

that we have in these organisms a new, undescribed species. The possibility that these pleomorphic forms may be stages in the life cycle of a true, attenuated, mammalian tubercle bacillus must be kept in mind.

Because of the constant occurrence of these forms, practically always in pure culture, in skin lesions of tuberculin-reacting cattle and in the organs of no-lesion-reactors, we are led to believe that they are the cause of nearly all of the skin lesions and of the tuberculin hypersensitiveness of most of the reactors in Utah.

If these organisms are finally shown to be the cause of the usual skin lesions of tuberculin-reacting cattle, their cultural reactions and their effects on guinea pigs may offer a means of definite early diagnosis and probably make unnecessary the slaughter of large numbers of cattle.

Extensive animal inoculations and cultural tests are now under way in an attempt to establish definitely either the positive or the negative rôle of these organisms in the skin lesions of cattle and also in the production of tuberculin sensitization in cattle.

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An Improved Gasometric Apparatus for Estimation of Amino Nitrogen.

MAX S. DUNN, B. W. SMART AND K. E. BROWN.

From the Chemical Laboratory, University of California at Los Angeles.

The first apparatus for the quantitative determination of amino nitrogen was devised by Sachsse and Kormann.¹ It consisted essentially of a cylinder for deaminizing the aliphatic amine and a buret for purifying and measuring the nitrogen. Mallet² described minor modifications in the form of the apparatus. Brown and Millar³ proposed an elaborate set-up for carrying out the amino nitrogen determination. Van Slyke⁴ devised an apparatus giving satisfactory accuracy yet requiring only relatively simple manipulations. Klein⁵ described an all glass deamination chamber to replace the bot-

¹ Sachsse, R., and Kormann, W., *Die landwirthschaftlichen Versuchs-Stationen*, 1874, **17**, 321. *Z. Anal. Chem.*, 1875, **14**, 370.

² Mallet, J. W., *U. S. Dept. Agri., Div. of Chem., Bull.*, 1898, **54**, 7.

³ Brown, H. T., and Millar, J. H., *Trans. Guinness Research Lab.*, 1903, **1**, 18.

⁴ Van Slyke, D. D., *J. Biol. Chem.*, 1909-10, **7**, XXXIV. *Ber.*, 1910, **48**, 3170.

⁵ Klein, D., *J. Biol. Chem.*, 1911, **10**, 287.

tle and tubes first used by Van Slyke. Later, Van Slyke⁶ not only made use of this feature but also added a motor shaking mechanism which, together with the gas buret and Hempel pipet, was mounted in the form familiar today to the many users of his amino nitrogen apparatus. A little later Van Slyke⁷ devised his micro apparatus which, except for size, is similar to the larger form. Kupelwieser and Singer⁸ and Koch⁹ modified the deaminizing chamber to prevent possible losses of nitrogen. Van Slyke¹⁰ published a description of his manometric apparatus and Folley¹¹ made a new

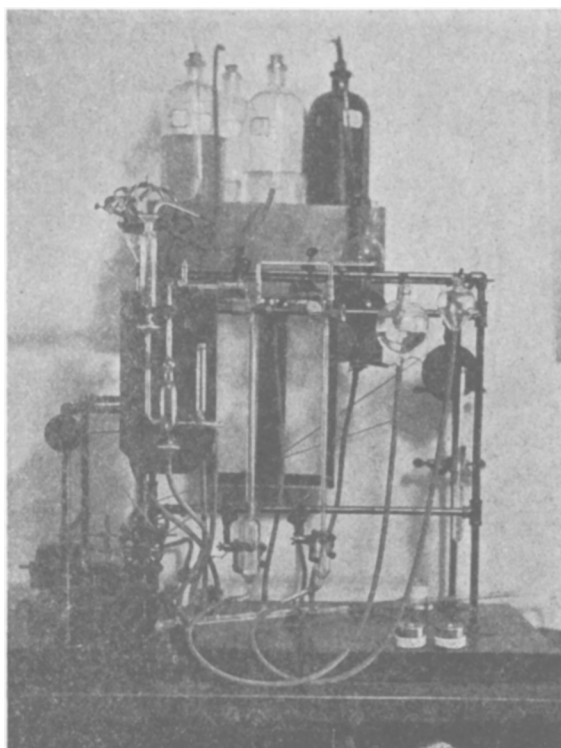


FIG. 1.

Photograph of an improved gasometric apparatus for the estimation of amino nitrogen.

⁶ Van Slyke, D. D., *J. Biol. Chem.*, 1912, **12**, 275.

⁷ Van Slyke, D. D., *J. Biol. Chem.*, 1913-14, **16**, 121; 1915-16, **23**, 407.

⁸ Kupelwieser, E., and Singer, K., *Biochem. Z.*, 1926, **178**, 324, as quoted in *Chem. Abstr.*, 1927, **21**, 1285.

⁹ Koch, F. C., *J. Biol. Chem.*, 1929, **84**, 601.

¹⁰ Van Slyke, D. D., *J. Biol. Chem.*, 1929, **83**, 425.

¹¹ Folley, S. J., *Biochem. J.*, 1930, **24**, 961.

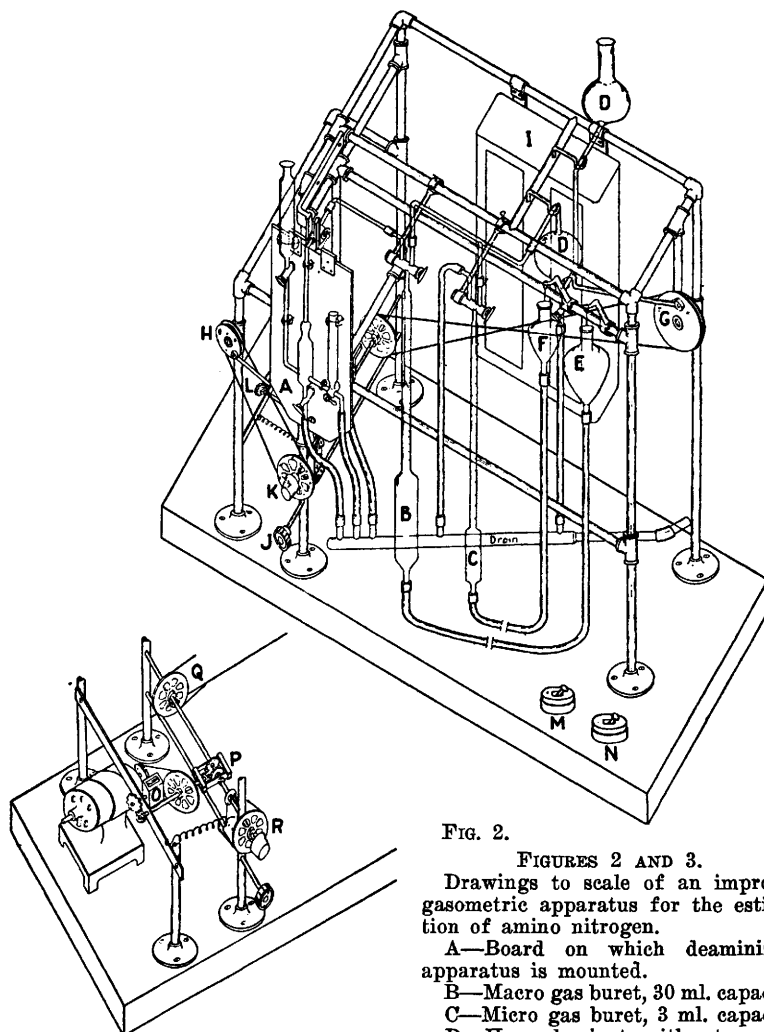


FIG. 2.
 FIGURES 2 AND 3.

Drawings to scale of an improved gasometric apparatus for the estimation of amino nitrogen.

A—Board on which deaminizing apparatus is mounted.

B—Macro gas buret, 30 ml. capacity.

C—Micro gas buret, 3 ml. capacity.

D—Hempel pipet with stop cock connected to drain.

- E—Leveling bulb for macro buret.
- F—Leveling bulb for micro buret.
- G—Driving cam for agitating Hempel pipet.
- H—Driving cam for agitating deaminizing apparatus.
- I—Illuminating chamber with 2 ground glass windows and containing 4, clear glass, 60 Watt bulbs.
- J—Control device for gear shift.
- K—Shaft upon which the driving gears are mounted and used for shifting the drive from the deaminizing apparatus to the Hempel pipet.
- L—Drive for oscillation counter.
- M—Control switch for motor.
- N—Control switch for illuminating chamber.
- O—Oscillation counter.
- P—Driving gears.
- Q—Pulley for oscillating the Hempel pipet.
- R—Pulley for oscillating the deaminizing apparatus.

design of the gasometric apparatus. Here a continuous all glass system eliminates the use of rubber connections through which there is a possibility of nitrogen leakage.

The new design of the amino nitrogen apparatus presented here is believed to be more satisfactory than previous forms. We have recognized the inherent deficiencies and the empirical nature of the determination. Quantitative accuracy in the determination of some amino acids is possible only when the temperature, the rate of shaking the deaminizing chamber, the time allowed for deamination, the value for the blank, and other factors are under precise control. With other amino substances such as glycine, cystine, glycylic peptides, and certain purines, unexplained abnormalities occur and are accentuated by higher temperatures as shown by Schmidt.¹² An investigation of these important physical and chemical problems is in progress.

As shown in Figures I, II, and III the new apparatus consists of a Hempel pipet, 2 gas burets, and the usual Van Slyke macro deaminizing chamber permanently mounted so that breakage is minimal. Though this apparatus has been in constant use for more than a year no parts have been broken. Obvious advantages of the new apparatus are a revolution counter for measuring the rate at which the deaminizing chamber and the Hempel pipet are oscillated, a simple device for shifting the shaking mechanism to oscillate either the deaminizing chamber or the Hempel pipet, a rheostat (not shown in the figures) for varying the speed of the motor, a macro and a micro buret for measuring large or small volumes of gas, a modified Hempel pipet easily drained and cleaned, and an illuminated background to facilitate accurate reading of the burets. Rubber connections are retained throughout because errors due to leakage of the gas through rubber are probably of little significance.

¹² Schmidt, C. L. A., *J. Biol. Chem.*, 1929, **82**, 587.