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Ohio Mining Journal

Title: Notes on the Coal Field

Creators: [Roy, Andrew, 1834-](#)

Issue Date: 15-Feb-1883

Citation: Ohio Mining Journal, vol. 1, no. 2 (February 15, 1883), 82-86.

URI: <http://hdl.handle.net/1811/32317>

Appears in Collections: [Ohio Mining Journal: Volume 1, no. 2 \(February 15, 1883\)](#)

NOTES ON THE COAL FIELD.

BY ANDREW ROY.

The area of the coal measures of the State has been very accurately defined in the published reports of the late Geological Survey. Regarding the structure and resources of the coal-bearing strata, however, there is much to be learned, for on these important questions every member of the geological corps seemed to hold different, and often mistaken views. The published sections of a district, and the conclusions reached as a result, with regard to the identity of strata taken at different points, when made by different members of the corps, are often so contradictory as to throw discredit on the whole work. For example, Prof. J. J. Stevenson and the late E. B. Andrews, who reported in Belmont, Harrison and Guernsey counties—Professor Stevenson working south and Prof. Andrews north of the Baltimore and Ohio railroad, arrived at strangely different conclusions regarding the structure of the strata in this part of the coal field. Prof. Stevenson insisted

that the three seams above the Pittsburg coal at Bellaire coalesce with the Pittsburg coal in the western part of Belmont county, while Prof. Andrews declared that all the four beds of coal in question were found in the same order and place in the western part of Belmont county as they occupy on the Ohio river at Bellaire, and he could find no coalescing of seams in going from the Ohio river to the west.

In the third volume, *Geology*, there are two reports of the Hocking Valley district—one by Prof. M. C. Reed, and the other, a supplemental report, by Prof. E. B. Andrews. In these reports Prof. Reed is quite positive that the Carbondale coal of Athens county is not the great vein or Nelsonville coal, but a seam 50 feet higher up; while on the other hand Prof. Andrews calls it, as he had hitherto done in former reports, the Nelsonville Coal.

The true horizon of the grey limestone, in the southern portion of the coal field, was, during the progress of the survey a matter of grave doubt. Prof. Andrews, in the earlier reports, located it above the Nelsonville coal, while Prof. Orton, in the later reports, has shown that it lies not only below the Nelsonville coal, but below coal No. 5, a still lower seam of the series.

In the north-eastern part of the coal field bordering the Pennsylvania line, there is a sad lack of harmony between the Pennsylvania and Ohio geologists—Prof. Lesley, Chief of the Pennsylvania Geological Survey, insisting that the Sharon coal of the Chenango Valley, which is the equivalent of the Brier Hill coal, is of sub-carboniferous age, while Dr. Newberry, Chief of the Ohio Geological Survey, is positive that it is a true coal.

These conflicting statements, which are but a few of many of similar import, will show the unsatisfactory work of the geological survey; yet, notwithstanding these facts, the survey is a great work, and was well done, considering the limited period of three or four years over which it extended. A perfect and complete geological survey of the State could not be made in less than twenty years, for as our mineral resources are developed from year to year, new problems arise, which, even with the ever increasing lights of science, will tax the mining engineer and geologists to solve.

Prof. Edward Orton, of the geological survey, whose reports are the most valuable, because the most accurate of any member of the geological corps, in a paper published in the *Secretary of State's*

Report for 1879, reviewing certain points in the geology of Eastern Ohio, speaking of the manner in which our coal strata were built, says, (page 616):

" Each coal-seam grew in a marginal marsh, comparatively few miles in breadth. To look for the lowest coal under the Nelsonville seam, for example, or for the Nelsonville coal under the Pittsburgh seam, is, as a general rule, to look for the living among the dead. It would be a geographical accident, and an unusual one, that would allow the marshes of such distant seams to occupy the same area. Subsidence of the interior region cannot be dispensed with, but the steady contraction of the gulf by the slow elevation of its border, seems to me essential to an explanation of the facts involved."

The theory that the interior of the great coal marsh, which now forms the Alleghany coal-field, was a shallow sea during the deposition of the vegetable material from which the coal-beds are derived, and that the coal-forests grew only on the border of this sea, is a favorite one with some of our geologists. But such practical facts as we have at command seem to warrant a different conclusion. That there were water-spaces in the interior of the great marsh, as well as upon its borders, while the coal-beds were forming, will admit of no dispute. There are many wants in the lower coal-seams of Ohio, the result of water-spaces; but the Nelsonville coal, No. 6, the steadiest of all our coal-seams, except the Pittsburgh, extends not only across the State, but far in the interior of the great coal field; and, perhaps, stretches across its whole breadth, with no doubt occasional wants in the central portions, as on the margin of the great plain.

The Steubenville shaft coal is mined 560 feet below the Pittsburgh coal found in the hills, above "the living and the dead" both alive and well, and the lower the richer and better coal. Forty-four feet below the Steubenville coal, a shaft has been sunk in the floor of the rolling-mill pit into another seam four feet thick. The two seams, the Pittsburgh and Nelsonville, stretch westward from the Ohio river to Cadiz, until the Pittsburgh is lost in air. At Bellaire, in Belmont county, the Pittsburgh seam comes down to the water-line of the Ohio river. The Nelsonville or Steubenville coal has been pierced through by boring nearly 600 feet below, while, in the hills fronting the river, 6 to 8 different and well developed beds of coal, ranging from 2 to 5 feet of thickness, are met in

the 500 or 600 feet of strata which there overlie the Pittsburgh coal. That the Steubenville coal, found by boring at Bellaire, is continuous from Steubenville to Bellaire, is proved by the Mingo, Rush Run and La Grange shafts, all sunk into the Steubenville coal; and there can be no question as to the Pittsburgh coal following and covering it all the way, since that coal is opened and mined in 50 places between Steubenville and Bellaire.

Again, at Pomeroy, in Meigs county, where the Pittsburgh coal is level free, the Nelsonville coal has been struck 500 or 600 feet below it at many points in the salt-wells of the district. And in the Hocking Valley district, where the high lands of Athens county inclose the Pittsburgh coal, the Nelsonville coal is met directly below; also, coals No. 5, No. 4, No. 4a, and No. 3, showing that the lower and upper coals are not only present, but probably stretch for 30 miles across the coal-field.

In the central portion of the great Alleghany coal-field, where the lower coal measures are buried deep out of sight, the richness and extent of the upper coal measures will supply the demands of trade for centuries to come. It is, therefore, of no great importance in a commercial point of view, and is mere matter of speculation in a geological point of view, as to what particular strata compose the lower measures there. In the coal-fields of Maryland and West Virginia, however, situate on the Potomac river where the strata, to a greater or less extent, became involved in the upheaval of the Alleghany mountains, the coal measures are torn in two, from top to bottom, exposing to view 1,200 to 1,500 feet of thickness of strata. There, all the seams are seen in place, from the lowest, resting on the conglomerate to the highest, several hundred feet above the Pittsburgh. In those mining regions, as in Ohio, many wants or faults are met, the result of various causes; but there is no evidence whatever of the existence of an ancient retreating sea, along whose shores the numerous coal beds were built above each other, like the steps of an inverted stairway.

That the lowest coal of the State series is not found under the Nelsonville coal, is due to its limited area in the deep and narrow basins in which it was formed. This coal, even on the extreme margin of the coal field, is not spread over one acre in a thousand where it is due. Higher up in the measure, however, the coals answering to No. 3, 3a and 4, are met with, not only below the Nelsonville coal, but below the Pittsburgh coal, and other higher

coals of the upper measures. These lower coals are not always of mineable thickness, and they are frequently wanting altogether, but they are as often missing on the out-crop or edge of the coal field, as they are in the more eastern portion of the basin.

As regards the lower coal, no one can say positively that it does not exist under the Nelsonville coal, or even under the Pittsburgh coal, because it has never been searched for to any extent immediately below these seams. It has been followed from its line of out-crop in Trumbull county, southward along the dip of the strata, until it is covered with nearly 300 feet of strata, and according to Dr. Newberry, Chief of the geological survey, the Nelsonville coal is not more than 300 feet above the lower coal, though my own calculations make the distance between those beds 400 feet or more.

All of the lower coals of the State series seem to have been formed in hollows or basins, scooped out of an originally level plain anterior to the deposition of the coal vegetation.

All the coals which occur between the Brier Hill and Nelsonville coals, although often found in basins or troughs, not unlike the basins or troughs of the Brier Hill coal, extend over much greater areas. The mines opened on these immediate coals, in being worked to the edge of the deposit, very frequently become exhausted by "cut-offs" on the hill-sides, or, if the seam holds its place in ascending the hill, it grows gradually thinner until it disappears like a feather edge. The sudden cut-offs on the hill-sides are no doubt, the result of shore waves which lashed the sides of the peat marsh during the early subsidence of the land. All the wants of the lower coals are not however, understood as occurring by reason of the basin or trough-like position in which the coals were formed. There are wants which are evidently the result of water-spaces in the old marsh, in which no coal vegetation grow, and, no doubt, great areas of now barren ground have been made so by evasion or denudation.