

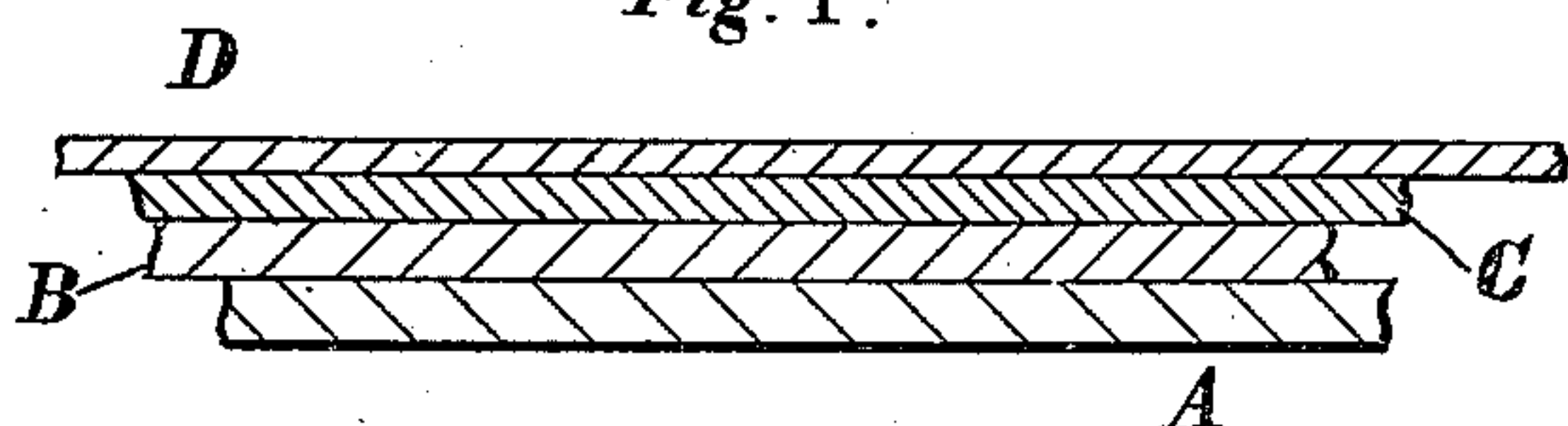
(No Model.)

W. H. WALKER & G. EASTMAN.  
FLEXIBLE PHOTOGRAPHIC FILM.

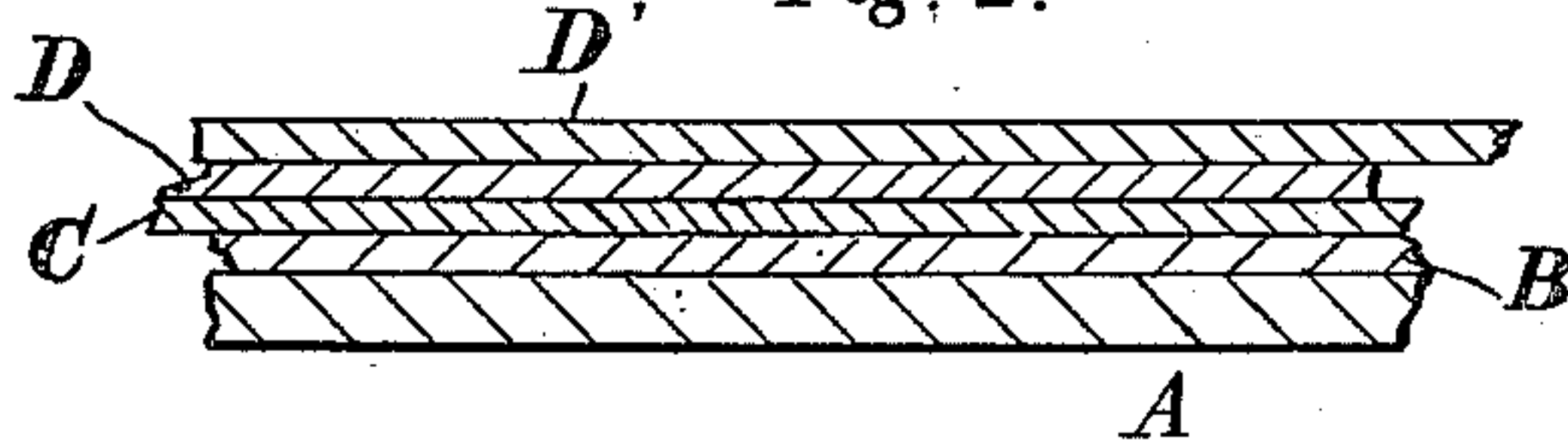
No. 420,130.

Patented Jan. 28, 1890.

*Fig. 1.*



*Fig. 2.*



WITNESSES =

*Jas. F. Gordon  
 H. G. Phillips.*

INVENTORS =

*Wm. H. Walker, and  
 George Eastman,  
 by Geo. B. Selden.  
 atty -*

# UNITED STATES PATENT OFFICE.

WILLIAM H. WALKER AND GEORGE EASTMAN, OF ROCHESTER, NEW YORK,  
ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE EASTMAN DRY PLATE  
AND FILM COMPANY, OF SAME PLACE.

## FLEXIBLE PHOTOGRAPHIC FILM.

SPECIFICATION forming part of Letters Patent No. 420,130, dated January 28, 1890.

Application filed June 27, 1884. Serial No. 136,132. (No model.)

*To all whom it may concern:*

Be it known that we, WILLIAM H. WALKER and GEORGE EASTMAN, citizens of the United States, residing at Rochester, in the county of Monroe, in the State of New York, have jointly invented certain Improvements in Flexible Photographic Films, of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates to certain improvements on the inventions described in the patents of George Eastman, (one of the present joint inventors,) No. 306,594, dated October 14, 1884, and of George Eastman and William H. Walker, (the present applicants,) No. 306,470, dated October 14, 1884, which improvements are fully described in the following specification, and the novel features thereof specified in the claim hereunto annexed.

Our present improvements in photography are illustrated in the accompanying drawings, in which—

Figures 1 and 2 are sections on an enlarged scale through our improved photographic films embodying the inventions herein described.

In the practical operations of producing our improved photographic films embodying the inventions claimed herein, we take any suitable paper A, Figs. 1 and 2, and apply to one side thereof by any suitable means a coating or layer of soluble gelatine B. We prefer to use those kinds of paper known in the photographic trade as "Saxe" or "Rives," on account of their freedom from chemical impurities and the evenness of their texture; but other brands of paper may be employed. The gelatine is dissolved in water in the proportion of about fifty grains to the ounce, the exact proportions being not very material, depending somewhat on the temperature of the atmosphere and the means by which the paper is coated, the object being to cover the paper with a thin uniform layer of gelatine. Any suitable gelatine may be employed that will not dissolve in water at ordinary temperatures; but we prefer to use Nelson's No. 1 or a mixture of Nelson's No. 1 and Simeon's hard gelatine in about equal proportions. The paper support may be coated by hand by

any suitable device, or by floating the support on the solution of gelatine; but we prefer to employ mechanism which we have invented for this purpose, and which mechanism we design to make the subject of a separate application for Letters Patent.

As the next step in the preparation of our improved photographic films, we pass the paper support coated with the layer of soft gelatine after drying through a suitable set of calender-rolls, by which the support and coating are compressed and hardened and the surface of the gelatine layer or substratum is smoothed or polished and rendered more suitable for the subsequent operations. The calendered support and substratum A and B are then coated on the surface of the substratum with another layer C, which consists of gelatine rendered insoluble by the addition thereto of chrome-alum or other suitable chemical, or by a layer of plain collodion or shellac or other suitable gum dissolved in alcohol or spirits, the object of this second coating being to isolate the emulsion film D from the soluble substratum B and to improve the surface on which the emulsion is coated. The gum or collodion layer C may be applied by floating on the surface of the solution or by hand or by machinery, in any preferred manner. The coated support is then again allowed to dry. If the second coating consists of gelatine, it may be of a strength of about fifty grains to the ounce of water and one-half grain of chrome-alum. We prefer to use insoluble gelatine for the second coating on account of its being cheaper. The support provided with the double coating may be again calendered, (and we prefer to do so,) after which it is ready to receive the coating of the sensitive gelatino-argentic emulsion D. The coated and calendered support is now covered with a layer of sensitive gelatino-argentic emulsion, the preparation of which is now too well known to require description here. The emulsion is spread evenly over the support in any suitable way, by hand or machinery, and after it has been dried thereon our improved photographic films are ready for use. The emulsion is rendered insoluble



by treatment with chrome-alum or other suitable chemical, as described in the before-mentioned applications, and all the operations of exposure, development, and the separation of the film containing the image from the support may be conducted in the same way as indicated in the said previous applications.

In the practical operation of preparing emulsions on a manufacturing scale, and especially with some formulas, it frequently happens that the finished emulsion is too thin to give sufficient body with a single coat, in which case we apply a second coating of emulsion (see D', Fig. 2) after the first has dried. The second coating of emulsion also enables us to modify the chemical effects—as, for instance, when the first coating of emulsion proves too slow, the sensitiveness of the film may be increased by applying another coating of a quicker emulsion, which may be quite thin or dilute. The first coating in this case gives the requisite printing density, while the second imparts the requisite sensitiveness to light.

Glycerine may be employed in any of the coatings into which gelatine enters as a base, in order to give a certain amount of flexibility to the completed film. The proportion of glycerine may be varied, the flexibility increasing with the quantity employed; but about two or three per cent. of it added to the bulk of the coating solution will answer the purpose.

The double coating of emulsion may be applied to a flexible support provided with a single layer of the substratum, as described in the applications hereinbefore mentioned.

The interposition of the layer C of relatively less soluble gelatine or of a suitable gum isolates and separates the emulsion layer D from the soluble gelatine coat B and overcomes a difficulty which we have sometimes encountered in coating the support with emulsions made from some samples of gela-

time, which require to be coated at a somewhat high temperature, the effect of which is to partially dissolve the soluble substratum and the surface of this second coating is much improved and rendered more suitable for the application of the emulsion thereto by the calendering, which polishes and smooths it and renders the layer of the emulsion more uniform.

The object sought by employing a double substratum or two layers between the support and the emulsion film—that is, the improvement of the surface and the filling up of any irregularities in the paper—may be attained by the use of two coatings of soluble gelatine, either or both of which may be calendered when dried. The only object sought in rendering the second coating C in any degree insoluble is to prevent its being softened by the application of the emulsion. With emulsions which can be coated at a low temperature it is unnecessary to harden the second coat C.

The double coating with emulsion renders our improved photographic films more substantial and less readily injured by handling, and greatly facilitates the process of removal from the support, besides enabling us to overcome the objections already mentioned arising from thin emulsions or from those deficient in sensitiveness.

We claim—

As an improvement in the art of photography, the herein-described sensitive flexible film, consisting of a flexible support A and a layer of sensitized gelatine emulsion D, attached to the support by a coating B of relatively more soluble gelatine, and an interposed layer of insoluble material C, substantially as and for the purposes set forth.

WM. H. WALKER.

GEORGE EASTMAN.

Witnesses:

GEORGE B. SELDEN,  
F. B. HUTCHINSON.