PHOTOGRAPHIC APPARATUS " THE HYPERGONAR "

NOTE by M. HENRI CHRETIEN, *Professor at the Institute of Optics - Paris.*

Extract from Reports of Proceedings of the Meetings of the PARIS ACADEMY OF SCIENCES

(30*th May*, 1927).

The "Société Française de Physique", founded in 1873, organises each year a series of lectures during which scientists of all nationalities discuss the latest discoveries in physics and their application to industry.

These lectures are terminated by a public exhibition of the latest productions and inventions.

The last exhibition was held on 1st June, 1927, in the new buildings of the Paris Institute of Optics.

Among the new instruments, M. Henri CHRETIEN exhibited one which he called the *Hypergonar* and which consists of a system of lenses. With this device, fixed in front of a cinematograph camera or of an ordinary projecting lantern, it is possible to produce panoramic cinematography either in an horizontal or vertical direction without making any change in the cameras, thus avoiding the serious inconveniences of taking photographs with multiple cameras.

The relative dimensions universally adopted for the frames of cinematograph pictures, viz :

$$\text{height} : \text{length} = 3 : 4$$

are inconsistent with the suitable presentation of certain pictures, such as panoramas, which need a greater length, or high buildings, interiors of churches, forests of high trees, *etc.*, which require a greater height.

A method has been tried of overcoming the difficulty of this limitation, at least in the case of panoramas, by projecting the pictures on the same screen by means of several objectives as was previously done for fixed views by Messrs LUMIERE and Major MOESSARD. In cinematography, however, very great mechanical difficulties are met with, which it is practically impossible to surmount.

The keen interest recently shown by the public in the presentation of these panoramic films is an encouragement to point to a solution which can be put into immediate practice, since it applies to instruments in actual use, with films of ordinary dimensions ; moreover, it can be as easily used for horizontal panoramic as for vertical views.

This solution consists of fitting a special optical device called the *Hypergonar* over the objective and in front of the projecting lens. This device considerably increases the field but in one direction only, *i. e.* in the direction required for the extension, be it horizontal, vertical or even oblique.

At first sight, the Hypergonar recalls ABBE'S *anamorphot* but it differs nevertheless from the latter in two points of elementary dioptrics.

a) the generatrices of the cylindrical lenses, of which it is composed, are all parallel to each other, and not crossed as they necessarily are in the anamorphot ;

b) the image plane coincides with the object plane, *i. e.* these planes are in this system *Bravais planes*. Moreover, it is owing to this peculiarity, as demonstrated by ABBE, that the necessity of crossing the generatrices is avoided. In practice it has the effect of preserving the focus of the object and facilitating the correction of aberrations.

The pictures obtained with the hypergonar are reduced lineally in a fixed ratio of two or three times, but in the horizontal or vertical direction only, according to the direction of the generatrices of the lenses and this doubles or trebles, in the same direction, the size of the field registered on a film of normal dimensions. In projecting through a similar contrivance, the exact proportions are restored and thus a screen two or three times the extent in length or height is covered.

From the point of view of advanced dioptrics, spherical aberration and astigmatism are corrected. The distortion is reduced; but this aberration, which does not interfere with the clearness of the image, is automatically compensated by restitution through a similar optical system. Finally, chromatic aberrations are eliminated. Except for the feeble absorption of light by the supplementary lenses, the illumination of the objective is not changed by the addition of the hypergonar.

An instrument for doubling the field, with some films taken by it, was exhibited at the Academy of Sciences.

This optical device might be found very useful for taking panoramic views of coasts, because of the large field covered with the one object lens and thus the greater extent of coast-line taken.

It is known, moreover, that the views of coasts which accompany Sailing Directions generally have their height dimensions extended in a certain proportion with reference to their horizontal dimensions, in order to show more distinctly the characteristics of the vertical marks when seen from a distance.

The hypergonar would enable the effect of extension to be obtained directly from a photograph of the coast and a clear picture would be given, one dimension of which would be strongly "astigmatised" in the direction required for the extension.