

Sept. 30, 1941.

O. F. WOOD
REPRODUCTION PROCESS

2,257,143

Filed May 23, 1938

FIG. 1.



FIG. 2.

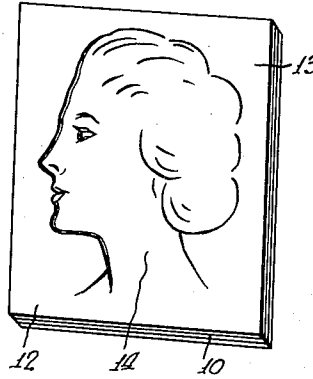


FIG. 4.



FIG. 3.

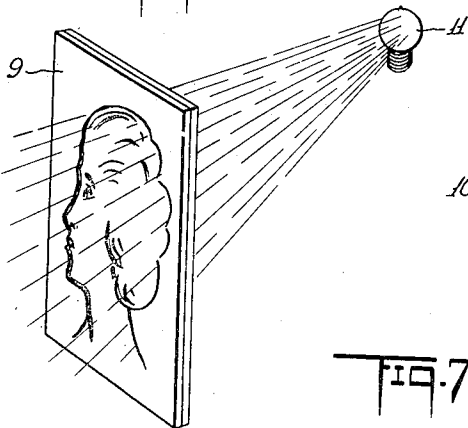


FIG. 5.

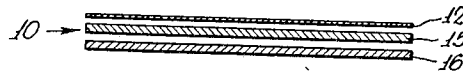


FIG. 6.

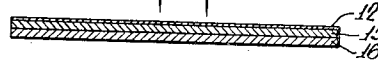


FIG. 7.

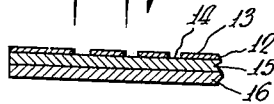


FIG. 8.

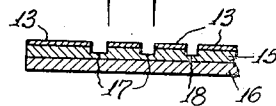


FIG. 9.

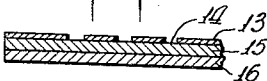


FIG. 10.

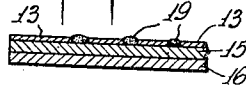


FIG. 11.

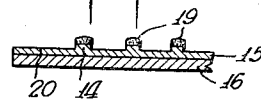


FIG. 12.

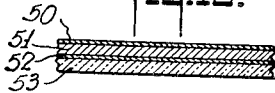


FIG. 14.

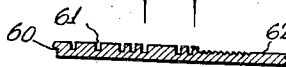


FIG. 16.

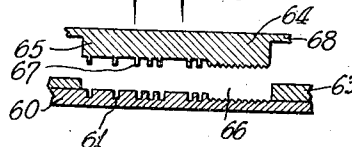


FIG. 13.

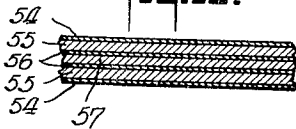
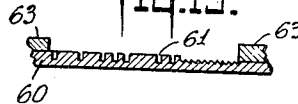


FIG. 15.



INVENTOR
Otis F. Wood
BY *Sam Price*
ATTORNEY

UNITED STATES PATENT OFFICE

2,257,143

REPRODUCTION PROCESS

Otis F. Wood, New York, N. Y.

Application May 23, 1938, Serial No. 209,468

7 Claims. (Cl. 41—25)

The present invention is directed to methods of reproduction and is particularly directed to methods of making printing plates.

It has been customary to prepare cuts and plates for printing purposes, whether for flat printing, as for example, in the case of books, or for relief printing, intaglio printing, cylinder printing, as for example, in the case of newspapers and magazines, by etching certain portions of a metal plate or cylinder with various acids.

The production of these printing plates or rollers necessitates the employment of photographers, photo-engravers, electro-typers and usually it is necessary to transfer the material from one group of workers to another and sometimes even from one shop to another or from one department to another before the final plate or cylinder is obtained, to which ink could be applied and from which the ink might be transferred to the paper or other stock which was to be printed.

These repeated handlings and transfers between different departments and from one group of workers to another not only resulted in considerable delay, but also substantially increased the cost of manufacture and in addition a great deal of time had to be spent in finishing, cutting away or routing the final cuts or plates with large amounts of waste materials.

Moreover it was frequently necessary to produce negative plates which had to be transferred into positive plates and various stereotype processes had to be utilized to obtain plates suitable for cylindrical or roller printing from the flat etchings which were initially produced.

Furthermore, considerable difficulty was experienced in the etching, requiring re-touching and expensive, and time consuming manual labor to obtain the proper depth and character of plate after the etching had been completed and it was not possible readily to gauge the depth of the etch or to control it in such a way as to automatically determine the depth of the various etches or character of the recesses formed therein.

It is among the objects of the present invention to provide an improved method of reproduction and of producing printing plates of the character above described in which by relatively inexpensive, rapid and simple methods, it will be possible to obtain reproductions or to obtain printing plates, either for flat or cylindrical printing, which will reproduce accurately the character and texture of the object or picture to be printed and which, at the same time, will be under accu-

rate control at all times by the operator or person in technical control of the printing processes in the printing establishment.

Another object is to provide an improved process for producing printing and other reproduction plates which will eliminate the necessity of making repeated negative and/or positive plates, which will eliminate most of the touching up, routing or manual labor which is necessary in the manufacture of printing plates of the present day and which will further eliminate the necessity of utilizing several shops or departments or different groups of workers before the final plate is produced with the resultant increased cost and delay.

Other objects will be obvious or will become apparent during the course of the following specification.

In accomplishing the above objects the object to be reproduced or the picture to be reproduced is directly photographed upon a sensitive emulsion carried by the element, which is to be etched by the etching agent, whether the etching agent be water or an organic solvent or an acid.

The plate to be etched may consist of a laminated structure including thin closely adherent layers of various metals, such as aluminum, copper, iron, tin, zinc, chromium and so forth; and/or of various synthetic plastic materials with pigments and/or fillers, such as vinylite resins, acrylic acid resins, rubber, phenol formaldehyde resins, styrene or styrol resins, urea formaldehyde resins, casein materials, natural resins as gum dammar, shellac, manila gum, rosin and gum accroides, phthalic acid-glycerol resins, and cellulose derivatives, such as cellulose nitrate, acetate or ethyl cellulose and so forth; and/or inorganic materials, such as wood, paper, glass, asbestos, combinations of wood flour, silica dust, magnesium oxide, calcium carbonate, barium sulphate or other insoluble inorganic salts, oxides, or pigments with flour, sugar, dextrin, sterol, arabic, water glass, gum tragacanth, gum shirez, water soluble cellulose ethers and so forth as binders. The fillers or pigments above mentioned may consist of ground ceramics, powdered chalk, powdered barium sulphate, white lead, clay, iron oxides, insoluble organic dyes, lacs, chrome green or yellow, Prussian blue, lithopone, plaster of Paris, aluminum oxide and so forth.

The top or upper layer or an intermediate layer may be sensitized and may consist of various combinations of colloids, such as glue, gelatin, albumen, Egyptian bitumen, and so forth, containing a substance acting as an insolubilizing

agent upon exposure to light such as a bichromate.

Although these laminated plates may be formed in many different ways by adhesion or spraying or painting the various materials upon a base, it is possible to form them by electrical deposition of different metals from different baths containing dissolved salts of the metals or from the same bath with the deposition being controlled by variation in the deposition potential.

This is particularly useful in forming laminated plates which may contain copper, iron, tin, zinc and other metals of this character.

If desired, the electrolytic baths may also be utilized to depose the finally divided suspensions of the resins or cellulose esters or even finally divided rubber in the form of latex.

In addition to depositing by electrolysis or electro-phoresis, it is also possible to deposit the layers of etchable metals, resins or other materials, by spraying, coating or in other suitable fashions. The thickness of the individual layers may vary from a fraction of a thousandth of an inch up to several thousandths of an inch, if desired, depending upon the particular form which is to be produced.

It is to be, however, understood that the present invention is also applicable in many respects to plates which are of one metal or of one material.

In carrying out the present invention the plate, which may be of laminated or unlaminated structure, is coated with the light sensitive gelatin material and then is exposed in a frame to direct sunlight passing through a picture or sketch to be reproduced or may be placed in a photographic camera or other apparatus and directly exposed.

After exposure for the desired length of time, that portion of the gelatin which has been acted upon by the light will become insolubilized, while the remaining portions will remain soluble and may be rubbed, brushed or sponged off or otherwise removed from the plate.

It is also possible, of course, instead of using combinations of gelatin and bichromate, to use other protein or colloid combinations which, upon exposure to light or treatment with a chemically active drawing ink or crayon, will undergo chemical changes in certain affected portions, corresponding to a picture or design to be reproduced, while other portions will remain unaffected.

In such case a special ink or material may be rubbed over or applied to the surface of the treated colloid to affect those portions which have been changed so as to protect them or insolubilize them while the remaining portions may be suitably removed by solution, by brushing or by other methods. Present photographic and/or engraving methods may of course be utilized insofar as they are applicable to the present invention.

For example to a gelatin layer containing suitable iron salts, a drawing in a chemically active ink or crayon may be directly applied without exposure to light. At portions corresponding to the crayon or ink lines of these drawings, there will be insoluble deposits formed in the gelatin, which insoluble deposits will insolubilize the gelatin upon subsequent treatment or will protect the metal beneath the gelatin, as the case may be. Other offsetting, transferring or printing processes may also be employed.

After the unaffected protein or gelatin or other

colloid has been removed, exposing the metal or other material forming the top surface of the printing plate, an etching material is applied.

For example, where glass is the surfacing of the plate, hydrofluoric acid may be used as an etching material.

With cellulosic materials, as paper or regenerated cellulose films, strong nitric or hydrochloric acids may be used as etching agents, as may also salts, and as zinc chloride, followed by drying and/or heating.

Where aluminum or zinc are employed, different concentrations of caustic soda or caustic potash may be employed.

With different metals, such as copper, iron, different acids or salts may be employed, such as nitric, sulphuric, phosphoric, acetic, iron trichloride and so forth.

Dilute acids will attack some metals and concentrated acids will attack others, while combinations of acids will attack still others and advantage may be taken of the specific or selective action of different acids in different concentrations and mixtures upon different materials.

With cellulose esters or resins or rubber as a surface or intermediate layer upon a laminated plate, organic solvents may be employed, such as acetone, benzene, ethyl acetate, various methyl, ethyl, propyl, butyl, amyl hexyl or esters compounds of sulphonic or carboxylic acids containing anywhere from 1 to 20 carbon atoms and containing straight aliphatic chains saturated or unsaturated, or various other ring nuclei, such as the aromatic and/or alicyclic nuclei.

In the case of laminated plates, where different solvents or different concentrations or mixtures of acids or organic solvents must be used to attack the various materials forming the laminations, it is possible after etching entirely through one layer or lamination to protect portions of the exposed next lamination and then etch through the next lamination in places or all over, if desired, by another solvent or a different concentration of the same solvent.

By the use of laminated plates, it is possible most readily to determine when the etching has progressed through one entire lamination by making the next lamination of a different color, which will immediately flash up when the first lamination has been etched away.

On the other hand, the rear laminations, or one or more of the laminations may be made transparent or translucent so that it is possible to inspect the plate from the rear when the etching is partly or wholly completed and determine whether the plate is in satisfactory condition. These transparent laminations may be formed of glass or of synthetic resins, or of rubber or even of cellulose esters or regenerated cellulose films.

On the other hand where copper is the facing layer and iron is the next lamination, if the iron sheet is polished, upon etching through the copper layer with sulphuric acid, the silver finish of the iron plate will immediately flash out when the etching is complete.

Where the bottom laminations are of transparent or translucent material, a light may also be placed below the plate, which light will shine through the plate as soon as the etching has been completed. In this manner it is possible most readily to prevent undercutting and to control the depth of the etching and the character thereof so as to give a proper finish to the edges

of the removed portions which will be of value in connection with the formation of the final printing plate from the etched plate. When the castings are made, the bottom of the etching becomes the top of the printing plate and the sides of the etched out portions will become the sides of the relief on the printing plate.

On top of the metal plates and below the photographically sensitive emulsion there may also be placed water soluble compositions, such as combinations of various water soluble gums or dextrins above mentioned and calcium carbonate, barium sulphate, insoluble inorganic salts, insoluble organic or inorganic lakes and pigments and so forth.

In this connection, these materials may be made in different layers and of different solubilities, as for example, by using different binders which will not all be affected by water or by water of the same temperature or by water containing certain dissolved salts.

For example, where pectin is a binder, a water alcohol mixture may be utilized which will not dissolve the pectin, while with certain types of cellulose derivatives or gums or synthetic resins or even gelatin, agents may be included which will prevent solution or on the other hand insolubilize partly or wholly the water soluble binder material.

During the process of etching it is necessary, of course, to protect the portions which are not to be etched and many suitable resistance inks may be applied to the gelatin portions which have not been removed, which will prevent any action of the etching solvent or liquid at these places.

When the etched plate has been finally produced the protection materials, whether they be varnishes or gelatin or other materials, are then removed and from the intaglio plate which is thus produced there may be formed or case the positive printing plate, either by casting metal thereon with the intaglio element in flat or curved condition or by pressing resin, rubber or other plastic materials thereon to obtain the desired reproduction of the etched portions.

This printing plate which is produced from the matrix, either in resin or metal or in plastic materials in flat or curved condition and which may be directly employed for printing purposes will give a faithful and clear reproduction of the original object or picture which is to be reproduced.

The process just described produces a negative matrix and a positive printing plate therefrom, but if desired a positive matrix may be produced in the first instance, which matrix may be used directly as a printing plate, or a negative printing plate may be obtained therefrom by impression or casting.

The latter may be done by removing the portions of the gelatin which have not been insolubilized and then filling the space left by these removed portions with a protecting material, such as a varnish, powdered resin or some other similar material which will prevent etching at these particular portions. Then the remaining insolubilized gelatin may be removed, exposing the metal or other surface of the plate which then may be etched by water, organic solvents, acids, alkalies, or other materials.

Where a special grain is to be obtained, the plate may consist of or be covered or laminated with selected alloys containing carbon which will have the effect of causing a grain of the plate.

Among the protecting materials which may be utilized are inks, waxes, bitumen, dragon's blood, various varnishes or lacquers and so forth and in general materials inert toward a non-soluble in the etching materials, waxes, such as paraffin, beeswax, carnauba wax, Japan wax and ceresin wax will protect against acids, alkalies and water, and drying oils or varnishes or inks containing the same will give similar protection.

In some cases it may even be desirable to build up the plate and in such a case, those portions in which the solubilized gelatin has been removed or in which the insolubilized gelatin is removed may be electroplated with a protecting material, such as chromium or where the exposed face is not of metal, such face may be covered with carbon, which in turn may be electroplated or subjected to electrophoresis.

Although many different etching materials may be utilized for the metals for copper, it has been found most suitable to utilize solutions of ferric chloride having a concentration of 37 to 45° Bè.

With zinc, nitric acid has been found to work quite satisfactorily, while with aluminum 10% caustic soda is quite effective.

In case of laminated plates of zinc and aluminum zinc is decomposed by nitric and sulphuric acid, while these acids in concentrated condition do not affect aluminum.

As protecting or binding agents, it is possible to use various inks, Venice turpentine, glycerol, waxes such as paraffin, beeswax, carnauba wax, Montan wax and so forth, linseed oil, rapeseed oil and/or various resins. Asphalt and shellac varnishes have also been found quite satisfactory. These materials may also be used as binders or ingredients of the laminated structure.

As light sensitive emulsion, it is possible to use combinations of albumen, gelatin or fish glue, together with ammonium bichromate and aqua ammonia.

Referring to the drawing which illustrates diagrammatically by way of example one possible method of carrying out the present invention, but to which the invention is by no means restricted.

Fig. 1 shows an exposed plate.

Fig. 2 shows the metal plate or combination plate having a laminated structure, as indicated at 10.

Fig. 3 is a perspective view illustrating how the plate may be examined or inspected from a light source.

Fig. 4 illustrates in perspective a final cast printing plate.

Fig. 5 illustrates diagrammatically in cross section a laminated sensitized plate with the various laminations thereof separated.

Fig. 6 represents the same plate with the laminations together.

Figs. 7 to 16 illustrate diagrammatically in cross section the various steps in the process of utilizing the sensitized plate.

The plate shown in Fig. 1 has been exposed in a camera. The light passing through the lens strikes the gelatin surfacing 12 on Fig. 2, insolubilizing portions thereof as indicated at 13 and leaving portions indicated at 14 unaffected. As a result the portions 14, may be removed by brushing or sponging or by solution and the exposed insolubilized portions 13 may be covered with an ink or other protective material to prevent etching thereof.

The plate, as indicated in Fig. 5, may consist of the sensitized gelatin layer 12, a metal or some

other composition 15 and a contrasting metal or some other composition or even a transparent or translucent layer 16. The three plates or layers may be assembled either by direct coating processes or by electro-deposition or electro-phoresis methods.

In Fig. 7 it will be noted that the emulsion is removed from the unexposed portions at 14 and stays in position at the exposed portions 13 where it may be coated with a suitable ink or protective material.

When the upper lamination 15 is then treated with an etching material, such etched material will eat into it as indicated at 17 in Fig. 8. As indicated at 17, the etching has not taken place to the full depth of the layer 15. Where the etching is carried out to the full depth, the metal or contrasting material forming the lowermost lamination 16 will immediately flash out and be visible.

Where the lowermost layer is transparent the plate may be examined or inspected by a light source 11 shown in Fig. 3 to determine the progress of etching through the upper layer.

In the alternative procedure illustrated in Figs. 9 to 11, in the portions 14 from which the emulsion has been removed, is placed a protecting resin or material 19, as indicated in Fig. 10, and then the insolubilized gelatin at 13 is removed.

Then an etching agent is added, with the result that the metal or other surface will be removed, as indicated at 20, while the portions 14 will remain unaffected. Finally, the resin 19 in Fig. 11 or the gelatin 13 in Fig. 8 may be removed and a cast made with resin or some other plastic material or with molten metal. The molten metal may be any suitable low melting point alloy including antimony, lead, zinc, tin, bismuth, cadmium and so forth. Stereotype metals having melting points ranging from 275 to 400° C. are very suitable.

This cast printing plate as indicated in Fig. 4 will reproduce the original object or picture shown in Fig. 1 with the metal or resin or other plastic material being relatively elevated at 21 as compared to 22, when the procedure of Figs. 7 and 8 is employed, or reversely when the procedure of Figs. 9 to 11 is employed.

In Fig. 12 a laminated structure is shown which includes an upper light sensitive layer 50, an intermediate metal layer 51 and an intermediate light sensitive layer 52 and a backing layer 53 of glass or other transparent or translucent materials.

With the construction of Fig. 12, the light sensitive layer 50 may be exposed in a camera, treated to remove the unaffected material, then directly etched as indicated in Fig. 8 or reversely etched by using the process indicated in Fig. 11.

The light sensitive layer 52 in the meanwhile may be exposed through the glass or transparent back 53 or by exposure to a source of light which will penetrate the copper metal or plastic layer 51, such as for example radiations from radioactive material or X-rays.

This treatment may result in a grain being formed upon the bottom of the etched out portions in the copper layer 51 and such grain will form the top of the printing plate which may be cast or formed from the laminated plate of Fig. 12.

In Fig. 13 is shown a double laminated plate having the outside light sensitive layer 54, the intermediate layer or plastic layers 55 which may be penetrated by X-rays or other forms of

radiation, the intermediate light sensitive layers 56 and the central layer 57. The central layer 57 may be of a material, such as lead, which cannot be penetrated by various forms of radiation above mentioned.

A suitable exposure on one or both sides followed etching or processing in the manner disclosed in Figs. 8 and 11, will result in the production of complementary or supplementary plates or matrices on opposite sides of the central supporting plate 57.

Figs. 14, 15 and 16 shown an alternative process according to which a plate 60 of metal or resin or of laminated construction, as indicated in Figs. 5 to 11, may be grained by etching, as indicated at 61. Then the ungrained portions 62 may be built up, as indicated at 63, by mixtures of plaster of Paris and binders, plastic clays, or combinations of other filler materials. Then the casting or impression, indicated at 64, may be made with the result that the portions at 65 formed in the recess 66 and having the grain surface 67 will project substantially above the other portions 68 of the plate 64.

The amount of relief may be readily varied by utilizing various heights of filler 63 upon the portions of the matrix outside of the portions have been grained or etched, as the case may be. Instead of utilizing a light sensitive upper layer, including gelatin, glue or albumen and a bichromate, it is also possible to utilize Egyptian bitumen which may be affected by light so that various portions thereof have different solubilities.

Also, if desired, one or more of the layers, and desirably the top layer, instead of consisting of a light sensitive coating, it may be formed of paper or some other cellulosic material which may be etched by means of an acid, such as nitric acid or hydrochloric acid, or by means of certain metallic salts, such as zinc chloride.

A drawing or writing may be formed upon the paper by means of the etching material and as a result the portion of the paper upon which the drawing or writing has been made, when dried and/or heated, may be rubbed out, dusted away or otherwise removed. The thickness of the paper may be controlled so as to give a desired depth to the plate, which may then be formed by impression from the printing plate.

It is also possible to wax or otherwise treat portions of a layer or surfacing consisting of paper or other cellulosic material which is ordinarily subject to disintegration by water or by action of various chemicals, whether they be acids, alkalies or salts. In such case after the wax has been applied, water may be utilized to rub away or cause disintegration of the untreated portions of paper or other materials.

Wax and resins may also be utilized directly upon metals to protect these metals in certain places from the action of etching agents, whatever their nature may be.

With resinous layers or layers of plastic materials, drawings or sketches or other protection may be applied thereto, which will not be affected by the organic solvents, which are utilized to dissolve, remove or cause disintegration of the resin or plastic material, as the case may be.

Furthermore one or more of the laminations, either the top lamination or the lamination next below the light sensitive gelatin or glue coating, may be made of a composition of an inorganic material and an organic material, such as for example, combinations of materials as powdered resin, rubber or other plastics above described

and inorganic materials, as chalk, clay, bauxite, ground ceramics, ground silica and so forth.

In this instance, when the gelatin coating is removed in those places, where it has not been insolubilized, treatment with a solvent or softener for the finally divided materials in the lamination will cause them to bind together.

For example, with a mixture of powdered resin and chalk, alcohol may be used to soften or cause a conglomeration or adhesion of the mixture of powdered resin and chalk.

Where the mixture consists of powdered sugar or other powdered or some other inert filler, water will be sufficient to cause the adhesion. Then upon removal of the insolubilized gelatin or other insolubilized material which has been protecting the residual surface, such residual material may be readily dissolved or disintegrated and removed, leaving only that portion of the lamination which has been caused to cohere or coalesce by reason of the action or absorption of the solvent or liquid reagent.

The etching material, of course, may be drawn by stylus, brush or pencil upon metal, resin or other types of upper laminations in lieu of or in addition to exposing such laminations to the action of light in a camera.

Among the other resinous materials which may be utilized in lieu of those mentioned above are the copals. Gum mastic, kauri gum, pitch and so forth may be used. In addition to the above waxes there may also be utilized as binders or as protectors ceresin, Japan wax, ozocerite and marble wax.

Many different types of saturated and unsaturated oils or fats may also be utilized either as protectors or binders such as castor oil, China nut oil, cocoa fat, tallow, cocoanut oil, Neets foot oil, corn oil, cottonseed oil, fish oils, animal oils, such as lard, seal, tallow, whale, oleo, and the like, paraffine oil, and various vegetable oils, such as wood oil, peanut oil, pine oil, rapeseed oil, red oil, rosin oil, sesame oil, soyabean oil, tar oil and so forth.

As pigments and/or fillers there may also be gold bronze, silver bronze, aluminum powder, casein powder, ultramarine blue, chrome blue, lamp black, bone black, titanium oxide, vermilion red and cadmium selenide. These pigments may be used as fillers or as pigments only and they may be combined with or substituted to by various materials, such as zinc oxide, stearate of zinc, whitening and so forth.

Many types of solvents, of course, may be employed, such as the various carbitols, carboxylic esters, as ethyl, methyl, butyl, propyl, amyl acetates, formates, succinates, phthalates, benzoates, lactates and so forth, toluol, benzol, xylols, acetone and so forth. Carbon tetrachloride, chloroform and dichlorethylene and other chlorinated or halogenated aliphatic or aromatic hydrocarbons have also been found valuable in certain connections.

As water soluble binders, it is possible to utilize water glass, tapioca starch, sweetpotato starch, British gum, molasses or honey, whereas tung oil, olive oil, lemon oil, lavender and other similar oils may be utilized both as binders, protectors, absorbents or coherers.

Where castings are made from readily molten materials, it is possible by an electric heating iron to melt the metal directly on the face of the matrix or grained or etched plate.

Where rubber is utilized to form the laminations or more preferably to form the impressing

or molding material, it is usually found most desirable to use a self-vulcanizing rubber.

Where cellulose acetate is used as the facing layer of a laminated plate, it is readily possible to etch the material with a suitable organic solvent.

Where the etching is done in a relatively brittle or scratchable mixture, say combined of calcium carbonate or plastic clay with suitable binders, a pen knife may readily be utilized to scrape away or correct the etched portions without the necessity of utilizing metal working tools and the matrix thus may be readily corrected without routing.

It is obvious, of course, that either the matrix or the impression made therefrom may constitute the negative or positive printing plate and that many variations may be made in the materials employed.

The present procedure simplifies methods of making engravings, etchings, matrices and printing plates by providing compositions and metals which are easily and rapidly etched by cheap solvents and acids which do not require expert manipulations as are required by present procedures. It eliminates the making of photographic positives and much of the time now required in making matrices and printing plates, and in addition it makes it possible to make cheap duplicates or reproductions of original engravings and it also eliminates the costly and time-consuming routing processes which must be conducted upon unetched metal and which cause serious waste of metal in most printing establishments.

By using the present procedure it would be possible for a printing establishment by the use of its own labor without the need of skilled workmen to readily produce within a short period the necessary reproductions to be incorporated in the final printed materials.

It is thus apparent that the present applicant has provided an improved reproduction process which may be widely employed in printing procedures and which is of great value in reproduction processes.

The invention, however, is not intended to be restricted to any particular construction or arrangement of reproduction plate, or to any particular application of any such construction, or to any specific method of operation, or manner of use, or to any of various details thereof, herein shown and described, since it may be applied to the production of all types of relief or intaglio matrices or printing plates and the same may be modified in various particulars or be applied in many varied relations without departing from the spirit and scope of the claimed invention, the practical embodiments herein illustrated and described merely showing some of the various features entering into the application of the invention.

What is claimed is:

1. A process of making a matrix or a printing plate comprising providing a transparent base, placing a photographically sensitive coating on said base, then placing a non-photographically sensitive coating on said sensitive coating, and then finally placing another photographically sensitive coating on said last-mentioned coating, exposing the coatings in a camera, removing parts of the coatings which have been differentiated from the other part of the coating by the light and etching the base where the coatings have been removed.

2. A process of making a matrix or a printing plate comprising providing a transparent base, placing a photographically sensitive coating on said base, then placing a non-photographically sensitive coating on said sensitive coating, and then finally placing another photographically sensitive coating on said last-mentioned coating, exposing the coatings, removing parts of the coatings which have been differentiated from the other part of the coating by the light, etching the base where the coatings have been removed, and then making an impression of the base to form the plate with a molten metal.

3. A process of making a matrix or a printing plate comprising providing a transparent base, placing a photographically sensitive coating on said base, then placing a non-photographically sensitive coating on said sensitive coating, and then finally placing another photographically sensitive coating on said last-mentioned coating, exposing the coatings, removing parts of the coatings which have been differentiated from the other part of the coating by the light, etching the base where the coatings have been removed, and then making an impression of the base to form the plate with a plastic resin.

4. A process of making a matrix or a printing plate comprising providing a transparent base, placing a photographically sensitive coating on said base, then placing a non-photographically sensitive coating on said sensitive coating, and then finally placing another photographically sensitive coating on said last-mentioned coating,

exposing the coatings, removing the parts of the coatings unaffected by the exposure, protecting the remainder of the coating, etching the base where the coatings have been removed and then making an impression of the base to form the plate.

5. For use in a process of making a matrix or printing plate, a reproduction plate comprising a base capable of being etched and a light sensitized protein coating thereon, said base consisting of a plurality of metals capable of being etched by an acid and the lowermost layer of said base being transparent and being coated by a thin coating of a photographically sensitive material.

6. For use in a process of making a matrix or printing plate, a reproduction plate comprising a base capable of being etched and a light sensitized protein coating thereon, said base consisting of a laminated structure of metals of contrasting color and solubility and the lowermost layer of said base being transparent and being coated by a thin coating of a photographically sensitive material.

7. For use in a process of making a matrix or printing plate, a laminated reproduction plate to be etched to form a printing plate or a matrix for a printing plate comprising, a transparent bottom layer, a glue-bichromate top layer, a copper layer next to the top layer and a glue-bichromate layer between the bottom layer and the copper layer.

OTIS F. WOOD.