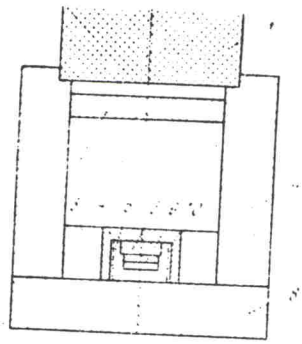

Fig. 1

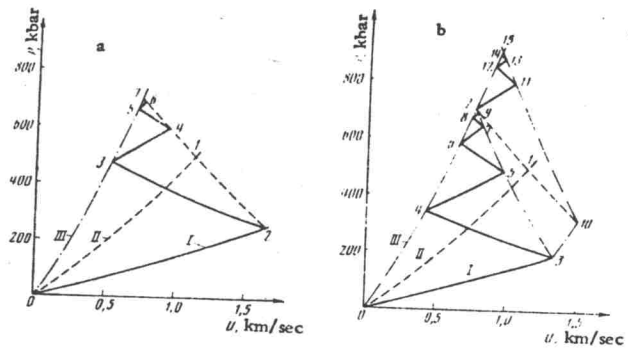

Fig. 2

Fig. 1. Block diagram of the explosive device: 1) generator of the plane detonation wave; 2) dispersal plate; 3) brass ring; 4) the outer case of the container; 5) the inner case of the container: 6) shield, covering the sample; 7) steel socket; 8) brass strip; 9) sample under investigation; 10) heavy-metal strip.

Fig. 2. P-U-diagram of the sample compression: a) device with a maximum pressure of 700 kbar (one tungsten strip); b) device with a maximum pressure of 900 kbar (two tungsten strips). I - shock adiabat of silica, according to [14]; II - shock adiabat of iron, according to [13]; III - shock adiabat of tungsten, according to [11 and 12]. 1) State of the shock wave in the container material; 2-9, 11-15) states of the shock waves in the sample: 10) state on the tungsten-iron interface.

an iron shield, U = 1.13 km/sec one or two strips of heavy metals (mainly tungsten) were introduced. These strips were in contact with the surface of the samples under study. On account of the change in the character of the sample loading, the above-mentioned method enables one to obtain in the samples higher amplitude characteristics of the pressures (P ~ 700 to 900 kbar).

The character of the sample loading in the devices with a single tungsten strip is shown in Fig. 2a. The shock wave, emerging from the iron shield (state 1) into the sample under inspection, stresses it to the state 2 (pressure amplitude P_2 and mass velocity U_2). At the time of its emergence into the lower surface of the sample. the tungsten strip of the sample, which is already compressed by the pressure due to the first passing wave. is additionally loaded up to the state 3 (P_3, U_3) by the shock wave. reflected from this strip. The subsequent magnification of the sample compression takes place due to the new reflection of the shock wave from the upper sample-shield boundary, and so on. Thus, by means of a series of circulating shock waves the sample is stressed from the state 2 (state of the first shock wave in the sample) up to the state 7.

A further magnification of pressures was obtained by placing the sample under study between two tungsten plates. In this the pressure in the sample changed in conformity with the states 3 to 9 (Fig. 2b) corresponding to the passage of the shock waves reflected from the tungsten plates. The additional magnification of pressure (states 9 to 15) was due to the approach of the wave reflected from the tungsten-iron interface to the SiO_2 sample (state 10). Assuming that the sample loading, after the first shock wave has passed through it, is almost isentropic. we estimated its temperature. In both cases it was of the order of 800°K.

The pattern of pressure change with time in the sample can be traced in P-τ diagrams (Fig. 3). The time of action of the shock wave on the sample is 4.5 msec according to the estimates and is determined by the duration of the passage of the waves in the striking plate. In this instance, the time of action of the shock wave with the maximum pressure amplitude is 0.5 msec. The dimensions of the container and the brass strip were chosen in such a way that the maximum breaking points were concentrated outside the container with the sample. In this way, the sample was also preserved after the experiment.

We may note here that we always employed the curve relating to the compression of silica, obtained in conditions of single compression [14]. Such an approximation does not affect the final states in the sample. but the pattern of pressure variation in time. at the initial stage, is only qualitative.

An analysis of the crystalline structures of the shock-compressed samples was carried out with an X-ray diffractometer of type URS-50-IM. We used an X-ray tube with a copper anode as the source of radiation. For filtering the radiation. we used a nickel filter. The compressed samples were scanned either from the surface of the sample (which is located at the immediate contact with the material of the container or the support) or from the surface of a specially prepared specimen. In this case the silica sample, as preserved in the experiments, was ground up and from the power so obtained

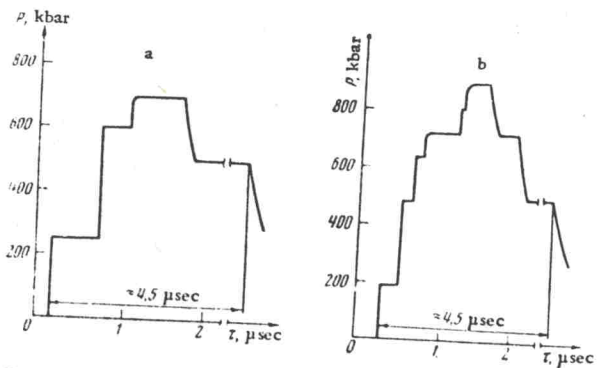

Fig. 3. P-τ (time) diagram of the sample loading: a) in the device with maximum pressure of 700 kbar, b) in the device with maximum pressure of 900 kbar.