

UNITED STATES PATENT OFFICE.

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COLORED PHOTOGRAPHIC PRINT AND MAKING SAME.

960,939.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, FREDERIC E. IVES, a citizen of the United States, residing in Woodcliffe-on-Hudson, Weehawken, New Jersey, have invented certain Improvements in Colored Photographic Prints and in Making Same, of which the following is a specification.

My invention is an improvement upon a method which I described in a paper published in the *Journal of the Camera Club*, London, April, 1894, page 63, as follows:

"The examples which I shall show were made from photochromoscope negatives. * * * Bichromatized gelatin films on clear celluloid were exposed from the back by electric light, developed as carbon prints, the images cut apart and each dyed to a suitable depth by immersion in a solution of its proper printing color. * * * A great degree of precision is necessary to secure the correct proportionate depth of coloring in the three prints."

The above described process was not as practical as was desired for the following among other reasons: 1. Celluloid films thick enough to be satisfactorily coated with the necessary thickness of gelatin for the process were objectionable because of color and of shrinkage and tendency to buckle through gradual evaporation or solution of contained camphor, and because when the prints were used as lantern slides the effect of heat in the lantern upon the celluloid was liable to destroy or seriously damage the pictures. 2. The bichromated gelatin film must be of such thickness that detail may be retained in the prints from both ends of the scale of gradation from black to white of the negative, and owing to the small percentage of bichromate salt that can be incorporated with gelatin without crystallization in drying, the gelatin film must be so thick as to make the process of development in warm water tediously slow, and the resulting print difficult to color up correctly, since if the color bath proved to have been too strong for the subject, washing to reduce the strength acted relatively too fast upon the thin parts, and strengthening by the use of a stronger dye bath, also acted relatively too fast on the thin parts. 3. The

finished color prints were seldom as sharp as is desirable, and the relief was so great that it became necessary, in order to obtain satisfactory results with the lantern slides, to seal the prints together with Canada balsam. By my improved process, all of these difficulties and defects are substantially eliminated, the time and labor involved greatly reduced, and the quality of the results improved. These improvements have been effected by substituting a film of amyl-acetate collodion for celluloid, and a coating of bichromated fish glue for bichromated gelatin; but these substitutions involve new methods of procedure, which are a part of my invention.

The amyl-acetate collodion film, containing no camphor, is unaffected by water and by any temperature to which the prints are ever legitimately subjected. So much bichromate salt may be incorporated with the fish glue without crystallization in drying, by heat, that a much thinner coating is sufficient for the purpose than when gelatin is employed, furthermore, the development may be made in cold water and completed in a few seconds, the dyeing and finishing of the color print may be effected in a few minutes, and the relief of the print is so slight as to be practically unobjectionable.

In carrying out my invention, I proceed as follows: Clean sheets of glass are leveled and evenly coated with liquid amyl acetate collodion, and allowed to dry spontaneously, though afterward they may be subjected to heat to drive off the last traces of volatile matter. The collodion surface of the plates is flowed with a solution of fish glue and bichromate of ammonia, spread with a photo-engraver's whirler, and dried by moderate heat while whirling. The collodion film, bearing the bichromated fish glue coating, is stripped from the glass and exposed to daylight or suitable substitute such as the electric arc, under the photographic negative, with the collodion side next to the negative.

By immersion in running water, the print is fully developed in a few seconds, those portions of the sensitized coating which have not been acted upon by the light, being dissolved and washed away, leaving a relief print, which may be at once immersed

in an aqueous dye bath, such as a solution of "neptune green" for a peacock blue print, a mixture of rhodamin and eosin for a crimson pink print, and brilliant yellow for a yellow print. They are sufficiently colored in a few seconds, or in a few minutes at most, then rinsed off and hung up to dry. The print is in low relief because of the very thin sensitized coating in which it was produced. The finished film color prints may be superposed in register between glasses to make trichromatic lantern slides or window transparencies, or upon paper or other opaque white surface to make composite color prints to be viewed by reflected light.

In making trichromatic lantern slides, I prefer to reduce the number of reflecting surfaces by cementing two of the film color prints to glass, and do this by laying them down on a wet gelatin-coated glass and putting them aside to dry over night or longer if necessary. They are then placed face to face, and the third print, on collodion film, held in place between them, with the images all brought into register, after which they are bound together to complete the lantern slide.

To superpose the color prints on paper, I may paste one face down on the paper, and after it has become perfectly dry by evaporation through the paper, the collodion film may be pulled off, leaving the print on the paper. The second print may then be pasted down on the first one, and when perfectly dry its collodion film pulled off. The third print may then be put down in the same way. In this process I prefer freshly made starch paste to gelatin or glue, using a liberal amount and pressing out the surplus by means of a squeegee. Care should be taken to use a suitable paste and to thoroughly dry the print before attempting to pull off the collodion film. It is evident that the collodion film might be dissolved off with amyl acetate instead of pulling it off, but the best and quickest method is to pull it off. Prints intended for application to paper should be colored up in a much weaker dye bath than is desirable for making lantern slides and window transparencies.

The amyl acetate collodion may be made by dissolving soluble gun cotton in amyl acetate, but substantially such a collodion of suitable consistency is a trade product, known as "albaline".

It should be understood that while a substitute for amyl acetate collodion may be used which is an equivalent therefor, within the scope of my invention, such for instance as an amyl acetate acetone collodion, the substitute should not be so porous as to absorb color in the dye baths, and for this

reason the ordinary alcohol-ether collodion is unsuitable. Even celluloid might be used in some cases as an equivalent of the amyl acetate collodion, where the color print is not intended for use in the lantern or is designed for such other use as will not subject it to an injurious degree of heat. A amyl acetate collodion however is preferred in all cases.

Gelatin can be "rotted" so as to act much like fish glue in carrying out my invention, hence the term "fish glue" should be taken as descriptive, rather than as rigidly definite, such term meaning a coating which will permit of the incorporation therewith of a relatively high percentage of the sensitive salt without crystallization. The coating is also, by preference, one which is soluble in cold water, and which, in solution, is of uniform character, and so fluid that it can be evenly distributed over the surface of its support by means of a whirler, and dried by the application of heat.

Instead of washing the print before immersion in the dye bath, the latter may also serve as a washing bath, the dye bath being so inexpensive that the limit to its period of usefulness, due to its gradual saturation with the fish glue, need not be considered.

I claim:

1. As an improvement in the process of making colored photographic prints, the mode herein described, which consists in providing the surface of a transparent supporting body with a sensitized coating of cold-water-soluble glue, then exposing this sensitized coating, through the transparent support, to light coming through a negative, and then developing in water to produce a relief print graduated in thickness.

2. As an improvement in the process of making colored photographic prints, the mode herein described, which consists in providing the surface of a transparent supporting body with a sensitized coating of cold-water-soluble glue, then exposing said sensitized coating, through the transparent support, to light coming through a negative, and then developing and dyeing the said exposed coating to produce a colored relief print graduated in thickness.

3. As an improvement in the process of making colored photographic prints, the mode herein described, which consists in providing the surface of an amylacetate collodion film with a sensitized coating of fish glue, then exposing said sensitized coating, through the collodion film, to light coming through a negative, and then developing and dyeing the exposed coating to produce a colored relief print graduated in thickness.

4. As an improvement in the process of

making colored photographic prints, the mode herein described, which consists in providing the surface of an amyloacetate collodion film with a sensitized coating of fish glue soluble in cold water, then exposing said sensitized coating, through the collodion film, to light coming through a negative, and then developing and dyeing the exposed coating to produce a colored relief print graduated in thickness.

5. As an improvement in the process of making colored photographic prints, the mode herein described, which consists in providing the surface of an amyloacetate collodion film with a sensitized coating of fish glue, then exposing said sensitized coating, through the collodion film, to light coming through a negative, and then developing and dyeing said coating to produce a colored relief print graduated in thickness.

6. As an improvement in the process of making colored photographic prints, the mode herein described, which consists in providing the surface of an amyloacetate collodion film with a sensitized coating of fish glue soluble in cold water, then exposing said sensitized coating, through the collodion film, to light coming through a negative, and then developing and dyeing said coating to produce a colored relief print graduated in thickness.

7. As an improvement in the process of making colored photographic prints, the mode herein described, which consists in applying an amyloacetate collodion film to a rigid support, providing the exposed face of said film with a sensitized coating of fish glue, stripping the coated film from its support, then exposing the sensitized coating, through the collodion film, to light coming through a negative, and then developing and dyeing the coating to produce a colored relief print graduated in thickness.

8. As an improvement in making trichromatic photographic prints, the mode herein described which consists in providing the surfaces of each of three amyloacetate collodion films with a sensitized coating of fish glue, exposing each of said coatings, through the collodion film, to light coming through a negative representing its respective color sensation, developing and dyeing the coatings to produce three properly colored relief prints graduated in thickness, pasting one of said prints face down upon an opaque surface, stripping the collodion film from the print when the latter is dry, and then superposing the other prints upon said first print by a repetition of such pasting and stripping operations.

9. As an improvement in the process of making colored photographic prints, the mode herein described which consists in coat-

ing one surface of a transparent support with sensitized fish glue, spreading and drying said coating by whirling the same under moderate heat, and then producing a dyed relief print in said coating.

10. As an improvement in the process of making colored photographic prints, the mode herein described which consists in coating one surface of an amyloacetate collodion film with sensitized fish glue, spreading and drying said coating by whirling the same under moderate heat, and then producing a dyed relief print in said coating.

11. As an improvement in the process of making colored photographic prints, the mode herein described which consists in applying a transparent film to a rigid support, drying said film, coating the exposed surface of the dried film with a sensitized solution of fish glue, spreading and drying said coating by whirling the same under moderate heat, stripping the coated film from its support, and producing a dyed relief print in said coating.

12. As an improvement in the process of making colored photographic prints, the mode herein described which consists in applying an amyloacetate collodion film to a rigid support, drying said film, coating the exposed surface of the dried film with a sensitized solution of fish glue, spreading and drying said coating by whirling the same under moderate heat, stripping the coated film from its support, and producing a dyed relief print in said coating.

13. A film for the production of a colored photographic print, the same consisting of a supporting film of transparent material having a sensitized surface coating of fish glue.

14. A film for the production of a colored photographic print, the same consisting of a supporting film of amyloacetate collodion having a sensitized surface coating of fish glue.

15. A film for the production of a colored photographic print, the same consisting of a supporting film of transparent material having a sensitized surface coating of fish glue soluble in cold water.

16. A film for the production of a colored photographic print, the same consisting of a supporting film of amyloacetate collodion having a sensitized surface coating of fish glue soluble in cold water.

17. A colored photographic print consisting of a supporting film of heat-resisting, non-absorbing collodion provided with a dyed relief print in fish glue.

18. A colored photographic print consisting of a supporting film of amyloacetate collodion provided with a dyed relief print in fish glue.

19. A composite colored photographic

print consisting of an opaque support carrying three directly superposed and differently colored relief prints, each graduated in thickness, and each constituting one member of the composite print.

20. A composite colored photographic print consisting of an opaque support carrying three directly superposed and differently colored relief prints in fish glue, each gradu-

ated in thickness, and each constituting one member of the composite print.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FREDERIC E. IVES.

Witnesses:

HAMILTON D. TURNER,
KATE A. BEADLE.