

bon than in those found on the east of the mountains, where no such disturbances have taken place, and this is one reason why lignites are relatively low in fixed carbon.

Volatile Matter.—Anthracite from Bankhead contains about 11 per cent. of volatile matter, and 85 per cent. of fixed carbon, while Souris lignite from Sutherland mine, for instance, contains 35 per cent. and 39 per cent. respectively. It will therefore be seen that in the anthracite the high percentage of fixed carbon gives off a hot, sustaining fire under steam boilers, whilst in the case of lignite the gases constitute one-half of the combustibles.

It is instructive to compare lignites from various countries and to contrast the same with American coal.

	Moisture	Computed to dry Bases					Heat value of coal as fixed
		Vol.	Mat.	F. Car.	Ash		
1. Saskatchewan lignite	29.7	49.0	42.9	8.0			7520
2. Alberta lignite	8.3	37.5	51.5	11.0			10740
3. North Dakota lignite.	35.78	45.00	45.05	10.0			7279
4. California	17.36	46.5	35.0	18.8			8530
5. Texas	33.71	44.0	45.0	11.10			7348
6. Italy	12.5	38.0	45.5	15.16			9350
7. Hungary	24.0	48.6	24.3	21.2			5750
8. Germany	52.7	44.5	43.8	12.3			4500
For comparison with best American coal from West Virginia	1.36	15.0	78.0	7.7			14420

It will be observed that the moisture content varies greatly. In one case it was as much as 52.7 per cent., and yet the gas produced from it was good.

1. Montreal test on Western Dominion Colliery lignite.
2. Montreal, Galt Colliery lignite.
3. U.S. Bureau of Mines, Wilton Colliery lignite.
4. U.S. Bureau of Mines, Tesla lignite.
5. U.S. Bureau of Mines, Hoyt lignite.
6. From Kerpely catalogue.
7. From Kerpely catalogue.
8. From Kerpely catalogue.

The production of lignite, according to information received, is as follows:

	Tons.
1911 Saskatchewan	204,000
1910 North Dakota	400,000
1910 Alberta	784,000
1910 Texas	881,000
1911 Germany	80,000,000

The use of lignite in this province has not yet become extensive. One of the principal consumers in the Robin Hood Mill Company, where a new type of furnace will shortly be installed to consume it. Estevan Power Steam Plant is run on lignite. The Rouleau Electric Plant is operated by means of producer gas from lignite.

Lignite is occasionally consumed at the power plants in Regina and Moose Jaw. Special tests were recently made at Weyburn and Estevan in connection with the use of lignite under boilers. Alberta lignite is used at Edmonton, Calgary, and Lethbridge for raising steam; these three employing chain grates and mechanical stokers.

The Canadian Mines Branch in 1908 carried out a series of tests in raising steam and with gas producers, with a large number of Canadian coals and lignites. These tests were made at McGill University, Montreal, and are dealt with in reports published recently.

Collecting the results obtained at those places where relative figures are reported, they can be tabulated as follows:—

Steam Plant.—Estevan—One pound of lignite as fired, equivalent evaporation was 3.76 pounds of steam from and at 212 degrees Fahrenheit. **Weyburn**—One pound of lignite as fired, equivalent evaporation was 4.13 pounds of steam from and at 212 degrees Fahrenheit. **Montreal**—One pound of lignite as fired, equivalent evaporation was 3.91 pounds of steam from and at 212 degrees Fahrenheit. **Average**, $\frac{1}{3}$ of 11.80, 3.93 pounds.

Thermal efficiency based on combustible consumed:

Estevan	50.85 %
Weyburn	56.01 %
Montreal	52.5 %

Average, $\frac{1}{3}$ of 159.36, 53.12 %.

Reference will later on be made to results obtained elsewhere, but it will be seen that in very instance the evaporation and efficiency were low. In each case the furnace and grade were practically the same as for superior coal. It is evident that much better results ought to be and are, no doubt, obtainable by adopting furnaces and grates better adapted for the consumption of lignites.

The United States Bureau of Mines conducted tests at Williston, North Dakota, steam plant, where a semi-producer furnace was built; superheated steam was used with Argand blower, and air was preheated in coils at the back of the boiler. The equivalent evaporation from and at 212 degree Fahrenheit was 3.17 pounds of steam and the overall thermal efficiency was 53.79 per cent. The moisture content of the lignite averaged 42.61 per cent.

Other steam tests were made at St. Louis, but the results were not so good.

Enough has been stated regarding the results of test obtained in raising steam with raw lignite.

It is well now to refer to results obtained with gas producers.

Two tests were made at the McGill University, Montreal, with the result that one brake horse-power per hour was obtained on a consumption of 2.58 and 2.70 pounds of lignite or an average of 2.64. These are the only tests made in Canada of which information has been received. Reference will be made to American tests later on.

Assuming that 18 pounds of steam are required per indicated horse-power hour to run a first-class steam turbine, then at least $4\frac{1}{2}$ pounds of lignite are required, and with gas producers at least $2\frac{3}{4}$ pounds.

The American gas producer tests will now be referred to.

So that this paper will not be overloaded with statistics, it may be stated that at St. Louis (Mo.) a large number of American coals and lignites were tested under steam boilers and in gas producers, and it required 8.46 pounds of lignite similar to that locally produced to generate one electrical horse-power at the switchboard when consumed under a steam boiler as compared with an average of 2.93 pounds of various lignites when used in gas producers.

In Texas the average consumption of raw lignite during last year at a 5,000 h.p. gas producer installation was 4 pounds per kilowatt hour, after allowing for all contingent losses, etc.

In these cases, with the exception of Williston, where the air was preheated, no attempts were made to utilize the waste heats.

You will readily understand that after the coal has been converted into gas and consumed under the boiler or in the gas-engine, there is much sensible heat left. If means were adopted to utilize the same by way of economizers, water-heaters, etc., the fuel consumption would doubtless be reduced.