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TASMANIA

GEOLOGICAL SURVEYOR'S REPORT

Of the country near Ilfracombe, in the West Tamar District

GOVERNMENT GEOLOGIST

Laid upon the Table by the Colonial Treasurer, and ordered by by the House to be printed, 31st August, 1866

Sir,

I have the honor to forward a Map illustrating the geological structure of the country in the neighbourhood of Ilfracombe, in the West Tamar, DISTRICT including those localities in which iron ore is abundant.

The presence of iron ore has been long known, but no authentic statement of its quality or amount has yet been furnished; and I therefore trust that the information on these points contained in the present Report will be sufficient warrent for the rather detailed examination I have made of the District.

The leading characters of the formations met with are as follows:—

1. The water-shed between the Tamar and Port Sorell Rivers consis-ts of a series of ridges, nearly parallel to each other and to the Tamar, connected by spurs, and forming together what appears from the distance one lofty range, the so called Asbestus Range, which terminates northwards in the prominent headlands of Great Badger Head and Little Badger Head, and merges on the south in the high lands about Dry's New Country, and the sources of the Franklin and Supply Rivers. This is the master range of the District; and the set or strike of all the formations appears to be generally parallel to it, and determined by its direction. The interval between it and the river varies from four to seven miles in breath. It is either plain, as on the north of West Arm (with the exception of a few isolated hills), or undulating and raises in ridges parallel to the Asbestus Range.

Within the limits treated of in this Report the Asbestus Range appears to be composed of rocks occupying a very low position in the sedimentary series, which, though not exhibiting the perfect metamorphism largely obtaining in Western Tasmania, closly approach it. Their structure is most easily examined in the cliff sections at Badger Head, where dark micaceous schists, occasionally contain-ing quartz in thin strings or interlaminations, alternate with thinly bedded grits and dark clay-slates. They are foliated, and strongly contorted. The average direction of the strike is from N.20°W. to N.30°W.; but this is much obscured by foliation, which produces a pseudo appearance of stratification in a direction sometimes inclined to that of the real strike, at others coincident with it. The beds are faulted; they generally lie at high angles, are occasionally perpendicular, and are repeated by several anticlin-als.

The intricacies of this range render its detailed examination inland difficult, but its structure appears to be generally similar to that described above, with perhaps a rather larger proportion of micaceous schists. There also appears some difficulty in drawing any trenchant line between the upper beds lying on the eastern flanks of the range and the lower ones of the formation next to be described.

2. Lower Silurian.- This formation constitutes a series of ridges parallel to the main ranges and forming a subordinate feature in the District, and consists essentially of clay-slates, limestone, and quartzose sandstones. These have been destroyed to a large extent in the general erosion of the Tamar Valley, but are still prominent in the Cabbage Tree and Blue Hill Tiers. The formation has been explored at various points with a view to obtaining roofing slates, as yet unsuccessfully, and is the source of the lime

Which has for many years past been an article of export from the District.

There are two important beds of limestone in the neighbourhood of Middle Arm Creek which are separated by a thickness of about 350 yards, and locally distinguished as the blue and the white limestone. The latter has only been quarried in one spot, where by measurements and calculation I have estimated the thickness to be about 140 feet. This is upon one of the tributaries of Middle Arm Creek, where the Messrs Dally have been working it for some years past. This limestone has a light colour, and crystalline structure. It takes a good polish, and would contrast favourably with many imported marbles. The blue limestone has been worked for many years past, and in several localities. For a long period it was chiefly obtained from quarries on the west side of Middle Arm Creek, where the stone was only met with below the level of the creek, and costly appliances for unwatering the quarry were necessiated. The Messrs Dally have subsequently discovered it in a more fovourable position on the east side of the creek, where the quarry is now open. The thickness of this limestone is probably in excess of that of the one described above. I believe that the limestone worked on Messrs Evans & Hudson's ground, south of the Ilfra-combe Tramway, will prove to be the same bed. In the latter localities the limestone forms an important feature in the District, rising into hills and projecting in large rocks from the surface of the ground; in the former instance it lies low and is concealed by drift, so that its probable position can only be determined by a careful study of the outbreaking of springs, peculiarities of vegetation, and other local physical characters which are consulted by those in search of it. The Messrs Dally have made numerous borings in search of it; and from the information afforded by them, and my own observations, I have indicated on the Chart by a broken line the probable continuation of the limestone beneath the surface from those points where it is ascertained to exist. It must, however, be in many instances covered by a great thickness of marine drift; for, on attempting to sink on the line of the limestone north west of Mr Blythe's old quarries, and near the side line of the property on rising ground forming the head of the small valley in which the quarries are situated, the Messrs Dally passed through a thickness of 40 feet of drift, leaving off in boulders exceeding a foot in diameter.

There is an oval Tufaceous deposit of lime about thirty yards in diameter which accompanies a slight rise in the middle of the Blue Hill flats, and from which breaks forth a strong spring of calciferous water, forming one of the most important sources of Middle Arm Creek. The disadvantage of position have prevented the search for the main body of the limestone being conducted here, but I have little doubt that it underlies the flat, and is the cause of the travertine deposit above.

The beds intervening between the blue and the white limestone contain several unimportant bands of limestone or beds with lime in admixture. Thus, the section at the quarry on Sassfras Creek was as follows:-

Limestone,
Hard siliceous rock, 15 feet,
Clay-slates with a granular intermixture of carbonate of lime,
Clay-slates,

while on Middle Arm Creek, at a little below the ford on the town track, a band of limestone was opened with the prospect of working it. From the description given of this it appears to have been an interlamination with the clay-slates, and it was soon abandoned. At the same point foliated clay-slates, much contorted, contain thin nodular layers of carbonate of lime.

The beds which succeed the lower or blue limestone are mostly of a hard quartzose character, and they consequently rise up into long ridges of considerable height, and running in the direction of the strike, the whole of this portion of the formation may be advantageously studied in that portion of the Middle Arm Creek where it cuts through the range of the Blue Hill. The beds are mostly tilted at an angle of from sixty to seventy degrees; and an entire thickness of about 2000 feet is contained in the interval between the ingress and egress of the creek from the gap.

The sandstones mostly weather externally to a white colour, but present a darker appearance on fracture: they lie in large and slab-like masses on the flanks of the hills, and by their partial disintegration produce a barren covering of fine white quartzose sand. Quartz here and there occurs in thin strings, but never in veins of any extent. The beds of conglomerate are not very important here, the size of the beds being small, and their thickness inconsiderable.

The sequence observed in ascending the Middle Arm Creek from Mr Dally's quarry was as follows:-

Clay-slates with quartz.
Clay-slates and grits with thin strings of quartz.
Fissile clay-slates, alternating with thin beds of sandy schists with very little quartz.
Dark sandstones.
Grits.
Conglomerates of small quartz pebbles in beds 1 foot thick, alternating with sandstones.
Conglomerate with quartz strings.
Coarse grits weathering whitish.
Grits, &c.

On the west of the Cabbage Tree Hill clay-slates are again met with, apparently succeeding the series given above; but, in the absence of information with regard to their dip, I should be inclined to doubt this, and to rather regard them from their general appearance as idential with those on the eastern side, their present position being induced by a fault or by an anticlinal axis. I regard the grey or whitish sandstone mainly forming the Blue Peaked Hill as identical with those in the Blue Tier which succeed the limestone.

The portion of the Lower Silurian system in this district appears, then, to consist essentially of the following series taken in decending order:-

Clay-slates, and reddish sandstones.
Limestone.
Clay-slate.
Foliated clay-slates.
Clay-slates much contorted, with calcareous admixture.
Grits in thin beds.
Clay-slates.
Limestone.
Clay-slates, and sandstones.
Grits.
Very quartzose sandstones.
Conglomerates.
Clay-slates?

Traces of fossils, apparently coral, occur in the blue limestone and the white quartzose grits. The Upper Palaeozoic formation consists essentially of sandstones, clays and shales, and conglomerates,--the latter being the lowest, and the former for the most part confined, from the dip of the formation, to the neighbourhood of the river.

The conglomerates of this formation are readily distinguished from those in the Lower Silurian, in which the uniformly conspicuous white quartz contracts strongly with the varied and always more or less tinted colour of the jasperiod constituents of the former.

The clays and shales are highly fossiliferous, containing in great abundance species of Fenestellae, &c., identical with those ordinarily met with in the formation. The calcareous bands found by the existence of these fossils are in places sufficiently important to be worth working as sources of lime; and at various periods kilns have been in operation in the district for that purpose.

The sandstones contain marine fossils, and also vegetable impressions. Great search has been made in them for the continuation of the Mersey seam, but without success. I shall append to this Report a record of several borings conducted by Messrs Dally and others, To determine the existence of this seam would require an independent and very careful survey, supported by a system of borings.

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3. Tertiary Deposits— Between the Asbestus Range and the Tamar the low lands are principally occupied by a tertiary drift of sand and pebbles. On the north of West Arm the underlying Upper Palaeozoic formations rarely protrude, their presence only being determined by shore sections and one or two quarries. The greenstone in like manner is much obscured, but may be traced along the coast, and rises into prominence at West Head and the Stock-yard Hills: it also occupies low rises west of Kelso.

South of West Arm the deposit of drift sand is much thinner, and the sandstones and shales of the older formations can be traced over a large extent of country beneath this drift,— and I have therefore not extended the colouring of the tertiary drift beyond that line. It is noticeable however, for some distance up the flanks of the Cabbage Tree and Blue Tier, and extends along the hills fronting on the east side of Anderson's Rivulet as far as the Ilfracombe Saw Mill, terminating southward in a small outlying mass on the summit of a hill on Mr Barne's property. These points of occurrence are respectively indicated on the general Map by lettering and colour.

4. Alluvial, &c.—The extensive flats known as the Blue Hill Flats north of the Blue Peaked Hill, appearing to be due to the redistribution of sandy material by aqueous action are sufficiently, accounted for by the existing creeks. It appears more than probable that the Cabbage Tree and Blue Hill Tier were originally continuous, and that their gradual erosion, with the formation of an outlet for the waters of Middle Arm Creek, served to drain a lake occupying the area of the existing flats.

5. Traps.— Basalts occupy little prominence in this district; but one of the most interesting rocks is the Serpentine, which occupies the basin of Anderson's Rivulet for a distance of 4 miles with average breadth of one. This presents all the ordinary features of a Trap Rock: it varies greatly in structure; at one point it projects from the surface in hard compact masses with a pseudo stratified structure a brown weathered surface, at others it is soft and sectile; on fracture it varies from every shade of green up to the brightest. On the edge of the mass some very interesting varieties occur; and I propose entering into the detail of these after the examination of other exposures of this rock stated to occur further south. It is this that the asbestus occur from which the term Asbestus Range has be n derived; although, as far as I have yet seen, this title has been given on the "lucas a non lucendo" principle, no asbestus or serpentine existing in the ranges themselves in this locality. Thin strings of magnetic oxide of iron are not unfrequent, and will be referred to more especially in another portion of this Report. The soil produced is generally a very stiff, black unctuous clay, said to be unproductive: this is probably due to an excess of iron in its composition, or possibly to a want of draining as under efficient draining the same formation is found to be moderately productive in Cornwall, where it occurs to some extent. This rock is susceptible of a good polish, and specimens will be forwarded to the Intercolonial Exhibition. There are many interesting points regarding the varieties of this rock, their mineral composition, and the associated vegetation, which I shall return to at another time.

Having thus sketched the leading characters and distribution of the several formations, I shall proceed in some detail to describe the points of occurrence of the iron ores of the District, their characters and respective amounts.

There are four varieties: the principal are earthen brown, crystallised brown hematite, and magnetic oxide; the other, which is earthy red hematite, is of more sparing occurrence, and is evidently a mere derivative from the previous ores.

Unlike other iron ores which I have observed in many parts of the Colony, and which consist merely of Hematites formed by the deposition of ferruginous matter from rocks containing a small per centage of iron as an element of composition, these appear to be contained in real mineral lodes, or to be derived from the contents of such, and their formations appears to have been determined by a mineral force acting in defined directions.

The points of outcrop of iron ores are indicated on the Map by a red colouring; and it will be at once observed that they are contained in the course of two lines parallel with one another, and with the general strike of the formations, and that they occur at various points, extending over a distance of nearly seven miles in the one instance, and three miles in the other. The direction of the various out-bursts will be found more or less oblique to that of the general direction of the ores, and in some instances transverse to it. It would thus appear as though some rending force, traversing the district from south east to north west, had fractured it in the direction of its course, and determined the formation of oblique and transverse lateral fissures, and that in these last more especially deposition of iron had taken place varying in character with the formation traversed.

In selecting for my first description the development of hematite which is specially illustrated in the chart No 3, I am influenced by the greater facility which the nature of its occurrence affords to my examination, and the more accurate estimate of its value which is so permitted.

The point illustrated is about seven miles from the beach, along the now disused tramway formerly belonging to the Ilfracombe Saw Mill Company.

To the west of the small creek indicated on the chart the ground is level, and therefore exhibiting no traces of the probably underlying lode.

To the east the ground rises gradually, and afterwards more steeply, until a maximum angle of elevation of about 20° is reached near the summit of the ridge, which is itself merely an offset spur from the conspicuous and elevated mountain known as the Sugar Loaf.

The ore is exhibited in boulder-like masses strewing the surface or imbedded in the ground, and may be traced along the surface for a distance of nearly 300 yards, corresponding to 286 in plan. The width of the deposit has been laid down upon the chart as accurately as it was possible without undertaking mining operations. At various points there are apparently offsetting veins, and towards the upper end appearances favour the conclusion that the vein is difurcating, and splitting into strings.

The ore is of greatest excellence in the lower ground, that at the extreme upper end being inferior in richness and not quite so abundant in quantity. The ore shows itself to be of good quality, however, for more than one-half of the length of the reef, and even the remainder is at least equal to much of the iron ores smelted in other countries. The general direction is about 30° W. of S. of W.; the average width about 66 feet, the lrngth outcropping 300 yards, and the average slope about 14°.

Taking a rough estimate this gives the cubic contents of the portion of the vein above the water level at about 705800 tons. Assuming that only one-half of this is rich ore,—and I consider this to be an estimate below rather than over the mark,—we have an amount of 350000 tons of rich ore lying above the water level, and presenting every facility for being quarried in stops at an exceedingly low rate per ton, the other moiety presenting equal facilities of working; while every yard in depth below the water level would yield, on the same calculation, 20458 tons, without taking into consideration the extension of the lode westward, which would largely augment it. The ore contained in this lode is brown hematite: it presents all the usual variations of the ore in different parts of it; at one place it is compact and massive, at another crystalline, in reniform and botryoidal masses, with a fibrous and radiated structure. It will probably average from 55 to 60 per cent, over a large portion of the lode. It stands out from the surface in weathered blocks, and towards the upper end detached masses of immense size occur. The largest of these blocks has the following dimensions:- 12 feet in height, 22 feet in length, and 15 feet broad. In this the orealternates in thin layers of from $\frac{1}{8}$ to $\frac{1}{2}$ inch in thickness, with ferruginous sand, and the layers have a somewhat waxy structure, so that the whole has a distant resemblance to one of the foliated rocks: even here, however, there is perfect crystallisation at intervals.

The next deposit of ore of a sililar character to the above, although much less extensive in amount, is at the end of the Tramways on which the first is situated, and at a distance of about ten miles from the shipping place. Hereagain appears to be a defined reef or lode containing brown hematite, and taking a general direction of east and west. This necessarily carries it across the strike of the formations, and we are enabled to trace it from the sandstone rocks into the limestone adjoining. It is however, much less exposed than the first one, and it is therefore difficult to estimate its thickness- an average of five or six feet would probably be near the mark- but to determine this point a rather considerable outlay for mining operations would be necessary; and, as its distance from the water is so considerable, it is probable that this would be one of the last to be investigated for practical purposes. Should, however, at any future period mining explorations for iron smelting purposes be conduct--ed in this District, it would be interesting to make a slight examinat--ion of this lode where it traverses the limestone country, for the purpose of ascertaining, what is not unlikely to be the case, that some important modification of its mineral contents had been determined by the change of gangue. This ore is a brown hematite, less pure than that last recorded.

I have taken these two cases first because in them the character of the deposits as a lode or mineral vein is more apparent, while in those which I shall now describe it is less so.

Still belonging to the same group, and dispersed along a N.W.line at short intervals apart, and more or less connected by slight indicat--ions of ore, there are three principal deposits, which from their magnitude and importance merit especial attention. Two of these are on the west side of Anderson's Creek, the other on the east; the first are on Crown Land, the last is on private property. They are all within the area of the serpentine rock, and I shall presently point out, have much affected by this circumstance.
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The chart of the Ironstone Hills appended to this Report illustrat--es the crown land deposits, the two several outcrops being distinguish--ed by the orange colouring and the letters No 1 and No 2.

These Ironstone Hills, as they may appropiately be called, lie about two miles from the water's edge, with a nearly level road to it through gently underlating country; and the hills themselves rise to about 100 or 150 feet above the level of the adjoining creek. The flat country between the two hills, and more or less surrounding their bases, is strewed with a superficial drift of magnetic oxide of iron, which is so abundant that in many places a cart could be quickly loaded by specimens picked up by hand. The largest fragments that I have met with on the surface in this manner have weighed from 20 to 30 pounds, and from this size downwards they are met with of all dimensions. In the early days of this Colony, a cargo of this was gathered in this manner and conveyed to England; and I have been favoured by J.E.Calder Esq., the Surveyor-General, with the following informations regarding its reception there:-

"No attempt has been made to convert into metal the iron ore that has been found in New South Wales and Van Dieman's Land. At the distan--ce of eight miles from Port Dalrymple, in Van Dieman's Land, consider--able quantities of iron ore have been discovered upon the surface, which, upon analysis in this country," (England of course)," have been found to consist of pure protoxide of iron, similar to the black iron ore of Sweden, and furnishing a very pure and malleable metal." Report of Commissioner of Enquiry(Bigge) on the state Agriculture and Trade in New South Wales, page 93.

Dr. Butler has also promised a report on the value of this ore, received from the eminent chemist Dr. Price, of London, which will be attached to this Report in an Appendix, together with a report furnished to me upon specimens forwarded to Messrs. Clark & Ford, Assayers in Melbourne, who state that it contains 72 per cent. of iron, and speak in the highest terms of its quality as an ore.

The area occupied by the drift of magnetic oxide surrounding the hematite deposits is very extensive; in fact, to be measured by acres; and on sinking through the drift, which is seldom more than a few inches in thickness, there occur at intervals in regular masses, seldom exceeding a few inches in thickness, a combination of magnetic oxide of iron and an asbestiform mineral, which is found traversing the Serpentine in short stringe. I commenced a series of open trenches, starting from the point on the flat where the drift was most abundant, and leading in an angular direction towards the summit of the hill. I did this with the object of satisfying myself as to the thickness of the magnetic oxide drift, and also for the purpose of partially exploring the surface of the bed rock, and ascertaining whether the ore had been liberated from it in immediate proximity to its present position, or had been slightly removed. The bed rock in all cases appeared to be serpentine. Some thin strings of magnetic oxide of iron were met with. I therefore am inclined to think that the origin of the drift may be twofold; viz.- from the strings immediately beneath the surface; and secondly, possibly from more important ones in the adjoining hill. With regard to the deposits No 1 and No 2, I am inclined to be speculative. They differ so remarkably from the hematite lode already described, that some different explanation of their occurrence becomes necessary. They essentially resemble each other in character, although somewhat different in dimensions.

In each case the main part of the deposit commences on the crown of a hill, and consists of large rounded boulders heaped on one another or protruding from the surface of the soil. On fracture they are found to consist of alternate layers of brown hematite and earthy matter, the richness varying, of course, with the relative portions of these two, and varying so much that it would be unsafe to attempt from surface knowledge to offer any estimate of the total amount or proportion of rich ore. I have contented myself with charting, as accurately as I could, the whole area within which these boulders occurred. It will be seen that in the one instance this area is about 360 yards long by 70 broad, and is of an elongated form extending to the north east. In the other it is subrectangular. To a cursory observer the appearance of these deposits is very anomalous, presenting, as I said before, that of a capping, on the summit of each hill, of from fifteen to twenty feet in thickness of large rounded boulders, ranging up to one or two tons in weight, all more or less good ore. How it got there, or where it came from, is then the question. On extended examination I found that, although the boulders cropped more or less over the area included in No 1 and No 2, yet that they occured in chief abundance in the direction of certain lines indicated on the charts by the small oval marking, and could be traced in those directions down the hills into the adjoining flat, and that many contained fragments of the magnetic oxide, together with other indications of their being of a derivative character. I therefore infer that the value of these deposits is very imperfectly represented by the surface masses,- which I look upon as having been derived from the destruction of rich iron ores, such as magnetic oxide or crystallised hematite (probably the former). It is also likely that they are nothing more or less than what miners call the back of strong lodes of magnetic oxide of iron, which would in that case be discoverable by mining operations conducted beneath the hills indicated on that vein. In fact, the drift below points to the existence of veins of magnetic oxide of some size, while the magnitude of the surface deposits renders it probable that that size would be considerable. I consider that eventually these spots will become of great value.

The next deposit I shall refer to is on private property, on the eastern side of Anderson's Creek: it lies on either side of the side-line which separates the properties of Messrs. Evans and Barnes and commences at about 25 chains from the joint northern boundary of the two proprties: it is of an oval form with the long diameter extending in the direction of N.E. and S.W.,) the length is above 440 yards, and the greatest breadth 400 yards: this more nearly resembles a capping on a hill than either of those last described. The surface is more or less strewed throughout the area reprented with rounded masses of hematite intermixed with a very variable proportion of clay and sand. These may be traced down the hills for a depth on the average of 20 feet. They have evidently been remade from some pre-existing ore of iron, which

as in the last two cases, will probably prove to be magnetic oxide, or a lode or lodes of brown hematite, the foreign material being mechanically intermixed and derived from the surface soil. The boulders in this instance are more prominent along the edges of the hill, and especially on the western side, where also the ore appears to be of better quality than elsewhere. The whole of the above-mentioned outcrops of ore are evidently referable to one line of force, determining lines of fracture, which in the sandstone and grit formations have been filled with crystallized brown hematite, and in the serpentine with magnetic oxide.

The next that I shall have described are also situated on one line, which has also evidently been a line of force acting in a direction parallel to the former, but along which it is more difficult to trace the outcrop of the ore, in consequence of the ground being to a great extent obscured by a thick deposition of marine or estuary drift. To which cause I also attribute a marked difference in the character of the ore along some portions, as, for instance, on the property of Mr James Dally, where an area of about 180 yards by 140 yards is occupied by what rather approaches a ferruginous grit than a hematite, boulders and tabular expansions of which crop from the surface or are met with a little below it. My impression is that this again merely represents the surface development of a richer ore below, occurring in veins, and which, from the nature of the adjoining formation, I should predicate to be hematite. The existence of grit and pebbles in the ore is quite a sufficient indication of its composite and derivative character. From this point the ore may be traced south-easterly continuously to Brandy Creek, and thence in intervals along the flanks of the Cabbage Tree Tier to the eastern side of Middle Arm Creek, some iron cropping out wherever the thickness of marine drift has been sufficiently stripped away to permit of its re-appearance. There is an interesting spot on this line where the formation of beds of iron ore, similar to those of which description has been made, appear to be actually going on at the present period. It is on the property of Alexander Hunter, where springs of water holding a very large amount of ferruginous matter in suspension break out and form mounds of an intermixture of ore, earth, sand, and matter with a large amount of peroxide of iron; while, at a short depth below the surface, hard and tubular masses of consolidated ore are met with. The farthest point south on this line where I have found the iron ore in any abundance is on the eastern side of Middle Arm Creek, immediately south of a small property of Mr. Blythe's, where there is what I believe to be the outcrop of a regular vein, closely resembling in character, though not in dimensions, the one referred to in a former portion of the Report. Here good hematite iron ore is met with, and the course of the lode can be traced for a distanve of fifty or sixty yards: mining operations would be necessary in this instance to determine the whole extent of it.

Having reached the limits of a geological report, it may, perhaps, be permitted me to exceed them for the purpose of pointing out certain points of importance in connection with the existence of iron ore which might otherwise escape observation.

Thus, although feeling that the question of the possibility or non-possibility of turnung to immediate account the results arrived at by the survey of the district is one which should engage the attention of, and be termined by, those who have been commercially interested in the production of iron in the adjoining Colonies or at home,- recognising it merely as a commercial question of expense and return, in which there is given upon the one hand ore of a certain richness and position, and upon the other a marked price of the reduced metal fluctuating between certain limits,- it may still be possible to greatly assist practical men in the consideration of that question, by a process of recapitulation and summation of the data affecting it.

The production of iron ore is effected in two ways, by means of coal and of charcoal. The two processes are different, and the products distinct. In the first case, cast-iron is primarily formed, and the production of malleable iron and steel arrived at by subsequent processes. In the second, malleable iron is produced directly from the ore. In the first instance poor ores may be treated, and

a flux such as limestone is generally necessary. In the second, very rich ores are essential, one proportion of the iron present being used to aid in fluxing off impurities from the remainder. The requisite data successful operations are these:—

A.—Coal.	}	Easy access and cheap labour, a constant in both cases.
Iron.		
Lime.		
B.—Coal		
Very rich iron		
Cheap charcoal.		

With regard to access little need be said; the position of the most important lode has been already described, and the facilities of working it pointed out. Its outcrop os close to the tramway, and the distance from the jetty but little exceeding seven miles. The deposits next in importance, viz., No 1 and No 2, at the Ironstone Hills, are only between two and three miles from the water's edge. It will be unnecessary to go further into this part of the question, as the above are the points to which in all cases attention would be first directed.

The quality of the hematite in the first case, and of the magnetic oxide in the second, need no further consideration; and enough has been stated in the body of this Report to show that limestone is sufficiently abundant in the district in the event of coal being discovered within it.

In the absence of coal in the district, it is desirable to consid-er the possibility of exporting the ore to coal in this or adjoining Colonies. With regard to this Colony our attention must be limited to those localities within easy access by water-carriage, which reduces the consideration to the various districts upon the North Coast, where the presence of coal has been determined, and less immediately on account of distance to the coal-fields on the east and south of the Island.

The amount of coal-containing country on the North Coast is very considerable, but the seam is thin, and at present only worked in one locality in the neighbourhood of the Don. A market would at once bring all this coal into production. The formation extends from the Mersey westwards as far as or beyond the Forth, a few miles up which river coal is reported to crop. I have not visited the locality, my previous Report having only extended to the Mersey and the Don. In the Seymour coal-fields the thickness of the seam is much more considerable; and it may be well for those who are commercially interested in that Company to determine on their own account whether the coal is suitable for iron smelting purposes. With regard to the second branch of the subject,- the question of the production of malleable iron by a direct process from the ore by means of char-coal,- this is one which may well engage the attention of those who are interested in obtaining chemical products from the distillation of our woods by a process which leaves a large amount of charcoal, as a by-product to be disposed of. It would at least be worth calculating whether the advantages afforded by the existence of rich ore in large quantities, readily worked, and of easy access, may not be set against the sole drawback- viz. dearness of labour- where the large additional advantage of very cheap fuel is created.

Let the question be determined how it may for the present, I feel confident at least of this, that at no very distant period the district in which iron ore of such quality, abundance, and favourable position occurs must become one of the most important in the Colony. There are other results arising from the survey of this District which will probably materially affect a large portion of it. The rocks described as belonging to the Lower Silurian formation possess the additional interest of corresponding very closely with those which form a large proportion of Western Tasmania. Here they may be studied with a degree of attention which the nature of the country prohibits in that wild and unsettled region.

It is in such spots as this the lesson must be learned, and the

sequence of the beds determined, the peculiarities of the different members of the series investigated and the mineral capacity of the formation measured,- that is with regard to the condition existing in the District. There the application of inductive reasoning must be made, and the difficulties of research, opposed by the concealment of aninhospitable region, encountered and overcome by a scientific and intimate acquaintance with the structure of the country,- this acquaintance having been previously attained with comparative ease under more fovourable circumstances.

The determination of the existence of a system of large mineral deposits of any character would be at once sufficient to stamp this formation with a value which it had not previously possessed; for it must be borne in mind that it is developed more or less over nearly one-third of the Colony, and that the conditions under which it occurs must be very varied.

We have seen that, in the District described in this Report, an important change was observable the moment the line of mineral producing force passed from the sandstone and stratified formation into the adjoining, the nature of the ore contained in the fractures of the two formations being entirely different.

This is merely a counterpart of what is generally observed in mining districts, where the passage of a lode from one formation to another is generally attended by a change in the character of the contents, so much so that, when the difference between the adjoining formations is very marked, not merely different mineral species, but different mineral species containing distinct metals, are developed. It is unfair, therefore, to speculate on the possibility of other useful metals than iron being discovered in any extensive tract occupied by this formation and traversed by sililar lines of force, since in that case scope will be afforded for the existence of numerous conditions which may materially influence and modify the contents of lodes.

In effect we know already that further west, upon the North Coast, promising strings of copper and lead ore occur in combination. I have not studied the locality, but believe the formation to be part of the series to which those above described belong; while, in the equivalent limestone, lead and traces of copper have been found in other parts of the Colony. This appears, then to be the formation which should be especially regarded by those searching for mineral deposits in this Country.

In an Appendix to this Report I shall give some details of boring, and some assays which have not yet come to hand.

I have the honour to remain,

Sir,

Your obedient Servant,

CHARLES GOULD.

The Honorable the Colonial Secretary.


DEVON No. 1A
WEST HEAD (or Pt. Flinders)
PORT DALRYMPLE
GEORGE TOWN
RIVER TAMAR
BELL BAY
EAST ARM
WEST ARM
STOCKPORT
YORK TOWN
PHILIPS NORTON
ILFRACOMBE
BEACONSFIELD
LEONARDSBURGH
SIDMOUTH
SALISBURY
SPRING BAY
EXETER
MIDDLE ARM
SUPPLY RIVER
TIMBER RESERVE
2500 AC.
SHEET No. 2.
Geoffrey Richard Gardner Lessee
Reginald Edward Gardner Lessee
Granted to Thomas Manifold
Granted to Malcolm McCaul Peter Ferguson & Robert Gow the Younger
Clarence Point Settlement Limd
Agricultural Bank of Tasmania
Granted to Francis Young Wilmore
Granted to James Duncan
Granted to William Perry
Granted to Thomas Scott
Granted to Joseph Hudson
William Barnes
Granted to George Cartwright & Joseph Allport
TASMANIA
SURVEYOR GENERAL'S OFFICE
E. A. COUNSEL.
SURVEYOR GENERAL.
Scale Two inches to a mile
Compiled and drawn at the Survey Office Hobart.
Recent
Late Tertiary
Upper Palaeozoic
Lower Silurian
Metamorphosed Rocks
Basalt
Greenstone
Serpentine
Limestone
Diabase
Gabbro
Iron
No. 1c
5 cm
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