NaCl. The pistons have a very short bearing area in the cylinder (not over 0.060 inch). This minimizes friction. They are jacketed to within 0.080 inch of the cylinder, and brass guides keep them aligned. The unusual features are described below.

1. The Windows. The windows consist of a series of concentric bales in the insert telescoping towards the center (see Figs. 1 and 2), NaCl is pressure fused in the windows by applying 20,000 atm to heated NaCl crystals, alternately in the window bales of the outer jacket and in the center hole. Ultimately one obtains a strained crystal which transmits light quite well. The strain is such as to cause about 20 per cent depolarization of polarized light, which is a handicap in some experiments. The center pellet can be pressed out and a new pellet inserted containing a new sample. This procedure can be repeated many times. Any cracking of the windows can be repaired by repressing. Cells have been used for over 100 runs without replacing the insert. Usually the insert is discarded because of stretching before the windows give out.

2. The Tapered Piston. In order to reach pressures several times the compressive strength of carboloy some form of support is necessary. The tapered pistons (Fig. 2) are normally 1/2 inch in diameter with a 0.090 inch diameter flat. A taper of 6° proves to be the most efficient when using NaCl as the "fluid." The entire chamber is filled with salt, but the sample is inserted in a small slot between the flats, so it is under uniform pressure. There are several advantages to the tapered piston arrangement. In the first place, only a small area in the center is strained beyond the yield point, and this area is supported by the mass of material not so strained. This is Bridgman's principle of "massive support." In the second place this is a very efficient multistage apparatus. Most two stage setups are already awkward. Here one has essentially an infinite number of supporting stages as each differential layer of salt, going out on the taper, supports the next inner layer which is at a slightly higher pressure. At the maximum average applied pressure of slighly over 50,000 atm, the pressure at the wall is well below this value. Thus the windows and vessel are not strained as highly as in the single-stage apparatus described earlier.

The calibration was accomplished as follows. It was possible to observe optically several phase transitions studied by Bridgman,[2] e.g., KCl--18,000 atm,

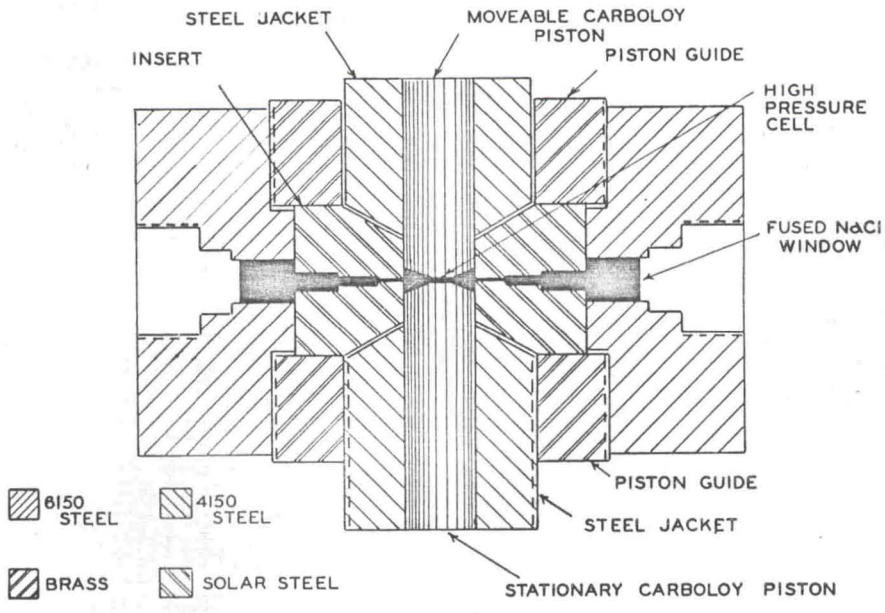

Fig. 2 Diagram of 0-250,000 atm pressure cell.