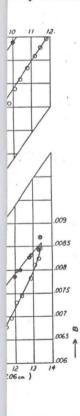s of B were
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for 5000, 5500, 6000 and 6500A, obtain the data which show very small but definite differences, the values of B for the shorter wave-lengths being larger than those for longer wave-lengths. The order of magnitude of this difference at $\Delta L=10$ cm can be expressed as $B_{4500}-B_{6500}=0.001$. Measurements on width and thickness indicated that during the stretching they decrease proportionally. Width was not measured for the strip in the constant temperature chamber, but it was assumed that the cross-sectional area would be proportional to d^2. With this assumption the data show that if there is a volume change under the conditions of stretching, it is certainly less than one percent. This of course means a Poisson's ratio of 0.50, which has been found to hold for rubber.

A further test was made to include both the increase in length and the subsequent decrease. A fresh strip was extended nearly 200 percent by one-millimeter steps every two minutes and then shortened the same way. The curves for this experiment are Figs. 5 and 6. It is obvious that the return differs decidedly from the stretching. The strip finally became slack before the nut had reached the zero position, in other words the two-minute interval was too short for the strip to keep up with. In all of these experiments the stretching was in the direction of calendering.

Birefringence measurements on rubber have generally been made on elastic rather than plastic rubber and have followed a somewhat different procedure,[4] yet they seem to indicate a similar behavior in many respects. The Vinylite resin, like rubber, is raised in temperature by stretching, and when under constant load shortens when heated. When heated, either with constant load or constant length, the birefringence decreases. When stretched and left standing at constant temperature the birefringence decreases. Measurements on these changes are in progress.

[4] W. E. Thibodeau and A. T. McPherson, Nat. Bur. Standards J. Research **13**, 887 (1934).

The Viscosity of Pennsylvania Oils at High Pressure

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Viscosity-pressure-temperature data are presented for six Pennsylvania oils which differ in chemical and physical properties at atmospheric pressure. This study is a continuation of one reported previously and employs the same apparatus and experimental method. While the pressure coefficient of viscosity increases in general with molecular weight, the relationship seems to be significant only for fractions of a narrow boiling range from a single oil. The mean temperature coefficient of viscosity, between 100° and 210°F, however, increases with molecular weight at all pressures for all the oil samples.

A PREVIOUS paper[1] presented viscosity-pressure-temperature data for three mineral oils refined from California, Oklahoma, and Pennsylvania crudes. This paper is the result of a similar study made on six Pennsylvania oils, an investigation undertaken to study the characteristics of such oils in more detail than has been made hitherto. Particularly, the viscosity at several pressures and temperatures has been studied in relation to the boiling point, tempera-

[1] R. B. Dow, J. App. Phys. **8**, 367 (1937).

ture coefficient of viscosity, and molecular weight.

Of the six oils, numbers 1, 2 and 4 were commercial Pennsylvania products. No. 1 was a "bright stock" of high molecular weight, No. 2 a "neutral" of low molecular weight, and No. 4 a highly refined oil, solvent extracted with Chlorex. Oils 3, 5 and 6 were narrow boiling cuts fractionated from oil No. 4 in the Petroleum Refining Laboratory of this school. Table I is a summary of the characteristics of the oils at atmospheric pressure.