Jan. 9, 1940. C. H. GREEN ET AL 2,186,637

RAPID PROCESSING MACHINE

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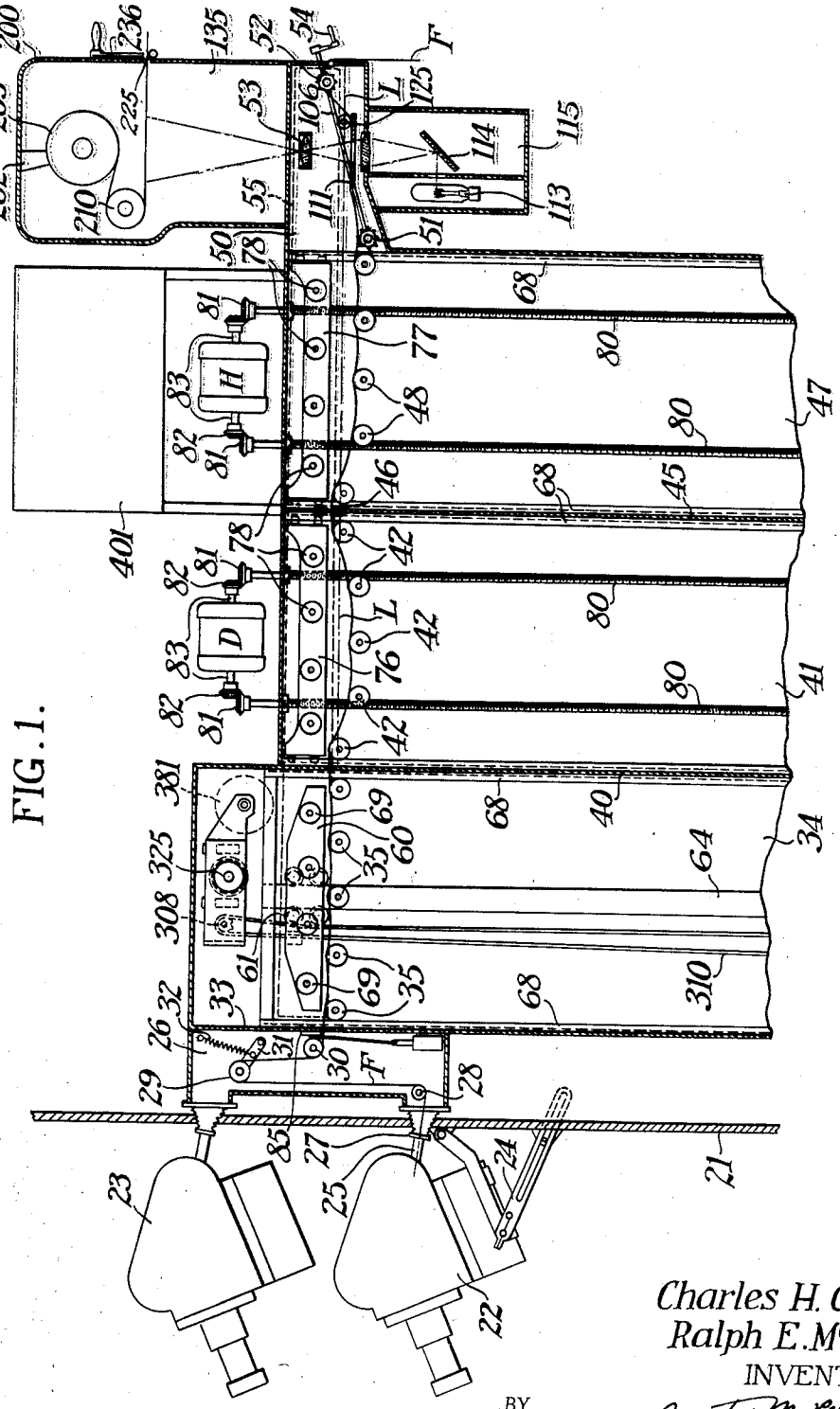


FIG. 1.

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Ralph E. McAdam
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BY

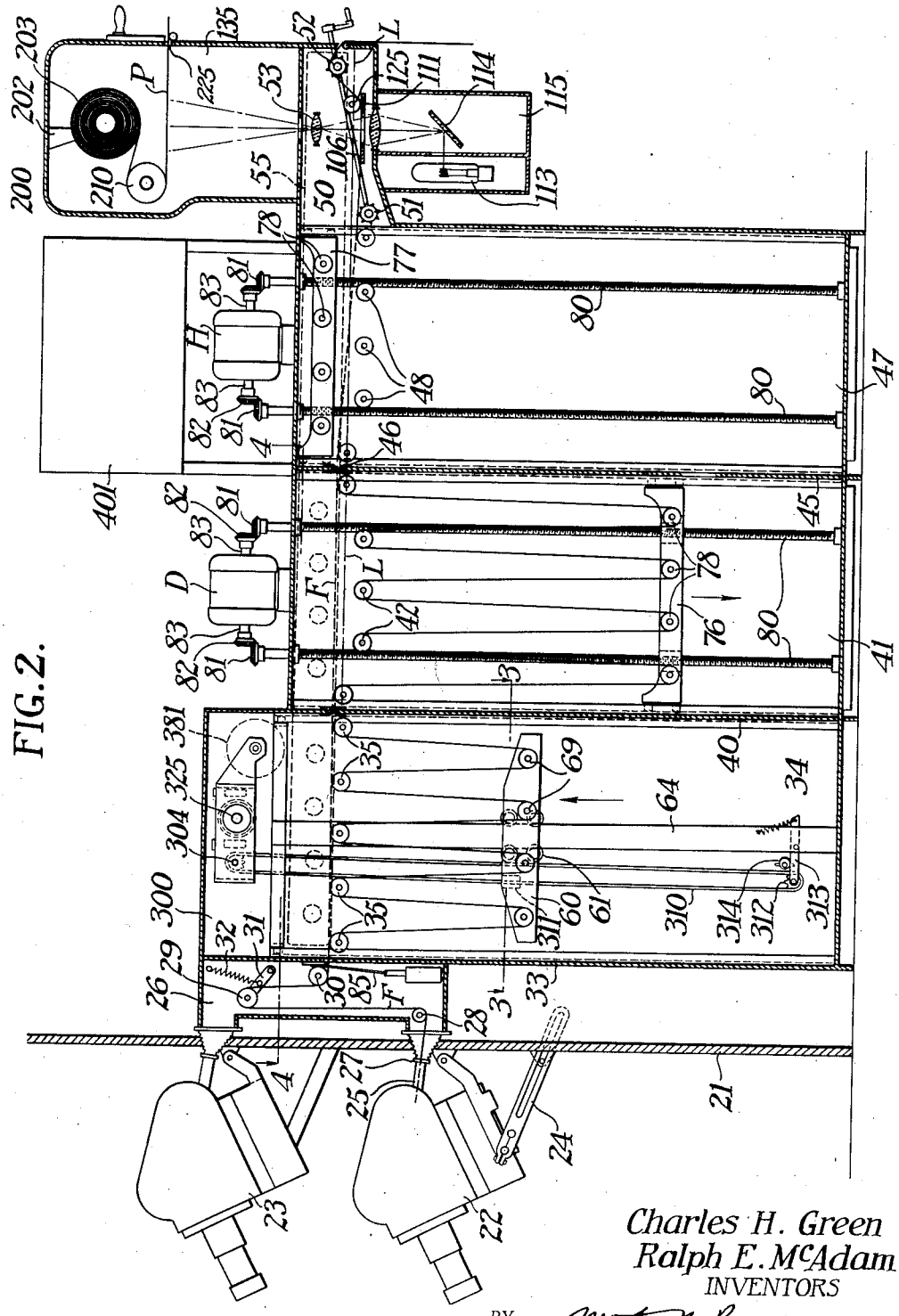
Newton M. Bennett
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RAPID PROCESSING MACHINE

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FIG. 2.



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RAPID PROCESSING MACHINE

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FIG. 3.

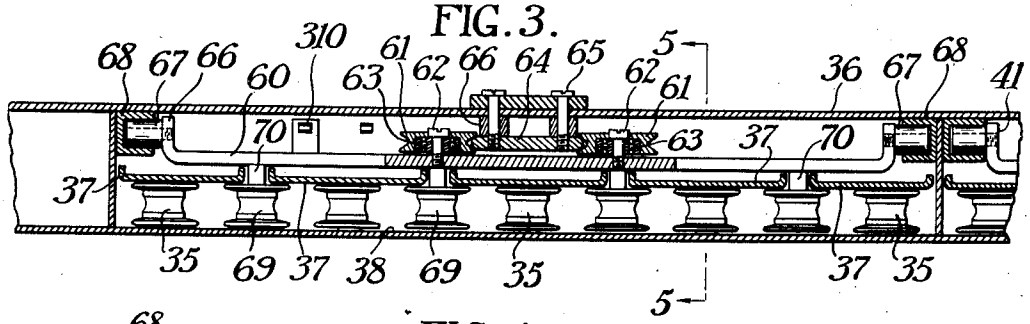


FIG. 4.

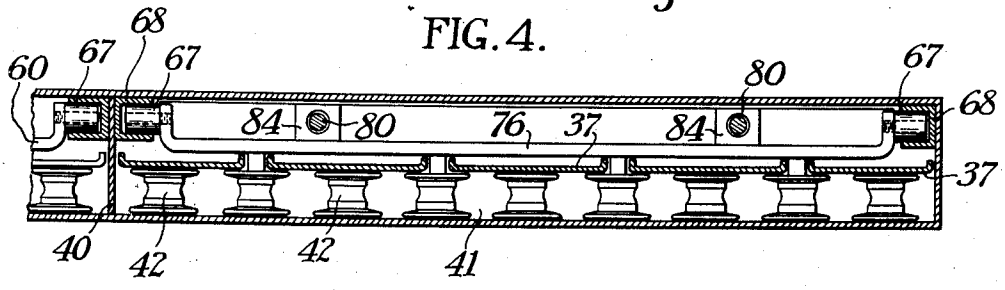


FIG. 5.

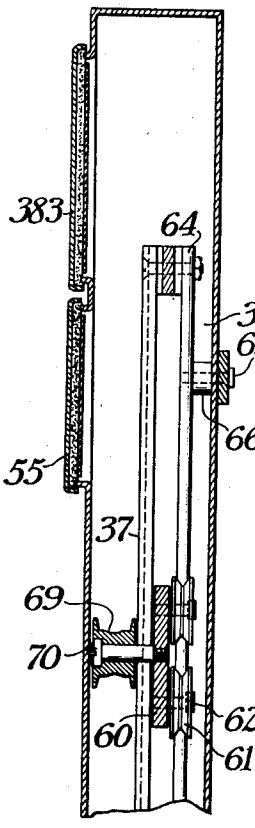


FIG. 7.

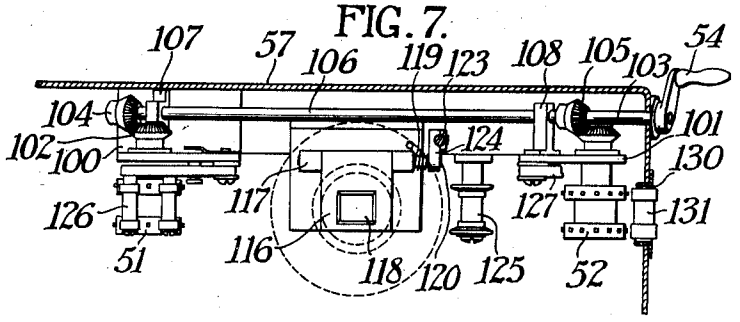


FIG. 6.

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FIG. 11.

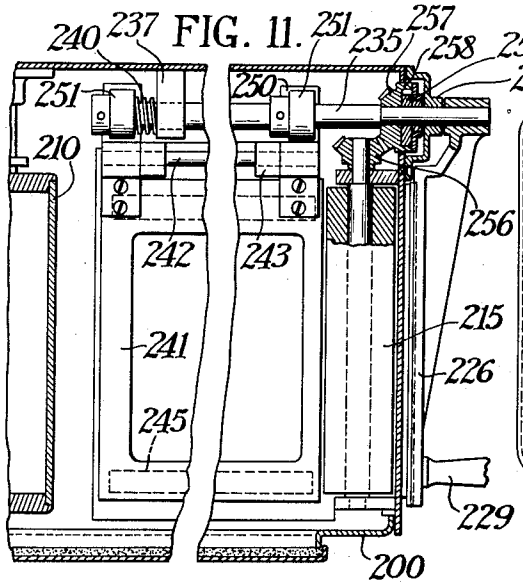


FIG. 10.

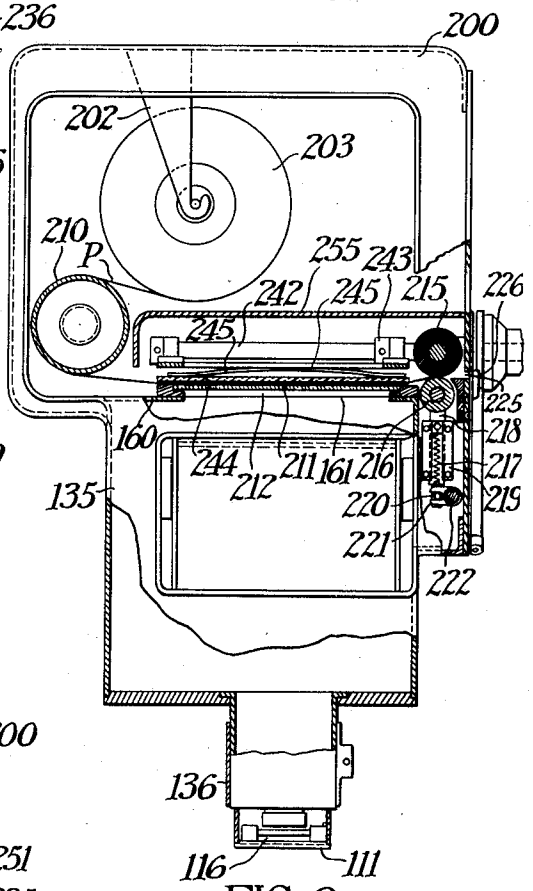


FIG. 8.

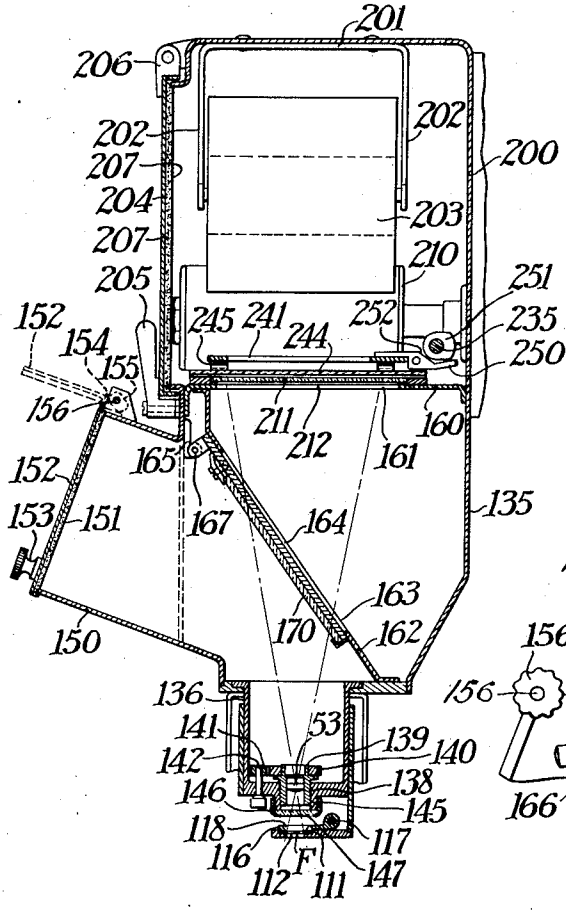
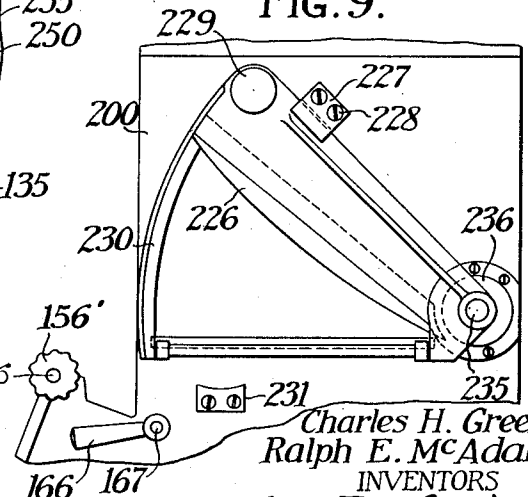


FIG. 9.



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FIG.13.

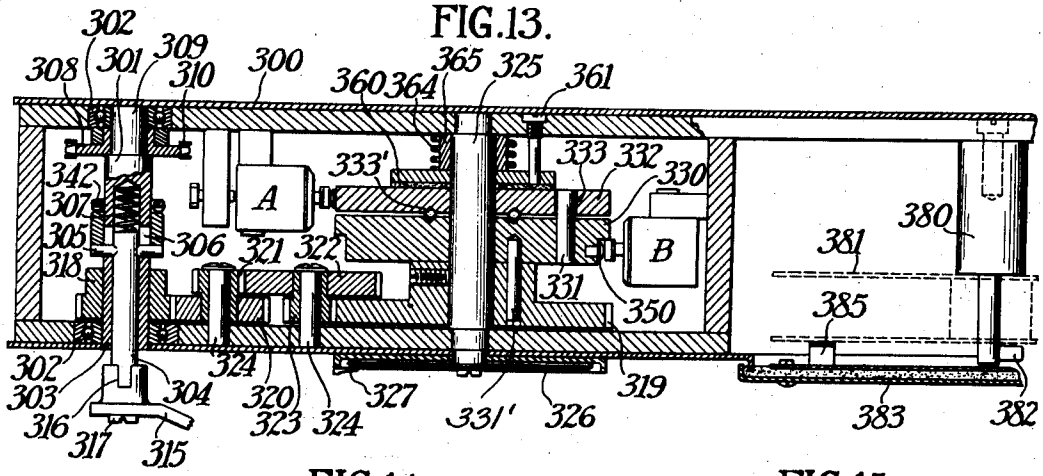


FIG.14.

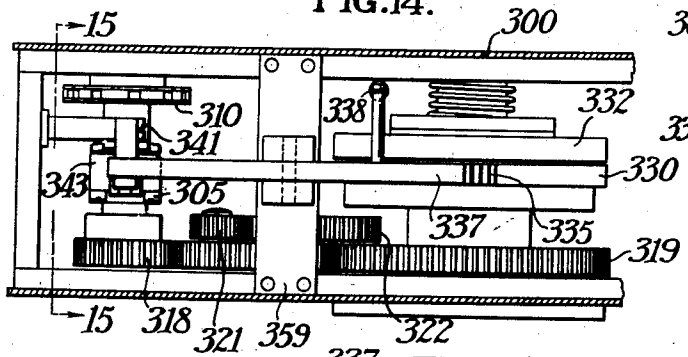


FIG.15.

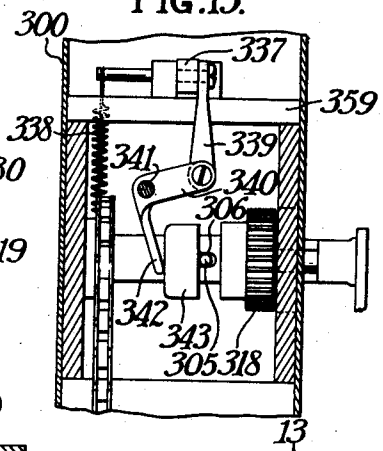
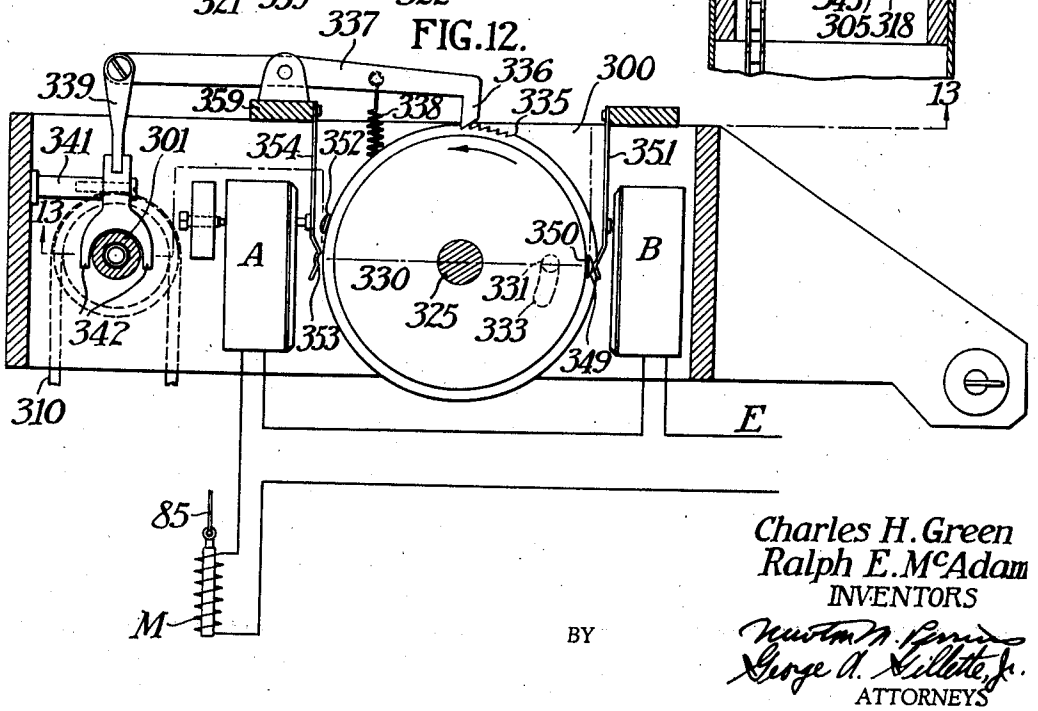


FIG.12.



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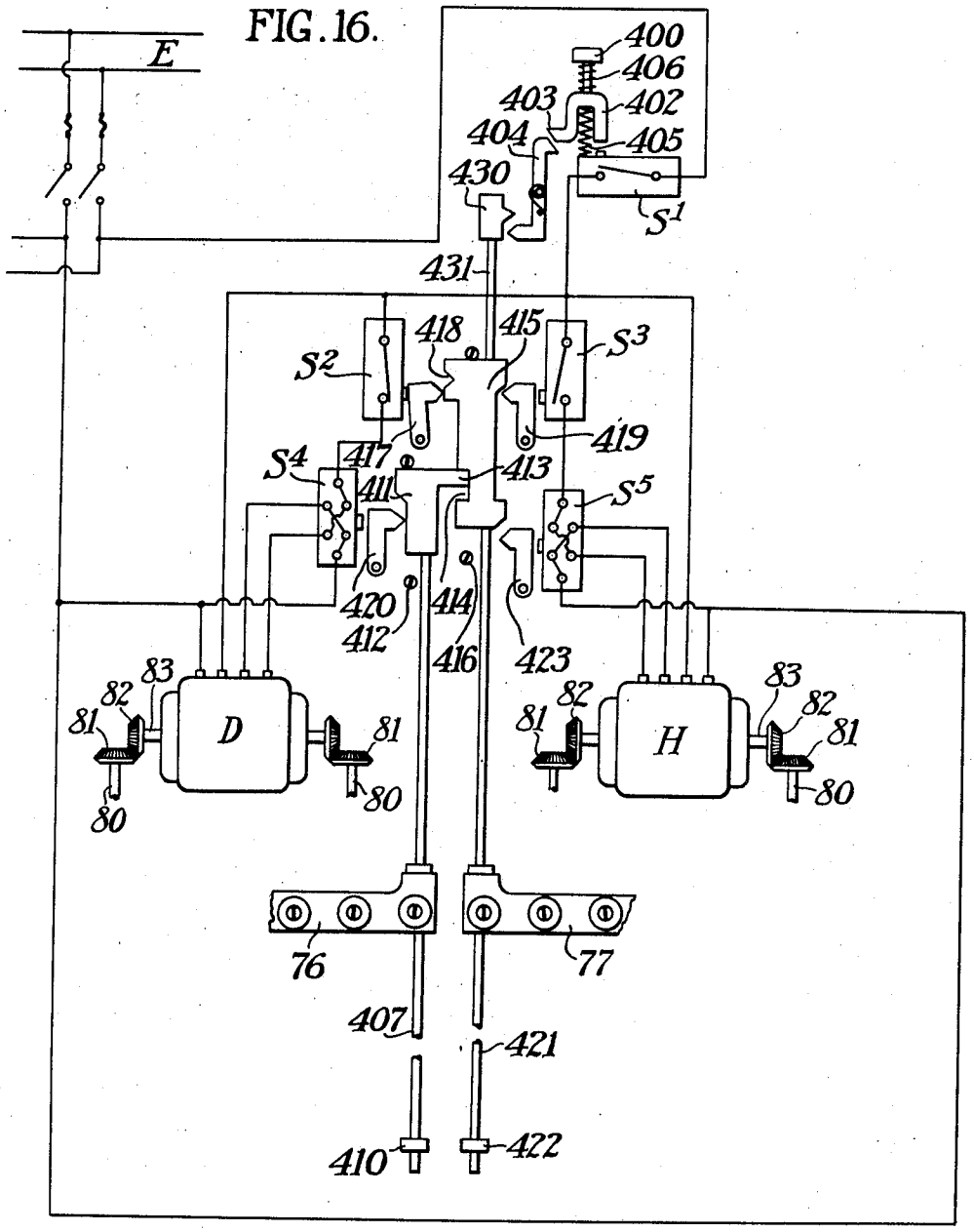
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RAPID PROCESSING MACHINE

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FIG. 16.



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Patented Jan. 9, 1940

2,186,637

UNITED STATES PATENT OFFICE

2,186,637

RAPID PROCESSING MACHINE

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Application November 20, 1936, Serial No. 111,887

20 Claims. (Cl. 95—94)

This invention relates to photography, and particularly to a rapid processing machine which is adapted to receive an exposed film directly from a motion picture camera, and process said film strip automatically in a very short time. The processing machine is also provided with a viewing and enlarging station wherein an operator can select suitable picture frames, enlarge, and print the same so that a finished enlarged print of any particular picture frame can be had within three minutes after the time of exposure.

In horse races, auto races, and similar sporting events, the finishes are at times so close that it is almost impossible for a group of judges to render an unquestionable decision. For recording an unbiased, and accurate decision on the results of such an event the high speed motion picture camera has proven itself to be an unparalleled and unbiased judge, and high speed cameras have been developed by means of which objects having excessive speeds can be photographed as motionless. However, although the high speed motion picture camera has proven its worth in connection with such events, it has as yet been impractical, because the time, heretofore, required for producing a finished print of the event has been prohibitive.

Therefore, the primary object of our invention is to provide a rapid processing machine by means of which a film from a high speed motion picture camera can be automatically processed on location, and a finished enlarged print of any desirable picture frame can be delivered to the judges within three minutes after exposure of the film.

Another object is to provide a rapid processing machine wherein the enlargement of a desirable picture frame is accomplished while the film is under the processing liquid.

And still another object is to provide a rapid processing machine wherein the film strip is fed into successive treating tanks in a series of loops whereby any given point on the film strip will remain in a given processing solution the same length of time as any other point on the film strip.

And yet another object is to provide a rapid processing machine which is adapted to be threaded by merely pulling the film strip across the top of the several treating tanks in a substantially straight line.

Another object is to provide a dry box in advance of the treating tanks into which the film strip emanating in spurts from a high speed motion picture camera can be carried in a series of loops by a gravity actuated carrier whereby a constant supply is provided for the smooth operation of the timed film feeding means in the subsequent treating tanks.

Another object is to provide an automatically operated knife in advance of said dry box which is adapted to sever the film strip entering said box when the gravity carrier therein reaches a given vertical point in said box on its upward movement, but is not actuated when said carrier passes said point on its downward movement.

And still another object is to provide a rapid processing machine of the type referred to which is semi-automatic in its operation and requires only two operators.

Briefly, our invention consists of a dry box, a pair of treating tanks, and a viewing and enlarging station, all in alinement with one another so that a film strip can be fed directly from one to another. A film strip from a high speed motion picture camera is fed across the tops of the dry box, and the treating tanks over a plurality of spaced guide rollers which are rotatably mounted near the top of each, and finally over a pair of manually operated sprockets in the viewing and enlarging station. For feeding the film strip into the dry box and the two treating tanks in a series of loops, a carrier is provided in each on which a plurality of guide rollers are mounted in staggered relation to said first mentioned guide rollers. When the camera is started, the carrier in the dry box, which is gravity actuated, is released and carries the film into said dry box in a series of loops. When a sufficient supply of film has been run into the dry box, a motor, which operates a driving screw by means of which the carrier in the first treating tank is fed into the dry box, is started and the carrier in the first treating tank feeds the film thereinto at a given speed. As the carrier in the first tank reaches the bottom thereof, a motor driving a similar screw in the second treating tank is automatically started, and the carrier therein pulls the film through the first treating tank and immerses it in the second tank in a series of loops. The speeds of the two carriers are so timed that the film is properly immersed in the respective treating solutions to insure proper processing. After the film has been immersed in the final treating tank the film is examined in the viewing station to determine which of the picture frames are most suitable for printing, and when a desirable frame

is found it is enlarged and a print thereof is made while the negative is immersed in the final treating solution. The enlarged print is developed and finished in the darkroom in which the processing station as a whole is generally situated.

The novel features that we consider characterstic of our invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its methods of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings in which

Fig. 1 is a longitudinal section of our rapid processing machine showing the carriers in the dry box, developing tank, and hypo tank in their threading positions,

Fig. 2 is a longitudinal section of my rapid processing machine showing the film being carried into the developing tank from the dry box,

Fig. 3 is a section of the dry box taken on line 3—3 of Fig. 2,

Fig. 4 is a section of the developing tank taken on line 4—4 of Fig. 2,

Fig. 5 is a vertical end section of the dry box taken on line 5—5 of Fig. 3,

Fig. 6 is a partial section of the viewing and enlarging station showing in detail the film path past the enlarging and illuminating means,

Fig. 7 is a section of Fig. 6 taken on the liquid level L,

Fig. 8 is a vertical section of the viewing and enlarging station,

Fig. 9 is an elevation of the end of the sensitive paper magazine atop the viewing and enlarging station showing the knife in detail,

Fig. 10 is a front view of the viewing and enlarging station partially in section and partially in elevation and showing the paper feeding mechanism in section and detail,

Fig. 11 is a partial plan view of the paper magazine showing the feeding mechanism in detail and partially in section,

Fig. 12 is a longitudinal section taken through the housing atop the dry box,

Fig. 13 is a section taken on line 13—13 of Fig. 12,

Fig. 14 is a partial plan view of Fig. 12,

Fig. 15 is a section taken on line 15—15 of Fig. 14, and

Fig. 16 is the electrical circuit for controlling the timed operation of the motors driving the film carrier into and out of the processing tanks.

Like reference characters refer to corresponding parts throughout the several figures.

Referring now particularly to Figs. 1 and 2, our rapid processing machine is shown as being mounted in a closed tower, one wall 21 of which is illustrated, said tower being erected at the finish line of a race track. A pair of special high speed cameras 22 and 23 are mounted on the wall 21 of the tower by means of brackets, indicated broadly at 24, said brackets permitting a vertical adjustment of the cameras so that the width of the track can be covered, but preventing a horizontal adjustment of the cameras since the cameras are very accurately positioned on the finish line and no horizontal movement is desired. Two cameras 22 and 23 are provided to insure against the possibility that one might fail to operate, but since the cameras are identical, and the film from only one can be threaded through the processing machine at a time, the other having the usual take-up reel for purposes hereinafter described, we will concern ourselves with camera 22, the film from which is shown in threaded position in the processing machine.

The camera 22 instead of having the usual take-up reel for the exposed film strip is provided with a chute 25 through which the film is ejected from the camera as it is exposed. In order to provide a light tight connection between the processing machine and the chute 25 of the camera 22 through which the film can pass, a bellows fixed to the take-up box 26 of the processing machine is adapted to extend through an opening in the wall 21, and be connected with the chute 25 of the camera by means of any suitable coupling 27. The bellows type connection is provided between the camera and the processing machine so as to allow for a vertical adjustment of the camera. The film strip F on emerging from the chute 25 of the camera 22 is threaded over guide rollers 28, 29, 30 which are rotatably mounted in the take-up box 26. Roller 29 is mounted on an arm 31 which is pivoted to the wall of the take-up box, and is tensioned by means of spring 32 for the purpose of maintaining a tension on the film strip F, and to provide a shock absorber for overcoming shocks to which the film strip is subjected when the camera is suddenly stopped.

From the take-up box 26 the film strip F passes through an opening in the partition 33 into the dry box 34 where it is threaded over a plurality of flanged guide rollers 35 which are rotatably mounted in spaced relation in the dry box 34 in substantially the same horizontal plane. Referring now particularly to Fig. 3, the dry box comprises a comparatively narrow tank 36 in which a plurality of vertical supporting plates 37 are fixedly mounted. The supporting plates 37 are spaced from the front wall 38 of the tank 36 just enough to allow the guide rollers 35 to be rotatably mounted between the two. It will be understood from the drawings that by spacing the vertical supporting plates 37 from the front wall 38 of the dry box just sufficiently to allow the guide rollers 35 to be rotatably mounted therebetween, an auxiliary guide-way is formed for the film strip which is just a trifle wider than the width of the film strip, so that if the film should jump off of one of the guide rollers 35 during the loop forming operation, as hereinafter described, the auxiliary guideway will prevent the film strip from twisting and becoming tangled.

From the dry box 34 the film strip passes through an opening in the partition 40 and into the developing tank 41 where it is threaded over another plurality of flanged guide rollers 42 which are rotatably mounted between the wall of the tank 41 and vertical supporting plates 37 fixed in said tank, see Fig. 4, exactly in the same manner as was described above in connection with the guide rollers 35 in the dry box 34. The guide roller 42 adjacent the point of entrance of the film into the developing tank 41, and the guide roller 42 adjacent the point of exit of the film from the tank are in the same horizontal plane as the guide rollers 35 in the dry box 34, but the three intermediate guide rollers 42 are mounted in a lower horizontal plane to insure that the top of the film loops in the tank will be below the level L of the developing liquid in the tank, see Figs. 1 and 2.

From the developing tank 41 the film strip F is passed through an opening in the partition 45 which is provided with a squeegee 46 which wipes

any excess developing solution from the film strip before it passes into the hypo tank 47. The film is threaded over another plurality of flanged guide rollers 48 which are rotatably mounted in the upper end of the hypo tank 47 in the same manner as are guide rollers 42 in the developing tank 41 and guide rollers 35 in the dry box 34.

The upper end of the hypo tank 47 opens directly into a shallow tank 50 which constitutes a part of the viewing and enlarging station hereinafter described, and the level L of the hypo solution is adapted to be sufficiently high to fill a portion of the shallow tank 50 as shown in Figs. 1, 2 and 6. A pair of film sprockets 51 and 52 are so mounted in the shallow tank 50 that the sprocket 51, to the left of the enlarging lens 53, is under the hypo solution, and the one to the right of the lens 53 is above the level of the hypo solution. The sprockets 51 and 52 are geared together, as will be hereinafter more clearly described, and are adapted to be manually rotated in either direction by means of a hand crank 54 for the purpose of selecting desirable picture frames for enlarging and printing. In threading the machine the film strip F is lead from the hypo tank 47, over sprocket 51, past the viewing and enlarging lens systems to be hereinafter described, over sprocket 52 and finally through an opening in the end of the tank where it can be collected in any desired form of container not shown, see Figs. 1 and 2. After the film strip is threaded over the sprockets 51 and 52 it will be understood that this end of the film strip is fixed until the sprockets are rotated through handle 54. Access to the flanged guide rollers 35, 42, and 48 and the sprockets 51 and 52 is made possible by removing a narrow elongated door 55, see Figs. 1, 2, and 5, which extends the full length of the machine adjacent the above mentioned parts, and which can be removable mounted on the machine in any suitable manner, so long as a light tight joint is provided as shown.

After the machine is threaded in the above described manner it is ready for operation, and the machine is in the condition shown in Fig. 1. When the camera 22 is started, the gravity actuated carrier 60 in the dry box 34 is released from its threading position wherein it is held at the top of the dry box, by means hereinafter described, and is allowed to descend in the box under the action of gravity. Four guide rollers 61 are mounted on the rear side of the gravity carrier 60 by means of bolts 62, and the guide rollers 61 are provided with ball bearings 63 for the purpose of reducing the friction therein to a minimum. A rail member 64 is vertically mounted on the dry box 34 by means of bolts 65, and is spaced from the rear wall of the box by bushings 66, see Fig. 3. The edges of the rail member 64 are rounded to fit into the grooves in the guide rollers 61 on the gravity carrier 60 to form a track on which the carrier is adapted to travel vertically. The ends 66 of the carrier 60 are bent at right angles to the carrier proper and have rotatably mounted thereon a pair of rollers 67 which ride in channels 68 fixed to the rear corners of the dry box 34 for further guiding and facilitating the vertical movement of the carrier.

On the front face of the carrier 60 are rotatably mounted a plurality of flanged guide rollers 69, said guide rollers being mounted on posts 70 which are long enough to extend from the carrier 60 through spaces between the vertical supporting plates 37 so that the guide rollers 69 will be in alinement with the guide rollers 35, see Fig. 3, but will have a staggered relation with respect thereto. When the carrier 60 is released it will descend and be supported by the film strip threaded over the guide rollers 35. As the film continues to burst from the camera, the carrier 60 will continue to descend carrying the film strip F into the dry box 34 in a series of loops as shown in Fig. 2. The dry box 34 can be designed to accommodate any desired film footage, but for purposes of photographing the finishes of horse races and the like, and processing the film immediately after each race, a dry box having a film capacity of thirty feet is entirely satisfactory. The purpose of the dry box 34 in the rapid processing machine is to insure a constant supply of film prior to feeding the film into the developing tank 41. It can be appreciated that if the film was taken directly from the high speed camera into the developing tank, the process would be far from satisfactory, because the speed of the film going into the developing tank, and its duration of stay therein is very closely controlled and the speed of the film issuing from the camera would never be exactly the same as the speed at which it would have to be immersed in the developing fluid in tank 41. However, it is possible to use this processing machine sans the dry box, if a roll of film is mounted in advance of the developing tank to provide the constant supply of film, as will hereinafter be described.

The developing tank 41 and the hypo tank 47 being identical as to construction, the description of one will serve for the other. The developing tank 41 and the hypo tank 47 are of the same dimension as the dry box 34, see Fig. 3, and they each have a plurality of vertical plates 37 spaced from their front wall between which flanged guide rollers 42 and 48 respectively are rotatably mounted near the top of each tank in spaced relation. The middle three guide rollers 42 in the developing tank 41 and the last four guide rollers 48 in the hypo tank 47 are mounted slightly lower than the other rollers 35, 42 and 48 in order to insure that the tops of the film loops formed thereon will be below the level L of the developing fluid in the developing tank and the hypo fluid in the hypo tank. The carrier 76 in the developing tank, and the carrier 77 in the hypo tank are provided with rotatable flanged guide rollers 78 mounted in staggered relation with the guide rollers 42 and 48 as are the flanged guide rollers 69 on the gravity carrier 60 so no detailed description will be given here, see Fig. 4. A pair of driving screws 80 are journaled in each of the tanks 41 and 47 and are provided on their upper ends with bevel gears 81 which engage bevel gears 82 fixed to the shafts 83 of the motors marked D and H to differentiate between the motor associated with the developing tank 41 and that associated with the hypo tank 47. A pair of blocks 84 are fixed to the rear side of each of the carriers 76 and 77, and each of these blocks is tapped to hold the carriers in threaded engagement with the driving screws 80 so that they travel vertically thereon as the screws are driven by the motors D and H. The ends of each of the carriers 76 and 77 are provided with rollers 67 which run in the channels 68 fixed to the rear corners of the tank as described in connection with the dry box 34 to guide the carriers in their vertical travel in their respective tanks.

After the film which has been exposed during the photographing of one race finish, usually about 20 feet, has been carried into the dry box 34 in loops by the gravity carrier 60, the motor

D for the developing tank is started. This drives the screws 80 in the developing tank 41 and starts the carrier 76 therein moving vertically downward. The rollers 78 engage the film strip F threaded over the guide rollers 42 and carry the film into the developing tank in a series of loops, see Fig. 2. The carrier 76 is moved downward into the tank 41 at a definite speed so that the film strip is immersed in the developing fluid a definite length of time so as not to be over developed. As the carrier 76 feeds the film into the tank 41, since the right hand end of the film strip is being held by the sprockets 51 and 52, the film must be pulled from the dry box 34. Since the gravity carrier 60 is comparatively light, and is mounted in the dry box 34, for free movement vertically thereof, as the film is fed into the developing tank 41 the shortening of the film loops in the dry box causes the gravity carrier 60 in the dry box to be carried to the top of the dry box where it is automatically engaged and held for the next threading operation. As the gravity carrier 60 is raised past the guide rollers 35, an electro-magnetically operated knife 85 located at the point of entrance of the film into the dry box 34 from the take-up box 26, cuts the film strip F and allows the free end to be pulled into the developing tank. The mechanism for controlling the cut-off of the film strip as the carrier 60 is raised past a given vertical point in the dry box, but which does not permit the actuation of the knife when the carrier 60 passes the same point on the down stroke will be described in detail hereinafter.

As the carrier 76 in the developing tank 41 reaches the bottom of its travel, which takes about 30 seconds, the motor H atop the hypo tank 47 is automatically started and the carrier 77 in the hypo tank is started downward. When the carrier 77 moves downward in the hypo tank the film strip F is fed into the hypo liquid in loops, and is pulled out of the developing tank 41. Inasmuch as the carrier 76 in the developing tank remains at the bottom of the tank 41 after the carrier in the hypo tank is started downward, the film strip F in passing from tank 41 to tank 47 must follow the loop formations in the developing tank. For this reason the speed at which the carrier 77 is fed into the hypo tank 47 must be such that any given point on the film strip F, with the exception of the leader strip, will remain in the developing liquid the same length of time as any other point on the strip. The time that the film is kept in the hypo is not so critical as is the case with the developer, because a film can be maintained in the hypo as long as 30 minutes without causing any damage to the film. The electrical circuit for controlling the timed operation of the two motors D and H which feed the carriers 76 and 77 into tanks 41 and 47 respectively, and which are reversed to bring the carriers back to their threading positions together will be described in detail hereinafter.

When the carrier 77 in the hypo tank 47 has reached the bottom of the tank, and the film strip F has been completely evacuated from the developing tank the operator is ready to perform the operation of selecting the picture frames which are desirable for printing and enlarging and then to make the enlargement. The viewing and enlarging station comprises a shallow tank 50, see Figs. 1, 2, 6 and 7, in which a pair of film sprockets 51 and 52 are mounted. Referring now particularly to Figs. 6 and 7, the film sprocket 51 is rotatably mounted on a bracket 100 which is fixed to the wall of the shallow tank 50, and the sprocket is so situated that it is below the level L of the hypo liquid in the tank. Film sprocket 52 is also rotatably mounted on a bracket 101 which is fixed to the wall of the tank 50, sprocket 52 being spaced from sprocket 51 and located above the level L of the hypo liquid. Film sprockets 51 and 52 each have bevel gears 102 and 103 respectively fixed thereto, said gears being in engagement with bevel gears 104 and 105 fixed to the shaft 106 which is journaled in bearings 107 and 108 fixed to the wall of the tank 50. The handle 54 is fixed to the end of the shaft 106 which extends through the wall of the tank 50 whereby the sprockets 51 and 52 can be simultaneously driven in either direction to feed the film strip backwards and forwards past the enlarging lens 53 for the purpose hereinafter described.

Between the sprockets 51 and 52 and submerged under the hypo liquid is a table 111 over which the film strip F is guided. The table 111 is provided with an aperture 112 through which light rays from the lamp 113 are reflected by a mirror 114, see Figs. 1, 2 and 6. The lamphouse 115 in which the lamp 113 and mirror 114 are mounted is fixed to the underside of the shallow tank 50 with a liquid tight connection in any suitable manner. Any form of switch, not shown, is provided for flashing the lamp on and off for viewing and enlarging purposes. A platen 116 is hinged at 117 to the rear edge of the table 111, and said platen is provided with an aperture 118 which is adapted to aline with aperture 112 in the table when the platen is moved to hold the film strip F flat on the table prior to making an enlargement exposure. The platen 116 is normally spring pressed to its disengaging position by spring 119 wound around the end of the shaft 120 fixed thereto, see Figs. 6 and 7, and is moved to its film engaging position by rotating the lever 121 mounted outside of the tank 50 and connected to the platen by means of a linkage including shaft 122, rod 123, and link 124. The film strip F is held below the surface of the hypo liquid while passing over the table 111 by guide roller 125 which is rotatably mounted on the wall of the tank 50 in advance of the film sprocket 52. Guards 126 and 127 are pivotally mounted to the mounting brackets 100 and 101 respectively to hold the film on the sprockets 51 and 52, said guards being pivotally mounted so that they can be raised from the sprockets to facilitate threading. The end of the tank 50, see Figs. 6 and 7, is provided with an outlet 130 above the liquid level through which the film strip F is led to a suitable container not shown, and in the outlet 130 is rotatably mounted another guide roller 131 whose purpose it is to prevent the film from rubbing on the edge of the outlet and becoming scratched.

Above the tank 50 is mounted the viewing and enlarging station indicated broadly as 135. The bottom of the viewing and enlarging station is provided with a reduced portion 136 which is adapted to extend into the shallow tank 50 to a point just above the level of the liquid in said tank 50. The bottom of the reduced portion 136 is provided with a threaded aperture 138, see Figs. 6 and 8, into which a threaded lens mount 139, in which the enlarging lens 53 is mounted, is threaded for focusing purposes. To effect a focus of the lens 53 from the outside of the portion 136, a gear 140 is mounted on the end of the

lens mount 139 in engagement with a pinion 141 which is fixed to an adjusting screw 142 extending to the outside of the reduced portion 136. The bottom of the portion 136 in which the aperture 138 is formed constitutes a shoulder 145 extending downwardly below the surface of the hypo liquid L, and this shoulder is threaded on its exterior to receive a collar 146 in which is seated a disc of plain glass 147. This disc of glass 147 projects below the liquid of the hypo, and breaks the surface of the liquid at the point through which the rays of light transmitted through the film strip F pass to the magnifying lens 53, so that movement of the surface of the liquid will not cause aberrations in the projected image, and to overcome any reflections from the surface of the liquid.

For the purpose of viewing and selecting the picture frames of the film strip that are deemed best for enlarging, the enlarging and viewing station 135 is provided with a sight opening 150 in the mouth of which is mounted a ground glass 151. The mouth of the sight opening is adapted to be closed by a cover 152 which is hinged on the wall of the sight opening to move between a covering and uncovering position therewith, see Fig. 8. As shown, the cover 152 can be raised by pulling on the knob 153 fixed to the lower edge thereof, or the hinged edge of the cover can be provided with a projecting lip 154 which can be depressed by a cam portion 155 on the rotatable shaft 156 operated by the wheel 156', see Figs. 8 and 9. The viewing and enlarging station 135 is provided just above the sight opening with a partition 160 which is provided with a rectangular opening 161 large enough to allow the magnified image of the transmitted picture frame to pass therethrough. Another partition 162 is positioned in the station 135 between the partition 160 and the bottom wall of the station, a portion of said partition 162 cutting across the enlarging station diagonally as shown in Fig. 3. An opening 163 is provided in the partition 162 which is adapted to allow the transmitted enlargement of the film strip to pass to the printing station above. A door 164 just slightly larger than the opening 163 in the partition is pivotally mounted in bearings 165 mounted on the wall of the station 135, and is normally spring pressed, not shown, into a position where it covers the opening 163 in the partition 162. A lever 166, see Fig. 9, extending to the outside of the station 135 is fixed to a shaft 167 on which the door 164 is mounted so that by rotating the lever the door will be swung down to cover the sight opening, and the opening 163 in the partition 162 will be uncovered to permit the transmitted enlarged image to fall on the printing paper in the printing station to be described hereinafter. A mirror 170 is fixed to the face of the door 164 in any suitable manner so that when the door is closed this mirror reflects the enlarged image onto the ground glass 151 in the sight opening where the operator can judge its qualities.

The top of the viewing and enlarging station 135 constitutes the magazine 200 which contains the supply of sensitive printing paper, and a mechanism for feeding said paper across the focal plane of the enlarging lens 53. Referring to Figs. 8, 9, 10 and 11, a U shaped bracket 201 having two hooked ends 202 is fixed in the top of the magazine 200, and a roll of sensitive printing paper 203 is adapted to be supported by said bracket. Access is had to the interior of the magazine 200 for threading purposes by removing the door 204 which is hinged at its upper edge as shown at 206, and held by a catch 205 at its lower end, said catch being rotatably mounted on the wall of the magazine 200. The inner face of the door 204 is provided with a pad 207 of resilient material, so that as the door is closed the edges of the magazine will depress this resilient pad and a light tight joint will thereby be formed. The paper strip P is led off of the supply roll 203, over a rubber coated roll 210 which is rotatably mounted in the magazine 200, and thence over a glass table 211 which is suitably mounted in the focal plane of the enlarging lens 53 over an opening 212 in the base of the magazine through which the projected enlarged image is adapted to pass. The end of the paper P is then fed between a rubber feed roller 215 and another roller 216 which is normally spring pressed toward the rubber roller 215 by a spring 217, said spring pressed roller 216 normally acting to hold the paper strip in engagement with the rubber roller 215. To facilitate threading, the spring pressed roller 216 is mounted on a pair of bars 218 which are adapted to slide in guides 219 mounted on the wall of the magazine. The lower end of each bar 218 is provided with a stud 220 which is engaged by the forked end 221 of a rod 222 rotatably mounted in the magazine to be accessible from the outside thereof, but not shown, so that by rotating the rod 222 in the proper direction the roller 216 is pulled away from the roller 215, and the end of the paper strip P can be inserted therebetween and fed to the opening 225 in the magazine where it is led under the knife 226.

The knife 226 having a handle 229 is rotatably mounted to the rear end of the magazine 200, and as shown in Fig. 9 is in its raised position wherein it is engaged by a stop member 227 fixed to the outside of the magazine by screws 228. An arcuate guard 230 is mounted on the wall of the magazine to cover the end of the knife during its travel, and a stop member 231 limits its downward stroke. The knife 226 is fixed to shaft 235 which is rotatably mounted in bearings 236 on the wall outside of the magazine, and 237 within the magazine, said knife being normally spring pressed to its raised position by means of the coiled spring 240 surrounding the shaft, see Fig. 11.

Platen frame 241 is rotatably hinged on a bar 242 which is in turn rotatably mounted in bearings 243 fixed to the magazine 200. A glass plate 244 is movable with the platen frame 241, and mounted on said frame by springs 245 so that as said platen frame 241 is lowered, the glass 244 fixed thereto will be spring pressed face to face with the glass table 211 to hold the strip of sensitive paper P flat thereon when an enlargement is to be made. A projecting finger 250 fixed to the platen frame 241 and extending rearwardly of the hinge connection is adapted to be contacted by the cam member 251 which is fixed to the shaft 235 on which the knife 226 is rotatably mounted whereby the platen is raised from engagement with the glass table 211 when the knife 226 is raised. When the knife 226 is pulled down to cutting position the cam member 251 is adapted to contact the inclined surface 252 on the projecting finger 250 so that the platen frame is forced against the glass table 211 to hold the paper P tight and flat thereon. The platen 241 and the feed roller mechanism are covered by a shielding member 255 which is mounted on the

wall of the magazine for preventing flakes of emulsion or clippings which might be on the supply roll of paper 203 from falling thereinto and causing spots on the print or clogging up the paper feeding mechanism.

A bevel gear 256 fixed to the end of the shaft, on which the rubber feed roller 215, is mounted is in engagement with another bevel gear 257 which is fixed to a clutch member 258 rotatably mounted on the shaft 235 on which the knife 226 is mounted. A clutch disc 259 is fixedly mounted to the shaft 235 adjacent the clutch member 258 to constitute a one way clutch which positively engages the feed roller 215 with the knife 226 when the knife is raised so that the paper strip is advanced on the upward motion of the knife. The gear ratio between the knife 226 and the feed roller 215 is such that the roller is timed sufficiently to advance a new picture area of paper when the knife is raised from its cutting position, the one way clutch allows the bevel gear 257 to remain stationary and the paper P is held flat in place on the glass table 211, by the spring pressed platen 241 until after the exposure is made, whereupon a continued movement of the knife cuts the previously exposed paper and is ready to advance a new area into exposing position on the upward movement. Any type of one way clutch can be used in the above mechanism, and since it forms no part of our invention, a detailed description of the form shown has been omitted. For exposing the sensitive paper P in the focal plane of the enlarging lens, a conventional shutter can be mounted in covering relation to the lens 53, or the movement of the door 164 into and out of the path of the image rays can constitute a suitable shutter if the speed of retraction of said door is made sufficiently fast. After the sensitive paper P is ejected from the magazine 200 by the feed roller 215 and is cut off by the knife 226, the operator processes it in the usual way. As described in connection with the drawings, the tower in which the processing machine as a whole is mounted is suitable to be used as a darkroom so that the enlargements can be processed in open trays in the open to speed up the operation. But it is to be understood, that if the machine is not mounted in a room or tower which is adapted to be used as a darkroom, a portable darkroom, of the curtain type through which the hands are inserted, can be mounted on the end of the machine adjacent to the magazine 200, and the processing of the enlargements can be carried on by feel.

Referring now particularly to Figs. 1, 2 and 12 through 15, the controlling mechanism for the dry box which provides for the automatic cut-off of the film strip F at the entrance to the dry box when the gravity carrier 60 passes a given point on its upward travel, but not on its downward travel, will be described. Above the dry box 34 in a housing 300, a shaft 301 is drilled out to form a sleeve 303 in which shaft 304 having pins 305 projecting through elongated slots 306 in the sleeve 303 is slidably mounted, and spring pressed outward of the sleeve by spring 307 mounted between the end of the shaft and the drilled out end of the sleeve 303. A sprocket 308 is fixed to a reduced end 309 of the shaft 301 to turn therewith, and is engaged by a chain 310 one side of which is fixed to the gravity carrier 60 at 311. The chain 310 is looped around another sprocket 312 which is mounted on the end of a spring pulled lever 313 pivoted to the vertical track 64 in the dry box 34. The tension in the chain 310 is controlled by rotating a cam member 314 which is fixed to the end of a rotatable rod accessible from the outside of the dry box. The gravity carrier 60 can be manually raised in the dry box 34, if it need be, by turning the crank 315 which is operatively connected to the end of the shaft 304 with a key and slot connection 316, the crank being fixed to the shaft by a screw 317.

Rotatable with the sleeve 303 is a gear 318 which is connected to a large gear 319 through a reduction gearing including gears 320, 321, 322, 323 which are rotatably mounted on studs 324. Gear 319 is fixed to shaft 325 which is rotatably mounted in the walls of the housing 300, said shaft extending through the forward wall of the housing and having a dial 326 fixed thereto which cooperates with a footage indicator 327 to give an indication of the amount of film in the dry box 34 depending upon the position of the gravity carrier 60 therein. A disc 330 is rotatably mounted on the shaft 325, but is pinned to the gear 319 by a pin 331' so as to rotate with said gear. Another disc 332 is rotatably mounted on the shaft 325 adjacent the disc 330, but to insure relative rotation between the two discs 330 and 332, a pair of ball bearings 333' are inserted therebetween to ride in grooves in the adjacent faces of the two discs. Disc 332 is provided with an elongated arcuate slot 333 into which one end of the pin 331 is adapted to extend to connect the two discs together with a delayed action for the purpose hereinafter described.

On the rim of disc 330 there are several ratchet teeth 335, see Fig. 12, into engagement with which the nose 336 of the lever 337 is adapted to be normally pulled by spring 338 whereby the mechanism is locked against movement. Lever 337 is pivoted at its midpoint to bracket 359 extending across the housing 300, and to its other end is fixed a rod 339, see Fig. 15, which is in turn pivoted to the end of bell crank 340 which is adapted to rock on the pin 341 fixed in the housing. The lower end of the bell crank 340 forms a yoke member 342 which surrounds the sleeve 303 behind a collar 343 which is slidably mounted on said sleeve and engaged by pins 305 on the shaft 304. Now in order to release the mechanism from its holding position, the crank 315 is pressed inwardly whereupon the pressure forces shaft 304 against the spring 307, and pins 305 in the shaft 304 engage and force the collar 343 rearwardly. The yoke member 342 is rocked on the pin 341 whereupon through the linkage described, the nose 336 is raised from the ratchet teeth 335 against the action of the spring 338, and the disc 330 as well as the rest of the mechanism is free to operate, and allow the gravity carrier 60 to descend into the dry box. The pressure on the crank 315 need only be applied until the disc 330 has revolved sufficiently to allow the teeth 335 to pass the nose 336 on the lever 337 whereupon the pressure can be released and the nose can be allowed to ride on the smooth periphery of the disc 330.

A micro-switch A and a micro-switch B are mounted in the electric line E connected to an electro-magnet M which is adapted to actuate the knife 85 which is situated at the entrance of the dry box 34, see Figs. 1 and 12, to cut the film strip F when the gravity carrier 60 reaches a given vertical point in its upward travel, but which is not actuated when the carrier passes

the same vertical point on its downward travel. The micro-switch A is normally closed while the micro-switch B is normally open. Disc **330** has on its periphery a button **350** which is adapted to contact a point **349** in spring member **351**, one end of which is mounted on the wall of the housing to actuate the switch B and momentarily close it. Disc **332** also has a button **352** on its periphery which is adapted to engage a cup formation **353** in the spring member **354** in which position it actuates switch A and opens it. The position of the discs **330** and **332** shown in Fig. 12 is reached when the gravity carrier **60** reaches the cut-off point on its upward vertical travel. It will be noticed that the switch B which is normally open is now closed by button **350**, and since switch A is normally closed, the electro-magnet is excited and the knife **85** is actuated to cut the film strip F. It will also be noted that the nose **336** has engaged the first of the ratchet teeth **335**, and the gravity carrier is held in this position, which is the position to which it is brought by the shortening of the film loops as the carrier in the developing tank descends as described before.

Now when the machine is ready to be rethreaded for the next operation, the gravity carrier **60** in the dry box has to be raised to its threading position which is indicated on the face of the dial **327**, the face not being shown. In order to raise the carrier to the threading position, the crank **315** is operated in the proper direction, and the disc **330** is moved in the direction shown by the arrow. The button **350** immediately releases the spring **351**, allowing switch B to return to its normal open position. Now since the pin **331** fixed to disc **330** has reached the end of the curved slot **333** in the disc **332**, disc **332** will be rotated along with disc **330** until the button **352** on the periphery thereof enters the pocket **353** in the spring **354** to open switch A. Now both switches are open, and nose **336** of lever **337** is engaging the last of the ratchet teeth **335** to hold the mechanism and gravity carrier **60** in the threading position. When the machine has been threaded and the camera is started, the crank **315** is pressed in thereby releasing the nose **336** from the ratchet teeth **335**, whereupon the carrier starts down and drives the mechanism in the housing **300** through the chain **310**. First the disc **330** rotates in the opposite direction to that indicated by the arrow, see Fig. 12, and due to the pin and slot connection between itself and disc **332**, disc **332** stays stationary for a time. To further insure that disc **332** remains stationary and always lags behind **330** until the pin and slot connection takes effect, a friction pad **360** which is rotatably mounted on shaft **325**, and is held against rotation by screw **361** extending through the housing **300**, is normally spring pressed into engagement with the face of the disc **332** by coiled spring **364** which surrounds a stationary collar **365**. The slot **333** is of such a length that disc **330** can rotate clockwise a sufficient amount to allow the button **350** on the periphery thereof to pass the spring member **349** before the button **352** on disc **332** releases the switch A. Then just after button **350** on disc **330** has passed switch B, the pin **331** picks up disc **332**, and releases switch A. And since switch B is normally open, the circuit to the knife is not closed when the carrier **60** makes its downward movement. The gearing between the chain sprocket **308** and the discs **330** and **332** is so regulated that the dial **326** in conjunction with the indicator **327** will always give the amount of film in the dry box depending upon the position of the carrier therein, and the relative positions of the discs **330** and **332** will always effect a correct control of the electro-magnetically operated knife **85**, and hold the carrier at any point above the cut-off point until the crank **315** is pressed inwardly.

In the end of the housing **300** we have shown a reel mounting for a supply of exposed film which is taken in the extra camera **23**. Inasmuch as the dry box **34** merely provides a constant supply of film in advance of the developing tank **41**, if a roll of film serves as a constant supply, the film can be fed directly into the developing tank without first passing through the dry box **34**. For this purpose the housing **300** is provided with a spindle **380** onto which a reel of exposed film **381** can be rotatably mounted and held by any conventional catch **382**. The housing **300** is provided with a light tight door **383** which can be removed to provide access to the spindle **380**, and said door is provided with a spring finger **385** which is adapted to engage the flange of the reel and prevent it from overrunning when the film is pulled therefrom. From the reel **381** the film is threaded directly into the developing tank **41**, and threaded through the remainder of the apparatus in the manner described.

Referring now to Fig. 16, a detailed description of the electrical hook up for the developer and hypo motors D and H, whereby the carrier **77** in the hypo tank **47** is automatically started when the carrier **76** in the developing tank **41** reaches the bottom of its tank, and the two carriers **76** and **77** are returned to their threading positions together, will be explained. The start button **400** for controlling the operation of the motors D and H can be mounted on a control panel **401** along with other apparatus, not described in this specification. The electrical diagram, Fig. 16, shows the electrical circuit in the position where both carriers **76** and **77** are in their threading position, see Fig. 1. When the starter button **400** is depressed the contact member **402** connected thereto is also depressed so that the beveled end **403** thereon is cammed past the spring operated catch **404** to be held depressed against the action of springs **405** and **406** which normally tend to force the contact member and the starter button to their raised position. This depression of the starter button closes switch S^1, and completes the circuit through the developer motor D which starts to drive the carriage **76** downward. The carriage **76** rides on a rod **407**, and when it reaches a stop **410** fixed to the end of the rod it will carry the rod and the cam **411** fixed to the end thereof downward until the cam reaches the stop **412** at which point of travel the carriage **76** is at the bottom of the developing tank **41**. The cam **411** has a projecting portion **413** riding in a cut out portion **414** in a cam block **415**, and the cut out **414** is sufficiently long to allow a back lash between the cam **411** and the cam **415**. When the cam **411** has reached its stop member **412** it has traveled far enough to overcome the above mentioned back lash, and move the cam block **415** downward half way to its stop member **416**. This position of the cams **411** and **415** causes the opening of switch S^2 since the pivoted cam member **417** has dropped into notch **418** in the cam block **415**; the closing of switch S^3, since the pivoted cam member **419** has ridden up on a high point of cam block **415**; and the reversing

of switch S^4, since the pivoted cam member **420** has ridden up on a high point of cam member **411**.

The closing of switch S^3 completes the circuit through the hypo motor H and the carriage **77** is driven downward to the bottom of the hypo tank **47**. On the way to the bottom, the carriage **77** which rides on a rod **421** abuts a stop member **422** fixed to the end of the rod **421**, and draws the cam block **415** downward through the last half of its stroke to the stop **416**. This causes switch S^5 to be reversed, since the pivoted cam member **423** has ridden onto the high point on cam block **415**; switch S^2 is reclosed, since the pivoted cam member **417** rides out of the notch **418** and onto a highpoint; and switch S^1 is tripped open, since the cam block **430** fixed to the cam block **415** by a rod **431**, engages and trips the spring latch **404**. At this point the switches are connected so that when the start button **400** is again depressed and switch S^1 closed, the current is supplied to both the developer motor D and the hypo motor H sending their respective carriers upward since the switches S^4 and S^5 have been reversed. When the carriages **76** and **77** reach the top, cam member **411** and cam block **415** are pushed all the way up and switch S^1 is tripped open setting up the same circuit conditions that existed in the first place.

Although we have shown and described a rapid processing machine adapted to take film directly from a high speed motion picture camera, process, and provide for the inspection, and enlargement of desirable picture frames of the same in a very short time; it is to be understood that certain features of our machine could be modified so as to be adapted to machines for processing motion picture film in the usual manner where several different processing and washing tanks are provided, and the film is permanently fixed, without deviating from the spirit of the invention. It will be understood from reading the above specification along with the drawings, that we have provided a rapid processing machine that is particularly adapted for easy threading, and which lends itself to rapid repeated operations for that reason. Also by providing an inspection and enlarging station which is directly connected with the processing machine, so that the film can be viewed and enlarged while it is completely submerged in the hypo solution and in strip form, we have overcome a difficult and cumbersome problem of handling a film strip while still wet, viewing the individual picture frames thereof, and finally making enlargements of the desirable picture frames without at any time requiring the operator to touch the film strip with his fingers and leave marks on the same.

Although we have shown and described certain specific embodiments of our invention, we are fully aware that many modifications thereof are possible. Our invention, therefore, is not to be restricted except in so far as is necessitated by the prior art and by the spirit of the appended claims.

What we claim is new and desire to secure by the Letters Patent in the United States is:

1. An apparatus for processing motion picture film comprising a plurality of closed tanks in consecutive arrangement, a plurality of spaced guide rollers mounted in and near the top of said tanks in alinement with one another whereby a film strip can be fed thereover, a carriage in each of said tanks adapted to be raised above said guide rollers and be lowered below them, a plurality of idler rollers mounted on said carriage in staggered relation with respect to said guide rollers and adapted to engage said film strip and carry it into said tanks in a series of loops when the carriages are lowered, and a door on each of said tanks through which access to the guide rollers therein can be had for threading purposes.

2. An apparatus for processing motion picture film comprising a tank, a plurality of partitions in said tank adapted to form a plurality of individual treating chambers for holding treating solutions necessary for processing a film strip, said partitions provided with openings above the normal liquid level of the chambers through which a film strip can pass from chamber to chamber, a plurality of spaced guide rollers mounted in and near the top of said chambers in alinement with one another whereby a film strip can be fed thereover, a carriage in each of said tanks adapted to be raised above and lowered below said guide rollers, a plurality of idler rollers mounted on said carriage in staggered relation with respect to said guide rollers, and adapted to engage the film strip and carry it into said chambers in a series of loops when the carriages are lowered, and a door on the side of said tank on a level with said guide rollers through which access to the interior of all of said chambers can be had simultaneously for threading purposes.

3. An apparatus for processing motion picture film comprising a tank, a plurality of partitions in said tank adapted to form a plurality of individual treating chambers, each of said partitions provided with an aperture through which a film strip can pass from chamber to chamber, a plurality of spaced guide rollers mounted in alinement in and near the top of each of said chambers over which a film strip is adapted to be threaded, a carriage in each of said chambers adapted to be raised above or lowered below said guide rollers, means for raising and lowering said carriages in said chambers, a plurality of idler rollers mounted on said carriages in staggered relation with respect to said chambers in a series of loops when said carriages are lowered, and a door detachably fastened to the side of said tank adjacent said guide rollers, and adapted to be opened for access to the guide rollers for threading purposes.

4. An apparatus for processing motion picture film comprising a tank, a plurality of partitions in said tank adapted to form a plurality of individual treating chambers, each of said partitions provided with an aperture through which a film strip can pass from chamber to chamber, a plurality of spaced guide rollers mounted in alinement in and near the top of each of said chambers over which a film strip is adapted to be threaded, a carriage in each of said chambers adapted to move vertically therein between positions above and below the guide rollers, means for raising and lowering said carriages comprising a pair of vertical screws journalled in said chambers, a prime mover for driving said screws, a plurality of idler rollers mounted on said carriages in staggered relation with respect to said guide rollers whereby the film strip is carried into said chambers in a series of loops when said carriages are lowered, and a door detachably fastened to the side of said tank adjacent said

guide rollers, and adapted to be opened for access to the guide rollers for threading purposes.

5. An apparatus for processing motion picture film comprising a tank, a plurality of partitions in said tank adapted to form a plurality of individual treating chambers, each of said partitions provided with an aperture through which a film strip can pass from chamber to chamber, a plurality of spaced guide rollers mounted in alinement in and near the top of each of said chambers over which a film strip is adapted to be threaded, a gravity actuated carriage movably mounted in one of said chambers, a chain drive connected with said carriage by means of which the carriage can be manually raised above said guide rollers, a plurality of idler rollers mounted on said carriage in staggered relation with respect to said guide rollers whereby the film strip is carried into said chamber in a series of loops when said carriage is lowered, and a door detachably fastened to the side of said tank adjacent said guide rollers, and adapted to be opened for access to the guide rollers for threading purposes.

6. An apparatus for processing motion picture film comprising a tank, a plurality of partitions in said tank adapted to form a plurality of individual chambers in consecutive arrangement said partitions being provided with openings through which a film strip can pass from chamber to chamber, a pluralitly of spaced guide rollers mounted in alinement in said chambers whereby the film strip can pass thereover in a substantially straight line, a carriage in each of said chambers adapted to move vertically therein from a position above said guide rollers to one below said guide rollers, a plurality of idler rollers mounted on said carriage in staggered relation with respect to said spaced guide rollers, means for driving said carriages downward into said chambers at a given speed whereby the film is carried into said chambers in loops, and means whereby the carriages in succeeding chambers are automatically started downward when the carriage in the preceding chamber reaches a given point in its chamber.

7. An apparatus for processing motion picture film comprising a plurality of tanks in consecutive arrangement, the walls of said tanks provided with apertures through which a film strip is adapted to pass from tank to tank, a plurality of spaced guide rollers mounted in alinement in said tanks whereby a film strip can be passed thereover in a substantially straight line, carriages movably mounted in each of said tanks and capable of being moved to a position above said spaced guide rollers for threading purposes, a plurality of idler rollers mounted on said carriages in staggered relation with respect to said spaced guide rollers, driving screws in each of said tanks adapted to move said carriages vertically in said tanks, means for rotating said driving screws, and controlling means in one of said tanks adapted to automatically start the driving screws in the succeeding tank when the carriage in said first tank reaches a predetermined position therein.

8. An apparatus for processing motion picture film comprising a plurality of tanks in consecutive arrangement, the walls of said tanks provided with apertures through which a film strip is adapted to pass from tank to tank, a plurality of spaced guide rollers mounted in alinement in said tanks whereby a film strip can be passed thereover in a substantially straight line, carriages movably mounted in each of said tanks and capable of being moved to a position above said spaced guide rollers for threading purposes, a plurality of idler rollers mounted on said carriages in staggered relation with respect to said spaced guide rollers, a pair of driving screws journalled in each of said tanks adapted to engage and drive the carriages vertically therein, individual prime movers for the individual carriages adapted to drive them into said tanks at a given rate of speed, and a controlling means in one of said tanks whereby the prime mover for the carriage in the succeeding tank is automatically started when the carriage in said first tank reaches a given point therein.

9. An apparatus for processing motion picture film comprising a plurality of tanks in consecutive arrangement, the walls of said tanks provided with apertures through which a film strip is adapted to pass from tank to tank, a plurality of spaced guide rollers mounted in alinement in said tanks whereby a film strip can be passed thereover in a substantially straight line, carriages movably mounted in each of said tanks and capable of being moved to a position above said spaced guide rollers for threading purposes, a plurality of idler rollers mounted on said carriages in staggered relation with respect to said spaced guide rollers, driving means for each individual carriage, adapted to drive the carriages into said tanks at given rates of speed, and a controlling means for the individual driving means adapted to automatically start the carriages into succeeding tanks in timed relation with each other.

10. An apparatus for processing motion picture film comprising a plurality of tanks in consecutive arrangement, the walls of said tanks provided with apertures through which a film strip is adapted to pass from tank to tank, a plurality of spaced guide rollers mounted in alinement in said tanks whereby a film strip can be passed thereover in a substantially straight line, carriages movably mounted in each of said tanks and capable of being moved to a position above said spaced guide rollers for threading purposes, a plurality of idler rollers mounted in said carriages in staggered relation with respect to said spaced guide rollers, a pair of driving screws journalled in each of said tanks adapted to engage and drive the carriages vertically therein, an individual electric motor for driving each pair of driving screws at a given rate of speed, and an electrical switch in each of said tanks for controlling the electrical circuit of the driving motor for the immediately succeeding tank, said switches being normally open but adapted to be closed when the carriages in the tanks contact them.

11. An apparatus for rapidly processing motion picture film emanating from a spontaneous supply comprising a dry box and a plurality of film treating tanks in consecutive arrangement, the walls of said dry box and film treating tanks provided with apertures through which the film can pass continuously from one to the other, a plurality of spaced guide rollers mounted in alinement in said dry box and said treating tanks whereby a film strip is adapted to be threaded thereover in a substantially straight line, a movable carriage in the dry box and each of said treating tanks, a plurality of idler rollers mounted on said carriages in staggered relation with respect to said spaced guide rollers, means for positively driving said carriages into the treating

tanks at given speeds and in timed relation, means for mounting said carriage in the dry box whereby it is gravity actuated, the speed of its descent depending upon the spontaneous supply of film, a knife at the entrance of the dry box, and suitable means adapted to actuate said knife to cut the film strip emanating from the spontaneous supply when the carriage in the dry box reaches a given point therein.

12. An apparatus for rapidly processing motion picture film emanating from a spontaneous supply, comprising a plurality of treating tanks in consecutive arrangement, means for feeding a film strip into successive treating tanks in loops at a given rate of speed, whereby a given point on the film strip will remain in one treating tank the same length of time as any other point on said film strip, a dry box in consecutive arrangement with said treating tanks but interposed between them and a spontaneous film supply, a plurality of spaced guide rollers mounted in alinement in said dry box over which a film strip is adapted to be threaded, a vertical track in said dry box, a carriage movably mounted on said box and adapted to move downward into the dry box through force of gravity, a plurality of idler rollers mounted on said carriage in staggered relation with respect to said spaced guide rollers, manually operated means for raising said carriage above said spaced guide rollers for threading purposes, a releasable catch means for holding the carriage in its threading position, a knife at the entrance of the dry box adapted to cut the film strip entering the dry box, and suitable means adapted to operate said knife when the carriage in the dry box reaches a given point therein.

13. An apparatus for rapidly processing motion picture film emanating from a spontaneous supply comprising a plurality of treating tanks in consecutive arrangement, means for feeding a film strip into successive treating tanks in loops at a given rate of speed, whereby a given point on the film strip will remain in one treating tank the same length of time as any other point on said film strip, a dry box in consecutive arrangement with said treating tanks but interposed between them and a spontaneous film supply, a plurality of spaced guide rollers mounted in alinement in said dry box over which a film strip is adapted to be threaded, a vertical track in said dry box, a rolling carriage adapted to move on said track through the force of gravity, a plurality of idler rollers mounted on said carriage in staggered relation with respect to said spaced guide rolls, and adapted to feed the film into the dry box in a series of loops when the carriage is moved downward by virtue of its weight, and be raised as by said film loops when the film strip is fed into the treating tanks, a manually operated chain drive connected to said carriage whereby said carriage can be manually raised, an electro-magnetically operated knife adapted to cut the film at its point of entrance into said dry box, and a mechanism operated by the movement of said carriage whereby the knife is actuated when the carriage reaches a certain point in the dry box on its upward travel but will not actuate the knife when passing the same point in its travel downward.

14. An apparatus for rapidly processing motion picture film emanating from a spontaneous supply comprising a dry box, a plurality of treating tanks in consecutive arrangement with said dry box and each other, a plurality of spaced guide rollers mounted in alinement in said dry box and treating tanks and over which a film strip from the supply is led in a substantially straight line, a vertical track in said dry box, a carriage movable on said track through the force of gravity, a plurality of idler rollers mounted on said carriage in vertical alinement but in staggered relation with respect to said spaced guide rollers whereby a film strip is adapted to be fed into said dry box in a series of loops due to the weight of the carriage, positively driven means adapted to feed the film strip into the treating tanks at a given rate whereby the loops in the dry box are shortened and the movable carriage therein is raised, a chain drive connected to said movable carriage for manually lifting the same, an electro-magnetic knife adapted to cut the film strip at its point of entrance into the dry box, and a circuit controlling mechanism adapted to close the circuit to operate said knife at predetermined positions of the movable carriage in the dry box, said controlling mechanism including a pair of magnetic switches one normally opened while the other is normally closed, a cam member adapted to close the normally open switch, a second cam member adapted to open the normally closed switch, a connection between said cam members whereby the two switches are both closed in but one position during the upward movement of the carriage, gearing for driving one of said cam members, said gearing adapted to be driven by said chain drive connected to said movable carriage.

15. In a film processing and printing apparatus, the combination with a plurality of treating tanks in consecutive arrangement, adapted to contain treating solutions, a plurality of spaced guide rollers mounted in alinement across the top of said tanks whereby a film strip can be threaded thereover in a substantially straight line, movable carriages in each of said tanks adapted to feed the film strip into each of said tanks in succession in a series of loops, of a viewing and enlarging station adjacent the last of said treating tanks and adapted to contain a treating solution, a sprocket in said film viewing station adapted to engage the perforations of the film strip passing through the processing apparatus, said sprocket being located below the level of the treating solution, an illuminating means located below the viewing station, an optical system adapted to project the light rays from said illuminating means into the upper part of the viewing and enlarging station while the film is maintained under the treating solution, means adapted to feed a strip of sensitive paper into the focal plane of said optical system, and suitable means adapted to rotate said sprocket whereby the film is pulled from the last treating tank to change the image projected by said optical system.

16. In a film processing and printing apparatus, the combination with a plurality of treating tanks in consecutive arrangement, adapted to contain treating solutions, a plurality of spaced guide rollers mounted in alinement across the top of said tanks whereby a film strip can be threaded thereover in a substantially straight line, movable carriages in each of said tanks adapted to feed the film strip into each of said tanks in succession in a series of loops, of a viewing and enlarging station adjacent the last of said treating tanks and adapted to contain a treating solution, a pair of sprockets in said viewing and enlarging apparatus adapted to engage

the perforations of said film strip passing through the processing apparatus, and feed it therethrough in a substantially taut condition, an illuminating means located in said viewing station below said film strip, an optical system adapted to project the light rays of said illuminating means through the processed film strip while it is still under the treating solution, an enlarging lens above said film strip adapted to enlarge and project the image made by said illuminating means, a casing associated with said enlarging lens, said casing adapted to project below the surface of the treating solution to prevent surface aberrations, a mirror pivotally mounted in said station adapted to be moved into the path of the image of the enlarging lens for viewing purposes, and means for feeding a sensitive paper into the focal plane of said enlarging whereby an exposure of the image is made thereon.

17. In a film processing and printing apparatus, the combination with a plurality of treating tanks in consecutive arrangement, adapted to contain treating solutions, a plurality of spaced guide rollers mounted in alinement across the top of said tanks whereby a film strip can be threaded thereover in a substantially straight line, movable carriages in each of said tanks adapted to feed the film strip into each of said tanks in succession in a series of loops, of a viewing and enlarging station adjacent the last of said treating tanks and adapted to contain a treating solution, a pair of sprockets in said station adapted to engage the perforations of said film strip passing through the processing apparatus, manually operated means adapted to rotate said sprockets in either direction simultaneously for selecting purposes, a lamp located in said station below the film strip, optical means for projecting the rays of said lamp through said film strip, a transparent platen for holding said film strip in a flat condition and completely submerged in the treating solution during the enlarging operation, means for manually operating said platen, an enlarging lens located in said station above said film strip adapted to project an enlargement of the image projected by said optical means into the upper part of said station, a shield for said enlarging lens adapted to project below the surface of the treating solution to prevent surface aberrations, a viewing mirror pivotally mounted in said station adapted to be moved into said station to intercept the image projected by the enlarging lens, a viewing ground glass the side of said casing onto which the projected image is reflected by said viewing mirror, and means in the top of said station adapted to feed a sensitive paper strip into the focal plane of said enlarging lens.

18. In combination with a machine for processing motion picture film in strip form, an enlarging station comprising a shallow tank containing a liquid required in the processing of the film strip, means in said tank for feeding the film strip from the processing machine through said tank in either of two directions, said means located below the level of the liquid in said tank whereby the film strip fed thereby is completely submerged, an illuminating means below said tank adapted to project rays of light through the submerged film strip, an enlarging lens mounted above said film strip in alinement with the light rays transmitted therethrough, said enlarging lens projecting below the level of the liquid to prevent surface aberrations, and means for feeding a strip of sensitive paper across the focal plane of said enlarging lens.

19. In combination with a machine for processing motion picture film in strip form, an enlarging station comprising a tank containing a liquid necessary in processing a film strip, means for feeding a film strip through the tank completely submerged in the liquid, an illuminating means below said liquid for transmitting light through the film strip, an enlarging lens in said tank above the film strip adapted to intercept the image of the film strip transmitted by said illuminating means, said lens adapted to extend below the surface of the liquid in the tank, means for viewing the enlarged image of said film strip, and means for feeding a strip of sensitive paper across the focal plane of said enlarging lens whereby a print of said image is made.

20. An apparatus for processing motion picture film comprising a tank, a plurality of partitions in said tank adapted to form a plurality of individual treating chambers, each of said partitions provided with an aperture through which a film strip can pass from chamber to chamber, a plurality of spaced guide rollers mounted in alinement in and near the top of each of said chambers over which a film strip is adapted to be threaded, a gravity actuated carriage movable mounted in one of said chambers, a plurality of idler rollers mounted on said carriage in staggered relation with respect to said guide rollers whereby the film strip is carried into said chambers in a series of loops when the carriage is lowered, an electro-magnetically operated knife located at the film entrance to one of said chambers, a chain drive connected with said carriage by means of which the carriage can be normally raised above the guide rollers, and a mechanism including electrical switches controlling the circuit to said knife and driven by said chain, said mechanism controlling the actuation of the knife to cut the film when said carriage passes a given vertical point in the chamber on its upward travel, but preventing the actuation of the knife when the carriage passes the same point on its downward travel.

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