

April 26, 1938.

G. S. ROWELL

2,115,471

METHOD OF FINISHING GRAINED PLANOGRAPHIC PLATES

Filed Oct. 23, 1934

3 Sheets-Sheet 1

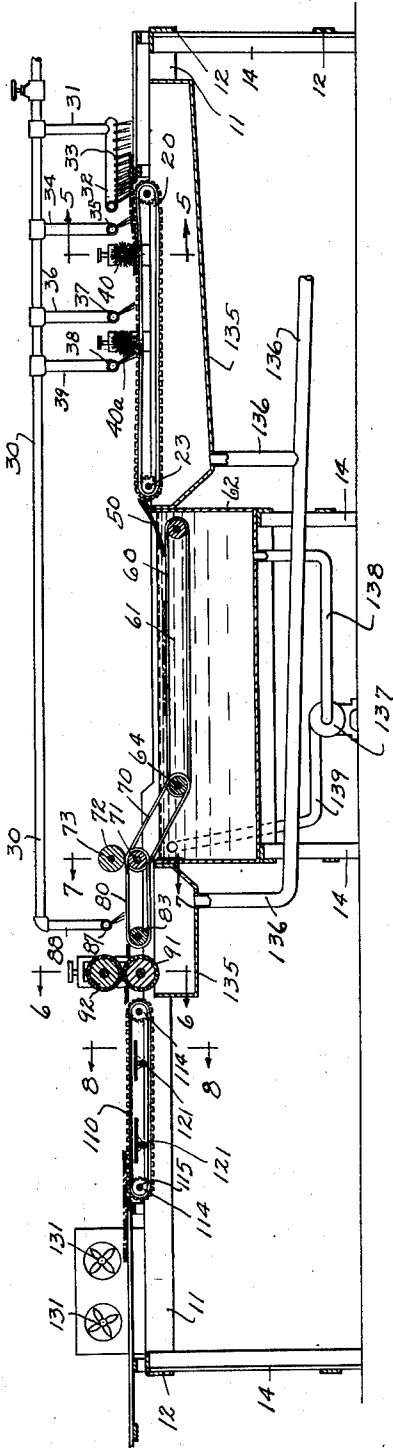


Fig. 2.

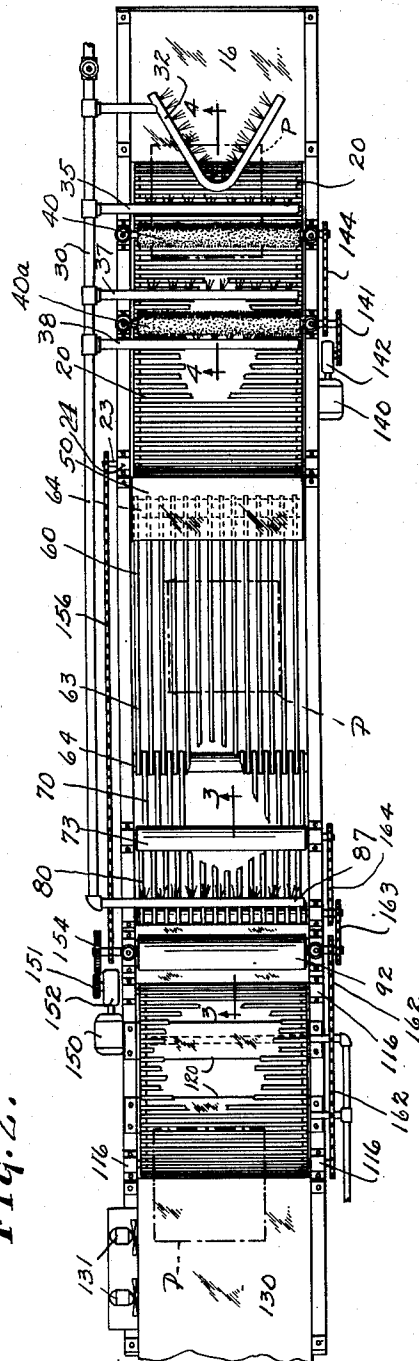


Fig. 1.

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3 Sheets-Sheet 2

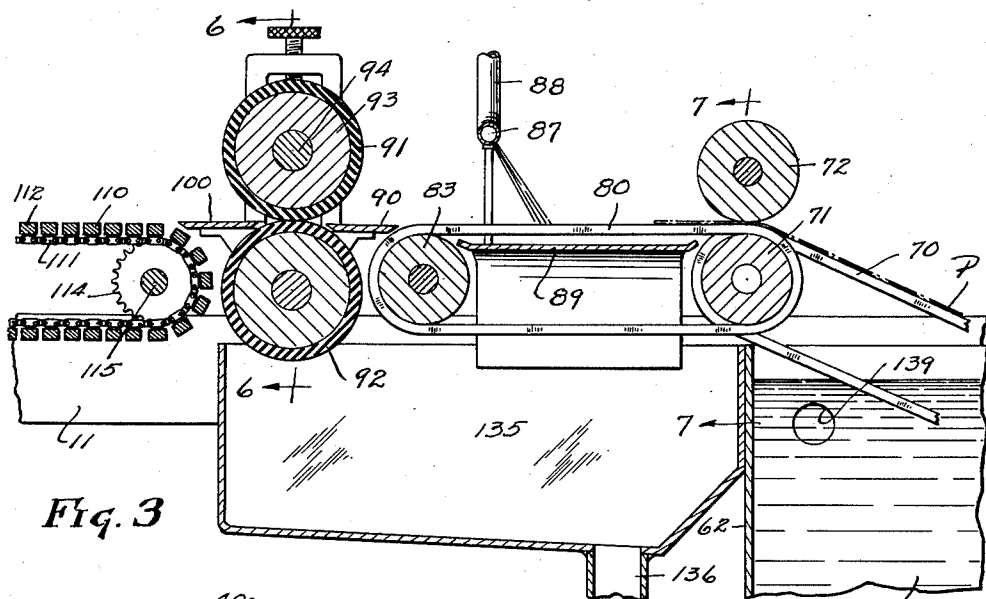


Fig. 3

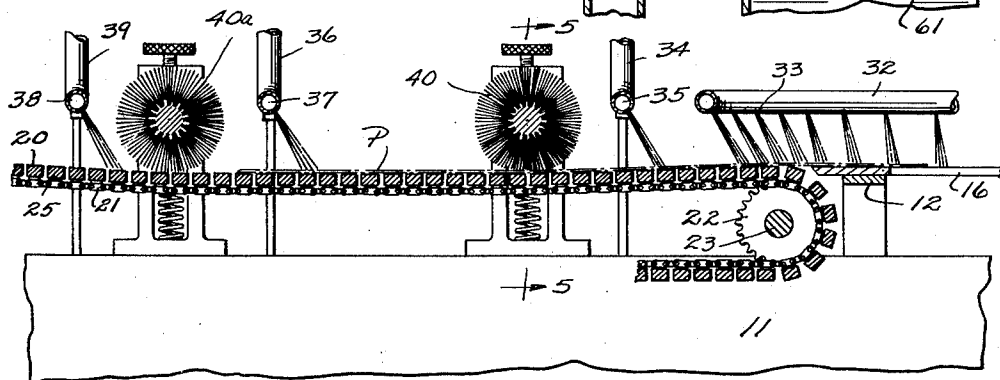


FIG. 4

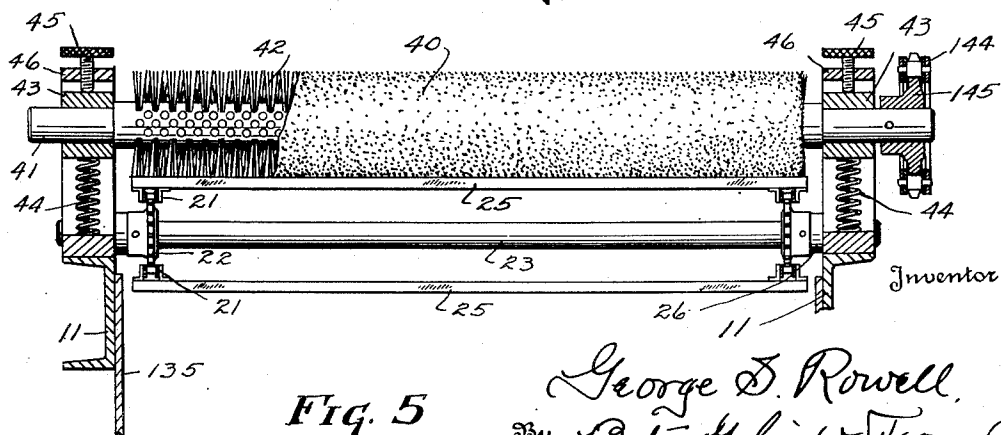


Fig. 5

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3 Sheets-Sheet 3

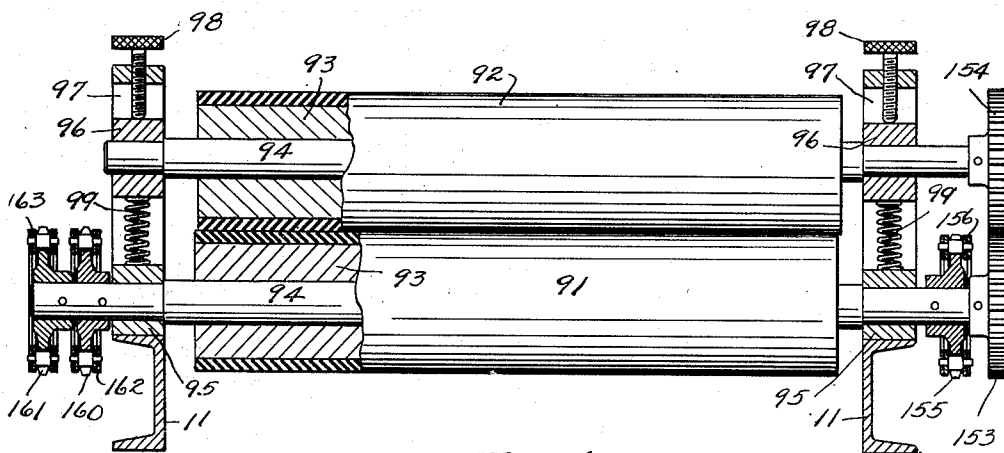


Fig. 6

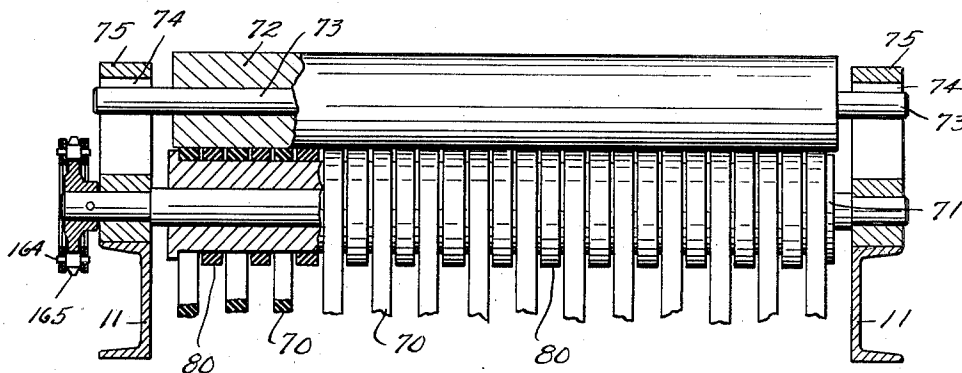


Fig. 7

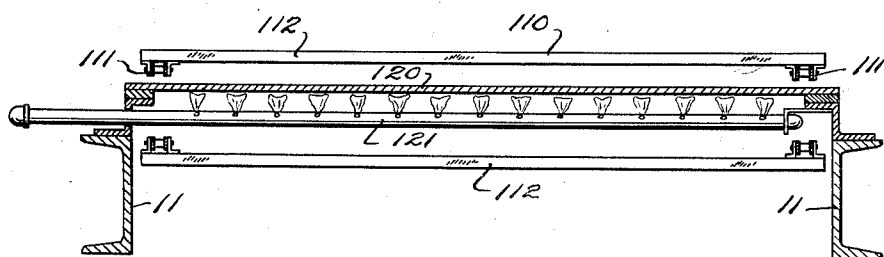


Fig. 8

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UNITED STATES PATENT OFFICE

2,115,471

METHOD OF FINISHING GRAINED PLANOGRAPHIC PLATES

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Application October 23, 1934, Serial No. 749,682

2 Claims. (Cl. 41—41.5)

This invention relates to a method of treating lithographic or planographic printing plates, and is especially concerned with the removal from the plate of the sludge or residue resulting from a graining operation and subsequently drying the plate to prevent excessive oxidation. This therefore is an object of the present invention.

Another object of this invention is to provide for treating a thin metallic printing plate to enable the production of such plates in quantities and in such a manner that the plates may be stored for a comparatively long interval of time without danger of deterioration.

A further object is to provide for removing from a printing plate the residue or sludge, resulting from a graining operation and for coating the cleaned plate with either an etching solution or with a solution to prevent the oxidation of the plate, and which will dry the coated plate, and wherein oxidization of the plate while it is being operated on is, for all practical purposes, prevented.

Another object of the invention is to provide a method whereby freshly grained planographic printing plates, and particularly zinc or aluminum plates may be freed of substantially all traces of non-metallic and free metallic particles and dried with a minimum of oxide. It is a further object to provide such a method which may be practiced with substantially complete independence of the human equation.

Other objects of this invention will become more apparent from the following description, reference being had to the accompanying drawings which illustrate a preferred form of apparatus for carrying out my improved method. The essential features of the invention will be set forth in the claims.

Planographic printing members generally comprise thin metallic plates, such as zinc or aluminum. The plate is first grained to give it the desired roughened surface. The graining is accomplished in any well known manner, such as mechanically by pumice stone and marbles. The conventional treatment of freshly grained plates usually consists in flushing the grain surface of the plate with water while manually swabbing the same and thereafter draining the plate in any convenient manner.

It is well known that both zinc and aluminum oxidize after graining and that this oxide must be removed prior to the use of the plate for lithographic purposes.

Aluminum oxidizes so fast, with the production of such a dense film of oxide, as to substan-

tially arrest further oxidation, while the oxide film is still extremely thin. Zinc, however, is not so well passivated by its oxide film as is aluminum and it is particularly susceptible to the formation of a basic carbonate which is just as objectionable, for lithographic purposes, as is the oxide. If the amount of either the oxide or basic carbonate is great, considerable damage to the grain may result from the rather drastic chemical treatment later necessary to prepare the plate for use.

I have found that the colloidal or quasi-colloidal particles, derived from the abrasive sand and/or the porcelain marbles used in the graining operation, become firmly attached to freshly grained surfaces. I do not know whether the adherence of these minute particles is a true absorption or a mere mechanical adhesion; but I do know that they effectively resist the customary washing process, and I have further discovered that they retard drying and, what is more serious, induce greater oxidation than occurs, under otherwise like conditions, in their absence.

The present invention is in part based on the discovery that these minute particles may be removed by drastic mechanical action such as brushing, and that a plate substantially free from these absorbed or adherent particles, may be dried more rapidly and with less oxidation than when the particles are allowed to remain absorbed in or adherent to the metal.

I have found that freshly grained plates, however carefully washed by hand, exhibit, after drying a "bloom" and have a dull grey appearance. The "bloom" is due in part to the adherence of the small minute particles heretofore mentioned, and in part to the oxides which form on the plate. It is obvious that fine dust, adherent to the grained surface of a planographic printing plate, is inimical to the attainment of a firm anchorage of a bichromated albumen image to the plate. And even though the oxides are removed by drastic chemical action immediately before the image is applied, the minute particles still would prevent firm anchorage of the image.

After the plate has been dried, it has been customary in the past, to coat the plate with a chemical solution. Such solutions may be of various kinds. For instance, the plate may be immediately coated with a light sensitive solution and stored in light proof containers until they are used, or the plate may be given a coating of an ink repellent solution, which, to prevent further oxidization of the plate, contains certain

salts. Again the plate may be given a treatment which acts only to prevent further oxidization. I have found that in any case the oxidization of the plate during the first drying process negatives the action of the oxide prevention coating or prevents a firm anchorage of the light sensitive solution.

I prefer to overcome the disadvantages heretofore mentioned by taking the plates still wet from the graining operation and mechanically cleaning them by subjecting such plates to the action of a plurality of scrubbing brushes, directing a stream of water or liquid on the plates during the scrubbing action, and subjecting the plates to a squeegeeing action to remove all possible moisture before the film of liquid has had an opportunity to drain from the surface of the plate and expose it to atmosphere, and drying the plate by the application of heat immediately after it has been subjected to the squeegee action. Thereafter, I direct a current of air across the surface of the plate to prevent collection of moisture on the plate while it is cooling.

I further contemplate applying the coatings heretofore mentioned to the plate immediately after the scrubbing action has taken place and before the film of liquid has been removed from the plate. The coating substance may comprise an ordinary lithographic etching solution for coating the plate to pre-etch it and deter oxidization without interfering with the intended purpose of the plate. I find it desirable that such coating solution be applied immediately after the scrubbing and spraying action and before the plate is engaged by the squeegee roll so that the plate is perfectly clean just preceding the coating operation and is dried immediately thereafter. This I find aids in the prevention of oxidization of the plate in the interval between the drying and the application of such solutions and requires only one drying operation, thus minimizing the total time required for the drying operation and decreasing the oxidization of the plate during such periods.

In the drawings, in which I illustrate a preferred form of apparatus for carrying out my improved method, Fig. 1 is a plan view of my apparatus; Fig. 2 is a central longitudinal section of the same; Figs. 3 and 4 are fragmentary longitudinal sections, on an enlarged scale, and are indicated by the lines 3-3 and 4-4 respectively on Fig. 1; Figs. 5 and 6 are transverse sections and are indicated by the correspondingly numbered lines on Figs. 2, 3 and 4; Figs. 7 and 8 are transverse sections and are indicated by the lines 7-7 and 8-8 respectively on Fig. 2.

Referring again to the drawings, my improved apparatus is supported by a frame or table comprising longitudinal side sill members 11 spaced apart by cross frame members 12 and supported by suitable legs 14. The freshly grained plates are removed from the graining operation and manually slid across a feed table 16, at the right hand end of the machine (Fig. 1), onto a conveyor 20. The conveyor 20 may comprise a pair of sprocket chains 21 adjacent and parallel with respective frame members 11. The chains are drivingly supported by sprockets 22, which are secured to suitable shafts 23, the ends of which are journaled in bearings 24 carried by the frame members 11. Suitable bars 25 extend transversely from one chain to another and are secured in the usual manner to the alternate links of the chain 21. Thereby providing a comparatively rigid surface through which liquid

will readily drain. The left hand sprocket shaft 25 is positively driven as will be hereinafter described in detail.

As the freshly grained plates are moved across the table 16 onto the conveyor 20, a stream of cleansing fluid or water is impinged upon them. This fluid is directed toward the plate at an angle to the direction of movement of the plate, as well as at an angle to the surface of the plate. The cleansing fluid or water is forced under pressure in the usual manner through a supply conduit 30 which is connected by a conduit 31 with a V shaped spray member 32 having its vertex superimposed above the longitudinal center of the moving plate and its ends diverging outwardly in a direction towards the sides and rear edge of the moving plate. Suitable jets or openings 33 in the lower region of the spray member 32 are arranged to direct the liquid toward the plate at an angle to its surface. A second spray 35 is connected to the conduit 30, and acts to impinge the cleansing fluid toward the plate. This spray extends above the plate in a plane normal to the path of movement of the plate and thereby attacks the particles at a different angle than does the fluid from the spray 32. These streams of cleansing fluid serve to forcibly rinse by a hydraulic action some of the absorbed and adhering particles heretofore mentioned.

The progress of the plate, due to the travel of the conveyor 20, brings the surface of the plate into contact with a scrubbing member 40. As shown, the scrubber comprises in Figs. 4 and 5 a cylindrical member or shaft 41 to the periphery of which is secured camel's hair or a similar substance 42, forming a compact cylindrical brush. The ends of the shaft 41 extend beyond the end of the brush portion and project into journal blocks 43 which are slidably mounted for movement toward and from the conveyor 20 in guides 44 carried by respective frame members 11. Suitable adjusting screws 45 extending through a top cap 46 limit the upward movement of the bearing blocks 43 which are under the impulse of suitable springs 44 interposed between the lower face of the blocks and the bottom of the guideway. Thereby permitting a positive yet adjustable downward pressure of the brush against the plate. The brush 40 extends at right angles to the direction of movement of the plate and is positively driven in a counterclockwise direction to impart a scrubbing action to the plate.

After the plate has been subjected to the scrubbing action of the brush 40, the particles which have been loosened by such action are washed from the surface of the plate by directing a second stream of cleansing fluid against the plate. As shown, in Figs. 1, 2 and 4, the conduit 30 is connected by a conduit 36 to a spray 37 which acts on the plate in the same manner as the spray 35 heretofore described.

Further progress of the conveyor carries the plate into contact with a second scrubbing brush 40a, similar in all respects to the brush 40. This brush acts to dislodge any remaining particles, from adhering to the plate, such loosened particles, if any, are then washed from the plate by a spray of cleansing liquid impinged thereon by a spray 38 which is connected to the supply conduit 30 and acts in the same manner as the spray 37 heretofore described. It will be noted that the surface of the plate has thus far been kept wet with the cleansing fluid to prevent oxidization, such fluid is preferably maintained slight-

ly warm to decrease its dissolved oxygen content and eliminate oxidization of the plate in this manner.

I have found that I may at this point in the progress conveniently give the plate its coating of light sensitive, ink repellent or oxidization prevention fluid. Any one of such fluids coating the plate and acting to prevent oxidization of the plate when dry. As shown in Figs. 1 and 2 the conveyor 20 progresses the plate P a slight distance beyond the last rinsing spray 38. This distance is sufficient to let any excess fluid drain from the surface of the plate, but is short enough to retain a film of liquid on the plate. The plate, being flexible, then is fed by the conveyor 20, across a bridge like member 50 onto a conveyor 60 which is submerged in a bath of coating solution 61 maintained in a reservoir 62. The conveyor 60 may comprise a series of spaced rubber belts 63 stretched about a pair of spaced rollers 64, journaled in suitable bearings, (not shown), but supported by the reservoir 62 in any convenient manner. The length of the conveyor 63 and the speed of travel of the conveyor is commensurate with the time required for the solution 61 to adhere to and cover the plate P.

A suitable conveyor 70 comprises a second series of rubber or similar belts, and is looped about a roller 71 and the left hand roller 64 and receives the plate from the conveyor 60 and draws it out of the solution 61. These belts are driven as will be hereinafter described and feed the plate into contact with a roller 72 which is superimposed above the roller 71. The roller 72 is mounted on a shaft 73 which is freely slidable in vertical ways 74 in guide members 75, which are secured to the frame members 11. The roller 72 acts to remove the excess liquid coating solution from the plate P.

The rollers 71 and 72 also act to feed the plate from the conveyor 70 to a conveyor 80. The conveyor 80 comprises a series of rubber belts which are looped around the roller 71 and a roller 83. The rollers 71 and 83 are journaled in suitable bearings which are secured to the frame 11 in any well known manner.

The conveyor 80 carries the plate beneath a rinsing spray 87 which is connected by a conduit 88 with the cleaning liquid supply line 30 heretofore described, and impinges a spray of cleansing fluid onto the coated plate rinsing any excess solution therefrom.

To prevent an excessive amount of cleansing fluid from following the conveyor and entering the solution in the reservoir 62, a drain board 89 is interposed between the upper and lower stretches of the conveyor 80, and serves to deflect the cleansing fluid from the return stretch of the conveyor.

The plate passes from the conveyor 80 across a guide bar 90 into the bite of a pair of squeegee rolls 91, 92. The squeegee rolls act to remove substantially all of the liquid from the plate. As shown, the rolls 91 and 92 each comprise a core 93 drivably secured to a suitable shaft 94, and which is covered with a soft rubber or composition covering. The lower roll 91 is mounted in suitable bearings 95 which, as shown in Fig. 6, rest on respective frame members 11. The upper roll 92 is journaled in bearing blocks 96, which are slidably mounted in respective brackets 97. The pressure between the two rolls is positively maintained by adjustable set screws 98 carried by the brackets 97 and serving to limit the upward movement of the roll 92. Suitable compression

springs 99 are interposed between the bearings 95 and respective bearing blocks 96, and serve to maintain the roll 92 in its uppermost position.

The rolls 91 and 92 act to remove any excess liquid from the plates and preliminarily dry them. Such rolls also feed the plates P across a table 100 onto a conveyor 110. The conveyor 110 comprises a pair of sprocket chains 111 spaced apart by bars 112 which form the conveyor surface.

The sprocket chains 111 are looped around suitable sprocket wheels 114 which are drivably secured to suitable shafts 115 which are journaled in bearings 116 mounted on the frame members 11.

The plates are dried by the application of heat while on the conveyor 110. As shown in Figs. 1, 2 and 8, burner plates 120 are mounted on the frame members 11 and pass between the upper and lower stretches of the conveyor. Beneath each burner plate is a suitable heating element, such as a gas burner 121. I find this dries the plates without damage to the coating. Likewise, as the heat acts from the bottom of the plate upwardly the moisture is expelled from the plate in such manner as to substantially eliminate oxidization during the actual drying of the plate.

As the plates are progressed by the conveyor 110 they are discharge onto a cooling table 130. A pair of fans 131 maintain a current of air circulating across the surface of the dried plates and prevents any accumulation of moisture while the plates are cooling to atmospheric temperature. The plates are thereafter manually removed from the table 130 and placed in suitable storage containers.

Suitable drain boards 135 are located beneath the conveyors 20 and 80. These drain boards are connected by conduits 136 to a drain, not shown. I likewise find it advisable to circulate the solution 61 in the reservoir or tank 62. I therefore provide a pump 137, the intake line of which is connected by a conduit 138 to the lower region of the reservoir, and the exhaust line 139 of which is connected to the upper region of the reservoir as shown in Fig. 2.

The scrubbing units 40 and 40a are driven by a motor 140 mounted on the frame 10 and connected by a speed reduction unit 142 and a drive chain 141 with a sprocket on the shaft of the scrubbing roll 40a. A second sprocket on such roll shaft is drivably connected by a chain 144 with a sprocket 145 which is secured to the scrubbing roll 40a thereby driving both rolls positively. The motor 140 is preferably of the well known variable speed type so that the speed of rotation of the scrubbing rolls may be regulated as desired.

The various conveyors together with the squeegee rolls are driven by a motor 150 independent of the scrubbing roll drive so that the speed of movement of the plates may be regulated independent of the speed of rotation of the scrubbers. As shown in Fig. 1, the motor 150 is carried by the frame 11 and drives a gear 151 through the medium of a gear reduction unit 152. The gear 151 meshes with a gear 153 drivably secured to the shaft 94 of the lower squeegee roll 91. A gear 154, secured to the shaft of the upper squeegee roll 92, meshes with the gear 153 thereby positively driving both gears. A sprocket 155 is drivably secured to the lower roll shaft and, through the medium of a sprocket chain 156, drives a sprocket carried by left hand sprocket roll shaft 23 of the conveyor 20, thereby driving such conveyor.

The conveyor 110 is likewise driven from the motor 150. As shown in Figs. 1 and 6, the shaft 94 of the lower squeegee roll 91 is provided with sprockets 160 and 161. The former sprocket, 5 through the medium of a drive chain 162, drives the left hand sprocket shaft of the conveyor 110, while the latter, through the medium of a drive chain 163, drives a sprocket carried by roller 83, thereby driving the conveyor 80. The conveyors 10 70 and 60, comprising looped belts, are driven by their rollers consequent upon the operation of the roller 80.

While I have included in this specification the coating of the plate with various solutions, in 15 some instances this operation will be omitted. This is especially true when the plates are to be coated with solutions which are extremely sensitive to light. In such instances it is desirable that the plates be kept wet until they reach the 20 squeegee rolls. While I may remove the roller 72 and replace the solution 61 with water, I prefer, under these circumstances, to eliminate entirely the conveyors 60, 70 and 80 and their attendant mechanisms. In this instance, the conveyor 20 25 will discharge the plates directly into the bite of the squeegee rollers. I also contemplate the use of the apparatus in this manner where a comparatively inexpensive oxidation prevention solution is to be applied to the plate. In this in-

stance I find that such solution may readily be used as a cleansing solution and applied through the various sprays which are connected with the conduit 30. This method I find is very satisfactory in prevention of oxidation during the entire 5 process.

I claim:

1. The method of preparing and drying freshly grained planographic printing plates, which comprises removing therefrom substantially all of the adherent particles by a scrubbing action in the presence of a liquid and by impinging a cleansing fluid onto the plate, subjecting the wet plate to a squeegee action to remove the bulk of the liquid, removing the residual moisture by 15 applying heat to the underside of the plate, thereafter immediately cooling the plate by circulating a current of air over the upper surface of the plate.

2. The method of preparing and drying freshly 20 grained planographic printing plates which comprises removing therefrom all the adherent particles in the presence of a liquid, coating the perfectly clean plate by immersing it in a liquid, thereafter removing the surplus liquid by rolling 25 pressure against the face of the plate, then heating the plate and passing a current of air across it.

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