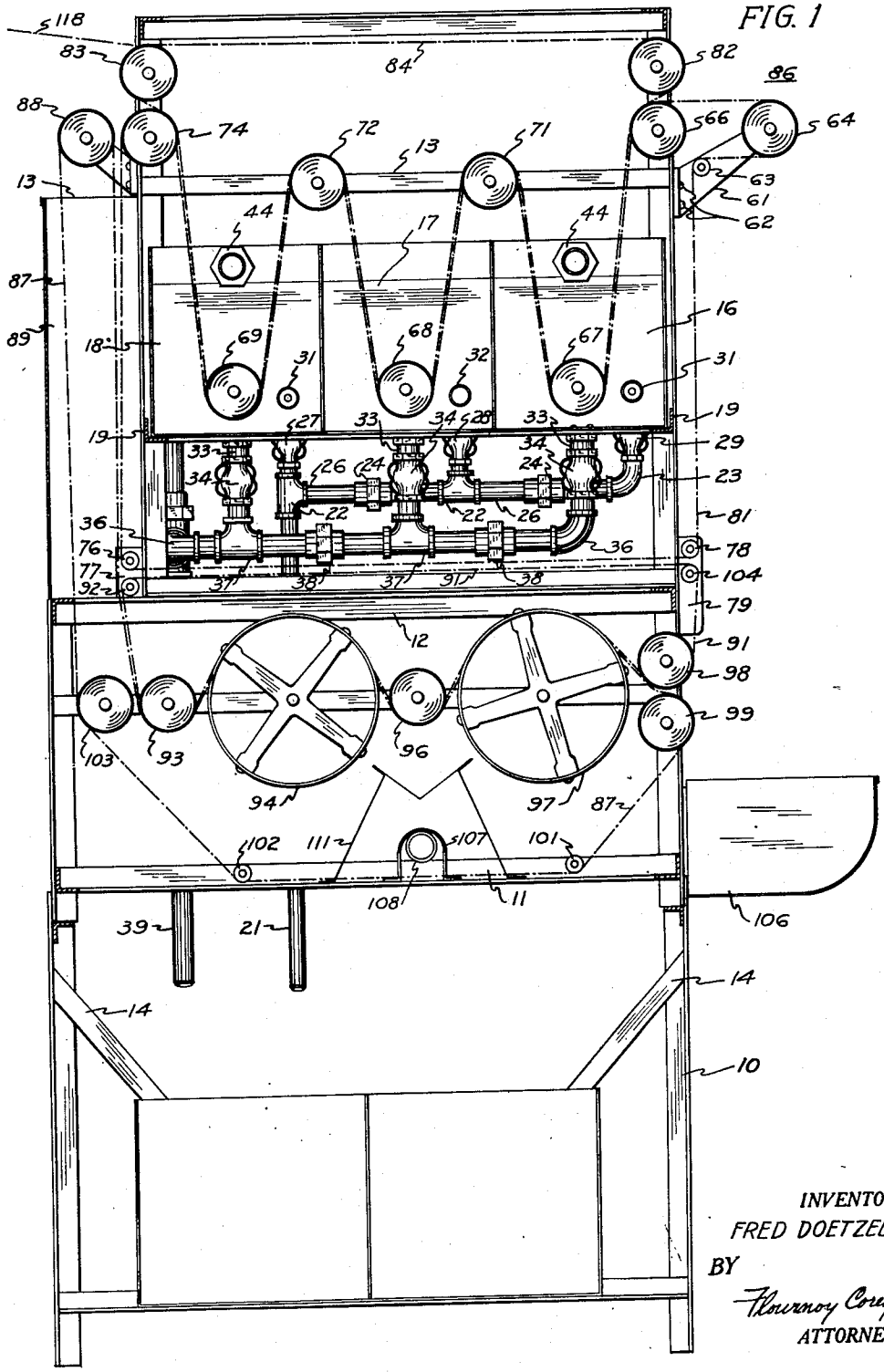
Nov. 10, 1936. F. DOETZEL, JR 2,060,286

WASHING AND DEVELOPING DEVICE

Filed April 15, 1932 4 Sheets-Sheet 1

FIG. 1



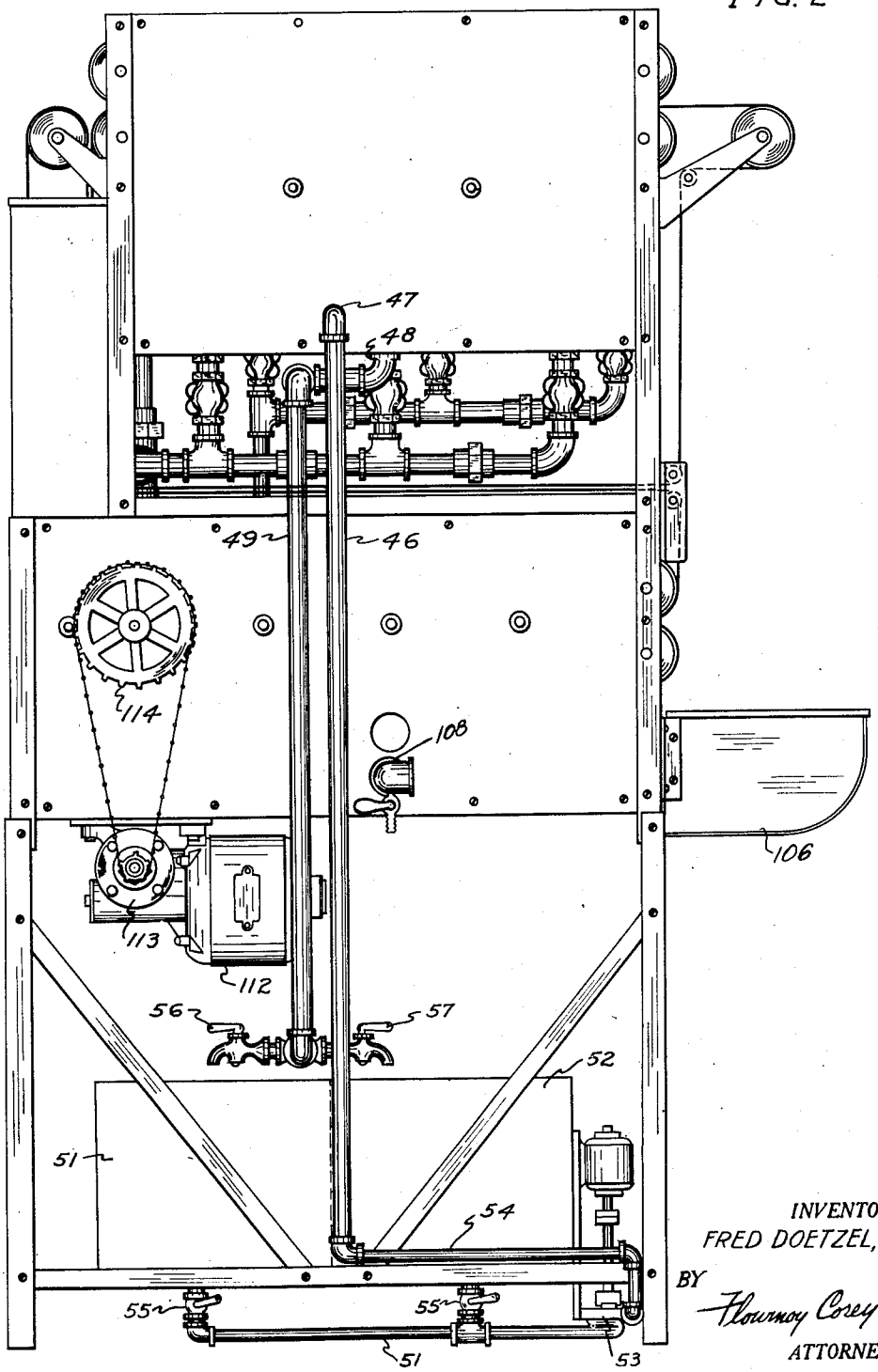
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WASHING AND DEVELOPING DEVICE

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FIG. 2



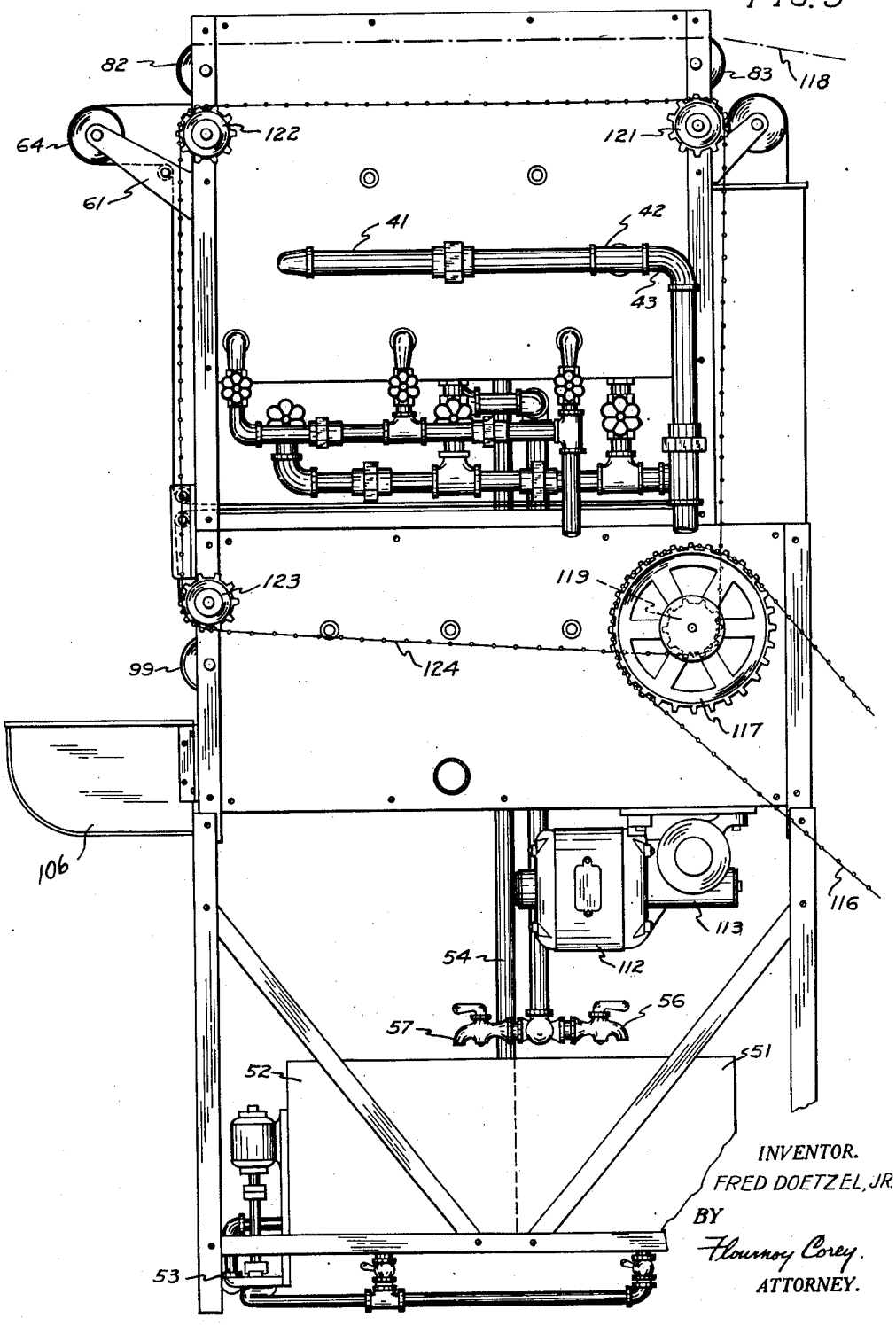
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FIG. 3



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WASHING AND DEVELOPING DEVICE

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FIG. 4

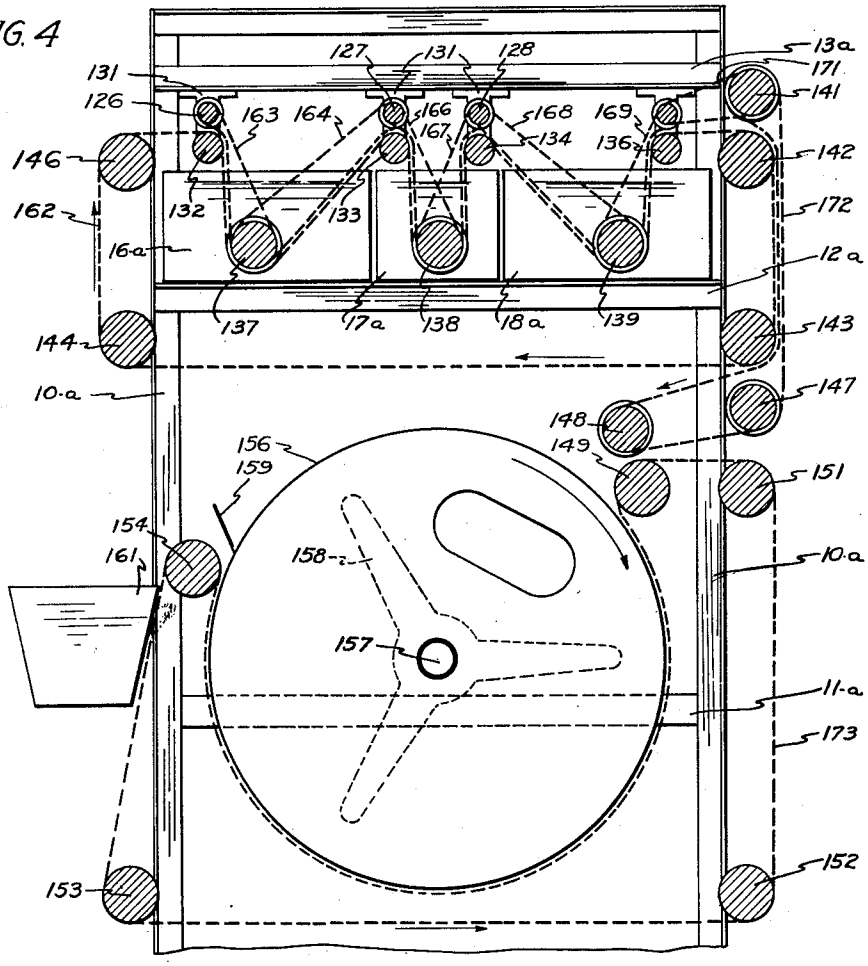


FIG. 5

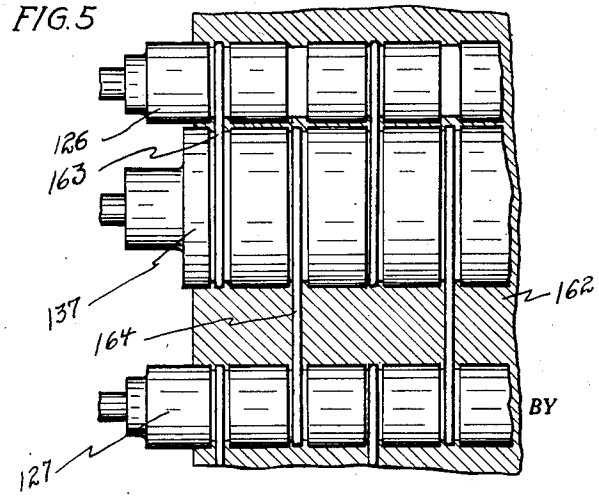
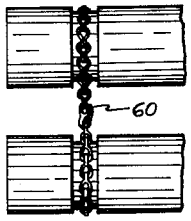


FIG. 6



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Patented Nov. 10, 1936 2,060,286

UNITED STATES PATENT OFFICE

2,060,286

WASHING AND DEVELOPING DEVICE

Fred Doetzel, Jr., Cedar Rapids, Iowa

Application April 15, 1932, Serial No. 605,496

9 Claims. (Cl. 95—94)

My invention relates to the art of printing by the photographic method and has particular relation to a device for developing, washing and drying photographic prints such as blue prints, photostats, Van Dyke prints and the like.

In the art of printing by the photographic process it is customary to expose a sensitized film, upon which an original or positive print is superposed, to light rays and thus alter the chemical condition of the sensitized film according to the degree or amount of light which filters through the original and strikes the film. In order to carry out the chemical change to completion it is necessary to wash the sensitized film in certain suitable chemical baths and to wash the chemical solution from the film. After the process has been completed the film is dried, in commercial work, by mechanical means such as heaters or blowers or both.

This printing process is usually accomplished by means of a machine which utilizes a continuous strip of sensitized film and which leads the strip into the various baths and over a dryer. This process is quite satisfactory where the operator has a large number of positive prints so that he may cover practically the entire sheet of sensitized film and thus prevent wastage. However, if the operator has only a few positives to work from he cannot cover the entire strip, and since the strip in the machine is several feet long he may waste six to eight square feet of film in order to obtain one square foot of printed film.

Furthermore, the printing devices of the prior art were not readily adaptable for washing and developing both blue-prints, Van Dyke prints and photostatic copies or the like because different chemical baths were utilized and the process of changing the baths was long and laborious.

I have conceived of a printing machine which obviates these difficulties and which will print individual strips or pieces of sensitized film. The machine is materially improved in structure and changing of the baths is readily and quickly accomplished by means of motor-driven devices. Drying of the prints is accomplished by means of an improved device and a quicker and more satisfactory method of drying is utilized.

A general object of my invention is to provide a device which will develop, print and dry individual strips or pieces of film or paper.

A more specific object of my invention is to provide means for carrying individual prints through the several baths of a developing machine and to dry the prints after they have passed through the baths.

Another object of my invention is to provide an improved drying device for a printing machine.

A feature of my invention is that the machine may be used without structural change for the developing of a continuous strip of film as well as for developing individual prints.

Another feature of my invention is the use of continuous belts of a character such that the chemical solution may readily contact the entire surface of the film during the developing process and the substitution, during the drying process, of still another type of belt suitable for conveying the washed film over a drying device.

Other and further objects and features of my invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification, wherein is disclosed an examplary embodiment of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

Referring to the drawings in which like figures indicate like parts through the several drawings:

Figure 1 is a view partly in side elevation and partly in section showing the mechanism for carrying the films through the various baths and over the heating device.

Figure 2 is a view in side elevation of the device and taken from the same position as Figure 1.

Figure 3 is a view in side elevation of the device taken from the opposite position from that of Figures 1 and 2 and showing more particularly the driving mechanism and the piping utilized to furnish and withdraw the solution from the various baths.

Figure 4 is a view partly in side elevation and partly in section of another embodiment of my invention.

Figure 5 is a front elevational view of the device shown in Figures 1, 2 and 3 showing the rollers and belts utilized in receiving the films as they are fed by the operator, and

Figure 6 is an elevational view of two rollers connected by a chain type of belt.

Referring more particularly to Figure 1 there is shown at 10 generally a framework of angle iron or the like provided with suitable horizontally-extending bars 11, 12, and 13 for supporting various parts of the device and with bracing 14 to afford stiffness where necessary. The

framework is substantially rectangular both in elevation and in plan view.

Three tanks 16, 17, and 18 are provided in adjacent relation within the upper portion of the framework and these tanks are secured within the supporting inclosure formed by the horizontally-extending angle irons 19. The tanks need not be rigidly secured to the angle irons but may rest upon the horizontally-extending flanges thereof so that they may move in accordance with the expansion and contraction of the piping utilized for carrying the solution to and from the tanks.

The middle tank 17 is preferably utilized for holding the chemical solution while the two outside tanks 16 and 18 are utilized for holding the water used in washing the prints. It is necessary to provide means for conducting water into and away from the two outside tanks in order that an adequate supply of clean, fresh water is always available and to provide also means for carrying clean water to the middle tank 17 in order to flush and clean it and carry away any residue of chemical solutions which may remain. Means must be provided for carrying the used chemical solution and the cleaning water from the chemical tank 17 to the drain.

The function of carrying the water to the tanks is accomplished by means of a pipe 21 leading from the source of water supply (not shown) and upwardly to the tanks. Suitable fittings such as the T's 22, elbows 23, connections 24 and conduits 26 are employed for conducting the water to valves 27, 28 and 29 which are used to regulate and control the flow of water into the tanks. Suitable connections such as the nozzles 31 may be employed in tanks 16 and 18 so that the water which flows into the tanks will have considerable momentum in order to thoroughly flush the tanks. Since the water is added to the chemical tank for the purpose of replacing the evaporated water rather than for flushing the tank a small nozzle is not employed for the middle tank 17 but a large conduit 32 conducts the water from the valve 28 to the tank.

Drain pipes 33, which include suitable valves 34, elbows 36, T's 37 and connections 38 conduct the water from the tanks to the drain pipe 39 in order that the water may be discharged into a suitable drain (not shown) which is disposed adjacent to the machine. The control of this draining system is effected by means of valves 34 and the water or chemical may be held within the tanks or may be permitted to drain slowly from them in order to permit gradually replenishing the supply of solution with a clear, fresh solution, or the valves may be opened wide to permit the solution to drain rapidly from the tanks.

In order to prevent the water in the outside tanks from overflowing, as for instance if the valves 34 are entirely closed and the valves 27 and 29 partly open in order to supply fresh water to the tanks, large overflow drain pipes 41 (see Figure 3) which include the various fittings such as T's 42 and elbows 43 are connected to the upper portion of the end walls of the tanks as by means of the fittings 44 and to the drain pipe 39.

The chemical solution is conducted to the tank 17 by means of the supply line 46 (Figure 2) which enters the tank by means of the conduit connection 47 and is conducted out of the tank by means of a drain connection 48 and drain pipe 49. In a preferred design of the device two or more chemical storage tanks 51 and 52 are disposed within the framework of the machine, near the base thereof, and a pump 53 is employed to pump the chemical from the supply tanks to the tank 17. Suitable piping 54 is employed for conducting the chemical solution to the pump, and valves 55 are employed to selectively control the flow of chemical from either of the tanks to the pump as desired. Other valves 56 and 57 in the return or drain line selectively control the discharge of chemical solution from the upper tank 17 into the supply tanks 51 or 52 respectively.

In carrying the prints through the various baths and over the drying device any suitable belts may be employed, but with the printing device described I prefer to utilize an open belt such as bronze or copper chain, or a suitable woven metallic belt which will permit the various solutions to intimately contact the entire surface of the films. I prefer to utilize cloth belts for carrying the prints over the drying device. The change from the link belt which carries the prints through the solutions to the cloth belt utilized in carrying the prints over the drier must be accomplished without crumpling or injuring the prints. A feed table must be provided so that the prints may be disposed thereon and carried into the machine, and a tray is preferably provided to catch the prints as they come from the machine.

I preferably utilize a number of suitably grooved rollers for carrying the chains and directing them from one tank to the other and back to the feed table. These rollers and the chains are best illustrated in Figures 5 and 6. If desired the chains may run flat or may be placed so that they turn over one or more times as does chain 60 in Figure 6 in order to facilitate contact of the various solutions with the films or prints.

The system for conveying the prints through the machine is shown in Figure 1 and the particular construction of the belts and rollers is shown in Figures 5 and 6.

Referring now more particularly to Figure 1 a pair of forwardly extending brackets 61 are provided which are fastened as by means of bolts 62 to the front wall of the printing device. A small roller 63 is mounted for rotation in the brackets and a large roller 64 is mounted for rotation at the outer ends of the brackets.

Another large roller 66 is mounted for rotation within the same horizontal plane as the roller 64. Large rollers 67, 68 and 69 are mounted for rotation in the respective tanks 16, 17 and 18.

Other large rollers 71 and 72 are mounted for rotation on suitable brackets secured to horizontally-extending portions 13 of the framework 10.

Another large roller 74 is mounted for rotation on the vertically-extending portion of the framework 10 and at the rear thereof and is oppositely disposed to the roller 66. A small roller 76 is mounted on the vertically extending bracket 77 on the angle iron supports 12 and a small roller 78 is mounted on another horizontally-extending bracket 79 on the front of the machine. The rollers 63, 64, 66, 67, 71, 68, 72, 69, 74, 76 and 78 constitute a complete support for the chain belt 81 which may thus pass in succession over the rollers and back to the starting point so that a continuous belt may be utilized.

A pair of oppositely-disposed rollers 82 and 83 are provided at the top of the machine and another link or chain belt 84 passes over these roll-

ers and successively over the rollers 82, 66, 67, 71, 68, 72, 69, 74 and 83 to form a continuous belt. It will be noted that if a print is laid on the feed table at 86, formed by the chain as it passes from the roller 64 to the roller 66, the print will be caught between the belts 84 and 81 and will be conveyed successively over the rollers and through the successive tanks 16, 17 and 18. The prints are carried upwardly from the last tank 18 and over the roller 74 where they are released from the belt 84.

At this point a cloth belt 87 is brought to bear on the print, as it passes over the roller 74, by means of a roller 88 which is mounted in close proximity to the roller 74. The cloth belt 87 bears against the chain belt 81 and moves downwardly with it through a vertically-extended chamber 89. The vertically-extended chamber constitutes a heat stack which conducts heated gases away from the lower portion of the machine, which is utilized in drying the prints. As the prints are conducted downwardly through the heat stack 89, they pass over the roller 76 where the link belt 81 is carried away from the print.

Another cloth belt 91 replaces the link belt at this point through the agency of a roller 92 disposed just beneath the roller 76. The print is now supported by means of two cloth belts or aprons 87 and 91 and is conveyed by them successively over the roller 93 mounted for rotation on an intermediate horizontally-extending portion of the framework 10, over a large open heating drum 94, over an intermediate roller 96 also mounted on the framework 10, and over a second heater drum 97.

The belts 87 and 91 separate at this point as they roll over the adjacently disposed rollers 98 and 99. The belt 87 passing downwardly over the roller 99, over the small horizontally disposed rollers 101 and 102, upwardly over the large roller 103 which is disposed adjacent to the roller 93, and over the roller 88 to complete the circuit.

The belt 91 passes upwardly over the roller 98, over the small roller 104, which is disposed on the bracket 79 adjacent to the roller 78, back to the rear of the machine, and over the roller 92 to complete this circuit.

A large tray 106 is secured to the front of the machine below the rollers 98 and 99 and as the prints are released they fall downwardly into this catch tray where they may accumulate until they are removed by the operator.

The prints are dried through the agency of the heat which passes upwardly from burner 108 through the heat stack 89, and by passing over drums 94 and 97 which are heated by convection currents of heated air from the flames of a gas burner 108 which is supported by a bracket 107. A baffle 111 extends the entire length of the burner 108 and causes the convection currents arising from the burner to be directed outwardly over the heater drums.

The machine is adapted to be selectively run by a motor 112 or other driving unit preferably mounted on the underside of the central portion of the frame 10, through the agency of a reduction gearing 113, which drives the spur gear 114 on the end of the shaft on which roller 93 is mounted, or it may be driven by means of a chain 116 and suitable sprocket gear 117 leading from the continuous printer (not shown) utilized in making the negative print.

If the machine is to be utilized for printing a continuous sheet such as issues from the continuous printer the strip of paper 118 from the printer is led over the table formed by the belt 84 (see Figure 3) and down over the roller 82 and to the feed table 86 where it passes into the printing device.

Small sprocket gears 119, 121, 122 and 123 are mounted respectively on the end of the shafts upon which the respective rollers 93, 74, 66 and 98 are mounted and by reason of the fact that all these belts contact one or more of these rollers throughout a large part of their circumference, the remaining rollers of the machine may be easily driven by reason of frictional engagement of the belts. Sprocket gears 119, 121, 122 and 123 are preferably driven by means of a chain 124 which in turn is driven by a suitable train of spur gears or by means of worm gearing and the like.

Another embodiment of my invention is shown in Figure 4. This machine is intended to operate in substantially the same way as the device just described, but is of simpler construction and employs to a greater extent the principle of substituting belts one at a time so as to insure proper feeding and movement of the prints through the machine at all times, and to insure also that the various solutions make complete contact at all points on the prints.

The device shown in Figure 4 comprises a rectangular frame 10a having horizontally extending bracing portions 11a, 12a and 13a. Tanks 16a, 17a and 18a are mounted upon the horizontally extending angle irons 12a in substantially the same manner as before. Rollers 126, 127, 128 and 129 are mounted upon downwardly extending brackets 131, which in turn are secured in a suitable manner to the angle irons 13a. Other companion rollers 132, 133, 134 and 136 are also mounted upon the brackets 131 at a position adjacent to and cooperating with the respective rollers 126, 127, 128 and 129. Large rollers 137, 138 and 139 are mounted for rotation in the respective tanks 16a, 17a and 18a.

A pair of large cooperating rollers 141 and 142 are mounted upon the rear uprights of frame 10a at a position in substantially horizontal alignment with the companion rollers 129 and 136. A large roller 143 is also mounted for rotation on the rear of the framework at a position below the roller 142. Two large rollers 144 and 146 are mounted for rotation at the front of the machine and are in substantially horizontal alignment with the rollers 143 and 142 respectively. A roller 147 is mounted just below the roller 143 at the rear of the machine and another roller 148 is mounted for rotation within the framework of the machine at a position slightly below the level of the roller 147. A companion roller 149 is mounted for rotation just below the roller 148 and slightly to the rear thereof. A pair of rollers 151 and 152 are mounted on the rear of the machine with the roller 151 in the same horizontal plane as the roller 149, and roller 152 at a position considerably below that of 151. A roller 153 is mounted on the front of the machine in a position in the same horizontal plane as that of roller 152, and a roller 154 is mounted inside of the front upright on the machine at a position somewhat below the level of the rollers 149 and 151.

A large heater drum 156 is mounted for rotation on the angle irons 11a, and a burner pipe 157, having openings therein to permit the escape of gas into the drum in order that it may be burned, passes through the center of the drum. The drum is braced by means of bracing 158.

A scraper blade 159 is mounted just above the roller 154 with its lower edge resting against the drum 156. A tray 161 for catching the prints is mounted upon the front of the machine at substantially the same level as the heater drum.

An endless belt 162 passes successively over rollers 146, 132, 137, 133, 138, 134, 139, 136, 142, 143 and 144 and back to roller 146. This belt may be of the usual narrow belt type such as shown in Figure 5, or may be a chain or the like such as shown in Figure 6, or may be a flat belt of canvas or similar material extending substantially the whole length of the rollers. If a narrow belt such as the belt shown in Figures 5 and 6 is used, the rollers must be suitably grooved to receive the belts. In the present instance, a canvas belt is preferably employed for the longer belts.

A short endless belt 163, which preferably is of the narrow type such as shown in Figure 5, passes over the roller 126, down over the roller 132, under the roller 137, and back to the roller 126.

In the same manner another belt 164 of the same type as the belt 163 passes from the roller 137, over the roller 133, around the roller 127 and back to roller 137.

Another belt 166 passes over the roller 127, down over the roller 133, beneath the roller 138, and back to roller 127. In the same manner other endless belts 167, 168 and 169 pass over the rollers 138, 134, 128, 139, 136 and 129. An endless belt 171 connects the rollers 129 and 141. Another endless belt 172 passes over roller 141, rearwardly over the roller 142, beneath the roller 143, over the roller 148, beneath the roller 147, and back to roller 141. Another endless belt 173 passes over the rollers 151, 149, down on to the drum 156 where it passes beneath the drum, up and over the roller 154, down beneath the roller 153, beneath the roller 152, and back up over the roller 151. This latter belt is preferably of canvas as is also the belt 172.

It may readily be understood that a print placed on the horizontal portion of the belt 162 between the rollers 146 and 132 will pass into the machine where it is engaged by the belt 163. The belts 162 and 163 cooperate to carry the print down into the water in tray 16*a* where the belt 164 is substituted for the belt 163, thereby insuring complete contact of the water with the print.

Belts 164 and 162 carry the print up out of the water and belt 166 is substituted for belt 164. The print is then carried down into the solution in tank 17*a* and then beneath the roller 138 and there the belt 167 is substituted for the belt 166 thus insuring complete contact of the chemical with the print. The print is carried up out of the bath by means of the belts 167 and 162. The belt 168 is substituted for belt 167 and the print is carried into the solution in tank 18*a*. The belt 169 is substituted for the belt 168, again insuring complete contact of the water with the print, and the print is carried up over the rollers 136 and 142. The belt 172 is substituted for the belt 171 and the print is carried downwardly beneath the roller 143 and over the roller 148. The print leaves the belt 162 by reason of its own weight, and because it adheres to the belt 172, and rolls over the roller 148. The print will not follow the roller 148 and belt 172 beyond the vertical because of its weight and therefore drops down until it strikes the drum 156. The print is then engaged by the belt 173, after it passes over the roller 149, and is carried between the belt and the surface of the drum, around the drum to the roller 154. The heat generated by the burner 157 heats the drum and the surface of the drum dries the print by the time it reaches the roller 154. At that position the blade 159 takes the print from the surface of the roller and throws it outwardly to a position where it falls into the tray 161.

It may readily be understood that by reason of the open belt construction employed for carrying the film or prints through the various tanks the chemical solution and the water make intimate contact with the surface of the films. The heater rollers and other rollers within the lower portion of the machine and the belt itself serve to dry the print quickly. Almost any size print will pass through the machine just so the longest dimension is not less than the distance between adjacent chains. The machine may be readily and quickly adapted for use with a continuous strip of film and, on the other hand, may be used to print only one small print at a time without waste and without any undue expenditure of time and labor. The machine is simple and inexpensive to build, install and maintain. The prints are positively engaged by the belt at all times, and do not need a water spray or the like for conducting them from one of the belts to another. The water and chemical supply for the tanks is readily controlled and different chemical solutions may be selectively introduced into the printing tank.

It is apparent that my invention is susceptible to a wide variation in construction and may be used for a variety of purposes. Although I have snown several specific embodiments of my invention I do not wish to be limited thereto. Wide variations and modifications may be made without departing from the spirit and scope of my invention as set forth in the appended claims.

I claim as my invention:

1. In a device of the character described a substantially rectangular framework, a plurality of tanks mounted in the upper portion of the framework, rollers on the front of and inside the framework, other rollers within the tanks, a belt passing from the roller outside the framework and over the rollers inside the framework and into and out of successive tanks, other companion rollers for the first named rollers and companion belts for the first named belt.

2. A machine of the character described including framework having several tanks mounted in the upper portion thereof, rollers mounted on the front of the framework, other rollers mounted within the framework and in the tanks, still other rollers mounted on the rear of the framework, a belt extending horizontally from one of the rollers on the front of the machine to the rollers within the machine to constitute a feed table for the prints, belts for conveying the prints into and out of successive tanks, some of the latter belts being connected to lead out over the rollers at the rear of the machine and downwardly and into the lower portion of the framework.

3. In a device of the character described a framework, a plurality of tanks disposed in side by side relation within the upper portion of the framework, conduits below the tanks for conducting solutions to and from the tanks, a drying device mounted within the framework below the tanks, and conduits and means for carrying prints through the successive tanks and down over the drying device.

4. In a device of the character described, a framework, a plurality of tanks mounted within the upper portion of the framework, a dryer

mounted within the framework below the tanks, a heater stack at the rear of the machine to conduct the gases away from the dryer, and means for conveying prints through the successive tanks down through the heat stack and over the drying device.

5. In a device of the character described a framework, a plurality of tanks mounted within the upper portion of the framework, a dryer mounted within the framework below the tanks, a heat stack at the rear of the framework for conducting the gases from the dryer, a feed table at the front of the machine, a catch tray at the front of the machine below the feed table, and belt means for conveying prints through the successive tanks down through the heat stack, through the dryer, and into the catch tray.

6. In a device of the character described, a framework, tanks mounted within the upper portion of the framework, a dryer mounted within the framework at an intermediate position, and supply tanks and a pump mounted within the lower portion of the framework.

7. In a device of the character described, an open framework, tanks mounted within the upper portion of the framework, dryer rollers mounted within an intermediate portion of the framework, the intermediate portion being enclosed, a heat stack leading upward from the enclosed portion and at the rear of the machine, and means for conveying prints through the successive tanks down through the heat stack through the dryer, and for discharging the prints from the dryer.

8. In a device of the class described, a series of tanks, and means for receiving prints and conveying them into and out of the tanks in succession comprising rollers so disposed and an open belt so trained over the rollers as to form a horizontally extending table for receiving the prints and means for carrying them into and out of the tanks, and a second belt and rollers so disposed and arranged as to be superposed on the first belt after the prints leave the table and to hold the prints in place on the first named belt as it passes through the tanks.

9. In a device of the class described, a series of tanks, and means for receiving prints and conveying them into and out of the tanks in succession comprising rollers so disposed and an open belt so trained over the rollers as to form a horizontally extending table for receiving the prints and means for carrying them into and out of the tanks, and a second belt and rollers so disposed and arranged as to be superposed on the first belt after the prints leave the table and to hold the prints in place on the first named belt as it passes through the tanks, and the second belt being arranged to leave the first belt, and a third belt and rollers trained to be superposed on the first belt to carry the prints downwardly through a heat stack, and rollers and a fourth belt so trained as to be substituted for the first belt, and drier drum and rollers for carrying the prints over drier means.

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