$\therefore$ Any one term of the first series represents a wave which travels the space between one particle and the next in time T. In the same way the corresponding term of the second series represents a wave which travels in the opposite direction with the same velocity.

Now v=velocity$=l'/T=l'c\sin\theta/\theta$; but $\theta=\pi/q$ and $c=\sqrt{\frac{E}{ml}}$.

$$\therefore v=l'\sqrt{\frac{E}{ml}}\frac{q}{\pi}\sin\frac{\pi}{q}.$$

141. Proposed by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud. England.

A simple pendulum hangs from a bicycle moving in a straight line. What deflection is produced by putting on the brake so as to exert on the machine a force equal to the nth of its weight?

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College. Philadelphia, Pa.

Let v=velocity of retardation, W=weight.

Then $v=\frac{Wg}{nW}t=\frac{g}{n}t$. Let $t=1$. $\therefore v=g/n$.

If θ=angle of deflection of the pendulum, and l=its length, then $v^2=g^2/n^2=2gl(1-\cos\theta)$.

$$\therefore \cos\theta=\frac{2ln^2-g}{2ln^2} \text{ or } \theta=\cos^{-1}\left(\frac{2ln^2-g}{2ln^2}\right).$$

142. Proposed by GEORGE R. DEAN, B. Sc., Professor of Mathematics, University of Missouri School of Mines and Metallurgy, Rolla, Mo,

An infinite mass of liquid is bounded by the plane zx, on which are small corrugations given by $y=\phi(x)$. The velocity of the liquid at an infinite distance from the plane is parallel to x and equal to V. Prove that the velocity potential is $V_x+\frac{V}{\pi}\int_{-\infty}^{\infty}\frac{(x-\lambda)\phi(\lambda)d\lambda}{y^2+(x-\lambda)^2}$. [Bassett's *Hydrodynamics.*]

Solution by G. B. M. ZERR, A.M., Ph.D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Let f=velocity potential.

$$\text{Then } \frac{d^2f}{dx^2}+\frac{d^2f}{dy^2}=\frac{d^2f}{dx^2}\left(1-\frac{1}{[\varphi'(x)]^2}\right)=0.$$

$$\therefore \frac{df}{dx}=\text{constant}=v \text{ when } y=\infty. \quad \therefore f-C=v\int dx=v\varphi_1(x).$$

When $y=0$, $f=\varphi_1(x)v$; when $y=\infty$, $\varphi(x)=x$.

$\therefore C=vx$. $\therefore f=vx+v\varphi_1(x)$.

$$\text{By Fourier's series, } \varphi_1(x)=\frac{1}{\pi}\int_{-\infty}^{\infty}\varphi(\lambda)d\lambda\int_0^{\infty}\sin\beta(x-\lambda)d\beta.$$