

June 21, 1932.

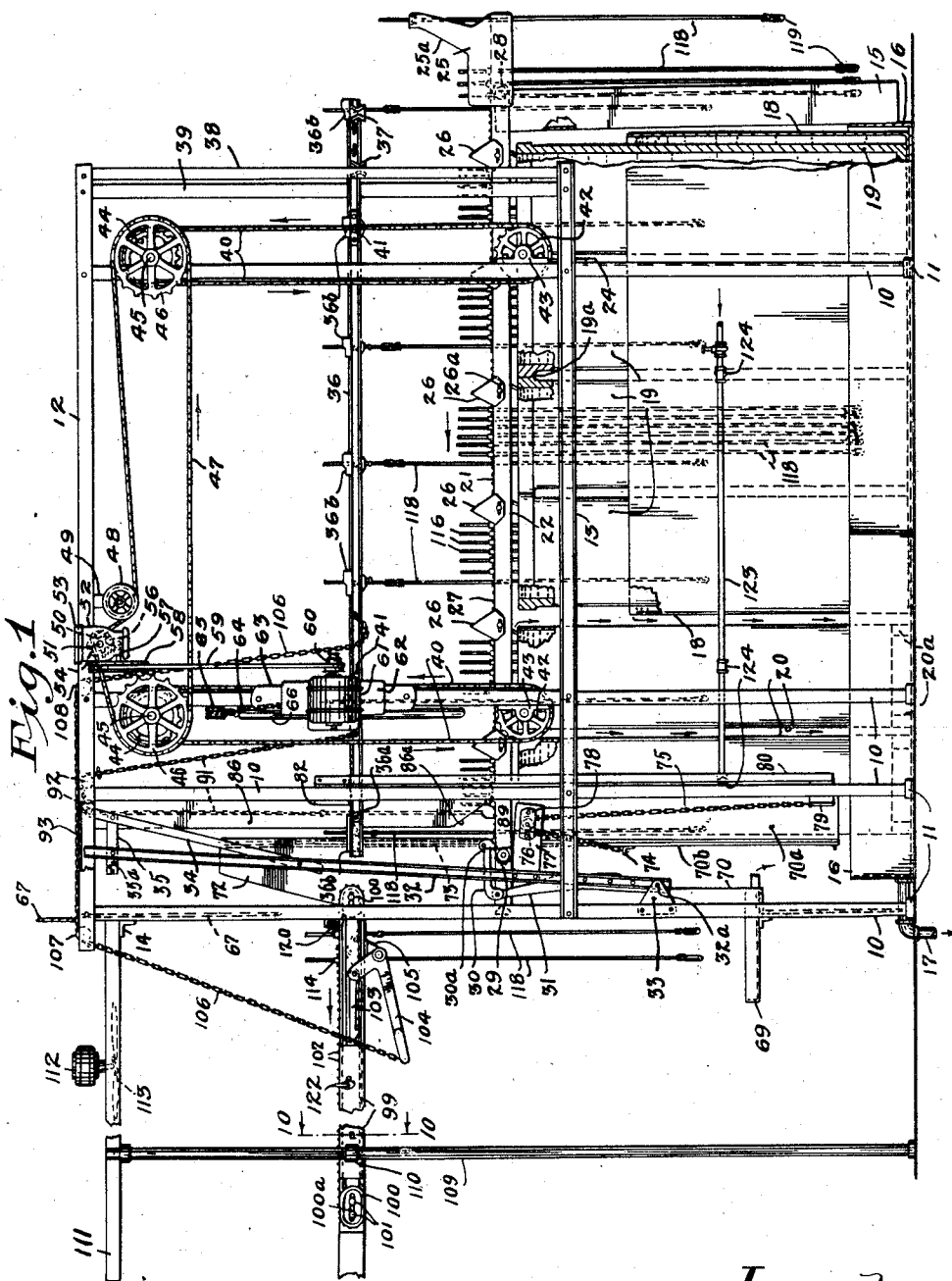
G. M. DYE

1,863,689

FILM DEVELOPING AND PROGRESSING MACHINE

Filed April 17, 1929

4 Sheets-Sheet 1



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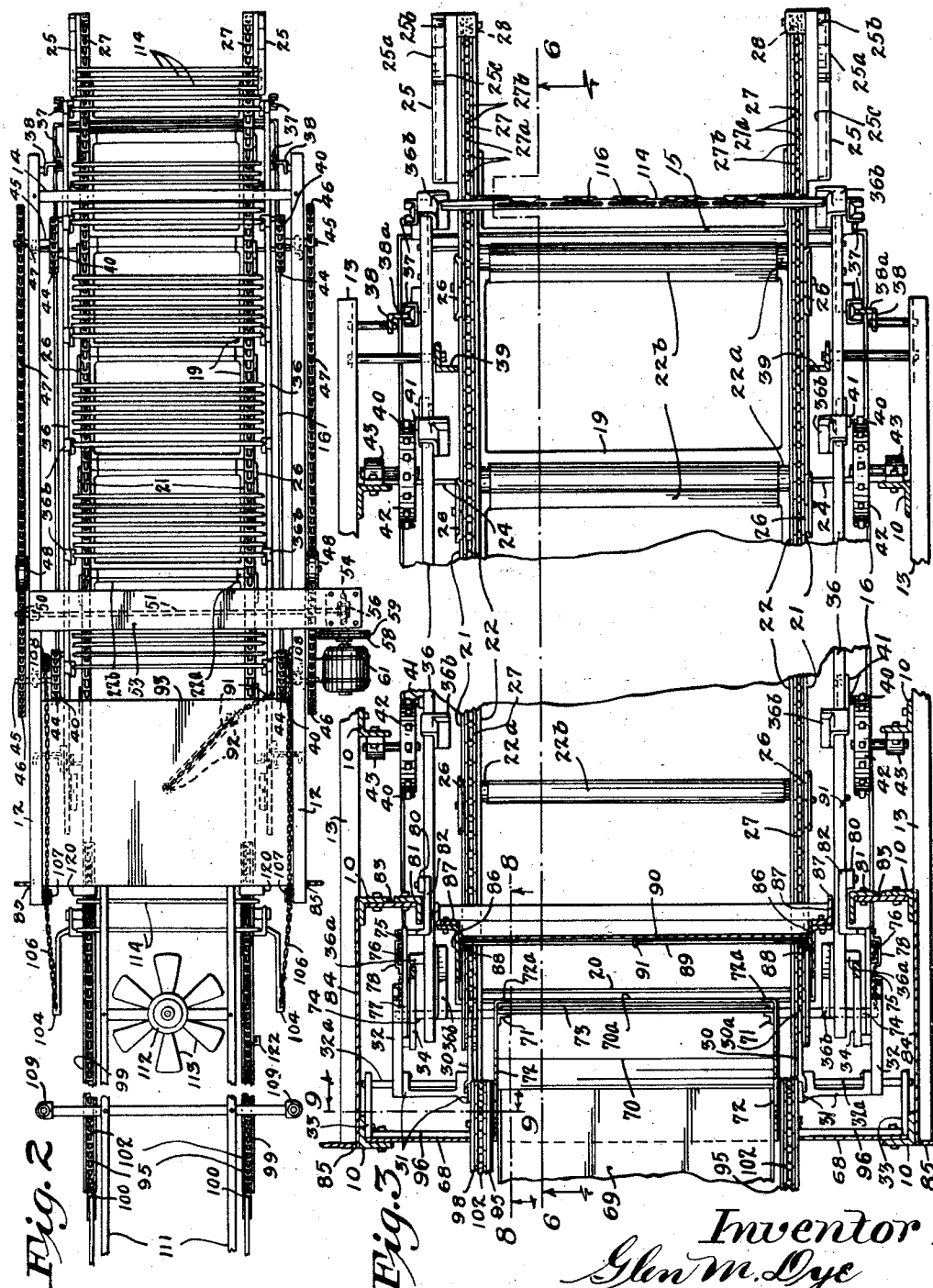
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FILM DEVELOPING AND PROGRESSING MACHINE

Filed April 17, 1929

4 Sheets-Sheet 2



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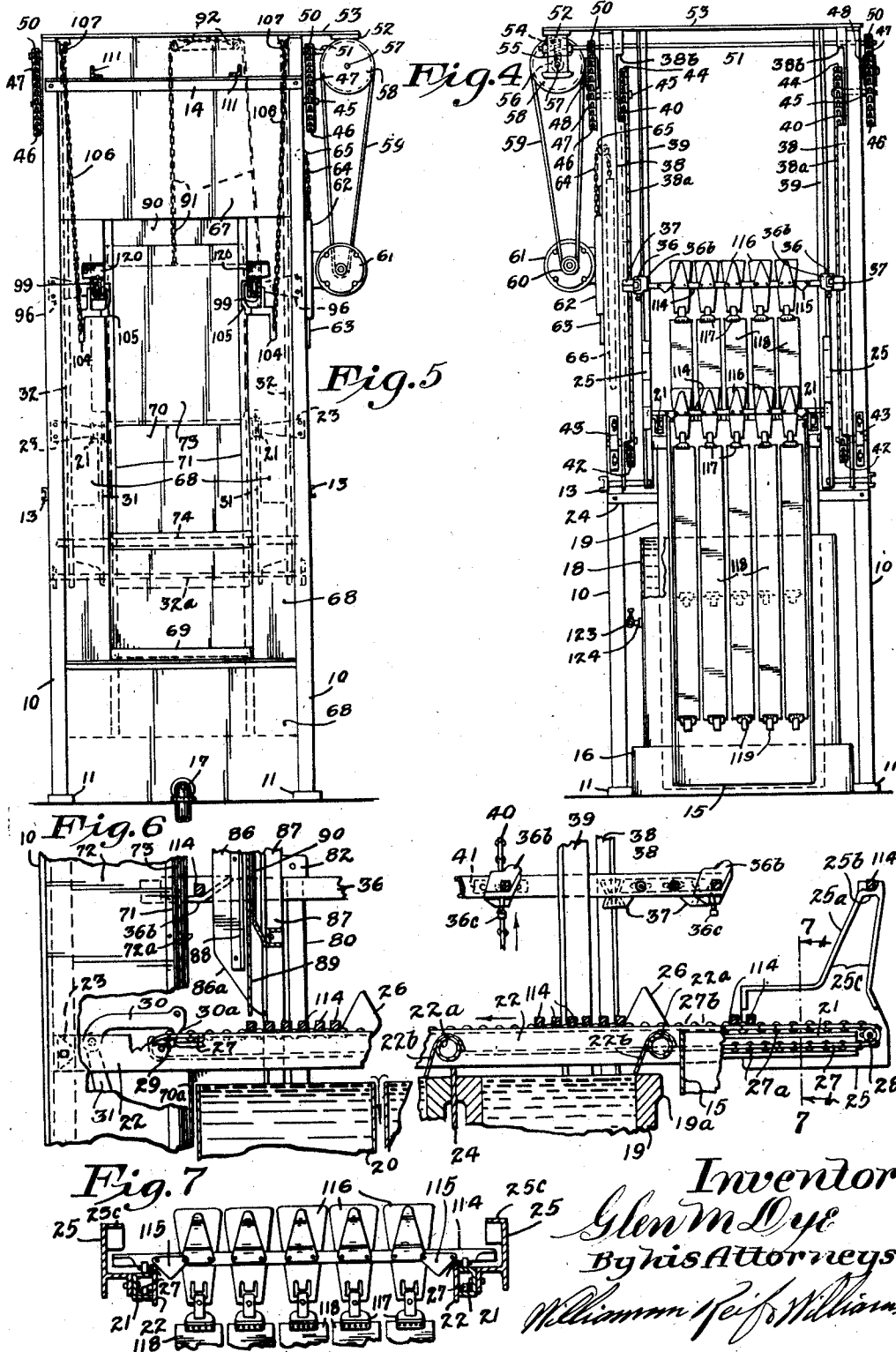
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FILM DEVELOPING AND PROGRESSING MACHINE

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FILM DEVELOPING AND PROGRESSING MACHINE

Filed April 17, 1929 4 Sheets-Sheet 4

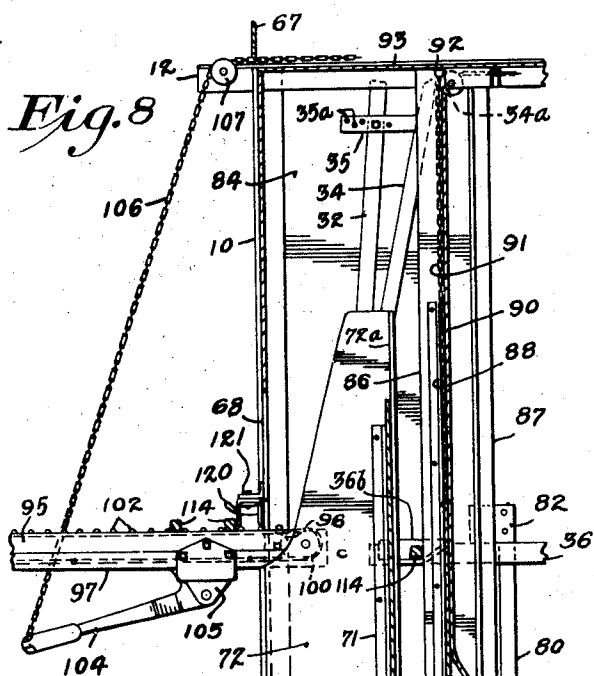


Fig. 9

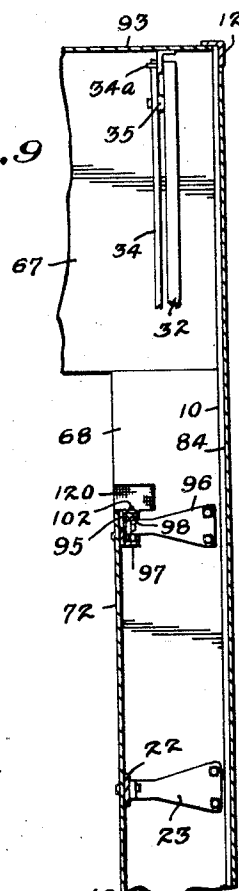


Fig. 11

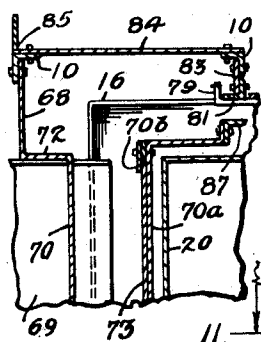
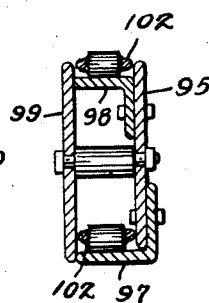


Fig. 10



UNITED STATES PATENT OFFICE

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FILM DEVELOPING AND PROGRESSING MACHINE

Application filed April 17, 1929. Serial No. 355,877.

This invention relates to an apparatus for automatically handling articles requiring treatment in various liquids, such as the sensitized sheets or plates used in photography and particularly to a machine for carrying the articles, such as films and plates through photographic treating liquids. As is well known to those skilled in the art, the common photographic films are now furnished in rolls which are several feet in length and these films are commonly developed while in one piece of such length. The films are first placed in a container having the developing liquid therein, are then placed in another container having what is called an acid short-stop solution, are then progressed through two containers containing hypo solution and are then moved through one or more containers containing water or washing solution.

It is an object of this invention to provide a machine which will automatically convey the film which is carried on a suitable holder or film-carrying member, insert the same into the various containers successively, move the same through the containers at the desired speed and withdraw the film from each container after it has been progressed there-through and insert it into the next container, a plurality of said holders being acted on simultaneously.

It is a further object of the invention to provide an apparatus for successively placing into and removing the film from the containers and advancing the same from one container to the other comprising a pair of rails extending along the containers and having means thereon for engaging the film holders, which means are spaced along said rails and can be held in various positions thereon.

It is another object of the invention to provide a machine having conveying means for progressing the films through a series of containers which, is, as usual, disposed in a dark room, said dark room having closing means constituting one wall thereof, together with operating means for relatively moving the conveyor means and said closing means to move the washed film from the dark room

without admitting light from the exterior thereinto.

It is still another object of the invention to provide a machine which will move the films through a series of containers and will then deliver the films to a conveyor after the same have been washed, comprising a pair of rails extending along the containers and having means thereon for engaging and lifting the film carrying holders, the parts being driven from a single driving means and synchronized as to their movement.

It is still a further object of the invention to provide such a machine as set forth in the preceding paragraph having means for varying the speed of travel of the films through the various containers.

These and other more specific objects of the invention will more fully appear 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 side view of the machine, certain portions being broken away and other portions shown in vertical section;

Fig. 2 is a plan view of the machine;

Fig. 3 is a partial plan view with some parts being broken away and other parts shown in horizontal section, the same being shown on an enlarged scale;

Fig. 4 is for the most part a view in end elevation as seen from the right of Fig. 1;

Fig. 5 is a view in end elevation of the machine, as seen from the left of Fig. 1;

Fig. 6 is a vertical section taken on line 6—6 of Fig. 3, certain portions being broken away, the same being on an enlarged scale;

Fig. 7 is a vertical section taken on line 7—7 of Fig. 6;

Fig. 8 is a vertical section taken substantially on line 8—8 of Fig. 3 as indicated by the arrows;

Fig. 9 is a vertical section taken on line 9—9 of Fig. 3 as indicated by the arrows, and

Fig. 10 is a vertical section taken on line 10—10 of Fig. 1 as indicated by the arrows, and Fig. 11 is a section taken on line 11—11 of Fig. 8.

Referring to the drawings, a machine is

shown comprising a frame including vertical standards 10, which in the embodiment of the invention as illustrated are shown as angle bars having their lower ends received in base members 11 secured to the floor or other support. The standards 10 are arranged in laterally spaced pairs as clearly shown in Figs. 4 and 5 and are connected at their tops by the horizontal bars 12 and the lower channel bars 13. Said frame also includes transverse angle bars 14 extending between standards 10. Within said frame at the bottom thereof and resting on the floor is a tank 16 of rather short height, from one end of which leads a drain pipe 17. A guard member 15, in the form of a three-sided box is disposed at one end of tank 16 as shown in Fig. 1, having one side extending along said tank and its other sides projecting forwardly at right angles. Within the tank 16 and at one end thereof, being the right hand end, as shown in Fig. 1, is a tank 18 of considerably greater height than the tank 16. Within tank 18 are disposed a plurality of still higher tanks 19, said tanks being illustrated as substantially rectangular in cross section and having flanges 19a at their upper ends which are in contact at the transverse sides of the tanks. At one end of the tanks 18 are disposed a plurality of other tanks 20, the same being shown as two in number and being disposed in the tank 16, tanks 20 also being substantially rectangular in horizontal cross section and setting on blocks 20a, the tops of tanks 20 being substantially at the same height as tanks 19. Supported by the standards 10 are longitudinally extending side bars 21 in the form of channel bars having their channels directed inwardly, said bars being respectively disposed at opposite sides of the machine. Vertically disposed plates 22 are provided extending along and engaging the inner sides of said bars 21 and extending slightly above and below the same. Bars 22a shown as pipes extend between and connect plates 22 and form supports for the plate members 22b having downwardly diverging sides extending over the spaces between the various tanks 19 and 20. Plates 22 and bars 21 are supported at one end of the machine, namely the left end, as seen in Fig. 1, by brackets 23 extending inwardly from standards 10 and are supported adjacent the other end of the machine by bolts or bars 24 extending between and spacing the same and projecting outward to a pair of the standards 10. At one end of bars 21 are secured brackets 25, the same having downwardly extending flanges forming a channel, the innermost one of which is bolted to the web of the side bar 21. Brackets 25 have upwardly projecting arms 25a at the inner sides of which are recessed flanges 25b, said brackets having inwardly extending flanges 25c extending around their inner edges. Bars 21 have bolts to the outer sides thereof at spaced intervals pointed plates 26, the same having downwardly diverging sides and having horizontal slots 26a through which the bolts securing them to bars 21 pass, whereby horizontal adjustment of said plates is possible. An endless chain 27 is supported on each of the bars 21, the upper run of the chain moving on the top of the bar as a track and the lower run running on the lower flange as a track. Chains 27 run over sprockets 28 journaled on studs carried in brackets 25 at the right hand end of the machine and run over sprockets 29 carried on studs secured in bars 21 at the left hand end of the machine. Chains 27 have connecting members 27a at the ends of the links and between the same projecting above and below the links, thus forming spaces or pockets 27b between adjacent members 27a. Chains 27 in the operation of the machine are intermittently moved in the direction of the arrows shown in Figs. 1 and 6 by a pawl member 30 having a hooked wedge shaped arm 30a adapted to engage between the members 27a and having a downturned end pivoted to a bracket 31 extending downwardly and secured to a channel bar 32. Channel bar 32 is carried at its lower end on a rod 32a pivoted in brackets 33 secured to one of the end standards 10. Bar 32 extends upwardly at one side of the machine and has secured adjacent its top another bar 34 which diverges therefrom and is connected to the bar adjacent its upper end by another bar 35. Bar 34 is provided for a purpose to be later described. Bar 35 will have a plurality of holes 35a therein through any one of which may pass the bolt connecting the same to bar 32. It will be understood that there is one of each of the members 30 to 35 at each side of the machine, one member 30 acting on one of the chains 27 and the other acting on the other of the chains 27. A stop pin 34a projects from each of the members 12 into the path of bar 34 and forms a stop therefor. A pair of rails 36 are provided, which, in the embodiment of the invention illustrated are shown as being in the form of channel bars with their channels directed outwardly, said rails being disposed at either side of the machine, as clearly shown in Fig. 4. Said rails have secured thereto pairs of guiding members 37 having outwardly directed flanges which diverge at the top and bottom of the bracket and embrace flanges 38a of vertically extending angle bars 38 secured at their tops to the frame members 12 and at their bottoms to frame members 13. Said rails 36 move between the vertically extending angle bars 38 and vertically extending angle bars 39 also connected at top and bottom, respectively, to frame members 12 and 13. Bars 38 have their inwardly extending flanges cut

away adjacent their upper ends as shown at 38b for a purpose which will later appear. Cam rollers 36a are carried on studs secured in rails 36 and adapted to engage bar 34.

5 Carrier brackets 36b are secured in spaced relation along rails 36 being clamped thereon by the set screws 36c, said brackets having horizontal and upwardly and rearwardly extending flanges projecting inwardly therefrom.

10 Rails 36 are constructed and arranged to be moved through an elongated oblong path and for this purpose are connected to endless chains 40 by means of brackets 41 disposed in the channels of rails 36 and connected to a link of said chain.

15 Chains 40 at their lower ends run over sprockets 42 carried on stud shafts mounted in brackets 43 secured to certain of the standard members 10. Brackets 43 are shown as having oblong slots in their attaching flanges to receive the securing bolts so that said brackets may be vertically adjusted.

20 Chains 40 at their upper ends run over sprockets 44 carried on shafts 45 mounted in bars secured to the standards 10, said shafts also carrying at the outer side of said channels sprockets 46. Endless chains 47 run over the sprockets 46 respectively at each side of the machine and also over small sprockets or pulleys 48

30 carried on studs mounted in brackets 49 depending from the frame members 12. Chains 47 also run over small driving sprockets 50 which are mounted on a shaft 51 suitably journaled in a bracket 52 secured to a plate member 53 extending across the top of members 12, said bracket constituting a casing housing a worm wheel gear 54 secured to shaft 51. Collars 55 are secured to shaft 51 at either side of bracket 52 and prevent

40 endwise movement thereof. Shaft 51 is journaled at its other end in a bracket (not shown) secured to one of the members 12. Worm wheel gear 54 meshes with a worm gear 56 also housed in bracket 52 and secured to a shaft 57 projecting from said bracket and having secured thereto a rather wide-flanged pulley 58. Pulley 58 is driven by a belt 59, shown as a round belt, the same running over a cone or stepped pulley 60 secured to the armature shaft of a motor 61.

50 Motor 61 is secured to a plate 62 having flanges which embrace the edges of a guide plate 63 mounted on the side of one of the standards 10. Said plate 62 has secured thereto a flexible member, such as a chain 64 which runs over a grooved sheave 65 mounted on the stud secured to the standard 10, said chain 64 having secured to its other end a counter weight 66 which hangs alongside of standard 10. In practice, counter weight 66 has been made about four pounds lighter than the motor 61. With the described construction it is seen that motor 61 hangs on the belt 59.

65 The machine described is practically all disposed in a dark room, such as commonly used in photographic work. The machine faces and is disposed adjacent one wall of the room, the top portion of which is shown in Fig. 1 as 67, extending above the top frame members 12. Said front wall or partition 67 also extends down between the end standards 10 as shown in Fig. 1. Side panels 68 extend downward from member 67 to a point adjacent a drain pan 69 below which end wall 67 again extends between standards 10. This leaves a rectangular opening between the top and bottom portions of wall 67 and the side panels 68. A vertically and inwardly extending plate or wall 70 extends from the inner end of drain pan 69 to a pair of vertically extending and comparatively small angle bars 71. Plate 70 extends substantially to the top of side bars 21 and has its top extending horizontally for a short distance. A pair of side plates 72 are provided having, as shown in Fig. 8, their upper rear portion sloping downwardly and rearwardly. Plates 72 extend downwardly at either side of plate 70 to the bottom of the machine. Above side bars 21 plates 72 have their inner ends 72a turned inwardly as shown in Fig. 3. Another plate 70a of channel shape in horizontal cross section has its sides extending along rear tank 20 and its central portion extending across the rear of rear tank 20, said plate extending upwardly substantially to the top of side bars 21. A vertically movable curtain or partition 73 moves at its upper portion between angle members 71 and ends 72a and at its lower portion between plate 70a at its rearward side and small guide members 70b secured to said plate. Said curtain has a horizontally extending angle bar 74 secured thereto extending outwardly some distance at each side of the curtain to each end of which is attached a flexible member such as a chain 75 which extends upwardly over a sheave 76 mounted on a stud carried by a plate 77 secured to and extending forwardly from bar 32. A plate bracket 78 is secured to plate 76 enclosing said sheave. Chain 75 extends downwardly from sheave 76 and is secured to a bracket 79 projecting forwardly from a vertically extending bar 80 movable alongside of a vertically extending angle bar 81 and having another bracket 82 at its top similar to bracket 79. Brackets 79 and 82 and the bar 80 are disposed respectively at the front and rear of the angle bar 81 and act as guides in connection therewith. It will be understood that there is one of the vertical angle bars 81 at each side of the machine, as there is also one of the bars 80 at each side of the machine with the attached parts. The bars 80 tend to descend by gravity and pull on the chains 75 thus tending to raise the curtain or partition 73, said bars and attached parts being heavier than said curtain. Vertical bars 81 are secured to the standards 10 by plates 83 which extend be-

tween the inwardly and outwardly directed flanges of bars 81 and 10 forming a connection shutting out the light. Side plates 84 extend between the rear standards 10 and are secured thereto thus shutting out the light at the sides of the machine. The wall of the dark room in line with side panel 68 may extend, as shown at 85, at each side of the rear end of the machine. Plates 86 are disposed respectively at either side of the machine having their planes extending longitudinally thereof, said plates having downwardly and forwardly beveled lower ends 86a, these plates being secured to vertically extending angles 87 disposed within the rails 36. Plates 86 at their inner sides have small angle members 88 secured thereto forming the rear guides for a vertically movable forward curtain or partition 89. A sheet metal plate 90 extends between plates 86 in front of curtain 89, the same extending from top members 12 downwardly to a point some distance above side bars 21. Curtain 89 has a flexible member such as a chain 91 secured centrally thereof, which chain passes upwardly and laterally to pass over a pair of sheaves 92 secured to a plate 93 extending across members 12. Chain 91 extends downwardly and is secured to one of the rails 36.

A drying rack or conveyor is provided outside of the dark room to which the films are transferred and in the embodiment of the invention illustrated this includes a pair of rail members each comprising a vertically disposed plate 95 at its inner side supported by a bracket 96 which projects inwardly from a standard member 10. Plate 95 has secured to its bottom an outwardly extending angle bar 97 and has also secured to its top and outer side another angle bar 98. A plate 99 extends between the outwardly extending flanges of bars 97 and 98 for a portion of their length thus forming a closed rectangular housing. At the ends of said rails plate 95 has secured thereto oblong castings 100 having longitudinally extending slots 100a through which the securing bolts 101 pass thus providing for adjustment of said castings longitudinally of plate 95. The angles 97 and 98 will extend to a point closely adjacent castings 100. Endless chains 102 travel respectively on said rail structures, the upper run of each chain traveling on the horizontal flange of angle bar 98 and the lower run traveling on the horizontal flange of angle bar 97. Said chains merely slide around the ends of castings 100. It will be noted that plates 95 and 99 extend above the horizontal flange of angle bar 98 so that the upper run of chain 102 travels in a trough and is kept from lateral movement. Plates 95 at their forward ends are disposed closely adjacent plates 72 and are bolted thereto. It will be seen that the rails carrying chains 102 move through openings cut in the side panels 68. To prevent the entrance of light around these rails the said openings are closed by fabric curtains 120 made of material such as felt and secured to small brackets 121 bolted to panels 68. The curtains 120 engage the chain 102 so a closed structure is formed. The chains 102 are intermittently moved by a pawl 103 which is disposed between the runs of the chain and engages the lower run, said pawl being pivoted at one end to a bell crank lever 104 which in turn is pivoted to a bracket 105 secured to lower angle 97. A chain 106 is secured at the outer end to the long arm of bell crank lever 104 and extends upwardly and over a sheave 107 carried on a stud secured in one of the top members 12 and over a second sheave 108 similarly secured, said chain then passing downwardly and being secured to rail 36. It will be understood that there is one of the bell crank levers 104 and chains 106 for each of the chains 102. The rails carrying the chains 102 are further supported rearwardly of the rear standards 10 by vertical posts 109 shown as made from pipe, the same having brackets 110 secured thereto and extending to and secured to outer plates 99. The posts 109 extend above chains 102 and support at their upper ends a pair of angle bars 111. The bars 111 form part of a frame work supporting a motor 112 constructed and arranged to drive a fan 113, said fan being arranged to direct a blast of air downwardly.

The films to be handled by the machine are supported on a film-carrying member comprising a stick or bar 114 having its sides converging downwardly to an edge for a short distance adjacent its ends. Said bar has secured thereto adjacent its ends triangular plates 115 having their pointed sides directed downwardly. Said bar has secured thereto a plurality of film retainers 116 having portions projecting below bar 114 and having film holding clips 117 secured thereto. The ends of the films 118 are clamped and gripped by the clips 117 and depend therefrom. A water supply pipe 123, shown in Fig. 1, is provided to supply water to the tanks 19 and 20 and will be connected thereto by suitable couplings 124.

In operation, the motor 61 will be driven, thus driving the chains 47 and 40 through the belt 59 and gears 54 and 56. Rails 36 are thus moved upward with chains 40 and are given rearward movement as the chains 40 pass over their upper sprockets. Guide members 37 move upward along angle bars 38 and pass through the openings 38b when the rails move longitudinally. As the rails descend the rear guide members 37 are brought into alignment with the inwardly projecting flanges of angle bars 38 respectively and move downward thereon. These guide members 37 prevent longitudinal vibration of rails 36. The operator places bar 114 on the ledge 25b of bracket 25 and connects

the films 118 to clips 117. A weight 119 is usually clipped onto the other end of the film to cause the film to hang vertically. When the films have been so connected, the operator lifts bar 114 and sets the same down on the chains 27, the bar extending across from one chain to the other and seating between the members 27a. The bar is guided to position by the plates 115 moving in between the plates 22. The bar and films are now supported by the chains 27. After the rails 36 pass through their movement at the top of the machine, rollers 36a engage bars 34 and move the same to the left as shown in Fig. 1, thus swinging bars 32 about their pivots in brackets 33. This moves the brackets 31 and pawls 30 and the movement is just sufficient to move the top runs of chains 27 rearwardly the distance of one link. Bars 114, therefore, placed on the chains will be intermittently moved rearwardly. When the bars reach a certain position they will be lifted at their ends by the members 36b at the ends of rails 36 as the same are carried upward by the upward run of chains 40. The end portions of bars 114 are made of wedge shape at their lower sides so that there will be wider spaces for the upwardly extending flanges of members 36b to pass between and so that said bars will easily seat themselves on members 36b. In Fig. 6 the bar 114 is shown as having been lifted a short distance above the chains 27. Bar 114 is carried upward on members 36b and by the rails 36 and the film is lifted up above the cross bars 21 well above the tanks 19 and 20. As the rails come down with the downwardly moving runs of chains 40, the film is lowered and moves downwardly in the front tank 19 adjacent the front end thereof. The members 26 are so placed that as the bar 114 approaches chains 27, its ends engage the rearward side of said members 26 and it slides forwardly some distance, thus coming to rest on chains 27 some distance ahead of where it would come to rest had it not engaged the members 26. This extra rearward movement of the bar 114 and films is provided to furnish plenty of clearance for the next row of films that is lowered by the rails 36. As above described, with each cycle of rails 36 chains 27 are moved rearwardly one link so that the next bar 114 lowered will come to rest on chains 27 on the links behind those on which the previous bar 114 is disposed. The chains 27 are thus progressed until enough bars 114 are disposed thereon to substantially fill the tank 19 or as many as said tank will conveniently hold. When this occurs the bar 114 holding the most rearward films in the tank comes into the path of the next pair of carriers 36b and will be lifted thereby and moved forwardly so that when said bar descends the film depending therefrom will be lowered into the forward end of the second tank 19. Chains 27 being moved, the films will be progressed step by step through this second tank 19 and when they reach the rearmost position thereof they will be lifted by the next or third set of the carriers 36b and raised from the second tank 19 and lowered into the forward part of the third tank 19. It will be understood that each time the films are lowered the bar 114 engages a pair of the members 26. The films are thus progressed through each tank successively and upon reaching the rearward end thereof are lifted and placed in the forward end of the next tank. This operation continues until the films have been progressed through the last tank 20. It will be understood that after the machine has been in operation some time each one of the carriers 36b will lift a film on the upward movement of the rails 36 as is indicated in Fig. 1. The rearmost film in each tank will be removed and placed in the forward position of the next tank and a fresh film will be lowered in the forward position in the first tank.

As above described, the rear end of the machine is adjacent the dark room wall and as clearly shown in Fig. 8, light is shut off from the exterior by said wall. The means shutting off the light includes the upper plate 85, the rear walls 67, panels 68, plate 70 and the sliding curtains 73 and 89. As the bar 114 is raised from the last tank 20 and moved up on the next pair of carriers 36b, said bar engages the lower beveled ends of the plates 86 and is cammed rearwardly. The carrier 36b at the rear is slightly different from the other carriers in that it is of greater longitudinal dimension and its rearwardly and upwardly extending flange is somewhat longer. The bar can thus be moved rearwardly without being moved off of the carrier. In Fig. 6 the bar 114 is shown as having passed the lower ends of the plate 86. As the rails 36 move downwardly and approach their lower position they pull down on chains 91 and raise the forward curtain or partition 89. This curtain is thus raised so that its bottom edge is above the top of the films in the rear tank 20 and the bar 114 can thus move to the rear of said curtain and elevate the films without any obstruction from the curtain. As the film is raised and rails 36 move upwardly, chain 91 is moved upwardly and the curtain is allowed to descend to its lowermost position, as shown in Fig. 8. As the rails 36 rise, carrying the films they engage the brackets 82 at the top of the bars 80 and bars 80 are raised thus slacking the chains 75 and allowing the rear curtain 73 to descend by gravity. This curtain continues to descend as the rails 36 move upwardly until its upper end is substantially at the top of bars 21. As the bar 114 is raised in the rear of the forward curtain 89, it can thus move over the top of the rear curtain 73. As

soon as the film moves over the rear curtain 73 and rails 36 start to descend, bars 80 also descend and raise the rear curtain 73. The forward curtain in the meantime has reached its normal low position and will not be again raised until another bar of films is lifted by the rails 36 and carriers 36b. It will thus be seen that the forward curtain 89 is down when the rear curtain 73 is lowered so that there is always a partition shutting out the light from the dark room in which the films are being progressed. As the rails 36 and the rear end members 36b descend with the bar 114 thereon which has been removed from the rear tank 20, the ends of said bar will engage the downwardly inclined sides at the rear of plates 72 and said bar will be moved rearwardly so that it will be deposited on the chains 102. Chains 102 are intermittently moved by pawl 103, which is actuated every time the rails 36 pass through a cycle. It will be seen that bell crank lever 104 is oscillated by chain 106 by the motion of rails 36 to which said chain is secured. Sufficient movement is given to pawl 103 to move chain 102 the distance of three links. The members 114 and the rows of films will thus be spaced quite a distance on the chain 102 and there will be no danger of the successive rows of films engaging each other. As the films move along on the chains 102 they are subjected to a blast of air from the fan 113 and are dried thereby. As the films are placed on the chains 102 they are wet and the drippings therefrom are received in drain pan 69. This pan is open at its forward end and the liquid falling thereinto will run into the tank 16. It may also be mentioned that the over-flow from tanks 20 will pass into tank 16 as indicated by the arrows in Fig. 1 and any liquid which may pass out of tank 18 will also be received in tank 16. Water may be delivered to tank 18 to control the temperature of the solution in the tanks 19. A counter 122 will be secured to the plate 99 and actuated at each operation of chain 102 so as to count the number of film holders delivered to said chain. It will be noted that bars 80 pull down on the brackets 77 thus normally swinging bars 32 to the right as shown in Fig. 1, the same engaging the stop pins 34a.

It is desirable to have means for varying the rate of travel of the films through the various liquids and such travel is varied in applicant's machine by shifting the belt 59 to the various steps on the cone pulley 60. It will be noted that when the belt is shifted to one of the smaller steps of the cone, the motor 61 and its plate 62 will move downward slightly thus taking up any slack in the belt 59 and maintain the same tension on the belt. In one embodiment in actual practice of applicant's machine, there is variation enough in the cone steps to give a variation

of speed of about 100%, although a greater variation could be accommodated if desired. The pulley 58 is made rather wide so as to accommodate the movement of the belt on the cone pulley 60.

It will be noted that the movement of conveyor chains 102, chains 27, and of the curtains 73 and 89 are all synchronized with or controlled by the movement of rails 36. All these movements are also caused by the one driving motor 61. Plates 26 are made adjustable so that they can be located in proper relation to the carriers 26b. The guard member 15 is provided to separate the dry undeveloped films from the tanks 18 and 19 and prevent any liquid from the tanks reaching said films or the operator.

From the above description it is seen that applicant has provided a comparatively simple and very efficient machine for developing and washing films and by means of which they are progressed through the various film treating liquids, being transferred from one liquid container to another. By so handling the films they are very accurately timed in their movements and scratching and damaging of the films by manual movement is avoided. The machine does the work of several operators who would have to be present to transfer the films from one liquid container to another after a certain time. The films are also automatically removed from the dark room without letting any daylight from the exterior of said room pass thereinto. It will be noted that after the machine has been operating a short time to have its quota of films in each container, that a holder of films is lifted from each container at each cycle of movement of the rails 36, one holder of films also being lifted to be placed in the first container. At each cycle of movement of rails 36 one holder of films is transferred from each receptacle to another or discharged from the dark room, one set of films being placed in the first container.

It will, of course, be understood that various changes may be made in the form, details, proportions and arrangement of the parts, without departing from the scope of applicant's invention, which, generally stated, consists in a device capable of carrying out the objects above set forth, in the novel parts and combinations of parts disclosed and defined in the appended claims. The term film used in said claims is intended to cover plates and other sensitized members.

What is claimed is:—

1. A film handling apparatus having in combination, a series of liquid containers, a conveyor movable therealong adapted to support film-carrying members from which the films extend into said containers, said containers to be of substantially equal dimensions in the direction of movement of said conveyor, a pair of rails extending along said

containers having spaced means thereon for lifting said film-carrying members from said conveyor, advancing said film-carrying members and lowering said film-carrying members into engagement with said conveyor, and means to progress said conveyor at each cycle of movement of said rails.

2. A photograph developing machine having in combination a plurality of liquid containers, a number of which are in alignment, a conveyor extending adjacent a number of said containers, film-carrying members supported by the conveyor from which films extend into said containers and are intermittently carried through said containers by said conveyor, and rigidly connected means for elevating a plurality of said film-carrying members from said conveyors while stationary and transferring the same from certain locations on said conveyor to other locations thereon respectively.

3. A film handling apparatus having in combination, a series of adjacent liquid containers, endless chains movable along each side thereof adapted to support film-carrying members from which the films extend into said containers, each container being adapted to hold films from the same number of film-carrying members, a film receiving conveyor at the rear end of said containers, a pair of rails extending along all of said containers having spaced means thereon for lifting a film-carrying member to remove films from the rearmost position in each of said containers, also having means thereon for lifting a film holding member from the forward end of said chains, means for moving said rails through a closed path to lift said film-carrying members, advance the same a fixed distance and lower the same whereby the films lifted from each of said containers respectively are lowered into the most forward position of the next adjacent container and the films on the film-carrying member lifted from the forward end of said chains are disposed in the forward end of the first container, the film-carrying member lifted from last container being transferred to said film receiving conveyor.

4. A film handling apparatus having in combination, a series of liquid containers, a conveyor movable therealong adapted to support film-carrying members from which the films extend into said containers, a pair of rails extending along said containers having spaced means thereon for lifting said film-carrying members from said conveyor, movable members moving said rails through an oblong path to lift, progress and lower said film-carrying members, and means engaging said conveyor for intermittently progressing the same, said last mentioned means being actuated by said rails.

5. A film handling apparatus having in combination, a series of liquid containers, a

conveyor movable therealong adapted to support film-carrying members from which the films extend into said containers, a pair of rails extending along said containers having spaced means thereon for lifting said film-carrying members from said conveyor, advancing and lowering the same, said means being movable longitudinally of said rails and means for holding said means in definite positions.

6. A film handling apparatus having in combination, a movable supporting means, a plurality of liquid containers below said supporting means, a drying support at one end of said containers, means for lifting a film-carrying means from one end of said support and moving it to immerse the film carried thereby in said first container, means for moving intermittently said supporting means to progress said film-carrying means to move the films carried thereby through said first container, said second mentioned means acting to successively transfer said film carried by said film-carrying means from one container to another after moving through said container and means co-acting with said second mentioned means to transfer said film-carrying means to said drying support.

7. The structure set forth in claim 6, and means for intermittently moving said drying support greater distances than said supporting means is moved.

8. A film handling apparatus having in combination, a supporting device for a film-carrying member, means for engaging and lifting said film-carrying member, advancing the same a fixed distance and then lowering said film-carrying member to said support and means for advancing said film-carrying member a short distance relatively to said means and support as it near said support.

9. A film handling apparatus having in combination, a film-carrying member, spaced longitudinally extending supports at each end of said member for supporting said member, means engaging the ends of said member and lifting the same from said supports, raising it a certain distance, advancing it a certain distance and then lowering it to said supports and means for advancing said member relatively to said means and supports as it nears said supports.

10. A film handling apparatus having in combination, a plurality of liquid containers, conveyors movable along the tops and at the sides of said containers, a pair of cross bars extending along the tops of said containers at each side thereof, cam plates having downwardly inclined edges carried by said cross bars adjacent one side of each container, said conveyors being adapted to support film-carrying members extending therebetween and resting thereon, a pair of rails extending along each side of said containers having

means thereon for respectively engaging film-carrying members supported on said conveyors, lifting, advancing and lowering said film-carrying members, said members being lowered into contact with said cam plates whereby they are moved longitudinally as they descend near said conveyors.

11. A film handling apparatus having in combination, a conveyor disposed in a dark room and adapted to support and move a film-carrying member rearwardly, means on said member holding a film depending in a substantially vertical plane, a forward partition in said room aligned with said conveyor, a rearward partition in said room aligned with said conveyor, means for vertically and relatively moving said forward partition and film-carrying member for progressing said film-carrying member under said forward partition while so vertically moved, means for vertically and relatively moving said rear partition and film-carrying member for progressing said film-carrying member over said rear partition while so vertically moved, whereby light is prevented from entering said dark room.

12. A film handling apparatus having in combination, a series of liquid containers, a conveyor movable therealong adapted to support a film-carrying means, a pair of rails extending along each side of said containers respectively, having means for lifting said film-carrying means from said conveyor, means for moving said rails through an oblong path to lift, progress and lower said film-carrying means, a pair of curtains past which the film-carrying means are moved, means for intermittently and synchronously moving said conveyor and means for moving said curtains, said last two means being actuated by said rails.

13. The structure set forth in claim 12, a conveyor for receiving said film-carrying means and means actuated by said rails for intermittently operating said conveyor.

14. A film handling apparatus having in combination, a liquid container, a conveyor movable adjacent the top thereof adapted to support a film-carrying member, means on said member supporting a film in depending position in a substantially vertical plane, means for raising, advancing and lowering said film-carrying member, means adjacent said conveyor for moving said film-carrying member longitudinally of said conveyor as it is raised, a vertically extending partition beneath which said film-carrying member is moved and past which it is moved by said longitudinal movement, means adapted to move said film-carrying member longitudinally of said conveyor as it is lowered and a vertically extending partition over which said film-carrying member is moved and past which it is moved by said last mentioned longitudinal movement, and a film-receiving means

to which said film-carrying member is delivered as it is lowered.

15. A film handling apparatus having in combination, a conveyor adapted to support a film-carrying member, said member having means supporting a film in depending position in a substantially vertical plane, a partition extending from adjacent said conveyor upwardly, a partition spaced from said first partition and extending from adjacent said conveyor upwardly, means for raising said first partition, means for lifting said film-carrying member and advancing it beneath said first partition, and lowering said first partition, means for lowering said second partition after said film-carrying means is raised and advancing said film-carrying means over said second partition and for raising said second partition after said film-carrying means has passed the same.

16. An apparatus for handling photographic films having in combination, a series of liquid containers, a conveyor for supporting film-carrying members so that the films carried thereby extend into said containers, means for lifting, advancing and lowering said film-carrying members, a pair of movable partitions past which said film-carrying members and films are moved, a drying conveyor to which said film-carrying members are delivered, and a common driving means for progressing said conveyor, to move the films through said containers, operating said first mentioned means, said partitions and said drying conveyor, whereby the movements of said parts are synchronized.

17. A film handling apparatus having in combination, a frame, a pair of conveyors movable in said frame at each side thereof respectively adapted to support a film-carrying member extending therebetween, brackets at one end of said frame adjacent said conveyors and longitudinally aligned with said conveyors respectively adapted to support said film-carrying member while the films are attached thereto whereby said film-carrying member can then be placed on said conveyor and carried thereby.

18. A photograph developing machine having in combination a series of liquid containers, a pair of conveyor chains running adjacent the upper edges of said containers, the links of said chains being constructed and arranged to support film-carrying members extending therebetween from which films extend into said containers respectively, means for intermittently advancing said chain the distance of one link and a pair of rails extending along all of said containers at each side thereof having spaced means thereon for simultaneously lifting said film-carrying members, advancing the same and lowering the same to advanced locations on said conveyor chains, said chains being

moved at each cycle of movement of said rails.

19. A film handling apparatus having in combination, a plurality of liquid containers, a conveyor movable thereover, a film carrying member supported on said conveyor, having films depending in a vertical plane therefrom, a pair of rails for lifting said film carrying member from said conveyor, advancing the same and lowering the same, a pair of longitudinally spaced partitions, means operated by said rail for raising one partition above said conveyor so said film carrying member can move thereunder, and means for lowering the other partition so that said film carrying member can be moved over the top thereof when lifted by said rails.

20. The structure set forth in claim 19, said last mentioned means also being operated by said rails.

21. A film handling apparatus having in combination, a pair of conveyors movable longitudinally in parallel relation, a film carrying member extending between said conveyors and supporting films in depending vertical position, a pair of rails extending parallel to said conveyors for lifting said film carrying member from said conveyors, advancing the same and lowering the same onto said conveyors, a pair of partitions spaced longitudinally of said conveyors, means for raising one partition with its bottom above said conveyor so that said film carrying member can pass thereunder, and means for lowering the second partition subsequently so that said film carrying member and films can pass thereover when lifted and advanced by said rail.

22. A film handling apparatus having in combination, a plurality of adjacent containers for liquid, means to support and automatically move a plurality of groups of films through said containers, there being one group in each container respectively, and means movable as a unit to simultaneously lift the film from one position in a group in each container, progress and lower the said film respectively to a different position relative to the group in the next adjacent container.

23. A film handling apparatus having in combination, a plurality of adjacent containers for liquid, means for supporting and automatically advancing groups of films in said containers intermittently, there being one group in each container, means movable as a unit for simultaneously lifting the rear-most film of each group in each container while stationary, advancing said film and lowering the same respectively to the foremost position of the group in the next adjacent container.

24. A film handling apparatus having in combination, a dark room, a film conveyor therein adapted to support film carrying

members, a film receiving means outside of said dark room, film carrying members on said conveyor from which films depend, means preventing the entrance of light into said dark room including alternately movable partitions, and means for moving a film carrying member under one of said partitions, then upwardly and over the other partition, said partitions being moved to constantly shut out light.

In testimony whereof I affix my signature.
GLEN M. DYE.

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