

A MOTION PICTURE MADE IN 1916 BY A TWO-COLOR SUBTRACTIVE PROCESS

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The working principle underlying the two-color process known as *Kodachrome* is the use of a tanning bleach for treatment of the duplicate negative, which removes the negative image and differentially tans the area where the image existed. When the film is treated subsequently with dyes capable of dyeing soft gelatin, a positive dye image is produced.¹

This tanning bleach effect was first observed accidentally by J. G. Capstaff about 1910 when engaged in experiments to find a method of making carbon prints without recourse either to artificial light or to daylight in order to tan the bichromated gelatin tissues. In the course of his work, a darkroom safelight was required and he decided to make one by dyeing a waste plate. Not having one handy, he used an old negative plate, which he bleached, washed, and immersed in the dye solution. On examining the plate he was greatly surprised to observe that it showed a dye image. No further use was made of the observation, however, until several years later, after he had joined the staff of the Kodak Research Laboratory.

Experiments on the Kodachrome process were initiated by Mr. Capstaff in the fall of 1913, using glass plates as the preliminary materials with which to work out the details although from the beginning the process was regarded as one to be developed for color cinematography. So successful were these experiments that, in the fall of 1914, exhibits of color portraiture on plates were sent to London and to the Panama Pacific Exposition in San Francisco. Examples of the process were first shown publicly during the month of November, 1914, at the Memorial Art Gallery, Rochester, N. Y.² Besides its use for portraiture, Kodachrome attracted the attention of the medical profession as a process especially adapted to photography of pathological specimens. Dr. N. T. Beers, a prominent Brooklyn surgeon,

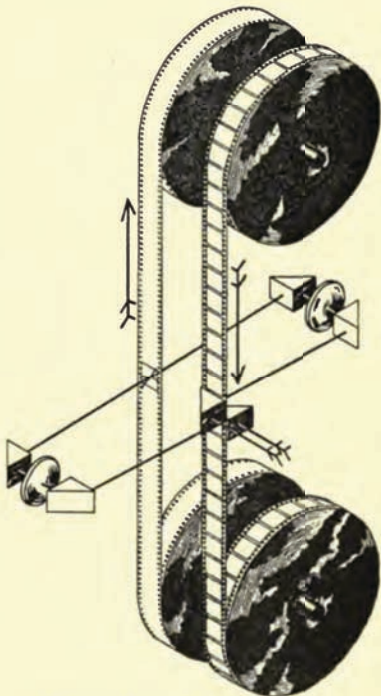
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has made many fine color transparencies with the process during the past fifteen years.

Early in 1915, the first experiments were started to work out the adaptation of the process to motion picture photography. A three-color camera was made over into a two-color camera using twin lenses for exposing the film, two pictures at a time, through green and red filters, the pull-down moving two frames each time.

The method of printing³ consisted in printing negative images from a master positive on opposite sides of a double coated film by means of an optical printer, a rough sketch of which appears in the figure. The duplicate negative was then bleached in a tanning bleach, cleared, and dyed with dyes complementary to the dyes used in the camera filters. The developing and dyeing equipment was of the crudest sort for these first experiments, and considering this fact, the quality of the pictures obtained at that time was remarkably good.

After the preliminary tests had been made on the process during 1915, it was decided to test the practical value of the method by actually photographing a motion picture story. Incidentally it was considered that this would reveal the weaknesses of the process as well. Miss Sylvia Newton prepared a scenario and the scenes were "shot" on the roof of the Laboratory and in Mr. Eastman's garden. Outside of the film and laboratory labor, the cost of the production was about zero. It is believed that this picture is the first motion picture story to be photographed by a two-color subtractive process. Gaumont and Urban had, of course, made pictures by additive processes previous to that time. The date of the production, July, 1916, is established



Two-color projection printer.

by a date on an actual letter written by request which appears in the first part of the picture.

The cast of characters in the picture which was called "Concerning \$1000" was as follows:

A promising young inventor.....	H. L. Halburt
His sister.....	Sylvia Newton
A friend.....	Doris Long
A child.....	Doris Mees
The father.....	Dr. C. W. Frederick

The results were naturally crude considered in the light of quality of present day color pictures, but are historically interesting as an example of an early color process. It may be noted in passing that one member of the cast has since married and is the mother of two grown children, whereas another member, the child, is now ready to enter the university.

Note.—The original two-color subtractive print (about 600 feet long) was shown at the conclusion of the paper.

REFERENCES

- ¹ U. S. Pat. 1,196,080, applied for Sept. 21, 1914.
- ² *Brit. J. Phot. Color Supp.*, 9 (Jan. 1, 1915), p. 3. See also note in *Brit. J. Color Supp.*, 8 (December 4, 1914), p. 48.
- ³ U. S. Pat. 1,478, 599, applied for Sept. 21, 1914.