

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN PHOTO-MECHANICAL PRINTING.

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To all whom it may concern:

Be it known that I, THOMAS C. ROCHE, of the city of Brooklyn, county of Kings, and State of New York, have made and invented an Improvement in the Art of Photo-Mechanical Printing, of which the following is a specification.

My invention consists, essentially, in the methods hereinafter mentioned and described of constructing and preparing the gelatine film employed for the reception of the photographic image or impression, and which, together with a supporting-plate having special features adapted to hold and retain the film firmly in place, is eventually used to print from in fatty inks, after the manner of lithography.

The first requisite to the greatest attainable perfection in this art after a clear and strong negative has been obtained is a gelatine type or film having those chemical and structural characteristics which will enable it to receive and retain in the most perfect manner the actinic image conveyed to it through the negative, with all the delicate gradations of light and shade found in the natural object, together with that firmness, smoothness of surface, and adhesiveness to the plate or tablet on which it is placed that will enable it to endure without injury or disturbance the application of ink of any desired consistency or stiffness and the pressure necessary to secure a complete transfer of the picture in the printing.

The main object of my improvement, therefore, is to secure with uniformity and certainty all the conditions essential to success; and to this end I have discovered that the requisite hardness, firmness, fineness of structure, and smoothness of surface may be secured in the gelatine film forming the photographically-impressed printing-surface, and also the necessary degree of toughness and elasticity, by the application during its preparation of alcohol previously heated to a degree of temperature nearly coincident with that of the gelatine solution, either before or after the application of the sensitizing agent employed.

I have also discovered that plates of metal, glass, or other material capable of abrasion,

when cut or roughened by the process known as the "sand blast," as contradistinguished from the more common methods of grinding or roughening by mechanical means with emery, or sand and water, or chemically by means of an acid bath, meet more adequately the conditions necessary to the procurement and production of the best effects in photo-mechanical printing, and which depend so greatly on the intimate union of the printing-film and its supporting plate or tablet, and especially the degree of tenacity with which the former is held to the latter.

This result may be due to the fact that the sand-blast treated plate or surface consists of pits, excavations, and under-cuts, into which the material of the film flows and becomes clinched, as it were, such condition serving to hold said film so firmly and tenaciously in place that it cannot be removed or torn away from its support when being printed from in any kind of press, and using ink of any desired thickness or consistency.

I will now proceed to describe more particularly and in detail my improved method of preparing the gelatine film previous to its being flowed upon its supporting-plate. I first take fine gelatine, say about three hundred and sixty grains, and immerse it in pure cold water until it has absorbed or taken up all of the liquid it will. I then pour off the surplus water, and dissolve the gelatine by the application of heat, a sand or water bath being the preferable way. I then dissolve, say, one dram of bichromate of ammonia or potash in about one ounce of water, and add this to the gelatine solution, keeping the same warm, preferably at a temperature of not less than 90° Fahrenheit nor higher than 150° Fahrenheit. I then take about six ounces of alcohol and dilute it with from one and a half to two ounces of pure water. Now, were the alcohol, diluted or not, added in its cold state to the gelatine solution, it would coagulate the same, the coagulum presenting itself as a curd-like or ropy substance, separated from the more fluid portion of the solution, thereby rendering it entirely unfit for its intended purpose. To avoid this coagulation, therefore, I heat the alcohol previous to adding it to and mixing

it with the gelatine solution, the relative temperatures being about 110° Fahrenheit for the alcohol and 130° Fahrenheit for the gelatine at the time of mixing the same together.

If undiluted alcohol should be used, it would produce partial coagulation even at a temperature of 145° Fahrenheit, with the gelatine solution heated to 180° Fahrenheit; but if heated only to its boiling-point—namely, 174° Fahrenheit—then coagulation of the gelatine is prevented. Still this method of using the alcohol is objectionable, both because of the loss of the spirit by rapid evaporation at that temperature and because the gelatine solution to which it might be added would dry too rapidly, and thereby injure the structural condition of the film. The better method, accordingly, is to dilute the alcohol in the proportion of from one-third to one-fourth water, heating the solutions separately up to about the degrees of temperature first stated, and then adding them together in their heated condition.

The proportions of the gelatine and bichromate or alcohol may be somewhat varied without material change, but the proportion of the diluted alcohol should not, preferably, be reduced below one-fourth, by weight, to about three-fourths of the gelatine and bichromate combined.

The mixture should be well stirred as the heated alcohol is added, and then the whole filtered, for which purpose a flannel cloth laid in a funnel may be used, and the filtering done while the mixture is being poured into the bottle in which it is to be kept for use. Preferably I use a funnel that extends to the bottom of the bottle, to avoid the formation of air-bubbles in the mixture, which, when once formed, are somewhat difficult to suppress, it being important that they shall not appear on the plate when the mixture is flowed onto it.

I prefer, also, not to allow the temperature of the solution to fall below, say, 130° Fahrenheit before it is applied to the plate, and to this end it may be kept in a sand or water bath of the proper degree of heat.

A gelatine solution thus made, when flowed onto a plate, will form a fine, hard, and tough film, tenaciously adherent to the plate, and presenting a fine, smooth, and glossy surface for the reception of the photographic impression.

This solution is applied in a heated state by flowing the same over a plate having a roughened surface of the character before described, which is also preferably heated to about the same temperature as the solution, so as to cover its surface thoroughly and allow the material of the film to enter completely into all the pits, excavations, and under-cuts of the plate, any surplus being then drained off. The plate, with the film on it, is then dried in a heated oven or by other suitable means, the heat applied to dry it preferably not to be greater than 120°, nor less than

100°, Fahrenheit. When dry, unless the plate has been dried on a leveling-stand, and thereby a film of sufficient thickness has been formed, a second coat of the gelatine mixture is preferably applied, drawing off the surplus from the opposite edge or corner from that from which the first flowing was drained. This second coat is dried like the first, the operation of drying in the oven being continued until vapor ceases to rise from the film.

The sensitized solution should, of course, be protected from actinic effect, and the operation of coating the plate be carried on in the absence of actinic light.

It may be stated, incidentally, that the sensitizing agent may be applied to the gelatine solution either before or after the application of the heated alcohol, and may even be applied to the plate after the gelatine film has been formed upon it with equal effect, and without departing from the spirit of my invention.

The plates prepared as hereinbefore described, like the gelatine solution when sensitized, must be kept from the effect of actinic light, but may be exposed at any time within ten or twelve days from their preparation with a negative for the reception of the photographic image.

After the plate has been exposed it is freed from all bichromate not acted on by the light, which may be done by washing in cold running water for a short time, and then as a matter of preference allowing it to dry, after which it is ready for the printing-press.

Now, I am aware that alcohol in a cold state has been mixed with gelatine to form a varnish or preservative coating for pictures and for other purposes.

I am also aware that alcohol in such state has been mixed and used in very small quantity with a sensitized gelatine solution, together with a hardening element—such as tannin and other ingredients—the whole compounded and intermixed by the application of heat to produce a photographic printing-film, from which to print in fatty inks; but I am not aware of alcohol being used previous to my invention, heated previously to its admixture with such solution, with or without the addition of a bichromate or other sensitizing agent nearly up to the same degree of temperature, for the twofold purpose of preventing the coagulation of the gelatine and also hardening the same, thus taking the place of and dispensing with the ingredients usually employed, and especially alum, or, as well known, the effect produced by the exposure of the film to light for the purpose of enabling it to withstand the pressure of printing.

I am also aware that glass and metal plates upon which to paint or print in the making of signs have been roughened mechanically in the ordinary way, or chemically by immersion in an acid-bath; also, that a glass plate so roughened has been used as a support for a sensitized film of ordinary character; but such I do not claim, broadly, as I have discovered

that no means for roughening the film-supporting tablet previous to the employment of the well-known sand-blast process by me have been found sufficient to produce the necessary and peculiar construction of tooth required for holding, writing, and securing the film to the plate with sufficient tenacity to admit of the use of a thick ink in the printing of proofs.

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

1. The described process of producing and preparing gelatine films for use in the production of plates for photographic printing in fatty inks, which consists essentially in first immersing the gelatine in cold water and allowing it to absorb as much of the same as it will, then dissolving the gelatine by heat in the usual way, then taking alcohol diluted with about one-fourth to one-third its volume of water and heating it to within a few degrees of the temperature of the gelatine solution, and finally uniting and mixing the alcoholic and gelatine solutions together while in their relatively-heated state, substantially as and for the purpose specified.

2. The described process of producing and preparing gelatine films for use in the production of plates for photographic printing in fatty inks, which consists essentially in first immersing the gelatine in cold water and allow-

ing it to absorb as much of the same as it will, then dissolving the gelatine by heat in the usual way, then adding to the gelatine solution while hot a solution of bichromate of ammonia or potash or other suitable sensitizing agent, then taking alcohol diluted with about one-fourth to one-third its volume of water and heating it to within a few degrees of the temperature of the sensitized gelatine solution, and finally uniting and mixing the alcoholic and sensitized gelatine solutions together in their relatively-heated state, all substantially as and for the purpose set forth.

3. In combination with a gelatine film compounded and prepared substantially in the manner above described and claimed, a supporting plate or tablet of metal, glass, or other hard substance susceptible of abrasion, having a sand-blast roughened surface for holding the film firmly and with such tenacity as to permit of the use of ink of any desired consistency in printing, the whole forming an improved photocollotype or photographically impressed and prepared plate for printing from in fatty inks after the manner of lithography, substantially as and for the purpose specified.

THOMAS C. ROCHE.

Witnesses:

B. G. CLARK,

M. F. CLIFTON.