

pressed under the action of the yellow and green luminous rays, differently and more easily than the iodide is, under similar circumstances.

In order to overcome the difficulties experienced in the representation of subjects in which the tints are very varied, and opposite in their chemical action, it is customary to introduce into the collodion a relative quantity of soluble bromides corresponding to the iodides which form the base of the generating salts, and by this addition we render coloured objects more completely than could be hoped for as perfect by any other means.

This fact is very important in photography, and has induced us to examine into the fundamental principle; whereupon we perceived that an error, apparently confirmed by experiment, had led to the conclusion that the action of coloured light upon bromide of silver, differs from that which this agent exercises upon the iodide of the same metal obtained and preserved under the same conditions. It is generally admitted that the green and yellow rays of the solar spectrum act relatively with greater activity upon bromide of silver than the other coloured rays: but if this fact be substantial and demonstrated in practice, the principle attributed to it is altogether illusory, as we shall attempt to show.

Suppose, for example, that we project the solar spectrum upon a white screen, in order that, by thus arranging a series of very pure and vivid colours, the experiment shall be clear and definite. In the place of this screen, substitute a glass plate covered with collodion prepared with iodide only (without bromides). After ten or fifteen seconds, withdraw the plate, and develop it with a weak solution of sulphate of iron, prepared in the usual manner, and there will appear a black confused trace along the entire length of the spectrum, extending from the red to the violet, and even beyond it. Upon examining the negative, we further discover that the portion impressed by the violet rays is grayer and more transparent than the rest, which indicates too long an exposure.

Experimenting afterwards with fresh plates, we reduce the time of exposure to the coloured spectrum until the most active portion (the blue and violet), has produced its maximum effect, without, however, exceeding it. Let us suppose that this space of time is a second, for example; after examining this last negative, we remark that the image obtained does not extend so far as before, and that the luminous action diminishes from the blue towards the green.

From these experiments we conclude:—

1. That the iodide is susceptible of being changed by all the coloured rays of the solar spectrum.

2. That this action is stronger with the violet, blue, and green rays, and much less active with the yellow, red, and orange rays.

3. That the action which light can exercise upon iodide of silver may be easily excessive, when there is chemical decomposition, and the effect of the developing agents no longer produces a picture, or at least, they act more feebly in causing the image to appear.

This last property, therefore, opposes itself to prolonging the exposure to light in order to obtain an impression from the green, yellow, orange, and red rays. Now, if we operate on a sensitive substance, which does not possess, like iodide of silver, the property of being "over-done" when developed, it is, of course, sufficient to prolong the exposure within determined limits, for this or that coloured ray to have time to produce an action which may be regulated in such a manner as to be relative to its apparent intensity, compared with the hues of the whole object.

It is precisely this property which is possessed by bromide and chloride of silver; these salts will even take a deeper tone under the action of light, without, in consequence, losing the property of being darkened by developing agents.

This characteristic of bromide of silver, then, very clearly

explains why this salt appears more sensitive to the green rays than iodide of silver, as it is equally susceptible to all the other coloured rays. Added to iodide of silver in the sensitive film, it in no respect modifies its properties, nor communicates new ones; on the contrary, where the solar rays have only a feeble action, it performs no part at all; but it is only where the light is so strong as to decompose the iodide of silver wholly, after a sufficient space of time, so to speak, to effect the chemical change, that the bromide of silver is found impressed in the limits necessary to render these parts of the picture in harmony with the rest.—*Bulletin Belge de la Photographie.*

A "SPIRIT" PHOTOGRAPH.

BY DR. T.L. PHIPSON, F.C.S., ETC.

SOME years ago, a friend of mine in Bruxelles received a box of glass plates for photographic purposes. They were highly polished, quite new, and each separate plate was enveloped in two or three folds of the journal *L'Indépendance Belge*. One of these plates was taken out and prepared to receive an image. The sister of the gentleman before alluded to, sat for the picture. In course of time, the plate was developed and finished, when, to our astonishment, the whole of the image obtained was covered with printed characters, which it was not difficult to identify with those of the paper which had enveloped the plate.

The "spirit" was, in fact, *the ghost of a political article in the Indépendance Belge.*

CARBON-PRINTING.

BY A. LANDUR.

PERFECT confidence in the stability of photographs printed with the salts of silver cannot be said to be established; and no one would venture to guarantee the existence of a picture ten years after it has left the hypo bath.

This instability is most probably due, mainly, to defective washing of the proofs; but even supposing the washing to have been most carefully and effectually performed—a fact the purchaser can never ascertain for himself—still the permanence of a picture cannot be guaranteed; for the atmosphere abounds in agents capable of attacking the thin metallic coating which forms the picture; and skilful chemists, such as M. Regnault (the President of the Photographic Society of Paris), even think that this metallic film may evaporate or diffuse itself in the substance of the paper.

For photographic pictures to possess a degree of permanence equal to that of engravings and lithographs, it is absolutely necessary for them to be formed of insoluble substances, as little volatile as possible, and unattackable by sulphur, ammonia, and nitrous fumes. If to these conditions we add that of the picture being of a fine black colour, similar to that of printing ink, our choice becomes limited almost entirely to carbon in powder. Seven or eight years have elapsed since the first attempts were made to produce carbon photographs; the scientific possibility of success depended upon the existence of substances which become hygrometric, or cease to be so, under the action of light, so that the parts impressed by it, or those which are not, become susceptible of fixing pulverulent matters. But until the commencement of the present year, the results attained in no respect the perfection of proofs furnished by the old processes, and possessed no value other than as curiosities.

In the month of March last, M. Charavet, photographer, of Paris, exhibited a series of carbon prints, both portraits and landscapes, which were greatly admired. These photographs, in finish and delicacy, could be distinguished from proofs taken with the salts of silver only by their permanence in the presence of nitric acid, and by the beauty of