

inserting a double-pole-double-throw switch into the circuit of the galvanometer within the instrument. In one position of the switch the circuit within the meter is unaltered, in a second position the galvanometer in the meter is disconnected and an outside galvanometer is substituted without disturbing the adjustment of the meter.

A Leeds and Northrup galvanometer unit (2420-c) with a plane mirror and mounted on a heavy wood base is used for recording. A narrow beam of light reflected from the mirror moves across the slit of the camera placed at a distance of one meter. A potentiometer, inserted between the pH meter and the recording galvanometer, is used to control the excursion of the light beam for a given unit change in pH. The calibration on the record is obtained by moving the pH dial through a given interval, usually 0.1 pH, and photographing the resulting excursion of the light beam.

For rendering the blood incoagulable heparin has been used in some instances; but we have also found Pontamine Fast Pink BL or Chlorazol Fast Pink B, 200 to 250 mgm per kilogram, satisfactory.

This apparatus is quite rugged and stable. Continuous records of the pH of the circulating blood can be made with an accuracy of at least 0.01 pH, and with good approximation to the third decimal place. The type of record obtainable is shown in Fig. 2. This

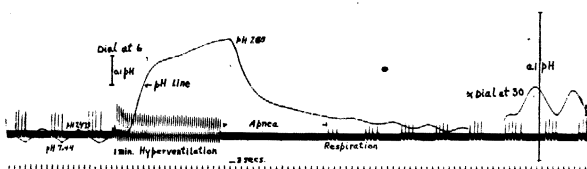


FIG. 2. A record of spontaneous breathing, hyperventilation, and the pH of the circulating arterial blood, obtained from a dog under barbital-sodium anesthesia. Dial readings refer to figures on the dial of the potentiometer between the meter and the recording galvanometer.

record was obtained from a dog under barbital-sodium anesthesia. The animal, as indicated, was hyperventilated for one minute. Prior to the hyperventilation, as well as after that procedure, the breathing was of the periodic type. The record shows, in addition to the marked rise in the pH of the arterial blood incident to the hyperventilation, a definite fluctuation in pH with each group of respirations. In a number of instances, in animals breathing slowly and deeply, we have observed and recorded measurable fluctuations in the pH of the circulating arterial blood coincident with each respiratory movement.

C. E. KING

EDMUND W. BENZ

VANDERBILT UNIVERSITY SCHOOL OF MEDICINE

A SIMPLE INEXPENSIVE DEVICE FOR ACCURATE DELIVERY OF SMALL AMOUNTS OF FLUID

To overcome the difficulties which are encountered when treating a large number of animals with small identical volumes of material, Dr. Robert T. Frank suggested that I devise an attachment for a tuberculin syringe which can be readily set and promptly made to deliver any desired amount of liquid. The device was not to interfere with quick assembly and cleaning.

The apparatus which has proved efficient consists of a spring clamp (A) encircling the barrel (C) with an arm (B) attached by a pivot. Both ends of this arm are bent at right angles. At the front end, facing the barrel, there is a sharp edge which engages the graduation lines etched into the barrel. The other end of the arm acts as a stop to the plunger (D) which carries a metal collar (E) with a flange to give a surface perpendicular to the stop. The amount delivered, when using this device, is as accurate as the graduation markings on the syringe. The device can be easily detached and applied to another syringe as required.

This device has been used with success by Dr. Robert T. Frank for injecting quantities as small as 0.02 cc.

FIG. 1

JOSEPH VONDRAK

THE MOUNT SINAI HOSPITAL,
NEW YORK

BOOKS RECEIVED

- CHANDLER, ASA C. *Introduction to Parasitology; with Special Reference to the Parasites of Man*. Sixth edition. Pp. xiii + 698. 309 figures. Wiley. \$5.00.
- CONN, H. J. *Biological Stains; A Handbook on the Nature and Uses of the Dyes Employed in the Biological Laboratory*. Pp. 308. Biotech Publications, Geneva, New York. \$3.40.
- FRANKLIN, PHILIP. *A Treatise on Advanced Calculus*. Pp. xiv + 593. Wiley. \$6.00.
- HARROW, BENJAMIN. *Laboratory Manual of Biochemistry*. Pp. v + 119. 19 figures. Saunders. \$1.50.
- HEHRE, FREDERICK W. and GEORGE T. HARNESS. *Electric Circuits and Machinery. Vol. I, Direct Currents*. Pp. ix + 513. Illustrated. Wiley. \$4.50.
- MACDUFFEE, CYRUS C. *An Introduction to Abstract Algebra*. Pp. vii + 303. Wiley. \$4.00.
- POTTER, GEORGE E. *Essentials of Zoology*. Pp. 526. 204 figures. Mosby. \$3.75.
- TIMBLE, WILLIAM H. and VANNEVAR BUSH. *Principles of Electrical Engineering*. Third edition. Pp. ix + 540. 388 figures. Wiley. \$4.50.
- TRANSEAU, E. N., H. C. SAMPSON and L. H. TIFFANY. *Text-book of Botany*. Pp. xi + 812. 424 figures. Harper. \$4.00.
- WHITE, E. GRACE. *Principles of Genetics*. Pp. 352. 179 figures. Mosby. \$2.50.