July 11, 1933. L. G. SIMJIAN 1,918,061

NEGATIVE DEVELOPING AND PRINTING DEVICE

Filed Sept. 21, 1931 5 Sheets-Sheet 1

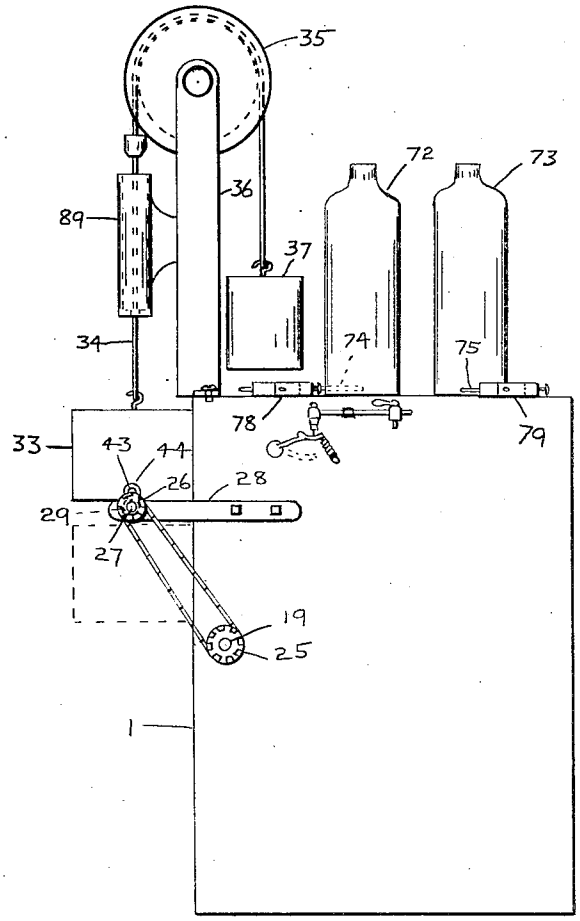


FIG 1

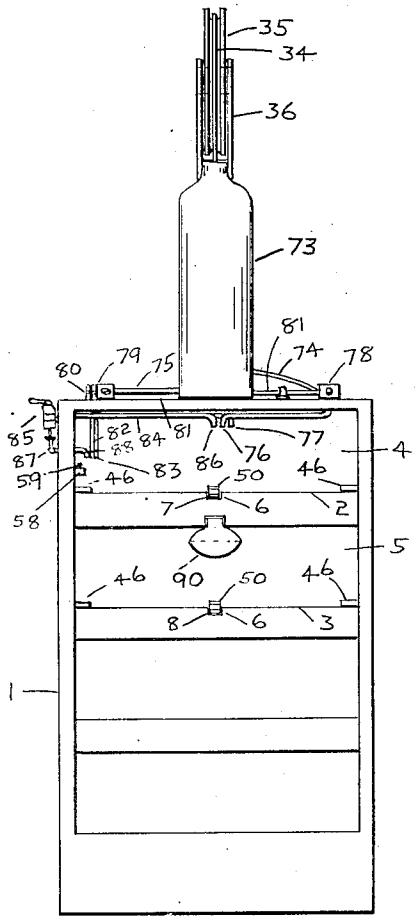


FIG 2

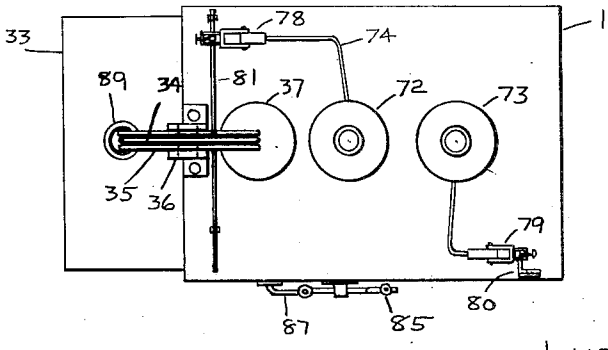


FIG 3

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July 11, 1933. L. G. SIMJIAN 1,918,061

NEGATIVE DEVELOPING AND PRINTING DEVICE

Filed Sept. 21, 1931 5 Sheets-Sheet 2

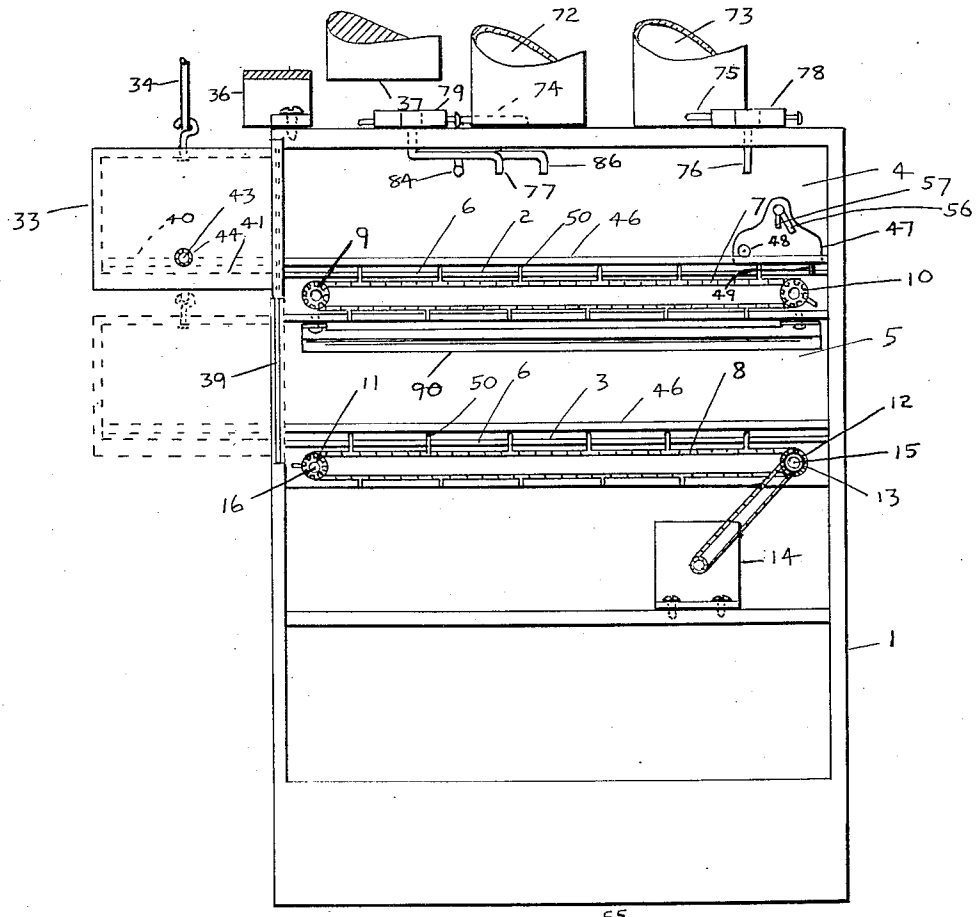


FIG 4

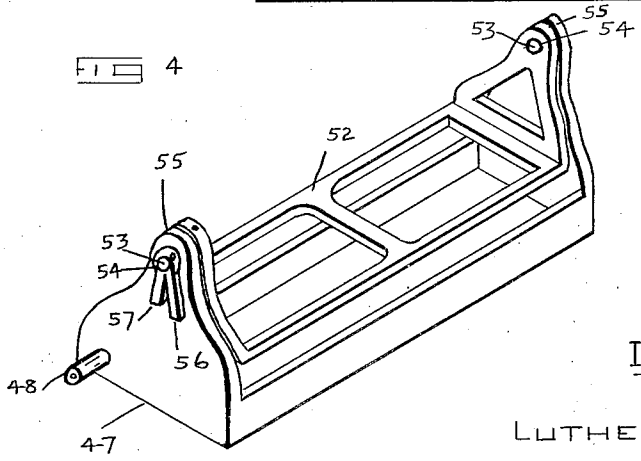


FIG 8

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NEGATIVE DEVELOPING AND PRINTING DEVICE

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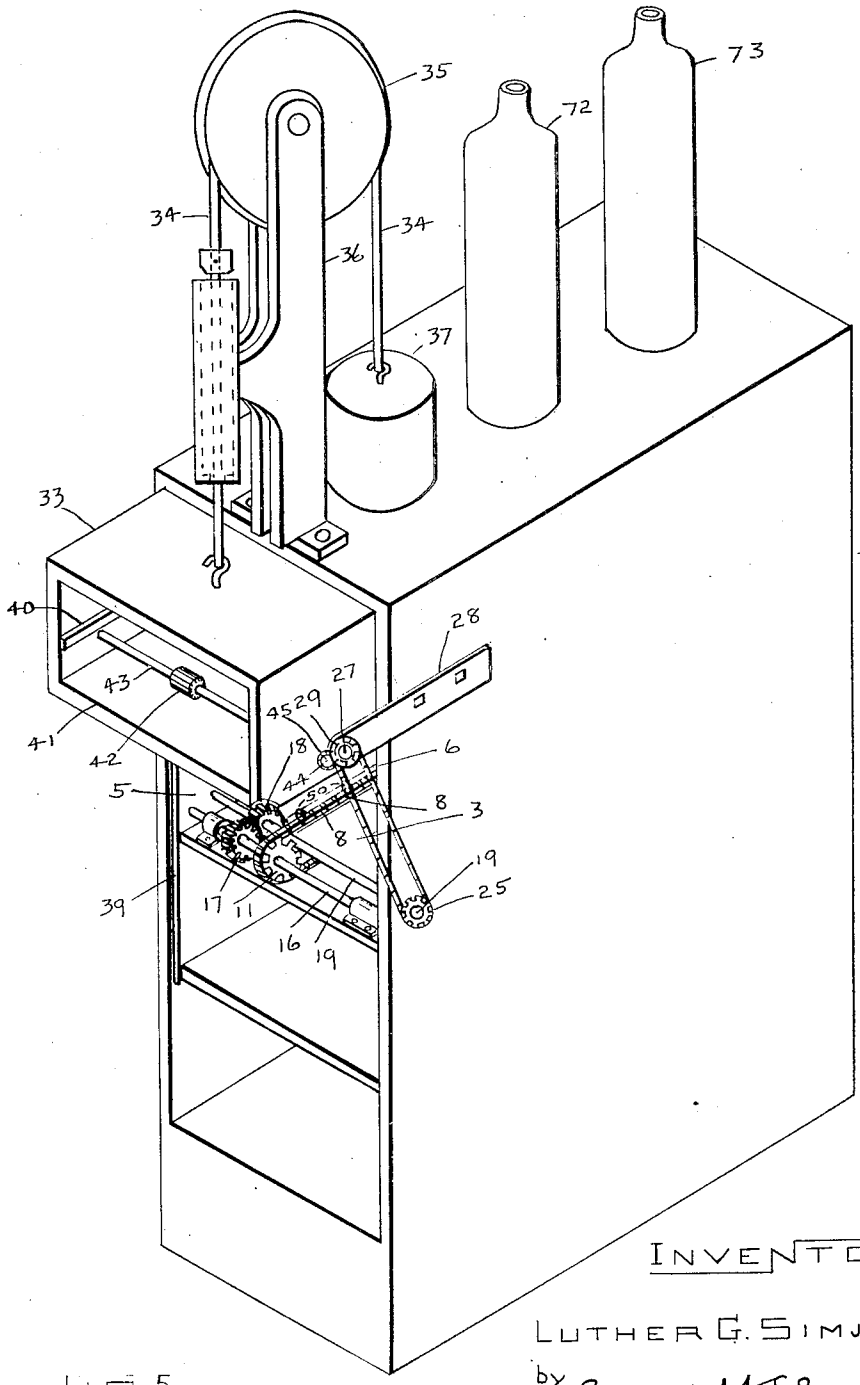


FIG 5

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NEGATIVE DEVELOPING AND PRINTING DEVICE

Filed Sept. 21, 1931 5 Sheets-Sheet 4

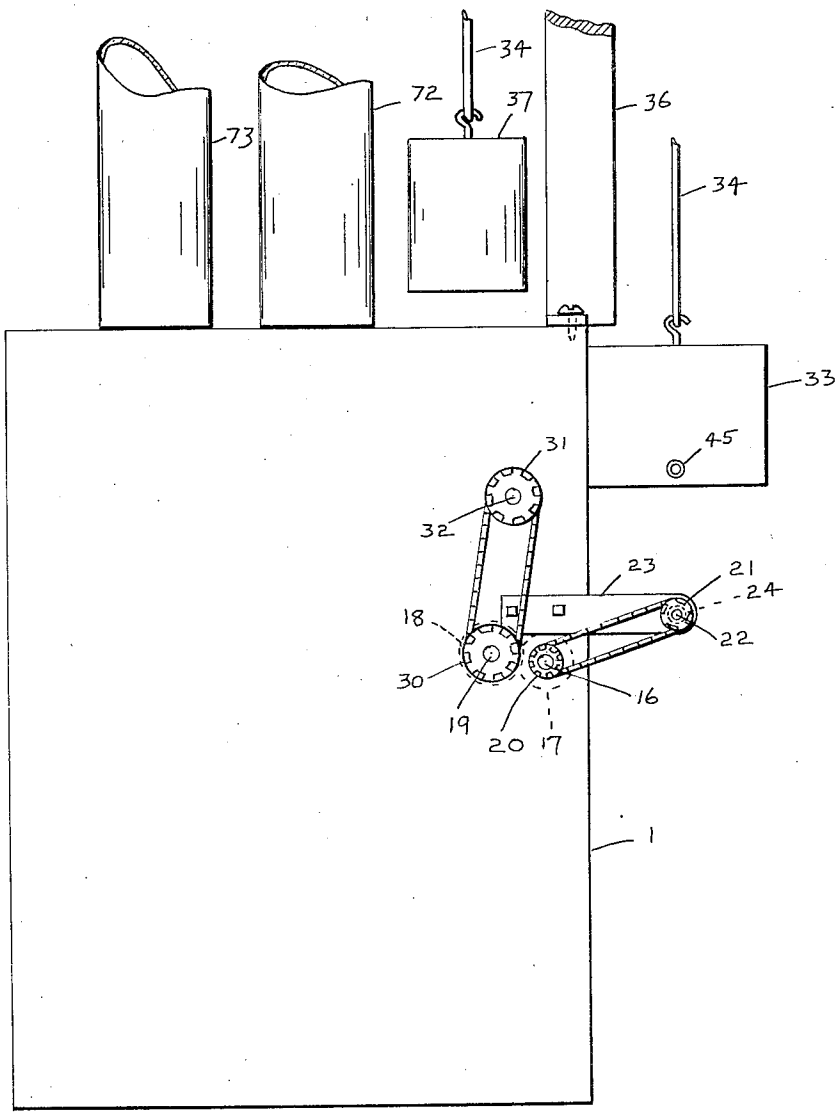


FIG 6

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NEGATIVE DEVELOPING AND PRINTING DEVICE

Filed Sept. 21, 1931 5 Sheets-Sheet 5

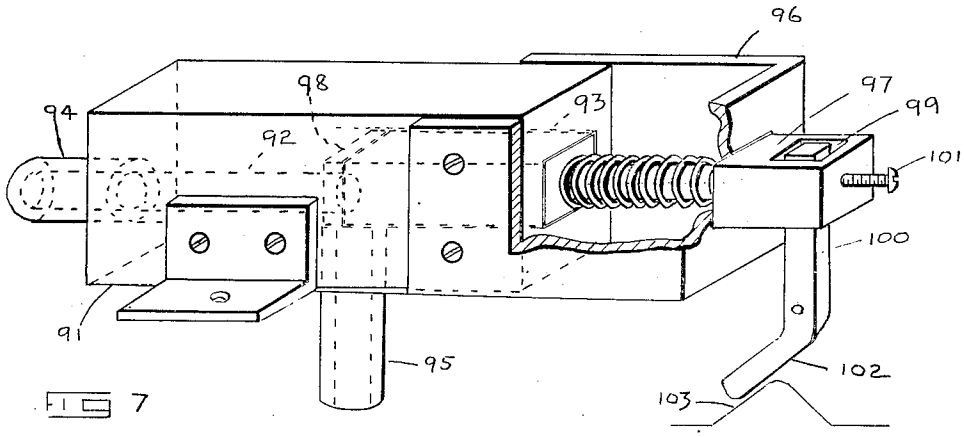


FIG 7

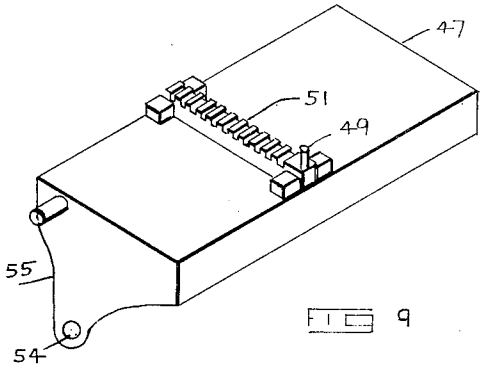


FIG 9

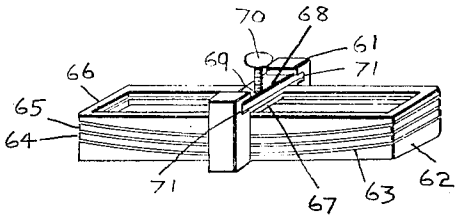


FIG 10

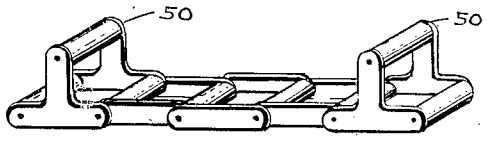


FIG 12

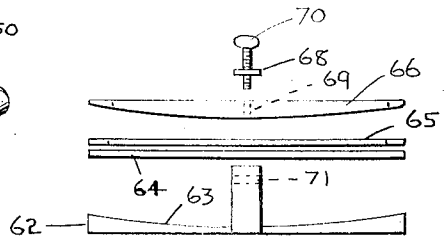


FIG 11

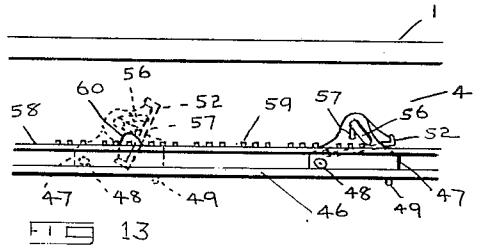


FIG 13

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Patented July 11, 1933 1,918,061

UNITED STATES PATENT OFFICE

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NEGATIVE-DEVELOPING AND PRINTING DEVICE

Application filed September 21, 1931. Serial No. 564,066.

This invention relates to negative-developing and printing devices, and more especially to that class of such devices that provides for contact printing while the negatives are still wet by reason of a developing process.

The objects of the invention are to provide an automatic negative-developing device, having parts relatively movable, and of which one part holds negative material previously exposed, and the other part automatically dispenses developing fluids to develop the negative material during the relative movement of the parts; to provide a combined negative-developing and printing device of parts relatively movable and of which one part holds, hermetically sealed, sensitized material in contact with negative material previously exposed, and the other part automatically dispenses developing fluids and provides a light-beam to respectively develop the negative material and print the image, thus developed, upon the sensitized material during the relative movement of the parts; to provide for such a device a support defining a path for the travel of a movable part adapted to carry a hermetically sealed holding means for sensitized material in contact with negative material previously exposed; to provide for such a device a support defining a path for a movable part and providing at intervals, along one portion of the path, means for dispensing developing fluids, and providing illumination for the other portion of the path; to provide for such a device, a support defining paths, for a movable part, upon different elevations, and providing an elevator adapted to connect said paths; and to provide such paths and elevator with means for moving a movable part of the device along both paths. With these and other objects in view as may become apparent from the within disclosures, the invention consists not only of the particular form herein pointed out and illustrated by the drawings but readily admits of certain modifications within the scope of what hereinafter may be claimed.

While the character of the invention has a broad application to the art of photography, it may be best understood by reference to one illustrative device embodying the invention and illustrated by the several figures of the accompanying drawings in which the Figure 1 is an upright elevation of one side of the device; the Figure 2 is an upright front elevation of the device; the Figure 3 is a top view of the device; the Figure 4 is an upright elevation of the device with a wall removed to illustrate the interior; the Figure 5 is an upright elevation of the device, in perspective, with an elevator wall removed and illustrating certain geared connections; the Figure 6 is an upright elevation of the side of the device opposite to that illustrated by the Figure 1; the Figure 7 is a perspective view of a valve member of the device; the Figure 8 is a perspective view of a conveyor and part pivotally carried thereby; the Figure 9 is a bottom view of the conveyor; the Figure 10 is a perspective view of a basined clamping-frame member; the Figure 11 is a view of the separated parts of the clamping-frame member; the Figure 12 is a perspective detail view of a chain portion; and the Figure 13 is a fragmentary view of a portion of an interior of the device, illustrating in full and dotted lines different positions of the part pivotally carried by the conveyor.

The improvement about to be disclosed is somewhat related to two co-pending applications for Letters Patent, both applications having been filed by the petitioner July 13, 1931, for improvements in the process of producing photographic proof prints, Serial Numbers 550,541 and 550,542, in that the basined clamping-frame, hereinafter described as a part of the improved negative-developing and printing device, is illustrated and described as an important feature in both processes for which applications were thus made.

Referring more particularly to the drawings, the support 1 may be of any desired form or structure that provides the interior floors 2 and 3, and defines the paths 4 and 5, respectively, of which one path is darkened and the other is illuminated and both paths are upon the same or different eleva-

tions. Each of the floors 2 and 3 is provided with a longitudinally extending slot 6 and an endless chain 7 or 8, mounted within each slot 6 and upon sprocket wheels 9 and 10, and 11 and 12, respectively, a sprocket wheel 13 being fixedly mounted upon the same shaft 15 that carries the sprocket wheel 12, the sprocket wheel 13 having an endless chain connection with an electric motor 14 by which power may be transmitted to the endless chain 8. Fixedly mounted upon the same shaft 16, as the sprocket wheel 11, is the gear wheel 17 in permanent mesh with the gear wheel 18 fixedly mounted upon the shaft 19, both shafts 16 and 19 being mounted in parallel relation, one with the other, upon the floor 3, the shaft 16 projecting exteriorly of the support 1 and there provided with a fixedly mounted sprocket wheel 20 having an endless chain connection with the sprocket wheel 21 fixedly mounted upon the shaft 22 journaled in the bracket 23 and fixedly carrying the gear wheel 24 for a purpose to be explained. The shaft 19 projects exteriorly of the support 1, upon the opposite side of the support to that upon which the shaft 16 projects, and is there provided with a fixedly mounted sprocket wheel 25 having a chain connection with the sprocket wheel 26 fixedly mounted upon the shaft 27 journaled in the bracket 28 and fixedly carrying the gear wheel 29 also for a purpose to be explained. The projecting shaft 19 is also provided with the sprocket wheel 30 having an endless chain connection with a sprocket wheel 31 fixedly mounted upon an exteriorly projected portion of the shaft 32 upon which the sprocket wheel 9 is mounted and thus transmitting to the endless chain 7 a movement opposite to that transmitted to the endless chain 8 by the motor 14. The elevator 33 is suspended by the cable 34 supported by the pulley wheel 35 mounted upon the standard 36 mounted upon the support 1, a weight 37, attached to the opposite end of the cable 34, being sufficient to maintain an unloaded elevator 33 in an elevated position at the end of the path 4, the elevator having side flanged portions 38 slidably engaging within the vertically extending slots 39 provided by the support 1, one of the slots 39 being illustrated by the Figure 5. Mounted interiorly upon either side of the elevator 33 are the spaced tracks 40, and intermediate of and below said tracks 40 is the pinion 42 fixedly mounted upon the shaft 43 of which both extremities project exteriorly of the elevator 33 and upon said extremities are fixedly mounted the gear wheels 44 and 45, respectively, the gear wheel 44 being meshable with the gear wheel 29 for operation in one direction when the elevator 33 is in its upper position upon the level with the path 4, and the gear wheel 45 being meshable with the gear wheel 24 for operation in the opposite direction when the elevator 33 is in its lower position upon the level with the path 5, the paths 4 and 5 each having upon its sides the tracks 46 in longitudinal alignment with the tracks 40 of the elevator 33 when upon their respective levels. The conveyor 47 is a movable platform or container having exteriorly the rollers 48 adapted to run upon the tracks 46 and 40, the conveyor 47 having upon its bottom the pin 49 for engagement by any of the multiple upright structures 50 provided by the endless chains 7 and 8 thus adapted to move the conveyor 47 along either of the paths 4 or 5 as the conveyor 47 is placed upon the tracks 46. The bottom of the conveyor 47 is also provided with the rack 51 for engagement by the pinion 42 to move the conveyor 47 upon the tracks 40 of the elevator 33 as the conveyor 47 approaches the elevator 33 in its upper position upon the level with the path 4, or to move the conveyor 47 out of the elevator 33 onto the tracks 46 of the path 5. The conveyor 47 is provided with the rockable tray 52 pivotally swung overhead by means of the shaft 53 fixed to said tray 52 and extending through the bores 54 with which the ends 55 of the conveyor 47 are provided, one or both of the shafts 53 extending beyond the bore 54 and having fixed thereto the arms 56 and 57 varying slightly in the length and direction. As the conveyor 47 is moved along the path 4, the longer arm 56 slides along a rail 58 with which the side of the path 4 is provided, the arm 56, and hence the rockable tray 52, being suddenly and repeatedly operated by the contact of the arm 56 with multiple short series of slight projections 59 provided by the rail 58 in the path of said arm 56, the arm 57, and hence the rockable tray 52, being operated at predetermined intervals by the greater projections, one of which is illustrated by the Figure 13, as at 60, to tip the tray 52. The tray 52 is adapted to carry the clamping-frame 61 comprising the base-plate 62 of which the inside surface 63 is made of arcuate form and provided with a flexible mat 64 preferably made of rubber and yielding to said arcuate form of the surface 63. Upon the mat 64 is placed any sensitized material, preferably printing-out paper (not illustrated), in contact with the film or other negative material (not illustrated) which has been previously exposed photographically. A flexible frame 65 is then placed upon the negative material and a rigid marginal frame 66 having the center structure 67 is placed thereon exposing the face of the negative material within the rigid frame 66. A clamping-bar 68, having an intermediate threaded bore 69 with a thumb-screw 70 therein, engages its extremities within the

interfacing slots 71 provided by the base-plate 62, the thumb-screw 70 being adapted to be screwed down upon the center structure 67 and thereby forcing the mat 64 and flexible frame 65, together with the material thus marginally held, to assume the arcuate form of the surface 63 and maintaining the sensitized material hermetically sealed to be water-tight, the assembled clamping-frame device providing a basin within which the face only of the negative material is exposed. The support 1 is provided with the liquid containers 72 and 73 adapted to hold developing and fixing fluids, respectively, the containers having conduits 74 and 75, respectively, with outlets 76 and 77 at spaced portions of the path 4, the conduits 74 and 75 having the valves 78 and 79, respectively, each valve being spring-pressed to a normal closed condition, but operable to a momentary open condition by means of the connecting rods 80 and 81 and levers 82 and 83, respectively, the levers 82 and 83 each being engaged by the advancing conveyor 47 along the path 4. The support 1 is also provided with the conduit 84 and the valve 85 connectible with a water supply, the conduit 84 having an outlet 86 at a portion of the path 4 intermediate the outlets 76 and 77, and the valve 85, normally spring-pressed to a closed condition, being operable to a momentary open condition by means of the rods 87 and the lever 88 operatively engageable by the advance of the conveyor 47 to the portion of the path 4 adjacent the elevator 33. Mounted upon the support 1 and the cable 34 are parts of the air-cushion device 89 adapted to retard the downward movement of the loaded elevator 33. The path 5 is illuminated by a vapor light 90 of sufficient intensity to print out the sensitized material as the conveyor 47 travels the path 5 in its connection, by means of the pin 49 engaged with one of the multiple structures 50, with the endless chain 8. The valves 78 and 79 are of a type having the body portion 91 provided with the bores 92 and 93, the inlet nozzle 94, the outlet nozzle 95, the yoke 96 and the spring-pressed member 97, the member 97 having at its inner extremity a rubber cushion 98 and, at the opposite extremity, a perforation 99 for the occupancy of the head of a lever 100, the head being intercepted by an adjusting screw 101, and the lever having a cam extremity 102 operable by means of the horizontal movement of a shoulder 103 provided by and carried by any convenient portion of the conveyor 47.

In operation, the water-tight clamping-frame 61, with the sensitized and negative materials therein as aforesaid, is placed upon the tray 52 and the conveyor 47 is placed upon the tracks 46 of the path 4 where one of the uprights 50 of the endless chain 7 may catch the pin 49, as illustrated by the Figure 4, and thus connecting the conveyor 47 to the moving endless chain 7. When the conveyor 47 is under the outlet 76, the valve 78 is momentarily operated against its spring tension by the contact of a portion of the advancing conveyor 47 with the lever 82, a quantity of developing fluid being thereby released from the container 73 to the basined clamping-frame 61 upon the face of the negative material therein exposed. As the conveyor advances, the arm 56, in passing over the multiple short series of projections 59, as illustrated in full line by the Figure 13, is intermittently operated by each of said series sufficiently to agitate the fluid content of the basined clamping-frame 61, which content, owing to the arcuate surface 63 of its basin, is given added motion in undulating form. Upon the conveyor 47 reaching a greater projection 60, the arm 57 is operated to tip the tray 52, as illustrated in dotted lines by the Figure 13, and hence the basined clamping-frame 61, thereby spilling the content of the basin into the container of the conveyor 47. When gravity returns the tray 52 to its normal erect position and the conveyor 47 has sufficiently advanced along the path 4 and under the outlet 86, it contacts with the lever 88 to momentarily open the valve 85, a quantity of water thereby being delivered to the basined clamping-frame 61 to rinse the face of the negative material, exposed within the basin, as the content is agitated by the further contact of the arm 56 with series of projections 59. A contact of the arm 57 with a greater projection 60 again tips the tray 52, together with the basined clamping-frame 61, to spill the content of the basin into the container of the conveyor 47. Gravity again restoring the tray 52 to its normal erect position and the conveyor 47 having advanced sufficiently to arrive under the outlet 77 and contact with and operate the lever 83, the fixing fluid is thereby released from the container 72 and delivered to the basin of the clamping-frame 61 in sufficient quantity, and the contact of the arm 56 with the series of projections 59 agitating the basin content as before, and contact of the arm 57 with a greater projection 60 tips the tray 52, and hence the basined clamping-frame 61, to spill the basin content into the container of the conveyor 47. The conveyor 47, having reached the elevator 33, meshes the rack 51 with the pinion 42 as the pinion 42 rotates by reason of its geared connection with the gear wheel 29, thereby moving the conveyor 47 onto the elevator 33 as the pin 49 is about to ride out of contact with the upright structure 50 of the endless chain 7 with which it has been engaged. The added weight of the conveyor 47 to the weight of the elevator 33 releases the elevator 33 from its upper level

position and breaks the geared connection of the pinion 42 with the gear wheel 29, the force of gravity in excess of the resistance of the weight 37 operating the elevator 33 downwardly while the air-cushion 89 retards its downward course until it reaches the lower level of the path 5. Upon reaching such lower level, the pinion 42 is automatically given a geared connection with the gear wheel 24 and is thereby rotated in its connection with the rack 51 to move the conveyor out of the elevator toward the path 5 to engage the pin 49 with one of the multiple upright structures 50 of the endless chain 8 thus adapted to carry the conveyor 47 along the path 5 under the elongated ray of the vapor lamp 90 directed upon the exposed face of the wet negative material as the conveyor 47 moves under the ray which prints out the sensitized material to produce thereon the image of the negative material developed as aforesaid.

The great advantage of the above-described and improved negative-developing and printing device is most obvious. To be able to place photographically exposed negative material in this device and in contact with sensitized material, and automatically have the negative developed and the sensitized material printed out before being returned to hand, makes it possible, not only for the photographer to busy himself in the meanwhile in photographically exposing other negative material, but to expedite the process of developing and printing in that it is not necessary to first dry the wet negative material before printing.

While a specific structure is herein illustrated and set forth as providing fixed paths and a material holding member movable along said paths, the material holding member might be a darkened stationary member and the structure providing the developing fluids, the means for dispensing the same, and the means for printing might be relatively movable as regards the material holding member, or the paths 4 and 5, instead of being upon different levels, might be arranged upon the same level in straight or curved continuance.

I claim:—

1. A movable platform upon a support of a negative developing device, means provided by the support for moving the platform, the platform being adapted to carry a member enclosing sensitized material in contact with previously exposed negative material, the platform being provided with means for operating valves provided by the container of developing fluids provided by the support for application to the negative material while the platform is moving;

2. A movable platform upon a support of a negative developing device, means provided by the support for moving the platform, the platform being adapted to carry a member enclosing sensitized material in contact with previously exposed negative material, the platform being provided with means for operating valves provided by the container of developing fluids provided by the support for application to the negative material while the platform is moving, and means provided by the platform and the support to agitate the fluids thus applied;

3. A negative-developing and printing device comprising a support, a container provided by the support, the container and the support being relatively movable, a rocking tray member provided by the container and a frame having a darkened basin and carried by the tray, the basin being adapted to hold, hermetically sealed, sensitized paper in contact with negative material, the face only of the negative material being exposed within the darkened basin, automatic means provided by the support and the container for applying developing fluids to said face within the basin, rocking and tipping means provided by the tray and the support to respectively agitate and spill the basin contents, and a light source providing a light-beam directed upon the said face to print the images of the negative, thus developed, upon the sensitized paper;

4. A negative developing device comprising a support, a container provided by the support, the container and the support being relatively movable, a rocking tray member provided by the container and a frame having a darkened basin and carried by the tray, the basin being adapted to hold, hermetically sealed, sensitized paper in contact with negative material, the face only of the negative material being exposed within the darkened basin, automatic means provided by the support and the container for applying developing fluids to said face within the basin, and rocking and tipping means provided by the tray and the support to respectively agitate and spill the basin contents;

5. A film-developing and printing device comprising a support, a defined path provided by the support, a conveyor adapted to travel said path, and means to move said conveyor, said conveyor having a rockable tray, a basined frame carried by the tray and being adapted to hold, hermetically sealed, sensitized paper in contact with exposed films, the faces only of the films being exposed within the basin, means provided by the support and the conveyor for applying developing fluids to said faces within the basin, rocking and tipping means provided by the tray and the support to respectively agitate and spill the basin contents, and a light source providing a light-beam directed upon said faces to print the

images of wet films, thus developed, upon the sensitized paper;

6. An automatic negative-developing and printing device comprising a support, a defined path provided by the support, said path including a darkened chamber, a conveyor adapted to travel along said path, said conveyor having a rockable tray, a basined water-tight clamping-frame carried by said tray, said frame being adapted to receive and to hold, hermetically sealed, printing-out paper in contact with negative material, the face only of the negative material being exposed for developing within the basin, means for moving the conveyor along said path, separate sources of developing, fixing and rinsing fluids, each source having conduits to spaced portions of said darkened chamber, automatic means for the separate and timed delivery of said fluids from said sources to the basin of the frame at predetermined intervals along said darkened chamber, means for alternately rocking and tipping said tray at predetermined intervals along said darkened chamber to respectively agitate and to spill the basin contents, and a light source within the other portion of said path and providing an elongated light-beam directed upon said face within said basin to print the image of the negative, thus developed, upon the printing-out paper;

7. An automatic negative-developing and printing device comprising a support, defined paths provided by the support upon different elevations, one of said paths providing a darkened chamber and the other path being illuminated, a conveyor adapted to travel said paths, the paths being connected by means of a gravity elevator, a rockable tray provided by the conveyor, a basined water-tight clamping-frame carried by said tray, said frame being adapted to receive and to hold, hermetically sealed, printing-out paper in contact with negative material, the face only of the negative material being exposed for developing within the basin, means for moving the conveyor along one path and into the elevator and along the other path, sources of developing, fixing and rinsing fluids provided by the support, each source having conduits to spaced portions of the darkened chamber, automatic means for the separate and timed application of said fluids to said face within said basin at predetermined intervals along said darkened chamber, means for alternately rocking and tipping said tray at predetermined intervals along said darkened chamber to respectively agitate and to spill the basin contents, and a light-beam along said illuminated path and directed upon said face to print the image of the negative, thus developed, upon printing-out paper;

8. An automatic negative-developing and printing device comprising a support, defined paths provided by the support upon different elevations, one of said paths providing a darkened chamber and the other path being illuminated, a conveyor adapted to travel said paths, the paths being connected by means of a gravity elevator, a rockable tray provided by the conveyor, a basined water-tight clamping-frame carried by said tray, said frame being adapted to receive and to hold, hermetically sealed, printing-out paper in contact with negative material, the face only of the negative material being exposed for developing within the basin, means for moving the conveyor along one path and into the elevator and along the other path, sources of developing, fixing and rinsing fluids provided by the support, each source having conduits to spaced portions of the darkened chamber, automatic means for the separate and timed application of said fluids to said face within said basin at predetermined intervals along said darkened chamber, means for alternately rocking and tipping said tray at predetermined intervals along said darkened chamber to respectively agitate and to spill the basin contents, and a light-beam along said illuminated path and directed upon said face to print the image of the negative, thus developed, upon the printing-out paper, said means for moving the conveyor comprising an endless chain with which each path is provided, the chains having geared connection for movement in opposite directions and each chain having automatic means for connecting and disconnecting with means provided by said conveyor, and a rack and pinion with which the conveyor and elevator are provided, the pinion being shiftingly connectible with said geared connection and the movement of the pinion being reversible, according to the position of the elevator.

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