Some Coal Measure Sections Near Peytona, West Virginia.

By Benj. Smith Lyman.

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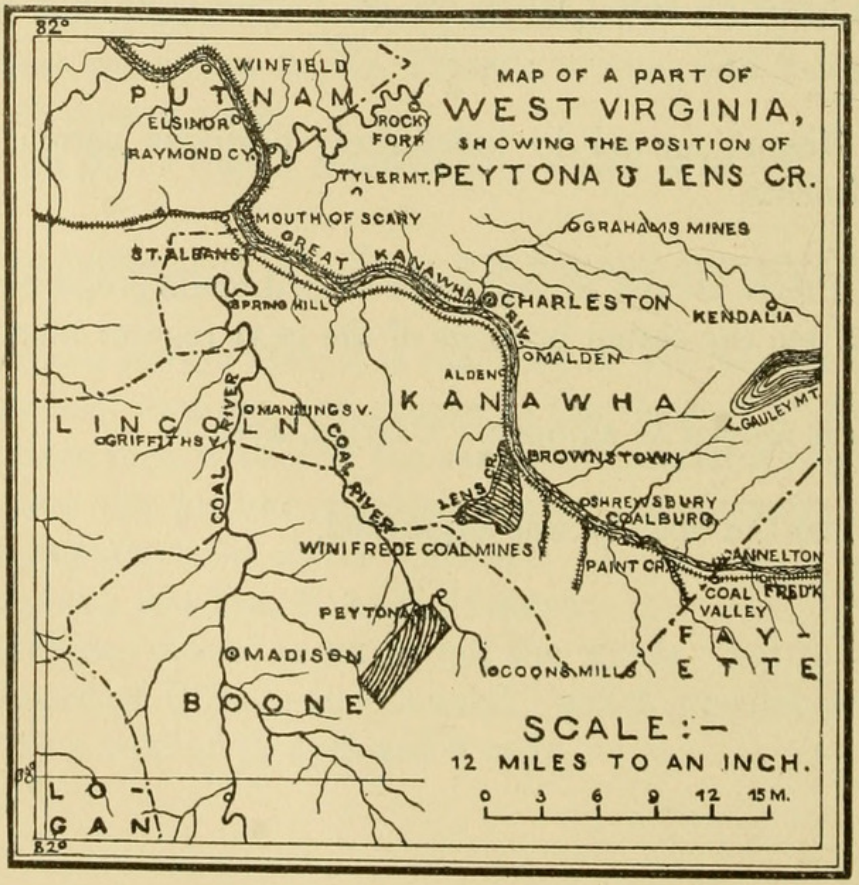
Some results of a couple of rough surveys made in 1872, near Peytona, Boone Co., W. Va., though without any addition from later observations, may be a useful contribution towards the elucidation of the geology of that region. The graphic comparison of columnar sections there with Prof. J. J. Stevenson's careful general section in the northern edge of that State, as published, without any diagram, in our *Transactions*, Vol. xv, p. 15, 1872, shows a remarkable general agreement, considering the great distance. The present sections also help very much in the identification of the different coal beds of the region, hitherto insufficiently studied, as remarked by Prof. I. C. White, in his valuable "Stratigraphy of the Bituminous Coal Field of Western Pennsylvania, Ohio and West Virginia," *U. S. Geol. Surv. Bulletin*, No. 65, p. 148, 1891.

It will be well to indicate first, with some precision, the situation of the tracts surveyed, and then briefly their main topographical features; before giving the geological details of the general structure and of the special observed facts, and pointing out the remarkable agreement of the resulting columnar sections with the distant northern section, and discussing the identification of beds that is consequently to be inferred.

SITUATION.

The accompanying small map shows in a general way the situation of the two tracts and their relative position.



One of the surveys covered the tract owned by the Peytona Cannel Coal Company, at Peytona, on Coal River, thirty-five miles above Coalsmouth (or St. Alban's), on the Kanawha, and about twenty-two miles by road south of Charleston, the State capital, and twelve miles southerly from Brownstown. It is a tract of 6137 acres, in the shape nearly of an oblong square about five miles long by a mile and three-quarters wide, with the long sides running about northeast.

The other survey covered the two Parker tracts on Lens Creek (marked as Callacham's Creek, on some maps), both together about 6500 acres, and somewhat in the shape of a leg of mutton, or of a rather one sided oak leaf, with the stem of the leaf or smaller end about a mile southwest of the mouth of the creek, near Brownstown, on the Kanawha, ten miles above (southwest of) Charleston, and with the eastern side running in a sinuous course southerly about three miles and a half, and the western side mainly following the course of the creek. The southwestern corner is about four miles northeast of Peytona.

LAY OF THE LAND.

The land of both surveys has the same general topographical character that is found under like geological conditions throughout so large a region in West Virginia and western Pennsylvania, namely, very steep, often cliffy, hillsides and narrow valleys, with the hills rising 800 to 900 feet, or even more to summits that are mostly narrow, here and there even sharp, but in some places broad and flat, and with narrow strips of nearly flat land, up to a couple of hundred yards in width, along the lower and comparatively level parts of the streams. The lowest points in each survey are some 600 feet above sea level.

The Peytona tract is drained by Coal River, flowing westward across its northern end, and in the central part by Indian Creek, flowing northerly, the western edge by the eastern branches of Droddy's Creek, up as far as its Lick Fork at the southwest corner ; and the southern corner by the head waters of the Sandy Lick Fork of Laurel Creek.

On the Parker tract, the lower part of Lens Creek, from its forks northeastward three-quarters of a mile to its mouth forms the stem of the oak-leaf shape, and the midrib of the leaf is the left fork of Lens Creek, with long side ribs and veinlets on the western side, and shorter ones on the east. A narrow strip besides is added along the west, containing the most eastern branches of the right fork of Lens Creek, which forms the western boundary. Both forks fall only fifty or sixty feet to the mile for four miles above their union ; but above that much more rapidly.

GEOLOGY.

STRUCTURE.—The geological structure that occasions the peculiar topographical character, with flat, table-like hilltops here and there, with flat valleys and with many cliffs on the almost uniformly abrupt hillsides is, of course, the very level bedding of a great thickness of rocks at a sufficient height above sea-level.

In the northern part of the Peytona tract, the rock beds seem to lie pretty regular, with the very gentle dip of 1 to 102, or 51¾ feet to the mile, southeasterly, and the strike of N. 14½° E. The same dip and strike perhaps continue throughout the southern part of the tract, but the lack of surveys there leaves this point uncertain. There are slight local variations from the general dip causing "swamps" in the mines, say one hundred yards across, and sinking, say, one or two feet; such swamps, however, as are common to all our western, flat-lying coal measures.

On the Parker tracts the dip is so slight that without much careful leveling it would be impossible to tell exactly what it is, or whether it is the same throughout the tracts. It seemed at the time of the survey and of drawing the map, to be in general uniform throughout them, and to be towards the north-northeast (N. 20° E.) about one foot in 78, or 68 feet to the mile. But there are local variations of the dip here, too, extending a few hundred yards, or at least "swamps" in the coal beds, depending on the varying thickness of the rock-layers.

It now seems, however, not improbable that the strike lines, drawn straight and parallel on the two large maps throughout the tracts of each survey, should have been gently curved as indicated by the lines of shading of the two surveys on the accompanying little map of their general situation, making the strike curves of one survey conform, by gradual transition, to those of the other, and to correspond with the northwesterly dip that is said to prevail at Coalburg, on the opposite, southeasterly side of the broad, shallow basin. The strike curves on Lens Creek would then be gently convex towards the northeast, and those of Peytona would be slightly so towards the east. Nevertheless, this little change would not affect the principal results of the surveys, nor the identification of the beds.

Rock-beds.—The following is a general section downwards of the rocks exposed on the Peytona tract, so far as known:

		FT.	IN.
Partly hidden, but chiefly sand rock and shales	about	155	0
Gray clay	"	1	0
Coal, *Pittsburgh Bed*, with some slate	"	4	0
Hard fireclay and sand rock and shales	"	23	0
Coal, bituminous, soft	"	0	4
Fireclay and hidden, but no doubt mostly sand rock and shales	"	85	0
Coal, bituminous	"	0	4
Fireclay and hidden, but no doubt mostly sand rock and shales	"	90	0
Bony coal	"	0	3
Hidden, but no doubt chiefly sand rock and shales	"	55	0
Coal, bituminous, with two feet of fireclay in the middle	"	5	0
Hard, gray sand rock and hidden, but doubtless mostly sand rock and shales	"	120	0
Coal, bituminous	"	0	6

		FT.	IN.
Hidden, but no doubt chiefly sand rock and shales about		13	0
Black slate	"	0	4
Coal, bituminous	"	0	2
Shale, or slate	"	0	4
Sand and bituminous coal mixed	"	0	9
Iron ore (carbonate)	"	0	$0\frac{1}{4}$
Slate and sand rock mixed	"	0	8
Black slate	"	0	5
Cannel slate ("bastard cannel")	"	0	1
Slate	"	0	1
Fireclay	"	0	2
Cannel slate ("bastard cannel")	"	0	$1\frac{1}{2}$
Fireclay	"	0	2
Coal, *Upper Cannel*, all "smooth cannel"	"	2	6
Cannel slate ("bastard cannel"), with fossil shells	"	0	$2\frac{1}{4}$
Sand rock and sandy shales	"	15	0
Slate	"	0	6
Iron ore	"	0	$0\frac{1}{2}$
Slate and iron ore mixed	"	1	0
Iron ore	"	0	0
Slate	"	0	10
Shale	"	0	4
Cannel slate	"	0	2
Fireclay	"	0	2
Coal, *Main Cannel*, partly bituminous	"	2	10
"Slate"	"	1	0
"Bastard cannel"	"	0	5
"Slate"	"	1	0
"Coal," bituminous	"	0	7
Hidden, but no doubt mostly sand rock and shales	"	89	0
Coal, *Shoot Bed*	"	3	6
Hidden, but doubtless chiefly sand rock and shales	"	17	0
Sand rock	"	4	0
Sandy shales	"	2	0
Coal, *Blacksmith Bed*	"	2	0
Fireclay and brownish gray sand rock	"	6	0
Sand rock and shales	"	37	0
Brown shales with small iron-ore balls	"	20	0
Black slate	"	0	3
Shales and sand rock	"	27	6
Sand rock, very cross bedded, brownish gray	"	9	0
Coal, bituminous	"	0	3
Sand rock, brownish gray, Penna. Formation No. XII			
		800	0

The following is a general section downwards of the rocks exposed on the Parker or Lens creek tracts, so far as known :

		FT.	IN.
Gray sand rock	about	8	0
Hidden	"	30	0
COAL, *Pittsburgh Bed*, 4,, 9 to 5,, 6, say	"	5	0
Hidden	"	44	0
Brownish-gray sand rock	"	4	0
Hidden	"	14	0
Slates	"	6	0
COAL, *Slate Vein*, in two or three thin layers separated by much clay, the upper one cannel, average, say	"	3	0
Hidden	"	190	0
Brownish gray sand rock	"	5	0
Hidden	"	105	0
COAL, *Wood's Upper Bed*, with commonly about half an inch of clay at about six inches below the top, 2,, 6(?) to 4,, 0, average, say	"	3	0
Hidden	"	7	0
Brownish-gray sandy shales and sand rock	"	37	0
COAL, *Factory Bed*, 0,, 9 to 3,, 8, with about two thickish layers of clay, average	"	3	0
Brownish-gray sandy shales	"	21	0
Hidden	"	20	0
Brownish-gray sand rock	"	10	0
Hidden	"	4	0
Brownish gray sand rock	"	12	0
COAL, *Wood's Lower Bed*, commonly with a half-inch seam of clay about five inches above the bottom, 3,, 3½ to 4,, 0½, average, say	"	3	8
Slate floor of coal and hidden	"	22	0
COAL, a very thin seam, say	"	0	4
Black slate	"	2	0
Hidden	"	24	0
Brownish-gray sand rock	"	12	0
Hidden	"	6	0
Brownish-gray sand rock	"	5	0
Brownish-gray sandy shales, sometimes with small iron ore balls	"	15	0
COAL, *Jerrold's Bed*, with sometimes a half-inch layer of clay at about nine inches below the top, sometimes one near the bottom also ; 2,, 8, or even less to 3,, 6, average, say	"	3	0
Brownish-gray sandy shales	"	14	0
COAL, *Vicker's Bed*, perhaps	"	2	0
		640	0

COAL OPENINGS.

PITTSBURGH COAL.—The Pittsburgh coal bed has been opened at only one place on the Peytona tract or in the neighborhood; and that was near the top of the mountain above the mines and east of them. The section measured there was as follows, from above downward:

	FT.	IN.	FT.	IN.
Loose sandstone blocks, somewhat limy?				
Sand rock, thick				
Hard gray clay	1	0		
Good COAL	0	11½		
Slate	0	2		
COAL and slate mixed	1	4		
Slate	0	2		
Good COAL	0	8½	4	0
Slate	0	3½		
COAL	0	0½		
Slate	0	1		
Good COAL	0	3		
Fireclay				
	5	0		

The coal bed contains, then:

	FT.	IN.
Good coal	1	11
Slaty coal	1	4
Slate	0	9
	4	0

That is, however, so much inferior both in thickness and in quality to what the same bed is even as near as Lens Creek, and still more to what it is in the northern part of the State, that it seems not unreasonable to hope that its average throughout the tract may prove better than at this opening.

On Lens creek the bed forms but small patches on the hilltops, and has (1872) been opened in only one place, namely, on the hill opposite Mrs. Nuby's house and King's Hollow, about the middle of the eastern edge of the map; with the following section, from above downward:

	FT.	IN.
Loam, with crop-coal		
COAL	1	9
Clay	0	6
COAL, with half-inch layers of clay at about four and six inches from the bottom, and perhaps at about a foot and a foot and a half from the bottom	3	4
	5	7

The opening is not a very perfect one, and perhaps does not show the

full thickness. The quality is only imperfectly shown, as the coal dug had no solid cover and is all mere crop coal, yet seems to be good.

The bed has been worked at Curry's mine, in Church Hollow, about one hundred yards outside the Parker tracts, and just outside the north-eastern corner of the Lens Creek map; with the following section from above downward:

	FT.	IN.
Sand rock		
COAL	1	5
Gray slate	0	2
COAL	3	2
Fireclay		
	4	9

The SIX-INCH BITUMINOUS COAL bed about twenty-three feet below the Pittsburgh bed at Peytona, was opened in June, 1872, on the lumber slide above the No. 1 Entry of the old Peytona mines.

The FOUR-INCH SOFT, BITUMINOUS COAL bed about one hundred and ten feet below the Pittsburgh bed, at Peytona, was opened in June, 1872, on the lumber slide above the No. 1 Entry of the old Peytona mines, with a fine-looking bed of fireclay partly exposed below.

SLATE VEIN.—The slate vein on Lens Creek was opened by an old drift, near Curry's coal mine in Church Hollow, just outside the northeast corner of the map; and measured as follows, from above downward:

	FT.	IN.	FT.	IN.
Slates, exposed some	6	0		
Coal, cannel	1	2		
Black slate	1	0		
COAL, soft, bituminous, more than half under water, about	1	3	3	5
	9	5		

The same bed was also opened in June, 1872, on the hillside up the hollow opposite Mrs. Nuby's house and King's Hollow on the Left Fork of Lens Creek, below the opening of the Pittsburgh bed there; and measures as follows, from above downward:

	FT.	IN.
Clay, gray, perhaps not in place		
COAL, cannel, slaty	0	8
Brown slate or clay, with a little coal	0	5½
Coal, bituminous	1	0
Gray clay	0	5½
COAL, bituminous	0	8
	3	3

The THREE-INCH BONY COAL about two hundred feet above the upper cannel coal bed was opened above Entry No. 4, at Peytona, in 1872; but only showed two or three inches of bony crop-coal, or crop-cannel, or perhaps merely crop-slate.

The THREE-FOOT BITUMINOUS COAL bed about one hundred and forty feet above the upper cannel on the Peytona tract, has been partially opened above Entry No. 4, with the following section from above downward :

		FT.	IN.
Loam	about	2	0
Crop-COAL, splint-like		1	0
Fireclay		1	5
COAL, bituminous, firm and good		2	6
		6	11

It may prove workable in some places, but cannot probably be counted on as such throughout the tract. It is most likely the same as a bed of unworkable thickness that has been opened on the waters of Indian creek, either the "Third Cannel," in Abshire's Hollow and on Meadow's Fork (a bed yielding there about seven inches of cannel at the bottom with bituminous coal above it), or a thin bed of bituminous coal said still more to resemble it, formerly opened some twenty feet higher up, on Meadow's Fork.

The SIX-INCH BITUMINOUS COAL some twenty feet above the upper cannel was opened on the top of the point on the south side of Droddy's Creek, near the western edge of the map ; and is said to have been six inches thick, pretty firm, but not splint-like, without solid roof, but about two feet of rather hard clay above it. The same bed shows about three inches of outcrop, without solid roof or floor, about thirty-two feet above the bottom of Entry No. 4, of the Peytona mines and on the north side of the hollow.

UPPER CANNEL.—The thicknesses of the beds in the general section within three or four feet above the Upper Cannel bed are the means of measurements at two places ; except that the thickness given for the principal cannel bench is the average of four measurements near the mines. That bench, however, is still more variable hereabouts. It has been worked at the Peytona mines by a short drift, on which it measures twenty-seven inches and about thirty-one inches ; and has also been opened by a slope from the Main Cannel bed and measures there twenty-one inches.

On Abshire's Branch of Indian Creek, half a mile southeast of the Peytona mines, the same bed is opened in several places, and at one of them measures as follows, from above downward :

		FT.	IN.
Slate			
COAL		0	6
Brownish-gray sand rock	about	3	6
Brown shales	"	1	6
Cannel COAL	"	1	11
Shales, exposed	"	0	3
		7	8

At another opening, about two hundred yards further up the branch and on its north side, the following section with the same bed is exposed from above downward :

	FT.	IN.
COAL, bituminous, "hard," merely the tail of the outcrop	0	9
Slate	2	0
Cannel COAL	1	3
	4	0

At an opening about thirty yards distant on the south side of the branch the Upper Cannel is about ten inches thick, but it is only the tail of the outcrop not well roofed over.

An opening was made on the Upper Cannel in June, 1872, back of John McCarty's house on Droddy's creek, in the western edge of the tract, and gave the following section from above downward :

		FT.	IN.
Sand rock, massive	about	2	0
Shales	"	3	0
COAL, soft, rotten, bituminous	"	0	6
Clay	"	0	6
Black slate	"	0	0¼
CANNEL, the upper inch perhaps a little bony	"	3	2¾
		9	3

The Upper Cannel was also opened in 1872 on the hillside over the blacksmith's shop on Droddy's Creek, half a mile northwesterly from the mines, and measures but 10½ inches, of which only the upper nine-eighths of an inch are cannel or cannel slate, the rest all bituminous ; but there was only clay and loam above, without any solid roof.

The quality of the cannel coal of this bed at Peytona is very good, though not quite equal to the remarkably fine coal of the Main Cannel bed.

On Lens Creek the Upper Cannel coal bed is of different character, but is beyond question the bed called there Wood's Upper Coal. It seemed in 1872 to have been worked only at Wood's upper mine on King's branch, where it was opened by a drift about twenty feet long in the winter of 1869 and 1870, with the following section from above downward :

		FT.	IN.
COAL, bituminous, softer	about	0	9
Clay	"	0	0¼
COAL, bituminous, hard, "splint"	"	2	8
		3	5¼

It was not then fully accessible on account of water dammed back by fallen earth at the mouth.

The same bed was imperfectly opened at the head of Big Hollow, in 1872, with the following section from above downward :

		FT.	IN.	FT.	IN.
Loose clay and shaly wash	about	2	0		
Coal, much weathered, rather hard	"	0	6		
Clay	"	0	0½	3	9
Coal, hard and firm, but weathered	"	3	2½		
Black slate, exposed	"	0	1		
		5	10		

The same bed was opened in 1872 on the very steep hillside on the south side of Schoolhouse Hollow, near the middle of the east edge of the map, with the following section from above downward :

		FT.	IN.	FT.	IN.
Slate roof exposed	about	2	0		
Coal, softer	"	0	5½		
Clay	"	0	0¼	3	3¾
Coal, hard, "splint"	"	2	10		
		5	3¾		

Floor, said to be slate, two inches under water.

Another opening made on the same bed in 1872, on Bee Branch, near the southern edge of the map, gave the following section from above downward :

		FT.	IN.	FT.	IN.
Slate	about	1	0		
Coal, rather soft	"	0	4½		
Clay	"	0	1	3	3
Coal, bituminous, hard, "splint"	"	2	9½		
Brownish-gray, fine, hard sand rock	"	1	0		
		5	3		

A rather imperfect opening made on the same bed in 1872 nearly opposite Nuby's house on the left fork of Lens Creek had the following section from above downward :

No roof but loose material, mostly brownish-gray sandstone blocks.

		FT.	IN.
Coal, bituminous		0	3½
Gray clay	about	0	1½
Coal, bituminous		2	1
Bony coal		0	6
Coal, bituminous		0	6
		3	6

Another opening on the same bed made imperfectly in 1872 at Perfater's Spring, on a small branch of the left fork of Lens Creek, nearly

south of Lavender's house, gave the following section from above downward :

No roof but wash.

	FT.	IN.
Coal, slaty.....about	0	1
Coal, with half an inch of clay about the middle, "	0	11
Hard fire clay.		
	1	0

The spring is only about three feet distant. Its water is called good, but said to taste a little sulphury.

It is probably the same bed that was very poorly opened in 1872 rather high up the hillside in Peels' Hollow, with the following section from above downward :

Wash loam.	FT.	IN.	FT.	IN.
Coal.....	0	$3\frac{1}{2}$		
Clay.....	0	$1\frac{1}{4}$		
Coal.....	1	$6\frac{1}{2}$	2	2
Clay.....	0	$0\frac{3}{4}$		
Coal.....	0	2		
Clay, exposed.....about	0	6		
	2	8		

The coal is only bituminous, and nothing but dirty crop-coal, and so not of very good appearance.

The bed was also opened in 1872 near Asa Ferrel's house, and near the southwest corner of the map, just above the so-called Ferrel's coal opening on the Factory Coal Bed, or the Peytona Main Cannel, and had the following section from above downward :

Roof, not solid.	FT.	IN.
Coal, bituminous, "splint"	0	6
Fireclay	0	6
Coal, bituminous, "splint".....	1	6
	2	6

The coal of Wood's Upper Bed is bituminous, of very fine quality, especially the main bench, below the seam of clay. The main bench is a remarkably firm splint coal, extremely well suited for steam purposes or domestic fires, or probably even for burning raw in iron furnaces. It is easily mined in large blocks that bear rough handling extremely well. A fair specimen of it was assayed in 1872 by the very able chemist, Dr. George A. Koenig, and yielded :

Coke	68.35
Gas.....	23.25
Ashes (gray).....	6.45
Hygroscopic water.....	1.95
	100.00

The coal seems to be very free from sulphur. The thin upper bench is less firm than the main one. This bed is undoubtedly the one described in the following extracts from a report on these tracts by the celebrated Professor James Hall (1854), as quoted in the pamphlet of the St. George Mining and Manufacturing Company, New York, 1865, page 7 :

"This bed was first opened on the point of a low hill in the rear of Mr. Vickar's house, as shown on the map. At this point it is three feet ten inches thick. Although in a most exposed situation, and covered only by a slight thickness of clay, the coal was quarried out in blocks of large size, and breaking into smaller masses only by the application of considerable force.

"The aspect of the coal is that of a laminated cannel coal with thin seams of bituminous coal intervening, but altogether forming a small part of the whole. On burning this coal side by side with the cannel coal from the bed previously mentioned, there was a remarkable similarity in the color and character of the flame, the amount of smoke and the ash. The coal burns with much white, or yellowish-white flame, without decrepitation, and with a small quantity of smoke. It maintains its form, showing no disposition to melt or run, and in the process of burning, throws out numerous jets of white flame, in addition to the steady burning flame. When partially burned, it presents a fine porous coke, finally burning away to a white or light-colored ash, without, in the cases tried, any appreciable quantity of slag or other impurity. The flame and quantity of smoke from a piece of cannel coal burned at the same time and by the side of this coal were not perceptibly different.

"From this little experiment, twice repeated at the locality, I infer that for all purposes for producing steam, or for a steady, dry-burning, blazing coal, the coal from this bed will answer all the purposes of the real cannel coal, and for these objects will be equally valuable. The only advantage possessed by the cannel coal for domestic use is that of its freedom from soiling in the process of handling. I am inclined, therefore, to regard this bed of coal as of very great value, particularly upon the western rivers, and for the steam boilers of all manufactories where the prevailing coals are of the soft, bituminous character.

"I may mention that such is the indestructibility of this coal from ordinary atmospheric agencies, that large fragments may be picked up in the beds of the streams half a mile from the coal in place, and the specimens burned were of such samples which had lain exposed to the weather probably for centuries. I need scarcely mention that from this remarkable indestructibility of the coal from the agency of the weather and from its breaking out in large blocks, even on the exposed outcrops, it is remarkably adapted to bear transportation with little loss from breaking or waste.

"This combination of qualities, which I hesitate not to say is possessed by no other coal in this region, except the cannel coal, renders it extremely valuable to any parties who propose to mine and send coal to market."

The bed seems to thin out, not only southwestward towards Peytona, but northwestward towards the Kanawha ; for near the river it measures but 2 feet 10 inches in one place, and would seem to be much less than that in Church Hollow and thereabouts. At the few points, however, where fully opened on the Parker tracts, it seems to be of good workable thickness ; and the bed seems to have its greatest size just here, and to be in general little noticeable everywhere else in the neighborhood.

The "bastard cannel" at the bottom of the upper cannel coal bed, at Peytona, contains numerous fossil shells.

MAIN CANNEL.—The Main Cannel coal bed had, in 1872, been worked for twenty years or more at the Peytona mines and near them, as well as at the adjacent mines of the Western Mining and Manufacturing Company. Seven measurements of the coal at different parts of the Peytona mines give the following section of the bed from above downward ;

	FT.	IN.	FT.	IN.
Smooth cannel, 1,, 8 to 2,, 1, average, about	1	10	2	6
Curly (or birds'-eye) cannel, 0,, 0 to 1,, 6	0	8		
Bituminous coal, 0,, 0 to 0,, 8	0	4	0	4
	2	10	2	10

After those measurements were made, another part of the mine yielded cannel, both kinds together, 3 feet 5 inches thick, the lower 17½ inches being curly and the rest all good cannel.

An opening on the river front of the hillside over Halsted's farm about three-quarters of a mile northeast of the mines shows the following section from above downward :

	FT.	IN.	FT.	IN.
Brownish-gray slate.....about	8	0		
Wild cannel or very bony cannel, or cannel slate	0	1		
Clay	0	1		
CANNEL, the lower inch a little mixed with bituminous coal	0	5		
COAL, bituminous, very hard	0	9		
Clay	0	1	1	11
COAL, bituminous, very hard, somewhat resembling "curly cannel"	0	7¼		
	10	1¼		

In Abshire's Hollow, about half a mile southeast of the mines, the bed is opened, with the following section from above downward :

	FT.	IN.
Smooth CANNEL	0	3
COAL, hard bituminous	0	11
Smooth CANNEL	0	10
	2	0

An opening near Droddy's Creek, about three-quarters of a mile northwesterly from the Peytona mines, gives the following section from above downward :

	FT.	IN.
CANNEL, slaty	0	6
COAL, bituminous	0	3
COAL, bituminous, resembling "curly cannel"	1	1
COAL, bituminous	0	6
	2	4

Near John McCarty's house on Droddy's Creek, about twenty feet below the opening on the Upper Cannel, there is an old opening quite fallen in that must have been on the Main Cannel ; but its coal is said to have been "bituminous mixed with cannel."

The smooth cannel is cannel proper ; the curly cannel is an intimate mixture of cannel coal and bituminous. The curly is more highly prized, as it makes the best coal for domestic use. The quality of both kinds is remarkably pure. Besides the very great merits of the coal for domestic purposes, it is very valuable for making gas, owing to the large yield and high candle power of the gas ; and the coal is therefore used as an "enricher" with bituminous gas-coal.

The following are the results of an assay of the Peytona cannel coal, as reported by the Manhattan Gas Light Company of New York, in 1869 :

"Maximum yield of gas per ton of 2240 pounds—13,200 cubic feet of 32.66 candle power.

"At 10,000 feet per ton (standard yield) the illuminating power of the gas is equal to 41.16 candles.

"Yield of coke per ton, 32 bushels, weighing 1380 pounds.

"One bushel of the hydrate of lime purifies 4510 cubic feet of gas.

"Analysis of the coal :

"Volatile matter	46.00
"Fixed carbon	41.00
"Ash	13.00
	100.00"

The cannel coal of the Main Bed has in some parts of the mine red ash, and in some parts white ash. At one place there is what they call "gummy coal" or "gum," red and white, said to be liquid when fresh, like syrup, thinner than cold molasses. Some of it when gathered dry in the mine looks like a rotten coal, and some of it like a bituminous powder.

In mining, the bituminous coal was thrown aside in the mine, and left there.

This bed is the same as the Factory Cannel Coal Bed of Lens Creek, but much superior to it in quality, as well as thickness, at the Peytona mines. It is a very irregular bed both in thickness and quality, and its unusual

merits in these respects at Peytona gave especial value to the deposit there.

The Factory Cannel Coal Bed was the most widely known of all the coals on Lens Creek, and is the one formerly worked at the old oil factory on the Left Fork. The section there, at about twenty-five yards inside the middle one of three drifts, is as follows, from above downward :

	FT.	IN.	FT.	IN.
Coal, bituminous	0	6	3	8½
Black slaty clay	0	9½		
Cannel	2	5		
Black iron ore ..... about	0	3		
	3	11½		

The bench of cannel however is said to yield only 1 foot 6 inches of good cannel, the rest being "wild cannel" or cannel shale.

The same bed was imperfectly opened in 1872 nearly opposite Nuby's house on the Left Fork of Lens Creek and had the following section from above downward :

	FT.	IN.
No solid roof.		
Cannel, partly good, partly slaty, all rather poor looking ..... about	3	0
Black carbonate of iron	0	2
Brownish-gray sand rock, at least	20	0
	23	2

The coal looks rather less pure than the Peytona mine cannel, but that is perhaps owing to its being merely crop-coal. The thickness, too, could not be properly measured without a firm roof.

The bed was opened also in 1872 near the schoolhouse of the Left Fork, with the following section from above downward :

	FT.	IN.	FT.	IN.
Shaly sandrock ..... about	22	0		
Black clay ..... "	0	1		
Coal ..... "	0	1		
Black clay ..... "	0	1		
Sand rock ..... "	3	0		
Gray shales ..... "	12	0		
Black soft slate ..... "	0	6		
Coal, bituminous	0	4½	0	9
Clay	0	1		
Coal, bituminous	0	3		
Bright cannel	0	0½		
Gray slaty clay	1	6		
Shaly sand rock ..... about	10	6		
	56	6		

The same bed apparently was imperfectly opened in 1872, near the head of Stewart Branch, and had the following section from above downward :

		FT.	IN.
Loam, no firm roof	about	2	0
Clay, mixed with coal slate, outcrop	"	0	6
Fire clay	"	1	6
COAL, bituminous		0	7
		4	7

The same bed was imperfectly opened too, in 1872, in Locust Hollow, east of the Right Fork, and had the following section from above downward :

		FT.	IN.
No true roof, but clay and wash	about	2	0
Crop-coal		0	7
Clay and wash		0	6
COAL, bituminous		1	5
Fireclay	about	0	1
COAL, bituminous		0	7
		5	2

The same bed was well opened in 1872, above Asa Ferrel's house, near the southwest corner of the map, with the following section from above downward :

	FT.	IN.	FT.	IN.
Gray and brown shales	2	5		
Hard black slate	0	1		
Gray and brown shales	0	6		
COAL, bituminous, good	0	2		
CANNEL, good, but not curly	0	5	2	5
Coal, bituminous, good	1	10		
Brownish-gray sand rock, exposed, about	0	6		
	5	11		

The place of the bed appears also to be indicated by an exposure of about three inches of bituminous coal a little more than 40 feet in level below the opening on Wood's Upper Coal at Perfater's Spring already mentioned.

The quality of the Factory Cannel Bed is plainly very variable, and its thickness extremely so. The bed thins out towards the Kanawha, near Brownstown and above, and can scarcely be found there at all, having but a few inches of thickness and no cannel. It may prove workable in some spots, especially near the factory, but is so thin and variable that it can hardly be counted on. The cannel lasts so long, when exposed to the weather, that bits of it are found all along the outcrop, which is therefore comparatively easy to follow on the ground ; and can be looked for between the outcrops of Wood's Upper and Wood's Lower Coal.

Shoot Coal.—The Shoot Coal Bed, at Peytona, is so-called from the opening near the foot of the shoot at the mines. The opening was closed and no longer accessible in 1872, but was said to have had the following section from above downward :

	FT.	IN.
Coal, bituminous, good, hard	0	10
Slate	0	1½
Coal, bituminous, good, very hard, "breaks almost like anthracite"	2	6½
	3	6

The same bed is also said to have been opened a great many years ago, by Dr. DuBois, above the Blacksmith Bank, and found to have a thickness of over 4 feet, besides 3 inches of slate at 10 inches below the top.

The bed was opened in 1872, in Abshire's Hollow, opposite Abshire's house, with the following section from above downward :

	FT.	IN.
No solid roof.		
Coal, bituminous	2	10
Coal, "splint," or bony	0	6
	3	4

The bed was likewise opened in 1872, on Indian Creek, about 300 yards above Abshire house, and 50 yards below the mouth of Meadow's Fork of Indian Creek, and had the following section from above downward :

	FT.	IN.	FT.	IN.
Gray shales.				
Soft black slate.....about	0	1		
Coal, bituminous	0	9		
Slate	0	3½	3	7
Coal, bituminous	2	6½		
	3	8		

On Lens Creek, the coal bed of Wood's lower mine (a drift some 20 feet long), on King's Branch of the Left Fork, is the same as the Peytona Shoot Coal Bed, and has the following section from above downward :

	FT.	IN.	FT.	IN.
Solid sand rock exposed.....about	4	0		
Coal, bituminous	1	0		
Slate or clay.....about	0	0½		
Coal, bituminous	1	7	3	8
Slate or clay.....about	0	0½		
Coal, bituminous	1	0		
	7	8		

The same bed was opened in 1872, near the schoolhouse of the left fork of Lens Creek, and had the following section from above downward:

	FT.	IN.	FT.	IN.
Brownish-gray sand rock, exposed, about	2	6		
Coal, bituminous, firm and good.....	2	9		
Bony coal or slate.....	0	0½	4	0½
Coal, bituminous, firm and good.....	1	3		
Slate, exposed.....about	0	3		
	6	9½		

The coal seems to be of fine quality.

The same bed was formerly opened at Fry's Coal Bank, still partially accessible in 1872, and had the following section from above downward:

	FT.	IN.
"Slate roof of unknown thickness."		
Coal, bituminous, very firm, good.....	3	3
"Slate bottom."		

Near the mouth of the drift the coal has a quarter-inch of slate at a foot or fifteen inches from the bottom; but the slate is said to disappear further in.

The same bed was opened rather imperfectly on Stewart's Branch, nearly three-quarters of a mile southwest of the forks of Lens Creek and had the following section from above downward:

	FT.	IN.
Gray and black shales .....about	10	0
Gray sand with some particles of coal mixed.....	0	4
Coal, bituminous.....	2	0
Hard, brownish-gray sand rock.		
	12	4

The same bed, apparently, was opened in 1872, in Peels' Hollow, with the following section from above downward:

	FT.	IN.
Loam.		
Brown shales.....about	2	2
Coal, bituminous.....	0	6½
Fireclay.		
	2	8½

But, perhaps, the coal bed was not fully exposed; or possibly, by an error of the aneroid level, this may be the representative of the Blacksmith Coal Bed.

Imperfect openings of the same bed were also made nearly opposite Nuby's, on the Left Fork of Lens Creek, where only two feet are exposed

in a crush of loose rocks ; and near Asa Ferrel's, on the Right Fork of Lens Creek, where less than a foot of crop coal has been uncovered.

This coal bed is clearly the same as the bed formerly worked at the Winifrede Coal Co.'s main mine, less than a mile east of the main Parker tract. That mine was still accessible in 1872, with a little difficulty, and near the mouth of the drift gave the following section from above downward :

	FT.	IN.	FT.	IN.
Brownish-gray, massive sand rock.about	5	0		
Slate	0	8		
Brownish-gray, massive sand rock	1	9		
Slate	3	0		
Coal, bituminous, firm and good	2	9		
Clay	0	3	4	6
Coal, bituminous, firm and good	1	6		
Shale, exposed.....about	1	0		
	15	11		

The quality of the coal, as well as the slate or clay parting, is extremely like what is found at the opening on Wood's Lower Bed (the Peytona Shoot Bed), near the schoolhouse of the Left Fork of Lens Creek, and at Fry's Coal Bank on Ketcham Branch and at other points. The identity was evidently recognized by Prof. Hall forty years ago.

The coal of Wood's Lower Bed on Lens Creek seems all to be of very fine quality, richer in gas than Wood's Upper Coal and somewhat less firm than that, though still very firm and capable of bearing handling very well. It is much liked as a domestic coal, and would probably be a good gas coal. It is unquestionably the same as the one of the Winifrede mines, the coal of which bears a very high reputation ; and is probably the same in quality, since those mines are within a mile of the eastern edge of the main Parker tract. Besides, as already pointed out, the resemblance is very strong indeed.

The Winifrede Coal was supposed in 1872 to be also the same as the bed of the Coalburg mines, a couple of miles more distant up the Kanawha ; but, in spite of the resemblance of the structure of the two beds and the quality of the coals and other arguments, Prof. White (Bulletin 65, p. 162), says that the Winifrede is seventy-five or one hundred feet lower than the Coalburg coal, reckoning from the Kanawha black flint. In that case it would seem that the Coalburg bed must be the same as Wood's Upper Coal, the Upper cannel of Peytona ; but the distance apart in these two surveys is about one hundred and twenty feet, a difference hard to reconcile. The Shoot Bed of Peytona, Wood's Lower Bed of Lens Creek, seems hereabouts to be the most uniform in thickness and in quality of all the coals below the barren measures, and to be everywhere a very excellent, firm, bituminous coal and of workable thickness wherever it has been fully opened. Towards the Kanawha,

outside of the tracts, it appears to be in two or three benches separated by layers of clay a foot or even more in thickness.

Blacksmith Coal.—The Blacksmith Coal at Peytona is so named for its purity and usefulness in the forge, and would seem to be very persistently of fine quality, since the same bed is called so in the northern edge of the State. It is, however, probably too thin to work at present, except for local use along the outcrop.

It was worked by a drift at the lower part of the Peytona mines, and had there the following section from above downward :

		FT.	IN.	FT.	IN.
Brownish-gray sand rock	about	4	0		
Hidden	"	1	6		
Brownish-gray, hard shales, exposed	"	0	6		
Soft shales	"	0	2		
Coal, bituminous	"	0	2		
Bony coal or slate	"	0	1¼		
Coal, bituminous	"	0	9	2	3
Slate	"	0	0¼		
Coal, bituminous	"	1	2½		
Clay, apparently.					
		8	5		

The bed was opened also at Abshire's Coal Bank, on Indian Creek near Abshire's Hollow, with the following section from above downward :

		FT.	IN.
Shaly sand rock, exposed	about	5	0
Coal, bituminous, good		2	0
Fireclay, mixed with slate.			
		7	0

The same bed is opened, too, in Abshire's Hollow, back of his house, with the following section from above downward :

		FT.	IN.
Shales, exposed	about	3	0
Shaly sand rock	"	2	0
Slate	"	0	6
Coal, bituminous	"	2	1
Fireclay mixed with slate.			
		7	7

This bed at Lens Creek appears at about twenty feet below Wood's Lower Coal.

It would seem to be the bed opened in 1872 on Ketcham Branch, near the southeast corner of the map, in two places near together on opposite

sides of the branch and about half a mile from its mouth. At the upper, southern, one there was the following section from above downward :

		FT.	IN.
Gray shale, exposed	about	3	0
Black slate	"	1	6½
Gray shales	"	0	8½
COAL, bituminous, and clay and slate in several layers, mostly coal	"	1	2
Gray shales.		6	5

At the lower, northern, opening of the two, there was the following section from above downward :

		FT.	IN.	FT.	IN.
Brownish-gray sand rock	about	1	6		
Brown and gray shales	"	5	0		
Black slate	"	1	5		
Gray shales		1	0		
COAL, bituminous		0	3		
Clay		0	2	0	7
COAL, bituminous		0	2		
		9	6		

The same bed seems also to have been opened on the Stewart Branch of the Left Fork, some 500 yards above the mouth of the branch, by a couple of old ruined drifts that expose a few inches only of the top of the coal, with two or three feet of shales over it.

JERROLD'S COAL.—Jerrold's Coal of Lens Creek seems not to exist at Peytona, but to be represented perhaps by some three inches of black slate at the bottom of about twenty feet of apparently iron-bearing brown shales just like those that overlie the bed on Lens Creek. The black slate is exposed on the railroad about sixteen feet above the top of the lower shoot.

The bituminous coal bed worked by Jerrold on the bank of the Left Fork of Lens Creek, just below the mouth of Ketcham Branch, has the following section there, from above downward :

	FT.	IN.	FT.	IN.
Loose blocks of sandrock.				
Roof slate, exposed	1	0		
COAL, bituminous, comparatively soft	0	7		
COAL, bituminous, much of it hard "splint," but generally less hard than Wood's Upper Coal	2	8½	3	3½
	4	3½		

It would seem probable on the whole that it is the same bed that was worked at Mitchel's Coal drifts on the left fork of Lens Creek about 200 yards above the mouth of Ketcham's Branch ; though it is possible that

the coal here is a local thickening of the small bed that occurs some fifteen feet below Jerrold's Coal. The section at Mitchel's drifts is as follows, from above downward :

	FT.	IN.
Slate, exposed.....about	1	6
COAL, bituminous, less firm than Wood's Upper Coal, but of fair quality.....	3	1
"Slate floor."		
	4	7

The same bed apparently was opened at the old drift on the Ketcham Branch of the Left Fork of Lens Creek, near the mouth of the branch. The coal is partly covered at the bottom ; but would seem to measure about two feet in thickness.

The Jerrold Coal is seen also at Mrs. Nuby's coal mine, a drift about six feet long on the Left Fork of Lens Creek, 300 yards below her house, with the following section from above downward :

	FT.	IN.	FT.	IN.
Shales, exposed.....about	4	0		
COAL, bituminous, of fair quality.....	1	0		
Clay.....	0	$0\frac{1}{4}$	2	$10\frac{3}{4}$
COAL, bituminous, of fair quality.....	1	$10\frac{1}{2}$		
	6	$10\frac{3}{4}$		

Two inches above the clay seam, there is, at least in places, another similar clay seam.

The same bed was worked with eight old drifts close together just across the creek, and had there the following section from above downward :

	FT.	IN.
Sand rock, massive.		
Slaty shales and shaly sand rock with small iron-ore nodules.....about	15	0
COAL, bituminous, with two or three quarter-inch seams of black clay at about nine inches below the top ; apparently 3,, 0 or more in one drift, in another, measured.....	2	10
Slaty shales.....	10	0
	25	0

The same bed is worked with a drift a dozen yards long at Myer's Coal Bank, close by the oil factory already mentioned, and has the following section from above downward :

	FT.	IN.	FT.	IN.
Brownish-gray sand rock, massive, about	12	0		
Slate.....	0	6		
COAL, bituminous, good.....	0	9		
Black clay.....	0	$0\frac{1}{2}$	2	$8\frac{1}{2}$
COAL, bituminous, good.....	1	11		
	15	$2\frac{1}{2}$		

The same bed is also worked by Gus. Hoffman, on the Vinnie Lick Branch of the Right Fork of Lens Creek, and has there the following section from above downward :

	FT.	IN.
Coal, bituminous	0	6
Clay	0	$0\frac{1}{8}$
Coal, bituminous	3	0
	3	$6\frac{1}{8}$

The bed has been worked, too, by a drift on the opposite (west) side of the Right Fork of Lens Creek, back of Gus. Hoffman's house, and has there the following section from above downward :

	FT.	IN.
Brownish-gray shaly sand rock.....about	8	0
Shales with iron nodules	1	6
Coal, bituminous	2	1
	11	7

The bed was imperfectly opened on the Right Fork of Lens Creek, opposite the mouth of Orchard Hollow and a quarter of a mile above the mouth of Vinnie Lick Branch, and had the following section from above downward :

	FT.	IN.
Shaly sand rock with some nodules of impure iron ore.....about	6	0
Coal, bituminous, good, but much weathered, at least.....about	1	$9\frac{1}{2}$
Dark shales	5	0
	12	$9\frac{1}{2}$

Half a foot of the top of the coal bed is exposed under the shales near Mr. Hoffman's, opposite the mouth of Big Hollow, on the Right Fork of Lens Creek.

The bed was opened in 1872 in Locust Hollow near the east bank of the Right Fork of Lens Creek, and had the following section from above downward :

	FT.	IN.	FT.	IN.
Clay shales, no solid roof	2	0		
Coal, bituminous, mostly hard and good.	1	$6\frac{1}{2}$	3	$0\frac{1}{2}$
Clay	1	0		
Coal, bony	0	6		
	5	$0\frac{1}{2}$		

Another imperfect trial pit on the same bed, some twenty yards to the south, gave about the same measurements, but some of the lower bench seemed to be like cannel.

The same bed is at least partially exposed where it finally passes southward beneath the bottom of the valley of the Right Fork of Lens Creek, at the mouth of Rise Hollow. The coal there is partially concealed by muddy water and perhaps rubbish in the hole, but would seem to be only 1,, 6 or two feet thick, with only two feet of wash for a cover. The wash is stripped off, and the coal dug out. The coal is firm and in large lumps, bituminous, of good quality and much liked by the country people.

The coal at Jerrold's, Hoffman's, Nuby's and Myer's mines, and at Rise Hollow is of good quality, but not equal to Wood's Upper and Lower coals. It is less firm, especially the upper six inches, than either of them ; but the greater part of the bed is far from being tender. The quality in fact seems to be on the whole pretty fair. The thickness would seem to be rather variable, and it may prove to be unworkable at present in some parts of the tracts. It not only disappears at Peytona, but on the Kanawha above Brownstown would seem to be hardly of workable thickness, or only two feet and a half, though worked a little at some points.

Vicker's Coal.—Opposite the mouth of Vicker's Branch, on the Left Fork of Lens Creek, at the lower end of the eight drifts on the Jerrold Coal, there are two old drifts on a coal, a dozen or fifteen feet lower ; and, for want of a more suitable name, it may be called Vicker's Coal. The coal is no longer exposed for measurement here ; but seems to have been perhaps two feet thick.

The same bed was worked at an old drift about fifteen feet below Jerrold's old coal opening on the Left Fork of Lens Creek, two hundred and fifty yards below the mouth of Ketcham Branch. There also the drift has fallen in so as to be inaccessible and leave the coal unexposed. The thickness seemed to have been perhaps two feet.

The bed may probably be the same as the one exposed at Peytona, nine feet below the top of the waterfall below the lower shoot. It has there the following section from the top of the waterfall downward :

	FT.	IN.
Brownish-gray sand rock, very cross-bedded.....	9	0
Coal, bituminous.....	0	3
Brownish-gray sand rock (?)		
	9	3

It is probable that the coal bed was of greater thickness than that, at the drifts on Lens Creek, or it would not have been opened for working at all ; but as it seems to have been little worked compared with the Jerrold Coal just above it, there is no probability that it was more than the two feet thick it seems to have been.

It is barely possible that the coal of Mitchel's old drifts on Lens Creek just above the mouth of Ketcham Branch may be the Vicker's bed ; and it was so supposed probable in 1873 ; but in that case it would have

been only quite locally thicker there. It seems on the whole very much more likely that Mitchel's coal was the same as Jerrold's.

Comparison with the Northern West Virginia Section.

According to Prof. J. J. Stevenson (*Trans. Am. Phil. Soc.*, Vol. xv, pp. 17–31, 1872), the section of the carboniferous rocks of a portion of Monongalia and Marion counties, in the northern edge of West Virginia, near the southwest corner of Pennsylvania, is as follows, from above downward:

UPPER COAL GROUP—MONONGAHELA RIVER SERIES.

		MEAN.			
	FT.	FT.	IN.	FT.	IN.
1. Sandstone, "Waynesburg"	30–40	35	0	43	0
2. Shale	1–15	8	0		
3. Coal, "Waynesburg"	6–9	7	6		
4. Sandstone	15	15	0	194	6
5. Shale	8	8	0		
6. Limestone	5	5	0		
7. Shales and sandstone	20	20	0		
8. Limestone and shale	30	30	0		
9. Sandstone and shale	35	35	0		
10. Limestone	6	6	0		
11. Sandstone	15	15	0		
12. Limestone	7	7	0		
13. Sandstone	10	10	0		
14. Limestone	8	8	0		
15. Sandstone and shales	23	23	0		
16. Shale	1–25	12	6		
17. Coal, "Sewickley"	4½–6	5	3	5	3
18. Shale	5–8	6	6	44	6
19. Limestone	9	9	0		
20. Sandstone	4–10	7	0		
21. Limestone	22	22	0		
22. Coal, "Redstone"	4–5	4	6		
23. Fireclay	1	1	0	39	0
24. Limestone	12	12	0		
25. Shale	5–12	8	6		
26. Sandstone	0–35	17	6		
27. Coal, "Pittsburgh"	7–14	10	6	10	6
28. Fireclay	3	3	0	20	0
LOWER BARREN GROUP—BARREN MEASURES.					
1. Shale with iron	14	14	0		
2. Limestone	2–4	3	0		
3. Coal	1½–2	1	9	1	9

	FT.	MEAN. FT.	IN.	FT.	IN.
4. Shale	3	3	0		
5. Sandstone	25	25	0		
6. Shales	8	8	0		
7. Limestone	3	3	0		
8. Shale with iron	4½	4	6	86	6
9. Limestone	1½	1	6		
10. Shales and shaly limestone	22	22	0		
11. Limestone	1½	1	6		
12. Shale	18	18	0		
13. Coal	1¼–2	1	7½	1	7½
14. Sandstone	10–35	17	6	17	6
15. Coal	⅔–1¼	0	11½	0	11½
16. Limestone	8	8	0		
17. Shales, olive	10	10	0		
18. Limestone	3	3	0		
19. Shales, olive	12	12	0	91	0
20. Sandstone	40	40	0		
21. Conglomerate	0–6	3	0		
22. Sandstone	15	15	0		
23. Coal	3½–4	3	9	3	9
24. Shales, variegated, with some shaly sandstone	33½	33	6		
25. Sandstone	1–4	2	6		
26. Shale, calcareous and fossiliferous	2–4	3	0	63	0
27. Shale, variegated, fossiliferous	24	24	0		
28. Coal	⅓–1½	0	11	0	11
29. Limestone	5	5	0		
30. Shales, variegated, with iron	20	20	0		
31. Sandstone	10–20	15	0		
32. Shales with iron	10–15	12	6	139	6
LOWER GROUP—ALLEGHENY RIVER SERIES.					
1. Sandstone, "Mahoning"	75	75	0		
2. Shales	12	12	0		
3. Coal	1⅓	1	4	1	4
4. Shales	1–25	13	0	13	0
5. Coal	4–5	4	6	4	6
6. Shales	10	10	0	10	0
7. Coal	1	1	0	1	0
8. Sandstone	5	5	0		
9. Shale	10	10	0	49	6
10. Limestone, "ferriferous"	4–5	4	6		
11. Shale	30	30	0		

		MEAN.			
	FT.	FT.	IN.	FT.	IN.
12. Coal	3½	3	6	3	6
13. Sandstone and shale	20–30	25	0	25	0
14. Coal, "Blacksmith"	2–3	2	6	2	6
15. Shale	15–20	17	6		
16. Sandstone, "Tionesta"	25–30	27	6	70	0
17. Shale	25	25	0		
18. Coal	1¾	1	9	1	9
19. Sandstone	4	4	0	4	0
20. Coal	1	1	0	1	0
21. Shale	10	10	0	10	0
Great conglomerate, Penna. No. XII	about 350			350	0

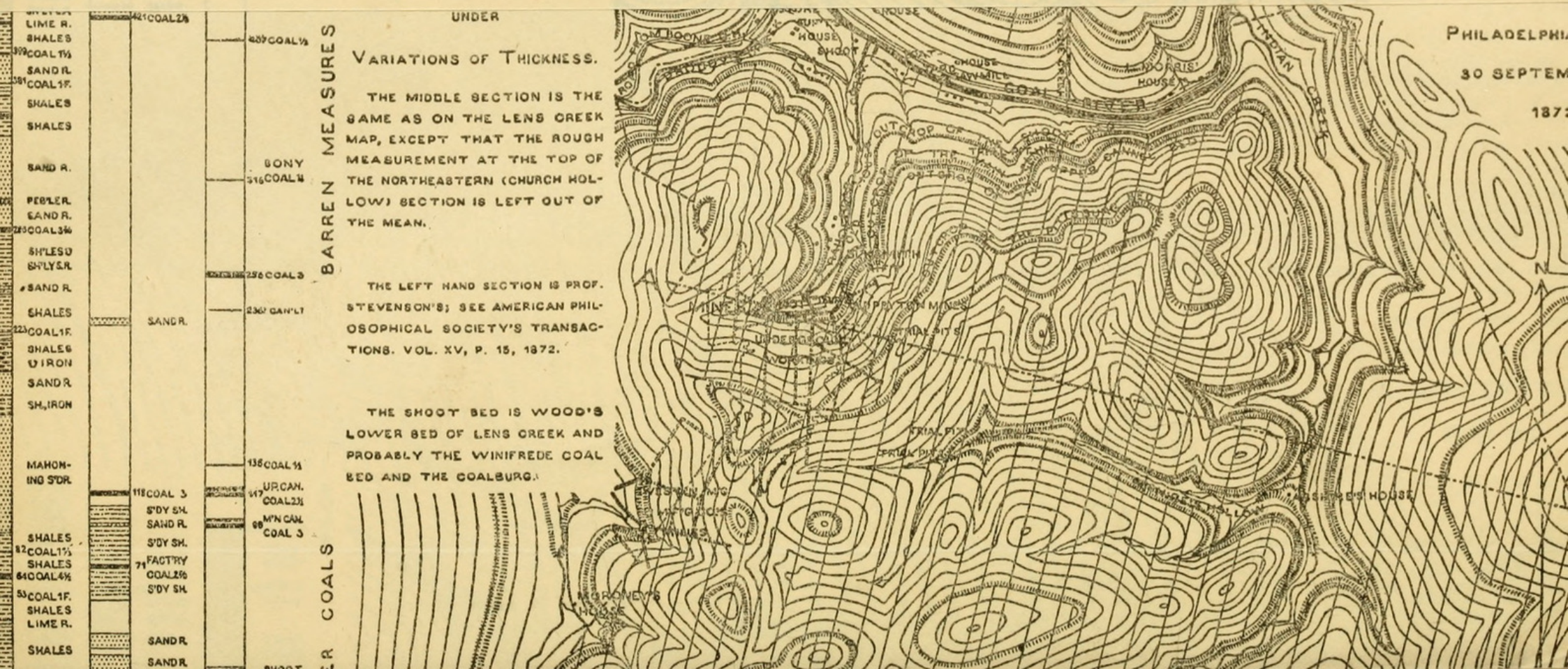
The following table of sections shows the coal beds and the intervals between them at Peytona, and in several parts of the Lens Creek field, as well as an average of the whole Lens Creek field, in comparison with the corresponding beds of Prof. Stevenson's section for the northern edge of the State, as just given.

The columnar sections drawn on the two maps show the correspondence of the coal beds still more clearly.

Identification of the Coal Beds.

Comparing these sections with the sections given by Prof. I. C. White in his Bulletin No. 65, it appears that the six-inch coal about twenty-three feet below the Pittsburgh Bed at Peytona is the little Pittsburgh Bed of Fayette county, Pa.; the Slate Vein would apparently correspond to the Little Clarksburg Coal, likewise slaty at Clarksburg, W. Va.; the three-inch bony coal about 200 feet below the Pittsburgh Bed at Peytona (or possibly the five-foot coal fifty-five feet lower) would correspond to the Elk Lick Coal of the Pittsburgh, Allegheny County and Fayette County region; the six-inch bituminous coal at nearly twenty feet above the Upper Cannel or Wood's Upper Coal, would be the Upper Freeport Bed; the Main Cannel, or Factory Cannel, would be the Middle Freeport Bed; Stevenson's coal bed No. 7 would be the Lower Freeport Bed; the Shoot Coal, or Wood's Lower Coal, or the Winifrede Coal, would be the Middle Kittanning Bed; the Blacksmith Coal would be the Lower Kittanning; Jerrold's Coal would be the Clarion Bed; and Vicker's Coal would be the Brookville Bed.

The leveling of the surveys was done partly with the vertical circle of a transit, partly with a hand level and partly with an aneroid; and though not perfectly exact, was no doubt quite sufficiently so to confirm the identification of the coal beds and to prove that the general sections of the surveys agree very strikingly with the one of northern West Virginia.


LIME R.
SHALES
COAL 1½
SAND R.
COAL 1F.
SHALES
SHALES
SAND R.
PEBBLE R.
SAND R.
COAL 3½
SH'LES &
SH'LY S.R.
SAND R.
SHALES
COAL 1F.
SHALES
U IRON
SAND R.
SH., IRON
MAHONING S'DR.
COAL 3
S'DY SH.
SAND R.
S'DY SH.
SHALES
COAL 1½
SHALES
COAL 4½
COAL 1F.
SHALES
LIME R.
SHALES
SAND R.
SAND R.
SHOOT
COAL 2½
COAL ½
COAL 1½
COAL 1F.
COAL 3½
COAL 3
SAND R.
COAL 1½
UP. CAN. COAL 2½
M'N CAN. COAL 3
FACTRY COAL 2½
BARREN MEASURES
UNDER
VARIATIONS OF THICKNESS.
THE MIDDLE SECTION IS THE SAME AS ON THE LENS CREEK MAP, EXCEPT THAT THE ROUGH MEASUREMENT AT THE TOP OF THE NORTHEASTERN (CHURCH HOLLOW) SECTION IS LEFT OUT OF THE MEAN.
THE LEFT HAND SECTION IS PROF. STEVENSON'S; SEE AMERICAN PHILOSOPHICAL SOCIETY'S TRANSACTIONS. VOL. XV, P. 15, 1872.
THE SHOOT BED IS WOOD'S LOWER BED OF LENS CREEK AND PROBABLY THE WINIFREDE COAL BED AND THE COALBURG.
PHILADELPHIA
30 SEPTEM
187
INDIAN CREEK
OUTCROP OF
MORRONEY'S HOUSE
N