tirely, composed of goethite. Tiny stalactites of limonite occur in many of the geodes. The walls of the bombshells range from considerably less than an inch up to an inch or more in thickness and in most specimens show a fibrous radiating structure in the inner layers. Some of the geodes contain sand grains firmly cemented by iron oxide, but others are practically free from any siliceous particles that can be detected by the eye. In general, the bombshell ore is the highest grade ore obtained and can be readily freed from any adhering clay by washing. Many of the geodes consist largely of iron carbonate ( siderite), and in a few mines the bombshell ore is called carbonate ore. Invariably, however, limonite also seems to be present, especially in the inner layers. The carbonate bombshell ore is gray when mined but later becomes brown as the carbonate changes to limonite on exposure. In some geodes the stratification of the original sandstone or limestone is preserved in the enclosing walls.

Closely related to the bombshell ore are the large irregular masses of cellular material that form the bulk of the limonite ores. These masses are from a few inches to ten feet or even more in diameter and consist of a network of thin partitions of limonite running in every direction. The cavities usually are small, as a rule not more than a few inches in extreme length, are exceedingly irregular in shape, and are commonly filled with an ocherous clay. The walls of the cavities are coated with a firmly cemented layer of the ocher. The character of this ore renders it possible for the miners to break the large masses readily with pick and sledge.

Some of the mountain ores occur as masses of porous limonite roughly arranged in parallel layers and resemble in structure pieces of rotten wood. The layers probably represent the stratification lines of the original rocks. Tiny stalactites of limonite are abundant between the layers.

Small pieces of cellular ore in which the cavities are rectangular are occasionally found. These specimens represent the segregation of limonite in joints of the original rock, the partial replacement of the original rock, and the subsequent removal of the remainder through solution. Some of the longer tubelike masses are called pipe ore, although true pipe ore is somewhat different. In some places the original rock remains, surrounded by a shell of limonite. In the mountain-ore mines pieces of limonite enclosing sandstone are not uncommon.

In many places the original sandstone of the mountain ores seems to have been broken into angular fragments, probably owing to the contraction of the mass as it changed to jasper, which usually preceded the formation of the ore. These angular fragments have later been cemented by limonite that was precipitated in the cavities and forms a limonite breccia. In many specimens fragments of sandstone or jasper have themselves later been replaced by limonite. In ore of this kind small particles of secondary vein quartz are more common than in the other kinds of ore, although quartz is not common in any of the limonite ores. The secondary quartz shows that part of the siliceous material removed by the solution of the original rock was precipitated in the cavities of the iron ore.