

UNITED STATES PATENT OFFICE

2,168,971

METHOD OF INCREASING THE EFFECTIVE
SPEED OF A PHOTOGRAPHIC ELEMENTJohn G. Capstaff, Rochester, N. Y., assignor to
Eastman Kodak Company, Rochester, N. Y.,
a corporation of New JerseyNo Drawing. Application December 30, 1937,
Serial No. 182,516

2 Claims. (Cl. 95-6)

This invention relates to a photographic process and more particularly to a method of intensifying or rendering more developable a latent image produced by exposure in the usual manner in a sensitive gelatino-silver halide emulsion.

I have discovered that if, after exposure and before development, a film be submitted to heat, the latent image when developed yields an image having a greater density substantially greater than would otherwise be the case and with negligible increase in fog when the heat treatment has reached optimum value. This treatment makes it possible to reduce exposure and thereby obtain a developable image under conditions when it otherwise would be underexposed, and is particularly useful in color motion picture photography.

The process is applicable to films of the types usual in either black and white or color cinematography. The single film, or in the case of certain color processes, the separate color component films or films especially prepared for color photography are exposed in the usual way and then passed through a heating chamber at as elevated a temperature as is feasible without injuring the emulsion. The particular temperature and duration of the heat treatment must be determined by experiment for the particular film used.

As a typical example, I have found that submission of exposed and undeveloped panchromatic negative motion picture film to an atmosphere having a humidity of 80% and a temperature of 120° F. for a period of four hours will result in a density of the silver image, after development, equivalent to an increase in speed of the emulsion of the order of from 50 to 60 per cent. Under these conditions, an increase of 25 per cent is noted after an hour's heating, and the increase continues rapidly for several hours and then more slowly, reaching a value of the order of 200 per cent at the end of twenty-four hours.

Fog and loss of contrast, however, begin to appear after prolonged heating under humid conditions, so that from a practical standpoint, the example given represents what seems to be the best practice with ordinary commercial film. The effect is materially less if the humidity is reduced, but even with very low humidity, an increase of speed of at least 25 per cent with little fog has been obtained by exposure to a temperature of 120° F. for two days. In some instances, an increase in red and green speed

of over 40 per cent has been noted after submission to an atmosphere having 20% relative humidity and 120° F. for four hours.

This effect described may also be obtained but to a less extent by heating at lower temperatures for an extended time. Submission to an atmosphere having 80% relative humidity and a temperature of 90° F. for a period of four hours yields an increase in speed of the order of 20 to 25% and, under the same conditions, after a period of twenty-four hours of 20 to 90% varying with the emulsion, and the color of the light used in exposure.

At a relative humidity of 50%, the increase in twenty-four hours at 90% has in some cases been over 40%.

Even at temperatures but slightly above normal, a long incubation at high relative humidity produces a considerable added density.

It is further to be noted that with panchromatic film the effect is not uniform following exposure to lights of different colors. The gain in red speed has, in most instances, been found to be greater than the gain in green speed, particularly under humid conditions and at higher temperatures.

If this invention is to be utilized in the photography of colored objects, the characteristics of the particular film must be ascertained and taken into consideration in making the exposure.

This invention is particularly useful when exposures are necessarily made under marginal light conditions.

Having thus described my invention, what I claim as new and desire to be secured by Letters Patent is:

1. The method of treating a photographic element including a photographically sensitive gelatino-silver halide emulsion that comprises exposing said layer to a light image, maintaining the element for at least an hour at a temperature of the order of 120° F. and a relative humidity of the order of 80% and then developing an image in said layer.

2. The method of treating a photographic element including a photographically sensitive gelatino silver halide layer that comprises exposing said layer to a light image, maintaining the element for at least several hours at a temperature of the order of 120° F. in an atmosphere having a relative humidity of at least 50% and then developing an image in the layer.

JOHN G. CAPSTAFF.