

except of tracts promising profitable veins of lead, of copper, or one of the precious metals.*

The coal-measures of Iowa are shallow, much more so than those of the Illinois coal-field. They seem attenuated, as towards the margin of an ancient carboniferous sea, not averaging more than fifty fathoms in thickness. Of these the productive coal-measures are less than a hundred feet thick. The thickest vein of coal detected in Iowa does not exceed from four to five feet; while, in Missouri, some reach the thickness of twenty-five feet and upwards.

In quality, the coal is on the whole inferior to the seams of the Ohio Valley. To this, however, some very fair beds form exceptions.

On the Mankato and its branches, several pieces of lignite were picked up from the beds and banks of the streams. Some of this lignite approaches in character to cannel coal; but most of it has a brown colour, and exhibits distinctly the ligneous fibre, and other structure of the wood from which it has been derived. Diligent search was made to endeavour to trace this mineralized wood to its source, and discover the valuable coal-field. At one point a fragment was found seventy feet above the level of the river, projecting from the drift, but no regular bed could be detected anywhere, even in places where sections of the drift were exposed down to the magnesian limestone.—The conclusion at which those gentlemen who were appointed to investigate this matter arrived was, that the pieces occasionally found throughout the Minnesota country are only isolated fragments disseminated in the drift, but that no regular bed exists within the limits of the district.

The occurrence of strata of brown coal, earthy coal, and bituminous coal and slate, on the west side of Great Bear Lake, as reported by Dr. Richardson, overlying a vast region of magnesian limestone, like those of Iowa and Wisconsin, rendered it possible that this lignite might be found in partial beds also on the Mankato; nevertheless, the observations of the subcorps on that stream do not leave any hope of the existence of even such local carbonaceous deposits. On the contrary, it appears most probable that the pieces found have been transported from the north along with the drift, perhaps from their very beds on the Great Bear Lake; or from the cretaceous or supercretaceous lignite formations which were observed by Nicolet, and others, off towards the Missouri and Rocky Mountains.

In further support of this view of the origin of the lignite of the Minnesota country, I may add that, every piece and fragment which the members of the sub-corps could find was collected and brought away, all of which when put together and weighed, did not exceed ten pounds.

From the confluence of the Waroju, to the mouth of the Red Wood River, which is as far up as the country was explored, different varieties of crystalline rocks, alone, make their appearance, varying in height from a few feet to a hundred and twenty-five feet. After passing Little Rock, twelve principal exposures are seen immediately on the bank of the river, in the distance of eighty miles, the intervals being covered by alluvium and drift, which hides them from view.—The principal varieties are granites and hornblende rocks, with occasional syenite. No traces of metallic veins worthy of note were observed traversing these formations. In the granite, eight miles below the Red Wood River, some specular iron was found, but only in thin crusts in the joints of the rocks.

The only mineral that promises to be of much value in this region of country is a bed of nodular iron stone, found at a number of localities both on the Mankato and Lesueur Rivers, at the base of the drift, resting either on the magnesian limestone or sandstone. This argillaceous bed of carbonate and hydrated brown oxide of iron, varies from one to three feet in thickness.

The middle division of the Iowa coal field affords, at many localities, iron stone of various qualities, associated frequently with hydraulic calcareous cement, and which occurs, either in the form of disconnected *separia*, or regular beds. In the same geological position, at many localities, crystallized selenite has been observed, which accumulates in quantity high up on the Des Moines; and finally, a few miles below its Lizard Fork, that mineral expands itself into heavy beds of gypsum, or plaster of Paris, which show themselves on both sides of the river, for the distance of about three miles, exposed in horizontal beds with a thickness of from twenty to thirty feet.

The iron stone occurs sometimes in the form concretionary nodules, sometimes in continuous bands of several inches in thickness, interstratified in the shales. In the chapter embracing the detailed description of the carboniferous rocks of Iowa, will be found the analysis of some of this iron ore, together with other more precise information regarding it.

On Soapcreek and its branches, in Davis county, where the middle

* A rich vein of lead ore, traversing the Lower Magnesian Limestone, was discovered on the "Half-breed Tract," south of Lake Pepin; but this being an Indian cession, it was not reported to the Department for reservation.

division of the coal series prevails, there are several salt springs which were tested qualitatively on the spot, and found to contain a portion of common salt (chloride of sodium). The amount of the precipitated chloride of silver, as well as the taste of the water, indicated, however, only a weak brine. By boring, a stronger water might possibly be obtained; nevertheless, the shallowness of these coal measures, the frequent rupture of the strata and consequent local reversion of the dip, together with the fact of the lowest division being composed chiefly of limestone instead of sandstone, are unfavourable indications of the existence of deep-seated brine, or of nests of salt, whence the percolating waters might become saturated and carry the saline matter to the surface.

Though deficient in productive minerals, such as are reserved by the Land Office, a large proportion of this district consists of rich fertile soil, well adapted to all agricultural purposes. Of such is a large portion of the Iowa coal field; and the region lying north both of that and the Illinois coal field, as far as the falls of the eastern tributary of the Mississippi. Some of the lands of the Des Moines and Cedar Rivers can be scarcely excelled for fertility, perhaps, in the world.

On the other hand there are portions of the district, chiefly in the vicinity of the sources of the Black and Chippewa Rivers, and of the streams flowing north into Lake Superior, which are, in part, so hopelessly arid that, in our generation, they will assuredly never be purchased or occupied; in part so covered with erratic boulders that the traveller can step from one to the other for miles, without setting foot on the drift soil on which they lodge, and that a bridle path for a pack horse cannot be picked out over the country they cover; in part, again so intersected by ponds and swamps, that fish, frogs and water-fowl must, in our day at least, be their only inhabitants.

In conformity with my instructions, I have heretofore, from time to time, reported to the Department what portion of these lands are so wholly worthless as not to justify, in my judgment, the expense of sectionizing or surveying at all, except so far as may be necessary to connect the surrounding surveys. These refuse lands amount to fifteen thousand miles. If, in consequence of the recommendation thus made they are excepted from the linear surveys which are usually extended by the Government over all its Indian purchases, without examination or inquiry, the saving to the Land Office will much over-pay the entire cost of the survey, the results of which I am now reporting.

A circumstance which to some may seem trivial, will delay, to a considerable extent, the settlement of a portion of the District. It is the prevalence, especially on the Upper Wisconsin, Chippewa, St. Croix and Black River countries, and thence north to Lake Superior and to the British line, of venomous insects, in such insufferable quantities, that, at certain seasons, they destroy all comfort or quiet by day or by night. Among the pineries of Northern Wisconsin, and more or less throughout the whole of the above designated region, the buffalo gnat, the *brulot** and the sandfly, to say nothing of myriads of gigantic mosquitoes, carry on incessant war against the equanimity of the unfortunate traveller. I and other members of the corps, when unprovided with the necessary defence, have had our ears swelled to two or three times their natural size, and the line of our hats marked all round by the trickling blood. It was often necessary to rise many times, in the course of the night, to allay the fever of the head, by repeated cold bathings; and, at some of the worst spots, we could scarcely have discharged our ordinary professional duties at all without the constant protection of mosquito-netting worn over our head and face.

The health, even of the more marshy portions of the District, seems better than, from its appearance, one might expect. The long, bracing winters of these northern latitudes exclude many of the diseases which, under the prolonged heat of a more southern climate, the miasm of the swamp engenders. Perhaps the healthiest portion of the whole District is along its northern limit, where it is continuous to the British dominions. At the Pembina settlement, owned by the Hudson's Bay Company, to a population of five thousand there was but a single physician; and he told me that, without an additional salary allowed him by the Company, the diseases of the settlement would not afford him a living.

Before starting on the expedition, I had obtained from Mr. John F. Crampton, of the British Legation at Washington, a letter commending me to the good offices of the officers of the Hudson's Bay Company, and which procured for us a most hospitable reception at the settlement.

On our arrival at the mouth of the Assiniboiu, Governor Christie, then acting as Superintendent of affairs of the Hudson's Bay Company, and Governor of the Colony, invited us to make his house our home during our stay on Red River, and entertained us in the kindest manner. I have to acknowledge the attentions paid to our party by the officers stationed both at the Upper and Lower Forts.

(To be Continued.)

* So called by the voyageurs *bruler*, to burn; the sting producing a burning sensation.