L. D. NESBIT.

APPARATUS FOR DEVELOPING OR INTENSIFYING PHOTOGRAPHIC PLATES.

APPLICATION FILED DEC. 29, 1914.

1,233,109.

Patented July 10, 1917.

2 SHEETS—SHEET 1.

FIG. 1.

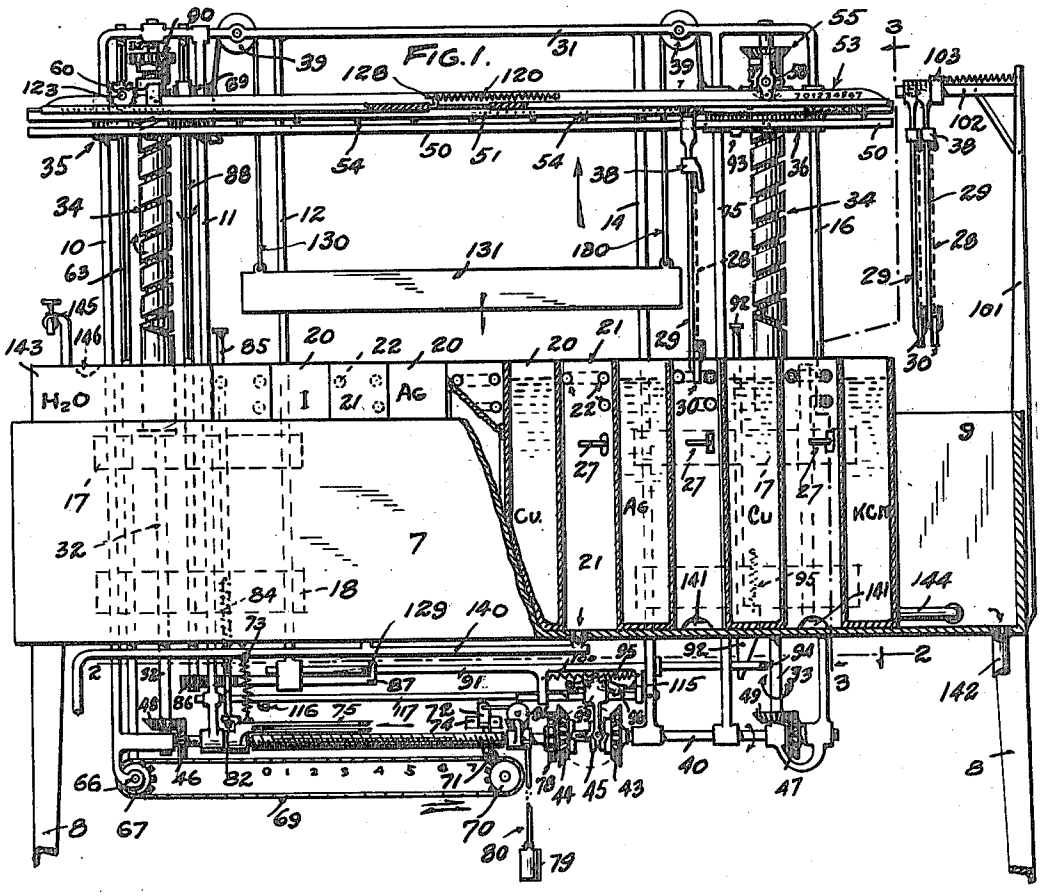


FIG. 2.

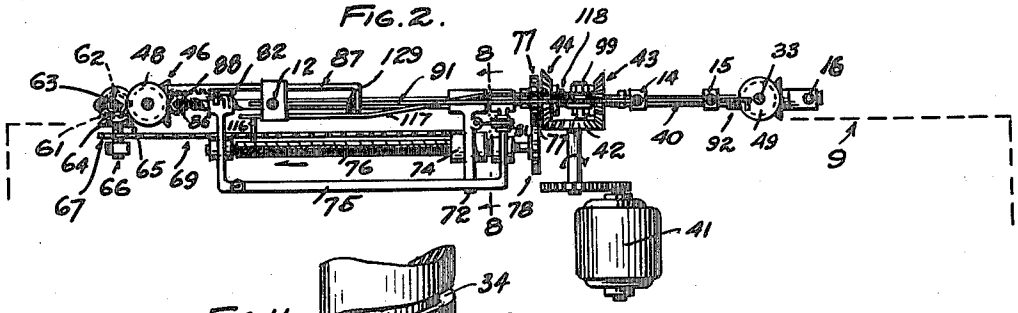
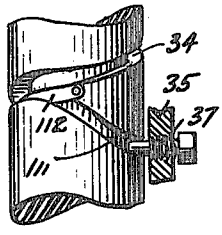


FIG 11



WITNESSES

John D. Smith

Elizabeth Schaelchlin

INVENTOR

LEROY D. NESBIT

BY Walter V. Keene

L. D. NESBIT.

APPARATUS FOR DEVELOPING OR INTENSIFYING PHOTOGRAPHIC PLATES.

APPLICATION FILED DEC. 29, 1914.

1,233,109.

Patented July 10, 1917.

2 SHEETS—SHEET 2.

FIG 3

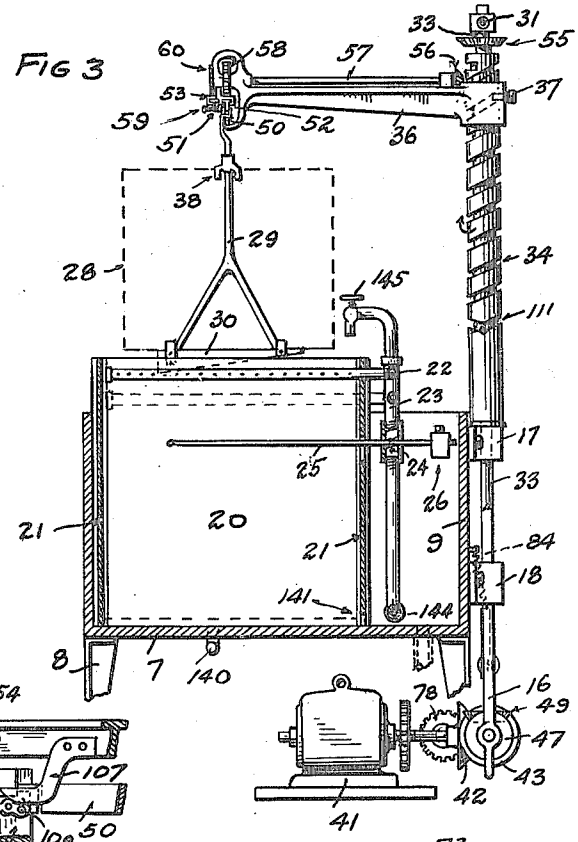


FIG. 4.

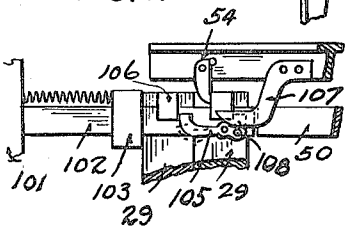


FIG. 5.

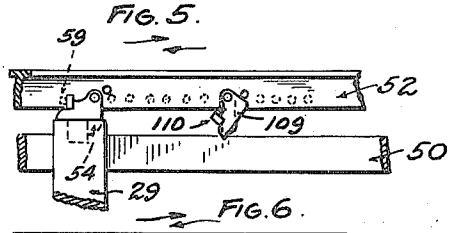


FIG. 6.

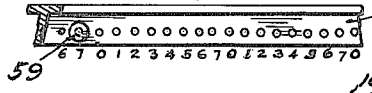


FIG 7

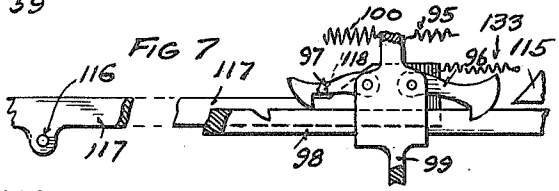


FIG 8.

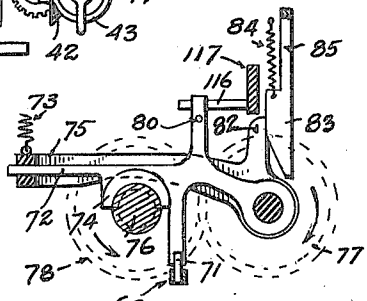


FIG 9

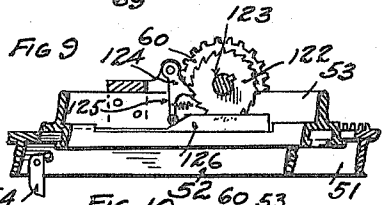
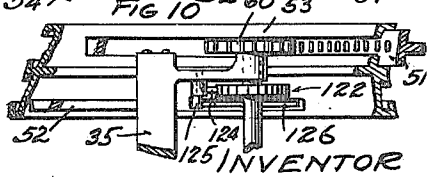


FIG 10



WITNESSES

Irvin D. Smith

Elizabeth Schoellkopf

INVENTOR

LEROY D. NESBIT

BY Walter V. Keene

ATTORNEY

UNITED STATES PATENT OFFICE.

LEROY D. NESBIT, OF LOS ANGELES, CALIFORNIA.

APPARATUS FOR DEVELOPING OR INTENSIFYING PHOTOGRAPHIC PLATES.

1,233,109. Specification of Letters Patent. Patented July 10, 1917.

Application filed December 29, 1914. Serial No. 879,468.

To all whom it may concern:

Be it known that I, LEROY D. NESBIT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Apparatus for Developing or Intensifying Photographic Plates, of which the following is a specification.

This invention relates to apparatus for developing or intensifying photographic plates, and the principal object is to provide an automatic device by which the plates are either developed or intensified by immersion in the proper solutions.

It is also an object to provide an apparatus as above described with means that also permit the washing of the plates between the developing or intensifying solutions, the water being automatically operated by the plate dipper.

It is also an object to provide means to automatically lower and raise the plates and to shift the plates when the carriage is in the elevated position, together with means to balance the carriage so that no strain will come upon the mechanism.

It is also an object to agitate the plates while immersed in the baths and while washing for a period as required, this period being so arranged that it may be varied for each immersion and washing or all may have their period the same.

It is a further object to provide mechanically operated means to control the clutch mechanism which is constantly driven by a suitable motor, the carriage lifting mechanism being so arranged that when in the upward position or elevated, the continued movement of the lifting screws throws the clutch and reverses the movement, at the same time shifting the plates on the carriage a determined distance for the next bath or washing.

It is a further object to provide an auxiliary stationary track upon which a supply of dippers with the plates clamped thereon may be placed at any time in the operation of the machine.

It is a still further object to provide means to separate the valuable washings and recover the salts of silver commonly lost.

In the drawings accompanying this specification;

Figure 1 is a front elevation, the legs of the sink being broken away as well as a portion of the sink to more clearly show the tanks and washing mechanism.

Fig. 2 is a section on the line 2—2 of Fig. 1 looking in the direction of the arrow to show the pause and reversing mechanism in plan.

Fig. 3 is a section on the line 3—3 of Fig. 1 showing most of the apparatus in elevation.

Fig. 4 is a detail of the two tracks from the rear showing the moving bar engaging a dipper just before shifting the same to the main track.

Fig. 5 is a front elevation of a portion of the dipper shifting bar, engaging a dipper, the pause producing bar being shown in

Fig. 6 from the front and in the companion position to the shifting bar in Fig. 5, the figures from 4 to 10 being on the same scale.

Fig. 7 is a front elevation of the trip bar for reversing the clutch, the pawls shown with the drive elevating the carriage.

Fig. 8 is a section on the line 8—8 of Fig. 2 viewed in the direction of the arrow, the nut being engaged with the screw.

Fig. 9 is a rear view of the ratchet mechanism for controlling the action of the spring actuated return of the pause bar.

Fig. 10 is a plan of the elevation shown in Fig. 9 and

Fig. 11 is a detail of the gate on the "dip" portion of the elevating and lowering screw.

Heretofore in making negatives by the wet plate method for process work the necessary developing, fixing and intensification has been done by pouring the chemicals from bottles onto the plates, back into the bottles and washing under a water faucet. This is a tedious and costly method requiring the time of the operator together with a great loss of chemicals and an excess of water.

This invention overcomes the objections as noted above and provides a fixing and intensification apparatus that is automatic in its action and requires no manual attention after having been regulated. The combined lowering, agitating, raising and advancing movements may be varied by the speed of the motor, and the pause and accompanying agitation by the automatic pause mechanism.

An auxiliary track is also provided so that the plates clamped to their dippers may be introduced to the machine at any time, the

apparatus shown being designed to give a fixing, double intensification and bleaching action with the required washings.

Any number of operators may use the same machine, sending the plates through the process as fast as the advancing means will allow, the plate dippers with their plates being stored up over the large water tank at the end and kept wet by each downward movement and dip until removal from the machine.

The washings after each immersion in the costly solutions of silver are separated from the other waste waters and piped to precipitating tanks, thus providing great economy and soon saving the cost of the apparatus as well as a saving in labor together with a more efficient and uniform operation and result.

More specifically in the drawings, 7 designates the sink or tank within which the solution tanks are preferably supported, this sink being shown as commonly made of plank and supported from the floor by legs 8—8. The main frame of the apparatus is preferably secured to the back 9 of the sink and as shown is composed of sections of pipe 10 to 16 vertically supported a suitable distance from the back 9 by the brackets or bearings 17, 18 these brackets being of metal.

Supported in the sink and preferably at right angles to the front wall and spaced a definite distance apart are a plurality of narrow vertical tanks 20, adapted to hold the solutions for the purposes designated, the equally spaced distance between each pair, being closed by the apertured side walls 21 as desired through the upper apertures of which project the perforated horizontally disposed spraying pipes 22, two being shown on the film side with their openings facing inward, each set being joined to an upright 23 in which is mounted a butterfly valve 24 operated by a balanced lever 25, the balancing weight 26 being on the opposite end from that having the finger 27 which extends into the path of the plate 28 clamped on the dipper 29, and is operated by the lower inclined edge of dipper foot 30, this inclination also serving to induce a rapid drip for the solutions adhering to the plate after withdrawal. The plates rest on the foot 30 and are clamped to the dipper by a sliding clamp 38, the film side away from the frame of the dipper and to the right.

The uprights 10 to 16 are preferably joined at their upper ends by a bar 31 to form the bearings for the shafts 32 and 33 and the sheaves 39 to carry the chains 130 secured to the carriage frames and the balancing weight 131, this weight being guided by the uprights 12 and 14. The shafts 32 and 33 have formed or support on the intermediate portions the screws 34 which are embraced by the carriage frames 35 and 36 respectively, the rear portion of these frames also being bored to slide upon the uprights 10 and 11 and 15, 16 respectively so that they preserve a parallel relation and movement conveyed thereto by the pins 37 projecting into the parallel screw cuts, the shafts being driven in the same direction by suitable connections from the main shaft 40, supported in bearings in the uprights and preferably in a plane below the sink 7. By this arrangement of the framework the sink may be placed near a wall and the front of the apparatus left entirely free, the ends being practically open also.

The main shaft 40 is constantly driven through the clutch mounted thereon, by the motor 41 geared to the jack shaft carrying the bevel gear 42, which meshes at all times with the bevel gears 43 and 44 loosely mounted on the shaft 40, and between which is the oppositely toothed member 45 of the clutch which is keyed to the shaft 40.

From the shaft 40 the shafts 32 and 33 are driven by the bevel gears 46 and 47 respectively on the ends of the shaft 40, these gears meshing at all times with the gears 48, 49 on the lower ends of the vertical shafts, suitable thrust bearings carrying the weight and thrust of these shafts when lifting the carriage frames and the carriage. These frames have arms that extend over the sink and to the central vertical plane of the tanks 20 and support the track 50 to carry the plate holders or dippers, which are adapted to slide upon this track 50; a continuous straight bar of metal rigidly secured to the arms of the frames below the sliding bars 51 and 52.

These bars 51 and 52 are slidably supported in a frame 53 forming part of the carriage and preferably T slotted, but other means may be provided for reciprocating the bars the short distance required, or the interval between centers of the tanks 20 and the spaces between, which are necessarily of the same length, the bar 52 being provided with a series of pluralities of pawls, those 54 preferably pivoted on the same pins as the pawls 109 are adapted to engage the top of the dipper and one side, to push the dipper the distance equal to the center distance above referred to, these pawls tripping when in the reverse movement or to the right.

This movement is produced by the gear 55 on the shaft 33 engaging with the gear 56 on the shaft 57 revolubly mounted on the frame 36 and carrying the gear 58 that meshes through a slot in the bar 53 with a rack on the bar 52, the motion being to the right on the continued movement of the screw to force the carriage up, and to the left or engaging movement on the beginning

of the movement of the screw to cause immersion.

The bar 51 is provided to regulate the pause and agitation in the various baths or washings and the interval between each center distance on the bar is divided by a number of holes in which a pin 59 may be placed from the front and extending to the rear into the path of the finger 110 on the pawl 109 on the bar 52, pivoted on the opposite side of the bar from the pawl 54 and adapted to rest on the top of the dipper slide when in engagement therewith, when the dipper is being advanced. The movement of the bar 51 as stated or to the left causes the rack thereon to operate a gear wheel 60 engaged therewith this wheel being keyed to a shaft 123 revolubly mounted on the frame 35 the other end of the shaft having keyed thereto the bevel gear 61 engaging at all times with the bevel gear 62 which is adapted to slide upon the squared portion of the shaft 63 mounted parallel the shaft 32 and carrying at the lower end a bevel gear 64 meshing with a bevel gear 65 on the shaft 66 carrying the sprocket wheel 67, the shaft 66 being at right angles to the shaft 40.

To return the bar 51 to the right a pull spring 120 is provided, connected to the bar and the slotted bar 53, and to prevent the pull or movement from effecting the spacing of the bar 52 a ratchet wheel 122 is keyed to the shaft 123, this ratchet being engaged by a pawl 124 having an arm 125 affected by a cam 126 projecting from the bar 52, so arranged that the bar 51 will not advance ahead of the bar 52 or to the right to trip the pawls 54 over the dipper slides to again advance those on the track or bring a dipper from the auxiliary track.

The sprocket 67 on the shaft 66 carries the chain 69 which in turn is carried over an idler 70, this chain having a fixed finger 71 which is adapted to engage the nut arm 72 when the latter is out of engagement with the screw 76 and move the arm to the extreme left or zero of the pause mechanism, this movement always taking place when the bar 51 is pulled to the right by the spring 120, the movement being limited by the length of the slot through which the pin 128 on the bar 51 projects, the spring 120 being secured to this pin.

The engagement of the arm 72 with its half nut 74 is controlled by the slotted yoke 75 which like the arm 72 is pivoted on the shaft 40 and extends therefrom over the continuously driven screw 76 driven by a gear wheel 77 on the bevel gear 44 meshing with a gear 78 keyed to the adjacent spindle of the screw 76.

To oppose the action of the sprocket 67 on the chain and its finger 71 and return the arm to the right to permit the action giving the greatest pause a line 80 is secured to the arm 72 and over a pulley 81 to a weight 79.

To operate the yoke 75 an arm 82 extends vertically from the left pivotal bearing of the yoke into the path of a cam 83 having an inclined face and a flat formed or secured to the sliding rod 85 the upper end of which is operated downward by engagement with the frame 35 a spring 84 returning the rod to normal position and the spring suspending the arm 72 and its yoke over the screw 76.

Adjacent this mechanism is the reversing gear 86 keyed to a shaft 88 and meshing with a rack on the arm 87, the shaft 88 being squared as the shaft 63 in the path of travel of the carriage and carries a gear 89 thereon adapted to slide on the squared portion and held in fixed relation to the frame 35 so that on the elevation of the latter the gear 89 engages in the path of the teeth on the gear 90 on the shaft 32, a portion of this gear being without teeth if necessary.

The bar or arm 87 encircles the slidable bar 91 and is adapted to engage a pin 129 thereon and to reverse the movement of the rod 91, a rod 92 is provided that is slidably mounted in the path of the stud 93 on the frame 36, so that when the latter is lowered, the inclined cam on the lower end of the rod 92 engages the pin 94 on the slide rod 91 and shifts the same to the right and puts a tension on the spring 95 secured to the arm of the clutch member 45 so that when the pawl 97 is released the clutch member will shift and the pawl 96 will engage in the fixed notch in the fixed bar 98 which forms a slide for the yoke arm 99 of the member 45. On the opposite side of the yoke a spring 100 is secured to the yoke and the left arm of the slide 91 that puts a tension on the yoke and pulls the same over when the pawl 96 is tripped by the trip 115 and the pawl 97 locks in its notch.

To trip the pawl 97 at the end of the pause or agitation a slide 117 is provided having a pin 116 extending into the path of the arm 72 so that when the latter nears the end of its travel on the screw the cam on the slide 117 engages with the pin 118 on the pawl 97 and releases the same, a spring 133 returning the slide to the right.

Returning to the carriage itself, the support 101 is for holding an auxiliary track 102 on which the plates may be introduced at any time on their holders in position to be moved on to the track 50, the auxiliary track being preferably in a slightly inclined position upward from the track 50 and provided with a slide 103 under tension toward the carriage of the spring 104. On the end toward the carriage is pivoted a double acting pawl 105 the shortest end also

being toward the carriage and adapted to engage the notched back edge 106 of the dipper slide, the opposite end also being cut away so that the pawl 54 on the adjacent end of the bar 52 can engage a dipper on the track 102 without interfering with the long end of the pawl 105 which is adapted to engage the next dipper, when the forward end is released by the cam 107 on the bar 52, so placed that it engages the pin 108 on the pawl 105.

The elevating and lowering screws 34 on the respective shafts have the upper end of their cuts extended or continued around in a horizontal plane or it may be continuous if required and provided with a gate as is the lower end; so that the carriage remains stationary while the bars 51 and 52 are reciprocated. The lower end of the cut is continuous having a "dip" 111 of a depth equal to about the radius of the periphery, a pivoted gate 112 being located at the intersection of the cuts and operated by gravity, a portion of the cut being preferably horizontal above the gate, so that the pin 37 and its wheel or roller will more readily ride over the gate on the reversal, to move the carriage upward.

Regarding the disposal of the washings, those after the silver solutions are caught and carried through a drain pipe 140 to a suitable tank while the sides of the washing chambers after the other baths are cut out at 141 and flow directly into the sink and out through the waste drain 142. Water for the overflow tank 143 comes through the main line 144 and is controlled by the faucet 145 the overflow from the notch 146 entering the sink and passing therefrom through the pipe 142.

The movement of one dipper through the machine will now be described the plate being secured as before described and hung on the auxiliary track 102 with the film side facing the right and the whole retained in position by the pawl 105. This introduction can take place at any time and with the carriage in the upward movement as shown in Fig. 1, when it reaches the extreme upward position with the pin 37 in the horizontal cut, the track 50 registers with the track 102 and the revolution of the gear 58 through its connections, slides the bar 52 to the right accompanied by the bar 51 and the end pawl 54 engages the dipper on the track 102 releasing the same at the same moment through the cam 107, tripping the pawl 105. The clutch member 45 is now automatically shifted to reverse the screws 34, gear 89 having engaged the gear 90 and operated the trip 115 so that the tension on the spring 100 locks the pawl 97 and the screws are reversed. This reverses the action of the gear 58 and the bar 52 is moved to the left and carries the dipper over the first, which in the intensification process is filled with a fixative solution of potassium cyanid.

The adjacent pause pawl 109 has ridden up on the dipper slide as shown in Fig. 5 and the pin is shown in the hole 7 or longest pause so that the travel of the slide 51 is the greatest to the left shifting the finger 71 to the position shown in Fig. 1 the nut arm being held in contact therewith by the weight 79 and as the carriage descends; caused by the reversal of the screws 34 as above described, and contacts with the bar 85 the nut is forced onto the screw 76 and the arm 72 is forced to the left thereon.

About this time the carriage or rather the pins 37 thereon have reached the "dip" and the plate is raised and lowered the depth of the "dip" or agitated within the tank, and a number of times equal to the number of revolutions of the screws 34 while the nut arm 72 is traveling to the left, the bar 92 having been depressed by the carriage and a tension held on the spring 95 by the flat on the cam 92 holding the slide 91 to the right.

When the arm 72 reaches the pin 116 the slide 117 is shifted and the pin 118 engaged by the cam to lift the pawl 97 and the clutch member 45 is again shifted, the shafts 32, 33 reversed and the pins 37 ride over the gates in the screws and the carriage is lifted to the elevated position where the gear 58 is again operated and the next pawl 54 rides over the dipper slide, the weight of the dipper holding it against the reverse action of the pawl, and after passing so as to engage the reversal takes place as before and the pause determined by the location of the next pin 59, the dipper is shifted to the correct position over the washing tank and the downward movement engages the foot 30 to operate the valve 24 and the vertical dipping or agitating is repeated and the plate efficiently washed, preparatory to the immersion into the next tank, containing a solution of copper sulfate and potassium bromid, a solution of silver nitrate completing one intensification, the arrangement of tanks shown providing a double intensification and the necessary washings. The washings from the two silver baths are segregated as described and preferably subjected to a precipitating action with brine to convert to the chlorid of silver that can be readily filtered out and the silver recovered. The percentage of loss by these means is very small and the resultant economy of chemicals and water greatly exceeds any manual method.

Following the last silver washing an immersion in a solution of iodin is preferably made to bleach the film on the plate preparatory to the final manual clearing with cyanid. From the washing following the iodin the plate and dipper is shifted to the overflow tank 143 and this tank is made large

enough to accommodate a number of plates that may be stored up on this end of the carriage.

What I claim is

1. In an apparatus of the class described the combination of a plurality of equally spaced tanks, means to automatically immerse a photographic plate in said tanks successively and means to regulate the periods of said immersions independently.

2. In an apparatus of the class described, the combination of a plurality of vertically disposed tanks arranged side by side and spaced apart to form compartments, spraying devices in the compartments and means for advancing a plate step by step in and out of said tanks and compartments.

3. An apparatus of the class described, comprising a trough having therein a plurality of vertically disposed and separated tanks dividing the trough into compartments alternating with the tanks, washing means in said compartments, said tanks being adapted to contain chemical solutions, and means for automatically introducing a plate into said tanks and compartments successively, and advancing said plate from one to the other.

4. A photographic intensification apparatus, comprising a plurality of vertically disposed tanks, end walls forming chambers intermediate said tanks, perforated washing coils mounted in said chamber, and means for automatically immersing a plate vertically therein successively, whereby alternate chemical treatments and washings are given said plate.

5. A photographic intensifying apparatus, comprising a plurality of parallel tanks having their side walls adjacent, end walls connecting said adjacent side walls of said parallel tanks to form washing tanks, water spraying means mounted in said tanks formed by said end walls, automatic means to control said spraying means and means to automatically immerse plates in said tanks and operate said control means to subject them to the action of said spraying means.

6. A photographic intensifying apparatus comprising a plurality of vertically disposed narrow tanks, a plurality of spraying devices interposed intermediate and adjoining said tanks, an elevated carrier suspended over said tanks and spraying devices, and means to automatically subject plates to action successively in and between said tanks.

7. A photographic intensifying apparatus, comprising a series of vertically disposed tanks to hold chemical solutions, water spraying means mounted adjacent said walls of said tanks, a carrier vertically supported in relation to said tanks and spraying means, a movable plate holding dipper mounted thereon and means to successively lower and raise said carrier and advance said dipper successively with the movement of said carrier, to register said dipper in said tanks and between said spraying means.

8. A photographic intensifying apparatus comprising a sink, a plurality of tanks supported therein, a plurality of washing means interposed between said tanks, a vertically movable carriage supported over said tanks, a track supported on said carriage, means for lowering and raising said carriage, a plate holding dipper movably supported on said track, and means to advance said dipper to successively register over one of said tanks or washing means coincidently with the movement of said carriage.

9. A photographic intensifying apparatus comprising a sink a plurality of vertical tanks supported therein, a plurality of washing means interposed between said tanks, a vertically movable track mounted over said tanks and washing means, a plate dipper movably supported on said track, a reciprocating bar mounted adjacent said track, means to reciprocate said bar, and pawls on said bar adapted to engage said plate dipper and advance the same.

10. A photographic intensifying apparatus comprising a support a plurality of tanks mounted adjacent said support, a plurality of washing means interposed between said tanks, a vertically movable track mounted on said support, over said tanks, dippers adapted to engage on said track, means to secure plates to said track, means to vertically lower and raise said track, a reciprocating bar mounted adjacent said track, pawls mounted on said bar, and means to engage said pawls with said dippers to advance the same in one direction upon reciprocation of said bar.

11. A photographic intensification apparatus, comprising a frame, vertically disposed guide rods mounted on said frame, a plurality of tanks adjacent said guide rods, a track slidably mounted on said rods a shaft supported on said frame, dippers adapted to slide on said track, and support plates, a reciprocating hanger operating bar, means to reciprocate said bar, means to engage said dippers secured to said bar, and means to lower and raise said track intermediate the reciprocation of said bar.

12. A photographic developing and intensification apparatus consisting of a frame, vertically disposed guide rods supported on said frame, a plurality of parallel tanks adjacent said frame, a carriage slidably mounted in relation to said guide rods, a track carried by said carriage, a drive shaft supported on said frame, dippers adapted to slide on said track, to support plates, a dipper operating bar mounted on said carriage, means to operate said bar to shift said dippers, means to lower and raise said

carriage, and mechanically operated means to control said carriage and bar operating means.

13. A photographic plate treating apparatus, comprising a sink, solution and washing tanks supported in said sink, a carriage vertically movable over said tanks, means to support and move plates in relation to said carriage, and auxiliary means mounted adjacent said carriage whereby a supply of plates may be supported thereon and conveyed to said carriage.

14. A photographic plate treatment apparatus, comprising a plurality of tanks adapted to hold solutions and washing means, a carriage mounted over said tanks, dippers movably supported on said carriage, and mechanical means to lower, agitate and raise said carriage so that plates mounted thereon are immersed agitated and removed from said tanks.

LEROY D. NESBIT.

Witnesses:
A. E. CORNWELL,
R. C. SPRINGER.