No. 21.	——9 1 6t275	No 26.	49382 e 16t57
2.	—— 5 1t726	7.	*495t1 6 e2738
3.	48591 3 e72t6	8.	*4972e 6 1t538
4.	—— - —t2-	9.	——3e 8 15t26
5.	48t59 e 13627	30.	4t36e 1 85297

FIFTH-PLACE SOLUTIONS.

No. 1.	524t8 e 13697	No. 2.	536t2 e 18497

On a Problem of Lewis Carroll's.

By Professor STEGGALL.

Fifth Meeting, 10th March, 1899.

ALEXANDER MORGAN, Esq., M.A., D.Sc., President, in the Chair.

Centrobaric Spherical Surface Distribution.

By Professor TAIT.

The following is a simple geometrical demonstration of the well-known theorem that, if matter be distributed over a sphere with a surface-density (*i.e.*, mass per unit of surface) inversely as the cube of the distance from either of two points which are the inversions of each other with respect to the sphere, it will act upon all external masses as if it were collected at the interior point:—and upon all internal masses as if a definite multiple of its mass were concentrated at the exterior point.

Suppose a cone of very small angle, whose vertex is S, to cut out small areas, P and Q, from a spherical surface. (Fig 5.) Then we have, obviously,

$$\frac{P}{SP^2}=\frac{Q}{SQ^2}$$

And, of course, the rectangle SP.SQ is constant, say c^2.
Let R be any point, outside the sphere if S be inside, and *vice versâ*; and take T (always *inside* the sphere) on RS so that SR.ST $= c^2$.

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Then, by similar triangles, we have

$$\mathrm{SQ}.\mathrm{PR}=\mathrm{SR}.\mathrm{QT}.$$

From these it follows directly that

$$\frac{\mathrm{P}}{\mathrm{SP}^3}\Big/\mathrm{PR}=\frac{\mathrm{Q}}{\mathrm{SQ}^2.\mathrm{SP}.\mathrm{PR}}=\frac{\mathrm{Q}}{c^2\mathrm{SR}.\mathrm{QT}}.$$

Thus
$$\Sigma\left(\frac{\mathrm{P}}{\mathrm{SP}^3}\cdot\frac{1}{\mathrm{PR}}\right)=\frac{1}{c^2\mathrm{SR}}\Sigma\left(\frac{\mathrm{Q}}{\mathrm{QT}}\right).$$

The first member is the potential, at R, if the surface-density be everywhere inversely as the cube of the distance from S. The second is the potential, at R, of a mass *concentrated at S;* since $\Sigma(\mathrm{Q}/\mathrm{QT})$ is constant, being the potential of the uniform shell at an internal point.

The mass of the centrobaric shell is

$$\mathrm{M}=\Sigma\frac{\mathrm{P}}{\mathrm{SP}^3}=\Sigma\frac{\mathrm{Q}}{\mathrm{SQ}^2.\mathrm{SP}}=\frac{1}{c^2}\Sigma\frac{\mathrm{Q}}{\mathrm{SQ}}$$

so that the expression for its potential at R is

$$\frac{\Sigma\frac{\mathrm{Q}}{\mathrm{QT}}}{\Sigma\frac{\mathrm{Q}}{\mathrm{QS}}}\cdot\frac{\mathrm{M}}{\mathrm{SR}}.$$

While S is inside the shell, the first factor is unity; otherwise it is directly as the ratio of the distance of S from the centre of the sphere, to the radius. Thus we prove by elementary considerations the important propositions enunciated above.

On Wireless Telegraphy and High Potential Currents.

By J. R. Burgess, M.A.

Sixth Meeting, 12th May 1899.

Alexander Morgan, Esq., M.A., D.Sc., President, in the Chair.

Discussion on "The Treatment of Proportion in Elementary Mathematics."

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