homogentisic acid began promptly after the ingestion of phenylalanine and the low ratio of 58 in the third period indicates that the extra excretion of the acid was nearly complete in the first 12 hours. Similar results were obtained in the other series during which the urine was collected over shorter periods of time than 24 hours.

Summary. Oral administration of 10 to 15 g daily of *l*(−)-phenylalanine to two alcaptonuric brothers resulted in a notable increase in the excretion of homogentisic acid in the urine, corresponding to about 70% of the amount theoretically obtained by complete conversion of the phenylalanine fed to homogentisic acid. The excretion of the extra homogentisic acid began promptly and was nearly complete within 12 hours after the phenylalanine was fed.

10003

A Mechanical Pump for the Drawing of Gas Samples.

S. B. BARKER AND EDWARD SMYTH. (Introduced by William H. Chambers.)

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Because of the interest aroused by a device made in this laboratory for the automatic drawing of samples from flowing gas, a brief description is being presented. The apparatus is in use here in conjunction with open-circuit respiratory metabolism determinations, the analyses for CO_2 and O_2 being performed on a Carpenter-Haldane analyzer,[1] but it can obviously be of service in any situation when it is desired to draw a continuous sample of gas over a set period of time.

Benedict and Ritzman[2] have described a method of drawing gas samples by attaching a Lee pump[3] to gearing activated by electromagnets controlled from the gas meter. The present apparatus uses a larger pump of similar construction but with the stopcock built into the cylinder head. The driving power is transmitted by

[1] Carpenter, T. M., in Abderhalden, E., *Handbuch der biologischen Arbeitsmethoden*, Berlin and Vienna, 1933, Abt. IV, Teil 13, 593.

[2] Benedict, F. G., and Ritzman, E. G., *Wissenschaft. Arch. f. Landwirtschaft*, 1931, Abt. B, **5**, 1.

[3] Lee, R. C., *J. Indus. Eng. Chem.*, Anal. Ed., 1933, **5**, 354.

gears to the threaded shaft from an electric motor which runs the blower. The sampler has the following qualifications:

Continuous drawing of a predetermined volume is obtained over a set length of time, not dependent upon the rate of gas flow. Since a single electric motor drives both the blower and the sampler through separate gearing, variations in gas flow due to fluctuations in electric current will automatically be compensated for in the aliquot drawn. The separate gearing allows the operator to vary the collection time of samples and the velocity of air passage independently of each other but insures a constant aliquot at all times.

Careful construction renders the sampler sufficiently gas tight so that a sample can be left in the apparatus (with the stopcock closed) for more than 12 hours with perfect safety.

Accurate estimation of the volume of samples can be obtained directly from the length of exposed pump shaft.

In all, a rugged system has been evolved, capable of functioning continuously over long periods of time without requiring constant adjustment and attention.

The original apparatus, built by Mr. James Evenden, has been giving satisfactory service for over 3 years;[4] several modifications suggested by experience with this have been incorporated in a newer design. This improved sampler, constructed by Mr. Smyth and Mr. R. E. Phipps, is diagrammed in Fig. 1, first in a horizontal cross-section through the middle and, below, in a rear view.

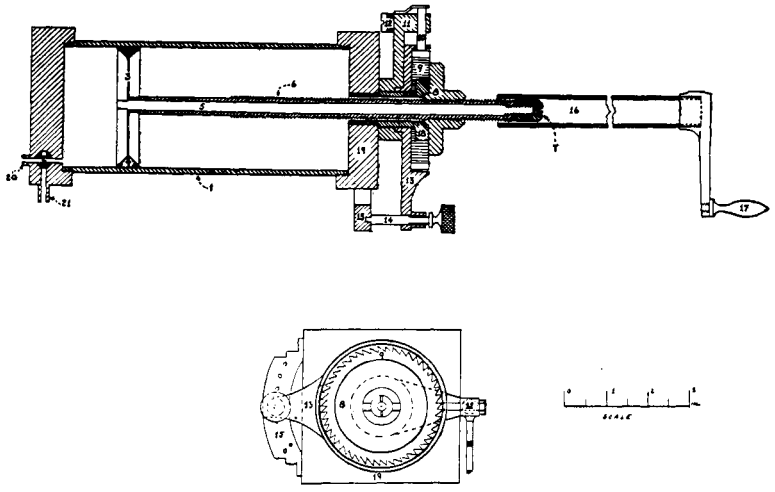

FIG. 1.

[4] Barker, S. B., Chambers, W. H., and Dann, M., *J. Biol. Chem.*, 1937, **118**, 177.

The apparatus is essentially a hollow metal cylinder (*1*), into which gas is drawn through a small hole in a ground-in metal stopcock (*2*) by a mechanically operated plunger (*3*). In order to insure a tight fit for the plunger, the edges are sealed by 2 circular leather washers (*4*), triangular in cross-section, which together form a V-shaped wedge. It is absolutely necessary, as stressed by Lee,[3] to remove all fat from the rings and to relubricate with petroleum oil only, in order to avoid changes in the composition of the sample. The leather wedge fits between the 2 beveled halves of the plunger head (*3*) and can be expanded by drawing the two halves together. In order to make this adjustment without removing the plunger from the cylinder, the first plate is fastened to a solid shaft (*5*) which is inside the hollow shaft (*6*) connected with the other plate. By tightening a nut (*7*) on the threaded projecting end of the solid shaft, one squeezes the leather rings, producing a tighter fit. The apparatus should be tested for tightness on both reduced and increased pressure, especially the former, to rule out the possibility of sucking in gas from any place other than through the hole at the stopcock.

The outside of the hollow shaft (*6*) is threaded to fit an inside thread on a brass collar (*8*) fastened to a wheel (*9*) with teeth on its outer circumference. A bakelite ratchet tooth (*10*) turns the collar, by which action the plunger is pulled out. Rotary movement of the plunger is prevented by a key-way which remains engaged all the time. In order to prevent the piston from being drawn back too far in the cylinder, the threads on the appropriate portion of the shaft are stripped. When this area comes into the ratchet-wheel drive mechanism, the pulling motion stops. This is merely an emergency provision and, since a certain amount of careful manipulation is required to replace the shaft on the threads, the gearing should be so arranged as to permit maximum gas collection only up to the stripped area in the desired length of period.

The thrust motion of the arm (*11*) activating the ratchet can best be obtained by connecting the arm by a rod (*12*) to an eccentric driven by a motor. The length of collection period is determined by the number of teeth engaged in a single excursion of the ratchet. This is controlled by turning the guard (*13*) so that a certain number of teeth on the notched wheel are exposed in a slot. During the rest of its arc the ratchet rides on the guard, which is held firmly by a pin (*14*) set into a guide (*15*). At the end of the period the operator turns the guard so that the ratchet is entirely disengaged, thereby stopping the collection of gas. The metal stopcock (*2*) is

turned to connect the sampler with a detachable gas storage pump, and the collected gas forced over by revolving the brass collar in the reverse direction to the one in which it was previously turning. For this purpose a long piece of hollow brass rod (*16*) with a crank (*17*) at the free end is slipped over the shaft, and two projections engaged in slots cut in the small portion of the collar (*8*). A bronze plug (*18*), pressed into the rear block (*19*), holds in place the rotating components of the gear-drive mechanism and also serves as a fulcrum against which the force of *8* and *9* can be exerted when the sample is being discharged.

In order to insure a tight, permanent connection between the sampler and the flowing gas, the projecting tip (*20*) is set into a washer in a hole in the pipe carrying the flow, a clamp drawing the pipe and the sampler firmly together. The other tip (*21*) is for connection through a short piece of heavy-walled rubber tubing to a detachable pump for storage and analysis. The detachable pumps have no gears, but have the same type of plunger and double shaft, which ends in a knob concealing the adjusting nut for the inner shaft. The capacity of these, as well as of the sampler, is about 700 cc. Excessive weight is avoided by employing duralumin wherever possible, except in the case of moving parts, for which brass is used as a dissimilar metal.

10004

The Excretion of Porphyrin in Pellagra.

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Beckh, Ellinger and Spies[1] and Spies, Gross and Sasaki[2] have described an increased output of porphyrin in the urine in both endemic and alcoholic pellagra. A normal excretion of porphyrin was observed after the symptoms regressed following suitable treat-

[1] Beckh, W., Ellinger, P., and Spies, T. D., *Quart. J. Med.*, New Series, 1937, **6**, 305.

[2] Spies, T. D., Gross, E. S., and Sasaki, Y., PROC. SOC. EXP. BIOL. AND MED., 1938, **38**, 178.