B. D. AVIS, JR.

ELECTRIC PROCESS FOR MAKING PICTURES.

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940,495.

Patented Nov. 16, 1909.

Fig. 1.

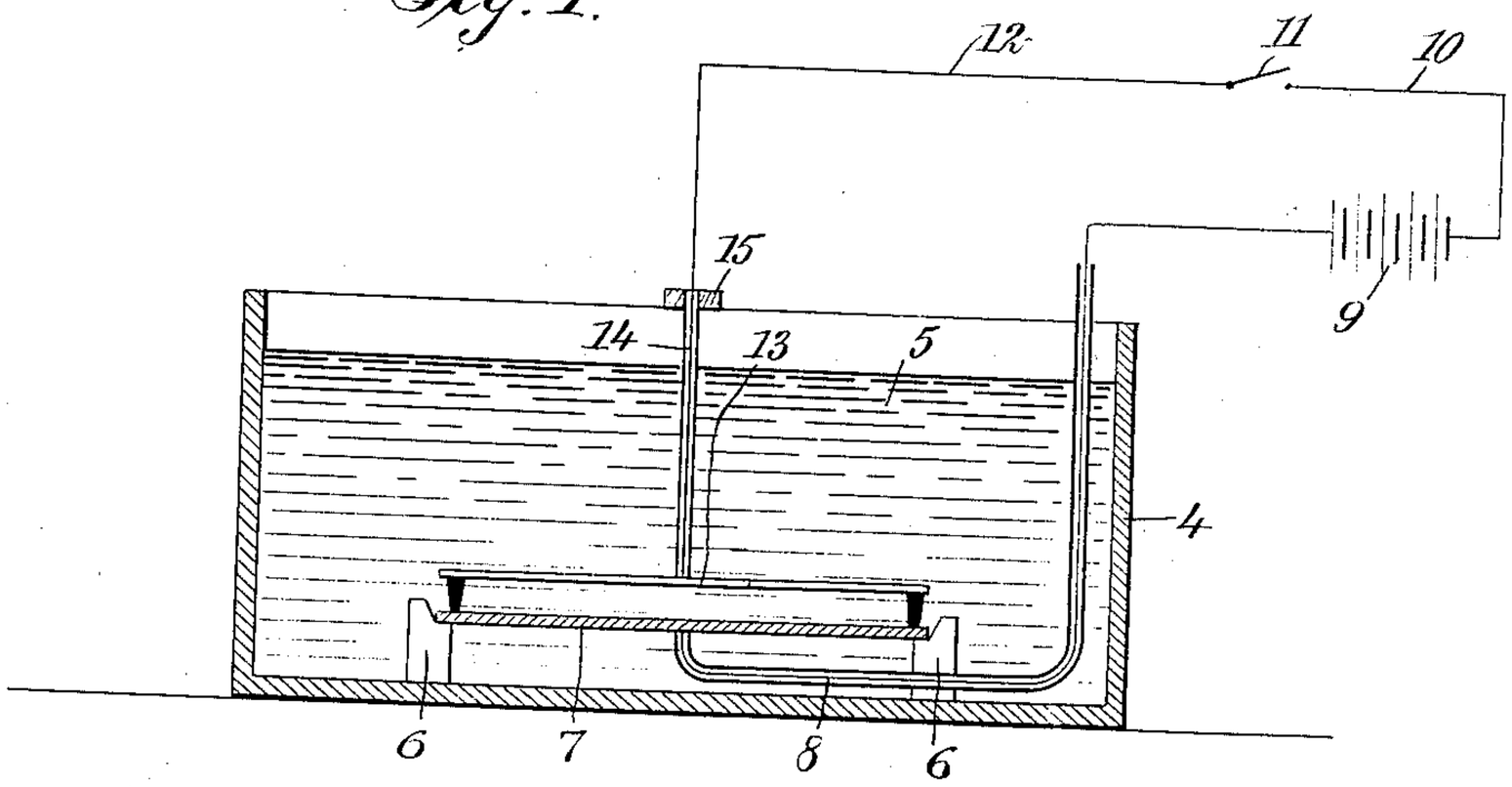


Fig. 2.

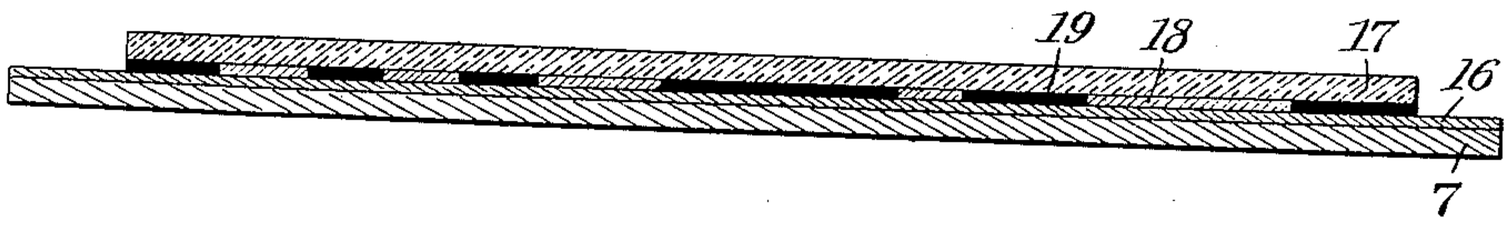
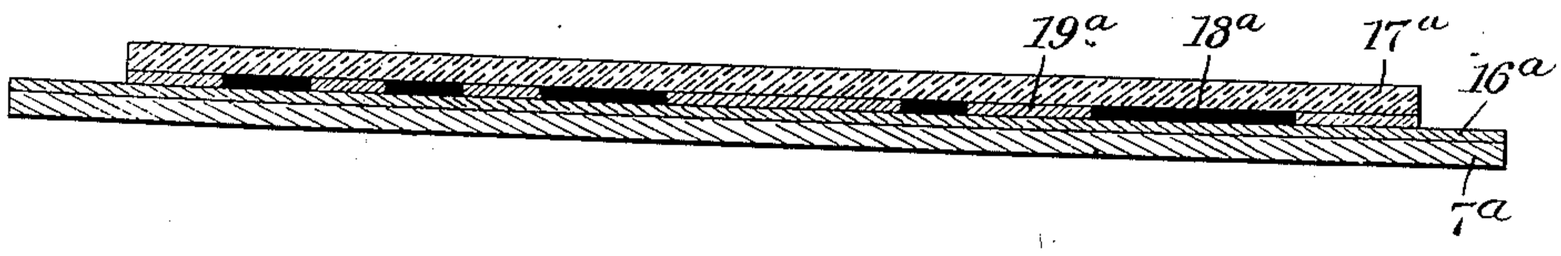


Fig. 3.



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ELECTRIC PROCESS FOR MAKING PICTURES.

940,495. Specification of Letters Patent. Patented Nov. 16, 1909.

Application filed June 23, 1908. Serial No. 439,992.

To all whom it may concern:

Be it known that I, BRAXTON DAVENPORT AVIS, Jr., a citizen of the United States, and a resident of Wallace, in the county of Harrison and State of West Virginia, have invented a new and Improved Electric Process for Making Pictures, of which the following is a full, clear, and exact description.

My invention relates to picture making, my more particular purpose being to provide a method and means for developing by electrolytic action a sensitive plate or analogous member which has been previously affected by the action of light.

I have made the discovery that if a plate or analogous member be properly sensitized and exposed to light under conditions such as tend to form an image temporarily upon it, the plate or other member may thereafter be developed by exposing it, under suitable conditions, to the action of an electric current containing certain metallic salts, the tendency of the current being to precipitate unequally upon the surface of the plate or analogous member the metals contained in the electrolytic solution.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical section through an electrolytic vessel arranged for use in accordance with my invention, this view showing one way in which the sensitive plate, after exposure, is subjected to the action of the electric current under a solution containing a metallic salt, for the purpose of developing the image upon the plate; Fig. 2 is an enlarged fragmentary section showing how the sensitive plate may receive an image by placing upon the plate a positive, and subjecting the plate to the action of light passing the positive; and Fig. 3 is an enlarged fragmentary section somewhat similar to Fig. 2, but showing the image as formed upon the plate by aid of a negative instead of a positive.

I take a metal plate 7 and confer upon it a high polish. This plate is made of nickeled copper or any other metal which presents a smooth, clean surface and is adapted to take on a sufficiently high polish. Upon this plate I spread a coating 16 which may consist of various substances. For this purpose I provide albumin, casein and some of the gums sensitized by the various bichromates. I also have found that by using sensitive tissue and securing it upon the plate by squeegeeing, a sensitive coating may be transferred to the plate; also that by the addition of various foreign substances to sensitive solutions, the latter may be employed to advantage. A typical concrete instance of one way of performing this step, however, is to spread over the polished metal plate a coating of gelatin solution containing a trace of the bichromates as a sensitizer. It should be distributed equally, and this may be accomplished by using a whirler or a leveling stand. The sensitive plate being thus prepared, the next step is to expose it. For this purpose I lay a positive 17 face downward upon it. In this positive the portions 18 (see Fig. 2) are translucent and the portions 19 are opaque, so that the face of the sensitive plate and the coating of gelatin upon it are subjected to the action of lights and shadows. In some instances I use a negative 17^a instead of a positive, the portions 18^a being opaque to light and the portions 19^a being translucent. In this case (see Fig. 3) the sensitive plate and its coating 16^a are subjected as before to the action of alternating lights and shadows, which, however, are reversed relatively to those obtained by the action of the positive, as indicated in Fig. 2.

I find that instead of using either a positive or a negative, a design or pattern, such, for instance, as a piece of lacework, may be pressed downward upon the coated plate and held thereupon by squeegeeing and the exposure made as before. The sensitive plate receives an optical impression and may be afterward developed.

An electrolytic vessel is shown at 4 and is filled with a solution 5 consisting preferably of plumbate of soda, plumbate of potassium or lead acetate, as the case may be. Mounted within the vessel 4 are supports 6 of insulating material, and the plate 7 is rested upon these supports. An insulated wire 8 is connected with the plate 7 and leads upwardly and outwardly to a battery 9. Connected with this battery is a wire 10 which leads to a hand switch 11 connected by wires 12, 14 with a metallic electrode 13. The wire 14 is insulated and is supported from a cross bar 15 so that the electrode 13 hangs in the solution directly over the center of the sensitive plate 7. The battery 9 may

be any well known form of battery ordinarily used and should preferably have a potential of at least five or ten volts. One or two cells of the Edison primary battery or of a dry battery will answer the purpose. The positive pole of the battery is connected with the plate 7 and the negative pole with the electrode 13.

The sensitive plate, after exposure, having been placed in the solution as above described, the hand switch 11 is closed and the current thus turned on. The solution is electrolyzed and the face of the plate 7 undergoes various changes in color. My purpose in making the electrode 13 spherical as shown in Fig. 1, and in placing it over the center of the plate 7 is to promote equality in the density of the current, thus preventing the current from being stronger around the edges of the plate.

I find that sometimes a positive should be used and at other times a negative, the choice between the positive and the negative being determined by the color effect desired. For instance, if I desire to confer upon the plate the color known as "blue of the first order" I use a negative. It will be understood that the portions of the negative showing as white correspond to portions where more gelatin is rendered insoluble and where the negative does not show white there is a large proportion of the gelatin rendered soluble. The more gelatin there is rendered insoluble, the greater the ohmic resistance of that part of the coating.

I find that the circuit must be broken promptly when the desired color is obtained, for the reason that the duration of the color, while the current continues to flow, is very changeable. In the case of the color known as "blue of the first order", the contrasting color is nearly a pure white. Generally speaking a strong current makes a darker color and any portion of the face of the plate so prepared as to permit the current to flow through it freely, requires a comparatively dark color. In instances where the circuit is kept closed for a length of time enabling the dominant color of the plate to become yellow or purple, I choose to employ a positive for the reason that these colors tend to run from lighter into darker shades by the action of the current.

The facts above cited may be summarized by saying that when I desire the colors to change from successively darker to successively lighter shades, I employ the negative, and when I desire the colors to change from successively lighter to successively darker shades I employ a positive. By skilful use of the electric switch and by close observation, the operator is enabled, with a little practice, to stop the formation of the picture at any period necessary to give the particular color desired. Any predetermined coloration can be obtained in a few moments. This being done the plate is removed and subjected to a washing in water, after which the plate is well dried and coated with a suitable transparent varnish which protects the film from external injuries. The washing appears to remove the unchanged portions of the sensitive film. I find that by exposing the sensitive plate under a positive, then washing the plate in cold water, next placing it in a solution of platinum to which has been added a small quantity of chlorid of iron, a white and black image is obtained upon the plate. If the plate be thoroughly washed in order to rid it of the platinum solution and placed in the electrolytic solution, and the current applied, there is formed a picture in which the shadows are more clearly accentuated.

My process may be used in numerous ways, among them being decoration of different metals with pictures and designs, preparation of lantern slides for opaque projection, forming images upon badges, producing metal postal cards, and the like. Under favorable conditions this process will give perfect results in so far as making duplicated images upon metals, these images being qualified by the addition of different colors. In order to destroy the picture and clean it from the plate, so as to leave the plate free for another use, the plate is submerged for a few moments in a solution of tin chlorid.

I have found that this process is not limited to flat plates, or even to metallic plates. Non-conducting surfaces, such as those of china, paper, wood, and the like, may be used to receive the pictures above described, if the surfaces in question be first rendered conducting. The sensitive coating of gelatin appears to act as a resist. When the pictures are to be placed upon objects of peculiar shape, the resist may be transferred, after exposure, from the metallic plate above described, to the surface of the object to be treated and this object then placed in the electrolytic bath.

It is apparent that by forming a surface, different portions of which vary in ohmic resistance, and passing a current through the entire surface, the portions thereof offering the least resistance will receive the most current, and consequently will have the greatest tendency to be varied in color. I find that under ordinary conditions, such as those above described, a color may be started as a dark brown, nearly black, which runs into blue, then into white, next yellow, orange, red, purple, light green, bluish green, dark green, and finally red.

The electrolytic action taking place within the vessel may be described as follows: Metallic lead is deposited upon the negative electrode 13, this being accompanied by

liberation of more or less hydrogen. The oxygen goes to the positive pole and there unites with lead drawn from the solution, thus forming on the plate 7 peroxid of lead, the color of which constantly changes while the current is flowing. The coloration effects are probably produced after the order of Nobilli's rings or the changing hues of a soap bubble.

The metal deposited electrolytically, as above described, appears to pass entirely through the film of gelatin and is deposited directly upon the solid metallic, or other conducting surface. The action of light upon the bicromated gelatin is such that a certain amount of insolubility is imparted to the gelatin film over other portions, thereby rendering the latter more resisting to the passage of the current.

I find that the plate 7 may consist of almost any metal, but steel, brass, copper plated with nickel, German silver or metal plated with silver are very good for the purpose. The electrode 13 may consist of either copper or brass and is equidistant at all points from the plate 7. The electrode 13 is preferably disposed about $\frac{1}{4}$ of an inch above the plate 7.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. The method herein described of making pictures, which consists in producing a conducting surface, spreading thereover a gelatinous film sensitive to light, exposing said film to the action of light so that different portions of said film receive more light than others, and depositing a metal electrolytically upon said conducting surface and through said film so that varying quantities of said metal are deposited upon different portions of said surface.

2. The method herein described of making pictures, which consists in preparing a conducting surface, coating the same with a film, the solubility of which is affected by light, exposing said film for the purpose of rendering different portions thereof insoluble in various degrees so as to vary electrical resistance of different portions of said film, and depositing a metal electrolytically upon said conducting surface through said film.

3. The method herein described of making pictures, which consists in preparing a conducting surface, coating the same with a medium the solubility of which is decreased quantitatively by the action of light, exposing different portions of said surface and said film to the unequal action of light sifted by aid of a transparency so as to practically vary the ohmic resistance of said film, and depositing directly upon said conducting surface varying quantities of a metal.

4. The method herein described of making pictures, which consists in preparing a metallic surface placing upon said surface a material sensitive to light and adapted, when subjected to different degrees of light, to acquire different degrees of ohmic resistance corresponding to the intensity of the light, exposing said material thus treated to the action of light distributed unequally upon different portions of said surface and finally passing metal electrolytically through said material and depositing said metal directly upon said metallic surface.

5. The method herein described of making pictures, which consists in preparing a conducting surface, coating the same with a material normally soluble but adapted to be rendered insoluble by exposure to light, exposing said material through a transparency to the action of light so as to distribute said light unequally upon different portions of said film, and electrolytically depositing a metal directly upon said conducting surface, said metal passing through said material.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

BRAXTON DAVENPORT AVIS, JR.

Witnesses:
FRANK E. MILLER,
WILLIE MILLER.