Fig. 1. Circuit diagram of control device: GE) generator equipment; MSF) minute-signal former; UR) unit readout; TMF) ten-min-pulse former; TR) ten-min readout; CT) code transformer; A) power amplifier; TIU) time-indication unit; TSU) time-setting unit; RPF) rectangular-pulse former; OU) output (command) unit; ARU) common automatic read-out reset unit; RTU) ten-min read-out reset unit; V1, V2 divider elements; PF1, PF2) pulse formers.

Fig. 2. External view of the flame-transfer complex.

PRODUCTION OF KERSIL DROP-FORMING DETAILS

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Up to the present time the ceramic details of drop feeders have been manufactured from various materials such as chamotte, alumina-chamotte, alumina, Bakor, and so on. These materials are not sufficiently glass-resistant and therefore their useful life is short. Moreover, damage to these details causes contamination of the molten glass and sometimes even changes the chemical composition of the glass.

Quartz ceramics (Kersil) made by a ceramic process from the waste products of vitreous silica have excellent corrosion-, heat-, and flame-resistance.

The Kersil drop-forming details were made from an aqueous suspension of vitreous silica [1]. Large lumps of vitreous silica were milled in a crusher mill to a particle size of 0.5-10 mm. The milled material together with water and milling bodies in a ratio, by mass, of 1:(0.15-0.2):(1.5-2) were loaded into a ball mill and ground to a 0.2-0.5% residue on a No. 006 sieve. A filler (fine fractions passing through a sieve with apertures of


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TABLE 1

<table>
<thead>
<tr>
<th>Products</th>
<th>SiO₂</th>
<th>Na₂O</th>
<th>CaO</th>
<th>MgO</th>
<th>P₂O₅</th>
<th>Fe₂O₃</th>
<th>Al₂O₃</th>
<th>Fe₃O₄</th>
<th>SO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mosaic-floor tiles</td>
<td>59.6</td>
<td>6.9</td>
<td>17.6</td>
<td>6.0</td>
<td>7.4</td>
<td>1.0</td>
<td>4.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass blocks</td>
<td>72.1</td>
<td>15.0</td>
<td>6.4</td>
<td>4.0</td>
<td></td>
<td></td>
<td>2.0</td>
<td>0.1</td>
<td>6.4</td>
</tr>
</tbody>
</table>

0.7 mm) was then added to the suspension in amounts equal to the mass of the first load and stirred for 1-2 h. The mass formed was then poured into gypsum molds. In order to obtain openings in the lugs and a cavity in the cylinder, rods were inserted into the mold; in the first case, metal rods and in the second, gypsum. After the crock had set the inserts were removed from the molds.

The details were dried in the shop on racks for 3-5 days or in a dryer at a temperature of 70-100°C for 1-2 days. The details were fired in a gas kiln at 1250-1300°C.

The temperature was raised to 300°C at a rate of 50°C/h and then to the final temperature at 100-150°C/h with a dwell of 1 h at this temperature.

The finished articles showed the following characteristics: water-absorption, 3-6%; apparent porosity, 6-12%; apparent density, 1.9-2.1 g/cm³; and an ultimate bend strength of 35-50 MPa.

From the results of the tests carried out at the State Scientific-Research Institute of Glass, the Kersil specimens made by the Institute of Vitreous Silica showed good corrosion resistance. The Kersil and vitreous silica were tested in parallel with the electrosmelted baddeleyite-alumina refractory TsAK 1681 (France); the high-density zirconia refractory, material 1300 (USA); the dense-ceramic refractory based on tin dioxide (Cassiterite refractory); and the electrosmelted refractory Korvishite (Hungary).

The tests were carried out in a melt of a low-alkali, phosphorus-opacified glass of the following composition, mass %: SiO₂, 56.5; Al₂O₃, 4.5; CaO, 17.5; MgO, 6.0; Na₂O, 6.5; P₂O₅, 7.5; and B₂O₃, 1.5. The specimens measuring 80 × 11 × 11 mm were rotated in the glass melt which was held in a Pt crucible of diameter 140 and height 100 mm. The mass of glass in the crucible was ~ 2.5 kg; the temperature of the melt, 1480°C; duration of experiment, 16 h; and rotational frequency of specimen, 20/min. The glass resistance was characterized by the reduction in the volume of the specimen after the test.

During the tests, the Korvishite, zirconia, and baddeleyite-alumina specimens were completely corroded; the remaining refractories showed the following average reduction in volume, %: tin oxide, 21.5; Kersil, 51.9; and fused quartz, 72.5.

The tin oxide refractory showed the best glass-resistance but because this material is not produced industrially the next best for the manufacture of the drop-forming details of feeders were the Kersil and fused quartz.