July 7, 1931. M. PROCOUDINE-GORSKY 1,812,981

PROCESS FOR TRANSFERRING GELATINE SILVER BROMIDE PICTURES

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Fig. 1.

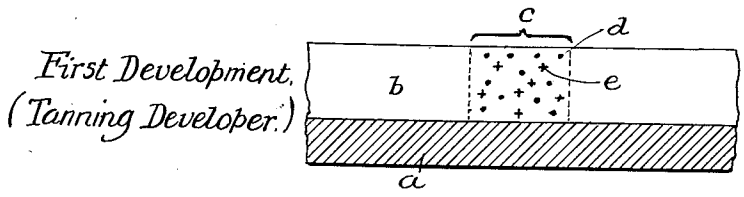


Fig. 2.

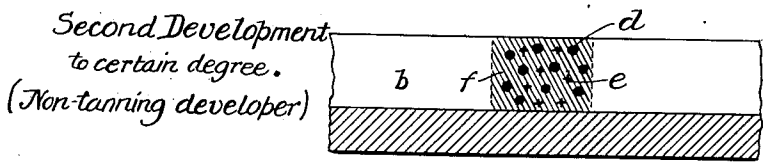
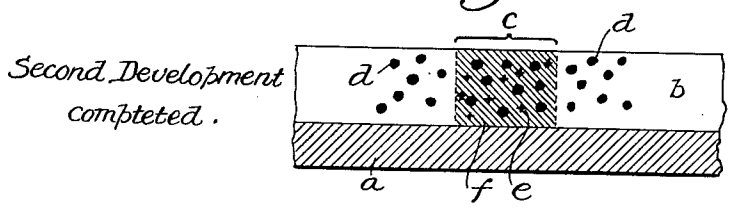


Fig. 3.



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PROCESS FOR TRANSFERRING GELATINE SILVER BROMIDE PICTURES

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It is known that an image on gelatine silver bromide layer developed with certain developers which tan the gelatine in the presence of nascent silver (especially pyrogallic acid slightly sulphited) can be transferred to any surface, either flat or cylindrical, and afterwards developed with hot water to produce a gelatine relief corresponding to the white parts of the picture photographed.

The application of this principle to photomechanical processes has been made known by Koppmann but up to the present time gelatine-silver-bromide paper has not been used practically in the photomechanical industry except perhaps by direct inking of the paper more or less according to the Bromoil process, and by transferring the ink upon the plate.

Numerous difficulties are met when trying to utilize the tanning properties of pyrogallic acid or like developers when transporting and developing with the hot water the pictures themselves as pigmentary pictures.

The main difficulty consists in the fact that it is usually impossible, even in the most simple line pictures, to obtain in the spaces between the portions or reserves of gelatine, a metal or the like (according to the nature of the support used) which is quite bare and capable of firmly retaining the ink.

If the action of the tanning developer is pushed sufficiently far to obtain a picture sufficiently tanned to withstand hot water, even in the small isolated points of the reserve, then the transparent parts are equally slightly hardened, and especially in very narrow spaces it is impossible to remove completely the gelatine. Otherwise stated it is impossible to make use of the transfer of a picture having both fine black and fine white details.

In the most favourable cases as when the picture is quite black and white, and when the emulsion diffuses very little while giving very contrasty pictures which are free from fog, the metal or the other support is not perfectly bare, even though it is not possible to detect, even by dyeing, any trace of gelatine in the parts from which the gelatine was washed out. Experiments show that the metal or the like retains in its pores a little gelatinized water which "prepares" it in the lithographic sense of the word, as does the gummy water of gallic preparations.

If in these conditions it be sought to invert the pictures by inking, then so soon as the plate is immersed in a dilute solution of sulphuric acid for the removal of gelatine, the ink first becomes removed from those parts where it would be thought that the bare metal would be capable of retaining it.

According to the present invention, in order to remedy this defect, a well defined differentiation of the two gelatines is obtained (tanned gelatine and tender or non-hardened gelatine) whereby the tender gelatine is as far as possible removed, while almost perfect "bare portions" can thus be formed on the support in the spaces of the reserves.

For this purpose development is carried out in two stages, i. e. a first partial development with a tanning developer, completed by a development with an ordinary developer.

When a picture, suitably taken on gelatine bromide paper, has been developed up to about half intensity with a tanning developer (pyrogallic acid slightly sulphited for example) then if development is brought to completion with a second strong developer not possessing tanning properties (diamido-phenol, mono ethyl-p-amino-m-cresol sulphate (metol), hydroquinone or the like, and even pyrogallic acid normally sulphited) the silver reduced by this second developer in the presence of the pyrogallic acid remaining in the layer, accelerates the tanning of the picture which takes place much more rapidly without hardening the transparent parts of the picture. The picture can then be transferred on to metal, for example, exactly as a carbon picture, and bare metal in the spaces of the resist can be obtained much more easily.

If however necessary, it is very easy to clean off the metal or other support in the transparent parts of the film (when for example the gelatine of these transparent parts has been very slightly hardened in spite of

the two stage development), by rubbing the surface of the plate with a pad of cotton wool impregnated with a slightly abrasive mixture (a cream of Spanish white in alcohol or the like), this cleaning can be effected very easily and rapidly.

This cleaning, which is however not absolutely necessary with the aforesaid two-stage development, may alone suffice in certain cases, as for example with lines of medium fineness, to render the metal bare in the spaces of the substance so that the process will then become a simple ordinary tanning development.

When fine drawings are in question however, it is necessary to develop in two stages as indicated above, with or without subsequent cleaning.

Whatever the procedures adopted, the plate may then be treated by any known process of inversion. It may for example be inked up, the gelatine then removed with a soft brush in a very weak bath of sulphuric acid for example, leaving a transfer with the greasy inks which is inverse to the first image and is therefore black and white as in the picture which was photographed. These transfers can be used for lithographic printings or be engraved as typographic plates by all known processes.

It is to be noted further that the two-stage development process, which is the subject of this invention, allows further advantages to be obtained by overcoming the secondary phenomena of silvering frequently occurring heretofore.

Experiment shows that when the usual fixing following a tanning development is not pushed much beyond the moment in which the white image has disappeared, the soluble silver salts remaining in the layer will give silver stains on zinc, beneath the black portions as well as in the transparent parts of the picture. Now nascent silver also possesses tanning properties under these conditions, and the soluble gelatine will become insoluble at the places where such stains exist.

These defects are easily avoided when the ordinary fixing process is replaced by a non-tanning development in day-light or white light, thus prolonging the two-stage development described whereby the bromide picture is masked by a thorough blackening.

One may, for example, after completely developing the picture in the second ordinary developer, continue development with white light, up to complete blackening of the material. Washing will then suffice to avoid secondary tanning phenomena due to the silvering of the metal.

As the gelatine which has remained soluble is now strongly coloured, its removal with hot water is more easily effected.

In order to make the steps of my process clearer, reference is made to the accompanying drawings showing in section and on an enlarged scale, in Figs. 1, 2 and 3, respectively, three steps of the process.

In the several figures of the drawings, *a* is the support (paper, for instance) carrying the emulsion layer *b*, a portion of which, within the bracketed zone *c*, is represented as having been treated according to the process. *d* are the grains of silver bromide which are more or less enlarged and condensed according to the stage of development, and the crosses *e* are the oxydizing products which remain after the action of the developer. The hatching *f* shows the tanned parts of the layer.

Fig. 1 shows the plate as it appears after the first (tanning) development has been partially carried out. The grains of silver *d* are small and spaced and the oxydizing products *e* are present in the zone but their action is not sufficient to render the gelatine insoluble.

Fig. 2 shows the same part of the plate after the second development with ordinary developer has been carried out to a certain degree. This second development has considerably increased the mass of the reduced silver and the amount of the oxydizing products of the tanning development is sufficient to insolubilize the gelatine.

Fig. 3 shows the same portion of the plate after the second development has been completed. It will be seen that the reduced silver is dispersed and is present everywhere. The paper is black everywhere but the gelatine is tanned only where the first development left oxidated residues. Elsewhere the gelatine remains soluble in hot water.

In a process according to the invention it may be desired to color the sensitive layer more or less with colours which do not act on the bromide (Congo red or the like) in order to limit the phenomena of the diffusion of the light in gelatine which hinders the production of fine details in the picture, and thus to increase the resolving power of the emulsion.

In the preceding, where metallic or like supporting plates have been spoken of, it is understood that there may also be used metallic plates already covered with a reserve varnish on which the gelatine transfer allows of local action by dissolving.

Naturally also the reserves of gelatine obtained can be strengthened by producing "ozobrome" pictures at their surfaces.

Finally, it is also evident that all gelatine silver bromide papers can be used for carrying out this invention.

Among the application of this invention, may be mentioned, among others, the reissue of texts and music scores, as also transfers on metal of texts and of music composed with the aid of machines using photography.

What I claim is:

1. In a process for transferring gelatine silver-bromide pictures, the steps which comprise first partly developing the picture with a tanning developer and then continuing the development with an ordinary non-tanning developer.

2. A process for transferring gelatine silver bromide pictures as claimed in claim 1, in which the operation of double developing of the picture is prolonged by a non-tanning developing in white light, to obviate secondary tanning effects caused by silvering of the metal.

3. Process as claimed in claim 1 in which a sensitive layer of gelatine bromide tinted with a colour having no action on the bromide is employed, whereby diffusion of light in gelatine is eliminated and its resolving power increased.

4. In a process for transferring gelatine silver bromide pictures the steps which comprise first partially developing with a tanning developer, then with an ordinary developer, continuing the second development in white light, inking the plate and after removing the gelatine as for an inversion, resining and heating the ink and treating with acid to obtain a first relief.

5. In a process for transferring gelatine silver bromide pictures, the steps which comprise partially developing the picture with a tanning developer and then continuing and completing the development with a non-tanning developer.

In testimony whereof I have affixed my signature.

MICHEL PROCOUDINE-GORSKY.