A TRICHROMATIC COLORIMETER

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Zusammenfassung

Nachtrag zu dem Artikel „Een trichromatische colorimeter", Physica 13, 1933, 77. Einige Ausbesserungen vorgenommen an diesem Kolorimeter werden erörtert. Besonders wird beschrieben auf welche Weise die früher auftretende Parallaxe aufgehoben wurde.

As a supplement to the paper „Een trichromatische Colorimeter" (1) the following improvements of the instrument, there described, may be communicated. In the original optical arrangement (see fig. 1). the three diaphragms D_1, D_2 and D_3 were imaged by the lens F_1 at the focus of F_2. The lenses F_2, F_4 and F_6 formed, in their turn, an image at the pupil of the observer's eye O. In the same way the object V was imaged by the lens F_5 at a non-variable diaphragm (not reproduced in the figure) placed at the focus of F_3; of this aperture, limiting the effective surface of V, the lenses F_3, F_4 and F_6 formed an image likewise in the eye pupil.

Now, from the chromatic aberration of the eye together with the condition, that all the light of the several light-pencils had to pass completely through the ocular pupil[1]), a very inconvenient parallax appeared in the field of view, causing the two halves of the Lummer-Brodhun prism to make large excursions relative to each other at the slightest movement of the eye. Moreover, one half of the field is seen as three coloured patches, corresponding to R, G and B, which makes a satisfactory setting of the instrument very difficult indeed.

These effects have been studied already by Guild (2) and are described and explained by him in some of his publications[2]). To make this parallax disappear, Guild fits a system of rotating

1) This was the necessary condition for a suitable intensity-regulation.

2) I am indebted to Mr. Guild for his explanation and his kind help.

lenses close to the lens F_2, by which contrivance the image is spread out into a band which fills the exit-pupil; so he obtained the desired result [1]).

For various reasons it seemed desirable, however, to devise still another arrangement to get rid of this difficulty; we proceeded as

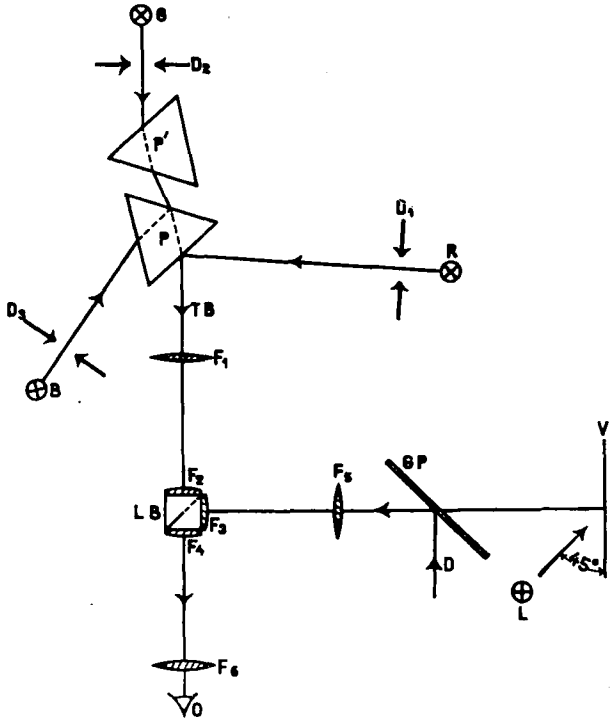

Fig. 1.

follows. The lens F_1 was chosen so, that the diaphragms D_1, D_2 and D_3 were at its focus. Immediately behind F_1 a piece of fine diffusing glass was placed and the distance between this piece of glass and the lens F_2 was equalized to the focal length of F_2. The pupil of the eye is now completely filled with light from the sources R, G and B.

The non-variable diaphragm in the lightbeam from V was enlarged, so as to fill the pupil also completely with its image.

By these simple alterations parallax effects could be made to entirely disappear without the introduction of rotating parts, of

1) For further details the reader is referred to the literature cited under (2).

which, besides, the application under the existing conditions would have been next to impossible.

The instrument needs not be gauged, because the illumination of the diffusing glass is proportional to the aperture of the diaphragms.

Another improvement, which was necessary in connection with the practical use of the instrument, regards the intensity-regulation of the testfield. Till now this regulation was effected by varying the distance between the source L and the object. A more convenient method, may be obtained by the application of a Brodhun sector [1]) immediately in front of F_5. It is true, that in doing this, a rotating part is introduced into the instrument, which is generally considered a disadvantage. Here, however, the disadvantage is more than counterbalanced by the gain of a much handier control. Besides, the arrangement and the dimensions of the instrument made the application of the distance-variation very troublesome in practice; so the introduction of the sector could not very well be avoided.

Another advantage, as it happens, is the fact, that the desaturation beam is reduced in the same ratio as the colour under test, so that the quality of the colour in the test-field remains the same. When distance-variation is applied, this is no longer the case.

It may further be mentioned, that the mercury lamps, which were used for the primaries G and B, did not prove to be sufficiently constant. It is therefore considered to replace them by Argenta bulbs with suitable filters.

In conclusion, I wish to express my sincere thanks to Prof. Dr. M. de Haas for his highly appreciated help in this research.

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LITERATURE

(1) H. P. J. Verbeek. Een Trichromatische Colorimeter. Physica **13**, no. 3, p. 77, 1933.

(2) J. Guild. Chromatic Parallax and its Influence on Optical Measurements. Proc. Phys. Soc. London vol. XXLIX, Part IV, p. 311, 1917.
J. Guild. On a New Method of Colorimetry. Trans. Opt. Soc., Vol. **27**, 1925—26.

1) This sector, which can be operated while rotating, is manufactured by Schmidt & Haensch.