

PHOTOGRAPHY

New Moving Pictures in Colors Use Tiny Colored Squares

TINY colored squares, each a seven hundred and fiftieth of an inch on a side, in orange, green and blue-violet, make possible the latest method of color movies. The new process, known as the Spicer-Dufay process, after its originators, was demonstrated recently to members of the Royal Society, in London. In a report to *Nature*, Dr. T. Thorne Baker comments on the faithfulness with which colors are reproduced.

Though novel in its application to the cinema, the system of using colored squares, through which the picture is exposed, is quite old in still photography. Before the War such a process was used commercially. This was known as the Paget process, and the colored squares were made on a screen that was placed in front of the plate when it was exposed. The colored squares were so small that they could only be seen with a microscope. With the naked eye, the screen appeared of a uniform grayish color.

The exposed plate, after development, showed a similar arrangement of squares, though uncolored, when viewed with a microscope. One square, on the negative, would be a record of the blues in that part of the picture, the one next to it, perhaps, of the red, and the one below it of the greens. From this negative, a transparent positive picture was made on another plate.

A screen, similar to that through which the picture was taken, was then carefully adjusted over this positive, and a reproduction of the original scene, in full color, was the result.

In the Spicer-Dufay process, a similar method is applied to the movies, and a very ingenious system is used to prepare the colored screen, which is placed right on the film. Starting out with a base of cellulose acetate, or non-inflammable film, one side is dyed green all over.

375 Lines in an Inch

Then the film is run through a special printing press, which prints on the green surface a series of parallel black lines, 375 to the inch, with equal clear space between. The film is then run through a bleaching bath, which dissolves out the green color in the intervening clear spaces; and then through a bath of orange dye to fill them in again. Next is a treatment with revolving brushes in tanks of benzol to remove the inked lines.

They have protected the green dye beneath them, so the result is a series of alternate orange and green lines, 375 of each to the inch. Then ink lines are printed over the film at right angles to the first, and after bleaching, a blue-violet dye is applied, and when

the ink is removed again, minute areas of all three colors cover the film.

After protecting layers are laid over the mosaic of color, a fast photographic emulsion, sensitive to all colors, is applied, and the film is ready for use. It is exposed in the camera, which requires no special attachments, and developed. But instead of making a print in the usual manner from a negative, the original film is "reversed" and converted into a positive itself. As the colored squares are still in the same relative position with respect to the negative as when exposed, a spot of the film that was exposed to green light appears green. This is because the film is black behind the orange and blue-violet square, so only green light can get through. The same thing is true of other colors.

Though this reversed negative is now capable of being projected on the screen, it is necessary to make copies if the method is to be practicable. Ordinarily, to copy this film directly on another unexposed film would result in unpleasant "moire" effects, such as can be seen when two screens are held together against a light background. However, this has been avoided, says Dr. Baker, using a lens in printing. This lens has very slight depth of focus, which means that it will focus sharply in one plane, while a point very slightly nearer to or farther from the lens will be out of focus.

Light passes through the original film, and the lens forms the picture on a strip of unexposed film, the two films moving along together. The actual picture, made of grains of silver, is focussed sharply, but the colored mosaic, only a twenty-five hundredth of an inch farther back, is diffused, and moire effects thus avoided. In making the copy, as in making the original film, the light passes through the film base before reaching the sensitive emulsion, unlike ordinary still or movie films, in which the film faces away from the lens.

The process can also be used for sound films, as it is possible to leave an uncolored strip a tenth of an inch wide along the side to take the sound track.

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