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STEREOSCOPIC PROJECTION IN NATURAL COLORS.

BY C. F. LORENZ.

The projection of pictures on a screen in such a way that they shall show relief, like that given by a stereoscope, has been accomplished by two methods, one of which depends on the use of polarized light, and the other on the use of color-filters. The following is an account of a modification of the latter method, which enables us to see the projected picture in relief, and at the same time in the original colors. A signal lantern is used.

As is well known, to make a natural-color lantern slide by the method of three superposed positives, three negatives are taken from the same point of view, through red, green and blue-violet color screens respectively; from these are made positives which are colored in the shadows and clear in the high-lights, the one from the red-record negative being cyan-blue, that from the green-record negative being magenta red or "pink," and that from the blue-violet record negative being yellow. Now let one of these negatives, say the green-record, be taken from a slightly different point of view; the pink print will then not register with the other two, and the resulting picture will be blurred. But when the screen is viewed through a pink glass over one eye and a green glass over the other, then the picture will stand out in relief, provided that the pink and green glasses are held respectively over the proper eye, because the pink picture will be invisible to the eye covered with the pink glass, while the picture formed by the combination of the yellow and the cyan-blue prints will appear to this eye as a picture black in the

shadows and pink in the lights. Similarly, the latter picture will be invisible to the eye covered with the green glass, but the pink picture will appear to this eye as a picture black in the shadows and green in the lights. Thus the condition for stereoscopic vision, which is that the one eye shall see only the one picture and the other eye only the other picture, is fulfilled. It might seem at first thought that the differences in the pictures due to the fact that the negatives were taken through color-screens might cause a difficulty, but experiment shows that the relief is perfect. The prints should be made to register in the background.

Now, since certain colors are prevented from entering each eye it follows, of course, that each eye alone can not see a natural color picture, but since the one filter transmits just what the other stops, the brain will get the correct colors provided that it can combine the color sensations. Although ordinarily when we attempt to combine in the brain color sensations received by the two eyes there occurs what is called color rivalry, there being a predominance first of one and then of the other color, yet under the conditions here described, where the attention is fixed by a picture, the brain seems to have the power of making the combination. At any rate, experiment shows that when the viewing glasses are of the proper relative density, then the picture is seen not only in bold relief, but also in its natural colors.

Such a stereoscopic transparency also shows well when viewed through the colored spectacles directly, instead of being projected. Prints on paper similar to the well-known "anaglyph" prints could also be made.

Evidently, instead of using green and pink for the spectacles we can use either of the other primary colors together with its complementary, namely, red and cyan-blue, or blue-violet and yellow, the negative taken from the displaced point of view being in the former case the red-record negative, so that the cyan-blue print is the odd one, and in the latter case the blue-violet record negative, so that the yellow print is the odd one.