High Temperature X-Ray Diffraction

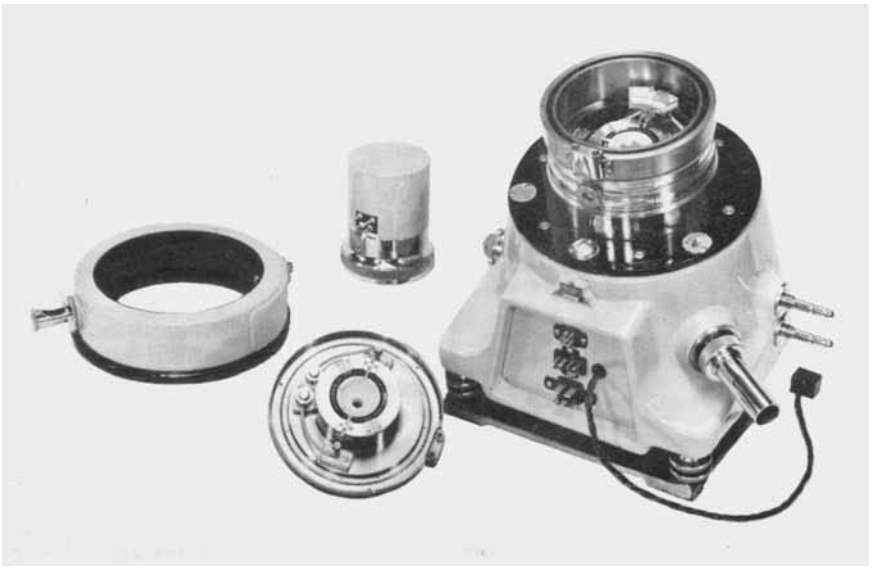
POWDER CAMERA WITH PLATINUM FURNACE

To provide a means of examining crystallographic structure by X-ray diffraction methods at temperatures up to as high as 1400°C, a high temperature powder camera has been developed by Unicam Instruments Limited of Cambridge. This instrument, developed from a design of the BSA Group Research Centre, is being found particularly useful in the investigation of alloy systems to determine phase changes with temperature and in the development of improved ceramic materials.

The camera has been designed to take normal 19 mm Debye-Scherrer X-ray diffraction photographs. To achieve this high temperature of operation the inner furnace of the camera is built of two opposing hemispherical platinum shells, wound internally with rhodium-platinum wire heating elements exposed to the inside. An X-ray gap of 5/16ths inch (7.93 mm) is left between the furnace sections, the top portion being removable to allow easy access to the specimen chamber.

Starting from room temperature, it is possible to reach constancy at any temperature up to 1400°C well within thirty minutes. The temperature/current curve is highly reproducible, and constancy of temperature with time is such that only current control is required to maintain constant furnace temperature within ± 2°C. The upper and lower furnace bowls are mounted in water-cooled jackets which maintain the outside surfaces of the camera at room temperature.

A platinum : rhodium-platinum thermocouple is built into the lower section of the furnace and is movable to allow measurement of the distribution of temperature along the axis of the furnace gap.



The Unicam S.150 high temperature X-ray diffraction camera, dismantled to show the platinum furnace assembly