January 31, 1918.

simply have to reduce our requirements or else find a substitute.

Our total oil production from all sources might probably be increased to 120,000,000 gallons; by erecting oil shale distillation plants in New Brunswick with a combined capacity of 100,000,000 gallons and by increasing the quantity of coal coked in by-product ovens or by carbonizing large quantities of bituminous coal at low temperature and briquetting the carbonized residue.

The low temperature carbonization and briquetting of Nova Scotia coal either in Nova Scotia or at some centre of distribution favorably situated with respect to water transportation, as Montreal for example, would not only appreciably increase our production of oils, but would also be the means of supplying, for domestic purposes, a coal equal in many respects to anthracite. The fuel situation of some parts, at least, of Ontario might, in this manner, be much improved.

If this idea were carried out, our oil production would be :----

From oil shales Gallons Coke ovens and low temp. carbonization 100,000,000 Ontario petroleum fields 6,000,000

120,000,000

This completes the survey of our fuel resources and our fuel situation as it exists to-day. The fuel situation of the future will depend on the efforts we make to render our own fuel supplies available for utilization by the people.

Economic Utilization of Our Fuels

I desire now to deal with the methods to be employed for the utilization of fuels in general, in order to convert the maximum of their heat energy into usable forms of energy, and to recover the maximum of the valuable chemical compounds which can be obtained from the solid fuels.

All of the solid fuels contain the element nitrogen, some to a very large extent, and this is the basic element of a most important chemical compound—ammonium sulphate. In normal times this substance is used very extensively for agricultural purposes, in order to restore to the exhausted wheat fields and other agricultural lands the essential nitrogen which has been removed, almost to exhaustion in certain instances, by the repeated raising of the same crops.

The necessity for employing such a fertilizer on our western wheat fields may not be apparent to everyone, because of the large increase in our wheat production reported from year to year. This is directly due to the large crops realized from the new virgin fields which are put under cultivation each year. The average yield per acre of the older wheat fields, however, is rapidly decreasing, and if their production is to be maintained or increased an artificial fertilizer will have to be employed.

This fertilizer is, however, in great demand in other countries, and its recovery in Canada and sale to other countries would, in many cases, prove to be a profitable venture.

The solid fuels are burned on a large and continually increasing scale for the production of power, town or retort gas, for the manufacture of metallurgical coke, and for general heating purposes.

The employment of the by-product recovery coke oven for the manufacture of metallurgical coke is taking place on a large and rapidly increasing scale in the United States, and Canada is now employing such ovens to a considerable extent. The manufacture of coke in by-product ovens is attended with the recovery of ammonia and the oils previously referred to. The entire quantity of coal used for coke and gas making should be utilized according to this method.

Power, other than hydro-electric, can be produced from the solid fuels in two principal ways: through the media of, first, the steam generator, and steam engine; second, the gas producer and gas engine.

When the energy of coal is converted into useful work by the first method, all valuable by-products are forever lost. When the second method is employed, and the producer is of the by-product-recovery type, it is possible to realize a maximum recovery of the nitrogen content of the fuel. The thermal efficiency obtainable with the latter is also considerably higher than can be realized with the steam power plant.

The producer gas by-product recovery plant is eminently suitable for the production of a power and industrial gas, and the field of its application might be extended to include the supply of gas for certain domestic purposes, e.g., general heating. Such a gas possesses the advantage of low cost, inasmuch as the plant can be situated at or near the source of fuel. Moreover, the cost of operating the plant can be appreciably reduced through the sale of the by-products and this results in a further reduction of the cost of the gas per 1,000 cu. ft., if the production of gas is the main purpose.

We, however, possess sources of fuels especially high in nitrogen, viz., the peat bogs. The average nitrogen content of all the peat bogs so far examined is high—but there are a few notable peat bogs of large extent, containing fuel of excellent quality, in which the nitrogen content is very high. The fuel of such bogs should unquestionably be utilized in by-product recovery producer gas plants, for the production of power or a power, industrial, and domestic gas. The bogs referred to and described in detail in Mines Branch Report 299, are favorably situaced with regard to populated communities and industrial centres.

Some of our fuels are especially valuable for purposes for which no other fuel can be substituted. This is especially the case in the coking variety of bituminous coals, and these fuels, at the present time, are being used indiscriminately for all purposes, notwithstanding the fact that the coking coals are invaluable for many metallurgical purposes and cannot be replaced, by any means known to-day, with non-coking coal. A coking coal should, therefore, never be used for any purpose for which a noncoking coal will be entirely suitable.

The quantity of coke produced in Canada to-day is small, and the necessity for conserving this class of coal may not be apparent. The great demand, however, for metallurgical coke in the United States and the probable depletion in the not far distant future of the supplies of this fuel in that country will, in time, make our deposits of coking coal of special value. When that time arrives, we shall have an excellent commodity for purposes of barter, if we now take steps to conserve our supplies.

The problems associated with the distribution of fuel to the various parts of Canada are somewhat complicated, owing to the distribution of its population. In order to supply heat and power in the most economical manner and at the lowest cost to a population so widely scattered, the most rigid economy must be installed. The added cost to a fuel consequent on large rail haulage and local distribution can be very materially reduced by centralizing heating and power plants.