flint, and plate, the sand is always carefully dried before being used.

In size for ordinary purposes of glass manufacture practically all of the sand grains should pass through a 30-mesh sieve, or in other words have a diameter less than .64 millimeters. The majority of the grains should be retained on a 120-mesh screen, or be over .136 millimeters in diameter. For optical glass, all of the sand should pass through a 48-mesh sieve. The shape of the grains has little to do with the relative values of the sand, although perhaps an angular sand is a little more desirable than one in which all of the grains are well rounded, other factors being equal.

In 1915, Pennsylvania produced 455,112 tons of glass sand. This represents about one fourth of the total production of glass sand in the United States. Pennsylvania holds this important rank as a producer of glass sand for two reasons: first there are found within her borders an abundant supply of nearly pure quartz sandstones that yield when crushed an excellent grade of sand, and secondly the center of the glass industry of the United States is located in western Pennsylvania so that there is a great demand for such sand. Nearly all of the glass sand at present produced in Pennsylvania comes from two formations, the Oriskany of the Devonian and the Pottsville of the lower Pennsylvanian. Of these the Oriskany is by far the more important.

The Oriskany formation occupies the belt of Appalachian folding which crosses Central Pennsylvania and which reaches a maximum width of nearly 56 miles. It varies greatly in this area both in thickness and in character. In Huntingdon and Mifflin counties a pure quartz sandstone phase, which has a thickness of from 60 to 200 feet, is particularly well developed. In its unaltered state it is a hard bluish-gray quartzite made up of interlocking grains of quartz in which silica in parallel orientation with the original grains is the bond. Under favorable conditions of weathering this has become disintegrated to a friable sandstone, or in some places even to a loose sand. These are the portions that are used for glass sand. For this purpose the sandstone must be sufficiently friable so that small pieces may be broken up between the fingers into loose sand. In preparing it for the market the rock is passed through a jaw crusher and chaser mill or wet grinding pan to disintegrate it into loose sand. It is then screened, passed through a screw conveyor type of washer, the excess water is allowed to drain off, and the sand is dried in a steam or direct heat dryer. After a final screening it is ready for the market. Much of the best grade of glass sand produced in the United States comes from this district.

The Pottsville formation of western Pennsylvania is divided into five members as follows, commencing at the top: the Homewood sandstone, the Mercer shale, the Connoquenessing sandstone, the Sharon shale, and the Sharon or Olean conglomerate. Of these portions of the Homewood and the Connoquenessing sandstones are at times sufficiently pure quartz sandstones to be available for glass sand. The sand derived from them, however, is never as pure as that from the Oriskany of central Pennsylvania and is, therefore, used only in the manufacture of the cheaper grades of glass such as bottle and window glass. A little is also used in the plate-glass industry. The method of treatment is usually the same as that used on the Oriskany sandstone in central Pennsylvania, except that drying is usually dispensed with. Sometimes, however, the rock is simply crushed dry and screened, washing not being resorted to.

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