

The Big Stone Gap Post.

"KEEPING EVERLASTINGLY AT IT BRINGS SUCCESS."

BIG STONE GAP, WISE COUNTY, VA., THURSDAY, MAY 25, 1893.

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BIG STONE GAP COAL FIELD
Its Advantages and Location.
Interesting Document by Prof. Jas. M. Hodge.

Below is given the body of an interesting document, prepared by Prof. James M. Hodge, on the Big Stone Gap coal-field and read before a recent meeting of the American Institute of Mining Engineers:

The Cumberland Gap extension of the Louisville and Nashville railroad, recently completed from Cumberland Gap to Norton, 71 miles, connects at the latter point with the Norfolk and Western, making a direct through line from Louisville to Norfolk.

The whole of this connecting link strikes the southern boundary of the southwest Virginia coal region, but for the first 57 miles of its course it is separated from the coal by a mountain range (Cumberland mountain and its extension, Stone mountain), which bars entrance to the field from that direction, excepting at Pennington Gap, where access may be had to a small area only, which has not yet developed any very satisfactory coal.

The railroad passes through the range at Big Stone Gap, and for the last 14 miles of its course to Norton is in direct contact with that part of the coal region known as the Big Stone Gap coal-field.

By this road a western and southwestern outlet from the field is secured; the Clinch valley extension of the Norfolk and Western railroad gives exit eastward from Norton, and the South Atlantic and Ohio railroad, built through Big Stone Gap simultaneously with the L. & N. R. R., delivers the coal to points south and southeast.

Besides these lines already built, an early connection with the East Tennessee, Virginia and Georgia railroad, via its Rogersville branch, is probable, and connections with the railroads of eastern Kentucky are projected. The Charleston, Cincinnati and Chicago railroad has already done some grading on one of the latter, but the rugged country intervening will prevent its construction till the demand for it becomes urgent.

The coal-field embraces in Virginia about 120 square miles, to which should be added some 80 square miles in Kentucky, also tributary to Big Stone Gap, the whole of it underlain by coal, probable of workable thickness, and much of it by two or more such beds. The determination of the boundaries of the field, however (except on the south, where Stone mountain forms a natural limit beyond which only a small, isolated tract of coal is found), is involved in much uncertainty; for the coal extends far beyond the assumed boundaries east, north, and west, and the area which may rightly be included in this field depends upon what means may be adopted in the future for reaching the coal and shipping it through other channels.

As here circumscribed, the area in Virginia includes the region drained by the headwaters of the Powell river, north of the crest of Stone mountain, in Wise county, and in Lee county to a distance of about 10 miles west from Big Stone Gap. The width of this area is, on the west, about 3 miles, and toward its eastern end, 10 miles or more. Its length is about 20 miles. The area in Kentucky included as a part of the field is a strip on the north side of Big and Little Black mountains (the State-line lying along their summits), assumed to average 2 miles in width and to be 15 miles long.

The main topographical features are given by Black mountain (which, on the west, divides into Big and Little Black, with a short, high spur between them) and Stone mountain. The latter ranges nearly straight northeast and southwest; the former is quite crooked, and has more northerly general direction. It attains 4000 feet at its highest point, while the greatest height of Stone mountain is about 3000 feet, or some 1500 feet above the town of Big Stone Gap.

From Black mountain spurs protrude southeasterly to Powell river, at the base of Stone mountain, and northwesterly to Cumberland river, at the base of Pine mountain, enclosing between them the principal sources of those rivers in extremely narrow valleys.

From the end of Little Black mountain a very low spur connects with Stone mountain. It is so low that it presents no serious obstacle to entering by railway the western end of the field, but it forms the dividing-line between the drainage to Pennington and to Big Stone Gaps, and between Lee and Wise counties. At Norton, the easter limit of the field, the Powell river valley continues into that of the Guests river, beyond.

All coal-land drainage of Wise county west of Norton passes through Big Stone Gap, already occupied by railroads, while that of the eastern part of Lee county, flowing through Pennington Gap, penetrates a region so rough as to preclude carrying coal in that direction.

Geologically, Stone and Pine mountains from the sides of a trough rising to a height of 1000 to 1500 feet, at angles varying from 20 degrees from horizontal up to, and even past, vertical. The bottom of this trough, about 12 miles wide, is comparative-

ly flat, but numerous flexures and cross-flexures have inclined the strata in all directions. The principal axis of the trough, however, is clearly apparent, lying some 3 miles from the base of Pine mountain.

Black mountain lies partly across the trough. South of that mountain, and hence over most of the field, this synclinal involves a pitch against drainage, but as the rate seldom exceeds 150 feet per mile, and is generally much less, and as cross-flexures may often be taken advantageously, the deep erosions made by the streams will make mining possible over a large area, from outcrop openings and on an ascending grade.

The coal-measures exposed in this field embrace a section extending from the base of the lower conglomerate (XII. of the Pennsylvania Survey) nearly or quite up to the Pennsylvania "Barren Measures." This section attains here probably the greatest development to be found in the Appalachian region, and is estimated to be about 3,000 feet thick.

The lower third of the section contains the conglomerate series, with three to five beds of coal, while the upper two thirds—the "Lower Productive" measures—contain fully twenty distinct coal-beds, averaging less than 100 feet apart. The exact number, however, must always remain indefinite, since the different seams combine or separate, to form one large bed or two or more small ones, in a manner which defies enumeration.

In tracing the identity of the beds, even within the confined limits of this field, this feature has been a source of great uncertainty, and other difficulties are added in the frequent changes of the character of beds (of their thickness and partings, and occasionally of the coal) and a lack of characteristic intervening rocks. But enough work has been done to identify the most important beds over the greater part of the field, and two or three can be included in the Kentucky nomenclature with sufficient certainty.

But the fact of such variation in the beds renders the need for identification proportionally slight. Each bed in its own field must be tested there, and be valued according to the results of the testing, without regard to what may have been proved of it elsewhere.

The field is not wholly without characteristic rocks. Besides the lower conglomerate, unmistakable as ever, a persistent fossiliferous limestone, 1 to 3 feet thick, is found at a height of 1,200 to 1,400 feet above it (one must usually climb 800 feet or more to see it), and above this is an upper conglomerate. This rock, sometimes 150 feet thick, appears to be included in the "upper series" of Kentucky, containing Coals 10, 11 and 12. Over parts of the field it forms a conspicuous crest or thrusts high cliffs out upon the sides of the mountain; at other points it is indistinguishable from the rocks above and below it. In the former case it is thickly studded with pebbles, while in the latter they are wholly absent, or so few that only most careful search reveals them. As in Kentucky, the rock encloses one or more beds of coal, with attendant shale and clay.

In describing the principal beds numbering is avoided as liable to be confused with numbering of other localities and only local names are used.

The highest bed of importance has its chief development in the western part of the field, and though not easily accessible and of comparatively small area, is especially valuable, and will probably be brought into early use, on account of its containing from 5 to 7 feet of exceptionally fine splint coal. It has been thoroughly explored in this western part of the field, and has been found most reliable both in size and quality. The coal is remarkably clean, mines in large blocks, like cannel, and, being light in ash and sulphur, should be highly as desirable for domestic uses as cannel-coal.

Several beds below this (one of them containing a pocket of cannel-coal) have not yet been much explored, because of the greater value of still lower ones; but they will become highly valuable as the latter are exhausted.

The next bed requiring special mention has also been thoroughly investigated only in the western part of the field. It has been opened in Lee county along the face of Little Black mountain about 200 feet above the base. On the northern side of the mountain it is mostly below drainage within the field-limits, but on both sides it shows a thickness of 44 to 64 feet of coal, not including a portion rendered unavailable by thin partings. The bed yields a bituminous coal, in which is a little splint, the whole making a good coke, as obtained by trials in open ricks, in each of which 3 to 4 tons of coal were burned, covered with leaves and dirt. The coal is even purer than that of the previously described bed, and it is not too dry in volatile matter for economical coke-making. The analysis of the coke puts it in the front rank, as far as its chemical constituents are concerned, and it is not lacking in favorable mechanical conditions.

The excellence of this coke, the large area and satisfactory thickness of the coal and its moderate height above the valley should lead to an early attack upon this part of the field, though to reach it a branch railroad 10 miles long must be built.

Still, lower beds will have precedence in other parts of the field.

Next in the series is a bed varying much in thickness, often altogether wanting, and probably covering but little area with workable coal. Its maximum thickness, as yet known, is about 8 feet, on Mill branch, an eastern tributary of Powell river. On Callahan creek, adjoining, it is known as a 5-foot coking-coal bed, but its inferiority to the bed immediately below it casts it wholly into the shade.

Averaging, perhaps, 50 feet lower than the bed just mentioned, and 300 to 350 feet above the lower conglomerate, lies the "Imboden" bed, the equivalent of No. 3 of Kentucky, where it is now well known as the "Elkhorn" coking coal of Pike and Letcher counties.

It has been pretty thoroughly explored over most of the Big Stone Gap field, where accessible in outcrop, and for nearly two years has been mined, on a small scale, for supplying the South Atlantic and Ohio railroad and local demands along its line.

Its outcrop lies along the base of Little Black mountain in Lee county, but in Wise county it generally goes under drainage 2 miles or more south from Black mountain, thus giving exposures along each main stream for a distance of 2 to 8 miles. Along Powell river, from Big Stone Gap nearly to Norton, it is found in the ends of the spurs on the north from 300 to 400 feet above the river.

Making full allowance for indentations of streams and absence of the bed from the southern part of the field, there remains not less than 60 per cent. of the total area covered by it, or fully 90 square miles.

East and south of the limits assigned to the field the bed has comparatively little or no value; west of it the coal is thicker, but still considerably below the average of the field; but on the north the coal holds well in thickness as far as to the Cumberland river.

Most of the openings made in the bed within the field disclose a thickness of coal of over 5 feet, varying with great irregularity up to 16 and even 20 feet of coal. Only in a few openings near the extremities of the field has the coal been found less than 4 feet thick. Though varying so greatly in thickness along its hundred or more miles of outcrop on the Virginia side of the field, its ample proportions there, combined with its favorable showing along the Cumberland river, warrant the assumption that the main body of the coal under Black mountain is also undoubtedly of abundant thickness. The excessive thickness has been found always within a few miles of Stone mountain, and may be attributed to the uplifting of that mountain as a cause.

On the Cane Patch, an eastern branch of Roaring Fork, the bed has 20 feet of coal with heavy partings, but it diminishes to about 5 feet on the eastern head of the branch and on Bear Pen branch, a mile or two south. Still further east, on the main head of Powell river, the coal is again 14 feet or more thick, with a parting of 5 feet, but here, at the eastern end of the field, it is too near the tops of the hills to be of value.

It is to be said of most of the opening made that they are merely surface openings, and consequently that the many partings sometimes shown would undoubtedly diminish in number and size on entrance underground. This has proved to be the case in several instances in this locality.

On the other hand, a qualification is also necessary in regard to the extreme thickness which the bed so frequently displays. A middle bench of this is so soft that it is often impossible to mine it except as slack, and it has, intimately mixed with it and so abundant as to seriously affect its quality, thin particles of soft shale, rarely more than 1/4 in diameter. Though much of this shale may be eliminated by washing, the cost of so doing, and the inferior quality of coke resulting, must detract largely from the value of the bed. In extreme cases, the expense of disposing of the whole bench may be a total loss.

The thickness of the bench varies with considerable regularity according to the total thickness of bed. It is generally absent when the coal is less than 7 feet thick.

The quality of the rest of the coal throughout, except in the extreme western part of the field, is remarkable fine. The coal is very low in ash and sulphur (as regards ash, the results for Looney creek and Mud Lick coals would probably have been better, but that the samples were taken from outcrop-openings), and that the proportion of volatile matter is suitable for economical coking and producing a strong coke. The coal of the neighboring Pocahontas field, having but about 18 per cent. of volatile matter, loses part of its fixed carbon in coking, and its coke is somewhat deficient strength.

The analyses of Big Stone Gap coke show higher fixed carbon and lower ash than any other of the principal coals in the market, while the percentage of sulphur is among the lowest. The table is given with the knowledge that some of the localities named have published analyses giving better results than here appear. While it is not intended to dispute these, the table is given with confidence in the high authority quoted. Much depends on the manner of sampling, and the writer acknowledges that from his open-rick tests he chose the finest looking coke as samples for analysis

by Dr. Peter though in the coals he took full working coal-sections for the same analyst, as is known to be the custom of Prof. McCreathe.

In appearance the Imboden coke gives no indication of inferiority to any of the others, and only the test of use remains to be applied to establish its reputation.

In a group of coals lying close above the lower conglomerate, occurs another coking coal almost identical in character with that just described.

It is above drainage in the field for only a very short distance north from the base of Stone mountain, excepting at its eastern extremity, where a cross-fold has brought the bed to the surface for some miles northward. At points except this latter, where the bed is exposed, it is broken up into several thin seams too thin for working. But at and near Norton they are combined in one bed, varying from 8 to 10 feet in thickness, and having one to three partings, usually small.

In this condition it has a frontage against Stone mountain of only one mile, extending from Powell to Guest river. Two miles northward it has 8 feet of coal, with parting of 15 inches, and a mile beyond, where it disappears below drainage, it still shows thick coal. Apparently it lies in a narrow band, cutting diagonally across rather sharp local north-east and southwest flexure. On either side of the strip two seams of the bed rapidly separate, to form two distinct beds, which, for an undetermined distance, but on the west for several miles, contain each from 3 to 5 feet of coal.

The coal is so like the "Imboden" (without the central bench of soft mixed coal and shale) that a description of one will answer for the other. The coke, from the open ricks, gave a little less fixed carbon on analysis than the "Imboden," but that is probably due to an accident of manipulation. The amount of ash is remarkably small.

The last beds to be mentioned lie within the lower conglomerate series. No attempt has been made within this field to investigate any of the conglomerate beds; but two of them have been exposed in driving a railway tunnel in Big Stone Gap. The larger one of these are hidden by the tunnel-timbering. It contains 6 feet of handsome coking gas-coal, which was highly appreciated as a grate and blacksmith's fuel by those who had an opportunity to try it. No sulphur was detected in it.

The bed outcrops all along the crest of Stone mountain dropping down to cross the streams in Big Stone and Pennington Gaps, but the steep inclination of the strata forming that mountain will delapid early attack upon the bed there, while throughout the rest of the field, its depth below drainage of 500 (?) feet minimum, will cause a like delay. But the bed situates an important reserve supply, to be drawn upon as the more convenient higher beds approach exhaustion.

It is hardly necessary to enter into a computation of the total amount of coal which may be produced from this field. According to the last United States Census, the Pocahontas field has yielded 1,400 tons per foot thickness per acre; at Connellsville it is claimed that 90 per cent. of the total coal per acre is obtained, which amounts to rather more than 1,400 tons per foot of coal. Assuming that the "Imboden" bed will yield an average of but 5 feet of coal, or 7,000 tons per acre over its 90 square miles, a total amount of over 400,000,000 tons is reckoned to be available in this bed alone. This is regarded as a conservative estimate. And this bed contains only a minor part of the workable coal in the field, of the area of which it covers but 60 per cent. It will hardly admit of doubt that there need be no delay on the score of quantity and quality of coal and coke in constructing such mining plants and systems of transportation as a practically unlimited supply would justify.

The activity now displayed in building new ovens at the older Pocahontas mines, and in the long line of those newly opened on Elkhorn creek, a few miles farther north, is conclusive proof of satisfactory profits.

Under like methods of mining the cost of production at Big Stone Gap will not vary materially from that at Pocahontas. Both fields present large areas which have as nearly perfect conditions in the chief elements of mining—character and thickness of coal, ease of access, drainage, and ventilation—as can be found in any competing field.

In cost of labor these fields may have some slight advantage over more northern ones, but its poorer quality and unreliability are believed to offset most of the apparent gain of lower wages. It is to be hoped that an early introduction of mining machinery will be made, which, though it may more nearly equalize what difference there may be in that respect, will greatly cheapen the cost of production.

Cost of transportation need be examined relatively only, distance to the market being the controlling element.

On this account the northeastern markets must always be supplied by the nearer coking coal-fields in that direction.

Lake Erie ports will continue taking their supplies from Connellsville as long as that field is able to furnish them, but

the enormous drain on it is rapidly exhausting its small area. The Pocahontas field, with its direct northern outlet now just opened is favorably situated for competing in this direction; but an equal opportunity will be given to Big Stone Gap by the completion of one of its projected railways northward. This gain, however, will be offset by the consequent development of the eastern Kentucky field, and probably others in Dickinson or Buchanan counties, Va., which will compete with Big Stone Gap in the southern market.

West of Lake Erie, Big Stone Gap may well look for a favorable market. Under existing railroad facilities, it is about equidistant with Pocahontas from Cincinnati, but projected lines are likely to give it the advantage. The southern Kentucky fields will compete in this direction, as in the Louisville market; but the difference in distance in their favor is too slight to cut out Big Stone Gap.

The principal market to be looked to, however, are, and will continue to be, southwest and south. The Cumberland river region will, in part, share in this, but the coke of Middlesborough and Pineville do not appear to be altogether satisfactory for furnace use, and the better coke which may be had from the upper Cumberland has not the advantage of position which pertains to those places.

Birmingham, Ala., and other places near the Alabama fields, will doubtless continue using native coke; but the higher cost of mining the comparatively thin beds there, and the poorer quality of coke, prevents its wide distribution. Chattanooga now consumes a large amount of Pocahontas coke, which is carried 324 miles against 142 miles from Birmingham. More than that, Pocahontas coke has been used in Birmingham, but to what extent, or whether its use was continued, is not known to the writer.

Big Stone Gap is but 251 miles from Chattanooga, and that distance is likely to be shortened soon. The northern Alabama markets are open to its coke, and from Chattanooga eastward through Tennessee it will have no serious competition.

In this direction lies its greatest field of usefulness, for it is the nearest coke to the great iron-ore deposits in northwestern North Carolina, to which direct rail connection is already made. To this point of first importance is to be added the fact of an immense, though scattered, supply of iron-ore throughout southwest Virginia and Tennessee.

These unbounded resources of ore have been made so well known within the last four years that they need only be referred to now. They are evidenced in that fact that there are now over twenty iron blast-furnaces using coke, or about to use it, built north-west of Birmingham between it and Big Stone Gap and Bristol, Tenn. Of these, seven have been built within the last two years and are within 100 miles of Big Stone Gap. Five of them were built in reliance of Big Stone Gap coke as fuel.

MONKEY TALK.
Prof. Garner Reports Wonderful Success in Learning and Translating It.

Prof. Garner has written a letter to his brother in Australia, in which he declares he has "succeeded beyond his widest anticipations" in his experiments with monkey talk in Africa. He says: "I am safe on the coast, just reeking with quinine, the proud possessor of a chimpanzee that can say 'Tenakoo Pakaha,' which is, you know, the 'Maoria for 'good day, stranger'; a gorilla that knows about twenty words of Fijian, and a female orange-outang that has picked up 'donner and blitzten' from my German valet, and has, judging from her actions, quite fallen in love with him. I have also got written down which is more important, nearly two hundred monkey words. Here are a few spelled phonetically: 'Achru,' meaning, sun fire, warmth, etc.; 'kukcha,' meaning water, rain, cold, and, apparently anything disagreeable; 'goshku,' meaning fool, the act of eating. You will see from this that it is a very primitive language. There are perhaps, not more than twenty or thirty words in it that I have not already got, so my task is now practically completed."

When his battery, phonograph and revolving mirror began to work, he says that the "glitter of the mirror soon attracted a host of chattering monkeys. I watched them for an hour and then cautiously approached. They disappeared like magic when they saw me—all but one, a chimpanzee. When I got close to it I found that it took no notice of me, but stood as if transfixed, with widely opened eyes and dilated pupils, gazing at the mirror. There was a slight tremulous motion in the limbs and a spasmodic twitching of the ears. I could hardly believe it. The animal was hypnotized. It was making a guttural sound like 'achru.' When I subsequently listened to the 'grau' I found that a similar sound was frequently recorded thereon amid what was then an unintelligible jumble of monkey chatter. I put the monkey in a bamboo cage, and on examining him about an hour afterwards found him still under the hypnotic influence. I revived him with a good strong sniff of ammonia and held a lighted tapir before his eyes. He was quite tractable and said 'achru,' and a few more tests satisfied me that this word embodied the idea of heat, light, warmth and brightness. Other words followed, and it was wonderful to take note of his awakening intelligence."