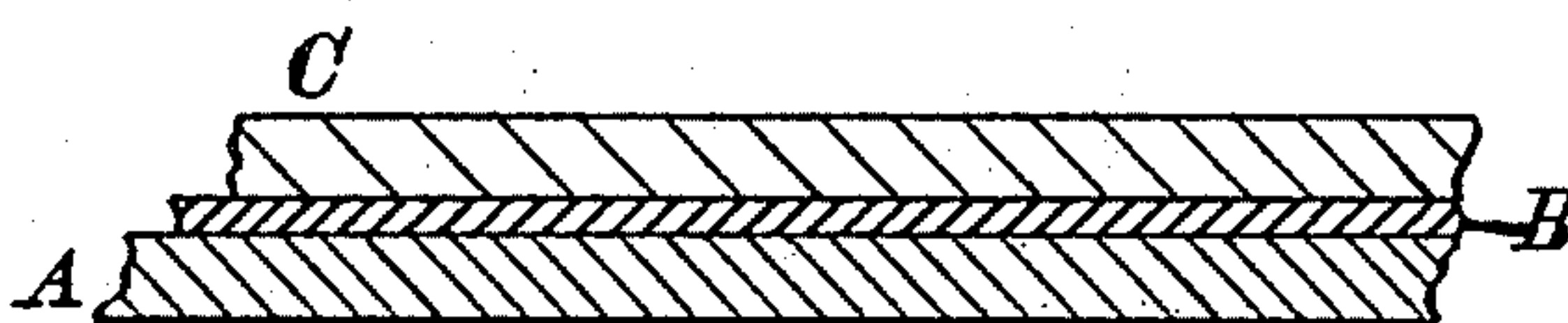


(No Model.)

G. EASTMAN.
PHOTOGRAPHIC FILM.

No. 306,594.

Patented Oct. 14, 1884.



WITNESSES=

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UNITED STATES PATENT OFFICE

GEORGE EASTMAN, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE EASTMAN DRY PLATE COMPANY, OF SAME PLACE.

PHOTOGRAPHIC FILM.

SPECIFICATION forming part of Letters Patent No. 306,594, dated October 14, 1884.

Application filed March 7, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE EASTMAN, of Rochester, New York, have invented an Improvement in Photographic Films, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates to an improvement in photographic films having for their object the production for the market of sensitized films, which are capable of being used in making positives and negatives in place of the sheets of glass coated with emulsion, now known in the trade as "dry-plates;" and to this end my invention consists in the new article of manufacture formed by my improved sensitized films, and in the process or mode of manufacture of my said films, all as more fully described in the following specification, and specified in the claims thereunto annexed.

In the accompanying drawing, the figure represents a section of one of my improved sensitized films on an enlarged scale.

In the practical operations of manufacturing my improved sensitized gelatine films I apply to a suitable paper or other fabric a coating of a solution of gelatine dissolved in water of a strength of about fifty grains to the ounce, and allow the same to dry either spontaneously or by artificial heat. I prefer to use Rives' paper—such as is ordinarily albumenized for the manufacture of silver prints—on account of its freedom from chemical impurities, fine even grain, and translucency, which permits the close examination of the image during the development; but any other suitable kind of paper may be employed.

The operation of coating the paper with the gelatine solution may be performed by floating, by applying it with a brush or dabber, or by suitable machinery, in all cases the requisite care being taken to exclude the access of dust. The gelatinized paper is now coated with a layer of any ordinary gelatine argentic emulsion the gelatine of which has been rendered more or less insoluble relative to that forming the layer next the paper by any appropriate means. The requisite degree of insolubility relative to that of the first layer may be attained by adding to the finished emulsion, when ready for the coating operation, a suit-

able quantity of any substance which possesses the property of rendering the gelatine insoluble when dried, and which will not cause any chemical decomposition of the emulsion. Chrome-alum answers this purpose effectually, and it may be employed in quantities varying with the character of the particular gelatine employed in the emulsion, the season of the year, or other circumstances, as the judgment of the operator may indicate; but which proportion may be stated generally as approximating five ounces of a solution of chrome alum of ten grains to the ounce of water to one gallon of the finished emulsion. The preparation of the sensitive gelatine emulsion is now too well understood to require particular description. The operation of coating the gelatinized paper with the sensitized emulsion may be performed in any preferred way in a sufficiently non-actinic light, and, after the coating thus applied has been dried, the film is ready for exposure, either in the camera or under a negative, as the operator may desire to produce a positive or negative image. For exposure in the camera the film is temporarily affixed to some rigid support, which may be done in any preferred manner.

It is unnecessary to remark to those accustomed to the preparation and coating of gelatine emulsions that the gelatine layer B and the emulsion layer C should be applied to the support at a suitable temperature, which may be about 90° to 110°, the object being to use the lowest temperature at which the gelatine will remain fluid, which is lower with the soluble substratum than with the emulsion hardened by a suitable chemical. The temperature will vary also somewhat with the particular samples of gelatines employed. After exposure, the development of the film may be carried out by any suitable development, although I recommend the well-known ferrous-oxalate development, or the so-called sulphite-of-soda development, in which sulphite of soda, carbonate of soda, and pyrogallie acid are employed. The fixing is accomplished in a solution of hyposulphite of soda, as usual. After being thoroughly washed, the film is detached from the paper in the following or in some equivalent manner: The fixed and washed

film is floated face downward in water, and a glass plate being introduced under it and lifted out of the water, the plate will lift the film with it, which is then caused to adhere closely to its surface by pressure on the back on the paper. The adhesion is preferably secured by the sliding pressure of the edge of a straight piece of rubber or other flexible substance carried along the back of the film. The application of the pressure should be repeated until contact is secured at all points by the entire removal of the water between the glass and the film. The paper support is now detached from the film by the application of the requisite degree of heat to the glass plate, the effect of which is to soften the gelatine layer between the paper and the relatively-insoluble gelatine layer containing the image, so that the paper may be readily stripped off or removed, leaving the image adhering to the glass. The heat may be applied uniformly by placing the glass on a heated plate of metal or on a water bath, or by the application of hot water to the plate. Any remaining traces of the soluble gelatine layer may be sponged or washed off with warm water, and the glass and adhering film, when dried and varnished, if desired, is ready for the printer.

In the accompanying drawing, which represents a section through one of my improved sensitive films, A is the paper or other support; B, the soluble gelatine layer, and C the relatively-insoluble layer of sensitized gelatine.

By the use of wax on the glass or other support, the film may be stripped and used or preserved independently. Thus the glass having been coated with beeswax dissolved in turpentine and subsequently polished, the gelatine image may be removed therefrom by applying a moist gelatine sheet to it and allowing it to dry, after which the two gelatine sheets may be removed together from the glass or other support, and may be subsequently used to print from, or mounted or preserved in any preferred manner.

The operations may be performed in different order. Thus the paper may be stripped from the film before development or after development, and before fixing or after fixing.

I prefer to use Cox's transparent, or Nelson's No. 1, or other soft gelatines for the first coating, and to make the emulsion with Simeon's or Heinrich's hard gelatine. In case the last-mentioned gelatines are employed, the quantity of chrome-alum may be diminished. The quantity of chrome-alum which is to be added to the finished emulsion will depend on the hardness of the particular sample of gelatine employed; but I have not observed any gelatine in which the requisite degree of insolubility could be obtained after drying without the addition of at least three ounces of a ten-grain solution.

Glycerine may be added to either or both of the layers B and C, for the purpose of ren-

dering the film flexible. The quantity of glycerine added should be about one-half of the weight of the gelatine employed, although a greater or less proportion may be used. The support A may also be treated with glycerine or a solution of glycerine in water; but I prefer to add it to the emulsion.

The advantages which my improved sensitized films possess over the ordinary glass dry-plates are too obvious to require description. Thus I am enabled to dispense entirely with the glass, the original cost and the expense arising from the handling, cleaning, breakage, and transportation of which I save. I am also able to effect a considerable economy in the amount of emulsion used, as the glass, owing to its curvature and uneven surface, requires to be coated thicker than the gelatinized paper; and, as the operation of coating the gelatinized paper with the emulsion may in manufacturing operations be carried on by machinery in absolute darkness, the highest sensitiveness may be given to the emulsion employed in my improved films without danger of fog from too much light; and the operations necessary to secure the desired image by the use of my improved films, in so far as they differ from the ordinary process now employed, are so simple as to be readily learned by the most inexperienced person.

The substratum or intermediate attaching film I prefer should be composed of gelatine, as described, as I have found in practice that said material possesses in an eminent degree the qualities necessary to carry into execution my invention; but it is evident other substances which possess the quality of resisting the solvent action of the developing-fluids at the normal temperatures, but will yield and dissolve under the action of heat in watery solutions, may be employed without departing from the spirit of my invention.

By the expressions "insoluble gelatine film" and "relatively insoluble gelatine film," as herein employed, is meant a film which will withstand the solvent action of water for a greater time or to a greater degree than the intermediate or soluble film.

In speaking of an insoluble film I do not mean to be confined to a film which is absolutely insoluble in water, the invention embracing any film which is adapted to withstand the solvent action of water in a marked degree.

I claim—

1. As a new article of manufacture, a sensitive photographic film consisting of a coating of insoluble sensitized gelatine, a paper or equivalent support, and an interposed coating of soluble gelatine.

2. In a photographic film, the combination of the support A, the insoluble sensitive gelatino-argentic-emulsion film C, and the soluble interposed gelatine layer B, substantially as described.

3. In a film for photographic purposes, the combination of a backing sheet or support of

paper or like material, a film of sensitized gelatine adapted to withstand the solvent action of water, and an intermediate film of soluble gelatine.

5 4. The herein-described sensitive flexible photographic film, consisting of the support A, having a layer of insoluble sensitized gelatine, C, attached thereto by means of an interposed soluble gelatine substratum, said film
10 being rendered flexible by means of glycerine, substantially as described.

5. As an improvement in the art of photography, the process consisting in, first, providing an insoluble sensitive gelatine film affixed
15 by solvent material to a supporting-sheet; second, in exposing and developing said film; third, attaching the developed film to a rigid plate by means of wax or its equivalent; fourth, in detaching the support from the film
20 by the application of heat; and, fifth, stripping the film from the waxed surface.

6. As a new article of manufacture, a sensitive photographic film composed of a paper or equivalent support, an insoluble sensitized film, and an intermediate soluble attaching- 25 film insoluble in the developing-fluids, and at normal temperatures, but rendered soluble by the application of heat in watery solutions, substantially as described.

7. As a new article of manufacture, a sensitive photographic film composed, essentially, of 30 a paper or equivalent support, a film of sensitized gelatine, and an interposed attaching-film, the said sensitized film being insoluble, and the said intermediate attaching-film being 35 insoluble with respect to the developing-fluids but rendered soluble in water by the application of heat, substantially as described.

GEORGE EASTMAN.

Witnesses:

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