

them. The medium which transmits the pressure (lithium), 19, fills part of the channels of supports, 9, and, 14, and the inside space of the beryllium chamber, 24. It is compressed by the pistons in the upper and lower supports by means of screw, 17, and also the lower screws in column, 2. In this way

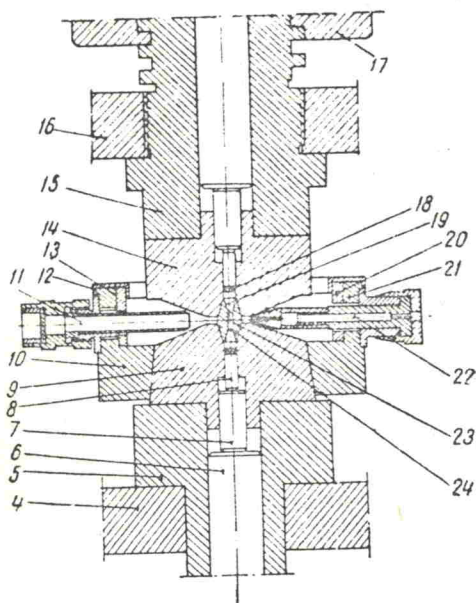


FIG. 1. Diagram of high pressure X-ray chamber.

the pressure created in the channels of the upper and lower supports is transmitted to beryllium chamber, 24, and specimen, 23.

The creation of pressure does not require very considerable force. In our experiments a pressure of up to 10,000 kg/cm<sup>2</sup> was easily created in the apparatus, which was on the supporting table of the X-ray tube. The position of the specimen inside the beryllium chamber was checked by means of the fluorescent screen. The maximum pressure created in the apparatus was 18,000 kg/cm<sup>2</sup>. Piston, 8, and the piston in the upper chamber corresponding to it were made of steel R18 with subsequent quenching to Rockwell hardness of 52. Paraffin wax, 18, was used for packing, in the form of 2-3 mm high cylinders.

*High pressure vessel.* The experiments showed that the degree of purity, grain size, previous deformation and nature of the heat treatment of beryllium all affect the level of the working pressure in the apparatus, the quality of diffraction

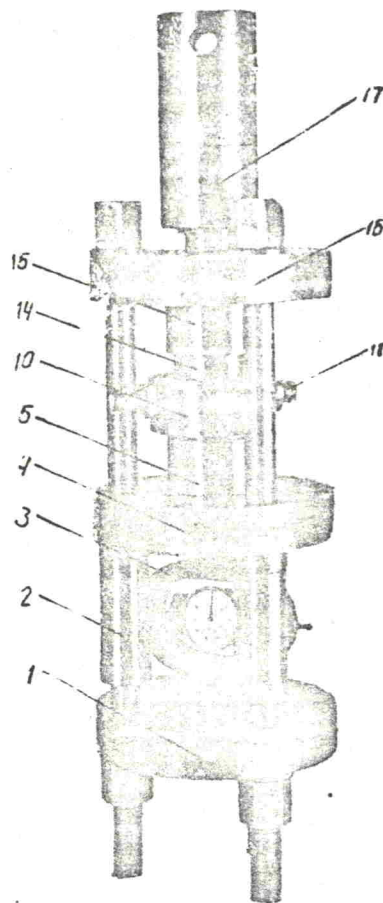


FIG. 2. General view of a high pressure apparatus.

patterns obtained and the life of the high pressure vessel, i.e. the beryllium chamber. Home-produced beryllium was used for the high pressure vessel.

We observed the following order in manufacturing the beryllium chamber. First of all the chamber was made in the shape indicated in Figs. 1 and 2. Its height 12 mm, internal diameter 1 mm, external diameter 7 mm, internal taper 30°. The optimum taper figure was found experimentally as a result of a series of experiments with chambers of different geometrical dimensions. Then the inner and outer tapers were carefully ground, and the cylindrical inside of the chamber. After this it was filled with lithium, placed in the apparatus and a pressure of 10-12,000 kg/cm<sup>2</sup> was created. The pressure was raised and lowered 2-3 times. Then the surface finish of the chamber was further improved and it was given a heat treatment to produce a coarse crystalline structure in the beryllium. It was placed in zirconium crucibles in a quartz tube in which a vacuum of  $2 \times 10^{-5}$  mm Hg

was created. It was used for 3 hr and cooled in the course of the experiment.

An X-ray diffraction pattern was obtained from the chamber after it had been used for 3 hr after heat treatment. The chamber produced a diffraction pattern with a pressure of 10-12,000 kg/cm<sup>2</sup> without any trivial deformation of the specimen, which remained virtually unaltered.

*Pressure calibration.* The pressure calibration measures were carried out in the apparatus. The pressure in the chamber and the pressure in the well surface-finished lower support and the upper one had a pressure of 10-12,000 kg/cm<sup>2</sup>. Paraffin wax was used for packing. The pressure in the supports (beryllium) was checked during tests up to 10,000 kg/cm<sup>2</sup>.

As can be seen from the diagram of the system of transmission of pressure to the chamber, the apparatus is placed in a plane perpendicular to the axis of the collimator. It is held in place by two pistons, 6, which were used in the apparatus. The apparatus was adjusted in the collimator and it was used at the top of the collimator. The same was done with the corresponding parts of the apparatus. The apparatus was used in a diffraction dynamometer determined on reference