removable cap 26 which fits snugly in the lower end of the shutter sleeve 23. The cap 26 is provided with an axial, inwardly projecting stud, or stub shaft 27 upon which a spool of film 28 is adapted to be positioned. The stub shaft 27 has a passage therethrough which brings passage 21, and the outer chamber into fluid communication with the inner chamber.

At the upper or outer end of the tube 20 is an imperforate cap 29 having an annular flange 30 which is adapted for snug reception in the shutter sleeve 23. Since the removal of cap 29 permits light to enter the inner chamber, and since it is necessary to preclude light from entering the outer chamber when undeveloped film is lodged therein, special means are preferably provided which serve to prevent the cap 29 from being removed except when the slot or passage 22 between the chambers is closed. This purpose is accomplished in the present device by the provision of a stud 31 which projects radially inwardly from the wall of tube 20, through a transversely extending slot 32 in the shutter sleeve 23 and through an L-shaped slot in the cap flange

30, such L-shaped slot having a transversely disposed portion 33 and an axially disposed portion 34, the latter of which terminates at the lower edge of flange 30. To render the described means properly operative to prevent removal of the cap except when the shutter sleeve is in closed position (Fig. 4), additional means for fixing the position of the cap on the shutter sleeve, or otherwise stated, which prevent rotation of the cap relative to the shutter sleeve, are provided. Thus a pin or stud 35 on the shutter sleeve projects through an axially disposed slot or recess 36 in the lower margin of the cap flange 30. Accordingly, it will appear that the cap 29 can only be applied to the tube when the studs 31 and 35 are spaced to register with the slots 34 and 36 in the cap flange. The studs are so located that such spacing is obtained only when the shutter sleeve is rotated into passage-closed position (Fig. 4). With cap 29 on the tube, and the cap and shutter sleeve rotated into passage-open position (Fig. 3), stud 31 lies out of register with slot 34, and removal of the cap is thereby prevented.

Additional precautionary means are preferably provided, directed to the end of preventing an operator from accidentally or carelessly opening the film passage (by rotating the shutter sleeve into open position) at such times when the cap 29 is removed from the tube. Such means may comprise a device which locks the shutter sleeve in passage-closed position and which requires a definite manual operation to release the same. Thus I provide a resilient strip 37, secured at one end to the outer surface of tube 20, the strip 37 carrying a pin 38 which projects through an aperture in the tube, and is adapted to seat in a recess formed in the shutter sleeve when the sleeve is disposed in passage-closed position. In order to turn the sleeve to passage-open position, the pin 38 must be withdrawn from the recess.

The shutter sleeve is adapted for adjustment into open or closed position by a projection 39 on the cap 29. For the purpose of indicating the condition of the film passage, the projection 39 may be in the shape of an arrow or pointer, and suitable indicia, such as the words "open" and "closed", may be formed at proper locations in the upper surface of the cover 11, as illustrated in Fig. 7.

Describing now a presently preferred instrumentality for transferring film from the inner to the outer chamber, I provide a cylindrical element or roller 40, termed a feeder roll, which extends along the outer surface of the tube 20, adjacent and parallel to the film slot 22. A bearing arm 41 carried by, and projecting outwardly from the tube 20 journals the lower end of the feeder roll, a suitable recess or pocket 42 in the bottom wall 12 of the receptacle accommodating the bearing arm and the lower end of the feeder roll. At the upper end of the roll 40 is a drive shaft 43, fixed for rotation with the feeder roll, which projects through a bore in the cover plate. A knurled manipulating knob 44 is provided at the outer end of the drive shaft. A cap 45 carried by shaft 43 and fitting over a boss 46 through which the shaft projects, prevents light from entering the outer chamber through the upper feed roll bearing.

Since the device of my invention is primarily intended for developing film strip customarily provided with series of evenly spaced perforations at the opposite edges thereof, the feeder roll 40 is provided near its upper and lower ends with series of radial projections or teeth 47, adapted

for sequential engagement with the film perforations for advancing the film strip.

The outer chamber, wherein the film is developed, is provided with means for receiving the film as it is passed therein from the inner, or loading chamber, and for holding the film in separated condition while being treated by the developing solution and other liquids. Such means preferably consist of corresponding, opposed spiral grooves or channels 48 and 49, formed in the receptacle bottom 12 and cover plate 11 respectively. Such channels have their inner ends terminating at the feeder roll, or, more specifically, at the film slot 22 in the tube 20. The channels 48 and 49 are so spaced and dimensioned that the film strip will slide loosely therein without binding, and the depth of the channels is preferably such that a substantial portion of the film perforations is located outside of the channels. This provision allows the developing fluid to pass readily through the apertures in the film strip and quickly fill the interstices between the film strip.

Since a non-registering position of the spiral groove in the cover plate with that in the container bottom would probably retard free movement of the film strip therein, the previously described means are provided which require a registering relationship of the spiral grooves when the cover plate is clamped on to the container.

The inner or loading chamber is adapted to receive a magazine of conventional type, which houses a spool of rolled film strip. The film magazine and spool form no part of the present invention, the same being customarily supplied with cameras, but for purposes of completeness may be described as follows. The spool 50 with the film strip wound thereon is enclosed in a tubular housing or magazine 51 which protects the film in handling and serves to exclude light therefrom. The spool is provided with an axial bore, and near one end of the bore is a transverse pin 52, shown sectionally in Fig. 1. As usually practiced, the film is provided with an unsensitized leader which projects through a slotted lip 53 in the magazine. As a measure for holding the magazine against rotation when disposed in the inner or loading chamber, the shutter sleeve may be provided with an internal projection 54 adapted to engage the lip 53 of the magazine. Means forming a light-proof passage for draining the tank of the liquids employed in the developing operation are illustrated in Figs. 7, 8, and 9. This passage, designated 55, is produced by an enlarged or widened portion of the groove in the cover flange 17 and the provision of a trough-like projection 56, forming a pouring spout, located near the upper edge of container wall 13 to register with the said enlarged portion of the groove.

Describing now a preferred manner of operating my device, the cover plate 11 with its associated parts are removed from the container 10, and the spiral channels 48 and 49 are rendered clean and dry. With the slot 24 in the shutter sleeve registering with the slot 22 in the tube, and with the lower cap 26 removed, the film magazine is inserted into the inner chamber through its lower end, a substantial length of the leader or pilot section projecting through the slot 22. The lower closure cap 26 is then replaced on the tube, the film magazine seating on, and being positioned by the stub shaft 27. The leader is directed toward the mouth of the spiral channel 48, and is operatively engaged by the toothed feeder roll.

The closure plate is then replaced and clamped onto the container which renders the interior of both inner and outer chambers light-proof. Rotation of the feeder roll in the proper direction by means of the knob 44 causes the film to be drawn through the slot 22 in the tube, the film being compelled to follow the convolutions of the channels which retain and hold it in separated condition. After the film has been passed completely into the outer chamber, the shutter sleeve is rotated into "closed" position, thereby permitting the outer cap 29 to be removed while preventing light from entering the loaded outer chamber through the film passage. When the shutter sleeve obtains full "closed" position, the pin 38 snaps into locking engagement with the sleeve and prevents that member from turning until released from the locking pin.

With the outer cap 29 removed, the empty film magazine is withdrawn and developing solution is introduced into the inner chamber, the solution flowing from the inner to the outer chamber through the fluid passage 16, sufficient fluid to completely submerge the film being employed. Following the requisite developing period, the tank is turned on its side to allow the developing solution to drain out of the tank through the drain passage 55. In like manner washing water and fixing solution, in proper sequence, are introduced and removed from the tank. After these operations the cover 11 may be removed and the film withdrawn from the container.

From the foregoing description it will appear that the device described simplifies the developing of film, does not require the use of a changing bag or dark room, and otherwise fulfills the objects initially set forth herein.

Although I have described my invention with reference to a presently preferred embodiment thereof, it is understood that certain changes, modifications and alterations may be made in the described device without departing from the spirit and full intended scope of my invention.

I claim:

1. In a device for developing film, an enclosure, means forming individual light-proof loading and developing chambers interiorly of said enclosure, said loading chamber having a fluid inlet opening, a film passage connecting said chambers, an adjustable shutter element manipulative externally of said chambers for closing said passage, and a non-light-transmitting fluid passage connecting said chambers.

2. In a device for developing film, a container, a removable cover for the container, means carried by the cover dividing the interior of said container into separate loading and developing chambers, said cover having an opening communicating with said loading chamber for the passage of a film spool, a removable closure element for said opening, a passage for film connecting said chambers, and means for preventing light from passing from one to the other of said chambers through said film passage.

3. In a device for developing film, an enclosure including a removable cover, a slotted partition carried by said cover, dividing the interior of said enclosure into individual chambers, an adjustable closure element for the slot in said partition, and means for transferring film from one of said chambers to another through said partition slot.

4. A film developing tank, including a cylindrical enclosure, an annular partition dividing the interior of said enclosure into individual concentric chambers, said wall having a longitudinal slot therein providing a film passage between the

chambers, a shutter sleeve journaled for rotation in the inner chamber, said sleeve having a slot registerable with said partition slot, and means for transferring film through said slots from the inner to the outer chamber.

5. A film developing tank including a receptacle, a removable closure element for the receptacle, means carried by the closure element forming a separate film-loading chamber internally of the receptacle, said chamber having an opening to permit access to the interior thereof while said cover is disposed on the container, and a removable closure cap for said opening.

6. In a device of the class described, an enclosure, an annular partition dividing the interior of the enclosure into inner and outer chambers, a longitudinal slot in said partition, providing a passage for film, and a spiral groove formed in a wall portion of the outer chamber for maintaining film located therein in separated condition, said groove terminating at said partition slot.

7. In a device of the class described, an enclosure, an annular partition dividing the interior of the enclosure into inner and outer chambers, a longitudinal slot in said partition, providing a passage for film, means forming a closure for said slot, and a groove for guiding and positioning film, formed in a wall portion of the outer chamber.

8. In a device of the class described, an enclosure, an annular partition dividing the interior of the enclosure into inner and outer chambers, said partition having an opening therethrough providing a film passage, means forming a closure for said opening, means for drawing film from the inner to the outer chamber through said passage, and film positioning means in said outer chamber.

9. In a device of the class described, an enclosure, including a hollow cylindrical body and a removable cover therefor, grooves of corresponding contour formed in the body and cover, said grooves being adapted to receive opposite edges of a film strip to fix the position of such strip within the enclosure, and means operable to secure the cover to the body only when their respective grooves are disposed in registering relation.

10. In a device for developing film, means forming separate chambers, one of said chambers having film inlet and film outlet openings, said film outlet opening communicating with a second chamber, an adjustable shutter element for said outlet opening, a removable closure element for said inlet opening, and means for preventing removal of the closure element except when said outlet opening is closed by said shutter element.

11. In a device for developing film, an enclosure, a partition having a passage therethrough dividing the interior of the enclosure into individual chambers, an adjustable shutter element for said passage, one of said chambers having a film-receiving opening, a removable closure element for said opening, and means for preventing removal of said closure element except when said shutter element is in passage-closed position.

12. In a device for developing film having separate film loading and film developing chambers, means forming a film passage connecting said chambers, an adjustable shutter element for said passage, and means for locking said shutter element in passage-closed position.

13. In a device for developing film, having separate film loading and film developing chambers, said loading chamber having a film inlet and a film outlet opening, the latter opening communicating with said developing chamber, a removable closure element for said inlet opening, a shutter element adjustable to render open and closed said outlet opening, means adapted to lock said shutter element in closed position, and means adapted to prevent removal of said closure element except when said shutter element is in closed position.

14. In a device for developing film, a receptacle, a removable closure element for said receptacle, partitioning means carried by said closure element, projecting into the receptacle, said partitioning means dividing the interior of the receptacle into separate film loading and film developing chambers.

15. In a device for developing film, a receptacle, a removable closure element for the receptacle, means carried by the closure element forming a separate film-loading chamber internally of said receptacle, said loading chamber having openings at opposite ends thereof, and a removable closure cap for each of said openings.

16. In a device for developing film, a receptacle, a removable closure for the receptacle, an annular partition carried by the closure forming a separate loading chamber internally of the receptacle, a detachable element at one end of said partition, and a stub shaft for a film spool carried by said element.

17. In a device for developing film, a receptacle, a removable closure for the receptacle, means carried by said closure forming an open-ended compartment internally of the receptacle, a removable cap for said compartment, said cap having an opening therethrough to permit the passage of fluid from said compartment to the space surrounding the same, and means on said cap projecting internally of the compartment for mounting a film spool thereon.

18. In a device for developing film, a receptacle, a removable closure for the receptacle, an annular partition carried by said closure forming inner and outer chambers internally of the receptacle, said partition having an axially disposed slot therein and means carried by said closure located in the outer chamber for drawing film from the inner to the outer chamber through said slot.

19. In a device for developing film, a receptacle, a removable closure for the receptacle, said closure having a longitudinally slotted tubular projection thereon forming inner and outer chambers internally of the receptacle, and a sleeve, journaled in said tubular projection, having a slot registerable with the slot in said tubular projection.

20. In a device for developing film, a receptacle, a removable closure for the receptacle, said closure having a longitudinally slotted tube projecting therefrom, forming inner and outer chambers internally of the receptacle, a shutter sleeve journaled in said tube and a feeder roll carried by said closure, said feeder roll being adapted to transfer film from the inner to the outer chamber through the slot in said tube.

21. In a device for developing film, a receptacle, a removable closure for the receptacle, said closure having a longitudinally slotted tube projecting therefrom forming inner and outer chambers internally of the receptacle, an adjustable shutter for said tube slot, a removable cap

at one end of said tube, and means adapted to prevent removal of said cap except when said shutter is in slot closed position.

22. In a film developing device, a receptacle, a removable closure plate for the receptacle, said closure plate having an open-ended tube projecting therefrom, forming inner and outer chambers internally of the receptacle, removable caps at opposite ends of said tube, a stud on one of said caps for positioning a film spool in the inner chamber, said tube having a longitudinal slot providing a passage for film from the inner to the outer chamber, and a shutter element for said passage.

23. In a film developing device, a receptacle, a removable closure plate for the receptacle, said closure plate having an open-ended tube projecting therefrom, forming inner and outer chambers internally of the receptacle, removable caps at opposite ends of said tube, a stud on one of said caps for positioning a film spool in the inner chamber, said tube having a longitudinal slot providing a passage for film from the inner to the outer chamber, a shutter element for said passage, and means adapted to prevent the removal of the other of said caps except when said shutter is in passage-closed position.

24. In a film developing device, a receptacle, a removable closure plate for the receptacle, said closure plate having an open-ended tube projecting therefrom, forming inner and outer chambers internally of the receptacle, removable caps at opposite ends of said tube, a stud on one of said caps for positioning a film spool in the inner chamber, said tube having a longitudinal slot providing a passage for film from the inner to the outer chamber, a shutter element for said passage, means adapted to prevent the removal of the other of said caps except when said shutter is in passage-closed position, and means adapted to lock said shutter in passage-closed position.

25. In a film developing device, a receptacle, a removable closure plate for the receptacle, said closure plate having an integral tube projecting transversely therethrough, a portion of said tube which extends into the receptacle having a longitudinal slot therein, a feeder roll carried by said closure plate, manipulating means for said feeder roll, disposed externally of the receptacle, and removable closure caps at the opposite ends of said tube, said feeder roll being adapted to move film from the interior to the exterior of said tube through said slot.

26. In a film developing device, a receptacle, a removable cover therefor, said cover having an opening therethrough and a tube extending from said opening into the receptacle, forming a separate compartment interiorly of the receptacle, an opening in the tube wall forming a film passage, a shutter sleeve rotatable in said tube for closing said film passage, a removable cap on the outer end of said sleeve, means preventing relative rotation of said cap and sleeve, manipulating means on the cap for adjusting said shutter sleeve, and means for preventing the removal of said cap except when said film passage is closed by the shutter sleeve.

27. In a device for developing film, a cylin-

dricl receptacle having an axial well in the bottom wall thereof, a removable cover for the receptacle having a tubular portion projecting into said well, said tubular portion forming inner and outer coaxial chambers interiorly of the receptacle, said tubular portion having an axially disposed slot for the passing film from the inner to the outer chamber.

28. In a device for developing film, a receptacle having a well in the bottom wall thereof, a removable cover for the receptacle, a tube projecting from said cover into said well, said tube being spaced internally of said well, said tube having an axially disposed slot forming a film passage, a shutter sleeve in said tube for closing said passage, and removable caps at opposite ends of said tube.

29. In a device for developing film, a receptacle having a well formed in the bottom wall thereof, a removable cover for the receptacle, a tube projecting from said cover into said well, said tube providing inner and outer compartments internally of the receptacle, said tube having a longitudinal slot therein, a shutter element for said slot, a removable cap at the outer end of said tube, means adapted to transfer film from the inner to the outer compartment, through said slot, said means being manipulable externally of the receptacle, and means in the outer compartment adapted to position film disposed therein.

30. In a device for developing film, a receptacle having a well formed in the bottom thereof, a removable cover for the receptacle, said cover having a tubular portion projecting into and spaced from the sides of said well, said tube having a longitudinally disposed slot therein, a slotted sleeve rotatable in said tube forming a shutter for the tube slot, removable caps at opposite ends of said tube, one of said caps having a stub shaft adapted to receive a film spool disposed within the tube, means adapted to prevent removal of the other of said caps except when said shutter sleeve is in slot-closed position, a feeder device, manipulable externally of the receptacle, for drawing film through said tube slot, and spiral, registering channels formed in the bottom of the receptacle and cover adapted to receive opposite edges of film strip and maintain film so received in separated condition.

31. In a device for developing film, a light-proof developing chamber, a light-proof loading chamber, a film passage connecting said chambers, means in the developing chamber for positioning film, and means manipulative externally of said chambers for pushing film received from the loading chamber into said positioning means.

32. A film developing tank including a developing chamber, a loading chamber having an external opening to permit the introduction thereto and removal therefrom of a film spool, a removable closure element for said opening, means in said developing chamber forming a convolute film passage having the mouth thereof opening into said loading chamber and means near said mouth for pushing film through said passage.

HARRY L. DAZEY.