The crystals decompose without melting between 195° to 200°.

The small amount of material prevented farther experiments.

The compounds most closely related to epithiocyanhydrin are the thiocyanacetone and thiocyanpropyl aldehyde. It resembles both in physical properties and in its unstable character.

The thiocyanacetone was reported by Tscherniac in 1883. It is an oil of very disagreeable odor and easily decomposed by heat.

The β-thiocyanpropyl aldehyde was prepared by Chautard.[2] It is a liquid of fetid odor, is decomposed by heat, and is easily resinified by acids and alkalies.

CONCLUSION.

The results of the experiments may be summarized as follows:

The monochlorhydrin, the α,γ-dichlorhydrin, and the acetodichlorhydrin, form corresponding thiocyanates which are very unstable and immediately change to complex secondary compounds.

The α,β-dibromhydrin and its acetic ester form dithiocyanates which are somewhat more stable and can be separated and purified. Treated with tin and hydrochloric acid they give double chlorides of tin and iminomethanepropylalcohol disulphide.

The epichlorhydrin forms the epithiocyanhydrin readily. It is a liquid of garlic odor, insoluble in water, but soluble in alcohol and ether. It cannot be distilled. With dry hydrosulphuric acid it forms epihydrin sulphide rather than a dithiocarbamic ester. With methyl iodide it forms epihydrindimethylsulphine iodide.

ORGANIC LABORATORY, HAVEMEYER HALL,
COLUMBIA UNIVERSITY.

LUBRICANTS FOR GLASS STOP-COCKS.

BY FRANCIS C. PHILLIPS.

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THE success of modern chemical research work depends frequently upon the maintenance in position for considerable periods of complex forms of apparatus in which glass stop-

[1] Tschmerniac: *Ber. d. chem. Ges.*, 16, 349.

[2] Chautard: *Ann. chim. phys.* [6], 16, 197.

cocks play an important part, and the failure or breakage of a stop-cock often proves to be the cause of serious loss of time or material. The efficiency of a stop-cock is, however, quite as much dependent upon the lubricant used for its protection as upon the skilful workmanship of the glass-blower in its manufacture.

It has been the common practice to employ an animal fat or a mixture of such fats for lubricating the stop-cock plugs of apparatus of all kinds and for work of every description, although it is a fact of experience that such lubricants are often a source of inconvenience and even danger to the apparatus.

A stop-cock lubricant should, besides overcoming friction, satisfy the following requirements:

1. It should adhere to the glass and should not be loosened by water.

2. It should be little affected by changes of temperature.

3. It should not be saponified by alkali.

4. It should be sufficiently transparent or translucent to render visible any clogging of the hole in the stop-cock plug while in use, and to show whether air spaces occur between the plug and the walls of the stop-cock.

Ordinary fats are so easily saponified and adhere so feebly to glass that they are seldom suited to the purpose. Pure rubber heated to a temperature sufficient to render it permanently viscid, has advantages over fats, but its adhesiveness is lessened by moisture, and it is completely removed by alkali.

Schmitz[1] recommends for glass stop-cocks the use of gutta percha dissolved in a high-boiling mineral oil. This mixture, although not saponifiable, does not adhere well to glass. If thinned down sufficiently with oil, its lubricating qualities suffer, while the gutta percha tends to become granular if the mixture is made thicker.

Vaseline, which is sometimes recommended for use alone, does not adhere to the glass, and does not overcome friction.

With a view to producing a lubricant better adapted to use on glass stop-cocks, a series of experiments has been tried. Various mixtures of softened rubber with other substances were tested. On mixing together

[1] *Ztschr. anal. Chem., 1884*, 516.

	Parts.
Pure rubber	70
Spermaceti	25
Vaseline	5

a mass is obtained which lubricates well, is translucent, adheres to the glass, and is not saponifiable. The vaseline was added to the mixture to increase its softness. The materials were thoroughly mixed while hot, the rubber being melted first, and the others stirred in. It is well to use a little more vaseline in winter than summer.

Another preparation, which gave still better results, was made by mixing

	Parts.
Pure rubber	70
Yellow unbleached beeswax	30

The rubber should be pure and fresh. Old rubber, or scraps of worn-out tubing, whether black or red, will not answer as well and may cause the mixture to become more or less granular and opaque when used in the stop-cocks. The rubber is best heated in a covered vessel until thoroughly melted, and then the wax should be added. The hot mixture is well stirred. No vaseline is needed. This lubricant is very serviceable, protects stop-cocks from sticking, even when used for concentrated solutions of caustic alkalies, and is quite translucent in thin layers. Care should be used not to scorch the mixture in its preparation. Strong alkalies tend in time to loosen and emulsify all lubricants and the stop-cocks should occasionally be cleaned and recoated.

It has been attempted to increase the adhesiveness of such lubricants by the addition of small quantities of balsam of fir and other strongly adhesive substances, but difficulty was found from the tendency to cause sticking of the stop-cock plug. The rubber mixtures should not be exposed to the air longer than is necessary during the heating, and they should be preserved in closed bottles.

Various mixtures of gutta percha with wax and with oils were tried but the gutta percha tends to cause granulation and diminishes adhesiveness. The mixtures above recommended may be readily removed from parts of glass apparatus which are difficult of access for cleaning, by the use of a little concentrated

nitric acid, which quickly attacks and loosens it so that it may be washed out by water.

No lubricant is fit for use unless it renders the stop-cock nearly or quite translucent, so as to show whether or not the plug is coated over its entire length.

A thick rubber and wax mixture is especially suited for well-ground glass stop-cocks upon gas vessels which are to be exhausted and which have therefore to sustain the full pressure of the atmosphere. Such mixtures have been in use for stop-cocks of ordinary burettes in volumetric work during about two years and have given satisfactory results in every way.

WESTERN UNIVERSITY LABORATORY,
ALLEGHENY, PENNA.

ABSTRACT OF A DESCRIPTION OF A RESPIRATION CALORIMETER FURNISHED BY PROFESSORS ATWATER AND ROSA.[1]

BY C. F. LANGWORTHY.

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IN 1892 Professors Atwater and Rosa undertook the development of an apparatus for measuring the income and outgo of matter in the animal body. It was proposed, among other things, to study the application of the law of conservation of energy in the animal organism, and plans were made for experiments with man. These required a respiration calorimeter large enough to accomodate a man in comparative comfort for several days at a time and capable of measuring accurately the total income and outgo of matter and energy. The work has been carried out at Wesleyan University, Middletown, Conn., where the facilities of the chemical and physical departments and the mechanical laboratory were made available. The work has been conducted with funds and appliances supplied by the U. S. Department of Agriculture, the Storrs Connecticut Experiment Station, and Wesleyan University.

Considerable time was spent in elaborating the apparatus until it was sufficiently perfected for use in experiments with man. That part which has to do with measuring the income and outgo of matter is similar in principle to the respiration apparatus of

[1] Read at the Sixteenth General Meeting of the American Chemical Society at Washington, D. C., December, 1897.