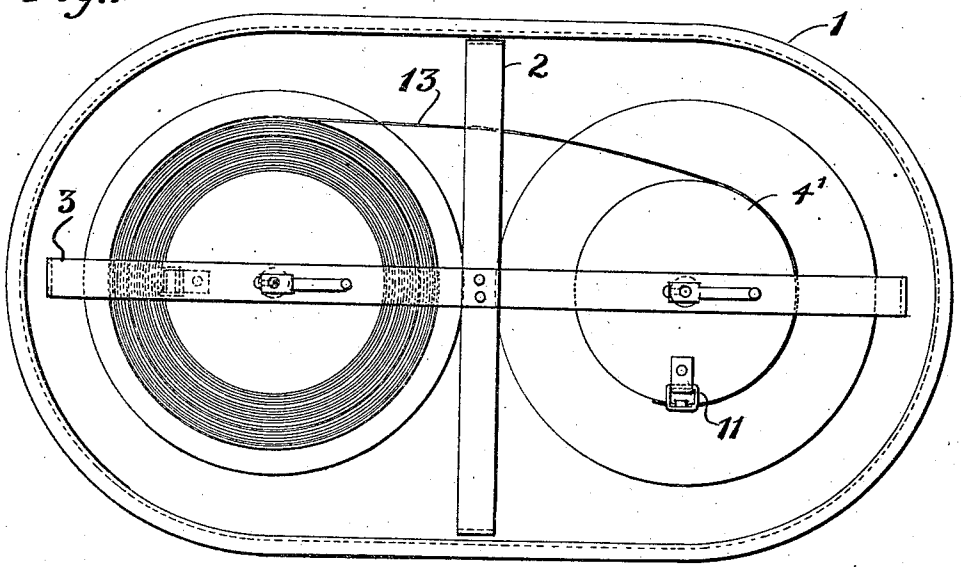
May 24, 1932. J. W. SMITH 1,860,059

APPARATUS FOR DEVELOPING FILMS

Filed Nov. 6, 1930

Fig. 1



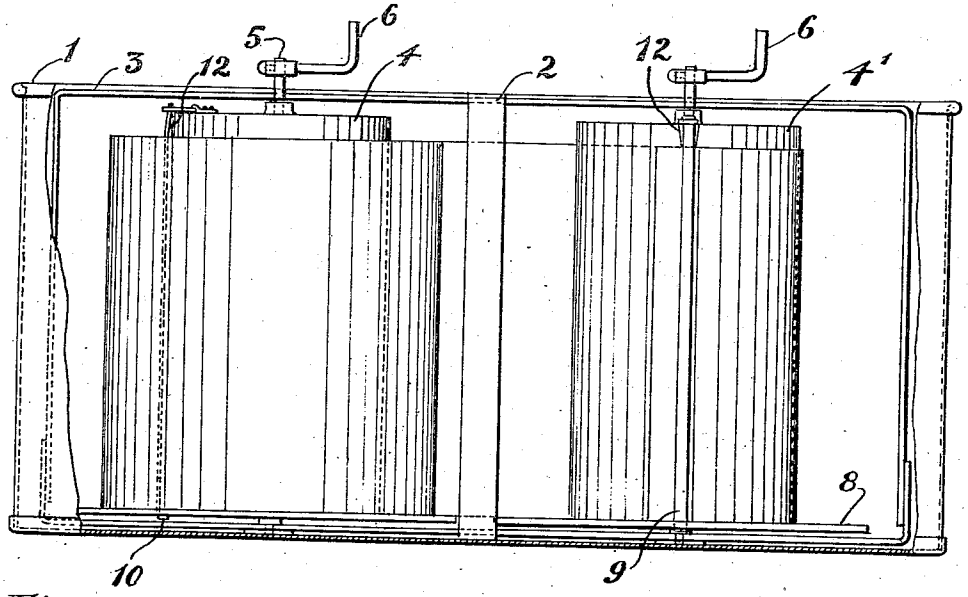


Fig. 2

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1,860,059

UNITED STATES PATENT OFFICE

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APPARATUS FOR DEVELOPING FILMS

Application filed November 6, 1930. Serial No. 493,727.

My invention relates to apparatus for developing roll films of relatively large size, such as are ordinarily employed, for example, in aerial photography, aerial map-making and the like, and is especially adapted to facilitate the developing of such films in the field, that is, where a permanent and well equipped developing laboratory is not available, although my invention may also be used to advantage for like purposes in such laboratories.

In development of roll films of the ordinary sizes employed in hand cameras, and the like, it has heretofore been the practice to wind the film, together with a suitable spacer or apron, upon a spindle immersed in a bath of the developing fluid, but so far as I am aware no satisfactory means has heretofore been devised for developing roll films of the sizes usually employed in aerial work, for example, a roll of film approximately 9″ wide and 75′ long.

In film rolls of this class it is often highly desirable that development thereof be accomplished without cutting the film, for example in order to avoid confusion in determining the subject of any particular exposure, and for other reasons, but the forms of apparatus heretofore employed for the development thereof frequently cannot be operated satisfactorily without such cutting.

A principal object of my invention, therefore, is to provide means whereby roll films of large sizes may readily be developed as a single unit.

A further object of my invention is to provide a novel form of apparatus for so developing such films, of compact and readily portable nature, adapted to be employed in field work, as, for example, by an army in campaign, and which does not require a fully equipped laboratory to permit the satisfactory accomplishment of its intended functions.

A still further object of my invention is to provide apparatus of the class described adapted to permit maximum exposure of the film to the action of the bath employed in the developing process without requiring the use of a large or bulky tank or the like, or that a large portion of the film be unwound from its retaining roll at any time.

Other purposes, objects and advantages of my invention will be hereinafter more specifically mentioned or will appear from the following particular description of a preferred embodiment thereof, in which reference will be had to the accompanying drawings.

In the said drawings, Fig. 1 is a top plan view of my invention, showing a roll of film in position for development therein and Fig. 2 is a side elevation of the same, in which a portion of the tank is broken away for the sake of clearness. In both figures like characters of reference are used to designate the same parts.

Referring now more particularly to the drawings, in which the preferred embodiment of my invention is shown, I provide a tank 1, which may desirably be made of sheet Monel metal or other sheet metal suitably resistant to the developing baths, and adapted to contain the latter. If desired, a plurality of such tanks of different sizes and adapted to nest together may be provided, thus permitting a separate tank to be used for each bath employed in the developing process.

Adapted to be removably disposed within the tank I also provide a cage preferably formed of metal straps 2 and 3 respectively defining rectangles and disposed normal to and centrally of each other, thus forming in effect a cross when viewed in plan, the requisite joints being made therein by rivets, spot welding or the like, thus forming a rigid cage of light weight.

Supported within the cage, and freely rotatable therein, are two film cylinders 4′ loosely journaled in the strap 3 on suitable vertical spindles 5 at the top and bottom.

Crank arms 6 may be secured to the upper spindles to permit manual rotation thereof, and thus of the cylinders. At the bottom of each of the latter is a radial flange 8, preferably integral with the base of the cylinder, and through a slot in which a spring metal strip 9 is loosely extended and normally held in place by a bent-over tongue 10 at its end, the strip 9 extending axially of the cyl-

inder adjacent its surface and being slightly bent outwardly at its upper end. A catch 11 comprising a metal ring hinged to the cylinder and adapted to secure the upper end of the strip 9 is also provided, the upper periphery of the cylinder being slightly flattened as at 12 to permit the end of the strip 9 to be sprung slightly inwardly to allow the catch to be readily slipped thereover. As clearly shown in the drawings, the strip 9 is adapted to clamp the end of a roll of film 13 against the cylinder and thereby secure the film to the latter.

In developing a roll of film with the aid of my invention the cage is first lifted from the tank and one end of the film then secured to one of the cylinders, for example 4, by passing it under the strip 9, the latter then being locked by the catch 11. The film is then wound onto the cylinder by means of the adjacent crank, preferably with the emulsion or sensitized surface on the outside, so that the film then rests on its edge, and is provided with vertical support by the flange 8.

After the entire strip of film has been wound on the cylinder 4, the free or rear end thereof is secured to the other cylinder 4', and the cage, bearing the cylinders and the film, is then introduced into the tank containing the developing bath. The cylinder 4' to which the free end of the film has been secured is then rotated by means of its crank so as to wind the film upon said cylinder and thus the entire surface of the film is progressively exposed to the bath as it passes from one cylinder to the other.

Furthermore, due to the ease with which the cylinders rotate, the film is not wound tightly thereon and thus a relatively large quantity of the liquid of the bath is retained in a layer between adjacent convolutions of the film which is consequently continually exposed to the action of the bath even after it is rolled up on the cylinder onto which it is being wound.

As is well understood in the art of developing films, it is desirable to pass the film through each bath several times, and this may be readily accomplished with my invention by winding the film back and forth between the cylinders. The passage of the film through the bath and the rotation of the cylinders are thus effective to maintain adequate circulation of the bath, and additionally, by arranging the film so that the emulsion is on the outside of the roll, a maximum exposure thereof to the main body of the bath is attained. Thus, assuming that the cylinders are each 4" in diameter, approximately one lineal foot of the film is exposed to the bath on the outside of each roll, and as cylinders of this size may conveniently be arranged with their centers approximately 8" apart, at least that much of the film is always exposed to the bath in its passage from one cylinder to the other; thus, in apparatus of the proportions above mentioned some 2' 8" of the film, measured lineally thereof, is always exposed to the main body of the bath, while due to the inclusion of a thin layer of the bath between the convolutions of the film on the respective cylinders, all the remaining portion of the film is also being subjected to the action thereof, the vertical support provided the lower edge of the film by the flanges 8 being effective to prevent the convolutions from bearing against each other and forcing out the layer of the bath lying therebetween as frequently occurs in developing by means of apparatus in which the film is wound on a spindle whose axis of rotation is arranged horizontally or which is incapable of very free rotation.

It is apparent that the cage, carrying the cylinders and the film, may be readily removed from the developing bath when the development is complete or when otherwise desired and that rinsing and fixing of the film may be readily effected in the same manner as above described, either in the same tank, after changing of the bath, or in other tanks containing respectively the water, fixing bath or other liquid.

While I have herein described a preferred embodiment of my invention with some particularity, it will nevertheless be understood that I do not thereby desire or intend to limit or confine myself thereto, as changes and modifications may be made in the mode of construction and the form and relationship of the several elements thereof, if desired, without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. Apparatus for developing roll films comprising a pair of vertically disposed cylinders, a cage adapted to rotatably support said cylinders in spaced relation, a radial flange formed on each cylinder and adapted to receive and support one edge of a roll of film when wound on the cylinder, and means carried by each cylinder operable to removably secure one end of said film thereto.

2. The combination with a film processing tank adapted to contain a fluid bath, of means operable to support a roll of film on a vertical axis therein, and means operable to continuously withdraw a strip of film from said roll and to wind said film into another roll having a layer of said fluid bath uniformly included between respectively adjacent convolutions of said second roll.

3. The combination with a film processing tank, of a pair of vertically disposed cylinders rotatably supported therein and each adapted to receive a roll of film, a flange carried by each of said cylinders adapted to

support the film received by such cylinder, and means operative to secure one end of said film to each of said cylinders.

4. The combination with a film processing tank, of a pair of cylinders rotatably supported therein and each adapted to receive a roll of film, a flange carried by each of said cylinders adapted to support the film received by such cylinder, a locking strip secured at one end to said flange and extending axially of the cylinder adjacent its surface, and means adjacent the other end of the cylinder adapted for engagement over the other end of said strip.

5. Roll film developing apparatus comprising a tank of greater depth than the width of the film to be developed, a pair of similar cylinders each provided with a peripheral flange adjacent one end of greater width than the thickness of the film when wound on the cylinder, an open cage adapted for insertion in the tank and operative to rotatably support the cylinders in spaced relation with their axes extending vertically, manually operable means for independently rotating each cylinder in the cage, and means comprising a locking strip extending axially adjacent the surface of each cylinder and a catch for releasably holding one end thereof, operable to secure an end of the film to the cylinder.

In witness whereof, I have hereunto set my hand this 5th day of November, 1930.

JOHN WESLEY SMITH.