to +47.95°; in forty-three minutes to +38.91°; in two hours to +27.4° and after forty-two hours the rotation had become 0°. On evaporation of the acetone–water solution there crystallized again the tetraacetylgluconic acid monohydrate.

The product though not crystalline is without doubt the 2,3,4,6-tetraacetyl-δ-*d*-gluconolactone. The rotational behavior of these two acetylated lactones parallels very closely that of the γ- and δ-gluconolactones as reported by Nef [*Ann.*, **403,** 322 (1914)] and also by Hedenburg [THIS JOURNAL, **37,** 345 (1915)]. Of special interest is the fact that δ-gluconolactone may be acetylated to give the 2,3,4,6-tetraacetyl derivative. To our knowledge all derivatives of this lactone hitherto reported have been obtained by the oxidation of the corresponding sugar derivatives. Thus attempts to methylate δ-*d*- and *l*-mannonolactones in this Laboratory have resulted in the formation of 2,3,5,6-tetramethyl-γ-lactones, change in the position of the lactone bridge occurring during the process.

In addition to the above we have prepared the following acetylated lactones: tetraacetyl-α-*d*-glucoheptonolactone (γ), m. p. 128°, $[\alpha]_D^{20}$ −23.83° (six minutes) and −21.58° (four days); tetraacetyl-γ-*d*-mannonolactone m. p. 119°, $[\alpha]_D^{20}$ +52° (six minutes), and +51.2 (three days); tetraacetyl-γ-*l*-mannonolactone, m. p. 119°, $[\alpha]_D^{20}$ −52.2° (nine minutes) and −51.2° (three days).

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CONCERNING THE EXPLOSION METHOD FOR THE DETERMINATION OF SPECIFIC HEATS OF GASES AT HIGH TEMPERATURES[1]

Sir:

Values of the specific heats of gases above 2000°C. are due mainly to the investigations of Pier, Bjerrum, Siegel and Wohl. The explosion method was used and the maximum temperature and specific heat were calculated from the maximum pressure developed in the explosion.

It has always been assumed that at the instant maximum pressure is established, the reaction inside the chamber is complete or has reached an equilibrium state; that little or no energy has been lost in the meantime, or whatever is lost is corrected for. Consider the explosion of hydrogen and oxygen and the determination of the specific heat of water vapor. The reaction which is started at the center of a chamber spreads in all directions with an accelerating velocity. Coincidentally the pressure in the flame front increases, increasing the percentage combustion in each succeeding

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unburned layer of gas. Somewhere between ignition and the wall, detonation sets in. The detonation wave is reflected from the wall and returns toward the center, compressing the partially burned gases and completing the combustion. Two questions arise: (1) Does the impact of the detonation wave on the diaphragm pressure indicator contribute to the maximum pressure and thus modify an otherwise static recording? (2) Is the magnitude of the maximum pressure affected by the location and therefore speed of the detonation wave at the moment it is recorded?

Information on these points may be obtained in the following way. It is known that the velocity of the detonation wave in a mixture $2H_2 + O_2 + 5He$ is about twice as great as in a mixture $2H_2 + O_2 + 5A$ [Bernard Lewis and J. B. Friauf, THIS JOURNAL, **52,** 3905 (1930)]. Argon and helium have the same specific heats and they do not affect the equilibria at explosion temperatures. If the explosion method is yielding correct results under all conditions, the explosion of argon and helium mixtures should give identical maximum pressures and therefore the same specific heat of water vapor.

It would be desirable to obtain specific heat measurements in various mixtures of hydrogen and oxygen in all of which the velocity of the detonation wave is the same. This can be realized by the addition of suitable amounts of argon or helium, or mixtures of the two inert gases. It is also desirable to study the effect on specific heats of varying the type, size and material of the diaphragm pressure indicator and the explosion chamber.

In view of the importance of high temperature specific heats and the fact that the explosion method is the only one available for their determination, such fundamental studies are now in progress in this Laboratory.

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NEW BOOKS

A Quarter Century of Learning, 1904-1929, as Recorded in Lectures Delivered at Columbia University on the Occasion of the One Hundred and Seventy-Fifth Anniversary of its Founding. Columbia University Press, 2960 Broadway, New York, 1931. vi + 380 pp. 15.5 × 23 cm. Price, $3.50.

In this book, eighteen professors of Columbia University "survey the progress of learning during the past twenty-five years"; each professor contributes a chapter on his own special field of learning.

The subjects discussed are the following: history, economics, sociology, government, jurisprudence, psychology, education, college administra-

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