With the lead in position B the fourfold vertical coincidences at 25,000 feet were three times as numerous as at sea level. This represents the ratio of the intensities of the vertical penetrating component, which agrees well with Heitler's[6] calculations. Braddick and Gilbert[7] found a ratio of 9 to 1 at 35,000 feet. This high ratio is explained by Heitler as due to insufficient shielding of the soft rays (3 cm of lead).

Twofold coincidences for the upper two tubes at 25,000 feet and at sea level give a ratio of 12 to 1 for the total vertical radiation. This is in good agreement with Pfotzer's[8] data obtained by balloon flights with threefold coincidences. Special care was taken to have the efficiency of the apparatus a maximum. By activating the tubes with a radium source, conditions similar to those at 25,000 feet were reproduced in the laboratory, without any apparent change in the efficiency. The above agreements seem to indicate this also.

The writers wish to express their appreciation to Professor A. H. Compton not only for suggesting the experiment, but also for his continued support.

MARCEL SCHEIN
VOLNEY C. WILSON

Ryerson Physical Laboratory,
University of Chicago,
Chicago, Illinois,
August 2, 1938.

[1] D. S. Hsiung, Phys. Rev. **46**, 653 (1934). B. Rossi, Proc. Lond. Conf. on Nuclear Phys. (1934).
[2] A. H. Compton, Proc. Phys. Soc. London **47**, 747 (1935).
[3] T. S. Bowen, R. A. Millikan, and H. V. Neher, Phys. Rev. **53**, 217 (1938).
[4] A. H. Compton and R. J. Stephenson, Phys. Rev. **45**, 442 (1934).
[5] W. Heitler, Proc. Roy. Soc. **A166**, 529 (1938).
[6] W. Heitler, Proc. Roy. Soc. **A161**, 261 (1937).
[7] T. Braddick and C. W. Gilbert, Proc. Roy. Soc. **A156**, 570 (1936).
[8] G. Pfotzer, Zeits. f. Physik **102**, 23 (1936).

A New Rydberg Series in N_2

The absorption spectrum of nitrogen below 1000A shows some interesting features that appear to have been overlooked by previous investigators because of insufficient dispersion. The lower spectrum of Fig. 1 (negative; absorption appears white) shows the general aspect between 785 and 850A at a pressure of 0.1–0.2 mm and path length 130 cm. The complex of overlapping band systems at longer wave-lengths definitely terminates at about 800A with a converging series of band heads. These are shown with greater enlargement in the upper spectrogram. They obviously constitute the higher and intermediate members of an electronic series, the lower members of which ($n<6$) are presumably confused with the complex of bands at longer wave-lengths. Diffuse absorption (O_2?) overlaps the bands $n=6$, 8, 10, 11, 12, 13, blotting out the first three and also the fourth except on two plates taken at lower pressures.

The frequencies of the heads follow a Rydberg law closely. With $n=7$ to 25 and $\alpha=0.34$ ($n+\alpha=$Rydberg denominator) only the lowest measured member deviates appreciably, being shifted about -10 cm^{-1}. The limit of the series lies at $125{,}670\pm2$ cm^{-1}, or 15.503 volts. This is just the first ionization potential of N_2 computed indirectly by Mulliken[1] from the data on Hopfield's Rydberg series. The latter converge to the $^2\Sigma_u^+$ excited state of N_2^+, while the limit of our series is the $^2\Sigma_g^+$ normal state. The latter has an internuclear distance of 1.11A as compared to 1.09 for the normal state of neutral N_2, a circumstance which is favorable to the observation of such series. Further evidence that this is actually an electronic series comes from the fact that no discrete bands are observed beyond the limit, but a region of continuous absorption extends from here with gradually diminishing intensity to at least 600A. The Hopfield series just referred to does not appear on these plates, while at higher pressures the continuum below 800A is almost completely absorbed.

That the high dispersion and resolution of a 3-meter grazing-incidence spectrograph were required to show the existence of this series will be apparent from the spectrograms. We are using the Lyman continuum, which covers the longer wave-length region not accessible with the helium continuum. A thorough analysis of the whole absorption spectrum below 1000A is in progress.

R. E. WORLEY
F. A. JENKINS

Department of Physics,
University of California,
July 19, 1938.

[1] R. S. Mulliken, Phys. Rev. **46**, 144 (1934).

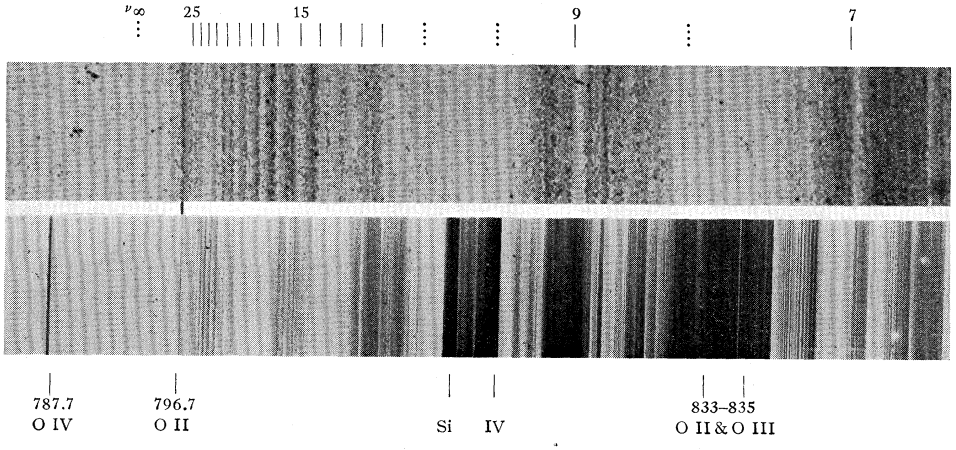

FIG. 1.

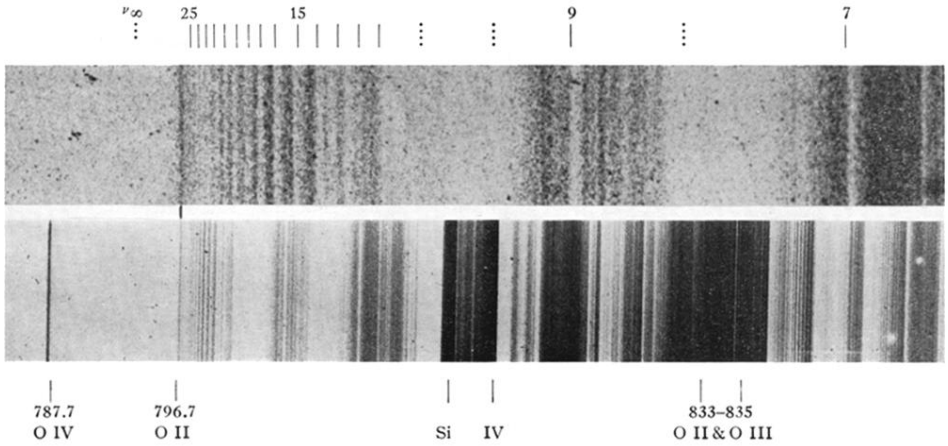

FIG. 1.