UNITED STATES PATENT OFFICE.

WM. HENRY FOX TALBOT, OF LACOCK ABBEY, ENGLAND.

IMPROVEMENT IN PHOTOGRAPHIC PICTURES.

Specification forming part of Letters Patent No. **5,171**, dated June 26, 1847.

To all whom it may concern:

Be it known that I, WILLIAM HENRY FOX TALBOT, of Lacock Abbey, in the county of Wilts, esquire, a subject of the Queen of Great Britain, have invented or discovered certain new and useful Methods of Making Photographic Pictures and Portraits, to which I have given the name of "Calotype" or "Talbotype" pictures, which terms must be understood as having the same import—as in the present specification I employ the latter one; and I, the said WILLIAM HENRY FOX TALBOT, do hereby declare that the nature of my said invention and the manner in which the same is to be performed are fully described and ascertained in and by the following statement thereof—that is to say—

The first part of my invention is a method of making paper extremely sensitive to the rays of light. For this purpose I select the best writing-paper, having a smooth surface and a close and even texture.

First part of the preparation of the paper.—I dissolve one hundred grains of crystallized nitrate of silver in six ounces of distilled water. I wash one side of the paper with this solution with a soft camel's-hair brush and place a mark upon that side by which to know it again. I dry the paper cautiously at a distant fire; or else I leave it to dry spontaneously in a dark place. Next I dip the paper in a solution of iodide of potassium containing five hundred grains of that salt dissolved in one pint of water. I leave the paper a minute or two in this solution. I then take it out and dip it in water. I then dry it lightly with blotting-paper and finish drying it at a fire, or else I leave it to dry spontaneously. The paper thus far prepared may be called, for the sake of distinction, "iodized" paper. When well made it is quite insensible to the action of light, and will keep for many years without suffering any change.

Second part of the preparation of the paper.—This second part is best deferred until the paper is wanted for use. When that time is arrived I take a sheet of the iodized paper and wash it with a liquid prepared in the following manner: Dissolve one hundred grains of crystallized nitrate of silver in two ounces of distilled water. To this solution add one-sixth of its volume of strong acetic acid. Let this mixture be called "A." Dissolve crystallized gallic acid in distilled water, as much as it will dissolve, (which is a very small quantity.) Let this solution be called "B." When you wish to prepare a sheet of paper for use mix together the liquids A and B in equal volumes. This mixture I shall call by the name of "gallo-nitrate of silver." Let no more be mixed than is intended to be used at one time, because the mixture will not keep good for a long period. Then take a sheet of iodized paper and wash it over with the gallo-nitrate of silver with a soft camel's-hair brush, taking care to wash it on the side which has been previously marked. This operation should be performed by candle-light. Let the paper rest half a minute, and then dry it lightly with blotting-paper. When nearly or quite dry the paper is fit for use; but it is advisable to use it within a short time after its preparation.

Use of the paper.—The paper thus prepared, and which I call "Talbotype" paper, is placed in a camera obscura so as to receive the image formed in the focus of the lens. Of course the paper must be screened or defended from the light during the time it is being put into the camera. When the camera is properly pointed at the object this screen is withdrawn, or a pair of internal folding doors are opened, so as to expose the paper for the reception of the image. If the object is very bright or the time employed is sufficiently long, a sensible image is perceived upon the paper when it is withdrawn from the camera; but when the time is short or the objects dim no image whatever is visible upon the paper, which appears entirely blank. Nevertheless it is impressed with an invisible image, and I have discovered the means of causing this image to become visible. This is performed as follows: I take some gallo-nitrate of silver, prepared in the manner before directed, and with this liquid I wash the paper all over with a soft camel's-hair brush. I then hold it before a gentle fire and in a short time, varying from a few seconds to a minute or two, the image begins to appear upon the paper. Those parts of the paper upon which light has acted the most strongly become brown or black, while those parts on which light has not acted remain white. The image continues to strengthen and grow more and more visible during some time. When it appears strong enough the operation should be terminated and the picture fixed.

The fixing process.—In order to fix the picture thus obtained, I first dip it into water. I then partly dry it with the blotting-paper and then wash it with a solution of bromide of potassium containing one hundred grains of the salt dissolved in eight or ten ounces of water; or else I fix it with a hot solution of hyposulphite of soda in the way described in a subsequent part of this specification. The picture is then washed with water and then finally dried. The picture thus obtained will have its lights and shades reversed with respect to the natural objects—videlicit, the lights of the objects are represented by shades, and vice versa—for which reason I call it a "negative" picture. But it is easy from this negative picture to obtain another which shall be positive or conformable to nature—videlicit, a picture in which lights shall be represented by lights and the shades by shades. It is only necessary for this purpose to take a second sheet of the same sensitive paper and place it in close contact with the first upon which the picture has been formed. A board is put beneath them and a sheet of glass above, and the whole is pressed into close contact by screws. Being then placed in sunshine or daylight for a short time, an image or copy is formed upon the second sheet of paper. This image or copy is often invisible at first; but the image may be made to appear in the same way that has been already stated; but I do not recommend that the copy should be taken on this kind of sensitive paper. On the contrary I would advise that it should be taken on common photographic paper. This paper is made by washing good writing-paper first with a weak solution of common salt, and next with a solution of nitrate of silver; but since it is well known, having been freely communicated to the public by myself in the year one thousand eight hundred and thirty-nine, and that it forms no part of the present invention, I need not describe it here more particularly. Although it takes a much longer time to obtain a copy upon this paper, yet the tints of the copy are generally more harmonious and agreeable. In order to fix such positive copies I recommend to dip them into three separate vessels of warm water, then into a cold solution of hyposulphite of soda, and lastly to dip them once more into three separate vessels of warm water.

The following may be considered as auxiliary and additional modifications of my discovery or invention: I sometimes take a sheet of iodized paper and wash it over with a solution of gallic acid in water and then dry it. Paper so prepared I call "iogallic" paper. It will remain good a considerable time if kept in a press or portfolio. When wanted for use I wash it with a solution of nitrate of silver, which renders it sensitive to light and fit to be used in the camera. This process differs from the talbotype process, before described by me, in not using the nitrate of silver and gallic acid in conjunction. I find it is advantageous to use them separately on many occasions, because it removes the great inconvenience arising from the speedy decomposition of gallo-nitrate of silver. Since the yellowish tint of some talbotype negative pictures impedes the process of taking copies from them, in order to remedy this defect I plunge the picture into a hot bath of hyposulphite of soda, (or any other soluble hyposulphite,) dissolved in about ten times its weight of water. This solution should be heated to nearly the boiling-point. The picture should remain in it about ten minutes. It is then removed, washed, and dried. By this process the picture is rendered more transparent and its lights become whiter. It is also rendered exceedingly permanent. After this process I sometimes wax the picture by causing melted wax to penetrate into the pores of the paper, the object of which is to give increased transparency.

In the above-described process I claim as of my own invention and discovery—

1. The preparation of iodized paper, as above described, which is not itself sensitive to light, but serves as the basis of all the subsequent operations.

2. The employment of gallic acid, in conjunction with iodine and the salts of silver, to render paper extremely sensitive to light, the gallic acid not having been used in photography previously to my discovery.

3. It was not known previous to my discovery thereof that paper could be impressed with a latent or invisible photographic image. I claim this as my own discovery and likewise the means of rendering the image visible at pleasure—namely, by washing the paper in the manner before described with gallo-nitrate of silver or with any other chemical liquids which act upon those parts of the paper only which have been previously acted upon by light.

4. The using hot or boiling solutions of the hyposulphites in order to give increased whiteness to talbotype photographic pictures and at the same time make them exceedingly permanent.

5. The waxing talbotype negative pictures in order to make them transparent, and thus to facilitate the obtaining positive copies therefrom, the said pictures having been previously whitened by immersion in the hot solution of hyposulphite, as last mentioned.

W. H. F. TALBOT.

Witnesses:

JOS. MARQUETTE,
W. H. RITCHIE.