requires!' 'le distinguish de rio inhretises influences r{ui paraissent intei'venir et dont les actions, coi "1' r{ii('es des orientations, se combinent récipro-
fJtic men t: influen cc direct stu' the corner not }'ar a kind of 'rubbing or
d'en traî meme ri t et in11 ucnc'- sur l'ai iriantiitioii }x opi'e bles ;ii quilles due au dép1acern ent in pidc diins le c)iam J , sans li:irlcr des ccii rati ts engendrés
pro bablcment dans l'i ctt vc r}u i j' ue en incrnc te mps tin rùle d'(Ecran and can partly mask these ell'ets.

Mais, cont iiic- on le conçoit faci le mien t, tlans bles conditions telles c}ue celles où nous opêrions (soit 'la ns un wagon .d'u ri train rapide ou sur une machine isolée) ct qui ue }icrine tien t de fii ire toutes les manœuvres désiratiles, par suite dii mia{; n/'tisiiie sous-}ieriiianent dcx elo}'pè }iar les vilii "utions et
the router in1, .iir)if 'iue of the installation where we are at high speeds, it was not }iossible to detei'iiiinate the diveiv-es magne- data.
ti'Jues and even less to dissociate ct d'É'tti il ier these different actions. Ces sans doute nc se iii1'len t }'as ¡ 'csentcr uti int('r^' 1' itir}ti'* iiii mt- diat, mais elles oc sont toute l'ois poin t sans port ce gcnerale, et nous mous
propose rl'cn continue lii rechei'clic.

O P'I'IQUE. - *Les syslênies optique.s* en rnoiireritrnf *et la ircinslalioii Ile la Ten e.*

Note by Mr. G. Saosac, presented by Mr. Lippmann.

1. E,frt fr rlémeiitaii-e movement. - J'ai expliqué einématiijuement : l'enti.i i ncuient [Partiel des ondes luini iieuses pai' l'eau en niouveine ri t *Comptes ren lus, t. I 2ñ, p.* 8 i 8; *Soci'éld fi'ançaise de* NÂJ sis-^' '°99) i =
Yelttnann's principle and astronomical aberration studied with a system optique t{uelcont}uc *Comptes rencliis,* t. 141 , I go5, p. i cao). Mes raison- nements supposent que l'etlicr du vide n'est pas entraîné tout dans la traduction de la matière (hypothèse de Fresnel), ou, dii moins, que la vitesse r du s3-stème -rlique }i.ir rapport fi l'ether du vide est uniforme aii.x
points of the system. But whatever the distribution of the vector v
in the scope of the system, it is periiiis to keep in the following form
the principle of the clcmentary motion effect, which I established in I°99 (toc. *cit.*) and which will serve as a breeze for a more cineniatic theory.
genéi'ale.

Sur char}ue elê-nien t de loiig'ucur *cll* lie à u ri système optique, la trans- lation du systeme fait varier la durée de propag ation des ondu lations lumi- neuses de *u* *dl* (effet dc mouvement eleiræn taii e); u désig'ne la composante, according to 'll, of the velocity v of the element Cf of the system with respect to the vacuum cther; V, designates the velocity of light ':lnns the tyree, iT1"ine if the ele- ment ch is coin}aris clans l'un des rn il ieur matériels du systèiTle o}atirjiic.

2. *E,fel. toni hltlonnaire maligne.* -◦ *Pl°-lle ainsi la variation AT que la dur ec de propagation sur le périmr-tre du cirçtiit subit sous.s l' influence du relative movement cle this invariable circuit and ether 'lii vide. This is the sum of clem on taii'es Vé c tendue fi tons les elena ents *'ll* alu circuit. Or, la somme des aletit s Ile rr r/f r-1-r:sente (lorcl I(e1vin) la r:'rro/"iir'n C cle l'e ther le lon g du circti it on (i3jerl'nes) 1'/n/erzsifr *':Iii lourl'i'llon* corres- }iondan t, through the circuit. 1ii ti'ofliiisons la valeur ur moyer ne /' d u vecteur de Bjerl'nes, ou densité tlu tourbillon, p-']'endiciilaireinent à la siii'face S dlI Cil'CUit StlppOSt }11 élfl . J-'C fPt tOtl1')JÎl1Ol1f1ilirC Optit{tle 8 }JOUl' Villetl1'

$$\Delta T \quad \frac{C}{V_0^2} = \frac{b\,S}{V_0^2}. \tag{1}$$

If the density of the tourlaillon is toiijotir.s ri i:lle, in other words, if the relative moirre- iiient tle l'etlier is *irrolalu'itnrl,* the valcNr of AT is zero and we }ieu t apply Vel tinan ri's theorem (/'c. "i/.).

If, on the other hand, the relative slack is *rotated nell* the delay dT {" ocliiit a variation 'J- 1◦ "ise *(L,* long'iierir d'onrle) :

$$x = \frac{b\,S}{\lambda V_0}. \tag{2}$$

then interferer bleu x systems of light ondiilations '{ii i have traversed in opposite directions the circuit o} tir}ue Ile large surface S (see inès Notes, *Comptes i eii':lus,* t. 160, I t) I O 1-◦ ^0* 0* '7)

L'effet tourlaillonnaire alterera de zm 1'i difference Ile phase des deux ondulations inverses, car il rcsul te rl'cffets de mouvement elu }" einier ordre c}ui cliaiig'ent Ile sens avec la }="◦1"'3'ation Ile la lumière.

3. *Limi "te siipériew-e Ile l'r.ntt'cn "iienienl rl,e l'élliei- rlcins In trcmslnIi'oii 'ie In Tew'e.* - Si l'étlier est su}'}iose entrainé aii oisina ge du sol, la vile.sse relative r de la Terre et clv 1'et lier aug'iiiente de fr r{uanrl l'altitude croit 'le As et ne devient ég'ale 'i lit vitesse r, de ti.iii.slation Ile 1:i Terl'e r}u'à l'altitude où cesse Ï 'entrainenien t.

Around noon (or midnight), the speed v is Jaarall!ele at the horizon, the vector ô is horizontal, close to the inericlian, and has the value ps if we neglect the

curvature of ether flux lines with respect to - Under these conditions, the value (*) of m applies to the surface S of a vertical circuit oriented east-west.

From noon to midnight, the direction of propabation of each ripple is reversed in space, the 2s variation of the phase di fference is inverted and the interference bangs must move by d m rows.

In the course of observations that I will describe elsewhere, I found that the position of the central fringe of my 'i inverse beam interferometer *(loc. cit.,* }i. i G26) did not depend on the time of day. my pointing accuracy made it possible to determine an upper limit of m corresponding to , "" of —— wavelength for a circuit of 3o'° contour, inclined to the horizon; vertical projection zo"". According to the formula (*), ù or $\frac{Ar}{\Delta z}$ then admits the radian per second. In other words, for a vertical ascent of I'", the relative velocity v increases by no more than a fraction $\frac{1}{3}$ i o" of the Earth's velocity v.

Taking up the theory of star alignment *Comptes rendus,* ' 9°°. *loc. rit.)* in the liy}iotliùse of an entrainment of the etlier r' ùs the ground, one sees easily c{u'elle subsiste, à condition de définir l'aberration par la vitesse relati -e r of the globe and the étlier att *place of observation.* As the value of the Earth's velocity v, makes the oliservated value of the alierration retron ver, to the a}'rroxiiriation of , is that the entrainment velocity (r, - v) near the ground adrriet Jr, as the su}ierieure limit. The result of these observations completes the r-ecedent· Moreover, it shows c}u il faiit réduire 1ieaucou}i la upper limit Ile the drive speed (r - r,) if you do not want to This speed is still noticeable at great altitudes.

6. Ef,fet toui-hillounnire optic]ue a,agiilaire. - Let two Jiinettes be directed towards each other at a great distance D. On the area (D . /) of the section (diameter f) of the long beam l uniineu.x which separates the glasses, l'efI'et tourliillonnaire 1' d nit le i et'ird ET ou D . / en entre les deux vilx a-tions elénientaires p- i'agées suivant les l'ordS ◦1◦1'Oscs du faisceau. To 'iue the focal synclironisine is ret,abli, the image of the foyet' of a telescope in the focus Ile l'autre 'loit é tre deviée tl'ti n any'1c t tel '}iie l'avance géométrique c1 compensates for the geoinetric}ue reta rd V, ET. It is easy to deduce that if the sharp lii L_ is exactly pointed at the lunet te L, , the latter is depointé-. 1'-' --rP ' ' I " of angle 2t or $\frac{AD}{V,}$

According to the upper lirrlÎte of ù, c}iie inès observations ont ('tablie, the effect

tonrbillonnaire angulaire * e admet la limi te supérieure 3 i o ' " ' - $\frac{}{c}$

To determine this limit directly, it would have been necessary to set the precision of the reciprор}ue tips of the two glasses at less than o", i through a mosplieric layer i oo' ' long, or liien at less than o", i 'a

15° Island distance.

TH ER MODYùtAMIQU E. - *A pylicnl.i'on dif I*'-*'-cij'e Ile heu - cmæ ju/iènornenes yti accomyamet lci charge des* coztdrtisnleurs. Note by il. A. EDLti, presented by II. E. Bouty.

I will first summarize, in a single section, the dernonst ations relating to .t these

1 lic-nomena given by Pellat (') and by Sacerdote (') using Massieu's remark.

Soi t u n co nrfenscifeii /' *fer mê* don t les a i in atit res in i n ces son t coll'ies su t le d ielec- triq ue. L'a rma t u re ex te rn e B c-ona m u ri iq ue où l'e ricei n te, ta n dii q u e l'i ri tern e est }iortce a u pot en t tel V > o.

The state of this condensate t1/ depends on V, its tent perat u re 'I" and 'the p ressi on s u ii i-forms P and *p* qu i ni g n e, one at the extü rien r, the other at the i ri tc ri eu r.

Let's assume 1° co nstant.

Sous 1'i ri fl uen ce des vari al ions d V, d'1', d/', la clia rie 31 de .\ a u, in e ri te de rf\f, le dié lectri c{ue reçoit une qua ri ti té de cli ale u r/Q, le s ol u nde in tc ri cu r (ca vité)' aux ir e ri te de *dv* e le vol u ir e ex rérie ur v' de *di"*.

The energy increase o f the condensate in this process is

$$dU = V\,dM + J\,dQ + p\,dv - P\,dv'. \tag{1}$$

If this transformation takes place in a way that is similar to il' le, rfU, *d(*SIY), rt(/ai) and c/ (1° i") are d i Her en tielles ex actes, and it is Ile iué in e de

$$dX = dU - d(MV) - d(pv) + d(Pv') = -M\,dV + J\,dQ - v\,dp. \tag{2}$$

Poso ns

$$dQ = a\,dV + b\,dp + c\,dT \tag{3}$$

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(1) PELLAT, *Journal de Physique*, 3e série, t. VII, p. 18.

(') I*. P'r.£ituoTc, ' *lit.e cle rloclora I, y. fi.* Pa i'is. i Sgg.