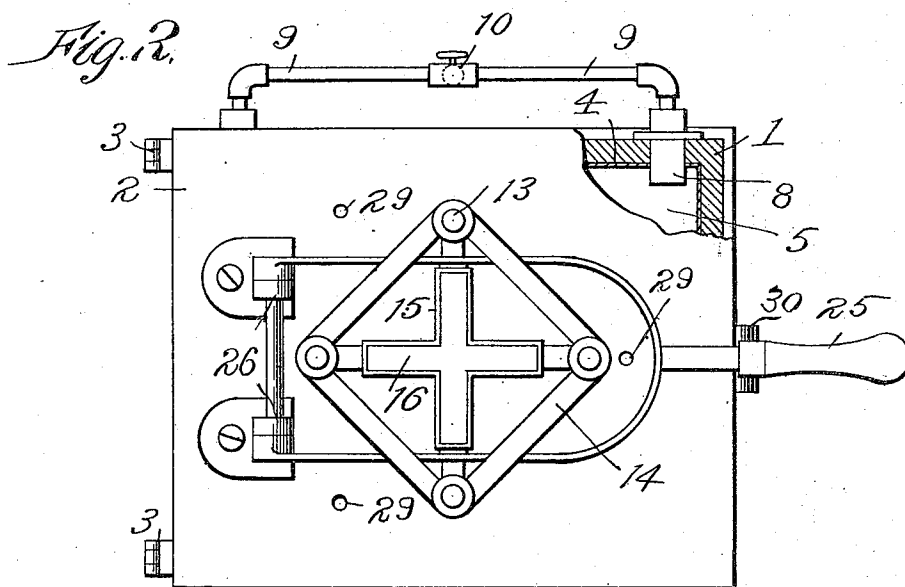
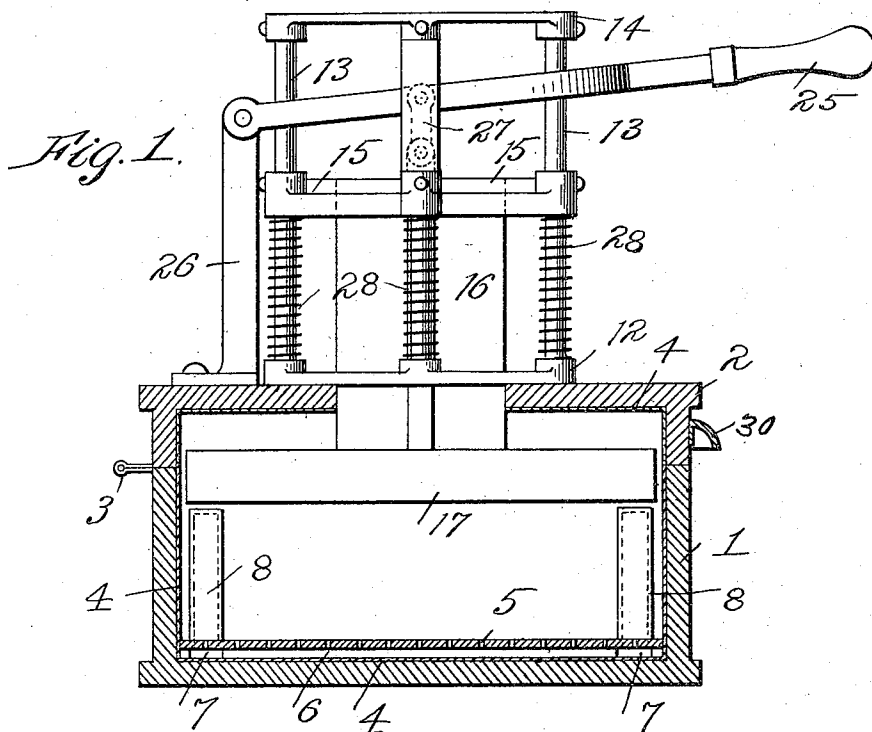


J. J. C. SMITH.
 APPARATUS FOR ETCHING PLATES IN THE PHOTO ENGRAVING PROCESS.
 APPLICATION FILED AUG. 21, 1912.

1,203,802.

Patented Nov. 7, 1916.
 2 SHEETS—SHEET 1.



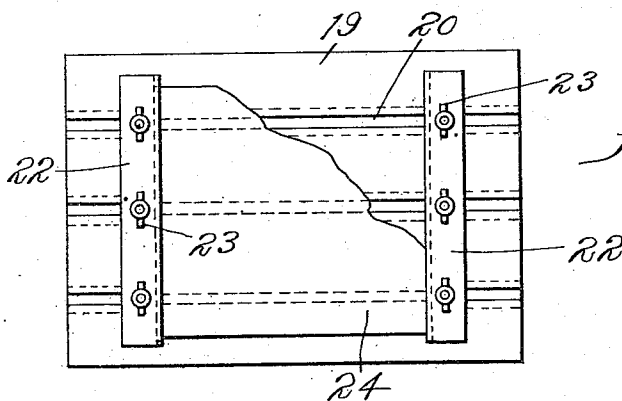
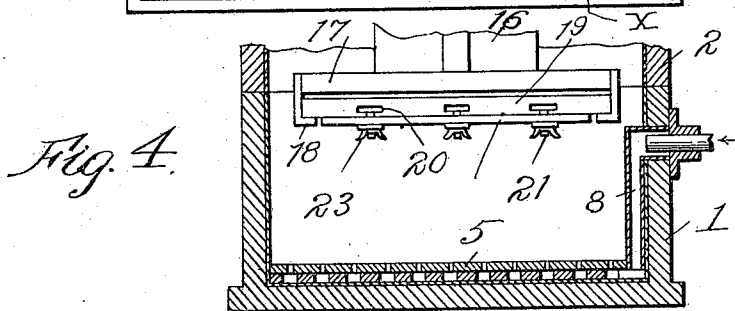
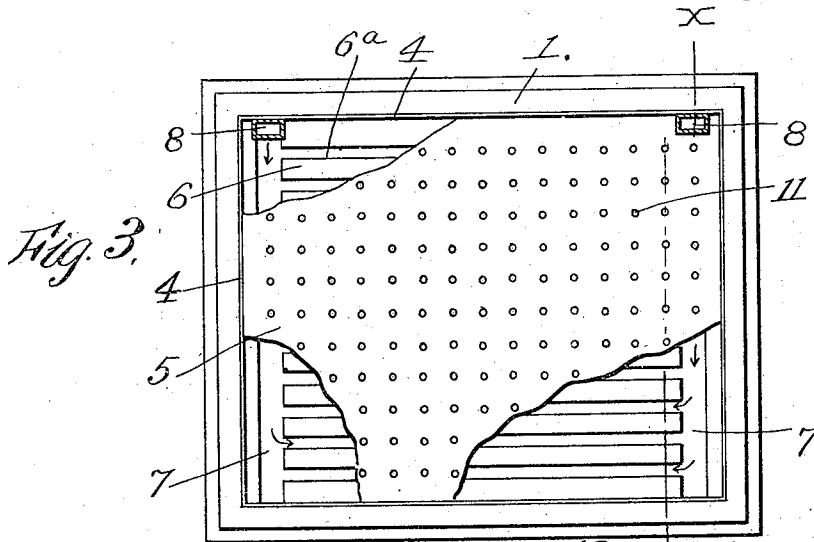
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UNITED STATES PATENT OFFICE.

JOHN J. C. SMITH, OF PASSAIC, NEW JERSEY, ASSIGNOR TO PAUL M. HAMMALIAN, OF HACKENSACK, NEW JERSEY.

APPARATUS FOR ETCHING PLATES IN THE PHOTO-ENGRAVING PROCESS.

1,203,802.

Specification of Letters Patent.

Patented Nov. 7, 1916.

Application filed August 21, 1912. Serial No. 716,244.

To all whom it may concern:

Be it known that I, JOHN J. C. SMITH, a citizen of the United States, and a resident of Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Etching Plates in the Photo-Engraving Process; and in order that those skilled in the art may make and use my invention I give the following specification thereof.

My invention relates to apparatus or machines for applying etching fluids to plates in the photoengraving process, the plates to be used for printing purposes as understood in the art, and the object of my invention is to provide an apparatus of this character which shall accomplish the etching in a uniform and rapid manner and which apparatus may be constructed at a relatively low cost.

It may be stated that among the objections to the present methods and apparatus for etching plates by the photoengraving process are (1) their high cost; (2) their lack of uniformity of operation upon the plate, particularly where, as is common, the plates to be etched are of considerable area; (3) the undercutting or widening of the lines of the design, and (4) the presence of moving parts exposed to the action of the strongly corrosive etching fluids which tend to rapidly corrode and deteriorate the same. My invention is designed to overcome these and other objections.

It may be stated that the desiderata in etching plates of the character described are: (1) rapidity of etching, since for most kinds of work, particularly newspaper work, the plates are required to be prepared within a very short time; (2) for good results the etching of the design must be uniform over the entire surface thereof, and the etching fluid must be so applied that its action is confined to the lines of the design and its tendency to broaden, undercut or widen said lines must be overcome to the greatest extent; (3) low cost of the apparatus and its maintenance, and its freedom from injury or destruction by the etching fluids. These and other advantages are particularly ob-

tained by my invention, as will be more particularly pointed out herein.

I have illustrated in the accompanying drawings a form of apparatus illustrating my invention, it being understood that said drawings are by way of illustration, and not of limitation, since various modifications can be made therein without departing from the invention.

In said drawings Figure 1 represents a vertical elevation, parts being shown in section to show the construction. Fig. 2 is a plan view, parts being broken away to show the details of construction. Fig. 3 is a plan view showing the interior of the apparatus and the construction of the bottom, parts being broken away to more clearly show details. Fig. 4 is a transverse sectional view taken on the line X—X, Fig. 3. Fig. 5 is a detail view showing the plate holder with a plate (partly broken away) supported therein.

The same reference numerals are applied to corresponding parts in the several views.

As illustrated the apparatus comprises a closed tank or receptacle for the etching fluid, this tank having a lower part 1, and a cover 2 thereon hinged to the lower part, as at 3. The tank, in the apparatus shown, is constructed of hard wood covered or faced on the side which is to form the interior with celluloid 4. This celluloid in the form of sheets of suitable thickness is cemented to the wooden pieces forming the walls, top and bottom of the tank after the manner in which veneer is applied. The pieces forming the walls, top and bottom of the receptacle are securely fastened together at their joints by celluloid cement, the joints being well coated with the cement and quickly brought together under pressure, and so maintained until the cement has hardened.

The bottom of the tank has a false or second bottom 5 supported upon parallel strips 6. Both the false bottom 5 and the strips 6 supporting the same are of celluloid, the former being a sheet about one-eighth of an inch in thickness. The celluloid strips 6 may be cemented to the bottom of the tank

and the false bottom 5 cemented thereon. At both ends of the tank these strips 6 stop short of the end walls of the tank so as to provide air chests or transverse channels 7, 7, at each end. The longitudinal channels 6^a between the strips 6 all communicate at each end with said air chests or transverse channels 7, 7. The false or second bottom 5 covers these channels and incloses the same forming air ducts as afterward explained. At one end of each of the transverse channels 7, vertical tubes 8, 8 are arranged which communicate at their lower ends, each with one of the transverse channels 7, 7, and at their upper ends lead through the wall of the tank where they are connected with branches 9, 9, of an air inlet pipe 10, leading from any convenient source of air supply (not shown). The false bottom 5 is provided over its surface with perforations 11 at frequent intervals, these perforations being situated over the longitudinal channels 6^a formed by the strips 6. The air under pressure from the oppositely disposed pipes 8 is thus led in opposite directions as indicated by the arrows in Fig. 3 toward the center of the tank where the oppositely directed air-currents communicate or intermingle with each other and the perforations are so arranged as to distribute the air issuing therefrom uniformly over the horizontal area of the tank. The vertical pipes 8 are, in common with all the interior surfaces and construction of the tank, formed of celluloid. The construction described is such that air under pressure delivered to the tank by pipe 10 passes through branches 9, 9, tubes 8, 8, to each of the air chests or transverse channels 7, 7, and is thence distributed uniformly into and throughout the etching fluid in the tank, escaping upwardly through the uniformly-spaced perforations 11 in the false bottom 5. The purpose and effect of this will be explained hereinafter.

While I have described the false bottom 5 and the strips 6 supporting the same as being cemented together and to the bottom of the tank, it is to be understood that the false bottom may be made removable, as for example by clamps or braces on the sides of the tank, in order to permit of cleaning out of the channels and bottom when necessary.

On the cover 2 of the tank is mounted the mechanism for supporting the plate to be etched in a horizontal position and for giving the same a vertically reciprocating movement. This mechanism comprises a base frame 12 secured on the top of the cover, in which are mounted vertical standards 13. At the top of the standards 13 a similar frame 14 is provided for holding the standards 13 rigidly in proper relation. Between the standards 13 is a cross head 15 ar-

ranged to slide up and down on said standards and to be guided thereby. To the cross head 15 is secured a cross-shaped plunger 16 which extends downwardly from the cross head and passes through the cover 2 of the tank, which is provided with a similarly shaped opening to permit of this. On the lower end of this plunger is secured a plate support 17 provided with guideways 18 at each end thereof to form a support for the plate holder; the construction being such as to permit a plate holder 19 to be held in horizontal position and to be inserted and withdrawn in and out of said guideways as required.

In order to reciprocate the cross head and plunger in a vertical direction I provide a lever 25 pivoted to a standard 26 mounted on the cover 2 of the tank. This lever is connected by a suitable cross piece and links 27 to the cross head so that by an upward and downward movement of the lever 25 the plunger, plate 17, and plate holder hereinafter described, are given a vertically reciprocating movement while maintaining the plate horizontally. In order to hold the plunger and plate holder in an upper position without attention on the part of the operator,—thus keeping the plate out of contact with the fluid in the tank,—I provide springs 28 surrounding the standards 13 and bearing against the base frame 12 at one end and the cross head 15 at the other. Suitable vents 29 are provided in the cover 2 to relieve the pressure of air in the interior of the tank.

The construction of the plate holder is illustrated in Fig. 5 and consists of a back 19 provided with a series of undercut or T-shaped grooves 20 in which slide screw-clamps 21, 21, having flat and enlarged heads corresponding to the T-shape cross section of said grooves. Holding strips 22, 22 are provided with holes to register with the screw-clamps 21 in the grooves 20 and are adjustably secured in place along said grooves by means of nuts 23. The construction is such that by means of the strips 22, which may be adjusted to any position along the grooves 20, a metal plate or plates 24 to be etched may be secured to the back or holder 19. It will be understood that the strips 22 are undercut to form retaining edges for the plate or plates 24. As before stated all the interior construction and fittings including the screw-clamps 21 and their nuts 23 are formed of celluloid, and the plunger 16 is also protected with celluloid to resist the action of the etching fluids. It will be observed that when the tank is closed by lowering the cover 2 to operating position, the plunger 16 is vertical and holds the plate to be etched 24 in a horizontal position, and that the same is maintained in said horizontal position and parallel with

the plate 5 having the uniformly-spaced perforations 11 throughout the operation.

The operation of the device is as follows: The apparatus being in a level position the tank is filled to within three or four inches of the top of the lower portion 1 with the etching fluid; the plate 24 to be etched is secured on the plate holder 19 by means of the adjustable strips 22, and the plate holder and plate are slid into the guides 18 on plate 17 at the lower end of the plunger 16. The cover 2 as understood will be thrown back on its hinges 3 for this purpose, a handle 30 being provided for conveniently lifting the cover. When the plate is secured in position the cover is closed and the air pressure turned on through the pipe 10 and branches 9. I have found that an air pressure of one pound to the square inch is a suitable pressure to employ. The air passing downwardly from the branches 9 through the tubes 8, 8, enters the transverse channels 7, 7 at each end of the tank and passes from them along the channels 6^a between the strips 6 toward the center of the tank as indicated by the arrows, Fig. 3, where the oppositely-directed air currents communicate or intermingle with each other. Air under pressure being thus delivered to channels 6^a escapes upwardly through the perforations 11 uniformly-spaced in the false bottom 5 and through the etching fluid in the tank. This causes a lively ebullition of the etching fluid and at the same time mixes air therewith. The plates are thus subjected to the combined action of the uniformly agitated etching fluid and of air, which is uniformly distributed throughout the area of the tank and is so supplied as to produce substantially uniform air pressure throughout the area of said tank. The action of said fluid is thereby rendered much more rapid, as the corrosive action of the etching fluid on the plate is considerably increased by the presence of the air, and the constant ebullition of the fluid. Such air passing up through the etching fluid from the bottom also keeps the same uniform in strength in all parts, and results in great uniformity in the etching process and the avoidance of undercut or widened lines in the finished plates. After the cover has been lowered and air turned on as above described the lever 25 is depressed and the plate is brought in contact with the bubbling fluid and may be held there for about half a minute in a steady position. The lever is then raised and depressed again in such manner that the surface of the plate to be etched is sharply dashed into and out of the bubbling fluid. This operation may be kept up at short intervals for about a minute when the plate may be examined by raising the cover to observe the progress of the

etching. This operation may be repeated as often as necessary to obtain the desired depth of lines. Practice and ordinary skill and observation will soon enable the operator to obtain the best results. For some plates, such as copper plates, it is not essential to give the same the upward and downward movement; but such plates may be held steady in contact with the bubbling fluid. The agitation of the fluid in contact with the plate not only considerably increases the rapidity of the action of the fluid but at the same time assists in removing and washing out the oxid formed in the lines, and the dashing movement of the plate up and down against the fluid further increases the action of the fluid and the washing out effect. The result is a very rapid and uniform etching of the plate.

While I have described in detail the various features of the invention it will be understood that the same may be modified and changed without departing from the principles of the invention.

What I claim is:

1. An apparatus for applying etching fluids to plates, having in combination a tank for the etching fluid, means in said tank for discharging and uniformly distributing air throughout the body of the fluid in said tank, said means comprising a series of air ducts arranged in the bottom of the tank, each of said air ducts having a plurality of discharge openings along its length, said openings being submerged in the fluid in the tank, air chests at the opposite ends of said air ducts into which each of said ducts opens, means for supplying air under pressure to said air chests, means for supporting a plate in a horizontal position in said tank and means for moving said plate and holder into and out of contact with the liquid in said tank.

2. An apparatus for applying etching fluids to plates, comprising a tank for holding the fluid, a plurality of spaced-apart strips on the bottom of said tank, a perforated false bottom covering said strips and inclosing the spaces therebetween to form a plurality of air passages, the perforations in said false bottom registering with said spaces, transverse air passages beneath said false bottom at each end of said strips and communicating with each of the air passages between said strips, means for delivering air to said transverse air passages, a plate holder supported in said tank for holding the plate to be etched substantially parallel with the level of fluid in said tank and means for moving said plate holder into and out of the liquid in the tank.

3. An apparatus for applying etching fluid to plates, having an air distributing plate that is provided with uniformly spaced

openings, means for supplying equal proportions of air to said openings and means for supporting a plate in proximity to said air distributing plate.

- 5 4. An apparatus for applying etching fluid to plates, having an air distributing plate that is provided with uniformly spaced

openings, channels communicating with said openings and passages for supplying opposed currents of air to said channels.

JOHN J. C. SMITH.

Witnesses:

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WM. A. COURTLAND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."