In almost every quarry the cement rock shows the effect of great compression by which it has been shattered, permitting water carrying mineral matter in solution to precipitate quartz and calcite in the open fissures and irregular cavities. In places the vein matter is pure white calcite, in other places white granular quartz, but more commonly a mixture of the two. The white veins contrasting with the black rock are very prominent in the working faces of most quarries. The veins are roughly parallel and tend to follow bedding planes, although they break across the beds in many places. Smooth slickensided surfaces coated with a soft black carbonaceous substance resembling graphite are very common on the vein walls.

Small cubes of pyrite are common near the veins and occasionally in rock where the vein material is absent. Purple and green fluorite have also been found in a few localities as vein material.

The chemical composition of the cement rock changes from bed to bed or even in the same bed within a single quarry. In some quarries the average rock contains almost exactly the right proportion of the various materials required for the best grade of portland cement. In most quarries the rock varies so that tracks must be run to several parts and the requisite mixture obtained by the proper combination of the various kinds of rock. In other quarries, however, the average rock runs too low in CaCO$_3$ so that it is always necessary to add some high-grade limestone. Some of the plants are fortunate in having quarries in the underlying cement limestone while others must bring limestone from a distance. Much limestone from Annville, Lebanon County, Pa., is used in the Lehigh district.

In many cement-rock quarries it is difficult to determine the bedding planes unless an interbedded pure limestone stratum can be found. Where these are absent the quartz and calcite veins, which, in general, follow the bedding planes, are useful in determining the structure. Almost invariably, the cement-rock strata are greatly crumpled and yet have low angles of dip. The normal direction of dip is toward the northwest beneath the Martinsburg slates, but in many quarries some beds dip in other directions.

When the region was subjected to the great dynamic forces that formed the Appalachian folds the cement-rock strata were so weak that they yielded by minor folding and faulting, resulting in local thickening of the different layers, but without producing high angles of dip. In very few places can one find the cement rock dipping more than 45° and usually the dip is much less, while in the adjoining limestone belt vertical or even overturned beds are not uncommon.

The crumpled character of the cement rock, the absence of any beds sufficiently distinct to be recognized in different openings, and the lack of any continuous or approximately continuous section across the belt normal to the strike render the exact determination of the thickness impossible. The local thickening of the beds due to compression also needs to be taken into account in any estimate of thickness.

**QUARRY METHODS**

The quarry methods used by the cement companies are similar throughout the district. If possible the quarry is opened in the side