SLIDE GATES FOR STEEL-POURING LADLES

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More than 97% of the steel produced at modern metallurgical plants is teemed with the use of different types of slide gates. The introduction of slide-gate teeming has facilitated the development of ladle metallurgy, which requires higher pouring temperatures and longer holding times.

However, the wide range of slide-gate designs and types at Russian metallurgical plants (most of the gates being of the "rigid" type), the variety of refractories used to make the gates, the absence of centralized slide-gate production in the sector, and the substantial cost of obtaining licenses for their production from foreign companies (on the order of 1 million U.S. dollars) show that there are many important problems yet to be resolved in this area.

The greatest needs are to standardize the refractories used in slide gates (according to size and type), select an efficient design for the mechanical part of the gate that allows quick and easy replacement of the set of refractories in the gate, and quality preparation of the gates for service in the shortest possible time. Another need is to organize the centralized serial production of new types of gates that can satisfy the various requirements of different customers.

After analyzing the commercial and patent information on foreign designs of slide gates and reports on their use at several plants here and abroad ("Flocon," "Vesuvius," "Interstop," etc.), it was found that while these gates have their advantages, they are not free of problems. For example, in addition to the problems of high cost (on the order of $11,000-$17,000) and a high metal content, the method used to secure the refractory slabs in the gates does not ensure a constant load in the nozzle region. Having a constant load in this area is one of the main prerequisites for safe and reliable operation of the gate.
The use of foreign slide gates generally requires the use of high-quality sets of refractories, especially for the slabs. This requirement is a consequence of specific design features of the gates. Another obstacle to their use in the Russian market is the difficulty of servicing the gates between heats. For example, a considerable amount of time and effort must be spent on opening the gate and replacing the slabs and spring-opposed elements. The human factor must also be taken into account: it is necessary to use torque wrenches to tighten the springs, and it is not possible to control the force needed to secure the bayonet fitting.

The need to develop a domestic slide gate that can compete in the world market and is free of the above problems required us to generalize existing designs and come up with an original new design. The latter has been realized in the form of slides gates of the series ZSh and VShL and the unitized gate of series VT (Russian Patent No. 2043856, issued 20.09.95,