NOTES

ON

THE COAL TRADE

—OF THE—

Chesapeake and Ohio Railroad,

IN ITS BEARING UPON THE

Commercial Interests of Richmond, Va

1878.

BAUGHMAN BROS., STEAM PRINTERS, RICHMOND, VA

Chesapeake and Ohio Railroad,

RECEIVER'S OFFICE,

Richmond, Va., February 25th, 1878.

THE PRESIDENT AND DIRECTORS C. & O. R. R. Co.:

GENTLEMEN,—I beg leave to submit to you a report prepared by Gen. I. M. St. John, Consulting Engineer, in regard to the coal trade of this road, with a view particularly of showing the benefits accruing to the City of Richmond from that trade.

The paper is prepared simply with a view of presenting figures and facts just as they are, and of allowing those figures and facts to themselves show how favorable the exhibit is.

I, myself, am so much gratified at the result that I have deemed it proper to put the paper in print for circulation.

Very respectfully, your obedient servant,

WM. C. WICKHAM,
Vice-President and Receiver.

Chesapeake and Ohio Railroad,

CONSULTING ENGINEER'S OFFICE,

Richmond, Va., February 1st., 1878.

GENERAL W. C. WICKHAM,

VICE-PRESIDENT AND RECEIVER:

SIR:—In accordance with your instructions, I have prepared and respectfully submit the following notes, descriptive and statistical, of the coal trade of the Chesapeake and Ohio Railroad—with especial reference to its bearing upon the commerce and economy of the city of Richmond.

Coal shipments to Richmond commenced soon after the opening of the road in the summer of 1873. Consignments beyond Richmond passed across the city in wagons until February, 1874, when the advanced construction of the Church Hill tunnel allowed car access to the company's lower wharves on James river. Since then transfer has been made directly from the C. & O. cars into sea-going vessels; and it may be added, that with their excellent wharf arrangements, at the lowest cost of coal transhipment.

Early in 1874 five mines shipped coal by the C. & O. railroad; in 1875, ten; in 1876, nineteen, and in December, 1877, official returns reported thirty-two good mines on the line of this road, either in actual operation or available for immediate service. It will be observed that this mine development commenced about the time of the financial panic of 1873, and continued through the subsequent pressure so generally severe upon new enterprises in coal and iron. The increased production upon the line of the C. & O. railroad will better appear

from the annexed statement from the tonnage reports of the company:

CHARACTER OF COAL.	Total shipments in tons of two thousand pounds.*			Increase in tons of two thousand pounds.		Percentage of increase.	
	1875	1876	1877	1876 over 1875	1877 over 1876	1876	1877
Cannel.....	37,901	50,456	40,000	12,555	Decrease	33	
Splint and Bituminous	168,239	185,394	234,282	17,155	48,888	10	26
Coke—Main Line.....	8,217	7,480	14,678	Decrease	7,197		97
" Branch Line..	17,360	21,056	21,392	3,696	†336	21	
				33,406	56,421		
				less 736	10,455		
Totals.....	231,717	264,386	310,352	32,670	45,966	14	17

†Quinnimont Furnace suspended for repairs, but now in blast.

GENERAL DISTRIBUTION OF ABOVE.

Shipm'ts from James River Wharves to Eastern Cities.....	86,397	107,324	119,028	20,927	11,704	24	11
Coal deliv'd at Richmond and on line of C. &. O. R. R....	119,743	128,526	155,254	8,783	26,729	7	21
Coke—Main Line.....	8,217	7,480	14,678	Decrease	7,197		97
" Branch Line..	17,360	21,056	21,392	3,696	336	21	
	231,717	264,386	310,352	32,670	45,966	14	17

*NOTE.—C. &. O. statements (usually given in tons of 2,240 lbs.) are reduced above to tons of 2,000 lbs.—for comparison with the report of the trade, as generally published.

In this tonnage statement, the increase in east bound shipments will first attract attention. During 1877, anthracite coal has been exceptionally low in the northern and eastern markets, having been delivered in New York harbor for $2 30 per ton, in quantity and of good "steamer" quality; also, in gas coals, an unusually active competition was pressed by the Pennsylvania and Westmoreland, the Youghiogheny and the Monongahela districts; and further complicating this competition and reducing prices, 125,000 tons of Nova Scotia and English coals were received at New York and Boston, mainly in ballast. That the Chesapeake and Ohio coal shipments to the same ports should exhibit an increase of 11 per ct. for 1877, over 1876, is the strongest possible evidence of their superior quality and rising reputation. It

should be added, that the Chesapeake and Ohio Coal Agency, under whose direction this trade is conducted, estimate that the totals for 1877 would have been increased 100,000 tons but for the labor troubles of last summer; every coal mine on the line of the Chesapeake and Ohio railroad having been suspended at least once from that cause, and the strike in the Cannelton and Coal Valley sub-district lasting over four months.

Yet, with these and other serious drawbacks, the mine development of the coal fields in question has steadily progressed, and in four years the trade has grown to be a material portion of the commerce of Richmond. Of 903 vessels cleared from this port during the past year, 316 left the Chesapeake and Ohio wharves with cannel, gas, splint and steam coals for northern and eastern markets; (among other shipments, 5,000 tons of gas coal to Baltimore, Md.;) and of the residue, no inconsiderable number carried C. & O. timber, coal oil, and other freight from the same road.

It is a well-known commercial truism, that "vessels getting cargoes, bring cargoes." Freight rates upon return cargoes from New York and other ports—notably salt, iron, ice and general merchandise—have been very largely reduced by the successful establishment of this trade, and this fact is now recognized among Richmond merchants as one of the most important local benefits resulting from the completion of the Chesapeake and Ohio railroad.

This business of the James river wharves gives employment to 250 mechanics and laborers, numbering with their families, 2,300 souls, (as estimated by the Superintendent) and residing in the immediate vicinity, or within Richmond city limits.

Vessels used in the C. &. O. coal trade are as yet chiefly coasting schooners, rating from 100 to 650 tons burthen, and 14½ feet greatest draft loaded. For a full development of the trade, vessels of a larger and more economical class are required. In this view, the progress of the James river im-

provement is watched with interest. Shipments of C. & O. coals have been made to the West Indies; and with greater water facilities, they will undoubtedly be continued. Further particulars of this and other freighting business from the C. & O. wharves will be found in the statement of the proper officer elsewhere given.

The mines which feed this trade draw no inconsiderable portion of their supplies and especially dry-goods, clothing, groceries and hardware, from Richmond. The competing points are Charleston, W. Va., Cincinnati, Huntington, Gallipolis and Portsmouth in the Ohio valley; also, occasionally, Baltimore. Returns of this business to the C. & O. officers indicate an increase in Richmond sales; and this increase can be made much larger with proper enterprise.

Citizens of Richmond, however, experience more directly in their own fuel consumption, the economic results of the introduction of Chesapeake and Ohio coals. The annual coal receipts of the Richmond local market average about 130,000 tons—of which the C. & O. R. R., from a small commencement in 1873–'4, delivered about 38 per cent. during 1877. With the fullest allowance for the shrinkage of values and the special decline in anthracite coals, it will still be observed that no small portion of the largely reduced cost of fuel to the Richmond consumer—domestic and otherwise—is directly due to the introduction of the Chesapeake and Ohio coals. In this connection, the following statement of coal receipts of the Richmond market during the years (fiscal) 1873, 4, 5, 6 and 7, taken from official returns, will not be without interest.

CHARACTER OF COAL.	TONS OF 2,000 POUNDS.				
	1873.	1874.	1875.	1876.	1877.
Chesapeake and Ohio	* 7mos. * 4,460	8,524	21,556	29,285	50,656
Anthracite and Cumberland	64,916	58,545	46,193	40,983	46,875
All other Coals	68,319	57,869	55,844	39,868	36,010
Total	137,695	124,938	123,593	*110,136	133,541

*Powhatan Iron Furnance suspended.

Also in point is the following statement compiled from the official papers of the Richmond Gas Works, with the assistance of the officers thereof.

Year.	Coal Carbonized in tons of 2,240 lbs.	Cubic feet of Gas made.	Cubic feet of Gas per ton of 2,240 lbs. of Coal Carbonized.	Candle Power.	COST of Coal per ton of 2,240 lbs.	COST of Gas to consumers per 1,000 feet.	CHARACTER OF COAL.
1870	8,817	60,672,100	6,892	No record of Candle Power kept prior to 1874.	$7 50	$3 00	Cloverhill, Midlothian, &c.
1871	9,900	67,196,900	6,789		7 50	3 00	" "
1872	10,378	74,547,500	7,183		7 50	3 00	" "
1873	10,654	84,352,800	7,918		6 13	3 00	" "
1874	10,455	82,390,500	7,880	14.60	6 00	3 00	Ches. & Ohio—21 per ct. Other coals—79 per ct.
1875	8,786	85,800,700	9,765	16.36	5 05	2 50	Ches. & Ohio—92 per ct.
1876	8,680	88,496,700	10,195	17.00	4 50	2 50	Ches. & Ohio—100 per ct.
1877	8,817	87,630,200	* 9,938	* 16.96	4 40	2 50	Ches. & Ohio—100 per ct.

* During November, 1877, the Richmond Gas Works were flooded by James river freshet, stock damaged, and production suspended three days. Notwithstanding this and other disadvantages, the annual average as above is found to exceed that of the Philadelphia Gas Works (which use the best gas coals of Pennsylvania,) viz: 9,699 Cubic feet per 2,240 lbs., and 16.39 candle power.

Gas experts will notice in this statement an almost progressive decrease, from the date of the introduction of Chesapeake and Ohio coals in 1874, in the cost of coal to the Gas Works, and in the price of gas to the consumer; also, a decrease in the quantity of coal used to meet a steadily increasing gas consumption, an increase in cubic feet of gas made, per ton of coal carbonized, and a very decided improvement in quality as indicated by higher candle power. Such working results, compared with the average of our larger cities, attest the excellent management of the works in question, their improved appliances, and the superior quality of the coal used.

It is well known that the Chesapeake and Ohio coals are very generally replacing Anthracite and Cumberland in all

portions of the State within reasonable access of that railroad and its connections. The details of this interior trade do not enter into the scope of this paper, except so far as connected with the business interests of Richmond—which gain to the extent that an increased demand in any locality whatever may enable the railroad company and the miner to reduce rates on shipments to all destinations. Probably of more interest, for the end in view will be a brief description of the coal fields from which this trade comes.

They comprise the most noted section of the "Great Allegheny" or Appalachian coal formation, extending from Alabama, through Upper Georgia, Eastern Tennessee and Kentucky, Eastern Ohio and Western Pennsylvania, towards the New York line. In extent, variety, quality and commercial value, these coal measures are considered remarkable with whatever others compared.

The New River and Kanawha valleys cross this formation at its greatest breadth, cutting deeply for 150 miles, in a winding course, through its purest and richest coals, and exposing their vertical sections for an average depth of 1,000 feet and more. In the New River section there is an outcrop of eight well-defined seams, ranging from one to six feet in thickness, aggregating in all 22 feet of coal; and in the Kanawha section, twenty-four seams, of which eleven (from 3 to 10 feet thick) aggregate from 40 to 50 feet of coal, above water level and workable.

The dip of these seams is northwesterly, and averages from 30 to 50 feet per mile to the Ohio river valley, which, in portions, coincides with the lowest line of depression of the coal trough or basin. Transversely to the direction of this dip, coal seams can be worked almost horizontally, with occasional slight waves or "rolls," and sometimes (but rarely) "faults." The general regularity of these coal measures is one of the most striking features of the entire formation. Another is the singularly easy access supplied to workable deposits by the deeply-worn valleys of the intersecting streams; and hence,

the exceptionally low cost of opening and working mines in the Kanawha and New River districts.

Shaft work, so generally a very heavy charge in mine operation, is here unknown, except for occasional air-holes, sunk at small cost. In all the better-located mines there is good drainage by gravity, aided, where "rolls" or waves intervene, by small syphon pipes. In but one mine of both districts does coal mined not pass downward from the mine breast into C. & O. R. R. cars. In no mining region of the world can coal be dug and delivered at less outlay, both for inside and outside work, than in the Kanawha. At least three mines have been opened on the line of this road, (and doubtless more,) and put in complete order to ship 100 tons daily, at a cost not exceeding $4,000 each; and *two of these have since increased their output to 200 tons daily. The larger number of the mines now in operation are worked on royalties of from 10 to 14 cents, according to locality and amount of annual output. Miners' pay ranges from 40 to 70 cents per ton, of 2,240 lbs., delivered on mine cars, according to thickness of seam and hardness of coal. Underground work is unusually safe. No serious casualty from rock-falls, bad air or other mine accidents has occurred in any of the Chesapeake and Ohio mines since the commencement of operations.

One other, and a very important characteristic of this coal-field remains to be noticed. In the same district, and in instances in the same vertical section, are to be found nearly all the varieties of mineral fuel sought in mechanical arts, and each variety competing in distant markets with the best of its class. They may be particularized as follows:

1. *Steam Coals* of very superior quality are mined in the lower measures, (New River,) yielding in the Quinnimont seam 76 per cent. fixed carbon, 18.19 volatile combustible and 4.68 ash (0.3 sulphur.) This and similar analyses explain the

*For one of the two mines referred to $6,230 was given by the Company's Agent as the total cost of mine opening and equipment, including all fixtures (save miners' cabins) incline, rails, tools, cars and stock; and all mine work chargeable to this account. For the other mine, the proprietor gives $7,340 as his entire outlay in opening and preparing his mine for a daily shipment of 250 tons, including all buildings and cabins.

use of New River coals by the Old Dominion and other steamers with anthracite accessible at lower rates. Also the fact, that after a thorough competitive trial with the best Cumberland (George's Creek) and Clearfield, (Penna.) the same coals were ordered for the Russian fleet, in Hampton Roads, last season.

The New River coals yield coke of the first grade for metallurgical uses—analyzing (Mallet and Britton) 91 to 93.85 per cent. fixed carbon ; 5 to 6 per cent. ash, and 0.3 to 0.4 sulphur. Connelsville, the standard coke of Pennsylvania, analyses (Britton) 87.46 fixed carbon, 11.36 ash and 0.69 sulphur. The Chesapeake and Ohio cokes have been used with the best results at the Quinnimont, Longdale, Callie and Elizabeth furnaces upon the line of road, and at the Huntington, Ironton and other furnaces and foundries of the Ohio valley. The first coke ovens of this district were built in 1874 ; there are now in operation, or just completed, 192 coke ovens, and at least two of these coke companies are to enlarge their works next season. It is upon this mineral fuel, as their nearest and best supply, that the estimates of the cost of iron production and manufacture along the valley of James river, from Clifton Forge to Buchanan and Lynchburg, have been made.

2. *The Splint Coals* appear in the New River section at and below the Hawk's Nest, and in the Kanawha section, almost continuously from where the New River takes that name, down to Coalburg, Coalmont, Lewiston and the vicinity of Charleston. Their analyses average 62 per cent fixed carbon, 35 per cent. volatile combustible, and 2 per cent. ash, of which the sulphur portion is unusually small. They are strong, hard coals, bearing distant transportation with little breakage, and from their lower cost divide favor with the cannels as a quick, clear, bright, rich grate coal. Several of these splints ("block" is the more correct designation,) bear the burthen of the largest blast furnaces, and are largely used in the Ashland, Ironton, and other furnaces of the Ohio valley, either alone or in com-

bination with coke. Splint coals excel as a locomotive fuel,* being preferred, from their superior economy and better engine performances, on the Virginia Midland, the Atlantic, Mississippi and Ohio, the Kentucky Central and other railroads conveniently accessible, which, for some time, have used the Kanawha coals at higher first cost than their own local coals.

3. *Cannel and Gas Coals.* Much the largest proportion of coal shipments by the Chesapeake and Ohio railroad, have been of these varieties.

Of the Cannel coals, the Peytona (on Coal river, a tributary of the Kanawha) and the Cannelton, stand first, and command the highest rates in the eastern markets as "enrichers" of gas made from ordinary coals. Their analyses average 46 per ct. volatile matter, 42 per cent. fixed carbon, and 12 per cent. ash. In gas tests the Cannelton has yielded per ton of coal, carbonized, 12,025 cubic feet of 45.6 candle power, and in the same analysis 10,000 cubic feet of 64.54 candle power. Peytona has recorded 13,200 cubic feet of 42.79 candle power. These results compare very favorably with those of the best gas enrichers of foreign countries.

The ordinary gas coals of commerce are the "Caking" varieties, which, on the Kanawha, average from 35 to 40 per

*Statement of Engine Performance with Chesapeake and Ohio Coal.

NAME OF ROAD.	Character of Train Service.	Kind of Coal used.	Maximum Weight of Engine and Tender loaded.	Average Weight of Trains.	Mileage.	Pounds of Coal Used.	Pounds of Coal per Mile Used.	Max. Curve in Degrees.	Max. Grade per Mile.	
C. & O. R. R...	Pass and Mix'd	Splint, gas & New River...	103,000	246,700	47,720	1454,000	30.5	8 8 8	75 80 30	Eastern Div Middle " Western "
A. M. & O. R. R	Pass.	Splint.....	110,300	243,670	408	11,940	29.02	7	70	
Va. Midland ..	Fr't..	Splint.....	110,000	460,000	1,170	44,800	38.29	5¾	66	
Kent Central..	Pass.	.....	Mon'ly	avera	ge, 11	months	29.4	. .	..	Light Grades and Curves.

Railroad experts will notice in the above an excellent engine performance, and materially above the average working results usually reported from other railroads.

cent. volatile matter, 53 to 63 per cent. fixed carbon, and 1.5 to 2 per cent. ash; and in gas manufacture yield per ton of coal carbonized usually 10,000 cubic feet of 17 to 18 candle power—results permitting successful competition in New York and New England, with the Penn. and Westmoreland and other standard coals much nearer to points of consumption.

This successful introduction of Kanawha and New River coals into markets so distant, is one of the strongest proofs of the ability of the Chesapeake and Ohio railroad, with its exceptionally favorable grades, to move heavy traffic at very low cost.

Closing this paper, I present for your detailed examination, the reports of the Richmond Gas Works, of the several railroad companies which bring coal into Richmond, of the James River and Kanawha canal, and other official papers from which the tabulated statements, herein given, have been compiled. Very Respectfully,

I. M. ST. JOHN,

Consulting Engineer.