important, when it saves us from loss of time, expense, and disappointment.

Common coal is a mineral too well known to require a particular description. Mineralogists divide coal into two species,—Brown coal, and Black coal; the former, sometimes called wood coal, is chiefly found in alluvial or diluvial ground. It contains, besides charcoal and bitumen, various vegetable principles, and the branches or trunks of trees partially decomposed, which mark the origin of this kind of coal.

Black coal or *common coal*, is composed of charcoal, bitumen and earthy matter. The latter forms the ashes which remain after combustion: these vary in proportion in different coals, from two to near twenty per cent. The proportion of bitumen varies from twenty to forty per cent., and the charcoal from forty to more than eighty per cent.

Mineralogists have enumerated many different kinds of black coal: several of these pass by gradation into each other in the same mine. The most important varieties in an economical view are the hard coal like that of Staffordshire, and bituminous or caking coal, called in London Sea-coal.

Anthracite is a mineral approaching to the state of plumbago; it consists nearly of pure carbon, is extremely hard and difficult to ignite, and has often a semi-metallic lustre. It occurs in rocks which have generally been regarded as belonging to the transition class, but is sometimes found in small quantities in regular coal strata. The coal in the extensive coal formation of Pennsylvania is called anthracite, because it emits but little smoke in burning, but is only a variety of common coal, containing but little bitumen.

Coal strata are frequently accompanied by thin strata of ironstone. This stone has a dark brown or gray color, it has an earthy appearance and fracture, and is about three times heavier than an equal bulk of water. Some kinds have the specific gravity of 3·6. Though modern mineralogists call this mineral clay-ironstone, after Werner, from its resemblance to argillaceous stones, on analysis it is found to contain but a very minute portion of alumine or pure clay, sometimes not more than two per cent. It is composed principally of iron combined with oxygen, carbonic acid and water, and a small quantity of silex, and in some instances with calcareous earth. If it be of a good quality, it yields more than thirty per cent. of iron. In some of the beds of clay over coal, detached nodules of ironstone occur, which are also smelted for iron.

The vast extent and importance of our iron works are well known but their establishment is of recent date. Formerly our furnaces were on a diminutive scale, and wood or charcoal was the only fuel employed, but in the present cultivated state of the country, wood could not be procured in requisite quantity. The application of coal or coke to the smelting of iron is among the most useful of modern