Commission of Conservation

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Peat as a Source of Fuel

BY

EUGENE HAANEL

Director, Mines Branch
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Reprinted from the Ninth Annual Report of the Commission of Conservation

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ON former occasions, when I addressed the American Peat Society, the Canadian Club at Toronto, and the members of this Commission, on the subject of the utilization of our Canadian peat bogs, the conditions prevailing throughout the country were totally different from what they are now. Then the country enjoyed peace and prosperity, and the spirit of *laisser faire* rendered efforts to arouse an abiding interest in the development of the peat resources of the country unavailing.

Now we are in the throes of a gigantic war, entailing colossal destruction of resources, and our minds are agitated with the question: "How can failing resources be replaced by others?" and, perhaps for the first time, compelled by the exigencies of the times, are we prepared to realize that the natural resources upon which the very foundations of our present civilization rest, and upon which future civilization must continue to build, are not inexhaustible, but limited, and that for some, it is feared, exhaustion is in sight. This is the case with fuel, of which class coal is the most important. How to conserve it by utilizing a maximum of its potential energy is a problem of the utmost importance wherever coal is the principal fuel.

A Possible Fuel Famine

But in countries where artificial heat must be provided for eight months annually for the sole purpose of maintaining life, the question of an adequate fuel supply is overwhelmingly important. This is brought home to us as never before, and the appointment of a Fuel Controller for Canada and a similar officer for the United States demonstrates that conditions may arise when, in spite of still abundant coal resources, a fuel famine may occur. The possibility of a shortage of fuel to meet the demand of the central provinces of Canada, which depend upon the United States for some 17,500,000 tons of coal, annually, and the probable suffering which may be entailed by such shortage have produced a profound change in the mental attitude of the people, rendering them more willing to consider, soberly and seriously, the fuel problem of the central provinces of Canada.

The difficulty regarding an adequate and cheap fuel supply which we are facing now, due to war conditions, may be less pressing, but will not vanish, after the war. The coal deposits of the east and west in Canada will still be too far from the central provinces to supply them with cheap fuel, and we will still be dependent upon the United States for the very means of keeping ourselves alive; for we have made no provision to meet an emergency arising from a shortage of fuel due to labour conditions in the United States, either by laying in stocks of fuel to carry us over the period of shortage, or by having developed and in active operation plants strategically situated to furnish an excellent substitute for coal—peat. Moreover, we can not be altogether certain that the United States will be able to continue to supply us with the amount of coal we have been receiving annually from that country. The war may reveal to their Government the necessity of husbanding their fuel supply, and they may therefore limit or altogether prohibit export of it in the near future.

The gravity of the fuel situation, as I see it, and the momentous problems presented by it, are my excuse for coming before the members of this Commission a second time to address you on the subject, "Peat as a Source of Fuel."

Peat Resources of Canada

The total area of the Dominion of Canada overlain by peat bogs is estimated to be 37,000 square miles, and of this total area the known peat bogs of Manitoba, Ontario, Quebec, and New Brunswick comprise 12,000 square miles, with an average depth of 6 feet. This is probably but a portion of the actual amount of this valuable fuel asset in existence in these provinces.

One square mile of peat bog with an average depth of 6 feet will produce 774,000 tons of peat fuel, with a moisture content of 25 per cent. The 12,000 square miles will, therefore, contain about 9,300,000,000 tons of peat, having a fuel value equivalent to about 5,400,000,000 tons of good coal. This calculation is made on the assumption that the total quantity of peat contained in the 12,000 square miles is suitable for fuel purposes. This assumption is not strictly correct, but is near enough to serve the purpose of illustrating the enormous potential energy stored in our peat deposits.

Exact Data *re* Deposits

Up to the present time, the Mines Branch has located, delimited, mapped, and investigated, as to depth, character, and quantity of peat available for commercial exploitation as fuel or litter, peat bogs comprising approximately 175,000 acres. Of this total amount, published

reports treat in detail about 140,000 acres distributed as follows: Ontario, 25 bogs; Quebec, 12; Nova Scotia, 8; Prince Edward Island, 6; and 7 in Manitoba; making 58 in all. These bogs are estimated to be capable of producing 115,000,000 tons of fuel, and 10,500,000 tons of peat litter.

Seven bogs within convenient shipping distances of Toronto are estimated to be capable of producing approximately 26,500,000 tons of fuel; and seven bogs in the vicinity of Montreal could supply that city with 23,500,000 tons of fuel.

Five bogs along the lower St. Lawrence, conveniently situated as regards water transportation to the city of Quebec, can, it is estimated, supply 16,250,000 tons of fuel, and 5,700,000 tons of peat litter.

The bogs examined in Nova Scotia can produce 6,200,000 tons of fuel and 500,000 tons of peat litter, and those of Prince Edward Island can produce 1,250,000 tons of fuel and over 1,000,000 tons of peat litter.

Manitoba is rather poor in peat fuel bogs, the aggregate fuel content of the bogs of that province being estimated at less than 2,000,000 tons. One bog alone, however, it has been estimated, is capable of furnishing 2,500,000 tons of peat litter.

Manufacture of Peat Fuel

Extracting the Moisture

Peat, in its natural state, is generally associated with about nine times its weight of water, and before the combustible matter, amounting to about ten per cent, can be converted into a fuel, the greater portion of this water must be removed. The water content of a bog is slightly reduced by a conventional system of drainage, but the remaining water, amounting to about 86 per cent must be removed by other means. The excavation of the peat, whether accomplished by hand or automatic machinery, does not present any problems of a difficult nature. The handling of the excavated material, containing about 90 per cent water, and the removal of this large quantity of water constitute the real problems with which peat engineers are confronted. Numerous attempts have been made to remove the water mechanically by hydraulic pressure, and to evaporate the water by means of artificial heat. Other attempts have been made to alter the chemical constitution of the peat substance—by wet carbonisation—in such a manner that it would more readily part with its water content through the agency of pressure, but none of the attempts made in this direction have, so far, been successful. It

has been demonstrated once and for all that the water content of raw peat cannot be reduced much below 80 per cent by pressure alone, and the process of wet carbonizing, upon which large sums of money have been expended, has not, up to this time, proved a success. In fact, it may be safe to make the statement that any process for the manufacture of peat fuel which depends upon the employment of artificial heat for the evaporation of the moisture will not prove economic.

Drying by Sun and Wind

The only economic process in existence at the present time is that which utilizes the sun's heat and the wind for the removal of the moisture. Such a process, it will be understood, can never be continuous, but is absolutely dependent on weather conditions. Nevertheless, all the peat fuel manufactured in European countries, and which amounts in Russia, the largest peat producing country, to 7,000,000 tons annually, is manufactured in this manner.

The process which makes use of the sun's heat and the wind for the removal of moisture is known as the 'wet process,' and the product obtained is called 'machine peat.' This is the process which was successfully employed for the manufacture of peat fuel at the Government peat plant at Alfred, Ontario. Briefly stated, it consists in the thorough maceration or pulping of the freshly excavated peat, and the spreading of the resulting mass on a portion of the bog prepared for drying purposes. When the pulped peat, which has been spread on the ground to a thickness of 4 to 6 inches, has sufficiently set, it is cut transversely and longitudinally into blocks which, when dried to about from 30 to 35 per cent moisture, have approximately the dimensions of the ordinary building brick.

Pulping the Peat

The operation of pulping or macerating serves to thoroughly mix the peat of the different layers or strata of the bog, thus forming a uniform product, and the fibres and roots, which are often found distributed throughout a peat bog, are cut, torn or ground into small fragments. But one of the most important results of this operation is the uniform distribution throughout the entire peat mass of a complex hydrocarbon compound, called 'hydrocellulose.' This is a gelatinous substance which serves the purpose of binding the particles composing the peat substance into a homogeneous whole.

It is believed by certain investigators that the great resistance exhibited by peat to parting with its water content, when subjected to pressure, is largely, if not entirely, due to the presence of this colloidal substance. But thoroughly decomposed fuel peat itself

may also possess to a certain extent the properties of a colloid. Whatever the resistance might be due to, the fact which concerns us is, that peat including this substance does part with its moisture when exposed to artificial heat or the action of the sun and wind. The latter is made use of in the only economic process known at the present time for the manufacture of peat fuel.

The Colloid Skin

During the drying period, the pulped peat mass contracts and thereby becomes more dense and resistant to breakage; in addition, the dried peat becomes more impervious to the absorption of moisture. When the drying process has been under way for two or three days, that part of the gelatinous substance above described, situated on the surface of the peat-block, forms a skin over it. This skin performs an important function in the drying process. It takes up the moisture from within and transmits it to the air surrounding the drying peat. During wet weather, the skin rapidly absorbs moisture until saturated. Since, in that condition, it can not take up more moisture, it protects the interior of the peat-block from absorbing moisture from without. When the rain ceases and the peat is again exposed to the heat of the sun's rays, the drying begins anew at the point where it was interrupted. Fresh peat-blocks which have not been protected by partial drying, as explained, on exposure to rain will be washed away and the blocks completely ruined. The drying operation is considered to be complete when the moisture content has been reduced to from 25 to 35 per cent.

Peat manufactured by this process is an excellent fuel. It will stand a large amount of handling without the production of much 'fines,' and when dried to about 25 or 35 per cent of moisture it resists, to a large extent, the re-absorption of moisture. This property permits the fuel to be stored in the form of stacks in the open field. Peat not dried down to 30 per cent should not be stacked for winter, since frost is ruinous to peat still in a wet state.

A Practical Test

Of the 3,000 tons peat fuel manufactured by the Mines Branch at the Alfred peat bog, 1,200 tons were distributed, at a nominal price, among the householders of Ottawa and the villages and small towns in the vicinity of the peat fuel plant, to give them an opportunity to try and accustom themselves to this new fuel. One hundred and fifty very favourable opinions regarding the value of this fuel, from those who have tried it, were collected by the Canadian Peat Society and published in their Journal. The following is a summary of the properties of peat manufactured as described.

Properties of Peat Fuel

Peat is a clean fuel to handle; has, as a rule, a very low ash content, and produces no soot or other deposit when burned in an ordinary cook stove or open fireplace. The ash, moreover, is in a very finely divided condition, free from combustible matter, and can be easily removed from the stove or fireplace. Clinkers are not formed. On account of the ready manner in which peat fuel ignites, often a little paper or a few shavings are sufficient to start the fire. A peat fire does not, therefore, require to be kept continually burning throughout the day, if not needed, since a new fire can thus easily be started when required.

Peat fuel, on the other hand, is more bulky than coal and is of lower heating value per pound. The relation between anthracite coal and peat fuel as regards heating value per pound is 12,500: 7,000, or 1.8, that is, one pound of the average anthracite coal is equivalent in heating value to 1.8 pounds of peat fuel, containing 25 per cent moisture. For a definite heating value, therefore, it is necessary to store 1.8 times the weight of the coal required in peat fuel. The volume occupied by the peat fuel, owing to its low specific gravity, will also be much larger than that of coal. One cubic foot of ordinary furnace anthracite coal weighs approximately 56 pounds, while one cubic foot of machine peat weighs about 27 pounds. The volume of peat required to equal coal of the above heating value will, therefore, be about 3.6 to 4 times that of the coal, which is a matter of considerable moment, and introduces serious problems when large quantities of fuel must be stored.

Nitrogen Content of Peat

The numerous chemical analyses, representing very nearly all the typical peat bogs of the more settled parts of Canada, show that the average value of the nitrogen content is very high, and, in certain individual cases, the nitrogen content has been found to be exceptionally high. Peat, therefore, becomes a most valuable source of nitrogen for the manufacture of ammonia and other nitrogen compounds. This phase of the utilization of peat has been occupying the attention of investigators for many years, principally on account of the great demand for artificial nitrogenous fertilizers, and, latterly, on account of the demand for nitrogen products in connection with various chemical industries and munition works.

Valuable as Fertilizer

The civilized countries are beginning to recognize the importance of restoring to the soil the food elements which have been extracted, almost to exhaustion in certain cases, by the continual raising of the same

crops. One of the principal elements upon which plant life depends is nitrogen, and the amount of this element taken out by the crop must be returned to the soil if its fertility is to be maintained. Sulphate of ammonia is the most common nitrogen compound used for this purpose. In the past few years, the demand for this product has been increasing so rapidly that—independent of the demand for nitrogen products, created by the war—coking plants of the old style throughout nearly all the civilized countries are rapidly being converted into by-product recovery plants with a view of recovering the nitrogen content of the fuel in the form of ammonia. This ammonia is afterwards combined with sulphuric acid to form ammonium sulphate.

For the purpose of showing the large quantity of nitrogen which can be recovered from peat bogs in the form of ammonium sulphate, thirteen of the bogs so far examined in the province of Ontario, which have a total fuel content of 43,000,000 tons of 25 per cent moisture peat, and an average nitrogen content of about 1.3 per cent in peat of this moisture content, will be taken as an example. The content of nitrogen corresponds to 560,000 tons, and this will give 1,800,000 tons of ammonium sulphate, with the present day efficiency of recovery.

The nitrogen content of peat can be most efficiently recovered in the form of ammonia by burning the fuel in a by-product-recovery-producer-gas plant. The percentage of the nitrogen content of the fuel recovered by this process is much greater than obtains in the case of by-product-recovery coke ovens. In addition to the recovery of ammonia, a large quantity of gas is produced, which can be used for power or industrial purposes.

The quantity of peat used in the above illustration could, if all were burned in a by-product-recovery-producer-gas plant, produce sufficient power gas to generate approximately 40,000 h.p. continuously, day and night, for 100 years.

The extensive and varied field for the utilization of peat must be apparent to all who have closely studied this question, and the urgent need for an intensive development of the Canadian peat resources should be brought forcibly before men actively engaged in the building up of the great commercial enterprises and industries of this country.

Peat Fuel for Heating Houses and Other Buildings

This, in general, is an extremely difficult problem, if it be desired to retain the present heating systems, which are suitable only for coal.

Central Heating Plants

In the interest of the more efficient utilization of fuels in general, but peat in particular, for general heating purposes, the fuels should be burned in a central plant, either located at a bog or at a point near or in a city or town conveniently situated with respect to transportation facilities. In the case of peat fuel, which is the fuel under consideration here, the best results would be obtained if the fuel were burned in a by-product-recovery-producer-gas plant, in which the valuable by-products, including ammonium sulphate, could be recovered. The gas produced could be transmitted to the different houses and buildings in the same manner as the ordinary city gas, and burned in cook stoves, house heaters, etc., in place of coal, or steam could be generated in the central plant and the city heated by means of steam transmitted in mains laid underground. I understand that this method has already been employed in heating certain sections of Baltimore, Maryland.

This method of burning peat for heating houses and buildings would result in many economies, but principally in labour in connection with the attendance of individual heating plants, and in the distribution of fuel and storage of it in individual homes and buildings. Such a method would also eliminate the waste now taking place in isolated heating plants—especially homes—inasmuch as a central heating plant would have at its disposal a trained staff of engineers and labourers.

Costs of Production of Peat Fuel

Short Manufacturing Season

The season during which the manufacture of peat fuel can be successfully conducted is limited to 100 to 110 days. This period may be materially lengthened when there is an early spring and late autumn, accompanied by moderately dry weather. It is, therefore, necessary, in order to manufacture a large output of fuel, that electric energy be employed to operate the plant. This will permit of the illumination of the bog by electric lamps, so that the operations, when weather conditions permit, may be continued during the night also. This method of operating will reduce the overhead charges, interest on investment, amortization, and repairs, by distributing the costs thus represented over a much larger output than would be the case with daily operation only.

The plant operated by the Mines Branch was supplied with hand-dug peat, and required for a daily output of 30 tons of 25 per cent moisture peat a complement of 14 men all told. But even under these unfavourable conditions, the result of the two seasons'

manufacturing operations indicates that, with efficient management, peat fuel can be manufactured at a cost of $1.75 per ton on the field.

Labour-Saving Machinery

The employment of mechanical excavators and other labour-saving devices not only increases to a very large extent the capacity of the plant, but materially reduces the number of men required to operate the plant. The improved plant at Alfred, which was installed by private parties, was equipped with an automatic excavator, spreading machine, and a cable-way for transporting pulped peat from the machine to the drying field. The entire plant was operated by electricity generated in a power plant, situated a short distance from the bog, which used the broken and waste peat fuel. The practice of employing individual motors was followed whenever possible. The unfortunate conditions prevailing at the time this plant was ready for manufacturing peat fuel on a commercial basis, and which prevented its continuous operation during an entire season, did not permit an accurate estimate of the manufacturing costs to be made. It has been stated,however, that these were much lower than those obtained with the Government plant.

Location of Plants

Great care must be taken in the selection of a bog in regard to ease of drainage, suitability of the peat content for the manufacture of fuel, and its situation with respect to railway or other transportation facilities and contiguous towns or villages. The large volume occupied by peat as compared with coal does not permit of its transportation over long distances. It is, therefore, vital to the success of a peat industry that the peat plants be situated as close as possible to the community or communities they are intended to serve. Fortunately, most of the peat bogs so far examined are admirably situated with respect to both transportation facilities and proximity to cities, towns, and villages, and are, in other ways, suitable to the manufacture of peat fuel.

Gas and Electricity

Certain of the bogs conveniently situated with respect to industrial centres, which have been shown to be of large extent of high nitrogen content, should be utilized in by-product-recovery-producers for the generation of an industrial and power gas. Electrical energy could be economically generated at the bog and transmitted to the industrial centres, or a power and industrial gas could be transmitted through mains to the same centres for various uses. This latter method of employing power gas generated by a by-product-recovery producer is made use of in the Staffordshire district, England.

Sulphate of Ammonia

By-product-recovery-producer-gas plants designed for the burning of peat fuel are in successful operation in Italy. At one plant, the peat is burned solely for the recovery of the nitrogen. In Canada, in the settled districts, there are peat bogs of very large extent eminently suitable for development, in which the nitrogen content is much higher than it is in any of the Italian peat bogs which have come under our observation. It appears, therefore, that the manufacture of sulphate of ammonia could be most profitably conducted at certain of our bogs which are known to be exceptionally rich in nitrogen.

The utilization of peat for the generation of steam will prove economic only when the price of coal is very high, or at such places where coal is difficult to get. Speaking generally, it is safe to say that peat fuel for steam raising cannot compete with good steam coal costing $5.00 or less a ton. But, as the price of coal increases, as has been the case in the immediate past, and as it is likely to do at a more rapid rate in succeeding years, peat fuel for steam generation, wherever large deposits of peat suitable for fuel purposes are available, will become a very serious competitor of coal.

Qualifications Required in Production of Peat Fuel

Now that renewed interest is manifested in the exploitation of peat bogs for the manufacture of fuel, as is evidenced by the increased number of applications which come to the Mines Branch for its literature on peat, from England, Ireland, Russia, France, the United States, and our own country, it is imperative that we insist that those who intend to engage in the active operation of the manufacture of peat fuel should possess certain qualifications for this class of work, to avoid a repetition of the failure and loss of capital which have characterized the history of attempts made in the past.

These qualifications are:

(1) Possession of the experimental facts relating to the physical and chemical properties of peat.

(2) Knowledge of the investigations which have been made by specially trained engineers in the peat-producing countries of Europe in the exploitation of peat bogs for the production of fuel.

(3) Possession of such knowledge of engineering and collateral sciences as will enable them to correctly design the machinery required for a successful peat plant.

Specialists Essential

In other words, the person entrusted with the designing and operating of a peat plant must be a peat engineer, a specialist, such as they turn out in the peat schools of Russia, Sweden, and other European peat fuel producing countries. No person should be employed who has not demonstrated, by previous work in the same line successfully accomplished, that he is the right man. This is a general principle, applicable to all technical work, and should, hereafter, be insisted upon throughout the country in the development of any industry. Any other course inevitably leads to failure and loss of capital, as has been abundantly proven by experience, extending over a period of nearly fifty years, in connection with the development of the peat industry.

Permit me to show by a few illustrations how failure might have been avoided in the establishment of this industry in Canada, if the persons engaging in this enterprise had possessed the knowledge and training we should insist upon.

Value of Scientific Knowledge

Nothing certainly seemed more simple and reasonable than to attempt to extract the 90 per cent water content of peat by pressure. The failure of the attempt was ascribed to the imperfection of the machinery employed. The solution of the problem, therefore, seemed to lie in the proper design and construction of the press. Much time and money were spent in the construction of presses which would accomplish the purpose, all of which might have been saved had it been understood that humified peat possesses the properties of colloids, resisting all attempts to remove the water by pressure.

It is quite evident also that the economic removal of water by artificial heat would be an immense achievement, since it would render the manufacture of peat fuel independent of weather conditions, and might be carried on all the year round. But the amount of heat required to extract the water content of raw peat has been calculated with mathematical exactitude, and the number of calories required is so great, that, to say nothing of the expense of the extra handling involved, this method is demonstrated to be impracticable.

Instead of rightly assigning the failure to the large quantity of heat required, it was charged to the improper construction of the dryers employed, and hence attention was directed to the improvement of the construction of dryers. It was not realized that a dryer with an efficiency of 100 per cent would not solve the problem, since, even with so perfect a dryer, the cost of the fuel required to

furnish the quantity of heat needed would render this method impracticable.

There is no question that peat fuel in the form of compact briquettes is more desirable than machine peat bricks or blocks, but after many trials and much experimentation the process of briquetting has not proven commercially successful, and briquetted peat fuel has not been and is not now on sale in the peat producing countries of Europe. And yet we still hear of schemes and processes, involving the impracticabilities described, being offered as solutions of the difficulties attending the successful production of peat fuel as a commercial enterprise.

Credulous Business Men

So rapidly has science advanced in recent years, and so startling have been the discoveries made, that what would, 50 years ago, have been regarded as almost a miracle is now passed over as something to be expected and not calculated to arouse wondering admiration. This frame of mind is responsible for the credulity of those not scientifically trained, and accounts for the fact that some of the shrewdest business men prove easy game to the enterprising promoter and pseudo-inventor of schemes and processes, incapable of commercial realization. No discovery has been made in any department of science which cancels in any particular the well-established laws of nature, and the scientist is, therefore, still able to say regarding a proposition of process, if it is contrary to laws well known to him, that it is economically impossible. Until the public cease to listen to schemes proposed by men who have neither the education, training and experience to arouse a legitimate faith in the soundness of the scheme offered, failure and waste of money must be expected.

In 1910, at the annual meeting of the American Peat Society at Ottawa, I made in my Presidential Address the following statement: "The endeavour to accomplish *economically* by artificial means and in a short time what has been accomplished by nature in exceedingly long periods of time, namely, the change of peat into a substance similar to coal, has so far apparently not been attended with success." This statement is still correct, as will appear from the following:

Some three years ago, just before the war, an agent representing a firm in Scotland, who were exploiting the wet-carbonizing process, appeared in my office, endeavouring to interest me in that process. He stated that he came to Canada, not so much for the purpose of selling the stock of the company, as to look up peat deposits in Canada and Newfoundland, which the company intended to buy for the purpose of introducing their process in these two

countries. He showed me a briquette of the fuel made from peat by the process owned by his company. The briquette had all the appearance and properties of a first-class coal. I have no doubt its heating value was very high.

I listened with great interest to his enthusiastic description of the process with which, by the way, I was entirely familiar. The process consisted in heating the raw peat as it came from the bog to a high temperature in iron tubes under pressure. This was done for the purpose of destroying the hydrocellulose and carbonizing the peat material in the hope of being able to extract the water content from this chemically changed material. But, unfortunately, the substance, when subjected to pressure, refused to part with the major quantity of the water content, and artificial drying and briquetting had to be resorted to, in order to produce the elegant briquette which I am passing around for your examination.

I looked over the cost-sheet he presented for my inspection. As a piece of book-keeping it was perfect, and the cost of the product per ton was ridiculously low. I forget the exact figures.

I can just imagine a number of financiers and business men sitting around a table, each holding one of these briquettes, and listening to the oratory of the promoter of this famous process. "What! produce from peat a coal cheaper almost than it can be mined, and in such elegant pieces! Why, there is a fortune in it!" How often must these little briquettes have served the purpose of a talisman to empty the purses of the listeners to the eloquent promoter, for I understand that the company has already spent $1,500,000, and the Swedish experts some $40,000 additional.

I asked the agent how many thousand tons they were producing per annum, and at what price the product sold, and with child-like innocence he informed me that the company were not manufacturing for sale as yet, since there were a few changes which had yet to be made in the machinery. This was three years ago, and I presume they are still making changes in the machinery, and are simply turning out these beautiful little briquettes to aid them in selling stock. I instructed the Chief Engineer of the Fuel Testing Division, when he was in England investigating by-product gas producers, to go to Scotland and examine and investigate in detail the process I have desscribed. But, although he made every effort and saw a number of the directors, he was not permitted to see the plant.

Back to Nature

Now, the process I recommend to be employed in the exploitation of our peat bogs does not attempt to produce a chemical change in the peat substance to turn out briquettes which in every respect have the properties of coal. The process I recommend takes the peat as nature has laid it down for our use, and utilizes for the extraction of the water content the forces of nature, sun and wind, which cost nothing. This is the process employed in the manufacture of peat fuel in all the peat-producing countries of Europe. Any improvement of this process will lie in the direction of labour-saving devices.

The promoter, as we know him, the pseudo-inventor, and the fakir, are passing away, for the British Empire and the United States have declared that hereafter science and scientific methods shall be applied to the affairs of nations, and councils and commissions of able, scientific men have been appointed in these countries, to advise the Government and their people regarding the subjects to be investigated, and recommend the men fitted by training, education and experience to undertake these investigations. The educative influence these councils and commissions can exercise upon the general mass of the people should be very great, rendering innocuous the present credulous frame of mind of the people, teaching them to look for sound opinions on industrial matters to those whose training and experience have rendered them competent to speak with authority. With this change in the mental attitude of the people we may look forward with hope to the establishment of a peat industry on a sound basis in Canada, and thus insure the people against a possible shortage of fuel and the suffering it would entail.