in grinding, I will cite our installation at the plant of the Lytle Coal Co., Minersville, Pa., which is dry grinding a very hard anthracite coal. Although coal is not the same as feldspar, the general operation is very similar. The Lytle Coal Co. were casting about for a machine to grind anthracite coal to a fineness of about 90% through 200-mesh. The mills tried out previously had proved too expensive from a standpoint of upkeep. From previous operation on similar materials, even taking into account our old operation of grinding feldspar, we recommended one of our mills to do one ton per hour to a fineness of 90% through 200-mesh. Changes in the method of operation were made which increased the capacity of this mill to $2^1/_2$ tons per hour. Another design of mill, having the same diameter as the first but changed in other respects, maintained a capacity of 3.67 tons per hour average over a month's operation. Often the capacity ran well over 4 tons per hour, the product being better than 92% through 200-mesh, the mill operating in conjunction with an air separator. This is four times as much as originally estimated and as a result this company recently ordered two 7-ft. diameter by 36-in. cylinder Hardinge Ball Mills to complete their installation.

The Canada Cement Co. is grinding a cement clinker, known to be the hardest clinker in the country. They installed our large 10-ft. mill to grind approximately 17 tons per hour, but are actually averaging over 25 tons per hour.

DISCUSSION ON "DERRY FELDSPAR QUARRY"[1]

By Raymond B. Ladoo:—The feldspar deposit described by Mr. Davis seems to be unusual, both in size and in the purity of the feldspar which it contains. While it is true that, in some districts, there occurs but one large deposit of unusual merit, surrounded by other deposits smaller and less pure, this condition does not seem to prevail generally.

In several of the large feldspar producing districts of the United States a number of deposits, nearly equal in size and purity, have been worked and other deposits discovered and held in reserve which seem to give promise of equal value.

Until the market price of feldspar reaches a point which will encourage the very thorough and systematic prospecting of less accessible areas, both in the United States and Canada, the presence or absence of other large deposits of feldspar cannot be definitely proved.

By H. Ries:—I have read Mr. Davis' paper with much interest. The general region in which the Derry quarry occurs has been proven to contain some most interesting deposits of feldspar. In the famous Richardson

[1] Davis, *Jour. Amer. Ceram. Soc.*, **5**, 294 (1922).

quarry, east of Godfrey, worked for a long period, there was a differentiation similar to that described by Davis. There the quarry showed a very large mass of deep pink feldspar in the center of which was a huge horse mostly of quartz.

The Richardson feldspar emphasized a curious fact, even more forcibly than does the Derry, that the cream or bright pink of feldspar is not necessarily due to iron oxide.

THEORY OF PLASTICITY AND POSSIBLE COMMERCIAL APPLICATION

A colloquium on this topic was intended for the Annual Convention. George A. Bole delivered an opening address, the substance of which is in his paper.[1] F. P. Hall[2] presented a summary of methods for measuring plasticity. Time did not permit extending the discussion at the convention as was planned. Hence it has been continued by correspondence.

The Editor was asked to open this informal discussion which, if done editorially, would require a review of the literature and an impartial presentation of the several theories that have been advanced. This seems to be unnecessary inasmuch as references will be made as the discussion progresses. The Editor would rather enter as a free lance, without editorial restrictions, and the following discussion is written with this freedom.

Discussion by Ross C. Purdy:—My first approach to this question of plasticity in 1904 was from a reading knowledge of the several experiments and theories reported in the literature. I accepted the very plausible theories that the "clay substance" was somewhat soluble in water and that clays contained alumina, silica and iron hydrates which would reverse back and forth from the gelatinous state (as when precipitated from solution) to dry powder. The dry powder of these hydrates was a "gel" which would adsorb enough water to again render their mass gelatinous. I had the conception that the portions of clay, which were too small to be distinguishable under an ordinary microscope, were the prime factors in rendering the mass as a whole plastic and that it was these small particles which, through some process of molecular disintegration and hydration, went into solution, thus making a gelatinous-like mass similar to freshly precipitated aluminum hydroxide. The physical phenomena of Brownian movement and of flocculation and deflocculation were thought to be evidence of ionization reactions between the salts

[1] "Mechanism of Plasticity from Colloid Standpoint," *Jour. Amer. Ceram. Soc.*, **5**, 469 (1922).

[2] "Plasticity of Clays," *Ibid.*, **5**, 355 (1922).