

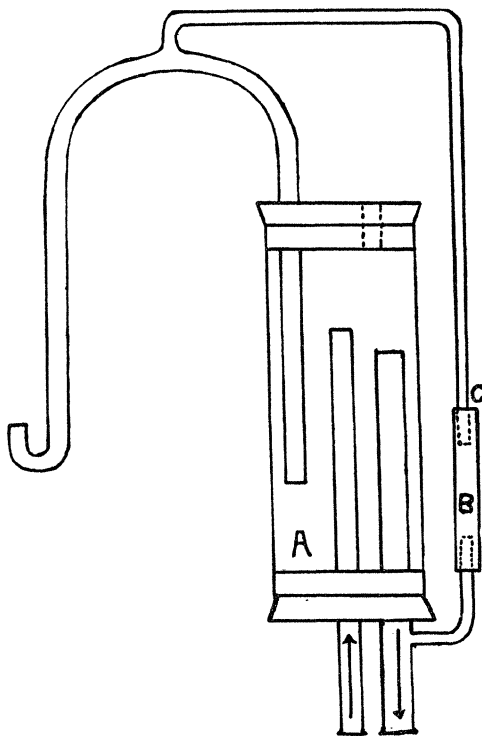
impart the spirit of creative inquiry. The latter would lose his contacts with the great intellectual tradition, with his colleagues in allied branches of knowledge, and with students who furnish both criticism and discipleship. The university is the proper center of scholarly endeavor, where are focussed the influences of history and culture, and where the achievements of maturity are renewed by the enthusiasm and forward-look of youth.

It is quite true, as asserted in the declaration of the National Research Endowment, both that facilities for research are inadequate, and that the demands of teaching and administration in American universities are excessive. It is to be hoped that both the problems will be met at the same time, and that the public interest in promoting research will be so directed as to improve the lot of those whose duty it is to teach and administer.—*Harvard Alumni Bulletin*.

### SCIENTIFIC APPARATUS AND LABORATORY METHODS

#### A MODIFIED CONSTANT-LEVEL REGULATING DEVICE

ABOUT a year<sup>1</sup> ago a satisfactory device for maintaining a constant liquid level in any open vessel



such as a beaker was described. Employing the same principle the construction may be simplified so as to

<sup>1</sup> *Journal of Industrial and Engineering Chemistry*, 17, 466 (1925).

require a minimum of glass blowing. The accompanying figure elucidates this adequately. Tube A is one inch by three inches and the outlet tube is somewhat larger than the inlet. Tube C is of small bore. To start the regulator the small bore rubber tube B is removed and suction applied at C. Once the siphon is started the rubber tube is replaced.

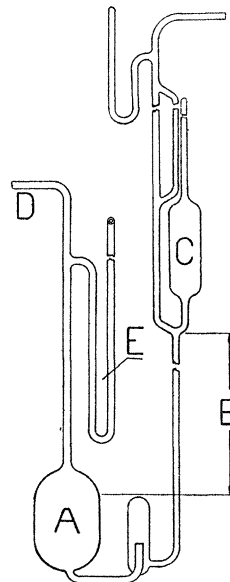
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#### AN IMPROVED MCLEOD GAUGE

THE writer recently had occasion to install a McLeod gauge in a production unit. Having, in the past, experienced some trouble with the usual flexible tubing type and having learned from experience that the average workman is incapable of handling the Bailey<sup>1</sup> model, a modified form was made. This gauge has the advantage of being all glass, does not require an aspirator and is simpler to operate than certain other models.

Referring to the figure, the gauge proper is of the usual construction. A is a reservoir containing sufficient mercury to completely fill the gauge. The distance B is made about thirty-one inches, slightly more than atmospheric pressure.



In operation, the mercury is forced into the chamber, C, by the application of air pressure through a three-way stop-cock (not shown) attached to pipe D. In the present instance the low pressure air supplied in the factory was used with a reducing valve. In order to preclude any possibility of mercury being forced into the system being exhausted, open arm manometer E was designed to act as a safety valve.

<sup>1</sup> Austin Bailey, *Phys. Rev.*, Vol. 15, No. 4, page 314, April, 1920.

The difference in mercury levels obtainable in this manometer is made slightly greater than the pressure required to force the mercury to the proper level in the capillary of the gauge.

In cases where compressed air is not available, a rubber atomizer bulb with a convenient releasing valve, such as is used by physicians with sphygmomanometers, will be found very satisfactory.

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## SPECIAL ARTICLES

### EXCITATION POTENTIALS OF THE SPECTRA ARGON II AND NEON II<sup>1</sup>

A PAPER now being written by the author gives some critical potential data obtained by a new method. The photo-ionization produced by the radiation from a thermionic discharge was measured by the effect of the photo-ions on the space charge in a second thermionic unit in the same tube but electrically shielded from the discharge. The present note covers only the results bearing on the excitation of the rare gas spark spectra. Argon showed three sharply defined increases in photo-ionization at  $32.2 \pm .2$ ,  $34.8 \pm .5$  and  $39.6 \pm .5$  volts. The first point measures a spark excitation potential, the second gives the work required to remove two electrons (each from a  $3_2$  orbit), while the third point probably measures the work required to remove one  $3_1$  electron. Spectroscopic studies by Dejardin<sup>2</sup> and others show that the second spectrum of argon appears in a low current discharge, near the second point. With higher currents this spectrum is excited near nineteen volts, the difference being equal to the first ionization potential. This furnishes definite evidence that the second spectrum is a first spark spectrum and gives the basis for the above interpretation of the critical potentials. Photo-ionization measurements in neon showed two critical potentials at  $48.0 \pm 1$  and  $54.9 \pm 1$  volts. For the interpretation of these points it was important to know the excitation potential of the neon II spectrum. Merton<sup>3</sup> discovered this spectrum and it has since been studied by L. and E. Bloch and Dejardin,<sup>4</sup> but it has never been observed under conditions of controlled voltage. I have photographed the thermionic discharge in a simple three electrode tube using currents of a few milli-amperes and a pressure

of .05 mm. The second spectrum is absent at 54 volts and distinctly visible at 55. The conspicuous lines as shown by a quartz spectrograph are between 3,700Å and 3,300Å. I conclude that 54.9 volts measures the work required to remove two  $2_2$  electrons. The first ionization potential is 21.5 volts; hence, the ionization potential of the ion is  $54.9 - 21.5 = 33.4$  volts. The 48 volt point probably measures the work required to remove one electron and displace another to a 3 quantum orbit of energy 26.5 volts. A 3 quantum electron in a hydrogenic ion has an ionization potential of 6 volts while the value derived from the observed potentials is  $54.9 - 48.0 = 6.9$  volts. The 3 quantum states are probably the final states for all the lines between 3,700 and 3,300, while the strongest spark lines, with final state  $2_2$ , will lie in the far ultraviolet between 470Å and 370Å. There will presumably be no lines of this spectrum between 1,800Å and 470Å. My results fail to give evidence as to the  $2_1$  level of neon, but lines associated with excitation from this level are to be expected in addition to the known arc spectrum and the first spark spectrum.

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BUREAU OF STANDARDS

### SAND FLOTATION IN NATURE

EARLY in July, 1925, the writer visited the Ohio River ten miles above Cincinnati. A strong, warm breeze was blowing across the dry sand and mud flats and out upon the river. To my surprise the windward third of the river's width bore films of floating sediment, each of minute thickness but several at least one foot square. The ratio of covered to exposed water was about as 1 is to 16. The floating material proved to be sand with a few flakes of dark mica, the grains roughly 0.025 centimeters in diameter. Each patch rested in a very shallow meniscus on the water surface. No oily films were seen, which might have aided in this unusual mode of transport. As I watched more and more material was brought downstream in the same manner.

This phenomenon has been recorded by Graham, Simonds and Hovey.<sup>1</sup> Graham found the sand floated by splashing waves against a bar in the Connecticut River. Simonds attributed the setting adrift of the sand to the undermining of sand beds bordering the stream—in this case the Llano River. Similar instances are recorded in which the sand was washed off bars on islands by tidal currents. In the case here described the writer believes the sand was blown out upon the water surface by the wind, but evidence is not conclusive.

<sup>1</sup> Published by permission of the director of the National Bureau of Standards of the U. S. Department of Commerce.

<sup>2</sup> *Annales de Phys.*, 11, pp. 241-327, 1924.

<sup>3</sup> *Proc. Roy. Soc.*, 89A, pp. 447-451, 1913-14.

<sup>4</sup> *C. R.*, pp. 731-733, 1925.

<sup>1</sup> Graham, J. C., *Am. Jour. Sci.*, III, 40, 476, 1890; Simonds, F. W., *Am. Geol.*, 17, 29-37, 1896; Simonds, F. W., *SCIENCE*, XI, 510-512, 1900; Hovey, E. O., *SCIENCE*, XI, 912-913, 1900.