

late to such an extent as to render the hydrometer test useless;" and doubling the assertion "that such an accumulation did not *practically* take place, except to a very limited extent," he afterwards analyzed some old baths in order to satisfy his own mind on the point. Consequently, in a paper he subsequently read upon the subject, in allusion to one of these baths, he says:—"I should certainly have expected to find a very much larger proportion of nitrates different from that of silver. The equivalent of nitrate of soda being 84.97 (say 85), it follows that, for every two grains of nitrate of silver abstracted by decomposition, one grain of the former *ought* to be left in the bath. In the above case, certainly, and in some other baths I have tried, this accumulation of nitrate of soda or ammonia did not take place in any way commensurate with the quantity *we ought to expect*. Although these nitrates must inevitably be found, they are partly retained and taken away by the paper, in a way which I am at a loss to account for."

Again, persons have assumed that the nitrate of the base of the salting chloride does not affect the colour of the print, and though an intelligent use of their eyes cannot fail to tell them the contrary, they still adhere to this idea, and endeavour to find *another cause* for the colouration which they cannot gainsay. Thus, Mr. Hardwich, in the last edition of his *Manual of Photographic Chemistry*, page 479, in speaking of chloride of barium, says:—"It also slightly alters the colour of the photographic image when used in preparing positive paper, which may be due, in some measure, to a chemical combination of baryta with albumen." That it is the *nitrate* of baryta which produces the alteration of colour, is evidenced, I think, by the fact that it takes place in a much greater degree in *plain salted paper*, than it does in albumenized; in *plain salted paper* the *black* colouring property of nitrate of baryta has not to contend against the *red* colouring of albumenate of silver, and no albumen being present, the peculiar colouration *cannot here be produced by its combination with baryta*. This theory of the nitrates of ammonia, soda, and baryta being formed in the bath, I believe to be based upon assumption, and *to be contrary to fact*. I maintain that the double decomposition and recomposition takes place *on the surface of the paper*; the nitrate of silver solution leaves the vessel which contained it and adheres to the surface of the paper, permeating the film of dried chlorided albumen; I am therefore at a loss to conceive why theory should *grant* to the chloride of silver the privilege of being formed on the paper, where its constituents are present, but should *deny* the same privilege to the nitrate of ammonia, soda, and baryta, whose constituents are *also* present there. Whatever nitrates, otherwise than silver, are found in an old sensitizing bath for paper, I believe find their way there in consequence of a too long floating *having dissolved them out of the albumenized surface of the paper* where they had *originally* been formed.

The philosophy of positive printing upon albumenized paper is really such a comprehensive subject, that it would even be a vain attempt for any one with far greater abilities than I am possessed of, to endeavour to treat it satisfactorily in a paper which must necessarily be circumscribed in its length, in order to afford time for after discussion. I have, therefore, omitted *even an allusion* to those necessary accompaniments of printing—*toning and fixing*—and confined myself to the action of the preliminary sensitizing bath; for, had I not done so, I must have encroached *much more* upon your time and attention, and I fear that you may think it has been trespassed upon too much already; moreover, I deem that I have already furnished you with quite enough matter for an evening's discussion.

As a question naturally fixes attention to its own individual subject, allow me to state in that form, the various points which I consider particularly require elucidation, and upon which I invite your opinions:—1st. *What salting chloride* for the albumen is the best to use, and why? Also, is a combination preferable to a single one? if so, what, and why? and what proportion should the chloride bear to the albumen? 2nd. *How* does the nitrate of the base of the salting chloride influence the colour of the print? 3rd. *Supposing* the albumenized surface of the paper be capable of being rendered insoluble *previous to sensitizing*, would that insolubility be an advantage; or, would it not tend to diminish—or destroy—its capability of being sensitized by the nitrate of silver solution? 4th. *Supposing* we use a *very strong* sensitizing bath, is the vigour of the print dependent upon the length of time the albumenized paper is floated upon

it; and does its employment necessitate *deeper printing* than a weaker bath does? 5th. In sensitizing a sheet of albumenized paper, are *two* separate and distinct compounds of silver formed, viz., the albuminate and chloride; or, is a *double compound* formed? 6th. *Supposing* two distinct and separate compounds of silver be formed by sensitizing, which of the *three* compounds of silver on the paper is the most important in the production of the image—the albuminate, the chloride, or the nitrate? What part does *each* play—and do they act conjointly or independently?

I do not mention the opinions I have advanced respecting dried albumen, and the manner in which the double decomposition and recomposition is effected when we sensitize a sheet of chlorided albumenized photographic paper, because they can be discussed incidentally with the points I have named.

In all philosophical discussions, but more especially when the subject is but little understood, mere *assertion* will never tend to enlighten us, however high an authority the person making it may be considered; for we have had too many instances of men of science being led into grievous error and promulgating most extraordinary fallacies as facts; every gentleman, therefore, who gives his opinion upon *any* points that arise in the discussion, will, I trust, state the *reasons* which induced him to form them, as he thereby gives the others an opportunity of showing whether they are fallacious or not. For the better elucidation of these points, I think I should be allowed the same privilege that counsel are, viz., that of *cross-examination*, which I will promise not to use rigorously. With this suggestion I now leave the subject in your hands to deal with in the manner you consider best.

## ADDENDUM.

This, Mr. President and Gentlemen, is what I wrote for our last meeting, but its having been unavoidably postponed, a short addendum is now necessary. A paper has since been published in the journals, by MM. Davanne and Girard, "On the Action of Nitrate of Silver upon Albumen,"\* they state:—"The combination of albumen with nitrate of silver varies according to the strength of the silver bath. Thus in treating five cubic centimetres of albumen with five grammes of nitrate of silver, we obtained very different precipitates, according as those five grammes of silver were dissolved, so as to form solutions of 15, 10, 5, 2½, or 1 per cent. With the solutions of 15 and 10 per cent., the albumen is strongly coagulated; it gives a heavy, abundant precipitate, which may be collected on the filter in the form of distinctly separate pellicles. With weak solutions of silver, the quantity of the precipitate is much less considerable. A notable quantity of albumen remains in the bath in a state of solution. The portion precipitated is soft, glutinous, and sticky."

This is an announcement that every one who knows anything at all about the subject, has been fully aware of *long ago*. If an egg be boiled what we deem soft, the white has very little consistence, but this consistence increases up to the point at which the yolk becomes, by boiling, what we designate hard; the albumen is then, what, for want of a better expression, I will call *saturated with heat*, and thus is perfectly coagulated; it is only therefore to *this* state that the term coagulated properly applies. The same, also, with respect to the combination of albumen with nitrate of silver. Albumenate of silver is, correctly speaking, only that combination of albumen which takes place when it is *saturated with nitrate of silver*, every combination *below* this is what may be considered as an *imperfect albumenate*. Common sense tells us that, as varying approximations to perfect coagulation are afforded by varying degrees of heat, so differing proportions of nitrate of silver must produce differing approximations to the perfect albumenate of silver.

I am ever willing to confess that I have formed an erroneous idea, when that idea is proved to be incorrect. I have, therefore, now to state that I have hitherto been in doubt whether, if the albumenized surface of a sheet of photographic paper were rendered insoluble *previous to sensitizing*, this insolubility would not almost destroy its capability of being sensitized. This doubt is now dissipated, for Mr. Simpson has kindly furnished me with a piece of albumenized paper, the surface of which, Mr. Wood, of Edinburgh, has rendered insoluble by the aid of steam. This paper does not *appear* to have lost any of its capability of yielding either the albumenate or chloride of

\* PHOTOGRAPHIC NEWS, vol. v. p. 116, and BRITISH JOURNAL OF PHOTOGRAPHY, vol. viii. p. 103.

\* PHOTOGRAPHIC NEWS, vol. vii. page 53.