THE LOWER TWO HUNDRED FEET OF THE COAL MEASURE OF JACKSON COUNTY.

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The lowermost two hundred feet of the coal measures in Jackson county, have been a disturbing element to geologists for a number of years—the main points at issue being the relations which the Wellston and Jackson coals bear to each other, and the relation of the Maxville limestone to these coals and their associate strata.

The Jackson coal was mined by shaft openings around the village of Jackson before the discovery of the Wellston seam by Mr. Bundy in 1873. For some time after the Wellston vein was found, an opinion prevailed that it was an extension of the Jackson bed. In 1876, while on a visit to the mines of Jackson county as Inspector of Mines, I traced the Wellston coal from Wellston to Coalton (then called Eureka), thence followed it southward along Horse creek, until it cropped out as the Hill coal in the hilltops directly north of the village of Jackson. An engineer's level, placed at the mouth of the McKitterick mine, the last opening of the Hill coal in approaching Jackson, struck

the dome of the Court-house one hundred and seventy feet above the shaft coal at the bottom of the Star shaft, and one hundred and fifty feet at the bottom of the Tropic shaft, the distance between the McKitterick and Star mines being three-fourths of a mile.

Since the discovery of the Wellston coal, more than forty mines have been opened on this seam of coal in Jackson county. A chain of mines has been formed between Wellston and Jackson, along the line of the Horse Creek branch of the Ohio Southern Railroad, which establishes beyond the possibility of dispute, that the Wellston and Hill coals are one and the same.

The Hill coal, in approaching Jackson from the north, rises unnaturally, as coal beds generally do on their line of outcrops. The vertical distance between these coals, where they are found in the same hill, is, therefore, considerably less than one hundred and fifty feet—one hundred and twenty to one hundred and thirty-five feet being the general average.

Above the Wellston coal, at Wellston, at Coalton, and in the neighborhood of Jackson, at an interval of ninety to one hundred and twenty-five feet, the blue limestone of Jackson county is due. This lime rock, which exposes itself as an outcrop in every hill where it belongs, is an excellent guide in locating the horizon of the Wellston coal.

The Jackson coal lies in basins or swamps, and is often wanting where it is due. The Wellston coal, as a minable vein, occupies a belt from three to five miles in width; outside of this zone, for some distance it is wanting altogether or is present in less height than two feet. Both seams are frequently found in the same hill, and the distance between them, as I have said, ranges from one hundred to one hundred and thirty-five feet. The wavy nature of both coals, particularly the lower seam, bring them apparently nearer each other at many points of the county.

In the last volume of the Geological Survey (Vol. V, Economic Geology), Prof. Edward Orton, in his account of the mines of Jackson county, says, on page 1008: "Almost all of those whose judgment in regard to the questions is entitled to respect, consider the Jackson shaft coal and the Wellston coal as two distinct seams, but now and then an intelligent person is found who still maintains the older view, that the two coals belong to the same horizon." And on the following page this statement occurs: "On lot 66, Lick township, on the lands of Ambrose Scott, a hole was drilled to the shaft coal which was found at a depth of 110 feet. This puts it at about the same depth with the coal in adjacent mines of the Jackson shaft coal. On the

same lot there are extensive developments of the Lower Mercer (blue) limestone. It has been quarried largely here for furnace flux. Moreover, the upper members of the series appear in their appropriate places in the hills above. The distance from the Shaft coal to the Lower Mercer (blue) limestone, on this lot, are 138 and 142 feet in two separate measurements. The Wellston coal is found in several instances in its own field 120 feet below the same limestone and thus it appears that the shaft coal in an unmistakable occurrence of it is but 20 feet from the possible horizon of the Wellston coal."

The above statements were read with no small degree of surprise by those who had studied the structure of the lower two hundred feet of the coal-bearing rocks of Jackson county. For my own part, I had not heard in several years of a single individual whose judgment is entitled to respect in the matter, who still maintains the older view that the Wellston and Jackson coals are one and the same seam. Since the publication of Vol. V, Economic Geology, I have visited the points where Prof. Orton reports so anomalous a measurement, and found that the geologist, and not the strata, was at fault. On the lands of the late Ambrose Scott, the Wellston coal is present in its own horizon in well defined outcrops, but in reduced thickness, one hundred and fifteen feet above the shaft coal where the drillers struck it.

Two separate exposures of the blue limestone occur on the north side of the road, half a mile east of the new shaft of the Tropic Iron Co A few weeks ago Mr. Evan C. Jones, the County Surveyor, at my request leveled from the bottom of the Tropic shaft to these exposures, and the vertical distance was two hundred and twenty-two feet, no allowance being made for the dip. These out-crops occur within half a mile of the Scott lands. A massive bowlder of blue limestone is seen on the Scott lands, almost directly south of the drill hole referred to, thirty-two feet above the horizon, referred to by Prof. Orton. This bowlder has evidently been moved some distance down the hill. Mr. Stephenson, the adjoining farmer, informed me that he, himself, had rolled it down the hill some ten feet from the place where he first saw it.

There is, however, a limestone where Prof. Orton locates it, and this is the disturbing element of the section. It is about fifteen inches in thickness, and is underlain with a stratum of lean ore which has been quarried and used to some extent by one of the furnacemen of the county. It did not work well and was discarded.

This limestone occurs occasionally in Jackson county, on the same horizon as that on the Scott farm, but it is more frequently

present as an iron ore. Mr. Evan C. Jones is of the opinion that it is the equivalent of the Boggs ore of Webster station on the Portsmouth branch of the M. & C. railroad. In the Wellston field it belongs about twenty-five to thirty feet above the Wellston coal.

Forty to fifty feet above the Jackson coal, a seam a foot or so in thickness is found in the shafts around Jackson. It occurs in the Huron shaft, in the air shaft of the Globe slope, in the new shaft of the Tropic Iron Co., and at many other points where it is due.

Half a mile north of the village of Wellston, the Wellston coal becomes unsteady. It is present in patches, but in reduced thickness around Hamden within twenty feet of the top of the ground. A few hundred yards north of Hamden, where the Marietta & Cincinnati railroad crosses Little Raccoon creek, the coal comes to day. At the turnpike bridge two or three hundred yards to the north-west of the railroad bridge the Maxwell limestone is present in the road. This limestone is below the Wellston coal twenty to twenty-five feet.

Directly underlying this limestone the conglomerate and Cuyahoga Shale appear, and there is not only no Jackson coal at this point, but there is no coal material—nothing but the bottom rocks of the coal drillers—affording another of the many proofs that the deep hollows or swamps or basins, in which the Jackson coal reposes, were scooped out of the conglomerate and Cuyahoga Shale by erosive agencies after the Maxville limestone and conglomerate and upper surface of the Waverly were deposited. Hence while the Maxville limestone lies 100 feet higher than the Jackson coal it is a newer creation of geology than the Jackson coal—the unconformable character of the strata making the older formations the higher ones. Around the village of Jackson, the Jackson coal is number one, and the Wellston coal No. 3, while at Hamden the Wellston coal is No. 1, as it has no coal material below it but rests directly on subcarboniferous strata. The same conditions are found in the Mahoning Valley and in the Massillon region where the lower coals are mined.

When a coal bed of workable height is met 70 to 80 feet below the Wellston coal in Jackson Co., it belongs in my judgment to the rider overlying the Jackson coal rather than to the Jackson coal itself. All experience in the Ohio coal field shows that when a seam of coal rises up out of its proper level, it loses height at an average rate of one foot for every 20 feet of vertical elevation until it thins out altogether. Coal beds constantly diverge and converge, but they thin down and thicken up as a

general rule, as they rise and dip on the hills and in hollows of the strata.

Mr. Henry Price, the intelligent superintendent of the Star mine, has furnished me the following levels of the shaft coal: The coal at the bottom of the old Tropic shaft is 13 feet lower than the coal at the bottom of the Globe slope; the Star coal is 20 feet lower than the old Tropic; the new Tropic shaft is 41 feet deeper than the Star and the Erie 14 feet lower than the new Tropic.

The distance from the Globe slope to the Erie shaft is a little more than two miles, the dip is 85 feet and the line of direction is a little south of east. If this dip were maintained to the drill holes on the Ambrose Scott lands it would carry the shaft coal 150 to 160 feet below the surface instead of 110 feet, as reported by the coal drillers. The shaft coal was evidently met on a hill or arch of the strata on the Scott lands.