In the production of ceramics the grinding of clay materials is of vital importance. Special value is attached to the grinding of the clays and also to the milling of dry ceramic bodies for making tiles by semidry pressing. In any case it is necessary during grinding to obtain a certain grain-size distribution to ensure a high density in the pressed goods.

Clay materials, like many others, are ground by pressure, abrasion, fracture or impact action, and in many cases a combination of these methods.

The commonest grinding equipment includes the runner mill, the rotation mill, disintegrators, aerospray mills, shaft and annular mills (rollers). However, these machines have important drawbacks which complicate the process of operation and make the production of milled products expensive.

Disintegrators for example are very sensitive to the presence of hard bodies such as stones, metal objects, etc., which deform or break the teeth, as a result of which the working equilibrium is disturbed. The console shaft of the chamber, when the balance is disturbed, becomes seriously bent which often stops the machine.

A disadvantage of the runner mill is the high energy consumption and the high metal content. Furthermore, grinding in runner mills forms a lot of dust which lowers the quality of the press powder.

Rotation mills are also sensitive to the presence of tramp iron [1] due to the premature mechanical wear of the gratings.

Aerospray and other mills owing to the complexity of their design and other drawbacks have not found wide use in the ceramics industry.

All the above grinding machines have quite a high specific energy consumption for grinding (up to 8 kwh/ton) and are relatively large in design.

In recent years much attention has been paid to the development and improvement of mills in which grinding occurs on account of the kinetic energy of the particles of materials due to centrifugal forces. The velocities of the particles may be as high as 200-250 m/sec [2]. The design of a centrifugal mill is simple. In these mills use is made of the principle of self-grinding and the protection of the working components by the material being ground which eliminates metal contamination of the product.
In 1962-64 the Kharkov V. I. Lenin Polytechnical Institute and the Kharkov Tile Factory developed a centrifugal mill [3] the design of which is based on self-grinding principles. The Kharkov Tile Factory has built an industrial model of the new mill and installed it in its grinding-production line for making floor tiles.

The basic working parts of the machine (Fig. 1) are two rotors 1, rotating toward each other with a high speed. The rotation of the rotors is due to two independent electric motors 2, working through a V-belt drive 3, and rotary shafts 4. All the rotor systems and the driving devices are fitted to a common frame 5.

The material being ground flows along a chute 6, into the grinding chamber formed by two symmetrically located rotor pans 1, and an intermediate, fixed ring 7. When a certain volume of the chamber is filled, the material is taken up by the rapidly rotating pans and its particles, under the action of centrifugal force, are thrown together from each pan and as a result of the large number of impacts the material is ground. Also under the influence of centrifugal forces, the ground product is removed through two annular slots between the pans and the intermediate ring.

The large force of impacts of the pieces of material and the high degree of grinding is attained with high rotation speeds.

The presence of braking ribs 8, prevents slipping of the material and this produces maximum velocity in the particles.

The lined rings 9, as a result of their protruding surface, maintain a layer of material on the internal surfaces of the pans, thus creating a clay lining. With this it becomes possible to create relative movement of the material being ground over the material itself, as a result of which we get grinding by abrasion.

The grading of the product can be controlled by changing the width of the discharging annular slots by axial movement of the rotors 1, with the regulating device 10.

Hermetically-sealed housing 11, on the conveyor belt prevents dust getting into the grinding department (specifications on following page).

To determine the efficiency of the mill, a comparative study of the action of the mill and also of runner mills was made in factory conditions. For this purpose, a centrifugal mill and a runner mill were installed at the same time in a grinding-screening section.

The scheme of the grinding-screening section is shown in Fig. 2. Dried clay from bunker 1 is fed from the section feeder 2, to the elevator 3, whence it moves along a chute to the centrifugal mill 4, or the runner mill 5.