brane (6), and Q is the total volume of liquid passing any cross-section per unit time in (7),

$$DAt = \sigma V/p = \eta Q/G = H/4 \qquad (8)$$

Since the torsion problem has been solved for many cross-sections, the corresponding solutions for mean first-passage time problems will be known also (in a finite form only for the circle, ellipse, equilateral triangle, and a few special curves). Conversely, an experimental arrangement is conceivable which might be used to determine by means of (1) the torsion function for cross-sections R for which the numerical evaluation is difficult: diffusing particles are observed microscopically, the field of view being restricted to an area of the same shape as the section. If practicable, such a method (refined by photographic techniques) could be superior to the one based on the membrane analogy where only small curvatures are possible and gravity interferes.

G. Klein

Department of Mathematics,
Royal College of Science and Technology,
Glasgow.
Jan. 16.

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An Explanation of the Tanberg Effect

When an arc discharge at very low pressure passes between metal electrodes the cathode experiences a force directed away from the anode. By suspending a copper cathode on a pendulum and observing the deflexion Tanberg[1] measured this force. At the same time he measured the rate of evaporation of cathode material. With these data he obtained the velocity of the evaporating atoms from Newton's laws of motion. From a force of 20 dynes/amp. and a rate of evaporation of 10^{-5} gm./coulomb, he estimated that the copper atoms left the cathode with a velocity of about 10^6 cm./sec. He suggested from this that the cathode was at a temperature of about 5×10^5 deg. C. Up to the present his claim has caused some concern. Opinions are divided into two groups: those who question the accuracy of the experiments and those who disbelieve in Newton's laws. However, other evidence[2-4] tends to support Tanberg's measurements.

In connexion with our recently proposed theory of the cathode spot[5] a novel explanation of this effect emerges. Some of the evaporated atoms are ionized in the region above the cathode and are returned to the cathode by the electric field. Because of the dense vapour the positive ions make many collisions and transfer momentum to the neutral vapour, as a result of which vapour atoms are also returned to the cathode. It is easy to show that if positive ions fall freely in the field of their space charge towards the cathode the latter experiences no net force, since the momentum delivered by the ions on arrival is balanced by the electric stress at the cathode surface. If, on the other hand, the ions move through dense vapour a large fraction of this momentum is transferred to the neutral vapour, which in turn transfers it to the cathode; the remainder of the momentum is carried by the ions. Thus the cathode still experiences no net force. (The momentum associated with electron emission is negligible.)

An interesting point arises now from the balance of numbers. If z atoms/sec. of mass m leave the cathode surface with velocity v, the force of reaction is $f = z.m.v.$ dynes. If z' atoms/sec. return to the cathode as a result of collisions with the ions, the net evaporation is reduced to $z-z'$ and this is the quantity which has been measured throughout. An estimate of z' follows from the new arc theory[5]. To release 1 ampere of electrons from the cathode, $z' \approx 10^{19}$ excited atoms must return per second. The measured evaporation of 10^{-5} gm./coulomb corresponds to $z-z' \approx 10^{17}$ atoms/sec. However, the measured force is caused by z, the gross evaporation. On this basis, we find from Newton's laws and Tanberg's results the velocities of evaporating atoms to be $v = f/z.m. \approx 10^4$ cm./sec., that is, reasonable thermal velocities. It transpires that our ideas about the importance of back-scattering in the cathode region and the significant difference between gross and net evaporation resolve all the difficulties previously associated with the Tanberg effect.

A. E. Robson
A. von Engel

Clarendon Laboratory,
Oxford.
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Microphonic Effect of the Larynx

In order to test a hypothesis[1] on the origin of the vibrations of the vocal folds—the vibrations were supposed to start *coup pour coup* at a contraction of the m. vocalis internus induced by an action potential along the corresponding fibres in the n. recurrens—we made some simultaneous recordings on the electromyogram of the m. thyreo-arytenoideus and the sound curve with a very suitable patient in Prof. H. A. E. van Dishoeck's Otorhinolaryngological Clinic, University of Leyden. This patient had a stoma just above the larynx and the internal laryngeal muscles presented themselves directly. One vocal fold was normal, the other one was slightly less movable. Phonation was practically normal; the patient only used the chest voice. Two very thin needle electrodes were put into the normal m. thyreo-arytenoideus, about 1·5 mm. from the glottis and about 1·5 mm. deep, one at the anterior side, the other one near the arytenoid. We thus recorded the myogram of the whole muscle instead of the activity of a small part, as is done with thin concentric needle electrodes.

When the electrodes were well fixed into the muscle, results as shown in Fig. 1 were obtained. A perfect synchronism between the myograms and their sound curves is to be observed. The myogram is in fact, however, a microphonic effect of the larynx, being passive in nature. The effect is caused by the passive simultaneous deformation of all the muscle fibres and their membranes as a result of the vibration of the vocal folds. This microphonic effect is comparable with the well-known Wever and Bray microphonic effect of the cochlea and the microphonic effect of the semicircular canals[2]. It can be