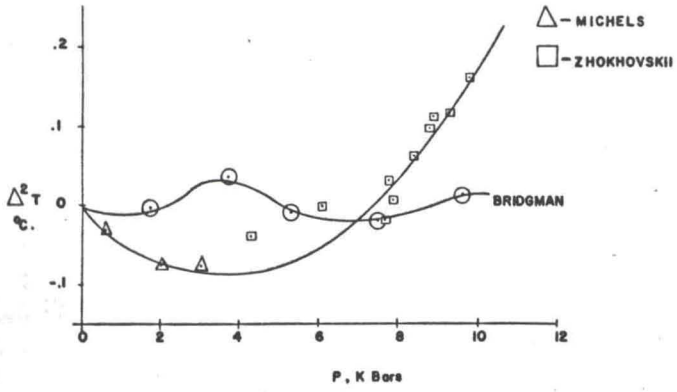

Fig. 1

the curves were forced to fit at two points, this probably represents the worst case. One may then conclude that Bridgman's scale is good to about 0.15 - 0.2 percent to about 10,000 bars. The CO_2 point falls in the region of maximum deviation, and yet may be corrected satisfactorily. Past 10,000 bars, using a one-point calibration, the errors are materially greater. On many of the melting curves run by Bridgman, the point at 12,000 kg/cm^2 does not agree with a value extrapolated smoothly from below, and this is a reflection of the fact that the scale is becoming inaccurate in this region. The pressure given by the manganin coil is lower than the true pressure.

THE 30,000 kg/cm^2 SCALE

As the pressure scale to 30,000 kg/cm^2 was achieved with a two-point calibration, its examination is more difficult. The bismuth point has been recently redetermined by Kennedy and LaMori (22), who find the pressure at 25 C to be some 230 bars higher than Bridgman's value. The percentage error of this point is thus less than that of the mercury point.

If the resistance of manganin is expressed as a linear and second-degree term in pressure, then both coefficients will be found to vary from one coil to another, even when cut from the same spool; and subjected to identical annealing processes. Therefore it is possible to be completely accurate in assessing the corrections to be made to the pressure scale only if the characteristics of the individual coils are known.

At approximately the time of extension of the pressure range to 30,000 kg/cm^2, Bridgman purchased a new supply of manganin wire. Most, if not all, of the measurements to 30,000 kg/cm^2 with a two-point calibration were made using this new grade of manganin (one or two of the first papers used the old manganin, and linearly extrapolated from the 0 C mercury point.)

Taking the information which has been published about this particular grade of manganin, one may calculate both the linear and second-degree coefficients for an average coil, using the knowledge of the pressures used as correct for the mercury and bismuth points. Since better values are now known one may, with a bit of algebra, find the values the coefficients should have had. From these the corrections are easily found, and are presented in Table 1.

The corrections will be seen to vary only slightly over the pressure range, percentagewise. Therefore these corrections should reduce the errors of the pressure scale to the same order as the other experimental uncertainties; i.e., 0.2-0.3 percent.

Table 1 is based upon the values 7723 kg/cm^2 (7573 bars) for the freezing pressure of mercury at 0 C, and 25,160 bars for the I-II transition in bismuth. If either of these values in incorrect by more than about 0.1 percent, the table will

TABLE 1

P_{old} kg/cm^2	P_{new} kg/cm^2	P_{new} bars	Rough Precision bars
1000	1012	992	3
2000	2022	1983	3
3000	3033	2974	4
4000	4045	3967	4
5000	5056	4958	5
6000	6066	5948	6
7000	7077	6940	7
8000	8088	7931	8
9000	9098	8922	9
10000	10106	9910	10
11000	11115	10900	11
12000	12123	11888	12
14000	14143	13869	15
16000	16159	15846	20
18000	18175	17823	25
20000	20192	19801	30
22000	22207	21777	40
24000	24216	23747	35
26000	26224	25716	35
28000	28250	27703	40
30000	30211	29626	45