magnetic field existing between the plane faces, 6 mm apart, of the pole pieces of an electromagnet. The incident edge of the pole pieces was given a convex circular curvature and the emergent edge a concave circular curvature. The circles contained correction for the bulging of the magnetic field at the edges. The abberation at the focus due to defects in the lens is less than the spread due to other causes, such as the thermal velocities normal to the electric field.

The objective being great intensity of positive ion current, a source of ions was developed to this end. To attain a high accelerating field so that space charge should not limit emission, a source, without grids, was designed to concentrate, in the absence of space charge, the whole emission from a concave surface 3 cm wide into a parallel beam 6 mm wide. Appreciable space charge diverges the beam from this source, but it has been possible partially to remedy this defect by empirical modifications.

By last summer it was possible to bring to the receiving slit a current of 0.1 milliampere of K^{39} ions. This current was space charge limited, represented nearly 20 percent of the total emission, and could be maintained for about 20 hours. The resolving power is adequate for elements such as lithium, but is susceptible to some improvement.

References to this apparatus will probably be appearing in the literature shortly since we have already supplied one-microgram samples of Li^6 and Li^7 to several workers on atomic disintegration, for which reason it seems advisable to publish this note. A complete description of the apparatus should appear in the next six months. A similar instrument embodying some refinements is under construction at the Bartol Research Foundation.

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"Doublet" Intervals for $H^1\alpha$ and $H^2\alpha$

The "doublet" structure of $H^1\alpha$ and $H^2\alpha$ has been examined by use of large-scale microphotometer records of interferometer patterns photographed on very fine-grained plates.[1, 2] The interval between *intensity peaks* of each "doublet" has been measured, and for this interval an average value of 0.304 cm^{-1} for $H^1\alpha$ and 0.317 cm^{-1} for $H^2\alpha$ has been obtained. With the half-line-width found from our analysis of the complex structure, theory predicts a value of about 0.323 cm^{-1} for this interval in the case of $H^1\alpha$, thus indicating a discrepancy between experiment and theory of about 6 percent. Similar theory applied to $H^2\alpha$ shows a discrepancy of about 2 percent. Unequal shifts of the $2s\,^2S_{1/2}$ levels for the two isotopes probably accounts chiefly for these differential discrepancies with theory, and these results support our reasons for choosing only the $2p\,^2P_{3/2}-3d\,^2D_{5/2}$ transition in the e/m computation.[2] The spread of the $H^2\alpha$ measurements was somewhat less than that for $H^1\alpha$. These preliminary results will be checked by further measurements.

Houston and Hsieh[3] have reported similar discrepancies for the first five members of the Balmer series of H^1. Spedding, Shane and Grace,[4] according to the interpretation of their report by Kemble and Present,[5] found somewhat smaller discrepancies between their measurements and theory for both $H^1\alpha$ and $H^2\alpha$. However, since they do not explicitly state that their findings in this connection apply to both isotopes, we think they may have given fine-structure-constant results for $H^2\alpha$ only. If so, there would be no serious disagreement between their results and ours.

Fine-structure analyses of the intensity curves indicate that the difference between the $H^1\alpha$ and $H^2\alpha$ "doublet" intervals cannot be ascribed merely to differences in the relative intensities of the components of the "doublets." A more detailed discussion of the general subject of $H^1\alpha$ and $H^2\alpha$ fine-structure will be reported in a later paper.

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January 6, 1934.

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[1] Williams and Gibbs, Phys. Rev. **44**, 325 (1933).
[2] Gibbs and Williams, Phys. Rev. **44**, 1029 (1933).
[3] Houston and Hsieh, Bull. Am. Phys. Soc. **8**, 5 (1933).
[4] Spedding, Shane and Grace, Phys. Rev. **44**, 58 (1933).
[5] Kemble and Present, Phys. Rev. **44**, 1031 (1933).

The Infrared Absorption Spectrum of Water, Containing Protium and Deuterium

It has been shown[1] that absorption bands of ordinary distilled water occur at the approximate wave-lengths 1.5μ, 2μ, 3μ, 4.8μ and 6.2μ. Of these, the 3μ and 6.2μ bands are very pronounced. The 4.8μ band is weak.

When water of deuterium content 56 percent (manufacturer's value) was used as the absorbing material, the bands at 3μ and 6.2μ were reduced considerably, and the band at 4.8μ practically disappeared. New strong absorption bands appeared at approximately 4.2μ and 6.9μ. The absorption curves in Fig. 1 show the results of readings taken at intervals of 30 seconds on a Leiss spectrometer.

The band at 4.2μ is due, probably, to the combinations

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[1] Schaefer and Matossi; Coblentz; Lecomte.