May 17, 1932. G. M. DYE 1,858,888

METHOD AND APPARATUS FOR DEVELOPING PRINTS

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Fig. 2.

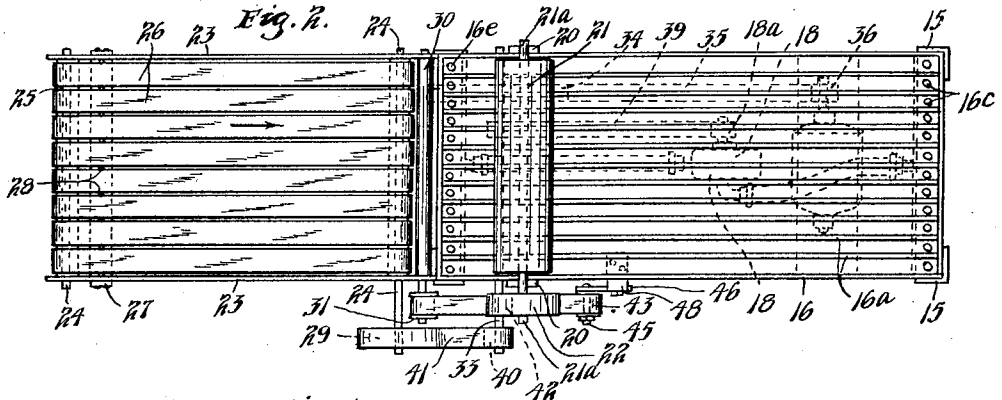


Fig. 1.

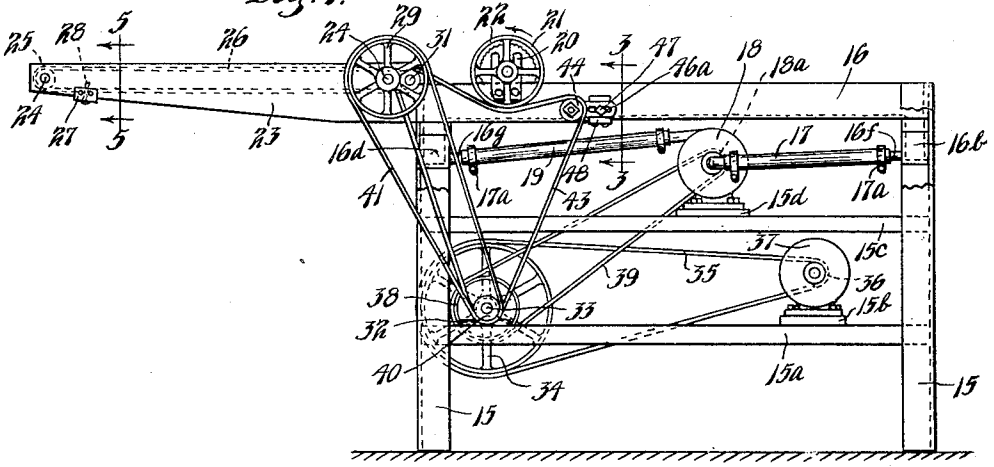
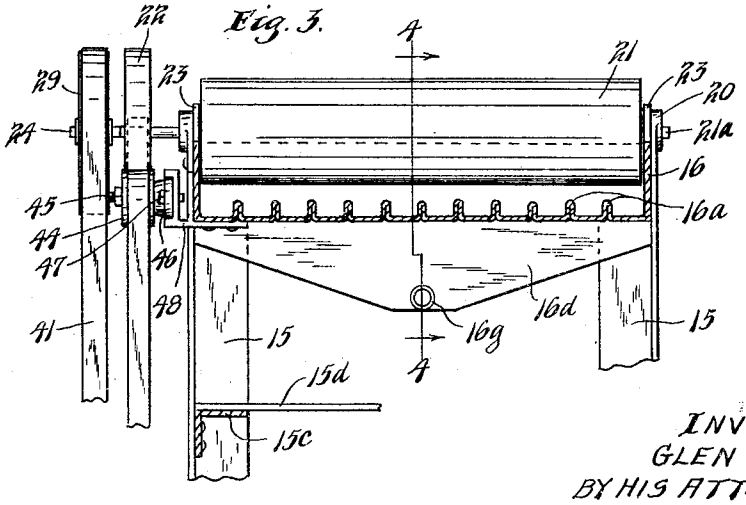


Fig. 3.



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METHOD AND APPARATUS FOR DEVELOPING PRINTS

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Fig. 4.

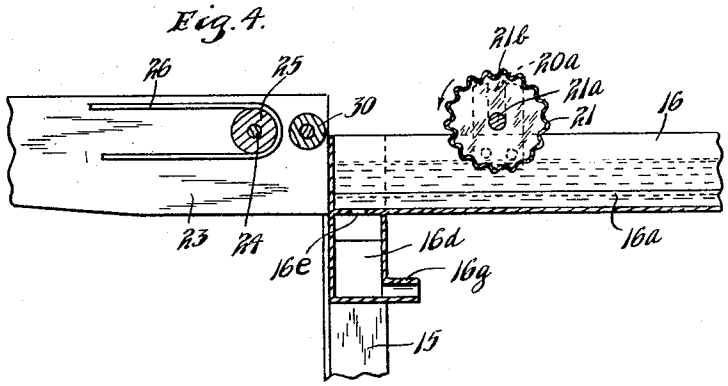


Fig. 8.

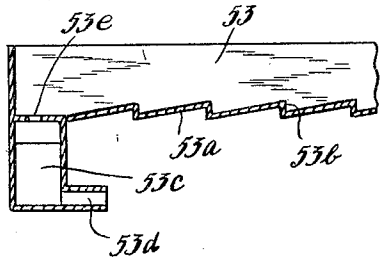


Fig. 9.

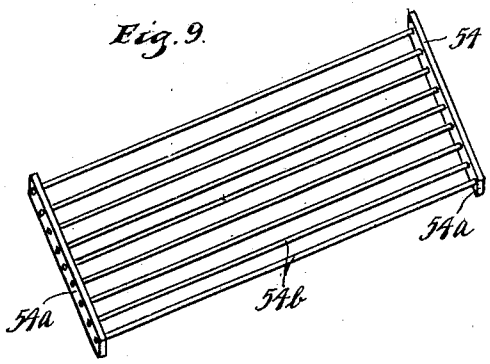


Fig. 6.

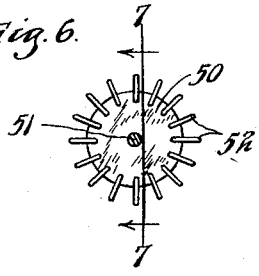


Fig. 7.

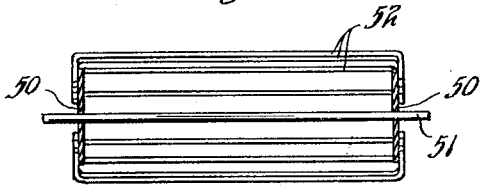
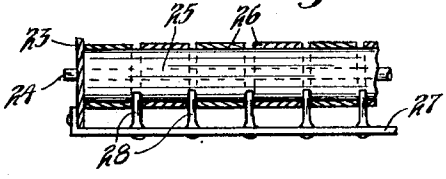


Fig. 5.



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR DEVELOPING PRINTS

Application filed April 27, 1927. Serial No. 186,925.

This invention relates to a method and apparatus for handling sensitized photographic sheets such as prints or negatives, and particularly to a method and apparatus for developing prints or negatives. It is desirable in modern photographic developing and printing establishments to have the prints or negatives move progressively through the various stages of operation thereon. It is also desirable to have the prints or negatives handled as quickly as possible and to have apparatus of great capacity.

It is an object of this invention, therefore, to provide a simple and efficient developing apparatus comprising a receptacle in which the prints are submerged and through which they progress until properly developed.

It is also an object of the invention to provide a developing apparatus having means for submerging the prints in the developing liquid, and means for progressing the prints in said liquid by the movement of said liquid.

It is a further object of the invention to provide a method of handling prints or sensitized sheets, which consists in submerging the same in the developing liquid and progressively advancing the same therein without handling or engaging the prints in said liquid.

It is another object of the invention to provide a device for handling sensitized sheets comprising a print conveyor, a receptacle containing developing liquid to which said conveyor delivers the sheets, with means for submerging the sheets in the liquid in said receptacle.

It is still another object of the invention to provide a device such as set forth in the preceding paragraph, in which the submerged sheets are advanced in said liquid without being touched or engaged by any advancing means.

It is still a further object of the invention to provide a method and apparatus for handling sensitized photographic sheets having a receptacle in which a treating solution is contained, said solution being caused to flow through said receptacle and to carry the sheets therewith.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings, in which like reference characters refer to similar parts throughout the several views and in which:—

Fig. 1 is a view in side elevation of the apparatus;

Fig. 2 is a plan view of the same;

Fig. 3 is a vertical section taken on line 3—3 of Fig. 1; as indicated by the arrows;

Fig. 4 is a vertical section taken on line 4—4 of Fig. 3, as indicated by the arrows;

Fig. 5 is a vertical section taken on line 5—5 of Fig. 1, as indicated by the arrows;

Fig. 6 is a view in end elevation of a modified form of the submerging roll;

Fig. 7 is a vertical section taken on line 7—7 of Fig. 6, as indicated by the arrows;

Fig. 8 is a partial section similar to Fig. 4, shown in the modification; and

Fig. 9 is a perspective view of the bottom member for the developer receptacle.

Referring to the drawings, a device is shown having a frame comprising the leg members 15 illustrated as of right-angular shape in cross section, at the upper ends of which is supported the tray or receptacle 16. While the receptacle 16 may be of various shapes, in the embodiment of the invention illustrated it is shown as substantially rectangular. Angle members 15*a* extend between the pairs of end legs 15 on which a shelf 15*b* is adapted to rest, said shelf extending between said members 15*a*. Other angle members 15*c* also extend between the end pairs of legs 15 at each side of the frame above the members 15*a*, which members 15*c* support the transversely extending shelf 15*d* extending therebetween. The bottom of the receptacle 16 is provided with a plurality of longitudinally extending upstanding parallel ribs 16*a*. The receptacle 16 has a trough 16*b* beneath one end thereof and holes 16*c* extend through the bottom of receptacle 16 between the ribs 16*a* into the trough 16*b*. Another trough 16*d* extends transversely beneath the other end of receptacle 16 and said receptacle has holes 16*e* between the ribs 16*a* extending through the bottom thereof into said trough. The troughs 16*b* and 16*d* have outlet spouts 16*f* and 16*g* respectively at the

inner sides thereof and substantially at transverse centers thereof. A tube or hose 17 is connected to the spout 16*f* at one end by a suitable clamp 17*a* and is connected at its other end to the inlet of the pump 18, said tube having clamps 17*a* thereon for connecting it to said spout and pump. Another tube or hose 19 is connected at one end to the spout 16*g* and at its other end to the outlet conduit of the pump 18, said tube 19 also being connected by clamps 17*a*. The pump 18 is bolted to the shelf 15*d* and is provided with a driving pulley 18*a* at one side thereof. Bearing plates 20 are secured to each side of receptacle 16 having central open-ended slots 20*a* at their upper sides and a submerging roll 21 is disposed across the tank or receptacle 16 adjacent one end thereof, having trunnion bearings 21*a* disposed in the slots 20*a* and resting in the bottom of said slots. One of the trunnions 21*a* is prolonged and has secured thereto a belt pulley 22. The roll 21 has longitudinally extending corrugations 21*b* formed in the surface thereof. A frame comprising parallel side members 23 extends from one end of receptacle 16, said side members 23 being illustrated as in the form of plates disposed in the same planes as the sides of receptacle 16. Shafts 24 are journaled in the plates 23 adjacent the ends thereof and extend therebetween, said shafts carrying rollers 25 over which run a plurality of comparatively narrow parallel endless fabric belts 26. A bar 27 is secured to the sides of plates 23 and extends transversely beneath the same, said bar having spaced upstanding pins 28 secured thereto illustrated as cylindrical in form, which are disposed between the lower runs of belts 26. The shaft 24 adjacent the receptacle or tray 16 is prolonged at one side and has secured thereto a belt pulley 29. A roller 30 extends between the plates 23 between one end of the belts 26 and receptacle 16 and has trunnions journaled in the plates 23. As shown in Fig. 4, the roller 30 has its top disposed a short distance below the upper runs of the belts 26 and a short distance above the edge of the front of tray 16. One of said trunnions is prolonged and has secured thereto a belt pulley 31. Bearings 32 are secured to the members 15*a* in which is journaled a jack shaft 33. This shaft has secured thereto a driving pulley 34 adapted to be driven by a belt 35 running thereover, and also running over a pulley 36 secured to the shaft of a motor 37 illustrated as of electrical type. The shaft 33 also carries a pulley 38 over which runs a belt 39, said belt also running over and driving the pulley 18*a* on pump 18. The shaft 33 also carries a small pulley 40 having a belt 41 running thereover, which belt also runs over the pulley 29. Another small pulley 42 is secured to shaft 33 having a belt 43 running thereover, which belt also runs over the pulley 29 and a comparatively small pulley 44, said latter pulley being journaled on a shaft 45 carried in a bracket 46 having an elongated slot 46*a* therein through which passes a bolt 47 securing said bracket in a channel formed in a bracket 48 secured to the bottom of receptacle 16 and upstanding at one side thereof.

In Figs. 6 and 7 another form of submerging roller 21 is shown, comprising end disks 50 secured adjacent each end of the shaft 51. Said disks 50 have rods 52 secured thereto, said rods having their ends bent substantially at right angles and extending across the outer ends of disks 50 radially of shaft 51, and being secured to said disks by any suitable means such as spot-welding. It will be noted that the bends or corners of the rods 52 are disposed some distance outwardly of the edges of the disks 50.

In Fig. 8 a modified form of the receptacle 53 is provided which may take the place of receptacle 16, said receptacle 53 having transverse corrugations 53*a* formed in its bottom, the same being of ratchet shape having vertical ends 53*b* and inclining downwardly between said ends, said receptacle, like receptacle 16, being provided with a transversely extending trough 15*c* at one end having the spout 53*d* therein, said trough communicating with the receptacle 53 through the holes 53*e*.

In Fig. 9 a member 54 is shown comprising end bars 54*a* having secured therein and extending therebetween the parallel rods 54*b*. The member 54 is adapted to be used in a receptacle similar to receptacle 16 but having a plain flat bottom.

In operation the parts will be arranged as shown and described and the member 46 will be adjusted so that belt 43 will engage the bottom of pulley 22 when the trunnions 21*a* rest in the bottoms of slots 20*a* in bearings 20. The shaft 33 will be driven by the motor 37 and the roll 21 as well as the rolls 25 and 30 will thus be rotated, the roll 21 being rotated in the direction indicated by the arrow in Fig. 1. The rollers 25 will be rotated so as to progress the top runs of the belts 26 toward the receptacle 16 as indicated by the arrow in Fig. 2. When the machine is used to develop prints, the prints will be placed by the operatives on the belts 26 and will be carried toward receptacle 16. As the prints pass over the ends of the belts 26 over roller 25, they will tip downward into contact with the roller 30. This roller is driven at comparatively high speed and the prints are given a quick impetus forward by frictional engagement with said roller. The prints are thus directed downwardly into receptacle 16 and come beneath the submerging roller 21. The surface of this roller is made corrugated, so that the prints cannot come into flat or

close contact therewith and adhere to the roll and be carried up thereby or around the same. The developing liquid in receptacle 16 is continuously circulated therein, passing through the holes 16*c* and being drawn from the trough 16*b* through the tube 17 by the pump 18. The pump 18 discharges the fluid again into tube 19 from whence it passes into trough 16*d* and upwardly through the holes 164 into the receptacle. The prints therefore, submerged by the roll 21 are carried lengthwise of receptacle 16 by the developing liquid moving lengthwise therein. It will be seen that the movement of roll 21 will assist the movement of the liquid longitudinally of said receptacle. The movement is determined so that the prints move at such speed that those requiring the most development will be fully developed before reaching the end of receptacle 16. The prints are usually deposited face up and their development can be watched by the operative who is stationed at the side of the machine and when the proper degree of development is reached, the prints can be lifted from the receptacle and placed into a tray which usually will contain a short-stop solution. The ribs 16*a* are provided in the bottom of receptacle 16 so that the prints cannot come into close contact with the bottom of the receptacle where difficulty would be experienced in getting hold of the same. They are easily picked up from the ribs 16*a* as the operator's fingers can enter between the ribs and easily get under the edge of the print. The prints can thus be very quickly lifted from the receptacle and this is important, as the print might be overdeveloped or darkened if it were necessary to make several attempts to get hold of it. The prints being progressively moved through the tray 16, the development thereof is definitely related to and indicated by the position of the prints in said tray.

The roller shown in Figs. 6 and 7 may be substituted for the roll 21. This roll as will be readily seen is of openwork or cage-like form and acts quite efficiently to engage and submerge the prints without the formation of bubbles. The prints also cannot stick to the roll.

The receptacle 53 shown in Fig. 8 may be used in place of receptacle 16. It will be noted that with the ribs 53*a* shown in this form, that the liquid can move rearwardly in said receptacle but will not readily move forwardly. The prints can also move rearwardly over the ribs 53*a* without any interference from the ribs. At the same time the operator can readily lift the prints from the bottom of the receptacle, as the ends of his fingers can reach under the prints between the ribs. The ribs, of course, will be of smaller width than the smallest dimension of the prints.

When the device shown in Fig. 9 is used, the receptacle 16 will have a plain flat bottom. The prints cannot sink lower than the rods 54*b* and will be supported thereon if they sink. The operator can readily lift the prints by inserting his fingers between the rods 54*b* and beneath the prints.

From the above description it will be seen that applicant has provided a simple and efficient method and apparatus for treating sensitized sheets such as photographic prints. The prints are automatically delivered to the developing liquid in position to be effectively submerged. The submerged prints are progressed at suitable speed longitudinally of the developing tray. The operator therefore merely watches the prints as they travel through the tray or receptacle 16 and picks the same out of said receptacle when they have reached the requisite degree of development. Some of the prints will, of course, travel further in the receptacle than others before being lifted out. The prints are gently and effectively moved without any mechanical means engaging the same. The prints are easily lifted out of the receptacle 16 as they do not engage the bottom thereof with their entire surface. The machine is quite simple in construction, compact and easily made and assembled. It is obvious that the method and apparatus will have a high degree of utility for the purpose intended.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the apparatus and in the steps and sequence of steps of the method, without departing from the scope of applicant's invention, which generally stated, consists in a method and apparatus capable of carrying out the objects above set forth, such as disclosed and defined in the appended claims.

What is claimed is:—

1. An apparatus for treating sensitized photographic sheets having in combination, a receptacle adapted to contain liquid for treating sensitized photographic sheets, a submerging means adjacent one end of said receptacle, means for delivering sheets to said receptacle at said end, and an accelerating means for receiving prints from said last mentioned means and for directing said sheets into said receptacle toward said submerging means.

2. An apparatus for treating sensitized photographic sheets having in combination, a receptacle adapted to contain liquid for treating sensitized photographic sheets, a submerging means adjacent one end of said receptacle, an endless conveyor for delivering sheets to said receptacle at said end, and an accelerating means for directing said sheets into said receptacle toward said submerging means, said accelerating means comprising a roller disposed at one end of said conveyor with its top surface slightly below

the same and adjacent one end of said receptacle.

3. A print developing apparatus having in combination, a frame, a roller journaled adjacent one end of said frame, an endless conveyor having one end thereof running over said roller for moving prints toward the same and delivering prints therefrom, a smaller roller disposed parallel to said roller at one end of said conveyor with its top surface below the top surface of said conveyor for engaging and moving said delivered prints, a receptacle adjacent said last mentioned roller having its end substantially parallel thereto and a short distance below the top of said last mentioned roller, said receptacle being adapted to contain a print treating liquid.

4. The structure set forth in claim 3, and a revoluble submerging member of substantially cylindrical form having spaced peripheral portions adjacent said end of said receptacle having its lower side extending into the liquid in said receptacle.

5. An apparatus for treating sensitized photographic sheets having in combination, a receptacle adapted to contain liquid for treating sensitized photographic sheets, means adjacent one end of said receptacle for conveying said sheets towards said receptacle and an accelerating means between said first mentioned means and said receptacle adapted to direct said sheets into said receptacle.

6. An apparatus for treating sensitized photographic sheets having in combination, a receptacle adapted to contain liquid for treating said sensitized photographic sheets and through which said liquid and sheets may move together to advance from one portion of said receptacle to a remote portion thereof, and a single means for positively submerging prints in said liquid and for moving said liquid and sheets through said receptacle in the same direction, whereby said sheet may be placed in said liquid and receptacle at one point and removed at a distant point when sufficiently treated.

7. An apparatus for treating sensitized photographic sheets having in combination, a receptacle adapted to contain liquid for treating sensitized photographic sheets and through which said liquid and sheets may be moved together to progress from one portion of said receptacle to another portion, and means bodily located at one point for submerging said sheets in said liquid at said first mentioned portion, and for progressing said sheets and liquid together in said receptacle and lengthwise thereof, whereby said sheets may be placed in said receptacle at one point and removed at another point when sufficiently treated.

8. A method of developing photographic prints which consists in placing said prints face upwards at one point in a receptacle containing developing liquid, positively submerging said prints adjacent said point and progressively moving said prints in said receptacle by moving the liquid in the said receptacle.

9. An apparatus for developing photographic prints having in combination, a receptacle adapted to contain developing liquid, means for positively submerging prints in said liquid and for producing an upper moving body of liquid from one end of said receptacle to the other to move said prints and liquid together therethrough, and for producing an oppositely moving return body of liquid, and means for separating said bodies of liquid whereby the liquid is circulated to continuously move from one end of said receptacle to the other and carry a print from one end of said receptacle to the other.

10. An apparatus for developing separate photographic prints having in combination, a receptacle containing liquid and constructed and arranged to have said liquid moved in one direction therein in a continuous circulation throughout the length of said receptacle, means for delivering prints to one end of said receptacle, and mechanical means for engaging said liquid in said receptacle for causing said liquid to carry said prints lengthwise of said receptacle.

11. An apparatus for developing separate photographic prints having in combination, a receptacle containing liquid and constructed and arranged to have said liquid moved in one direction therein in a continuous circulation lengthwise of said receptacle, means for delivering prints at one point in said receptacle and rotary means adjacent said point for engaging said prints delivered to said receptacle, submerging the same in said liquid, and for moving said liquid lengthwise of said receptacle for carrying the prints with said liquid lengthwise of said receptacle.

12. A method of developing photographic prints which consists in delivering prints at one point in a receptacle containing liquid, positively depressing said prints in said liquid adjacent said point, and causing a movement of the body of said liquid in said receptacle lengthwise of said receptacle by circulating said liquid to carry said submerged prints lengthwise of said receptacle.

13. An apparatus for treating separate sensitized photographic sheets having in combination, a receptacle adapted to contain liquid, and constructed and arranged to have said liquid moved throughout the length thereof in one direction in a continuous circulation, means for delivering prints adjacent one point in said receptacle, and a member adjacent said point for submerging said prints in said liquid and bodily moving the liquid in said receptacle uniformly in one di-

rection throughout the length of said receptacle to carry the prints throughout the length of said receptacle.

14. A submerging means for sensitized photographic sheets comprising a revoluble member having a plurality of means disposed substantially in the surface of a cylinder, said means extending longitudinally of said cylinder and having circumferential spaces therebetween and below a line joining the same, said means acting to engage said prints and press the same into a liquid.

15. A print treating apparatus having in combination, a receptacle adapted to contain a print treating liquid, a driven revoluble member having a print engaging and submerging periphery and having trunnions at each end, a belt pulley secured to one of said trunnions, a belt on which said pulley rests for rotating the same and said member, and bearings secured to each side of said receptacle having open upper portions in which said trunnions rest, whereby said trunnions and pulley are vertically removable from said bearings.

In testimony whereof I affix my signature.

GLEN M. DYE.