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*Maryland Geological Survey, 1833-1841*

ANNUAL REPORT

OF THE

GEOLOGIST

OF

MARYLAND.

1840.

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TO

HIS EXCELLENCY,

WILLIAM GRASON,

GOVERNOR OF MARYLAND.

SIR:

I have the honour of submitting to you, herewith, the result of my geological examinations for the past year, and as this will be the last *Annual Report* which I shall make, it is proper that I should lay before you, the present condition of the Survey, as well as the relation which I conceive I will bear towards it, at its completion.

Nearly all the scientific information, a small portion of which only is embraced in the Annual Reports, and most of the economical geology of the State, a great deal of which is contained in these same Reports, have been obtained and collected together for the FINAL REPORT. For it will be remembered, that the main object of the Survey, so far as the Geologist is concerned, was to obtain materials, not only to illustrate the geology of the State upon its projected NEW MAP, but that these materials were to be used for the purpose of bringing, within a comprehensive shape, a full account of the Physical Geography, and of the Mineral and Agricultural Resources of Maryland.

account of the Physical Geography of Maryland; of her Agricultural condition and resources in the several counties, together with their agricultural statistics; of her Geology, scientific and economical, the former illustrated by maps and sections; and of her Mineral Resources and their statistics, also according to counties. There will be appended to the work a Geographical and Geological Map of the State, embracing the latest Surveys.

It is believed, that a work of this description, properly executed, cannot fail to prove of both benefit and interest to the citizens of Maryland, as a work of reference, in which all her resources will be duly classified; and may tend to elevate the character of the State abroad, by a faithful exhibition of these same resources. The dignity of Maryland seems to demand, that she should mature a scheme, which she was amongst the first to suggest, as it can now be accomplished in a short time, and at a trifling additional expense. If it be thought proper to refer the matter to any of the Standing Committees of the House of Delegates, I will cheerfully appear before them, to explain my views more fully. In reference to myself, farther, as regards the Survey, it is only justice to say, that abundant evidence could be produced that my labours have already been highly beneficial to the State, and have contributed to impress upon the citizens of surrounding States, a much more favourable opinion of her resources, than they had previously entertained. The importance of having a responsible State officer, to decide upon the true character and probable success of projected mining operations, has also been rendered evident in more than one instance, where doubt, hesitation, and want of confidence, might have retarded, or even prevented large foreign investments.

During a part of the last campaign, I have been engaged in making a full examination of the Frostburg coal basin, a direction to which the attention of heavy foreign capitalists has lately been turned. Seeing the immense consequence attached to a faithful account of the mineral wealth of our country, which they seem willing to aid us in exploring, upon just representations, I have given the subject of the intrinsic value of this coal basin a

close consideration; so far it was entirely within the scope of my duties to advance; but as its actual value depends upon the facilities that will be offered for sending its contents to a market, and that the State has already embarked largely in the construction of works to that effect, and is consequently deeply interested in their receiving the most advantageous direction, I have ventured to submit my opinion in reference to this matter also, which will be found fully treated of in SECTION II. of this Report.

The other sections contain accounts of the Physical Geography, Agricultural and Mineral resources of Allegany and Washington counties; and in a final section, there are some farther notices of the present condition of the mining operations in the copper region of Frederick county.

In conclusion, I have to acknowledge, as usual, my indebtedness to the Topographical Engineer, for his valuable and disinterested services in preparing the sections and map that accompany the Report.

I beg your Excellency to accept the assurance of the sincere respect of

Your obedient servant,

J. T. DUCATEL,

*State Geologist.*

BALTIMORE, *January 1st, 1841.*

## REPORT.

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### SEC. I. *Physical Geography and Geology of Allegany County; with some remarks on its actual Agricultural condition, prospects and resources.*

1. THE area of this county, which is the largest in the State, is estimated at about one thousand and forty square miles, or little less than six hundred and sixty-six thousand acres. It is emphatically the mountainous region of Maryland; traversed from N. E. to S. W. by all the lesser ridges that constitute the eastern portion of the Apalachian mass of mountains, and including within its limits, the dividing ridge, or *Big Back Bone*, as it is termed, a spur of which separates the eastern from the western waters. Even between these ridges the country is still mountainous and rugged, and the intervening rolling valleys between these lofty chains as one proceeds westward, are observed to be more and more elevated, the hills presenting a longer ascent from the east than descent to the west. The aspect of the country from the mountain tops is at first grand and imposing, but the eye is soon gratified, as it rests upon apparently an interminable forest, principally of pines, the value of which has been much impaired by the frequent recurrence of fires, in most cases no doubt accidentally communicated. There are but few places between Sideling hill—at the western foot of which flows a creek of the same name, forming the divisional line between Washington and Allegany counties—and the valley of Frostburg, where the view is gladdened by the appearance of luxuriant pastures or fertile fields. Some such there are, however, that will be noticed in their proper places.

Viewing the country geologically, the prevailing rocks that present themselves within the range of country now to be described—namely, between Sideling hill and Dan's mountain,

west of Cumberland—are *limestone, red sandstone and slate*. Rocks of the *coal period* also present themselves, whose interest and importance will likewise be considered in a subsequent portion of this Report. The limestone which contains fossils, is cavernous; a circumstance having both its advantages and disadvantages. The caverns form subterranean reservoirs of water of great extent; and when they open at the surface, throw out abundant and permanent streams, which in this section of the county afford almost the only water-power that can be relied upon. The waters of these streams, issuing from the caverns at a temperature never under the mean of the year, and in some cases much above, are not frozen during the severest winters, which imparts interest and value to the mill-seats established upon them. In this way, *Murley's branch* taking its rise under the circumstances just mentioned at the western foot of Warrior mountain, by furnishing facilities of this kind, flows through one of the most flourishing portions of this part of the country. The Flintstone, which is partly a tributary to it, loses all its waters in dry seasons in a cavern of which the Warrior mountain opposite to the Flintstone settlement is the protruding dome. These make their appearance on the opposite side, and singularly enough, in two springs, one of the usual mean temperature of springs here (52° F.) the other warm (68°.) The Flintstone and *Murley's branch* empty into a more important stream—*Town creek*—which flows between Polish and Warrior mountains, affording a very advantageous mill-seat at its mouth. *Wills' creek* also appears to lose a portion of its waters in its passage through the gap of *Wills' mountain* and Cumberland; and it affords but a limited amount of water-power exclusively employed at this latter place. The other water-courses are merely drains, or at best feeders to the Chesapeake and Ohio Canal, with the exception of *Evit's creek*, which is much better and more constantly supplied.

The mountain ridges traversed in succession after crossing *Sideling hill creek* are: *Town hill*, which is based upon a red sandstone capped by coal rocks, consisting of sandstone, *anthracite*, and slate; *Green ridge*, shewing a continuation of the red sandstone covered by *quartzite*; the same may be said of *Polish mountain*, to which succeeds *Warrior mountain* already alluded to as being composed of the cavernous limestone. Beyond *Warrior mountain* and *Martin's mountain*, red slaty sandstones make

their appearance, and the latter is composed of limestone covered by thick masses of quartzite; from this, crossing Ewit's mountain, there is a succession of slaty red sandstones and slates to the basin upon which Cumberland is situated.

The crests and flanks of the mountains are covered principally with pines and chestnut. The yellow and spruce pines are the most abundant of that species of timber in this section of the county; the white pine occurring only in few places. On the bottom lands are found nearly all of the most valuable forest trees; oaks, walnut, poplar, locust, hickory, the *Magnolia acuminata*, or cucumber tree, as it is here called, and the maples, among which is the sugar maple, which beautifully overshadow extensive camps, whence the smaller farmers of the county, and indeed most of the inhabitants, are supplied with sugar. The lime tree (*Tilia glabra*) here called linn, is also conspicuous amidst the larger trees of these forests. Among the flowering shrubbery are particularly noticed the mountain laurel, (*Rhododendron maximus*), Calico bush (*Kalmia latifolia*) and the wild honeysuckle (*Azalea viscosa*) of large size, bearing a cluster of white flowers that emit a delicious fragrance.

These bottoms and hill sides, the original appearance and condition of which have been just described, when cleared and cultivated, are found to be easily converted into rich pastures and productive fields of oats, rye, wheat, buckwheat, corn and potatoes. But it is from the alluvial soils that present themselves occasionally in extensive flats along the Potomac, that the richest harvests are gathered; furnishing every convenience and facility both to the grazier and feeder. Among these may be more especially noticed, those known as Harney's bottom, east of Old town, and a valuable tract of land of similar character extending along the river, with few encroachments from mountain spurs, from Cressap's town to Westernport.

Within this range there are several mineral springs of the kind called sulphur and chalybeates. At Flintstone there is one of the former denomination that might have acquired importance but for conflicting private interests. Between the Green ridge and Polish mountain, on the property of William Carroll, Esq. there are several of the same kind that have been examined and analysed by two experienced chemists—Prof. Wm. R. Fisher and Mr. Geo. W. Andrews. An abstract of the account which these gentlemen give of the springs, and that may be entirely relied upon, is

added, as a further inducement perhaps to their improvement, for the benefit of the proprietors and the public.

These springs are four in number, all issuing from a slate rock (containing fossils) which appears to constitute the substratum of the entire valley in which the springs are situated. Three of them have their openings near each other, within an area of thirty or forty feet in diameter, while the fourth is distant from these about two hundred yards, though flowing from a rock of the same kind. As two of them take their rise in the bed of a small branch, they are liable to be overflowed; but this, however, seldom takes place during the summer months. One of the springs, situated thirty or forty feet from the margin of the branch, and at all times free from inundation, is more particularly described as rising 'from the same slate rock, and preserving its perfect transparency and limpidity, in the small basin which has been excavated around it, flows off through a channel, upon which, immediately after leaving its basin, it commences to deposit the peculiar white material, from which the characteristic title of 'White Sulphur' is derived. This deposit was found in great abundance in the bed of the stream proceeding from the spring. The taste at once indicates the character of the spring as a sulphur water, which corroborated by the appearance of the copious deposit, leaves no doubt upon the mind of the visiter, that the spring before him is honestly entitled to the denomination of a 'White Sulphur Spring.' From this spring was obtained the water subsequently subjected to analysis, and by which its constituents were determined.'

The physical condition and analysis of this spring are given as follows :

'Temperature, 47° to 48° F.

GASEOUS CONTENTS.

Sulphuretted Hydrogen,  
Carbonic Acid.

SOLID CONTENTS.

Sulphate of Magnesia,  
Muriate of Soda,  
Sulphate of Lime,  
Muriate of Lime,  
Carbonate of Lime.

In reference to the temperature, it is conceived 'that the Carroll White Sulphur Springs have decided advantages, their temperature being so low, that beside furnishing a cool and refreshing draught, they are enabled to retain their gaseous contents much longer in state of combination.'

'These springs were all found to contain carbonic acid gas, or fixed air, which contributes its peculiar pungency and sedative influence to the water. Owing to the presence of this gas, too, the water is found to be what is called in familiar terms, a 'light water,' terms designed to express that several glasses may be taken without any sense of oppression, such as is almost invariably experienced after drinking two or three glasses of common water in rapid succession. The carbonic acid gas serves the purpose also, of rendering the earthy carbonate soluble, thus communicating some antacid effect to the water.'

Each of the Carroll Springs are said to yield nearly twenty-four hogsheads per day, 'showing manifestly that no scarcity of water can ever be apprehended, how numerous soever the company of visitors may be.'

It is asserted of these waters, that they will be found to 'possess all the medicinal properties usually met with in white sulphur springs.' 'Alterative, aperient, diuretic and diaphoretic effects,' being anticipated from them; and it is added, 'as all the adjuncts of healthy climate, pure mountain air, beautiful and romantic scenery, with healthy exercise and recreation, may be obtained at these springs, we can see no reason why these anticipations may not be realized, why the dyspeptic may not recover the tone and appetite, of which improper or imprudent excess may have deprived him; why the sallow complexioned son of the south may not lose the yellow hue which tinges his blood, giving evidence of diseased hepatic function; and why the sufferer from calculous and nephritic disorders may not be relieved from the painful and distressing symptoms to which his frame is a martyr.'

The advantages of location and its capacity for improvement are fully and accurately set forth. 'The distance from Baltimore to the springs is about one hundred and nineteen miles; one hundred and fifteen or sixteen of which are on the present main route to Cumberland, and the remainder of the distance along the valley of 'Fifteen Mile Creek.' Through this distance after leaving the turnpike, a most beautiful and romantic ride may be accom-

plished ; the rise of the valley being so gentle as to present to the eye the appearance of a level plain.

'From the Potomac a most excellent and well graded road may be constructed. Passing over Town hill, through the gap of Fifteen Mile creek, and gently descending on one of its numerous spurs, it may cross Green ridge at a moderate height, whence a gentle slope may be obtained that will conduct the traveller without inconvenience and in perfect safety to the springs.

'From this road one of the most grand and romantic views may be obtained which perhaps the country affords. From the top of Town hill are seen on one hand the mountains of Pennsylvania, cultivated to their summits, and on the other, beyond the valley of the Potomac, whose waters irrigate and bound acres of cultivated farms, appear the distant mountain ranges of Virginia, clad in the deep blue haze, with which distance and elevation invest them.

'Looking through the gap in an easterly direction, Sideling hill and the Great Cacapon bound the horizon with their summits ; and toward the west are seen ridge upon ridge of mountain tops, until the view is closed by the remote ranges above Cumberland, some thirty or thirty-five miles distant.

'One decided advantage which the locality of these springs affords, is the practicability of reaching them by the canal, by means of which the invalid and timorous may reach them, unexposed to the fatigue, inconvenience, or fancied danger of mountain travelling.

\* \* \* \* \*

'Numerous rounded and gently sloping knolls or spurs surround the springs, upon which at almost any desirable elevation may be erected cottages or cabins for the accommodation of the company who may seek the sanative properties of the waters, and who, while thus elevated above the fogs of the valley, will enjoy the bracing and healthful breezes from the west, which prevail during the summer months in this climate. The character for health which this county enjoys is so well established, that it is deemed superfluous to dwell upon it here.

'The approach to the springs from the west is equally favourable with that from the east, and may be accomplished by either the turnpike, canal, or rail road. \* \* \* \* \*

Their near proximity to the celebrated Bedford Springs is conceived 'to be another favourable feature of their locality, as an

opportunity is thus afforded to those who frequent the latter, either to commence or terminate their course of treatment with the use of sulphur waters.

‘Ravines and spurs of gentle elevation offer every facility for beautiful paths and roads, and afford means of easy access to the summits of the neighbouring mountains, upon which level roads for miles in length may be opened: and the gracefully rounded knolls radiating from the immediate vicinity of the springs, offer most eligible sites for the erection of cottages and accommodations for visitors.

‘The springs are situated in the neighbourhood of a fertile and cultivated district, from which supplies of agricultural produce may be obtained; and the mountains in the vicinity abound in game, such as deer, pheasants, partridges, &c. &c. from which many of the delicacies of the table may be furnished. Materials of other descriptions for the use of a numerous company, can be readily conveyed to this spot from Baltimore, either by the canal, rail road, or turnpike, as upon either of these routes they come within a few miles of the springs, &c. &c.’\*

In addition to this circumstantial account, the accuracy of which is vouched for, of the character, advantages of position and susceptibility of improvement as a place of public resort given in the preceding abstract, it may be stated that the contemplated operations in the coal region of Allegany county, by assembling a large population within a day’s ride of these springs, may be looked forward to confidently as calculated to supply a permanent run of customers. It is doubtless the interest of land-holders in this vicinity, to aid in and to encourage the improvement of the locality.

The ‘National road,’ or great thoroughfare for the west through Maryland, which commences at Cumberland, passes through a remarkable gap of Wills’ mountain, as interesting to the geologist as it is imposing to the traveller. The width of this gap is estimated at about five hundred feet, extends to the base of the mountain, and crosses it along a distance of more than a mile, leaving an excavation of upwards of eight hundred and fifty feet in

\*Charter of the Carroll White Sulphur Spring Company, in Allegany county, Maryland, with a scientific Report upon the situation, properties, composition, &c. of the springs—1838.

depth. It forms the natural outlet for the united waters of Wills', Braddock's and Jennings' runs, that empty into the Potomac at Cumberland. The rocky strata that present themselves in this gap are very interesting. On the south-east side of the mountain, the summit is reached by a gradual ascent over a coarse greyish sandstone, superimposed upon a red sandstone; the grade of the ascent indicating the inclination of the strata at angles of about  $30^{\circ}$ . At the summit the strata are horizontal, or nearly so, overlying a precipice of about three hundred feet, at the bottom of which is an extensive talus of fallen pieces reaching to the bottom of the gap. On the north-west side, the strata of greyish sandstone are nearly vertical, as if they had been forcibly compressed against the flank of the mountain, the nucleus of which, concealed in the gap by the fallen debris, is probably a cavernous limestone. The theory of the formation of this extensive gorge has been ventured upon on a former occasion, and will be discussed again more in detail in the final Report of the Survey.

The Frostburg coal basin, one of the most interesting features in the physical geography of the county, as well as in its geology, is reached through the gap of Wills' mountain either by the valley of Braddock's run, or by ascending Wills' creek to where it receives Jennings' run, and following its ravine, or by the longer and more circuitous route along the Potomac, on the south-west foot of Dan's mountain, around its termination to Westernport. By the two former of these routes, the predominant rocks observed are encrinital limestones and the red sandstone. On the road to Westernport, previous to meeting with the red sandstone, the alternating rocks are carboniferous limestone with fossils and slates. In all these positions the red sandstone seems to form the immediate floor of the rocks belonging to the *coal* series, which lie unconformably upon it, without the interposition of any millstone grit. This statement of the relative position of the rocks *under* the coal basin presents, it will be seen, two signal discrepancies from the accounts furnished us by other geologists, in which the carboniferous limestone is placed between the old red sandstone and the millstone grit. Out of the Frostburg coal fields the carboniferous limestone holds a lower relative position than the red sandstone, the latter being usually interstratified with a fine-grained light-blue limestone; but no where at the outcropping of the red sandstone are there any regular outcrops of the millstone grit to be seen. The position which the fragments and

bowlders of this rock occupy, namely, on the crests of the mountains that bound the coal formation, on both their western and eastern flanks, in the midst of the coal formation and low down in the valleys within it, may be accounted for by supposing that it originally lay in unconformable strata over the outcrops of the coal rocks, and that in progress of time disintegrating causes and displacing causes have brought upon it its present appearances. It would seem that if, as some believe, (the millstone grit being considered to form the floor of the coal basin,) it had outcropped *over* the other coal rocks, and then become disintegrated to the extent we now see it, the fragments would necessarily have fallen *outside* of the basin in the direction of the anticlinal axis of the geological system to which it belongs, whereas, so far as observations in Maryland go, it is the reverse. And, indeed, in no instance was it seen, that the outcrops of the red sandstone, which in the controverted hypothesis would necessarily be *conformable*, are concealed by any such accumulation of fragments of millstone grit, as might in such case have been expected; though erratic masses of the rocks are certainly seen dispersed over its surface at a considerable distance beyond its supposed original deposite. But it is not intended to discuss at large, in the present Report, any theoretical views in reference to the geological peculiarities of the formation. To determine, however, as early as possible the exact position of the millstone grit, is important to those interested in developing the resources of this tract of country; since it serves to widen or contract the data of their calculable wealth. The following account of examinations made at two remarkable spots, may perhaps be thought to throw some light upon the subject.

At the northern extremity of the coal basin, towards the head waters of Wellers' branch of Jennings' run, there is a deep ravine, interesting in many respects, and among them, one in regard to the subject now under consideration. This spot was visited in company with Mr. Lewis Howell. On descending its steep declivity there was observed the alternating strata of slate, shale, coal, sandstone, iron-ores, &c. to the run, and following its course it was found that these strata are here underlaid by thick ledges of a sandstone, at first fine-grained and resembling that so well known as belonging to the coal series, but evidently graduating into one of coarser grain, which finally assumes the character of a millstone grit. After examining this

spot on crossing the Savage, over the Somerset turnpike in Pennsylvania, no outcroppings of the millstone grit are met with; though other rocks of the coal series presented themselves in their expected order of superposition, the liminary *red sandstone* still in its unmoved and unconcealed position. In another excursion, in company with Henry Thomas Weld, Esq. an English engineer, attached to the Maryland and New York Iron and Coal Company, there was seen at the bottom of a slide of about 500 feet, occurring between Westernport and the mouth of Savage river (at the southern extremity of the basin in Maryland) a succession of ledges of sandstone rocks, of fine grain, graduating into coarse, and which, if found on the mountain tops, would probably have been called a millstone grit. The whole depth of the strata of sandstone was estimated at thirty feet, and they are continuous for several yards, without any appearance of a crush; *but they overlie a seam of coal.* They form, therefore, members of the series of coal rocks.

The situation of this coal basin is between Dan's mountain to the east and Savage mountain to the west; extending, within the limits of the state of Maryland, twenty miles in length, with an average breadth of four and a half miles. There is a transverse ridge upon which Frostburg stands connecting the two mountains just named, dividing the basin into two unequal parts, and determining two distinct and opposite directions of drainage. The northern portion, which is much the smaller, occupying about one-fourth of the whole basin in Maryland, is principally drained by Jennings' run, which takes its rise at Frostburg, and receives as tributaries from south to north Cranberry run, Workman and Mattingly runs, and Wellers' branch from the Savage side, and Trotter's run from Dan. These all unite within the basin, and flowing through a gap between Dan and Piney mountains, finally empty into Wills' creek three miles north of Cumberland. Brad-dock's run also takes its rise near Frostburg, and in the northern portion of the coal basin, and receiving Preston's run flows easterly through a gap in Dan's mountain, and empties likewise into Wills' creek two miles north of Cumberland. The southern portion of the basin, forming three-fourths of the whole, is drained by George's creek, with numerous tributaries both from Dan and Savage. Its whole length is twenty-two miles, and it empties into the Potomac twenty-eight miles above Cumberland. The principal lateral streams that flow into George's creek are Neff's, Elk-lick, Hill's,

Hoye's and Moore's runs that rise in Dan, and Koontz's, Laurel, Bartlett's and Mill runs that come from Savage. The main branches of these streams afford a moderate amount of water-power.

As to the internal structure of this basin, if we suppose a transverse section of it to be made, it would be found to exhibit a succession of alternating strata of various thickness of sandstones, slates, coal, iron-ore, fire clays and lime-stone, disposed in a moderate curve, and filling up the valley between the two prominent ridges designated as Savage and Dan's mountains. The depth of this basin is computed at fifteen hundred feet; and the lower strata that have not been interfered with by the water-courses, being continuous, probably crop out towards both extremes at a considerable elevation in these mountains. The surface of the basin is of course irregular, being intersected by deep ravines formed by the streams and runs that traverse it. George's creek in a distance of seventeen miles and in a longitudinal direction, has scooped out its bed through a mass of rocks twelve hundred and fifty feet deep, carrying away an immense amount of coal, iron-ore and other materials, valuable in themselves, but under existing circumstances not to be regretted. On the other hand, Jennings' run has caused still more damage; for in the short distance of six miles in a direct line, it cuts both longitudinally and transversely through the whole formation, having swept away a large portion of the most important veins of coal, and exposing to view the subjacent red sandstone. Braddock's run has removed but a small portion of them; because, flowing laterally, it soon leaves the coal basin. The Potomac river enters the basin at its south-western extremity, cutting through it diagonally, and carrying off much of the principal upper beds of coal. Some lacerations of the basin have been produced by the lateral streams, that, at some periods of the year, act with all the impetuosity of torrents. The original irregularities of the surface, too, that have determined the present direction of the water-courses, were doubtless produced by some more general and powerful excavation, that has removed perhaps more than one-third of the whole mass, as it existed after its first deposition. These irregularities have been obviously produced by the partial destruction of the uppermost strata, since they are found not to affect the dip or inclination of those that remain. Whenever they are found to be cut off by the intervention of a valley, they will be seen on

the sides of the opposite hills at the same relative levels; shewing that they were once continuous. But although these causes have removed a large portion of very valuable beds of coal and iron, by imparting this peculiar configuration to the surface of the country, they have furnished at the same time facilities for the exploration of strata that could not otherwise have been reached, except with great labour and at the expense of deep mining operations. The great interest, in truth, connected with this coal basin, is its uncommon regularity; for as yet there is no reason to suspect the occurrence of any *faults*, or other serious dislocations of strata.

Without adverting particularly at present, to the immense mineral wealth in the way of coal and iron ores contained within this basin, it must be considered as forming in other respects one of the most interesting portions of Allegany county. The soil is uniformly good, affording, soon after being cleared, a spontaneous growth of timothy, and the finest pasturage. The arable lands yield heavy crops of wheat, oats, rye, barley and potatoes, and in favourable seasons tolerable crops of Indian corn. The potatoes are equal to any raised in the New England States. Most of the esculent vegetables of the sea-board, when properly attended to, are cultivated with success; and among the fruit trees, the apple, peach and plum, the last being considered of superior flavour. Among the smaller fruit the currant seems to be the most hardy, and the mountain sides are literally matted with several varieties of wild berries. The country is also well timbered; the varieties of oaks, the yellow, white, and spruce pines, poplar, locust, several kinds of hickory, the cucumber tree, (*Magnolia acuminata*,) the lime tree, beech, walnut and sugar maple, forming the principal growth on the uncleared lands. The curled maple, so highly prized in cabinet making, and the wild cherry, used in the manufacture of gun-stocks, are also found in quantity.

As we may confidently expect that the day is not far distant when this tract of country will possess a numerous population, engaged in mining and in manufactories of various kinds, it is fortunate that its agricultural resources should be found paramount to its other advantages; and as the mining and manufacturing industry will be actuated and directed by men of fortune, there is no doubt they will be attracted to it by its wild and majestic scenery, its unvaried salubrity, and the certainty of enjoying during one-half of the year a most delicious climate. This portion of the county will ere long, then, deserve and obtain a decided preference as a summer retreat, where those interested in the sur-

ounding operations, as well as others who can afford to flee from the anxieties of business and the warm and sickly atmospheres of towns, will be content to retire. For, numerous as we suppose the population is to be, as it will spend the greatest part of its time under ground, the retirement of the hill top and of the mountain side need seldom be encroached upon. The denizen of a cottage on the mountains may come in from the chase or hunt to repose himself, if he prefer it, under a quiet and solitary roof; or he may assemble under it a choice selection of kindred souls, or a long tried friend, to share with him his haunch of venison, or his brace of pheasants, or his mess of trout, all of which he can have no great difficulty of obtaining, in their respective seasons. The Great Savage mountain, or *Big Back Bone*, as it is frequently called, is not the dividing ridge separating the eastern from the western waters. The Savage river reinforced by two streamlets—the Middle fork and Crabtree creek—makes its way through it to empty itself into the Potomac. A spur of the Great Savage, known at the head of Deep creek as the Little Back Bone, is the true dividing ridge, the waters of this creek flowing west, and those of Crabtree creek running east, though taking their rise only a few hundred yards apart.

Starting from Westernport and ascending the Potomac along the S. E. flank of Savage mountain, the country is rugged and broken, densely timbered, and not much cultivated; except the rich alluvial bottoms on the margin of the river. The water-courses on the Maryland side are short, rapid and of little consequence in regard to hydraulic power, though a sufficient and constant water-power can be obtained both on the north branch of the Potomac and at the mouth of Savage river. This portion of the county, broken and mountainous, and not as yet sufficiently explored, is no doubt an invaluable repository of coal and iron-ore, which time and enterprize will bring to light; whilst from what is now known of it,\* it already affords evidence of an important addition to the mineral wealth of Allegany county. Connected with this portion of the coal formation in Maryland, are extensive beds of coal and iron-ore on the Virginia side of the Potomac river.† The agricultural resources of the county

\* See Report of Professor F. Shepherd, 'To the Potomac and Allegany Coal and Iron Manufacturing Company.' New Haven, December 26, 1839.

† See 'Charters of the Union Potomac Company and the Union Company, with a Description of their Coal and Iron Mines, situate in Hampshire County, Virginia, and in Allegany County, Maryland. Baltimore, 1840.'

are also full of promise; possessing a soil generally good, and being here and there interspersed with tracks of luxuriant glade lands. Among these may be mentioned pre-eminently the beautiful tract of about three thousand acres, known as *Ryan's Glade*, forming a part of the estate of the late Upton Bruce, Esq. The mountain tops are covered with the disintegrated fragments of the millstone grit.

Pursuing the National road across Savage in a more northerly direction, the coal rocks disappear at the summit of the ridge, and the outcroppings of the red sandstone present themselves only a few yards below on its western slope. The inclination of the strata of red sandstone is E. S. E. the reverse of its presentation at the opening of the coal basin in Dan's mountain. It preserves this inclination through the Little Savage as far as the crossings of a lesser ridge, called the Dividing ridge, about half way between the Little Savage and Meadow mountains. Boulders of millstone grit are then met with in the east side of the last mentioned mountain, on the west verge of which the coal rocks re-appear. Here then is another coal basin between Meadow mountain and the Negro mountain, the centre of which, however, and more available portions, belong to the State of Pennsylvania. Some seams of good coal have been worked in the neighbourhood of the Little Crossings, and beyond them on the N. E. side of a spur of Negro mountain, after which the coal rocks disappear, and another anticlinal line belonging to the red sandstone formation presents itself on the west flank of Keyser's ridge, indicating the approach to a third coal basin of which Smithfield in Pennsylvania is the centre. The Yohogany, which takes its rise in the S. W. angle of the State, cuts through this coal formation longitudinally from south to north, and exhibits the strata of coal and iron-ore with associated coal rocks from within a few miles of its head to its junction with Casselman's river. The section on the map attached to this Report exhibits the relative position and the alternations of the rocks included within the coal region.

The eastern slope of the Briery mountains which form the western limits of the State is also composed of coal rocks, supporting a very productive soil, in some places highly cultivated, and occasionally presenting some beautiful and valuable tracts of *glade lands*. This section of country is watered by the Yohogany, whose principal tributaries from south to north are,

in Maryland, the Cherrytree fork, Little Yohogany, Muddy creek, Deep creek, (which consists of the accumulated waters of numerous streams and streamlets that irrigate the *glades*) and Bear creek. All these streams having a pretty rapid fall, afford a considerable amount of water-power. Muddy creek in its flow through a magnificent grove of white pine, offers a beautiful cascade about an hundred feet wide and sixty in perpendicular fall. The country thus but faintly described is interesting in many respects; but has not yet been sufficiently examined geologically. There is every reason to believe that borings made in the red sandstone formation of this western portion of the county, and even in the immediate vicinity of the coal formation, would reach waters highly impregnated with salt. Success in an enterprize of this kind would be next in importance only to what is expected from the explorations of coal or the manufacture of iron. An enterprizing citizen of the county, Mr. John Hoyer, of Cumberland, has within the past year obtained salt water at the depth of five hundred and twenty feet. This experiment was made without the limits of the State, on the banks of the Cheat river in Virginia. *Licks*, as they are termed, which are oozy spaces where the deer and cattle resort, it is supposed, to gratify their craving for saline food or drink, are so numerous as to constitute indications and landmarks all over the country.

The ridges just referred to present in many situations large tracts covered with the white pine. This is especially the case with an extensive range at the head waters of Piney run, which takes its rise on Little Savage, where there occurs a splendid forest of this valuable tree. Several steam saw-mills are now in operation, furnishing materials for the various improvements that are carried on all over this section of country. It may be said in general terms, that white pines affect a soil produced by the disintegration of a shaly red sandstone, and when removed leave a very productive soil, throwing out a spontaneous growth of herds grass so soon as it receives the genial influence of the sun. The grey and white sandstones seem more favourable to the growth of the yellow pine, most commonly intermixed with dwarf oak and chestnut. Between the ridges there are fertile tracts of arable land, from which good crops of fine tobacco, besides the usual grain crops, have been raised. Among these may be more particularly designated the settlement between Keyser's ridge and Winding ridge.

But a still more interesting portion of this western part of the State comprises what are termed the *GLADES*. These are natural meadows of variable extent, with a deep mould for soil, apparently in its origin produced by the decomposition of a red shaly sandstone, to which time has added a rich accumulation of decayed and decaying vegetable matter. This soil throws up a spontaneous growth of succulent grasses and plants, that afford the finest and most abundant pasturage for cattle; during a long portion of the year; and in the months of June and July, present to the eye of a traveller who crosses them a delightful parterre composed of flowers of all hues, over which the botanist would be rejoiced to roam among old and perhaps new acquaintances. The whole extent of these glades within the limits of Allegany county, may be estimated at about twelve thousand acres, the greatest portion of which, east of the Yohogany, is located towards the summit of the dividing mountains. They are not connected with each other, and their outlines are very irregular; spurs and ridges intersecting them, and knolls sometimes rising up from amidst them. The *Green Glade*, which is the largest tract of this kind, is beautifully watered by Deep creek, whose branches permeate it in all directions. They are said to be all at the same general level, with the exception of the Cherrytree meadow, which is a plain possessing in all respects the peculiar character of the glades, and on the authority of John McHenry, Esq. an intelligent and highly respected inhabitant of this country, is said to be from sixty to a hundred feet more elevated than the common level of the other glade lands.\* A tract of beautiful glade land equally well watered also occurs on the west side of the Yohogany river, at the foot of the Briery mountains.

It is more than probable that these upland meadows are the basins of former shallow mountain-lakes, the waters of which were formerly retained by a rocky barrier at the falls of Deep creek. These falls, in the immediate vicinity of those of the Yohogany, and the cascade of Muddy creek previously referred to, are said to have a fall of two hundred feet in half a mile. This sudden depression in the basins of these respective streams was doubtless still greater in past times, and the barrier which then retained them sufficiently high to enable them to flood all the glade country which they now drain. It is stated by Mr.

\* An account of the Surveys and Examinations, &c. &c. for the Chesapeake and Ohio Canal, by James Shriver—1824.

over, that after the usual thaws in the spring of the year, the melting of the heavy snows which commonly fall in this winter, an inundation is produced, which covering the flat lands many miles along Deep creek, produces a lake of considerable extent. This overflow frequently continues for several days, during which time, the wild fowl that frequent inland seas, in their migration to the north, frequently stop, and are seen for a time upon the bosom of this transitory mountain lake.

In concluding the account of the physical geography of this county, it may be proper to add a cursory view of its agricultural condition, prospects and resources.

The territory composed of mountain ridges and spurs, intersected by narrow valleys, will necessarily present large tracts unavailable for agricultural purposes, and when remote from a market of consumption, its improvements proportionally retarded. Hence the agricultural statistics of this portion of the State are not interesting in fact, nor show such rich results as those of the adjacent counties. As has already been said, that the soils, which are produced by the disintegration of limestone rocks, sandstone, shale and slates, or richly constituted alluvial bottoms, in their natural condition productive, highly improveable, and sufficiently protected in many places from sudden inclemencies of the season to allow them to be safely and profitably cultivated.

The facilities that will, it is hoped, before long, be offered by the passage of a canal and rail road, through part of it, in addition to a paved road nearly through its whole breadth, cannot but enhance its value in this as well as other respects; whilst a rapid increase of population, which it is confidently expected will be the result among these mountains, collected together for the purpose of carrying out the great operations to which their mineral resources inevitably invite, will furnish inducement enough to the advantage of every tillable rood of land. Many vales and mountain slopes, now covered with valuable timber, will be converted into arable fields, and in progress of time the county will be superficially rich only second to that, which it will presently shew she possesses almost to an incredible extent, on her surface.

All the cleared lands, at present, the least attention to a judicious cultivation is rewarded by an abundant harvest of grass, provender, bread-stuff of every description, and the crops generally, in abundance and of very superior quality.

Were the value of the soil estimated in reference to this alone, it should stand much higher in the scale than it is now usually rated.

The *glades* previously referred to, afford, as has already been stated, facilities for raising immense herds of cattle, horses and mules—and the multiplication of this last mentioned animal ought at once to engage the attention of breeders and graziers, as they will no doubt be in great demand as carriers in and out of the subterranean drifts into the coal and iron-ore beds that remain to be excavated, in continuation of those already commenced with the most favourable prospects. Connected with the occupation of the herdsman is that of the sheep-master, to whom the mountain pasturages afford great advantages;—this region of country, including the glades, being considered as better adapted for raising sheep, than perhaps any other in the United States.

Few experiments have as yet been made in the County, with a view of imparting a more permanent or additional fertility to the soil. Lime has been used in some instances, and always with success, furnishing sufficient evidence that this unfailing amender of soils of every description, can render the same services to Allegany county, that it has to other portions of the State. The object is to apply it judiciously. The great abundance of fuel, both in the way of coal and wood, and the consequent cheapness at which the lime may be made, either by perpetual or periodical kilns, or even without kilns by the method of *clamps*, places the article within the reach and means of every farmer.

Upon examining the character of the different soils that are met with in the county, it would seem that only a few directions are necessary as a guide to the surest and most advantageous way of using lime. On these soils, a first dressing of fifty bushels is advisable, after which a sowing of buckwheat to be turned in when in full maturity. As the soil improves more lime is added, until the whole amounts to about one hundred and fifty bushels. Where the soil is rich and under active cultivation, the whole one hundred and fifty bushels may be applied at once; but it is always advisable to turn in the first growth in its green state.

The inestimable value of lime to *all* the soils of the State has so frequently been adverted to, that some disinclination is felt to repeat the earnest solicitations that have been made to our farmers not to neglect its use; but they require to be cautioned against the scepticism of some who receive every thing that is

offered to them with suspicion, and more especially the infidelity of others who disbelieve without inquiry, and scoff at the experience of the more confiding and enterprising. There is a natural disposition in farmers to avoid what they deem extra labour, and they are particularly afraid of extra expenses. But when it is considered that the labour of liming when accomplished, is soon amply repaid, and continues to be so without any additional trouble, almost indefinitely, it becomes reproachable to dispense with it. As to the expense, in most parts of Allegany county it is trifling, and were it five times as great, it would be difficult to point out any other surer or more profitable mode of investment. A very remarkable instance of prejudice is mentioned as having occurred not many miles off. Some years back a quarry of very soft limestone was accidentally opened, which from its softness and other appearances was mistaken for plaster or gypsum. Under this supposition it was ground and used as a top-dressing, or scattered over the surface in quantities represented to be from six to eight bushels to the acre. This operation was attended visibly with the most beneficial results. In this state of things specimens were forwarded to different chemists, whose analyses concurred in proving that it was carbonate of lime—a soft limestone. Would it be believed, that so soon as this fact was known, which broke the delusion as to the possession of wealth in the shape of plaster of Paris, its use, notwithstanding the success of its former application, was immediately discontinued!

SEC. II. *Mineral Wealth of Allegany County, and considerations on the best means of developing it.*

In a report submitted to his excellency, Governor Thomas, in 1833,\* after an excursion into Allegany county, it was stated that before long this western portion of the State of Maryland would become the 'Wales of North America;' and it might have been added, Cumberland its Sheffield. It was then thought, however, that a more satisfactory evidence of the probable fulfilment of this prediction would have been furnished, ere this time, by the completion of the great works of internal improvement projected by the State. There is reason to believe that the progress of one—the Canal—has been delayed: first, by a want of necessary information, as to the actual and positive resources of the coun-

\*Report on a projected geological and topographical survey, by J. T. Ducatel and J. H. Alexander, Esqs. (assisted by Philip T. Tyson,) in 1833.

try into which it is destined to penetrate: secondly, and consequently, by incorrect as well as inadequate estimates of the returns to be received by the State for her large investments. It is the object in this section, therefore, to endeavor to furnish true elements by which to estimate the mineral resources of the country; to submit what, after mature deliberation, is conceived to be the proper extension that should be given to the canal, after it shall have reached Cumberland; and finally, to prove, that whatever be the amount of past expenditures, and those required for the future, according to the largest estimates, they will be amply repaid by its completion to its natural termination in Maryland.

In 1836, some systematic researches were made under the direction of the George's Creek Coal and Iron Company, having for object, to expose to view some of the geological features of the great coal basin of Frostburg. The details of a section obtained on this occasion, (very nearly, it is deemed, at the centre of the basin,) were published in the Annual Report of the same year; and a plate of those details is appended to this Report, as an illustration of the subject under consideration. It will be seen that there have been exposed 18 beds of coal in a height of 450 feet, the largest of which is 14 feet thick; and the total thickness not less than 52 feet. The drifts have been carried on in the largest vein, and extend at this time upwards of a mile and a quarter in length. There have been erected a furnace and a foundry. The furnace is 50 feet high, with boshes of 14 feet; and when in blast, the consumption of coal at the works has been 1,200 tons per month. During a campaign of a little less than 4 months, 900 tons of iron have been made; and the highest yield per week was 92 tons, the least 62, giving an average of 75 tons. The lump coal is delivered at the opening of the drift, at an average cost of 50 cents per ton, and the iron-ore for \$2 50. Plate No. 2, appended to this Report, shews the positions and relations of the different measures which are explored for the extraction of the iron-ores.

The iron obtained at those works (both with the cold and hot blast) has been submitted to numerous tests, under the direction of an experienced and intelligent iron-worker—Mr. Winans—and has proved itself of superior quality; being very soft and malleable, easily wrought, and at the same time sufficiently tough.

As these works were the first to be established, with a most laudable enterprize, and as great advances have already been

made towards developing the resources of their location, it is very proper they should be instanced with commendation; whilst their results have served to show corresponding resources in many other portions of this interesting region of country.

Within the present year, other operations have been commenced in another division of the coal basin, that have been carried on with equal energy, activity and skill; and, it is understood, with the command of an adequate capital to realize, in time, the rich promise of this new location. The operations of the Maryland and New York Iron and Coal Company, the one referred to, have been carried on in the northern part of the basin on Jennings' and Mattingly's runs. In making their researches for coal, iron-ore and other necessary substances, regard has been, in a great measure, paid to the facility of working the mines, the transportation of the materials to the furnace, as well as down the valley to a market. In consequence of this, the drifts are at a considerable distance apart; hence no accurate section has been made, shewing the relative position of the strata with regard to one another at any one given spot. But it is evident that such examinations have more fully served to develop the mineral resources of the region, and afford details that cannot fail to prove interesting to those desirous of obtaining information on the actual wealth of the basin, independent of any particular location.

It appears that the strata of coal, iron-ore, &c. &c. which are available on the property now referred to, are comprehended in a section of nearly 1,400 feet. Two series of operations have been carried on; one in the immediate vicinity of the furnaces; the other consists in openings made at various elevations on the east flank of Mount Savage, consequently on the western side of the coal basin. The researches in the former direction have brought to view 6 coal seams, forming in their aggregate 26 feet of workable coal. In the beds of iron-ore, two important openings have been made that exhibit bands of a rich argillaceous oxide of iron, averaging, probably, 30 per cent. of metal.\*

\*It may be proper to remark here, that no *chemical analyses* of these ores have as yet been made: the object at present, being to call the attention of the public and the legislature, to the general resources of the country. The estimate of their value is based upon their *physical characters*, which, when applied to specimens of usual occurrence, scarcely leave room for any serious deception. More specific information has been given in some cases, and will continue to be given as circumstances may require, to those more directly interested in their exploration and practical use.

Another has been designated as occurring in balls imbedded in a fire-clay, which is said to contain from 15 to 20 per cent. of iron, and from 30 to 40 per cent. of lime. Several strata of fire-clay have also been opened, from which bricks have been manufactured for the inwalls of the furnaces. It is doubtful, from some practical experiments, if they will prove available for the puddling furnaces, but clays better constituted may still be expected to be found. Two beds of limestone, one ten feet and the other six feet thick, have been found within a convenient distance of the furnaces, and of all other operations around them.

The second series of openings along the side of Savage show, so far, 3 seams of coal, affording, on an average, 12 feet of workable material. With regard to the ores, there have been six beds of them opened, of variable richness as to quality and quantity; but all presenting themselves with favourable appearances. Among these, one has been designated as brown hæmatite, (a hydrated peroxide of iron.) Should it continue to preserve its present characters as the drifts are prolonged, it will rank with the most valuable iron-ores of the coal basin.

Two bands of limestone have been discovered in this direction also; and the existence of fire-clays ascertained. Besides this, at both localities, there are numerous smaller bands of iron-ore and seams of coal, that are kept in reserve for more extended operations.

The present condition and expectations of the Mount Savage Works are detailed in the following communication from Henry Thomas Weld, Esq. one of the engineers attached to the works.

'Since the commencement of operations in May last, up to the 1st of December, more than two thousand five hundred tons of ore had been taken out, besides large quantities of coal, limestone and fire-clay, and a sufficient length of levels driven in the ore-beds to take out at least thirty thousand tons of ore.

'With regard to the general progress of the works for the manufacture of iron, the following is the result of our labour:

'The stacks of two blast furnaces of the largest class, have been completed, and two engines rated at eighty horse-power each, but capable of being worked much higher, have been made and delivered by the West Point Foundry Association: the first being intended for the blast furnaces, and the second for the rolling mill and its appendages. The apparatus necessary for grinding, drying and burning fire-brick to almost any extent, has been

erected: likewise limekilns, blacksmiths' and carpenters' shops, boarding-houses, store and dwelling-houses, for the accommodation of upwards of one hundred families, while many more are in progress of erection.

'Workmen are now employed in building the engine-house and foundry, to be completed, if possible, before the severe weather comes on. In the mean time, an engine of twenty horse-power has been completed in Baltimore to blow the cupola, turn the lathes, &c.

'Our progress is such that we can confidently expect to have both furnaces in blast in the course of a very few weeks.'

These two enterprises—the George's Creek Coal and Iron Company, and the Mount Savage Works—are more particularly referred to, because they have contributed more than all the rest towards the development of the resources contained within the coal basin. There are other concerns ready to go into operation, so soon as the promised facilities for obtaining an outlet to their now literally buried wealth will be presented to them by the State. It appears that there are at present within the limits of the coal region twelve incorporated companies, with a chartered capital of six million seven hundred thousand dollars; and it is probable that the value of their property in the market, whenever the canal shall have reached its natural termination, will rather greatly exceed than fall short of this amount.\*

\*The following are the Reports and Documents, official or otherwise, so far published, embracing accounts of different sections of the coal basin, with opinions concerning, and estimates of, the quantity, quality, and value of the coal and iron-ores within it, and also the charters of the different companies.

1. Collection of Reports and Letters of the Engineers of the Chesapeake and Ohio Canal Company.
2. Report on a projected Geological and Topographical Survey of the State of Maryland, by Julius T. Ducatel, Professor of Chemistry, &c. and John H. Alexander, Esq. Top. Eng.—1833. Republished in Silliman's Journal, No. 1, vol. xxvii.
3. Report of an Examination of the Coal Measures including the Iron-ore deposits, belonging to the Maryland Mining Company, in Allegany County, &c. &c. by George W. Hughes, United States' Civil Engineer.—1836.
4. Report on the New Map of Maryland.—1836. Report of the Geologist, sec. 6, p. 48.
5. Charter, &c. of the George's Creek Coal and Iron Company, containing a detailed account of the Geology, &c. of this locality.—1836.
6. Report of the Hon. Wm. Cost Johnson to Congress, Doc. H. Rep. No. 168.—1836.
7. Report of the Hon. Charles Fenton Mercer to the House of Representatives of the United States in 1834, Doc. No. 414, Appendix.
8. A Letter addressed to the General Assembly of Maryland, by Duff Green, on the Bill incorporating the Union Company.—1836.

Some conception may already be formed, from the preceding pages, of the immense value of this coal-field, in reference to its coal alone. But in order to exhibit more satisfactorily its true intrinsic value, both as regards coal and iron, the following calculations, founded upon data carefully obtained, are further submitted.

The length of the George's creek coal basin, taking its northern extremity to be a little beyond the Maryland line, and its southern to reach about two miles above Mr. Bruce's, on the North branch of Potomac, may be stated at forty miles. Its width along the National road, where there are good opportunities of observing it, is four and a half miles; and it seems to be about the same, where it is cut through by the Potomac, near Westernport. Its shape is therefore oval; its longitudinal axis being as before, forty miles, and its transverse five miles and two-thirds. As the distances from which this transverse axis is derived, are along the inequalities of the surface, it may also safely be assumed, that this length is the development of the curved strata of the coal. These elements of calculation, give for the area of the oval an extent of one hundred and seventy-six square miles; which, to determine the quantity of the coal, would only have to be multiplied by the thickness before given of the strata, were it not

9. Charter and By-Laws of the Boston and New York Coal Company, &c. to which is appended the Report of the Special Agent.—1837.

10. Report of the Examination and Survey of the Coal-field and Iron-ore, belonging to the Boston and New York Coal Company, at Frostburg, &c. &c.—1837.

11. Extracts from a Report made to the New York and Maryland Coal and Iron Company, &c. by Benjamin Silliman, aided by Benjamin Silliman, Jr.—1838.

12. A Report made by Henry Thomas Weld, Esq. of the Maryland and New York Iron and Coal Company's Land, &c.—1839.

13. A Letter to the President and Directors of the Boston and New York Coal Company, by John Pickell, late U. S. Army, and on Engineer Service.—1839.

14. Report of Captain Ericsson, Civil Engineer, London, shewing the cost of the coal of the *Maryland Mining Company* per ton, delivered at the several cities of Washington, Baltimore, Philadelphia and New York.—1839.

15. Report to the Potomac and Allegany Coal and Iron Manufacturing Company, by F. Sheppard.—1839.

16. Major Douglass' Report on the Coal and Iron Formation of Frostburg and the Upper Potomac, in the States of Maryland and Virginia.—1838.

17. Charters of the Union Potomac Company and the Union Company, with a description of their Coal and Iron Mines, &c.—1840.

18. A description of the Frostburg Coal Formation of Allegany County, Maryland, with an account of its Geological position, by Philip T. Tyson. Published in the Transactions of the Maryland Academy of Science and Literature, vol. i. part i.—1837.

that the numerous streams which are tributary to Jennings' run, George's Creek, and the Potomac, as well as those branches themselves, have altered the shape of the surface and washed out, as previously stated, a considerable quantity of coal along with the earth that they have carried away. The accurate determination of the amount of this denudation could only be made after a special survey, having for its object to determine the shape of the surface; but it is supposed that an approximation may be made, not liable to material error.

From surveys of the George's Creek Company, we are warranted in concluding that at the level of the large bed, in a distance of five miles above Lonaconing, there has been denuded two hundred acres, for every mile in length of George's creek—not counting the subsidiary streams that unite with the creek in that distance. In a similar manner, at the level of the eight-foot bed, one hundred and forty feet lower, there has been denuded one hundred acres, for every mile in length of George's creek. From the consideration of the proportion furnished by these two cases, and the details of the particular measurements which lead to the results above given, it may be assumed that every mile in length of all the streams in the basin, has been equivalent to a denudation, or washing away, of one hundred and seventy-five acres.

A minute and careful measurement on the map of the streams laid down, shews their combined lengths to be one hundred and thirty-eight miles and three-quarters; which sum, making allowance for those not laid down, because not known, and others too minute for the scale of the map, may be raised to one hundred and fifty miles.

For the amount of denudation then, we have

$$150 \times 175 = 26,250 \text{ acres.}$$

The entire extent of the coal field was said before to be one hundred and seventy-six square miles, or nearer 113,097 acres.

From which subtracting . . . . . 26,250 "

There is left . . . . . 86,847 "

as the extent underlaid by the beds of coal and iron-ore.

To determine accurately the available thickness of those beds is a difficult point, but may be arrived at, approximately, upon the following data. From the workings and sections at Lonaconing, it appears that there are in a height of four hundred and fifty

feet, beds, amounting in all to fifty-two feet of coal and seventeen feet of iron-ore. No borings have been made, with a view of determining the strata below: but there is no conclusive reason why, in the depth of six hundred feet (from Lonaconing to the Potomac at Westernport) there should not be alternations of beds to an equal amount. However that may be, there are at present only known twenty-five feet of coal, in the aforesaid space of six hundred feet. And when it is considered how many of those beds are only one or two feet in thickness, and from their associations above and below, not to be got out with a reasonable economy, it is better to suppose, with our present means of knowledge, that the workable beds of avail, do not exceed in thickness, forty-five feet, or fifteen yards. This is the quantity which may be assumed in the calculations that follow, to ascertain the whole number of cubic yards in the coal field.

Extent in acres, . . . . .	86,847
Number of square yards per acre, . . . . .	4,840
Thickness of beds in yards, . . . . .	15

These numbers multiplied together will give the whole number of cubic yards, . . . . . 6,305,137,287

And as one ton of coal is generally estimated as occupying the space of one cubic yard, there is in the basin no less than SIX THOUSAND THREE HUNDRED AND FIVE MILLIONS ONE HUNDRED AND THIRTY-SEVEN THOUSAND TWO HUNDRED AND EIGHTY-SEVEN TONS OF COAL.

As regards the iron-ore:—the thickness of the beds in the Lonaconing section has been before said to be seventeen feet; and there are other beds below, in the six hundred feet before mentioned. A report of the Union Company (whose examinations have been particularly directed to this space) states sixteen feet as having been measured and identified. When the position and associations of these beds are considered, (as in the case of the coal,) not more than nine feet or three yards can be assumed as workable. In the report of the George's Creek Company, seven feet were assumed as the probable amount above the base of their section.

Taking then the same elements of calculation as for the coal, the number indicating the total amount of ore is, 1,261,027,457 yards; and in weight, . . . . . 3,237,576,144 tons; or about half the weight of the coal in the basin, and enough to

held, in the proportion demonstrated by actual practice, ONE THOUSAND AND SEVENTY-NINE MILLIONS ONE HUNDRED AND NINETY-ONE THOUSAND SEVEN HUNDRED AND FORTY-SEVEN TONS OF CRUDE IRON.

These quantities are so enormous, as to render impracticable any valuation of the contents of the basin from the selling price of any small fractional part of its products. Thus, for instance, if for a guide the rent of the anthracite mines of Pennsylvania be taken at its lowest, 25 cents per ton of coal, the value of the Alleghany coal only, would be nearly \$1,600,000,000—a sum which, under all circumstances, might be called impossible to be realized at any one epoch. Or, if we attempt to arrive at it in another way, by determining the amount of capital necessary to be outlaid in working the mines to their full extent, it would be difficult to accord in the estimate; and not less so, to define the precise period of years which would be required to effect the total extraction of the material. The method of *rental*, however, may be taken as an exponent of the *intrinsic* value of the basin, so far as coal and iron are concerned.

But there is one practical calculation which may be fairly made, and which should have just weight with the interests of the State; and that is the *present value of the annuity* of tolls on the Chesapeake and Ohio canal, (through which the whole quantity must pass,) rated according to the capacity of the canal, upon the entire quantity of coal and iron which has already been indicated.

That capacity was stated by the committee of the stockholders in 1839, as being at present 1,000,000 tons per annum, but capable of increase by double locks, and some additional feeders, to 10,000,000 of tons annually. In the one case, the coal could not be exhausted for upwards of 50 centuries: in the other, it would last for 500 years.

The whole of the coal in the basin, as before stated, must, of necessity, be delivered along the canal—after subtraction made of the waste in the mines, and elsewhere. This waste in the English mines, is one-half of the quantity sold; or one-third of the entire coal in the mine. Applying this deduction, there is left about 4,200 millions of tons of coal, which must all go down the canal in annual quantities, up to ten millions of tons, and pay toll at the present established rate, of one-half cent per ton per mile, or *ninety three cents in all*, from Cumberland to Georgetown.

If one million be assumed as the annual trade, the present value of the stock would be about, at six per cent. seventeen millions of dollars.

If the maximum of ten millions be taken, it would be one hundred and sixty millions of dollars.

Thus it appears; that whatever the State may outlay for the canal, and facilities to the coal-proprietors, under seventeen millions of dollars, is perfectly secure from the downward coal-trade alone, supposing that trade to be equal to, and never exceeding, a million of tons. If it did exceed this amount, the annual revenue would be correspondingly increased, the premium of the stock would advance, and the cash value of the annuity of tolls would vary from seventeen to one hundred and fifty millions of dollars; or in other words, the State would be in possession of a permanent capital to that amount.

The determination of the amount of trade likely to be carried on in the article of coal along the Chesapeake and Ohio canal, is another point hardly to be predicted. What has been said heretofore, is upon the supposition, that the entire downward capacity of the canal be employed. There are no conclusive data tending to establish this as a fact of occurrence, immediately upon the completion of the work: but neither the value of the coal basin, nor the interest of the State in owning the communications from that basin, can be supposed to be overrated, even in case some of the deductions from the positions just taken, should not, for several years, hold good in point of fact.

The export of coal from the anthracite fields of Pennsylvania, may be said to have grown, in a period of fifteen years, from nine thousand five hundred tons to eight hundred thousand tons.\* As

\* The following table shews the amounts of anthracite coal exported annually, from the commencement of the trade to the present year.

Years.	Tons.	Years.	Tons.
1820	365	1831	226,820
1821	1,073	1832	363,871
1822	2,240	1833	545,588
1823	5,823	1834	376,636
1824	9,541	1835	557,535
1825	33,699	1836	696,526
1826	48,115	1837	864,751
1827	64,798	1838	709,718
1828	85,292	1839	735,553
1829	122,403	1840, estimated	794,000
1830	192,734		

that growth had, however, to contend against much prejudice, against the intrinsic inconveniences of the article itself, and against the absence for some time of means to communicate readily with a market, while it was wanted by a smaller population than exists now, it cannot be considered an extravagant estimate to suppose the trade on the canal, *provided suitable approaches are made to the coal region itself, which the canal does not reach, and will not have reached at Cumberland*, might attain the same quantity, (eight hundred thousand tons,) in seven years. After that, referring to the fluctuations of the Pennsylvania coal trade, it cannot be safe to suppose that the consumption will increase in a ratio greater than the population, inasmuch as the exports from this region will be then fully one-third of the entire consumption of the United States, in coal which can be said to have been *exported*. This increase of population may be set down, in the districts accessible to the Frostburg coal basin, at about two per cent. per annum; and assuming at the end of 7 years after completion, a trade of . . . 800,000 tons; the increase would amount

at the end of 10 years after completion, to	848,967 tons ;
do. 15 years do.	937,328 tons ;
do. 20 years do.	1,034,886 tons.

This increase is not, perhaps, so rapid as might be desired by those interested in the subject; but it appears a safe estimate, and is abundant to demonstrate the immense value which should attach to the region; inasmuch as it shews that the State will be receiving at the end

of 7 years after completion, more than	8 per cent.
of 10 do. do. nearly	9 do.
of 15 do. do.	9½ do.
of 20 do. do. more than	10 do.

upon all her past, present and future investments in the work, assuming the estimates of last year to have been correct, and that the work can be finished in two years from this time.

Nevertheless, all estimates in matters of this sort, are to be received with a great deal of caution; and the Geologist has been, perhaps, tediously particular in referring to the data upon which he has founded the present results. A remarkable instance of the fallacy of calculations, applied to a similar subject, may be found in the estimate made, apparently with great care, for the

Legislature of Pennsylvania, in 1834.\* Taking, as they did, the progression of ten consecutive years, the exports of anthracite was, this year, to have exceeded four millions: or what is the same thing, every *fourth* soul of our whole population, east and west, should make way with rather more than one ton per annum. Yet all parties, from the State that constructs the means of communication, to the proprietors of the mines, appear to be well satisfied with a trade, of less than one-fifth the expected amount.

In the above table of exports, 800,000 tons has been allowed as the consumption likely to exist by analogy with the Pennsylvania coal trade, at the end of 7 years after the completion of the canal. But it would be very difficult to assign for each one of those seven years, its corresponding consumption. The following considerations may be taken in connection with this part of the subject.

With a large amount of nominal capital, as before stated, it yet happens that but a small sum, comparatively, has been actually outlaid, or is ready to be outlaid for the exploration of the mineral resources of Allegany. One main reason for this is, the delay in the canal and the loss of interest, which those who

\* The following extract from the Report alluded to, may be taken in illustration of the text.

The average increase of consumption from the commencement of the anthracite coal trade in 1820, has been a fraction more than 33 per cent. or an increase of one-third yearly. —

If the annual consumption of coal for the ensuing ten years, should be in the same ratio as that of the ten years past, the increase will be as follows:

1833,	592,210 tons,	at \$5 00 per ton,	\$2,961,050.
1834,	789,613	do. do. do.	3,948,065.
1835,	1,082,280	do. do. do.	5,261,100.
1836,	1,403,040	do. do. do.	7,015,200.
1837,	1,870,713	do. do. do.	9,353,555.
1838,	2,494,284	do. do. do.	12,171,420.
1839,	3,325,712	do. do. do.	16,628,560.
1840,	4,434,282	do. do. do.	22,171,410.
1841,	5,912,377	do. do. do.	29,561,830.
1842,	7,833,163	do. do. do.	39,415,840.
1843,	10,510,890	do. do. do.	52,544,450.

Report of the Committee of the Senate of Pennsylvania on the subject of the Coal Trade; 4 March, 1834—page 44.

It may only be remarked, in connection with this, that the actual increase in twenty years, has been at the rate of 40,000 tons per annum, or less. To apply this in any fractional relation to the amounts of any one of the years of the progression, is to bring in questions of compound interest, which are inapplicable in matters of this kind.

became proprietors some time since, at high prices, have found themselves compelled to suffer. Out of the twelve incorporations who hold property in the coal fields, it is therefore hard to say, what number will go into immediate operation. If one-third of the number, or four companies, be supposed to go into immediate operation, the probable amount delivered might be from one hundred thousand, to one hundred and twenty thousand tons of coal: and if so many should not be active, the export, it is to be presumed, will not exceed twenty-five to thirty thousand tons from each mine. This is not an arbitrary limit, but has been fixed after consulting with those who have already acquired practical experience. It is by no means meant that a larger amount could not *in possibility* be got out; but that the interest of the proprietors would be soon seen to be better secured in this proportion, under all circumstances, than in costly and troublesome attempts to expand the amount of their exports. The quantity just mentioned can be readily delivered from one adit; and it is to be presumed, that the proprietors would desire to see the machinery and arrangements of the first mine working to their satisfaction, before the establishment of the second. It will be found, also, that this result agrees with what has taken place on the opening of new mining operations in Pennsylvania.\*

The uncertainty as to the amount to be delivered at first, is increased by the circumstances of the location of the most important coal beds with reference to Cumberland; which is so far considered to be the terminus of the canal, though yet *ten* miles from

\*The following table compiled from the Senate Report, already referred to, shews the names of sundry proprietors of active coal mines, the time that they had been engaged in the working of their mines, and the amount of exports which they had attained during the last year of that period. Almost all the individuals concur in asserting an ability to render active the trade in coal, fully equal to that of incorporated companies.

	in 3 $\frac{1}{2}$ years,	mined 4,500 tons, per ann.
Samuel Lewis,	4 do.	3,000 tons.
F. Hass,	6 do.	4,500 tons.
Samuel Brooke,	3 do.	6,200 tons.
W. Wagner,	10 do.	5,000 tons, nearly.
F. B. Nichols,	4 do.	25,000 tons.
James Wilde, <i>stopped in 1830,</i>	2 do.	1,300 tons.
V. B. Palmer,	7 do.	25,000 tons.
N. America Co.	4 do.	1,000 tons.
John C. Ernst,	4 do.	5,500 tons.
Hodgson, Pinkerton & Co.	2 do.	3,000 tons.
D. R. Bennett,	3 do.	5,000 tons.
Jacob Serrill,	4 do.	

the nearest coal, and more than *forty* from the farthest. It is manifest, that the use of the canal depends upon the willingness and ability of the coal proprietors to construct the necessary intercommunications. It so happens too, that the bulk of the coal is more remote than the mean distance: and from the nearer points, it is questionable whether the most prudent policy would not be to restrain the export of coal, in order to preserve it for a more profitable application in the manufacture of iron. Now assuming that the owners in the southern extremity of the basin, are prepared at present with the necessary funds for the construction of the suitable intercommunications, it is rather to be expected that as sagacious men, they will not be led away by the prospect of gain, to adventure largely, until they are satisfied that the main channel of transit will be completed for them, from Cumberland down. It is admitted now, that to have commenced their improvements before, would have been premature; it will be equally so, until the canal can be more certainly expected to be finished at a stipulated period, than is at present ascertained. From the amount of work, too, necessary to be done upon the aforesaid intercommunications, some time (it may be safely said two years) must elapse between their commencement and completion. And this circumstance throws another uncertainty upon what they might be disposed to do. If, for instance, the works alluded to, should be commenced at any time, say one year before the completion of the main canal, it could not be assumed that they should be finished in less than one year after such completion. The consequence would be, an idle year, so far as the transportation of coal is concerned. It is hardly possible that a trade in other articles would supply the expected revenue.

All these facts and remarks bear upon the propriety and advantage of the State's adventuring to construct an improvement of the Potomac above Cumberland, into the very heart of the coal region, that is, to the mouth of Savage. This would not only equalize the localities in the coal region, but would tend to render certain, what is now only problematical; namely, a trade to the proportional amount before mentioned from each of the several companies owning property at the southern extremity of the basin.

It may not be amiss to remark, in view of the profits to be derived from this work, that whilst it might be delayed in the hands of private enterprize—among other things, by the fear of its not being productive—the State alone has no such cause for

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apprehension. It may be said generally, that every ton passing over the thirty miles from Cumberland, to the mouth of Savage, and paying a toll, say of fifteen cents, (or thirty cents, if the full tariff is imposed, to which the coal proprietors would probably make no objection,) pays six times that amount on the main canal—all of which goes to the State treasury. To apply and illustrate this in a specific case; suppose the canal finished to Cumberland and there stopping—no trade would come down from the southern extremity of the basin so long as the works in that extremity remained incomplete. Preceding considerations have indicated one year as a period of incompleteness certainly to be expected. Greater detailed information than the Geologist can be supposed to have access to, would perhaps make reasonable a longer period. But it is sufficient for the illustration to take one year. By the first hypothesis, the revenue of the canal will be at best, but twenty-five per cent. of what might otherwise be derivable from the coal trade. Under the second hypothesis, of the extension being made to the mouth of the Savage by the State, *simultaneously* with the main canal, take two companies out of the four or five who are located there, and suppose them active to the amount before mentioned, viz: fifty thousand tons in all: full tolls on this amount to Cumberland would be \$15,000

And the present tariff on the canal, on only 40,000 tons, supposing 10,000 to be abstracted for consumption at Cumberland, may be set down 40,000

\$55,000

Or very nearly six per cent. on a million of dollars.

This forty thousand dollars, it is to be observed, is clear gain; for it only exists in consequence of the co-existence of the extension, and may be fairly set down as profits of that extension. Only the State however—no other party—can be in the case of regarding it in this light. To private corporations making the extension, the first year's work under their management would be, more or less, according to the character of the work, a loss.

The extra profit on the main canal, from upward freight, in the five hundred cargoes of coal which have gone down, is left out of view. And another remark may be made here, in connection with what was before said about equalizing facilities for all the localities—and this expression is not used with any reference to the interest of the several proprietors, but to the interest of the

State, as the assignee of the profits of the canal. It is admitted that the mines of the northern end of the basin would be, upon completion of the canal to Cumberland, first in activity. But may it not be presumed that for some time, the great part of their products will be used on the Baltimore and Ohio rail road? Assuming a trade, less active than there is reason to hope will exist upon that road, and it will require nearly all the produce of two mines, rated as before, to supply it in fuel. It is all very well that the coal owners get a prompt market for their produce, and that the rail road company get a better and cheaper fuel—but no part of this fuel, be its amount great or small, goes upon the canal, at least for a long time to come, or pays any toll to the State.

Of the cost of the extension here suggested, the Geologist is not the proper person to present an estimate. He contents himself with extracting the following passages from a recent letter of Judge Wright, whose skill as an engineer is indisputable, remarking upon this very subject. He says:

‘In my examinations of the river, (Potomac,) I came to an opinion, in my own mind, that the formation of the country and the river would induce me to adopt the lock and dam and short canals, as the preferable plan.

‘I made up an opinion that a good and useful navigation by dams, pools, with tow-path along them, and canals of a half mile to two miles long, could be carried up to Westernport, for about twenty thousand dollars per mile.’

—At this rate the extension could be made to Savage for \$600,000.

It has already been shewn, that if a trade of only fifty thousand tons be created upon it, the interest of the outlay to its extreme limit, will be borne by said trade. And as it would not for sometime be to the advantage of private corporations to construct such a communication, it would necessarily remain undone; so that the hitherto-formed expectations of the State upon revenue from the coal region would be, to a considerable extent, frustrated.

The principal reliance of the State and of the stockholders in the canal must, doubtless, be upon the *coal trade*; still there is room to expect large profits from the transportation of *iron*—in its crude and manufactured state—and of various commodities that will be produced out of the other resources of the county. In estimating, therefore, upon a preceding page, the progressive

increase of trade on the canal, the most obvious and paramount cause only was taken into consideration. The resources now alluded to, as well as contingencies that might create an unexpected expansion of the coal trade itself, were overlooked; which would be necessarily calculated to increase it beyond the limit of the former computation. One of these contingencies may be considered as having already occurred; in the navigation of the ocean by steam-ships. There can be no doubt, from the great superiority of the Allegany coal, that wherever it can be obtained at the same price, or even at a small advance in price, it will be preferred. As an agent for the generation of steam, it has been found much more effective than the ordinary English coal imported into this country, and, of course, infinitely more than anthracite; the use of which, it is presumed, it will almost entirely supersede. Lieutenant W. Y. Lynch, of the United States navy, in a letter to the Hon. Wm. Cost Johnson, published in a report to congress, says: 'that *one ton* of Cumberland coal is, in mechanical effect, equal to two tons of anthracite.' Mr. Brien, the proprietor of the Antietam iron works, says: 'we have made a fair experiment of this coal compared with the Richmond, and find it to be a much superior article. *One bushel* of Cumberland coal is worth *two* of Richmond, or any other we have used.' It is supposed to be at least twice as efficacious for the same purpose of generating steam, as pine wood, and consequently will be preferred in the navigation of our own waters by steamboats, or in the transportation over the rail roads by locomotive engines. The gases obtained from it for illuminating purposes have been found to be purer and more brilliant than from other coals; and as it also furnishes a larger quantity of coke, its use, in this respect, will be deemed more profitable. The chemical composition of this coal has been so frequently given, that it is useless to repeat it. It may be sufficient to state, that an average of all the analyses made by different chemists, shows it to contain about ninety-three per cent. of combustible matter, with not more than five per cent. of earthy matters, and in the main vein no sulphur.

After a careful survey of the Frostburg coal basin, having become acquainted with evidences of the immense wealth it contains, and considering it in connexion with that great State work, the Chesapeake and Ohio canal, (which it would have been justifiable to make, if only for the purpose of transporting the coal of this region,) the above conclusions have been arrived at, and are

submitted. In his intercourse with his fellow-citizens in all parts of the State, the Geologist has discovered, that the ideas entertained of the value of the mineral region of Allegany county, and of the services which the canal is to render, are very vague and indefinite; and not aware that any document is in course of preparation to be laid before the public or the legislature, he has extended his remarks beyond what might be considered his legitimate province. His opinions, however, in reference to the more intimate connection of the canal and coal basin, are given with due deference to the more experienced and more enlightened judgment of those who may have brought to the subject the same attention, and will probably be called upon to decide upon it *professionally*. Conflicting opinions may arise also out of supposed local advantages; but it is to be hoped that the general interest of the State and canal principally, will be taken into consideration. The Geologist, in forming his opinion, has looked at nothing else.

It is hardly to be believed, that the canal proper will ever be extended beyond Cumberland; and at this place it has not reached the coal trade, upon which its utility and value depend. To wait until the necessary connection with the coal basin shall be made by individual enterprise, would be retarding, to an almost indefinite period, the profits which the State expects eventually to derive from it. Should the companies situated at the southern extremity of the basin conclude finally to construct the suggested intercommunication, then it becomes doubtful whether it would be good policy to allow them the exclusive control of it.

So far then as calculations upon reasonably assumed facts, laid down in the preceding pages, can be relied on, it would appear, from what has been previously said, that the State is perfectly justifiable in advancing up to an outlay of seventeen millions of dollars for the canal and slack-water navigation up to the mouth of Savage; for so soon as it will begin to carry down one million tons of coal annually, which is its present capacity, its intrinsic value will be represented by that sum. But this amount of trade can only be expected to arise out of the simultaneous activity of both the northern and southern ends of the basin—the latter of which, without the slack-water extension to the mouth of Savage, must remain for a considerable period dormant.

The interest that would be attached to other items that might be included within the statistics of the mineral wealth of Alle-

gany county, is absorbed by what belongs to those that have just been considered; yet there are other materials of value within its limits which go to swell the amount of its mineral resources. In the western part of the county in the Yohogany coal field beds of excellent iron-ore, have been discovered on Bear creek, and specimens of very good peroxide of manganese have likewise been found. On Keyser's ridge there is a good deal of this mineral, but so ferruginous as to impair its value. Lead has been reported as also occurring; but this whole region remains yet to be explored.

In the immediate vicinity of Cumberland there occur, between the strata of limestone, ledges of a mixed rock, consisting of carbonate of lime, alumine, silix and a small proportion of oxide of iron; which produces an excellent hydraulic lime. It is simply calcined and then ground. The Messrs. Linn, upon whose property it is found, and who discovered it, have obtained contracts from the Chesapeake and Ohio Canal Company, to whom they supply large quantities of this cement, which, for their constructions, proves as conveniently situated as it is advantageous.

The encrinital limestone mentioned in the the first section as occurring in the valley of Braddock's run is found to receive a good polish; it is of a light red colour, variegated by the fossils which it contains, and may possibly, some day, find its way to a market as an ornamental marble.

Beds of iron-ore, of the variety known as bog-iron, are found on Warrior mountain; and some inferior kinds of argillaceous oxides of iron, together with erratic pieces of brown hæmatite occur in Town-hill. It is not deemed prudent to calculate largely upon their value; and so it has been represented to those who own the property upon which they have been seen. The same remark applies to the existence of irregular veins of *anthracite* coal, that seem in some unaccountable way to have become wedged in, together with other coal rocks, on the summit of the last named hill.

### SEC. III. *Physical Geography and Geology of Washington County, with an account of its Mineral resources.*

The geographical extent, included within the limits of Washington county, is computed to be nearly five hundred and twenty-five square miles, or three hundred and thirty-six thousand acres.

Its limits are Sideling hill creek, which separates it on the west, from Allegany county, the crest of the South mountain dividing it from Frederick county to the east, Mason and Dixon's line to the north, and the Potomac at the south. It has always been considered one of the most productive counties of the State, and its physical geography and geology are peculiarly interesting. For description, it may be divided into two regions, one west of the North mountain, commonly known as the *Blue ridge*, its mountainous portion, the other, the broad and fertile valley of which Hagerstown is the centre.

The western slope of Sideling hill, is drained by a creek to which it gives its name, that empties into the Potomac at a gap through the ridge. It is used as a feeder to the Chesapeake and Ohio canal, and flows through a forest of yellow pine. The timber, however, on this side of the hill, has suffered much from accidental fires. The traveller from the east, on ascending to the summit of this ridge, sees an imposing mass of mountains before him; and if he would enjoy as magnificent a view of the scenery which they afford, as might probably be found any where, he should take lodgings the night before, at the comfortable inn of Mr. John H. Mann, situated at the foot of Sideling hill. Rising the next morning before day, if the weather be calm and the sky clear, he should leisurely ascend the mountain, and on reaching its top, cast his view back over the eastern country. He beholds at first an extensive and darkly shadowed valley, intersected transversely, and in two or three places longitudinally, by serpentine lines of a lighter colour. He soon recognizes in these, the mists settling upon water-courses; the former lines indicating the course of the Potomac, the others, the direction of the smaller streams that empty into it. The view of the spectator is bounded by the flank of the North mountain, over which a bright line indicates the approach of day. As it advances, the mists seem to increase, and on the emergence of the sun from behind the mountain mass, they become luminous. The spectacle at this time is indescribably grand. The broad valley now reflects the dark green colour of the pines, the lofty summits of which become visible; the vapours over the river and confluent streams assume a phosphorescent appearance, and as they are dispelled by the sunbeams, form into wreaths of surpassing brightness. The striking contrast which they then exhibit with the still dark surface of the valley, is fancied to be imitated in the splendid mez-

zotint engravings of the school of Martin. As the shades disappear, and the sun gains the ascendancy, the interest of the scenery is still kept up in the extensive prospect it affords, as well as in the beauty of its details.

The geology of Sideling hill is interesting. Its base and mass consists of the red sandstone; whilst its superior portions are composed of rocks of the coal series—sandstones, shales and anthracite. These seem to have been originally very irregularly deposited, or subsequently strangely distorted; the strata being, as it were, wedged into the red sandstone. Masses of millstone grit also occur on the crest of the mountain and on its flanks.

Deep run and the Little Conoloway take their rise on the two sides of a spur, connecting Sideling hill with the Conoloway mountain; the former running south and emptying into the Potomac, the other in a north-eastern direction, through a gap in the last named mountain, to discharge itself also into the Potomac, at Hancock. The mass of Conoloway mountain is the blue cavernous limestone. In the vicinity of Hancock, at the eastern foot of the Conoloway, there are slates and shales, apparently belonging to the coal series; but they form only a superficial covering to the red sandstone, into which they run, and will which even they sometimes alternate. Among them, there are some strong sulphuretted chalybeate springs, on the property of Captain Johnson. On the Virginia side of the river, two miles from the village, on the road to Bath, a white sulphur spring has been recently opened, on the estate of John C. Orrick, Esq. An alternation of slate, red sandstone, and limestone, continues into the North mountain, on the summit of which, an indurated sandstone, truly a quartzite, makes its appearance. This portion of the county, between Hancock and the North mountain, watered by the Big Conoloway and Licking creek, together with some unimportant streamlets, all emptying into the Potomac, lies on the southern slope of subordinate hills belonging to Pennsylvania. On the borders of the Potomac, there are extensive alluvial bottoms, that have been much interfered with by the excavations for the canal. There are no indications within these limits of the continuation of the anthracite formation occurring in Virginia, on Sleepy creek.

A more detailed account of the geology of the North mountain is postponed to another occasion. Between it and the South mountain, lies the valley of Hagerstown, which viewed from the

summit of Mount Casey, one of the projecting knobs of the Blue ridge, can scarcely, it is thought, be surpassed in interest and beauty, by any other region of country. Forming only part of an immense valley, extending between two prominent ridges, from the northern boundaries of the State of Pennsylvania, beyond the southern limits of Virginia, the view wanders from north-east to south-west, over an interminable succession of woodland and cultivated fields, traversed in a south-eastern direction by the Potomac, and lengthwise by the Conococheague, and the Antietam. The whole of this valley, with the exception of a ridge of slate rocks commencing on the east side of the Conococheague, and extending between two and three miles, rests upon limestone rocks. The limestone is cavernous, which imparts a peculiarity to the physical geography of this portion of the county, of the same sort of interest that was said to belong to some parts of Allegany county. Most of the water-courses are furnished by copious streams that issue from caverns in such abundance, that they furnish mill-seats a few hundred feet from their sources. The *cold spring* in the immediate vicinity of Hagerstown, possesses in this respect sufficient interest to deserve a visit from travellers; and under the management of its present proprietors, Mr. Hiser and Son, who are about fitting up public baths on this spot, will acquire additional claims to their attention and favour. Another peculiarity of these springs is, that their waters are highly charged with the bi-carbonate of lime, which they acquire by contact with the limestone rocks in their subterranean reservoirs. When exposed to the influence of the sun, the excess of carbonic acid which they contained, and that rendered them solvents of calcareous rocks, escapes, a pulverulent neutral carbonate is precipitated along their course. It is probable that formerly these streams were still more abundant than at present; for on both sides of their actual course, there are broad and deep deposits of this calcareous sediment. In consequence of their copiousness, moreover, they never freeze; and the Antietam, which is supplied in this way in every stage of its progress through the country, thus furnishes a very large amount of never failing water-power.

The Little Conococheague, on the west side of the valley, is a stream of little importance. The Big Conococheague, which in the same direction, divides the limestone from the slate rocks, though affording some water-power, is not so constant as the

Antietam. The latter, reinforced by Beaver creek, which flows through a flourishing settlement on the east side of the valley, and by the Little Antietam, is the most important stream of the county.

There is no doubt that there are in this limestone formation of the valley, numerous caverns that are so many reservoirs of water that have flowed into them from the adjacent mountains. These waters are evidently not of subsidence from the rains that have fallen over the surface of the country; for in this case, their level would be that of the springs whence they issue; whereas, when dammed, they are made to rise several feet above the springs: they have, therefore, come mostly from the mountains. These circumstances have suggested the probability that borings for water, (or as they are termed, *Artesian* wells,) might be sunk with success, which would furnish a constant supply, even at some elevation above ground, of *soft* water. If it be true that the waters of the springs have come from the mountains, they have become *hard*, or impregnated with lime, during their sojourn in the caverns previously referred to; and should it be found practicable to tap them before their passage, they might be brought to the surface with their original purity, which would be for many purposes desirable. There can be but little doubt, at all events, that a constant supply of water of some kind would be obtained by boring at probably no very considerable depth. Some of the caves are very near to the surface, and in one instance, there is formed a remarkable, circular, funnel-shaped pond, upwards of a hundred feet in diameter, and of considerable depth, without any outlet to the water contained within it, the level of which is said to vary but little, and without any accordance with the variations of the seasons. This pond occurs at the western foot of the South mountain, near Cavetown.

The surface of the valley is rolling, in some places hilly; these irregularities arising from the different character of the limestone rocks and slates, that have opposed various degrees of resistance to the disintegrating effects of time. At its south-east extremity there is a prominent ridge, called the Elk hills, running parallel with the South mountains, and like them, capped with quartzite. Between them is a thrifty settlement, known as Pleasant valley, which is watered by Israel's creek. The southern termination of the Elk hills, forms the Maryland side of the gap at Harper's Ferry, and between their western slope and the Antietam, and

generally on the eastern side of this stream, the limestone rocks assume a distinct character, passing from the ordinary blue-limestone to marbles of the finest grain, from white, to many shades of colour; fitting them for statuary and other ornamental purposes. It would seem, that by an effort which it is difficult to understand, and much more to appreciate, the marbles of this region have been used in nature's great factory, as the materials required in the formation of the breccious rock quarried on the banks of the Potomac, and used in the erection of the well known colonnade for the house of representatives and senate chamber, at Washington. Some of these marbles now form, and will in time constitute a more important item in the mineral statistics of the county. White statuary marbles, and others variegated and of fine grain, are quarried north of Leitersburg, on the Little Antietam, and a few miles south of Boonsborough.

The *iron-ores* that formerly furnished occupation for three furnaces and two forges have been well nigh exhausted. Only one of these establishments, is at present in operation—the Antietam Works—which is in part supplied with ore from a locality two miles above Harper's Ferry, on the Maryland side of the Potomac, and from a similar deposit on the Virginia shore, six miles above the ferry. The ore is of that variety usually termed *pipe-ore*, or sometimes *limestone-ore*, from the circumstance of its usually occurring in this rock. It yields a metal of very good quality, well adapted to the manufacture of bar-iron, and is said to be in great esteem at the United States' armory, Harper's Ferry, from which the works are only at a short distance. The iron-ores, and indications of iron-ore, that present themselves at the other extremity of the county—on Sideling hill—are not deemed to be promising enough to justify any great outlay for their exploration.

In the report addressed to the executive of Maryland as early as the year 1833,\* there is the following paragraph:

'Williamsport, situated near the confluence of the Conococheague and Potomac, has been frequently indicated as the centre of a district in which *anthracite coal* might confidently be expected to occur. The undersigned are not aware of the grounds upon which this assertion has been made. As was stated in regard to certain parts of Frederick county, there is nothing which

\*Report on the projected survey of the State of Maryland; Silliman's Journal, No. 1, vol. xxvii. page 27.

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absolutely forbids it, nor is there any thing which, in their knowledge, indicates it. The known region of *anthracite*, supposing it necessarily to extend from Pennsylvania through Maryland, would not be found to correspond with this portion of the State; it would rather strike farther west, between Hancock and Sideling hill.'

This prediction has been verified. Anthracite is found in Sideling hill; but unfortunately under circumstances that preclude the probability of its being made available, except to a very limited extent.

Specimens of sulphuret of lead have been collected in this vicinity, and forwarded a few years back for examination. One of these was found to contain three per cent. of silver: but all endeavours that could be made during the past year to ascertain their locality, have been fruitless. Another article of some commercial value has been produced from within the limits of the county, which want of opportunity, and the absence of those acquainted with its precise locality, have left still unexplored. The article referred to is known in the arts by the name of *Emery*. It is an exceedingly hard mineral, associated to the corundum or adamantine spar, and is extensively employed for grinding metals, glass, &c. for which purpose it is reduced to various degrees of fineness by elutriation and other processes, and then sent into the market, where it commands from three to four dollars per cwt. This mineral has been found on the estate of Mr. Brien, in the vicinity of the Antietam iron works. Indications of copper present themselves in the quartzite of the South mountains in Harman's gap, but with little promise of any consequence. Cabinet specimens of the green carbonate of copper were presented for inspection, that are said to have been derived from this locality.

Among the mineral resources of the county, should be enumerated, together with that inexhaustible and most valuable one to its agricultural interests—limestone—those calcareous deposits that have been previously referred to as occurring along the margin of the streams that flow from the limestone springs of the country. These deposits occur wherever such springs are, and considered collectively, furnish an abundant material wherewith to improve the agricultural condition of the lands. Few experiments have been as yet made with it, and the results, so far, appear discrepant; but there can be no doubt of its usefulness, if properly employed; a desideratum which time and experience

only can supply. It has already been found that the meadows, which rest upon this calcareous sediment, and are in their original condition unproductive, are benefited to a great degree, by hauling upon them the clay soil of the hill-sides; so that it is reasonable to suppose that a converse operation would prove equally beneficial. If so, it is only necessary to point to the advantages of both operations being carried on simultaneously. Another obvious mode of employing it with certain advantage, is as an ingredient in composts; for which purpose it should be liberally hauled into the barn-yard and manure-pits. Under these circumstances, in contact with vegetable and animal matters, it would bring about a rapid fermentation, during which numerous salts would be formed that in themselves constitute powerful manures. It has been strongly urged upon the intelligent and enterprising farmers of the county to submit this material to varied experiments; and there is reason to expect that some good will result to its agricultural interests from them.

The limestone rocks, that have been referred to as underlying a large portion of the county, vary considerably in their chemical composition. They are found of great purity, constituting the statuary marbles already mentioned; whilst there are others that contain a large proportion of silex and alumine, which greatly enhances their value; as they are, in consequence of this admixture, rendered fit for the production of a hydraulic cement that has been employed with great advantage in the construction of the locks and dams of the Chesapeake and Ohio canal. The true character of those limestones, that afford hydraulic lime, has been of late years investigated with great care. It results from a great number of analyses made by some distinguished chemists abroad, that *silex* alone may form with lime a compound eminently hydraulic, and that *magnesia* alone, or mixed with the oxides of iron, or manganese, or with both, cannot produce a similar compound. These results have been confirmed by a series of synthetic operations conducted by Vicat, proving that *alumine* alone, which is the basis of all clays, has no more efficacy in rendering the lime hydraulic, than *magnesia*; secondly, that *silex* is one essential ingredient in all limes of this sort; thirdly, that the oxides of iron and of manganese exert no influence of the kind; and fourthly, that the proportions of *silex* and *alumine*, should be such as to constitute the ordinary kinds of clay. The material quarried near Funkstown, and used by Mr. George

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Schaeffer, answers admirably this last condition; it is in fact a mixture of carbonate of lime and clay. At this last named locality the cement stone, which is in strata of from two inches to eighteen inches, lies imbedded in the ordinary blue limestone of the county, and is not unfrequently covered by layers varying from six inches to four feet of a refractory limestone, of light yellowish colour, hard, compact, and containing an excess of alumine. The draucic lime is of a pale blue colour, compact texture, with an even fracture. Other localities affording materials of the same value occurs within the limits of the county. The same enterprising citizen just named, it is understood, has large contracts for this cement with the Chesapeake and Ohio Canal Company, which he produces from materials at hand, in the vicinity of Hancock.

#### SEC. IV. *Agricultural Condition of Washington County.*

Though the agricultural condition of the county may be said to be prosperous, there is still room to expect some benefits from the application of mineral and other manures, directed according to a better knowledge of the various kinds of soil that occur within its limits. These soils vary according to the nature of the rocks from which they are in part derived and which they overlie. In the preceding section, the limits of the different kinds of rocks were laid down; and it now remains to point out the distinctive characters of the soils which cover them.

The western portion of the county embraced by the North mountain and Sideling hill, has been described as formed, in a great measure, of the termination, or spurs, of subordinate ridges that constitute a part of the territory of Pennsylvania. It is but a small part of the county, from which the excavations for the canal have abstracted a considerable portion of its best arable lands, consisting of rich alluvial bottoms in the valley of the Potomac. The value of the remainder, however, has been doubtless enhanced by the passage of this great work of internal improvement. These bottom lands are very productive, and are already contributing their quota to the tollage of the canal by which they are traversed. The hills and hill-sides, being composed of limestone, slate, shales and sandstone, afford soils that vary from a stiff-clay to a light loamy soil, all naturally of good quality, and readily improved by lime; a material which, from the

facilities offered by the canal for obtaining coal, will shortly be procured for a trifle. The slate soils and the light loamy soils are those that will be found to derive the greatest benefit from lime; or rather whose improvement by it will contrast more forcibly with their actual productiveness; for all the other soils may also be expected to improve by a like treatment.

The valley of Hagerstown, which comprises about two-thirds of the county, is its most flourishing portion. It is based principally upon limestone; with the exception of a low ridge of slate already referred to, on the east side of the Conococheague, and on the flanks of the mountain, the soil of which is mostly derived from the disintegration of a white sandstone. With regard to the limestone rocks, however, as they vary in their composition, they occasion corresponding variations in the character of the soils which they yield. These limestone soils may be divided into three kinds, deserving of more especial notice, as the others graduate into each other in multifarious ways that would require a much longer and minute investigation for practical purposes than could have been given to them, in the time allotted to the survey of the county during the past year.

1st. *The compact blue limestone*, which is the most abundant, furnishes a soil of a red colour, rather stiff, well adapted to the growth of *wheat*, but somewhat uncertain in a season of long continued drought. This limestone is a mixture of carbonate of lime, clay and oxide of iron, with (for a limestone rock) an excess of alumine and silex or clay; whence the soil probably derives its peculiar stiffness. An additional proportion of lime would, beyond a doubt, improve a soil of this kind; and whenever convenient, no supply of calcareous matter can be found, it would seem, better suited, than in the deposits previously alluded to, that occur on the margin of the limestone springs. Besides, wheat, oats, rye, corn, and grain generally, as well as the root crops, might necessarily be expected to be not only more abundant, but in truth, secure from peculiar inclemencies of season, that render them, even under apparently the most favourable natural condition of things, still precarious.

2d. *The purer limestones* that occur principally east of the Antietam, and furnish the marbles also referred to in the former section, yield a soil likewise of good, and in some places, superior quality to the preceding. Their natural admixture of silex and alumine, of which neither is in excess, renders them porous,

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and yet sufficiently tenacious to produce grain crops of every description. They, however, too, would be improved by the application of lime, in which, remarkably enough to be sure, they are found to be deficient, at least in its desired combination; that is, as *carbonate of lime*.

3d. There occurs west of the Antietam, and between the region of the blue limestone and the slate ridge of the Conococheague, a ledge of limestone rocks of a peculiar character. The portion of the county which it supports, is known as the *Salisbury tract*, passing in a north-east and south-west direction through the county, on an estimated average breadth of a mile and a half. It has been remarked of the soil produced by the decomposition of this rock, that it is, to use the provisional term, *spummy*. In frosty weather, it cracks and freezes; the intervals between the crevices are filled with small icicles; the tender roots of the winter grains are thus thrown out and exposed, and in this manner, as a natural consequence, the wheat crops especially, are rendered very precarious. The physical characters of the limestone that furnishes this peculiar soil are well determined; so well indeed, that any one with the experience of only a few rides over one section of the county to the other, recognizes at once that he has reached the Salisbury tract, by the colour of the soil, which is much lighter, and the appearance of the protruding limestone rocks. The latter varies insensibly between two kinds: one of a dull white, comparatively soft, and of less weight and compactness than the blue limestone; the other of an ash-grey colour, traversed by numerous small veins of calcareous spar, probably constituting that variety of limestone, known as the *magnesian carbonate of lime*. There can be no doubt that the difference in the character of the soils of this section of the county, is due to a corresponding difference in the nature of the rock that furnishes it. As the lands situated within this tract, are, in consequence of these peculiarities, considered generally less valuable, the subject deserves to be more carefully examined into, by instituting a series of chemical analysis of the rocks themselves, as well as of the soils which they produce. This matter is in progress of investigation, and the result will be communicated as early as possible to those immediately interested. Experiments have been commenced in the vicinity of Hagerstown, with a view of determining whether these soils will be improved by lime. There is every reason to believe that they will.

The soils that are formed over the slate rocks are commonly thin, better adapted to corn, oats and rye, than to wheat. They assimilate in character to what on this side of the mountains are termed the chestnut lands, that are proverbially known to be susceptible of the highest degree of improvement by lime. No failure can be anticipated in the use of it upon them; so that every encouragement was given to carry out the experiments, which in this quarter also have been undertaken but recently.

A fourth distinctive character of soil presents itself at the foot of the ridges; where the mountain sandstone has contributed its silicious particles in pretty considerable proportion. Soils of this description, are of the kind denominated *light*. Lime, by imparting body to them, invariably improves them, as is shewn by a very successful operation, performed in the vicinity of Boonsborough, upon a field that could not be made to yield a crop of wheat in its original condition, but from which, twenty-two bushels per acre were taken this year, after an application of about fifty bushels of lime. This result, which fully establishes the efficacy of lime upon these soils, was obtained by Mr. Samuel Bentz, of Boonsborough.

It is always dangerous to throw doubts over a system of agricultural improvement, that has succeeded in obtaining general credit, and has been apparently working well. The danger is the greater, in consequence of the difficulty of substituting for it a new one, howsoever superior it may be. Yet when new lights make their appearance, a prolonged experience develops the imperfection of the former system, and better means suggest themselves—it would be folly to shut one's eyes and refuse to accept the proffered boon. This is the case with the comparative value of the use of plaster and that of lime. Plaster has rendered, and continues to render great benefits to the agricultural interests of Maryland. In its day, it revived hopes that seemed well nigh expiring, especially in the tobacco-growing portion of the territory, of the possibility of reclaiming large tracts of apparently exhausted lands. It required time, however, to introduce it; but when once tried, it was impossible to resist its magic influence. By bringing soils otherwise incapable, into the condition of bearing a luxuriant growth of clover, an abundant source of vegetable manure was at once created; for in this seems to lie its principal efficacy—probably from its extraordinary power of absorbing moisture in the first instance. But has it done more? It is doubtful: nay,

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whilst gilding our present hopes with a fallacious promise of permanent benefit, may it not have insidiously laid the foundation of a more inveterate disorder in our soils, than that from which it was expected to relieve them. The experience of many intelligent farmers in some districts of the State, leads to the apprehension of this danger. Wherever new facilities for the transportation of limestone or lime, have been offered, it is well known that the latter is now exclusively used; the objections to plaster being that, after long usage, it hardens the soil; and in fact, brings it into a condition in which the plaster loses its own efficacy. Moreover, as the application of plaster has constantly to be renewed, it becomes an expensive means of improvement. In liming soils to the extent required by their peculiar character and condition, it is understood that the operation is attended with permanent benefits; that is, need not be repeated for a great length of time. The farmers of Washington county, who have the limestone rock in abundance about them, and who it is hoped will, before long, obtain coal as fuel to enable them to make lime cheap, are earnestly urged to try without further delay the efficacy of lime in their soils. This they may do to any extent they please—upon half an acre or an acre—as their facilities for procuring it, or their other means, will admit.

Beautiful and fertile as the valley of Hagerstown is at present, there is ground to believe that the average of all the crops can be increased at least one-third, by the means that have just been suggested. They are submitted to the intelligent and enterprising farmers of Washington county, as the best judges of the degree of importance to which they are entitled.

The other agricultural resources of the county, of a miscellaneous character, are such as might be expected in a productive grain country, supplied as previously stated, with a great abundance of water-power.

SEC. V. *Further Notice of the Condition of the Mining Operations in the Copper Region of Frederick County.*

An account of some openings made in Frederick county, for the extraction of copper-ore, was given in the Report of 1839. The character and extent of the works, near New London, belonging to Mr. Isaac Tyson, Jr. of Baltimore, were referred to; since then, the mine has been worked by a few hands. The ore is found to continue as good and abundant as at any former

period. The rock in which it is embedded continues soft, easily removed, and the operations have been but little impeded by water, which passes off freely by the adit opened for that purpose. It is understood that about EIGHTY THOUSAND POUNDS OF PIG COPPER, have been extracted from this mine, which were sold in Baltimore, to Messrs. W. & H. McKim, for refining, and who have pronounced it equal to any they have ever used.

When all the circumstances connected with this mine are taken into view, namely, the regularity of the lode and softness of the rock; its perpendicular position; the thickness of the vein of ore; the facility of working the mine; the great yield of copper after digging to only the very limited extent of a few hundred feet; it certainly presents inducements for mining adventure much beyond most, if not all localities, hitherto attempted in the United States. In Cornwall, the copper region of England, the depth at which the ore is sought for is never less than fifty fathoms, and after crushing, cleansing and dressing, yields only eight per cent. of metal. At the New London mine above referred to, the ore averages about twenty per cent. of copper.

There are besides, other localities in the county that deserve special attention. The Liberty copper mines, as they were formerly styled, situated two miles north of Liberty, at which considerable sums have been expended in explorations principally near the surface, have furnished probably not less than two hundred tons of pig copper, at various times. These mines are drained by an adit of great length, and only want adequate capital and enterprise to make them very valuable to the State.

The operations on the property of Captain Richard Coale, in the immediate vicinity of Liberty, continue to be carried on, but only on a small scale, and furnish a copper-ore of good quality. The diggings, so far, are wholly in the loose soil near the surface, from which, it is understood, from sixty to eighty tons of ore have been raised during the past year, and have been sold at \$60 a ton. The ore is a mixture of oxide of iron, manganese, copper black and principally the green carbonate of copper; the last mentioned compound forming nearly two-thirds of the whole amount in weight. It will be found most probably to yield, when worked and duly treated, twenty-five to thirty per cent. of metallic copper.

These remarks are made, in addition to what was reported last year, in consequence of a disposition manifested on the part of

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