UNITED STATES PATENT OFFICE.

GEORGE EASTMAN, OF ROCHESTER, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE EASTMAN KODAK COMPANY, OF SAME PLACE.

MANUFACTURE OF PHOTOGRAPHIC FILM.

SPECIFICATION forming part of Letters Patent No. 584,862, dated June 22, 1897.

Application filed February 15, 1892. Serial No. 421,626. (No specimens.)

To all whom it may concern:

Be it known that I, GEORGE EASTMAN, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Photographic Film and Methods of Manufacturing the Same; and I do hereby declare the following to be such a full, clear, and exact description of the same as will enable one skilled in the art to practice the invention.

In the manufacture and use of photographic film such as is now in general use, consisting of a base or support of a nitrocellulose or similar compound, provided with a sensitive coating of gelatino-argentic emulsion, a considerable difficulty has manifested itself and large quantities of film have been rendered worthless by reason of the streaks or markings found in the sensitive coating upon development, caused by the sparks or electrical discharges produced when the film is rolled or unrolled in the roll-holders used for carrying it in long lengths, and also oftentimes during its manufacture and subsequent treatment, as when cut into strips or wound on the spools. These discharges manifest themselves as sparks, which are sufficiently bright to fog the sensitive emulsion in lines resembling discharges of static electricity, as seen, for instance, in flashes of lightning or discharges from a static electrical machine. Of course when the film is in this way practically exposed during manufacture it is rendered worthless at the exposed portions for negative-making purposes, and it is impossible to determine whether it has been thus fogged until it has been developed, which is of course too late to save the negative that may contain these damaged portions; and it is therefore the object of my present invention to obviate this difficulty and prevent the formation of these sparks or discharges by rendering the film-support "non-electric," so to say, by the addition to it of a suitable material which will not affect to any appreciable extent the quality of the support as a support—that is, will not render it too opaque for photographic uses by precipitating any of the substances therein, being precipitated by them, or coloring it, nor affect the sensitiveness of the emulsion applied to it.

After considerable experimenting I have discovered that if a small quantity of a metallic salt possessing the above characteristics and soluble in the solvents of nitrocellulose, preferably one of the alkali nitrates, as potassium nitrate or ammonium nitrate, be added to the emulsion support the latter is thereby rendered non-electric, and the objectionable electrical manifestations will be prevented both during the manufacture of the film, its subsequent treatment, and when used in roll-holders. These discharges or sparks are particulary apparent when the method of making film described in Letters Patent No. 417,202, granted December 16, 1889, to the Eastman Dry Plate and Film Company, is practiced, said method consisting in depositing or spreading a nitrocellulose compound upon a plate-glass support, the emulsion being afterward applied or coated upon it and the whole after drying being stripped from the support.

When making film according to this patent, I prefer to incorporate in the nitrocellulose compound a small quantity of ammonium nitrate, the proportion of which I have used with success being about ten (10) grains to the pound, but it is obvious that a larger or smaller amount could be used if not in sufficient quantity to affect the quality of the film or the film-support.

In Letters Patent No. 441,831, granted to me December 2, 1890, I have described an improved film consisting of a nitrocellulose support sealed between two gelatin coatings, one of which is the emulsion, said film being made by depositing upon a plate-glass table or support, first, a coating of insoluble gelatin, then a nitrocellulose compound, and finally the sensitive emulsion, the whole when dry being stripped from the glass, and in making this film also a considerable amount is rendered worthless by the electrical discharges produced when it is stripped from the glass, which, however, can be prevented

by adding to the solution of gelatin that is first deposited on the glass a quantity of potassium nitrate, and I have used with success about fifty (50) grains to the pound, but, as before stated, a greater or less amount such as would not affect the quality of the film may be employed.

As the proportion or the other ingredients employed in both the nitrocellulose compounds and the gelatin and the apparatus and manipulations necessary to manufacture the film have been described in the beforementioned patents and other applications now pending at the Patent Office, it is deemed unnecessary herein to specifically describe the same.

The film produced by my invention, having what I term a "non-electric" support, is found to be practically free from the electrical markings and can be wound and unwound and used in roll-holders of the usual or any preferred construction in long lengths without liability of being damaged from these causes, and small sheets or detached pieces of photographic film, the supports of which are rendered non-electric, either during the methods of manufacturing just described or when manufactured by other methods, can be used without liability of being affected in an objectionable manner.

While I have described one method of manufacturing my improved film and one material that can be used with success, I do not wish to be confined to either of these, as a number of other substances producing the same results can be used and other methods of manufacture employed.

I claim as my invention—

1. As an article of manufacture, a photographic film consisting of a non-electric transparent or translucent support containing a nitrocellulose compound and a superposed coating sensitive to the action of light, as set forth.

2. As an article of manufacture, a flexible photographic film consisting of a flexible transparent or translucent support composed of a nitrocellulose compound containing an inorganic salt soluble in nitrocellulose solvents, as methyl alcohol, and a superposed gelatino-argentic emulsion, as set forth.

3. As an article of manufacture, a flexible photographic film consisting of a flexible support composed of a nitrocellulose compound containing an alkali nitrate and a superposed gelatino-argentic emulsion, as set forth.

4. As an article of manufacture, a flexible photographic film consisting of a flexible support composed of a nitrocellulose compound containing ammonium nitrate and a superposed gelatino-argentic emulsion, as set forth.

5. As an article of manufacture, a flexible photographic film consisting of a flexible support composed in part of a nitrocellulose compound and rendered non-electric and a superposed gelatino-argentic emulsion, as set forth.

6. In the method of manufacturing sensitive photographic film involving the deposit upon a vitreous support of a fluid substance which when dry forms the support for the sensitive emulsion, and the subsequent stripping of the complete film from the vitreous support, the improved step consisting in rendering the emulsion support non-electric whereby when the film is stripped from said support electrical discharges and the consequent fogging of the film are prevented, as set forth.

7. The method of manufacturing transparent or translucent sensitive photographic film consisting in adding to a fluid nitrocellulose compound, which when dry forms the support for the sensitive emulsion, a quantity of an inorganic salt soluble in the solvents of nitrocellulose, as methyl alcohol, and which will not precipitate any of the materials of the compound, nor be precipitated by them, spreading said fluid compound upon a vitreous support, then drying it, then spreading a sensitive emulsion thereon, and drying it, and finally stripping the complete film from the vitreous support, as set forth.

8. The method of manufacturing sensitive photographic film consisting in adding to a fluid substance, which when dry forms the support for the sensitive emulsion, a quantity of an alkali nitrate soluble in the solvents of said substance, spreading said fluid substance upon a vitreous support, then drying it, then spreading a sensitive emulsion thereon, and drying it, and finally stripping the complete film from the support, as set forth.

9. The method of manufacturing sensitive photographic film consisting in adding to a fluid nitrocellulose compound which when dry forms the support for the sensitive emulsion, a quantity of ammonium nitrate, then spreading said compound upon a vitreous support and drying it, then spreading a sensitive emulsion thereon and drying it, and finally stripping the complete film from the vitreous support, as set forth.

10. In the method of manufacturing sensitive photographic film involving the deposit upon a vitreous support, first, of a gelatin solution, secondly, a nitrocellulose compound, and lastly, a sensitive gelatino-argentic emulsion, the whole when dry being stripped from the vitreous support, the improved step consisting in rendering the gelatin next the vitreous support non-electric by the addition to it of a quantity of potassium nitrate, whereby when the film is removed from the vitreous support electrical discharges are prevented as set forth.

GEO. EASTMAN.

Witnesses:
HORACE MCGUIRE,
FRED F. CHURCH.