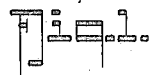


MACHINE FOR THE AUTOMATIC DEVELOPMENT OF PHOTOGRAPHIC PLATES AND FILMS.

Patented Jan. 22, 1918.

5 SHEETS--SHEET 1.



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MACHINE FOR THE AUTOMATIC DEVELOPMENT OF PHOTOGRAPHIC PLATES AND FILMS.

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5 SHEETS—SHEET 2.

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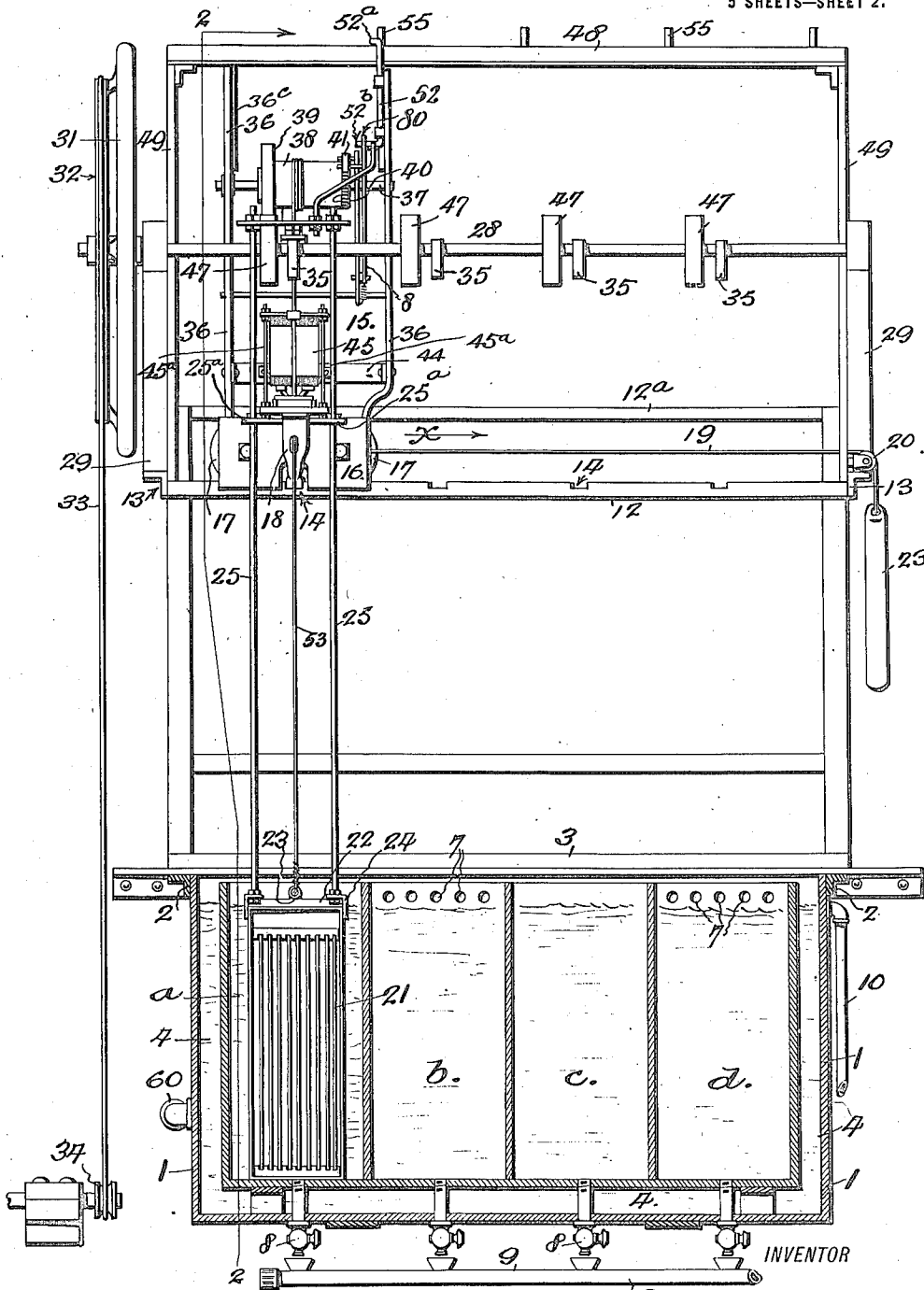


Fig. 2.

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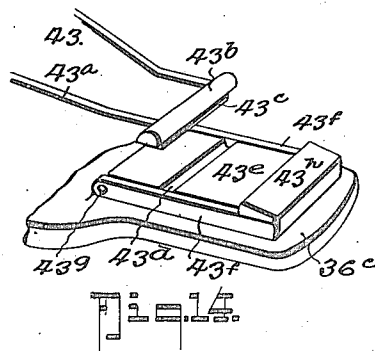
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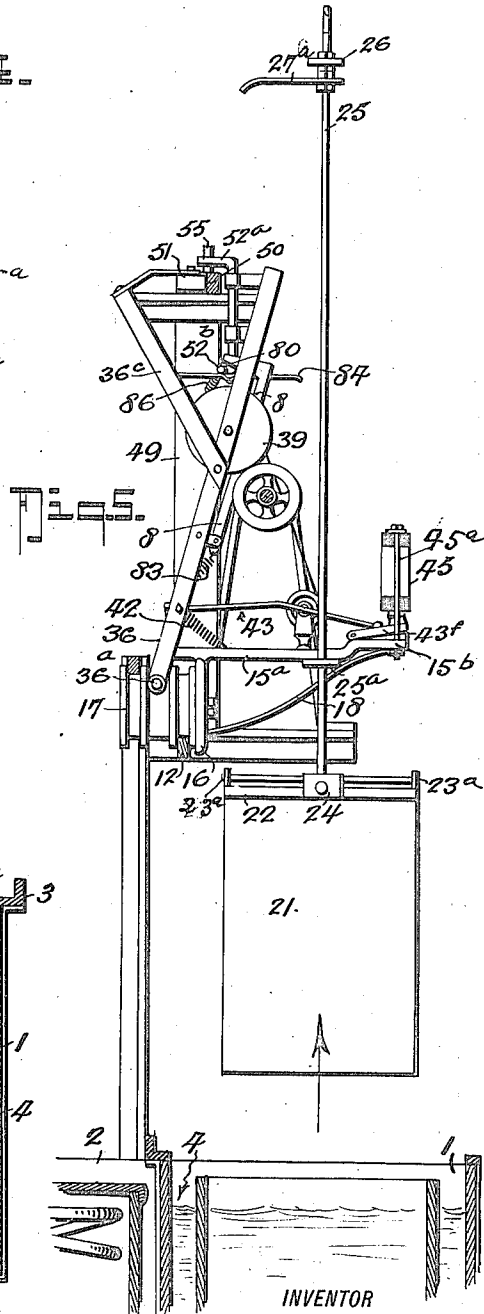
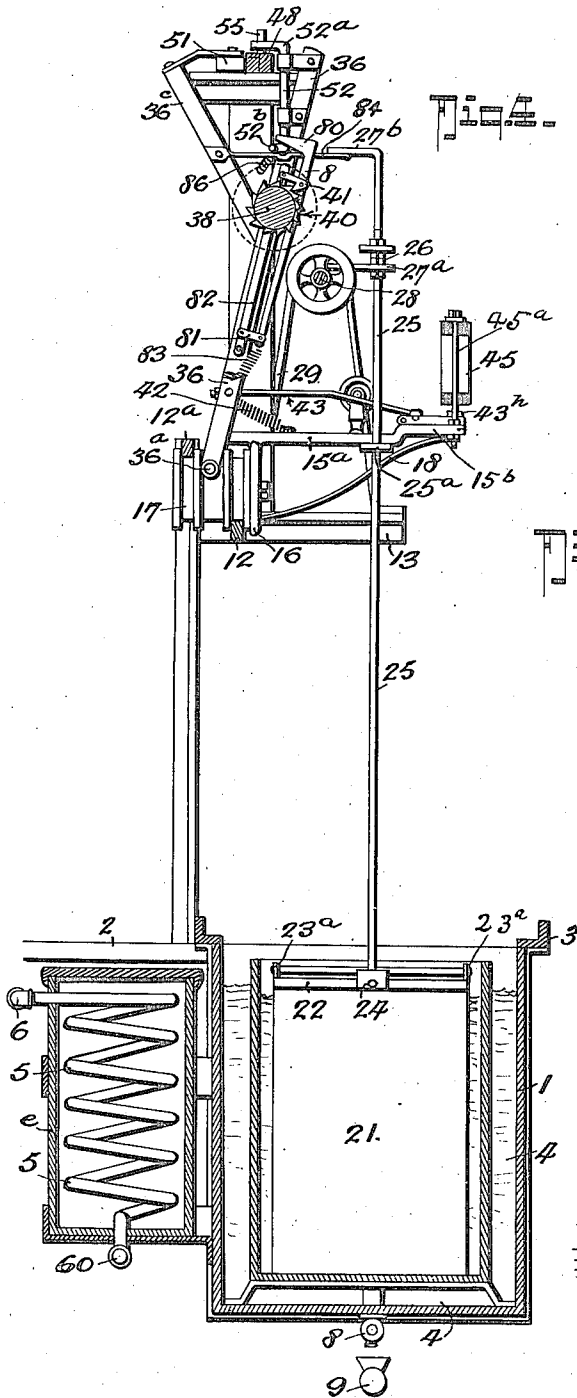
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5 SHEETS—SHEET 4.



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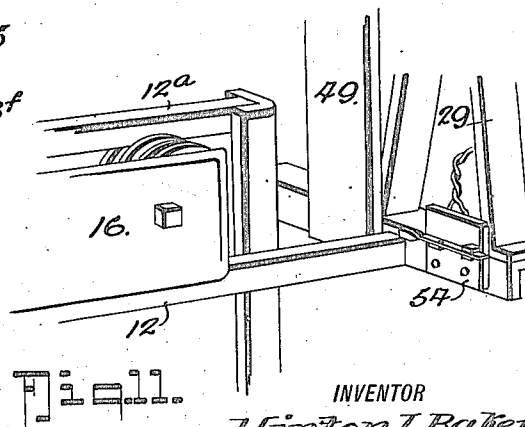
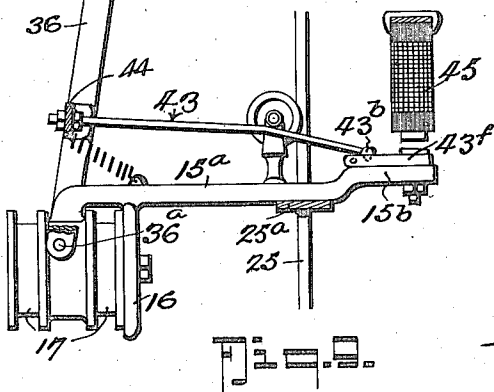
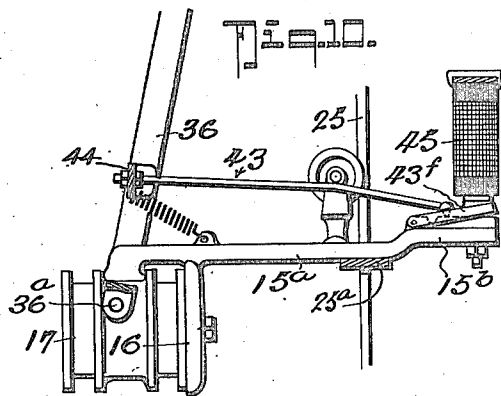
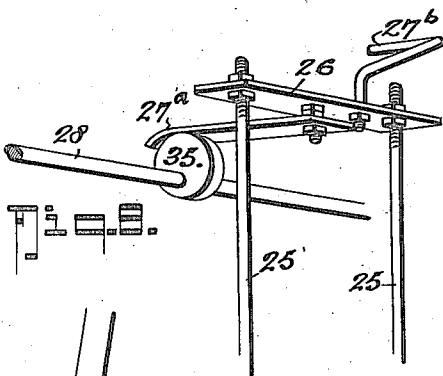
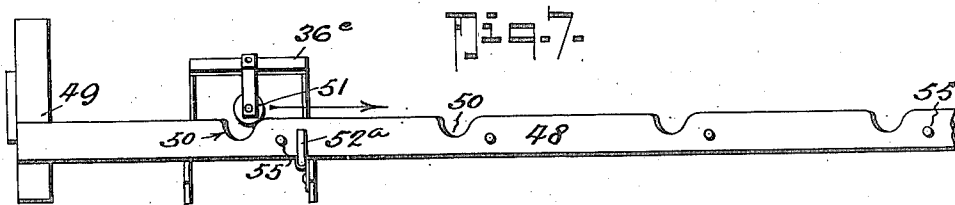
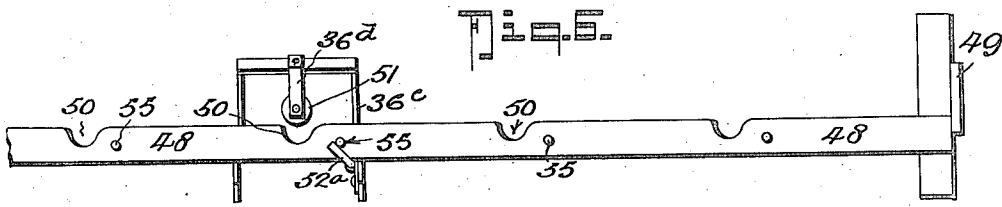
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5 SHEETS—SHEET 5.

1,254,300.



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MACHINE FOR THE AUTOMATIC DEVELOPMENT OF PHOTOGRAPHIC PLATES AND FILMS.

1,254,300.

Specification of Letters Patent. Patented Jan. 22, 1918.

Application filed October 2, 1916. Serial No. 123,337.

To all whom it may concern:

Be it known that I, HINTON J. BAKER, residing at Augusta, in the county of Richmond and State of Georgia, have invented a new and useful Machine for the Automatic Development of Photographic Plates and Films, of which the following is a specification.

This invention, primarily has for its object to provide a practical, and compactly arranged mechanism for the development of plates, moving picture and other films, whose operative parts are especially designed whereby the plates or films may be automatically conveyed and positioned for being successively subjected to the desired washing, developing, and fixing operations, the said several operations being intermittently effected and under predetermined time periods.

Another object of my invention is to provide, in a machine of the general character stated, a suitable vat having separate tanks or containers for the different, developing, first washing, fixing, and final washing solutions, and automatically operating means controlled by a driving mechanism in which is included time gearing, for holding the plates or films in suspension and for successively lowering the plates or films into the developing tank, then raising them out of the said tank, then conveying the holder, with the primarily washed plates or films, in position to be lowered into and raised from the next or washing tank and successively repeating the aforesaid cycle of movements in the fixing tank and the final washing tank, and then finally operating a switch device for cutting out the driving mechanism.

Again, my invention embodies, in a plate and film treating mechanism of the character stated, suitably arranged detent devices for temporarily holding the plate or film holder to its different shifted positions, means for raising the holder out of the tank, and other means, operating when the plate or film holder is lifted out of the solution tank, to release the detents whereby to cut out the plate holder elevating means and bring into action the means for conveying

the film or plate holders in position for being lowered into the next solution tank and so on until all of the plate or film dipping operations are completed.

My invention further seeks to provide a machine for the purposes stated that embodies certain features of construction and combination of parts, all of which will hereinafter be first explained, specifically pointed out in the appended claims and illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view that illustrates an operative arrangement of my invention, the plate holder being shown at the elevated position and so much of a motor driven mechanism being shown as is necessary to illustrate the connection thereof with my invention.

Fig. 2 is a front elevation of my invention, parts being in section, the plate holder being shown as lowered into the first washing solution container.

Fig. 3 is a detail plan view of the magnet controlled releasing means hereinafter referred to.

Fig. 4 is a cross section of the combined plate holder lifter and carrier mechanism, taken substantially on the line 2-2 on Fig. 2, the plate holder being shown at its submerged position in the first washing tank.

Fig. 5 is a similar view, the plate holder being shown as near the limit of its upward movement and as about to engage and lift the detent that holds the carriage to its set position, the means for shifting the lifting drum mechanism being also indicated.

Fig. 6 is a detail plan view of the upper track or rail and the shifting roller that coöperates therewith, the roller being shown in the position it assumes when the lifting drum devices are in operation.

Fig. 7 is a similar view, the roller being positioned for shifting the said lifting drum devices out of their operative positions.

Fig. 8 is a detail view that illustrates the operative application of the means for keeping the plate holder constantly in motion when lowered into the solutions.

Fig. 9 is a detail cross section that shows the magnet controlled detent which holds

the hinged frame that carries the lifting drum devices, at the drum released or inoperative position.

Fig. 10 is a similar view, the detent being shown as shifted to permit the said drum mechanism to drop into the operative position.

Fig. 11 is a detail view that illustrates the switch device operated by the plate holder carriage for cutting out the driving mechanism.

Fig. 12 is a cross section taken substantially on the line 12—12 on Fig. 13, and illustrates in detail the winding pawl releasing and resetting devices and the magnet controlled devices hereinafter specifically referred to.

Fig. 13 is a front elevation of the parts shown in Fig. 12.

Fig. 14 is a detail perspective view of the magnet controlled releasing device hereinafter fully described.

In the practical embodiment of my invention, the same comprises a large tank 1 mounted upon a suitable upright frame that includes side members 2—2 and end members 3—3 upon which the supplemental upright framing, presently again referred to, is mounted.

Tank 1 is divided into a number of distinct smaller tanks or containers *a*, *b*, *c* and *d*, and is so arranged that it is surrounded on all sides, except the top, which is open, by a water space or jacket 4.

At the back of the main tank 1 is located another or fifth tank *e*, smaller than the other four tanks, and in the said tank *e* is located a pipe coil 5 which connects with a water supply pipe 6 from which the water flows through the coil 5 and from it through a lead 60 into the side wall of the water space or jacket 4 wherein the water circulates around the small tanks *a*, *b*, *c*, and *d*. Part of the water passes into the tanks or containers *b* and *d* through perforations 7 in their upper edge, and from the said tanks, the water discharges through pet cocks 8 in the bottom of the tanks, and which extend through the main tank and discharge into a drainage pipe 9. Solution tanks *a* and *c* also have pet cocks 8 that discharge into the drainage pipe 9, as shown. Excess of water in the tanks or containers passes off into a waste pipe 10 which connects with the main tank and drainage pipe 9, as shown.

It should be here stated, that in cold weather, the water circulating through the water jacket is heated by a suitable burner under the tank *e* and kept at proper temperature and during the summer, the water may be kept cold by packing ice around the coil in the tank.

12 designates a track rail which extends lengthwise of the machine from one end

frame member 13 to a like member 13 at the opposite end and the said track rail, at predetermined intervals, has notches 14 in its upper face, one of such notches being provided for each of the tanks or solution containers *a*, *b*, *c* and *d*.

A traveling frame or carriage 15 is mounted on the track 12 and the said frame includes a base or platform 15^a and a pendent front plate 16 that carries stud bolts 16^a—16^a upon each of which is loosely mounted a grooved roller 17 that engage with track rails 12—12^a, as is best shown in Figs. 4, 5 and 12, by reference to which it will be noticed that when the plate holder 21, presently again referred to, is lowered into either of the solution tanks, a spring detent 18, that is secured at one end to the underside of the forwardly extended arm 15^b of the platform 15^a, engages the adjacent notch 14 and thereby holds the carriage 15 at a fixed position on the track 12.

The carriage 15 tends to normally move in the direction of the arrow *x* Fig. 2 under tension of the weight 23 attached to a cable 19 that is secured to the carriage and is guided over pulleys 20, as shown.

21 designates the holder in which the plates or films to be developed are contained; and the said holder is in the nature of an open ended rectangular receptacle adapted for being suspended on a hanger 22. The hanger frame 22 includes a horizontal cross rod 23 connected at its ends to ears 23^a on the holder and side extensions 24—24 in which are secured the lower ends of a pair of upright guide rods 25—25 that pass through guides 25^a—25^a on the carriage frame, the upper ends of which are joined by a cross head 26 on which is mounted a trip member 27^a, the purpose of which will be hereinafter explained.

28 designates a motor driven shaft that is journaled in end standards 29—29 mounted on the horizontal members 13—13 of the supplemental upright framing and, at one end, the said shaft 28 carries a fly wheel 31 and a pulley wheel 32 around which takes the driving belt 33 that engages the driver pulley 34 on the motor shaft, as shown.

Shaft 28 also carries a series of driving disks 47 and eccentric disks 35, one of each being provided for each of the small solution tanks and the eccentric disks are so located, relatively to the uprights of the plate holder hanger frame, that when the plate holder reaches its lowermost point in any one of the solution tanks, the member 27^a at the top of the uprights, engages the corresponding eccentric disk 35 and, by reason thereof, the hanger frame and plate holder is kept in constant agitation while in the solution.

Two uprights 36—36 are mounted on the

back end of the base of the carriage frame, and on a cross shaft 37, connected at its ends to the uprights 36—36, is mounted a winding drum 38 that carries a friction disk 39, at one end, and a ratchet wheel 40 at the other end, with which ratchet wheel engages a back check pawl 41, arranged for being released from the ratchet wheel and for being returned to its operative condition at predetermined times, the reason for which will be hereinafter explained. The disk 39 is adapted to be frictionally engaged with different ones of the disks 47, above mentioned.

The uprights 36—36, before referred to and upon which is mounted the winding drum devices mentioned, are hinged at their lower ends as at 36^a to the carriage portion 36^b and are normally held under tension of the springs 42 secured thereto and to the carriage base, and which tends to swing the said members 36—36 toward the motor driven shaft 28.

43 designates a horizontally disposed pawl in the nature of a frame consisting of opposite side rods 43^a, Fig. 3, fixedly joined at one end to a cross bar 44 that has pivotal connection with the opposite uprights 36—36, and the said frame also includes a cross member or head 43^b that is provided with a depending detent or rib 43^c Fig. 14 adapted for engaging a cross groove 43^d in a block 43^e fixedly attached to or formed upon the carriage portion 15^b, as is best shown in the said Fig. 14 of the drawings, from which it will also be noticed that the detent or rib 43^c of the cross member 43^b is adapted to interlock with the groove 43^d when the hinged uprights 36—36 are held to their back position, in which they are clearly shown in Fig. 4, and where they are held when it is desired to disengage the winding drum disk 39 from the adjacent one of the driving disks 47 mounted on the motor driven shaft 28.

When the parts are at the position shown in Fig. 4, the cross member 43^b of the pawl 43 has its opposite ends projected over and in contact with two lever arms 43^f pivotally joined at 43^e to the block portion 43^e of the carriage base and whose outer ends are joined by a cross or armature bar 43^g that coöperates with the magnet 45 that is supported by uprights 45^a—45^a on the forwardly extended member 15^b of the carriage frame, as is best illustrated in Figs. 4, 5, and 12.

A yoke shaped frame 36^c is attached to and extends upwardly and rearwardly from the uprights 36—36 and the said frame 36^c carries a forwardly projecting member 36^d on which is journaled a horizontally disposed roller 51 that is so positioned, relatively to the over-head track 48, that it

travels along that edge of the track 48 provided with a series of notches 50, as is best shown in Figs. 6 and 7, and at this time, it should be stated, that when the carriage reaches a position in proper registration with the tank in which the plate holder is to be immersed a roller 51 is in a position to engage with one of the notches 50, as shown in Fig. 6. Assuming that the plate holder carrier, which is connected to the winding drum 38 by the cord 53, has been lowered so that the holder is in the tank, the operator by energizing the magnet 45 effects the following operation:—

As the magnet 45 becomes energized it lifts the armature bar 43^g and correspondingly swings the side arms 43^f upwardly to the position shown in Figs. 5, 10 and 12 and in doing this the said side arms 43^f engage the cross head or member 43^b of the pawl device 43 and thereby lift the detent portion 43^c out of the stop groove 43^d and free the winding drum carrying frame, which then swings forwardly to cause the drum friction pulley 39 to engage the corresponding friction pulley 47 on the motor driven shaft 28 and thereby put the winding drum mechanism in working condition for raising the immersed plate holder out of the tank, from the position shown in Fig. 4 to that shown in Figs. 1 and 5, it being understood that when the holder is lifted, as indicated by the arrow on Fig. 5, the said holder engages and lifts the detent 18; and the carriage is then automatically released and conveyed over to the next tank where the spring detent 18 on the carriage, (as the plate holder lowers) again comes into action and engages the next notch 14 in the track, and thereby holds the carriage from further movement pending the operation of lowering the holder into the said next tank, it being understood that the check pawl 41 of the winding drum mechanism is released as hereinafter stated from the drum ratchet 40, so that the winding drum is permitted to turn back as the holder gravitates into the solution tank; and it should here be stated that the said check pawl 41 is automatically returned to its ratchet engaging or operative position when the holder reaches the lower or immersion limit so as to put the winding drum mechanism back into condition for lifting the holder out of the tank.

The means for automatically releasing the check pawl 41 and for restoring the same to its operative position are best shown in Figs. 12 and 13 by reference to which (and to Figs. 1, 2, 5 and 7) it will be seen that studs 55 vertically project from the top of the over-head track 48, one of said studs being provided for each of the notches 50—50 on the said track 48.

52 designates a vertically disposed rock

shaft that is journaled in brackets on the upper end of one of the uprights 36 and the uppermost end of the said shaft terminates in a crank member 52^a that projects in the path of the studs 55 and by contact therewith rocks the shaft 52 and thereby causes another crank member 52^b, on the lower end thereof, to engage the beveled heel 80 of a vertically shiftable member 8, the lower end of which connects, through a short link 81, with a bar or rod 82.

Check pawl 41 is hinged to the upper end of the bar 82 and the said pawl forms a link connection with the shiftable member 8 to which its outer end is pivotally joined, as shown.

83 designates a stout spring connection that tends to normally pull the member 8 down to hold the pawl 41 in engagement with the ratchet 40. 84 is a spring arm which is secured at one end to the frame 36^c extends forwardly and has its free end in the path of a trip member 27 on the cross head 26 carried by the vertically movable rods 25—25; and the said arm has a cross seat or notch 84^a into which the crank member 52^b of the shaft 52 slips, when the said shaft is rocked to the position shown in Figs. 12 and 13, and 86 designates a spring attached to the yoke frame and to the crank member 52^b that serves to rock the said member and the shaft 52 back to their normal positions when the spring arm 84 is pulled down by the member 27 in the manner presently further explained.

Each of the friction disks 47 is mounted on the shaft 28 to turn therewith and is located adjacent an eccentric 35 and in position to be engaged by the friction pulley 40 on the winding drum when the drum devices are swung forwardly to their operative position.

The overhead track 48 extends lengthwise of the machine, its opposite ends being secured to the upper ends of a pair of uprights 49—49 of the supplemental frame, as is clearly shown in Fig. 1.

56 designates a suitably constructed driving motor with time gearing for determining the time for the plates or films to remain in the solutions.

52 designates the circuit line to the magnet that has a switch for placing the magnet under energy when it is desired to allow the winding drum device to assume the operative position.

54 denotes a switch device in the circuit to the motor mechanism which switch is engaged by the carriage when it reaches the limit of its travel, to cut out the motive power, see Fig. 11.

From the foregoing description taken in connection with the drawings, the complete arrangement and the general operation of

my machine will be readily understood by those skilled in the art to which my said invention relates.

The manner in which the plates or films are developed is best explained as follows:

First, the solutions are made up and put into the proper tanks, care being taken that they are of proper temperature for tank development. The small tank *c* containing the pipe coil is then either packed with ice, if the weather be hot, or filled with water, if it is to be heated, and in that event, the thermostat is properly adjusted.

The water from the feed pipe is then turned on, passes through the coil and into the water jacket in the large tank and, when the said jacket fills, the water passes through the perforations in the two washer tanks *b* and *d*, fills the said tanks and flows out through the pet cocks at the bottom into the drainage pipe, the flow from the wash tanks being so adjusted that the said wash tanks remain full of water during the operation of the machine.

The timing device of the driving power is now set, say thirty minutes for development, two minutes for first washing, twenty minutes for fixing and fifteen minutes for the final washing.

The motor is then started and the plates or films are placed in the holder and the latter lowered into the first or developing tank *a*, it being understood that the part 27^a of the cross heads on the hanger frame rods engages the corresponding eccentric on the driven shaft 28, which in revolving keeps the holder and its contents constantly in motion while in the solution.

When the thirty-minutes for developing is up, a connection is made in the timing device which energizes the magnet on the carriage to thereby trip the pivoted pawl or detent 43 and allow the winding drum devices to automatically move so that the friction disk thereof engages the corresponding friction pulley 47 on the driven shaft 28, it being understood that when the winding drum devices are in action, the roller 51 seats in the corresponding notch 50 in the track 48 (see Fig. 5).

When the winding drum devices are brought into action, the plate holder with the developed plates or films is slowly drawn up out of the solution tank *a* by means of the cable 53 attached to the holder frame and to the winding drum.

When the plate holder reaches a predetermined height, the holder frame engages the spring detent 18 and raises it out of the first notch 14 in the track 12, thereby releasing the carriage 15 which then moves along the track 12 and, as it travels along the said track, the roller 51, now traveling along the rear face of the track 48, moves out of the notch

50 and onto the smooth face portion 48^a thereof and thereby pulls the winding drum devices back to their inoperative position, and since the magnet controlled pawl 43 now drops by gravity into the operative position with its detent 43^c in engagement with the groove 43^e, it holds the said winding devices back out of engagement with the disks on the driving shaft 28.

As the carriage moves to the next tank and the plate holder comes directly over the said tank, the spring catch 18 automatically slips into the corresponding notch 14 in the track rail over the tank *b* and holds the carriage while the plate holder again descends.

At this point, it should be stated that during the successive operations of the machine and as the plate holder carriage passes from one tank to the next succeeding tank, when the holder reaches the lowermost position in the solution, the trip 27^b on the cross head of the hanger frame rods engages the spring arm 84 that held the hold-back pawl 41 out of engagement with the ratchet wheel on the winding drum shaft and thereby allows the pawl, at such periods, to again assume its operative position during the time that the plate holder is being elevated through rotation of the motor driven shaft 28 and the winding drum, it being also clear that when the holder reaches the limit of its up movement, the hanger frame again engages and releases the pawl 18 and allows the carriage, with its attached parts, to travel to the next tank, and the devices that shift the pawl 41 out of operation to again come into action.

After the final washing, the plates are drawn out of the water and the carriage is allowed to run to the end of the track 15 and, in doing so, it contacts with and opens a switch 58 and thereby cuts out the motor drive.

The plates may remain, at this point, in suspension to dry or the plate holder may be taken out of the hanger frame and set aside to dry while another holder is slipped into place and a fresh batch of plates started through the machine.

It is understood that in the practical application of my invention, special plate holders may be provided, adapted for roll films, cut films, and moving picture films. The size of the machine is not limited and may be made to suit the particular character of work required.

What I claim is:

1. A plate or film developing mechanism that embodies, in combination; at least two solution holding tanks, a plate or film holder, a carriage that supports the film holder, means tending to constantly move the carriage and the holder from over one solution tank to the other, a hanger frame suspended from the carriage to which the

plate holder is attached, means for holding the hanger frame and holder in elevated position, means to release the holding means to permit the hanger frame and the holder to gravitate, whereby the holder is immersed in the solution, detent devices to hold the carriage from movement as the holder remains in the solution, other means for raising the holder out of the solution, the said holder including a member adapted to trip the carriage holding detent when the plate carrying holder passes up out of the solution tank, whereby to permit the carriage and the holder to travel toward the next solution tank.

2. In an apparatus of the character stated, a plurality of tanks, an article holder adapted for insertion into and removal from the tanks, a raising and lowering mechanism for the said holder, a carriage for sustaining the said holder and raising and lowering mechanism, means for applying power to the said carriage to cause it to travel in one direction successively over the tanks, a detent device for holding the carriage against movement with the holder in position with relation to the respective tanks, the said detent including a projection extending into the path of movement of the said holder, whereby the said holder will release the said detent at times.

3. A plate or film developing mechanism that embodies in combination; at least two solution holding compartments, a plate or film holder, a carriage normally under tension tending to move it from over one solution compartment to the next solution compartment, a hanger frame suspended from the carriage to which the plate holder is attached, means for holding the hanger frame and holder in elevated position, means to release the holding means to permit the hanger frame with the holder to lower by gravity to immerse the holder in the solution, detent devices for temporarily holding the carriage in position over the respective solution compartments during the operation of raising and lowering the holder, and means for raising the hanger frame to lift the plate holder out of the solution.

4. In a photographic film or plate developing means of the character stated, a plurality of solution tanks in relative alignment, a trackway located over the aligned tanks, a carriage that travels on the trackways and is normally held under tension tending to move it from one of the tanks successively over others, a plate holder supported on the carriage, means on the carriage for interlocking with the trackway to hold the carriage successively in position over the several tanks, a member on the plate holder adapted for releasing the detent when the holder rises out of the tank,

to thereby permit the carriage to convey the said holder in position for being lowered into an adjacent tank, and means for raising the holder out of the tank.

- 5 5. In a photographic film or plate developing means of the character stated, a plurality of solution tanks in relative alignment, a trackway located over the aligned tanks, a carriage that travels on the trackways and is normally held under tension
10 tending to move it from one of the tanks successively over the other tanks, a plate holder supported on the carriage, means on the carriage for interlocking with the trackway to hold the carriage successively in position
15 over the several tanks, a member on the plate holder adapted for releasing the detent when the holder rises out of the tank, to thereby permit the carriage to convey the said holder in position for being lowered
20 into an adjacent tank, and means for raising the holder out of the tank, the said means including a motor driven shaft and a winding drum mechanism operatively connectible
25 with the said shaft at times.
6. In a photographic film or plate developing means of the character stated, a plurality of solution tanks in relative alignment, a trackway located over the aligned
30 tanks, a carriage that travels on the trackways and is normally held under tension tending to move it from one of the tanks successively over the other tanks, a plate holder carrying means supported on the carriage, means on the carriage for interlocking
35 with the trackway to hold the carriage successively in position over the several tanks, a member on the plate holder carrying means adapted for releasing the detent when the holder rises out of the tank, to
40 thereby permit the carriage to convey the said holder in position for being lowered into an adjacent tank, and means for raising the holder out of the tank, the said means including a motor driven shaft and
45 a winding drum mechanism operatively connectible with the said shaft at times, a detent for normally holding the said winding mechanism out of operative condition, and means for tripping the said last named detent
50 at times, and further means operating to bring the winding mechanism into operative connection with the motor driven shaft when the last mentioned detent is tripped.
- 55 7. In a photographic film or plate developing means of the character stated, a plurality of solution tanks in relative alignment, a trackway located over the aligned tanks, a carriage that travels on the trackway
60 and is normally held under tension tending to move it from one of the tanks successively over the other tanks, a plate holder frame supported for vertical movement on the carriage, a plate holder carried

by said frame, a detent on the carriage for 65 interlocking with the trackway to hold the carriage successively in position over the several tanks, a member on the plate holder frame adapted for releasing the detent when the holder rises out of the tank, to permit
70 the carriage to convey the said holder in position to be lowered into an adjacent tank, and means for raising the holder out of the tank, said means including a motor driven shaft and a winding drum mechanism co-
75 operatively connectible with the said shaft at times, said winding mechanism including a hold-back pawl, means for moving the pawl to a released position so that the plate holder may gravitate into the solution tank, 80
a holder frame, and other means controlled by the drop of the holder frame for restoring the said pawl to its operative position when the holder reaches the lowermost point of immersion in the solution tank. 85

8. In an apparatus of the character stated, a plurality of solution tanks, at least one of which is a washing tank, a water jacket surrounding the tanks, means for maintaining a fluid circulation in the said
90 jacket and through the washing tank, an article holder adapted for insertion into and removal from the tanks, a raising and lowering mechanism for the holder, a carriage for sustaining the said holder and the raising
95 and lowering mechanism, means tending to normally cause the carriage to travel from over one tank to the next tank, a detent for holding the carriage against movement, means for applying power to cause
100 the raising of the holder, means whereby the said last named is held out of operative position as the lowering of the holder takes place, the power applying means being adapted for being brought into operation
105 when the holder is at the lowermost position, and a member on the holder adapted for releasing the detent that holds the carriage, when the holder is lifted out of the tank.

9. In an apparatus of the character described, the combination of a carrier intermittently movable laterally from one predetermined position to another predetermined
110 position, a plate holder sustained by the said carrier, a plate holder lifting mechanism that includes a winding drum mechanism mounted on the carriage, a lifting element connected to the drum and to the holder, a
115 driving shaft, means for moving the winding drum mechanism into operative connection with the driving shaft, whereby to impart rotation to the winding drum for elevating the plate holder, the said winding drum mechanism including ratchet and
120 check pawl devices, means operable by the movement of the carriage from one position to another position for releasing the pawl from the ratchet, to thereby permit the drum
125

to unwind and lower the plate holder lifting element, and other means operable as the plate holder lowers, for releasing the aforesaid pawl and ratchet devices to thereby allow the resetting of the winding drum pawl as the plate holder is again elevated under the winding drum action.

10. An apparatus in which is included a driving shaft, an intermittently laterally movable carriage, an elevating frame, a winding drum mechanism for raising and lowering the elevating frame, said mechanism being mounted on the carriage and including a ratchet and a hold-back pawl co-operating therewith, means for transmitting motion to the winding drum at times for lifting the elevating frame, means for releasing and holding the pawl released from the ratchet to thereby permit the winding drum to unwind for lowering the elevating frame, and other means for rendering the releasing means ineffective so as to permit the pawl to engage the ratchet, the said other means being set into action by the movement of the elevating frame when the latter approaches its lowermost limit and when the winding drum is out of operative connection with the driving shaft.

11. In an apparatus of the character stated, a plurality of successively arranged solution tanks, a plate holder, a holder hanger frame, a carriage upon which the holder frame is mounted, means on the carriage for effecting alternate lowering and raising of the holder into and out of the tanks, means tending to normally impel the carriage from over one tank to the next tank, means for arresting the movement of the carriage as it comes into position over a tank, and for holding it during the operation of lowering and raising the holder into and from the work, the said means for effecting the raising and lowering of the holder including a winding drum mechanism having ratchet and check pawl devices, means set into action by the movement of the carriage from one tank to another for disconnecting and holding the pawl disconnected from the ratchet while the holder is in the elevated position whereby to allow the said holder to be lowered into the said tank, and other means actuated by the downward movement of the hanger frame for rendering the pawl disconnecting means ineffective for holding it in such adjustment as the winding drum raises the holder out of the tank.

12. In an apparatus of the character described, a vertically reciprocable plate holder carrier, and means for reciprocating the said carrier, the said means including a driving shaft, a winding drum mechanism, and means for connecting the said winding drum mechanism at times with the driving

shaft whereby to set the said mechanism into action, the said winding mechanism including ratchet and check pawl devices, means, operating at times, for holding the said pawl released from the said ratchet to thereby permit the drum to freely turn backward as the plate holder lowers, devices for rendering said pawl holding means inefficient and means for restoring and holding the pawl in engagement with the ratchet, said devices being set into action by the reciprocable plate holder carrier when it reaches its lowermost position.

13. In an apparatus of the character described, an intermittently projected carriage, a vertically reciprocable plate holder carrier mounted thereon, and means for reciprocating the said carrier also mounted on the carriage, said means including a winding drum mechanism, a driving shaft, means for connecting the said mechanism at times with the driving shaft whereby to set the winding drum mechanism into action, said mechanism including ratchet and check pawl devices, means operating at times for holding the said pawl released from the ratchet to thereby allow the drum to freely turn backward as the plate holder gravitates, and devices for rendering the said pawl holding means ineffective, means for restoring and holding the pawl in engagement with the ratchet, the said devices being set into action by the reciprocable plate holder carrier when it reaches its lowermost position.

14. In an apparatus of the character described, an intermittently projected carriage, a vertically reciprocable plate holder carrier mounted thereon, and means for reciprocating the said carrier also mounted on the carriage, said means including a winding drum mechanism, a driving shaft, means for connecting the said mechanism, at times, with the driving shaft, whereby to set the winding drum mechanism into action, said mechanism including ratchet and check pawl devices, means, operating at times, for holding the said pawl released from the ratchet to thereby allow the drum to freely turn backward as the plate holder gravitates, the said means including a lifting bar pivotally connected to the free end of the pawl, a rock shaft, said shaft and the lifting bar having interengaging members constructed to effect a pull on the lifting bar as the rock shaft is turned in one direction, and devices operable by contact upon movement of the carriage for turning the rock shaft, and other means for turning the rock shaft back for restoring and holding the pawl in engagement with the ratchet, the said other means being set into action by the reciprocable plate holder carrier when it reaches its lowermost position.

15. In an apparatus of the character described, an intermittently projected carriage, a vertically reciprocable plate holder carrier mounted thereon, means for reciprocating the said carrier also mounted on the carriage, said means including a winding drum mechanism, a driving shaft, means for connecting the said mechanism at times with the driving shaft whereby to set the winding drum mechanism into action, said mechanism including ratchet and check pawl devices, means operating at times for releasing and holding the said pawl released from the ratchet to thereby allow the drum to freely turn backward as the plate holder carrier gravitates, the said means including a lifting bar pivotally connected to the free end of the pawl, a rock shaft, said shaft and the lifting bar having interengaging members constructed to effect a pull on the lifting bar as the rock shaft is turned in one direction, devices operable by contact upon movement of the carriage for turning the rock shaft, other means for rendering the pawl releasing means ineffective so as to permit the pawl to engage with the ratchet, the said other means being set into action by the reciprocable plate holder carrier when it reaches its lowermost position, the said last named means including a spring arm that engages and holds the rock shaft to its rock position, and a member on the reciprocable plate holder carrier that engages and releases the spring arm that holds the rock shaft, means for turning the rock shaft back to its normal position, and a tension device for pulling the lifting arm back to the normal position whereby to lock the pawl into engagement with the ratchet.

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