The work so far done by geologist and miner gives little information on which to predicate the future of the mining industry of this region. It has been profitable only to sellers of mines. Whether in the event of the establishment of iron and steel manufactures at Kingston, a permanent supply of good ore can be reckoned upon would seem to be unquestionable. But before accepting such conclusion on the basis of the meagre data at hand, prudence would dictate a very thorough examination of the ferriferous terranes which occupy so large a part of the district under consideration. The insane destruction of forest and soil by recklessly improvident free grant settlers, has removed hindrances encountered by Vennor, and rendered practicable the operations of the diamond drill, without the aid of which this extensive iron-ore district will never be able to satisfy reasonable enquiry into the permanence of its iron ore mines. Much may be done by roasting and concentration to place the discredited ores in the very front rank for furnace supply. Abundant water power at various points affords facilities for this enterprise, without recourse to which there is little prospect of any inquiry for dense refractory ores carrying sulphur, or phosphorus, or titanium, above objectionable points.

Peat Fuel.

MR. T. W. GIBSON, (Toronto)—The uses of fuel may be roughly classified under four heads:—

(1) Domestic—cooking, heating, &c.
(2) The generation of steam for industrial purposes.
(3) The smelting of ores and refining of metals.
(4) The production of illuminating gas.

The substances which have hitherto been almost exclusively employed for these purposes in Canada, as in most other countries, are coal and wood, either in their natural condition or in the form of coke and charcoal. The use of petroleum and petroleum products is not unknown in Ontario, particularly in the furnaces of steam boilers, and recent improvements in the method of combustion have rendered this fuel of importance where distance from the source of production does not unduly enhance its cost. Natural gas has also begun to be used and is now in employment on a limited scale, both for manufacturing, domestic and illuminating purposes, but we are exporting for consumption in a foreign country as much as, or perhaps more than we use ourselves, and the probability is that when we get ready to make use of it in earnest we shall find the supply very much reduced. Wood, as every one knows, is becoming scarcer every year, and increasing scarcity brings its natural result—increased prices. In some country districts in Ontario with which I am acquainted, the profusion of wood for fuel purposes which not long ago existed is now at an end. Of recent years such wood as maple has brought a higher price in the log than when cut into lengths for fuel, and the consequence is that farmers have sold their maple trees to saw millers and their tops and branches only to the users of fuel. These of course are inferior to the body of the tree, both for domestic and furnace purposes, and in such districts where wood was once the only kind of fuel thought of it is now a question as between wood and coal, with advantage in economy of price in some cases in favor of the latter.

Unfortunately, we have no coal in Ontario; at least none has yet been found in the southern portion of the province, though deposits of lignite are known to exist in the far off valleys of the Moose and Abbitibbi rivers on the Hudson Bay slope. The extent and value of these deposits are as yet unknown, as no systematic survey has been made with a view of determining whether or not they could be made available for economic use, but as they appear to occur in the drift it may be doubted whether they are likely to prove sources of important supply to the coal users of southern Ontario. At any rate they are yet far removed from communication and means of transport, so that were they ever so valuable they must for the present be left out of consideration. It is quite true that everybody does not agree with the geologists that we are below the coal bearing rocks in Ontario. It is natural to argue thus: we have been favored by Providence so highly in almost every other respect that it is almost inconceivable we should have been neglected in the matter of coal; consequently, we have heard in past years and still occasionally hear of discoveries of coal having been made in various parts of the province. Coal has been found at Collingwood, at Bowmanville and several other points. Some months ago a very valuable deposit was discovered—just to put the geologists to shame—not more than eight miles from the city of Toronto, and so precious is the bed to its owners that they have not yet been able to bring themselves to part with any portion of it, or even to raise it to the surface. No later than this week the Bureau of Mines was in receipt of a letter from a man who by means of a divining rod of his own construction had located a seam of coal eight feet in thickness in Western Ontario, which upon receipt of a suitable bonus from the government of the province he was willing to develop. The advisability of granting such a bonus, I need hardly say, remains under the government's most serious consideration.

But the lack of coal within our own borders leads to serious consequences. The coal we use comes almost wholly from the mines of Pennsylvania and Ohio, and whenever the gentlemen in control of these mines say "thumbs up" on the other side, thumbs have got to go up on this side. Were there even unrestricted competition among the producers of coal in the United States we could hope to get it in Ontario at the lowest price for which it could be profitably sold, but rings and monopolies govern the production and sale of this important article, and we are thus entirely within the power of foreign corporations who cannot be reached by Canadian laws, and who have "neither bodies to be kicked nor souls to be damned." Nova Scotia, the only other possible source of supply, has, unfortunately, been shown by experience to be too far removed from our markets to admit of our drawing upon it for any considerable part of our requirements. In view then of the increasing scarcity and dearness of wood, and of our coal supplies being in a foreign land and the subject of an odious monopoly, we are, it seems to me, in presence of a situation which demands our instant and most careful consideration. How are our private and public interests to be protected?

There are those who hold out the hope of escape from the situation by means of electricity, that force which has already done so much, and which is to solve every possible problem of transportation, lighting, heating, smelting and power. Fuel is not required, they say, for the generation of electricity where you have sufficient water power, and in the undeveloped rapids and falls of the upland regions of Ontario, where the headwaters of the Muskoka, the Madawaska, the Petewawa, the Bonnechere, the Mattawa, the Severn, the Otonabee, the Trent, and many other streams take their rise, not to mention the immense potentiality of the falls of Niagara itself, lies the ultimate solution of the fuel question of Ontario. But while the grass grows the steed starves. There are many and great improvements to be made in the generation, transmission and utilization of electric force before these distant sources of power can be utilized for the ordinary purposes of every day life, and some greatly superior means of transmitting electricity through long distances is especially required before that form of force can be expected to supersede for all uses the chemical energy evolved by the oxidation of carbon.

In older countries where wood has become scarce and coal for various reasons unavailable, recourse has long been had to peat as fuel, both in the ordinary air-dried form and in a manufactured condition after treatment by various processes. In Ireland, Scotland, Germany, France, Russia, Norway, Sweden and every other European country where peat is found—and it occurs in almost every country lying within the temperate zone—a large proportion of the peasantry have for centuries depended almost entirely upon peat for heating and culinary purposes. I do not need to give any description of the ordinary method of cutting and saving peat, which is practically the same in all lands. It is cut with spades or tools of special form into brick-like blocks, which after sufficient exposure to sun and air become dry enough to burn. This is the method employed where a peat bog can be entered upon and dug with safety and convenience. Where the peat occurs as it sometimes does in a pasty or mud-like mass of little consistency, it is dragged or scraped out to firm land, and upon evaporation of the contained water it forms an article of fuel considered even superior to that produced from an ordinary bog. Air-dried peat, from a good bog, properly cut and saved, is by no means a despicable article of fuel. There are those, indeed, who have used it in the old land who do not hesitate to claim for it an equality with coal or wood. Doubtless, however, one of its principal advantages to the poorer people of European and other countries is that it can be obtained at an expenditure of little more than their own labor. A family of growing boys with some assistance from the father or even the mother, can easily secure a year's fuel at the cost of a few days' or weeks work. The fact that—as in Scotland—where wages have risen and increased facilities of transport have made coal available, the latter is preferred to peat, shows that on the whole common air-dried peat is not to be compared with coal as a fuel.

By various methods of manufacture, however, the crude article is very greatly improved, and brought more nearly upon an equality with coal. The principal objections to air-dried peat are its bulkiness and the considerable percentage of water which it retains. One ton of coal is said to be equivalent in evaporative effect of eight to eighteen tons of common air-dried peat, and ordinary specimens of the latter, even when considered dry and fit to use, contain not less than 25 or 30 per cent. of water. The object of manufacture is therefore to reduce the peat in point of bulk, and to free it from water. One method adopted to compass these ends has been tried by means of a great variety of mechanical appliances by inventors on the continent of Europe, in Great Britain and even in the United States. It consists essentially in reducing the peat as taken from the bog by grinding, triturating or macerating machinery, to a pasty, pulp-like condition, after which it is spread out upon the surface of the ground, marked off into divisions of suitable size, and allowed to dry. Sometimes the peat is moulded or pressed before being dried, sometimes air-dried before being compressed, and in some methods the drying is done by artificial heat. The result, especially where the drying is hastened by artificial means, is a hard, dense fuel approaching, or equal to, coal in specific gravity and capable of emitting intense heat. The cost, however, is considerable, and though occasionally especially favorable circumstances have conspired to render the experiment feasible and to enable the manufacture to be continued, sooner or later the expense has risen to a point beyond the returns and failure has been inevitable. Peat as it exists in the bog contains 90 per cent. and upwards of water, a large proportion of which it retains with the utmost tenacity, but all, or nearly all, of which must be got rid of in process of manufacture. To evaporate eight or nine tons of water in order to obtain one ton of fuel would on the face of it seem an impracticable undertaking, hence various plans have been attempted to overcome this difficulty. One is, after the living and (for fuel purposes) worthless growth on top of the bog has been removed and the bog drained, to pass a light harrow over the surface, after which the partially dry peat is collected and the process completed. Compression of the crude peat, whether by rollers or powerful presses, has also been attempted, but in connection with the pulping process has not proven very successful, as the pulping is done with much more difficulty and requires much heavier machinery when the material is in a partially dry state. Indeed with some stiff, dense peats from the lower portions of deep bogs water has not unfrequently to be added in order to effect a reduction to the necessary paste-like condition. Another system of manufacture is one in which the peat is passed through compressing machinery at the beginning of the operation, and without being pulped or having its original fibre destroyed, is dried by artificial heat and by strong pressure formed into blocks, cakes or cylinders of the desired size. The employment of artificial heat of course adds to the cost of the process, but it is doubted by some whether the water contained in the peat can be wholly expelled, or even eliminated to the required extent by pressure alone, and experience appears to bear out this view.

Peat is used not only in its ordinary form, but like wood and coal may be carbonized and reduced to coke or charcoal. Containing a percentage of carbon in proportion to its weight intermediate between that of wood and coal it gives on carbonization a corresponding weight of charcoal. Wood yields about 22 to 27 per cent. of charcoal and coal 75 to 90 per cent. while peat gives about 23 to 35 per cent. The condensed peat produced by the pulping process gives a much harder and denser charcoal than the ordinary air-dried article, the charcoal from which is so friable and light that it cannot be used in metallurgical operations. Peat charcoal has this advantage in common with wood charcoal over coke from coal, that it is much freer from impurities such as sulphur and phosphorus which exercise so injurious an effect in the smelting or reduction of iron. These and other impurities however, are not unknown in peat, and their absence or presence is usually dependent upon the constituents of the rocks and soil surrounding the bog from which the peat is taken. The decomposition of gypsiferous or pyritous rocks in the neighborhood of a peat bog would, for example, be sufficient to account for the presence of sulphur in the ashes of peat fuel manufactured from it. A bog in Wales containing copper pyrites was long used for the production of peat which was burned for the sake of the resulting ashes, many thousands of pounds worth of copper having been extracted therefrom. Peat usually yields more ash from a corresponding weight than wood and about the same as coal, but it varies greatly in this respect with the composition of the bog from which it is taken. Sand, lime and other similar substances are generally found in the ashes of peat, either in chemical combination or mechanical mixture, having in most cases been derived from the surrounding soil.

As might have been expected much more effort has been made to produce a good article of peat fuel economically in European countries than in the United States, where there is a comparative abundance of coal. In the latter country about twenty-five or thirty years ago coal was even higher in price than it is at present and much attention was directed to the utilization of peat, without however any lasting result. In Canada on the other hand, the fuel problem has been more pressing and at various periods processes have been in actual operation for the manufacture of peat fuel for a longer or shorter time. Recent events seem to indicate a revival of the interest in this question, for at the present moment there are three or four processes under way by which their inventors hope to solve the perplexing problem. In the neighborhood of Montreal and elsewhere in the Province of Quebec probably more persistent attempts have been made in this direction than anywhere else in Canada. Nearly thirty years ago Hodges placed his pulping machinery on a scow and manufactured peat at Buestrode, at we are informed a cost of 92 cents per ton, and large quantities were consumed as fuel for the locomotive engines of the Grand Trunk Railway. A somewhat similar process invented by N. Aubin and improved by Hally was at work for a time under the management of the Valleyfield Peat Company, while Aikman of Montreal for many years has been experimenting and is still experimenting, with the process of manufacture which bears his name. Mr. Dickson of the same city has invented a process somewhat different in principle from any of these which he believes is now perfected and which the company he has formed intend to have in operation this coming summer in a bog on the Welland Canal where they have purchased a tract 3,000 acres in extent. I have here specimens of Aikman's, Hally's and Dickson's peat fuels, as well a sample taken by myself, from a small bog near Berlin, Ontario. The last named sample is of the ordinary air-dried kind and being taken from the bottom of the bog, shows the deposit of shell marl underlying the bed of peat. Specimens of Aikman's and Dickson's manufacture—corresponding to these have been submitted to Prof. Ellis of the School of Practical Science, Toronto, for examination. He has tested them in a Thompson calorimeter with the following result:—

	Aikman Peat.	Dickson Peat.
Moisture.....	7.4	10.2
Ash.....	19.5	2.9
Heating Power....	5115 units	5280 units