

From Lignite to Anthracite

R. A. ROSS, C.E.

(Member of National Council for Scientific and Industrial Research.)

Even in the most primitive community in order that the individual may survive, it is necessary that he should be in possession of food, shelter (including clothing) and sufficient fuel for domestic purposes and heating where necessary. Lacking any one of these, the individual must succumb or remain at the mercy of those who can supply him and to whom he must pay tribute.

In Canada, although we have an abundance of all three, yet we depend upon the United States for one half of our coal, and are thus placed at the mercy of their strikes and embargoes with the possibilities inherent in any misunderstanding with our neighbors.

Attention need be called in this country to the very well known fact that coal prices are advancing, and none so rapidly as that of anthracite upon which we depend for our house comfort. It is not perhaps so well known that the exhaustion of the anthracite mines of the United States is so well within view that the Government has been urged by its responsible officials to prohibit export. In any case we are faced with the elimination of anthracite in one of three ways:

- 1st. By the increasing cost which will eventually become prohibitive to the ordinary individual.
- 2nd. By a complete embargo being placed on all shipments of coal outside the United States.
- 3rd. During some international crisis very effective pressure might be brought to bear upon this country by the stoppage of coal shipments.

While not neglecting the factor of proximity to the mines, short haul, etc., as determining what fuel will be used in any particular district, and without any attempt to override by artificial processes the law of supply and demand based thereon, it does seem as though this country would be well advised to at least study the whole fuel problem with a view to the contingencies of the future, and so that we may become independent as regards a vital necessity in such a climate as ours.

When it is realized that next to the United States Canada has the greatest coal reserves of any country in the world, and next to Russia, the greatest peat fields in existence, it does seem that the question of self-support in fuel is one which lends itself to easy solution.

In the fat days through which we have lived up till the present, and while we apparently prospered by borrowing and spending capital, it was easy to neglect vital matters of this kind because we were able to pay without feeling it. The case for the future is different for it is safe to say there will be no influx of capital, and that the accumulated savings of Canadians will be largely absorbed for war purposes before the end comes, and that, therefore, there will neither be foreign nor domestic reservoirs of capital to draw upon, and the business of the country will be production and not construction.

Apart altogether, therefore, from the question of direct profit and loss on purchases of coal from the States, sound economics would indicate that we should as far as possible keep our money in circulation at home rather than send it abroad in payment for that which we can produce ourselves with a little expenditure of energy and enterprise.

Canada's coal fields lie in the Maritime Provinces and in the western provinces of British Columbia, Alberta and Saskatchewan. These districts are, therefore, supplied from their own mines, while the great central districts of Quebec, Ontario and Manitoba must be fuelled from outside those provinces. As a matter of fact, up to the beginning of the war the province of Quebec was largely supplied from the Maritime Provinces, while Ontario and Manitoba were fed from the coal fields of Pennsylvania and Illinois through the agency of the cheap transportation afforded by the Great Lakes. This American coal, therefore, pushed its way to the centre of the province of Saskatchewan. In the neighborhood of Regina and Saskatoon where the prices from East and West are equal, we find the highest cost of coal suitable for domestic purposes in America, and yet a large portion of that district is underlaid with countless millions of tons of poor lignite, which, however, may by proper manufacture be transformed into the equivalent of Pennsylvania anthracite.

Neglecting wood, straw and other burnable materials, the fuels with which we are vitally concerned and their characteristics are indicated in the table below, the arrangement of which is such as to indicate the process of manu-

facture which goes on in the laboratory of nature, resulting finally in the production of anthracite coal from peat; the figures illustrating the progressive concentration of heat values as the process is carried out:

Average Constitution of Fuels.

	Moisture	Ash	Volatile	Heat
	P.c.	P.c.	P.c.	Units.
Peat (On dry basis)	10	10	60	8,500
Lignite (As received)	37	7	26	6,500
Sub-bituminous (Rocky Mountain)	25	5	30	9,000
Bituminous (Rocky Mountain)	6	10	36	12,500
Bituminous (Appalachian)	3	6	37	13,500
Anthracite (Pennsylvania)	4	15	9	12,000
Carbonized Lignite Briquets	5	15	16	11,700

The last line of the table shows what has been done by hastening the process of nature in converting the poorest class of lignite mined in Saskatchewan, into a domestic fuel which is the equivalent of the best Pennsylvania anthracite.

In the laboratory of nature long centuries have been devoted to the production of anthracite coal from lignite. Processes of distillation have gone on through untold ages, and this combined with immense rock pressures have eventually given us the hard anthracite coal which we use in our furnaces. It is proposed to replace these slow processes by artificial heating and distillation and the cementing together of the carbonized material under high pressure in briquetting presses, thus obtaining from a friable fuel which cannot be stored, is liable to explosion, and must be used immediately it is mined, a permanent material of half the weight per heat unit, which can be shipped at half the freight charges, will stand up under handling and all weather conditions and which may be stored without fear of spontaneous combustion.

The study of figures like these of the table led to Honorary Advisory Council for Scientific and Industrial Research to investigate the commercial problem in order to ascertain whether this desirable transformation could be accomplished economically, and the output compete successfully with nature's product in the open market.

At present the requirements of the district under consideration for domestic fuel are met by the importation of Pennsylvania anthracite and some semi-anthracite from the Rocky Mountain fields, and while a certain amount of lignites are used for domestic purposes, its low heating value, friability, liability to spontaneous combustion and general dirtiness, renders it very undesirable. It is felt, therefore, that if a briquet could be produced selling at anything less than the cost of anthracite and obtainable in sufficient quantity to satisfy the demand that there would be little raw lignite used. It would, however, be no demonstration of commercial feasibility merely to manufacture briquets in a laboratory or even in a superlaboratory way. A complete demonstration would have to be given, not only of the possibility of actual manufacture, but of the cost and specially of the ability of the manufactured fuel to drive anthracite from the market. The decision, therefore, was reached to suggest to the Government that this matter be handled free from governmental restrictions and on a commercial basis for a period of at least a year during which time the processes would be standardized, adjustments completed and the product actually marketed and sold, by which time a successful demonstration would render it possible to duplicate the equipment at any point desirable for the supply of the district market.

The Council realized that one of the largest, if not the very largest question within their view was the fuel situation in Canada, and while desirous of taking the problem on a broad front, they felt that the most vulnerable point to attack was the domestic fuel situation especially in its relation to the North West provinces.

Investigation showed that a great deal of work had been done by both the United States and Canadian Governments and private individuals on the briquetting of various classes of coal, but that so far no acceptable method had been found for briquetting the dry lignites of Saskatchewan and Dakota. It was found, however, that by carbonizing or coking these lignites a structure was given to the material which would allow of successful briquetting under com-

(Continued on Page 482.)