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The Daguerrean Process.

THIS most beautiful branch of the photographic art is at present somewhat obsolete, only, however, for the reason that card photographs are in vogue. The now, old-fashioned daguerreotype possesses a finish which defies microscopic criticism, in vain looked for in paper photographs, which are comparatively very coarse. In *fact,* as the microscope exposes the fibres of the paper, the printed photograph never bears microscopic inspection. Besides, the exquisite finish of all details, and the softness, roundness, and stereoscopic effect of the daguerreotype, constitute together a beauty which is appreciated by the connoisseur and true lover of art.

In this article, therefore, a short exposition of the manufacture of the daguerreotype will be given, for the additional reason that it must be considered the best school for the future photographer to have gone through the practice of daguerreotyping, as it not only contains the essence of the practice of photography, but also the theory of this fascinating occupation. Some professional photographers, who have to pursue this business day after day, month after month, and year after year, may not perhaps agree as to the justice of the last remark; but the writer speaks as an amateur, to whom this occupation has a peculiar fascination. The writer of this article will give an account of his early and successful attempts at daguerreotyping, made in 1839 and 1840, immediately after the government of France bought Daguerre's process, by according to him a pension for life, and gave it to the world.

The tools were first to be procured. They consisted of a camera-box, with meniscus lens, ground glass, and plate-holder; a few silver plates, a box lined with glass for iodine,

and another iron box containing a few drops of mercury, with spirit-lamp fitting under it to heat the mercury. The whole arrangement is now complete.

The camera-box is so arranged that the distance of the lens from the ground glass is equal to the focal length of the lens, and also is alterable, so as to be adjusted according to circumstances. The silver plates fit in the plate-holder, also in the iodine-box, and in the mercury-box. The first step in the operation is the cleaning of the plates, which is begun with a piece of carded cotton, very fine pumice-stone, and alcohol, and afterward completed with dry cotton and Paris rouge. This cotton must be frequently substituted with fresh bits, and care must be taken that no greasiness or other impurity of the fingers touches the cotton at a spot which afterward comes in contact with the silver. When thus scrupulously cleaned, the plate is placed, with the polished side downward, on the top of the opened iodine-box, which is kept in a dark room, and in the bottom of which has been placed some dry iodine. In a few seconds or minutes, according to the heat of the room and other circumstances, the vapor arising from the iodine will have come in contact with the clean silver surface of the plate, and combined with it to a thin film of iodide of silver. The thickness of this film increases with the time of exposure to the iodine vapor, and can be recognized by the color. The first thinnest film is straw yellow; the next thicker, yellow and dark yellow; then pink, then violet, then blue, then greenish, and finally yellow again, after which the colors mentioned come back in about the same order, and with nearly the same shades. But the most singular fact is, that the two yellow shades, either the first corresponding to the thinnest film, or the last indicating the much thicker film, are the only ones available in this process. This last operation has to be performed in a room where no chemical rays can penetrate, which means that it must be either illuminated by a lamp or candle, or that the daylight must be only admitted through red, orange, or dark yellow glass. Otherwise, the iodized silver plate, now sensitive to light, will be affected by it. This plate then is placed in the plate-holder and transferred to the camera-box, which has been placed in the right position during the time that the silver plate was exposed to the iodine vapors. This iodized silver plate being put in exactly the same place occupied by the ground glass, now receives the impression of the luminous image formed at that spot by the lens, the impression received separating the combination of iodine and silver, setting the silver free, or, in a word, resolving the so-called iodide of silver, which was formed in the dark, into its two constituent elements.

This action of light, in separating compounds into their elements, takes place also in the vegetable kingdom in regard to the carbonic acid gas contained in the atmosphere. It has been proved, in fact, that the leaves of plants absorb this carbonic acid in the same manner as the lungs of animals absorb the oxygen, for which reason leaves have been called the, lungs of the plants. It has also been proved that, under the influence of sunlight or daylight, this so-absorbed carbonic acid is decomposed in the leaves, the oxygen escaping in its gaseous form; while the carbon, taking on its natural solid form, is retained, and, in combination with water, is deposited in the plant as woody fibre. In a perfectly similar manner, in the process of daguerreotyping, the silver is set free in the metallic state by the influence of light in a degree proportionate to the intensity of the light acting on different parts of the film of iodide of silver.

When such a plate is left exposed in the camera-obscura for a few hours the image will finally appear on it by means of the silver reduced, which, after its separation from the iodine, will appear upon the surface of the iodized silver plate as a fine pulverulent

substance, of a different aggregate condition from the silver not so reduced. The coating of iodide of silver must then be removed by some kind of solution, as otherwise the decomposition of the iodide of silver would continue every time that the plate was exposed to daylight, and the picture, consequently, would, in the end, entirely disappear. When, however, this sensitive coating is dissolved away, the plate has nothing on its surface but silver in different aggregate conditions, polished in the shadows, and pulverulent in the light; and the picture is permanently fixed.

This was the first process of Daguerre; but as it took too long an exposure in the camera, he attempted to shorten the time from hours to minutes; and had the good fortune to conceive that, in the short time of a few minutes, already a change must have taken place in the iodide of silver film, which, notwithstanding it was invisible to the eye, might manifest itself when the plate was exposed to the influence of other substances. It was soon found that this silver, separated from the iodine by the influence of light, had obtained a great affinity for mercury, and, consequently, a strong tendency to combine with mercurial vapors not possessed by the iodide of silver when the vapors were not heated above 180 to 200 degrees Fahrenheit. This iodide of silver, then, not combining with those vapors, the consequence was that, when such a plate had been exposed to the luminous rays in the camera for a few minutes only, and on which nothing was yet visible, exposure to mercurial vapors of some 180 degrees Fahrenheit would not affect the silver plate wherever it was protected by the film of iodide of silver, but only where some silver of this film had been set free by the action of light. The amount of deposit of mercurial vapor was also found to be proportional to the amount of silver set free, which, again, was proportional to the previous intensity, of the light acting on different parts of the plate.

The deposit of mercury, or rather amalgam of mercury and silver, thus formed on the surface of the protecting film of iodide of silver, constituted the picture. A microscope, when of sufficient magnifying power, detected the amalgam to consist of minute globules, very close together in the high lights of the picture, less close in the less illuminated portion, very sparsely distributed in the shadows, and altogether absent in the blanks, which consisted of pure iodide of silver.

The next operation was to remove the iodide of silver, which formed the coating sensitive to light. Upon the removal of this, in a word, depended the permanency of the picture, as the plate could not be exposed to daylight without final destruction—at least great deterioration of the impression. Fortunately, as in all problems of the kind, substances which would readily dissolve the iodide of silver without acting on the amalgam of silver and mercury, were at hand. One of the best substances of this kind was found to be the hyposulphite of soda, a strong solution of which rapidly removed the yellow coat of iodide, leaving a clear silver surface in the shadow; the lights being formed by the amalgam of silver and mercury in a very finely divided form, as mentioned. The plate was then washed with distilled water and dried by heat. This is the process as it came from the hands of Daguerre. Successive improvements will form the subject of future articles.

From page 344 of same issue:

ATTENTION may be directed, among other valuable articles in the present number, to Dr. P. H. VAN DER WEYDE'S paper on the *Daguerrean Process.* The paper is one of the pleasantest scientific reminiscences ever collated in the form of a practical essay. Dr. VAN DER WEYDE is too well known as a scientific man, both in European and American circles, to need compliment from any source, however authoritative; and it is somewhat in the way of self-felicitation that the proprietors of THE MANUFACTURER AND BUILDER announce his name us that of a contributor. Our March number will contain a capital article from his pen, upon the *Uses* of Gun-Cotton.

(Van der Weyde is mentioned in *Appleton's Journal* (New York) in vol. 6, no. 130 (23 September 1871) p. 360 under the heading "Scientific Notes" regarding a discovery in the field of spectrum analysis and the Fraünhofer lines; and in vol. 14, no. 341 (2 October 1875) p. 446 under the heading "Science, Invention, Discovery" regarding his effort to challenge certain "spiritual" phenomena including "table-tumblers."—Gary W. Ewer.)