reading of the percentage humidity. $I$, $I$ are pointers set at the dry and wet bulb readings by means of pieces sliding on the rods $A$, $B$ and joined together by a link $C$, which actuates by a slot the scale $F$ (movable in the vertical) on which the percentage humidity is read at the pointer $D$.

Let $t_1$, $t_2$ be the temperatures of the dry and wet bulbs respectively, $t_3$ the dew point; let $v_1$, $v_3$ be the vapour tensions of saturated air at $t_1$, $t_3$ and $H$ the percentage humidity. Then the approximate theory is as follows:

$$t_3 = t_1 - c(t_2 - t_1) \quad (c \text{ constant})$$

(According to Glaisher $c$ varies with $t_1$: this is taken into account by the inclination of the rods).

Experiment gives

$$v_1 = a10^{t_1} \text{ and } v_3 = a10^{t_3}$$

also by definition

$$H = 100v_3/v_1$$

so that

$$H = 100 \,.\, 10^{-c(t_2 - t_1)}$$

$$\log H = 2 - c(t_2 - t_1)$$

$$= 2 - HK.$$

This relation shows that the humidity scale is that of an inverted slide rule.

WALTER JAMIESON.

**Geometrical Illustrations of a Formula in the Differential Calculus.**—In this note the formula

$$\frac{1}{PT} = \frac{d}{ds}(\log y)$$

is illustrated for a few curves.

For any curve

$$PT = y \operatorname{cosec} PTN = y\frac{ds}{dy}$$

from which the above formula follows. Only two variables are involved: the $y$ axis may be excluded. Also the formula holds for oblique axes.



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1. Parabola $y^2 = 4ax$. (Fig. 1)

$$\frac{2}{y}\frac{dy}{ds} = \frac{1}{x}\frac{dx}{ds}.$$

$$\therefore \quad \frac{2}{PT} = \frac{1}{PY}$$

whence $TA = AN$.

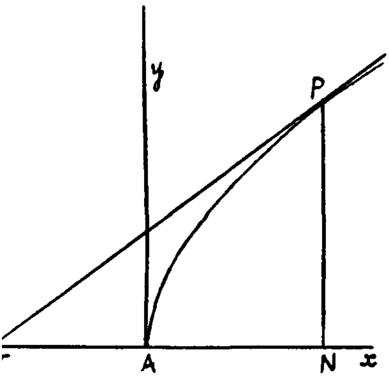


FIG. 1

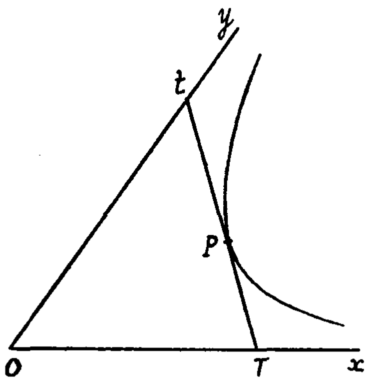


FIG. 2

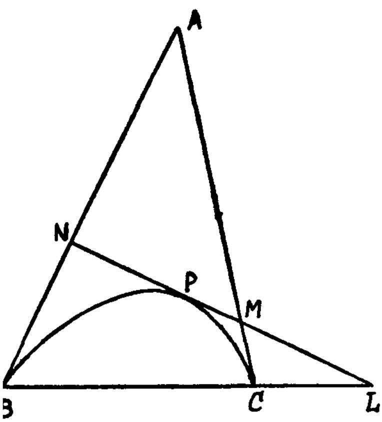


FIG. 3

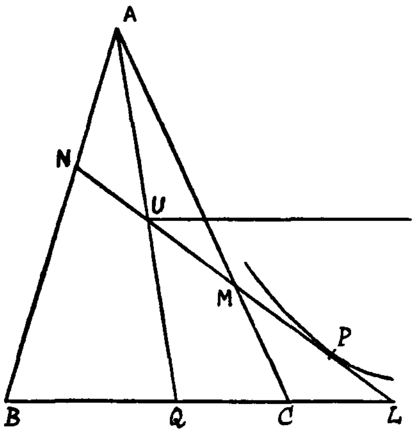


FIG. 4



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2. Hyperbola $xy = \text{const.}$ (Fig. 2)

$$\frac{1}{x}\frac{dx}{ds} + \frac{1}{y}\frac{dy}{ds} = 0.$$

$$\therefore \quad PT = -Pt.$$

3. Conic $\beta\gamma = k\alpha^2$, having $AB$, $AC$ tangents and $BC$ chord of contact. (Fig. 3)

$$\frac{1}{PM} + \frac{1}{PN} = \frac{2}{PL}$$

hence $$(MN, PL) = -1.$$

4. Cubic Hyperbola $\alpha\beta\gamma = \alpha'\beta'\gamma'$ through $P(\alpha_1, \beta_1, \gamma_1)$. (Fig. 4)

$$-2\,PL = \text{harmonic mean between } PM, PN.$$

Draw $AQ$ the fourth harmonic mean to $AB$, $AP$, $AC$ and a parallel to $BC$ at three times the distance $P$ has to $BC$. The intersection $U$ of these lines gives the tangent at $P$, for

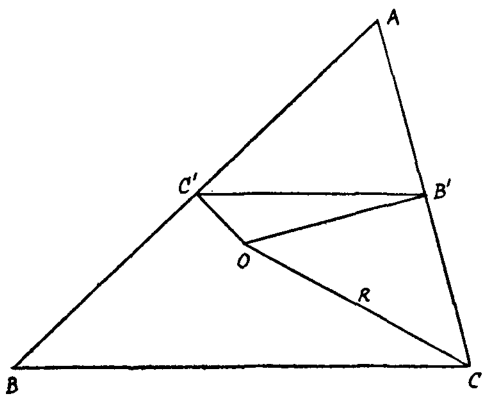
$$PU = \text{harmonic mean of } PM, PN = -2PL$$

5. Similar results apply to curves $\alpha\gamma = k\beta\delta : OP^2 = kPU \, . \, PU'$ (where $O$ is a fixed point and $PU$, $PU'$ are perpendiculars on fixed straight lines); $27ay^2 = 4x^3$; $(x+y+z)^3 = 6mxyz$, etc.

R. F. Davis.

**Geometrical Proof of a Trigonometrical Identity.**— The following method of proof of the identity,

$$1 - \cos^2 A - \cos^2 B - \cos^2 C - 2\cos A\cos B\cos C = 0$$



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