0.35 per cent. of ash. It is probable that it does occur as a seam of altered bituminous coal, like ordinary anthracite, but rather as resulting from hardened pitch, or a mineral like albertite by the loss of its bitumen, and it may not exist in large quantities. I was prevented by circumstances from visiting the locality at which it is found, which is said to be on Long Island, at four or five miles from its south-western extremity."

It appears that a trial opening had been made by some prospectors at the above locality many years ago. Two of my men happened upon the spot when out hunting on the island one day, but they did not tell me of it till we had left the neighborhood, and it was impossible for me to return that year, and I have never been near the place since. The island is upwards of 30 miles in length. If an intelligent search for this valuable mineral were made upon Long Island, and some of the islands to the north westward of it, important results might perhaps follow. It will be observed that the anthracite is of extra good quality. In order that expectations based upon my discovery might not be disappointed, I thought it as well in mentioning it in my report, not to allow it to be inferred that the mineral existed in large quantities until we knew more about it. Still I know of no reason why it may not occur there in some cases in deposits large enough to be valuable. If it exists in workable quantity, it will no doubt be found in the form of vein or veins, analogous to those of albertite in New Brunswick and not in beds like ordinary anthracite. In my first announcement of anthracite, above quoted, I mentioned that the late Mr. Cotter had informed me that a similar mineral was reported by the Indians as occurring inland or eastward from Little Whale River. In confirmation of this report, Mr. A. P. Low of the Geological Survey on his late traverse of the Labrador Peninsula found a vein of this mineral about seven inches in thickness. It would be a rare chance if this were identical with the occurrence mentioned by these Indians, and we may presume that these rocks hold many such veins; and this leads us to hope that sooner or later, one or more of a workable thickness may be discovered.

LIGNITE.

Indications of a variety of lignite, closely allied to *bituminous coal*, were observed by me in 1871, when surveying the Albany River, the most southern of the large streams, which flow into the west side of James Bay. In reporting its occurrance, I said (page 112, Geological Survey Report for 1871):

"In one place just below the mouth of the Goose River, or three miles below the point where the river turns southeast, bright red marl occurs on the north bank, and on a small island a mile further down some loose fragments of a bright bituminous coal were found. The Hudson Bay Company's officers informed me that coal had never been brought into the country; and considering that the conveyance of even light and valuable goods is so expensive in this region, this is only what might have been expected, so that I cannot suppose this coal to have been brought here by human agency.

The occurrence of lignite on the Kenogami, the great southern branch of the Albany, is mentioned in the same report. On this river, which discharges Long Lake into the Albany, there is an interesting deposit of lignite in the drift filling a preglacial channel of a stream which probably corresponded in its general course with the existing river. It occurs at six miles, by the stream, above the mouth of the large southern branch called the Baguichewan (or Pa-wetch-a-wan). Here the river makes a sudden bend to the north and about a mile further up another similar bend. "These unusually sharp curves, which are unlike any others in the course of the stream, appear to be caused by the river traversing preglacial excavations, in the Silurian strata, which here consist of dull red, coarse, somewhat indurated arenaceous marl with green blotches and layers. These excavations have become filled up with loose material before the formation of the present river channel. At the lower bend gravel fifty feet deep is exposed in the south bank. At the upper bend the excavation of the Silurian marls is plainly seen. Starting from the level of the river, the lower ten feet of the filling of this hollow consists of boulder-clay. Upon this rests a bed, six to eight feet thick, of soft lignite, containing many flattened stems of small trees which are partially carbonized, but are somewhat elastic when newly excavated and still wet. The lignite bed is overlain by thirty or forty feet of rudely stratified red and grey drift *holding rounded boulders and many pebbles. Marine shells were observed in the* drift along the Kenogami, almost up to this point, which, according to my barometic readings would have an elevation of about 500 feet above the sea" (See Annual Report of the Geological Survey for 1886, p. 37-38 C.)

With reference to lignite in the basin of Moose River, I will quote the following from my report for 1877, page 4 C.:

"The existence of lignite on the Missinaibi River was referred to in my report in 1875. During the past season I have found it *in situ* in several places on this river between the Long Portage and its junction with the Matagami. The first or highest of these was in the west bank of Coal Brook, three quarters of a mile from its mouth. Coal Brook is a small discharge or channel which leaves the main river opposite the head of the fourth or Riverside Portage, and rejoins it at five and a half miles below Round Bay, at the foot of Hell's Gate. This bed of lignite is about three feet thick and is underlaid by soft sticky blue clay, and overlaid by about 70 feet of drift clay or till, full of small pebbles and passing into gravel towards the top. Much of the lignite retains a distinct woody nature. Some of the embedded trunks are two feet in diameter. When dry it makes a good fuel, but contains a little iron pyrites.

"On the south-east side of the river, at nineteen miles below Coal Brook, or two miles above Woodpecker Island, a horizontal seam of lignite was found in the midst of a bank of till 125 feet high. It is from one and a half to two and a half feet thick and is made up principally of sticks and rushes. Below the lignite are 80 feet of yellow-weathering grey clay and about 45 feet of blue clay. Both varieties of clay are full of pebbles, and they also hold some striated boulders of Laurentian gneiss, Huronian schists and unaltered Devonian limestone.

"At three miles below Woodpecker Island, or nine miles above the mouth of the Opazatika (Poplar) River, another bed of lignite occurs in the bank on the same side. It is six feet thick, but diminishes to the eastward and is of a shaly character, being made up of laminæ of moss and sticks. Immediately beneath the lignite is a layer, one foot thick, of irregularly mingled clay and spots of impure lignite. Next below this are 40 feet of unstratified drift, full of small pebbles, under which are a few feet of stratified yellowish sand and gravel. Resting upon the lignite are five feet of hard lead-colored clay with seams and spots of a yellow color and layers of red, grey, drab and buff. Above all and forming the top of the bank, 65 feet high, are 10 feet of hard drab clay with striated pebbles and small boulders and holding rather large valves of *Saxicava rugosa*, *Macoma calcarea* (*Tellina proxima*) and *Mya truncata*.

Small seams of lignite were seen in two places in the bank on the same side at, and again half a mile below, the foot of a rapid which occurs about six miles above the Opazatika. In the interval between one and two miles above this stream the whole bed of the river appeared to be underlaid by lignite. When sounded with a heavy pole it has an elastic feel and gives off large volumes of gas which may also be seen at any time bubbling up spontaneously here and there all along this part of the river. This phenomena has been observed by the Indians from time immemorial, and the locality has received the name of the 'Bubbling Water.'"

Since the above was written Mr. E. B. Borron, J. P., Stipendiary Magistrate for Northern Ontario, was sent by the Provincial Government to test the lignite beds of Coal Brook by boring. I have not seen his report, but I have been told that he found the mineral to be of fairly good quality, I have also been informed on good authority that beds of lignite have been found within the last few years on the lower part of the Abittibi River, where we noticed loose pieces of it in 1877.

Considering the very small amount of exploration which has yet been done in the regions referred to in the above extracts and notes, the discoveries which have been mentioned appear to indicate the existence of a good supply of lignite scattered over a vast area in the level country around the southern and western side of James Bay, where valuable deposits of iron ore are also known to occur.

"Charcoal; its Bearing on the Utilization of our Forests."

By Mr. T. J. Drummond, Montreal.

In asking the attention of a Mining Association to a paper on a forest product, I think perhaps it is best at the outset to remind you that, as so far, charcoal is the only known fuel natural to this province for the smelting of iron ore, this important product of the mine must be governed by the product of the forest. If we cannot produce cheap charcoal, and if we cannot see a supply ahead, then any attempt to establish an iron industry in this province, on anything like an extensive scale, would mean failure. The importance of this question of the production of charcoal and its encouragement, and the conservation of woods for its manufacture, therefore, cannot well be over-estimated. Canadian have truly a magnificent national asset in their forests, and every care and thought should be given to the question of how it may be utilized.

It will be unnecessary for me to dilate on the forests of the Dominion. While the variety of trees is not as great, still the area under timber in Canada is certainly equal to that of the United States, and the woods are useful and valuable. In our own province there are probably not more than fifty or sixty species, but they have already yielded a large revenue to the country, and with proper care they will continue to do so for generations to come. In fact, with a climate like ours, our supply should be unending, as it is in every way favorable to the growth of forests, and if a proper system of cutting is followed and due care given by the government through a system of inspection, new forests will spring up to replace the timber removed, where the land is not put to agricultural or other purposes. To preserve these forests, and to utilize them to the best advantage to the country, should be both a national and provincial care and if necessary, vast districts should be set aside and reserved for this purpose, over which the government should exercise full control.

We have forest wealth now, and so, as I have said, what we must consider is how we can utilize this to the best advantage to the nation. In considering this, it seems to me that as in the case of private assets, we must consider each class of wood separately, and try and find out in what way these woods can be utilized so as to return the greatest benefit in cash and labor, and in my opinion, we should not be content to be simply "hewers of wood" and allow others to reap the benefits derivable from the labor that may be employed in bringing any of our woods to a higher state of finish and value, but should encourage by legislation and otherwise, the manufacture within our own boundaries of whatever articles the variety of our woods may be suitable for.

If we are to advance in wealth and population, if we are to build a nation, we must be able to offer fair work and fair wages, and to do this, we must develop our natural resources, more especially in those directions that require the greatest amount of labor. When we have labor and the producing power of the earth working together, whether in agriculture, mining, or the utilizing of our forests, we are doing this, and the higher the point to which we can bring the earth's product, with the consequent increase of value through extra labor expended within our own boundaries, the better for our country. So, I reason, that if instead of shipping our forest products in practically a raw state, we can carry the process of finishing to a higher stage, then our forests will of a necessity yield us so much greater benefit. To a very large extent, the value of a forest tree is the value received for the labor expended in hewing it into square timber, sawing it into boards, or turning it into an article of furniture, and it stands to reason that the tree that was by Canadian labor transformed into furniture, has yielded more than its fellow that was exported in the form of square timber, or that a spruce tree shipped in the form of paper yields more than if it had left Canada in the form of sawn logs or even pulp. As with our soft or merchantable woods, so with the unmerchantable or hard woods. If we burn these woods to clear the land, it means dead loss, or if we use them for domestic fuel, the return is small, and if we turn them into charcoal and export the charcoal in that shape, the value to the country will not be very great, but if we use those woods in such a manner as to develope an industry that must otherwise be non-existent, then we have obtained something worth while, and so I hold that by burning into charcoal and using that coal for the smelting of iron, the value of the cord of wood to the country becomes the value of the labor expended in producing the amount of pig iron that quantity of wood will smelt, in other words, the value of a cord of wood for domestic purposes to the farmer would be say $1 50 to $2.00, and would yield nothing beyond that to the country. But if that cord of wood was burnt into charcoal, and by that fact an iron industry becomes possible, then as it takes from two to two and one-half cords of wood to obtain sufficient charcoal to produce a ton of iron, so it must be plain that a cord of wood utilized in this way brings through the labor consequent on raising the ore, flux, etc., and smelting, say from $6 to $9 per cord, according to the class of ore smelted and wood used. In making this statement, I am, of course, dealing principally with our Province of Quebec, where the conditions are such that without charcoal an iron industry cannot be commercially established, and where, with proper attention, consideration, protection and encouragement towards the utilization of what are known as unmerchantable and waste woods, insuring a long and regular supply of charcoal, a charcoal iron industry can be developed as great and as important to the province and the Dominion as that industry has been, and is to Sweden and the United States.

Now that I have given in a general way my ideas as to the utilization of our forests, and the bearing those forests have on the iron industry in this province, I will, in as few words as possible, explain the different systems of manufacture of charcoal generally followed, giving particularly the practice adopted at the works with which I am identified.

In cutting wood for pit burning, the custom in Sweden is to cut the logs in about 9 foot lengths, but in our own experience we have found it better to cut to shorter lengths for reasons hereafter given.