

(No Model.)

2 Sheets—Sheet 1.

H. M. REICHENBACH.
MANUFACTURE OF FLEXIBLE PHOTOGRAPHIC FILMS.
No. 417,202. Patented Dec. 10, 1889.

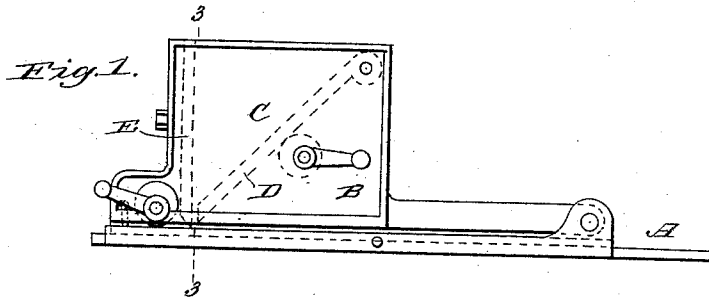


Fig. 2.

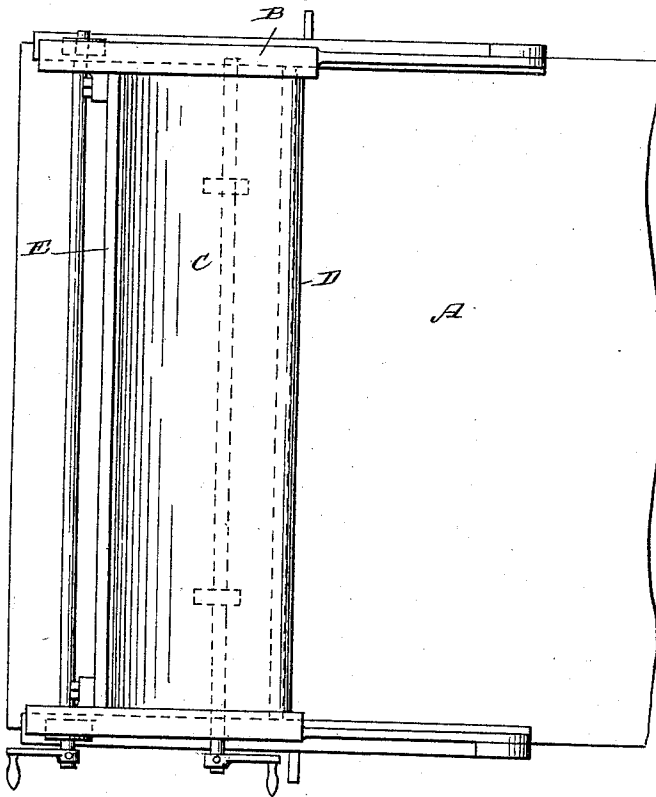
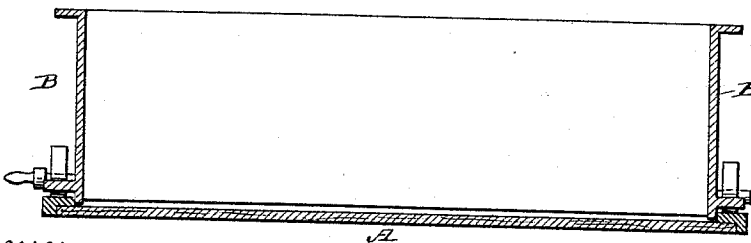


Fig. 3.



Witnesses

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2 Sheets—Sheet 2.

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Fig. 4.

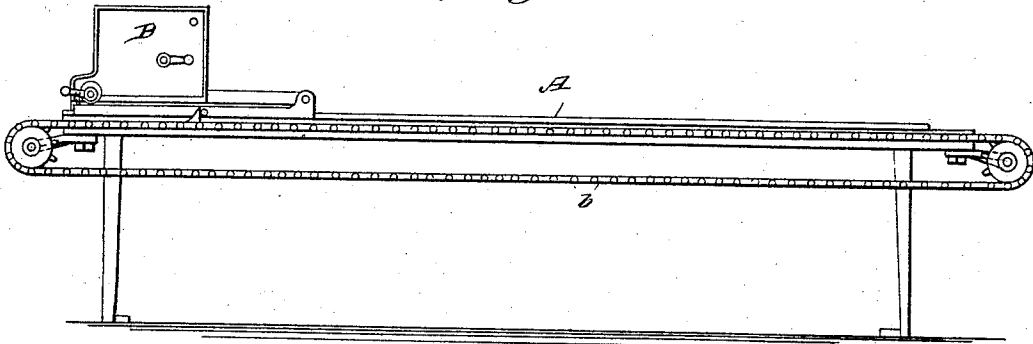


Fig. 5.

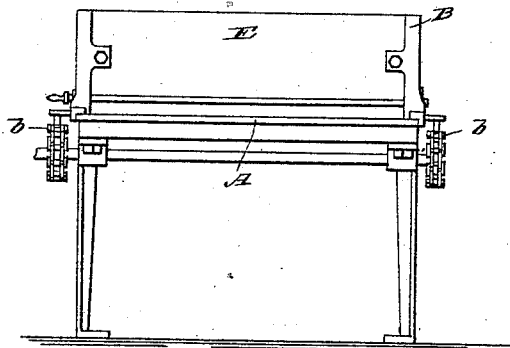


Fig. 6.

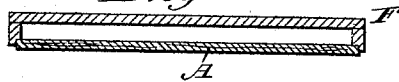
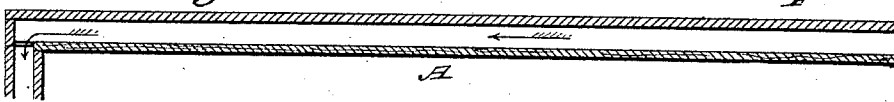


Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

HENRY M. REICHENBACH, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE EASTMAN DRY PLATE AND FILM COMPANY, OF SAME PLACE.

MANUFACTURE OF FLEXIBLE PHOTOGRAPHIC FILMS.

SPECIFICATION forming part of Letters Patent No. 417,202, dated December 10, 1889.

Application filed April 9, 1889. Serial No. 306,575. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. REICHENBACH, a citizen of the United States, residing at Rochester, county of Monroe, and State of New York, have invented certain new and useful Improvements in the Manufacture of Flexible Photographic Films, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to improvements upon or pertaining to the manufacture of flexible photographic films; and it consists in the improvements hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of the devices for depositing and spreading the fluid solution and emulsion hereinafter described. Fig. 2 is a plan view of the same. Fig. 3 is a section of the same on the line 3 3 of Fig. 1. Fig. 4 is a side elevation of the said devices and the means for moving the same. Fig. 5 is an end view of the same. Fig. 7 is a longitudinal vertical section of a casing with a conduit leading therefrom; and Fig. 6 a transverse section of Fig. 7.

Similar letters of reference in the several figures indicate the same parts.

Prior to my improvements in the preparation and manufacture of films of a fluid solution of nitro-cellulose and camphor to form the support or backing for a sensitive film for photographic purposes the nitro-cellulose and camphor were dissolved to form a clear fluid solution in a suitable solvent, and the solution was spread in an even coating upon a rigid supporting-surface, such as plate-glass. The film thus formed, which I shall term the "film-support," was permitted to dry or harden, after which a layer or film of gelatino-argentic emulsion was applied to the surface of the film-support, and after having been dried—the two forming what I shall term a "photographic film"—was stripped from the glass and was ready for use in ordinary roll-holders, such as the Eastman-Walker roll-holder, and for negative-making.

In using a solution of nitro-cellulose and camphor in methyl-alcohol on a large scale, in the endeavor to produce large film-supports

to support and sustain the sensitized film, it was found that in drying such film its exposed surface was liable to become pitted or covered more or less with small depressions, and was otherwise objectionable. In seeking for a remedy I have discovered that if a small quantity of fusel-oil is added to the solution before spreading upon the glass or other rigid supporting-surface the formation of irregularities in the surface of the film-support during the drying process, and other objections, are almost entirely avoided, and upon further investigation and experiment I have ascertained that the resulting product could be still further improved by the addition of a small quantity of amyl-acetate.

Up to the present time the best results have been obtained with a solution prepared in about the following proportions: Dissolve nine thousand grains of nitro-cellulose and five thousand four hundred grains of camphor in one hundred and twelve ounces of methyl-alcohol, and to the solution thus obtained add twenty-eight ounces of fusel-oil and seven ounces of amyl-acetate. The nitro-cellulose is dissolved in the methyl-alcohol and the gum-camphor added, the solution being made in a closed vessel which is subjected to gentle heat and agitation to expedite the action of the alcohol. After this solution is made the fusel-oil and amyl-acetate are then added thereto.

To remove all unconverted or imperfectly-dissolved substances and to clarify the solution, I prefer to filter it through fine cotton cloth. Apparently the fusel-oil operates to retain the camphor in solution during evaporation of the volatile constituents and to retard and render more uniform the evaporation of the liquid solvent, so that the film-support, when dried, will preserve the smooth and even surface produced when the fluid solution is first deposited and spread upon the rigid supporting-surface. The amyl-acetate appears to operate in the solution to assist the fusel-oil in preserving the evenness of the surface of the film-support, preventing the formation of pits or small depressions thereon during the drying of the same.

Having prepared a fluid solution of nitro-cellulose and camphor in methyl-alcohol and

added a proper quantity of fusel-oil, and, when necessary or desired, amyl-acetate, the next operation is to spread the solution upon a rigid supporting-surface in a thin layer or film, care being taken to secure contact with such surface and prevent the formation of bubbles between it and the solution, after which the film, while still on such surface, is dried, thereby forming a flexible photographically-structureless film-support, which adheres firmly to the rigid supporting-surface.

If the fluid solution is applied directly to the perfectly clean surface of a glass plate, then dried while still upon such surface, then coated with gelatino-argentic emulsion and again dried, the photographic film will, when dried, be found to adhere so firmly to said rigid supporting-surface that it can be removed only by the application of considerable force, sometimes resulting in the tearing of the photographic film, or stretching it unequally, so that it will buckle and be unfitted for use in roll-holders and for negative-making.

To facilitate the subsequent removal or stripping of the completed photographic film, I rub or coat the surface of the glass or other rigid supporting-surface with a very weak solution of mineral wax in benzine or other suitable solvent, or a weak solution of bees-wax, or with any other equivalent agent to produce the same result, before spreading the fluid solution upon said rigid supporting-surface. This preliminary coating should be of a character to weaken without preventing the adhesion of the film-support to the glass surface, as it is very desirable that this film-support when dried should adhere throughout its whole under surface to the rigid supporting-surface during the application thereto and drying of the gelatino-argentic emulsion film and until the photographic film is ready for removal and use. Heretofore the fluid gelatino-argentic emulsion has been spread upon the surface of the film-support in a thin layer or film; but experience has shown that when this is done it will not adhere to all points, but will be detached or separated in spots, forming blisters in the photographic film. This I have ascertained is due, in part at least, to the greasy character of the surface of the film-support, to remove which I first wash such surface, preferably with clear water, to which has been added two or three per cent. of a binding agent—such as silicate of potash or silicate of soda—then dry the same, and then spread the layer or film of gelatino-argentic emulsion evenly upon the washed surface, whereby it is caused to stick and adhere. The next step is the drying of the film of gelatino-argentic emulsion, after which the film is stripped from the rigid supporting-surface, preferably by detaching one end and applying it to a winding device.

The depositing and spreading of the fluid

solution is best accomplished by mechanical devices illustrated in the drawings, wherein A designates a rigid supporting-surface, preferably composed of polished plate-glass, mounted in a suitable frame with the upper surface of the glass level. Extending transversely across and above the surface A is a carriage B, which is mounted upon guides or upon the opposite edges of the surface A, and is caused to traverse longitudinally of said surface by means of suitable driving mechanism, such as chains or belts *b*. The carriage B is provided with a hopper C, carrying the fluid solution, and also with an adjustable gate or valve D, for controlling the flow of the solution, and with an adjustable spreading-blade E in the rear of the opening, through which the solution is deposited upon the surface. The edge of this blade E should be adjusted and held at all times parallel with the surface A over which it travels, in order that the solution may be spread in a film of substantially uniform thickness. In operating with this mechanism the fluid solution is placed in the hopper C and the discharge therefrom regulated and proportioned by the adjustable gate or valve D, and the carriage is moved at a regular speed by the chains or belts *b* over the surface A, the adjustable scraper-blade E spreading the solution discharged from the hopper in a film of substantially uniform thickness upon the surface A. The layer of solution having thus been spread upon the surface A, the next step is to dry the same while it is attached to said supporting-surface. This can be accomplished in any convenient way which will enable the volatile constituents to pass off by evaporation from the exposed surface of the film—as, for example, by leaving the same exposed to the influence of the atmosphere, which may be artificially heated or not, as preferred.

The film of gelatino-argentic emulsion may be spread upon the film-support by the same mechanism that I have just described for depositing and spreading the fluid solution upon the rigid supporting-surface.

After the film of gelatino-argentic emulsion has been dried the photographic film is stripped by means of a winding device, such as a roller mounted upon a carriage traversing longitudinally the rigid supporting-surface A, or in any other way.

I do not herein claim as my invention the process of making flexible photographic films, which consists in flowing liquid celluloid upon a plate or support, drying the same, then coating with a photographically-sensitive material, and after drying said coating removing the film of celluloid and sensitive material thus formed from its original support. Nor do I claim herein that part of the invention described relating to the preparation of the plate, by waxing or otherwise, preliminary to the application of the nitro-cellulose, the washing of the nitro-cellulose film preparatory to the application of

the gelatino-argentic emulsion, nor the employment of a binding solution or material such as described, since these features are reserved for and made the subject of a divisional application filed by me November 18, 1889. Serial No. 330,638.

Having thus described my invention, what I claim as new is—

1. The hereinbefore-described improvement in the art of forming flexible film-supports which consists in adding fusel-oil to a fluid solution of nitro-cellulose and camphor and subsequently depositing and spreading such solution upon a rigid supporting-surface and drying it.

2. The hereinbefore-described improvement in the art of forming flexible film-supports, which consists in combining methyl-alcohol, camphor, nitro-cellulose, and fusel-oil to form a fluid solution, and then depositing and spreading the latter upon a supporting-surface and drying the same.

3. As an improvement in the art of producing flexible film-supports, the hereinbefore described improved step in the process, which consists in forming the fluid solution of a mixture of methyl-alcohol, fusel-oil, nitro-

cellulose, and camphor, to form a fluid solution for spreading in a thin film upon a support.

4. As an improvement in the art of producing flexible film-supports, the addition of amyl-acetate to a fluid solution of nitro-cellulose and camphor in a liquid solvent and the subsequent depositing and spreading of said solution in a film upon a supporting-surface and drying the film upon the latter.

5. As an improvement in the art of producing flexible film-supports with smooth surfaces, the same consisting in adding fusel-oil and amyl-acetate to nitro-cellulose, camphor, and a fluid solvent, and subsequently spreading the fluid solution in a thin layer or film upon a supporting-surface and drying the said film preliminary to the application of a film of gelatino-argentic emulsion.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HENRY M. REICHENBACH.

Witnesses:

GEORGE EASTMAN,
FRED F. CHURCH.