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G. F. COLBERT ET AL

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PROCESS OF MAKING ORNAMENTAL MIRRORS

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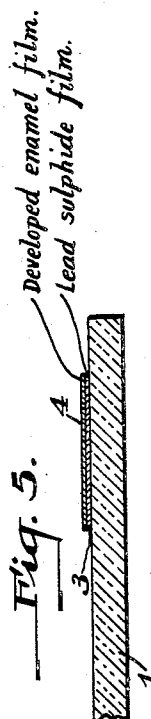
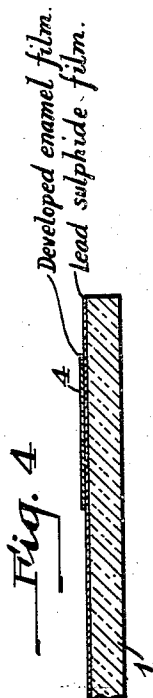
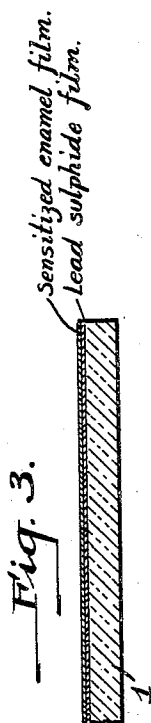
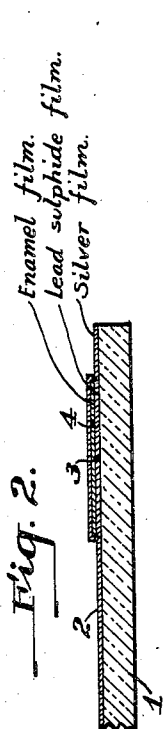
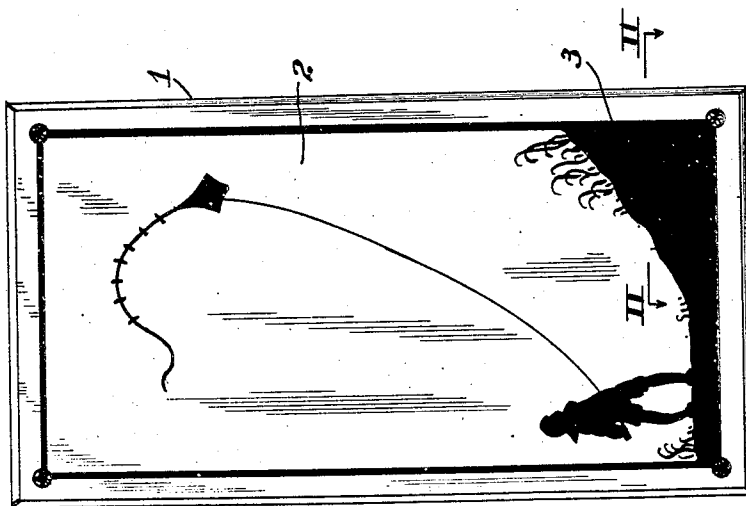


Fig. 1.



INVENTORS

Geo. F. Colbert
and
Wm. H. Colbert
by James C. Bradley
att.

UNITED STATES PATENT OFFICE

GEORGE F. COLBERT AND WILLIAM H. COLBERT, OF PITTSBURGH, PENNSYLVANIA, ASSIGNORS TO LIBERTY MIRROR WORKS, A CORPORATION OF PENNSYLVANIA

PROCESS OF MAKING ORNAMENTAL MIRRORS

Application filed April 16, 1929. Serial No. 355,507.

The invention relates to a process of making multi-tone ornamental mirrors similar to those shown and described in our copending application, Serial Number 340,378. The invention has for its object the provision of a method for producing mirrors of this type in a better and cheaper manner. A further object is to provide a method which can be practiced to produce these mirrors rapidly and with the exercise of a much less degree of skill.

In the practice of the process set forth in our previous application, the portions of the metallic film first applied to the glass, which required removal to form the pattern or picture, were removed by mechanical means involving cutting, scraping and brushing or the like; while in the practice of the present invention, these mechanical manipulations are all avoided, and the production of the required design is accomplished by the use of solvents; the basic coating being so prepared or treated that only parts thereof are acted on by the solvent, thus leaving the remainder of this coating in the form of the requisite pattern. The term "solvent" is used throughout in its broad sense to designate any compound which is effective to remove or dissolve certain unprotected portions of the film by chemical reaction therewith or otherwise. A mirror made in accordance with the process and certain steps in the procedure are illustrated in the accompanying drawings, wherein:

Figure 1 is a face view of the mirror. Fig. 2 is a section on the line II—II of Fig. 1, the films of material shown in this figure (and Figs. 3 to 5) being much exaggerated in thickness for the purpose of clear illustration. And Figs. 3 to 5 illustrate steps in the process.

Referring to the drawings, 1 is a sheet of transparent material, such as glass, 2 is a precipitated film, preferably of a white metal, such as silver or mercury, which covers the main body portion of one surface of the glass, and 3 is a precipitated film of a metal or metal compound, such as lead sulphide; which presents the desired contrast in color to that of the film 2. The two films are so disposed, as to give an ornamental design, such as is indi-

cated in Fig. 1. This particular illustrative design is of very simple character; but, as will later appear, patterns or pictures of the most elaborate character can, by our improved process, be just as easily produced, and at no greater cost. The film materials, which we may use, are not limited to those above specified, although they are two of the most important ones. Other materials which may be employed are gold and silver or mercury, gold and lead sulphide, copper and silver or mercury, and copper and lead sulphides, or combinations of such elements, and their chemical compounds, with certain organic substances.

In carrying out the process to make the particular mirror herein shown, the glass is placed in a horizontal position and its upper surface is covered with a solution containing a lead salt which is precipitated, as a film of lead sulphide, over the entire surface;—the procedure followed, in matter of detail, being preferably that set forth in our Patent No. 1,662,565. This film is then thoroughly cleaned by washing in water, and is immediately coated with an emulsion sensitive to light (Fig. 3), such, for example, as the so-called cold top enamel well-known in the photo engraving art. The desired design or picture is then impressed on the sensitized surface either by direct contact printing from a photographic negative, or by the projection of an illuminated image thereon, or by covering the surface with a stencil plate, cut to the required pattern; and after the necessary exposure to light—which varies with the intensity of the illumination used—the latent image is developed in such a manner that the light treated portions of the enamel emulsion are rendered insoluble; the details of such treatment being well known to those skilled in this art. The plate is then rinsed in water which removes the portions of the film which have not been exposed to the light (Fig. 4), after which the plate is dried. The plate now has on its rear side the patterned portions of the enamel covered film which it is desired to retain in the finished mirror. The plate, with the metallic film up, is now placed in a tray containing a dilute solution

(e. g. about 10%) of nitric acid. This removes all of the metallic film except the part 3 which is protected by the insoluble enamel coating (Fig. 5). The plate is then immediately washed with water to prevent the nitric acid from attacking and injuring the enamel film.

The final silver film 2 is now deposited over the entire back of the plate by the usual procedure of the art;—the glass being ordinarily placed in a horizontal position and the previously treated surface covered with a layer of solution containing silver, which is caused to precipitate over the upper surface of the plate (Fig. 2). As indicated before, the films shown in Figs. 2 to 5 are much exaggerated in thickness, for the purpose of illustration, the combined thickness of the three films shown in Fig. 2, for instance, not being appreciably greater than that of the single film 2.

It is also possible to produce the desired multitone effect by depositing the silver film, instead of the lead sulphide film, as the first step of the process; but this is not productive of as satisfactory results as the procedure first described, since in the application of a lead sulphide film over silver, the sulphide film tends to work under the edges of the protected silver areas and blur, or impair the sharpness of, the boundary lines.

If it is desired to produce a silver mirror having certain areas covered by paint or lacquer, this may be accomplished by first coating the entire plate with silver, then coating the silver film with the cold top enamel and printing (by exposure to light), thereon the desired design, then developing and removing the soluble portions of the enamel, and then removing the uncoated portions of the silver film with a solution of nitric acid;—after which any desired color of paint or enamel may be applied to the entire area of the surface as treated.

In order to use gold as the first film,—in producing a gold and silver composite,—it is desirable to precipitate a lead sulphide film over the entire gold film, as the lead sulphide gives a strong enduring protection of the gold coat which can, under these circumstances, be made usually relatively thin;—this being the most satisfactory method of reinforcing the gold film when a one-tone gold mirror is to be produced. After thus protecting the gold coating with the lead sulphide coat, the procedure follows that already described in the production of the mirror of Figs. 1 and 2, except that a dilute solution (about a 10% solution) of aqua regia is used in place of nitric acid.

It is also possible to practice the process by a printing method, which may be carried out in either of two ways. In the first of these methods one entire surface of the plate is coated with one of the desired metallic

films, and then carefully cleaned by washing. The freshly cleaned metallic film is then flowed with a solution sensitive to light,—such as the bichromated albumen solution used for photographic printing on zinc—and the required pattern is impressed on the sensitized surface by the usual printing and developing process, which leaves the design in raised relief. The developed surface is now inked up with a leather roller which shows up on portions of the film that have been exposed to the light, and is next covered with dragon blood (a red resinous powder which, when melted, becomes an acid resist) and heated. The plate is then immersed in water and by careful swabbing with soft cotton all the unprinted portions are rubbed away, leaving only the desired design which is covered and protected by the ink. After this treatment the plate is thoroughly dried, and then immersed in a dilute solution of nitric acid, which removes the portion of the original film not protected by the ink.

The second method is to coat one entire surface with one of the desired metallic films; which is thoroughly cleaned by washing, and carefully dried. We next apply to this film a pattern coating of acid resisting ink by using transfer paper (taking the design from an etched or cut printing plate), and then air dry the plate until the inked pattern is completely set. We then place the plate in a dilute acid solution to remove the portion, not protected by the pattern, and proceed as in the first method above described. A further modification of this procedure is the use of a protecting pattern in the form of a stencil in place of the ink pattern, such stencil being pasted in place and composed of acid resisting material.

The process is also applicable in the production of mirrors in which a portion of the metallic coat must be removed to provide a clear area for the application of a print, legend, photograph, or the like, or to make visible some object behind the mirror, such as the face of a clock, which clock may be secured to the back of the glass sheet. In such case the process, as heretofore described, is followed up to, and including, the step of removing the unprotected portion of the metallic film with the acid, after which the clear glass area may be utilized, as heretofore suggested, in a number of different ways.

Having now disclosed the general nature of our invention and having fully described several illustrative and alternate ways in which it may be practiced, what we claim is:

1. A process of forming a decorative reflective article, which consists in covering the face of a transparent glass sheet with a metallic film precipitated from a solution, coating said film with a photo-sensitive emulsion, exposing portions of said coating to the ac-

tion of light, developing said exposed portions to form a pattern so that one part of the coating is subject to the action of a solvent and the remaining part is not subject to such action, applying solvent to remove the soluble part of the coating, and the underlying parts of said film, and then applying a backing of a color contrasting to that of said film over the entire surface of the sheet carrying said film.

2. A process of forming a decorative reflective article, which consists in covering the face of a transparent glass sheet with a metallic film precipitated from a solution, coating said film with a photo-sensitive emulsion, exposing portions of said coating to the action of light, developing said exposed portions to form a pattern so that one part of the coating is subject to the action of a solvent and the remaining part is not subject to such action, applying solvent to remove the soluble part of the coating and the underlying parts of said film, and then depositing a second metallic film of a color contrasting to that of the first film over the entire area of the sheet carrying such first film.

In testimony whereof, we have hereunto subscribed our names.

GEORGE F. COLBERT.
WILLIAM H. COLBERT.