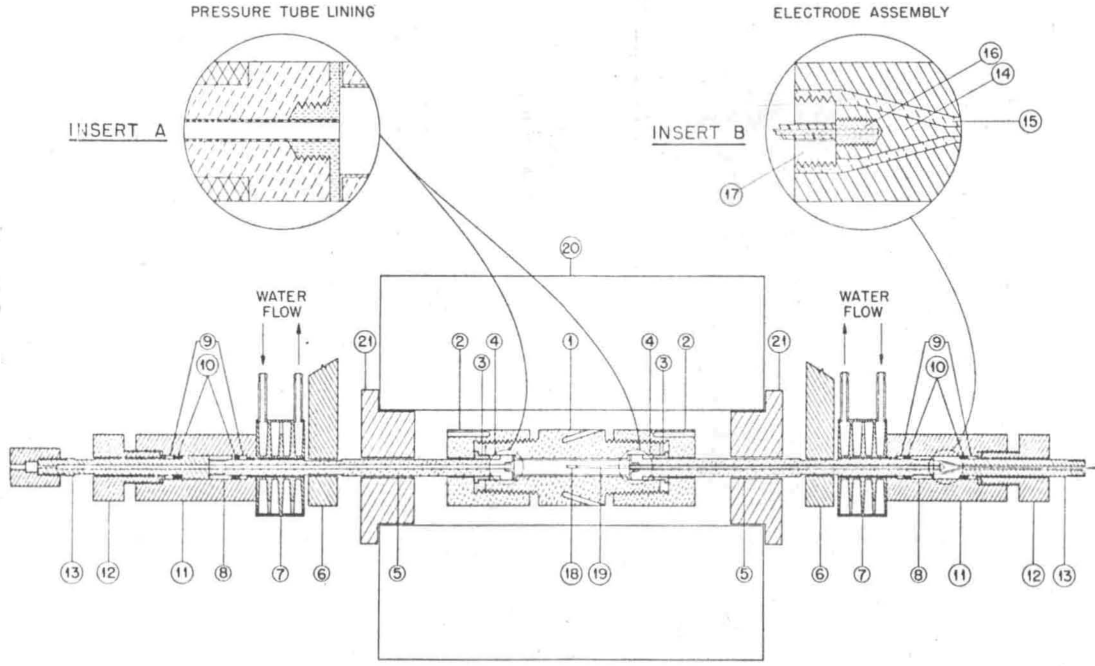

FIG. 1. Conductance cell assembly.

carbide retaining rings (3) against the copper packing rings (4) which seal and hold the enlarged ends of the pressure tubes (5) against the internal shoulder. This forms a Bridgman closure serviceable at high temperatures.

The pressure tubes of Udimet alloy have outer and inner diameters of 0.400 and 0.090 in. and enlarged ends of 0.600 in. diam. The flat surfaces of the enlarged ends have 0.060-in. thick face-plates of platinum-iridium alloy fastened to the tubes as shown in insert A, Fig. 1. The pressure tubes are lined with inserted platinum-iridium alloy tubes with 0.010-in. walls which are gold soldered to the face-plates. The volume contained in the chamber between the face-plates is aproximately 3.7 cm^3.

Two tightly fitting stainless steel clamps (6) support the assembly. Copper cooling jackets (7) keep the ends at room temperature. The rings (8) (9) form Bridgman closures using a Neoprene packing ring (10). The threaded ring (8) which is slotted for removal, and the pressure ring (9) are made from Udimet. Closure seals and plugs (11) (12) are constructed from 410 stainless steel. The plugs hold the upper and lower closing pistons (13) in position. These pistons are made of 17-4-PH stainless steel.[14] The packing around these pistons is also of Neoprene. The lower piston is connected to a stainless steel capillary tubing by a conical seal through which the solutions can be pressed into the cell. The upper piston (see insert B, Fig. 1) has a stainless steel conductor (14) which is insulated by linen reinforced Bakelite (15), cemented into position with an epoxy resin. This closure was satisfactory to 4000 bars. The threaded platinum tip (16), which is screwed into the stainless steel cone (14) is silver soldered to the platinum electrode lead. A Teflon plug (17) completes the insulation. At the top of the upper closure piston, the conductor is connected to a shielded cable which leads to the inductance bridge.

The inner surface of the Pt–Ir liner within the cell is platinized and serves as one electrode. The second electrode is the Pt–Ir cylinder (18) which is 0.31 in. in length and has a 0.062 in. o.d. The insulation tube of pure, nonporous, sintered Al_2O_3 (19) (o.d.=0.062 in., i.d.=0.012 in.) is tapered at the lower end and protrudes into the Pt–Ir cylinder so that small variances in thermal expansion between electrode rod and insulating tube cannot affect the cell constant. The cell constant as determined with a 0.010 molal KCl solution at 25°C was approximately 0.3 cm^{-1}; the exact value will depend upon the specific dimensions and characteristics of each electrode assembly. Removal of the central electrode is accomplished by opening the upper plug and removing the upper closure piston together with electrode and insulating tube.

The cell is suspended within a resistance furnace indicated in Fig. 1. The furnace (20) can be lowered to expose the cell or to immerse it in a constant temperature bath. Split, ceramic plugs (21) close the ends of the furnace. Heating currents are controlled by three Variacs connected to different windings of the furnace. The temperature is controlled by a Chromel-Alumel thermocouple in the annular space between cell and furnace. Calibrated Pt: Pt-10% Rh thermocouples distributed over the cell and the caps permit the determination of the cell temperature and any temperature gradients along the cell. The thermocouple

[14] Armco Steel Corporation, Middletown, Ohio.