sionally this checks with $[R] = [L^{-1}\,T]$, for now, of course, the electric factor is dimensionless. The law of force between two charges in a uniform medium becomes $F = q_1\,q_2/\alpha\,r^2$, where α is proportional to the dielectric constant of the medium and is a pure numeric.

The dimensions of magnetic pole, m, are readily obtained from the relation $[m.q] = [M\,L^2\,T^{-1}]$ which is independent of the medium. From this equation, $[m] = [M^{\frac{1}{2}}\,L^{\frac{1}{2}}]$ and the law of force between two magnetic poles, m_1 and m_2, spaced a distance r apart in a uniform medium is given by $F = m_1\,m_2\,c^2/\beta r^2$, where c is the velocity of electromagnetic radiations *in vacuo* while β is proportional to the permeability of the medium and is a pure numeric. The relation $[m] = [M^{\frac{1}{2}}\,L^{\frac{1}{2}}]$ may not look promising but for a U-shaped magnet with poles at its extremities, the force between the poles produces a bending moment in the magnet and a very direct connexion between $[m^2]$ and $[ML]$ is apparent. The magnetic factor applicable to the rationalized M.K.S. system is proportional to β/c^2 and should therefore be given in units of sec.^{2}/m.^{2}.

The equation $[F] = [q^2\,L^{-2}]$ is the only one which leads to the plausible relationships discussed above. More general equations are $F = \dfrac{q_1\,q_2}{\alpha\,\varkappa_0\,r^2}$ and $F = \dfrac{m_1\,m_2}{\beta\,\mu_0\,r^2}$, where $\varkappa_0$ and μ_0 represent unknown properties of free space and $\varkappa_0\mu_0 = 1/c^2$. Let $\mu_0 = 1$ and $\varkappa_0 = 1/c^2$, from which we obtain $[E] = [M^{\frac{1}{2}}\,L^{\frac{3}{2}}\,T^{-2}]$, $[C] = [L^{-1}\,T^2]$ and $[R] = [LT^{-1}]$. These expressions cannot be simply related to the nature of the quantities concerned and, for example, capacitance becomes the inverse of acceleration, while resistance has the dimensions of velocity, the inverse of what might reasonably be expected.

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CHEMICAL ENGINEERING

Inversion of a Laplace Transform arising from a Problem in Applied Chemical Kinetics

THE solution to a problem (Wood, T., unpublished work) arising from an analysis of a closed circuit consisting of a stirred-tank reactor and a tubular reactor in series, with first-order, isothermal, irreversible kinetics, involves finding the inverse of the Laplace transform :

$$\bar{c}(s) = \frac{1}{s + \beta_1 - \beta_2.\exp(-\beta_3 s)}$$

where β_1, β_2, β_3 are known, positive, constants. The transform can be re-arranged:

$$\bar{c}(s) = \frac{\dfrac{1}{(s+\beta_1)}}{1 - \dfrac{\beta_2}{(s+\beta_1)}.\exp(-\beta_3 s)}$$

Since no tabulated transform could be found, the denominator was expanded as a power series, giving:

$$\bar{c}(s) = \sum_{n=0}^{\infty}\left[\frac{\beta_2{}^n}{(s+\beta_1)^{n+1}}\,.\,\exp(-n\beta_3 s)\right]$$

The inverse of the transform is now readily shown to be[1]:

$$c(t) = \sum_{n=0}^{\infty}\frac{\beta_2{}^n}{n!}\,.\,(t-n\beta_3)^n.\exp\{-\beta_1(t-n\beta_3)\}.H(t-n\beta_3)$$

where $H(t - n\beta_3) = 0$ when $t \leqslant n\beta_3$; $H(t - n\beta_3) = 1$ when $t > n\beta_3$.

The validity of the solution in this particular case was proved by its ability to satisfy the original problem and the given initial and boundary conditions. It would be of interest to know, in the general case, the conditions for which the approach adopted above is valid.

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GEOLOGY

Continuation of the Great Glen Fault beyond the Moray Firth

THE Great Glen Fault was shown by W. Q. Kennedy[1] to be a sinistral tear fault on which a displacement of about 65 miles has occurred since Middle Old Red Sandstone time. E. M. Anderson[1] considered that "the curvature of the fault trace may indicate that we are dealing with the south-western sector of a major fault and that the main extension of the dislocation will probably lie to the north-east". This curvature is a gradual change of strike from about 040° in Loch Linnhe to about 035° at Inverness.

Examination of the submarine topography of the Moray Firth, Orkney and Shetland areas shows that a possible course for the Great Glen Fault lies through Shetland to the edge of the continental shelf north of Shetland[2]. The features which seem to indicate the continuation of the fault in this direction are shown in Fig. 1. Between Smiths Bank and the Caithness coast, a shallow submarine valley is especially well shown by the 30-fathom contour; the axis of this valley has a strike of 035° like the Great Glen Fault at Inverness. However, to pass along the axis of the valley, the strike of the fault north-east of Inverness has to change from 035° to 040° and then back again to 035° over a distance of about 40 miles.

To the north, the sea-floor east of Orkney is rather flat and featureless, and provides no evidence. If the fault crosses it with a gradual swing in strike towards the north, it runs into, and along, a trench to the south-west of Fair Isle shown up by the 50-fathom contour. The axis of this trench has a strike of about 025° to the south-west of Fair Isle and swings round to about 020° in its continuation up the west side of Shetland; it reaches its greatest depth of more than 70 fathoms at its northern end in a latitude of 60° N.

At the northern end of the trench, if the fault passes just east of the deepest part and to the west of The Deeps (a narrow submarine valley extending beyond the end of the trench and shown up by the 50-fathom contour) it runs ashore in Shetland at the head of Seli Voe and joins on to the Walls Boundary Fault[3]. The Walls Boundary Fault can be followed overland until it runs into the sea at Aith Voe. Still