

## ECONOMICAL PRODUCTS.

*Coals, Iron Ores, Clays, and Salt of the Carboniferous and Subcarboniferous Formations.*

1. **Coal.**—Coal occurs of three kinds: (1) *Anthracite*, or stone coal; (2) ordinary *Bituminous*, sometimes distinguished as “cubical coal,” in view of its natural fracture; and (3) *Cannel* coal, the dull textureless bituminous coal, breaking irregularly, with a conchoidal fracture, and only occasionally constituting parts of coal-beds. Excepting the cannel, the coals have distinctly, on a cross-fracture, a faint banding, due to a straticulate structure or bedding, and are rarely laminated unless very impure. The blocks into which bituminous coals break have probably been made by the strains to which the coal-bed had been subjected; they are not those of crystallization.

The bituminous coals which soften in the fire and cake over are called *caking* or *cementing* coal; and those which burn without caking, the *open-burning* coals. The “Block coal” of Ohio, Indiana, and the neighboring states, is of the non-caking kind, that most convenient for furnaces and open fires. The caking coals are prepared for metallurgical purposes by conversion into coke by partial combustion under cover (in ovens), which drives off the volatile matter. In the best process there is a loss usually of 20 to 35 per cent of weight, and an increase in bulk and hardness. At the same time the coal loses about half its sulphur.

The first of the following tables gives the results of analyses of coals, and also of peat, showing the amount of the several constituents; and the second, the amount of fixed carbon, and of volatile hydrocarbons (gas, oil) afforded, and besides, the water and ash, or impurities.

The flame given out in a fire is that of the burning gas as it escapes. This gas is almost wholly a compound of carbon and hydrogen, or a hydrocarbon; but it includes a little carbonic oxide (carbon monoxide), which has a bluish flame; and in the case of anthracites, which have very little volatile matter apart from the moisture, this gas is the chief one. But anthracites shade down into the semi-bituminous, and the flame varies consequently from bluish to yellow.

Cannel coal (called in Scotland Parrot coal) affords usually the most volatile hydrocarbons, and is valuable for gas making; and it will be much used for its yield of mineral oil or petroleum whenever the oil-wells give out. It occurs in Ohio and Indiana, and still more abundantly in eastern Kentucky, where Breckenridge is a noted locality. The amount of impurity in them is often large, and the beds frequently contain remains of Fishes, Crustaceans, and some other fossils, which is not true of the ordinary bituminous coal. The fossils appear to be almost solely those of fresh waters. Linton, Ohio, is a locality famous for its Fishes and Amphibians, its cannel coal affording 50 species or more.

The Subcarboniferous beds of New Brunswick, in some parts of King's, Albert, and Westmoreland counties, afford a semi-asphaltic material called