héliogravures
sensibilisation

HELIOGRAVURE – The elegance of C.T.

The Carbon Tissue represents a little/great idea that dates back to the mid-1800s, to obtain a photographic image that, besides durability over time (compared to silver salts prints), also provided an extended, smooth and regular tonal range.
Although the S-shape curves by Hurter & Driffield's sensitometry were not yet available (circa 1890), in the mid-sixties of the nineteenth century a process was patented by the Englishman Joseph Swan: a printing method that connected a temporal stable image with a very long and straight distribution of the tonal scale: it was the ***carbon (single or double) transfer printing process.*** (https://unblinkingeye.com/Articles/Carbon/carbon.html)

'*Carbon*' because carbon black was used for colouring and '*transfer*' because the wobbly gelatin film on which the image lay had to be 'transferred' - by overturning it - from the Carbon Tissue which is a temporary backing (the CT is also named 'Transfer Paper') to a subsequent final backing.

This action produced a mirror-image and it was necessary by the observation that the sensitized gelatin layer, exposed under and in tight conctat to an image-transparency to ultraviolet light, began to harden — hence becoming insoluble — from the upper surface, the very one exposed to the light (1). Furthermore, this hardening proceeded into the jelly-depth proportionally to the amount of light received. ... Last notation but not least, not appearing in the name of the process, is that a chromium salt, producing only a pale image, is used instead of a silver one as sensitizer. And even nowadays ... things have not changed.

Thus, where the film is very transparent (highlights in the case of a positive-slide) large amount of UV light will affect the sensitive gelatine and the hardening reaches the proximity of the paper surface and whereas the film is more opaque (the shadows, in the aforementioned case), less UV affects the gel-coat and the hardening stops more superficially, leaving the deepest layers soluble. All that takes place with a surprising regularity.

All this verbose talk ... needs some more ejaculations, to say that once the soluble gelatin has been wiped off ('*stripped*') (2), the image that appears is composed by different thicknesses of hardened jelly, depending on the tone to be reproduced (greater thicknesses in the lights, thinner in the shadows and vice versa using a negative film, as truly it is for a carbon print) (3).
... But this only happens of course by performing the 'stripping' ... from the back, i.e. unveiling the surface of the jelly in contact with the paper. This forces to perform the mentioned overturning of the gelatine layer on a new backing.
Therefore the gelatine layer on the C.T. — moistened — is gently pressed onto a new support and the by now old paper detached, revealing the ...variable-solubility side: only afterwards the 'stripping' is run. But don't think all the matter is a cushy job!

It is easy to understand how these micrometric thickness differences are not very significant *visually*, unless a colouring agent is added to the gelatin (carbon black, in the case, or other) to make the phenomenon visible, differentiating the shades on the basis of the pigment amount blocked by the hardened jelly. This in fact is valid for the carbon process, whose other qualities, preciousness and executive prowess are omitted here.

For the photogravure process, the Carbon Tissue dye has no final value and it is only handy to make the image visible during the subsequent steps of the whole way.
Much more interesting for the followings and to grasp the peculiarity of heliogravure, is to know that the insolubilized jelly remains permeable to water (4): the jelly swells but does not dissolve, not even in hot water.
The step of 'transfer' in this case is not performed onto a permanent sheet of paper, but on top of a copper plate, which is then 'stripped' and dried.

We have thus come to discover the arcane mechanism altogether: when this hardened gelatinous layer covering the metal with infinitesimal thickness gradations, will be drowned into the acid bath, the speed of penetration of the liquid travelling towards the underlying copper surface, will match the thicknesses of that layer: in the thinner ones (the shadows, for any respectable negative) the 'biting' will quickly reach the metal and gradually in the greater thicknesses it will take longer time (half tones and lights) .... That's why in the above speaking I used a positive-film (5). Then, in the shadows, the acid solution will remain for a longer time in contact with the metal digging deep grooves and in the lights a very small time leaving just fine dots.

The elegance of Carbon Tissue lies in this immense and automatic modulation created by light into gelatine and through which the gelatine itself allows the acid to penetrate it bit by bit, to reach the metal, paying back entirely the tonal range of a photograph. The image will be seen **engraved** on the copper instead of sparkling on the paper. It is a magical development over time — for those familiar to the emergence of the ghost-picture from a photographic development bath — lasting a laborious half an hour instead of the classic 3 minutes.

a.m.

NOTES

(1) To re-adjust this reverse image could be necessary a double transfer: the first to perform correctly the 'stripping' (read forward) and the second to restore the original orientation of the image. All this as long as glass plates werwe in use, since, due to their thickness, could not be printed by contact upside down without going out of focus; they did not allow large formats because of their fragility; there were no versatile enlarger-printers to easily modify the size of the image to be reproduced; there were no powerful sources of UV except the sun, ... with some nice chance of failures.

(2) The 'stripping' is not a 'development' in the photographic sense, as this last generates the image chemically, by reaction between the sensitive silver salt and the revealing agent present in the developer, while the first is simply a dissolution — in warm water — of all the unhardened jelly that does not contribute to the image building.

(3) In photogravure process at the contrary, a positive transparency is used that will give a negative jelly image on the copper plate, restoring the positive in the etching step.

(4) Insolubilization is a 'tanning' of the gelatine proteins through the sensitive salt of chromium. Precisely as leather does, in which a proteic reticulate makes it resistant and durable.

(5) In reality the speed of propagation of the 'biting agent' within the gelatine, slows down rapidly with increasing thickness of the layer. For this reason it is necessary to carry periodically the plate in acidic solutions at different concentration to match the penetration speed with the correct shaping of the image. This is done using a suitable wedge-step at the side of the plate at work, from which peer out and drive the biting progress.