the fact that $d(e^2)/d\theta$ varies very little during the life of an artificial satellite.

If $\psi < 2$, the approximate formula (14) becomes very inaccurate and $\sin^2 \theta$ can no longer be equated to $2(1 - \cos \theta)$, so that (5) must be used in its full form. The eccentricity, e , however, is so small that it can be omitted from the remainder of the formulae.

Solutions are easily obtainable in terms of the Bessel functions I_0 and I_1 , but they are rather long and only apply to the last few days of a satellite's life.

If the mean temperature between R and r_p falls from equator to poles the ellipticity of the surfaces of constant density will be increased. This can be allowed for by a change in ϵ .

For a mixture of gases of different molecular weights it is necessary to sum the values of (12) and (13) for the components. Values of H obtained from satellites with different perigee radii may give some information about the change of composition with height.

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Thermo-electric Observations on Grey Selenium

THE thermo-electric power of grey selenium has been accorded considerable attention in recent years, and Henisch and Francois¹, among others, have carried out accurate measurements and discussed their results in terms of a simple model. We wish to report some thermo-electric results, obtained in the course of an investigation of the photo-catalytic properties of this modification of selenium, which are at variance both with common experience and with these workers' model.

It seems to be experimentally well established that selenium is almost unique among semiconductors in having a thermo-electric power with a positive temperature coefficient: this can be explained¹ by assuming that the activation energy of the semiconductor is so small that most of the impurity centres are normally ionized. By submitting selenium to repeated vacuum distillations followed by recrystallization, we have prepared spectrographically

Fig. 1. Thermo-electric power of grey selenium crystals. B5, single crystal; B6, oriented polycrystal

pure samples, from which a few substantially monocrystalline ingots were grown by the Bridgman technique. Most of the ingots, however, consisted of bundles of large grains all having their c -axis parallel to the growth direction (oriented polycrystals). Thermo-electric power measurements on ingots of both types, extending over many months, yielded results of marked qualitative difference. As shown in Fig. 1, the oriented polycrystal specimen has a thermo-electric power which increases with temperature, and further exhibits hysteresis and secular changes, since the scatter of the points is much worse than the measurement error (of the order of 1 per cent at all but the lowest temperatures). Both these features have been reported to be of common occurrence with monocrystalline as well as with polycrystalline samples². We found, however, that monocrystals showed a thermo-electric power quite independent of temperature, and insensitive to thermal history. The scatter of results below -100°C . is due to the rapidly increasing resistance of the specimen (upwards of 10^{10} ohms), which impaired the precision of the measurement, carried out by means of an integrating potentiometric circuit already described³.

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New Supersonic Phenomena

POLARIZED light has been used for determining the propagation of stress waves in solids for some time. We have employed it to study the propagation of stress waves in glass and plastics and have found what we believe to be evidence of new supersonic phenomena. The experimental arrangement follows classical lines, using 'Polaroids' and quarter-wave plates that give circularly polarized light through the transparent sample. For illumination, we used a 1530 *PI* discharge tube (General Radio) with an effective flash duration of 2 μsec . The transparent sample was loaded by exploding small amounts of lead azide with an electric 'bridge'. The timing between the flash and the explosion was achieved by a suitable electric timer which allowed a variation of the delay from zero to 30 μsec . It is well known that shock loading causes a compressional and a shear wave to be propagated in the material, both of which essentially follow the so-called Huygens construction.

However, our 'single shot' tests showed that, far in advance of the compressional wave, which has a speed of propagation of 5,500 m./sec. in glass, dark lines occurred at the far corners of the rectangular specimen at about 45° . These dark lines appear as much as five times as early as the compressional wave could have reached the point. We also investigated 'meeting shots' where two explosive charges at the centres of the short ends of a sample of glass,