electric fields, a property which seems to be characteristic of negative ions produced by positive-ion bombardment of surfaces^{1,2}.

We also detected two negative ion peaks with mass-to-charge ratios 23 and 22, again with peak heights in approximately the ratio of the lithium isotopes. This ratio was maintained under different experimental conditions, although the relative intensities of neighbouring peaks at 24, 25 and 26 varied markedly. These observations suggest that 23 and 22 may be due to $\text{Li}_2\text{O}_{16}^-$ and $\text{Li}_6\text{O}_{16}^-$, an interesting possibility in view of the fact that 23, when reported before³, has been attributed to Na^- . One of us (R.H.S.) and J. F. I. Cole recorded the 23 peak last year while bombarding a tantalum gauze with ions from a Kunsman sodium positive-ion source; but, because of its behaviour when experimental conditions were altered, hesitation was felt in attributing it to Na^- . It was always so small that the possible presence of 22 could not be checked.

These new results do not, of course, preclude the existence of a stable sodium negative ion; but they do appear to show that a negative ion peak at 23 can be due to a lithium compound, and that it is unwise to identify it as Na^- unless the peak due to 22 is simultaneously shown to be less intense than it would be if it were due to the compound containing the other lithium isotope.

In their important pioneer work on this subject K. S. Woodcock⁴ and J. S. Thompson⁵ bombarded surfaces with positive ions from a lithium source but did not record Li^- .

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Uranium Not a Superconductor

It has recently been reported¹ that Justi has found uranium to become superconducting at 1.25° K. About a year ago, I looked for superconductivity in a very pure sample of uranium using the magnetic moment method. Below about 1.45° K. a slight diamagnetic effect appeared, as if about 0.5 per cent by volume of the metal had become superconducting; the critical field of this slight effect was about 210 gauss at the lowest temperature used (1.08° K.). Similar behaviour has previously been observed² for titanium and for a less pure sample of uranium, and it was then suggested that the slight superconducting effect is due to an impurity. The present results considered in conjunction with the chemical analysis of the sample suggest that the superconducting impurity may be uranium carbide, but I have not yet had an opportunity of testing this suggestion by direct investigation of a uranium carbide specimen.

It seems, then, that uranium is not a superconductor down to 1.08° K., and this illustrates the danger of drawing definite conclusions about possible superconductivity from resistance measurements alone (such as Justi used). A superconducting impurity, though only a small fraction of the volume, may shunt the bulk of the metal and cause the resistance

to fall, but the magnetic moment provides a direct measure of the fraction which is superconducting.

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Stabilizing Linear Particle Accelerators by Means of Grid Lenses

THOUGH nothing appears to have been published, it is now fairly generally known that linear particle accelerators of the standing-wave type cannot be satisfactorily stabilized with electron lenses of conventional design for energies much exceeding about 10 MeV. I have confirmed this in an investigation starting from first principles, which showed also that lenses terminated at the exit end by a thin metal foil, such as the beryllium windows proposed by L. Alvarez of Berkeley University, promise satisfactory stability up to at least 1,000 MeV. On the suggestion of Prof. M. L. Oliphant, I extended the theory also to lenses in which the metal foil is replaced by a wire mesh grid or the like. 'Grid lenses' were investigated experimentally by Knoll and Ruska in the early days of electron optics, but they have largely fallen into oblivion. It appears now that they may well be revived for the concentration of the beam in linear accelerators, as they offer advantages equal if not superior to beryllium foils.

A gap open at one end and terminated at the other end by a conducting foil, with an electric field intensity E in the centre of the foil, acts as a condensing lens if E is accelerating. Introducing the foil produces an additional lens-power

$$\frac{1}{f} = \frac{1}{2} \frac{(1 - \beta^2)^{1/2}}{\beta^2} \frac{eE}{m_0 c^2},$$

where f is the focal length. As explained in the figure, this effect arises not at the foil, but by the divergence of the electric field at the other end. In the paraxial approximation it is independent of the shape of the foil.

If now the foil is replaced by a wire mesh grid or the like, with square or round holes, the beam is

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