The Virginias,

A Mining, Industrial & Scientific Journal,

Devoted to

The Development of Virginia and West Virginia.

Edited and Published by

Jed. Hotchkiss,

Consulting, Mining and Civil Engineer.

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The Virginias:

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Renewals for *The Virginias* for 1885 are now in order.—Those who desire to have this journal for 1885 will please send me Two Dollars at once.—I do not send it to any one who does not pay for it *in advance* and *for the whole year.* All subscriptions must be for the year.

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Jed. Hotchkiss,
Staunton, Va.

Contents of No. 61.

The Railway Time Tables given below are based on 75th meridian or *Eastern standard time;* they are also in *24-hours time*, from midnight forward to midnight, so midnight appears as 24 00, and noon as 12 00. When the hours given are over 12 the present clock or watch time can be found by taking 12 from the hours. All junction stations are given. Where two times are given at a station the first is that of arriving and the second that of leaving.—Condensed time tables of the other railways of the Virginias will be added hereafter.

Chesapeake & Ohio Ry.

(Oct. 12, 1884.)

Westward.	No. 3.	No. 1.	
New York, (Pa. Ry).....	8 30 or 10 00	24 00	.....
Philadelphia.....“	11 55 or 12 30	3 45	.....
Baltimore.....“	15 20 or 14 55	6 50	.....
Washington, (Va. Mid.)	17 10	9 10	.....
Charlottesville “	21 50	13 40	.....
Norfolk.....	14 50	7 40	.....
Old Point Comfort.....	15 25	8 15	.....
Newport News.....	15 50	8 45	.....
Richmond.....	18 15	9 35	.....
Hanover Jn. (R. F. & P.).....	19 30	10 43	.....
Gordonsville (Va. Mid).....	21 03	12 45	.....
Charlottesville “	21 43	13 35	.....
Waynesboro Jn. (S. Val.).....	23 09	15 16	.....
Waynesboro.....	23 11	15 18	.....
Staunton (B. & O.).....	23 42	15 57	.....
Goshen.....	24 15	17 19	.....
Clifton Forge (R. & A.).....	1 45	18 20	.....
White Sulphur.....	....	20 40	.....
Kanawha Falls...	7 30	2 30	.....
Charleston (O. C.).....	9 00	4 25	.....
Huntington*.....	9 40	6 20	.....
Ashland (Sci. Val.).....	10 19	7 02	.....
Winchester (Ky. C.).....	14 30	11 45	.....
Cincinnati.....	18 05	17 35	.....
Lexington.....	15 20	13 35	.....
Louisville.....	19 10	17 20	.....

*All stations beyond Huntington have 90th meridian or Central time, one hour *slower* than Eastern time.

No. 3, the Louisville and Cincinnati express, is a daily train, with sleepers, from Washington and Richmond, without change from Washington to Louisville and Richmond to Cincinnati. It does not stop for local business.

No. 1, the mail train, is daily, except Sunday.

No. 5, the night express, is daily from Clifton Forge to Ashland; and daily except Sunday from Richmond to Clifton Forge, with sleeper.

Westward.	No. 4.	No. 6.	.....
Louisville (L. & N.).....	19 15	7 00	... .
Lexington “	22 30	11 30	.....
Cincinnati (Ky. C.).....	20 10	8 30	.....
Winchester (Ky. C.).....	23 15	24 45	.....
Columbus.....	17 30	12 00	.....
Chillicothe.....	20 05	14 10	... ..
Ashland.....	3 26	17 55	.....
Huntington*.....	4 00*	18 40*	.....
Charleston.....	6 36	22 00	.....
Kanawha Falls	7 50	23 43	.....
White Sulphur.....	.....	5 10	.....
Covington.....	.....	6 07	.....
Clifton Forge.....	13 30	6 40	.....
Goshen.....	14 47	8 02	.....
Staunton.....	15 57	9 26	.....
Waynesboro.....	16 22	9 58	.....
Waynesboro Jn. (Shen. Val)	16 23	10 00	.....
Charlottesville (Va. Mid.).	17 20	11 05	.....
Gordonsville “	18 20	12 00	.....
Hanover Jn. (R. F. & P.)..	20 20	14 16	.....
Richmond..... .....Arr.	21 15	15 25	.....
Richmond .....Leave	.....	15 45	.....
Newport News.....	.....	18 30	.. ..
Old Point Comfort.....	.....	19 00	.....
Norfolk.....	.....	19 30	.....
Charlottesville, V.M.Jn....	17 25	.....	... .
Washington (Pa. Ry.)....	21 50	.....	.....
Baltimore, “	23 35	.....	.....
Philadelphia, “	3 00	.....	.....
New York “	6 30	.....	.....

*Louisville to Huntington Central time; east of Huntington Eastern time.

No. 4 is the Washington daily express, from Louisville to Washington, and Cincinnati to Richmond, with sleepers, without change. Columbus, Ohio, at 17 30 and Chillicothe at 20 05 connect at Ashland. Observation car from Kanawha Falls to Clifton Forge. No. 6 is the Virginia Springs express, daily except Sunday.

No. 2 is the mail train, daily, from Ashland to Clifton Forge; daily, with sleeper, except Saturday, from Clifton Forge to Old Point Comfort.

☞Hotel Warwick, at Newport News, and Hygeia Hotel, at Old Point Comfort, are open all the year round. Boating, fishing, and tonic sea-air are always in order at these places.

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Shenandoah Valley Ry.

(Nov. 23, 1884.)

Southward.	(No. 3.)	(No. 1.)
New York..... .....20 00		8 30 or 10 00
Philadelphia..... .....23 20		11 55
Baltimore.....		15 35
Harrisburg..... ..... 4 20		.....
Hagerstown, (Wn. Md)..... 8 10		23 25
Shen. Junc. (B. & O.)..... 9 05		24 12
Charlestown (Val. B. & O)..... 9 17		.....
Riverton (Va. Mid)..... .....10 26		.....
Luray.....11 55		2 26
Waynesboro Junc., C. &O 14 05		4 17
Loch Laird, R. & A		....
Natural Bridge (R. & A).....16 15		....
Buchanan, R. & A.....		....
Roanoke (N. & W.).. .....18 00		7 45
Bristol, Tenn 24 29		13 20
Chattanooga, Tenn,..... 8 45		22 10
Memphis, Tenn,.....2 10		12 25
Atlanta, Ga,..... .....13 30		4 20
New Orleans.....10 10		19 30
Jacksonville, Fla,..... 7 40		20 00

No. 3, the New Orleans express, runs daily, with Pullman sleeper without change from New York to Chattanooga.

No. 1, the Memphis express, runs daily, with Pullman sleeper from New York to Memphis.

Northward.	(No. 2)	(No. 4.)
Roanoke (N. & W.).....23 50		13 00
Buchanan (R. & A).....		.....
Natural Bridge (R. & A),..... 1 16		14 20
Loch Laird (R. & A.)..... 1 43		14 51
Waynesboro Junc. (C. & O.).. 3 13		16 20
Luray... ..... 5 20		18 40
Riverton (Va. Mid.) 6 26		20 10
Charlestown (Val. B. & O.)... 7 34		21 22
Shen. Junc. (B. & O.)..... 7 46		21 35
Hagerstown (Wn. Md.)..... 8 40		22 30
Harrisburg, Pa.....		1 00
Baltimore, (via Wn. Md).....11 50		.....
Philadelphia, (via Balto.) 15 15		4 25
New York, (via Balto.)..... ....18 20		7 00

No 2, the Baltimore and Philadelphia express, runs daily, with Pullman sleeper, without change, from Memphis to Philad'a via Harrisburg and Pa. Ry.

No 4, the New York express, runs daily, with Pullman sleeper from Chattanooga to New York, via Harrisburg and Pa Ry.

One thousand mile ticket $25; five hundred mile ticket $15. 61

Virginia Midland Ry.

(Oct. 11, 1884.)

Southward.	(No. 50.)	(No. 52.)	(No. 54.)
Washington.....	9 10	22 40	17 10
Alexandria.....	9 35	23 05	17 30
Manassas.....	10 33	23 55	18 35 or 18 45
Warrenton Junction....	11 05	24 22	19 20
Orange.....	12 35	1 38	20 50
Charlottesville....	13 40	2 35	21 50
“	13 50	2 45	.....
Lynchburg.....	16 05	5 00	.....
“	16 25	5 05	.....
Franklin Junction	18 01	6 32	.....
Danville..... .	19 10	7 32	....
Northward.	(No. 51.)	(No. 53.)	(No. 55)
Danville.....	11 45	23 30	.....
Franklin Junction.....	12 54	24 29	.....
Lynchburg.....	14 30	1 50	.....
“ leave	15 00	1 55	.....
Charlottesville	17 25	3 55	.....
“ leave	17 35	4 00	17 25
Orange.....	18 43	4 56	18 19
Culpeper.....	19 25	5 30	.....
“	19 40	....	18 51
Warrenton Junction....	20 34	6 12	19 39
Manassas.....	21 03	6 37	20 10
“ ....leave	21 05	6 39	20 25
Alexandria.....	22 00	7 30	21 25
Washington.....	22 25	8 00	21 50

All these trains run daily.—Nos. 50 and 51 are mail trains.—Nos. 52 and 53 are the Southern express.—Nos. 54 and 55 are the Louisville and Washington express of Ches. & Ohio Ry.—Nos. 50, 51, 52 and 53 make through connections from Boston to Atlanta; they all have sleeping cars.

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Norfolk & Western RR.

(Nov. 23, 1884.)

Westward.	(No. 13.)	(No. 3.)
Norfolk.....	14 25	8 55
Suffolk.....	15 10	9 40
Petersburg	17 10	11 35 or 11 45
Burkeville.....(No. 1)		13 38
Lynchburg.....	5 45	16 05 or 16 45
Roanoke.....	8 00	18 37
Central....	9 34 or 10 55	20 24
Pocahontas	13 00	
Wytheville.....	10 53	21 53
Bristol.....	13 20	24 20

No. 3 runs daily, with sleeper, without change, from Washington, D. C., via Lynchburg and Atlanta to New Orleans.

No. 1 runs daily, with sleeper, from Lynchburg to Bristol, and sleeper from New York (taken from S. V. RR., at Roanoke) without change, to Memphis, Tenn.

Nos. 13 and 3 connect at Petersburg for Richmond at 12 58 and 18 00. Leaving Richmond by R. & A., at 9 20, 15 30, and 21 45 connections are made at Lynchburg for westward.

Eastward.	(No. 2.)	(No. 4)
Bristol.....	18 15	7 10
Wytheville.....	20 50	10 11
Pocahontas.....	16 15	
Central.....	22 10	11 09
Roanoke..	23 35 or 23 45	12 50 or 13 00
Lynchburg.....	1 45 or 6 50	14 45
Burkeville...	9 25	
Petersburg	11 20 or 11 50	7 30
Suffolk.....	13 46	9 40
Norfolk.....	14 35	10 30

No. 2 runs daily, connecting at Petersburg for Richmond at 12 58, and at Norfolk with steamers for Baltimore and New York. Nos. 2 and 4 connect at Roanoke with Shenandoah Valley Ry., with Pullman sleepers to New York. At Lynchburg they connect with Va. Midland for Washington etc. at 2 45 and 13 55; and with R. & A. at 3 10, 14 00, and 21 40 for Richmond. 61

Richmond & Danville RR.

(Oct. 12, 1884.)

Southward.	No. 50.	No. 52.
Richmond,.....	13:30	2:00
Burkeville,.....	15:38	4:03
Danville,.....	19:41	7:56
Greensboro,.....	21:35	9:30
Salisbury.....	23:58	11:10
Charlotte,.....	1:35	12.35
Northward.	No. 51.	No. 53
Charlotte,.....	4:20	18:30
Salisbury,.....	6:10	19:57
Greensboro,.....	8:20	21:38
Danville,.....	10:08	23:09
Burkeville,.....	13:32	3:57
Richmond,.....	15:45	7:00

All these trains are daily and connect with north- and south-bound trains on other roads so as to make thorough connections in all directions.—No. 53 runs to Atlanta without change.—Buffet sleeping cars run on Nos. 50 and 51 between New York and Atlanta, via Washington and Danville, and also Raleigh and Asheville.—Pullman sleepers on Nos. 52 and 53 between Richmond and Danville, and Washington and Augusta (Ga.) and Washington and New Orleans, via Danville. 61.

Richmond & Alleghany RR.

(Oct. 12, 1884.)

Westward.	(No. 1.)	(No. 9.)	(No. 3.)
Richmond	8 20	18 40	15 30
Scottsville	11 35	23 44	19 01
Lynchburg.....	14 40	3 25	22 00
Balcony Falls....	16 22	5 25	.....
Lexington,.....	18 15	7 00	.....
Natural Bridge (S. V)	16 32	.....	.....
Buchanan..... “	17 12	.....	.....
Clifton Forge (C.&O.)	18 35	.....	
Eastward.	(No. 2. & 12)	(No. 10.)	(No 4)
Clifton Forge. 10 30		.....	.....
Buchanan.....	12 04	.....	.....
Natural Bridge.....	12 43	.....	.....
Lexington.....	11:05	18 40	
Balcony Falls.....	13 00	20 40	
Lynchburg.....	14 15 or 15 00	22 19 or 22 35	(No. 4) 3 15
Scottsville....	17 36	2 40	6 08
Richmond	21 15	7 15	10 00

No. 16 runs from Lexington at 4 55 to Lynchburg at 7 25 daily, the others daily except Sunday. Sleepers are attached to night trains between Richmond and Lynchburg.

Mrs. R. E. Christian

The Virginias.

Serial No. 62. Vol. VI.—No. 2.

Staunton, Va., February, 1885.

Jed. Hotchkiss, Editor.

Erratum.—On page 10, of Jan. 1885 No., 1st column, 5th line from bottom, 85′ should be 850′.

The Map of the Semi-bituminous Coal-field of the Great Kanawha basin, on the next page, is the one that accompanies the report of Mr. Jos. D. Weeks on the Coke industry of West Virginia, published on page 21 of this issue, reproduced, after a photographic reduction of about one-third, by the Crosscup & West Engraving Co. of Philadelphia, who have prepared most of the much admired plates that have recently appeared in *The Virginias.*

This map represents the condition of this noted semi-bituminous coal-field, as understood and developed in 1881, when this map was prepared. If this were revised to correspond to present information and developments some important additions and changes would be made in it: The Norfolk & Western RR. would be shown with a branch extending several miles down the Bluestone, from the mouth of Laurel, to three new coal mines there opened. Several new coal mines would be located on the Chesapeake & Ohio Ry. along New river, as may be seen by refering to the list on page 6 of our Jan., 1885, number.

More important than these additions: the area of the field would have to be contracted to adapt it to the results of the labors of Prof. White (published in the Jan. number of this year) in this coal-field last year. His *lowering* of the "Sewell" bed (see page 16), so to write to the place of the "Nuttall," proving these beds identical, makes it necessary to bring the northwestern border of this Semi-bituminous coal-field, as shown on this map along Gauley river, back a number of miles to the southeast, to the vicinity of Hawks-Nest, making the breadth of this field about one-fourth less than it appears on the map. Its northwestern limits on the headwaters of the Guyandot and Big Sandy could now be fairly well defined from surveys made last year, so we should now say that, approximately, this Semi-bituminous, coking-coal field, where reliable, is about 50 miles long, from northeast to southwest, from about midway between Meadow and New rivers in Fayette county southwest to between Elkhorn and Tug forks of Big Sandy river in McDowell county; and that it is about 30 miles wide from its eastern border as shown on the map to its western; making its total area about 1,500 square miles.

The Chesapeake & Ohio crosses the northeastern end of this field and now takes from it (including coal coked) some 50,000 tons a month; the Norfolk & Western has reached the border of the southwestern end of this field and is now also taking from it nearly 50,000 tons a month.

Knowing the limited area of the coal-fields of this country that yield first-class coking coal, one must conclude that a grand future is before this large one when the two great railways that now have hold of the opposite ends of it shall have fully comprehended the value of the prize to which they hold the keys and solved the problem of its complete utilization. Neither one has yet firmly secured it, and there is the best field we know of for the "survival of the fittest."—We note that Special agent Weeks says that the coke made from this coal is "second to none in the country," and the users of coal for steam appear to have adopted the same expression.

The Lumbering Industries of the Virginias at the 10th Census.—The ninth volume of the 10th census of the United States, that has recently appeared, is on the Forest Trees of North America, exclusive of Mexico; it is a quarto of 612 pages, illustrated by numerous maps and accompanied by a superb atlas of 16 maps. This report, by Charles S. Sargent, professor of Arboriculture in Harvard college and Special agent of the census, is one of the most elaborate and exhaustive of the numerous reports of this census that have as yet been published; it is full of reliable information of permanent value concerning the forests of the United States and British North America, and the character of the timber they furnish; it also contains the statistics of the lumbering industries of the United States for the year ending May 31, 1880, compiled from the returns of the enumerators; from these we have compiled the following figures for Virginia and West Virginia.

	Virginia.	W. Virginia.
No. of establishments	907	472
Capital invested	$2,122,925	$2,668,920
Average No. of hands employed:		
Maximum at any one time,	5,812	3,765
Males above 16 years,	3,922	2,057
Children and youth,	89	126
Wages paid during year,	$540,231	$459,945
Materials:		
Value of logs,	$1,864,288	$1,307,843
Value of mill supplies,	$119,489	$67,529
Products:		
Lumber, board measure, ft.	315,939,000	180,112,000
Laths,	14,400,000	12,071,000
Shingles,	8,233,000	3,695,000
Staves,	14,333,000	41,992,000
Headings, sets,	929,000	1,952,000
Spool and bobbin stock b. m.	800,000	. . . . .
Value of all other products,	$30,355	$140,195
Value of all products,	$3,434,168	$2,431,857
Rank by value of products,	18th	34th

The following table shows the *average* character of the saw mills of the Virginias and of the U. S., in amount invested, labor employed, products, etc. Its figures are obtained by dividing the totals of the preceding table by the number of establishments in each state:

	Virginia.	W. Virginia.	U. States.
Establishments, No.	907	472	25,708
Capital invested in	$2,340	$3,535	$7,048
Hands employed, No.:			
Maximum at one time,	6	8	8.8
Average number,	4	4	5.8
Materials and labor:			
Value of logs,	$2,055	$2,770	$5,436
Value of mill supplies,	$131	$143	$246
Wages paid during year	$595	$974	$1,235
Products:			
Lumber, b.m., ft.	348,000	381,000	703,000
Laths,	16,000	25,000	68,000
Shingles,	9,000	8,000	216,000
Staves,	15,000	89,000	48,000
Headings, sets,	1,000	4,000	5,700
Value of other products,	$33	$85	$104
Value of all products,	$3,786	$5,152	$9,078

A comparison of the average figures above for the Virginias with those for the whole country shows that these states are far below the average in nearly all particulars, notably in the average value of the production of each mill, West Virginia ranks 34th in average value of products among the states and territories and Virginia 44th, or near the bottom of the list. These figures show how little attention was given to lumbering in these states during the census years, notwithstanding their well known wealth of forests.

Coal and Coke Traffic of Ches. & Ohio Ry. Dec. 1884.

General Manager C. W. Smith sends *The Virginias* the data for the following statement of the total output and distribution of coal and coke received from mines on line of C. & O. Ry., (including fuel on Lexington division) during December, 1884, and December, 1883, in tons of 2,000 lbs., compiled by fuel agent, J. W. Hopkins:

Kind.	1884.	1883.	Increase.	Decrease.
Cannel	2,121	73	2,048	.....
Gas	39,282	41,869	.....	2,587
Splint and block	26,320	8,807	17,513	.....
New River, &c	33,797	36,105	....	2,308
Coke	11,077	6,500	4,577	.....
Totals	112,597	93,554	24,138	4,895

The distribution of the above was as follows:

		1884.	1883.
1.	To Ches. & Ohio Co. for its own use	23,923	26,002
2.	To Huntington, for West via. Ohio river	1,357	696
3.	On Elizabethtown, L. & B. S. and K.C.RRs	18.202	3,649
4.	On Ches. & Ohio Ry., excepting Richmond	15,249	12,975
5.	To Rich. & Alleghany RR. at Clifton Forge	3,521	1,093
6.	To Valley RR. of Baltimore & Ohio at Staunton,	....	.....
7.	To Shenandoah Valley RR. at Waynesboro	53	217
8.	To Va. Midland at Charlottesville	4,466	5,744
9.	To Rich. Fred. & Potomac RR., at Junction	2,252	455
10.	To Richm'd for consumption, includ'g tugs, &c,	9,130	11,382
11.	To James River wharves for shipment	4,474	....
12.	To Newport News, For consumption, &c	437	908
	To Newport News, For shipment	29,533	30,233
	Totals	112,597	93,554

The movement from January 1st, 1884, to Nov. 30th, 1884, inclusive, and for same time in 1883, was as follows:

	1884.	1883.	Increase.	Decrease.
Cannel	23,056	21,013	2,043	.....
Gas	324,473	373,371	.....	48,898
Splint and Block	154,803	103,327	51,476	.....
New River, &c	383,063	405,602	.....	22,539
Coke	81,515	100,786	.....	19,271
Total	966,910	1,004,099	53,519	90,708

Low Moor furnace in 1884.—The fine large blast furnace of the Low Moor Iron Company of Virginia, located at Low Moor station of Chesapeake & Ohio Railway, made a good record during the year 1884, as specially reported for *The Virginias*, as follows:

Tuesday, the first day of January, 1884, was the 470th day of its second blast, one that continued for 701 days to Sunday, August 17, 1884, when that blast ended, at 5:23 p. m., for repairs.

The third blast began by lighting the furnace, after extensive and thorough repairs, at 5 p. m., Saturday, Nov. 15, and puting on the blast Monday, Nov. 17th. The runing time of the second blast included in 1884 was 232 days, and that of the third blast was 45 days, making the runing time of the furnace during 1884 two hundred and seventy-seven days.

The output of the furnace for these 277 days was about 31,741 tons, of 2,300 lbs., or an average of about 114.6 tons a day. The largest output in one day was 141.5 tons, Dec. 26th, 1884.

The consumption of ore was about 70,000 tons, of coke 46,000, and of limestone 34,000, or a movement of about 150,000 tons of raw materials in about 9 months, not counting that of coal, which is coked as the furnace, which would bring this quantity up to near 175,000, to which adding the pig iron product we have a handling of over 200,000 tons of raw materials and product in 9 months, or in reality a handling of over 400,000 tons, since each of these is of necessity handled twice.

An Examination of Blue Quartz from Nelson Co., Va.

Prof. F. P. Dunnington, Acting professor of General and Analytical Chemistry in the University of Virginia, has kindly furnished *The Virginias* a copy of "Notes of work by students of practical chemistry in the laboratory of the University of Va.," reprinted from the London, Eng., Chemical News. In this we find a number of very valuable and interesting papers on Virginia minerals which we propose to republish. We cannot too highly commend this publication of the results of original chemical work by students of our university, at the same time it seems to us that the proper thing to do would be to have it appear first in the "American Chemical Journal" of Baltimore, that Prof. Remsen so admirably edits.

The following paper, No. 104, of those communicated from the University, is entitled: "**An Examination of Blue Quartz**, from Nelson county, Va., by Robert Robertson of Danville, Va."

Nelson county lies in the belt of country which extends along the eastern slope of the Blue Ridge, that is known as the Piedmont region, and is composed of Archaean rocks. Near the middle of this belt, and also of Nelson county, passes a strip of light-colored land locally known as the "Kaolin belt." This is from ¾ to 3 miles wide and of undetermined length, and is largely the product of decomposition of a granulitic rock (felspar and quartz). The aggregation of these minerals varies much, the quartz being in some places in small grains and in others forming rather large masses. In some localities the quartz forms a considerable component of the rock, in others but little or none is mixed with the felspar. In all its occurence, however, the quartz presents a characteristic waxy lustre, and a color varying from pale to deep blue. It, therefore, appears of interest to ascertain to what this color is due.

The thin brown films which penetrate this quartz are so numerous that no homogeneous pieces with any dimension exceeding a few centimetres can be obtained, yet the whole forms a firmly coherent mass.

A fragment was fused before the hot-blast blowpipe flame and retained its blue color. The pulverised mineral was digested in hydrochloric acid to remove all ferric oxide which might exist in these films, and then treated with hydrochloric acid to remove all silica. The analysis presented the following composition:—

Ferric oxide	0.539
Titanic oxide	0.069
Silica (by diff.)	99.392

A thin section of the rock was examined under the microscope and found to show throughout the mass a net-work of extremely thin acicular brown crystals, thus presenting, when magnified about 400 diameters, an appearance very similar to that of sagenite to the naked eye. Some of the crystals were twined, forming the geniculations common with rutile. The angles of these geniculations when lying approximately in the plane of vision, measured 70°, 71°, 76°, and 52°, 57°; hence probably identical with the arrangement of the needles in sagenite observed by Dr. A. von Lasaulx in Bonn, being twined at the angles 65° 35′ and 54° 44′. This thin section is decidedly yellow by transmited light, also shows the threads of iron above refered to, and by reflected light is blue.

In view of the color of some varieties of titanic oxide, when seen by reflected light, it appears possible that the partial re-

flection of light by the surfaces of these microscopic crystals occasions the color in question, or the latter may be in a measure due to the interference of light occasioned by these crystals.

It is to be noted that this belt of granulitic rocks and the accompanying gneiss frequently show crystaline masses of rutile on the surface, which have weathered out on decomposition. Moreover the magnetic iron ores contained in these rocks show a large amount of titanic oxide.

The following paper, No. 116 of the University Notes, is entitled: "**Analysis of Infusorial Earth, Richmond, Va.** By J. M. Cabell." This is of especial interest just now when there is a demand for this earth for manufacturing dynamite and other powerful explosives, and when a quantity of this "Infusorial earth" is on exhibition in the Virginia collection at New Orleans.

Since the analyses heretofore made of this well-known infusorial earth appear to have been of rather impure specimens, Mr. Cabell procured from the middle of the exposed bed of this earth just below the colored normal school on President hill, in Richmond, Va., a specimen which, without any previous treatment, proved to be almost exclusively composed of distinguishable infusoria.

It is white with a tinge of yellow, feels a little harsh; specific gravity of mass coated with varnish = 0.922, the specific gravity of powder = 2.321.

Analysis afforded the following:—

Silica dissolved in 1st hour,	29.60	
" 2d "	4.97	75.68
" undissolved,	41.29	
Alumina		9.88
Ferric oxide		2.92
Lime		0.29
Magnesia		0.69
Potash		0.02
Soda		0.08
Nitrogenous matter (nitrogen × 6)		0.84
Water by H_2SO_4	3.37	
" by 100° C.	1.17	8.37
(less N) by ignition,	3.83	
		98.77

To ascertain the solubility of the silica as above, the powder was boiled in a 20 per cent solution of sodium hydrate.

Virginia Maps, Sections, etc., at the New Orleans Exposition.—In the matter of physical and other maps and geological sections illustrating the condition of the state Virginia leads all the state, territorial and general government exhibits in the vast illustrative collection in the Government and States building at the New Orleans Exposition. These illustrations cover over 650 square feet of surface on both sides of a parallelogram over 40 feet long and 7 feet high, raised above and between her extensive mineral exhibit and extending N.W.-S.E., and on two screens placed on the N. W. end of the space occupied by her mineral exhibit and between that and the space allotted to her fish and timber exhibits

These maps and sections were prepared in the office of Major Jed. Hotchkiss, Consulting engineer, geologist, etc., Staunton, Va. As a matter of general interest and as a guide for those that will examine these illustrations, we give the following brief description of them. The ten first mentioned are each maps of Virginia, on a scale of 3.5 miles to one inch, each 6 ft. by 12 ft. in size, and each one is mounted in a frame 6 inches wide, each made from a different kind or kinds of native Virginia woods handsomely finished to show their character; the 12th and 13th are also framed in native woods; a list of these is appended.

The Virginia Maps.

1. **A Railway map,** showing all the railway lines and branches in Virginia and West Virginia, each system colored differently.

2. **A Mineral Deposits map,** one showing the location of the proven extensive deposits of Coal, Iron, Gold, Copper, Lead, Building Stones, etc., of Virginia and, in a general way, of the thousand or more specimens from these and other mineral deposits that are exhibited in the mineral collection of Virginia's exhibit, each designated by a distinct color. On this map all her railway lines are located, to show their relations to these mineral deposits, and also her blast furnaces, both old and new.

3. **A County map** on which each of the one hundred counties of Virginia is shown with its boundaries defined in colors, the counties of each grand division of the state having the same color, thus grouping them and facilitating an understanding of their location.

4. **The Natural Grand Divisions of Va.** are shown on this map each by a distinct color, viz:—1. Tidewater Virginia, on the east, with its 10,850 square miles of surface; 2. Midland Virginia, next on the west, with an area of 12,470 square miles; 3. Piedmont Virginia, next in the same direction, having 5,680 square miles of surface; 4. Blue Ridge Virginia, in the same order, with its far-projecting spurs, the three counties of its southwestern portion, the Floyd-Carroll-Grayson plateau, containing 1,230 square miles; 5. The Great Valley of Virginia, the noted bluegrass, limestone country, of which the famous Valley of the Shenandoah forms a part, with its 7,550 square miles of territory; 6. Apalachian Virginia, the parallel mountain-and-valley country, with 4,520 square miles of territory, that lies to the westward of the Great Valley; 7. Trans-Apalachian Virginia, the 1,200 square miles of the great westward sloping plateau of the Coal basin of the Ohio that belongs to Virginia:—All combined making up the 44,500 square miles of territory now embraced within the limits of Virginia. These regions are all distinct in character, adaptations, climate, productions, etc.

5. **The Hypsometric map of Va.** shows, in 8 separate colors, the approximate areas of the state in reference to their altitude above sea level, as follows:— 1. The irregular dark areas on the east, including the Eastern-shore and the north and-south lying peninsulas and bordering the tidal rivers, are the portions of the state that have their relief between the level of the sea and 50 ft. above that level.—2. The next color to the westward covers the country that has its relief of surface between 50 and 100 feet above sea-level. —3. The next color in the same direction covers areas lying between 100 and 500 feet above sea level.—4. The next color indicates the country which has its relief between 500 and 1,000 feet above tide.—5. The next succeeding color shows what part of the state lies between 1,000 and 1,500 feet above the sea-level.—6. This color indicates the country between 1,500 and 2,000 feet above tide, the high valleys and the low mountain ranges. - 7. The country lying between 2,000 and 3,000 feet above the sea-level is pointed out by the last color, the one next to the white or uncolored areas,-the region of the high valleys and of many of the mountain chains. —8. The white or uncolored areas designate the portions of Virginia that have their surfaces from 3,000 feet above the sea-level to her extreme limit of altitude, which is found, so far as now known, in the summit of Balsam mountain, in Grayson county of the Blue Ridge, 5,700 feet above sea-

level.—This map shows what an extensive range of areas of different habitable elevations, and therefore of climates and adaptations, Virginia possesses, one equivalent to 19 degrees of latitude.

6. **A Geological map of Virginia and West Virginia,** one showing by ten separate colors the areas occupied by the general groups of geological formations exposed in the Virginias—and that includes all those found in the United States, since the Virginias have all those within their limits, viz., from the bottom of the column, upward:—1. The Archaean, including Laurentian, Huronian and Montalban, in Midland and the Blue Ridge, in red.—2. The Siluro-Cambrian (Lower Silurian) of the Great Valley and the limestone mountain valleys, colored blue.—3. The Silurian (Upper) group, the dark brown of Apalachia.—4. The Devonian group, the light brown of Apalachia.—5. The Lower Carboniferous, the lowest coal group, that from which come the anthracite and semi-anthracite coals of the collection, left white or uncolored on the map.—6. The Middle Carboniferous or Carboniferous limestone (Greenbrier) group, the pink areas of the map.—7. The Upper Carboniferous or Great Coal-group, the semi-bituminous and bituminous coal areas of Virginia and West Virginia—their portion of the "Great Coal basin of the Ohio," the one usually called Apalachian—dark slate colored on the map.—8 and 9. The Lower and the Upper Jurassic, the dark and light red patches in and along the Archaean of Midland.—From the Lower Jurassic come the coals of Chesterfield, Powhatan, and Cumberland that are shown in the Virginia collection.—10. The Tertiary areas of the state, the Tidewater country, colored yellow.—This map is replete with scientific and economic information, especially when studied in connection with map No. 11 and the sections of No. 12.

7. **The Hydrographic map of Virginia** is one on which its river basins, the areas drained by each river, are defined by different colors, as:- 1. The Big Sandy basin occupying 900 square miles;- 2. The Tennessee 2,200;- 3. The New-Kanawha 3,200;- 4. The James 11,000;- 5. The Rappahannock 2,800;-6. The Roanoke 6,200;-7. The Potomac 6,200;- 8. The York 2,900;- 9. The Chowan 4,100;- 10. Chesapeake Bay 1,300;- 11. Other small river Basins 4,100 square miles.—This map is not only suggestive of the points where the water-powers of the state have their largest and most reliable supply of water (especially when studied with the Hypsometric map), but it also shows the aspect, or general slope of the different portions of the state; an important element in their crop and other adaptations.

8. **The Distribution of the Mean Annual Rainfall in Virginia,** compiled from the Tenth census, is shown on this map by four shades of color:—1. The lightest shade, that of the westerly regions, covers the country that has a mean annual rainfall of from 35 to 40 inches;- 2. The next deeper shade to the eastward, indicates a rainfall of from 40 to 45 inches annually;- 3. The next shade, still farther east, covers the territory that has a precipitation of from 45 to 50 inches yearly;-and 4. The deepest shade, that next the Atlantic coast, shows a region that has a mean annual rainsall of from 50 to 55 inches.

9. **The Distribution of Lines and Areas of Mean Temperature during the month of Jan'y in Virginia,** compiled from the Tenth census is shown in four colors on this map, viz.—1. The areas of Virginia that have a mean January temperature—that found to be the *winter* temperature of a locality—of from 25° to 30° Fahr.- 2. Those having one of from 30° to 35°.— 3. Those having one of from 35° to 40°,—and 4. Those areas having a mean January temperature of from 40° to 45°.—This map shows a wide range of localities from which to select a *winter climate*, especially when studied in connection with the Hypsometric, the Rainfall, and other maps of the series.

10. **The Distribution of Lines and Areas of Mean Annual Temperature in Virginia** is shown on this map in four colors, or four different belts of mean annual temperature, as on the Tenth census map of the U. S, from which it is compiled; viz:— 1. The areas having a mean yearly temperature of from 40° to 45° Fahr.;- 2. Those having one of from 45° to 50°;—3. Those having one of from 50° to 55°;—and 4. Those having one of from 55° to 60°.—This map indicates the areas of the state, large ones it will be seen, that are adapted to special products in consequence of their mean annual temperature which largely decides the range of agricultural, horticultural and other vegetable productions.

11. **Hotchkiss' Geological map of the Virginias, the Geology by W. B. Rogers,** a new edition, 1885, scale 24 miles to one inch, showing, for the first time, the Permian area of W. Va. and locating the lines of Rogers' Virginia sections (those shown on the next illustration); prepared to accompany "Rogers' Geology of the Virginias," a work just issued by D, Appleton & Co. On this map is a synoptical table correlating the geological formation of the Virginias with those of other states.

12. **Virginia Geological Sections,** constructed by Wm. B. Rogers, Director of the Virginia Geological Survey, 1835-41. Edited by Jed. Hotchkiss, 1883-4; a series of 96 colored geological sections, most of them now published for the first time, on a sheet 3 ft. by 6, to illustrate the Geology of the Virginias by Prof. W. B. Rogers, above refered to.—The location of these remarkable sections is shown on the preceding map, No. 11:—These sections indicate, in a most lucid way, the location, position, and relations of the rock masses and mineral deposits of the Virginias as ascertained and delineated by the real "Father of American Geology," Prof. Wm. B. Rogers. It would require a volume to call attention to what they indicate and suggest. No state can show more.

13. **Measured Sections of the Great Kanawha Coalfield** are shown in one mounted section, nearly 3 yards long, on a scale of 250 feet to one inch. This section, made from actual measurements, shows that the three great groups of the Carboniferous in this basin, in Virginia and West Virginia, have a greater thickness and contain more coal beds than in any other portion of the great Apalachian Coal basin.—The location of the Big bed," No. 3, at Pocahontas, Va., from which the block of coal, 12 ft. thick, was taken, that is exhibited in the Virginia collection, is shown near the bottom of this section.

14. **A reduced copy** of the above, No. 13, is also shown on which the Pennsylvania and West Va. and other names of the coal beds of the Kanawha field, as recently provisionally determined by Prof. I. C. White (See *The Virginias* for January, 1885,) are approximately indicated.

15. **Section of Great Kanawha basin,** from Point Pleasant to Quinnimont, as measured by Prof. I. C. White of United States Geological Survey in 1884, (See his report in January, 1885, number of *The Virginias*); constructed by Jed. Hotchkiss, from Prof. I. C. White's notes.

January Weather in The Valley.—The Staunton "Spectator" reports the meteorology for January, 1885, at Dale Enterprise, Rockingham county, Va., from observations of L. J. Heatwole, as follows:—Temperature: Maximum 66°; minimum, 2°; average, 32°.4, warmest day 16th, coldest day 22d.—Rain: total fall of month 4.37 inches, days on which rain fell 6,-longest interval without rain 5 days.—Clear days 10, cloudy without rain or snow 12, calm days 3, longest interval without sunshine 1½ days.

The Staunton Life Association of Virginia is a Life insurance company that by its advertisement is constantly before our readers. At the begining of this year its president, General Echols, issued a circular from which the following statement is taken, one that presents a most remarkable record for the business of this company during the past year,—a record that is its best recommendation to all that would insure their lives for any purpose—an "all" that in this enlightened age means nearly everybody:

"It will doubtless be satisfactory to our policy-holders to have at the begining of the new year, a statement of the condition and progress of the Association.

Since we commenced work, on the 10th of April, 1883, twenty-one months ago, we have issued over 1,100 policies, insuring risks to an amount exceeding $2,600,000. The business of the last twelve months reached nearly $2,000,000, and the outlook for the future is promising

The death upon which the present assessment is made, is just the fifth that has occured since the organization of the company. Only five deaths in nearly two years, out of a membership of more than 1,100, is far below the average in insurance companies, which is generally placed at 8 per 1,000, while some companies and orders run from 10 to 15, and even to 20 per thousand per year.

We assessed for only three deaths during the past twelve months, and our losses, since organization, amounting to $7,000, on the four deaths which have occured, the claims for which having matured, have been promptly paid in full for the amounts of policies held by deceased members.

It will thus be seen that the policy-holders who have paid assessments on all the calls that have been made have, at the average age of 39 years, on which the assessment is 79 cents for $1,000, paid on a $3,000 policy only $9.48 in assessments, all told, up to this date."

The English Mineral, etc., Market in 1884.—As a matter of interest to those of our subscribers interested in the mining or ownership of ores and minerals for which there is a foreign demand, we reproduce, from the Liverpool, Eng., Journal of Commerce, a portion of the report of Geo. G. Blackwell, mineral dealer, under date of Jan. 1, 1885:

Reviewing the operations of the past year, I find that whilst there has been a considerable business done in minerals prices have, notwithstanding, ruled pretty even, without any undue fluctuations. *Manganese*:—Our importations this year have been above the average, and although there have been sales made at exceptionally lower prices than for a number of years past, yet we close the year with a considerable improvement, and there is every prospect of much higher prices in 1885, as the demand is keeping pace with the production. *Iron ore*:—There is no special feature to report in this trade, this year's prices throughout have maintained an almost unparalleled steadiness. *Barytes*:—As I predicted at the commencement of this year, there has been an increase both in demand and price, and there are signs of a good business next year. *French chalk*.—The importations throughout the whole of the year have considerably improved, and throughout the whole of the year prices have been well maintained, the consumption having kept well in pace with the production, and we look forward to a still larger business for 1885. *Magnesite* has found increased consumption in connection with the various new patents, and a still larger quantity has been sold this year at full prices. The prospects of the coming year are such as to anticipate a still larger improvement in this article. *Emerystone* has maintained a very even course during the whole of the year, and we close absolutely without any stock and little coming; we therefore look forward for higher prices. *Phosphate of lime*:—We began the year at lower prices than had previously ranged. There had been a large import and a large demand, but notwithstanding prices close the year lower than they began by at least 2d per degree. The prospects, however, for the future are very good, and we anticipate a large trade during next year. *Antimony*:—There has been a gradual fall both in the crude ore and the manufactured article, in consequence of the imports exceeding the demand for the metal, and we close the year very much lower than we began. *Asbestos*:—There has been an increased impetus in the outlets of this mineral, therefore, although we have had large imports, there is no weakness to report in price, and we prognosticate a good business in this article for next year. *Calamine* has gradually fallen in consequence of the manufactured article being over-produced, and prices low. *Bauxite*:—The demand for this article has this year very materially increased: prices have been well maintained, although the production has kept in good pace with the demand. *Ferro-Manganese*:—Notwithstanding that the foreign competition has been strong, a very large amount of business has been done in this metal, and prices have, during the latter part of the year, very materially improved, the prospects of the future year being very promising.

On the whole, therefore, trade in minerals during the year has been good, although values have been lower than for some years previously. The prospects of the future year are very hopeful, not only for a larger business but a considerable improvement in prices.

Coal and Coke Traffic of Ches. & Ohio Ry. Nov. 1884.

General Manager C. W. Smith sends *The Virginias* the data for the following statement of the total output and distribution of coal and coke received from mines on line of C. & O. Ry., (including fuel on Lexington division) during November, 1884, and November, 1883, in tons of 2,000 lbs., compiled by fuel agent, J. W. Hopkins:

Kind.	1884.	1883.	Increase.	Decrease.
Cannel	2,044	318	1,726	.....
Gas	31,622	28,213	3,409	.....
Splint and block	34,244	8,434	25,810	.....
New River, &c	24,994	38,107	....	13,113
Coke	9,092	7,428	1,664	.....
Totals	101,996	82,500	32,609	13,113

The distribution of the above was as follows:

		1884.	1883.
1.	To Ches. & Ohio Co. for its own use	23,978	20,064
2.	To Huntington, for West via. Ohio river	2,438	1,510
3.	On Elizabethtown, L. & B. S. and K. C. RRs	21,611	8,786
4.	On Ches. & Ohio Ry., excepting Richmond	10,052	15,551
5.	To Rich. & Alleghany RR. at Clifton Forge	2,903	1,672
6.	To Valley RR. of Baltimore & Ohio at Staunton,	....	.....
7.	To Shenandoah Valley RR. at Waynesboro	....	85
8.	To Va. Midland at Charlottesville	3,539	6,405
9.	To Rich. Fred. & Potomac RR., at Junction	1,111	702
10.	To Richm'd for consumption, includ'g tugs, &c,	11,761	10,097
11.	To James River wharves for shipment	4,387	....
12.	To Newport News, For consumption, &c	413	767
	To Newport News, For shipment	19,803	21,841
	Totals	101,996	82,500

The movement from January 1st, 1884, to Nov. 30th, 1884, inclusive, and for same time in 1883, was as follows:

	1884.	1883.	Increase.	Decrease.
Cannel	20,935	20,941	.....	6
Gas	285,191	331,502	.....	46,311
Splint and Block	128,483	94,520	33,963	.....
New River, &c	319,266	339,497	.....	20,231
Coke	70,438	94,285	.....	23,847
Total	854,313	910,745	33,963	90,395

The Collieries on Chesapeake & Ohio Ry.

By direction of General Manager, C. W. Smith, Mr. J. W Hopkins, fuel agent of the Chesapeake & Ohio Railway, has furnished *The Virginias* the following list of the collieries and coke works on the line of that railway that furnish it freight or fuel coals, and their average daily output at the begining of. 1885, taking them in their order from the east to the west. We have classified this list into New River or Lower Measures (No. XII) Semi-bituminous coals and Kanawha or Bituminous Middle and Upper Measures coals.

Mr. Hopkins says: "The amount given as output is not, by any means, the capacity of these collieries; but it is a fair estimate of what they are now geting out. All are capable of a much larger daily production."

1. New River or Semi-bituminous Coals.

Colliery.	Operators.	Station.	Tons.
1. Quinnimont	Quinnimont C. & I. Co.	Quinnimont	40*
2. Stone-Cliff	Fayette Coal & Coke Co.	Stone-Cliff	100*
3. Echo	Beury, Cooper & Co	Echo	75*
4. Fire Creek	Fire Creek C. & C. Co.	Fire Creek	250*
5. Sewell	Longdale Iron Co	Sewell	All coked
6. New R. C. & C. Co.	M. Erskine Miller	Caperton	275
7. Caperton	Beury, Cooper & Co	"	400
8. Keeney Creek	Nuttallburg C. & C. Co.	"	250
9. Nuttall	" "	Nuttall	250*
10. Fayette	Masters & Son	Fayette	Idle.
11. Elmo	W. A. Burke & Co	Elmo	60
12. Sunnyside	Straughan & Crump.	Sunnyside	50
13. Gaymont	J. Peirrung	Gaymont	150*

*(Output exclusive of amount coked, as all these collieries have coke ovens which are supplied from them)

The coals from the above 13 collieries are classed by the railway company as steam and coking coals; they furnish the noted high grade New River steam coals and the coals from which are made the pure New River cokes, the very best known for all metallurgical purposes.

2. Kanawha or Bituminous Coals.

Colliery.	Operators.	Station.	Tons.
1. Hawks-Nest	Hawks-Nest Coal Co.	Hawks-Nest	150
2. Great Kanawha.	S. G. Phillips	Mt. Carbon	100
3. St. Claire	Wm. Wyant	Eagle	All coked
4. Eagle	"	"	275
5. Faulkner	F. Faulkner	Frederick	275
6. Crescent	W. R. Johnson	Crescent	175
7. West-Crescent	" "	"	100
8. Cannelton	Henry Davis, Supt.	Cannelton	250
9. Coal Valley	Coal Valley Coal Co	"	100
10. Straughan	Geo. Straughan	"	100
11. Eureka	M. T Davis & Co	"	180
12. Excelsior	" " "	"	120
13. Mt. Morris	Mt. Morris Coal Co.	"	180
14. Morris Creek	Carver Bros	"	180
15. Union	Union Coal Co	"	150
16. Kanawha	Kanawha Mining Co	"	175
17. Wyoming	L. S. Oakford, Treas,	Upper Creek	Idle
18. Kanawha-Cannel,	Kanawha Cannel C. Co.,	Paint Creek,	125
19. Crown Hill	Brewer Smith	"	250
20. Edith-Marion	Wm. Sharpe	Blacksburg	100
21. East Bank	Stuart M. Buck	"	150
22. Coalburg	Robinson Coal Co	Coalburg	275
23. Fairfield	Fairfield C. & C. Co.	"	Idle
24. Reynolds	Reynolds & Sturdevant,	"	"
25. Stevens	Stevens Coal & Coke Co.,	"	"
26. McCarty	McCarty Bros	"	"
27. Peerless	Peerless Coal Co	Peerless	100
28. Winifrede	Winifrede Coal Co.	Winifrede Junction,	400
29. Black-Band	Black-Band C. & I. Co.,	Spring Hill	150

Of the above collieries: Nos. 1 to 4 are classed by the railway company as "coking" coals, as they all have coke ovens, and the output given for No. 1 is exclusive of the quantity coked; Nos. 5 to 7 and 9 to 14 are classed as "gas" coals; Nos. 8 and 18 are cannel coal; Nos. 15 to 17, 10, and 21 to 29, are classed as "splint" coals; and No. 20 as "fuel" coal.

All of these Kanawha coals are among the very best of the bituminous coals known for gas, steam, fuel, domestic and other purposes.

Coal and Coke traffic of Chesapeake & Ohio Ry. in 1883 and 1884.—The following comparative statistics of the coal and coke traffic of the Chesapeake & Ohio Ry. from the coal mines and coke ovens along its line in West Virginia, by kinds, during the years 1883 and 1884, compiled, in 2,000 lbs. tons, by Fuel agent J. W. Hopkins, have been kindly furnished *The Virginias* by General manager C. W. Smith.

Kind.	1884.	1883.	Increase.	Decrease.
Cannel	23,056	21,013	2,043	.....
Gas	324,473	373,371	.....	48,898
Splint and block	154,803	103,327	51,476	.....
New River, etc..	383,063	405 602	.....	22,539
Coke	81,515	100,786	.....	19,271
Totals	966,910	1,004,099	53,519	90,708

The above shows that the total movement for 1884 was 37,189 tons, or nearly 4 per cent less than it was in 1883. Over half this loss was in the movement of gas coals from the Kanawha region; the remainder was in the movement of coal and coke from the New River region. There were fair gains in the movement of cannel and splint and block coals from the Kanawha field.

We have not far to go to find the causes of this decrease of traffic: Those interested in this region did not enter into the sharp and ruinous competition for gas coal contracts that characterized the year, prefering to let their coal remain in the bed rather than mine and sell it at a loss; then two of the large furnaces on this road were idle for a number of months of the year for extensive repairs, thus curtailing the demand for New River coal and coke to more than the decrease above shown. An inspection of the monthly returns that we publish verifies this statement.

Monthly Coal and Coke traffic of C. & O. Ry. in 1882, '3 and '4.—We have compiled from the volumes of *The Virginias* the following table showing the quantity of coal and coke, in 2,000 lbs. tons, moved by the Chesapeake & Ohio Ry. from the mines and works on its line in West Virginia during each month of the years 1882, 1883 and 1884.

Months.	1884.	1883.	1882.
January	79,540	80,628	66,987
February	69,149	83,308	74,377
March	83,194	90,387	81,168
April	80,961	95,369	75,029
May	65,642	91,284	80,965
June	66,888	81,233	72,277
July	78,154	83,387	82,468
August	75,050	69,429	84,130
September	80,004	70,161	89,557
October	69,160	80,061	83,363
November	101,996	82,500	77,643
December	112,597	93,554	82,936
Total tons,	966,910	1,004,099	950,900

This table is especially valuable for reference to those of our readers interested in the coal trade; its figures are suggestive and may be studied with profit.

Resumê of the work of the U. S. Geological Survey, In the Great Kanawha Valley, during the summer of 1884.

By I. C. White.

About the 1st of July of the past year, the writer was commissioned by the director of the U. S. Geological Survey, Maj. Powell, to begin geological investigations in the Kanawha valley. And with a *carte blanche* as to instructions, work was begun early in July and prosecuted until the 20th of October.

As the maps in course of preparation by the geodetic corps of the survey were yet in an incompleted state, and all work must consequently be of a preliminary nature, it appeared that the season could best be spent in a detailed examination of the stratigraphy of the Coal measures along the Kanawha and New river valleys, since, although much geological work had previously been done in this region by local geologists, mining engineers, and others, yet no connected study of the region had been undertaken from the time when Wm. B. Rogers and his assistants first maped out its essential features 40 years ago, up to the present time.

There being a desire on the part of many citizens, and those who have large coal interests in the Kanawha valley, to get access to the general results of my season's work in advance of the appearance of the detailed report, I have consented, with permission of Maj. Powell, the director, to write a short article for *The Virginias*, in which I shall endeavor to embody a summary of such results as are of immediate importance to the citizens of the valley, or to the coal interests in general, reserving the right to change or modify any conclusions herein given, if such change be found necessary when all my notes have been fully studied and compared.

It gives me pleasure in this connection to make general acknowledgment, as I shall hereafter do in detail, of the kindly and generous aid cheerfully given me in my work by the citizens of the valley, coal operators, mining engineers, and railway companies.

The Kanawha coal-field is a portion of the great Apalachian basin, which seting in near the northeastern corner of Pennsylvania, extends uninterruptedly through the states of West Virginia, Ohio, Kentucky and Tennessee into Alabama. Considered as a whole, this wide area may be regarded as a single trough, the deepest portion or central line of which, enters West Virginia from the southwestern corner of Pennsylvania and passes through the counties of Wetzel, Tyler, Pleasants, Wood, Jackson and Mason, in the last of which it crosses the Kanawha river about 10-15 miles above the mouth of that stream. Along much of this portion of the great trough or basin, the *Coal Measures* proper are deeply buried from sight by several hundred feet of *Permian* or *Permo-carboniferous beds*, the No. XVI of Rogers. Where the Kanawha river trenches across these No. XVI rocks, in Mason county, however, they have been so greatly eroded that they now occupy only the summits of the hills, and hence in our account of the Kanawha measures they will be neglected altogether.

It will be seen from the foregoing statements as to the central line of the Apalachian trough, that what is known as the Kanawha and New River coal fields, lie entirely on the eastern slope of the basin, while the corresponding western slope comes up in Ohio along the Hocking valley and other streams.

In Pennsylvania, and in the northern portion of West Virginia, this eastern slope of the Apalachian trough is it self thrown into several parallel basins by a series of great folds, but as we go southwestward to the Kanawha river, these arches flaten out and die away until only two or three small crumples are left.

Many persons suppose that there is a continuous northwestward dip in the rocks from where the Coal measures pass into the air near Quinnimont northward to the Ohio river, but this is not strictly true, since my investigations have developed the existence of two well marked waves in the rocks along the Kanawha, and one at least on New river.

The first of the arches encountered above Charleston crosses the Kanawha river in the vicinity of Brownstown, and from this fact I have named it the *Brownstown axis* or *anticline*. The rise of the rocks from the bottom of the Apalachian trough above Point Pleasant to the crest of the Brownstown arch is about 1600 feet in a distance of 50 miles, and since the river flows nearly at right angles to the strike along this part of its course, the above figures may be taken as the amount of dip between the two points, though its rate is far from uniform, because more than half of this rise is accomplished in the last ten miles. The dip from Brownstown to 10 miles above the mouth of the Kanawha may be said to vary from 10 to 90 feet per mile, N. 50°–60° W.

From Brownstown the rocks dip southeastward for six miles until we come to the bottom of the *Coalburg syncline*, half-way between Coalburg and Hampton. The descent of the rocks to the southeast from the crest of the *Brownstown wave* to the bottom of the *Coalburg trough* is about 210 feet, or say 35 feet per mile.

From the *Coalburg syncline* the rocks begin again to rise to the southeast and continue doing so until we come to the crest of the *Paint Creek axis*, which crosses the Kanawha river near the mouth of Paint creek, 3½ miles southeast from the *Coalburg trough*, and gives the rocks a hoist in that direction of 140 feet.

From the crest of the *Paint creek arch* the rocks again fall slowly away to the southeast until a drop of 75 feet has been made, where we come to the bottom of another trough which crosses the Kanawha river at Wyoming, two miles from the Paint creek uplift.

Thence on up the Kanawha and New rivers to the southeast the rise is continuous and rapid, varying from 50 to 400 feet per mile, until we reach the neighborhood of Fire creek where another slight roll seems to interrupt the northwestern dip, beyond which the rocks again rise southeastward until the last of the *coal measure beds* has been carried into the air above Quinnimont.

It is quite possible, and indeed very probable that many other flexures cross the rocks along the Kanawha, but they are of such insignificant proportions that they could not be detected with the barometer, and hence may be neglected in the general summary of the structure.

The following generalized section of the *coal measure rocks* along the Kanawha river, has been worked out by the writer during this and other years and is given here for convenient reference, begining with the *Upper Coal Measures*, No. XV, and ending with the *Great Conglomerate*, No. XII.

1. *Waynesburg Coal*	coal, rather shaly	0′ 10″		3′	No. XV. Upper Coal Measures. 274′
	coal, soft, sulphureous	0′ 8″			
	shale,	0′ 5″			
	coal, good	0′ 8″			
	coal, slaty,	0′ 5″			
2. Shales and sandstones				75′	
3. *Raymond City limestone*				5′	
4. Shales and sandstones				130′	
5. Massive sandstone, Pittsburg				35′	
6. Shales				15′	
7. *Coal, Pittsburg,*	coal, slaty	1′ 0″	Roof.	10′ 10″	
	coal,	0′ 6″			
	slate,	0′ 1″			
	coal,	0′ 8″	4′ 10″ coal.		
	shale,	0′ 1″			
	coal, slaty	1′ 6″			
	fire clay	1′ 0″			
	coal, main bench,	6′ 0″			

8. Concealed, *red shales* and sandstone,	140′			
9. Massive sandstone,	30′			
10. *Red shales*, sandstone and concealed,	150′			
11. Coal, impure, (Elk Lick)	1′			
12. Shales,	10′			
13. Sandstone, pebbly at base,	30′			
14. Marly shales, with limestone nodules,	30′			
15. *Two-mile limestone*,	5′			
16. *Dark red shale, with iron ore*,	30′			
17. Shales,	25′			
18. *Coal*, and *coaly shale*, (Bakerstown)	5′			
19 Fireclay, and shales,	5′			
20. Massive, pebbly sandstone,	30′			
21. Shales, and massive sandstone,	100′	Upper Mahoning.		
22. Shales, coal, and *iron ore*,	20′			
23. Very hard, yellowish-white s-stone,	25′			
24. *Coal Brush creek*, ("Big bed")	1′—15		321′	
25. Massive sandstone,	75′	Lower Mahoning.		
26. Shales,	10′			
27. *Coal*, (Upper Cannelton)	0′–6′			
28. Massive sandstone,	50′			
29. Shales, sandy,	10′–20′			
30. Coal, (Middle Cannelton)	0′–2′			
31. "Black Flint,"	0′–10′			
32. Shales,	1′–5′			
		Barrens,	806′	No. XIV.
33. *Upper Freeport coal*, (Cannelton)	0′–10′			
34. Shales and sandstone,	75′			
35. *Lower Freeport coal*, (Coalburg)	0′–8′			
36. Shales and massive s-stone, (Upper Freeport)	75′			
37. *Upper Kittanning coal*, (Winnifrede)	0′–6′			
38. Shales and massive sandstone, (Lower Freeport), with several thin streaks of coal,	250′			
39. *Middle Kittanning coal*, (Cedar Grove)	0′–4′			
40. Shales,	50′			
41. *Campbell creek limestone*, (Johnstown cement bed),	1′			
42. Shales,	20′–40′			
43. *Lower Kittanning coal*, (Campbell creek),	2′–10′			
44. Fireclay and shales,	5′		976′	
45. Massive sandstone, *Kittanning*,	40′			
46. *Coal*,	0′–2′			
47. Shales,	30′			
48. *Ferriferous limestone*, (Cannelton cement),	2′			
49. Shales,	35′			
50. *Clarion coal*, (Eagle)	2′–4′			
51. Shales,	20′			
52. *Coal*,	1½′–2½′			
53. Sandstone, and sandy shales,	55′			
54. *Putnam Hill limestone*, ("Black Marble"),	1′			
55. *Black, fossiliferous shales*,	6′			
56. Shales and sandstones with two or three unimportant coal streaks,	275′			
		Lower Coal Measures,		No. XIII.
57. Homewood sandstone (Kanawha Falls rock)	150′			
58. *Coal*	0′–2′			
59. Massive sandstones and shales	275′			
60. *Nuttall coal* (Sewell)	2′–6			
61. Shales	75′			
62. Massive sandstone	150′			
63. Shales	75′		1810′	
64. *Coal, Quinnimont?*	0′–5′			
65. Shales and sandstone	100′			
66. *Coal*, Fire creek?	0′–5			
67. Shales and massive sandstones with a few streaks of coal	580′			
68. Limestone of No. XI				
		Pottsville or No. XII (Conglomerate		

Summary of the section.

Upper Coal Measures, No. XV	274′
Barren Coal Measures, No. XIV	806′
Lower Coal Measures, No. XIII	976′
Pottsville Conglomerate, No. XII	1310′
Total	3,366′

This summation gives a thickness of nearly 3400 feet for the Carboniferous beds proper, along the Kanawha river, as measured between Point Pleasant and Quinnimont, but had erosion not removed Nos. XV, XIV and XIII in the vicinity of Sewell on New river, it is probable that the sum total of the Carboniferous rocks would have exceeded 5000′ in that latitude, so great is the thickening in Nos. XII and XIII as we go southward up the Kanawha and New rivers.

The Upper Coal Measures, No. XV.

The members of this group stretch along the Kanawha river from Point Pleasant to Raymond city, at which latter locality its lowest beds shoot into the air along the river hills, but still occur on the east side of the river, a few miles back from the same, nearly as far south as Charleston.

The group as a whole when compared with the same measures at the northern line of the state, has undergone the following changes: It has lost 100 feet in thickness; two important coal beds are entirely absent, the Sewickley and Redstone; the group contains more than 100 feet of *red shale* on the Kanawha, not a trace on the Monongahela; 100 feet of limestone are found on the latter stream, but only 5 feet on the Kanawha. These are the principal changes, but others will be noted in connection with the two coal beds of the series.

The Waynesburg coal, at the top of this group, is found along the river hills near the center of the great Apalachian trough, in the vicinity of Ten-mile, Leon, Arbuckle and Buffalo. It was once opened and mined to a small extent on the land of Mr. G. W. Craig, near Arbuckle, where it has the structure given in the section. It does not exceed 3 feet in thickness anywhere on the Kanawha. Not more than half of this is pure enough to use, and the bed is often absent entirely, so that economically it is of no importance.

The Pittsburg coal, the lowest member of No. XV, has been successfully mined for many years at Raymond City, where aside from the roof coal, it has a thickness of 5′ to 6′. Its final outcrop to the south is on Two-mile run, below Charleston, and there it has the structure given in No. 7 of the general section. Its outcrop is four miles back from the river, and hence it has been mined only in a small way for country use and for hauling to Charleston, 6 miles distant. The coal is a "splint" of most excelent quality on Two-mile, and is greatly prized for domestic purposes. The thickness of the main bench is seldom less than 5½ feet, and often exceeds 6, and since its area spreads from Two-mile across to the Pocatalico at Sissonville and thence to the Kanawha at Raymond City, there is evidently an important coal-field awaiting development here, when railroad facilities shall have rendered it accessible.

When followed down the Kanawha river from the region of Raymond City, the *Pittsburg coal* develops a tendency to patchiness, i. e., it is either absent entirely from large areas, or too thin and uncertain to warrant mining. Thus near Red House, opposite Winfield, it is gone completely, although its underclay remains at the proper horizon, suggesting the thought that the Pittsburg marsh may here have had its vegetable deposits swept away by the current which transported the coarse overlying sandstone.

Just before this coal disappears below the Kanawha river,

however, it comes in again, 5 miles below Winfield, and has there been mined by Mr. Boyer at Oak Ridge. How much farther down the river from the Oak Ridge mines this productive area extends, is unknown, since the outcrop of the coal is covered up by the terrace deposits until it sinks below the bed of the Kanawha river, and when it comes up to day again near Point Pleasant the coal is only two feet thick. A boring put down by Mr. G. W. Craig at the mouth of Thirteen-mile midway between the two points, throws some light on the subject, since there, at a depth of nearly 100' under the river, the *Pittsburg coal horizon* was drilled through and only a trace of coal obtained, although the underclay below and sandstone above were in their proper places as usual. Hence although it may be possible that there are productive areas of the *Pittsburg coal* where its horizon underlies the Kanawha river between Big Hurricane creek and Point Pleasant, yet all the evidence so far obtained points to a different conclusion, or at least renders the existence of such productive patches very uncertain. Since, however, the coal's horizon does not get much farther below the river than 100 feet the question can be very easily determined by boring on the lands of those interested.

Some have supposed that the *Pittsburg coal* occurs in the hill tops, south of Charleston, but its outcrop does not cross Elk river in the region of the Kanawha at least, and ought not to do so anywhere to the east, since Elk flows nearly parallel to the strike of the rocks.

The Barren Coal Measures, No. XIV.

In seting off the next lower group of beds in the Kanawha region, I find no change to be made from the limits fixed long ago by Wm. B. Rogers to No. XIV, viz: the *Pocatalico (Pittsburg) coal*, above, and the *Black Flint ledge* below, since there can be no doubt that these two horizons were correctly adjusted to the corresponding beds in the Pennsylvania column of rocks.

The great thickness (806 feet) of the *Barren measures* is a feature that arrests the attention of the geologist when examing this section, since the maximum of these beds in Pennsylvania is only 600' feet, while in Ohio it is sometimes only 400,' as against 645' in Preston Co., W. Va. Great, however as the thickness (806) appears, it is very probable that if we could have measured all of No. XIV, say in the region of Kanawha Falls, this 806' would have become at least 1000', since the measurement given was obtained in the vicinity of Charleston, while both Nos. XIII and XII swell up to double the thickness they have at Charleston, when traced southward to Kanawha Falls. Then, too, the interval from the top of the *Mahoning sandstone* to the base of No. XIV which measures only 300' at Charleston, increases to 456' at the head of Cabin creek, which would tend to show that the whole Barrens (XIV) also keep increasing in thickness southward from Charleston to the region of the great geo-synclinal of the Kanawha field.

No. XIV may be conveniently subdivided into two portions, an upper, *soft*, or *shale series*, and a lower *hard* or *sandstone* and *conglomerate group*. The former is about 500' thick and contains much *red shale*, while the latter is only 300' thick and contains not a trace of *red beds*.

The *soft series*, yielding easily to erosion, soon disappears from the surface after the sandstone portion rises above drainage; thus all the *shale series* disappears in the vicinity of Charleston, while the *sandstone group* is found on southward to Armstrong creek, 30 miles distant.

The only important member of the *shale series* is a *limestone* which from its development on Two-mile run, below Charleston, I have termed the *Two-mile limestone*. It occurs almost exactly midway in the *Barrens* (No. XIV) and in this respect occupies the same relative geological position as the *Green Crinoidal limestone* of northern W. Va., and adjoining regions of Penna. and Ohio. But while the latter is certainly of *marine* origin, the *Two-mile bed* seems to be a *fresh water* deposit, since the only fossils found in it are species of *Spirorbis*. These, however, occur in immense numbers in the dark gray, and sometimes earthy limestone found at this horizon. This bed has been burned for lime at several localities, and when the purer portions are selected it slakes quite well.

The Green Crinoidal limestone of Pa., is everywhere underlain by a bed of dark red, marly shales, containing iron ore nodules, and we find an exactly similar stratum 25'–30' thick immediately below the Two-mile limestone

The *lower*, or *sandstone member* of the Barrens, seems to represent collectively the *Mahoning sandstone series* of Pennsylvania. Though never more than 175' thick in the latter state, and holding but one coal (Brush creek), yet on the Kanawha, it attains a thickness of 300' to 400', and includes two and sometimes three coal beds.

The group is caped at top as in Pennsylvania, by a conglomerate which on the Kanawha is a mere mass of pebbles, many of which are larger than a hen's egg. The coarse sandy matrix holding these pebbles frequently disintegrates and leaves them free in immense numbers on the summits of the hills where some have mistaken them for transported boulders. The great divide at the head of Cabin creek is covered with these large quartz pebbles at an elevation of 2500 feet above the sea.

This *Mahoning sandstone series*, taken as a whole, is the friendly roof which has preserved much of the underlying *Lower Coal Measures* (No. XIII) from erosion These (Mahoning S.S.) cover all the highlands from the Kanawha river southward to Guyandot mountain, whose lofty summits are caped and protected by them at an elevation of 3000 feet above the sea.

From the lowest of these sandstones, Nos. 25 and 28 of the section, comes that splendid building stone on Elk river, above Charleston, that has been so highly commended by the government engineers.

The Coals of the Barrens (No. XIV.)

In the section of the *Barrens* along the Kanawha river we find traces of five coal horizons, in descending order as follows:

Elk Lick.
Bakerstown.
Brush creek.
Upper Cannelton.
Middle Cannelton.

Of these, the three first represent well enough, in their stratigraphical relations, the beds which have received corresponding names in Pennsylvania, and the same are retained for them here; but the two last are new elements in the Barren series not hitherto noted elsewhere, and I have thus been compeled to give them names. The Elk Lick bed was observed only along Two-mile, where it is often a mere mass of bituminous shale, 1–2 feet thick. It has been dug into at one locality about 3 miles above the mouth of that stream and is there an impure cannel 10–15 inches thick.

The Bakerstown coal comes immediately on top of the great sand-rock group, and although it attains a thickness of five feet or more, yet in the region along the Kanawha it nowhere furnishes any coal fit for fuel, being generally composed of alternating layers of slaty coal, shale and fireclay so that the whole is worthless stuff. This bed was once opened on Two-mile at the mouth of Sugar run, and also on the land of Hon. Wm. A. Quarrier, opposite Charleston where it is 350 feet above the river.

The Brush creek coal is the persistent bed in the *Mahoning sandstone group* of Pennsylvania and Ohio, and it like-

wise proves the same on the Kanawha river. This coal comes up to the Kanawha below the mouth of Elk, and rising rapidly reaches the level of the C. & O. RR., in a cut just opposite Elk shoals, ½ mile below Charleston station, where it exhibits the following structure:

Coal	0′ 6″	
Black, sandy slate	2′ 6″	4′ 6″
Coal	1′ 6″	

This coal is thin, irregular and of no importance in the immediate vicinity of Charleston, but as we go south from there to Porter's run (branch), 3 miles distant, it thickens up to 3′-4′ and has been successfully mined for local use being known as the "*Joel Ruffner vein.*" Still further south in the vicinity of North Coalburg it swells up to an immense thickness, and is usually called the "*Big bed;*" it exhibits the following structure there at Mr. Lovell's opening:

1. Coal	1′ 6″	
2. Black slate	0′ 6″	
3. Coal, good splint	4′ 2″	
4. Shale	2′ 6′	17′ 8″
5. Coal	0′ 6″	
6. Shale	5′ 0″	
7. Coal	3′ 6″	

At another locality it shows the following:

1. Coal	2′ 0″	
2. Dark slate	0′ 6′	
3. Coal, good	4′ 8″	15′ 2″
4. Shale	3′ 6″	
5. Coal, impure	4′ 6′	

No. 3 of these sections is the valuable portion of the *Brush creek bed*, since it is a "block" or "splint" coal of very fair quality. It has not been mined for shipment heretofore because of its inaccessibility, occuring as it does in the tops of the hills 750′-800′ above the Kanawha river.

This bed which is nearly always a *splint coal* will doubtless furnish a considerable quantity of valuable fuel in the region south-west from the Kanawha, since at the head of Cabin creek, it exhibits 5′ of good coal in one bench, while on Huff creek mountain, near Guyandot river, in Wyoming co., it is reported as 10 feet thick. This also seems to represent one, or perhaps two of the beds of *splint coal* reported along Elk river, since it is double or triple nearly everywhere

The Brush creek bed is overlaid by a white or yellowish white sandstone, so hard and silicious as to be totally unlike any other rock in the XIV series, thus rendering its recognition easy.

Occasionally one or two streaks of coal make their appearance above the sandstone just mentioned, but as they are local and sporadic, and moreover belong to the general horizon of the *Brush creek bed* as represented in Penn., and Ohio, I have not given them a separate designation. Should it be found hereafter that they attain workable dimensions (as they may possibly do on Elk river) then they may receive separate names.

The Brush creek coal comes about 125 feet above the base of XIV in the vicinity of Charleston, but at Coalburg this interval is increased to nearly 200 feet.

The Upper Cannelton coal, as previously stated, is an interloper in the No. XIV series as known elsewhere, and I have designated it from the locality where it has long been mined, viz., Cannelton. It has been mined here by the Cannelton Coal Co., at 75 feet above the black flint and 85′ above the Kanawha river, under the name of No. 5 (it being the 5th coal bed above water level there). It is an excelent quality of *splint*, having been used successfully in the raw state for smelting iron ore. The entire bed is about six feet thick, but the upper portion is split up with partings, so that only 4½′ of good coal is obtained from the bed.

Near the mouth of Armstrong creek, at an elevation of more than 1200 feet above the Kanawha river, this bed shows a thicknes of 54″ of clean coal on the property of Mr. Wyant. It is also the uppermost bed on the Mt. Carbon coal property, one mile above.

Followed northward from Cannelton, this coal becomes thinner and poorer in quality, and in the vicinity of North Coalburg is only 3½′–4′ thick with two slates 2″ and 4″ thick respectively, so that it is not there regarded as a workable bed. Farther north, at Charleston, it is just on the point of disappearing, since in the cliffs opposite the station its place is marked only by a vast quantity of vegetable debris scattered through 10′ of sandstone, though one mile up Elk, near the mouth of Coal branch, it comes in as a sulphurous seam ½′–1′ thick, to disappear in coaly fragments again in the middle of the great sandstone quarry just around the point of the hill.

The name, *Middle Cannelton coal*, has been given to a valueless seam which immediately overlies the "Black Flint" and seems to be rather persistent. A trace of this bed may be seen in a coaly stain along the C. & O. Ry. a short distance above Charleston station. In the vicinity of Coal valley, Faulkner and Eagle, 30 miles south from Charleston, this coal streak has thickened up to 3 feet, but being slaty and worthless has never been mined.

The "Black Flint" ledge, at the base of the Barren Measures (No. XIV), is one of the most characteristic rocks in the Kanawha valley, and although perfectly worthless in an economic sense, yet as a guide to the geologist and mining engineer, it is invaluable, since it furnishes the best possible datum line by which to trace and keep hold of the important coal beds which underlie it in No. XIII. This stratum is usually of dark gray or blackish blue color, and exhibits every gradation between regular massive flint and sandy shale. Its horizon rises from the bed of Kanawha river just about opposite the Charleston depot of C. & O. Ry. and not at Elk shoals as has been sometimes stated; in fact it is very doubtful if the *flint* could be found at Elk shoals if a shaft were sunk to its horizon, since it disappears from view, gradually changing into a mass of arenaceous shale about one-half mile above Charleston station in a cut of the C. & O. Ry. and as it is absent as *flint* on the north bank of the Kanawha river just opposite this point, I think it quite possible that it does not extend much farther north than Charleston. No microscopic examination of this rock has been made with reference to its origin, but the occurence of the fossils *Discina sp. Productus Nebrascensis* and *Spirifera camerata* in it at several localities would prove that it is a marine deposit beyond question, and when examined microscopically it will doubtless be shown that its *silex* has been derived from the same sources as the *chert* in limestones, viz: from the silicious skeletons of *diatoms* and *protozoa*. But whatever its source, it appears to be confined to the immediate region of the Kanawha valley, since after we leave the river 5–6 miles on either side, it disappears, being gradually replaced by sandy shales. This stratum varies in thickness from 4′–10′ and although of such insignificant thickness has played an important part in shaping the topography of the region where it is found, since, being almost indestructible by ordinary atmospheric agencies, it has preserved many surfaces at a great elevation that would otherwise have been leveled by erosion. The cap of Lower Coal measures (XIII) caught in the summit of Gauley mountain at Ansted is due to its protecting cover. Through the agency of heat and cold and the general warfare of the elements, it is finally broken up into oblong, quadrangular pieces, of small size, which cover the surface and line the

stream beds wherever its outcrop extends. No deposit of like kind has yet been reported from this horizon in Pennsylvania or Ohio, though the fossils held by the "Black Flint" are common in the shales which there intervene between the base of the *Mahoning sandstone* and the *Upper Freeport coal.* Prof. Stevenson also reports a bed of *chert* in the roof of the *Upper Freeport coal* in the "Oil Break" on the Little Kanawha river and its tributaries.

This flint when impure or shaly, contains a large quantity of *iron pyrite*, and its oxidation gives rise to "Alum springs," of which a very fine one exists about one mile above Charleston, on the north bank of the Kanawha.

Sometimes the "Black Flint" lies immediately on top of the next succeeding coal bed, the top of No. XIII, but more frequently 5'-25' of shales or sandy beds intervene before we come down to the base of the Barrens.

The Lower Coal Measures (No. XIII.)

The measurement of these rocks as given in the section, (Nos. 33-56) shows a thickness of 976 feet, but this is not the maximum, since at the latitude of Armstrong creek, a vertical measurement gives them a thickness of 1,100 feet. When it is stated that these rocks never exceed 200 to 250 feet at the northern boundary of W. Va.—and that the maximum in Western Penna. is only 350 feet, while in Ohio it is much less, the great change which has taken place in the series along the Kanawha river may be more fully appreciated.

With this immense thickening of the rock intervals of No. XIII to more than four times their average size in Penna. and Ohio, we would naturally at first thought expect to find a greater number of workable coal beds, but the following lists of the beds in western Penna. and on the Kanawha will show a different result:

Penna. coals:	Kanawha coals.
1. *Upper Freeport,*	1. *Lower Cannelton,*
2. *Lower Freeport,*	2. *Coalburg,*
3. *Upper Kittanning,*	3. *Winifrede,*
4. *Middle Kittanning,*	4. *Cedar Grove,*
4. *Lower Kittanning,*	5. *Campbell Creek,*
6. *Clarion.*	6. *Eagle.*

Or in other words, there are within the 250 to 300 feet of Lower Coal Measures (No. XIII) in western Pennsylvania six beds (leaving out the *Scrub-grass* and *Brookville* which are synonymous with *Clarion*), that at one locality or another furnish workable coal, and in the Kanawha valley, as shown by the above list (from which are likewise excluded mere local streaks and splits from other beds), with its 1,100 feet of No. XIII, we find only the same number (6) of workable coals.

Prof. Orton, State geologist of Ohio, has recently shown that these six coal beds of Pennsylvania can be traced bodily across the Ohio coal field to the Hanging-rock region, and on into Kentucky, and that no other workable coal beds are found within the limits of the group, and my own work in northern W. Va (Monongalia, Preston, Mineral, Grant and Tucker counties) reveals the same state of affairs there, so that, however improbable it may appear at first, there is really scarcely any doubt that the 6 great coal marshes which gave us the workable coal beds of No. XIII in western Penna. and Ohio, also spread entirely across W. Va., and furnished the 6 workable coal beds that we find along the Kanawha valley. The evidence for the truth of this proposition will be fully given in my detailed report, and it is so strong that I feel little hesitancy in replacing the Kanawha local names as given in the above list with what appear to be their Pennsylvania equivalents, and I do this the more readily, since Prof. Orton, State geologist of Ohio, in his recently published Vol. V. of the Ohio survey, has fully adopted the Pennsylvania nomenclature. The advantages to be gained from this unity of nomenclature in the Apalachian coal field, are so obvious that I could not forbear introducing it into the Kanawha valley, since all the benefit of local names can be had by retaining their synonymy in the general section. Hence, although future work may reveal some errors in this first attempt at correlating the Kanawha coal beds with the Pennsylvania series, yet such errors can be corrected much more easily than new names can be introduced after the local ones have become thoroughly established without reference to their synonymy elsewhere.

In these six beds, then, are stored up all the valuable fuel found in what is generally known as the Great Kanawha coal field.

This field stretches along the Kanawha river from Charleston to the mouth of Gauley, a distance of 40 miles by the meanders of the stream. The highest bed of coal in the group rises above water level at Charleston and at Gauley river the lowest one (Clarion-Eagle) just overshoots the mountain tops.

It must not be supposed, however, that all of these six beds furnish valuable coal along this entire distance, far from it; for while all of these coal horizons, with the exception of the lowest, (Clarion), are accessible above water level for 35 miles out of the 40 miles of outcrop between Charleston and Gauley river, yet at no single locality along the river are there more than two of the six beds successfully mined on the same property now, or ever have been. Many years of mining industry in the Apalachian coal field have enforced the lesson on geologists as well as capitalists that however regular or persistent a given bed of coal may be in one region, when traced into others either near or remotely distant, it becomes patchy, and interrupted, or too thin to mine, while very often a coal horizon above or below the latter, worthless where the first was valuable, may often become workable when the first thins away. In fact there is nothing like perfect regularity in the thickness or quality of any single coal bed over large areas in any coal field. *The Pittsburg bed* in western Pennsylvania, seems an exception to this statement, since it is persistent over such a wide area, but, as the writer has already shown, even this bed when traced into central W. Va., becomes thin, worthless, and is often absent entirely from large areas. A too implicit trust in the persistency of coal beds has already proven disastrous to many capitalists who have made investments in coal fields, and the Kanawha valley has proven no exception in this respect.

The worst possible service that a geologist can do for any coal field is to exaggerate its value. Many are sure to be disappointed because of such exaggeration, and the reaction is such that really valuable properties suffer depreciation along with the worthless.

The Kanawha coal field has not escaped from the tendency of first explorers to take a "rose-colored" view of mineral properties, and this field, rich as some portions of it undoubtedly are in valuable coals, is suffering today from the unintentional exaggeration of its too zealous friends.

It was once (and is yet in some localities) the common opinion that the *Lower Coal Measures*, (No. XIII), in the Kanawha valley, would everywhere yield from 30 to 50 feet of merchantable coal, but several years of practical mining there have shown quite a different result; for the best properties in the valley do not yield more than 10 feet of merchantable coal from No. XIII; a much larger area yields only 5', and a considerable territory practically none.

A prominent characteristic of all the 6 beds of XIII, in the Kanawha valley, is their variableness both in thickness and quality. A certain bed may prove excelent on one property, and on the adjoining land thin away to a streak, be split up with partings, or disappear entirely, and as this may happen to every one of the 6 beds, it results that sel-

dom more than two are workable on the same property, and sometimes none. It is a common belief of the miners that when one bed is good, the coal next above and below will prove worthless, and experience,as a rule,(although there are exceptions) confirms the general truth of the proposition, strange as it may appear.

The cause of all the irregularities in the Kanawha coal beds must be sought in the rapid subsidence, and deposition of sediment by which 1,100 feet of rocks accumulated there in the same time that 250 to 300 feet accumulated in Ohio and Pennsylvania. This accounts satisfactorily for all such phenomena as the spliting of coal beds by shale and rock deposits; their thining away and disappearance over wide areas; the fact that only one or two good beds are found in the same hill; and all other features by which this region differs from other coal fields of the country.

These are some of the disadvantages of the Kanawha field that have not hitherto been dwelt upon to that extent which the facts demand in order that the land owners as well as those seeking investments in coal properties may be well informed as to the value of the same.

On the other hand the Kanawha field has many features that give it great advantages over other coal regions of the country. In the first place., it has all the principal kinds of bituminous coal, viz: cannel, gas, splint and coking varieties, a combination exceptional anywhere else. Then its proximity to market and cheap transportation facilities (a slack-water river free from tolls), are advantages not to be despised. Besides, it must be remembered that there are scarcely any bituminous coal fields in the country where more than 10 feet of merchantable coal is accessible, while 5 is a fair average, the famous Monongahela region furnishing only the latter quantity.

It should also be stated that the barren regions where the coal is wanting along the Kanawha, seem to come in belts of greater or less width and can therefore, (with ordinary business foresight,) be avoided by the investor.

In order to be sure of the value of coal property on the Kanawha, it is necessary to be more thorough in exploitation than elsewhere. It will not do to simply expose the face of the bed in one or two localities; the property must be girded with at least a dozen openings, and the entries driven in, not a few feet, but a few hundred, before any certain conclusion can be drawn as to the actual amount of merchantable coal the property contains.

As my work during the past season has consisted largely in studying out the stratigraphy of No. XIII in the Kanawha valley, not much time could be devoted to the study of the economic value of the different seams, and as no analyses have yet been made, this subject will be only incidentally refered to in the following brief account of the six main seams found in the No. XIII measures.

1. The Upper Freeport, (Lower Cannelton) coal.

This highest member of the No. XIII coals, rises above the Kanawha river near the Charleston ferry, where it has a thickness of 3 to 4 feet, including parting slates, and is in structure about half-way between cannel and ordinary bituminous coal. It seems to contain rather too much sulphur, and hence is not mined except for local use at a few points, though it formerly furnished a considerable quantity of fuel to the salt furnaces between Charleston and Malden. About one mile and a half above Charleston, this coal shows a curious case of spliting up by the thickening of interstratified shales, a feature so often noted in the Kanawha coals. On the north side of the river, near the "Alum Spring," the bed shows a total thickness of 5′ 8″ with two parting shales, but on the opposite side of the river, just one mile distant, the lower parting, which is only 1 foot thick on the north side, has thickened up to 20 feet, and the lower "split" is mined as a separate bed at the mouth of Porter branch.

About four miles above Charleston this coal thins away to only a few inches of worthless stuff, and we get it no more in workable condition until Coalburg is reached, 19 miles above Charleston, where we find two benches of this coal separated by 25 to 40 feet of rocks. The lower bench is 3 to 4 feet thick. and has long been called the "Lewiston seam," under the mistaken idea that it was the same bed as that once mined extensively at Lewiston or Winifrede Junction, on each side of Fields creek. The upper bench is 2½ feet thick at North Coalburg, according to Mr. C. C. Lewis, but neither it nor the lower one has been mined in that vicinity. the lower bench being too impure, and the upper too thin. However, at the Crown Hill mines, below Paint creek,the upper bench seems to have thined away, and the lower one has developed into an excelent quality of "splint" coal, 3 to 4 feet thick. This same bed has recently been opened by Mr. Buck, at East Bank mines, near Hampton, where it is 35 feet under the "Black Flint" ledge against 25 at Crown Hill. In the river bluff below the mouth of Hughes creek, this bed attains a thickness of 5½ feet, the most of which appears to be good "splint," but as we go further up the Kanawha it gains quantity at the expense of quality, and in the vicinity of Upper creek, on the Kanawha Mining Co's property and others, it attains a thickness of 11 feet, but the little good coal is so interstratified with worthless stuff as to be valueless. At Cannelton, two miles above where it shows such an enormous thickness, it undergoes another great change, and we find its lower half developed into 1½ to 4 feet of most excelent cannel, while 2′–2½′ of bituminous coal rests immediately on top of the latter. The coal has long been mined here, and has received its local designation of "*Stockton cannel*" from the former owner of this property. In this paper it has been termed the *Lower Cannelton bed*, since it becomes necessary to designate two beds (Upper and Middle Cannelton) in the Barrens (No. XIV) from the same locality.

As we pass on up the Kanawha from Cannelton, this coal thins away again to a thin bed of worthless stuff, and is mined no more, though its outcrop does not pass into the air until we pass Mt. Carbon.

That this Lower Cannelton bed is the representative of the *Upper Freeport coal* of the Pennsylvania series, there can be no reasonable doubt.

2. Lower Freeport (Coalburg) coal.

The next coal bed below the one last described is known in the Kanawha valley as the *Coalburg seam* from it development at the village of that name, 19 miles above Charleston. Its interval below the *Black Flint* varies from 30 to 130 feet, but at Coalburg, its typical locality, this distance is 90 to 100 feet. The rocks between it and the *Upper Freeport coal* consist of shales and massive sandstones, and their thickness runs all the way from 5 to 100 feet. Since this bed corresponds stratigraphically to the *Lower Freeport coal* of the Pennsylvania series, it has been provisionally identified with that bed.

The *Lower Freeport* or *Coalburg bed* is always double, and sometimes triple, as seen at the old Brooks mine on Black Hawk run, three miles above Charleston. Where this bed first rises above the C. & O. Ry., ¼ mile south from Porter branch, it is split into two or three worthless layers by 25 to 30 feet of sandstones and shales,and these partings do not thin out and bring the separate layers of coal close enough together to warrant mining until we come to the

neighborhood of the Daniel Boone salt works, 3½ miles above Charleston. Here this coal is mined in three benches, each 12-24 inches thick and separated by rock layers of 2-24 inches thickness. The coal is known as the "*Brooks vein*," and is mined for use at the salt furnace, its interval below the "*Black Flint*," being about 75 feet. As we pass up the river from the Boone salt works the coal again becomes worthless along the river hills by the great thickening of its partings, but at the Snow Hill salt works we find the partings thined away to a small thickness, and the bed again workable, though not until we go 1½ to 2 miles back from the river hills. This same productive belt seems to stretch through to the first branch of Campbell creek along a tributary of which this coal has very much the same structure as seen at Snow Hill and Boone mines. From this point on up the Kanawha, however, the bed splits up and is worthless until we come to Coalburg, the region of its greatest development. Here it has been successfully mined for a long time on both sides of the river, and is characterized by the following structure, from above downward: Splint coal 6"-10"; "Nigger head," 4"-8"; splint coal, 2½'-3½'; shale, 1'-8'; soft coal, 1'-1½'.

The term "Nigger head" is used by the Kanawha miners to designate a hard, heavy, impure coal often resembling cannel, which to the unpracticed eye can scarcely be distinguished from genuine coal, but which on the fire refuses to burn up and remains as a solid block after its carbon has disappeared. It evidently owes its origin to an invasion of the old coal marsh by sediment (fine sand and clay). The Kanawha coals are much injured in value by this substance, since it occurs to a greater or less extent in the upper three beds of No. XIII, and its removal is necessary, however troublesome or expensive it may be. The great heaps of refuse about Coalburg and other mines along the Kanawha, are composed largely of this material.

The Coalburg bed continues up the Kanawha river from Coalburg in rather fair development, with only occasional barren patches, until we come to within two or three miles of Cannelton, when it again deteriorates and becomes worthless, although exhibiting a thickness of 5–6 feet on the Cannelton Coal Co's property. Here it likewise shows one of the curious changes in its interval below the coal next above (Upper Freeport). At one locality on the Cannelton Coal Co's property, it is only 10 feet under the cannel bed (U. F.); 275 feet from this a shaft showed the interval increased to 26 feet, and further in a boring revealed 30 feet of separating material, while on the opposite side of the hill the same interval measured 75 feet at the outcrop of the beds, only a few hundred yards from where it was only 10 feet. At one locality on this property the interval decreases to 5 feet as I am informed by Mr. Davis, the superintendent.

The outcrop of this bed passes into the air near the mouth of Loup creek, but the coal has there thined away almost entirely.

At the head of Cabin creek it exhibits 5 feet of clean coal with 2' 8" of shale and coal, under the latter, and then 5' of shale succeeded by 20" of coal.

I also recognized the same coal on Huff creek, in Wyoming county, where it is 400 feet above the *Lower Kittanning coal* (Campbell creek), and has a thickness of 3' 4", of which 4" is "Nigger head" at 10" below the top, and it is there a "splint" coal as usual.

3. *The Upper Kittanning) Winifrede) coal.*

At an interval below the "Black Flint," varying from 150 to 235 feet, but which is usually about 165, we come to the third important *coal horizon* of the No. XIII measures, and since it is very extensively mined near Winifrede, on Fields creek, a tributary of the Kanawha, 13 miles above Charleston, it has been locally designated from that village. Its stratigraphical position is within the *Freeport sandstone group* of Pennsylvania, and as this corresponds to the horizon of the *Upper Kittanning coal* of that state, I have correlated it with the same. Its irregular distribution very much resembles the "*Eichenaur*" *coal* of western Butler county, which I have always considered a representative of the true *Upper Kittanning*, the *Darlington cannel* being the *middle member* of the Kittanning series.

The Winifrede bed is usually a mixture of "splint" coal layers interstratified with richly bituminous ones, the whole making a domestic fuel of excelent quality. The "splint" coal in this bed often has a physical structure resembling cannel, but possesses a grayish color, and hence is usually termed "gray splint."

The structure of this bed at its typical locality, near Winifrede, is as follows:

Gray splint	5"	
Bituminous coal	5"	
Gray splint	3'	
Bituminous coal	3"	4' 10"
Gray splint	2"	
Bituminous coal	15"	
Slate	4"–6"	
Coal	16"–24"	

This same coal was once mined at the mouth of Fields creek under the name of "*Lewiston*" coal, which designation was subsequently, by a singular error in identification, transfered to the *lower "split"* of the *Upper Freeport coal* in the vicinity of Coalburg and elsewhere in the valley.

This bed is frequently characterized by having a "rider" coal 6"-12" thick at 5'-20' above it, and generally a companion coal, slaty and impure, at 20'-40' below, but as neither is ever valuable, and both are often absent, I have regarded them as belonging to the same general horizon as the *Winifrede bed*, and have not dignified either with a separate place or name in the series.

The Upper Kittanning, or *Winifrede bed* first, makes its appearance along the Kanawha at the mouth of Wilson run, 2½ miles above Charleston, where it is 45 feet above the river and only 18"-20" thick, and 150' under the *Black Flint ledge*. On the opposite or south side of the river here, it thickens up to about 3 feet and was once mined for the salt furnaces under the name of the "*Point*" *seam*. It also appears to be this bed which was once wrought in the hill above Malden station, to which the old incline leads, where it is 235 feet under the "Black Flint," being thrown so far below the latter by the great sandstone deposits between the two horizons. It has long since been abandoned in this region however on account of its small thickness and large amount of impurities, so that it really does not attain workable dimensions until we come to the vicinity of Fields creek. A short distance above this stream Mr. Macfarlane now mines it on the north bank of the river, where it is 230' under the "*Black Flint*" and a most excelent coal.

In going up the river from Macfarlane's, however, it thins down and when we come to Coalburg, where the *Coalburg bed* is well developed, we find the *Winifrede seam* represented by 4'-5' of coaly slate interstratified with thin seams of *iron ore* (Lewis). Occasionally this bed develops into an impure *cannel*, as at Brownstown, and in such cases it nearly always shows some included layers of *black-band iron ore*, in fact Capt. Hovey, of the Davis Creek Coal & Iron Co., thinks the Davis creek *black-band* comes at this horizon. This is possible, since the same coal also exhibits *black-band* on Witcher creek

On up the Kanawha river in the region of Upper and Morris creeks, this coal comes in again about the time that the

Upper and *Lower Freeport beds* (Lower Cannelton and Coalburg) have become worthless. This is the bed at the Kanawha Mining Co's works, from which the C. & O. Ry. engines receive their supplies. At Coal Valley, however,one mile above the latter locality, the bed has all disappeared except 15″–20″ of worthless stuff which remains at its proper horizon, and it does not thicken up again to a workable condition before the horizon passes into the air above Loup creek. This coal also shows a good development on Hughes creek, about 4 miles up the waters of that stream. Judged with reference to its Pennsylvania equivalent (Upper Kittanning) the *Winifrede bed* is likely to prove less constant in its distribution between the Kanawha and Big Sandy rivers than any of the other coal beds in No. XIII.

4. The Middle Kittanning (Cedar Grove) coal.

Below the last described coal, we find a succession of sandstones and shales in which we get only thin streaks of coal, and none of any productive value until an interval of 200 to 250 feet has been passed, when we come to a small but very pure bed of splint coal that has its productive development between Simmons creek and Kelley creek, since the bed in question gets too thin for mining both north and south from these points. This is the highest bed of No. XIII with which we find an abundant *fossil flora* associated. A great wealth of beautiful ferns is found in its roof shales, many of which are identical with those found in connection with the *Darlington (Middle Kittanning) bed* of western Pennsylvania, and on this account, reinforced by its similar stratigraphical position, it has been provisionally correlated with the latter coal. It is extensively mined in the vicinity of Cedar Grove one mile below Kelley creek, and has received its local name from that village. Here, as well as elsewhere, it usually has a "rider" coal 3″–4″ thick which occurs in its roof 4 inches to 15 feet above the main coal. The latter is free from slate or partings of any kind, but only 2′ 8″—3′ 4″ thick. It furnishes a splint coal of very good quality, though it is difficult to mine since the only soft coal in it is a few inches at its very top.

This coal first rises above the bed of the Kanawha river about one-half mile below Campbell creek, and at the mouth of this stream it shows a thickness of 16″–18″, and was once mined to a small extent, being called the "*Trimble*" or "*Arno*" *vein*. Its interval above the *Lower Kittanning*, or next lower coal, is there only 40′–50′, but as we proceed up the river, this increases to more than 100 feet in the vicinity of Simmons creek, and the coal at the same time develops into a workable bed, having a thickness of 40″ pure splint, and being underlaid by a bed of good fireclay which on Witcher creek is about 3 feet thick.

This coal seems to disappear almost entirely in the vicinity of Cannelton, and northward, or else it thins to a mere streak.

The *Middle Kittanning bed* (Cedar Grove) is now mined at only one locality on the south side of the Kanawha river, viz: the Marion mines, at Blacksburg.

Johnstown cement bed (Campbell creek limestone)

In the shales which separate the last described coal from the one next below we often find a layer of impure limestone in disconnected, lenticular masses which exhibit the curious "cone-in-cone" structure. It makes it appearance first along Campbell creek, and has been designated from that locality. It seems to be quite persistent, since it is seen wherever its horizon is uncovered as far up the Kanawha river as Loup creek, and Mr. Page gives a limestone in his Gauley mountain section, near Ansted, which is identical with it. Hence it appears possible that it may represent the *Johnstown cement bed* of Pennsylvania, since,according to my identification of the coals, it occurs at the right geological horizon for that bed.

5. Lower Kittanning (Campbell creek) coal.

The next coal bed in descending order is one that has long been successfully mined on Campbell creek, in the vicinity of Malden, and it is generally known in the Kanawha valley as the *Campbell creek bed*. In stratigraphical features it seems to accord well with the *Lower Kittanning coal* of the Pennsylvania column, and it has been put down provisionally in my general section as identical with that bed.

This is the most persistent of the No. XIII coals in the Kanawha valley, agreeing in this respect with its equivalent in Pennsylvania, the *Lower Kittanning coal* being seldom absent from the section there. It is true that on the Kanawha this bed is not constantly workable, still it is not because it has disappeared like some of the other beds, but because it has been split up into several layers by the thickening up of partings.

The study of this coal bed in its various phases, from the time it rises above water level at the mouth of Campbell creek, 5 miles south from Charleston, until it passes into the air at the Ansted mines on Gauley mountain,40 miles distant, reveals many chapters in the history of coal making in the Kanawha valley.

In the Campbell creek region this bed is from 4 to 6 feet in thickness and is usually subdivided into three benches by two slates, of which the lower is always thickest, the upper indeed being often absent entirely. The lower slate is seldom less than 6″–8″ thick and in some directions thickens so fast that the lowest bench of coal cannot be mined, while the upper slate is not often more than 2″–4″ thick. As we pass up the Kanawha beyond Malden, however, these slates begin to thicken up and others make their appearance until the upper and lower members of the bed are separated by 20′ of shales in which a third layer of coal is generally found. This expansion of the bed continues until in the vicinity of the Peerless Coal Co's. mine, 10 miles above Campbell creek, it is spread through the enormous amount of rock material shown in the following section:

1.	*Middle Kittanning coal,*				2′
2.	Fireclay,				3′
3.	Concealed,				35′
4.	Shales and concealed, containing *Johnstown cement bed*				20′
5.	*Coal*, upper member of C. C. bed,	0′	11″	Lower Kittanning (Camp. C.) coal.	
6.	Shaly sandstone and shales,	13′	0″		
7.	*Coal*	1′	1″		
8.	Shales and concealed	20′	0″		
9.	*Coal*	0′	8″		
10.	Concealed,	20′	0″		
11.	Sandstone and sandy shales	5′	0″		
12.	*Coaly shales*	1′	0″		
13	Blue shales full of fossil ferns,	8′	0″		
14.	*Coal*, Peerless,	2′	7″		97′ 0″
15.	Sandy shales and sandstone,	8′	0″		
16.	*Coal* and *coaly shales*,	1′	4″		
17.	Shale,	10′	0″		
18.	*Coal, bony* at top and bottom,	1′	6″		
19.	Shale	0′	8″		
20.	*Coal*	0′	2″		
21.	Shale	1′	3″		
22.	*Coal*	0′	10″		
23.	F. C. and shales				1′ 6″
24.	Massive sandstone visible				10″

The only layer of coal that can be mined in this 97 feet of rocks is No. 14, which is here a very superior gas coal, that has recently been opened up for shipment by Messrs Hale & Hallwood under the name of *Peerless coal.*

This same portion of the Campbell creek bed is also mined by Mr. Carkin, two miles above Malden station. To understand the cause of this great spliting up of the *Camp-*

bell creek bed, we must remember that at Snow Hill, 3½ ms above Charleston, where Dr. Hale sunk a shaft to this coal, the interval from it to the "*Black Flint*" is only 375 feet; but here at the Peerless coal works this same interval, measured from the bottom member of the *Campbell creek bed*, has increased to about 550 feet, or a thickening of (550 —375 ft.) 175 feet,and,as may be seen from the section nearly half of this swelling out of the measures has taken place within the limits of the *Lower Kittanning coal*

That this was partly due to *local* subsidence we know, for when we go on south to the Coal Valley region,where the interval from the base of the Lower Kittanning coal to the "Black Flint" has thickened up still further to 640 feet, these rock intervals which separate the members of the coal so widely at the Peerless mines, have thined almost completely away, and on Morris creek the several components come practically together again and form a bed 10 feet thick.

The lower half of the Campbell creek bed remains worthless after we pass one mile above Malden until the neighborhood of Blacksburg is reached, when the separated members fuse together and form a bed of good coal 4 ft thick. This is often called the *Blacksburg oal*, but it is only the lower half of the *Campbell creek bed*, or that portion of this bed which lies below the *Peerless member*.

This is also the condition of affairs with the *Coal Valley gas vein*, since it includes only that portion of the *Campbell creek seam* which lies under the *Peerless bed*, the latter being separated from the *Coal Valley seam* by a thickness of shale too great to take down. On the Mt. Carbon property this shale thins out at one locality and lets the *Peerless* and *Coal Valley seam* come within 2-3ft. of each other for a short distance. The same thing has taken place at Ansted on Gauley mountain, where the so-called "11 foot" bed, now mined and coked by the Hawks Nest Coal Co. is simply the *Campbell creek bed* with the shale partings between the several members reduced to a few inches.

At the head of Cabin creek the *Peerless* and upper half of the *Coal Valley* portion of this bed come entirely together, and form a splendid bed of gas coal 5½ ft. thick, from which the lower half of the *Coal Valley portion* is separated by 3–15 ft. of shales.

In the neighborhood of Oceana, Wyoming Co., this coal has a good development, being generally triple beded, the two lower benches alone being workable, and having a combined thickness of 4′-5′ of good coal.

Below this bed along the Kanawha valley we generally find a massive sandstone (Kittanning) and under it a thin coal is often present but never attains workable dimensions.

Ferriferous (Cannelton) limestone.

At 75 feet under the *Lower Kittanning coal*, a bed of *silicious limestone* makes its appearance, and seems to be quite persistent along the valley, since it is found wherever its horizon is exposed. It was once burned for cement at Cannelton by Mr. Stockton and hence is often called the "*Stockton*" *limestone*. It is never more than 30″ thick, very frequently exhibits the "cone in cone" structure, and sometimes occurs in lenticular masses, separated 1′–10′. The bed is not fossiliferous so far as I have observed, but it seems to represent pretty fairly the *Ferriferous limestone* horizon of Pennsylvania, and for the present it is correlated with that bed under the name of *Cannelton limestone*. It makes its first appearance above the Kanawha at the mouth of Rush creek where it is brought up to Ry. level by the *Brownstown axis*.

6. *Clarion (Eagle) coal.*

At 30′-45′ below the limestone last described we come to the lowest bed of coal in No. XIII that attains workable dimensions on the Kanawha river. Regarding the *Cannelton limestone* as representing the *Ferriferous* of Pennsylvania, this coal would harmonize with the *Clarion* of that state. The bed in question has been extensively developed at the Eagle mines, two miles above Cannelton, where it has proven a superior coking coal, and hence is generally known along the valley as the "*Eagle seam*. It is also successfully mined at Frederick, the next station below Eagle. Its structure in this region is as follows:

Coal	14″	4′ 9″	In passing down the river from Frederick to Cannelton, the upper bench of this coal disappears, and the lower is reduced to 24 inches, where it disappears from view on Morris creek. As we go up the river the upper bench does not disappear, but the intervening shales thicken up and at Mt. Carbon have become 15-25 feet, while the lower bench retains its usual thickness of 34 inches. This upper "split" from this bed would represent the *Scrub Grass coal* of Pennsylvania.
Shale	3″		
Coal	3″		
Shale	3″		
Coal	34″		

The *Brownstown axis* brings this coal a few feet above the Kanawha river, and the piers of the Rush creek bridge rest upon it, but the surface deposits conceal it from view, and nothing definite is known of its quality there, though it is reportcd as 3 feet thick. The abutments of the Paint creek bridge are also reported as built on coal, and this would be the same bed brought to the surface again by the *Paint creek axis*.

Another small *coal* 18-20 inches thick is usually found at 20 feet below the *Clarion (Eagle) bed*, but as it never attains a workable size, the seam has not been dignified with a name.

Putnam Hill ("Black Marble)" limestone.

At about 75 feet below the *Clarion coal* or 200 under the "Lower Kittanning bed," another thin limestone rises above the C. & O. Ry. in the vicinity of the Crescent Coal works. It has a blackish color and hence has been locally called "Black marble" for a long time. It likewise exhibits the "cone-in-cone" structure and is underlaid by very fossiliferous shales, containing practically the same *fauna* that is always associated with the "Ferriferous limestone" in western Pennsylvania. Prof. Orton of the Ohio geological survey has shown, however, that the "Ferriferous bed" of Pennsylvania has a "double" in Ohio known as the "Putnam Hill limestone," which contains the same fossils as the "Ferriferous," but underlies the "Clarion coal," and the "Black marble" of the Kanawha valley fits in exactly with this order.

Below the last described stratum we find 250–275 feet of shales and sandstones in which two or three thin beds of coal are sometimes found, but none of which have proven workable on the Kanawha.

A bed of richly *bituminous shale* also occurs locally, at 150–200 feet under the Clarion coal, and was once used in the manufacture of oil above Eagle.

Some *black-band iron ore* also occurs somewhere in the interval between the Clarion coal and the base of No. XIII, probably about the horizon of the little coal bed next below the Clarion. It is said to be of good thickness on the tributaries of Gauley river, but is unimportant along the Kanawha.

The *Davis creek black band* which occurs up near the top of No. XIII was not examined, and hence no special reference has been made to it in this paper.

The Pottsville (No. XII) Conglomerate.

At the base of No. XIII we come down to a series of rocks which although holding important coal beds, are so shaply set off from No. XIII by natural lines that any true system of classification will always retain the distinctness which the Rogers brothers gave them many years ago.

As has been shown by Profs. Fontaine, Stevenson and others, the *Pottsville conglomerate series* of rocks attain a development on New river (a continuation of the Kanawha) W. Va., unequaled anywhere else in the country.

The top of No. XII makes its appearance in the bed of the Kanawha river, just above the mouth of Armstrong creek, and rising rapidly reaches an elevation of 200 feet above the same in the vicinity of Loup creek, but in ascending the river from this point the course of the stream turns north and at Kanawha Falls the top member of XII comes down again, and almost disappears under the Kanawha between the Falls and the mouth of Gauley river. South from this it rises rapidly and makes the walls of New River canyon until its lowest members pass into the air, near Quinnimont.

The uppermost member is a great pebbly sandrock which makes a constant line of cliffs from the Kanawha Falls southward until it passes into the air near Caperton. This stratum is usually known as the "*Falls*" *sandstone*, along the Kanawha valley. It is 150 to 175 feet thick, and corresponds to the *Homewood sandstone* of the Pennsylvania series.

A small coal bed is often seen directly under it, but at no locality does the coal obtain workable dimensions.

The productive coals of the No. XII series are three in number, viz:

1. *Nuttall.*
2. *Quinnimont.*
3. *Fire Creek.*

These coals of No. XII are sharply distinguished from those of XIII by their excelent coking qualities. Of the six coals in XIII only one, the lowest, or *Clarion* has coking qualities in the Kanawha field, while of the three No. XII coals given above, all are coking coals.

1. The Nuttall coal, (Sewell).

The above name has been given to the first workable coal bed that we get in descending from the top of XII on New river. It has been mined successfully for several years at Nuttall station on the C. & O. Ry., and the coal is designated from that locality. Its geological horizon on New river varies from 400 to 425 feet below the top of XII.

For regularity and persistency this bed seems to surpass any of the coals of XIII, since it is never absent at its proper horizon after rising above New river, a short distance below Hawks Nest station. It is there, however, but 2 to 2½ feet thick, and has been mined to only a small extent. This bed increases regularly in thickness toward the south, and when we come to Stone Cliff, it has attained a thickness of 4½–5 feet thick. A curious mistake was made with regard to this coal by the early geological explorers along New river. In passing up the river from the vicinity of Caperton, the dip suddenly increases to 300–400 feet per mile, which carries into the air the great cliff rocks found above the *Nuttall coal* all along the stream below Caperton, while at the same time it brings up to a corresponding place in the mountains the massive sandstones that begin 75 ft. *under* the *Nuttall coal.* This rapid dip seems to have been unheeded, and consequently the coal bed (Nuttall) in the summit of the mountain at Sewell and southward was identified with the lowest bed of the No. XIII coals, entirely above No. XII, whereas the truth of the matter is that the highest coal found at Sewell, Fire creek, Stone-cliff, &c., is the *Nuttall seam*, a bed belonging 400 feet under the top of XII.

It is the same *Nuttall coal* which occurs a few feet above the top of the great cliff rock on the road leading from Prince station to Raleigh C. H., where it is 5-6 feet thick and trends away toward the Flat-top region in a seemingly persistent bed. It is everywhere pure, and free from admixture of slate, and a coking coal of unsurpassed excelence. Its productive development will be confined to a limited area, however, for on the Tug Fork of Sandy, near the mouth of Dry Fork, it has thined down to only 20 inches, just as it thins away on New river below Hawks Nest. Hence any expectation of finding this coal in workable condition by shafting on the Kanawha or Big Sandy rivers must be considered futile, since all the evidence goes to show that it accumulated in workable thickness only around the southern border of the coal field.

2. and 3. The Quinnimont and Fire Creek coals.

In the vicinity of Sewell station two more workable coals make their appearance in the No. XII series, the upper one coming about 300 feet under the *Nuttall bed*, and the other 100–130 feet lower. Both have been mined at Sewell where they are each 3–4 ft. thick, though quite irregular, the upper one thining away entirely when followed into the mountain.

One of these beds has been extensively mined at Quinnimont and the other at Fire Creek, and they have been designated from these localities. The two beds are never well developed at the same time, however, and hence some doubt yet remains as to their relative positions, some coal operators contending that the "Quinnimont bed" is the *lower*, and others that the "Fire Creek" is. While inclining to the view that the "Fire Creek" is the lower one, I have left the matter open by inserting an interrogation after the names of these beds in the general section. It can only be determined by a careful study of the region when the leaves have fallen, so that the cliffs can be kept continuously in sight between Fire Creek and Quinnimont.

Both are coking coals of excelent quality, though neither can compare with the Nuttall bed in regularity or freedom from impurities.

These coals, like the *Nuttall* above, are confined to the southern margin of the coal field, since although their horizons are above water level at Caperton and Nuttall we find them represented there by thin streaks only. They seem to thicken up southward very much however, for the great bed at Pocahontas, in the Flat Top country, appears to be identical with one of them as claimed by Maj. Hotchkiss.

No reference to the salt, lumber or other interests of the Kanawha valley has been made in this paper, from the fact that a limit of reasonable length has already been exceeded, in reviewing as briefly as possible the coal series.

New Brown-stone quarry in Va.—The Richmond State reports: "The Richmond and Alleghany Ry. has developed many new subjects tor profitable industry in the future, but none more potent than the various quarries of stone on its line between this city and Lynchburg, which are bound in the near future to take their place in the building architecture of the country. The James River Freestone Co., chartered by the last legislature, Maj. Marion J. Dimmock president, is now developing with success a splendid quarry of brown-stone building material at Midway Mills, on the above road."

We may add that there is no finer exhibit of Granites and granite work at the New Orleans Exposition than that of the Richmond Granite Co., from its quarry and works at Korah station of the R. & A. Ry., 4 miles above Richmond, of which H. F. Smith is superintendent; and that a fine exhibit of the same granites is made by J. B. Mitchell & Co, from their quarry and works at Mitchell, on same road, one mile above Korah.

The Virginia China-clay & Fire-brick Co., on Shenandoah Valley RR., Lipscomb, Va, has repaired all the damages of the last fire and is now again in operation making fire-brick and diging and preparing china-clay for market, enabling it to supply any demands for these articles. We see that its annual meeting is called for March 2, 1885, at the office of the company, 1321 Main St., Wheeling, W. Va., by John F. Sweeney, secretary, We are informed that orders are coming in for fire-brick for coke ovens from the lines of the Ches. & Ohio and the Norfolk & Western railways.

Sale of Coal and Timber Lands.

Commissioners' Sale of 14,307.17 acres of valuable Coal and Timber Land situated on Cabin Creek and Coal River, in the counties of Kanawha and Boone, West Virginia.

Augustus Pack's Adm'r. against Jed. Hotchkiss and others. } In equity.

In pursuance of decrees rendered in the above cause, pending in the District Court of the United States, at Charleston, West Virginia, on the 21st day of November, 1884, and on the 2d day of February, 1885, we will proceed, on

Saturday, May 16th, 1885,

at the front door of the county court house of Kanawha county, West Virginia, to sell to the highest bidder that tract of

14,307.17 Acres of Land,

lying on Cabin Creek and Coal River, in Kanawha and Boone counties, fully set out and described in the deed of escrow executed by Augustus Pack and others to Jed. Hotchkiss, dated 10th day of January, 1874, and filed in the papers of this cause, upon the following terms, to-wit:

$10,000 dollars of the purchase money to be be paid, cash in hand upon the day of sale, and the residue in six equal annual installments, with legal interest on each of said installments, from the day of sale. The purchaser or purchasers will also required to give his or their notes with good personal security for all the defered payments, and a lien will also be retained upon said lands for the payments thereof. But no sale of said lands will be made or bids received for a less sum than $60,000.

A map of this land can be seen at the office of of Commissioner T. B. Swann, at Charleston, West Virginia.

T. B. Swann,
E. W. Wilson,
S. A. Miller, Sr.,
E. B. Knight,
J. F. Brown,
W. S. Laidley,
62-65 Special Commissioners.

The Virginias.

A Mining, Industrial and Scientific Journal:

Devoted to the Development of Virginia and West Virginia.

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The Five Volumes and *The Virginias for* 1885 will be sent, post-paid, for $16.00 in advance.

Advertising rates furnished on application.

Contents of No. 64.

The Railway Time Tables given below are based on 75th meridian or *Eastern standard time;* they are also in *24-hours time*, from midnight forward to midnight, so midnight appears as 24 00, and noon as 12 00. When the hours given are over 12 the present clock or watch time can be found by taking 12 from the hours. All junction stations are given. Where two times are given at a station the first is that of arriving and the second that of leaving.—Condensed time tables of the other railways of the Virginias will be added hereafter.

Chesapeake & Ohio Ry.

(May 10, 1885.)

Westward.	No. 3.	No. 1.	
New York, (Pa. Ry).....	8 30 or 10 00	24 00	.....
Philadelphia .....“	11 55 or 12 30	7 20	.....
Baltimore.....“	15 20 or 14 55	9 50	.....
Washington, (Va. Mid.)	17 45	11 15	.....
Charlottesville “	22 35	15 55	.....
Norfolk.....	15 25	7 25	.....
Old Point Comfort.....	16 00	8 00	.....
Newport News.....	16 25	8 30	.....
Richmond.....	19 20	11 30	.....
Hanover Jn. (R. F. & P.).....	20 13	12 34	.....
Gordonsville (Va. Mid).....	21 51	14 50	.....
Charlottesville “	22 30	15 45	.....
Waynesboro Jn. (S. Val.).....	24 01	17 15	.....
Waynesboro.....	24 02	17 16	.....
Staunton (B. & O.).....	24 30	17 50	.....
Goshen.....	1 56	19 16	.....
Clifton Forge (R. & A.).....	2 45	20 20	.....
White Sulphur.....	4 12	22 20	.....
Kanawha Falls.....	8 10	3 05	.....
Charleston (O. C.).....	9 32	4 42	.....
Huntington*.....	11 00	6 20	.....
Ashland (Sci. Val.).....	10 41	7 02	.....
Winchester (Ky. C.).....	14 30	11 45	.....
Cincinnati.....	18 00	18 00	.....
Lexington.....	15 43	12 40	.....
Louisville.....	19 10	.....	.....

*All stations beyond Huntington have 90th Meridian or Central time, one hour *slower* than Eastern time.

No. 3, the Louisville and Cincinnati express, is a daily train, with sleepers, from Washington and Richmond, without change from Washington to Louisville and Richmond to Cincinnati.

Through connection at Louisville over C. O. and S. W. for New Orleans, with sleeper, without change.

It does not stop for local business.

No. 1, the mail train, is daily, except Sunday.

Eastward.	No. 4.	No. 6.	.....
Louisville (L. & N.).....	19 35	.....	.....
Lexington “	22 50	11 45	.....
Cincinnati (Ky. C.).....	20 10	8 10	.....
Winchester (Ky. C.).....	23 30	13 00	.....
Columbus.....	17 30	12 00	.....
Chillicothe.....	20 05	14 10	.....
Ashland.....	3 32	17 55	.....
Huntington*.....	4 10*	18 40*	.....
Charleston.....	6 43	22 17	.....
Kanawha Falls	7 50	23 55	.....
White Sulphur.....	12 10	5 10	.....
Covington.....	12 52	6 18	.....
Clifton Forge.....	13 35	6 50	.....
Goshen.....	14 24	8 15	.....
Staunton.....	15 40	9 41	.....
Waynesboro.....	16 09	10 15	.....
Waynesboro Jn. (Shen. Val)	16 10	10 16	.....
Charlottesville (Va. Mid.).	17 25	11 30	.....
Gordonsville “	18 04	12 20	.....
Hanover Jn. (R. F. & P.)..	19 55	14 30	.....
Richmond..... .....Arr.	20 30	15 40	.....
Richmond .....Leave	.....	15 50	.....
Newport News.....	.....	18 30	.....
Old Point Comfort....	.....	18 55	.....
Norfolk.....	.....	19 30	.....
Charlottesville, V. M. Jn....	17 25	.....	.....
Washington (Pa. Ry.)....	21 50	.....	.....
Baltimore, “	23 35	.....	.....
Philadelphia, “	3 00	.....	.....
New York “	6 30	.....	.....

*Louisville to Huntington Central time; east of Huntington Eastern time.

No. 4 is the Washington daily express, from Louisville to Washington, and Cincinnati to Richmond, with sleepers, without change. Columbus, Ohio, at 17 30 and Chillicothe at 20 05 connect at Ashland. Observation car from Kanawha Falls to Clifton Forge. No. 6 is the Virginia Springs express, daily except Sunday.

No. 2 is the mail train, daily, from Ashland to Clifton Forge; daily, with sleeper, except Saturday, from Clifton Forge to Old Point Comfort.

☞Hotel Warwick, at Newport News, and Hygeia Hotel, at Old Point Comfort, are open all the year round. Boating, fishing, and tonic sea-air are always in order at these places. 61

Shenandoah Valley Ry.

(March 16, 1885.)

Southward.	(No. 3.)	(No. 1.)
New York.....	20 00	8 30 or 10 00
Philadelphia.....	23 20	11 55
Baltimore.....	....	15 35
Harrisburg.....	4 20	.....
Hagerstown, (Wn. Md).....	10 30	23 25
Shen. Junc. (B. & O.).....	11 28	24 12
Charlestown (Val. B. & O).....	11 40	.....
Riverton (Va. Mid).....	12 50	1 26
Luray.....	14 20	2 26
Waynesboro Junc., C. &O	16 20	4 17
Natural Bridge (R. & A).....	18 23	....
Roanoke (N. & W.)..	19 54	7 45
Bristol, Tenn	1 45	13 20
Chattanooga, Tenn,.....	10 00	22 10
Memphis, Tenn,.....	....	12 25
Atlanta, Ga,.....	16 40	4 20
New Orleans.....	19 45	19 30
Jacksonville, Fla,.....	21 00	20 00

No. 3 has Pullman Sleeper New York to Atlanta without change, via Harrisburg and Roanoke, and Washington to New Orleans without change via B. & O. Railroad and Calera.

No. 1 has Pullman Sleeper Philadelphia via Harrisburg, and Roanoke to Chattanooga, Cleveland to New Orleans without change.

Northward.	(No. 2)	(No. 4.)
Roanoke (N. & W.).....	23 20	13 00
Natural Bridge (R. & A),.....	24 49	14 25
Loch Laird (R. & A.).....	1 17	14 51
Waynesboro Junc. (C. & O.)..	2 51	16 20
Luray...	5 03	18 35
Riverton (Va. Mid.)	6 12	19 43
Charlestown (Val. B. & O.)...	7 23	20 48
Shen. Junc. (B. & O.).....	7 35	21 15
Hagerstown (Wn. Md.).....	8 30	22 10
Harrisburg, Pa.....*..... ...11 15		1 05
Baltimore, (via Wn. Md).....	11 50	11 40
Philadelphia, (via Balto.) 15 15		4 25
New York, (via Balto.)....	18 20	7 00

No 2, the Baltimore and Philadelphia express, runs daily, with Pullman sleeper, without change, from Chattanooga to Philad'a via Harrisburg and Pa. Ry.

No 4, the New York express, runs daily, with Pullman sleeper from Atlanta to New York, via Harrisburg and Pa Ry.

One thousand mile ticket $25; five hundred mile ticket $15. 61

Virginia Midland Ry.

(May 10, 1885.)

Southward.	(No. 50.)	(No. 52.)	(No. 54.)
Washington.....	11 15	22 40	17 10
Alexandria.....	11 40	23 05	18 10
Manassas.....	12 38	23 55	19 14
Warrenton Junction....	13 10	24 22	19 48
Orange.....	14 51	1 38	21 31
Charlottesville....	15 55	2 35	22 35
“	16 00	2 45	.....
Lynchburg.....	18 15	5 00	.....
“	18 20	5 05	.....
Franklin Junction	19 51	6 32	.....
Danville..... .	20 52	7 32	....
Northward.	(No. 51.)	(No. 53.)	(No. 55)
Danville.....	10 46	23 30	.....
Franklin Junction.....	11 50	24 29	. ...
Lynchburg.....	13 25	1 50	.....
“ leave	13 45	1 55	.....
Charlottesville	16 02	3 55	.....
“ leave	16 10	4 00	17 15
Orange.....	17 19	4 56	18 12
Warrenton Junction....	18 54	6 12	19 31
Manassas.....	19 32	6 37	20 03
“ ....leave	19 50	6 39	20 20
Alexandria.....	20 50	7 30	21 15
Washington.....	21 15	8 00	.....

All these trains run daily.—Nos. 50 and 51 are mail trains.—Nos. 52 and 53 are the Southern express.—Nos. 54 and 55 are the Louisville and Washington express of Ches. & Ohio Ry.—Nos. 50, 51, 52 and 53 make through connections from Boston to Atlanta; they all have sleeping cars. 61

Richmond & Danville RR.

(Oct. 12, 1884.)

Southward.	No. 50.	No. 52.
Richmond,.....	13:30	2:00
Burkeville,.....	15:38	4:03
Danville,.....	19:41	7:56
Greensboro,.....	21:35	9:30
Salisbury,.....	23:53	11:10
Charlotte,.....	1:35	12.35
Northward.	No. 51.	No. 53
Charlotte,.....	4:20	18:30
Salisbury,.....	6:10	19:57
Greensboro,.....	8:20	21:38
Danville,.....	10:08	23:09
Burkeville,.....	13:32	3:57
Richmond,.....	15:45	7:00

All these trains are daily and connect with north- and south-bound trains on other roads so as to make through connections in all directions.—No. 53 runs to Atlanta without change.—Buffet sleeping cars run on Nos. 50 and 51 between New York and Atlanta, via Washington and Danville, and also Raleigh and Asheville.—Pullman sleepers on Nos. 52 and 53 between Richmond and Danville, and Washington and Augusta (Ga.) and Washington and New Orleans, via Danville. 61.

Norfolk & Western RR.

(Mar. 23, 1885.)

Westward.	(No. 1.)	(No. 3.)
Norfolk.....	15 10	10 00
Suffolk.....	15 56	10 45
Petersburg	17 50	12 40 or 12 50
Burkeville.....		14 51
Lynchburg.....	5 45	17 25 or 17 45
Roanoke.....	8 00	20 13
Central.....	9 34 or 10 55	21 59
Pocahontas	14 30	
Wytheville.....	10 53	23 23
Bristol.....	13 20	1 45

No. 3 runs daily, with sleeper, without change, from Washington, D. C., via B. & O. RR., and Calera to New Orleans.

No. 1 runs daily, with sleeper, from Lynchburg to Bristol, and sleeper from New York (taken from S. V. RR., at Roanoke) without change, to Memphis, Tenn.

Nos. 13 and 3 connect at Petersburg for Richmond at 12 58 and 18 00. Leaving Richmond by R. & A., at 9 20, 15 30, and 21 45 connections are made at Lynchburg for westward.

Eastward.	(No. 2.)	(No. 4)
Bristol.....	17 15	7 10
Wytheville.....	20 05	9 52
Pocahontas.....	16 15	
Central.....	21 28	11 15
Roanoke..	23 00 or 23 12	12 40 or 13 10
Lynchburg.....	1 15 or 8 00	15 10
Burkeville...	10 31	
Petersburg.	12 25 or 12 40	7 10
Suffolk.....	14 30	9 15
Norfolk.....	14 20	10 10

No. 2 runs daily, connecting at Petersburg for Richmond at 12 58, and at Norfolk with steamers for Baltimore and New York. Nos. 2 and 4 connect at Roanoke with Shenandoah Valley Ry., with Pullman sleepers to New York. At Lynchburg they connect with Va. Midland for Washington etc. at 2 45 and 13 55; and with R. & A. at 3 10, 14 00, and 21 40 for Richmond. 61

Richmond & Alleghany RR.

(Apr. 12, 1885.)

Westward.	(No. 1 & 11.)	(No. 9.)	(No. 3.)
Richmond	10 10	19 10	15 30
Scottsville	13 18	24 01	19 00
Lynchburg...	16 15	3 50	22 00
Balcony Falls....	17 35	5 40	.....
Lexington.....	19 15	7 10	.....
Natural Bridge (S. V)	17 44	.....	.....
Buchanan..... “	18 19	.....	.....
Clifton Forge (C. & O.)	19 35	.....	
Eastward.	(No. 2. & 12)	(No. 10.)	(No 4)
Clifton Forge.	10 00	.....	.....
Buchanan.....	12 28	.....	.....
Natural Bridge.....	13 09	.....	.....
Lexington.....	11 25	19 37	
Balcony Falls.....	13 20	21 05	
Lynchburg.....	14 40 or 15 20	22 40 or 22 55	3 35
Scottsville.....	17 57	2 53	6 27
Richmond	21 20	7 25	10 15

All trains daily except Sunday. Sleepers are attached to night trains between Richmond and Lynchburg.

Mrs. R. E. Christian

The Virginias.

Serial No. 67. Vol. VI.—No. 7.

Staunton, Va., July, 1885.

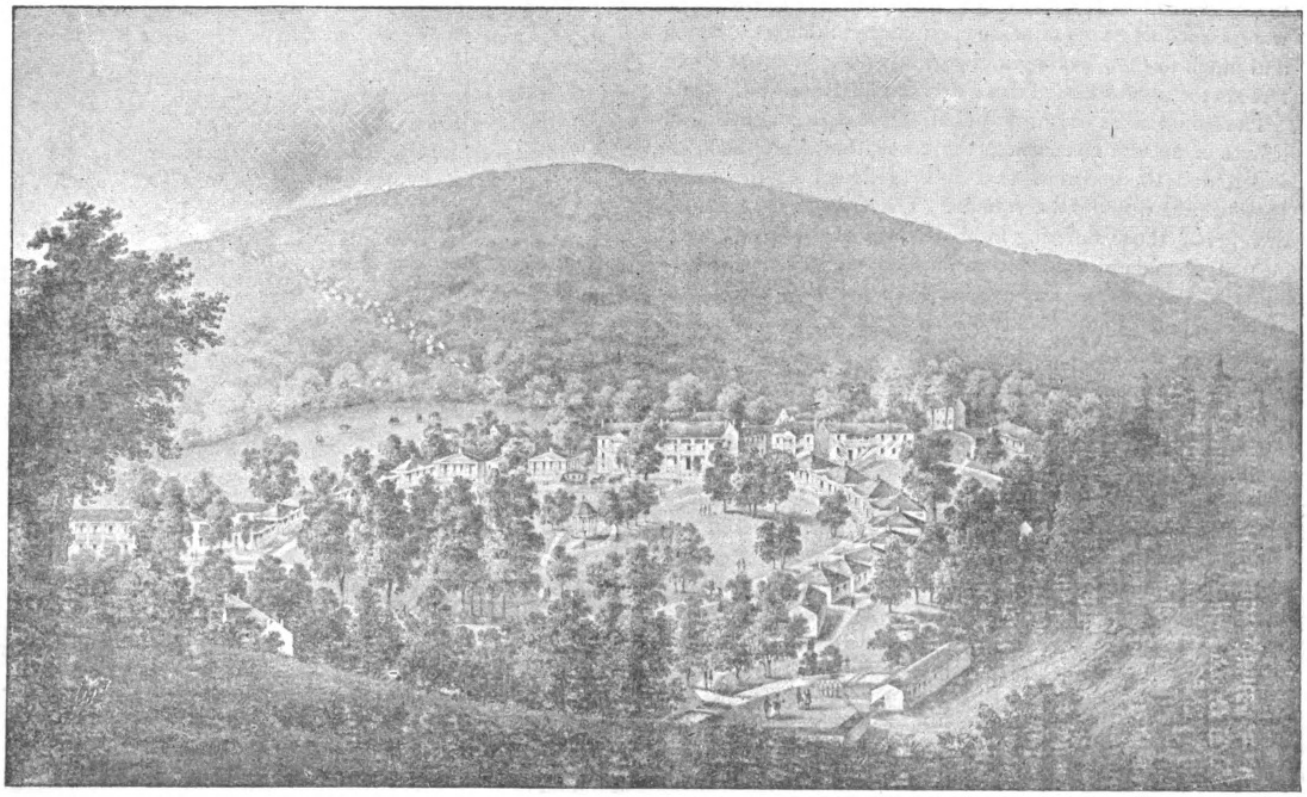
Jed. Hotchkiss, Editor.

The Rockbridge Alum Springs.

Among the many famous health resorts of Virginia none is more widely and favorably known than the Rockbridge Alum Springs, for, during more than half a century, tens of thousands of men and women, the sick, the weak and the weary, have found health and strength and vigor by drinking from one or another of the wells of remedial waters that there abound and breathing the pure air of the high mountain valley in which these health-restoring and health-giving waters are found.

These springs are located in the wide Apalachian region of the Virginias, a country made up of beautiful long and narrow parallel valleys, separated from each other by lofty and equally parallel ranges of forest-covered mountains. Locally they are in the valley of Bratton run, a southwestward extension of the valley of the Big Calf-pasture river of the James, which in turn is part of the second range of Apalachian valleys lying westward of the Great Valley of Virginia. The valley of Bratton run, near the head of which these springs are nestled, looks out to the northeast between the bold ranges of Mill mountain on the northwest and the Big North and its extension as Bratton mountain on the southeast. The valley itself ranges in altitude from 1,400 to 2,000 feet above the sea level, the bounding mountains rise from 1,000 to 2,000 feet higher, while the vanishing point of the landscape, in the northeast, is the noble dome of Mount Rogers, rising to the commanding elevation of 4,500 feet above tide. These conditions of location—elevation, exposure, height of forest-covered surrounding mountains—give to the region of these springs the cool climatic summer of the Adirondacks of New York combined with the longer and more equable latitude summer of 38° North.

Near the Rockbridge Alum Springs the valley of Bratton run—about seven miles southwest from Goshen station of the Chesapeake and Ohio Railway, where it may be said to begin—is divided into two valleys by the rising of Brushy mountain that extends to the southwest as an independent range between the North and the Mill mountains. The accompanying view, from Ed. Beyer's Album of Virginia, shows the village of cottages and hotels that pertain to these springs, disposed around and near an ample and beautifully shaded lawn, in the middle foreground, while in the background rises the massive and forest-covered ridge of Brushy mountain to near a thousand feet above the springs valley. At the foot of the densely wooded hill on the right are the alum springs, or wells, that have made this place famous.



The Rockbridge Alum Springs, looking Southwest.

As the waters af these springs have become famous for their efficacy in the cure or alleviation of many diseases, especially those of a chronic nature, it is a matter of more than curious interest to know how a beneficent Creator has compounded them so as to give them their remedial virtues. Chemists of repute have, successively, during the past 50 years, brought their analytic skill to bear upon this question of their composition. One of the first to reverently question Nature as to how she had made these healing waters was Prof. William. B. Rogers, the grand physicist, who, while laying

the foundations of American geology in his great survey of Virginia, from 1835 to 1841, analyzed the waters of the principal mineral springs of Va. and classified them by their chemical composition. The waters of the Rockbridge Alum Springs, he classed as *Sulphuric or Alumino-Chalybeate*, as their mineral ingredients are chiefly sulphates of alumina and iron with free sulphuric acid. He found their temperature to be from 50° to 56° and that 100 cubic inches of the waters of two of these springs, contained, in grains, the following mineral substances:

	No 1.	*No. 2.*
Sulphuric acid,	14.398	18.508
Sulphate of protoxide of iron,	2.035	0.967
Sulphate of alumina,	6.916	3.875
Sulphate of lime,	0.150 } in minute	
Sulphate of magnesia,	a trace } quantity.	

In the third edition of his work on the Virginia Springs, that of 1851, Dr. Wm. Burke says of these springs, after describing them and commenting on their healing virtues and the cures they had wrought: "It is a matter of real concern to me that I am not able to lay before my readers a reliable analysis of this water. It will be found perhaps to contain magnesia, carbonate of potash, alumina, and possibly other salts."

Recent analyses, made in accordance with the exacting demands of modern chemistry, show that medicinal agents, not revealed by the analysis above given, exist in these waters, such as traces of arsenic, antimony, lithia, etc., which add much to their healing and curing value. Want of space forbids the publication of these detailed analyses now.

The testimonials of physicians of repute and patients of all classes of society concerning the cures that have been effected and the maladies that have relieved by the use of these waters would fill a volume. These certify to the cure or relief of those suffering from all forms of dyspepsia, indigestion, scrofula, incipient consumption, and chronic bronchitis, laryngitis, pneumonia, diarrhœa, dysentery, skin diseases, etc., etc.

We have been led to say this much concerning this delightful summer resort and famous sanitarium, one that is handsomely improved and has ample and pleasant accommodations for many guests, because, as a reference to our advertising columns will show, these springs and the improvements that accompany them and the ample domain of a thousand acres that surrounds them, are to be offered for sale on the 12th of August, 1885. This is, beyond question, one of the most valuable properties in the Virginias, one that can always be made to pay a handsome profit on its cost. We hope it may fall into the hands of good and enterprising men, for we consider it one of the permanent sources of our present and future prosperity.

Three Masses of Virginia Meteoric Iron.

By J. W. Mallet,
Prof. of Anal. and Ap. Chem., University of Va.

[From Am. Jour. of Science, etc., July, 1871.]

Nearly two years ago I learned that a lump of iron, which from the description given of it I supposed to be meteoric, had been turned up by the plough in Augusta county in this state (Virginia), and soon afterwards I obtained possession of this specimen by the kind assistance of Hon. J. B. Baldwin of Staunton. It proved to be beyond question a meteorite, weighing about 56 lbs.

A few months later, I saw at the annual fair of the State Agricultural Society in Richmond, a second mass, of smaller size, weighing about 36 lbs., which had come from the same county, and was exhibited along with some iron ores by Maj. Jed. Hotchkiss of Staunton. Learning from me that I was about to examine and analyze my own specimen, and was anxious to compare it with the other found in the same part of the country, Maj. Hotchkiss was obliging enough to lend me the latter, and to permit me to cut off enough for analysis.

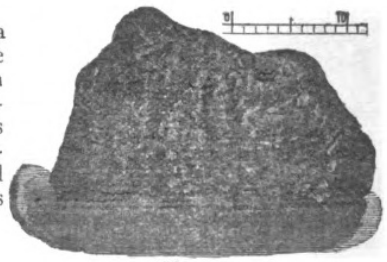
Quite recently he has placed in my hands a third specimen—also from Augusta county—weighing but about 3½ lbs.

I shall speak of these three masses as No. 1, No. 2, and No. 3, in the order in which they are mentioned above; No. 1 being my own specimen, and Nos. 2 and 3 those of Maj. Hotchkiss.

All three present quite the same general appearance. They are of a very irregular pear shape, one end of each mass being larger and more rounded than the other—the smaller end of each is somewhat flatened, but by concave surfaces, in one direction. No. 1 was more massive and rounded than the others—No. 2 most flatened—the latter had some rude resemblance in shape to a shoulder of mutton. The dimensions of the masses before cuting, in centimeters, were as follows:

	No. 1.	No. 2.	No. 3.
Maximum length,	28 c. m.	27 c. m	11 c. m.
" width, at large end,	21 "	10 "	9 "
" " at small end,	17 "	19 "	5 "
" thickness, at large end,	13 "	13 "	8 "
" " at small end,	11 "	5 "	3 "

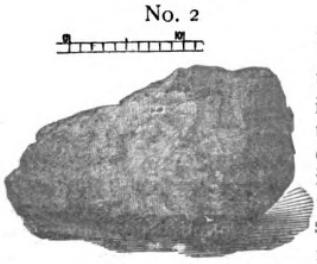
A pretty good idea of the shape and size may be obtained from the accompanying figures, from photographs of the original specimens with attached scales; the exact weights before cuting were,



No. 1.

No. 1, 25,429 grams. No. 2, 16,441 grams. No. 3, 1,644 grs., the masses being entire, nothing having been previously detached from any of them.

No. 2



No. 3.

The surface of each of the masses is rough and irregular. At some points which have been rubed, the iron exhibits its metalic luster, and traces of its crystaline character may be observed, but nearly the whole surface is covered with a dark brown crust, consisting essentially of hydrated ferric oxide, which varies from about an eighth to a third of an inch in thickness. This crust is hard, and pretty firmly adherent. On exposure to moist air a rusty

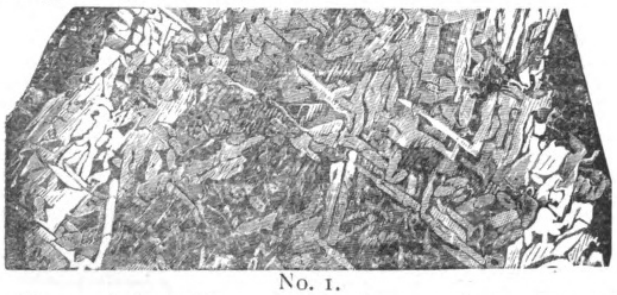
liquid exudes in drops from numerous points upon the surface, and in this watery liquid chlorine, iron (chiefly as ferrous chloride), and nickel were detected. The masses are of course magnetic, and on examination give evidence of feeble magnetic polarity, with multiple poles.

The union of hardness and toughness in the iron makes it quite difficult to cut, and in attempting to obtain with the planing machine a slice of considerable size the ordinary cuting tools were blunted and broken; it was found necessary to drill a row of holes and connect these by a cut made with the planer.

The specific gravity was taken for Nos. 1 and 2, with solid pieces of about 140 grams and 95 grams respectively, cut from the interior of the masses, and for No. 3 with about 10 grams of clean shavings (from the planer) in a specific gravity bottle. The results were,

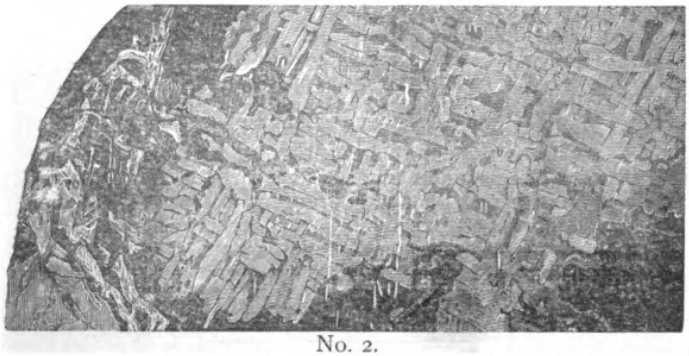
	No. 1.	No. 2.	No. 3.
Specific gravity, at 15° C.	7.853	7.855	7.839

The interior structure of the iron is compact and highly crystaline, of much the same general character throughout, but a few small grains and streaks of a brownish yellow mineral were noticed, which on being picked out and examined proved to be troilite. There are, however, minute fissures runing through several portions of the metal.



No. 1.

Traces of the Widmannstättian figures may be detected upon a polished surface even without the aid of an acid, and when the iron has been etched by nitric acid the markings are exceedingly distinct and beautiful, fully as much so as in any specimens of meteoric iron I have ever seen. The general appearance is a good deal like that of the iron from Lenarto in Hungary, and some of the Mexican specimens. In the mass No. 1, upon the principal cut surface, narrow, well-defined bands of alternate nickel-iron and Schreibersite are parallel or intersect each other at angles of about 60° and 120°; in the figures on the principal surface of No. 2, the angles of intersection more nearly approach 90°; on the much smaller cut surface of No. 3, the figures are somewhat



No. 2.

more irregular, but the angles approach 60°. By etching surfaces obtained in other planes it was rendered evident that the difference of appearance is merely due to looking at different projections of the same crystaline structure. The accompanying engravings, taken from photographs, exhibit the results of etching these specimens.

The metal soon rusts upon cut surfaces, especially where the exudation of chlorine occurs, and this renders more distinctly visible the slight fissures which penetrate the interior.

The iron is not passive, though very easily rendered so by nitric acid. It reduces copper rather slowly from the sulphate, and if the whole surface be covered with water, rubing hard with the hand or a cloth, a part of the copper comes off very easily, leaving the remainder firmly attached and reproducing very beautifully the Widmanstättian figures; obviously a case of galvanic deposition, the Schreibersite being the electro-negative solid and receiving the coating of copper.

No. 3.

By the prolonged action of acid delicate white laminæ of Schreibersite are brought into view, which if completely detached are found to be flexible and strongly magnetic.

The following are the results of chemical anal ysis:

	No. 1.	*No. 2.*	*No. 3.*
Iron,	88.706	88.365	89.007
Nickel,	10.163	10.242	9.964
Cobalt,	.396	.428	.387
Copper	.003	.004	.003
Tin,	.002	.002	.003
Manganese,	trace	. .	trace
Phosphorus,	.341	.362	.375
Sulphur,	.019	.008	.026
Chlorine,	.003	.002	.004
Carbon,	.172	.185	.122
Silica,	.067	.061	.056
	98.872	99.659	99.947

These numbers are so closely accordant that there can be no doubt of the masses being essentially identical in chemical composition.

The nickel and iron were separated, in a cold and quite dilute solution, by means of carbonate of baryta, and the precipitates obtained were carefully tested as to purity before the weights were finally accepted as correct.

Considerable quantities of material were used for the determination of the minor constituents. Particular attention was given to the identification of the minute quantity of tin present, as Professor J. Lawrence Smith has lately mentioned (This Journal, II, xlix, 333, May, 1870,) the fact, that he has never found this metal in the course of numerous analyses of meteoric iron. The precipitate with sulphureted hydrogen, which contained the tin and copper, was in each case obtained from a solution of more than a hundred grams of the iron.

I feel satisfied that the chlorine is not of meteoric origin—not an essential constituent of the original masses—but has been derived from the soil in which the iron has lain imbeded. The exudation of watery drops containing metalic chlorides is observable only at points on the outside and on cut surfaces along the lines of fissures communicating with the outside. Although chlorine is mentioned as above as found in the general analysis of the planing machine shavings, I failed altogether to detect it in a specially selected solid piece

of some 50 grams taken from a part of No. 1 destitute of fissures or flaws.

The siliceous residue is set down as silicic acid, but some of it seems to have in reality existed as silicide of iron. A part of this residue having been examined with the blowpipe to identify it as silicic acid, another portion was looked at with a magnifying power of 250 to 500 diameters, and in polarized light was seen to consist of amorphous powder, and rounded, transparent grains of very small dimensions, for the most part from .0025 to .0100 millimeter in diameter, of well-marked doubly refracting character.

It seems in the highest degree probable that these three masses of meteoric iron represent portions of a single fall from the heavens, agreeing so closely as they do in external character and appearance, in density and internal structure, and in chemical constitution; having, moreover, all been found at but short distances from each other. The precise localities from which they came are as follows:

No. 1, from a spot on the land of Mr. Robert Van Lear, about five miles (a little east of) north from Staunton, in 38° 14′ N. lat. and 79° 0′, W. long.

No. 2 from the land of Mr. M. Fackler, about one mile to the southeast of the locality of No. 1.

No. 3, about half a mile still further southeast, or rather a little north of a northwest and southeast line passing through the last named locality.

It will be interesting to watch for the possible detection of other masses in the same neighborhood.

This makes the fourth recorded instance of meteorites found within the state of Virginia, the three preceding having been:

1. Meteoric stone, which fell in Chesterfield county, June 4th, 1828, (this Jour. I, xv, 195 and xvi, 191.)
2. Meteoric iron, found in Grayson county, described by Prof. Rogers of this University in 1842, (this Jour., I, xliii, 169.)
3. Meteoric iron, found in Roanoke county, and described by Prof. Rogers in 1842 (this Jour, I., xliii, 169.)

University of Virginia, March 27, 1871.

A Fourth Mass of Va. Meteoric Iron.

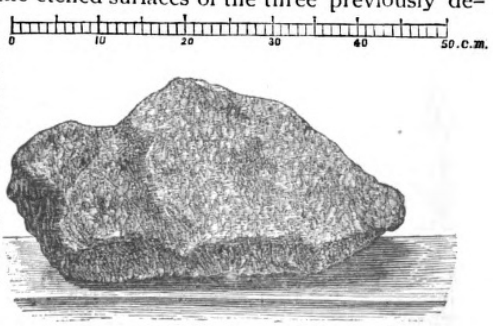
By J. W. Mallett.

[From Am. Jour. of Science, etc., May, 1878.]

In 1871 I described in this Journal, III, ii, 10, three masses of meteoric iron found a few miles from Staunton in this state: still another has lately been brought to light under the following circumstances. About the year 1858 or 1859 a negro man named Alf, belonging to Mr. Robert Van Lear (on whose land the largest of the three already described meteorites was found), brought to Staunton a lump of iron which he had found, and tried to sell it, but no one considered it curious or valuable enough to pay the price asked, a dollar. This man is dead, and it cannot now be ascertained where he found the specimen, but probably on Mr. Van Lear's land, and undoubtedly in his immediate neighborhood. Failing to sell the mass, Alf threw it away in a vacant plot of ground behind a blacksmith's shop. Here it lay for several years, until it was used, with some other loose material, to build a stone fence. On account of its irregular shape and great weight it soon fell out of the fence, and was then thrown aside in the rear of a dentist's house. He used it for some time as an anvil on which to hammer metals and crack nuts, and afterwards had it built into a wall around the curbing of a cistern. Here, during the summer of 1877, it came under the notice of Mr. M. A. Miller, of Staunton, (who furnished the above history) who obtained possession of it, had it removed from the wall, and near the end of the year disposed of it to Messrs. Ward and Howell, of Rochester, N.Y. These gentlemen, who were at the time engaged in the arrangement of a geological and zoological collection which they had contracted to furnish for the University of Virginia, allowed me to examine the meteorite before it was sent to Rochester, and have furnished me with material for its analysis. They are having the largest part of the iron cut into slices, as specimens for sale.

The shape of the mass is like that of many other metalic meteorites, irregularly rounded, larger at one end than the other, something like a shoulder of mutton in general outline, with well marked concave depressions or pitings. The accompanying woodcut is from a photograph of the specimen.

The greatest length was 45.7 centimeters, greatest width 29.2 centimeters, and greatest thickness 20.3 centimeters. The weight was 152 pounds, or 68,950 grams. The crust was not as thick as that upon the masses from the same locality previously examined, and at a number of points the metalic luster of the iron was visible. Magnetic polarity was detectable at various parts of the surface. The specific gravity, taken with a clean piece of 87.5 grams was found = 7.688 at 18°C. The iron is compact and crystaline, with plates of Schreibersite runing through it, while a few specks of troilite were detected. On etching with nitric acid the Widmanstättian figures are clearly and beautifully brought out, and their general character is quite the same with that shown upon the etched surfaces of the three previously described masses. On one surface two distinct sets of crystaline markings are observable, the angles of intersection in each of these being nearly uniform.



An analysis made by Mr. J. R. Santos of Guayaquil, Ecuador, now working in this laboratory, gave the following results:

Iron	91.439	Sulphur	.018
Nickel	7.559	Chlorine	*trace*
Cobalt	.608	Carbon	.142
Copper	.021	Silicon (counted as silica)	.108
Tin	*trace*		
Phosphorus	.068	Total	99.963

The chlorine occurs as ferrous chloride, soluble in water. 87.5 grams of iron was used for the analysis, so as to render accurate the determination of the minor constituents. A partial examination of another specimen, however, showed that, as usual in such masses, the distribution of the Schreibersite, and probably of the nickel in the alloy, is not altogether uniform. The average amount of nickel is somewhat less than in the three formerly described masses, and the proportion of cobalt and copper rather larger; but there can be no doubt, I think, that all four specimens, found in the same neighborhood, resembling each other closely in all their physical properties, and exhibiting the same general chemical character, represent different portions of the same meteoric fall.

University of Virginia, March 6, 1878.

A Half-year's work at Low Moor, Va., Furnace.—On page 45 of this volume of *The Virginias* we published a detailed report of the operations and output of the furnace of the Lower Moor Iron Co. of Virginia, at Low Moor

station on Chesapeake & Ohio Ry., from Jan. 1 to April 25 of this year. We have now gathered the results of the operations of this large and successfully managed Virginia furnace from April 25 to June 30, 1885, and combined them with those of this year previously published and present them below as the operations of this furnace for the first six months, or half year, of 1885.

The third blast of Low Moor furnace began Nov. 17th, 1884; Tuesday, June 30, 1885, was the 226th day of this blast, and the period embraced in this statement, that from Jan. 1st to June 30th, 1885, represents 185 days of furnace work.—The tons used for pig iron are furnace tons of 2,300 pounds; those for limestone and coke are 2240 lbs. The quantities given are very nearly the actual figures.

The furnace operations of six months.

Limonite iron ore used, tons,	51,941
Coke, from New River coal, used, tons	27,769
Limestone, No. VI, used, tons	25,639
Raw materials used, tons,	105,349
No. 1 pig iron made, tons,	9,120
No. 2 pig iron made, "	8,710
"Mill" pig iron made, "	3,557
"Silvery" pig iron made, tons	1,424
"Mottled" pig iron made, "	373
Tons of pig iron made	23,184

The time lost by stopages was only about 2½ days, a remarkably small loss for 6 months. The average daily yield for the 185 days was 125.3 tons of pig iron per day. The best day's run was 143 tons.

The average eonsumption of raw materials per ton of pig made was:

Iron ore, about,	2,19 tons.
Coke, about,	1.19 "
Limestone, about,	1.11 "

These results compare well, in every particular, with the best blast furnace returns of this country as published by our cotemporaries; few of them show as low a consumption of raw materials to the ton of product, especially in coke, and but few as small a consumption of common brown hematite iron ore. But few furnaces show such large percentages of the higher grades of pig iron in their total product as does Low Moor.

Lumbering.

Lumbering on the Upper Greenbrier, W. Va.—Mr. John Peters of Mill Point, Pocahontas county, W. Va., recently favored *The Virginias* with a pleasant call on his way back from the North, where he has been purchasing a new steam saw-mill, to his home amid the pineries and other splendid forests of the Upper Greenbrier river basin in Pocahontas and Greenbrier counties, West Virginia. From him we gather a number of lumbering items and a refreshing account of the prosperity of the region where he and other pushing and skilled Pennsylvania and New York lumbermen have made their homes. Mr. Peters has only words of hearty praise for his West Virginia neighbors,—people equal in all good qualities to any on the face of the globe, as he puts it.

Capt. James C. Lakin, formerly from Delaware county, New York, now has a saw-mill near Dunmore, Pocahontas county, in which he saws white pine and black walnut for local use, having cut last year from, 300,000 to 400,000 feet. Walnut is geting scarce around him, but white pine is plentiful.

The Garber brothers, formerly from Augusta county, Va., have a saw-mill on Deer creek, near Greenbank, in which they saw mainly white pine for local use; last year they cut some 200,000 feet.

Charles Collison, from near Frankfort, Greenbrier county, has a mill at Academy, Pocahontas county, which he employs in cuting "sets" of white oak and white pine; he began sawing last May and has cut some 4 "sets," making about 200,000 feet to this time.

J. R. Marshall, recently of Hillsboro, W. Va., formerly from Augusta county, Va., has a mill at Renix valley, which saws about 200,000 of white pine and black walnut, custom work, a year; he also runs a thresher.

John Peters of Mill Point, Pocahontas county, formerly from Delaware county, New York—now well known as a skillful raft navigator on the Greenbrier—in company with Wm. H. McClintic, a native of Pocahontas, will soon start a first class saw-mill on Swage creek for cuting choice walnut, white and red oak, chestnut, ash and poplar lumber, which will be rafted to Ronceverte, on the Chesapeake & Ohio Ry., and there stacked to dry and for sale. They will cut about 100,000 feet this year and also run out about 50,000 feet of walnut in the log, having 11 rafts now on the bank of the Greenbrier; they will also saw for local use, as there is a good demand for local building purposes. The establishing a stock of choice varieties of lumber at Ronceverte will be a good thing for the country and a paying one to the parties establishing it if properly managed.

The St. Lawrence Boom and Manufacturing Co. of Ronceverte, W. Va., cut last year about 15,000,000 feet of white pine and 1,000,000 feet of hemlock on Deer and Sitlington creeks of the Greenbrier, Pocahontas county; they "drove" about 13,000,000 feet of this "cut" down the Greenbrier to Ronceverte station of the Chesapeake & Ohio Ry. in April and May of this year. Next winter this company will log about 10,000,000 feet of white pine on Thomas creek and Sitlington creek; it is now engaged in improving the navigation of the Greenbrier for rafting purposes; its extensive and well-equiped saw, planing and other mills at Ronceverte are among the best in West Virginia.

The Lumber Business on the Chesapeake and Ohio Ry. is in a fairly prosperous condition; some new mills are being located and some old ones moved nearer to untouched supplies of standing timber. The Black-band Coal and Iron Co. has recently sold the stumpage on its Davis Creek lands, Kanawha county, W. Va., to parties that will saw it at Spring Hill station of C & O. Ry.; we learn that the prices obtained were, per M., $2.50 for tulip-poplar, $2 for white-oak and $1.50 for pine and hemlock. The Mt. Carbon Coal Co. has negotiated a sale of the stumpage on its Armstrong creek lands, some 10,000 acres, at about $3 per M.

Mr. Wm. L. Rawson, lumber agent, formerly with the C. and O. Ry., has now established three lumber yards on the C. and O. Ry., one at Huntington, W. Va., and one at Covington, Va., and one at Richmond, Va. At each of these points he is collecting a large stock of the superior lumber that the country tributary to the C. and O. Ry. furnishes. Arrangements are completed for furnishing dressed stuff from each of these depots. Mr. Rawson has his main office at Richmond. He is now filling numerous orders from all parts of the Middle and New England states by rail direct. The demands for West Virginia lumber as far eastward as Maine are quite numerous. Mr. Rawson is, in fact, "a lumber exchange;" he is doing more than any one else we know of to call attention to and promote the use of our fine West Virginia timber.

Geologic.

Rogers' Geology of the Virginias.—The Boston, Mass., Daily Advertiser, of July 9, 1885, commenting on the recently published Rogers' Geology of the Virginias, says:

The volume of "Annual Reports," which contains the results of the late Professor Rogers' investigations during his five years' work on the geological survey of Virginia, has a rare scientific as well as a general value. The extent of the ground over which the exploration was carried comprised the largest area ever subjected to systematic geological examination in any part of the world. The work is accompanied with a series of carefully engraved sections and other drawings, showing the geology of every part of the state, together with a geological map of the Virginias, exhibiting each formation in its appropriate place. The volume contains, in addition to the annual reports, various papers relating to the geology of the Virginias; and its usefulness is vastly enhanced by a general index and an index to the names of persons and places to be found in its 730 closely printed pages.

From the New Era, Amherst, Va, of May 14, 1885.

For years and years the legislature of Virginia received suggestions from many directions to do a great work for the state in having published the results of the scientific labors of the distinguished Rogers in her geological field. Such suggestions have been in vain, but today, without state aid, and purely by private enterprise, the long needed and much desired book has been printed. It is issued by D. Appleton & Co., of New York, in the shape of a handsome volume of over 800 pages, with abundant plates and maps. The editor of this work, Mrs. Emma Rogers, widow of Wm. B. Rogers, the deceased geologist, acknowledges in the preface the assistance of Maj. Jed Hotchkiss in the preparation of the accompanying maps as well as otherwise. The book is a reprint of the annual reports as made by Mr. Rogers when in charge of the geological survey of the state which was conducted by him during the years from 1834 to 1841.

In looking over its pages the reader will be struck with the marvelous accuracy of the predictions made by the faithful laborer from the data of his observations, as we have them now verified by the discoveries since made in the mineral fields of the state. It is our purpose to print in these columns various extracts from the work bearing upon matters of interest to our readers by their local connection. Amherst is often refered to and her iron, copper, and other mineral possibilities afforded many occasions for remark in the annual reports.

When we can give these extracts in a connected manner we hope to furnish much of interest and value to those interested in the mineral fields of this county.

Prof. Niles of the Mass. Institute of Technology, writes:—"Its arrangement, the distinctness of its subdivisions, the clearness of the print, the neatness of the pages, the plates, index and preface, are each and all highly satisfactory. The sections, more numerous than I had anticipated, are very finely done."

Apalachian Coal Basin:—Work by Prof. I. C. White in 1885.—Last year Prof. I. C. White, of West Virginia University, entered the service of the U. S. Geological Survey during his vacation and worked out a detailed descriptive geological section across the Great Kanawha basin and correlated its coal beds with those of Pennsylvania, as set forth in a paper he contributed to the January, 1885, number of *The Virginias*. The results of these few months' work done by Prof. White on the Great Kanawha were exceedingly satisfactory to Director J. W. Powell, since they not only showed a difficult and tangled geological problem, one of great enconomic as well as geological importance, well worked out, but also revealed a remarkable familiarity in the worker with Apalachian carboniferous geology.

As an outgrowth from this Great Kanawha work and of the rapid development of the Geological survey so characteristic of Director Powell, Prof. White is now engaged in the preparation of a report on the whole Apalachian, or Ohio River Basin, coal-field from Pennsylvania to Alabama, under the immediate direction of Prof. G. K. Gilbert, who is the Geologist in charge of the Apalachian district of the Geological survey.

Prof. White has removed his interesting family to Mt. Lake Park, Md., on the Baltimore and Ohio RR., for the summer, where his address will be: thence he goes first to review the coal measures of the Tygart Valley river, the Philippi and Buckhannon region, and of the Upper Potomac, in West Virginia. After that he will spend several weeks in Western Pennsylvania renewing his acquaintance with that coal-field and verifying by personal observation the recorded statements of others. The coal measures of Ohio will next be reviewed in the good company of Prof. Edward Orton, the clear-headed Geologist of that state, and, in passing, some attention will probably be given to the coal measures of Kentucky along the Ohio and the line of the Chesapeake and Ohio Railway.

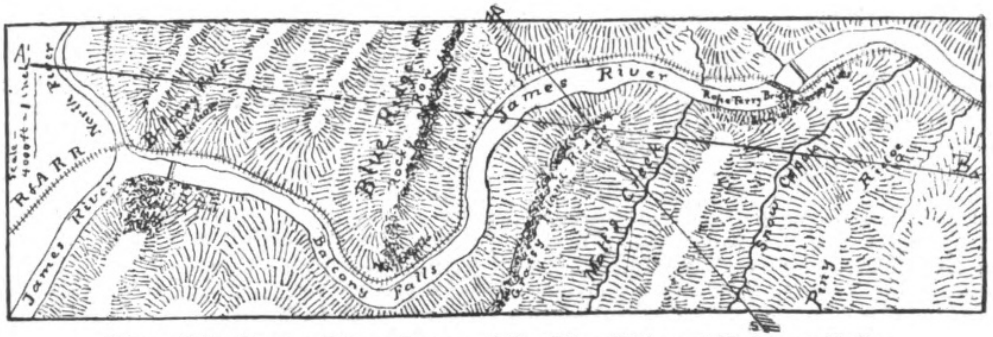
Later in the season, Prof. White will come to the eastern side of the Apalachian coal basin, on the line of the Norfolk and Western RR., and make a study of the Lower coal measures, No. XII, in the eastern escarpment of the Flat-top field and in the Upper Guyandot basin; he will then make a section from Pocahontas across Flat-top mountain and down the Chaterawha (Big Sandy) in Virginia, West Virginia and Kentucky, to the Ohio, which will probably end his field work for this year,—though he may find time for a rapid review of the coal measures of Tennessee and Alabama in the Apalachian basin.

We look with eager anticipation for the completion of this report on the great Apalachian coal basin, one of the greatest and most remarkable coal basins in the world, knowing that it will be fully, ably, and reliably treated of by the master in carboniferous geology that has undertaken its preparation.

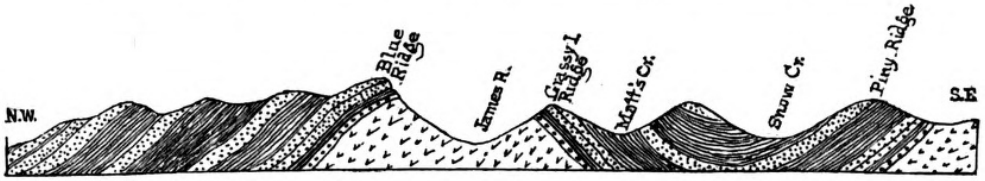
☞**Errata.**—The following should succeed the last column of the next page, 99, as part of Prof. Campbell's article:

No. 8 is the sandstone that constitutes the type of this formation. It consists here of two hard beds of gray sandstone with a more brittle bed intervening. The two hard beds carry numerous markings at right angles to the stratification, supposed to be borings of a worm called *Scolithus linearis*. These three beds, together with some more brittle sandstones underlying them, measure 350 feet. We have now arrived at the entrance of the gap. If we go away from the banks of the river some distance we shall find about 600 feet more of sandstone and friable slate before we get to the westerm limit of the Potsdam formation.

Passing now to the eastern slope of the Blue Ridge we find similar beds of sandstone and slate which have been hitherto classed as Archæan by professors Wm. B. Rogers, J. L. Campbell and others, and have been spoken of as lying unconformably beneath the Potsdam sandstones and slates of the western slope. In Macfarlane's Railway Guide (1879,



Map of the James River Gorge of the Blue Ridge at Balcony Falls.



Vertical Section along the Line A-B of the Map.—Scale, 4,000 feet=1 inch.

The Potsdam Group East of the Blue Ridge at Balcony Falls, Virginia.

By H. D. Campbell.

Balcony Falls is the name given to a succession of rapids in the gorge through the Blue Ridge by which the James river finds its way from The Valley to Piedmont, Virginia. There is no other locality in Virginia where the Potsdam formation is better exposed than at this point. All of its strata are cut through by the river. The accompanying map and section are designed to throw a clearer light upon the topography and geological structure of the region.

The Blue Ridge here has been sculptured into seven ridges, the middle one of which is the most clearly defined and alone has a granite axis. This is the Blue Ridge proper. On the map it is called Rocky Row on account of a very bold escarpment of sandstone upon its southeast face. The three ridges lying northwest of it are each crested with sandstone, and have been formed by the disintegration and washing away of the intervening slates. As seen from the river they appear as peaks with depressions between them. The ridges lying southeast of Rocky Row run rather obliquely across the beds of sandstone, and the intervening ravines have been formed by the erosive power of streams several miles in length, such as Matt creek and Snow creek.

Geology.—The section is meant to be somewhat general, and hence the local displacements are left out, which makes the strata appear thicker than they are in reality. It represents an immense broken arch, or anticline, of Potsdam sandstones and slates, followed to the southeast by a trough or syncline of the same.

For about a mile after entering the gorge through the mountains the James river runs almost at right angles to the strike of the strata. Here and there it has washed away the softer slates and caused local displacements of the sandstones on either side, its waters having for a long time been damed back by the lowest heavy bed of Potsdam sandstone, which is very hard and durable. Where the river crosses this ledge are the rapids known as Big Balcony falls Before the canal was built (along the bank of which the Richmond and Alleghany Railroad now runs), the ledge of sandstone projected considerably beyond the margin of the river, and was known as "Balcony rock," hence the name of the falls. For about a mile after passing Balcony rock the river runs obliquely across the strike. By its erosive power, aided by a fissure, and probably by ice also, it has worn its channel deep into the underlying Archæan rocks, consisting of granulite, syenite and rocks of a gneissoid character. The river then leaves the mountains about at right angles.

The sandstones and slates from these Archæan rocks to the western limit of the gap have been classed as Potsdam or Lower Cambrian. Starting from the Archæan axis of the Blue Ridge and proceeding northwestward up the river we cross the following series of beds:

No. 1 is a bed of conglomerate composed of sand, rounded quartz pebbles, fragments of feldspar and epidote and other material more or less water-worn. This bed is immediately followed by several beds of slates and conglomerate sandstones which have evidently been much altered by heat from the subjacent igneous rocks. The aggregate thickness of these beds is above 120 feet.

No. 2 is a heavy mass of sandstone about 360 feet thick. It consists of two varieties. The lower bed is a hard gray quartzite and is the material of the Balcony rock. The upper bed is of a grayish and purplish color and finely conglomeritic in texture.

No. 3 consists of dark colored slates with interstratified beds of specular iron ore of low grade, having pebbles of quartz disseminated through them. The thickness of these slates is about 500 feet.

No. 4 is a hard bluish sandstone 150 feet thick, which has been locally displaced near the river, forming several waves that are conspicuous from the railroad. This feature is not represented on the section.

No. 5 is a heavy bed of bluish and greenish slates about 700 feet in thickness. They have been considerably warped and contorted.

No. 6 consists mostly of a brownish gray sandstone with very regularly jointed structure—90 feet thick.

No. 7 is made up of numerous thin beds of slate which show a variety of shades of color from nearly white and yellow to dark brown. The coloring is produced by iron ore which encrusts many of the thin beds. The thickness of these slates is 120 feet.

p. 182) we find the following note by Professor Rogers: "About twenty miles northwest of this point (Lynchburg) by canal or road, we enter the gorge by which the James river traverses the Blue Ridge, where are exposed fine sections of Archæan rocks, A and B, and of the Cambrian, Primal 2 *a*, resting unconformably on the western slope of the former, and occupying the flanking ridges which adjoin The Valley."

It is with diffidence that I offer my views as opposed to these, making (as seen in the section) an anticline here instead of unconformability; and yet I feel confident that the highly metamorphosed condition of all the rocks east of the Archæan axis, and the hurried review of this locality, led these geologists to place these sandstones and slates as Archæan, and that if the facts which I shall present had been known our views would coincide.

The evidences in support of the section I have drawn are as follows. Rocky Row on the north side of the river is caped with a hard sandstone of a grayish color diping gently toward the northwest. Grassy Island Ridge, on the south side of the river, is caped with a sandstone of similar appearance, though not so thick, diping about 40° S. E. Each of these beds of sandstone is underlaid by a brownish decomposing slate, and a bed of coarse conglomerate which lies upon the Archæan rocks. To the N.E. of the river about four miles and again to the S.W. about one mile these strata seem to connect and make a complete anticline. But this might seem to be the case where there is unconformability and hence we need stronger proof.

In all of the heavy beds of sandstone in the Potsdam group of the Blue Ridge above the lowest, *Scolithus* borings are found, varying in abundance in different localities, and being always more numerous in the higher beds. These markings have determined the age of the rocks along the western slope, and also their stratigraphical position. They occur here only in the upper beds, No. 8; but at White gap some miles N.E., they occur in abundance in the next lower bed of sandstone. Going now east of the axis of the Blue Ridge and examining the sandstones along the ridge between Matt creek and Snow creek we find unmistakable *Scolithus* borings. The sandstones are conformable with those on Grassy Island Ridge. Proceeding up Matt creek we cross two of these beds, each carrying Scolithus borings. Between them lie heavy beds of slate, and in the first of these is found a bed of hematite ore similar to that mentioned above as occuring on the western side of the Blue Ridge and locally known as "block ore" on account of its breaking readily into cubical and rectangular masses. This variety of ore in Virginia seems to be characteristic of the Potsdam formation. Cresting the ridge on the left, in ascending Matt creek near its source is found a white sandstone of firm texture containing Scolithus borings. It has a dip of 45° S.E. which carries it across the head of Snow creek to the crest of Piney Ridge which is not so elevated.

If we cross James river and follow the eastern face of the Blue Ridge toward the N.E. for several miles we find sandstones carrying Scolithus markings and beds of slate alternating with them, all diping S.E. They correspond very closely in character and position with those described to the south of the river. Three miles N.E. of Rope Ferry a bed of these slates is quarried by the Virginia Slate Mining Co. for roofing purposes. They are somewhat different lithologically from the corresponding slates along the western slope of the Blue Ridge, being much more highly metamorphosed and hence having a more perfect cleavage.

The foregoing observations lead to the conclusion that the stratified rocks upon the western and eastern slopes of the Blue Ridge belong to the same geological formation, and that the latter ought to be classed as Potsdam or Lower Cambrian instead of Archæan. This would make of the Blue Ridge at Balcony Falls an immense broken arch.

This broken arch or anticline is immediately succeeded by an unbroken syncline about two miles in width, near the axis of which is Rope Ferry bridge. How far on either side of the river this syncline may extend we have not yet fully determined. The upper beds of sandstones and slates do not make their appearance for some distance on either side of the river, having probably been somewhat broken in their upheaval, and washed away before the river became confined to its present narrow channel.

It seems more than probable that ice was one of the great agents in determining the features of this region.

To the east of the syncline mentioned above we find Archæan rocks again represented by granite and gneiss. These correspond to the axis of Cold mountain, which is a ridge lying several miles S.E. of the axis of the Blue Ridge and parallel with it. A few miles N.E. of this locality Cold mountain is very high and conspicuous.

From what has been written above, the general conclusion may be drawn that the belt of sandstones and slates lying east of the Blue Ridge at Balcony Falls belongs to the Lower Cambrian or Potsdam group of rocks, and that the Primordial beach of the Palæozoic Sea was farther east at this locality than was formerly supposed.—*American Journal of Science*, June, 1885.

The Geology of Natural Gas.

By I. C. White.

The recent introduction of natural gas into general use as a source of heat for industrial and domestic purposes has raised it from the rank of a mere curiosity to one of the earth's most valuable treasures.

To the reader unacquainted with the great change natural gas has effected in all industries where it can be obtained, the following quotation from an article in *Macmillan's magazine* for January, written by Mr. Andrew Carnegie, the chief iron master of Pittsburg, will be a revelation: "In the manufacture of glass, of which there is an immense quantity made in Pittsburg, I am informed that gas is worth much more than the cost of coal and its handling, because it improves the quality of the product. One firm in Pittsburg is already making plate glass of the largest sizes, equal to the best imported French glass, and is enabled to do so by this fuel. In the manufacture of iron, and especially in that of steel, the quality is also improved by the pure new fuel. In our steel-rail mills we have not used a pound of coal for more than a year, nor in our iron mills for nearly the same period. The change is a startling one. Where we formerly had 90 firemen at work in one boiler-house, and were using 400 tons of coal per day, a visitor now walks along the long row of boilers, and sees but one man in attendance. The house being whitewashed, not a sign of the dirty fuel of former days is to be seen; nor do the stacks emit smoke. In the Union iron mills our puddlers have whitewashed the coal-bunkers belonging to their furnaces. Most of the principal iron and glass establishments in the city are to day either using this gas as fuel, or making preparations to do so. The cost of coal is not only saved, but the great cost of firing and handling it; while the repairs to boilers and grate-bars are much less."

This new fuel, which bids fair to replace coal almost entirely in many of our chief industrial centres, has not received that attention from the geologist which its importance demands. So far as the writer is aware, nothing has been published on the subject which would prove of any value to those engaged in prospecting for natural gas, and it is the

existence of this blank in geological literature that has suggested the present article.

Practically all the large gas-wells struck before 1882 were accidentally discovered in boring for oil; but when the great value of natural gas as fuel became generally recognized, an eager search began for it at Pittsburg, Wheeling, and many other manufacturing centres.

The first explorers assumed that gas could be obtained at one point as well as at another, provided the earth be penetrated to a depth sufficiently great; and it has required the expenditure of several hundred thousand dollars in useless drilling to convince capitalists of this fallacy which even yet obtains general credence among those not interested in successful gas companies.

The writer's study of this subject began in June, 1883, when he was employed by Pittsburg parties to make a general investigation of the natural-gas question, with the special object of determining whether or not it was possible to predict the presence or absence of gas from geological structure. In the prosecution of this work, I was aided by a suggestion from Mr. William A. Earseman, of Allegheny, Penn., an oil-operator of many years' experience, who had noticed that the principal gas-wells then known in western Pennsylvania were situated close to where anticlinal axes were drawn on the geological maps From this he infered there must be some connection between the gas-wells and the anticlines. After visiting all the great gas-wells that had been struck in western Pennsylvania and West Virginia, and carefully examining the geological surroundings of each, I found that every one of them was situated either directly on, or near, the crown of an anticlinal axis, while wells that had been bored in the synclines on either side furnished little or no gas, but in many cases large quantities of salt water. Further observation showed that the gas-wells were confined to a narrow belt, only one-fourth to one mile wide, along the crests of the anticlinal folds. These facts seemed to connect gas territory unmistakably with the disturbance in the rocks caused by their upheaval into arches, but the crucial test was yet to be made in the actual location of good gas territory on this theory. During the last two years, I have submited it to all manner of tests, both in locating and condemning gas territory, and the general result has been to confirm the anticlinal theory beyond a reasonable doubt.

But while we can state with confidence that all great gas-wells are found on the anticlinal axes, the converse of this is not true; viz., that great gas-wells may be found on all anticlinals In a theory of this kind the limitations become quite as important as, or even more so than, the theory itself; and hence I have given considerable thought to this side of the question, having formulated them into three or four general rules (which include practically all the limitations known to me, up to the present time, that should be placed on the statement that large gas-wells may be obtained on anticlinal folds), as follows: —

(*a*) The arch in the rocks must be one of considerable magnitude; (*b*) A coarse or porous sandstone of considerable thickness, or, if a fine-grained rock, one that would have extensive fissures, and thus in either case rendered capable of acting as a reservoir for the gas, must underlie the surface at a depth of several hundred feet (500 to 2500 feet); (*c*) Probably very few or none of the grand arches along mountain ranges will be found holding gas in large quantity, since in such cases the disturbance of the stratification has been so profound that all the natural gas generated in the past would long ago have escaped into the air through fissures that traverse all the beds. Another limitation might possibly be added, which would confine the area where great gas-flows may be obtained to those underlaid by a considerable thickness of bituminous shale.

Very fair gas-wells may also be obtained for a considerable distance down the slope from the crest of the anticlinals, provided the dip be sufficiently rapid, and especially if it be irregular, or interrupted with slight crumples. And even in regions where there are no well-marked anticlinals, if the dip be somewhat rapid and irregular, rather large gas-wells may occasionally be found, if all other conditions are favorable.

The reason why natural gas should collect under the arches of the rocks is sufficiently plain, from a consideration of its volatile nature. Then, too, the extensive fissuring of the rock, which appears necessary to form a capacious reservoir for a large gas-well, would take place most readily along the anticlinals where the tension in bending would be greatest.

The geological horizon that furnishes the best gas-reservoir in western Pennsylvania seems to be identical with the first Venango oil-sand, and hence is one of the Catskill conglomerates. This is the gas-rock at Murraysvile, Tarentum, Washington, Wellsburg, and many other points. Some large gas-wells have been obtained in the subcarboniferous sandstone (Pocono), however, and others down in the third Venango oil sand (Chemung).

In Ohio, gas-flows of considerable size have been obtained deep down in the Cincinnati limestone, while in West Virginia they have been found in the Pottsville conglomerate: hence natural gas, like oil, has a wide range through the geological column, though it is a significant fact that it is most abundant above the black slates of the Devonian.

Of the composition, probable origin, extent of gas territory in the country, and many other interesting points connected with natural gas, the necessary brevity of this article forbids any mention; but the writer has in preparation a more general paper on the subject, in which these and kindred questions will be discussed with more detail.—*Science* No. 125.

The Morgantown Gas-well; Errata.—In the article on the sections revealed by the boring of the Morgantown, W. Va., gas-well, by Prof. I. C. White, on page 91 of this volume of *The Virginias*, there are several errors. These can best be corrected by republishing the *Recapitulation*, on page 92, corrected, as follows:

Recapitulation.

Barrens (No. XIV)		97′
Lower Coal measures (No. XIII)		227′
Pottsville conglomerate (No. XII)		276′
Mauch Chunk (No. XI)	shale 220′	310′
	limestone 90′	
Pocono sandstone (No. X)		730′
Catskill red beds (No. IX)		380′
Chemung shales (No. VIII)		237′
Total		2267′

Supplementing these figures by accurate surface measurements of Nos. XIV, XV, and XVI that the writer has made in Monongalia county, we get the following thicknesses for the different sub-divisions of the Carboniferous formation:

Permo carboniferous beds (No. XVI)	1200	
Upper Coal Measures (No. XV)	365′	1418′
Barrens (No. XIV)	550′	
Lower Coal Measures (No. XIII)	227′	
Pottsville Conglomerate (No. XII)	276′	
Mauch Chunk (No. XI)	310′	1040′
Pocono Sandstone (No. X)	730′	
Permo-Carboniferous		1200′
Carboniferous proper	1418′	2458′
Sub-carboniferous	1040′	
Total		3658′

Coal and Coke.

Flat-top Semi-bituminous Coal and Spontaneous Combustion.—In the "Coal Trade Journal" of New York of June 24, page 502, we find the following statements which need no comment as they state fairly and fully the facts in reference to the character of this coal and its freedom from any tendency to spontaneous combustion:

There have been numberless statements printed showing, by analyses and practical tests, the superiority of the Pocahontas Flat-top coal for the generation of steam and for blacksmithing purposes. Many persons who have been prepared to admit the correctness of these statements have claimed that the coal is liable to spontaneous combustion. This may have been only one of the means adopted to prevent the introduction of this fuel, (which is no doubt one of the best semi-bituminous coals mined), but, from whatever motive these charges may have arisen, we think that the following testimony which we have secured will set at rest the minds of any who have been doubters on this score:

Mr. H. Wickham, who is president of the Southwest Virginia Improvement Co., says:—"I beg to say that our data on the question of spontaneous combustion are of such a character as will warrant us in submiting Pocahontas coal to any known scientific or practical test, and we feel assured that this feature of safety must commend the use of our coal to all consumers who are aware of the dangers involved in carrying stocks of inflammable coal. I need not, of course, call your attention to the fact that ours is a *Semi-bituminous* coal, one low in volatile matter, and remarkably free from sulphur. It will, however, be proper for me to mention the following test, and in doing so, I would say that I know of no similar test having been made with any other steam coal in America. We commenced the development of our mines in January, 1882. All the coal mined from that time until May, 1883, was heaped near the mine openings awaiting the completion of the railroad to Pocahontas. This coal, which amounted to 35,000 tons, according to actual statistics, remained in the original heap until March, 1884. We then commenced shiping it to supply our trade during the interruption of mining operations occasioned by the mine explosion which occured March 13, 1884. Twenty-six thousand tons of it were shiped, and the bulk of the balance was used in our coke ovens. There was not a single trace of heating anywhere to be found, and the coal gave general satisfaction. This test should certainly settle the question of spontaneous combustion with Pocahontas coal."

Mr. J. H. Bramwell, M. E., who was one of the mining experts appointed by the American Institute of Mining Engineers to investigate and report on the causes which led to the explosion in the mines at Pocahontas, Va., on the 13th of March, 1884, says:— "It is the generally accepted theory that the principal cause of the spontaneous combustion of coals is due to the large amount of heat generated by the oxidation and consequent decomposition of iron pyrites (bisulphide of iron) into a sulphate in the presence of moisture absorbed whilst exposed to atmospheric influences. Careful and repeated analyses of the Pocahontas Flat-top coals, by the following eminent chemists: Profs. Chandler, Silliman, McCreath, Genth, and Terry, have discovered less sulphur in this coal than in any other bituminous coal mined in America. I have had occasion to hold large quantities of these Lower measures semi-bituminous coals in stock piles for months and have never discovered any disposition in them to ignite spontaneously. There can be seen at this date at many points in the Flat-top coal field hundreds of tons of run-of-mine and slack coal in large heaps which have been exposed to the action of the weather for the past two or three years without exhibiting the slightest indication of even heating. No more conclusive evidence could be adduced than this as to the perfect safety of these coals from spontaneous combustion."

Prof. C. F. Chandler, Ph. D., writes as follows:— "The danger of spontaneous combustion in bituminous coals is usually regarded as measured by the quantity of pyrites they contain, the oxidation of pyrites generating a degree of heat which sometimes results in combustion. While it is not absolutely certain that spontaneous combustion from this latter cause has been given and the probabilities are that pyrites is the only dangerous element. The purity of Pocahontas coal is exceptionable both as regards sulphur and ash, and if the specimens sent me represent anything like the average of the coal it is equal in excelence to any other known for the generation of heat. The amount of combined water in the coal is exceptionably small, and this constitutes one of its excelencies inasmuch as the water is an inert and valueless element, but the combined water has little or nothing to do with the danger of spontaneous combustion. Judging from the purity of the specimens of Pocahontas coal sent me for analysis, I should consider it less liable than most coals to spontaneous combustion, and it is quite certain that any statements to the effect that the composition of Pocahontas coal renders it prone to spontaneous combustion are erroneous. The purity of the coal is the best guarantee of its freedom from danger, and statements to the contrary are either the result of ignorance or misrepresentation."

The Peerless Gas Coal.—On page 76 of this volume of *The Virginias* are published gas-work tests of the Peerless gas coal from the mines of the Peerless Coal Co. on the Chesapeake & Ohio Ry. and the Great Kanawha river, Kanawha county, W. Va.: below is a new and full analysis of this superior gas coal, made June 27th, 1885, specially for *The Virginias* by Mr. Andrew S. McCreath, the distinguished chemist of the Second Geological survey of Pennsylvania, at his chemical laboratory at Harrisburg, Pa.

This analysis is of samples from the top, the middle, and the bottom of the coal bed, numbered, respectively, Nos. 1, 2, and 3, and of a sample, No. 4, of a whitish crystaline substance, easily pulverized, found in some of the rooms of the Peerless mine in very thin sheets, about as thin as paper, between the blocks of coal.—Owing to failure to send explanations, equal portions, by weight, were taken of each of these four samples to make the sample for the following analysis. Only Nos. 1, 2 and 3 should have been taken.

The results of this analysis are:

Volatile hydrocarbons	39.822
Fixed carbon	55 416
Water	1.442
Ash	2.536
Sulphur	0.784
Total	100.00
Coke, percentage	58.39
Sulphur volatilized by coking	0.346 } 0.784
Sulphur left in the 58.39 parts of coke	0.438 }

Coke made from this coal should contain:

Fixed carbon	94.907
Ash	4.343
Sulphur	0.750

Mr. McCreath adds: "In order to see whether the different samples varied in character, a determination of the percentage of ash in each sample was made separately, as follows:

In No. 1, ash	2.42
" " 2, "	1.53
In No. 3, ash	1.68
" " 4, "	4.42

Average ash in the 4 samples 2.5125 per cent, a result agreeing closely with that obtained in the general analysis.

The average of the ash in samples 1, 2, and 3 is only 1.877 per cent. No. 4 contains not only the most ash but also the most sulphur; indeed it was the only one of the samples showing any appreciable amount of pyrites."

In conclusion Chemist McCreath writes: "It is unnecessary to say anything about the high character of this coal as the results given above speak in sufficiently strong terms."

If the samples had been properly described and No. 4 omited the above analysis would have shown but 1.877 per cent of ash and a very small per cent of sulphur, and the volatile hydrocarbons and fixed carbon percentages would have been correspondingly increased, all to the great advantage of the high character of this coal.

A reference to page 14 of this volume of *The Virginias* will show that Prof. I. C. White makes this "Peerless" coal a member of the Lower Kittanning bed of the Pennsylvania series, or the Campbell Creek bed of the Great Kanawha series.

On Cabin creek of the Great Kanawha, in Mud-lick hollow, 12 miles southeastward from the Peerless mine, Prof. White found this bed of coal and says of it, on page 15: "At the head of Cabin creek the Peerless and the upper half of the Coal Valley portion of this bed come entirely together and form a splendid bed of gas coal 5½ feet thick."

A reference to page 7 of *The Virginias* for 1883, to a paper by Prof. S. P. Sharples, will show that he examined and analyzed this same bed, he says: "The next bed examined was in Mud-lick hollow, at 1460' altitude; this seems to be a solid bed of 6', without partings. The analysis of a specimen taken from its outcrop aud somewhat weathered, gave the following results:

Volatile matter	38.09	100
Fixed carbon	56.42	
Ash	4.15	
Moisture	1.34	
Coke percentage	60.57	
Sulphur, mainly in pyrites	1.68	

A comparison shows a close agreement between this analysis by Prof. Sharples and the preceding one by Mr. McCreath, especially when it is considered that Prof. Sharples analyzed a "weathered" outcrop sample, one that of necessity would show more ash and less volatile matter than a fresh sample from the regular workings of a mine like that analyzed by Mr. McCreath.

Mr. E. McMillin, superintendent of the Columbus, Ohio, gas works, in a chapter on the gas coals of Ohio in Vol. V of the Ohio Geological survey, says: "To determine the commercial value of any particular coal for gas-making several points must be considered. First, convenience to market; second, quantity and illuminating power of gas to be obtained from the coal; third, character and weight of coke; fourth, freedom from impurities."—Judged by these "points" of a gas expert the Peerless gas coal is entitled to a first place in the estimation of consumers of gas coal in the East as well as in the West, because:

1st. Its best development, in the central portion of the Middle measures of the Great Kanawha coal field, is on and near the improved Great Kanawha river, by which it can be cheaply water-borne to all places on the navigable waters of the Mississippi system, and on and near the Chesapeake and Ohio railway, part of a transcontinental system, by which it can be transported to all railway points both East and West and to Atlantic ports for coastwise demands at fair freight rates; thus giving it "convenience to markets."

2nd. As the Cincinnati gas works test, on page 76 of this volume, show, it yields very nearly 13,000 cubic feet of gas of about 15 candle power to the ton of coal, thus fully meeting the requisitions for "quantity and illuminating power."

3rd. The yield of 36 bushels of "excelent" coke, of the composition indicated by the preceding analysis, fills the requirement for "character and weight."

4th. The low percentages of ash and sulphur—only 1.877, per cent of the former and a small per cent of the latter if the fourth sample is rejected—compared with other gas coals, meet the demand for "freedom from impurities."

New analysis of Peerless Gas coal.—Since the above analysis of gas coal from the Peerless mine, Kanawha county, W. Va., by Mr. Andrew S. McCreath, was put in type, *The Virginias* has been favored by Dr. Fred. P. Dewey, Curutor of metalurgy in the U. S. National Museum, Washington, D. C., with the following analysis of Peerless gas coal, made in the laboratory of the Metalurgical department of the Museum from samples collected to form part of the coal exhibit of the National Museum at the late New Orleans world's fair.

The results of that analysis are:

Volatile matter	38.05	100
Fixed carbon	58.62	
Moisture, at 100° C.	0.90	
Ash	2.43	
Sulphur	0.775	

The samples analyzed by Dr. Dewey were taken from the mine soon after its development by the Peerless Coal Co. began; those analyzed by Mr. McCreath were taken much later and after a considerable quantity of coal had been mined.

Coal and Coke traffic of Chesapeake and Ohio Ry. for June, 1885.—General manager C. W. Smith furnishes *The Virginias* the data for the following report of the coal and coke traffic of the Chesapeake & Ohio Ry. during the month of June, 1885, and for the same month of 1884, in 2,000 lbs. tons, prepared by fuel agent J. W. Hopkins:

The movement, by kinds and quantities, was.

Year.	*Cannel.*	*Gas.*	*Splint.*	*New R.*	*Coke.*
1885	1,530	25,576	13,256	45,930	10,915
1884	1,337	20,242	9,112	31,073	5,124
Increase,	193	5,334	4,144	14,857	5,791

Total movement in June, 1885, 97,207 tons.
" " " " 1884, 66,888 "
Increase in June, 1885, 30,319 "

The movement, by kinds and quantities, from Jan. 1 to June 30, 1885, six months, and for the same time in 1884, was:

Year.	*Cannel.*	*Gas.*	*Splint.*	*New R.*	*Coke.*
1885	10,197	201,170	75,924	269,398	59,468
1884	6,730	155,597	38,828	220,664	28,131
Increase,	3,466	45,573	37,096	48,734	31,337

The total movement during the first six months of 1884, and of 1885, was:

During first 6 months of 1885, ... 616,157 tons.
" " " " 1884, ... 449,951 "
Increase in 1885 over 1884, 166,205 "

Results of six months.—This is a gratifying report of the coal fuel traffic of this railway for the first half of this year, in so far as quantities are concerned, compared with the traffic for the first half of last year, since it shows very handsome gains in each of the five kinds of fuel transported by it. The gain in the movement of cannel coal was over

Gas Tests of Great Kanawha Cannel coals.—In the Economic Geology of Ohio, published in 1884, we find (pages 734 and 736) the following tests of *Cannel coals from Cabin creek*, Kanawha county, W. Va., "made by one of the larger gas-works" of Ohio.

1. *Test No. IX.*

Coal charged into retorts, pounds,	200
Gas made, cubic feet,	1,000
Gas made per pound of coal, feet,	5
Candle feet obtained,	94.50

Weights Obtained.	*Pounds.*	*Percent.*
Gas (spec. grav., est., 500)	38.46	19.23
Coke	128.00	64.00
Tar	5.00	2.50
Liquor	3.00	1.50
Lost	25.54	12.77
Totals	200.00	100.00

2. *Test No. X*

Weight per bushel, pounds,	72
Coal charged into retorts, pounds,	250
Time carbonizing, hours,	5

Produced:

1st hour,	350	cubic feet,	40	candle-power	jet.	
2nd. "	331	"	"	24	"	"
3rd. "	281	"	"	16	"	"
4th. "	248	"	"	12	"	"
5th "	70	"	"	7	"	"

Yield of gas per pound of coal, cubic feet,	5.12
Candle power (Bunsen),	18.70
Candle-feet, per pound;	95.74
Weight of coke, pounds,	163
Coke made, bushels,	3.75
Tar made, gallons,	3.50
Breeze, bushels,	0.30
Ammoniacal liquor (5.50°) gallons,	1.50

Inlet of condenser, 64°; outlet of, 62°
Scruber, 62°; Meter, 62°
Atmosphere, 60°; Barometer 30".40

Produced per ton of coal carbonized:

Coke, bushels,	33.60
Breeze, "	6.70
Tar, gallons,	31.36
Ammoniacal liquor, gallons,	13.44
Coke, pounds,	1,590
Gas, cubic feet,	11,468

In the same series of tests the Hocking Valley coal, from No. 6 seam, yielded, 52.76 candle feet; Pomeroy coal, 75.82; Pittsburg coal, from Rend's mine 75; Youghiogheny gas coal from Shaner's mine, 86.57; and Hocking cannel, 87.115.

Forty-eight Hours Coke is generally considered to be worth appreciably less in the manufacture of pig iron than 72-hours coke, but Mr. J. H. Skelding, the very efficient and successful founder of Low Moor furnace, Alleghany county, Va., asserts, after numerous trials, that he always gets better results from the 48-hours coke, made from New River semi-bituminous coal in the ovens at that furnace, than from the 72 hours from the same coal and ovens."

No. X Coal.—Says the "Greenbrier, W. Va., Independent," we have received a specimen of coal from Dr. Wm. H. Caldwell's land, three miles northeast of Lewisburg—thickness of vein, 5'7". The specimen indicates an excelent quality of coal, and has been so pronounced by an experienced miner.

The Chesapeake and Ohio Ry. Coal Agency, No. 150, Broadway, N. Y., occupies a full page of a recent issue of the *Coal Trade Journal*, with an advertisement of the New River steam coal. This advertisement says truly, that "this coal is acknowledged by all to be a highly satisfactory fuel." It gives the following analysis of it:

Volatile matter	22.35
Fixed carbon	75.02
Ash	1.46
Sulphur	0.56
Moisture	0.61
Total	100.00
Parts of lead reduced by one part of coal,	31.373

One part of pure carbon reduced 34.56 parts of lead.

Percentage of heating power of New River coal to that of pure carbon	90.78
Specific gravity	1.272
Weight of one cubic foot	79.5 lbs

It states that during the last few years over four hundred foreign steamers have been supplied with New River steam coal at Newport News, which port, owing to its accessibility, deep water, and excelent facilities has become the favorite coaling station on the coast.

The shiping points for this coal are Richmond and Newport News, Va. This agency coals steamers at New York harbor on short notice. It also supplies railways, and the general manufacturing trade.

We wish this agency would adopt the suggestion we have frequently made and put this coal upon the market as semi-bituminous coal, which it really is, if there is any such coal in the United States. Aside from having the coal properly named there is a very decided commercial value in adopting this distinction that we should think coal dealers would be very prompt to know of.

Flat-top semi-bituminous coal to California.—Castner & Co., limited, report the shipment of 2,500 tons of Pocahontas Flat-top bituminous coal to San Francisco, says the Coal Trade Journal, N. Y., of July 8.

Refering doubtless to the same shipment, the Norfolk, Va., Ledger, of July 6, says: "It is learned that one of the O'Brien fleet, the ship John Bryce, is expected this week by Messrs. William Lamb & Co. to load coal for San Francisco. The loading of a 2,000 ton American ship at this port, in mid-summer, with the products of Virginia mines for the far distant Pacific coast, marks a new era in the commerce of Norfolk, which gives hope for the future."

We may add, that we see no reason why this superior coal should not be regularly shiped to the Pacific coast from Norfolk and Newport News. According to Saward's "Coal Trade" for 1885, the receipts of coal at San Francisco alone in 1884 were 987,151 tons, all bituminous but 13,486 tons of anthracite. Of this quantity 153,192 tons were from Australia, sold at an average of $7.57 per ton; 138,295 from Great Britain, sold at an average of $7.25; and 25,047 tons of Cumberland, Md., coal. Only about one third of the coal brought to San Francisco was from Pacific coast mines, the coals of which are generally high in "ash" and low in "carbon" compared with the No XII coals of the Virginias.

We find, from the same source, that 10,695 tons of coke were received at San Francisco from foreign ports and sold at from $11 to $13 per ton. This shows that a very good market could be found there for coke, made from our XII coals, the very best article, in all respects, and for all purposes, as we have repeatedly proved, that now enters the markets. Our coke makers should have a business eye to the Pacific coast coke market, which is a constantly growing one.

Flat-top Semi-bituminous Coal and Coke output for May and June, 1885.—The last report to *The Virginias* of Flat-top coal and coke output, that for April, 1885, was published on page 75 of this volume; below we give the output of the Pocahontas mines of the Southwest Virginia Improvement Co. for the months of May and June, 1885, in 2,000 pounds tons, furnished *The Virginias* by E. J. Collins, secretary and treasurer of that company, 244 S. 3rd St., Philadelphia, Pa.

	May.	*June.*
Coal shiped, tons	33,106	30,432
Coal coked, tons	815	6,070
Coal used at mines and on hand, tons	2,354	898
Coal mined, total	36,275	37,400
Coke made, tons	497	3,642
Coke shiped, tons	2,386	5,137

Adding the May and June output to the previous output for 1885, from page 75, we have:

Coal output from June 1 to May 31, 1885, tons, 194,385
Coal output from Jan. 1 to June 30, 1885, " 231,785

This shows that the output from the Pocahontas mines for the first half of this year was 231,785 tons; a large increase over its output for the corresponding half of last year.

Copper, Etc.

The Utilization of the iron and copper sulphides of Virginia, etc.

By C. R. Boyd.

The sulphureted ores of Carroll and Grayson counties, Va., Ore Knob, Ashe county, N. C., and Ducktown, Tenn., in their general position, are in the prolongation of the same massive deposits. The existence of extensive ore-bodies has been well-established, not only in a practical way, but by the careful research of a number of men of science, including Dr. T. S. Hunt, Prof. Kerr, Dr. Genth, Rogers, Safford, Prof. Egleston, Dr. H. E. Colton, the writer, and others, and described in one or more of the volumes of our *Transactions*, as well as in other publications. The greater quantity of these ores is pyrrhotite, although many of them carry non-magnetic disulphide; their reduction on the ground will probably lead to better results than attempts to mine and ship them to distant places. Their use as sulphuric acid producers, to be employed in the cheap manufacture of valuable fertilizers, will be chiefly the subject of this paper.

The great deposits of Carroll county, Va., are now nearer to railway transportation than any of the others, being six to eight miles from the Cripple Creek extension of the Norfolk & Western RR., now being constructed, the grading of which is in an advanced state of completion.

I am not able to state what are the present prospects of an early completion of the contemplated line of railway to Ducktown. For a long while, during the time those deposits were mined and reduced for their copper, the works were 40 miles from any railway; and the same may be said of Ore Knob, N. C.

The deposits in Carroll and Grayson counties, Va., being now the most accessible to cheap transportation, will naturally claim the greater part of our attention. It may be pertinent to remark, just here, that the ores of Ducktown, like those of Carroll and Grayson, Va., exist in the undecomposed levels as iron and copper sulphurets, much of which is a non-magnetic disulphide, as stated, with occasional exhibits of sulphides, such as covelite, erubescite, etc. There are, now and then, small quantities of silver, lead, and zinc, no arsenic and 0.70 to 1.10 per cent. of nickel; assays have so far been reported, the purpose of which was to determine whether tin is present in any of the veins or not. These ores range in their contents of copper from 1.70 to 5 per cent for averages, copper pyrites often occuring in handsome bunches nearly pure; 38 to 46 per cent of sulphur, and about 50 per cent of iron. The average thickness of the ore-deposits, between hanging and foot-walls, is from 26 to 100 feet and more. Their dip is usually from 45° to vertical; sometimes presenting the appearance of a distinctly bedded vein, at others that of true fissure, filled with pyrites in the usual manner, with light intrusions of quartz, talco-mica, and doubtless, small quantities of calc-spar.

It being reduced to a certainty, from experience, that these ores can be mined and dumped on the surface at 60 cents per ton of sulphuret, so great a quantity as exists in the 20 miles length of the veins in Carroll, Va., to say nothing of the others for the present, must very soon command the earnest attention of those who are now or will be engaged in the cheap manufacture of the more valuable fertilizers produced from phosphate-rock by means of sulphuric acid; in the reduction of ores containing silver or gold, in which sulphides of iron and copper may be employed, and in the production of copper metal.

Possibly the most extensive und lucrative industry will be the manufacture of fertilizers containing from 8 to 15 per cent of available phosphoric acid, using the sulphuric acid made on the ground from these pyrites of iron and copper. Of this class of fertilizers there are now consumed annually in the Southern states east of the Mississippi, about 750,000 tons; and, in the whole country about 12,000,000 tons, with the demand constantly on the increase.

Obtaining the sulphuric acid from these ores, either by the common process, in the leaden chamber, or by the interesting method of Roessler, explained in volume xii., p. 274, *Transactions* of this Institute, by Mr. Arthur F. Wendt, by which copper sulphate may also be obtained in quantity (100 tons of the ore yielding 55 to 75 tons of sulphuric acid,) this acid is then used upon the phosphate rock, which holds a high and often variable percentage of phosphoric acid, leaving it in such a condition that it is ready for the conclusion of the process by which it is manufactured into a fertilizer, having such constituents, and in such proportions as are required for use in commerce, either as a high or a low-grade superphosphate.

The phosphate-rock may be considered to hold the following percentages of ingredients:

Phosphate of lime (as tribasic phosphate or orthophosphate	50 to 80
Carbonate of lime	20 to 25
Sesquioxide of iron	1 to 3
Alumina	1
Silica	0.13
Organic matter	0.04
Water	1.40
Chloride of sodium	0 33

The whole process of the reduction of the rock and conversion into the final product results in the preparation of a fertilizer holding 8 to 15 per cent of available phosphoric acid and 2 to 4 per cent of ammonia, worth, according to its available phosphoric and ammoniated constituents from $30 to $50 or $60 per ton, while the cost of production, as will be shown, can be reduced to a figure surprisingly low.

It would be interesting to describe the entire process of reduction and preparation; but there is scarcely space to do more than call attention to the fact that the cost of obtaining the sulphuric acid from the ores mentioned, as well as the whole cost of producing the fertilizers, will probably be fully compensated by the amount of copper sulphate, iron sulphate, iron and metalic copper produced at the same time,

above the quantity of such of these reagents as may be required in the manufacture of fertilizers. For we must remember that from Roanoke, through Montgomery county, Va., to those Carroll and Grayson mines, there are several extensive bodies of ores, yielding from $15 to $25 per ton of silver, and on Brush and Laurel creeks, in Montgomery and Floyd counties, extensive gold deposits, yielding per ton of rock $15 to $50, as well as in some counties of East Tennessee, in the reduction of which the sulphates of copper and iron will be useful. (See the interesting papers in vol. xi. of W. Lawrence Austin, Ph.D., pp. 91-104, and Richard P. Rothwell, pp. 191-196, on the Mears process, in which sulphuric acid is also used, and many others.) Now, owing to the fact that the Norfolk and Western RR. is carrying to Norfolk and Lambert Point, on deep water, from Pocahontas, a large and constantly increasing quantity of coal to supply sea-going steamers and the general trade, the cars returning to Southwest Virginia, will take South Carolina phosphate rock and the recently discovered coprolites of the Virginia Peninsula, in ballast, at a very low rate.

The cheapness of production of the sulphuric acid, the low rate of transportation, and the possible utilization of by-products in several other paying metalurgical operations, besides those mentioned above, such as the conversion of the kettle salt-cake now accumulating at Saltville, near by, into soda ash, conspire to render the locality under consideration one of the most favorable in the whole country for the early establishment of highly remunerative chemical works on a large scale. To this may be added the possibility of converting the iron-residues into metal at a cost of $7.50 to $9.50 per ton, using coke in the furnace. Ducktown, with its proximity to the phosphate beds of Alabama and South Carolina, will present the same facilities when communication by rail shall have been established.—From Trans. of Am. Institute of M. Engs. Read at Chattanooga meeting, May, 1885.

Copper Pyrites of Blue Ridge Plateau.—In a letter to the New York Tribune of Sept. 21, 1873, concerning the manufacture of soda-ash in the United States, Dr. T. Sterry Hunt remarks as follows about the copper pyrites of the Blue Ridge Plateau in Virginia:

"Meanwhile other and more accessible localities invite attention. The conditions of Ducktown are reproduced in Southern Virginia, where, in Floyd and Carroll counties are the great lodes of iron and copper pyrites, which, previous to the war, were mined like those of Ducktown, and yielded large quantities of rich ore. When the low grade ores beneath were reached, the mines were abandoned, and unlike those of Tennessee have not been reopened. From a recent examination of the lodes in Carroll county, there seems every reason to conclude that if the same skill and capital were applied there as at Ducktown the mines might be made to yield as large an amount of copper under conditions much more favorable for working and shipment than in South-eastern Tennessee. These ores contain as much sulphur as those of Ducktown, and inexhaustible supplies of pyrites rich in sulphur, and holding more or less copper, like those of Spain, can be mined. A railway of 17 miles would connect these mines with the Virginia and Tennessee Railroad [Now the Norfolk and Western.—Ed.] at a point 125 miles from Lynchburg the head of water communication. At this point, at Norfolk, or at Charleston itself, these sulphur ores will one day be brought in contact with the South Carolina phosphates. The sulphur, the copper, and the iron of these ores will be utilized, as is now the case with the Spanish ores in England, and the phosphates converted into fertilizers not only for our own soils but for shipment abroad. I have spoken thus of the copper and sulphur deposits of Carroll county because their greater accessibility points them out for more immediate development, and will permit their accompanying sulphur to be turned to advantage. The deposits of Floyd county are, however, probably not less worthy of attention as sources of copper, and others doubtless await discovery."

Of the Ore Knob copper mine in N. C., some 20 miles S. W. from those of Carroll county and in the same range, Dr. Hunt wrote, in the letter above refered to:

"Another mine which has lately attracted much attention, the Ore Knob mine, although opened only a few months, has disclosed a deposit of copper of almost unexampled richness. In the first ten weeks of its opening over 1,500 tons of ore of 25 per cent were extracted by 14 men: in other words the labor of these men produced daily during that time over 10,000 pounds of copper in the shape of a 25 per cent ore. This at the present price of 27 cents is worth $2,700 and its conversion into ingot copper and shipment to market would still leave a net profit of over $2,000 a day. This remarkable deposit of ore has been traced for a distance of over a mile with a breadth of from 12 to 15 feet."

New Mine Inspector in W. Va.—The term of office of Mr. O. A. Veazey, M. E., as mine inspector of West Virginia having expired June 30, 1885, he having held the office for two years, Gov. Wilson appointed Mr. H. J. Tucker, of Sewell, Fayette county, to succeed him and be Mine Inspector of West Virginia for two years.

Mr. Veazey has been a faithful official and has discharged the onerous duties of his office in a zealous and fearless manner; under his administration there is no question but that mining methods in W. Va. have been very much improved. The first incumbent of a new offiee in the state he has had many difficulties to encounter, many interests and prejudices to oppose, and so has probably made a good many enemies, at the same time, as we know from personal observation, he has made a good many strong friends among the coal operators who heartily commend his ability and his inspection work.

Of Mr. Tucker's qualifications for this office we know nothing; we hope he may fill it properly, for it has much to do in promoting the success of the rapidly developing mining industries of West Virginia.

Great Kanawha W. Va. Fire-clay.—In 1874 Mr. Jno. Pattinson, a well known chemist of New-Castle-on-Tyne, England, analyzed a sample of fire-clay obtained from the coal measures near Charleston, W. Va., with the following result:

Silica, . .	55.67	Magnesia, . .	a trace.
Alumina, .	30.39	Soda, . . .	0.12
Iron peroxide,	0.61	Potash, . .	a trace.
Lime, . .	0.37	Loss by calcination,	12.87

The elements of this indurated fire-clay show it to be a better material for fire-bricks than that used on the Tyne for such purposes.

The Fort Spring W. Va. Limestone.—In 1874 Mr. John Pattinson, a noted chemist of New-Castle on-Tyne, England, analyzed a sample of the Greenbriar No. XI., limestone, from Fort Spring station of the Chesapeake and Ohio Railway, with the following result:

Lime carbonate,	84.10	Silicious matter, .	8.64
Magnesia,	6.02	Sulphur,	a trace
Iron protoxide,	0.46	Phosphoric acid,	0.02
Alumina,	0.50	Moisture,	0.12

This limestone was quarried and used for flux at Quinnimont furnace and is now burned for building and other purposes.

The Building Stones of Virginia:— From the voluminous mass of information in regard to the building stones and the quarry industry of the United States, in volume ten of the census of 1880, we have compiled, for *The Virginias* the following information:

Table IV of this report, indicates the amount and kinds of rock quarried in each of the different states. According to this three kinds of rock were quarried in Virginia: first, the crystaline siliceous rocks, 10 quarries in which are reported; second, marbles and limestones, 2 quarries; and third, slates, 2 quarries. The details of this table are as follows:

Virginia Quarries in Crystaline Rocks.

	Operator.	*County.*	*Location.*	*Popular name.*	*Scientific name.*
1.	Chase Andrews,	Fauquier,	Near Catlett station,	Diabase,	Diabase,
2.	E. J. Leyburn,	Spotsylvania,	1½ miles from Fred'g,	Granite,	Biotite-muscovite granite,
3.	J. B Mitchell & Co.,	Henrico,	Tuckahoe district,	"	Biotite granite,
4.	Richmond Granite Co.,	"	Near Richmond,	"	"
5.	Old Dom. Granite Co.,	Chesterfield,	Granite post-office,	"	"
6.	Westham Granite Co.,	"	Manchester,	"	"
7.	Casey & O'Connel,	Amherst & Campbell,	Near Lynchburg,	Gneiss and mica-schist,	Biotite gneiss,
8.	S. Patterson & Son,	Campbell,	"	Gneiss,	"
9.	Smith & Southall,	Dinwiddie,	Namozine district,	Granite,	Biotite granite,
10.	Gill & Hubbard.	"	"	"	"

	Color.	*Texture.*	*Stratification.*	*Jointing, etc.*	*Period.*	*Year opened.*
1.	Dark Gray,	Fine,	Massive,	Broken irregular,	Mesozic (Trias)	1880
2.	Light Gray,	Medium,	Indistinctly laminated,	Vertical and horizontal,	Archæan,	1880
3.	Gray,	"	Massive,	"	"	1880
4.	"	"	"	Irregular,	"	1835
5.	"	"	"	Inclined sheets,	"	1850
6.	Light Gray,	Fine,	"	Horizontal sheets,	"	1837
7.	Blue,	"	Laminated,	Irregular,	"	1867
8.	"	"	Massive,	Inclined sheets,	"	1858
9.	Greenish Gray,	Medium,	Indistinctly laminated,	Few joints,	"	1840
10.	"	"	" "	Solid,	"	1879

Virginia Quarries in Marble and Limestone Rocks.

	Operator.	*County.*	*Location.*	*Popular name.*	*Scientific name.*
1.	Red Bud Slate Co.,	Augusta,	2 miles northeast of Staunton,	Slate,	.....
2.	Coral Marble Co.,	"	Craigsville,	Marble,	Magnesian limestone and limestone,

	Color.	*Texture.*	*Stratification.*	*Jointing, etc.*	*Period.*	*Year opened.*
1.	Drab,	Fine,	Even, parallel,	Vertical and transverse,	Lower Silurian,	1879
2.	Pinkish gray,	Fine semi-crystaline fossiliferous,	Indistinct,	Uneven, thick,	Upper Silurian,	1879

Virginia Slate Quarries.

	Operator.	*County.*	*Location.*	*Popular name.*	*Scientific name.*
1.	J. R. Williams & Co.,	Buckingham,	New Canton,	Slate,	....
2.	Edwards & Roberts,	"	Orebanks,	"	.....

	Color.	*Texture.*	*Stratification.*	*Jointing, etc.*	*Period.*	*Year opened.*
1.	Bluish Black,	Fine,	Rectangular,	Even, smooth,	Archæan,	1840
2.	"	"	"	"	"	1859

Table V shows the extent of stone construction in 153 of the principal cities of the United States. The Virginia cities embraced in this table are Petersburg and Richmond. In Petersburg there are three stone buildings, one entirely of stone, and two with stone fronts; the percentage of stone buildings to the other buildings of that city was only 0.05 of one per cent. Two of these buildings are constructed of Connecticut sandstone, and one of Dinwiddie county, Va., granite, from quarries near the city. The stone employed for foundations in Petersburg is principally granite Stone is but little used for pavements; cobble stones from the vicinity are used for the streets; some of the side-walks are made of stone from the vicinity of the city; the curb-stones are, most of them, local granite.

In Richmond five stone buildings are reported: four entirely of stone, and one with a stone front. The percentage of stone buildings to all the buildings of the city was 0.05 of one per cent. All these stone buildings are constructed of granite from the vicinity of the city, and from Massachusetts. The stone employed for foundations was principally granite. The business streets of the city are reported as paved with cobble stones from the vicinity. Stone is but little used for side walks, but there are some constructed of stone from Lynchburg, Va., and Rondout, N. Y. The curb-stones are mainly local granite.

From the chapter on stone construction in cities we learn that in Baltimore, Md., Virginia, as well as other granite is used for building purposes and for street pavements. In Chattanooga, Tennessee, Virginia granite is used, with others, to a moderate extent for building purposes. In Harrisburg, Pa., the exposed part of the foundation of the new post-office building is of Old Dominion granite, "a liolite granite quarried near Richmond. Va." In Philadelphia, Pa., Richmond granite has been considerably used for general building purposes. In the cemeteries of that city granite is being used more and more for expensive monuments, and considerable Richmond granite is there used for monumental purposes. Philadelphia has 900 miles of paved streets; it is estimated that 44 of these are paved with Cape Ann granite, and 3 with Richmond granite. The side-walks in front of some of the larger business houses on Chestnut street are paved with large flags of Richmond and other granite.

In Petersburg, Va., we find: "There are three stone

buildings in Petersburg—one, the custom-house, built of granite from the Namozine district, Dinwiddie county, in the immediate vicinity of the city. It is now more than twenty years since it was completed and the stone is remarkably free from discoloration of every kind. That in the foundation, from the quarry of Dr. D. W. Lassiter, ranks with the best of building stones; and that in the superstructure is from a quarry now abandoned. Two fronts of Connecticut sandstone, on Sycamore street, show signs of decay; the material is destructible even in this latitude. The materials for foundations and all other ordinary purposes are obtained from the granite quarries in the immediate vicinity. A few of the streets are paved with cobble-stones; there is very little side-walk paving of granite from the local quarries, and North river blue-stone, from Rondout, N Y., has also been used for paving. Curbstones are of local granite."

Richmond, Va.: "There are but five buildings in Richmond constructed of stone, four entirely of stone and one front. In two of the buildings granite quarried in the vicinity is used: and in the walls of two buildings stone from surface bowlders found in the vicinity is used, while one building is of Quincy, Mass., granite. There is a one-story building on Main street, between nineteeth and twentieth streets, which has stood for more than a century. It is constructed of bowlders of granite rock, and has no significance in an inquiry concerning stones used in construction, except to show the durability of these bowlders. The stone used in a church on Grace street was obtained from a quarry below the city, but it has been practically abandoned. The stone used in the custom-house came chiefly from the Old Dominion Granite Co., and there is scarcely any change perceptible in the material since it was laid in the walls of the building. The pedestal of the Washington monument is constructed of granite from the Tuckahoe district, Henrico county. The piers of the five bridges across the James river at Richmond were constructed of stone quarried for the most part on the island in the river and along the right side of the river not far from the ends of the bridges. There are several docks where this material is also largely used. The granite quarried near Richmond ranks with the best granites, and it has been used in the construction of many important public buildings throughout the country notably the superstructure of the new State, War, and Navy Department building in Washington, D. C. In the business portions of the city the streets are paved with cobble and rubble stones from the vicinity. The side-walks are but little paved with stone, aud the material used are the mica-schist from Lynchburg, and North river blue-stone shiped from Rondout, N. Y. The curbstones are of the local granite."

In the article on Washington city we find the following statements which will be of interest in Virginia, as the same building stones are found in Virginia in the country opposite the District of Columbia: "Mr. George P. Merrill, of the Smithsonian Institution, made careful field observations and examined specimens and microscopic sections of the different varieties of this rock, and reported as follows:

"The rock quarried in the vicinity of Washington, and of which the walls of the Georgetown college, and various other public buildings are composed, is a compact mica-schist, of a structure and texture varying from coarsely schistose, spliting easily into thin sheets, and a fine-grained massive rock in which the individual ingredients are so evenly commingled that all traces of stratification are lost. The essential constituents are quartz and mica, the latter being liolite of a deep green color.

"Under the microscope numerous accessories are found to be present, among which are epidote, apatite, garnet, magnetite, and rutile, the first named being the most abundant, while the rutile occurs only as small occular crystals penetrating the quartz granules. A plagioclastic feldspar is occasionally met with, and in this case the rock approaches gneiss in constitution. The chief objection to the use of this rock for architectural purposes lies in the fact that it frequently contains a large amount of pyrite or iron bisulphide. On being exposed to the air this pyrite becomes oxidized, and the rock disintegrates, or at best is badly stained or discolored. It is this same ingredient that renders many of our sand and lime stones unfit for use, they becoming streaked and spoted with unsightly spots of a rusty red color after being exposed a short time to atmospheric agencies.

"In conclusion, I would say that there seems no reason why this rock should not be utilized for building purposes, provided sufficient care be exercised in selecting only such portions as are entirely free from this deleterious substance."

On the Potomac river, 40 miles below the city, at Aquia creek, there is a ledge of light gray and rather coarse sandstone, and quarries of the material were purchased by the United States government in 1791, for the purpose of using it in the construction of the public buildings; the Executive mansion and other older buildings are of Aquia creek sandstone.

The Executive mansion or "White House," was commenced in 1792. On September 19, 1793, the corner-stone of the Capitol building was laid by Washington himself, and the central or older portion is constructed entirely of Aquia creek standstone from the government quarries. This material was used in the construction of all the important public buildings that were commenced up to 1837. The list includes the Executive mansion, the central or old part of the Capitol building, the old portion of the Treasury building, the old portion of the Patent office building, and the foundation of the City hall. The Van Ness residence, at the foot of Seventeenth street, was also built of it in 1802.

About 20 miles north of the District on the Potomac river, the southern edge of the Triassic, or new red sandstone, formation crosses the river, and at this point furnishes the material called 'Seneca sandstone,' the equivalent of the Connecticut brownstone.

(To be continued.)

Cincinnati Iron Market Report.—Under date of July 18, 1885, E. L. Harper & Co. send the following special report to *The Virginias:*

The business of the past week has been an improvement over the preceding one, and consumers who have orders in hand are supplying their pig iron wants with more confidence. There is a shade better feeling prevailing, and while the short wheat crop is a dampener upon the hopes of many for a good fall trade, the prospects notwithstanding for business generally are better. The people have been frugal and economizing, the merchants and manufacturers prudent and conservative, stocks are small, and wants large, justifying we think the expectations of an average fall trade. Inquiries for manufactured iron, as well as pig, are a little more numerous. "Longdale" furnace continues producing liberally of her standard quality. "Princess" having been out a fortnight for repairs, is blowing again, and making very superior metal. We quote as prices current, cash f. o. b. wharf here:

Virginia Coke Foundry, No. 1	$15.50 to	$16.50
" " " " 2	14.50 "	15.50
" " " " 3	13.50 "	14.50
" " Gray Forge	13.00 "	14.00
" " Mottled	12.50 "	13.50
Amherst Charcoal, No. 1	22.00	
" " " 2	21.00	
" " " 3	20.00	

Attorneys.

H. C. McWhorter. L. E. McWhorter.

H. C. & L. E. McWhorter,
Attorneys-at-Law,
61 Charleston, W. Va.

Wm. A. Quarrier,
Attorney-at-Law,
61 Charleston, W. Va.

Thos. C. Elder. Wm. J. Nelson

Elder & Nelson,
Attorneys at Law & Real Estate Agents,
Staunton, Virginia.
Conference with parties proposing to purchase or sel real estate of any kind in Virginia respectfully solicited.
☞ Best references furnished when desired. 61

W. S. Laidley. Wm. H. Hogeman

Laidley & Hogeman,
Counselors-at-Law,
Charleston, Kanawha Co., West Va.
Examination of land titles carefully attended to. 61

Thomas B. S ann,
61 Attorney-at-Law,
Charleston, Kanawha County W. Va

H. B. Reynolds,
Attorney-at-Law,
61 Charleston, W. Va.

Southern
Real Estate Investments
Agricultural, Timber, Grazing, Phosphate and Mineral Lands, also
Manufacturing Properties,
No investments offered without expert surveys made at the owner's expense, and guaranteed by this office.
Sale Correspondents in New York, Boston, Mass., and London, Eng.
Expert examiners in all the Southern states.
Correspondent and Listing Agent for West Virginia, Russell W. Montague, White Sulphur Springs.
Clarence Gordon,
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Geo. G. Blackwell,
Manganese Merchant,
and
Mineral Broker,
Richmond Building,
26 Chape Street,
Liverpool
England,
MANGANESE
Is always open to handle this ore by purchase or consignment Guarantees good value and prompt returns. Correspondence invited on this and other
Ores, Minerals, &c., &c.
66

Luray Inn,
Luray, Page Co., Va.
At The Wonderful Caverns.
Only Caverns in the world lighted by electricity.
Geo. K. Mullin, Proprietor.

ROCKBRIDGE ALUM SPRINGS FOR SALE

By virtue of a decree of the Circuit Court of Augusta county, Virginia, rendered on the 8th day of July, 1884, in the cases of Porter and wife vs. Frazier, &c., and two other suits, which decree was affirmed by the Supreme Court of Appeals on the 17th day of March, 1885, the undersigned, appointed Commissioners for the purpose, will offer for sale, at public auction, on the premises, on—

Wednesday, the 12th day of August, 1885,

this CELEBRATED WATERING PLACE. For medicinal qualities, no waters in the "Two Virginias" excel these. In accommodations and popular patronage the celebrated White Sulphur alone surpasses the Rockbridge Alum. Six or seven hundred guests may be accommodated. It is accessible by Railway branching from the Chesapeake and Ohio Railway, to a point within two miles of the Springs in Rockbridge county.

THE TRACT CONTAINS ABOUT 1000 ACRES

It lies between North Mountain and Mill mountain, and with the large and well arranged Hotel building and Cottage ranges, it constitutes a beautiful group in a lovely valley. Apart from its value as a Summer resort, the sales of the water and Alum Mass would alone justify an investment at a handsome price.

TERMS OF SALE.—Ten per cent. in money; balance in five equal annual payments to be secured by bonds, with approved sureties therein, bearing interest from date, and by retention of title as ultimate security.

JOSEPH CHRISTIAN,
F. S. BLAIR,
WILLIAM A. ANDERSON,
HUGH W. SHEFFEY,
GEO. M. COCHRAN, JR.,
Commissioners.

—

I, Joseph N. Ryan, Clerk of the Circuit Court of Augusta county, do certify that Geo. M. Cochran, Jr., one of the Commissioners in the causes of Porter and wife vs. Frazier, &c., and two other suits, has this day executed bond according to law, in the penalty prescribed by the decree, in said causes, at the July Special Term, 1884. Given under my hand this 16th day of June, 1885.
jne18-tds JOS. N. RYAN, Clerk.

Executor's Sale of 1980 Acres of Valuable Timbered and Grass Land.

By virtue of the will of Clinton Hall, deceased, the undersigned, Executor therein named, will, on

Wednesday, the 12th day of August,

1885, at 12 o'clock, M., in front of the Court-house of Mercer county, in the town of Princeton, West Virginia, offer for sale at public auction, a tract of land containing **1980 Acres**, situated in Mercer county, West Va., within two miles of Princeton; the county seat of Mercer, and eight miles of Ingleside Depot, on the New River Railroad.

This land is gently undulating, well watered, and adapted to grass. The timber is exceedingly valuable for railroad ties and other purposes, and no portion of the tract is too steep for wagons. About 200 acres have been cleared, of which 100 acres are bottom land; a large portion of the tract is limestone, and when timber is removed, will be admirably adapted to farming and stock-raising Churches and schools convenient, and the population intelligent and refined.

Terms.—Cash to pay costs of advertisement and sale, and $3,000, or negotiable note well endorsed, for last named sum, interest added, at 60 or 90 days, and residue on credits, evidenced by bonds, with good security, bearing interest from day of sale, and title retained as ultimate security. For further particulars, address,

John A. Stuart,
Ex'or of Clinton Hall, dec'd,
Lyndhurst, Augusta Co., Va.

C. & M. Engineers.

C. R. Boyd,
Consulting, Mining & Civil Engineer,
Wytheville, Virginia.
The Mineral Lands of Southwest Virginia, in the Blue idge, Valley, and Apalachian Districts a specialty. Correspondence solicited. 61

Albert M. Campbell,
Civil and Mining Engineer,
Charleston, Kanawha Co., Va.
References:—Marmet Mining Co., Raymond City, W. Va.; Campbell's Creek Coal Co., Malden, W. Va. 65-73.

B. S. Randolph,
Civil Engineer and Geologist,
Martinsburg, W. Va.
Examines and reports on Mineral, Railroad and other properties; makes Surveys, Maps, Plans, Estimates etc., for all kinds of Engineering work. References furnished. 6

J. E. TINSLEY,
Architect,
Office and Residence,—No. 4 W. Fred-
61 erick St., Staunton, Va.

Jed. Hotchkiss,
Staunton, Virginia,
Editor of The Virginias,
Consulting Engineer.
Examines and makes reports on mineral lands and their titles; makes geological and topographical surveys, maps, &c. May be consulted in reference to purchase of lands in Virginia and W. Virginia 61

N. L. Reynolds.
Civil Engineer,
Princeton, West Virginia.
63-72.

Hotels.

G. K. Mullin. E. L. Bean.
St. Cloud Hotel,
Arch Street, below Eighth,
Philadelphia.
Mullin & Bean, Proprietors.

Virginia Hotel,
Staunton, Va.
The "Old Reliable." The People's Favorite. Complete in all its appointments.
The only First-Class Hotel in the city. Rates reduced to $2.00 and $2.50 per day. 61
H. C. FELLER, Clerk. JNO. D. CROWLE, Prop'r

Hotel Roanoke,
Roanoke, Va.
Is now open to the public under the management of
Mr. George K. Mullin,
Proprietor of St. Cloud Hotel, Philadelphia, Pa.

The Virginias.

A Mining, Industrial and Scientific Journal:

Devoted to the Development of Virginia and West Virginia.

Serial No. 68
Vol VI, No. 8.

Staunton, Virginia, August, 1885.

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$2 a Year in Advance.

The Virginias:

Published the last Saturday of each month, at 346 East Main Street, Staunton, Va., by Jed. Hotchkiss, Editor and Proprietor.

Bound Volumes of *The Virginias*, from Vol. I to Vol. V, 1880 to 1884, inclusive, can be had, post-paid, at $3.00 each.

The Five Volumes and *The Virginias for* 1885 will be sent, post-paid, for $16.00 in advance.

Advertising rates furnished on application.

Contents of No. 68.

The Railway Time Tables given below are based on 75th meridian or *Eastern standard time;* they are also in *24-hours time*, from midnight forward to midnight, so midnight appears as 24 00, and noon as 12 00. When the hours given are over 12 the present clock or watch time can be found by taking 12 from the hours. All junction stations are given. Where two times are given at a station the first is that of arriving and the second that of leaving.—Condensed time tables of the other railways of the Virginias will be added hereafter.

Chesapeake & Ohio Ry.

(May 10, 1885.)

Westward.	No. 3.	No. 1.	
New York, (Pa. Ry).....	8 30 / or 10 00	..... / 24 00	....
Philadelphia....."	11 55 / or 12 30	7 20	.....
Baltimore....."	15 20 / or 14 55	9 59	.....
Washington, (Va. Mid.)	17 45	11 15	.....
Charlottesville "	22 35	15 55	.....
Norfolk.....	15 25	7 25	.....
Old Point Comfort.....	16 00	8 00	.....
Newport News.....	16 25	8 30	.....
Richmond.....	19 20	11 30	.....
Hanover Jn. (R. F. & P.).....	20 13	12 34	.....
Gordonsville (Va. Mid).....	21 51	14 50	.....
Charlottesville "	22 30	15 45	.....
Waynesboro Jn. (S. Val.).....	24 01	17 15	.....
Waynesboro.....	24 02	17 16	.....
Staunton (B. & O.).....	24 30	17 50	.....
Goshen.....	1 56	19 16	.....
Clifton Forge (R. & A.).....	2 45	20 20	.....
White Sulphur.....	4 12	22 20	.....
Kanawha Falls...	8 10	3 05	.....
Charleston (O. C.).....	9 32	4 42	.....
Huntington*.....	11 00	6 20	.....
Ashland (Sci. Val.).....	10 41	7 02	.....
Winchester (Ky. C.).....	14 30	11 45	.....
Cincinnati.....	18 00	18 00	.....
Lexington.....	15 43	12 40	.....
Louisville.....	19 10	.....	.....

*All stations beyond Huntington have 90th Meridian or Central time, one hour *slower* than Eastern time.

No. 3, the Louisville and Cincinnati express, is a daily train, with sleepers, from Washington and Richmond, without change from Washington to Louisville and Richmond to Cincinnati.

Through connection at Louisville over C. O. and S. W. for New Orleans, with sleeper, without change.

It does not stop for local business.

No. 1, the mail train, is daily, except Sunday.

Eastward.	No. 4.	No. 6.	
Louisville (L. & N.).....	19 35	.....	.....
Lexington "	22 50	11 45	.....
Cincinnati (Ky. C.).....	20 10	8 10	.....
Winchester (Ky. C.).....	23 30	15 00	.....
Columbus.....	17 30	12 00	.....
Chillicothe.....	20 05	14 10	.....
Ashland.....	3 32	17 55	.....
Huntington*.....	4 10*	18 40*	.....
Charleston.....	6 43	22 17	.....
Kanawha Falls	7 50	23 55	.....
White Sulphur.....	12 10	5 10	.....
Covington.....	12 52	6 18	.....
Clifton Forge.....	13 35	6 50	.....
Goshen.....	14 24	8 15	.....
Staunton.....	15 40	9 41	.....
Waynesboro.....	16 09	10 15	.....
Waynesboro Jn. (Shen. Val)	16 10	10 16	.....
Charlottesville (Va. Mid.).	17 25	11 30	.....
Gordonsville "	18 04	12 20	.....
Hanover Jn. (R. F. & P.)..	19 55	14 30	.....
Richmond..... .....Arr.	20 30	15 40	.....
Richmond .....Leave	.....	15 50	.....
Newport News.....	.....	18 30	.....
Old Point Comfort.....	.....	18 55	.....
Norfolk.....	.....	19 30	.....
Charlottesville, V.M.Jn....	17 25	.....	.....
Washington (Pa. Ry.).....	21 50	.....	.....
Baltimore, "	23 35	.....	.....
Philadelphia, "	3 00	.....	.....
New York "	6 30	.....	.....

*Louisville to Huntington Central time; east of Huntington Eastern time.

No. 4 is the Washington daily express, from Louisville to Washington, and Cincinnati to Richmond, with sleepers, without change. Columbus, Ohio, at 17 30 and Chillicothe at 20 05 connect at Ashland. Observation car from Kanawha Falls to Clifton Forge. No. 6 is the Virginia Springs express, daily except Sunday.

No. 2 is the mail train, daily, from Ashland to Clifton Forge; daily, with sleeper, except Saturday, from Clifton Forge to Old Point Comfort.

☞Hotel Warwick, at Newport News, and Hygeia Hotel, at Old Point Comfort, are open all the year round. Boating, fishing, and tonic sea-air are always in order at these places. 61

Shenandoah Valley Ry.

(August 30, 1885.)

Southward.	(No. 3.)	(No. 1.)
New York.....	20 00	8 30 / 10 00
Philadelphia.....	23 20	11 55
Baltimore.....	....	15 35
Harrisburg.....	4 20	.....
Hagerstown, (Wn. Md).....	10 30	23 25
Shen. Junc. (B. & O.).....	11 30	24 12
Charlestown (Val. B. & O).....	11 40	24 24
Riverton (Va. Mid).....	12 58	1 26
Luray.....	14 22	2 28
Waynesboro Junc., C. &O	16 28	4 22
Natural Bridge (R. & A).....	18 28	6 11
Roanoke (N. & W.)..	20 00	7 45
Bristol, Tenn	1 45	13 17
Chattanooga, Tenn.....	10 00	22 10
Memphis, Tenn,.....	....	10 20
Atlanta, Ga,.....	16 40	5 30
New Orleans.....	19 45	19 30
Jacksonville, Fla,.....	21 00	.. ..

No. 3 has Pullman Sleeper New York to Savannah without change, via Harrisb'g and Roanoke, and Washington to New Orleans without change via B. & O. Railroad and Calera.

No. 1 has Pullman Sleeper Philadelphia via Harrisburg, and Roanoke to Chattanooga, Cleveland to New Orleans without change.

Northward.	(No. 2)	(No. 4.)
Roanoke (N. & W.).....	3 20	12 50
Natural Bridge (R. & A),.....	4 52	14 15
Loch Laird (R. & A.).....	5 21	14 42
Waynesboro Junc. (C. & O.)..	6 53	16 09
Luray...	9 05	18 23
Riverton (Va. Mid.)	10 12	19 36
Charlestown (Val. B. & O.)...11 17		20 47
Shen. Junc. (B. & O.).....	11 30	21 15
Hagerstown (Wn. Md.).....	12 30	22 10
Harrisburg, Pa..... ....15 30		1 05
Baltimore, (via B. & O.).....	17 15	21 40
Philadelphia, (via Balto.)	18 30	4 25
New York, (via Balto.)....	21 35	7 00

No. 4, the New York express, runs daily, with Pullman Buffet sleeper from Savannah to New York, via Harrisburg and Pa Ry. and New Orleans to Washington, via Calera, Roanoke and B. & O. R. R. 61

Virginia Midland Ry.

(August 30, 1885.)

Southward.	(No.50.)	(No.52.)	(No.54.)	(No.58)
Washington.....	11 15	22 40	17 10	.....
Alexandria.....	11 40	23 05	18 10	7 30
Manassas.....	12 38	23 55	19 10	8 27
Warrenton Junc..	13 08	24 22	20 00	9 01
Orange.....	14 30	1 38	21 28	10 40
Charlottesville....	15 30	2 35	22 35	11 40
"	15 50	2 40	.....	11 45
Lynchburg.....	18 00	5 00	.....	14 10
"	18 10	5 05	.....	.....
Franklin Junction.	19 47	6 32	....	.....
Danville.....	.20 52	7 35	....	.....

Northward.	(No.51.)	(No.53.)	(No.55)	(No.59)
Danville.....	10 46	23 31	.....	.....
Franklin Junc....	11 45	24 29	.....	.....
Lynchburg	13 15	1 50	.....	.....
" leave	13 25	1 55	.....	7 20
Charlottesville 15 55		3 55	.....	9 30
" leave	16 15	4 00	17 15	9 35
Orange.....	17 23	4 56	18 11	10 40
Warrenton Junc..	18 55	6 12	19 44	12 03
Manassas.....	19 25	6 37	20 20	12 33
" leave	19 45	6 39	20 21	12 38
Alexandria.....	20 50	7 30	21 15	13 27
Washington.....	21 15	8 00	.....	.....

All these trains run daily.—Nos. 50 and 51 are mail trains.—Nos. 52 and 53 are the Southern express.—Nos. 51 and 55 are the Louisville and Washington express of Ches. & Ohio Ry.—Nos. 50 51, 52 and 53 make through connections from Boston to Atlanta; they all have sleeping cars. No. 58 and 59 are mail trains to and from Baltimore and Lynchburg, daily except Sunday.

No. 56 is a train daily except Sunday, leaving Alexandria at 17.20 and runing to Manassas at 18 20, and No. 57 is a train, daily except Sunday, leaving Manassas at 7.18 and reaching Alexandria ar 8.20.

On Manassas Branch trains run daily except Sunday, No. 56 from Manassas at 18.20 to Shenandoah Junction at 20:53 and Strasburg at 21:15; and No. 57 from Strasburg at 4:20, to Shenandoah Junction at 4:49 and Manassas at 7:18.

On Warrenton Branch No. 22 leaves the Junction at 20.05 daily, and No. 20 at 6.20 daily except Sunday, for Warrenton in 25 minutes; and No. 19 leaves Warrenton daily, except Sunday, at 6:05, and No. 21 daily at 18:45, and reach the Junction at 5:10 and 18:20 respectively.

On Gordonsville Branch a train runs daily at 21:10 to Gordonsville at 22:10; and one daily from Gordonsville at 4:15 to Orange at 4:45.

On Franklin Branch a mixed train runs daily except Sunday, from Franklin Junction at 20:00 to Rocky Mount at 23:30; and from Rocky Mount at 6:15 to Franklin Junction at 9:35.

Richmond & Danville RR.

(Oct. 12, 1884.)

Southward.	No. 50.	No. 52.
Richmond,.....	13:30	2:00
Burkeville,.....	15:38	4:08
Danville,.....	19:41	7:56
Greensboro.....	21:35	9:30
Salisbury.....	23:58	11:10
Charlotte,.....	1:35	12.35
Northward.	**No. 51.**	**No. 53**
Charlotte.....	4:20	18:30
Salisbury,.....	6:10	19:57
Greensboro,.....	8:20	21:38
Danville,.....	10:08	23:09
Burkeville,.....	13:32	3:57
Richmond,.....	15:45	7:00

All these trains are daily and connect with north- and south-bound trains on other roads so as to make through connections in all directions.—No. 53 runs to Atlanta without change.—Buffet sleeping cars run on Nos. 50 and 51 between New York and Atlanta, via Washington and Danville, and also Raleigh and Asheville.—Pullman sleepers on Nos. 52 and 53 between Richmond and Danville, and Washington and Augusta (Ga.) and Washington and New Orleans, via Danville. 61.

Norfolk & Western RR.

(Mar. 23, 1885.)

Westward.	(No. 1.)	(No. 3.)
Norfolk.....	15 10	10 00
Suffolk.....	15 56	10 45
Petersburg	17 50	12 40 / 12 50
Burkeville.....		14 51
Lynchburg.....	5 45	17 25 / 17 45
Roanoke.....	8 00	20 18
Central....	9 34 / 10 55	21 59
Pocahontas	14 30	
Wytheville.....	10 53	23 23
Bristol.....	13 20	1 45

No 3 runs daily, with sleeper, without change, from Washington, D. C., via B. & O. RR., and Calera to New Orleans.

No. 1 runs daily, with sleeper, from Lynchburg to Bristol, and sleeper from New York (taken from S. V. RR., at Roanoke) without change, to Memphis, Tenn.

Nos. 13 and 3 connect at Petersburg for Richmond at 12 58 and 18 00. Leaving Richmond by R. & A., at 9 20, 15 30, and 21 45 connections are made at Lynchburg for westward.

Eastward	(No. 2.)	(No. 4)
Bristol..... .....17 15		7 10
Wytheville..... .....20 05		9 52
Pocahontas..... .....16 15		
Central.....	21 28	11 15
Roanoke..	23 00 / 24 12	12 40 / 13 10
Lynchburg.....	1 15 / 8 00	15 10
Burkeville... .....10 31		
Petersburg.	12 25 / 12 40	7 10
Suffolk.....	14 30	9 15
Norfolk.....	14 20	10 10

No. 2 runs daily, connecting at Petersburg for Richmond at 12 58, and at Norfolk with steamers for Baltimore and New York. Nos. 2 and 4 connect at Roanoke with Shenandoah Valley Ry., with Pullman sleepers to New York. At Lynchburg they connect with Va. Midland for Washington etc. at 2 45 and 13 55; and with R. & A. at 3 10, 14 00, and 21 40 for Richmond. 61

☞ **Errata in No. 69.**—The pages of this issue are wrong and the error was discovered too late to correct it. Please change the paging as follows and then read the pages as corrected, turning backward and forward in reading:

The second page of this issue, now paged 125, should be page 128 and follow 127.

Page 125 that follows 127, as printed, is properly paged, but it ought to be the second page of this issue in place of the wrong 125 that is now the second page.

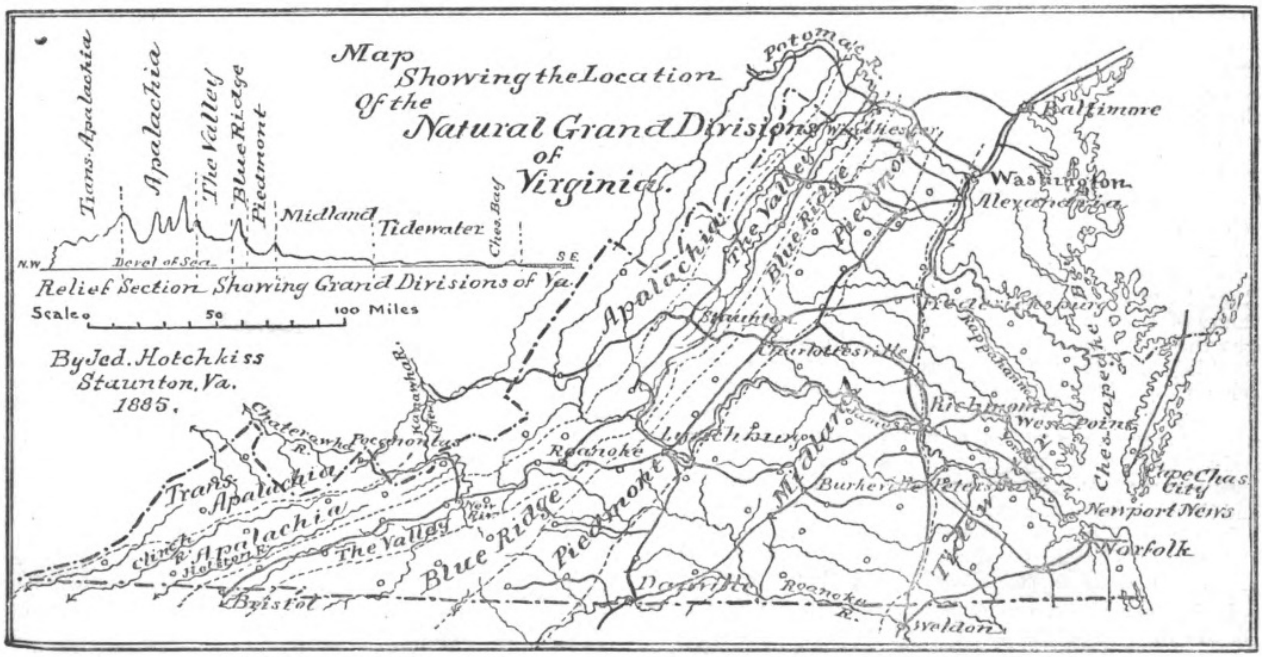
Serial No. 69. Vol. VI.—No. 9.

Staunton, Va., September 1885.

Jed. Hotchkiss, Editor.

The Natural Grand Divisions of Virginia.

The Natural Grand Divisions of Virginia are often mentioned in this journal, and in treating in detail of the statistics or resources of this state we always group or classify them by these grand divisions, generally by the counties in each of these divisions; having opportunity to present a map, of Virginia showing the location of these grand divisions—a map prepared by the editor for the Handbook of Virginia for 1885, issued by the Department of Agriculture, for the use of which we are indebted to Commissioner Randolph Harrison—we avail ourselves of it to give the following brief history of the establishing and



naming of these grand divisions and of the extent and general character of each. This will be of present interest in connection with the article in this issue on the Value of the Real Estate of Virginia by counties and cities grouped in these natural grand divisions, viz: 1. Tidewater, 2. Midland, 3. Piedmont, 4. Blue Ridge, 5. The Valley, 6. Apalachia, and 7. Trans-Apalachia.

These grand divisions, as above named, are those originally recognized and published in 1876 by Jed. Hotchkiss, the writer, in the Summary of Virginia, that he wrote for the State Board of Immigration, except the 7th, which he subsequently added in his Geography of Virginia. These sub-divisions of the state are now generally accepted and used as the correct ones, being founded on its readily recognized natural and permanent features.

Some of the names thus given to these grand divisions have been in use ever since writers have described the territory embraced in the Virginias, but in a loose and undefined way

re maped and described in the Summary above

n his "Notes on Virginia," 1781–7, says of the counties of the state, as then constituted: "They are 74 in number, of very unequal size and population. Of these 35 are on the tide waters, or in that parallel; 23 are in the midlands, between the tide waters and the Blue ridge of mountains; 8 between the Blue ridge and Alleghaney; and 8 westward of the Alleghaney."—This is the only use he made of these descriptive terms.

Martin's "Gazetteer of Virginia," published in 1835, a volume full of valuable information, divided Virginia into four sections: 1. A sea and alluvial section; 2. A middle or hilly section; 3. A central or mountain section; and 4. A western or Ohio section. Subsequent writers up to 1876 either followed Martin or described the state as Eastern and Western Virginia, sometimes subdividing the former into Northside and Southside of the James, and the latter into The Valley and the Alleghany regions.

When Hotchkiss' Summary appeared in 1876 with its colored map showing *six* natural grand divisions and its text descriptive of each of these and their resources, its nomenclature and limitations were at once adopted by all well-informed persons. The New American Cyclopedia, just then appearing in new edition, presented them in full; the special Geographies of Virginia by Monteith, Lafferty, and Maury, that appeared in 1878, all adopted and followed them; so also in 1878 did Hotchkiss' Geography of Virginia, except in this particular that he then for the first time recognized in his description of the state *Trans-Apalachia as a 7th grand division* of Virginia, realizing by so doing an intimation in his Summary that such a subdivision should be recognized for the portion of the state embraced in the Great Carboniferous plateau.—So much for the history of the grand divisions.

The Natural Grand Divisions of Virginia, taken in the order of their succession from the Atlantic westward, with the number of counties in each and the approximate area, in square miles, of each division are:

The increase in values in the "truck"-growing counties of Tidewater was generally remarkably large, as will appear by reference to the figures for Accomac and Northampton of the Eastern Shore, Norfolk and Princess-Anne of the Norfolk peninsula, and Nansemond, Isle-of-Wight, Southampton, Sussex and Surry of the Southside. Elizabeth-City and Warwick show the effects of the construction of the Chesapeake & Ohio Railway. Henrico shared in the prosperity of Richmond, and so did the counties around Norfolk and Portsmouth share in the prosperity of those cities. We cannot account for the increase in Westmoreland, one of over 100 per cent, from any data at hand.

In Midland the counties near Washington city and those near Danville appear to have prospered most. The gain in all the counties, exclusive of the cities, was nearly 12 per cent. The counties of Cumberland, Powhatan, Appomattox, Prince Edward, Lunenburg, Brunswick, and Charlotte, all decreased in values. In fact most of the tobacco-growing counties show decreased valuations. All the Midland cities show largely increased valuations; Danville more than doubled its values in the half decade, and Alexandria increased over 25 per cent; the cities of Midland, as a class, increased their values about 60 per cent.

The Piedmont county valuations increased over 11 per cent. There was a gain in all the counties except Fauquier, Rappahannock and Madison. Franklin, Henry and Patrick show the influence of railways in increasing the value of real estate. Lynchburg increased in valuation over 25 per cent.

Of the Blue Ridge counties Grayson, the remote one, decreased its values, while Floyd and Carroll increased theirs.

The Valley counties, exclusive of the cities, increased their values about 8 per cent, all but five, Clarke, Botetourt, Roanoke, Montgomery, and Smyth, sharing in this increase. Roanoke probably owes its decrease to a separation of the values of Roanoke city from those of the county in 1885; why the other counties decreased we do not understand. Rockingham increased its values $1,324,087, or over 23 per cent; Rockbridge increased its values $1,012,249, or over 33 per cent; the former the result of farm improvements by its sturdy German descended population and a new railway, and the latter from three new railways and a new large iron blast-furnace. Winchester shows a gain of over 20 per cent and Staunton over 9, while the city of Roanoke—one not in existence in 1880—appears with a valuation of $1,481,632 in 1885 and bids fair to be the largest Valley city in 1890. Railways and manufactures have made Roanoke what it is.

In Apalachia all the counties except Highland, Craig and Bland—three counties remote from railways—show handsome gains. Alleghany, with its gain of nearly 56 per cent, shows the effects of the development of its iron ore deposits and iron making, and Tazewell, with its gain of over 27 per cent, those of the construction of a railway and the development of its coal beds.

In Trans-Apalachia Buchanan, a county remote from railways, decreased in value, while Dickenson and Wise, stimulated by the prospect of a railway in the near future and the development of their iron and coal resources, made handsome gains, especially Wise county which increased nearly 90 per cent.

The three leading counties in the state in county valuation alone are: 1st Loudoun, 2nd Augusta, and 3d Rockingham; the three aggregating $25,130,309, or nearly one-tenth of the entire valuation, county and city, of the state.

The average county valuations (omiting city valuations) per square mile and per acre, in each grand division and in the whole state, in 1885, are given in the following table, taking the areas given on page 125 as a basis of calculation.

	Per square mile.	*Per acre.*
1. Tidewater . . .	$3,650	$5.70
2. Midland	3,311	5.17
3. Piedmont . . .	6,289	9.83
4. Blue Ridge . .	1,571	2.46
5. The Valley . .	6,431	10.50
6. Apalachia . . .	2,048	3.20
7. Trans-Apalachia	588	0.02
Virginia	$5,896	$9.21

Iron Market Report.—E. L. Harper & Co., of Cincinnati, under date of Sept. 19, 1885, make the following special report to *The Virginias:*

Since our last writing there has been considerable animation in the market and the furnaces have booked liberal and numerous orders. The general demand the past few days has abated somewhat, and the market is a shade easier, though prices are well sustained. The noteworthy features of the trade, at this writing, are the facts that the producers of steel rails are full of orders for all they can supply during the balance of the year, and that the car shops are more active. Virginia irons continue to command the top of the market for the several qualities and grades. We quote as prices current, cash, f. o. b., wharf here:

Virginia Coke, foundry, No. 1	$15.50	to $16.50
" " " " 2	14.50	" 15.50
" " " " 3	13.50	" 14.50
" " gray forge	13.00	" 14 00
" " mottled	12.50	" 13.50
" Charcoal foundry, No. 1	$21.	
" " " " 2	20.	
" " " " 3	19.	

The Dismal Swamp Canal, the one connecting the waters of Chesapeake bay, Virginia, with those of Albemarle sound, North Carolina, is to be deepened and its locks widened to admit wessels of a larger tonnage, says the Norfolk News. This canal is one of the kind that can always successfully compete with railways, as it has but few locks and but little rise and fall.

The Navigation of Staunton river, Va., from Randolph station of the Richmond & Danville RR. up to Coles Ferry, as we learn from the "Campbell County Record," will begin the 1st of next December, when a stern-wheel steamer 12'x90', will commence regular trips. The general government has improved this river between the points named by cleaning out the sand bars and deepening the channel and so made it navigable the year round. It is probable the river will be improved 10 miles further to Brookneal and perhaps beyond that. This will give improved market facilities to a fertile region, one rich in agricultural, forestal and mineral wealth.

The Apalachia Normal school has been opened at Doe Hill, Highland county, Va., by J. L. Sheppe. There has been a normal school at Doe Hill for some time, but now that it has assumed a new and appropriate name, one having a good local flavor, we feel like thus calling attention to it.

Coke as a locomotive fuel is now being tested on two locomotives of the N. Y. Lake Erie & Western RR. that take express passenger trains over the Eastern division of that road.

The Norfolk News of Sept. 1 reports that the day before this railway received 1,500,000 pounds of freight from New York, by the Old Dominion SS. line, and 1,000,000 from Boston, by the Merchants & Miners Transportation Co., for shipment to the southwest.

The Lynchburg Virginian reports that on the 1st of next May the broad gauge of the Norfolk & Western will be changed to the standard gauge by laying another rail from Norfolk to Bristol, and that they will leave the third rail until they can get all the engines from the shops, runing trains on both the narrow and broad guages. They have ordered 9 new engines from the Roanoke Machine Works and 10 from the Baldwin works. The work of changing all the cars will be done in Roanoke. It is said that there are 110 old style engines that will be rendered comparatively worthless by the change.

This change of guage will doubtless be made, but we question the retention of the third rail and the runing of trains on both gauges. The present guage of the Norfolk & Western is 5′, the standard gauge as now used by most railways is 4′ 9″, not 4′ 8.5″ as formerly, so there would but 3″ between the rails, a space that will hardly admit the laying of any ordinary rail.

The Petersburg, Va., Index-Appeal says: For the first time within the memory of the "oldest inhabitant," the employees of a railroad in this city have been paid off in gold coin. The pay car of the Norfolk & Western RR., which has just closed its welcome visit here, brought with it many thousands of dollars in gold coin with which the railroad's operatives were paid for their services from the date of the last payment.

The Value of Real Estate in Virginia.

In the "Richmond Dispatch," of Sept. 13, 1885, is a table, compiled from the official returns filed in the office of the First Auditor, showing the value of the real estate in Virginia, by counties and cities, by the Reassessment of 1880, the Assessment of 1884, and the Reassessment of 1885. The Dispatch presents these figures by counties and cities arranged alphabetically; we have re-arranged them for *The Virginias*, grouping the counties and cities by Grand Divisions, as originally done in Hotchkiss' Summary of Virginia, 1876, and as now generally adopted.

1. Tidewater Counties and Cities.

Counties.	*1880.*	*1884.*	*1885.*
1. King-George	823,509	814,582	823,516
2. Westmoreland	339,459	844,804	889,778
3. Richmond	583,814	590,355	598,329
4. Northumberland	848,270	847,044	864,962
5. Lancaster	626,761	633,714	624,714
6. Essex	746,208	754,464	819,633
7. Middlesex	457,802	479,603	500,987
8. King-and-Queen	819,664	817,234	847,638
9. Mathews	566,990	580,580	597,672
10. Gloucester	1,082,097	1,084,656	1,032,294
11. Caroline	1,698,264	1,719,362	1,754,657
12. King-William	1,218,303	1,163,698	1,654,635
13. Hanover	1,777,962	1,779,641	1,855,603
14. New-Kent	344,288	345,284	410,858
15. James-City	378,440	337,200	381,646
16. York	589,371	602,559	561,398
17. Warwick	305,027	1,079,827	512,840
18. Elizabeth-City	947,736	982,180	1,072,456
19. Henrico	4,483,917	4,482,017	4,713,435
20. Charles-City	596,907	600,995	661,979
21. Prince-George	950,649	913,611	961,415
22. Surry	739,572	756,329	859,006
23. Sussex	848,496	1,134,028	1,287,827
24. Southampton	1,615,904	1,681,456	1,709,195
25. Isle-of-Wight	1,172,607	1,223,581	1,311,946
26. Nansemond	1,591,741	1,721,869	1,816,745
27. Norfolk	3,259,046	3,592,150	5,063,601
28. Princess-Anne	1,134,552	1,201,708	1,226,462
29. Accomac	2,998,675	3,140,302	3,239,109
30. Northampton	872,748	875,528	945,385
Totals	34,411,780	36,810,361	39,599,721
Cities.			
1. Norfolk	9,593,751	10,003,698	12,307,130
2. Portsmouth	2,643,085	2,789,095	3,775,600
3. Williamsburg	143,375	150,723	177,173
4. Petersburg	5,921,845	5,319,987	5,658,785
5. Richmond	28,638,281	28,886,181	34,502,903
Totals	46,940,337	47,149,684	56,421,591
County values	34,411,780	36,810,361	39,599,721
City values	46,940,337	47,149,684	56,421,591
Aggregate	$81,352,117	$83,960,045	$96,029,312

2. Midland Counties and Cities.

Counties.	*1880.*	*1884.*	*1885.*
1. Alexandria	791,362	772,989	940,423
2. Fairfax	2,706,637	3,669,201	3,837,276
3. Prince-William	2,034,454	2,028,092	3,027,732
4. Stafford	894,289	863,935	949,902
5. Spotsylvania	1,104,524	1,123,887	1,191,172
6. Louisa	1,542,102	1,751,074	1,813,388
7. Fluvanna	844,000	853,228	881,544
8. Goochland	1,342,799	1,345,167	1,368,477
9. Buckingham	1,421,940	1,433,247	1,362,479
10. Cumberland	1,030,884	1,039,631	1,023,936
11. Powhatan	1,059,505	1,045,284	992,545
12. Chesterfield	2,983,013	3,205,952	3,100,551
13. Appomattox	868,818	868,121	840,716
14. Prince-Edward	1,912,255	1,894,365	1,824,895
15. Amelia	906,881	907,975	908,079
16. Dinwiddie	1,075,963	1,063,104	1,120,677
17. Nottoway	780,764	799,204	817,877
18. Lunenburg	687,671	696,284	687,297
19. Brunswick	937,278	953,996	993,391
20. Greensville	586,904	597,527	681,825
21. Campbell	2,095,821	2,175,615	2,280,780
22. Charlotte	1,604,914	1,606,336	1,574,138
23. Pittsylvania	3,405,625	2,769,256	4,020,565
24. Halifax	2,832,207	2,907,637	3,496,909
25. Mecklenburg	1,505,492	1,414,763	1,548,614
Totals	36,956,102	37,785,870	41,285,188
Cities.			
1. Alexandria	2,907,570	2,934,753	3,645,355
2. Fredericksburg	1,078,565	1,091,275	1,261,344
3. Manchester	1,066,673	1,399,744	1,938,774
4. Danville	2,718,620	3,187,295	5,511,097
5. North Danville	277,380	365,035	494,909
Totals	8,048,808	8,978,102	12,851,479
County values	36,956,102	37,785,870	41,285,188
City values	8,048,808	8,978,102	12,851,479
Aggregate	$45,004,910	$46,763,972	$54,136,667

3. Piedmont Counties and Cities.

Counties.	1880.	1884.	1885.
1. Loudoun	8,943,545	7,239,787	9,414,484
2. Fauquier	7,864,318	7,408,061	7,736,722
3. Culpeper	2,168,476	2,180,762	2,365,200
4. Rappahannock	1,714,195	1,721,987	1,658,618
5. Madison	1,677,994	1,682,358	1,668,625
6. Greene	461,951	464,802	498,194
7. Orange	1,900,995	1,788,066	1,964,673
8. Albemarle	4,799,191	4,639,992	5,371,704
9. Nelson	1,868,920	1,882,752	1,907,586
10. Amherst	938,082	1,889,626	2,024,236
11. Bedford	2,236,206	3,227,830	3,217,316
12. Franklin	1,318,103	1,822,344	1,812,506
13. Henry	1,046,104	1,127,915	1,389,956
14. Patrick	787,253	819,063	982,401
Totals	37,725,333	37,895,345	42,012,221
Cities.			
1. Lynchburg	5,065,385	5,432,636	6,388,171
Aggregate	$42,790,718	$43,327,981	$48,400,392

4. Blue Ridge Counties.

Counties.	1880.	1884.	1885.
1. Floyd	823,888	833,242	830,031
2. Carroll	530,018	551,742	539,297
3. Grayson	593,380	594,827	562,409
Totals	$1,947,286	$1,979,811	$1,931,737

5. The Valley Counties and Cities.

Counties.	1880.	1884.	1885.
1. Frederick	3,294,255	3,454,409	3,684,147
2. Clarke	2,618,471	2,842,021	2,503,979
3. Warren	1,176,183	1,440,603	1,374,141
4. Shenandoah	3,521,114	3,575,899	3,558,516
5. Page	1,669,304	1,748,642	1,705,964
6. Rockingham	5,678,120	9,880,751	7,002,207
7. Augusta	8,114,827	8,165,145	8,713,618
8. Rockbridge	3,038,464	3,495,531	4,050,713
9. Botetourt	2,249,287	2,308,704	2,247,457
10. Roanoke	2,733,971	2,570,254	2,505,096
11. Montgomery	2,020,494	2,020,372	1,927,188
12. Pulaski	1,720,255	2,047,340	1,868,122
13. Wythe	2,634,326	2,678,945	3,061,005
14. Smyth	1,602,279	1,467,236	1,163,287
15. Washington	2,8.6,696	3,219,580	3,190,195
Totals	44,958,046	50,915,432	48,555,635
Cities.			
1. Winchester	1,392,425	1,617,595	1,678,514
2. Staunton	1,591,035	1,674,859	1,734,025
3. Roanoke		1,171,866	1,481,632
Totals	2,983,460	4,464,320	4,894,171
Counties	44,958,046	50,915,432	48,555,635
Cities	2,983,460	4,464,320	4,894,171
Aggregate	$47,941,506	$55,379,752	$53,449,806

6. Apalachia Counties.

Counties.	1880.	1884.	1885.
1. Highland	794,775	808,276	785,785
2. Bath	736,566	783,484	839,895
3. Alleghany	925,098	961,735	1,440,672
4. Craig	569,405	564,387	568,301
5. Giles	958,949	970,858	991,570
6. Bland	454,299	449,603	446,126
7. Tazewell	1,010,840	1,128,277	1,284,574
8. Russell	969,995	1,005,616	993,428
9. Scott	690,515	714,087	781,350
10. Lee	1,011,615	901,030	1,076,987
Totals	$8,122,057	$8,287,353	$9,208,688

7. Trans-Apalachia Counties.

Counties.	1880.	1884.	1885.
1. Buchanan	340,965	367,135	276 892
2. Dickenson	95,002	99,121	112,618
3. Wise	166,709	286,690	315,788
Totals	$602,676	$752,946	$705,298

Recapitulation of values by Grand Divisions.

	1880.	1884.	1885.
1. Tidewater	$81,352,117	$83,960,045	$96,029,312
2. Midland	45,004,910	46,763,972	54,136,667
3. Piedmont	42,790,718	43,327,981	48,400,392
4. Blue Ridge	1,947,286	1,979,811	1,931,737
5. The Valley	47,941,506	55,379,752	53,449,806
6. Apalachia	8,122,057	8,287,353	9,208,688
7. Trans-Apalachia	602,676	752,946	705,298
Totals	$227,761,270	$240,451,860	$263,861,900

Note.—The footings of the Dispatch are: for 1880, $227,761,264; for 1884, $237,468,659; and for 1885, $263,864,389. These are *not* exactly the totals of the separate valuations of the counties as given in the table published by the Dispatch, and we have as yet no means of correcting them; so we must, for present use, assume that our footings are correct. We have omited the cents of the table and added one to the dollars where they were in any case over 50.

Taking the reassessment values of 1880 and of 1885 as the true ones, we find that in the five years from 1880 to 1885 the increase in the value of real estate in Virginia as a whole was $36,100,630, or nearly 16 per cent, notwithstanding the fact that most values have been decreasing during these five years. The only grand division that shows a decrease in valuation was that of the Blue Ridge, a region that has not yet been reached by railways. The gain in values in Tidewater was over 18 per cent; in Midland over 20 per cent; in Piedmont nearly 13 per cent; in the Valley over 11 per cent; in Apalachia over 13 per cent; and in Trans-Apalachia over 17 per cent. The decrease in values in the Blue Ridge division was less than one per cent.

In Tidewater the gain in the values of the counties, exclusive of the cities, was over 15 per cent; while the gain in city values was about 21 per cent; the latter mainly due, as the table shows, to the great increase in the value of real estate in Norfolk, Portsmouth and Richmond. In some of the Tidewater counties values have decreased or remained nearly stationary, and the same is true of the city of Petersburg. These are chiefly the counties remote from railways.

Grand Divisions.	*No. of counties.*	*Area.*
1. Tidewater Virginia	30	10,850
2. Midland Virginia	25	12,470
3. Piedmont Virginia	14	6,680
4. Blue Ridge Virginia	3	1,230
5. The Valley of Virginia	15	7,550
6. Apalachia Virginia	10	4,520
7. Trans-Apalachia Virginia	3	1,200
Totals	100	44,500

What counties and cities are embraced in each of the above grand divisions may be learned by consulting the tables of valuations on pages 126 and 127. Some of these counties are partly in two of the grand divisions,—but they are classed where the larger portion of their area belongs.

These seven grand divisions are seven belts of country, shown between doted lines on the map, that extend, except one, entirely across the state in a general northeast-southwest direction. They differ from each other in elevation, in relief-features and geological structure; consequently they differ in climate, soils, adaptations, etc. In a general way each of these natural grand divisions is a great step in a grand westwardly ascending stairway of plains, escarpments, mountain chains and valleys.

1. *Tidewater Virginia*, about one-fourth of the territory of the state, is a north-and-south extending belt reaching from the Atlantic westward to the Midland escarpment at the head of tide. Its eastern boundary in this state is the Virginian sea of the Atlantic, Chesapeake bay and the Potomac river; its western corresponds, very nearly, to the line of railway that crosses the state from Washington by way of Alexandria and Richmond to Weldon.

This is Virginia's part of the great Tertiary marine plain of the Eastern United States carved into numerous peninsulas, both large and small, separated from each other by Chesapeake bay and by its tidal rivers. These peninsulas are composed of low, flat water-shed ridges from which the land descends by slopes or terraces and bottoms, swamps or salt-marshes to the surrounding waters.

The eastern part of Tidewater, the region of north-and-south trending peninsulas, is a nearly level country the general surface of which is not more than 12 feet above the sea-level; it is especially adapted to market gardening and fishing by its light, warm soils and its wonderfully indented coast and many islands.

The western is the larger part of Tidewater; this is the region of northwest-southeast trending peninsulas; its surface is much broken and rises from sea-level to elevations of 100 feet, and in places to even 300; its peninsulas are everywhere deeply trenched by short, secondary tidal streams.

2. *Midland Vrginia*, nearly three tenths of the state, is the triangular region extending from the Tidewater escarpment to the broken Coast range of mountains and hills and the great turns of the rivers that separate it from Piedmont. It is part of the great undulating, higher plain of the Atlantic slope, one that rises from an elevation of from 100 to 200 feet along the Midland escarpment on the east to from 400 to 800 on the west. The surface of this grand division, while plain-like and undulating as a whole, is much broken by deeply eroded stream-valleys. This is a region of metamorphic or granitic rocks inclined at a high angle and striking northeast-southwest. In it are several large island-like areas of Jura-trias rocks.

3. *Piedmont Virginia*, a little over one-seventh of the state, is a belt of country from 20 to 30 miles wide and varying in altitude from 300 to 700 feet in the northeast to from 500 to 1000 feet in the southwest. It is a foot-of-mountain region extending from and embracing the Coast range mountains westward to the Blue Ridge. Its surface is greatly diversified, embracing high mountains and low valleys and all intermediate gradations of relief forms. Its underlying rocks are the rich soil producing ones of the Archæan age. Few sections surpass Piedmont Virginia in beauty and fertility.

4. *Blue Ridge Virginia* as a natural grand division is the great mountain chain of that name that, with its plateaus, extends entirely across the state for over 300 miles and embraces about one-eighteenth of its surface, varying in altitude from 240 feet in the Potomac pass to 5,700 in Balsam mountain. As a political grand division it is only the three counties that occupy its southwestern plateau, an undulating and fertile region that is from 3,000 to 4,000 feet above the sea; like Piedmont its foundation is the rich soil making old rocks; it is a fertile and attractive region.

The Valley of Virginia, about one ninth of the state, is the belt of plateau-like or mountain valley country—part of the great Apalachian valley of the Atlantic Highlands—that extends for over 300 miles in a northeast-southwest direction between the Blue Ridge on the east and the Apalachian ranges on the west; it is mainly a Cambrian limestone valley averaging 16 miles in breath. Its surface, rolling as a whole, is fluted into valleys parallel to its trend that in turn are cut by cross drainage valleys; it varies in altitude from 500 to 2,500 feet, averaging about 1,000, causing it to be classed as a plateau. As a whole it is a blue-grass region of great natural fertility and beauty. The counties classified as Valley ones necessarily embrace portions of the natural Blue Ridge grand division on the east and of Apalachia on the west.

6. *Apalachia*, over one-sixth of the state, is Virginia's portion of the wide belt of nearly parallel mountains and narrow valleys lying west of The Great Valley and between it and the Great Carboniferous escarpment; its valleys range in altitude from 800 to 2,000 feet and its mountain ranges from near 1,500 to over 4,000;—Mount Rogers, in Augusta county, rises to 4,457. This region is underlaid by numerous formations of Cambrian, Silurian, Devonian and Lower Carboniferous ages; so it has a great variety of soils and abounds in mineral wealth; its landscapes are varied and picturesque.

7. *Trans-Apalachia*, about one-forty-fourth of the state, is Virginia's portion of the Great Carboniferous plateau, the great Apalachian or Basin of the Ohio coal-field; it varies in altitude from 1,500 to 3,000 feet and is a land of deeply eroded valleys and high ridges.

The Arminius Copper Mines Co., near Tolersville station of Chesapeake & Ohio Ry., Louisa county, Va., of which Mr. W. H. Adams is general manager and mining engineer, now employs 300 men in its extensive mining of sulphuret ores of copper and iron which are mainly used in the manufacture of sulphuric acid for which there is such a large and constantly increasing demand by the great army of manufacturers of fertilizers. We note that a "sulphur" process for making paper pulp is now coming into use with advantages that will secure it the first place; this will further increase the demand for sulphur.

The Association of official Agricultural Chemists at its late meeting in Washington, D.C. chose C.W. Dabney of Raleigh, N. C., formerly of Virginia, its vice-president, and W. J. Gascoyne, chemist of the Va. department of Agriculture, a member of its executive committee and also of the committee on potash.

Coal and Coke.

The Cabin Creek Coal Co. Lands.

By D. T. Ansted, F. R. S.

Note.—In Nov. 1873, Prof. D. T. Ansted of England, Consulting Mining Engineer, Fellow of the Royal Society, and one of the most widely known of English geologists, paid a second visit to the Great Kanawha coal-field during which he examined the lands of the Cabin Creek Coal Co. and made the following report, which, coming from such a source, has in it enough of general interest to warrant its publication in *The Virginias.*—Ed.

This vast tract, of more than *twenty-seven square miles*, occupies a part of the lofty plateau between Cabin creek, an important tributary to the Great Kanawha, and Coal river, one of the largest affluents of the same river, runing parallel to it for a long distance and entering it at Coalsmouth (or St. Albans) 15 miles below Charleston and 42 miles above the junction of the Great Kanawha with the Ohio. The whole tract is heavily timbered with valuable trees almost from the bottoms of the valleys.

The middle of this estate, rising nearly 2,300 feet above the level of the sea, is the dividing ridge between Cabin creek to the northeast and Coal river to the southwest,—these are two of the most important tributaries of the Kanawha from the south.

These coal lands are partly accessible from Cabin creek, where there is a continuous frontage of about five miles, and partly from Coal river, where the frontage is about two miles. The Coal river frontage is about 19 miles higher up the river than the town of Peytona, where are the well known cannel coal mines of the Peytona Company, who send their coal to the Chesapeake & Ohio Railway by boats, Coal river being made navigable to that point. The Kanawha is navigable for ten months of the year from the same point. Both Coal river valley and Cabin creek valley are sufficiently open and unincumbered into and beyond the limlts of this property to offer no serious impediments to the construction of a railway, with very moderate and equal natural gradients throughout and at very small cost. The nearest point of the estate is 10½ miles from the Chesapeake & Ohio Railway at the mouth of Cabin creek, measuring along the windings of the creek. The direct distance is 7½ miles. The estate is situated partly in Kanawha and partly in Boone county.

The geological conditions of the country between the Great Kanawha and Coal rivers, and especially between Cabin creek and Coal river are known with absolute certainty and are proved by numerous natural sections.—Coal crops out in almost all the forks of Cabin creek and the coal lands worked by the Peytona Company approach these lands within a few miles. This part of the coal-field presents the beds in an almost horizontal position and almost the whole of the middle series of the measures, including the best seams, certainly exists in almost every part, above the water-line.

The usual slight northwesterly dip of the beds in the north of these lands is believed to be slightly turned in the neighborhood of Coal river, giving drainage from the beds both ways towards the rivers from the dividing ridge. The amount of inclination varies and is always small.

Some of the *upper* coals and perhaps an ironstone band may also be expected. In the accompanying *section* only the principal seams are refered to, but these no doubt contain a total of not less than 50 feet of the middle part of the series in beds of convenient thickness. The seams shown in the section are those refered to in the subjoined list, viz.

d—Splint—(at mouth of Slaughter cr.)—valuable . . . . . 6′ to 8′

g—Mixed splint, cannel and bituminous—(Gauley, Paint cr. &c.) . . . . . 7′

h—Excelent seam—(Paint cr.—Alden,&c.) . . 6′

i—Coalburg bituminous–(Gauley–Kanawha) . 3′

k—Paint Creek seam . . . . . 3′

m—Splint and cannel . . . . . 3′ to 6′

o—The Cannelton, Paint Cr. and Armstrong cr., 12 ft. cannel coal seam, (perhaps with bituminous, including partings) . . . . 10′ to 12′

q—Bituminous—(Wickham) . . . . . 3′½

n—Splint at various places—widely known . . . 7′ to 10′

u—Coalburg Seam { Cannel, Splint, Bituminous, } . . . . 8′ to 11′

v—Bituminous seam at Paint creek . . . . . 4′

Cannel on Armstrong, mixed at Gauley—important.

The section is taken across the widest part of the estate on the probable line of dip, and most of the coals are here shown below the level of the forks intersected; where these beds would be attacked near Cabin creek to the north, and also on Coal river in the south, the lower seams would be perfectly accessible and above the water level.

There would be no difficulty in opening the coal on this property from Alum Lick hollow, where it fronts on Cabin creek, near the nearest point to the Great Kanawha. There is here ample room for buildings, and for all required for a large establishment. There are good seams at this point near the creek and large quantities of coal might be mined and sold from lower seams, while the requisite works for opening the upper seams were in progress. It is certain that the properties lower down on Cabin creek must before long provide a railroad to convey their coal to the rail and river, and the extension of such a line for three miles, would bring it within these lands. The increased cost of conveyance for coals opened at a distance from the main line of railway and the Kanawha, would be counter-balanced by the greater cheapness in working the valuable seams nearer the water level. Preparation is now being made for constructing the line up the creek, and the way leaves are obtained from the various land owners. The line of this road is indicated on the map, subjoined to this report.

In reference to the coals on this property, I may remark that my report on the coal lands of the "Wilson" survey, prepared in 1853, refers specially to the "Maomi" estate, now worked by the Coalburg Company, which adjoins, for nearly four miles, these lands. The following extracts from that report have been fully confirmed by subsequent investigation, and may now be repeated with confidence:

"One of the most important seams at Paint creek, I found to be a bed of very fine, hard, bituminous coal, locally known as a splint coal, measuring ten feet ten inches in total thickness." "The seam has been cut at the same level on the Wacomah property." "This fine bed of coal offers everywhere the greatest possible facilities for extraction." "Its floor is a pale grit and its roof a black shale, covered with a very hard band of grit." "The intervening space is also partly occupied by three other seams of coal, the uppermost of which is one of the bands of cannel extensively worked at Stockton mine, on the other side of the Kanawha at no great distance." "Below the thick seam, as exhibited in a ravine on the Wacomah side, are eight bands of coal distinctly marked, the seventh of which, commencing from the creek, also appears to be a cannel." "The Maomi estate contains the same beds as those already described in speaking of the Wacomah, but the beds are rather nearer the water, and

therefore more easily and conveniently worked." "There is no difference whatever in the general character either of the coals or associated beds. One of the beds seen and partly opened on Cabin creek in this estate is a distinct and compact cannel of about 2 feet 6 inches thick at its crop, covered by a bituminous coal, having a thickness of one foot to 18 inches." "This bed of cannel is thus identified with one of the seams proved in the Wacomah property."

As an investment, this property offers special advantages, for whilst a sufficient area is adapted for immediate opening, its vast extent enables the owners to reserve large tracts whose value will be steadily and rapidly increasing as the district becomes developed. The intersection of numerous creeks admits of a sub-division of the whole survey into a number of independent properties, each sufficiently large to be worked on its own account and on a large scale. The quality of the Great Kanawha coals is too well known and has been too often described to require special remark. All the varieties are good and perfectly marketable.

But there is another mode in which this land, so valuable for its minerals, might be immediately rendered available and at the same time be prepared for future operations. There are on the plateau, intersected by the valleys, many thousand acres of good land, admirably adapted for cultivation. These lands are nowhere far from settled habitations, and would supply everything required for a colony of emigrants. The climate is delightful for the greater part of the year, and the winters moderate and short. There is excelent water and deep soil, well adapted to the growth of wheat, Indian corn, potatoes and other crops. The pastures where the trees have been removed are excelent, and the cattle are left to graze far into the winter. By offering allotments of moderate extent on easy terms, reserving the minerals, population could be secured and the whole district improved. The reserved allotments would soon increase in value. The cost of placing emigrants on these lands, from Liverpool, would not exceed $45 per head.

The Market for West Virginia Coke, that made from the semi-bituminous coals of the New River and Flat-top coal fields, is constantly enlarging as the especial merits of that fuel—its high carbon, low ash, low sulphur and phosphorus—become better known and their money value to the consumer understood and appreciated. For the superiority of this coke over any other in the country for all metalurgical purposes we have long contended by calling attention to the results of its use in Virginia, West Virginia and Ohio blast-furnaces, foundries, etc.

Mr. H. Tracy, representing George H. Hull & Co., the well-known metal and fuel dealers of Louisville, Ky., during a recent visit to the office of *The Virginias*, informed us that they could not obtain New River coke enough to supply the demands of their customers at prices very considerably above those at which "standard" Connellsville coke could be bought, and that he had been visiting the Nuttall, Fire Creek, Echo, Stone-cliff and Quinnimont New River collieries on the Chesapeake & Ohio Ry., for which G. W. Hull & Co. are the Western agents, to urge them to increase their product of coke to enable them to meet this increased and steadily increasing demand.

Permanent agencies for the sale of New River coke have been established in Cincinnati, Columbus, Evansville, Indianapolis, Detroit, Chicago and St. Louis, while G. W. Hull & Co. are not only supplying Louisville but extending their sales to Nashville, Memphis, and other points in the southwest, where these cokes command a dollar and over a ton more than do the inferior Alabama cokes. The St. Louis agency is supplying smelting works in Colorado and other distant points in the far West, and the Chicago agency makes sales in Milwaukee and to northwestern points. Some central Ohio blast-furnaces will use this coke as soon as a steady supply of it can be assured.

The New River region needs a great many more coke ovens, and capital invested there now in coke making will meet very handsome returns even at present prices. The time has come when coke making should be there made a special industry, so that not only an abundant supply of coke can be had to meet all demands for it, but so that coke of a uniform grade and of a high standard of excelence can always be had, which can only be the case where coke making is followed as a distinct business and not as a mere adjunct to the coal trade as it now is. Our coke producers must see to it that only first class coke, such as will bear the most rigid inspection, is sent to market. They have the material to make a coke *at least six per cent better than any other*, and it will be their own fault if they do not reap this six-per-cent of advantage. Consumers want cokes having small percentages of ash, sulphur and phosphorus in them, and for such they are willing to pay good prices.

From here Mr. Tracy went to visit the Flat-top region of the Norfolk & Western R.R., where these same semi-bituminous coals are mined and where, at Pocahontas, some coke ovens are in blast, to ascertain whether arrangements could not be made at the Pocahontas and Bluestone mines for a large quantity of coke to be shiped southwest, over the Norfolk & Western and roads beyond, to supply the blast-furnaces, foundries, and other coke using establishments of Tennessee, Georgia and Alabama. No good coking coal has yet been found in those states and these establishments can better afford to pay a good price for Flat-top coke than to use the inferior article made from local coals.

In this connection we would again call attention to the great advantages that will accrue to both the coking coal regions above refered to when the Ohio Central shall have made a connection with the Chesapeake & Ohio at Kanawha Falls or Hawksnest, and the Norfolk & Western shall have extended its road northward to a connection with the same road by way of Cabin creek to a point opposite Coalburg or by way of Coal river to a point opposite St. Albans, thus securing a short and direct way for these superior cokes to all the great coke-consuming northwest.

The demand for coal to points supplied by the Chesapeake & Ohio Railway is now, as we learn from an authentic source, far greater than that road can supply with the rolling stock it now has in hand. This is a condition of things that we hope may be of short duration. Those controling the interests of this railway, one that has at its command the best coal region on the continent, should at once see to it that an ample supply of coal cars and other needed rolling stock is provided, not only to meet the present demand for coal but also to meet the vastly larger demand that will speedily follow the general revival of business that nearly everyone concedes has already begun. The miners ought to have immediate assurances that this rolling stock will at once be forthcoming so they may make preparation for it, which they can only do by having timely notice.

The semi-bituminous coals of the New River region and the high grade cokes made from them, the cannel, splint, gas and other bituminous coals of the Great Kanawha region, abundantly stored away along the track of this railway for a hundred miles, are now both widely and favorably known, and there should be no slackness in supplying any demand for them that may arise.

Coal River Railroad.—The St. Albans, W. Va., Nonpareil of Sept. 17 comments as follows on a recent visit of experts to the line of the St. Albans & Boone County RR.: We are pleased to learn that Judge Thomas, an expert in the coal business, and Col. Austin, both capitalists of N. Y., have returned from a visit to the vast coal fields of Coal river. They were more than pleased with the quantity and especially the quality of the cannel, bituminous and splint coals on Coal river. Unfortunately many of the best seams of coal were not opened in such a manner as to warrant Maj. Kessler and Mr. Rock, to take these gentlemen to look at them. For instance, the celebrated vein near the mouth of Cobb creek, which is well known to every one here, was not open at the time, and was not seen by them. Mr. W. B. Ingraham, a prominent blacksmith of this place, who has for 10 years used coal from this vein for his blacksmithing, gives the following description:

At the bottom or the vein are 14 inches of peacock coal, on top of this, are 3½ feet of splint coal and on top of this, 1 inch of slate, and still on top of this, are 5⅓ feet of splint coal, making 9 feet in all.

About 40 feet above this vein, is a fine seam of cannel coal, 3½ feet in thickness, and 45 feet above this is a vein of soft coal. Mr. Ingraham also states that there is a vein of coal below Boone C. H., that will coke in the open air. He was raised in the coal fields of Pa., and says the coal on this road up Coal, will surpass any coal fields in that state.

What a pity that our people are so indolent that they will not open up their coal veins, so that capitalists when visiting this section, may see the rich deposits in our mountains.

These gentlemen will submit their report on this vast field of coal to the syndicate on the 25th of this month, then we will know whether the Coal River Railroad is to be built or not.

Flat-top Semi-bituminous Coal and Coke Output for August, 1885.—The last report to *The Virginias* of Flat-top coal and coke output, that for June, 1885, was published on page 12 of this volume; below we give the output of the Pocahontas mines of the Southwest Virginia Improvement Co. for the month of August, 1885, in 2,000 pounds tons, furnished *The Virginias* by E. J. Collins, secretary and treasurer of that company, 214 S. 3rd St. Philadelphia, Pa.

	August.
Coal shiped, tons	34,362
Coal coked, tons	6,658
Coal used as mines and on hand, tons	898
Coal mined, total	41,918
Coke made, tons	4,079
Coke shiped, tons	5,293

Adding the output from January to July, 1885, to the above, we have:

Total output from Jan. 1 to September 1, 1885, . 314,847

Coal and Coke traffic of Chesapeake and Ohio Ry. for August, 1885.—General manager C. W. Smith furnishes *The Virginias* the data for the following report of the coal and coke traffic of the Chesapeake & Ohio Ry. during the month of August, 1885, and for the same month of 1884, in 2,000 lbs. tons, prepared by fuel agent J. W. Hopkins:

The movement, by kinds and quantities, was:

Year.	*Cannel.*	*Gas.*	*Splint.*	*New R.*	*Coke.*
1885	1,974	17,963	15,047	58,431	9,090
1884	3,688	24,395	11,836	26,952	8,179
	—1,714	—6,432	+3,211	+31,479	+911

This shows a decrease, as compared with August, 1884, in the movement of cannel and gas coals, but handsome increases in splint, and New River coals and in coke.

Total movement in July, 1885,	102,505
" " " " 1885,	75,050
Increase in July, 1885, tons,	27,455

A reference to page 113 of this volume will show very handsome gains in this month over the preceding one, especially in the movement of the New River semi-bituminous steam and domestic coals and in the superior Kanawha splint coals, the demands for which appear to be constantly increasing.

The movement, by kinds and quantities, from Jan. 1 to August 31, 1885, eight months, and for the same time in 1884, was:

Year.	*Cannel.*	*Gas.*	*Splint.*	*New R.*	*Coke.*
1885	15,710	236,963	101,463	379,947	78,059
1884	13,464	206,483	58,437	282,142	42,628
Increase,	2,246	30,480	43,026	97,805	35,431

The total movement during the first eight months of 1885, and of 1884, was:

During first 8 months of 1885,	812,142 tons.
" " 8 " " 1884,	603,154 "
Increase in 1885 over 1884,	208,988 "

The increase for the first eight months of 1885 over the same period of 1884 was one of nearly 35 per cent.

A monopoly of Connellsville coke, in the opinion of our watchful cotemporary, the "Iron Trade Review," of Cleveland, Ohio, is likely to be the result, in the near future, of the recent purchases by Frick & Co. of the bulk of the coking coal lands of the Connellsville region that they did not previously control, making an immediate investment of some $5,000,000, paying for these lands enormous prices,—"50 per cent more than they ever brought before," says the "Review," adding: "The probability is that the time is by no means remote when the price of coke will be more than double the present rate. The control of the price of coke will be the lever by which the Carnegies will be enabled, at least for the present, to control the steel manufacture of the country. The scheme is a stupendous one, giving, as it does, the key to millions of property into the hands of manipulators, and the sequence will undoubtedly be the invention of some process for making steel without the use of coke."

The Review seems to think, like some other people that we know of, that the Connellsville coal is the only coal in this country that can be used in the manufacture of Bessemer steel when it ought to know that there is a coking coal field in West Virginia, that of New-river and Flat-top mountain, that is not only five or more times as large as the Connellsville and contains more than twice as much coal on a given area, but that yields a coke that is purer and better than the Connellsville for use in Bessemer steel making, as the reports that have been published from time to time and the results of its use unmistakably prove. The chemist of he Second Geological survey of Pennsylvania says of it, comparing it with Connellsville: "It shows fully 4 per cent less ash and over 3 per cent more fixed carbon, while the phosphorus is very much lower."

The coke from this field, as stated elsewhere in this issue, is now in use over a wide extent of country and all that is needed to make the supply equal to all the demands of the whole country for a coke of unsurpassed excelence at a fair price, is for capital to take hold of the cheap lands of this

West Virginia coking coal-field,—lands that can now be bought at from $5 to $10 per acre while those of Connellsville are sold at from $500 to $1,000, or even more per acre —and develop it by mining its coal and converting it into coke.

The Chesapeake & Ohio Railway now crosses this coal-field for 35 miles and by it over 750,000 tons of this coal will be marketed this year, over 200,000 of it in coke. The Ohio Central Railway will soon penetrate this field by way of the Great Kanawha valley and furnish direct access to it from all parts of Ohio and beyond The Norfolk and Western Railroad has already reached it and will this year market over 600,000 tons of coal from it, part of it in coke.

Even the Baltimore & Ohio Railroad, which the "Review" considers a predestined victim in the Frick & Co. purchase, can reach this grand coking field at a moderate expenditure, compared with the prize to be won, by extending its Valley Branch on from Lexington, Va., to the southwest, through one of the best unoccupied and undeveloped iron regions of the country, into this field, and so reciprocate favors by supplying "other" steel makers with a coke better than Connellsville.

The Richmond & Alleghany Railway of Virginia is also fairly headed towards this coal bonanza—for such experience at Connellsville warrants us in calling it—and the West Virginia Central and Pittsburg Railway shortens the distance to it by every mile of its extension to the southwest.

While on this question it may be well to say that the near future will probably see some *basic* steel-works in operation in Virginia and elsewhere in the South, where ores adapted to it are cheap and abundant, "by permission" of the holders of that patent, or the Bessemer steel-makers who have "pocketed" the basic process will find themselves voted out from the duty list. The only tariff that can stand in this country is a reciprocity one. Not only must all our home "raw materials," so-called, be protected, but every part of the country must have the largest free-trade liberty in processes for working up these raw materials into more valuable forms.

The Flat-top Coal-field and beyond.—On the 5th of last month Prof. I. C. White of the U. S. Geological survey began the Virginia, West Virginia and Kentucky coal-field explorations spoken of in the August number of *The Virginias*, by examining the mines of the S. W. Va. Improvement Co. at Pocahontas, Va., and those of the Bluestone Coal Co., near Bramwell, W. Va., in the Flat-top coal-field, and all the exposures of the beds of the Lower Coal measures, No. XII, near those places on the eastward slope of Flat-top mountain, accompanied by Mr. J. H. Bramwell, mining engineer of the Bluestone Coal Co., and Capt. M. A. Miller, the engineer and general-manager of the Trans-Flat top Land Association.

After spending several days in exploring this Flat-top field, Prof. White wrote us: "I am astonished at the wealth of coal in this field. Of course I knew it before through your reports and those of others, but one cannot appreciate the extent of the deposit and its great regularity until he actually sees it." This statement recalls to mind that our friend, E. C. Pechin, of Cleveland, Ohio, when looking at the grand proportions of the No. 3, or "Pocahontas," coal bed of this region, turned to us and remarked: "You may say all you please about this coal field; it will bear it."

From Pocahontas Prof. White and party, on horseback, crossed Flat-top and went down the Elkhorn branch of Tug fork of Sandy river, a distance of 15 miles, following the outcrop of No. 3 coal bed, there about 8' thick and diping with great regularity, until it sinks beneath water level at The Forks of Elkhorn. He and Capt. Miller then crossed Indian ridge to the basin of the Guyandot and examined the outcrops of No. 3 on Pinnacle fork and Guyandot river, finding it still regular in dip but decreasing somewhat in thickness at its western horizon. Other beds of No. XII were also located and examined and an inspection made of the beds of the Middle measures, No. XIII, that Capt. Miller had opened on the lands of his company on the waters of Clear fork of Guyandot, bringing up at Oceana, Wyoming county, on the 13th of August.

From Oceana, accompanied by a guide, Prof. White again crossed Indian ridge to the mouth of Elkhorn, having riden on horseback 200 miles in Mercer, Wyoming and McDowell counties and examined the coal beds of the Middle and the Lower measures, Nos. XII and XIII, there exposed. From the mouth of Elkhorn, where coal bed No. 3, the "Pocahontas," sinks under water level. Prof. White footed it down to the mouth of the Dry fork of Big Sandy river. There a "Joe" boat was procured in which they paddled down the Chaterawha (Big Sandy) to the mouth of Mote creek, where the boat was abandoned, on account of low water. They then walked to Warfield, Ky., whence a hack was taken to the Peach Orchard coal mines. The Chatteroi railroad was then taken for Catlettsburg, stoping at Louisa and at the mouth of Blaine creek to examine the borings for oil at those places. Elkhorn was left the morning of August 16th and Catlettsburg was reached on the evening of the 24th.

A day was then spent at Huntington, during which Prof. White satisfied himself that the coal bed recently opened near the tops of the hills back of that town is the "Pittsburg" bed of the upper measures, No. XIV. He found this bed 3' 6" to 4' thick and a "rather good fuel." Near the foot of the hills he also found the "crinoidal limestone." A day was then spent in Charleston, to get the record of the gas well that has been sunk near that city, and thence Prof White returned to Morgantown, by way of the Ohio Central and the Baltimore & Ohio, to be present at the opening of West Virginia University for the current year.

Of the No. 3 or "Pocahontas" coal bed on Pinnacle fork of Guyandot, Prof. White says: "It goes under Pinnacle about 7 miles from Peters gap, and is split there by 7' of shale, the upper bench being 18" thick and the lower 5' 4" of excelent coal, the same feature show on the opposite side of the mountain making just enough room for a tunnel by taking down the shale and overlaying 18" of coal to the sandstone roof. If a railroad ever comes across the mountain (and it must some time) this is the way to get through."

The Pocahontas Coal Co., the one that with its headquarters at Roanoke controls all the inland sales of Flat-top coals from the Pocahontas and the Bluestone collieries—at a meeting of its stockholders held in Philadelphia, August 18, elected W. C. Bullit, Esq., of that city, president; D. H. Matson secretary and treasurer; and W. W. Curran of New York superintendent. Mr. Curran will probably reside at Roanoke, Va. H. Wickham resigned as a director and Jos. H. Sands, of Roanoke was elected in his place.

The Trans-Flat-top Land Association has its two parties of engineers, under the direction of Capt. M. A. Miller, its engineer and general superintendent, now making detailed surveys of its coal lands on Indian ridge and along Pinnacle fork of Guyandot river, Wyoming county, W. Va. These parties, headed by engineers J.Craig Miller and R.W. Harris, will soon reach the Peters gap of Flat-top mountain, they will then continue work down Bear-town ridge.

Manufacture of Iron in Virginia 1619-1776.

By R. A. Brock, Sec. Va. Hist. Soc.

The following paper is from the Proceedings of the United States National Museum for 1885. It was sent to the Museum with specimens of slag (Donation No. 9378) from the old foundry at Falling creek, Chesterfield county, Va., established in 1619. We hope to follow this valuable paper with other notes on the early manufacture of iron in Virginia.—*Editor.*

To Virginia, the first of the English settlements in America, belongs the honor of inaugurating within her limits as a colony that most important industry, iron manufacture.

The London Company, it is exhibited, contemplated a variety of manufacturing enterprises from the very begining of its authority; prominent among them was that of iron.

In 1610, Sir Thomas Gates testified before the council of the company at London that in Virginia "there were divers minerals, especially 'iron oare,'" lying upon the surface of the ground, some of which having been sent home had been found to yield as good iron as any in Europe. (True Declaration of Virginia, 1610; Force's Tracts, Vol. III, p. 22.)

Under a new administration of its affairs, the London Company, in 1619, after 12 years of unprofitable expenditure, sent to Virginia a large body of emigrants, including workmen, and materials for some new branches of industry. These embraced no less than 100 persons skilled in the manufacture of iron, with the design of erecting in the colony three iron-works. Of these, 110 were from Warwickshire and Staffordshire and 40 from Sussex, and were selected for their skill and industry. (A Declaration of the state of the Colonies, &c., 1620, p. 10; Stith's History of Virginia, Book IV, p. 176.)

A part of the funds liberally contributed in England about the same time for a college at Henrico, for the education of native and colonial youth, was appropriated by the treasurer, Sir Edwin Sandys, to the erection of iron-works, in the expectation of deriving a revenue from that source. Works for smelting the ore were erected in 1619 on Falling creek, a tributary of James river, in Chesterfield county, about seven miles below the city of Manchester. Most sangine hopes of profit from this undertaking were cherished.

Three of the master workmen having died, a re-enforcement of 20 experienced hands was sent over in 1621, accompanied by Mr. John Berkeley and his son Maurice, as skillful persons to superintend the operations. A mine of the brown iron ore in the neighborhood was opened and found to yield "reasonably good iron." (Beverley's History of Virginia.) But the jealousy and enmity of the native inhabitants had unfortunately been aroused. In an hour of fancied security, when all suspicions of hostility had been lulled by the friendly protestations of the Indians, on the morning of Friday, March 22, 1622, a general attack was made by the savages upon the settlements in the colony, and 347 persons slain. Of those engaged at the iron-works at Falling creek all perished save a boy and girl, who fled to the bushes for safety. (Stith, Book IV, p. 218; Bishop's American Manufactures, I, pp. 468–469.)

The iron-works being demolished, so great was the discouragement consequent that a long period elapsed before this useful manufacture was again attempted in Virginia. A writer from the colony in 1649 published that "an iron-work erected would be as good as a silver mine." (A Perfect Description of Virginia, London, 1649, Force, vol. ii, No. 8.)

The exportation of iron from the colony was forbiden by an act of the assembly in 1662, on penalty of ten pounds of tobacco for every pound of iron exported, and the prohibition was renewed in 1682.

Col. William Byrd, the first of the name and family in Virginia, obtained, April 20, 1687, a grant of 1,800 acres in Henrico county, on the south side of James river, within the limits of which was included the site of the fated iron-works on Falling creek. On the 29th of October, 1696, he obtained a patent for 5,644 acres lying contiguous thereto, giving as a reason for such action, in a note prefixed to his record of his landed possessions, that "there having been iron-works on Falling creek in the time of the company, and Colonel Byrd having an intention to carry them on, and foreseeing that abundance of wood might be necessary for so great a work, he took up a large tract," &c., as above. He died on the 4th day of December, 1704, and it is not known that either he or his son and heir, of the same name and title, ever instituted any further steps towards the revival of the works at Falling creek, as apparently projected. (MS. Deed-Book of William Byrd.)

Governor Alexander Spotswood appears to have been the first to break the spell of dormancy in the iron industry in Virginia, which he did by the establishment of a smelting furnace on the Rappahannock river near the present site of Fredericksburg, and of a very complete air-furnace at Massaponax, 15 miles distant, on the same river, and near the site of his settlement, Germanna.

In an account-book (1726–30) kept by Rev. Robert Rose, who was an agent for Governor Spotswood, there are numerous entries of fire-backs cast at Germanna which were sold by him. In 1732 there were four furnaces operated on the Rappahannock, in one of which, Principio furnace, Augustine, the father of George Washington, was largely interested; the ore used in it being supplied by him from his plantation at Bridge creek, on the east side of the river. (Iron-making and Coal-mining in Pennsylvania, by Col. James M. Swank, p. 11.)

The Falling Creek tract fell to the possession of Col. Archibald Cary some time prior to the Revolutionary war. Upon it he erected his well known seat, the name of which became in the records of the period a part and parcel of his personal designation as Archibald Cary of Ampthill. He erected new iron-works on Falling creek. "He purchased pigs of iron from Rappahannock, Patowmack, and Maryland. Of these he made bar iron. The profits, however, were so small that he abandoned his forge and converted his pond to the use of a grist-mill about 1760. Nobody then knew of any iron mine convenient to Falling creek. (A marginal note in MS. on a copy of Stith's History of Virginia, Williamsburg, 1747, p. 218, which formerly belonged to Robert Bolling, of Chillowe, author of the Bolling Memoirs.)

The writer visited Ampthill and Falling creek in May, 1876. The mansion was then in fair preservation. It is now owned by Mr. John Watkins, of New York.

Falling creek is about a mile below Ampthill. Its waters still furnish motive power to a grist-mill owned by Mr. H. Carrington Watkins, and known as the Ampthill mill. The creek is but an insignificant rivulet above the mill, but some 20 yards below it widens into a handsome little lake, and some quarter of a mile thence empties into James river.

About 60 yards from the mill, on the western bank of the creek and nearing the river, the writer picked up several small pieces of furnace-cinder, presumptive relics of the iron-works of 1622. The bluff adjacent and incumbent has, it is evident, from repeated washings of the soil, nearly covered the exact original site.

On the opposite side of the creek, and to the east of the mill, is clearly indicated the site of the forge of Archibald Cary. Here we found numerous pieces of slag or cinder, some of them fully a hundred pounds in weight, and an irregular area an acre or more in extent, covered with finely-

broken or comminuted charcoal to the depth of fully two feet; a memorial of the fuel used.

We were informed that about half a mile below Falling creek, near James river, there is a low piece of ground known to this day as "Iron Bottom," where may be found plentifully what is known as bog iron, on the surface. It will be recollected that the iron ore already cited as being mentioned by Sir Thomas Gates was described as "lying on the surface of the ground." We have also learned since our visit to Falling creek that at a point upon its banks distant inward about two miles from the site of the iron-works there are numerous pits some five or six feet in depth, which it is evident from the mineral character of their surroundings furnished the crude ore for the original and ill stared works.

In June, 1870, a freshet, the result of previous heavy rains, overflowed and broke the dam at a point known as Old Forge, on the Jones branch of the Chickahominy river, in New Kent county, Virginia. Trees were overturned, a building undermined, and a gorge cut, uncovering in its route the remains of an early forge or smelting furnace. The foundation, portions of a chimney, an anvil, a hammer, and six bars of iron were exposed to view—one of the last bearing, in raised letters, the inscription "B. G., 1741," which were supposed to indicate the place and date of manufacture; the first of which was assumed to have been Bear Garden furnace, Buckingham county, Virginia. The forge is marked on Fry and Jefferson's Map of Virginia, 1765, as Holt's Forge. It must have commenced operations at a period not much later than 1741, if not as early, and was continued until some time during the Revolutionary war.

Tradition assigns to Col. William Byrd (the second) the credit of erecting and first working the forge, and Mr. William H. Christian, of Richmond, states that in his boyhood he was informed by an old negro man, named Guthridge, that his owner, one Jones, who operated the forge until its destruction, stationed him, then a youth, upon an eminence to watch the movements of the British soldiery who were in the section. Their approach being descried, the buildings were hastily fired and earth thrown upon the ruins to conceal the tools, &c. After the war bar iron was produced so cheaply in other sections that no efforts were made to revive the works. A grist-mill being erected in late years near the site of the forge, and driven by water from the pond used for its operations, was first called Providence Mills, but such was the force of custom that the residents of the section would retain the old designation, Forge; hence the new and the old name have, by common consent and usage, been united in the component term Providence Forge.

W. Va. and the Second New Orleans Exposition. Gov. E. W. Wilson, of West Virginia, has issued the following proclamation:

The North, Central and South American Exposition will open at New Orleans, November 10, 1885, and close about April 1st, 1886. It will be under the immediate management of a chartered company of the citizens of New Orleans, with a capital of $500,000, assisted by commissioners from each of the United States, possessing the grounds, buildings, exhibits, apparatus, etc., of the World's Industrial and Cotton Centennial Exposition, just closed. The liberal appropriations already made by the management will encourage a complete exhibition of the natural resources and various industries of our country. The sum of $2,000 has been appropriated for each of the states respectively. Philip Pendleton, of Berkeley Springs, Morgan county, has been appointed commissioner, and Alex. Campbell, of Bethany, Brooke county, alternate, to represent this state. By concert of action it will require but a very limited expense and attention to secure an exhibition worthy of our great resources. Impressed with the importance of the subject to our industrial pursuits, I earnestly recommend the co-operation of private enterprise and suggest correspondence with the commissioner aforesaid.

The West Virginia Normal schools will this year enlarge their regular course of studies so as to make it equivalent to the preparatory course of the West Virginia University—this step will bring the schools of the state into a better graded system and in time lead to the abandoning of a preparatory course at the University.

The Dolly Ann furnace lands, those on which was located the old Dolly Ann or Rough and Ready furnace, some 2,851 acres on Brown and Peters mountains, on the branch road up Pounding-mill run, from the C. & O. Ry. to the mines of the Alleghany Iron Co., Alleghany co., Va., have recently been purchased by Mr. Frank Lyman of Brooklyn, N. Y., the owner and operator of the Stack iron mines which are also in Alleghany county. These lands contain extensive deposits of limonite iron ore, in the No. VII or Oriskany formation. Mr. Lyman has tested these ore deposits and will probably work them and sell ore to Low Moor furnace.

Lease of Mineral Lands.—The Alleghany Sentinel of Sept. 16 contains this item: The mineral lands of William M. Brown, Telford J. Bratton and others, on Dunlap creek in this county, have recently been leased to a Pennsylvania company, who propose to begin mining on a large scale at an early day. They will probably erect a furnace in the neighborhood of the leased lands. The same company, we are informed, have leased several large tracts of mineral lands in West Va. This sounds like our county was at last taking another step towards prosperity.

Output of Bluestone Coal Co. for August, 1885.—On page 112 we published the output of the Bluestone Coal Co.'s collieries in the Flat-top, Va., coal-field to July, 1885; below is the output, in 2,000 lbs. tons, of these collieries for the month of August, furnished *The Virginias* by J. H. Bramwell, the mining engineer, etc., of that company:

Operators.	*Tons mined.*
John Cooper & Co.	5,494
Freeman & Jones	5,644
Wm. Booth & Co.	3,396
August output	14,534

It appears from the offlcial record that the condition of this coal, as shiped, was: Run-of-mine 13,499 tons; Lump 634; and Slack 401.—It should be stated, though, in this connection, that there is no loss in this coal, as each of these grades burns equally well, as any consumer of these superior semi-bituminous coals will find.

Virginia Coals to Boston.—The Coal Trade Journal reports the coal receipts at Boston, Mass., for August, 1885, and for eight months prior to September 1, by ports whence received; from this it appears that Newport News and Norfolk furnished:

In August, 1885	24,318 tons.
" " 1884	11,610 "
In first 8 months of 1885	131,443 "
" " 8 " " 1884	67,913 "

In 1884 these Virginia coaling ports, during the first 8 months of the year, furnished only about one-twenty-third of the coal received at Boston, but during the same period of 1885 they furnished about one-twelfth of the receipts.

Fish.

Shad fishing, in the belief of most people, is conducted solely in fresh waters, the fisherman capturing this delicious scale fish as it ascends the fresh water or fluviatile streams in the spring time coming up from the ocean in search of spawning grounds which, of necessity, must be in fresh, flowing waters. They would have been correct in this belief prior to 1871, for before that year shad were taken only from fresh waters; but in that year fishing with pound nets began in Chesapeake bay, the fisherman meeting the shad with his extensive and extended nets as they appeared along the shores of the bay seeking for the mouths of the rivers, as we learn from Col. Marshall McDonald, the enthusiastic Virginia Fish Commissioner and active member of the corps of the United States Fish commission, a gentleman learned and skilled in all that pertains to the arts and ways of the migratory fishes. To him we are indebted for the facts here stated.

Begun in 1871 in Chesapeake bay, pound net fishing for shad so increased that in 1880 there were 124 pound nets in use capturing shad and herring off the mouth of York river and along the Eastern shore. Now, in 1885, there are 566 pound nets in use along the shores of Chesapeake bay in Virginia and in the salt or marine waters of its tidal rivers. In the Rappahannock, between its mouth and Tappahannock, there are now 76 against 14 in 1880. On the west shore of the bay, between the entrance to Hampton Roads and the mouth of the Potomac, there are 300 pound nets now in use; in these 817,000 shad were taken this year, while 146,000 were taken in the marine Rappahnnock, where prior to 1871 none were taken, and none elsewhere in marine waters except a few in Lynhaven bay.

Col. McDonald truly says this method of fishing which takes milters and spawners alike before they enter the waters where they can propogate their kind, would soon exterminate this valuable fish from our waters if the services of the Fish Commission did not here come in and by artificial means supply fertilized shad spawn to the head waters of the rivers and so keep up the stock of young shad.

This year Col. McDonald put 6,700,000 young shad into Virginia waters alone, and for the past four years he has put 6,000,000 young shad, on an average, into the waters of this state, so that notwithstanding the apparently wholesale capture of a large proportion of these fish before they can reach the spawning grounds the aggregate supply of shad in the markets has actually increased. This result, not to mention the propagation and distribution of various other kinds of fish in Virginia, has been accomplished at a yearly cost of but $250 to the state. This could not have been acplished but for the efficient aid of the United States Fish Commission, under the superintendence of Prof. Spencer F. Baird, Director of the Smithsonian Institution, which in the discharge of its general duties finds opportunities to foster and encourage, by its substantial and intelligent aid, the extensive propagation and wide distribution, in and to all parts of the country, of valuable and desirable food fishes.

Col. McDonald deserves well of the Commonwealth for his labors—which no one can say are not those of loyalty and love—in thus maintaining and increasing the supply of our choice food fishes. Long may he be spared to prosecute this work that he so enthusiastically pursues, and well may he be rewarded for his unwearied efforts in this direction.

Black bass are now very abundant in most of the Apalachian, Valley and Piedmont rivers of Virginia; they have multiplied wonderfully since their introduction into the Potomac from the Ohio waters, a few years ago, so that now good fishing points are very numerous, especially in all the James and Potomac waters.

Manganese.

Mr. M. P. O'Hern is preparing to work the valuable deposit of manganese that has been discovered on his farm near Waynesboro, Augusta county, Va.

On Back creek, in this, Augusta, county, explorations for manganese are being made all along the line of outcrop of the No. I or Potsdam, shales, where there are numerous surface indications of this now much sought after ore. Some Baltimore parties are shafting on the land of David Hiserman, near Sherando.

From the Houston mines, on Shenandoah Valley RR., Botetourt county, Va. they are making almost daily shipments of manganiferous iron ore, containing about 30 per cent of metalic manganese, to Pittsburg, Pa.

The St. Albans and Boone County RR.—The Valley Record, of Madison, Boone county, W. Va., of Sept. 17, under a set of much-to-be-wondered-at head lines, has the following account of a recent visit of New York men to the country on the proposed line of railway from St. Albans on the Chesapeake & Ohio Ry.—at a good point for crossing the Great Kanawha to the Ohio Central Ry.—up Coal river and across to Indian gap where it is expected that it will meet the westward extension of the New River branch of the Norfolk & Western RR. by way of Peters gap:

Messrs. Kessler and Rock, with Judge Thomas and Col. Austin, of New York, were here last Saturday on their return trip over the route of the St. Albans and Boone County Railroad, in charge of Capt. Thos. Hill. Judge Thomas is one of the best mining experts in the United States, and his opinion upon the quality and quantity of our coals will be taken as final. They are members of the syndicate who propose to contribute the necessary link to complete the trunk line connecting Chicago and the great Northwest with the Atlantic seabord by a short, easy and direct route. Col. Austin is looking after matters commercial connected with the projected line. It cannot be ascertained at present what these gentlemen will report to the capitalists whom they represent, but we have every reason to believe that their report will be favorable. In fact, we do not see how it could be otherwise, for they have doubtless seen some of the finest coal on this trip that is to be found on the continent. Our friend Thos. Hill had already exposed to view about thirty veins of coal for inspection by these gentlemen at various points along the line. They had the satisfaction of measuring veins of coal in one single mountain aggregating eighty-three feet. When they were shown a single vein thirteen feet in thickness, of pure bituminous coal of superior quality, near the confluence of the Pond and West forks of Little Coal, the distinguished expert said: "I have seen enough—I am satisfied. I do not care to go further." So they returned and started at once for New York city to make their report. We expect to publish some cheering news very soon in regard to this enterprise.

Tan-bark is now being gathered on a large scale at numerous points along and near the lines of our Virginia railways; the bark bought is mostly oak for the large taning establishments of the Defords at Luray and the Appolds at Appold, both Virginia stations of the Shenandoah Valley RR. We have noticed in passing, that large quantities of bark have been brought to Afton station of the Chesapeake & Ohio Ry. from the eastern slopes of the Blue Ridge and Lyndhurst and other stations of the Shenandoah Valley RR. from the western slopes of the same ridge.

Richmond & Alleghany R.

(May 31, 1885.)

Westward.	(No. 1 & 11.)	(No. 9.)	(No. 3.)
Richmond	10 40	20 00	15 35
Scottsville	13 40	22 45	19 05
Lynchburg	16 30	4 20	22 05
Balcony Falls	17 45	6 20	.....
Lexington	19 15	7 15	.....
Natural Bridge (S. V)	17 56	.....	.....
Buchanan "	18 35	.....	.....
Clifton Forge (C.&O.)	20 00	.....	

Eastward.	(No. 2. & 12)	(No. 10.)	(No 4)
Clifton Forge	9 45	.....	.....
Buchanan	11 07	.....	.....
Natural Bridge	11 46	.....	.....
Lexington	9 30	18 25	
Balcony Falls	11 55	20 10	
Lynchburg	13 00 / 15 20	21 40 / 22 55	3 50
Scottsville	17 45	2 27	6 29
Richmond	20 50	7 05	9 55

All trains daily except Sunday. Sleepers are attached to night trains between Richmond and Lynchburg.

Valley Branch of B. & O. RR.

(May 3, 1885)

Southward.	No. 210.		
New York	24 00		
Philadelphia	3 45		No. 220
Baltimore	7 20		16 25
Washington	8 40	(No. 288)	17 30
Harper's Ferry	11 25	1 30	20 07
Charlestown (S. V)	11 48	2 16	20 28
Winchester	12 44	3 35	21 14
Strasburg (Va. Mid.)	13 44	4 59	No. 280
Harrisonburg	16 05	9 30	5 00
Staunton (C. & O.)	17 06	11 25	7 00
Lexington (R. & A.)	18 52	....	10 08

No. 210, the Lexington mail, leaves New York at midnight, daily but on Sunday, with sleeper to Washington.

No. 220, the Winchester accommodation, and No. 280, mixed train, run daily except Sunday.

No. 288 runs daily, except Sunday only to Harrisonburg.

Northward.	No. 231.	No. 291	
Lexington (R. & A.)	7 35	13 25	No. 281
Staunton	9 36	16 21	15 25
Harrisonburg	10 35	18 20	17 23
Strasburg (Va. Mid)	12 52	19 37	No. 219
Winchester	13 52	23 04	5 50
Charlestown (S. V.)	14 40	24 31	6 30
Harper's Ferry	15 00	1 04	6 50
Washington	17 30		9 50
Baltimore	18 40		10 15
Philadelphia	19 40		
New York	22 35		

No. 231, the Baltimore mail, No. 281, a mixed train, and No. 219, the Baltimore Accommodation run daily except Sunday 61

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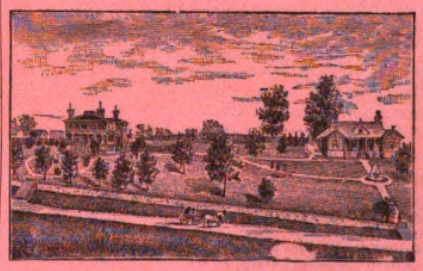

The Railway Time Tables given below are based on 75th meridian or *Eastern standard time;* they are also in *24-hours time*, from midnight forward to midnight, so midnight appears as 24 00, and noon as 12 00. When the hours given are over 12 the present clock or watch time can be found by taking 12 from the hours. All junction stations are given. Where two times are given at a station the first is that of arrivlng and the second that of leaving. Condensed time tables of the other railways of the Virginias will be added hereafter.

Chesapeake & Ohio Ry.

(Oct. 11, 1885.)

Westward.		No. 3.	No. 1.	
New York, (Pa. Ry).....		8 30 or 10 00	21 00	.....
Philadelphia.....“		11 55 or 12 30	24 29	.....
Baltimore..... “		3 20 or 14 55	4 05	.....
Washington, (Va. Mid.)		17 30	7 00	.....
Charlottesville (“ “)	Ar.	22 15	11 40	.....
	Lve.	22 25	12 15	No 1-9
Norfolk.....		14 55	.....	8 05
Old Point Comfort.....		15 30	.....	8 40
Newport News.....		15 55	.....	9 05
Richmond.....	Ar.	18 25	.....	11 55
	Lve.	18 30	7 40	16 00
Hanover Jn. (R. F. & P.).....		19 28	8 49	17 10
Gordonsville (Va. Mid).....		21 20	10 47	.....
Charlottesville “	Ar.	22 15	11 40	.....
	Lve.	22 25	12 15	.....
Waynesboro Jn. (S. Val.).....		23 40	13 33	.....
Staunton (B. & O.).....		24 11	14 15	.....
Goshen.....		1 27	16 00	.....
Clifton Forge (R. & A.)	Ar.	2 25	17 15	No. 5
	Lve.	2 30	19 00	7 00
White Sulphur.....		.....	20 47	8 30
Kanawha Falls...	Ar.	8 05	2 25	13 00
	Lve.	8 25	2 25	13 20
Charleston (O. C.).....		9 27	4 17	15 15
Huntington*.....		10 00	6 20	16 20
Ashland (Sci. Val.).....		10 42	7 02	17 00
Winchester (Ky. C.).....		14 30	11 45	7 15
Cincinnati.....		18 00	18 00	11 30
Lexington.....		15 20	12 45	8 05
Louisville.....		19 10	16 45	....

*All stations beyond Huntington have 90th Meridian or Central time, one hour *slower* than Eastern time.

No. 3, the Louisville and Cincinnati express, is a daily solid train, with sleepers, from Washington and Richmond, without change from Washington to Louisville and Richmond to Cincinnati. It does not stop for local business.

Through connection at Louisville over C. O. and S. W. for New Orleans, with sleeper, without change.

No. 1, the mail train, is daily, except Sunday. No. 5 is daily from Clifton Forge to Ashland. No. 1-9 is daily except Sunday. The meal stations are Charlottesville (V. M. Junction), Clifton Forge, Kanawha Falls and Huntington.

Eastward.		No. 4.	No. 6.	
Louisville (L. & N.)..... ...		19 35	6 50	... .
Lexington “	Ar	22 50	11 25	.....
	Lve.	23 00	11 45	.....
Cincinnati (Ky. C.).....		20 10	20 10	.....
Winchester (Ky. C.)	Ar.	23 49	12 30	.....
	Lve.	23 53	13 00	. ...
Columbus.....		17 30	11 45	.....
Chillicothe		19 55	14 05	No. 2
Ashland.....		3 44	17 55	6 20
Huntington*.....		5 25*	20 00*	8 30
Charleston.....		6 52	22 19	10 52
Kanawha Falls.....		7 55	23 55	12 40
White Sulphur.....		.....	5 11	17 30
Clifton Forge.....		13 25	6 45	18 45
Millboro.....		14 24	7 56	.....
Goshen.....		14 40	8 15	.....
Staunton.....		15 52	9 41	.....
Waynesboro Jn. (Shen. Val)		16 22	10 15	.....
Charl'tsv'e (VaMid)	Ar.	17 20	11 30	.....
	Lve.	17 40	11 50	... .
Gordonsville “ ..		18 25	12 43	No. 8
Hanover Jn. (R. F. & P.)..		20 01	14 38	7 35
Richmond.....	Arr.	20 55	15 45	8 45
Richmond	Leave	8 15	15 50	.....
Newport News.....		10 50	18 35	.. ..
Old Point Comfort....		11 15	19 05	.....
Norfolk.....		11 50	19 35	.....
Charlottesville, V. M. Jn....		17 25	.....	... .
Washington (Pa. Ry.).....		21 45	.....	.....
Baltimore, “		21 35	.....	.....
Philadelphia, “		3 00	.....	.....
New York “		6 30	.....	.....

*Louisville to Huntington Central time; east of Huntington Eastern time.

No. 4 is the Washington daily express, from Louisville to Washington, and Cincinnati to Richmond, with sleepers, without change. Columbus, Ohio, at 17 30 and Chillicothe at 19 55 connect at Ashland. No. 6 is the Virginia Express, daily except Sunday.

No. 2 is the mail train, daily, from Ashland to Clifton Forge.

No. 6 leaves Cincinnati daily except Sunday and arrives at Clifton Forge daily except Monday; from Clifton Forge to Old Point daily except Sunday. No. 8 daily except Sunday.

☞ Hotel Warwick, at Newport News, and Hygeia Hotel, at Old Point Comfort, are open all the year round. Boating, fishing, and tonic sea-air are always in order at these places.

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Shenandoah Valley Ry.

(August 30, 1885.)

Southward.	(No. 3.)	(No. 1.)
New York..... .....20 00		8 30 10 00
Philadelphia..... .....23 20		11 55
Baltimore.....		15 35
Harrisburg..... .... 4 20		.....
Hagerstown, (Wn. Md).....10 30		23 25
Shen. Junc. (B. & O.).....11 30		24 12
Charlestown (Val. B. & O).....11 42		24 24
Riverton (Va. Mid)..... ..... 12 53		1 26
Luray.....14 04		2 28
Waynesboro Junc., C. &O 16 28		4 22
Natural Bridge (R. & A).....18 28		6 11
Roanoke (N. & W.).. .....20 00		7 45
Bristol, Tenn 1 45		13 17
Chattanooga, Tenn.....10 00		22 10
Memphis, Tenn,.....		10 20
Atlanta, Ga,..... .....16 40		5 30
New Orleans.....19 45		19 30
Jacksonville, Fla,.....21 00		.. ..

Northward.	(No. 2)	(No. 4.)
Roanoke (N. & W.).....	3 20	12 50
Natural Bridge (R. & A).....	4 52	14 16
Loch Laird (R. & A.).....	5 21	14 42
Waynesboro Junc. (C. & O.)..	6 58	16 09
Luray.....	9 05	18 28
Riverton (Va. Mid.)	10 12	19 36
Charlestown (Val. B. & O.)...11 17		20 47
Shen. Junc. (B. & O.).....	11 30	21 15
Washington (B & O.).....13 15		22 50
Baltimore (B & O.).....	14 15	23 50
Hagerstown (Wn. Md.).....	12 30	22 10
Baltimore (Wn. Md.).. .....16 00		.. ..
Philadelphia..... .....19 30		.....
New York..... .....22 00		.....
Harrisburg, Pa..... ....15 30		1 05
Philadelphia..... .....18 50		4 25
New York..... ... .21 30		7 00

Nos. 3 and 4 have Pullman Palace Sleepers between Washington and New Orleans, via B. & O. RR. and Shenandoah Junction; also Pullman Palace Buffet cars between New York and Cleveland without change.—Nos. 1 and 2 have local sleepers between Roanoke and Hagerstown.

Richmond & Danville RR.

(Oct. 12, 1884.)

Southward.	No. 50.	No. 52.
Richmond,.....13:30	.....	2:00
Burkeville,..... .....15:38	.....	4:08
Danville,.....19:41	....	7:56
Greensboro,..... .....21:35	.....	9:30
Salisbury.....23:53	.....	11:10
Charlotte,..... 1:35	.....	....12.35

Northward.	No. 51.	No. 53
Charlotte,..... ..... 4:20	.....	....18:30
Salisbury,..... ..... 6:10	....	19:57
Greensboro,..... 8:20	....	21:38
Danville,..... .....10:08	....	23:09
Burkeville,.....13:32	.....	. 3:57
Richmond,.....15:45	....	7:00

All these trains are daily and connect with north- and south-bound trains on other roads so as to make through connections in all directions.—No. 53 runs to Atlanta without change.—Buffet sleeping cars run on Nos. 50 and 51 between New York and Atlanta, via Washington and Danville, and also Raleigh and Asheville.—Pullman sleepers on Nos. 52 and 53 between Richmond and Danville, and Washington and Augusta (Ga.) and Washington and New Orleans, via Danville. 61.

Valley Branch of B. & O. RR.

(May 3, 1885)

Southward.	No. 210.		
New York.....	24 00		
Philadelphia...	3 45		No. 220
Baltimore.....	7 20		16 25
Washington.....	8 40	(No. 288)	17 30
Harper's Ferry.....	11 25	1 30	20 07
Charlestown (S. V) .	11 48	2 16	20 28
Winchester.....	12 44	3 35	21 14
Strasburg (Va. Mid.)	13 44	4 59	No. 280
Harrisonburg.	16 05	9 30	5 00
Staunton (C. & O.)..	17 06	11 25	7 00
Lexington (R. & A.)	18 52	....	10 08

No. 210, the Lexington mail, leaves New York at midnight, daily but on Sunday, with sleeper to Washington.

No. 220, the Winchester accommodation, and No. 280, mixed train, run daily except Sunday.

No. 288 runs daily, except Sunday only to Harrisonburg.

Northward.	No. 281.	No. 291	
Lexington (R. & A.).	7 35	13 25	No. 283
Staunton.....	9 36	16 21	15 25
Harrisonburg.....	10 35	18 20	17 23
Strasburg (Va. Mid)..	12 52	19 37	No. 219
Winchester..... .	13 52	23 04	5 50
Charlestown (S. V.)..	14 40	24 31	6 30
Harper's Ferry..	15 00	1 04	6 50
Washington	17 30		9 50
Baltimore.....	18 40		10 15
Philadelphia.....	19 40		
New York.....	22 35		

No. 281, the Baltimore mail, No. 281, a mixed train, and No. 219, the Baltimore Accommodation run daily except Sunday 61

Virginia Midland Ry.

(Oct. 11, 1885.)

Southward.	(No. 50.)	(No. 52.)	(No. 54.)	(No. 58)
Washington.....	11 15	22 40	17 30	7 05
Alexandria.....	11 40	23 05	17 55	7 30
Manassas.....	12 38	23 55	18 50	8 20
Warrenton Junc..	13 08	24 22	19 47	9 01
Orange.....	14 30	1 38	21 11	10 47
Charl'tesville Ar.	15 30	2 35	22 15	11 40
“ Lve.	15 45	2 40	.....	11 57
Lynchburg...Ar.	18 00	5 05	.....	14 10
“ Lve	18 10	5 05	.....	.....
Franklin Junction.	19 47	6 32	....	.....
Danville.....	20 54	7 34	....	.....

Northward.	(No.51.)	(No.53.)	(No.55)	(No.59)
Danville.....	10 48	23 33	.....	.....
Franklin Junc....	11 45	24 29	. ..	.....
Lynchburg arrive	13 15	1 50	.....	.....
“ leave	13 25	1 55	.....	7 20
Charlottesville	16 05	3 55	.....	9 30
“ leave	16 20	4 00	17 25	9 35
Orange.....	17 25	4 58	18 20	10 40
Warrenton Junc..	18 52	6 12	20 04	12 02
Manassas...arrive	19 30	6 37	20 30	12 38
“ leave	19 50	6 39	20 30	12 38
Alexandria.....	20 50	7 30	21 20	13 27
Washington.....	21 15	8 00	.....	.....

All these trains run daily except 58 and 59.—Nos. 50 and 51 are mail trains.—Nos. 52 and 53 are the Southern express.—Nos. 54 and 55 are the Louisville and Washington express of Ches. & Ohio Ry.—Nos. 50, 51, 52 and 58 make through connections from Boston to Atlanta; they all have sleeping cars. Nos. 58 and 59 are mail trains to and from Baltimore and Lynchburg, daily except Sunday.

No. 56 is a train daily except Sunday, leaving Alexandria at 17.20 and runing to Manassas at 18 20, and No. 57 is a train, daily except Sunday, leaving Manassas at 7 18 and reaching Alexandria at 8 20.

On Manassas Branch trains run daily except Sunday. No. 56 from Manassas at 18.20 to Shenandoah Junction at 20:52 and Strasburg at 21:15; and No. 57 from Strasburg at 4:20, to Shenandoah Junction at 4:49 and Manassas at 7:18.

On Warrenton Branch No. 22 leaves the Junction at 20.10 daily, and No. 20 at 6.20 daily except Sunday, for Warrenton in 25 minutes; and No. 19 leaves Warrenton daily, except Sunday, at 5:04, and No. 21 daily at 18:20, and reach the Junction at 6:05 and 18:20 respectively.

On Gordonsville Branch a train runs daily at 21:20 to Gordonsville at 21:55; and one daily from Gordonsville at 4:15 to Orange at 4:45.

On Franklin Branch a mixed train runs daily except Sunday, from Franklin Junction at 20:00 to Rocky Mount at 23:30; and from Rocky Mount at 6:15 to Franklin Junction at 9:35.

The Virginias.

Serial No. 70. Vol. VI.—No. 10.

Staunton, Va., October 1885.

Jed. Hotchkiss, Editor.

The Southern Bivouac, published at Louisville, Ky., by B. F. Avery & Son, reaches the 6th month of its publication in the November number, one replete with historic, biographic, linguistic, topic and other deeply interesting articles, one of them, the Adventures of Gen. James Ray, a Kentucky pioneer, illustrated.

Moving in the current of present popularity this number of the "Southern Bivouac" has graphic a "War paper" by Col. Swallow on the movements of the Confederate army leading to the battle of Gettysburg, a salient feature of which is a defence of the much criticised—unfairly too, generally, as we well know—operations of Gen. J. E. B. Stuart.

The article on "Southern Dialect in life and literature" by Prof. Chas. F. Smith of Vanderbilt University is a very readable study in living English as spoken in the Southland, following in the path blazed by Prof. Jas. A. Harrison of Washington and Lee University. To some of Prof. Smith's "renderings" we would take exceptions, as when he says "biddable (obedient)," the word, in our opinion, is *bit-able*, and in other illustrations. To this article we will recur hereafter.

We hope this new venture to establish a Southern magazine may prove successful. Louisville is a very flourishing and enterprising city, one where a large amount of good publishing is done, and its location in the Central West is all that can be desired for reaching a constituency.

Science, the ably conducted weekly journal of that name, removed its editorial office from Cambridge, Mass., to New York city, where its publication office was already, at 743 Broadway, 1st of Oct, 1885, as we learn by a circular from Messrs. Samuel H. Scudder and N. D. C. Hodges, its editors.

We have read "Science," from its first number, with constantly increasing interest, finding it just the thing needed to keep one fully abreast of the tide of scientific information of all kinds that in these days is always at its flood, and we trust that this moving and bringing together of all its interests in our great metropolitan city will advance all the interests of this most deserving and much-to-be-commended publication. Its address now is "Editors of Science," New York, N. Y.

"*The Virginias.*"—We are indebted to the "Valley Record" of Madison, Boone county, W. Va., for this kindly notice:

"Probably no agency has wrought better results in bringing to the notice of capitalists abroad the wonderful natural resources of Virginia and West Virginia than that popular mining journal, *The Virginias*, published at Staunton, Va., by Mr. Jed. Hotchkiss, the noted geologist and practical mining engineer. Every number of this magazine contains articles of absorbing interest to mining operators and manufacturers and the contents of its pages are devoured with avidity. It is the reliable authority on all matters relating to mining and manufacturing in these two states."

Personal.

Edmund C. Pechin, M. E., we are much gratified to see, has become the "Associate Editor and Special Contributor on Metalurgical Topics," of the "Iron Trade Review and Western Machinist," of Cleveland, Ohio. The great industrial public, as well as the "Iron Trade Review," will be benefited by having such a well informed and fact comprehending metalurgist and mining engineer as Mr. Pechin at the head of the most important department of such a vigorous journal as our cotemporary of the great Central West. Mr. P.'s practical experience in mining and metalurgical matters in all parts of the Union will be of very great advantage to him in discharging his editorial duties and in consequence of this his statements and comments, which are sure to be fair and impartial, will command and receive an attention and credence such as those of a less practically informed writer would not be entitled to. It is especially gratifying to find a gentleman who is personally familiar with the resources, wants, and manufacturing conditions of the South filling such a post of vantage as does the Associate Editor of the "Iron Trade Review."

Joseph S. Clark of Philadelphia, Pa., says "The Progress" of McDowell county, W. Va., "qualified to practice law in the circuit court of this county at its October term." This young gentleman is a son of E. W. Clark, the head of the well known and substantial banking-house of E. W. Clark & Co. of Philadelphia, Pa., one identified with the Norfolk & Western R.R. and that has taken a great interest in the development of the Flat-top coal field. We are pleased to note that our young friend has not only qualified to practice law, but also that he has with well-posted guides been riding over the Trans-Flat-top counties of West Virginia and making himself familiar with their resources.

Sev. P. Ker of this city, who has been in the service of *The Virginias* for over a year, has recently obtained a place as clerk, stenographer, type-writer, etc., at the La Belle Steelworks of Smith Bros. & Co., Pittsburg, Pa. Mr. Ker is one of the most efficient, accomplished, and reliable young men we ever had in our employ; we are pleased to learn that he has obtained the position he has in the thriving "Iron city." We not only congratulate him but also the company that has secured his services. It can rely on him for the prompt and faithful discharge of all duties entrusted to him.

Gilbert R. Frith of Richmond, Va., a gentleman possessed of much artistic talent, has, during his recent summering at Woodville, Albemarle county, been engaged in modeling *a relief Map* of Virginia, 57″ by 28″ in size, using as a basis the topographical map in "Hotchkiss' Summary of Virginia." Such a map would be a most valuable addition to the teaching appliances of our schools, and we hope Mr. Frith will place duplicates of his model on sale at such a price as will insure its introduction. The German schools, the ones that teach geography best, are all supplied with relief maps,

Prof. I. C. White, our geologic friend, is briefly discussed by the Huntington, W. Va., Argus in the following item:

We would inform our neighbor that Prof. White is not a devil, but an intelligent human being who, we are informed, was invited to come here by our Mayor, and see if there was not coal, oil, gas or something in the southern part of the city, where some one is said to own some land, and as he says water can be obtained at a depth of 800 feet, and as the city wants water works, why, of course, it is all right that the city should pay for his entertainment. Now, don't you see, or don't you?

Coal and Coke.

Flat-top coal shipments.—The Norfolk & Western RR. makes the following report of its shipments of semi-bituminous coal from the Pocahontas and Bluestone mines of the Flat-top coal field to the end of the 2nd week in Oct., 1885, in 2,000 lbs. tons:

	1884.	*1885.*	*Increase.*
Shipments 2nd week of Oct.	6,358	17,875	11,517
Previous shipments of year,	134,988	433,716	298,728
Totals.....	141,346	451,591	310,245

The above shows that the shipments of 1885, both weekly and yearly, are about three times as great as were those of 1884.

A Southern Coal and Coke-producing Region.—Under the preceding heading the "Baltimore Sun" of Oct. 22d has the following editorial:

Persons whose knowledge of Virginia and West Virginia dates from a period of fifteen years past can form an idea how much they are behind the times by taking a trip over the Chesapeake & Ohio Railway from Newport News to the Ohio river. They will experience their first surprise perhaps in learning that in August of the present year fifty-six vessels were loaded at Newport News and Richmond with New River and Great Kanawha coals, the quantity taken being 38,483 tons, and their wonderment will not be diminished at the statement that the quantity of semi-bituminous coal that will be conveyed to market this year by the Ches.& Ohio Railroad is estimated at 650,000 tons. The supply is obtained in great part from the New River coal field where there are now thirteen collieries in operation. At the Quinnimont, Stone Cliff, Echo, Fire Creek, Sewell, Nuttall and Fayette collieries there are coke ovens which prepare fuel for the many large iron furnaces built in the last few years along the Chesapeake & Ohio and its connections. The product is remarkable for its light percentages of ash, sulphur and phosphorus, and is becoming a formidable rival of the famous Connellsville coke. All the New River collieries are said to be busy, and at many of them steps are being taken to increase the output. The workings are being extended, and in several instances branch lines of railroad of some length are being constructed to coal properties back from the Chesapeake & Ohio Railway. The Shenandoah Valley, the Richmond & Alleghany and the Norfolk & Western have each a similar story to tell of large industries well established in districts which a few years ago were mere backwoods.

Southern Coke.—Prof. H. E. Colton, of Tennessee, under the heading of "Coke-making and the use of coke in the South," has recently furnished an article to the "Iron Age," of New York, in which he stated "that there is not any first-class coke of commercial importance made in the South" and that there is no coking coal there to make such a coke. Having been taken to task for his statements, he proceeds in a second article to defend his position by a bill of particulars concerning the coking coals and the coke made from them in Tennessee and Alabama from the standpoint of Mr. Fulton's "requisites of a first class coke."

Prof. Colton does not include Virginia and West Virginia in the South, for he says: "Lest some of my Pocahontas friends should take offence, I state that I have not yet come to discuss that coal and coke, in fact it is hardly in the field of which I am treating, yet is rapidly earning its way into use there and elsewhere, though low first cost and cheapness of transportation, as well as its own general excelence."—So we have nothing to say in reference to his statements. When he comes into our field we will look after him.

Coastwise Coal Shipments of Chesapeake & Ohio Ry. in September, 1885.—Below we give a list of the vessels and steamships, by name, their destination, and the number of tons of coal taken by each, that took West Virginia coals from the Richmond and Newport News wharves of the Chesapeake & Ohio Ry. during the month of September, 1885, for ports outside the Capes of Virginia, and a list of the steamships that coaled at the same wharves. This report, prepared especially for *The Virginias* by Fuel Agent J. W. Hopkins of the C. & O. Ry., is in continuation of one for August on page 140.

The points of destination, the names of the vessels and the tons of coal taken by each, are as follows:

To Portland, Me.: Yale, 1,050 tons.

To Boston, Mass.: C. D. Lathrop, 443 tons; Weybosset, 886; Abbott W. Lewis, 1,005; H. A. Barry, 843; M. A. Drury, 699; Jas. B. Ogden, 1,046; H. R. Sturgis, 898; Howard Williams, 658; and G. D. McFarland, 321.

To New York city: H. P. Shores, 650 tons; F. Merwin, 494; Sue Williams, 1,060; E. M. Golder, 1,002; J. N. Brown, 769; S. S. Thorp, 878; F. Merwin, 484; Sue Williams, 1,061; Str. Kanawha, 776; W. H. Bailey, 794; John D. Williams, 807; and Str. Kanawha, 763.

To Providence, R. I.: John D. Williams, 803 tons; Sam. McMewsy, 425; Str. Kanawha, 776; and D. S. Williams, Jr., 1,086.

To Charleston, S. C.: L. T. Garretson, 810 tons.

To Portsmouth, N. H.: Geo. S. Tarbell, 758 tons; and Wm. Cobb, 575.

To Fall River, Mass.: H. S. Williams, 1,275 tons, and Wild Pigeon, 467.

To Portsmouth, R. I.: Gov. J. Y. Smith, 439 tons.

To Yonkers, N. Y.: Belle Holliday, 501 tons.

To steamships, for fuel: Legislator, 241 tons; Haworth Castle, 47; Feuanice, 1,261; Aurora, 115; Hallamshire, 237; and Sandringham, 163.

Recapitulation.

To Portland, Me, . . .	1	vessels;	. . . 1,050 tons.
" Boston, Mass. . . .	9	"	. . 6,799
" New York, N. Y. .	12	"	. . . 9,538
" Providence, R. I. .	4	"	. . . 3,090
" Charleston, S. C. .	1	"	. . . 810
" Portsmouth, N. H. .	2	"	. . . 1,333
" Fall River, Mass. .	2	"	. . . 1,742
" Portsmouth, R. I. .	1	"	. . . 439
" Yonkers, N. Y. . .	1	"	. . . 501
" Steamships for fuel,	6	"	. . . 2,064
Totals,	39	"	27,366

The above shows fewer shipments and a less total than in the preceding month; September appears to be an "off" month in the coal trade.

"**Kanawha Splint coal** makes an excelent fuel for grate fires, and we notice that it is being sold here at the reasonable price of ten dollars per ton at retail."—We find without further comment this noteworthy statement in a recent number of the "Coal Trade Journal" of New York, the reliable metropolitan organ of the coal trade in the United States. We do not doubt the accuracy of this statement, but we would like to have our friend explain about this "splint coal" quotation for fear some of the miners of that high grade fuel may "take note" and attempt to corner the New York market.

The Porosity and Specific Gravity of the Flat-top Coke.

By Fred. P. Dewey.

In the continuation of the examination of the physical properties of cokes, as described before the Roanoke meeting of the American Institute of Mining Engineers, the coke made in the Soldenhoff-Coppee ovens at Hawksnest, W. Va., from the Flat-top semi-bituminous coal of the Bluestone mines, as described in this journal, has recently been examined.

The determinations made are: The Moisture in the specimens as received; the True Specific Gravity, or the specific gravity of the particles of the coke; the Apparent Specific Gravity, or the specific gravity of the mass including the coke and cells; the Percentage of Cells by volume; the Volume of Cells in a given weight, which for convenience is given as the number of cubic centimeters in 100 grams of the coke; and the Weight in pounds of a bushel of the coke. This last result is the weight of a bushel of the coke without cracks or empty spaces, this condition, however, can never be accomplished in measuring a bushel, so the results are a little higher than would be found by measuring a bushel and weighing it.

The following are the results obtained on a series of 16 specimens:

No.	*Moisture.*	*True specific gravity.*	*Apparent specific gravity.*	*Per cent of cells by volume*	*Volume of cells in 100 grams, cc.*	*Weight per cubic foot, pounds.*
1.	0.332	1.78	.892	50.11	56.15	55.67
2.	0.341	1.78	.927	48.16	51.94	57.86
3.	0.431	1.82	.884	51.50	58.24	55.17
4.	0.343	1.79	.923	48.47	52.47	57.61
5.	0.784	1.83	.922	49.62	53.79	57.55
6.	0.406	1.77	.881	50.43	57.20	54.99
7.	0.019	1.68	.906	46.16	50.92	56.55
8.	0.022	1.77	.863	51.41	59.56	53.86
9.	0.374	1.77	.933	47.44	50.80	58.23
10.	0.326	1.76	.856	51.55	60.20	53.43
11.	0.282	1.79	.933	48.05	51.48	58.23
12.	0.385	1.81	.892	50.70	56.82	55.67
13.	0.228	1.78	.918	48.62	52.95	57.30
14.	0.338	1.79	.904	49.47	54.67	56 42
15.	0.535	1.84	.847	54.09	63.80	52.86
16.	0.456	1.81	.916	49.36	53.82	57.17
Av.	0.350	1.70	0.899	49.72	55.30	56.16

An inspection of these results will show that in the properties examined this coke is fully the equal of any of the cokes previously examined.

Fred. P. Dewey.

U. S. National Museum,
Washington, D. C, Oct. 21, 1885.

The Milton, W. Va., Coal & Mining Co. has been incorporated with a capital of $200,000, and headquarters at Catlettsburg, Ky. The corporators are S. F. Black, T. B. Kline and S. P. T. Moore.—An exchange says this company "will mine coal and tin in West Virginia," a pointer which indicates a spread of the "tin fever," the symptoms of which are noted elsewhere in this issue.

Coastwise Coal freight rates to Hampton Roads, Etc.—A special telegram of Oct. 19, to the Richmond "Dispatch," says: "Col. Wm. Lamb has returned from attendance on the annual convention of the Captains' & Vessel-owners' Association, and through his efforts it was decided to put the freights of coastwise coal from Hampton Roads—that is, from Newport-News and Lambert Point (Norfolk)—on the same footing as those from Philadelphia."

This is a very important concession, one granted, most probably, in consequence of the growing coastwise coal trade from these coaling ports, a trade which, like the cotton trade of Norfolk, is having a phenomenal growth, one that leads the "Coal Trade Journal" of New York city, in speaking of prices of bituminous coals for another season in its issue of the 14th instant, to say "It remains for the movers in this direction to secure the adherence of the shipers from the Chesapeake & Ohio and Norfolk & Western roads, for it will be noticed that on these lines is the increase most noticeable."

The telegram above quoted also stated that "five ocean steamers from Galveston and New Orleans to Europe, put in at Hampton Roads on the 18th and 19th for coal." *The Virginias* has been constantly insisting not only that the New River and Flat-top semi-bituminous coals of Virginia and West Virginia are the best steam coals found on this continent, but also that Hampton Roads is the *natural coaling port* of the Atlantic coast; so it is well pleased to record such an item as the preceding and to add that we have the evidence that every steamship that once uses these coals will come out of its way, if necessary, to get them again.—The same issue of "The Coal Trade Journal" quoted above also says:—"It is pleasing to notice that the shipments of American coal from Norfolk and Newport-News to the West Indies continue on a large scale."

New Cumberland W. Va. and Md. coal companies.—The Baltimore papers of Oct. 8 report that on the 7th a certificate of incorporation of the Cumberland Coal Company of Baltimore City was filed for record. The incorporators are Henry G. Davis, of Piedmont, W. Va., Stephen B. Elkins, of New York city; Arthur P. Gorman, of Howard county, Md., and Robert Ober, of Baltimore city. The operations of the company are to be carried on in Maryland and West Virginia, and the principal office will be in Baltimore city. The capital stock is $30,000, divided into 300 shares of $100 each. Mr. Wm. H. Gorman, who is a brother of Senator A. P. Gorman, is to be the manager, with his office in this city, in the Keyser building, on German street, where the offices of the West Virginia Central Railway and the Elk Garden Coal Company are located. It is understood this new Cumberland company has secured the ownership of coal property in the Cumberland region, near Piedmont. The New England, Fairmont and Western Gas Coal Company of Baltimore city is another new corporation that has recently commenced operations. The owners are Northern parties, and Messrs. Black, Sheridan & Wilson, of this city, are the selling agents. Mr. Alfred E. Smyrk, formerly sheriff of Baltimore city, is superintending work at the mines near Fairmont, West Virginia, and it is stated that he will be the resident superintendent. The first coal was shiped about three weeks ago. Mr. Henry Y. Attrill, one of the original managers of the Equitable Gas Company of Baltimore, was the owner of the coal lands which the new company is developing.

The Pennsylvania Coal & Coke Co. of West Virginia, formed for the purpose of mining ahd shiping coal, manufacturing coke, &c., was recently incorporated, under the laws of W. Va., by Secretary of State Walker at Charleston. The principal office and place of business of this company is to be at Oakvale, Mercer county, the charter to expire Aug. 15, 1935. Nine hundred dollars have been subscribed in shares of $100 each, with privilege of increasing stock to $100,000. The corporators of this company are George Evans and Mary J. D. Evans of Oakvale, W. Va.; D. W. Evans of Astley, Pa.; and James P. Taylor, Mrs. R. S. Taylor, Owen P. Henly, S. L. Hardenburgh, H. A. Hoyt, and Harry W. Taylor of Wilkes Barre, Pa.

Flat-top Semi-bituminous coal and coke output for September, 1885.—The last report to *The Virginias* of Flat-top coal and coke output, that for August, 1885, was published on page 131 of this volume; below we give the output of the Pocahontas mines of the Southwest Virginia Improvement Co. and that of the mines of the Bluestone Coal Co. for the month of September, 1885, in 2,000 pounds tons, furnished *The Virginias* by E. J. Collins, secretary and treasurer of the S. W. Va. I. Co., 244 S. 3rd St., Philadelphia, Pa., and D. H. Matson, secretary and treasurer of the Pocahontas Coal Co. of Roanoke, Va.

1. Pocahontas mines.

	September.
Coal shiped, tons	31,694
Coal coked, tons	8,564
Coal used at mines and on hand, tons	532
Coal mined, total	40,258
Coke made, tons	5,181
Coke shiped, tons	4,936

2. Bluestone mines.

Coal shiped, tons	11,933

So the total shipment of Flat-top semi-bituminous coal by the Norfolk & Western RR. during the month of September, 1885, was 43,627 tons.

The *July 1885* output of the Bluestone Co's mines was 13,502 tons. We give this to complete our record of its work, having failed to insert this item in the August number.

The Soldenhoff-Coppee coke oven, the one erected at Hawksnest station of Chesapeake & Ohio Ry., Fayette county, W. Va., and operated by the Hawksnest Coal and Coke Co., is described as follows in the Bulletin of the U. S. Patent office:

No. 273,822. Coke oven. Richard de Soldenhoff, Merther-Tydvil, county of Glamorgan, England. Filed Aug. 8, 1882. (No Model).

Claim.—1. A coking-oven provided with a foundation arch, A, and the series of openings D, formed therein, the bricks lying above said arch being arranged with intervening spaces, whereby the air is received and heated, as specified, in combination with the passage H, conduits G I, and the flues K, constructed in the manner and for the purposes set forth.

2. A coking-oven provided with the foundation arch A and the series of openings D formed therein, the air-heating spaces F, the passage H, conduits G I, and flues K, arranged and constructed as described, in combination with the gas-flues B, substantially as and for the purpose set forth.

3. A coking-oven provided with the foundation arch A, having the openings D formed therein, the air-heating spaces F, formed by the bricks, as set forth, the passage H, conduits G I, and flues K and B, constructed as described, in combination with the cross-flues L, located away and outside of the ovens, as shown and specified.

"Future Sources of Coke Supply" is the heading that the "Iron Trade Review" of Cleveland, Ohio, in its issue of Oct. 10, gives to its conspicuous reproduction of our comments on "A monopoly of Connellsville coke." In the same number, under the head of "The Coke Syndicate again," it says:

"We reproduce elsewhere, from the pen of the well informed editor of *The Virginias*, a very interesting account of the immense coking coal deposits of West Virginia and their probable influence upon the great syndicate that now controls the famous Connellsville region. Since the occasion of *The Virginias*' article was a recent editorial in the "Iron Trade Review" giving from inside sources the present status of the Connellsville syndicate, it seems proper to say that the whole subject was treated by us in the light of the *existing* relations between the Connellsville region and the Bessemer steel industries of the Central West, rather than upon what may be in the immediate future.

Up to this time the immense coal region of West Virginia, though wonderfully increasing its product each year and though susceptible of far greater development when once it is taped by other leading lines of railways, has nevertheless made little impression upon the heaviest steel-producing districts as yet. What it may do within the next ten years, especially in the South, as well as north and west of the Ohio river, is quite another thing. The language attributed to the present Associate Editor of this paper by the Editor of *The Virginias* is still as true as when uttered; and we look for some early and decided changes in the fuel question outside of the region directly dependent upon Connellsville coke. This is emphatically a big country; and the syndicate that thinks it can hold the key to any great commodity for a long period is going to get 'left.' Concerning the comparative merits of the Connellsville and the Flat-top cokes we may have something to say hereafter."

The Nuttallburg Coal & Coke Co. that has its headquarters, colliery, and coke ovens at Nuttall station of the Chesapeake & Ohio Ry., Fayette county, W. Va., deservedly has the credit of furnishing about the best quality of the much-sought after New River Semi-bituminous coal and the high grade of coke made from it.

The coal bed mined by this company is the upper one of the Lower or No. XII coal measures, the one that Prof. I. C. White of the U. S. Geological survey designates as the "Nuttall" bed, from this colliery where it has been so successfully mined for nearly ten years and where it was first worked by Mr. John Nuttall, and of which Prof. White says in his report: "It is everywhere pure, and free from admixture of slate, and a coking coal of unsurpassed excelence."

Prof. Thos. Egleston of the School of Mines of Columbia college, New York, made an analysis of a sample of the entire thickness of the Nuttall coal bed in 1879 with these results: Fixed carbon 70.67 per cent; Ash 2.10; Moisture 1.35; Volatile matter 25.35, Sulphur 0.57; and Phosphorus 0.08; results showing that this coal has from 6 to 11 per cent the advantage of the Connellsville so-called "standard" in the important element of fixed carbon, and from 4 to 6 per cent less ash.

The members of the Nuttallburg Coal & Coke Co. are Messrs. John Nuttall, L. W. Nuttall, Jackson Taylor and W. H. Holland; these parties lease, on a tonage royalty, the

Nuttallburg and Keeney Creek collieries, two adjacent ones, from Mr. John Nuttall who is the owner of a large body of the best coal lands on New river on which these collieries are located and on which there is ample room for several other equally good ones. This is, deservedly, a prosperous and popular coal and coke company.

Coal and Coke traffic of Chesapeake and Ohio Ry. for September, 1885.—General manager C. W. Smith furnishes *The Virginias* the data for the following report of the coal and coke traffic of the Chesapeake & Ohio Ry. during the month of September, 1885, and for the same month of 1884, in 2,000 lbs. tons, prepared for *The Virginias* by fuel agent J. W. Hopkins:

The movement, by kinds and quantities, was:

Year.	*Cannel.*	*Gas.*	*Splint.*	*New R.*	*Coke.*
1885	4,276	15,255	23,953	48,593	11,172
1884	3,014	26,085	19,684	22,046	9,175
	+1,262	−10,830	+4,269	+26,547	+1,997

The above comparative statement shows a gain in this month's shipments in 1885 over those for the same month in 1884 of 23,245 tons, or over 29 per cent This gain was shared in by the cannel, splint and New River coals and by coke. Gas coal alone shows a decreased shipment. As usual for some time past the New River semi-bituminous coal scores the largest gains.

Total movement in September, 1885.....103,249 tons.
" " " " 1884..... 80,004 "
Increase in September, 1885..... ..... 23,245 "

The movement, by kinds and quantities, from Jan. 1 to September 30, 1885, nine months, and for the same time in 1884, was:

Year.	*Cannel.*	*Gas.*	*Splint.*	*New R.*	*Coke.*
1885	19,986	252,218	125,416	428,540	89,231
1884	16,478	232,568	78,121	304,189	51,802
Increase,	3,508	19,650	47,295	124,351	37,429

The total movement during the first nine months of 1885, and of 1884, was:

During first 9 months of 1885..... .....915,391 tons.
" " 9 " " 1884..... .....683,158 "
Increase in 1885 over 1884 ..... 232,233 "

The increase for the first nine months of 1885 over the same period of 1884 was one of about 34 per cent.

These returns for 9 months indicate that the Chesapeake & Ohio will this year transport to market about 1,250,000 tons of coal and coke, and that fully 750,000 tons of this, or considerably over half of it, will be New River semi-bituminous coal (converting the coke carried into equivalent tons of coal.)

Ocean Coal Shipments of Chesapeake & Ohio Ry. in August, 1885.—Below we give a list of the vessels and steamships, by name, their destination, and the number of tons of coal taken by each, that took West Virginia coals from the Richmond and Newport News wharves of the Chesapeake & Ohio Ry. during the month of August, 1885, for ports outside the Capes of Virginia. On page 111 of the August number were given similar returns for the month of July.

We repeat that this official report, prepared especially for *The Virginias* by Coal agent J. W. Hopkins, is full of interest to the shipers of coal from the line of the C. & O. Ry., for, although the quantities of coal taken are not very great, it shows that the superior steam and gas coals of the Great Kanawha basin, coals especially adapted by composition for storage, are being sent to quite a number of important coastwise and foreign ports, thus opening the way for larger shipments in the future, and giving these coals a wider reputation.

The points of destination, the names of the vessels and the tons of coal taken by each, are as follows:

To Portland, Me.: J. F. Murry, 659 tons; Nellie W Craig, 828; and Jonathan Bourne 1,161.

To Boston, Mass.: George A. Tarbell, 764 tons; A. F. Whiting 501; Cox & Green 898; Woodbury 512; Wm. Cobb 567; M. A. Reed 521; Williamine, 634; Lula, 751; L. A. Burnham, 534; and Yale 1,057.

To New York city: Rhoda Holmes, 530 tons; S. S. Thorp, 876; Kanawha, 753; John M. Brown, 748; W. H. Bailey, 790; Kanawha, 765; John R. Fell, 511; Kanawha, 713; H. P. Shores, 648; John D. Williams, 802; Kanawha, 747; John D. Williams, 809; H. P. Shores, 636; Jos. H. Jackson, 1,001; and S. S. Thorp, 882.

To Providence, R. I.: J. D. Ogden, 1,048 tons; barge Benefactor, 1,010; and J. Rudd, 463.

To Portsmouth, N. H.: M. J. Chadwick, 401 tons; Viola Reppard, 755; Wms. C. Wickham, 430; and Speedwell, 213.

To Fall River, Mass.: Wild Pigeon, 466 tons; Hattie S. Williams, 1,270; James B. Ogden, 1,035; and Wild Pigeon, 464.

To Portsmouth, R. I.: Gov. J. Y. Smith, 424 tons; and Gov. J. Y. Smith, 429.

To Allynspoint, Conn.: Montano, 506 tons: and L. T. Garretson, 875.

To New Bedford, Mass.: G. W. Jewitt, 456 tons; to St. Thomas, West Indies, bark Olustee, 652; to Aspinwall, Central America, SS. Craighill, 1,108; to Yonkers, New York, Hattie Page, 391; to Charleston, S. C., F. B. Baird, 478; to Brooklyn, N. Y., John M. Brown, 764; to Bangor, Me., Viola Reppard, 730; and to New London, Conn., barge Albemarle, 1,200.

To steamships, for fuel: Advance, 1,382 tons; Craighill, 350; Stag, 215; Bellingham, 242; and Merrimack, 138.

Recapitulation.

To Portland, Me, . . .	3	vessels;	. . . 2,648 tons.
" Boston, Mass. . . .	10	"	. . 6,739
" New London, Conn,	1	"	. . . 1,200
" New York, N. Y. .	15	"	. . .11,211
" Providence, R. I. .	3	"	. . . 2,521
" Charleston, S. C. .	1	"	. . . 478
" Aspinwall, Cent. Am.	1	"	. . . 1,108
" Portsmouth, N. H. .	4	"	. . . 1,799
" Fall River, Mass. .	4	"	. . . 3,235
" St. Thomas, West Ind.	1	"	. . . 652
" Portsmouth, R. I. .	2	"	. . . 853
" Bangor, Me. . .	1	"	. . 730
" New Bedford, Mass.	1	"	. . . 456
" Brooklyn, N. Y. .	1	"	. . . 764
" Allynspoint, Conn.	2	"	. . . 1,381
" Yonkers, N. Y. .	1	"	. . . 391
" Steamships for fuel,	5	"	. . . 2,327
Totals,	61		38,493

A reference to the July report of these shipments, page 111, will show that during that month 50 vessels were loaded with coal, and 7 steamships were coaled, all taking 33,658 tons. The above report shows that in August 61 vessels were coaled, all with 38,493 tons; making a gain of 4,835 tons, or over 14 per cent, in the August shipments over those in July.

Protection vs. the Bessemer steel Monopoly.

The "American Manufacturer" of Pittsburg, Penna., the sturdy and always consistent friend of protection, has the following quotation and comment in its issue of Oct. 2 :

"*The Virginias* for September shakes its fist in front of the Bessemer steel-makers in this threatening fashion : "The near future will probably see some *basic* steel-works in operation in Virginia and elsewhere in the South, where ores adapted to that process are cheap and abundant, 'by permission' of the holders of that patent, or the Bessemer steel-makers who have 'pocketed' the basic process will find themselves voted out from the duty list. The only tariff that can stand in this country is a reciprocity one. Not only must all our home 'raw materials', so-called, be protected, but every part part of the country must have the largest free-trade liberty in processes for working up these raw materials into more valuable forms."

"A great many things have been said in favor of protection, but the above contains a point in its favor that has not hitherto been brought forward, and which the author himself possibly did not notice when he wrote it—namely, it can be used as an engine of compulsion or destruction against those who are disposed to be too grasping and monopolistic."

We assure our highly esteemed cotemporary that "the author" intended to make "the point" in the case of *protection versus monopoly*, thus early in the coming "tariff reform" or "tariff revision" movement, just as he understands him to have made it.

The great states of West Virginia, Virginia, North Carolina, Kentucky, Tennessee, Georgia, and Alabama, to go no further, may truthfully say that they have untold millions of tons of iron ore, dolomitic limestone, and coking coal, all of the best quality for the cheap manufacture of *basic* steel, because the raw materials are not only abundant but are in proximity to each other where labor is plentiful, food cheap and the elements propitious ; but they are compelled to see all these bounties of Providence, intended for their upbuilding in wealth and power and for giving them industrial life, lie dormant and to them useless because the owners of the "Bessemer steel process," operating in sections less favored in such resources, have knowingly, advisedly and graspingly, with the very money they have made by the ample protection granted them, purchased the "basic process," the only one hitherto discovered and proved to be properly adapted to steel-making with the ores that most abound in the states named, not for the purpose of using it themselves or of allowing, on any terms, anyone else to use it, but for the express purpose of "pocketing" it and preventing its use in this country, where it could be so advantageously used, in order that the monopoly of steel-making they have so long and so profitably enjoyed may be continued, to the manifest detriment of the larger and more needy portion of our common country.

And more. Not satisfied with the monopoly in "processes" that it holds, this one and indivisible steel-making syndic, strong in the wealth and power it has acquired during years of fostering protection, now comes boldly forward and demands that foreign iron ores, such as they need for the only process they will allow to be used, shall be admited into this country "duty free"—the iron ores mined and loaded for a trifle by the convicts, paupers and slaves, or the ill-fed and poorly paid laborers of Spain, Algiers, Cuba and any other region where so-called "Bessemer ores" can be cheaply bought, so they may weld another link in the chain of their monopoly and be further strengthened in their ability to hold processes for their own sole use and behoof.

The steel-making industry is now prospering and we hope it may continue to prosper, but the people of these states have no intention of having less than their legitimate share in the prosperity of the country. They propose to take a manly part in the struggle for industrial supremacy and all that that implies, consequently they do not propose to be either passive or active agents in any scheme of "tariff revision or reform" that does not give them a fair field for this contest. They are informed of what the world is doing in these matters; they know that in many of the largest steel-producing countries the *basic process* is the leading and most successful one, and they are rightfully indignant because the monopolist of processes will not throw open to home competition, on fair terms, the making of steel in any and every locality by the means adapted to local requirements.

We wish it distinctly understood that we are in favor of protection for every American industry against all the world, and that the only free-trade we are in favor of is home free-trade. Our country is self-contained and we can afford to be independent in this matter. But let it be equally well understood that we are for reciprocal protection. We are not like some only in favor of protecting "sumac," or some other one article of home production or manufacture. We want *no free list*, and *no internal revenue* to furnish an excuse for one ; but when any set of men in any part of the country put a *prohibitory duty* on processes against the interests of part of the country, and when this set of men or any other set moves to take the duty from iron ore, coal, or any other raw material that here abounds and is as cheap as honest labor spent in mining or raising it can make it and live as a citizen of this land full of Heaven's bounty ought to live, then we are in favor of simultaneous action for removing all duty from Bessemer steel, or any other that is made by a monopoly process, and for increasing the duty on any raw materials that such monopolists may desire to import. We demand the continuance of the duty on iron ore and the throwing open of all processes, at a fair profit, to common use ; if these things are not conceded those opposing them will find a strong and determined body of citizens and their representatives that will not hesitate to use "an engine of compulsion or destruction against those who are disposed to be too grasping and monopolistic," as the "American Manufacturer" forcibly puts it.

A rolling and nail mill will in all probability now be built and put in operation at Huntington, W. Va., the first Ohio river station of the Chesapeake & Ohio Railway, judging by the tone of the following from its "Advertiser" of Sept. 19th.—The great want of all our Virginia towns is diversified manufactures, so as to bring the plow, the loom, and the anvil together ; therefore we are always glad to make record of such a movement as this. :

"The plans are rapidly maturing to build a steel rolling mill and nail mill in this city. Mr. John Hastings, who represents a crew of experienced mill men, has been to New York and had a consultation with Mr. C. P. Huntington, and laid his plans before him. He says he was surprised to find that Mr. Huntington was fully posted as to the most modern methods of steel making and therefore an apt hearer, so that a short talk put him in possession of all the facts necessary to an understanding of the scheme. Mr. H. gave him to understand that he would place the necessary bonds to put the business on a solid financial basis, leaving the details to be arranged by Col. Emmons of this city. With these very satisfactory assurances Mr. Hastings returned to this city this week and consulted Col. Emmons, whom he found

quite well disposed to put the project upon foot at once. With this view Col. Emmons has opened a correspondence with Mr. Huntington which there is a good prospect will result in the early building of the mill.

It is known that a rolling and nail mill can now be built for $125,000, which will do the work of a $400,000 plant built on the old plans of years ago. This is owing to the very great improvement in the methods of making steel and iron. The plan now is to put about the former sum into the works here. It is probable that a joint stock company will be formed here as a basis of organization and in that case we hope our monied men will come forward while everything is propitious and the originators of the plan, which is to be of such great importance to our city, are full of enthusiasm."

In another place "The Advertiser" says: "If we get a rolling mill here it will attract a number of other manufacturing industries. About all sorts of woodworking establishments use peculiar shaped angle- and T-irons which must be made near them so as to be handy and within easy reach. This want will be supplied by the mill."

Tin.

Tin ore in West Virginia.—Under the heading "Cabell county's bonanza" we find the following statement, credited to the Huntington, W. Va., "Republican," going the round of the newspapers and even some of the mining and trade journals of the country:

"While at Middleport, Ohio, a few days ago a representative of the Republican found that considerable excitement prevailed in that city over the recent discovery of tin ore in Cabell and Mason counties, this state. In order to ascertain the truth of the reports that were current we called upon Mr. S. R. Bartlett, a geologist of considerable note, who has made several tests of the ore, and as a result of our interview we were assured that the reports in regard to the matter were absolutely true, and that the greatest amount and best quality of ore was in this county, about four miles from Milton. The ore has been thoroughly tested and the results are highly satisfactory and of the most flattering character, and such as to warrant the conclusion that tin in that section is very abundant, and exists in large and paying quantities. Mr. Bartlett says there can be no mistake about it, as the ore has several times been thoroughly tested and with about the same results, proving the mineral to be genuine. The metal has not only the peculiar smell of tin, but in bending makes that crackle, or "tin cry," by which this metal is distinctly noted.

With this important discovery of tin it will thus be seen that a new field of enterprise, of immense extent and far-reaching in its benefits, has been opened in the Ohio valley, and such as will undoubtedly prove one of the richest boons to this section. A more important discovery of metal could scarcely be made, and one that is more likely to assist in bringing general prosperity to this county.

The land on which this ore was discovered is owned by the Tin Ore Smelting and Mining Co., of Covington, Ky., which will proceed without delay, we are informed, to erect works commensurate with such an enterprise and operate the mine."

The "Commercial," also published at Huntington, W. Va., has the following *cumulative* item, which is also traveling in the wake of the above "*bonanza*" one:

"The process of smelting tin can now be witnessed at the Glenwood mines, in Mason county. They obtained more than one pound of tin from 18 pounds of ore. A more important discovery of metal could scarcely be made, or one that is more likely to assist in bringing general prosperity to this vicinity. In fact it will open up a great field of business and enterprise on this side of the Atlantic hitherto unknown and almost unthought of."

The "Irrepressible," a paper published somewhere in this "tin" region, has also floated its say, as follows:

"They got the tin ore from the mines of Glenwood, Mason county, assayed in the smelting furnace at Clifton, last week, and the result was 1½ lbs. of pure tin to every 18 lbs. of ore, which is the richest yield of any mine known in the world. Verily West Virginia is destined some day to become a great state."

Last April *The Virginias* quoted from Ohio papers statements concerning this so-called "Glenwood tin mine" to which it had called the attention of Prof. I. C. White, the distinguished professor of geology and mineralogy in the West Virginia University and assistant geologist in the U. S. Geological survey. In his reply to our request for reliable information concerning the alleged discovery of tin, he said: "I regard this tin excitement in some of our counties as goten up by a ring for mercenary motives. I think it possible that a 'confidence game' is being played upon some of our farmers by a rascal who is in collusion with some pretended chemist in one of the cities. I am instigating inquiries to find out this chemist's address who has discovered so much 'tin' in our state, and when I run him down I shall write you an article for publication on these bogus analyses and ore discoveries."—We published this note of warning that people might be put on their guard against this transparent tho' plausible swindle, but noticed that the papers that had published the story of the "find" paid no attention to our warning.

We now give publicity to the above extracts that we may have an opportunity for saying that we do not believe one word of these statements, and that the writers of them have been duped by clever and unprincipled swindlers into making them. We intimated as much before from our general knowledge of tin deposits and the geological formations in which they have always been found, but now we have proof, beyond question, that the whole thing is a "put up job." When at the National Museum, Washington, D. C., a few days ago, we were shown by Dr. Fred. P. Dewey, the Curator of the department of Metalurgy of that institution, an accurate analyst, a massive sample of calcarous conglomerate, filled with shining specks of mica, and accompanied by a slender bar of tin. This sample was sent to the Museum as the "tin ore" of this W. Va. region with the statement that the accompanying "bar of tin" had been smelted from it. Dr. Dewey carefully analyzed this "tin ore" and found that it *did not contain a particle of metalic tin.*

This is not the first time that a "tin swindle" has been attempted in West Virginia. A few years ago Senator Hereford sent the writer, from Monroe county, a lump of "tin ore," accompanied by a lump of tin which it was asserted had been smelted from that ore. A careful analysis could not find a particle of tin in the ore sent. A vigorous statement of facts and opinions put an end to the Monroe tin mines, and we now hope, for the good of the mining interests of West Virginia, that some proper end may be put to this new "tin swindle" and to all the parties that have been en-

gaged in "salting" the so-called mines, the smelting furnace, and those who have in any way taken "stock" in the bogus concern. This state is rich in genuine mineral wealth needing development, and—puting it on no higher plane—it cannot afford to acquire the reputation of originating or even of harboring such swindling mining schemes.

We sent the above to Prof. I. C. White for comment; he replies, from Columbus, Ohio, where he has been with Prof. Orton reviewing the Coal measures of that state: "I have your slip and at the same time a letter from Prof. Seamon of the Miller Manual Labor School, to whom I had sent two weeks ago specimens of the "tin" and alleged "tin ore" for analysis. I enclose you his letter from which you will see he *could not get a trace of tin* from a pound of the ore. I got these from a reputable man in Louisa who assured me the ore was from the Mason county mines. I still think it a fraud of the first water, but until I have larger samples sent to Seamon for analysis I do not like to say positively that it is."

Prof. W. H. Seamon of the Miller School, Crozet, Va., replied as follows to Prof. White:

"The metal sent me is mainly pure tin and contains in addition thereto zinc and lead. As I made no quantitative analysis, I can only state that my belief is that the greater portion of the metal is tin. The sample of ore was carefully assayed and no metal was obtained I am inclined to believe that there is some trickery about that whole affair; the reputed ore is limestone and quartz pebbles cemented most likely by lime. Mr. Barb gave me at M. last summer a sample of the reputed silver ore from some point near Mason county (this contained no silver); that ore was exactly like the sample of tin ore you sent me, so far as I can recall and from my notes taken at that time.

Did you see the smelting works? I can't see how men could be duped to that extent or that they would go that far in their endeavors to dupe others. I made two assays and did not get a trace of metal. Another thing, their ore is too rich (according to their statements). The Cornwall ores contain only from ½ to 2 lbs. of tin per 100 lbs. of ore.

I feel so much interested in the subject that I would gladly make an examination of another and larger sample of the ore if you will have it sent to me.

After while I will make a wet analysis of the ore and let you have the result."

The Grape, Wine and Fruit Industries.—In a recent circular of the Southern Fertilizing Co., of Richmond, Va., we find the following horse-sense remarks: All the indications point to a tremendous development in the South for many years to come. The matter (slavery) that made the sections hostile, is finally disposed of, and the South, from being, as in old times, an agricultural region by distinction, will rapidly fill up with capital and enterprise from other sections of the country, and its resources, under and above ground, be made available. (One has only to look at the map to see that most of the good things East and West have been taken up.) This movement, if we will but use our eyes, is already quite advanced; how will it be when our own sons shall be educated to be leaders in this development? Law and medicine must hereafter share the honors, they have in times past almost monopolized, with the profession of the mining and mechanical engineer, the expert in transportation, and the man of affairs. Why? Because they will all alike be cultured men. It is found that the Southern man is not behind the Northern man in inventive ability; the difference is simply one of experience. That experience is coming, and coming too in all lines of enterprise. The man, for example, who looks to the handling of the soil for his living, is thinking of other sources of revenue as an addition to that arising from the cultivation of the regular staple crops. The breeding of the best classes of cattle for beef and the dairy, the production of the finer grades of wool, the growing of poultry (involving the use of the incubator) for market, the planting of vineyards for table grapes and wine, and orchards for apples and other fruits for use in season and for drying (involving the use of the evaporator), are now occupying his attention. These latter industries have already assumed very large proportions in Virginia and North Carolina, and the men who are in the lead are resolved to take no step backward.

Virginia Counties.

Northampton county, Va.—A correspondent of "Farm & Home" of Harrisonburg, Va., writing from Eastville, Northampton county, the southern one of Virginia's Eastern Shore peninsula, makes the following interesting statements:

Most persons have an erroneous idea of the healthfulness of our climate; and now that I have lived in this county six years, having traveled over the United States and a greater portion of Europe, I can with truth say that there is no section of Virginia so healthy or so desirable as a residence as this county of Northampton. Of course, strangers coming to the tidewater of Virginia are apt to suffer the first season of what is called malaria, but even this with prudence and a proper diet can be avoided, and as soon as they are acclimated they may defy the chills. Our winters are mild, our summers comparatively cool, and our spring and autumn seasons rival the climate of North Italy. Our soil is peculiarly productive, easily tilled, quickly improved, and when in the hands of a skillful farmer, I will put it against the world for the variety and yield of its crops. The soil is a sandy loam, with sufficient clay subsoil to retain the fertilizer, and yet not enough to hold the water causing swamps and bogs. Every plant that is found in Virginia can be produced from this soil and in paying quantities, too, if properly managed; but it is peculiarly adapted to early trucking, and the markets of the United States, at a certain season, are furnished with early vegetables, &c., from this Peninsular of Virginia. Our waters abound in fish, oysters, clams, terrapin, and during the winter and spring swarm with wild fowls and sea birds, all of which are a great source of profit to our people.

What we want is immigration, and I feel certain that as soon as the many advantages we offer are made known through your valuable organ, people will come and try it for themselves. We have all the school facilities, both private and public, and large sums are being appropriated by our county for the establishment of graded public schools.

Our crops this year are remarkably good, and farmers will come out with full pockets. The sweet potato crop alone is something immense, some of the farmers this early are diging at the rate of a hundred barrels per acre, and in New York these potatoes are today selling at two dollars and fifty cents per barrel. In Boston and Providence mine brought yesterday three and three dollars and fifty cents per barrel. Can any other county in Virginia do better than that?

Highland County, Va., items.

Manufactures—The census of 1880 reports 8 manufacturing establishments in this county having a total capital of $13,200, employing 12 men and 2 youths, paying, during the year, $2,335 for wages and $31,876 for materials, and producing articles valued at $39,545. What these manufactures are the report does not state.

The Coast and Geodotic Survey of the United States in prosecuting a triangulation across the continent near the 39th parallel has determined the exact latitude and longitude of a number of points in this county; Paddy knob was occupied as a station in the primary triangulation and on it is placed a station monument. The Sounding knob, a peak on Jack mountain, North River Gap mountain, near the northeast corner of the county, and Northeast peak, near the southeast corner of the county, were located by triangulation, as shown on a map published in 1883.

Altitudes.—The only elevations above sea level in this county that we have in hand are some approximate ones taken with a barometer by Mr. A. T. Mosman, of the U. S. Coast Survey, in 1877. He said these were not more than 50 to 75 feet in error. They were taken on the Staunton and Parkersburg turnpike as far as Monterey.

Shenandoah mn.,	2,750′	Jack mn.,	3,050′
Bull-pasture "	2,500′	Monterey,	2,770′
McDowell,	2,000′	Alleghany mn.,	2,860′

The elevation of Alleghany mountain was taken on the road to Huntersville from Back creek.

The Luray Cave and Inn have not only lost none of their popularity and attractiveness during the current year but have been more patronized than in any previous year since they were opened to the public. There have not been as many excursion parties this season as in former ones, but there has been a large increase in the number of single visitors and of small private parties. As a knowledge of this wonderful Virginia cavern and of the endless charms of the famous Valley of the Shenandoah in which it is embosomed extends among intelligent people, which it is sure to do with the advancing years, the number of delighted visitors thereto will constantly increase until they will be numbered by hundreds of thousands in a single year.

The attractiveness of the now famous cave and its scenic surroundings are greatly increased by the restful and satisfying comfort that the traveler finds at the well kept and eye-pleasing Luray Inn that the proprietors of the cave have erected and put in charge of a level-headed host for the accommodation of those that would visit their great curiosity. This Inn so commends itself that many who have come but for a day to see the cave tarry for a week or more to enjoy the charming scenery that environs Luray and enjoy the solid comforts of the Luray Inn and the genial care that those in charge of it exercise for the comfort and pleasure of its guests.

Luray Inn & Cave Co.—The Hagerstown, Md., "Mail" has the following statement: Last Wednesday, Oct. 14, 1885, there was a very important and encouraging meeting of the president and directors of this company, at Luray, and among those present, besides the president Mr. Robt. F. Corson, were Col. U. L. Boyce, of Virginia, and Mr. Wm. G. Macdowell, of Philadelphia, directors in the company. The present season has been one of great prosperity to the company—never indeed have more distinguished visitors, composed of persons from all parts of the world, visited this spot—and as a result, the company is relieved of all pecuniary obligations, and at its meeting on Wednesday, resolved upon the building of an additional wing, extending 100 feet, to the Inn.

Manganese.

The American Manganese Co. is vigorously pushing its mining operations at the Crimora manganese mines near Crimora station of the Shenandoah Valley RR., Augusta county, Virginia. It is now mining about 1,800 tons of high grade manganese ore a month; about 1,500 tons of this are taken by the Bessemer steel works at Pittsburg, Pa., and most of the remainder by the Cambria works at Johnstown, Pa. The mining operations of this company now reach a depth of about 120 feet, the mine cars are lowered and raised by steam power, and two large ore washers and their accompanying ore crushers and a mill for grinding manganese to powder for chemical and other purposes, are run by the same engine. This company employs between 200 and 300 men and its monthly pay roll is about $6,000; it has erected a large and handsome building for its store, offices, etc.; it pays a handsome royalty to the Virginia Manganese Company for each ton of ore it takes from this mine.

The manganese deposit at Crimora is in the Potsdam or No. 1 shales held in a synclinal trough of Potsdam sandstone. The boring of an Artesian well for a water supply has revealed the fact that the bottom of this trough, or rather the top of its sand-rock bottom, is about 220 feet below the average level of the surface at the Crimora mine.

These mines are connected with the Shenandoah Valley RR. by a branch road about 4 miles long; a water pipe is run along the railway to South river through which water is pumped for ore washing and other purposes at the mine.

Manganese.—A recent issue of the "Shenandoah Herald," of Woodstock, Va., says: Work has been resumed at the manganese mines in Powell Fort, this county, under the management of a Northern company. A number of hands have already been set to work, and a new and much larger engine has been put in to pump out the water that caused so much bother and loss before. We hope to see this enterprise pushed right along as it will give employment to many and bring much needed money into our county.

Railways.

The Shenandoah Valley Railroad has recently put on new sleeping cars between Hagerstown and Roanoke for which the charge for a night, the time of the run between the terminal points of this road above named, is only one dollar, just half the Pullman charge for the same service.

These sleeping cars have been constructed by the railway company itself for its own use, and, in our opinion, they are not only equally as comfortable and pleasant as the Pullman sleepers, but in several particulars they are much more agreeable, especially in this that there are no upper berths, thus making every berth at the half single rate as airy and pleasant as a whole section in a Pullman sleeper for which the charge is never less than four dollars.

It is gratifying to record such improvements in traveling facilities for which only moderate and yet fair charges are made, thus placing them within the reach of more people. For many years the Chesapeake & Ohio Railway has had a sleeping car of its own with berths for one dollar a night, but its berths are stationary. The expiration of many of the Pullman patents now puts in the power of railways to construct comfortable sleeping cars in which the desirable features of the Pullman cars can be embodied without imposing upon travelers the high charges that have characterized the era of the Pullman monopoly.

West Virginia Central & Pittsburg RR.—The Wheeling, W. Va., Intelligencer recently questioned ex-Senator Hy. G. Davis, the energy-embodied president of the West Virginia Central & Pittsburg RR., concerning the present and future prospects of this important West Virginia railway—important in what it is now doing in developing what was a few years ago a mere wilderness, full of mineral, forestal and

pastoral wealth, and more important in what it will do and become when it is extended southwestwardly across West Virginia, becoming truly *the West Virginia Central railway*, to connections with the Chesapeake & Ohio, the Richmond & Alleghany, the Norfolk & Western and the Kanawha Valley (Ohio Central) railways, as it surely will be in the near future.

Mr. Davis is reported as saying that the affairs of his company are moving along in a very satisfactory way, adding: "We have just concluded an arrangement with the Messrs. La Doo to establish at Davis city a tanery that will employ 300 men. Then we have sold three acres to a party who will put up a sash and general wood-working mill, employing about 60 hands. Then you know we are erecting a hotel, which we hope to have ready in the spring. The outlook for our road is excelent.

Last Saturday we shiped eight car-loads of cattle that had been driven in to Davis from Pocahontas county, and we shall in a few days ship ten car-loads that come from Pendleton. I think this business will grow with us."

The Len's Creek & Coal River RR. Co. has recently been chartered, under the corporation laws of West Virginia, for the purpose of building a railroad from Brownstown, on the Chesapeake & Ohio Ry. and at the mouth of Len creek in the Great Kanawha river, to the mouth of Bull creek, on Big Coal river, a short distance below Peytona, Boone county, W. Va.; its charter is perpetual. Its capital stock is $40,000, divided into shares of $100 each; these are held as follows: J. W. Humbird, Cumberland, Md., 360 shares; Walter L. Ashby, R. J. Ashby, W. E. Chilton and M. J. O'Brien, of Charleston, W. Va., 10 shares each. The "Valley Record" comments that the shortest and most direct route from Brownstown to Coal river would be up Len creek and down Short creek to Racine, on Coal river, two miles above Peytona, but the fact that some of these shareholders own land on Bull creek is the probable reason why the contemplated road takes that direction.

The Point Pleasant, W. Va., Railway Bridge and the franchises of the Ohio River & Point Pleasant Ry Co., in Gallia and Meigs counties, Ohio, were sold at auction on the 15th instant, at Parkersburg, W. Va., under a decree of the U. S. Court, to a syndicate of the bondholders of the River division of the Central Ohio RR., for $200,000. This bridge, crossing over the Ohio river at the mouth of the Great Kanawha river, with its approaches, was constructed for the use of the Ohio Central RR., a line completed from Charleston, W. Va., to Toledo, Ohio; it will now belong to and form part of the line of the new company that purchased the River division of the Ohio Central, the portion of that road extending from Columbus, Ohio, by way of this bridge and up the Great Kanawha to Charleston, W. Va.

Technical Education.

School of Mines of the Va. Agricultural & Mechanical College.—A recent circular calls our attention to the fact that the Agricultural and Mechanical College of Virginia organized a school of Mines in 1883 "for the purpose of educating the young men of Virginia in all the branches of learning pertaining to mining and metalurgy." This circular remarks of this school of mines and the advantages of its location as follows:

Since its establishment, laboratories have been equiped and much valuable apparatus purchased, to conduct chemical investigations and to illustrate the various means and methods now in use in practical mining and metalurgy, in this and other countries. The course of study is rigidly enforced upon all who seek the degree of mining engineer, so that the intelligent young men who complete it are well fited for positions as superintendents of mines and metalurgical establishments.

Virginia is known to the scientific world as one of the leading states in mineral resources; its coal beds, and iron, lead, zinc, tin, gold and silver ores are among the finest in the world; and perhaps there is no other locality in Virginia so favorably surrounded with these sources of natural wealth as Blacksburg, the seat of this institution. To the immediate west are the noted coal mines of Flat-top, or Pocahontas, and the lead and zinc mines of Wythe; to the northeast are the well-known Rockbridge tin ore deposits; and within a pleasant drive of the college are the gold fields of Montgomery and Floyd counties. The renowned White and Yellow Sulphur springs are within the immediate vicinity, where hundreds of tourists gather annually to enjoy the health-giving qualities of the waters.

The elevation of Blacksburg is about 2,200 feet above sea level. The cool evenings, the pleasant breezes, and the embracing mountain air make the town an extremely delightful retreat during the heated summer season. There is no healthier locality in the state; no epidemics are known to the town. The scenery is unsurpassed in beauty and grandeur by even that of the far West. The high peaks of the distant mountains can be seen forty miles away. The watershed which divides the Atlantic and Mississippi slopes is within a few hundred yards of the college.

The course of study leading to the degree of Mining Engineer (E. M.) is literary, scientific and technical, embracing the course in Agriculture or the course in Mechanics, with an additional year of professional study in Analytical Chemistry, Drawing, Solid Geometry, Mining, Determinative Mineralogy, Calculus, Metalurgy, and Assaying. Graduates of other colleges of good standing are only required to complete the full course in Chemistry, and the last year in the Mining or professional course.

The training offered in chemistry, mining, ore dressing and metalurgy is intended to fit young men for the work with which the mining engineer has to deal. The course in general and analytical chemistry is the most elaborate of its kind taught in any Southern college or University. Students in mining have a thorough training in the analysis of minerals, mineral waters, and metalurgical and commercial products. The laboratories are well-equiped with apparatus and re-agents for conducting analyses.

The subject of mining is discussed under the following heads: Formation of mineral deposits, Prospecting or searching for minerals, Preliminary opening of mines, Explosives and blasting, Sinking and walling of shafts, Mining tools and machinery, Draining and ventilation of mines, Means of subterranean transportation, Illumination of mines, Placer mining, Crushing machinery, Coal mining, Coal cuting machinery, &c.

The theory of ore dressing is discussed in all its important features, and forms the connecting link between the mining of ores and their metalurgical treatment. The study of metalurgy is begun by a consideration of furnaces and furnace materials. Then follows a study of fuels, their properties, calorific power and intensity, and manufacture. Especial attention is given to the metalurgy of iron, copper, lead, zinc, silver, gold, mercury, platinum, tin, cobalt, nickel, arsenic, antimony, bismuth and aluminium.

This college makes no charge for tuition to students from Virginia. The estimated expense of attending its school of mines for the session of ten months, including board, cloth-ing, fuel, lights, washing, laboratory expenses, etc., etc., are only $168. President T. N. Conrad, Blacksburg, Va., will furnish any further information desired.

A Scientific and Industrial Association.

Major Jed. Hotchkiss:

My Dear Sir:— In a printed circular sent out from Natural Bridge by a committee, of which you were a member, it was proposed to form a "permanent organization" to consider, among other matters, the following topics: 1. "The settlement of the state debt;" 2. "The establishment of an intermediate grade of schools, or school of mines;" 3. "Means of ascertaining and advertising the real resources of the Virginias."

The following is the substance of my response to a copy of the circular sent to me:

Washington & Lee University, July 29, 1885.

To Col. H. C. Parsons, Maj. Jed. Hotchkiss and others, Committee, etc.:

Gentlemen: Your printed circular, having reference to the formation of a "permanent organization" for promoting the development of the mineral and other resources of Virginia and West Virginia, has suggested to my mind several matters which seem to me of such moment that I venture to lay them before you.

A permanent organization for the promotion of the study of the Physical Sciences, with their ever widening and varying applications, has long been a desideratum in the South, and especially in the Virginias—two states that successfully vie with any others in the Union, in both the variety and richness of their mineral and other resources. Most of the scientific organizations of the United States have been too purely scientific in their work, and not sufficiently practical. Of course there are some exceptions to this statement. Then they are generally too remote from us to be of much practical benefit. Again, most of them fall short, in a great measure, of well defined practical results in their work; their fields are too broad. Virginia and W. Va. present a field quite sufficient in extent for any single scientific association to cultivate as it should be cultivated.

I hope therefore, that you will at once construct the nucleus of a "Scientific & Industrial Association," to meet at an early day for a more complete and permanent organization.

I. As regards the first topic presented in your paper—a "Settlement of the state debt"—this must devolve chiefly upon the Legislature and the Courts. Of course, whatever tends to develop the material resources of the state will increase her ability to make a speedy settlement of her debt. And *vice versa*, whatever tends to settle all controversy about the debt will promote the influx of outside capital and enterprise into these states so highly favored by Providence.

II. The second topic seems to me to come more properly within the scope of your purposes. By a "System of Intermediate Schools," I suppose, is meant a system to hold an intermediate place between the common State Schools on the one hand, and the Colleges and Universities on the other. To establish such a system, and make it efficient, would require a very large expenditure of funds, with such an increase of taxation as I am confident the state would not at present tolerate.

The establishment of a "School of Mines" would be a much easier task, because we already have foundations, on some one of which, such a school could be easily erected. The State University, and the Agricultural and Military Colleges have no doubt occured to your minds already; and present claims worthy of your consideration. One chief objection, common to all of them, however, is the increasing danger that they, as well as the Public Schools, may be made parts of the political machinery of the state. It seems to me that a School of Mines should be kept outside of the compass of all political rings, and at the same time be placed on a sure foundation. To attain these ends, it ought to be engrafted upon some firmly established and well endowed institution, in which those branches of science that constitute the real foundation of every well ordered course of instruction in Mining and Metalurgy are already well taught.

You, of course, are not ready to take definite action on this subject; but allow me here to direct your attention to an Institution which seems to present all the requisites refered to above. Washington & Lee University has: (1) A hundred years of somewhat varied but generally successful history; (2) Its permanent endowment now exceeds $600,000, of which $500,000 is paying 6 per cent interest per annum. The remaining $100,000 is due from the state and will doubtless be paid and invested within a year; (3) This Institution is not subject to any outside control, either state or ecclesiastical; (4) It has, organized and in successful operation, departments of instruction (appertaining especially to a School of Mines) of *English and Modern languages; Mathematics; Natural Philosophy; Chemistry*, both general and applied; *Mineralogy and Geology; Applied Mathematics*, embracing Architecture, Mechanics and Civil Engineering; (5) In addition to these it would be an easy matter to engraft upon the course of Applied Chemistry a course in Metalurgy, and upon the course of Civil Engineering a course in Mining Engineering.*

I have no authority to pledge our University to adopt any changes in its present organization, but I know that such suggestions as you may present will meet with respectful consideration on the part of our Board of Trustees, and may eventuate in very important results.

Perhaps most of the points above presented would be more appropriate for your subsequent and more complete organization, but I am sure that the intelligence embodied in your committee will readily sift out what is valuable in what I have said, and cast to the winds what is worthless.

III. Your third theme is important. The most direct and practical way (as it appears to me) of "discovering and advertising" the real resources of the state (or states) under consideration, would be the establishment by the Legislature of a "Department (or Bureau) of Science and Industries" to gather and make known to the world our varied resources, and suggest means for their development.

In the meanwhile I do not know that we can do better than to subscribe for, write for, and read "*The Virginias*," and do what we can to increase the circulation of this valuable journal. Then, if each intelligent citizen would buy and read carefully a copy of "Rogers' Geology of the Virginias" the result would be a flood of light all over the state in regard to our developed as well as potential resources.

If you are successful in establishing a "Scientific and Industrial Association" its transactions will be an important means of discovering and advertising our incalculable sources of wealth.

*(*Note.*)—I might add the fact that no institution in the South is more favorably located for a department of Mining. It is quite as central as any other to the mineral regions of the state. The iron, manganese and tin mines are close at hand, while some of the largest and best furnaces of this country are near, and easily accessible. Then no location in the world is more healthful.

Very truly, yours, John L. Campbell.

The Shenandoah Iron Co's Failure.—Under this heading the Philadelphia "Press," alluding to the application for an injunction and receiver for the Shenandoah Iron-works, at Milnes, Va., says:

"The Shenandoah Iron Company was founded about six years ago. Mr. John Milnes is the head of it, and it is understood that the Shenandoah Valley Railroad Company fostered its interests. It was one of the best known producers of what is called in the trade Southern iron, and endeavored to acquire trade by selling its products at a low rate, but it did not meet with prosperity. About two years ago it was seeking an agent in this city. A prominent broker to whom a proposition was made said Monday night upon investigation he learned that the only means by which a business connection could be carried on was by advancing the company's paper the corporation having apparently very little available capital.

He declined for that reason to have anything to do with it, and said that the trade regarded the company as practically insolvent from that time on. The placing of the liabilities of the corporation at $900,000 in the bill in equity was, he said, a mere legal formality and largely included watered capital. The actual credit that the corporation has been able to command for a long time, he continued, was small. He did not think that the break would at all effect the condition of the iron trade. The failure, he thought, was due wholly to losses on the iron put out. Mr. Milnes, who was also seen Monday night, said that he was not in possession of sufficient data at the moment to give the actual as compared with the nominal losses. He added that the receiver, when appointed, would take charge of the business pending the settlement of affairs."

In this issue we have only room to say of the above extract that this company *did not* acquire trade by selling its products at a lower rate than the regular market prices, and that its failure was *not due* "to losses on the iron put out." Its affairs were placed in the hands of receivers at the instance of its own officers, and its president, Hon. Wm. Milnes, Jr., was made one of the receivers by the court, Mr. John W. Hoffman of Philadelphia being associated with him.

This company has *neither made nor sold any iron at a loss* and it would not now be in the hands of receivers but for the unusual drouth that recently prevailed for a long time in the region where it is located and cut off its water supply and forced it to put its large new furnace out of place and so lose the daily profit of its output which was necessary to meet its obligations. Our next number will contain a detailed statement of its affairs and of the causes that led to its troubles. The local papers report that its "Gem" furnace went into blast again on the 26th instant, the late rains having renewed its water supply.

The Rorer Iron Co held its annual meeting at the Hotel Roanoke, Roanoke, Va., the 13th instant, and elected as directors for the current year George M. Bartholomew and J. H. Sykes of Hartford, Conn., J. H. Bramwell and E. G. McClanahan of Roanoke, Va., Jed. Hotchkiss, of Staunton, Va., and G. N. Gray, of Ironton, Ohio. At a meeting of the new board of directors George M. Bartholomew was chosen president, J. H. Bramwell vice-president and general manager, and J. H. Sykes secretary and treasurer.

This company owns several very valuable and fully developed iron mines a few miles south of Roanoke; these are connected with the Norfolk & Western and the Shenandoah Valley railways at Roanoke by a first-class narrow gauge railway. During the past year it has mined and sold considerable quantities of iron ore to the Crozer and Lynchburg furnaces, but its mines are now idle as it is unwilling to sell ore at the extremely low prices now offered.

Virginia and West Virginia furnaces in blast Sept. 1, 1885.—The Iron Age of Sept. 10 reports the condition of the anthracite and bituminous blast-furnaces of the U. S. on Sept. 1, 1885; from that we obtain the following figures for the Virginias:

	Va.	*W. Va.*
Whole number of stacks,.....	12	7
Stacks reported in blast, ...	6	3
Capacity per week, tons,.....	3,120	1,356
Stacks reported out of blast,.....	6	4
Capacity per week, tons,.....	1,291	1,470

This report shows that the coke using furnaces of the Virginias compare favorably in condition with those of the country generally. Those of Virginia would compare better if the number of stacks given represented *live ones*. So far as we can learn every coke-using stack in the state that can be properly called a living one, with a single exception, is in blast at the end of this month.

The Lynchburg, Va., furnace again went into blast the latter part of September under the management of W. H. Patterson, of Philadelphia. It is now making from 36 to 40 tons of iron a day, using Riverville, Blue Ridge and Rorer Iron Co. ores and Connellsville coke, the last by way of the Baltimore & Ohio and Richmond & Alleghany railways. The owners of this furnace have purchased the Munford iron mines near Blue Ridge Springs, Botetourt county, and connected them with the Norfolk & Western RR. by a branch railway three miles long; from this large mine they will hereafter supply their furnace.

The Longdale furnaces, near Longdale station of Chesapeake & Ohio Ry., Alleghany county, Va., are both in blast making their usual output of from 70 to 80 tons a day. The Longdale company has extended its ore railway to nearer a new ore mine it is working on the Simpson-Bratton creeks divide; it is also building a new railway, some 8 miles, up Mann creek from Sewell station of C. & O. Ry., W. Va., to a bed of the "Nuttall" New River coal that it has recently purchased for use in making coke for its furnaces.

Low Moor furnace, at Low Moor station of Chesapeake & Ohio Ry., Alleghany county, Va., continues its good record; during the week ending Oct. 17 it made 824 tons of pig iron 400 of which was No. 1 and 413 No. 2. Some 10,000 tons of the product of this furnace were recently sold reducing to a moderate quantity its stock of iron on hand.

Princess furnace, Capt. D. S. Cook's, at Wilton station, of Richmond & Alleghany RR., Botetourt county, Va., is now making about 30 tons a day of a pig iron that Western dealers speak of as very superior in quality, from ore mined near the furnace in Rich-patch mountain.

Crozer furnace, Roanoke, Va., is now making about 100 tons of pig iron a day, using Blue Ridge, Va., and Cranberry, N. C., ores and Pocahontas, Va., coke; most of its product is marketed in and near Philadelphia.

The Lynchburg, Va., Nail & Iron works have been improved so as to nearly double their former capacity to enable them to supply the steady demand for their nails and bar iron.

Good words for "The Virginias."—Rev. R. H. Fleming of Woodstock, Va., a native of Highland county, writing of our August No., says: "You have done a good work for Highland. Why not have a number devoted to many of the other counties, especially those in which there are minerals?"

Norfolk & Western RR.

(Aug. 30, 1885.)

Westward.	(No. 1.)	(No. 3.)
Norfolk	15 10	10 00
Suffolk	15 56	10 45
Petersburg	17 50	12 42 / 12 55
Burkeville		14 52 / 15 10
Lynchburg	5 45	17 45 / 18 10
Roanoke	7 45 / 8 00	20 06 / 20 25
New River	9 35	22 11
New River	1 05	.....
Pocahontas	14 30	.....
Wytheville	10 45	23 30
Bristol	13 17	1 45

For beyond Bristol see Shenandoah Valley R'y.—A local train leaves Central at 5 40 and New River at 5 50, daily, except Sunday, reaching Bristol at 17 00.

Eastward	(No. 2.)	(No. 4)
Bristol	21 40	7 00
Wytheville	24 01	9 42
Pocahontas	16 15	.....
New River	19 36	.....
New River	1 19	10 58
Roanoke	3 10 / 4 45	12 30 / 12 50
Lynchburg	7 00 / 7 59	14 50 / .....
Burkeville	10 27	No. 4
Petersburg	12 20 / 12 35	7 45 / .....
Suffolk	14 31	9 57
Norfolk	15 22	10 45

For northward from Roanoke see Shenandoah Valley RR.—A local train leaves Bristol, daily except Sunday, at 6 20, passes New River at 17 25 and reaches Central at 17 30.

Nos. 3 and 4 have Pullman sleepers between Washington and New Orleans via B. & O. and S. V. at Roanoke; and also between New York and Cleveland via Philadelphia, Harrisburg and Roanoke.

Richmond & Alleghany R.

(Aug. 30, 1885.)

Westward.	(No. 1 & 11.)	(No. 9.)	(No. 3.)
Richmond	10 25	19 40	15 30
Scottsville	13 31	24 39	19 09
Lynchburg	16 30	5 00	.....
Balcony Falls	17 48	6 29	.....
Lexington	19 02	7 15	.....
Natural Bridge (S. V)	17 58	.....	.....
Buchanan "	18 35	.....	.....
Clifton Forge (C. & O.)	20 00	.....	
Eastward.	(No. 2.)	(No. 10.)	(No 4.)
Clifton Forge	9 45	.....	.....
Buchanan	11 07	.....	.....
Natural Bridge	11 45	.....	.....
Lexington	9 30	18 25	
Balcony Falls	11 30	20 00	
Lynchburg	13 05 / 15 10	21 45 / 22 00	.....
Scottsville	17 46	2 27	5 59
Richmond	20 55	7 05	7 05

All trains daily except Sunday. Sleepers are attached to night trains between Richmond and Lynchburg.

Lithographers.

The Virginias.

A Mining, Industrial and Scientific Journal:

Devoted to the Development of Virginia and West Virginia.

Serial No. 71.
Vol. VI, No. 11

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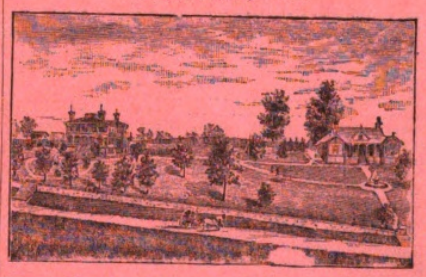
Contents of No. 71.



The Railway Time Tables given below are based on 75th meridian or *Eastern standard time;* they are also in *24-hours time*, from midnight forward to midnight, so midnight appears as 24 00, and noon as 12 00. When the hours given are over 12 the present clock or watch time can be found by taking 12 from the hours. All junction stations are given. Where two times are given at a station the first is that of arrivlng and the second that of leaving. Condensed time tables of the other railways of the Virginias will be added hereafter.

Chesapeake & Ohio Ry.

(Oct. 11, 1885.)

Westward.	No 3.	No. 1.	
New York, (Pa. R)	8 30	21 00	.....
	or 10 00	.....	.....
Philadelphia ..... "	11 55	24 20	....
	or 12 30		
Baltimore..... "	3 20	4 05	
	or 14 55		.....
Washington, (Va. Mid.)	17 30	7 00	.....
Charlottesville (" ") Ar.	22 15	11 40	.....
Lve.	22 25	12 15	No 1-9
Norfolk	14 55	.....	8 05
Old Point Comfort	15 39	.....	8 40
Newport News	15 55	.....	9 05
Richmond Ar.	18 25	.....	11 55
Lve.	18 30	7 40	16 00
Hanover Jn. (R. F. & P.)	19 28	8 49	17 10
Gordonsville (Va. Mid)	21 20	10 47	.....
Charlottesville " Ar.	22 15	11 40	.....
Lve.	22 25	12 15	.....
Waynesboro Jn. (S. Val.)	23 40	13 33	.....
Staunton (B. & O.)	24 11	14 15	.....
Goshen	1 27	16 00	.....
Clifton Forge (R. & A.) Ar.	2 25	17 15	No. 5
Lve.	2 30	19 00	7 00
White Sulphur	.....	20 47	8 30
Kanawha Falls Ar.	8 05	2 25	13 00
Lve.	8 25	2 25	13 20
Charleston (O. C.)	9 27	4 17	15 15
Huntington*	10 00	6 20	16 20
Ashland (Sci. Val.)	10 42	7 02	17 00
Winchester (Ky. C.)	14 30	11 45	7 15
Cincinnati	18 00	18 00	11 30
Lexington	15 20	12 45	8 05
Louisville	19 10	16 45	....

*All stations beyond Huntington have 90th Meridian or Central time, one hour *slower* than Eastern time.

No. 3, the Louisville and Cincinnati express, is a daily solid train, with sleepers, from Washington and Richmond, without change from Washington to Louisville and Richmond to Cincinnati. It does not stop for local business.

Through connection at Louisville over C. O. and S. W. for New Orleans, with sleeper, without change.

No. 1, the mail train, is daily, except Sunday. No. 5 is daily from Clifton Forge to Ashland. No. 1-9 is daily except Sunday. The meal stations are Charlottesville (V. M. Junction), Clifton Forge, Kanawha Falls and Huntington.

Eastward.	No. 4.	No. 6.	.....
Louisville (L. & N.)	19 35	6 50	.....
Lexington " Ar.	22 50	11 25	.....
Lve.	23 00	11 45	.....
Cincinnati (Ky. C.)	20 10	20 10	.....
Winchester (Ky. C.) Ar.	23 40	12 30	.....
Lve.	23 53	13 00	.....
Columbus	17 30	11 45	.....
Chillicothe	19 55	14 05	No. 2
Ashland	3 44	17 55	6 20
Huntington*	5 25*	20 00*	8 30
Charleston	6 52	22 19	10 52
Kanawha Falls	7 55	23 55	12 40
White Sulphur	.....	5 11	17 30
Clifton Forge	13 25	6 45	18 45
Millboro	14 21	7 56	.....
Goshen	14 40	8 15	.....
Staunton	15 52	9 41	.....
Waynesboro Jn. (Shen. Val)	16 22	10 15	.....
Charl'tsv'e (VaMid) Ar.	17 20	11 30	.....
Lve.	17 40	11 50	.....
Gordonsville " ..	18 25	12 43	No. 8
Hanover Jn. (R. F. & P.)..	20 01	14 38	7 35
Richmond Arr.	20 55	15 45	8 45
Richmond Leave	8 15	15 50	.....
Newport News	10 50	18 35	.....
Old Point Comfort	11 15	19 05	.....
Norfolk	11 50	19 35	.....
Charlottesville, V.M.Jn	17 25	.....	.....
Washington (Pa. Ry.)	21 45	.....	.....
Baltimore, "	23 35	.....	.....
Philadelphia, "	3 00	.....	.....
New York "	6 30	.....	.....

*Louisville to Huntington Central time; east of Huntington Eastern time.

No. 4 is the Washington daily express, from Louisville to Washington, and Cincinnati to Richmond, with sleepers, without change. Columbus, Ohio, at 17 30 and Chillicothe at 19 55 connect at Ashland. No. 6 is the Virginia Express, daily except Sunday.

No. 2 is the mail train, daily, from Ashland to Clifton Forge.

No. 6 leaves Cincinnati daily except Sunday and arrives at Clifton Forge daily except Monday; from Clifton Forge to Old Point daily except Sunday. No. 8 daily except Sunday.

☞Hotel Warwick, at Newport News, and Hygeia Hotel, at Old Point Comfort, are open all the year: ound. Boating, fishing, and tonic sea-air are always in order at these places.

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Shenandoah Valley Ry.

(November 22, 1885.)

Southward.	(No. 3.)	(No. 1.)
New York	20 00	8 30
		10 00
Philadelphia	23 20	11 55
Baltimore	....	15 35
Harrisburg	4 20	.....
Hagerstown, (Wn. Md)	6 10	18 30
Shen. Junc. (B. & O.)	7 05	19 27
Charlestown (Val. B. & O)	7 17	19 37
Riverton (Va. Mid)	8 29	20 42
Luray	9 55	21 48
Waynesboro Junc., C. &O	12 00	23 45
Natural Bridge (R. & A)	14 11	1 41
Roanoke (N. & W.)	15 45	3 10
Bristol, Tenn	21 20	8 25
Chattanooga, Tenn	5 00	16 55
Memphis, Tenn,	....	5 30
Atlanta, Ga	9 20	23 20
New Orleans	13 00	13 00
Jacksonville, Fla,	7 20	12 00
Northward.	**(No. 2)**	**(No. 4.)**
Roanoke (N. & W.)	3 45	12 05
Natural Bridge (R. & A),	5 11	13 38
Loch Laird (R. & A.)	5 39	14 06
Waynesboro Junc. (C. & O.)	7 07	15 37
Luray	9 22	18 03
Riverton (Va Mid.)	10 26	19 14
Charlestown (Val. B. & O.)	11 33	20 26
Shen. Junc. (B. & O.)	11 55	20 38
Washington (B & O.)	13 50	22 50
Baltimore (B & O.)	15 00	23 50
Hagerstown (Wn. Md.)	12 45	21 30
Baltimore (Wn. Md.)	16 00	24 40
Philadelphia	18 50	4 25
New York	21 35	7 00
Harrisburg, Pa	15 30	1 05
Philadelphia	18 50	4 25
New York	21 35	7 00

Nos. 3 and 4 have Pullman sleepers from New York to Chattanooga daily, without change, each way, via Harrisburg and Roanoke; and from Baltimore to Luray, each way, via Western Md. Nos. 1 and 2 have Pullman sleepers Washington to New Orleans, each way, via B. & O. and Shenandoah Junction.

Richmond & Danville RR.

(Oct. 12, 1884.)

Southward.	No. 50.	No. 52.
Richmond	13:30	2:00
Burkeville	15:38	4:03
Danville	19:41	7:56
Greensboro	21:35	9:30
Salisbury	23:53	11:10
Charlotte	1:35	12.35
Northward.	**No. 51.**	**No. 53**
Charlotte	4:20	18:30
Salisbury	6:10	19:57
Greensboro	8:20	21:38
Danville	10:08	23:09
Burkeville	13:32	3.57
Richmond	15:45	7:00

All these trains are daily and connect with north- and south-bound trains on other roads so as to make through connections in all directions.—No. 53 runs to Atlanta without change.—Buffet sleeping cars run on Nos. 50 and 51 between New York and Atlanta, via Washington and Danville, and also Raleigh and Asheville.—Pullman sleepers on Nos. 52 and 53 between Richmond and Danville, and Washington and Augusta (Ga.) and Washington and New Orleans, via Danville. 61.

Valley Branch of B. & O. RR.

(May 3, 1885)

Southward.	No. 210.		
New York	21 00		
Philadelphia	3 45		No. 220
Baltimore	7 20		16 25
Washington	8 40	(No. 288)	17 30
Harper's Ferry	11 25	1 30	20 07
Charlestown (S. V)	11 48	2 16	20 28
Winchester	12 44	3 35	21 14
Strasburg (Va. Mid.)	13 44	4 59	No. 280
Harrisonburg	16 05	9 30	5 00
Staunton (C. & O.)	17 06	11 25	7 00
Lexington (R. & A.)	18 52	....	10 08

No. 210, the Lexington mail, leaves New York at midnight, daily but on Sunday, with sleeper to Washington.

No. 220, the Winchester accommodation, and No. 280, mixed train, run daily except Sunday.

No. 288 runs daily, except Sunday only to Harrisonburg.

Northward.	No. 231.	No. 291	
Lexington (R. & A.)	7 35	13 25	No. 281
Staunton	9 36	16 21	15 25
Harrisonburg	10 35	18 20	17 23
Strasburg (Va. Mid)	12 52	19 37	No. 219
Winchester	13 52	23 04	5 50
Charlestown (S. V.)	14 40	24 31	6 30
Harper's Ferry	15 00	1 04	6 50
Washington	17 30		9 50
Baltimore	18 40		10 15
Philadelphia	19 40		
New York	22 35		

No. 231, the Baltimore mail, No. 281, a mixed train, and No. 219, the Baltimore Accommodation run daily except Sunday 61

Virginia Midland Ry.

(Nov. 15, 1885.)

Southward.	(No.50.)	(No.52.)	(No.54.)	(No 58)
Washington	11 15	22 40	17 30	7 00
Alexandria	11 40	22 55	17 55	7 35
Manassas	12 38	23 45	18 50	8 27
Warrenton Junc.	13 08	24 13	19 47	9 01
Orange	14 30	1 30	21 11	10 40
Charlottesville Ar.	15 3	2 25	22 15	11 35
" Lve.	15 45	2 30	.....	11 40
Lynchburg Ar.	18 00	4 50	.....	14 00
" Lve	18 10	4 55	.....	.....
Franklin Junction	19 47	6 23	....	.....
Danville	20 54	7 25	....	.....
Northward.	**(No.51.)**	**(No.53.)**	**(No.55)**	**(No.59)**
Danville	11 03	23 33	.....	.....
Franklin Junc	12 07	24 29	.....	.....
Lynchburg arrive	13 50	1 50	.....	.....
" leave	14 00	1 55	.....	7 20
Charlottesville	16 20	4 05	.....	9 30
" leave	16 40	4 10	17 40	9 35
Orange	17 43	5 05	18 40	10 40
Warrenton Junc.	19 08	6 22	20 04	12 02
Manassas	19 47	6 48	20 30	12 38
Alexandria	20 50	7 40	21 20	13 27
Washington	21 15	8 00	.....	.....

All these trains run daily except 58 and 59.—Nos. 50 and 51 are mail trains.—Nos. 52 and 53 are the Southern express.—Nos. 54 and 55 are the Louisville and Washington express of Ches. & Ohio Ry.—Nos. 50, 51, 52 and 53 make through connections from Boston to Atlanta; they all have sleeping cars. Nos. 58 and 59 are mail trains to and from Baltimore and Lynchburg, daily except Sunday.

No. 58 is a train daily except Sunday, leaving Alexandria at 14.55 and runing to Manassas at 16 00, and No. 57 is a train, daily except Sunday, leaving Manassas at 9 13 and reaching Alexandria at 10 15.

On Manassas Branch trains run daily except Sunday, No. 58 from Manassas at 16.00 to Shenandoah Junction at 18:38 and Strasburg at 19:05; and No. 57 from Strasburg at 6:10, to Shenandoah Junction at 6:40 and Manassas at 9:13.

On Warrenton Branch No. 22 leaves the Junction at 20.10 daily, and No. 20 at 6.30 daily except Sunday, for Warrenton in 25 minutes; and No 19 leaves Warrenton daily, except Sunday, at 5:40, and No. 21 daily at 18:35, and reach the Junction in 35 minutes.

On Gordonsville Branch from Orange, a train runs daily at 14:40 to Gordonsville at 15:10; and one daily from Gordonsville at 4:15 to Orange at 4:45.

On Franklin Branch a mixed train runs daily except Sunday, from Franklin Junction at 20:00 to Rocky Mount at 23:30; and from Rocky Mount at 7:00 to Franklin Junction at 10:20.

The Virginias.

Serial No. 71. Vol. VI.—No. 11.

Staunton, Va., November 1885.

Jed. Hotchkiss, Editor.

Protection vs. the Bessemer Steel Monopoly. Comments, etc.

The editorial in the October number of *The Virginias* on "Protection vs. the Bessemer Steel Monopoly," has been quite extensively and conspicuously copied by our cotemporaries in the North and West as well as in the South. All of them that comment on it at all have, as far as we have seen, done so favorably. The journals that are controled by the Besssemer monopoly are silent on this subject, as we expected they would be. They are, we are pleased to say, advocates of ample protection, including Bessemer steel; most of them are for admiting so-called "Bessemer ores" duty free, but generally they are vigorously opposed to any reform of the tariff, not for reasons they state but for other reasons not necessary to mention in this connection.

From Col. Thomas Dunlap, of Laird, Rockbridge county, Va., under date of Nov. 5, we have a letter from which we take the liberty of making some extracts. Col. Dunlap is a Northern man who has been engaged for a number of years in developing the mineral interests of Virginia and who has been the means of introducing a large amount of capital into this state. He writes: "If you had never before written a line or published a *Virginias* your article on page 141 of October number, headed 'Protection vs. the Bessemer Steel Monopoly' would entitle you to the thanks and plaudits, not only of the people who are trying to develop the minerals of the South, but also of the true friends of protection throughout the country. You have struck the bed-rock truth in the science of Protection—the truth that must be enunciated and insisted upon if the protective system is to be maintained in our country. No more effective weapon has been used by the enemies of protection, in all previous contests, than the fact that our protective system has been so perverted as to foster monopolies, than which no more powerful one exists to-day than the Bessemer Steel monopoly.

Positive and actual freedom in the licensing of our patented processes, throughout the country, on fair royalties, should be insisted on; also a duty on foreign iron ores which would be prohibitory.

General Grant, in 1872, said to a delegation of Iron manufacturers, of which I had the honor to be secretary: 'I have no hesitation in expressing my views on the tariff. I believe we should prohibit the importation of everything which we can produce or manufacture in sufficient quantity to supply our markets; and admit free all raw material which we cannot produce.'—These are my ideas of a tariff system.

If the Representatives of the South will be true to her interests during the next session of Congress, and to the interests of the country, we will get a revision of the tariff that will enable steel manufacturing throughout the country and give us a price for iron ore at which we can live.

I am not writing for publication, but to thank you for the honest truths you have had the manliness to publish against this 'rotten borough,' the Bessemer monopoly, which has cursed protection wherever it has been planted."

The "Valley Virginian," of this city, in its issue of Nov. 5, comments as follows:

We call attention to the article in another column from Hotchkiss' *Virginias* headed "Protection vs. the Bessemer Monopoly." It presents a very important question for Virginia and the whole South to consider, but especially for this state. Our iron ores are so impregnated with phosphorus, as to make most of them unsuited to the manufacture of steel by the Bessemer process. The basic is a dephosphorizing process, and under it every ton of ore in our mountains could be used for making steel. This process the Bessemer interests claim to have purchased, not for the purpose of practically utilizing it in making steel, but to pocket it, so as to prevent competition with their present process, and in fact create a monopoly in steel manufacture. The great injury done to the iron ore bearing districts of the South by this selfish course on the part of the Bessemer company is such that the spirited men of this section will not tamely submit to. If fair play is not accorded, then they will be worked up to a point of resentment, and having justice and the public welfare on their side they will win. A monopoly of such proportions as the Bessemer company is seeking to effect, or indeed any monopoly, affecting the public interest, cannot be obtained and maintained in this country. It is against the genius of our institutions. Our diversified productions and sources of wealth demand reciprocal favors—equality under the law, and nothing else will satisfy the country, where it is devoted to a palpable contravention or defeat of this primary policy. The basic process must be let loose, or the South, and a great portion of the North will want to know the reason why it is not. There are various ways to effect this result, and one of the effective methods is suggested in the article refered to. The subject will be agitated, and agitated in earnest, for the people interested in iron properties in Virginia have no idea of having them made worthless by the selfish purpose of the Bessemer company, as manifested in thus pocketing the basic process.

A Year's Work at Low Moor Furnace.

The annual meeting of the Low Moor Iron Company of Virginia, was held at Low Moor, Alleghany county, Virginia, the 17th instant. The officials of the previous year were all re-elected, viz: John Means of Ashland, Ky., president; H. M. Bell, of Staunton, Va., vice-president and secretary: E. A. Low, of New York, treasurer; John F. Winslow, of Poughkeepsie, N. Y., chairman of executive committee; H. W. Goodwin, of Low Moor, Va., general manager; and James Skelding, of Low Moor, Va., furnace manager.

There was but a small attendance of stockholders, most of them being represented by proxies. There was a general discussion of the condition of affairs and an approval of what had been done during the year, but no changes were made and no new plans formulated. Some members proposed that the Company should proceed to mine its own coal from lands it had leased on New river, a number of years ago, on a low royalty; but it was decided to continue to buy coal, as heretofore, from the Caperton mines.

The day of this meeting, Nov. 17, was also the anniversary of the first year of the third blast of Low Moor furnace, that blast having begun with a run of metal Nov. 17, 1884. From the begining of pig iron making at Low Moor we have presented in *The Virginias* detailed statements of its work; the work of a large, typical and constantly successful coke-using Virginia blast-furnace. This we continue below with the returns of its operations from Nov. 17, 1884, to Nov. 14, 1885, inclusive, a period of 363 days of runing time, or 365 days from the lighting of the furnace for this, its 3rd blast.

a reduced production—a renewed activity in gold mining has been developed in Virginia. The following extract from a letter to the *Mining Review* gives important information on this subject:

Mining lands are cheap in this State and labor is cheap: top hands $1 per day and good miners at from $1 to $1.50 per day. Wood costs only 40 cents a cord and lumber for buildings is delivered on the mine for $10 per thousand feet of all kinds. The climate is first class: no chills or fevers of any kind. The citizens are all good law-abiding people, and we have good schools and churches and a good healthy country. Railroads are plentiful, runing very near the mines, the Chesapeake & Ohio one side and the Virginia Midland on the other, with the Piedmont, Fredericksburg & Potomac on the other and the Richmond, Fredericksburg & Potomac the other side. Thus we have everything here for successful mining, including the very necessary article the metal itself. Our ores are runing from $5 to $25 per ton. We have plenty of ores, the veins averaging four feet all through the leads.

The mineral exhibit made by Virginia at the Exposition was very fine and comprehensive; 83 counties were represented. All the minerals were classified in the following State subdivisions:

1. Tidewater Virginia.
2. Midland Virginia.
3. Piedmont Virginia.
4. Blue Ridge Virginia.
5. Great Valley of Virginia.
6. Apalachian Virginia.

Most of the specimens were collected and arranged by Major Jed. Hotchkiss, editor of *The Virginias*, of Staunton, and Assistant U. S. Commissioner, aided by an appropriation of only $800. The very full catalogue was first printed in *The Virginias*, and then cut out and pasted in a blank book. This was afterwards reproduced in the Handbook of Virginia by Randolph Harrison, the Commissioner of Agriculture, Richmond, 1885, in which much other valuable information may be found.

The catalogue shows the collection to be very extensive; too much so to be described in detail here. The catalogue consisted of 64 pages of closely printed matter. There were also many geographical, geological, and special charts and maps shown. The minerals were placed on terraced tables, and were well displayed. The specimens were all clean and distinctly labeled, and while the selection was not made for beauty, but rather to convey a correct idea of the minerals as they occur in nature, there were many fine and even magnificent specimens of great interest to the scientific mineralogist as well as to the technologist. It is to be hoped that this magnificent collection will be placed in some central city in the State, and become the nucleus of a grand State museum.

The minerals were exhibited partly by the Virginia Department of Agriculture, and were partly loaned by individuals or corporations.

Ores and minerals of a like character were often shown in several counties, the object of the collection being to represent the general mineral resources of the State, rather than to make a scientific classification. The most important minerals I observed are embodied in the following list: Coal and coke; fertilizers—the fertilizers found in the State seem to be tertiary shell marls and greensand; extensive beds of these minerals are stored up by nature for future use. At Evergreen the deposit seems to be 20 feet thick; asbestus; barite; chalcopyrite; corundum; erubescite; graphite; kaolin; mica; ochre, good quality; pyrolusite; argentiferous galena; copper ores; ferro-manganese; gold-bearing quartz; iron ores and pig iron, in large piles; manganese ores; concentrated pyrites; tin ore, Martha D. Cash mine, Rockbridge county; zinc ores and bars of metal; fine model of the Natural Bridge, a very attractive feature of the Exposition; bricks; building stones, a large collection; china clay; fire clay; glass sand; granite; grindstone and grindstone grits; hydraulic limestones; limestones; marbles, in blocks and slabs; millstones; mineral waters; slates; whetstones, etc.

Flat-top Coal output, Nov., 1885.

Our Oct., 1885, report of the output of semi-bituminous coal from the Flat-top, Va., and W. Va., mines was published on page 155. Below are the returns of the output for November, 1885, furnished *The Virginias*, in long tons, by Mr. D. H. Matson, secretary and treasurer of the Pocahontas Coal Co., Roanoke, Va.

Miners.	*Run of mine.*	*Lump.*	*Slack.*	*Total.*
1. S.W.Va. Improvement Co.	29,949	3,816	. .	33,765
2. John Cooper & Co.....	5,212	898	486	6,596
3. Caswell Creek Coal Co....	6,513	. .	. .	6,513
4. William Booth & Co.....	4,719	. .	. .	4,719
Totals	46,392	4,714	486	51,593

A reference to the October output will show that it was 1,749 tons more than the above, yet the comparative output of Nov. was larger, as a reference to the almanac will prove, for there were 27 working days in October and but 25 in November. The daily average output was 1,976 tons in October and 2,064 tons in November.

The Bluestone mines, Nos. 2, 3, and 4 of the above, made rather more gain in output than did the Pocahontas mine, No. 1 of the above.

The returns furnished *The Virginias* by the Norfolk & Western RR. of the weekly and yearly shipments of coal from the Flat-top field, up to Nov. 28th, are as follows, in net tons:

	1884.	*1885.*	*Increase.*
Shipments 4th week of Nov.	10,240	13,151	2,911
Previously shiped	172,508	524,666	352,158
Totals	182,748	537,817	355,069

Tests of Great Kanawha and Pittsburg Coals.

In a recent issue of "Van Nostrand's Engineering" there is a report by John W. Hill, M. E., on a series of tests he made last March for the Cincinnati Water department "with several of the best known brands of bituminous coal in the Cincinnati market" for the purpose of establishing "a standard of comparison for the determination of the relative money value to the Water department of such coals as were, or might be in the future, available in large quantities at moderate cost for steam purposes."

"Four kinds of the best known and most available coals were tried," namely:

1. Pittsburg (Youghiogheny) No. 2, lump, furnished by W. H. Brown's Sons.

2. Great Kanawha, "Winifrede" mines, lump, furnished by East End Elevator Co.

3. Great Kanawha, "Campbell Creek" mines, lump, furnished by Campbell Creek Coal Elevator Co.

4. Kentucky, "Peach Orchard" mines, lump, furnished by Daniel Stone & Co.

All these coals were obtained from the local stocks of the Cincinnati dealers named "without previous intimation that they were wanted for test purposes, and the several results may be accepted as fair averages for ordinary market coal of the different brands, under similar conditions of use."

The report then describes the boilers used for the tests and the arrangements by which all the coals were tested under conditions as nearly identical as could possibly be se-

cured, because these tests were "for purposes of comparison, and not for absolute values of the coals burned."

The "relative values" of these four coals, "based on their performance" in the tests, were:

1. Pittsburg..... .....1,000 3. Campbell Creek... 967
2. Winifrede..... 969 4. Peach Orchard.... 930

Their "relative values based on performance of combustible" were:

1. Pittsburg .....1,000 3. Campbell Creek... 967
2. Winifrede..... 972 4. Peach Orchard ... 930

It is stated that "the comparison by combustible has no commercial value excepting the coals should be contracted for upon the basis of combustible."

Samples of all the coals used were taken, during the trial, and analyzed with these results:

	Fixed carbon.	*Vol. mat.*	*Ash.*	*Water.*	*Sul.*
Pittsburg.....	59.88	33.71	4.10	1.87	0.44
Winifrede.....	57.21	37.58	2.72	1.93	0.56
Campbell-Creek	53.24	34.23	9.66	2.15	0.72
Peach-Orchard.	52.83	36.83	4.98	4.60	0.76

A note says: "The 'ash' found for Campbell Creek coal by analysis must be an error, because the non-combustible (6.9369 per cent of original weights of coal burned on the grates) includes, in addition to ash and clinker (non-combustible), some combustible which filtered through the grates in charging coal and breaking the fires."

From the "summary of trials" we take the following, No. 1 standing for Pittsburg, No. 2 for Winifrede, No. 3 for Campbell Creek, and No. 4 for Peach Orchard:

Produced.	*No. 1.*	*No. 2.*	*No. 3.*	*No. 4.*
Steam per pound of coal...	10.638	10.310	10.181	9.756
Steam per pound of combustible	11.314	10.992	10.940	10.594
Value based on coal.....	1000	969	957	917
Value based on combustible...	1000	972	967	930
Percent of non-combustible...	5.968	6.191	7.937	7.303

We suppose that Mr. Hill means by the "combustible" of coal the sum of its Fixed carbon and its Combustible volatile matter. Taking these from his table of analyses we find the "combustible value" of the four coals tested, in ranking order, to be:

1. Winifrede.....94.79 3. Peach Orchard 89.66
2. Pittsburg ....93.59 4. Campbell Creek 87.47

The suspected error in the analysis of the Campbell Creek coal, that Mr. Hill calls attention to, probably gives it the 4th place in "combustible" rank. A correction of that would add over 3 per cent to the "combustible" of the Campbell Creek coal and bring its value to over 90, thus restoring it to the 3d rank.

Obtaining the "combustible" values by subtracting the "non-combustible" percentages of the "general averages" from 100, we have this order and these percent values:

1. Pittsburg..... 94.032 3. Campbell Creek 93.063
2. Winifrede. ..... 93 809 4. Peach Orchard. 92.697

In our opinion this is the best and fairest measure of the comparative values of these coals. Mr. Hill, by implication, admits that rank "by combustible" would have a "commercial value" if "coals should be contracted for upon basis of combustible." We say they should be thus contracted for. Now that sensible purchasers contract for and buy ores of all kinds and many other mineral substances at so much "per unit" of the thing wanted that is contained in such ore, etc., we do not see why it would not be equally sensible and prudent to buy coals by the "combustible unit," since "the combustible" is is the thing, and the only thing, the coal is bought for.

The question that the consumer will ask about all this will be: What is each of these coals worth, in dollars and cents, on the basis of these tests? The average price of Pittsburg coal, delivered, in Cincinnati, during the fiscal year 1882-3, was $3.155 a net ton. Taking that price for Pittsburg coal and the figures of "combustible" in each coal, as determined by these tests, as last given above, as bases of calculation, we have these market values, for the coals named:

1. Pittsburg ..... . $3.155 3. Campbell Creek $3.130
2. Winifrede. ..... 3.148 4. Peach Orchard. 3.011

This calculation shows that according to Mr. Hill's tests Pittsburg coal was actually worth 7-mills a net ton more than Winifrede, 2½ cents a ton more than Campbell Creek, and 14.4 cents more than Peach Orchard. It also suggests that eliminating "the small dust of the balances" Pittsburg and Winifrede were on a par and combusted with equal honors in the Cincinnati Water-works tests.

By way of suggestion we would add that there are quite a number of abundant coals in West Virginia, that have a down-hill road to Cincinnati, that have over 3-per cent more "combustible" in them than even "Pittsburg."

West Virginia Coals and Cokes for the New Orleans Exposition.—We find the following interesting information in the Huntington, W. Va., Advertiser of Nov. 28th:

It is gratifying to know that this section of West Virginia, so rich in timber, coal, and mineral wealth, will not be entirely unrepresented at the second great New Orleans Exposition.

On Thursday a car-load of exhibits consisting of specimens of coals and cokes from the following mines along the Chesapeake & Ohio Railway, was shiped from the freight depot at this place to Col. Philip Pendleton, West Virginia's Commissioner at New Orleans.

Fire Creek Coal & Coke Co., on New river, two cases of coal and coke.

Beury Coal & Coke Co., New river, two hogsheads of coal and coke.

Nuttallburg Coal & Coke Co., New river, two cases of coal and coke.

Crescent Coal mines, W. R. Johnson, Kanawha river, two packages of hard coal.

Straughn & Co., Kanawha river, two packages of gas coal.

Black Band Iron & Coal Co., Davis creek, two packages of block coal. This is the mine in which our county man, Capt. W. M. Hovey, is interested.

In addition to these exhibits, Mr. A. Huddleston, from Kanawha Falls, sends a large box of minerals.

All of these exhibits come from Fayette and Kanawha counties. Would it not be well for Cabell, Wayne, Lincoln, Logan and other counties of this region to follow the example set by Fayette and Kanawha? In all of the counties named coal abounds, and the timber resources are unequaled in this or any other state. A little enterprise and industry on the part of those owning coal and timber lands will enable them to advertise their property more cheaply and effectually now through the New Orleans Exposition, than ever again. Let specimens of our poplar, oak, walnut, ash, cherry, and other woods be sent to New Orleans without delay. It will be a paying investment.

New Tests of Kanawha and Other Coals.

In the "American Engineer" of Chicago, of Nov. 26, there is a noteworthy editorial on 'The Commercial Value of Steam Coals.' It begins by saying: "In these times when the markets are stocked with so many varieties of coal, it may be of interest to our readers to have some facts in regard to what is the actual value of a coal for generating steam.

That value to the consumer is composed of two factors: The price per ton, and the heat capacity. A coal may be low in price and yet be a dear coal to buy, while another may be high-priced but the most economical to use. The first may be a lean coal, rich in earthy matters, and poor in heat generating material; or, as expressed by the fireman, 'it will require two wheel-barrows to wheel away what is brought in one.' The second may be a coal rich in carbon and hydro-carbon gases, with a small proportion of waste material—one that will leave but little in the ash-pit.

The first will require a large amount burned to evaporate a small quantity of water; because, of the gross weight, only a small part is heat-producing, and a portion of that is absorbed in heating the ash or non-producing part which passes into the ash-pit. The second will evaporate a large quantity of water; because, of the total weight a large proportion is composed of heat-producing material, and as there is little ash, only a small amount of heat is absorbed by it. Then again, some coals, although they have quite a large per cent of refuse, yet because of the peculiar proportions of the heat-producing elements their combustion gives a high rate of evaporation. Therefore, the commercial value of a coal is: *The amount of work performed multiplied by the cost of the coal.*"

The "American Engineer" then proceeds to give the detailed results of a series of evaporative tests, all made under exactly the same conditions, "to determine the comparative value of nine of the well known bituminous coals" of the Ohio river trade. The conclusions as to comparative values are as follows:

Coals.	*Evaporation.*	*Per cent.*	*Comparative value.*
1. Youghiogheny, lump, .	11.38	1.000	$3.50
2. Campbell Creek, lump, .	10.20	.896	3.14
3. Campbell Creek, nut, . .	10.09	.887	3.10
4. Youghiogheny, nut, . .	10.00	.878	3.07
5. Coalburg, lump, ...	9.99	.878	3.07
6. Jackson Co., lump, . .	9.61	.845	2.96
7. Jackson Co., nut, . .	8.76	.769	2.69
8. Dark-horse, lump, . . .	8.65	.760	2.66
9. Straitsville, nut, . . .	8.56	.752	2.63

The basis of comparison in the above table of equivalent values is: The pounds of water evaporated to each pound of coal, from and at 212° Fahr. The price of Youghiogheny, Pa, coal is taken at $3.50 per ton, delivered; the comparative commercial value of the other coals to a consumer would then be the price opposite each.

The article concludes: "Based on these prices, the coal to buy should be the one that will have in practical operation the least deleterious effect on grates and furnace."

The duty of these coals was, furnishing steam for wood-pulp digesters. The coals were furnished in car-load lots, and were good fair samples of each variety.

An inspection of the above table shows that only the Youghiogheny, Pa., lump did more duty in these tests than did the lump and the nut coal from the Campbell Creek, W. Va., mines, these ranking 2nd and 3rd; and that the lump coal from the Coalburg, W. Va., mines ranked 5th, standing higher than any of the noted coals of Ohio, the Jackson county and the Straitsville, that were tested, and being outranked only by the Campbell Creek and the Youghiogheny. This is a good comparative showing for two of our West Virginia coals, although it does not accord with the trade opinion in Cincinnati, which generally classes Campbell Creek and Youghiogheny together.

The Campbell Creek, W. Va., clean lump coal used in these tests is described as: "A hard coal having the break and characteristics of the splint or block coals. It was somewhat seamy in appearance but was compact and close in structure. The clinker was light and easily broken and did not clog the grates, and the fires only required cleaning once. This coal gave a good, strong, even fire, and would bear forcing, and had no tendency to smoke." The nut coal from the same mine is described as: "A large sized nut, clean, with very little fine. It burned with a rich flame in the furnace and slight tendency to smoke. It showed itself a strong coal and would stand crowding. The refuse in furnace was a loose clinker, easily broken up and had no tendency to pack or coke over the grates."

The Coalburg, W. Va., clean lump coal is described as: "Of an average degree of hardness and rather uneven as to structure, having hard seams runing through it. It burned well in the furnace, making a hot fire and holding on well. In fact, it was a good strong coal. The refuse did not form a hard clinker, and the furnace only required cleaning once during the ten hours The ash was white and fine."

The Youghiogheny, Pa., clean lump coal is described as: "A fair average sample, although it showed somewhat seamy. A hard compact coal with square breakage. It burned with a rich flame and required a strong draft from the bottom to consume the gases and prevent smoke, and showed by its work it was a strong coal. The clinker had to be removed from the furnace with the slice bar." The Youghiogheny screened nut coal is described as: "An average sample taken from a pile where it had laid in bulk for several months. It burned well in the furnace but the clinker was hard and required lifting from the grate, as it has a tendency to coke over and prevent the free circulation of air through the grates."

We think coal consumers in furnaces would subtract a few points from the Youghiogheny coals, after reading the above description of "behavior," and add them to the Great Kanawha coal and so make the "commercial values" very nearly equal.

Excursion to the Flat-top Coal-field.

A party of gentlemen, representatives of leading New England railroads, recently visited the Flat-top Coal-field at the invitation and under the auspices of the well known coal firm of Messrs. Castner & Co., Limited, of Philadelphia, the sole Tide-water agents for the coal of the entire Flat-top district. The following named gentlemen composed the party: C. N. Yeamans, president of New Haven & Northampton RR.; A. Perkins, fuel agent of Boston & Maine RR.; E. Chatterton, agent of New York, New Haven & Hartford RR.; E. S. Quintard, superintendent of New Haven & Derby RR.; Mr. Downes of Benedict & Downes, coal dealers, New Haven, Conn.; C. H. Duhring, president Flat-top Coal Co.; W. C. Wickham, president of South-west Virginia Improvement Co.; C. N. Mellen of Norfolk & Western RR., Philadelphia; S. P. Burton, Jr., Boston agent of Castner & Co., Limited; A. D. Curran, of Castner & Co., Limited, New York city; F. E. Saward, editor of Coal Trade Journal, New York city; and W. W. Curran, superintendent of Pocahontas Coal Co., Roanoke, Va.

The party was in charge of Mr. Henry B. Curran, who is the Co. in the firm of Messrs. Castner & Co., Limited; the perfect success of the trip was due to his admirable arrangement of details and characteristic forethought. Leaving Philadelphia on the 28th of October, 1885, in the special car "Kearsarge," Luray, Page county, Va., on the Shenandoah Valley RR., was reached on the morning of the 29th. A stop of two or three hours was made to visit the marvelous and widely renowned Luray Caverns, illuminated by Electric lights. Proceeding thence 110 miles southward, by the S. V. RR., passing many points of historic interest in the "late unpleasantness," a halt was made at the Natural

Bridge station and a hurried visit paid to the celebrated Natural Bridge of Virginia. After viewing this wonderful arch of Nature's building, the party was driven around by Col. Parsons, its appreciative and hospitable owner, who has undertaken the conversion of this magnificent estate of several thousand acres, many hundreds of which are covered with a primitive forest growth, into an immense Royal Forest Park, traversed throughout by miles of beautiful woodland drives. With many regrets at the briefness of a visit offering so much to see and enjoy, the party once more boarded the comfortable and homelike "Kearsarge," and Roanoke City, the banner town of Virginia, was reached about 8 p. m.

Situated at the junction of the Norfolk & Western and the Shenandoah Valley railroads, this town, with its immense Machine-works, Blast-furnace and Factories has sprung into existence like magic; with a population in 1882 of 600 it has in 1885 one of 7,000. It bids fair to rival in time its only other competitor of rapid growth in the South, Birmingham.

Those who accompanied the able executive of the Roanoke Machine-works and Car-shops, Mr. S. B. Haupt, on a tour of inspection, were agreeably surprised and delighted at the completeness and extent of this immense establishment, so remote from great business centers. It is said to have the honor of having constructed the first locomotive, in its entirety, in the South. Many of the large consolidation freight engines in use on the Norfolk & Western RR. have been built here; these car-shops have a capacity of 20 freight cars per day and are provided with all the labor saving machinery requisite to ensure economy of construction.

After resting a night at the Hotel Roanoke, an Inn unsurpassed in its creature comforts in the South, and having been thoroughly awakened, but not entirely recovered from the shock of a hideous steam blast from the Roanoke Machine-works, the journey was resumed by the Norfolk & Western Railroad to the coal-fields. The beautiful and fertile Valley of Roanoke is soon left behind and in a short time we reach Central, 53 miles south of Roanoke and midway between Lynchburg and Bristol, the latter the southwestern terminus of the Norfolk & Western RR.

Central is the starting point of the New River Railroad, a 70-miles long branch of the Norfolk & Western leading to the Flat-top Coal-field. After a picturesque ride of 40 miles to the northeast, following the course of the New River valley, the road suddenly diverges north-westwardly and winds up the narrow East River valley, crossing, as its summit, the divide between the waters of East and Bluestone rivers. Bluestone river skirts the easterly base of the Coal measures. At Bluestone Junction station the railway branches, one arm extending westwardly to Pocahontas, a town nestled in the heart of the mountains, the mining center of the Flat-top Coal-field with a population of about 2,000. This place has been built up entirely by the extensive mining operations of the South-West Virginia Improvement Company, the pioneer company of this great coal-field. Recognizing the great value of these semi-bituminous coking coals and the importance they are destined to acquire in the soft coal markets of the country, the work of this company, from its very inception, was laid out systematically and with a view to permanency; everything has been constructed solidly and substantially with ample provision for the largest possible output.

After an inspection, under the guidance of Mr. W. C. Wickham, president of the S. W. Va. I. Co., of the extensive improvements and facilities for handling the large coal tonnage daily mined at Pocahontas, and the 200 coke ovens used in coking the slack coal of mining operations there, the party was conducted underground, where miles of tunnels and gangways were traversed so as to give some adequate idea of the great extent and capacity of the Pocahontas mines, which are in a regular seam of coal, without fault or parting, *eleven-and-a-half feet in thickness*, which underlies thousands of acres of land owned by this company. The present output of this mine is 2,500 tons a day; if required this output can be increased to 3,500 tons from one opening. Should the demand require it 5,000 tons can be taken daily from two openings. Everywhere either Coal or Coke greeted the eye, until one naturally wearied of the sight of so much black and gray fuel, and it was a great relief to be told to get aboard and to learn, that for that day at least, there was to be an end of Coal.

Leaving Pocahontas, the "Kearsarge" returned to Bluestone Junction and then went by the other arm of the railway northeast three miles down the Bluestone river to Bramwell, the new mining village of the Bluestone Coal Company, where, under the hospitable roof of President C. H. Duhring, the entire party was elegantly entertained until the following day when a tour of inspection was made of the three coal mining operations conducted by Messrs. John Cooper & Co., Freeman & Jones, and Booth & Co., under leases from the Bluestone Coal Co.

The same coal seam is mined on the Bluestone as at Pocahontas; it is known throughout the district as the "No. 3 Bed," a designation first given it by Major Jed. Hotchkiss, M. E., editor of *The Virginias*, because it is here the 3rd coal bed, from the bottom, of the Lower, or No. XII, Coal measures. The same features of regularity in stratification and purity in composition noted in the mines of the S. W. Va. Improvement Co., characterize the coals mined on the Bluestone The capacity of each of the three mining operations on the Bluestone is 1,000 tons a day; or a combined capacity of 3,000 tons.

A heavy rain storm prevented the party from geting more than a general idea of the extent of this great coal-field, but enough was seen, both as to quantity and quality, to convince the most skeptical of its future importance as a potent factor in the soft coal markets of the country.

From the coal-field the party was next taken over the Norfolk & Western to Norfolk, to view the terminal arrangements erected by that railway at Lambert Point for tidewater shipments of Flat-top coal. Here were inspected the terminal facilities now in use for handling 5,000 tons of coal a day. This in itself was the most convincing argument that the Norfolk & Western Railroad Company well understands the necessities of the great coal traffic which will naturally accrue to them and seek an outlet over their system, and has with sagacious foresight, made ample, provision to meet the remarkably rapid development which they correctly anticipated would take place in a coal-field unequaled in its resources and endowed with so many natural advantages. That the Flat-top coal trade will be the great future traffic of the Norfolk & Western Railroad no one will question after a visit to the Flat-top coal-field, the output of which for 1885 it is now estimated will be fully 600,000 tons. It is said that from one hundred to two hundred coke ovens will be erected on the Bluestone Coal Company's property during 1886 to meet the increasing demand for coke made from Flat-top coal.

A trip to the Gosport Navy-yard and to Fortress Monroe terminated an excursion that was alike instructive and entertaining. The skill and business energy shown by the firm of Castner & Company in thus rapidly introducing a new coal to the best markets, has surprised the coal-trade world. It is understood that Mr. Henry B. Curran of the firm has special charge of introducing this new and excelent steam fuel to the markets; his success has been and is something phenomenal.

B.

Agassiz on the Negro Race.

(Continued from page 150.)

The second letter of Prof. Louis Agassiz to Dr. Howe, on the subject of the Negro Race, dated August 10, 1863, was as follows:

I am so deeply impressed with the dangers awaiting the progress of civilization, should the ideas now generally prevalent about amalgamation gain sufficient ascendency to exert a practical influence upon the management of the affairs of the nation, that I beg leave to urge a few more considerations upon that point.

In the first place let me insist upon the fact that the population arising from the amalgamation of two races is always degenerate, that it loses the excelences of both primitive stocks to retain the vices or defects of both, and never to enjoy the physical vigor of either. In order clearly to appreciate the tendencies of amalgamation, it is indispensible to discriminate correctly between the differences distinguishing one race from another and those existing between different nationalities of the same race. For while the mixture of nationalties of the same race has always proved beneficial as far as we are taught by history, the mixture of races has always produced a very different result. We need only look at the inhabitants of Central America, where the white, the negro, and the Indian races are more or less blended, to see the baneful effects of such an amalgamation. The condition of the Indians on the borders of civilization in the United States and in Canada, in their contact with the Anglo-Saxons as well as with the French, testifies especially to the pernicious influence of amlgamation of races. The experience of the Old World points in the same direction at the Cape of Good Hope, in Australia; everywhere, in fact, history speaks as loudly in favor of the mixture of clearly related nations as she does in condemnation of the amalgamation of remote races. We need only think of the origin of the English nation, of that of the United States, etc. The question of breeding in-and-in, that of marriage among close relations, is again quite distinct. In fact, there is hardly a more complicated subject in physiology, or one requiring nicer discriminations, than that of the multiplication of man, and yet it is constantly acted upon as if it needed no special knowledge. I beseech you, therefore, while you are in a position to exert a leading influence in the councils of the nation upon this most important subject to allow no preconceived view, no favorite schemes, no immediate object, to bias your judgment and mislead you. I do not pretend to be in possession of absolute truth. I urge upon you the consideration of unquestionable facts before you form a final opinion and decide upon a fixed policy. Conceive for a moment the difference it would make in future ages for the prospects of republican institutions, and our civilization generally, if instead of the manly population descended from cognate nations the United States should be inhabited by the effeminate progeny of mixed races, half Indian, half negro, sprinkled with white blood. Can you devise a scheme to rescue the Spaniards of Mexico from their degradation? Beware, then, of any policy which may bring our own race to their level.

These considerations lead me naturally to the inquiry into the peculiarities of the two races, in order to find out what may be most beneficial for each. I rejoice in the prospect of universal emancipation, not only from a philanthropic point of view, but also because hereafter the physiologist and ethnographer may discuss the question of the races and advocate a discriminating policy regarding them, without seeming to support legal inequality. There is no more one-sided doctrine concerning human nature than the idea that all men are equal, in the sense of being equally capable of fostering human progress and advancing civilization, especially in the various spheres of intellectual and moral activity. If this be so then it is one of our primary obligations to remove every obstacle that may retard the highest development, while it is equally our duty to promote the humblest aspirations that may contribute to raise the lowest individual to a better condition in life.

The question is, then, what kind of common treatment is likely to be the best for all men, and what do the different races, taken singly, require for themselves? That legal equality should be the common boon of humanity can hardly be matter for doubt nowadays, but it does not follow that social equality is a necessary complement of legal equality. I say purposely legal equality, and not political equality, because political equality involves an equal right to every public station in life, and I trust we shall be wise enough not to complicate at once our whole system with new conflicting interests, before we have ascertained what may be the practical working of universal freedom and legal equality for two races, so different as the whites and negroes, living under one government. We ought to remember that what we know of the negro, from the experience we have had of the colored population of the North, affords but a very inadequate standard by which to judge of the capabilities of the pure blacks as they exist in the South. We ought, further, to remember that the black population is likely at all times to outnumber the white in the Southern States. We should therefore beware how we give to the blacks rights, by virtue of which they may endanger the progress of the whites before their temper has been tested by a prolonged experience. Social equality I deem at all times impracticable,—a natural impossibility, from the very character of the negro race. Let us consider for a moment the natural endowments of the negro race as they are manifested in history on their native continent, as far as we can trace them back, and compare the result with what we know of our own destinies, in order to ascertain, within the limits of probability, whether social equality with the negro is really an impossibility.

We know of the existence of the negro race, with all its physical peculiarities, from the Egyptian monuments, several thousand years before the Christian era. Upon these monuments the negroes are so represented as to show that in natural propensities and mental abilities they are pretty much what we find them at the present day,—indolent, playful, sensual, imitative, subservient, good natured, versatile, unsteady in their purpose, devoted and affectionate. From this picture I exclude the character of the half breeds, who have, more or less, the character of their white parents. Originally found in Africa, the negroes seem at all times to have presented the same characteristics wherever they have been brought into contact with the white race; as in Upper Egypt, along the borders of the Carthaginian and Roman settlements in Africa, in Senegal in juxtaposition with the French, in Congo in juxtaposition with the Portuguese, about the Cape and on the eastern coast of Africa in juxtaposition with the Dutch and the English. While Egypt and Carthage grew into powerful empires and attained a high degree of civilization; while in Babylon, Syria, and Greece were developed the highest culture of antiquity, the negro race groped in barbarism and *never originated a regular organization among themselves.* This is important to keep in mind, and to urge upon the attention of those who ascribe the condition of the modern negro wholly to the influence of slavery. I do not mean to say that slavery is a necessary condition for the organization of the negro race. Far from it. They are entitled to their freedom, to the regulation of their own destiny, to the enjoyment of their own life, of their earnings, of their family circle. But with all this nowhere do they appear to have been capable of rising, by themselves, to the level of the civilized communities of the whites, and

therefore I hold that they are incapable of living on a footing of social equality with the whites in one and the same community without becoming an element of social disorder.

I am not prepared to state what political privileges they are fit to enjoy now; though I have no hesitation in saying that they should be equal to other men before the law. The right of owning property, of bearing witness, of entering into contracts, of buying and selling, of choosing their own domicile, would give them ample opportunity of showing in a comparatively short time what political rights might properly and safely be granted to them in successive installments. No man has a right to what he is unfit to use. Our own best rights have been acquired successively. I cannot, therefore, think it just or safe to grant at once to the negro all the privileges which we ourselves have acquired by long struggles. History teaches us what terrible reactions have followed too extensive and too rapid changes. Let us beware of granting too much to the negro race in the beginning, lest it become necessary hereafter to deprive them of some of the privileges which they may use to their own and our detriment. All this I urge with reference to the pure blacks of the South. As to the half-breeds, especially in the Northern States, I have already stated it to be my opinion that their very existence is likely to be only transient, and that all legislation in reference to them should be regulated with this view, and so ordained as to accelerate their disappearance from the Northern States.

Let me now sum up my answers to some of your direct questions.

1st. Is it probable that the African race will be a persistent race in this country, or will it be absorbed, diluted, and finally effaced by the white race?

I believe it will continue in the Southern States, and I hope it may gradually die out of the North, where it has only an artificial foothold, being chiefly represented by half-breeds, who do not constitute a race by themselves.

2nd. Will not the practical amalgamation fostered by slavery become general after its abolition?

Being the result of the vices engendered by slavery, it is to be hoped that the emancipation of the blacks, by securing to them a legal recognition of their natural ties, will tend to diminish this unnatural amalgamation and lessen everywhere the number of these unfortunate half-breeds. My reason for believing that the colored population of the North will gradually vanish is founded in great degree upon the fact that that population does not increase where it exists now, but is constantly recruited by an influx from the South. The southern half-breeds feel their false position at the South more keenly than the blacks, and are more inclined to escape to the North than the individuals of purer black blood. Remove the oppression under which the colored population now suffers, and the current will be at once reversed; blacks and mulattoes of the North will seek the sunny South. But I see no cause which should check the increase of the black population in the Southern States. The climate is genial to them; the soil rewards the slightest labor with a rich harvest. The country cannot well be cultivated without real or fancied danger to the white man, who, therefore, will not probably compete with the black in the labors of the field, thus leaving to him an opportunity for easy and desirable support.

3rd. In those sections where the blacks and mulattoes together make from 70 to 80 and even 90 per cent of the population will there be, after the abolition of slavery, a sufficiently large influx of whites to counteract the present numerical preponderance of blacks?

To answer this question correctly we must take into consideration the mode of distribution of the white and of the colored population in the more Southern States. The whites inhabit invariably the sea-shores and the more elevated grounds, while the blacks are scattered over the lowlands. This peculiar localization is rendered necessary by the physical constitution of the country. The lowlands are not habitable in summer by the whites between sunset and sunrise. All the wealthy whites, and in the less healthy regions even the overseers, repair in the evening to the seashore or to the woodlands, and return only in the morning to the plantation, except during the winter months, after the first hard frost, when the country is everywhere habitable by all. This necessarily limits the area which can be tenanted by the whites, and in some States that area is very small compared with that habitable by the blacks. It is therefore clear that with a free black population, enjoying identical rights with the whites, these States will sooner or later become negro States, with a comparatively small white population. This is inevitable; we might as soon expect to change the laws of nature as to avert this result. I believe it may in a certain sense work well to the end. But any policy based upon different expectations is doomed to disappointment.

4th. How to prevent the whites from securing the lion's share of the labor of the blacks?

This is a question which my want of familiarity with the operations of the laboring classes prevents me from answering in a manner satisfactory to myself. Is it not possible to apply to the superintendence of the working negroes something like the system which regulates the duties of the foreman in all our manufacturing establishments?

I should like to go on and attempt to devise some scheme in conformity with the convictions I have expressed in these letters. But I have little ability in the way of organizing, and then the subject is so novel that I am not prepared to propose anything very definite.

Some Indian Names of Tributaries of Ohio River.

We are indebted to Col. John Mason Brown of Louisville, Ky., for the following interesting list of equivalent names of rivers and creeks of the Ohio river basin, most of them in West Virginia, in the Miami and Delaware Indian languages. These names are from some Indian vocabularies, now in the possession of Col. Brown, that were compiled by Col. William Preston, the younger, son of the first Col. William Preston of "Smithfield," Lieutenant of Fincastle county of the Colony of Virginia.

Col. Brown remarks that the Indian suffix "*cepe*," meaning "water," sometimes appears as "*seepe*," "*seepwe*" or "*cepewe*;" and that in either case it is clearly equivalent to "*sippi*," as seen in the name "Missis-*sippi*."

1. Miami Indian Names.

Ohio river, Causisipione.
Scioto river, Siotha-cepe.
Little Kanawha river, Onimgohow-cepe.
Great Kanawha river, Piquemetami.
Coal river, Walandeconi-cepe.
Elk river, Pequoni-cepe.
Paint creek, Moscoos-cepewe.
Gauley river, Chinquetana-cepewe.
Bluestone river [*New river?*], Meccenekeke-cepewe.
Greenbriar river, Weotowe-cepewe.
East river, Notweo-cepewe.
Guyandot river, Lakeweketon-cepewe.
Big Sandy river, Wepepocone-cepewe.
Kentucky river, Milewakeme-cepewe.
Falls of the Ohio, Lewekeomi.
Great Kanawha (another name), Osane-cepewe.

2. Delaware Indian Names.

Ohio river, Kitono-cepe.

Great Kanawha river, or White-stone river, Keninshekacepe.
Scioto river, Siota-cepe.
Muskingum river, or Goose creek, Muskingo-cepe.
Blue-stone river, or Big-stone creek [*New river?*] Momongaseneka-cepe.
Greenbriar river, Onepake-cepe.
Elk river, or Walnut river, Toquemin-cepe.
Coal river, or Hill creek, Walhonde-cepe.
East river, or Wyandot creek, Talemoteno-cepe.
Gauley river, or Falling creek, Toke-belloke.
Paint creek, or Deer creek, Ottowe-cepe.
Big Sandy river, or Big Salt creek, Sikea-cepe.
Little Sandy River, or Little Salt creek, Tangate-sikea-cepe.
Big Miami river, or Stone creek, Oswene.
Little Miami river, or High-bank river, Pioquonee.
Guyandot river, or Narrow Bottom river, Seconee.

Tin.

The West Virginia "Tin" again.

We supposed the West Virginia "tin mining and smelting" matter was pretty much disposed of in the October and November numbers of *The Virginias*, but we find the West Virginia and Ohio papers that are published in and around the "tin" district still furnishing "information" and commenting on what is said and done. The promotors of the "mining and smelting" have also been much moved by our averments and strictures and in columns of print abuse us roundly and savagely for what we have said. More than this; they have been stired to have further and public "mining and smelting tests" for the benefit of those still doubting the existence of tin in the ore they mine while admiting that "tin" is a product of the smelting operations as conducted. This state of things makes it necessary for *The Virginias* to continue in the field, and there it proposes to remain until this question is settled beyond peradventure. We are after the truth, nothing more, nothing less. We have neither intention nor desire to do any one wrong, nor to in any way hinder mining operations in anything in these states; on the contrary we have done and are doing all in our power to promote such enterprises. At the same time we owe it to the public to expose schemes that in our informed opinion are fraudulent, as we have before said, not only for truth's sake but for the good and prosperity of our substantial mining and manufacturing interests. We have done this before when dozens of "professors." "analysts," "capitalists" and "promotors," were for months and years combined against us. The results proved the wisdom of our course, but did not repair the incalculable damage that was done to our mining interests by these "schemers."

This question can be settled, beyond controversy, in ten days, and yet it has been before the public as a doubtful question for more than a year during which time most extravagant statements have been published as to the extent of the "tin district" and the quantity and richness of the ore "in sight." And yet no man "outside of the ring, so far as we have heard, has been able to obtain a sample of this abounding ore that contained a particle of tin; although a number of analysts of established reputation, as we have shown and continue to show, have had these ores sent them, accompanied by metalic tin that it was deliberately stated had been melted from identical ores, and yet, after the most careful assays, not one of them has found a particle of tin in such ores. If tin exists in these ores as reported any tyro in chemistry could prove its presence in ten minutes. Assertions by the column in newspapers and public tests by interested parties that produce a pound of tin amount to nothing. Let them get one man or two men of known reputation to go to the reputed "tin" mine and in person sample and assay the ore and report the result and the question will be settled, and not before. If the existence of tin in paying quantities is proven by such a test we promise that *The Virginias* will be as hearty in promoting as it now is (on the good evidence it has) in condemning this "tin mining and smelting" scheme. This is what was done when the discovery of tin ore was announced in the Blue Ridge in Virginia, and in a few days no one doubted the existence of such ore there; We submit that the weight of evidence is in favor of our position.

We concluded our "tin" article last month (page 151) with the statement of the "Kanawha Gazette" that the Glenwood tin ore was to be tested by a committee named for that purpose. The "Gallipolis," Ohio, "Journal" of a recent date says:

"The Point Pleasant Tin Smelting Co. made a public test at Clifton, Saturday, of the Glenwood tin ore. Sixty pounds were smelted under the supervision of Jas. Clendenin and Clum Shrewsbury, who followed the ore from the vein and saw the metal taken from the furnace. The yield was 7 per cent. The company claim that a fairer test of the presence of metal could not be made. It is now in order for *The Virginias* to respond."

The "Huntington," W. Va., "Republican" says of this test:

"The question as to whether tin exists in this and Mason counties seems to be still an open one. The following is from the Point Pleasant Register":

"The test of the tin ore, secured from the mines by Messrs. Jas. E. Clendenin and C. Shrewsbury, and taken to Clifton, Saturday, where it was smelted in the presence of a large number of people, interested and disinterested, was very satisfactory. There was 16 pounds of the ore and the product was something over a pound of metal, pronounced by judges to be tin. Further tests will be made. If this development proves a success, the stockholders of this company will soon become very rich men, as well as prove a big bonanza for Mason county."

Dr. Henry Froehling of Richmond, Va., one of the most reliable analytical and consulting chemists of the country, under date of Nov. 28, 1885, writes us, of his own motion, as follows: I have read your articles about the West Virginia Tin swindle with very great interest, for they confirm my experience. Some time ago when on a visit to Louisa, Ky., a gentleman showed me a piece of what he called "tin ore," and a piece of tin said to have been extracted from this ore. This so-called tin ore was a calcareous conglomerate, and I warned him against having anything to do with the concern. I tried to secure a piece of the ore and succeeded in geting a small fragment. A gentleman from Huntington, W. Va., who was present, suggested that this matter might be worth looking into, as evidently the metal shown was tin, and it might be possible that a wrong sample of ore might have been goten hold of. To prove this matter that gentleman had a lot of ore collected from all the points from which the reputed tin ore was said to have been secured, and sent it to me for assay. A number of carefully made assays of this ore as sent and several assays of concentrates from a large amount of the ore failed to give even the faintest trace of tin.

I had previously written to parties whose names I saw in connection with the tin discovery asking for small samples of the ore, but my letters met with no reply.

I am very glad to see you have taken this matter in hand and hope you will by exposing this swindle prevent future attempts in the same direction.

Under date of the 3rd inst., Dr. Dewey, of the National Museum, writes us: I was kindly invited to superintend the said public tin smelting at Clifton. The kindness of the invitation was only exceeded by the coolness with which I was asked to pay my own expenses. I have another "tin" crank on hand—this time in Virginia, but he does not say where, and as he writes from Philadelphia I have no means of knowing the locality. This ore, however, is just like a great many other tin ores, no good.

The Virginia Tin Mines.

In the Engineering and Mining Journal of New York, of Nov. 7, 1885, we find the following account of the Virginia tin region, written for that journal by Arthur Winslow of Raleigh, N. C. As published this paper is illustrated by three maps; the first a small outline one of Virginia showing the location of the tin area (which may be equally well located by refering to the map of Virginia on page 124 of *The Virginias* and placing a dot on the Blue Ridge 20 miles south-by-west from Staunton); the second a small, rude outline map of Rockbridge and parts of adjacent counties, showing the more particular location of the area; and the third a small map of the Irish Creek Tin property, with 50 feet contours, showing the location of the cuts, pits and tunnel that have been made in proving the tin deposit.

"The Virginia tin area, as at present defined, extends along the east edge of Rockbridge county, in the line of the Blue Ridge mountains, from a few miles north of the James River gap to about the north line of the county. The cross-lined area on Map I. shows its position and approximate outline. Over this area, large tracts of land have been bonded to different individuals, and prospecting and exploration have been carried on with varying success. Cassiterite is reported to have been found in many places; but the most promising finds have been made along the upper waters of Irish creek, in the northeast corner of the county. (See Map II.) There, on both sides of the creek, for a distance of about a mile and a half, the veins have been abundantly proved by trenches and pits, and numerous analyses have been made of the ore. The tract lies amid the hills and minor mountain ridges that flank the main crest of the Blue Ridge on the west side, and the topography is exceedingly rugged. The nearest railroad station is Vesuvius, on the Shenandoah Valley railroad, some 500 feet below the level of the creek. It can be reached by a foot-path six or seven miles long, which leads one across several ridges and their intervening valleys, with many a tough climb and precipitous descent. There is also a rough wagon-road to Vesuvius, eight or ten miles long. Another road follows the creek, with an almost continuous descent, into the Shenandoah (Should be James River valley. *Ed. Vas.*) valley, where it crosses the railroad at a distance of about twelve miles. The country-rock is chiefly a coarse hornblendic and porphyritic granite, with large crystals of feldspar, an inch and more in length; but a finer variety of the same rock is also quite common. No evidence of stratification is anywhere visible. The rock is generally very much decomposed at the surface to a mottled clayey mass, and this decomposition has been proved to extend to depths of fifty feet. At times, however, the rock is hard and compact at the surface, and though its decomposition would, without doubt, much facilitate mining operations near the surface, this advantage would be lost when any considerable depth was reached. Trap dikes cut the formation in all directions, and they are frequently intimately associated with the tin veins.

The veins in which the tin occurs are true fissure-veins. They traverse the granite in all directions, with steep though varying dips. On Map III., a number of these veins are located and the corresponding dips noted. The thickness is generally small, one foot or less, though it is frequently more, and some veins are several feet thick. The gangue of the veins is at times almost pure pellucid quartz, in which the tin-stone occurs in crystals, in nodules, and in strings. Generally, however, it is a dark earthy rock composed largely of quartz with iron pyrites, mica, and various earthy minerals, among which the cassiterite is disseminated in small crystals and in fine grains indistinguishable to the naked eye. This vein-rock, as found near the surface, is in a very much decomposed and roten state, friable, and of a redish or yellowish-brown color from the decomposition of the iron bearing minerals. Undecomposed, however, it is readily distinguished from the country-rock, and could be easily separated from it by hand-picking.

The location and character of these veins have been proved by numerous pits and trenches. These are generally from 6 to 10 feet long and from 4 to 6 feet deep, though many are much larger. At *c* (Map III.), a tunnel has been driven over 70 feet long; and at *D*, a shaft has been sunk some 30 feet.

Analysis proves almost every vein to contain tin; but the quantity is in many cases very small, amounting to only a small fraction of one per cent. An average sample from the vein at *D*, which is about one foot thick, yielded 0.63 per cent of tin. At *E*, the vein, as exposed at the surface, is about three feet thick, and an analysis of an average sample gave 1-12 per cent of tin.

At *A*, a vein of white quartz with micaceous rock is clearly exposed in a ledge on the hillside. Through this runs a veinlet of solid cassiterite an inch or more thick, and the tin stone also occurs as nodules in pockets and fine grains disseminated in the rock.

At *B*, the vein is of quartz, carrying the cassiterite in pockets. Numerous nodules, the size of a hen's egg, or larger, scattered over the surface in this vicinity, and at the time of my visit, the top of the vein, at about six feet below the surface, held a block, about a foot in diameter, of nearly pure cassiterite. It is probable that the tin will be found throughout this vein in concretions such as this.

These two veins at *A* and *B* present the best showing of any on the property; enough to warrant their further exploration. Present developments are not sufficient to permit an estimation of their value, nor have the characteristics of these or of any of the veins upon the property been laid bare sufficiently to study for one to ventnre the prediction whether they will or will not increase in thickness or in value as greater depths are reached. Such questions can only be solved by careful and systematic exploration."

In this connection we add the following from a letter from Irish Creek, of Nov. 29, to the "Industrial South":

"At a recent meeting of the stockholders of the Virginia Tin Mining and Manufacturing Co., Capt. Taylor Berry, of Amherst, was elected president. It is reported that very soon a furnace will be built for smelting the tin ore, which is very rich and abundant, and it is expected that the furnace will yield a net profit of $600 per day. There are other tin mines here that experts pronounce very promising, but capitalists seem slow in taking hold of them."

New Analyses.

Analyses of W. Va. Limestone.—In Bulletin No. 9, page 17, of the U. S. Geological Survey, a report of work done in its chemical laboratory at Washington in 1883-4, we find the following analyses, by T. M. Chatard, of two samples of limestone from the Moundsville Narrows, 12 miles below

Wheeling, W. Va. No. 1 is from the upper ledge and No. 2 from the lower ledge of the stratum.

	No. 1.	No. 2.
Moisture	0.05	0.10
Insoluble	10.33	1.53
Carbonic acid (CO_2)	39.18	43.16
Lime (CaO)	48.02	53.26
Magnesia (MgO)	1.08	0.93
Iron (Fe_2O_3)	0.90	0.96
MnO and P_2O_5	traces.	traces.
	99.56	99.94

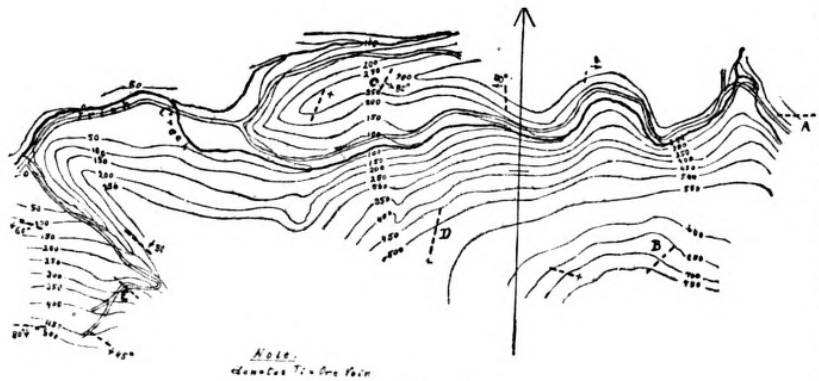
The above are equivalent to:

	No. 1.	No. 2.
Moisture	0.05	0.10
Lime carbonate ($CaCO_3$)	85.75	95.10
Magnesia ($MgCO_3$)	2.26	1.95
Iron carbonate ($FeCO_3$)	0.73	0.79
Sand, clay and Fe_2O_3	10.77	2.00
	99.56	99.94

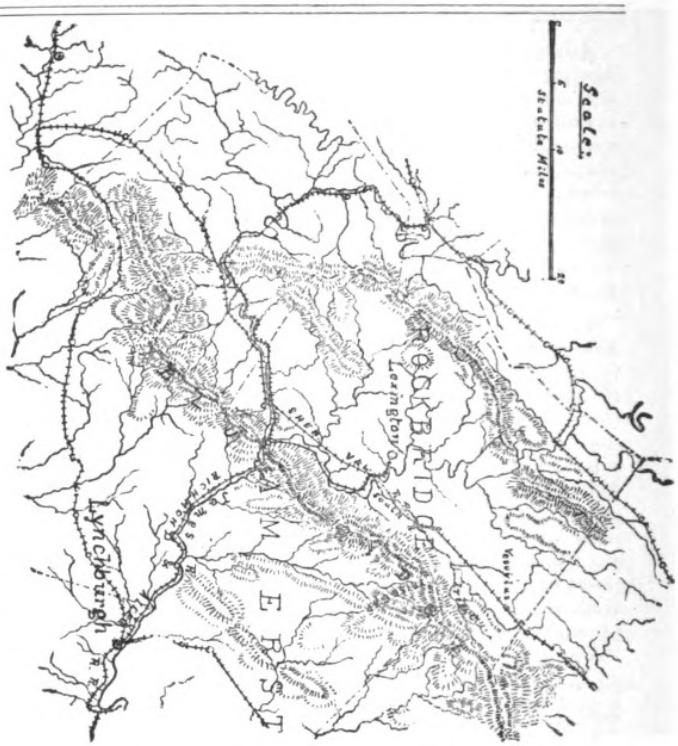
It is probable that this limestone is from the Permian limestone bed that Prof. I. C. White commented on as having a very large economical value to the farmers of the Ohio river region of West Virginia, on page 126 of *The Virginias* for 1883; the limestone No. X of Dr. Stevenson's Pa. reports. The above analyses shows that No. 2, the lower ledge, would make a first-class lime, as it contains over 95 per cent of Carbonate of Lime.

Maps Illustrating Va. Tin paper, p. 168.

Map No. I.



Map No. III.



Map No. II.

The Virginia Tin Mines.—Since the article on the Virginia Tin mines, on page 168, from "The Engineering and Mining Journal," was "in form" we have, by the accustomed courtesy of that journal, been furnished the cuts of the maps illustrating that paper; these we reproduce, upon this page, and return our thanks for their use.

The volume of the U. S. Geological Survey, by Albert Williams, Jr., on "The Mineral Resources of the U. S., 1883–4," says on this subject: "Tin ore has for a long time been known to occur sparingly in some of the auriferous gravel drifts of the gold-bearing belt of rocks, but it has not been found in quantity sufficient to justify the hope of mining it profitably until the past year. It is now reported from Rockbridge and Nelson counties, and in West Virginia from Mason and Cabell counties.

In Rockbridge county the ore is found in the crystaline rocks of the Blue Ridge on a branch of Irish creek, 7 or 8 miles from Vesuvius station of the Shenandoah Valley railroad. Two openings had been made before October, 1883. The locality is described by Messrs. McCreath and Platt.* Opening No. 1 shows the crystaline rocks standing nearly vertical and consisting for the most part of quartz, feldspar (orthoclose and albite), hornblende, and at a few points mica-schist. The tin-bearing vein apparently cuts across the rock for 36 feet and then follows the beding. This vein is made up of white quartz with tin ore, but the thickness is not stated. The largest piece of rich ore was not over 2 inches in thickness, and much was not over an inch. A

*The report of these gentlemen is credited by Mr. Williams to the "Bulletin of Iron & Steel Association," Nov. 7, 1883. It appeared in *The Virginias* for Oct., 1883, page 150, in company with a report by Prof. H. D. Campbell.—*Editor*.

7-inch vein has been reported in the vicinity. The samples assayed showed an average of 36.60 per cent. Opening No. 2 shows only some loose flat specimens of ore.

The Nelson county tin district adjoins that of Rockbridge. Veins of good size are reported, and they are said to have been traced for a great distance on the surface."

Then follows a further description of this Blue Ridge tin district and its ores, compiled and condensed from the reports of Prof. H. D. Campbell, Dr. Wm. Robertson and Mr. F. A. Massie, all of which, either in full or condensed, have heretofore appeared in *The Virginias*; concluding: "specimens from these localities were exhibited in the Virginia mineral collection at New Orleans."

The Pocahontas Coal Mines.

By Prof. Floyd Davis, C. E., E. M., M. S.

The readers of *The Virginias* are all familiar with the character and characteristics of the No. XII, or Sub-Carboniferous Coal measures of the New River region in Virginia and West Virginia, and especially with the great coal bed, "No. 3," that is now so extensively mined at and near Pocahontas, Tazewell county, Virginia, and with the coal there mined that is marketed over the Norfolk & Western Railroad. The writer here proposes to decribe the method of mining practiced in the Pocahontas mines of the S. W. Va. Improvement Co.

The method of exploitation in the Pocahontas Coal mines is that known as pillar and stall, or pillar and gallery work. The stalls consist of entries, headings, and rooms. The entries are 10′ wide for mules and 12′ wide for engines. The main entry has already attained a length of over 3,000′; it is parallel to the strike of the seam. Parallel to this is the main airway of the mine. At distances of 1,500′ along the main entry, double cross-headings are driven at right-angles to the strike, and at distances of 500′ along the headings, double cross-entries are driven parallel to the main entry, thus dividing the mine into blocks 1,500′ by 500′. These are bisected in length by extra cross-headings. To the north and south of the cross-entries the rooms are driven 9′ wide, increasing in width at a distance of 21′ to 18′, leaving pillars 15′ thick for support. The rooms are driven 400′ deep, leaving a wall 100′ thick along the main entry. Between the cross entries and their air-courses, pillars 50′ thick are left, having "break-throughs" at distances of 90′. As the entries and airways progress the break-throughs are closed, either by masonry or by firm wooden partitions; in some cases valve doors are inserted.

The method of attack is by removing about 2′ of the under part of the coal seam to a distance of 8′ in the drift by 18′ wide, with picks weighing from 2 to 3 lbs., after the style of the prospector's pick. Two men work together. The overhanging coal is then blasted with powder, each shot bringing down about 20 tons of coal. As the work progresses, wooden props, about 8″ in diameter, are set up in parallel rows 6′ apart and 10′ from centre to centre.

In this pillar and stall work it is estimated that 30 per cent of the entire coal bed is removed. Pillar work is begun as soon as a block is stalled, and the 2′ or 3′ of coal remaining above are removed as the pillars are blasted away. South of the main entry most of the pillar and stall work has passed into pillar work, and the robbing leaves about 20 per cent coal buried under the attle as it falls.

The main entry is firmly timbered to the first door, a distance of about 40′. The timber consists of frames of oak, set from 8′ to 10′ apart, surrounded with heavy plank. In some of the entries and headings, large timbers, consisting of props and cap, are imbeded in the walls and roof, and in some places these timbers are connected with heavy planks to prevent the crumbling coal and shale from falling into the passages below. Several accidents have occured from large "kettle-heads" falling into the rooms and entries; and only in September last five men and several mules were imbeded at one time by rock falling in.

The mines are ventilated by exhaust fans. The East mine was formerly exhausted by a Murphy fan 8′ in diameter with wings 30″ in thickness, but in December, 1884, this was replaced by a large centrifugal fan after Guibal's type, 25′ in diameter and 8′ in thickness. This is placed with its side to the fan entry, from which it receives the air and discharges it at its circumference. This fan makes 55 revolutions per minute and draws nearly 200,000 cu. ft. of air. The old Murphy fan is now used at the West mine; it draws 154,000 cu. ft. of air per minute. The entrance to the main airway of the East mine is about 75′ north of the main entry. The air is first taken into cross-heading No. 1 N. A portion is carried west through cross-entry No. 1 N. and its rooms, and the remainder to the end of the cross-heading, then returning through the airway it passes west through cross-entry No. 4 N. and its rooms. It then returns through cross-entry No. 3 N. and its rooms, and after passing through the airway of cross-heading No. 1 N. it passes to the west through cross-entry No. 2 N. and its rooms. When the air reaches cross-heading No. 3 N. it passes directly to the end of the airway parallel to the main entry; it then passes through cross-heading No. 4 S. and its rooms; then returns through the main entry to No. 3 S., and after passing through the rooms, it passes out through the fan entry, which is a continuation of No. 3 S. Some air is also taken in through Nos. 1 and 2 S., along the hillside, and passes directly through their rooms into the fan entry.

The air is distributed in the mine by doors, which swing to one side of the passage, and are attended by door boys. Heavy canvas curtains are used to divide currents. Cross currents are separated from each other by air-bridges of ordinary construction. The under flue of the bridge is separated from the upper flue by a heavy frame well planked and battened. The rock in the upper floor is blasted away to a height of 6′ above the bridge, and the entrances to these flues slope down at an angle of 45°, so that but little resistance is offered to the passage of air, and but little inconvenience to persons passing through.

The mine is nearly free from water, and so dry is it in most of the galleries that they have to be sprinkled weekly to keep down the dust. For this purpose the mine is traversed with iron pipes carrying water, having stopcocks at suitable intervals to which hose are attached for sprinkling. In a few place, however, water passes through the porous roof, and near the end of the new entry adjacent to the main entry so much water has collected of late, in a synclinal fold, that a syphon has been introduced for draining it out.

The headings are illuminated by the miner's ordinary cap lamp, in which is burnt lard oil or "lightning-jack." The miners furnish their own oil and are allowed for it 8 cts. per day by the Co. When the miners are at work removing the under layer of coal they generally leave their lamps on the broken coal, a few feet behind them. Every morning the fire-bosses test in the advance galleries for fire-damp, with Davy or Clauny lamps, but so perfect is the present ventilation that it is rarely if ever found.

Night work is only carried on in the entries and headings. At present the Co. employs about 1,000 men, but only Co. men are paid by the day. The price for labor is as follows: Ordinary miners in rooms receive 70 cts. per car load; ordinary miners in entries and headings receive $1.00 per car load; drivers receive $1.58 per day; ordinary workmen on track receive $1.58 per day; timbermen receive $2.08 per day; and tracklayers receive $2.08 per day.

The distance between the tipple and the mine entrance is

the nearest possible accessible place—some point on the Ohio river at or near Ceredo is the natural terminus for this road. The management appears to be alive to the importance of taping the rich coal fields of Wayne county on the way to water and already has an engineer, in the employ of that company, been out prospecting the comparative feasibility of the Twelve-pole and Tug river routes. If the road should be constructed on either of the routes we would be vastly benefited as it must of necessity traverse the entire length of this county.

The Ensign Car-works.—The "Advertiser" of Huntington, W. Va., in its issue of Oct. 31, describes the Ensign Car-works of that Ohio-river-side and Chesapeake & Ohio Ry. station city, as follows:

A representative of the Advertiser visited the Ensign Manufacturing Co.'s Car Works during the week, and was shown through the establishment by the courteous superintendent, Mr. Ely Ensign.

These works are among the largest and most extensive in the South, the whole plant covering an area of about ten acres. The works are made up as follows: A large foundry where the car-wheels and all necessary castings are made, near that is the forge in which are hammered out the wrought iron axles for the car trucks; close by is the brick erecting shop where the material is all assembled and the cars put together; this shop is 100 by 200 feet in size, and has a capacity for building 20 cars at one time. The blacksmith shop, also of brick, is 80 by 240 feet; there are some 30 forges with the sturdy smiths and machinists fashioning into shape the numerous bolts and bars that enter into the construction of cars. North of and just opposite to the blacksmith shop, is the brick building, 100 by 200 feet, used for wood working machinery, such as planers, saws, and all the appliances required in preparing the wood work for the erecting shop. Between this last mentioned shop and the blacksmith shop, stands the engine house and boiler room from which power is furnished to drive all the complicated machinery in the two immense shops. The paint shop, dry kiln, offices, turn tables, etc., all go to make up and complete this vast enterprise, which contributes so largely to the prosperity and importance of Huntington. The establishment has a capacity of about 60 cars a week, and is being added to as the demands of trade require. Just now workmen are engaged in puting in huge scales for weighing the various car loads of material daily used in the works. The wood used in building the cars is oak, poplar and yellow pine. The oak and poplar are furnished from the forests of our own mountain state, but for the yellow pine, the company is compeled to resort to the glades of Florida. This pine is brought to Savannah, Ga., and shiped by sea to Newport News, and thence by rail to the works. The pine sticks are from 30 to 40 feet long, and the character of the wood closely resembles what is known as the black pine, growing on New river and its tributaries. It is very full of resin, is easily worked and quite durable. The West Virginia pine is quite as good as that of Florida, except that it is difficult to get sticks of the required length free of knots and sap, such as this company uses.

The Ensign works are now runing on full time, and have orders ahead for some months. As business revives throughout the country orders will multiply and the company is reasonably sure of a long and prosperous run, which will insure to our city a revival of trade and business, as the pay roll of the works runs from ten to twenty thousand dollars per month.

Norfolk Va. exports.—What Norfolk, Virginia's goodly commercial city on the grand Atlantic harbor of Hampton Roads, contributes to the world's commerce, may be infered from this item under the "departures" of the "shiping news" of the "Norfolk Virginian" of Oct. 21.

"British steamship Waverly, Calvert, Liverpool, by Shippers' Compress Co., with 7,438 bales cotton, 37 tons manganese, 45 hogsheads and 20 tierces tobacco, 991 bags bark, 25,000 staves, 141 cases shuttle blocks, oak, poplar and walnut logs."

Exports of Norfolk Va., in Sept., 1885.—The "Norfolk Virginian" reports that during the month of September the following foreign bound vessels cleared from that port, through the custom-house:

1st.—American brig Jennie Phinney, 416 tons, for Matanzas, Cuba, with 601 tons coal, valued at $1,502.

7th.—British steamship Renfar, 1,249 tons, for London, with 240 tons coal for ship's use, valued at $840.

12th.—British bark Maggie J. Foley, 446 tons, for Barbadoes, with 171,000 staves, valued at $5,400; American schooner Fred A. Carle, 417 tons, for Barbadoes, with 210,000 staves, valued at $6,200; and American schooner Edward Johnson, 380 tons, for Demerara, with 206,200 staves and other goods, valued at $13,493.

21st.—American schooner Belle Hooper, 451 tons, for Demerara, with 227,300 staves, etc., valued at $12,300.

Aboriginal Fort on Big Kanawha river.—In one of the manuscript field note books of the Virginia Geological Survey of 1835-41, under the heading of "Mud Fort, or grounds that the aborigines held their councils in," we find the following:

One of those curious entrenchments which I passed through going from the mouth of Pocatalico river to Tyler creek, along the Kanawha river, is situated on the bottom land four miles below the mouth of Tyler creek and one mile from the Kanawha river. I found it to be in size 260 feet in length and 150 feet in breadth having a ditch on the inside of the embankment averaging 15 feet in width, the bank being 8 feet in heighth, with a roadway at one end to pass in and out. The soil is very thin on the inside, which goes to prove that the embankment must have been thrown up from the interior. Trees 3 feet in thickness are growing upon it. The hills here are 451 feet above low water mark.

The Natural Bridge of Virginia.—A correspondent of the Washington, D. C., "Star" comments in this fashion on recent statements about Virginia's unrivaled Natural Bridge; "I have seen two articles upon the Rocky Bridge of Arizona, one of which states it as larger than the Natural Bridge of Virginia, and one gives its depth as from 25 to 40 feet—one as 60 feet long and twice the height of a man standing under it. Both state its width at 15 feet. The apparent cause of that was the wearing away of a soft underlying bed of sandstone. The Natural Bridge of Virginia is of blue limestone, or Isle Le Motte marble. Its cause is an absolute mystery. From base to roadway the wall is the same, without sign of softness, cleft or displacement. Its arch is perfect. A roadway of ordinary width passes over it. It is fifty feet higher than Niagara Falls. Your Metropolitan church could stand under the arch. The height of this bridge exceeds 200, the width 100 and the arch 80 feet. Its roof is blue and its abutments redened by the driping from the iron veins above form a superb study of color.

Let me now refer to another report published six months ago. A rock weighing 35 tons fell from the edge of the bridge. The Associated press report in the West was improved until the bridge was gone. In the blocks that rest on the piers there are estimated to be 70,000 tons. If such a block fell once a year it would therefore be 2,000 years before this great arch falls. This is, however, the first fall since 1789."

Norfolk & Western RR.

(Nov. 22, 1885.)

Westward.	(No. 1.)	(No. 3.)	(No 21.)
Norfolk	9 35	6 40	.....
Suffolk	10 20	7 20	.....
Petersburg	12 17	9 30	.....
Burkeville	.....	4 26	.....
Lynchburg	1 10	13 57 / 14 10	6 40
Roanoke	3 25	16 05	9 00
Central	4 44	17 40	10 50
Central	.....	.. ..	11 15
Pocahontas	.....	.....	14 30
Wytheville	6 07	19 15	.....
Bristol	8 25	21 20	.....

For beyond Bristol see Shenandoah Valley RR.

Eastward.	(No. 2.)	(No. 4)	(No. 22)
Bristol	22 15	6 25	.....
Wytheville	24 44	9 05	.....
Pocahontas	.....	.....	11 00
Central	.....	.....	14 49
Central	2 05	10 20	14 50
Roanoke	3 30 / 4 45	11 45 / 11 55	16 45 / 16 50
Lynchburg	7 00 / 7 50	13 45 /	19 00 / .....
Burkevillu	10 27	No. 4.	.....
Petersburg	12 20 / 12 35	... / 15 30	..... / .....
Suffolk	14 30	17 30	.....
Norfolk	15 20	18 10	....

For northward from Roanoke see Shenandoah Valley RR.

Nos. 3 and 4 have Pullman sleepers between Washington and New Orleans via B. & O. and S. V. at Roanoke; and also between New York and Chattanooga via Philadelphia, Harrisburg and Roanoke.

Parlor and sleeping cars on Nos. 1 and 2 between Bristol and Lynchburg.

All trains run daily except Nos. 21 and 22 which run daily except Sunday.

Richmond & Alleghany R.

(Aug. 30, 1885.)

Westward.	(No.1 & 11.)	(No. 9.)	(No. 3.)
Richmond	10 25	19 40	15 30
Scottsville	13 31	24 39	19 09
Lynchburg	16 39	5 00	....
Balcony Falls	17 48	6 20	.....
Lexington	19 02	7 15	.....
Natural Bridge (S. V)	17 58	.....	.....
Buchanan "	18 35	.....	.....
Clifton Forge (C.&O.)	20 00	.....	
Eastward.	(No. 2.)	(No. 10.)	(No 4)
Clifton Forge	9 45	.....	.....
Buchanan	11 07	.....	.....
Natural Bridge	11 45	.....	.....
Lexington	9 30	18 25	
Balcony Falls	11 30	20 00	
Lynchburg	13 05 / 15 10	21 45 / 22 00	....
Scottsville	17 46	2 27	5 59
Richmond	20 55	7 05	7 05

All trains daily except Sunday. Sleepers are attached to night trains between Richmond and Lynchburg.

Attorneys.

H. C. McWhorter. L. E. McWhorter.

H. C. & L. E. McWhorter,
Attorneys-at-Law,
61 Charleston, W. Va.

Wm. A. Quarrier,
Attorney-at-Law,
61 Charleston, W. Va.

Thos. C. Elder. Wm. J. Nelson

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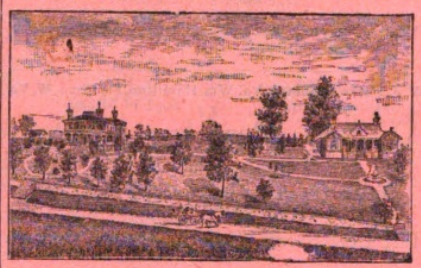

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