As is well known, for observing the water level in steam boilers, their water-indicating columns are fitted with heat-resistant, hardened glasses of the type "Klinger" where the steam is worked at pressures of up to 35 kg/cm², and of the type "durans" (with compulsory, protective mica inserts on the inner surface of the glass to keep the glass from the working atmosphere) when the apparatus is working at pressures of up to 70-120 kg/cm².

For many years the best type of glass for water-indicating apparatus was considered to be the aluminoborosilicate glass, pyrex. However, with the development of the power industry in the Soviet Union and with the use of steam boilers with high pressures (120 kg/cm² and higher), with working temperatures of up to 320 °C, the pyrex glass has proved to be far from adequate; in these conditions a white scum forms on the working surface of the glass, making difficult the observation of the water level; and beside this, the pyrex will not stand high pressures and is destroyed.

The Institute of Glass has developed a new, more effective glass belonging to the SiC-Na₂O-ZrO₂ group, possessing high chemical resistance to water and weakly alkaline solutions at high temperatures (up to 320 °C). The white deposit does not form on these glasses and they are quite transparent during the whole working period. Many years of experience has shown that high-zircon glasses for water meters in steam boilers work successfully and do not need mica inserts.

The technological process for melting and conditioning high-zircon glass was developed at the Konstantinovsky "Avtosteklo" factory in a period of seven years. During this period, the Institute of Glass, the factory and the Ukraine branch of the Institute carried out much work on experimental melting in small furnaces of periodic action. The chemical composition of the glass was changed, different melting conditions and types of refractories were tried, but the trials were not very successful. The glass crystallized and was poorly fined. The quantity of seeds and bubbles in the glass increased with time.

The experiments showed the best glass to have the following composition in the high-zircon range, which was denoted Ts18: 59.6% SiO₂; 11.5% Na₂O; 2.5% K₂O; 17.7% ZrO₂; 3.8% Al₂O₃+Fe₂O₃; 4.8% CaO; 0.2% MgO. The industrial melting of this glass was done in a pot furnace with a maximum temperature of 1490-1500 °C in fireclay pots of 500-liter capacity.

Owing to crystallization in the glass, it was not subjected to conditioning in the normal but was during the final melting, the crystallized scum was removed from its surface in the pot, and the glass was poured on to a casting table with subsequent rolling into the given plate thickness.

After annealing, the plate was ground and polished, and then the water-indicating glasses were prepared by hand from it, and these were then hardened.

With this method of melting and conditioning, the output of useful products did not exceed 3% of the quantity of melted glass.
It was only at the end of 1959 that the problem of making water-measuring glasses of composition T5-18, by the method of melting in a continuous tank furnace and pressing the goods, was solved.

According to this technology, the glass T5-18 is melted in a small regenerator glass-tank furnace of continuous action, which possesses for the conditioning process a chamber joined to the melting tank with a channel. The furnace design is shown in Figs. 1-3.

![Fig. 1.](image1)
![Fig. 2.](image2)
![Fig. 3.](image3)

As these show, the area of the mirror in the tank equals 5 m²; with a tank depth of 0.6 m the capacity is about 7 tons of glass.

In the tank is built a special conditioning chamber area 0.25 m² connected to the main tank with a channel, whose cross section equals 0.1 m². To maintain in the conditioning chamber the required temperature, it is connected with the gas region of the furnace itself.

The walls and the bottom of the furnace and also the conditioning chamber are made from fused-quartz blocks and the upper structure of the furnace, over the tank, from dinas.

The furnace is heated with purified generator gas with a C.V. of 1240 kcal/m³ obtained in the gas generators of the NKMZ system from grade-AM anthracite.

The process of melting and working of the goods proceeds continuously: melting at 1550°, working at 1440-1450°. The secondary heating of the glass in the working chamber with this design is excluded.

Loading of the batch and returned cullet is done in the small-heap method periodically, not more frequently than at one hour intervals with portions of 26 kg and 36 kg of cullet. To increase the melting time, loading is done into an aperture located on the diagonal from the working chamber to the opposite wall of the furnace.

Under these conditions, a specific glass yield of 277 kg from 1 m²/day was obtained, i.e., the total daily output of glass comprised 1385 kg. With an increase in the temperature of melting to 1550°, the specific yield rose to 415 kg/m²/day, and the total yield to 2075 kg per day.