the difference in strength and character between the coal and the slate, shale, etc. The idea in crushing is to remove as much slate and shale as possible without breaking the coal into too small pieces—for calorific value decreases with the size of the coal. In sizing, the principal consideration is to have the coal graded into pieces of uniform size. The exact size varies from ¼ inch to 3 and 4 inches—but all the ¼ inch pieces must be treated separate from the ½ inch pieces, and the 2 inches separate from the 3 inches and so on. The machinery for these operations will be explained below. The principle of coal-washing is the same as that of ore-concentration. It depends upon the difference in specific gravity between the mineral sought for and the impurities. The washing of gold is a good example of ore-concentration. The specific gravity of gold is from 15 to 19 and so it is much heavier than the rock which bears it. The ore is carefully pulverized, and placed in a pan in which there is a small quantity of mercury. The pan is immersed in water and rocked and twisted in such a way as to cause the heavy gold to drop to the bottom while the lighter rock remains on top of it. The water is allowed to carry away this top waste and the gold unites with the mercury. A stream of water is directed onto this mixture and the last particles of rock are carried away. The lighter material is called the tail; the heavy substance, the concentrate. Now the principal difference between ore-concentration and coal-washing is this—that in the former process the material sought for is the concentrate, in the latter the concentrate is the waste and the tail is retained. This is because of the fact that coal is lighter than the rock in which it is found. It is the only important industrial mineral of which this is true. Its specific gravity varies from 1.129 to 1.420.

It is because of this that sizing is so important. When the size of the crushed rock and coal is uniform it is easy to effect a separation of the two substances. Let us suppose that the impurities are five times as heavy as the coal. It would be easy to separate slate and shale ¼ inches in diameter from coal of that size or even of three times that size; for the coal would still be lighter and would be separated from the worthless material. But if pieces of coal, after crushing, were allowed to enter the washing apparatus mixed with slate four or five times as large, the specific gravity of the two materials would be about equal and the principal of coal-washing could not be applied.