ON INVARIANT AND SEMI-INVARIANT ABERRATIONS OF THE SYMMETRICAL OPTICAL SYSTEM.

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Introduction.

An attempt was made[1], by the present writer, to examine theoretically the diffraction patterns associated with the symmetrical optical system, as modified by the presence of the geometrical aberrations of the system, and the investigation was carried out as far as the first order aberrations were concerned, and for the region in the neighbourhood of the axis of the system. But, in order to consider the effects in the outer parts of the field it appeared necessary, as a preliminary measure, to examine the higher order geometrical aberrations themselves, and this[2], accordingly, has been undertaken in several papers. The five first order aberrations, commonly known as the 'five aberrations of VON SEIDEL' — although these had all been discussed fully by HAMILTON, by AIRY, and by CODDINGTON long before the time of VON SEIDEL — are *spherical aberration, coma, curvature of the field and astigmatism*, and *distortion*. And, in a detailed examination of these it becomes evident that one of them stands altogether apart from the others, and this in several respects: this aberration is *curvature of the field and astigmatism*. The condition for the absence of curvature of the field, the condition, that is to say, that a flat field should, in the absence of astigmatism, be reproduced as flat, is found to be independent of the positions of the object-image planes and of the positions of the pupil-planes, and also of the separa-

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[1] *Aberration Diffraction Effects:* Phil. Trans. Royal Soc. (Lond.) A. 225.

[2] see, for example, *The Aberrations of a Symmetrical Optical System*, Trans. Camb. Phil. Soc. XXIII, No. IX, and also *The Symmetrical Optical System:* Camb. Tracts in Mathematics and Mathematical Physics, No. 25.