scarce commodity, its price is necessarily high. The writer has been driven to employ by-product coke made from bituminous coal in its stead, and would commend to those depending on anthracite, this future use for the produce of by-product coke ovens. Anthracite prices range from 25s. to 35s. per ton, compared with coke from 12s. to 18s., and the power development for this class of work obtainable from the two grades of fuel is altogether out of proportion to the difference in price. In Lancashire, the writer substituted coke for anthracite; the prices were as 12s. is to 33s., and the power developed as from 90 is to 100 respectively, ratios which speak for themselves. The main point in the substitution of by-product coke for anthracite, lies in the provision of a larger grate area in the former instance, whereby a larger surface of the lighter and harder fuel, coke, may be afforded to the ingoing draught. With hard burned coke no more scrubbing is required for coke-producer gas than is the case with anthracite, and perfectly even running throughout months of work is ensured.

The writer has also found, that in the case of the domestic stoves which are coming into fashion, the same principles hold, that given sufficient grate area, coupled with sufficient depth of fuel, by-product coke will take the place of anthracite at a much reduced cost per calorie.

Finally, the writer would refer to the possibilities of by-product coke ovens as a solution for the conservation of coal supplies, and for the smoke problem. To many of you these questions may have become hackneyed, and to others they may even appear chimerical, but whether we like it or not, the day when they will have to be considered is bound to come. That they are correct in theory no doubt can exist, and their practical treatment will follow. Up to now few methods have been advanced for the ready combustion of hard burned coke in household grates, and there has been a tendency towards the production of a soft low temperature domestic coke, e.g., coalite, which would be suitable for grates of ordinary design. In the writer's opinion this movement is retrograde, since it entails the production of large quantities of paraffiny tars with small yields of gas of very high candle power. By the inception of the incandescent mantle, the need for a high candle gas is no longer of moment, and a large quantity of gas, in view of its application for power and lighting purposes, is of more value to the country as a whole than a large quantity of tars. Making due allowance for our requirements of tar-derivatives for the textile industry, medicinal products, antiseptics, road treatment, etc., the aim of all carbonization processes should be, to obtain as much gas from as little coal as possible, and since this entails (by the high temperatures necessary for such gas production) the manufacture of a hard coke, we must seek some means to utilize the latter, and more economically produced fuel for every possible purpose. This is not so insuperable as the tendency towards coalite production would have us believe. It is true that closed stoves would have to be employed, and central heating, or a composite gas and coke fire might be essential, but all of these are worth the trouble in the consideration of coal economy. The change may not come about until as a race, we decide to abolish the blazing coal fire, but that time is bound to come, although legislation may be the last resort. When this new era in coal economy arrives, and all coal has to pass through a carbonization stage, the by-product coking process will lay still further claims to national utility.

The Problems of Tungsten Concentration

By H. C. PARMALEE.

The mining and milling of tungsten ores has been a growing industry in Boulder County, Colorado, since 1900. In the early days of gold and silver mining in this district the tungsten minerals were unrecognized, and they received various names from the prospectors and miners. In general they were regarded as forms of iron, and were considered without value. In 1900, however, the first production of tungsten occurred, amounting to 40 tons of ore valued at $3,216. Since then the production of high-grade ore and concentrate has increased annually, except during a depression in 1907-8.

The output for 1909 amounted to 1,100 tons of high-grade ore and concentrate, valued by the United States Geological Survey at $396,000. The total output in the United States for the same period was 1,607 tons, valued at $559,500. From this it will be seen that the Boulder County production is by far the most important in this country, amounting in 1909 to about 70 per cent. of the whole. In 1910 the output from Boulder was 1,530 tons of high-grade ore and concentrate, valued by the State Bureau of Mines at $736,700. During the same period the output of all other metals in the county was valued at $161,589.

*Reprinted from Metallurgical and Chemical Engineering.

The tungsten minerals in the Boulder field are the three iron-manganese tungstates, ferberite, hubnerite, and wolframite, and the calcium tungstate, scheelite. Ferberite predominates, but scheelite occurs in many mines, as is shown by the occurrence of lime in the analyses of ore and concentrate—there being no other source of lime worthy of consideration. These minerals are of high specific gravity, scheelite being 6 and the other three ranging from 7.1 to 7.5. They are generally soft and friable. The ferberite occurs in three rather well defined forms which, however, frequently grade into each other. These are (1) Well-crystallized crusts and layers covering the surface of rock fragments and cementing them together; (2) massive granular ore occurring in more dense seams; and (3) the highly silicious ore in which ferberite occurs in fine grains scattered through the gangue.

In breaking ore in the mine the highest grade is sorted and shipped without preliminary milling. At present this grade must average 40 per cent. or more tungstic acid. The lower grades, ranging from 3 per cent. to 15 per cent. tungstic acid, are concentrated by wet methods. Two grades of concentrate are recovered and shipped; the first contains 60 per cent. or more tungstic acid, and the second ranges from 35 per cent. to 40 per cent. The former is usually recovered as coarse concentrate and the latter as slime.