

E. ALBERT.
METHOD OF ETCHING.
APPLICATION FILED OCT. 15, 1906.

928,922.

Patented July 27, 1909.
2 SHEETS—SHEET 1.

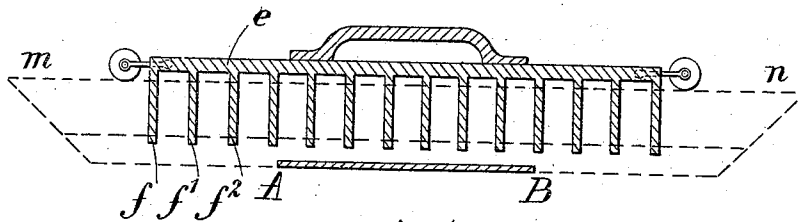


Fig. 1.

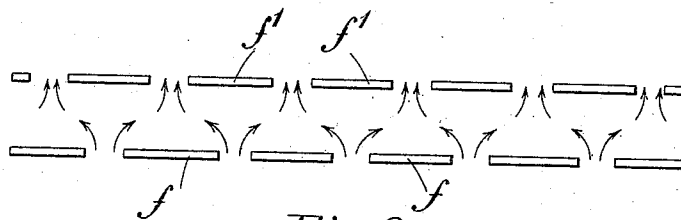


Fig. 2.

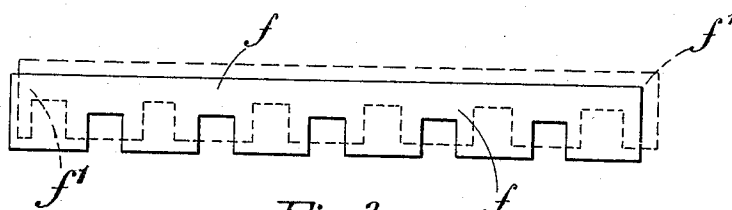


Fig. 3.

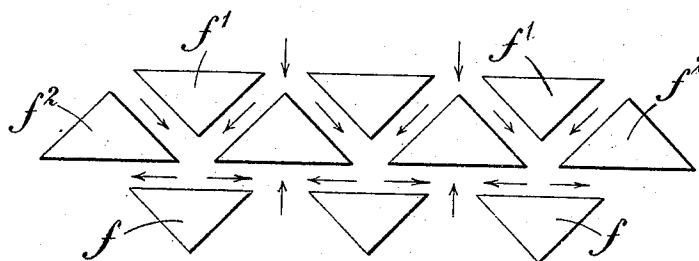


Fig. 4.

—Witnesses—

A. H. Rheinlander
A. W. Marshall

—Inventor—

Eugen Albert
by Sydney E. Page
—Attorney—

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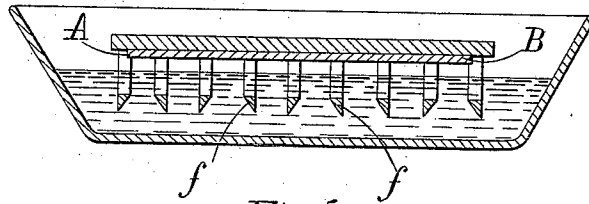


Fig. 5.

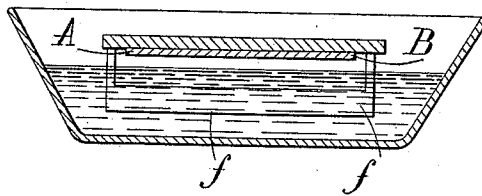


Fig. 6.

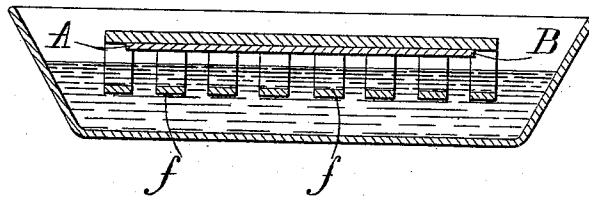


Fig. 7.

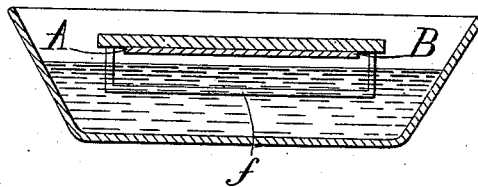


Fig. 8.

—Witnesses.—

A. H. Rheinlander
A. W. Marshall

—Inventor.—

Eugen Albert
by Sydney E. Page

—Attorney—

UNITED STATES PATENT OFFICE.

EUGEN ALBERT, OF MUNICH, GERMANY.

METHOD OF ETCHING.

No. 928,922.

Specification of Letters Patent.

Patented July 27, 1909.

Application filed October 15, 1906. Serial No. 338,980.

To all whom it may concern:

Be it known that I, EUGEN ALBERT, a subject of the Emperor of Germany, residing at Munich, in the Kingdom of Bavaria and Empire of Germany, have invented certain new and useful Improvements in Methods of Etching, of which the following is a specification.

This invention relates to improvements in the method of etching the surface of metals and the like, it is more especially applicable to the etching of metal printing plates, in a bath containing acid.

The process of etching with acid is accelerated and improved in proportion to the number of the atoms of the acid which can be brought into contact with the surface to be etched in the unit of time, that is, the more the etching liquid is moved the better the result. In etching metals with acids an insufficient movement of the latter causes not only a prolongation of the time of etching by forming layers poor in acid lying over the surface to be etched, but the oxid being irregularly formed on the metal and protecting the metal partially from the action of the acid, influences in a disadvantageous manner the uniformity of the etching, a circumstance which, with zincographical etchings for instance, where the elements are very delicate, directly deteriorates the quality of the product.

The traditional forms of movement, such as oscillating the etching trough and brushing the surface to be etched, not being sufficient, several machines have been heretofore proposed for the purpose of bringing the etching liquid in contact with the metal surface with great rapidity, as for example the Levy machine in which by means of very complicated and expensive mechanism jets of acid are thrown by compressed air against the etching surface, or the Axel Hölstroms apparatus, in which the same effect is attained but in a much more simple manner by means of quickly rotating paddles reaching partially into the acid and lashing the same against the printing plate lying about three feet higher.

The primary object of this invention is to render the process of etching more expeditious and more effective than heretofore.

Among other objects are to provide a process in which a maximum number of the atoms of the etching liquid are caused to have a small movement against the surface

of the plate in a short time; to provide a process for producing foam in the etching liquid whereby the time taken is materially reduced and the cavities of the plate thoroughly cleaned out; and to provide a process for removing oxid from the surface of the plate by the rubbing of solid particles contained in the liquid against it.

To the above ends the invention consists in the matter hereinafter described and more particularly pointed out in the appended claims.

The accompanying drawings illustrate diagrammatically apparatus suitable for carrying out my invention.

Figure 1, is an illustration showing in section a comb device used for stirring the liquid, Figs. 2 and 3 being a plan and perspective elevation respectively of two adjoining boards of the comb. Fig. 4 shows in plan view a modification of the form of the stirring device. Fig. 5 shows a side elevation, and Fig. 6, an end elevation both in section, of apparatus in which the metal body to be etched is out of the etching liquid, and Figs. 7 and 8 show a modification of such a device for operation vertically.

Referring to Fig. 1, the etching trough and the height of the liquid are indicated in dotted lines. The printing plate A—B lies on the bottom of the trough. The motion of the liquid against the plate is produced by oscillating a stirring device such as *e* in the direction of *m—n*; such a device is comparable to a curry-comb and may be formed in the most simple shape by a number of small out-standing boards *f*, *f*¹ *f*² and so on. But as it is desirable that the movement of the etching liquid take place not only in the direction *m—n* but that this movement be a bubbling one throughout the liquid, it may be suitable to provide these small boards with openings which are displaced in relation to each other in the manner shown in Fig. 3 in a front view with a second board in dotted lines, while Fig. 2 represents the plan-view indicating the direction of motion of the liquid by arrows.

Another arrangement more in form of a coarse brush is shown in Fig. 4 in plan view and in this case the motion of the liquid is accomplished still more thoroughly.

The Figs. 5 to 8 represent examples of my process when the metal body to be etched is out of the etching liquid and the surface to be etched turned downward. By the little

horizontal oscillations of the stirring device the etching liquid is thrown back every time according to the force of the movement and is dashed up against the opposite metal surface A—B to be etched. The parts *f, f* of the stirring device may be given different forms to cause the squirting up of the etching liquid to be as forcible and distributed as possible. It is preferable to extend these stirring plates *f, f*, as nearly as possible to the bottom of the etching trough so that the process of etching may be effected by means of a small quantity of acid only. As the distance of the metal surface A—B above the stirring plates must also be small (about 1 cm.) the apparatus is an extremely compact arrangement which may be applied to almost every existing etching trough. A similar etching effect results, if the reciprocating movement of the stirring elements takes place in a vertical direction, in which case of course the stirring plates are to be arranged not vertically but horizontally as shown in Figs. 7 and 8. The etching effect of the liquid is materially improved by the addition thereto of foam producing substances as for instance the bark of *Radix Quilaja Saponaria*. The innumerable small air bubbles formed favorably influence the process of etching and shorten the time for the process by nearly one half; they also are very effective in thoroughly cleaning out the bottom of the etched cavities; the intense bubbling motion of the etching liquid thus produced materially increases, in zincographical plates especially, the quality of the product of the printing. The good effect of these actively bubbling motions is still further increased by adding solid particles to the etching liquid by which the oxid being formed is removed where not required in a mechanical and speedy manner by the rubbing of these bodies against the plate. The force of the whirling and bubbling motion of the liquid manifests itself less of course in recesses of small dimensions than in recesses of large extension, that is to say, in the latter which correspond in zincographical plates to the lights of the original and the oxid is more removed than in the small recesses which correspond to the darker parts. From this it results that it is possible to quickly etch the lights in a deep and sharp manner, without bleaching the dark spots, as these are protected partially from the action of the acid by oxid lying thereon. Therefore a picture of good effect and rich in tones results without the need for the expensive processes of tone-covering and effect-etching used heretofore.

It should be understood that the process herein described is not limited to any particular etching liquid or to plates of any particular material.

What I claim as my invention and desire to secure by Letters Patent is:—

1. The improvement in the art of etching in a liquid bath, consisting in immersing the plate in the etching liquid, adding solid particles to the liquid, and then agitating the entire volume of the liquid in the bath in a manner such as to produce a continued succession of short wave movements of the liquid over the surface to be etched and thereby causing the solid particles to rub against the plate and to remove therefrom the oxids formed by the action of the liquid.

2. The method of etching plates consisting in subjecting them to the action of an etching liquid containing a foam-producing substance and agitating the liquid in a manner such as to produce a continued succession of short wave movements of the liquid against the surface to be etched and to produce bubbles thereon.

3. The method of etching plates which consists in subjecting them to the action of the etching liquid, agitating the liquid in a manner such as to make a continued succession of short wave movements against the surfaces of the plates, adding to the liquid a foam-producing substance, and adding also solid particles which, carried by said wave movements, shall rub against the parts of the plates requiring the most etching.

4. The improvement in the art of etching which consists in supporting the plate to be etched face upward in an etching tray, covering the plate with a shallow layer of etching liquid, adding a foam-producing substance thereto consisting of the bark of *Radix Quilaja Saponaria*, and agitating the liquid from within the same and in close proximity to the face of the plate to cause short bubbling movements of the liquid to take place successively against the face of the plate.

5. The improvement in the art of etching, which consists in supporting the plate to be etched face upward in an etching tray, covering the plate with a shallow layer of etching liquid, adding a foam-producing substance thereto consisting of the bark of *Radix Quilaja Saponaria*, adding particles of a suitable solid substance to the liquid, and agitating the liquid from within in a manner to cause bubbling wave movements of the liquid and a rubbing action of said particles to take place successively against the face of the plate.

In testimony whereof I have affixed my signature in presence of two witnesses.

EUGEN ALBERT.

Witnesses:

H. D. JAMESON,
F. L. RANDS.