XXVII. Suggestions for rendering a meridian mark visible at night

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and the equation (1.) becomes after reduction

$$\varphi(\theta) - \varphi\left(\frac{\pi}{2} - \theta\right) = 0,$$

which is rendered *identical* by putting $\varphi(\theta)$ equal to any arbitrary function of $\sin 2\theta$, as $F(\sin 2\theta)$.

Hence the most general solution of equation (1.) is

$$\{f(\theta)\}^2 = \cos^2 \theta + (\cos \theta - \sin \theta) F(\sin 2\theta). \quad (2.)$$

In the application of this formula to the Parallelogram of Forces, we must make use of some condition that the function F may be determined; as mechanical experience shows it cannot remain arbitrary. Such a condition is the following: that if θ be increased by π , the resultant will obviously be the same as before in magnitude, but opposite in sign: this will therefore be the case with $f(\theta)$.

Put, therefore, $\pi + \theta$ for θ in (2.), and equate the two values of the square of the function (as they must be the same), and reduce, and we have

$$\cos^2 \theta + (\cos \theta - \sin \theta) F(\sin 2\theta) = \cos^2 \theta - (\cos \theta - \sin \theta) F(\sin 2\theta);$$

$$\therefore F(\sin 2\theta) = 0$$

for all values of θ .

Hence in the case of the Parallelogram of Forces,

$$f(\theta) = \cos \theta \text{ or } -\cos \theta;$$

the latter is excluded, because when $\theta = 0$, the resultant is the force itself, or $f(0) = 1$.

Hence $f(\theta) = \cos \theta$ is the complete solution.

I am, Gentlemen,

Your obedient Servant,

Bombay, Dec. 14, 1848.

T. H. PRATT.

XXVII. *Suggestions for rendering a Meridian mark visible at Night.* By N. S. HEINEKEN, Esq.

To the Editors of the Philosophical Magazine and Journal.

GENTLEMEN,

Sidmouth, Feb. 14, 1849.

SHOULD you deem the following suggestions likely to be of service, I shall be glad if you will give them a place in the *Philosophical Magazine*.

I am, Gentlemen,

Respectfully yours,

N. S. HEINEKEN.

It occurred to me eleven years since, that platinum wire, rendered incandescent by the galvanic battery, might be ap-

plied to the purpose of rendering a meridian mark visible at night; and that the same means might also be used for illuminating the wires of the transit instrument. I proposed that the meridian mark should consist of a hole in a plate of brass, adjustable in a vertical and horizontal direction by screws, and that behind this hole should be placed the incandescent wire in a glass tube for the purpose of illumination, the battery being of course at *any required distance*. For illuminating the wires of the telescope, I proposed that the platinum wire, protected by a glass tube, should be placed either within or at the side of the eye-piece, and thus obviate the necessity of piercing one of the transit-arms, as is usual. I was only able to try the above plans upon a small scale for want of a more powerful battery; but the experiments of Mr. Staite lead me to think that there may be cases in which his method of illumination by galvanism might be used with the greatest advantage for rendering a *very distant* meridian mark visible. I have found that even platinum wire, rendered incandescent *by alcohol*, may be distinguished by the telescope at a considerable distance; as may also the hydrogen and platinum lamp. By any of the above plans, the necessity of attention to the lamp itself by an assistant is done away.

While upon the subject of micrometer-wires, may I also be allowed to state, that so far back as 1831 I invented a substitute for them by lines drawn upon glass with a diamond, which lines were illuminated through the edge of the glass? but I was led to abandon the plan after trial, fearing to introduce the *errors of the two surfaces* of the glass, though I found that in other respects the plan fully answered. I am induced to mention this, having lately seen in the public prints that the same method has been since independently discovered, and I rejoice to find satisfactorily employed, by the Earl Rosse.

XXVIII. *On the Theory of Sound, in reply to Professor Challis. By G. G. STOKES, M.A., Fellow of Pembroke College, Cambridge*.*

AS the subject of plane waves does not seem likely to be elucidated by further discussion, I pass on to spherical waves.

Professor Challis has divided his demonstration of the "contradiction" arrived at in this case into five heads. I entirely agree with the first four; the fifth I beg leave to dispute. The part to which I object is contained in the sentence,

* Communicated by the Author.