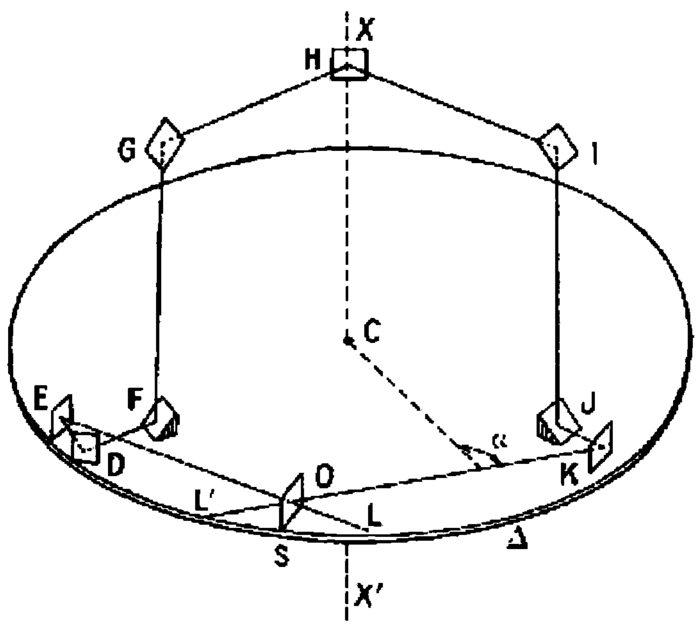
OPTICS. — *On the effect observed on a disc of Sagnac in rotation when part of the optical circuit is not involved.* Note by Messrs. **Alexandre Dufour** & **Fernand Prunier**.

The device used in the study is schematically shown in prospective in the Figure. The collimator L' and the eyepiece L are not drawn; the glass S (separating and receiving,) where the observer O is located, and the mirrors K, J, D, E, F are all entrained on the disc of Sagnac Δ, here 1 m in diameter, and turn with it; the glass S is about at equal distance from mirrors F and J; moreover CF = CJ. Mirrors G, H, I remain fixed and do not take part in the



rotation of the disc. For all the mirrors other than F, G, I, J, the planes of incidence are horizontal, parallel to the disc. Only the planes of incidence of the mirrors F, G, I, J are vertical and contain the axis of rotation XCX'. These mirrors are tilted with 45° on the vertical, F being parallel with G, and J parallel with I at the time of the flash, carried out here in white light. FG and IJ are equal in length at 10 cm. One of the interfering beams follows path SKJ on the disc; then the JIHGF path fixed in the laboratory, and finally FDES on the disc; the other beam goes in opposite direction. The fringes are recorded on a photographic plate related to the disc Δ in the focal plane of the eyepiece L.

For a rotation without significant disc speed, the fringes do not undergo any modification during the flash.

When the number of revolutions of the disc becomes appreciable, the photographic plate records a fringe shift reaching 2/10th of the distance between interference rings for the two directions of rotation when the angular velocity is approximately 3.5 turns per second.

Let us announce immediately that: **1**° displacements of the point of arrival on J of the ray resulting from F, during rotation, and reciprocally for F compared to J, do not determine any additional delay, the compensation of these two effects being carried out in consequence of the reversal of the one of the beams by the additional mirror E; **2**° the linear velocity of the mirrors F, J, are not exceeding 9 meters a second, which can result in a skewing for ray FG or JI, by only 6/1000th of a second of arc, a value considered here as negligible. The two fixed optical paths then keep lengths equal to an infinitely small higher order.

The phenomenon of interference observed by O, entrained, can be envisaged by consideration of wave number, spread out at one moment given on the optical paths. However, along fixed traverses in the laboratory, of F with J and of J with F, the number of waves has a certain value defined by the properties of the light and which is necessarily the same regardless of the theory of interpretation that is used by the observer entrained at O. But if this observer entrained at O admits $c \pm v \sin\alpha$ as speed of light compared to him (v being the linear velocity of entrainment, variable with the point considered on the optical path on the disc), the number of waves allotted with the reverse light journey on the disc are not the same; it thus envisages a shift of the fringes of value determined by the surface area of top C center of rotation, and whose base is the light path on the disc. While, if the observer entrained at O admits that speed of light is c, except for the second order, for any rectilinear course passing by O, the number of waves which it will allot to these journeys will reverse itself, and the displacements for the fringes will be lower than the precedent; in the current assembly, it will thus lead to a shift of the fringes value determined by the surface area of peak O, position occupied by the observer, and basic entrained light path, a shift which would be approximately 10 times smaller than the precedent.

For an angular velocity of 3.75 turns per second and for the two directions of rotation, under the conditions of our experiments corresponding to an angle FCJ of 120° and distances CF = CJ = 40 cm, the expected fringe shift is about 2/10th of the distance between interference rings on the first assumption, and, in the second, only of 2/100th of distance between the interference rings.

The experiment carried out here thus gives reason, it seems, with the observer entrained at O, for which speed of light would be $c \pm v \sin\alpha$ on the disc in rotation.