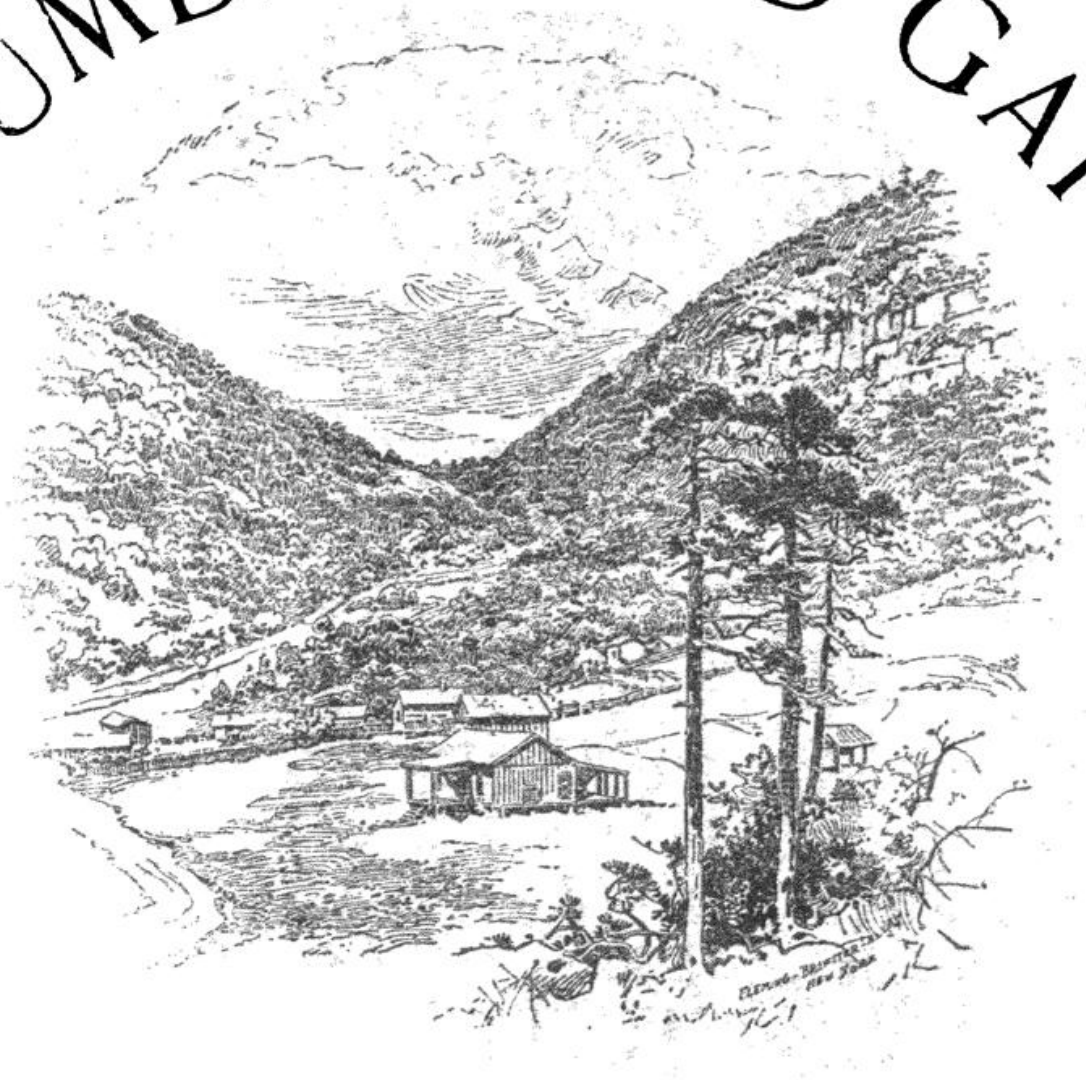
CUMBERLAND GAP



ITS

GEOGRAPHICAL AND COMMERCIAL FEATURES

AND

IMPORTANCE

AS A

RAILROAD CENTRE

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CUMBERLAND GAP

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INTRODUCTION.

THE very old project of building railroads through Cumberland Gap, and developing the immense mineral and timber resources of that region, has at length been matured through the efforts and with the capital of the American Association, Limited, of London, England, and the Louisville & Nashville Railroad Company, of Kentucky.

The American Association, Limited, with a paid up capital of $1,250,000 (a company organized under the laws of Great Britain, and having statutory and legislative privileges from the States of Virginia, Tennessee, and Kentucky), have purchased sixty thousand acres of coal, iron, and timber lands, lying together in a compact body around the Gap in the States mentioned.

These properties embrace lands suitable for every class of commercial and industrial development. The iron ore lies wholly in the Cumberland Mountain, and in the spurs of the same, in the States of Tennessee and Virginia, within an area of about thirty miles long by one mile wide. The coals lie in the regular coal measures of Eastern Kentucky in the Log Mountain surrounding the valley of Yellow Creek, in Bell County, and along the banks of the Cumberland River before it passes through Pine Mountain to the north. The timber covers all of the hills and mountains owned by the company for many miles in every direction from Cumberland Gap. Excepting that the black walnut has been cut out, the forests are yet in their virgin state. The town lands owned by the company occupy the large flat valley in Kentucky through which the Yellow Creek winds, and the more circumscribed valley which occupies the base of the mountain on the Tennessee side of the Gap. The towns are named respectively Middlesborough, Kentucky, and Dillwyn Springs, Tennessee.

The Association has entered further into a contract with the Louisville and Nashville Railroad Company, providing for the immediate construction of that railroad to Cumberland Gap, there to make close connection with the Knoxville, Cumberland Gap and Louisville Railroad, which the Association itself is building from Knoxville through a tunnel under Cumberland Gap.

There are other railroad connections being made in addition to those above mentioned, pointing to the adoption of the Cumberland Gap Tunnel as the readiest means for trunk-line communication between the great Northwest and the equally great South and Southeast.

Certain franchises have been conveyed by the American Association to the Middlesborough Town Company, and it is the intention of the latter to make a preliminary sale

of Town Lands on the completion of the Company's railroads early in 1889. And it is furthermore the aim of both companies to foster capital and enterprise of every nature in this overflowingly rich and attractive section. The money already spent, and yet to be expended by the Association, the Town Company, and other subsidiary organizations, under the direction and control of the parent company, warrants beyond peradventure the creation and maintenance of a commercial centre as yet without an equal in the whole history of the South.

The following facts, extracted from the reports of well-known mining engineers, geologists, and others, are presented to the public, and particularly to Coal and Coke Operators, Iron and Steel Manufacturers, Saw-mill Owners, Wood, Wagon and Furniture Manufacturers, and to all those seeking a field of enterprise where the resources are good and abundant, the climate moderate and healthful, and the facilities for production and sale of unusual magnitude.

EXTRACTS FROM THE REPORT OF ALEX. A. ARTHUR, TRUSTEE, UPON THE PROPERTY OF THE CUMBERLAND GAP ASSOCIATION.

THE valuable properties of this Association, consisting of about 20,000 acres of iron and coal deposits, lie on either side of the Cumberland Gap, where the States of Kentucky, Tennessee and Virginia join their boundary lines. The iron beds are found by themselves on the south side of the Cumberland Mountain, and the coal lands are between the same on its northern slope and the range of the Pine Mountain in Kentucky. The iron ores occupy a long stretch of land lying adjacent to, and running parallel with the Cumberland Mountains, while the coal measures are above drainage level in the hills, forks, spurs and knobs that fringe the valley of the Big Yellow Creek. The lands containing the ores are partly upon the main mountain, partly in the Poor Valley, partly on the Poor Valley and Powell River ridges, and stretch almost continuously from four or five miles above the Gap to about twenty miles below it. The Association owns and controls all the mineral lands about the Gap, and the right to the ores at other places on option and by contract.

The ores at and near the Gap in the section of country above named show by analysis as follows :—

	Metallic Iron.	Phosphorous.	Sulphur.
Red Fossil Ore	58,730	0.041	0.230
Brown Hematite	56,490	0.006	0.210
Carbonate	44,660	0.020	traces

	Manganese.	Iron.	Phosphorous.
Manganiferous	37,209	5.000	traces

	Zinc.
Zinc	34 per cent.

The red and brown hematite are *good* Bessemer Ores.
The carbonate ore is a good foundry ore.
The manganiferous ores will make No. 1 spiegeleisen.
The zinc ore also contains lead, and is said to give 12 dols. per ton of silver.

The hammered bars made from the red ores by charcoal, analyze 98.64 per cent. of iron.

The specimens of ores giving the foregoing analyses were taken from the outcrop, and the analyses represent an average of the specimens.

RED FOSSIL ORE.

This also is called the "Clinton," "Dyestone" and "Fossiliferous" ore. At the Alabama end of the lead Mr. J. M. Swank, Secretary of the Iron and Steel Association, U. S. A., gives its percentage of metallic iron . . . . . as 52.975 per ct.
At the Virginia end Mr. McCreath gives its percentage of metallic iron " 52.600 "
In the middle, at the Cumberland Gap, Dr. Peter gives its percentage of metallic iron . . . . . " 54.166 "
Ditto, ditto, LeDoux gives its percentage of metallic iron . . . . . " 58.730 "

This ore is in three seams underlying the Poor Valley and the Powell River ridges at and near the Gap, but where the Poor Valley ridge gives out both above and below the Gap, the veins are then found in the main mountain. On the ridges the ore seems to lie in sheets, and as the uppermost is only from two to four feet under the surface, it is easily mined by throwing off the soil. This uppermost seam is the one best known at the Gap. It was used by the Rose and Crockett furnaces there in the primitive days. By the work done then it was demonstrated that one man could mine eight tons of ore per day at a cost of 50c. per ton; that contractors delivered it at the furnace banks for an additional 50c., and that cold-blast charcoal iron was produced for $7.50 per ton. The work of these pioneer iron-masters also shows that the seam of ore they encroached upon varied from 28 to 36 inches in thickness, and is in sheet form, about 600 yards wide. This extent means a very large quantity of ore, and if to the upper seam named are added the two lower veins, which are not less than 18 inches in thickness each, it is safe to say that at the Gap alone, leaving out the same ore on the river ridges and at Speedwell, near by, and the brown hematite and carbonate ores as well, there are ten millions of tons of red fossil. Given furnaces on the spot, and modern mining and transportation facilities, this ore could be laid down at furnace mouth for 40 or 50 cents per ton; or carry this ore through the Gap by railway five miles to coking ovens on Yellow Creek, where furnaces might be profitably erected, the cost will not be more than 65 cents per ton. The "dip" of the ore towards the mountain, and in it, is very regular and easy, and nothing appears to prevent inexpensive mining. In fact, the conditions that obtain in the Gogebic ore regions of Michigan repeat themselves at the Gap and round about it, except that the ore will cost the Gap or Yellow Creek furnaces not over 65 cents per ton, whereas the Michigan ore costs at Cleveland about $5.50 per ton, and at Pittsburgh about $7.00.

The old Speedwell, Rose, and Crockett furnaces upon the property made cold-blast charcoal, foundry, mill and car-wheel pig-iron out of the red ore, and it was shipped in considerable quantities, before railroad days, by the Powell River, the Clinch, and the Big Tennessee to Knoxville, Chattanooga, Nashville, Mobile, Memphis, New Orleans and St. Louis. They also made several thousand tons of hammered bars, which were in great and active demand before the war for ploughs, horseshoes, etc.; and the Speedwell furnace (now the property of the Association) had a five years' contract for cast hollow-ware for Atlanta and Chattanooga.

* BROWN HEMATITE AND CARBONATE.

These ores appear to be chiefly in the main mountain. They also outcrop plentifully on the Powell River ridges. They have never been worked or developed, but at several places exposures of the veins show thicknesses varying from 12 to 16 feet, and widths of 35 to 40 feet. There is very little doubt of these ores being in practically inexhaustible quantities. For either working alone or mixing with the red hematite or magnetic they are invaluable.

MANGANIFEROUS ORE.

Beds of manganiferous ores are found about two miles from the Gap, south, and cover an area of about seven miles. No attempt has yet been made to find the depth, width and extent of the deposit.

ZINC, LEAD, ETC.

A remarkable vein of zinc is found in the Powell River ridges, and is traced northeast to the main mountains of the Gap. Where exposed it is four feet wide, and appears to be very uniform in quantity and quality. The ore is partly zinc and partly lead, with an admixture of arsenical silver, which is said to analyze 12 dols. worth of silver to the ton of ore.

In the Powell and Poor Valley ridges, and in the main mountains, limestone and sandstone abound, and for furnaces and building purposes are comparatively inexhaustible.†

Fireclay in great quantities is found in the coal measures of Yellow Creek, and will equal anything in England or Scotland for the making of bricks and retorts, or ovens.

All of the iron ores named, excepting only the carbonate ores, are admirably adapted to the making of Bessemer pig-iron, and the newly introduced Clapp-Griffith, and the Reese processes enhance their value.

The following named publications, etc., are referred to as evidence of the intrinsic and commercial value of the lands and ores.

Certificates of Analyses—LeDoux & Co. July, 1886.

Harper's Magazine—"Through Cumberland Gap on Horseback." June, 1886.

Enc. Brit.—9th Ed. Titles, "Kentucky," "Minerals."

"North Cumberland Valley"—Prof. J. R. Proctor. Oct., 1880.

"Report on Ores in the Vicinity of Cumberland Gap"—Professor Moore.

"Virginia"—Blue Book, 1876, pp. 43, 44.

"Report on Iron Ores of the United States"—J. M. Swank, 1885; p. 28.

Copy of letter by the Hon. Judge J. T. Shields.

Extract from report of Mr. Kirk, engineer of the Cumberland Gap, Charleston and Chicago Railroad Co., 1882.

Copy of the report of Mr. Fitzhugh, chief engineer of the Louisville and Nashville Railroad Co., 1885.

* Since proved to be the Oriskany ore and to extend in continuous stratification entirely through the property.

† This Limestone assays about 97 per cent. Carbonate of Lime.

COAL LANDS.

The coal lands are separated from the iron properties by the Cumberland Mountains. The railway which will come through the Cumberland Gap, will first touch the coal lands where it crosses the Cumberland River near Pineville, Kentucky, then skirt the rest of them all the way, and finally debouch in Tennessee in the midst of the iron holdings of the Association, by means of a short tunnel. The distance across the coal properties from north to south, or from Cumberland Gap to Pineville—the points where the parallel "faults" occur, is thirteen miles, and from east to west about eight miles—leaving the whole area of the coal belonging to the Association compact and desirable and presenting the fewest engineering and mining difficulties.

These cover all of the butts and the spurs of the intervening mountains from creek to creek around the valley, and in some cases run back on the main mountain itself. They also border the Yellow Creek near its mouth and are on the main river at the point designed naturally, and by the engineers, for the crossing of the railway. The aim was to secure the best lands along and fronting upon the route of the railroad, and this endeavor has been wholly successful. Moreover, the position of the properties forces later buyers to a second choice of back-lying lands, and puts it in the power of the Association to add to their holdings. As all deliveries of coals from the mountains would be accumulated on the railroad that skirts the valley, parties operating behind the owners of the front lands would have to secure rights of way from the latter.

The hills of coal are very soft and regular, and by tests of levels and openings, and the evidence of the State geologists, it is fully proved that the seams of coal are almost perfect in their level, and occur in all the hills, the same seam appearing in hill after hill at the same altitude. This demonstrates the remarkable facility with which the coals can be mined, as there can be no difficulty of drainage or ventilation in such level drifts as would be run. Workings could be made on both sides of the same hill, and the coals run out by cable or mule railways to the shipping or coking point. The lump coal could be put on cars at the main line from any point on the property for $1.00 per ton, and steam coal for 80 cents. The coal openings thus far made show in every instance a good substantial roof of slate or sandstone.

In the selection of the lands prominent consideration was given to their adaptability to the introduction of coal railways, mining facilities, and proximity to suitable spots for the erection of furnaces and coking ovens.

No estimate has been made of the coal veins *under* the drainage level, although it has been shown by well-diggers that several six to fourteen feet seams exist close to the surface. The coals found *above* the drainage level, as may be seen by the specimens, consist of pure cannel, regular bituminous, semi-splint, and semi-anthracite and coking. These occur in seams of various thicknesses—as many as fourteen seams being found in the hills of the highest elevation.

The following shows the measurements of the coal seams thus far exposed, and a partial analysis of their quality.

LIST OF SOME OF THE COAL OPENINGS ON COMPANY'S PROPERTY IN KENTUCKY.

Seam.	Exposure.	Thickness of Seam.	Altitude.	Location.
No. 1	Gross	6 feet	300 feet	River Section.
No. 2	Gross	5 feet	200 feet	
....	Hoskins	3½ feet	200 feet	
....	F. Green	7 feet	300 feet	
....	Kellems	4 feet	Level	Cannon Creek.
....	Samsom	3½ feet	Level	
....	J. Busseli	5 feet	270 feet	
....	Barner's	4 feet	Level	
....	A. McTee's	5 feet	50 feet	
....	George Heirs	3½ feet	200 feet	Yellow Creek.
....	Buckeye Lick	4 feet	200 feet	
....	Evans	5 feet	150 feet	
....	W. T. Campbell	8 feet	250 feet	
....	King	3 feet	100 feet	
....	Turner & Colson	52 inches	250 feet	Beans Spur.
....	Mason	60 inches	150 feet	
....	Gibson	82 inches	600 feet	Mosely's Spur.
....	Hignite	14 feet. Some partings	800 feet	Hignite Creek.
....	I. C. Turner	8 feet	700 feet	
....	Ballew	4 feet	75 feet	Stony Fork.
No. 1	Chris. Turner	57 inches	200 feet	Fork Ridge.
No. 2	Chris. Turner	44 inches	300 feet	
No. 3	Chris. Turner	43 inches	150 feet	
	Dishman	43 inches	350 feet	
No. 1	Tudder	52 inches	50 feet	
No. 2	Tudder	60 inches	75 feet	
No. 1	Meyers	54 inches	275 feet	Mingo.
No. 2	Meyers	44 inches	300 feet	
No. 1	Sowder	61 inches	150 feet	
No. 2	Sowder	44 inches	130 feet	
	Watson	38 inches	300 feet	
No. 1	Morrison	68 inches	400 feet	
No. 2	Morrison	58 inches. Partings		
	Carroll	71 inches	700 feet	
No. 1	Gibson	60 inches	200 feet	Bryson.
No. 2	Gibson	56 inches	300 feet	

As no work has been done, it is impossible to say what mining will develop, or to designate particular seams to compare with those worked west, south, and east of the field, but experience in the Alabama, Tracy City, Poplar Creek and Jellico end of the coal measures, and a knowledge of the Virginia and Pennsylvania "tailing off," clearly prove that the coals are alike in quality, and similar in their stratification, being the middle and lower coal series of Virginia, or the lower productive and conglomerate coal measures of Pennsylvania.

ANALYSES OF THE COALS.

An analysis of specimens of the coals from the outcrop of the various coal seams of the Association, made by LeDoux & Co., shows from 57 to 60 per cent. of fixed carbon, 36 to 41 per cent. of volatile combustible matter and water, 1¼ to 3 per cent. of ash, and ¾ to 1 per cent. of sulphur.

The report of the Analyst (which may be seen when desired) remarks in regard to the various specimens submitted, as follows: "No. 24 is a good cannel, and all the others are regular bituminous coal. Nos. 12, 16, 20, 21, 25 and 26 are the best coking coals."

The following comparative analyses exhibit the quality of coals from mines in actual working:

COALS.

	Moisture.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.	Candle power.
PENNSYLVANIA COALS.						
Cambria Iron Company	....	....	....	6.930	2.843	....
Woodcock Mine	....	....	...	5.750	.567	....
Kittanning	....	....	....	4.750	2.738	....
Cambria Coal and Coke Company	....	....	....	6,163	2.352	....
Johnstown	....	....	....	.830	2.780	....
OHIO COALS.						
Hocking Valley	5.98	36.48	52.41	5.13	1.090	....
Mahoning Valley	3.60	32.58	62.66	1.16	.850	....
ALABAMA COALS.						
Pratt Seam	1.508	31.480	61.600	5.42	.918	....
Helena Seam	1.740	35.480	58.690	4.090	1.740	....
		Coke Soft	and Porous			
TENNESSEE COALS.						
Tracy City	....	28.230	60.660	10.440	.700	....
Poplar Creek	....	36.985	58.	4.145	.890	....
Jellico	....	36.810	60.310	5.950	.930	....
E. KENTUCKY COALS.						
Yellow Creek (average of six seams)	...	35 470	60.40	4.860	.630	....
Cannel Coal	....	49.85	35.03	15.12	.748	40.

COKE.

	Carbon.	Ash.	Sulphur.		Carbon.	Ash.	Sulphur.
PENNSYLVANIA.				TENNESSEE.			
Connelsville	87.46	11.32	.810	Sewanne	83.364	15.440	1.420
Monongahela	86.990	11.899	.789	Rockwood	84.187	14.141	1.240
Beaver Falls	84.79	12.636	1.994				
				ALABAMA.			
OHIO.				Pratt	83.200	15.06	.740
(Average)	89.760	6.430	1.494	Helena	83.600	15.206	.683
ILLINOIS.				VIRGINIA.			
(Average)	91.010	5.960	1.946	Pocahontas	90.02	7.75	.67
INDIANA.				E. KENTUCKY.			
(Average)	90.170	7.230	1.946	Bell County (average of 9 Seams)	92.46	6.66	.67

TIMBER.

The accessible merchantable timber upon the properties consists of white oak, chestnut oak, black oak, hickory, poplar (whitewood, canary wood), ash and walnut. The timber upon a third part of the iron lands is second growth and upon the other two-thirds is virgin, and of very fine quality. The whole of the coal lands are covered with virgin, and except for local use, entirely unculled forests.

Mr. Fitzhugh, in his report to his railway company, states that there are 12,000 feet of timber to the acre in this region ; but as we count only four kinds, and those of trees not under twenty-four inches in diameter at the butt, of choice quality, and yielding of from 1,200 to 1,500 feet per tree in sawn lumber, our estimate places the quantity at 6,000 feet per acre.

This takes no count of the maple, red oak, lynn, chestnut, birch and hemlock remaining, as these would be eminently serviceable for coal and iron mining purposes in the form of headings, tram sleepers, props, roofing, etc., etc., and fuel.

GENERAL REMARKS.

That the iron and steel industries of America are to be located in the South is not now questioned. The only question is as to the exact point were the economic problem of producing iron and steel the cheapest is to be solved, and the point at which the raw materials can be brought together and the resulting manufactures poured into the consuming regions at the lowest cost.

The proximity of iron and coal has been the secret of England's mercantile success, and history will repeat itself in the Southern States.

Sir ISAAC LOTHIAN BELL said, in 1875, before the Iron and Steel Institute of Great Britain, that "the undeveloped resources of Tennessee, Alabama and Georgia would prove a match for any part of the world in the production of cheap iron ;" and added, "there seems every reason for believing that pig-iron can *now* be laid down in the Southern States mentioned above, at little above half the cost of that made in the North. Then, in regard to transportation of raw material, he went on to say, "the great advantage possessed by the mineral fields of the South is exemplified by the cost for transport in the State of Alabama, which compares favorably with the best of those of Great Britain. Localities in Tennessee possess powers superior, if anything, to Alabama. Enough, however, has been said to prove that while in the South ore and coal exist under conditions not surpassed by any in Great Britain, the metal produced can be poured into the heart of the iron-making regions of the North at a total cost for transport little more than half that involved in bringing raw materials together in Scotland and in sending the resulting pig to the same point."

The point of all others most suitable for the production of the cheapest iron—the theatre and centre of the industry—has now been found. As long ago as 1840, experts and geologists pointed to the resources of the Cumberland Gap as offering the greatest and surest promise for the cheap production of iron, coal and coke, and it is believed that these results can be obtained there.

The Cumberland Mountain rises from 1,500 to 2,500 feet above drainage level—except at the Gap, where there is a depression a mile and a half wide, which alone

presents a wall between the iron ores and the coals. The foot-hills, on the other hand, of the Poor Valley and Powell River ridges are low, soft and round, and the entire country, excepting the valleys of the Poor Valley and the Powell, are thickly wooded. The Poor Valley is about one half mile wide, and the Powell Valley two to two and one half miles. This latter is very rich and fertile, and the arable lands are high-priced. The Powell River is the natural drain of the country, and many streams, taking their source in the Cumberland Mountains, run into it.

The soil of the valley lands is rich loam, free from stone, and very productive. Cleared bottom lands are in great demand. Beef-cattle and wheat are the products of the Tennessee Valley lands, and corn of the Kentucky Valley farms. The climate of the district is very healthy and fine, being moderate in degree, neither too hot nor too cold. The summer is long and the winter short. There is abundance of good water; that on the Tennessee and Virginia sides being limestone, and that on the Kentucky side freestone. Malaria and fever are entirely unknown to the settlers, who appear strong and robust, and seem to live long.

In conclusion, it may be remarked that the Cumberland Gap ores and coking coals might best be used for making Bessemer pig-iron on the spot, and also common foundry, mill, pig and car-wheel iron, all of which would find a ready market in St. Louis, Louisville, Cincinnati, Baltimore and Philadelphia.

Surplus coke could be sent to Knoxville, Dayton, Tracy City, Chattanooga, Birmingham, etc., where the furnaces are constantly short of supply. The railways of Georgia, N. and S. Carolina, Tennessee, Alabama and Kentucky would contract for the steam coal; and lump coal for domestic purposes fetches high figures in all the large Southern cities. A shipping trade can be established for this quality, and for the cannel coal.

Since reporting as above, Mr. Arthur has been able to make further developments and investigations for the American Association. The following are a few of the results:

First.—A stratification of red hematite ore facing 4 feet in thickness has been found between the stratifications of the "Fossil" ore and the "Oriskany."

Second.—A large deposit of magnetic ore has been found close to the line of the Company's railroad, between Knoxville and Cumberland Gap.

Third.—A stratification of manganese ore, running over fifty per cent. in metallic manganese, has been found one and one-half miles east of Cumberland Gap in the main mountain. This seam is of great promise.

Fourth.—Very extensive stratification of argillaceous iron ore (black band) has been discovered in the coal measures at various points around Yellow Creek valley. These ores will be valuable for mixing.

It may here be pointed out that the centre of population of the United States lies just southeast of Cincinnati, or within 100 miles of Cumberland Gap. Again, the centre of the coking coal beds of Eastern Kentucky and the Virginias lies within fifteen miles of Cumberland Gap; and, once again, the greatest bodies of ores of all kinds yet discovered in the United States are found within a radius of 100 miles of Cumberland Gap.

These facts have been taken from the last U. S. Census.

INSTRUCTIONS TO THE EXPERT SENT OUT TO AMERICA TO REPORT ON THE PROPERTY OF THE AMERICAN ASSOCIATION, LIMITED.

LONDON, 15th January, 1887.

To JACOB HIGSON, Esq., of Messrs. J. & P. Higson,
Civil and Mining Engineers,
18 Booth Street, Manchester:

DEAR SIR,—Your selection by the American Association for the important mission which has been entrusted to you evidences the confidence they place in your judgment and abilities, so that there is but little necessity to enter with minute detail into all the various points which should form the subject of your report, feeling assured that those points will occur to you without any suggestions from us. To put it shortly, our desire is to know whether, in your judgment, and in view of all the surrounding circumstances both at present existing and those likely to arise in the near future, the property is a desirable one to acquire upon the terms agreed upon. The property, as you are aware, is mainly valuable on account of its possessing large quantities of iron ore and of coal in close juxtaposition, so that the process of smelting the iron ore should be a comparatively cheap one. There is also alleged to be a deposit of manganese ores close at hand, which the Company are to have the option of acquiring, with a view to utilizing the manganese in the process of converting the iron ores into steel by the Bessemer or other process. It is hardly anticipated that either the coal or the iron alone would be of sufficient importance to induce the Association to purchase the property, and they are aware that the presence of both minerals is needed to confer a value upon it. Seeing, however, that the coal supply might be valuable in view of the requirements of the approaching railroads, and of other markets for its disposal, you will please to report separately upon this point.

Neither is it assumed that the presence of the two minerals, even in their close juxtaposition, would be of sufficient value, except it were for the fact that railway communication is about to be brought within the property. You will, therefore, please direct your attention to the subject of how far these increased facilities of transport will ensure the profitable working of these minerals, having reference to the markets, the supply of which they will be able to command.

It is particularly to be desired that some information should be obtained as to the consumption of iron and coal in those neighboring markets, and how far this particular property will have the advantage or otherwise over those sources which either at present supply them, or which may, by improved communications, or otherwise, be shortly expected to become competitors in the market.

It is stated that this particular property possesses great advantages over any other mineral deposits known in the neighboring States. It is not sufficient to know that this property possesses coal and iron of good quality and in considerable quantities, and that the deposits are situated close together, but that they exist in such circumstances as will give us considerable advantages over any competitors that either now exist, or whose existence can in any way be foreseen in the near future.

A most important consideration is whether the iron to be obtained from the ores on the property is such as will be fit for steel making, either by the common Bessemer process, or by the Gilchrist, Recce, or other process.

It is also alleged that there is a considerable quantity of timber on the estate. It may not be quite within your province to estimate the value of standing timber, but any information that you can give on that point, especially as to its suitability for mining work, will be of use.

Putting the matter broadly, I can only repeat that what we want from you is such a report as you, as an expert, know will be sufficient for the purposes of enabling the Association to form a judgment as to whether or not the property is worth acquiring upon the terms named, always bearing in mind that the position is not analogous to the purchasing of a property here which you actually want to acquire and are willing to pay full market value for, but that this is in the nature of a speculative purchase, which the Association would not desire to entertain unless it presents at least very good chances of a large profit in the near future.

We shall expect to have, later on, your written detailed report, in which we will ask you to give us not only a description of the property, with your opinion of its present value and future prospects, but also your suggestions as to the best way of developing it in the future, with a description of the operations which you would recommend us to carry on.

I am, dear sir,

Yours faithfully,

EDMUND A. PONTIFEX,

CHAIRMAN OF THE AMERICAN ASSOCIATION, LIMITED.

REPORT.

KNOXVILLE, Tenn., Feb. 15, 1887.

TO THE DIRECTORS OF THE AMERICAN ASSOCIATION, LIMITED,
LONDON, E. C.

GENTLEMEN,—In accordance with my instructions, conveyed in the chairman's letter to me of the 15th of January, I duly proceeded to America, arriving in New York on the 31st of January. Dealing at once with the information placed at our disposal, I beg to inform you that I learned that the Richmond and Danville system has, since my departure

from Liverpool, become incorporated with that of the East Tennessee, Virginia and Georgia Railroad. The effect of this combination, it appears, will be that all traffic hitherto received by the East Tennessee, Virginia and Georgia Railroad, and heretofore passed on by them to the Norfolk and Western System at Bristol, will now be hauled over the Richmond and Danville lines in order that the united companies may get the benefit of the long haulage.

The matter is important to your company in this sense that, whereas, when leaving England it appeared desirable that we should ascertain how far the Richmond and Danville would be anxious to avail itself of such railway charters as you possess, it now appears desirable to consider whether for the district south of the Cumberland Mountains it may not be equally advantageous to deal with the Baltimore and Ohio, or the Norfolk and Western Railroad. The latter company are now at Bristol, and we are told that their intention is to carry their system from that point to Cumberland Gap, thence to connect with the Northern lines.

For this purpose they would have to build their railroad along the valley on the south side of the range, and from what I was able to learn and observe, I can see no natural difficulty in this operation. Whilst at Pineville, and during my inspection of the property, I was informed that the Baltimore and Ohio contemplate a similar extension from their nearest point in Virginia (Salem) to the Gap, and this statement was made, I was informed, on the authority of a letter written by the attorney of the road to his superior officers. Again, while in New York we were informed that the railroad now known as the Chicago, Cumberland Gap and Charleston Road, had obtained the necessary capital for the construction of their road, and would immediately commence operations.* Coming to later information, we also learned at Pineville that the Louisville and Nashville Railroad, which is now actually under construction in a substantial way, as we were able to see for ourselves, from Corbin to Pineville, and which will be open to that place probably in the next few months, have determined to extend their line from Pineville across the Cumberland River, and through the Gap. The foregoing will show you that any company constructing a road from Pineville to Morristown, a distance of fifty-three miles, will own a section of railroad connecting two or three of the most important lines in the Union. Such a section, apart from its own traffic, which, for reasons I will explain, should be considerable, will share in the through rate of all the foregoing railway systems.

Before leaving the question of the railroad it may be desirable that I should here state my opinion upon the facility with which the Junction Road from Pineville to Morristown can be built.

At this point I would beg to refer the Board to the report on this topic of Mr. Fitz-Hugh, Chief Engineer of the Louisville and Nashville Railroad. This document emanates from a gentleman who is now prepared to build this section for his company. It necessarily involves more detail than my inspection of the district can do. My opinion is that if you construct a tunnel through the Clinch Mountain of 400 feet, and one of some 1,200 yards through the Gap, the line can follow on level land by the side of the various watercourses and through the valleys which intersect the route without any difficulty. In fact, it is not too much to say that the natural contour of the land is such as to necessitate very little grading for the formation of the road.

* Now building in North and South Carolina.

The vendors to your company possess, I am informed, railway charters and rights of way from the Gap to Morristown. If, therefore, your company should desire to form this junction with the Louisville and Nashville only from the south side of the Gap, they would only have to encounter the tunnel at Clinch Mountain, and in any case, should you decide to leave the railroad question entirely alone, you will remember that such railways as these, passing through your properties and rights of way, and acquiring your charters, will have to pay reasonable compenstion, whether in cash or kind, for such acquisition.

* * * * * * * *

If your vendors succeed, and they have determined at once to secure the rights of way from Pineville to the Gap, not already contained in such properties as are already under offer to you, a railway from Pineville to Morristown would be able to make all its arrangements independently for securing the most advantageous access to the property possessed by your vendors.

On this side north of the Gap, no natural difficulty exists except bridging the Cumberland River, which again might be left to the Louisville and Nashville Railroad.

The line would pass again through valley land, and no natural difficulty that we could see, in grading to the tunnel, will be found. It therefore appears to me that your board will do well to consider the desirability of making arrangements for the construction of the road through their own combinations. On the north side of the Gap your vendors are possessed of a railway charter from Jellico to the Gap, and in this route they control the actual property for 10 out of 30 miles—the whole distance. This charter would be most valuable to the Baltimore and Ohio line should they desire, as now appears to be the case, to continue their line from Salem, *via* Jellico, to Nashville and Memphis.

The Directors may think this railroad hardly compatible with your present capital; but Mr. Pollock, who is with me, suggests that your company might, by the issue of debentures, construct the whole line (avoiding the tunnel) to Morristown; or again, by the issue of debentures, might materially subsidize another company formed for the purpose of constructing the whole line, and so as to secure all the railway advantages you may desire in the development of the main property.*

The foregoing *résumé* of the railroad position brings me at once to the first inquiry in your Chairman's letter, viz., whether in my judgment, and in view of all surrounding circumstances at present existing, or likely to arise in the near future, the property is a desirable one to acquire.

The Chairman will remember that in my conversation with him I laid particular stress upon the fact that whether the minerals were good or bad, I should not advise the acquisition of any property which it would take years to develop for want of railway accommodation.

The fact that the Louisville and Nashville Railroad have now determined to construct a railway from Pineville to Cumberland Gap, apart from all other railroad considerations indicated, is certainly, in my judgment, a complete answer to this query. I fully believe that the immediate construction of this road, as now contemplated, leaves

* Following Mr. Higson's suggestions, the company has since his visit commenced the building of a trunk line from Atlanta, through Knoxville and the Cumberland Gap tunnel, to join the Louisville and Nashville Railroad, and have further connections and extensions in progress.

no room to doubt that ample opportunities for development will be afforded to the property whose purchase you contemplate. Moreover, it must not be forgotten that the extension of the Norfolk and Western, as indicated in the foregoing, will afford another trunk line outlet from the Cumberland Gap.

PRICE TO BE PAID.—I have carefully noted the statement in the prospectus and accompanying papers on this head and the reference in the Chairman's letter of instructions. It appears to me that, taking the shares at their full cash value, the price to be paid will amount to per acre. I cannot think that this is excessive. Departing for the present from the regular sequence of my letter of instructions, I will now come to that portion in which I am requested to say how far, in my judgment, this particular property possesses great advantages over any other mineral deposit in the neighborhood. The quality of the ores and their adaptability for iron and steel making has been duly dealt with in Dr. Riley's report, which I have perused since my arrival here. Nothing can be more satisfactory in my judgment than the quality of the brown and red ores as assayed by him. Whilst on the ground I was able to see some brown ore of quality which I believe will be found superior to any brought to England as samples.

The reason for not putting this forward originally is a very proper one—that its existence to the same extent as that exhibited in London was not and is not known. The vein of this brown ore was 15 feet thick, and in my judgment is identical with the one from which the brown ore was taken and exhibited in London. It would be impossible in a report like the present to undertake to describe in detail the numerous seams and veins of ore which I personally inspected. To sum up, the statements made in Mr. Arthur's report are, I consider, fully confirmed, and the position of the ores which everywhere lie in the side of the hills, and adjoining the route of the railway, will enable the company to work, or lease them for working, to the greatest possible advantage. When the proximity of the coal and the quality of the ore are taken into account, combined with the deposit of manganese and iron hereafter referred to, I believe it will be possible, having all the necessary material for the purpose in the locality, to make steel on the spot at a cost not exceeding £4 a ton.

Manganese.—This deposit was duly inspected by me, and lies below the South of the Gap at the foot of the hills; I believe that it was indicated on the surface map made by Mr. Arthur, while in London, by a patch of light green. The surface indications of this deposit extend for about seven miles in length, and where it can be seen, it is of very rich quality; but as no operation has been made upon it, an opinion can only be formed that it continues below the surface, but to what depth it is impossible to say. By comparing it with deposits of a like nature, it is reasonable to assume that the vein continues in a manner similar to all such deposits.

On the north side of the mountain and at distance from the iron ore, at the nearest point of two miles, I found the coal seams. These lie in conical hills forming a circle from the centre, through which the railway from the Gap to Pineville will pass, and for a distance following a semicircle of thirteen miles. All the coal seams lie above the level of the watercourses running through the hills, from the lowest coal seam to the highest in the section. In one instance eleven working seams of coal have been discovered, and in another thirteen, and in the remainder from the explorations that have been made, there is no doubt that their coal section is identical with the foregoing.

In no case have I taken into consideration any seam which at its exposure has

shown less than three feet of solid coal without any intersection. The quantity of coal is, I believe, far beyond any calculations submitted by Mr. Arthur, for many seams have during his absence been opened by his workmen, and much of this fresh discovered coal is of greater thickness than any he knew of when in London. No coal has been considered lying below the valley level, although there is undoubted proof of its existence. In order that some idea may be conveyed of the richness of this coal field, two well-known seams may be taken as landmarks for the guidance of the Board. These are a seam identical with the Pocahontas coal, and another identical with the Elkhorn coal. These two seams are being largely worked in the adjoining States of Virginia and Kentucky, and within a short distance of the *locus in quo*. As to the suitability of these two seams for standard coking purposes, no remarks of mine are necessary as their character is too well established. I am perfectly satisfied that there are other seams now exposed in these mountains which will coke equally well, whilst there are others better adapted for household purposes and for producing gas. The value of these coal deposits is rendered greater from the fact that they lie so adjacent to the main line of railway, that they can all be worked practically without any outlay of capital beyond the construction of self-acting tram-roads to the seams. The enormous water supplies which flow at the foot of all these mountains past the coal measures, would enhance the value of almost any sort of works where a continuous water supply becomes a question of serious import to their success. The thickest seam of coal which I was able to inspect, showed nearly eight feet of solid coal, and whilst there are many from four to five feet, I have, as I have stated before, taken no consideration of any under three feet.

Timber.—I have in the course of my experience seen much timber land which contains a greater variety of timber than any existing on the property (for instance the black walnut has been culled throughout its whole extent), but on no property have I ever seen valuable timber such as poplar, white oak, and sycamore, in greater abundance and of finer quality than here. And again, growing as it does on the sides of the hills at whose foot large streams flow, or the railway would pass, it can in my judgment be easily and profitably handled.

Markets.—I will now return to the question asked by the Chairman earlier in his instructions. As to coal markets there is no question, in my opinion, but that advantageous contracts for supply of coal for all the railroad systems could be immediately made. I may point out that the construction of the railroad will open direct access to the ports of shipments on the southeast seaboard, such as Brunswick, Norfolk and Charleston, and to the immense area of intervening country between these places and Cumberland Gap, which are practically wholly unsupplied. The brown ore, in my opinion, is of such a quality that it will readily find its way through all the steel-making industries of the Union, and for this purpose I may refer to the immediate connection this property will possess with such large towns as St. Louis and Cincinnati, a connection which will be shorter by many miles than any other source of supply now open to these markets.

Development.—It will be seen from what has been heretofore stated that the property, although valuable in every respect as it stands, requires to be put in some definite form for bringing it into useful operation, as soon as it can be done, either by yourselves or others. A well prepared scheme should be thought out for this purpose,

after the Board have decided the course of the action they will take for its purchase. If capital can be found for the immediate development of coal, iron and timber, a large percentage of profit may be realized upon such an outlay, which can either be made on a large or small scale, as circumstances may admit. If, after the purchase of the property, the Board are simply content to wait on events, and to sell off or lease lands, development will probably proceed somewhat slower, and the share owners will simply derive the benefit from the profit which may arise from time to time upon these operations.

Finally, Gentlemen, I believe that in purchasing this estate you will be acquiring a property able to compete on the most favorable terms with any similar ones already established in this country. I can hardly suppose that a similar opportunity will ever present itself again. Under these circumstances, I cabled you to-day as follows :

SARGENT, CARE OF THOMEDHAR,

LONDON :

Am entirely satisfied with property on merits alone, aside from Railway Charters, and strongly advise Company complete purchase estate and options. My friends good for £20,000 ; am cabling them apply shares forthwith. Existing railway extension now decided build past Pineville to Morristown if permitted, but consider our railway rights so valuable, wholly apart from minerals, that we shall secure Directors time consider propriety arrange building it themselves. (Signed) JACOB HIGSON.

I have not hesitated to recommend the investment to my friends and I trust they may be of service to you.

I remain, Gentlemen,

Your obedient servant,

JACOB HIGSON.

LABORATORY AND ASSAY OFFICES, 2 CITY ROAD
(14A FINSBURY SQUARE),
LONDON, E.C., January 17, 1887.

Messrs. PAINE, SON & POLLOCK :

GENTLEMEN,—In reply to your queries given in your favor of the 11th inst., I will answer them in the order given.

1. All the iron ores are well adapted for the manufacture of good foundry iron, and also for the conversion of pig-iron into malleable and merchant iron.

2. The ore marked No. 3 (if in bulk similar to sample) is practically a non-phosphoric ore, and might be used for the acid Bessemer process, although the phosphorus is about the maximum limit ; and unless the coal used in smelting the ore were free from phosphorus it would only make an inferior Bessemer pig, or the ore might he used as a mixture with other ore adapted for the manufacture of Bessemer iron, such ore containing a minimum of phosphorus. Ores 2 and 3 are suitable for the manufucture of steel by the Basic process. One favorable feature is the low percentage of silica, and one ore is calcareous—also favorable. The manganese in these ores is practically nil ; had this been present it would have enhanced their value.

3. The ores analyzed are very similar in their character to the ores of Alabama now being developed.

4. Phosphatic ores are now used in steel-making by the Basic process. There is no objection to one per cent. of phosphorus or even more—in fact, it is desirable to have a certain amount of phosphorus.

5. I should consider such ores valuable in proximity to coal, that is, assuming that they are in quantity, and can be cheaply worked, and provided the coal is adapted either *per se*, or as coke, in smelting this ore.

With my experience in working the Basic process (either Bessemer or Siemens) it is desirable to have a certain amount of manganese in the pig, and consequently the presence of manganiferous iron ore, or poor manganese ore, in conjunction with ores similar to the samples submitted to me, would be very advantageous.

Believe me to remain, yours very faithfully,

EDWARD RILEY, F.C.S.,

Metallurgist, Analytical and Consulting Chemist.

ANALYSES OF ORES.

LABORATORY AND ASSAY OFFICES, 2 CITY ROAD,

LONDON, E.C., January 17, 1887.

Messrs. PAINE, SON & POLLOCK :

GENTLEMEN,—Herewith I beg to forward you the results of my analyses of the three samples of iron ore received from you as under :

The samples gave—

	NO. 1.	NO. 2.	NO. 3.
Silica	12.20	5.80	4.72
Peroxide of Iron	80.16	39.94	79.26
Protoxide of Iron	traces	6.01	traces
Alumina	3.94	3.48	2.57
Oxide of Manganese	.35	.40	nil.
Lime	nil.	15.73	.21
Magnesia	traces	4.70	.75
Phosphoric Acid	.30	1.34	.12
Sulphur	traces	traces	traces
Carbonic Acid	nil.	19.63	traces
Combined Water	2.08	2.35	11.41
Moisture	1.02	1.11	1.56
	100.05	100.49	100.60
Metal Iron	56.11	32.64	55.48

No. 1, Large Red Block ; No. 2, Calcareous Ore ; No. 3, Brown Hematite.

Believe me to remain, yours very faithfully,

(Signed) EDWARD RILEY, F.C.S.,

Metallurgist, Analytical and Consulting Chemist.

Mr. Pollock, who accompanied Mr. Higson to America in order to ascertain the nature of the titles under which the property is held, and to see the authorities of the various railway systems in the neighborhood of the Gap, met, whilst in New York, a friend who had recently been in Alabama, and he suggested to Mr. Pollock certain matters for investigation as being highly important. It is thought that extracts from Mr. Pollock's letter written to his friend, and which the Board have had an opportunity of perusing, may be of interest.

The following are the questions referred to :

1. Whether average samples of ore showed 58 per cent. of metallic iron and no silicon and only a trace of phosphorus. Samples to be taken so as to demonstrate that the whole body of the ore should produce such results.

2. That the outcropping of this seam of fossiliferous ore extends no farther north than twenty miles or south twenty miles from Cumberland Gap, and that the seam is at least five feet thick.

3. That the so-called eight-foot seam of coal, now stated to be about eleven miles from the ore, really extends into the property.

4. It should be a *sine qua non* that a seam of coal over four feet six inches in thickness should be proven to be a coking coal by actual test in a coke oven, and not by analysis.

REMARKS.

Practical men at Roanoke and Pocahontas are likely to be able to give more information on the third question than any investigation on the ground in midwinter could develop.

KNOXVILLE, TENNESSEE,

February 16, 1887.

* * * *

I now proceed to deal with the "subjects for investigation" you submitted.

We arrived at Morristown on Friday, the 4th February, and riding from eighteen to twenty miles a day, finished on Sunday the 14th, examining in the first five days the ores on the south side of the Gap, and the later days the coal on the north side. A staff of men under a capable foreman had been for the last three months opening the veins of ore and seams of coal, fixing timber struts and roofs to the openings, so that we saw everything to the best advantage. No snow had fallen, and except for one or two rainstorms and frosts the weather was nearly perfect.

We found the brown ore and the red ore in great abundance and in close proximity. In no case did we pay any attention to any seam of ore, whether red or brown, running less than 28 inches thick, the average was about 3 feet 4 inches ; and one vein or seam of brown ore, far richer in appearance than any Arthur thought it fair to bring to London, went as high as 16 feet in thickness.

Brown.—I saw and followed this for upwards of ten miles in practically one continuous outcrop on the Powell River Ridge. And again, for seven miles on the bench of the Cumberland Mountain.

Red Fossiliferous.—I saw this throughout the district at points nine miles apart and extending for that distance.

Here I would wish to refer you to the following authorities which, as solicitor to the proposed purchasers, it has been my duty to peruse and as far as possible master.

Mr. James Lane Allen, geologist, in *Harper's Magazine* for June, 1886, p. 65, says in an article entitled "Through Cumberland Gap on Horseback :"

"At no other point in the Mississippi Valley are iron ores suitable for steel-making purposes so close to fuel so cheap."

Again C. D. Fitzhugh, Chief Engineer to the Louisville and Nashville Railroad, in his report to his President, dated December 28, 1885, written from Birmingham, Ala., says :

"An examination was made of these ores from a point five miles below Cumberland Gap and extending eastward for forty miles. The ores are stratified red hematite, known as 'The Dyestone' fossil and red ore. . . . The larger amount of these ores lay above drainage level, where they can be easily and cheaply mined."

Again, Mr. J. B. Killibrew, Commissioner of Agriculture, Statistics, Mines and Emigration for the State of Tennessee, in his work, "Resources of Tennessee," states :

"One of the richest deposits of this ore (red fossiliferous) occurs at Cumberland Gap and extends without a break twenty miles along the ridge and half a mile in width.

"It forms a regular stratum four feet below the surface and varies from eighteen inches to three feet in thickness. The whole cost of raising this ore is $1 per ton. This fact will be appreciated when we reflect that ores delivered ready for smelting at Pittsburgh cost from $10 to $12 per ton."

Again, Mr. P. N. Moore, in part v., vol. 4, second series of his Geological Survey of Kentucky, says (p. 6) what practically amounts to the foregoing.

Again, Judge O. C. King, ex-Member of Congress, in a letter to Judge Shields, of Tennessee, says : "Immediately on the south side of Cumberland Gap occurs the most remarkable and probably the most extensive deposit of iron ore to be found in the United States. It is a red hematite fossiliferous ore, singularly free from sulphur or phosphorous. Overlying the red, I am told, there are large deposits of brown hematite ore, but these I did not examine."

The following geologists, whose names are, I make no doubt, known to you, report to the same effect :

Professor A. R. Crandell,
" Rogers,
" John J. Stevenson,
Professor Proctor,
" J. P. Leslie,
" A. C. Macreath,
Professor Dr. R. Peters.

The effect of the local inquiries I was able to make and the testimony of the foregoing authorities, some of which you should peruse, go to prove that this ore, whilst occurring at Cumberland Gap in the way and quantity indicated, does not reappear in an accessible position, except as what they term a "lean ore," until we reach Alabama, near Chattanooga, on the southwest, and Wheeling and Roanoke on the northeast. In other words, there is a break of over 100 miles on the southwest, and of 200 miles on the northeast. If you will turn to the map and see what this means, I need not, to you, as a railway man and acquainted with freights, say another word on this head. This property will compete in this respect with any other.

QUALITY.

The quality of these ores has been tested by Messrs. Ledoux, of New York; Messrs. Johnson, Matthey & Co., of London; and Professor Riley, also of London. As to the former, I say nothing, for I do not know them; as to the latter, you know Mr. Sellon, of Johnson, Matthey & Co., and Riley is one of our leading iron experts. He is also a practical maker, and as a director of the Middlesborough Steel Company, one of our leading iron companies, and a part owner of the Thomas Gilchrist process, is necessarily well acquainted with the various modes of steel-making. He reports that both ores are undoubtedly suitable for steel-making, and it is satisfactory to find his analysis so identical with the others. He makes—

Contents red ore, 56 per cent. metallic iron.
Phosphoric acid, only .30 per cent.= .130 phosphorous.
The like brown ore, 55.48 per cent. metallic iron.
Phosphoric acid, .12 per cent. = .055 phosphorous.
Silica, 4.72 per cent.

COAL.

Of this we saw any quantity; like the ore, the seams had been opened and roofed.

The average of the eight or ten distinct seams that underlie the property, and which we saw, must, I think, be over five feet.

The best seam I saw without any parting, was measured and found to be just over nine feet thick of solid coal, and is identical with what I am told is a celebrated coal, "the Elkhorn."

This particular seam has been traced for ten miles through our property.

Another I saw, 14 feet thick but with three thin partings, exists for a similar distance.

We saw, as I have said, and examined many seams, among them two identical with the coal now being worked at Jellico Mountain and Flat Top Pocahontas. In most cases we were able to trace a seam of coal cropping out and exposed on one side of the hills equally appearing on the other side, thus showing complete continuity, and I am perfectly certain that an estimate of 5,000 tons per seam to the acre is under rather than over estimated.

In one place I counted 11 distinct seams opened in the side of the hill, of these 5

were over 4 feet in diameter solid coal. In another I counted 13 similar seams of which 7 were similarly workable, 5 being within a distance of 50 yards apart vertically.

TIMBER.

This has been counted and, I am told, we can rely on a supply for a 50,000 feet per day mill for the next eight or ten years, worth per annum £45,000 sterling gross. I am no judge of timber, but I saw many rafts on the Clinch River on their way to Chattanooga, and certainly the timber I saw standing compared well in size with those in these rafts.

TOWN SITES.

We have secured desirable positions for these near Pineville and at the Gap, together with various furnace and coking sites throughout the valleys.

DEVELOPMENT.

Throughout the whole property it is obvious that the coal and iron can be readily brought to the railway by light tramways acting automatically by gravitation. All the ore and coal is well above drainage level. No account has been taken of any below.

RAILWAYS.

We possess the charters and rights of way—

From Morristown to the Gap.

Gap to Jellico.

Rights of way Pineville to the Gap.

For a very large portion of these distances we own the property.

The Louisville and Nashville road have now determined to build from Corbin to Morristown (tunnelling the mountain) and the line is already graded in the most substantial manner (no trestles) from Corbin to Pineville. So that if we decided to abandon all idea of railway building, it will be brought to our doors without any expense. But if, as I believe, our policy is to build for ourselves : Then—

At Morristown we join the Richmond and Danville Road.

At Pineville, the Louisville and Nashville Road.

At the Gap, the Norfolk and Western Road, who have decided to build along the southern valley of the mountains from Bristol to the Gap, to connect with the Louisville and Nashville.

With a board at home free to develop this estate, and unharassed by the numerous booms which seem to cross every man's track here like red herrings, I believe we can formulate and carry out a thoughtful development of this scheme which will make it, in your own words, "a better thing than Birmingham or Sheffield, Alabama." We have coal, iron, manganese, limestone and sandstone, all actually together, and our railway outlets can hardly be surpassed.

I am, always,

Yours most sincerely,

HARRY POLLOCK.

Mr. C. D. Fitzhugh, C. E., Chief Engineer Louisville and Nashville Railway Company, in a report to Mr. M. H. Smith, President, says of this district:

"After passing through Pine Mountain at Pineville, the North Cumberland Coal basin properly begins. This basin of coal is about ten miles wide at where the line of survey crosses it. The basin is one synclinal bounded on the north by Pine Mountains, and on the south by the Cumberland Mountains. The axis of the synclinal is about one mile from the Pine Mountains. The length of this basin of coal, as far as examined, is about seventy miles, and it has an average width of eight miles. The coal measures on either side of the basin begin to dip toward the centre at an angle of twenty-five degrees, but this strong dip does not continue for more than about one-half mile from either side of the basin where the coal measures dip to average not more than one degree, except where the local disturbances occur, incident to coal fields. The coal measures in this *remarkable* coal field are not less than 2,500 feet thick. Examinations were made and test pits cut on the different veins of coal at points beginning about six miles west of a line running north from Cumberland Gap, and extending east along this basin for a distance of seventy miles. No faults causing any disturbances in the coal veins were found, except a fault about midway between Pineville and Cumberland Gap, and shown on the map of Rocky Face Mountain. This fault is about two and one-half miles long, and one mile wide. Excepting the space it occupies in the basin, this fault has not affected the coal veins to any great extent so as to interfere with mining. The coals found in this basin are *undoubtedly* coking coals, and samples were taken from the several openings to be coked, to show the coking qualities. Nine different veins of coal were cut into and examined; the thickness of these veins was from two and one-half to seven feet. The area of this coal basin, as far as examined, is estimated to be 500 square miles, having a splendid and sufficient drainage by the Cumberland River. The veins of coal are located from 50 to 800 feet above drainage, or above the source of streams emptying into the Cumberland River. The Cumberland River passes close under Pine Mountain for thirty-five miles until it reaches Harlan Court House, where the three main branches—Poor Fork, Martin's Fork, and Clover Fork, diverge through the coal basin, forming fertile valleys averaging about one mile wide, and forming good routes for railroads, costing not more than $2,500 per mile for the grading. Yellow Creek, the principal eastern prong of the Cumberland River in this coal basin, furnishes a drainage for about seventy-five square miles, and on either side of this creek and its tributaries *enough coal presents itself for mining to be carried on for an indefinite period.*"

IRONTON, Ohio, June 28, 1887.

TO THE AMERICAN ASSOCIATION, LIMITED,

ALEX. A. ARTHUR, Manager:

DEAR SIR,—At your request, I submit the following report on your property in Kentucky and Tennessee. I deal with facts from a short observation of your property and past experience in development of like properties.

Coal.—You have now 30,000 acres of coal lands which I represent as one-third carrying coal averaging (all the veins above water level) fourteen feet in thickness, and I believe

you have more below water level, together with the seven feet at level, which should yield coal enough to supply two blast furnaces of 70,000 tons iron per year capacity, together with two and one-half million tons per year for market, and should hold out at least 100 years.

The dip of the coal veins being about one yard to the mile, it is a desirable coal to mine for natural drainage. It should be mined (taking run of mine) at 40 cents per ton, making coal 65 cents per ton on cars at mines.

Coke.—Cost of same per ton :

1½ Tons Coal, at 65 cents per ton	$0 97½
Manufacture, repairs, ovens, etc.	45
Carriage to furnace	05
Total cost	$1 47½

Fossil Ore (in Tennessee).—I put the vein at a belt of fifty feet wide, six feet deep, and two-thirds length six miles, as given in report, allowing one-third of length for ravines, watercourse, etc., and should yield above water level at least 4,000,000 tons. My judgment leads me to believe that there is ten times more in the belt mentioned than was in sight, which can be mined by shafts or slopes.

Brown Hematites I believe to be in quantities from two to three times that of the fossils. It was shown up in an area of about eighteen miles and running about 215 feet wide ; and one development by shaft showed a thickness of 18 feet, and a spur of the Twin Mountain I believe to be all brown hematite.

Red Hematites.—The same area as given under brown hematites contains red hematites from four to six feet thick, and should yield more tonnage than the fossil ores ; it is also underlaid with from four to six feet of carbonate, which will make iron equal to the Scotch pig-iron imported here.

Reported Analysis of Ore :

	RED HEM.	BROWN HEM.	CARBONATE.
Iron (metallic)	58.730	56.490	44.660
Phosphorus	.041	.006	.020
Sulphur	.230	.210	trace

Estimated amount of ores, properly stratified, in sight :

Fossil Ores	4,000,000
Red Hematites	20,000,000
Carbonate, about	20,000,000

The brown hematites are apparently inexhaustible.

The ore should be received and delivered on railway cars at not to exceed 60 cents per ton, with an addition of 25 cents per ton for dead work, tram railway freight 5 cents to furnace, making cost equal to—

Mining	$0 60
Sundries	25
Hauling to furnace	05
Total	$0 90

Magnetic Iron Ore.—The great Cranberry Iron Mine can be reached by a road of sixty miles in length, and with the ores on the property, together with the Cranberry ore,

any desired quality of iron can be produced. Limestone is inexhaustible and can be put to furnace at not to exceed 30 cents per ton. The analysis at 90 per cent. carbonate of lime shows it to be an excellent stone for flux.

Railways or Tramways.—There should be about five miles divided into five or six short lines, inclines, etc., which should be put down at a low cost—the ties being on the property and very little grading to be done.

The Furnace Plant, consisting of two modern furnaces at 70,000 tons per year capacity (35,000 tons each), with all modern improvements, can be built for $500,000, with $100,000 additional for railroads, locomotives, cars, offices, reservoirs, tools, etc.

I would build the furnaces 80 feet high by 16 feet, bosh. It will require 1,600 men to mine material for and operate such furnaces, who will need 1,000 houses. The houses should be built at an average cost of $400 each, said houses to be of 5 rooms, 3 down and 2 up stairs, and each to be built on ground 25 x 100 feet lot and fenced, total cost of the houses, $400,000.

There should be built 250 coke ovens to yield 300 tons of coke per day, at a cost of $50,000, making a total cost of plant of 2 furnaces, 250 coke ovens, 1,000 houses, equal to $1,050,000. There are natural advantages on your property that should reduce the figures named, consisting of timber, stone for foundations, material for red brick, also clay for common fire-brick, but the best quality of fire-brick must be the brands that have been tried and their reputation established. You have an abundance of fine water.

Below I present an estimate of the cost of iron based upon the 56 per cent. of iron contained in the ore, as reported in Cumberland Gap Association Report; also estimate upon the ore if containing but 40 per cent. of iron.

56 PER CENT. ORE.			40 PER CENT. ORE.		
1¼ ton Coke . . .	$1 47½	$1 84¾	1½ ton Coke . . .	$1 47½	$2 21¾
3600 lbs. Ore . . .		1 44½	5600 lbs. Ore . . .		2 25
½ ton Limestone .	30	15	1¼ ton Limestone . .	30	37½
Labor and incidentals		3 00	Labor and incidentals		3 25
		$6 44¼			$8 09¼

Accidents, strikes, disabled men, depreciation of plant and renewal of machinery, insurance on property, etc., should not make the iron exceed $10 per ton at the outside figure. The average price of such iron (which would be first-class) in Cincinnati, Chicago, Pittsburgh or Philadelphia, is about $19 cash, or less $2 freight. The iron should net $17 at the furnace on the present market.

Recapitulation.—(Pig-iron reduced to $1 per ton profit)—

70,000 tons Iron at $1 per ton	$70,000
1,000 Houses at $60 per year rent	60,000
1,600 Men at 60 cents per day each, through store, at profit 20 per cent.	57,600
2,500,000 tons Coal at 10 cents per ton royalty . .	250,000
	$437,600

$437,600 — 41.68 per cent. profit on $1,050,000 spent.

The timber, which is as good as any I have seen in this country, should pay the cost of the lands and minerals.

I would locate the furnaces about one mile from Cumberland Gap, in Bell County, Kentucky, where there is room to locate a town of 100,000 people. Would also locate coke-oven plant at furnaces. Would also suggest that the tunnel be put through Cumberland Gap, and be kept level with the old stage road, or high-water mark, making the tunnel about 3,600 feet long with a grade on the Kentucky side of the mountain, so as to be of economical use in mining the coal seams in Bell County above high-water mark. The tunnel should be put through and controlled by your company, so as to control the freight from the four proposed lines which should lead up to it. It should be put through for a cost not to exceed $280,000, including a substantial brick lining throughout. The tonnage from the proposed lines should pay a good rate of interest on the investment, allowing the company's material to pass free.

NOTE.—The present profit of iron should be $7 per ton. My reason for putting it at $1 per ton is to show what can be made on the selling price of $13 per ton in Cincinnati and other iron centres. The profit at $7 per ton would bring the dividends up to about eighty-five per cent.

NOTE.—The analyses given in the report are from the Cumberland Gap Association Report. Late reports to me from Kentucky Geological Reports, dated June 24, 1887, and not yet in print, show the value of the lands to be largely in excess of my estimates.

In Conclusion.—My report is based upon figures I can guarantee, and I am willing to enter into a contract to deliver the iron on furnace yard at $10 per ton; provided the plant is erected, as recommended in my report.

Yours truly,

(Signed) E. J. BIRD.

FRANKFORT, Ky., January 5, 1888.

A. A. ARTHUR, Esq., Manager,

THE AMERICAN ASSOCIATION, LIMITED,

Knoxville, Tennessee.

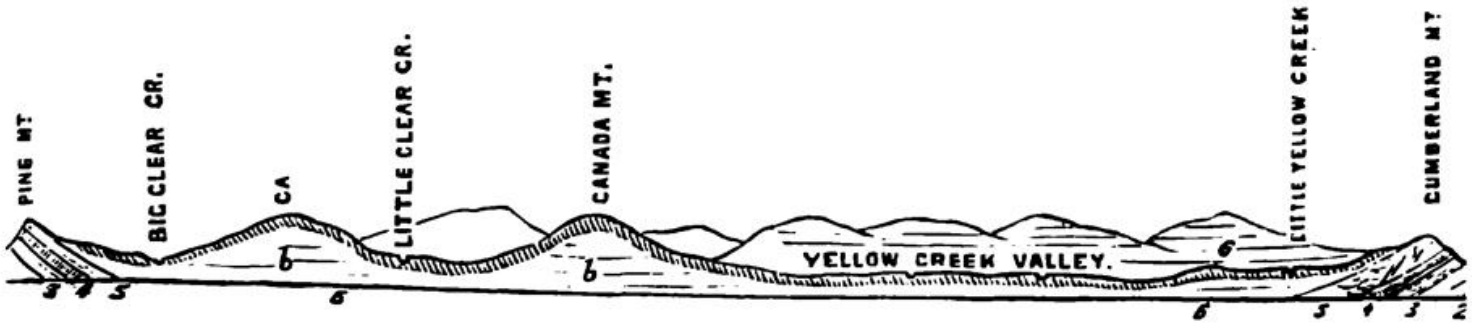
DEAR SIR,—I have recently returned from a personal examination of the properties owned by your company in the vicinity of Cumberland Gap.

These properties may be divided into three classes:

(1) Coal, timber and farming lands between Cumberland and Pine mountains;
(2) Iron ore, limestone, and farming lands in Virginia and Tennessee;
(3) Lands for town sites.

(1). *Coals.*—Between the Cumberland and Pine mountains are the highest mountains in Kentucky, known as the Log Mountains and the Black Mountains. Some of the highest of this range—Bryson, Canada (in your property), and the Big Black, etc.—reach an altitude of from 3,250 to 4,000 feet above sea level, giving as much as 2,500 feet of productive coal measures in a vertical section.

I give below a cross section drawn to natural scale from Cumberland to Pine Mountain. It will be seen from the section and map that the carboniferous rocks in this valley are protected by the broad synclinal in which they rest, and that the rocks are practically horizontal.



SCALE—2 MILES TO 1 INCH.

1. Cambro-Silurian. Brown and Red Ores and Manganese.
2. Upper Silurian. "Red fossil" Ore.
3. Oriskany. Large deposits of Brown Ore.
4. Sub-Carboniferous Limestone. Brown Ore in places.
5. Carboniferous Conglomerate.
6. Coal Measures.

NOTE.—It would appear from the section that the Oriskany Ore would be found at drainage level, but, both on Cumberland and Pine Mountain, it is usually in foot-hills from 100 to 200 feet above the level of projected railways.

The streams penetrate the mountains in a manner to permit of mining the coal to greatest advantage, and availing of the gentle dip to drain mines by gravity. The valleys are broad, and afford easy access to railway lines to reach the stores of coal and timber. *It has been demonstrated that all the coals known*, excepting anthracite, *abound in this region:* cannel coal, steam and domestic coals, coking coals, gas coals. The Cumberland Mountain is the southeastern boundary of the coal field, there being *no coal* to the southeast between Cumberland Gap and the Atlantic Ocean. This fact insures to the coals of the Cumberland Valley a large and increasing market so soon as transportation is provided.

Cannel Coals.—I give three analyses of Cannel coals from Bell County, and for purposes of comparison give also analyses from some of the most celebrated Cannel coals now in use :

	Volatile Combustible Matter.	Fixed Carbon.	Ash.
No. 2,578, Bell County, Kentucky	41.54	50.60	7.00
No. 2,838, Bell County, Kentucky	51.60	40.40	7.00
No. 2,841, Bell County, Kentucky	47.40	47.70	3.30
Kirkless Hall, England	40.30	56.40	3.30
Boghead, Scotland	51.60	15.70	32.70
Lesmahago Cannel	49.60	41.30	9.10
Peytonia, West Virginia	46.00	41.00	13.00

I give below sections and analyses of some of the coals in the Cumberland Valley. The sections are from careful measurements by myself and officers of the Geological Survey, and the analyses are from carefully averaged samples. These include the coking and other coals.

"Gibson's No. 2" Coal, mouth of Big Sugan Branch of Bennett's Fork of Yellow Creek, about four and one-half miles above mouth of Bennett's Fork. Coal outcrop about fifteen feet above water in "branch."

Sandstone 12 ins.

Shale 14 ins.

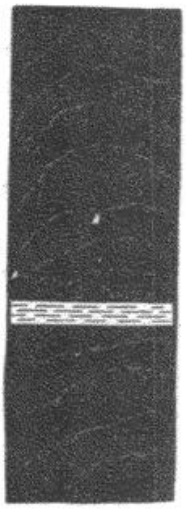
Coal 32½ ins.

Shale 1 in.
Coal 1 in.
Shale 1 in.
Shale and Coal 2 ins.

Coal 30 ins.

Hygroscopic Moisture	7.00
Volatile Combustible Matter	30.90
Fixed Carbon	58.30
Ash	3.80
Sulphur	0.685

"Robbin's" Coal. Crane's Creek of Yellow Creek, Bell County, Kentucky.

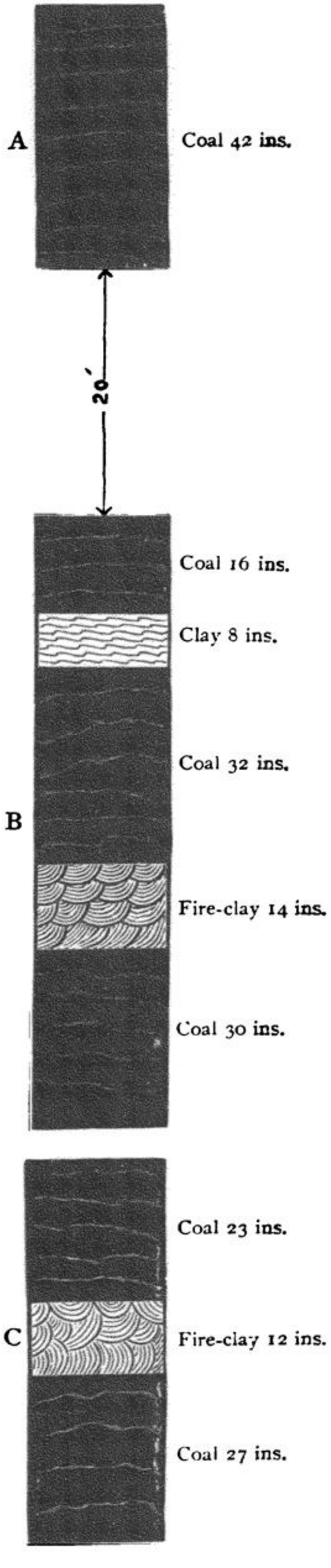


Coal 36 ins.

Shale 3 ins.

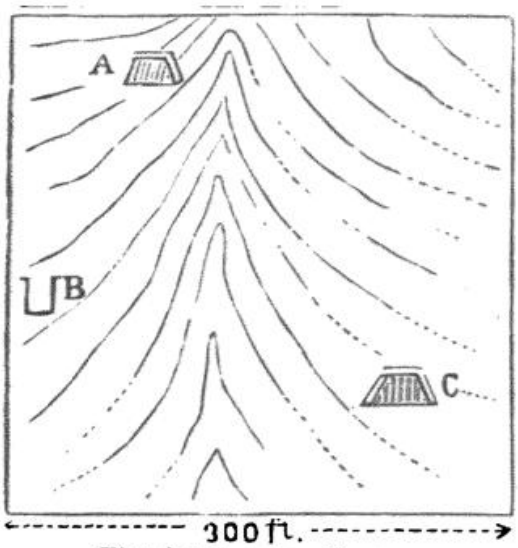
Coal 23 ins.

	ANALYSES.	
	Upper 36 ins.	Lower 23 ins.
Volatile Combustible Matter	32.30	34.90
Fixed Carbon	63.50	62.10
Ash	2.80	1.80
Sulphur	0.670	0.529



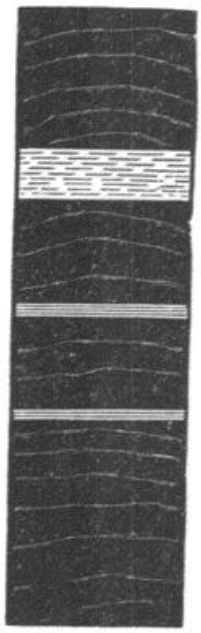
Coals recently opened on Mealer Land, Spur of Mingo Mountain, North of Little Yellow Creek.

These measurements were made from outcrop with the exception of upper coal, where a drift has been driven in some distance exposing a section of very pure coal. From the hurried examination, and owing to the fact that the opening at C was



Five feet between Contours.

so filled with water that I could only see outcrop, I am not certain whether it be a lower coal than B, or only a part of that coal exposed. The dip from B is in that direction, but not steep enough to bring the coal so low as the opening at C.



Coal bank, head of middle Fork of Williams' Branch of Yellow Creek, Bell County, Kentucky.

ANALYSIS.

Volatile Combustible Matter	32.20%
Fixed Carbon	60.60
Ash	4.60
Sulphur	0.876

Carefully averaged from the four benches.

ANALYSES OF ADDITIONAL COALS FROM BELL COUNTY.

1. Coal from Myers' Bank, Low Branch of Yellow Creek. Sample from 43 inches of the coal.
2. Coal from McTees' Bank, Yellow Creek.
3. Coal from Dean Bank, Greasy Creek.

	(1)	(2)	(3)
Volatile Combustible Matter	34.90	38.60	35.20
Fixed Carbon	55.70	57.30	58.80
Ash	8.40	2.70	4.00
Sulphur	.829	0.629	0.637

Coal from Muddybranch of Clear Creek, Bell County, Kentucky.

	A 34 ins.	B 43 ins.
Volatile Combustible Matter	32.60	51.60
Fixed Carbon	62.30	40.40
Ash	3.40	7.00
Sulphur	0.684	0.739

Both analyses from much-weathered samples.

As the coals of the entire Cumberland Valley above Pineville will be made tributary to your proposed development in the Yellow Creek Valley, and at Cumberland Gap, because of the peculiar topography, I give sections and analyses of a few of these coals.

I do not regard your property as having been fully explored, and further exploration and development will doubtless bring to light coals now unknown.

Coal from head of Wallins Creek, five miles from Cumberland River.

Volatile Combustible Matter	35.10
Fixed Carbon	62.70
Ash	6.00
Sulphur	0.818

Specific Gravity, 1.307.

Coal from Robert's Branch.

	From 54 ins. (A)	From 41 ins. (B)
Volatile Combustible Matter	30.94	33.18
Fixed Carbon	57.75	59.26
Ash	8.81	5.50
Sulphur	0.629	0.790
Specific Gravity	1.278	1.225

Coal on Jas. Howard's land, Martin's Fork.

Coal 68 ins.

Volatile Combustible Matter	33.40
Fixed Carbon	61.60
Ash	3.00
Sulphur	0.643

Coal from Elijah Creech's land, Loony Creek.

Coal 7 1/2 ins.

Shale 2 ins.

Coal 6 ins.

Volatile Combustible Matter	35.34
Fixed Carbon	61.80
Ash	1.40
Sulphur	0.497

Specific Gravity, 1.198.

COKING COAL.

Frequent tests have demonstrated that a good furnace coke can be made from two and possibly three of the Cumberland Valley coals.

I give below analyses by chemists of the Kentucky Geological Survey of some of the cokes made from the Yellow Creek coals, Bell County :

No. 1 Coke—42-hour Coke—made at Birmingham, Alabama, under direction of R. H. Fitzhugh, Ch. Engineer, Louisville and Nashville Railroad, from Barners' Coal, Yellow Creek.

No. 2 Coke—48-hour Coke—made at Quinnemont, West Virginia, under direction of R. C. B. Thurston, Kentucky Geological Survey, from Barners' Coal, Yellow Creek.

No. 3 Coke—72-hour—made at Quinnemont (R. C. B. T.), from Myers' Coal, Yellow Creek.

No. 4 Coke—72-hour—made at Quinnemont (R. C. B. T.), from McTees' Coal, Yellow Creek.

No. 5 Coke—72-hour—made at Quinnemont (R. C. B. T.), from King's Coal, Yellow Creek.

No. 6 Coke—42-hour—made at Quinnemont (R. C. B. T.), from King's Coal, Yellow Creek.

	(1)	(2)	(3)	(4)	(5)	(6)
Fixed Carbon . . .	93.90	95.80	90.80	94.00	92.20	92.94
Ash	5.30	4.00	8.80	5.60	7.60	6.80
Sulphur	.480	.710	0.547	0.629	0.491	1.033

For comparison, analyses are given from the best cokes now in use in the furnaces :

Average of—	Fixed Carbon.	Ash.	Sulphur.
3 samples Connellsville Coke	88.962	9.741	.810
4 of Chattanooga, Tenn. "	80.513	16.344	1.595
4 of Birmingham, Ala. "	87.299	10.545	1.195
3 of Pocahontas, Va. "	92.550	5.749	.597
8 of West Virginia "	92.380	7.210	.552
6 of Yellow Creek "	93.270	6.310	.981

It is worthy of note that in chemical composition these Southeastern Kentucky coking coals more nearly resemble that of the celebrated Connellsville than do the coking coals of *West Virginia, Tennessee or Alabama.* The volatile combustible matter is very low, both in the Pocahontas and Quinnemont, averaging from 17 per cent. to 25 per cent., and some manufacturers claim that it is too low for best results in coking, and in the Alabama and Tennessee coals the ash and sulphur are high. In this connection, I append an extract from a report recently made by me to the Governor of Kentucky on the "Progress of the Geological Survey, during the years 1886–7."

With reference to this Southeastern Kentucky coking coal and its relation to the iron ore of the South Appalachian region :

"The importance of the discovery of this coking coal, and its bearing upon the future industrial development of the State, cannot be overestimated. It adds to the value of the iron ores in Northeastern Kentucky, and the ores in Bath County, and to

the brown ores in the limestone of the Red and Kentucky rivers. In fact, it adds to the value of the ores of the entire State.

"It is the nearest coking coal to Cincinnati and Louisville, and also the nearest good coking coal to St. Louis. It is as near Chicago as is the Connellsville coking coal, and *nearer to large deposits of Bessemer steel ores than is any other coking coal in this country.*

"As the southeastern boundary of the State is for many miles also the southeastern limit of the Appalachian coal field, and the great deposits of iron ores beyond our border must, in large measure, be smelted with Kentucky coke, a slight reference to some of these ores may prove of interest.

"Just beyond, and parallel to the southeastern border of the State, there is a stratified ore, ranging from two to five feet in thickness, and averaging from forty-five per cent. to fifty-four per cent. of metallic iron. This ore is known by the several names of 'Clinton ore,' 'Dyestone,' and 'Red Fossil.' It extends along the eastern base of the Cumberland and Stone mountains, and is duplicated along the slope of Powell's Mountain and Wallen's Ridge, giving three parallel lines of this cheap ore, convenient to the Southeastern Kentucky coke, and often most favorably located for cheap mining.

"Recently, it has been my good fortune to prove the existence of a reliable horizon of limonite or 'brown' ore extending parallel, and near to the above. This ore has been opened in a number of places, showing a thick deposit of excellent ore, averaging as high as fifty-two per cent. of metallic iron. This ore is in the Oriskany of the Upper Silurian. This is a rich ore, and I hope that it will prove a reliable and extensive deposit.*

"Beyond the ores above mentioned, in the great valley, are large deposits of brown ore, resting on the Cambro-Silurian limestones of the several counties of Southwest Virginia; and in Carter, Johnson, and Unicoi, and other counties in East Tennessee. These ores range from fifty to sixty per cent. in iron, and frequently low enough in phosphorus to make a good Bessemer iron. Large deposits of manganese ore, favorably located for cheap mining, are abundant. Yet farther east, additional brown ores are

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* As this is a new discovery, and the ore has never been mined in Southwest Virginia nor in Kentucky, we can only form opinion respecting it of what is known of the same ore where it has been developed. It is the same as the brown ores so successfully used at the Low Moor, Longdale, and other furnaces near Clifton Forge, West Virginia.

Prof. Thomas Egleston, of the Columbia College School of Mines, writes of this Low Moor ore, in his report to the C. & O. R. R., as follows:

"An imperfect examination of localities containing such material on the surface has given rise to the impression, announced in some of the most important local works on the Geology of the United States, that the Oriskany deposit contains no iron ores that can be worked. I have made over sixty analyses, from samples collected by myself and others, of these ores, and I find by far the larger part of them valuable for the manufacture of iron, and many of them very rich in iron and very low in both sulphur and phosphorus. . . . The ore deposits are not, as they usually are at the north, pockets uncertain in their yield and in their extent, but are regular geological formations, which can be followed for miles, and which, with few exceptions, can be depended on both for quality and quantity of their iron ores."

T. T. Wicks, Engineer and Managing Director of the Low Moor Company, says of the Oriskany ore in his report:

"Thus far, in mining these ores, the rule has been found unvarying that, as the workings deepened, the vein has widened and the quality has improved; in one instance, where the vein of ore was 16 feet wide at the surface, 280 feet down from *this* surface the vein was 70 feet wide."

Prof. John L. Campbell, in his report to the Buchanan and Clifton Forge Railway Company, says: That of all the ore-bearing formations in that portion of Virginia, "this (the Oriskany) is the most remarkable for the quantity of limonite ore that it contains, and the facility with which it is mined."

The industries at Low Moor, based upon this ore, furnished, a few years since, one-eleventh of all the freight hauled on the Chesapeake and Ohio Railway.

found in great abundance, in the Potsdam formation, and quite recently an immense deposit of high grade ore has been found at the base of this formation.

"Specular ore of great richness, and as low as .003 per cent. of phosphorus, is found in East Tennessee; * and along the flanks of the Great Smoky Mountain, having the Great Roan Mountain as a centre, are deposits of very rich and pure magnetic iron ore. These ores have been found along this range for many miles.

"The Bessemer steel ores of the Lake Superior region are over 700 miles from the nearest coking coal, whilst the abundant Bessemer steel ores of this region are less than 100 miles from the Kentucky coking coal. Assuming Cleveland and Youngstown region as the natural meeting point between the Lake Superior iron ores and the Connellsville coke, the cost of the raw material (coke, limestone, and ore) necessary for the manufacture of a ton of Bessemer pig, will be at least $5 a ton more at those points, than will be the cost of similar materials at favorable localities where the Kentucky coke and the North Carolina magnetic and specular ores may be brought together; and the difference in the cost of materials necessary to make a non-Bessemer pig will be yet greater, and more in favor of the same region.† The facts above stated are at last known and appreciated by iron-masters and railway builders.

"Four important lines of railway are being pushed to rapid completion, and will penetrate this region during the coming year, viz.: (1) The Clinch Valley extension of the Norfolk and Western. (2) The South Atlantic and Ohio. (3) The Knoxville, Cumberland Gap and Louisville and the Marietta and North Georgia railways from Atlanta to Cumberland Gap; and (4) The Cumberland Valley extension of the Louisville and Nashville Railway, through the great water gap in Pine Mountain to a connection with the Knoxville, Cumberland Gap and Louisville Railway from Knoxville to Cumberland Gap, and with the Clinch Valley extension of the Norfolk and Western."‡

Leaving out for the present the discussion of iron manufacturing, it is evident that the manufacture and shipment of coke from the Cumberland Valley must prove profitable. The recent demands for Southern iron has led to the erection of furnaces beyond the local coke supply. The new furnaces at Sheffield, Alabama, are using coke from Pocahontas, Virginia, a haul of 525 miles by the most direct route. The furnace men of the Chattanooga district are looking to Southeast Kentucky for the future supply for the furnaces of that district, and I am informed by one of the best informed, that a high-grade Bessemer steel cannot be manufactured in that district until pure cokes from Kentucky are obtainable. Pocahontas coke is now going into that district. A letter to the *American Manufacturer and Iron World*, from Birmingham, Alabama, December 14, 1887, says: "The situation in regard to the supply of coal and coke in Alabama is at present very peculiar. The great source of supply of both these articles has previously been the Pratt Mines. The Company owning these mines have now almost ready for operation, four 20 by 80 furnace stacks. These will partially absorb their

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* And on the line of the Marietta & North Georgia Railroad, which is being extended to Cumberland Gap.

† Latest quotations give the price of ore at Cleveland as follows:
Specular and Magnetic Bessemer, per ton, $7.00 to $7.50.
Bessemer Hematites, per ton, $5.75 to $6.70.
The cost of the ore and coke necessary for the production of a ton of iron in Mahoning Valley district is given in *Iron Trade Review* at $9.90 for the ore, and $4.50 for the coke; total, $14.40.

‡ Other connections and extensions have since been arranged. Reference is made to accompanying map.

product. Coalbury, the next large supply of coal suitable for coke-making, has also two large furnaces of its own building, which will cut off the supply from that source. These two mines have been substantially the sole supplies of coke in the entire Birmingham district. There are over a dozen furnaces, in addition to those already in blast, to go into operation in this section within six months. The coke to put them in operation is non-extant. Such, in unvarnished terms, is the exact fact of the case."

The output of Connellsville coke has reached over 1,100 car-loads per day during the past season, and yet the supply has been so far below the demands that Pocahontas coke is now shipped, via Knoxville, to St. Louis and Chicago. Doubtless many of your shareholders living in England may fear that there will be an overproduction of iron in this country; but could they realize the wonderful expansive capacity of this growing country, the influx of immigrants, the new uses to which iron and steel are put each year—so that the demand increases in a greater ratio than the increase of population—they would conclude that certainly, where the advantages are so great as in the district under consideration, fears of overproduction may be dismissed. Were there no iron ores in the immediate vicinity of Cumberland Gap, that place would yet be a most advantageous location for the manufacture of iron and steel. This condition is rendered more advantageous by the abundance of cheap ores upon the property of the Company, and near to the coke and pure limestone. Since writing the report, from which extracts have been given above, I have satisfied myself, by personal inspection on the ground, that the Oriskany ore is present in thick deposit along the southern base and foothills of the Cumberland Mountain on the property of the Company.

On the accompanying map I have marked the outcrop of the two principal ore horizons: the Clinton, or "Red Fossil" ore, and the Oriskany, or "Brown ore."

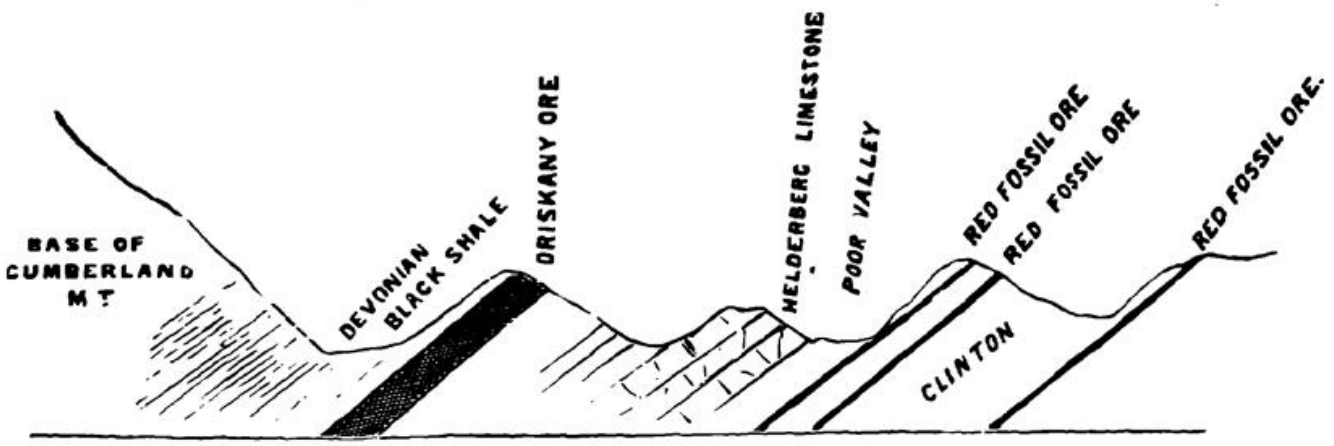
The Clinton ore is persistent along the Poor Valley ridge from a point 65 miles east of Cumberland Gap to a point 40 miles west of the Gap, giving a continuous outcrop of stratified ore of over 100 miles. There are three strata of ore. The main ore is a reliable ore of from twenty inches to five feet thick, and in a few places even a greater thickness has been exposed. I saw three exposures on your property, one 24 inches thick, one 38 inches thick, and one, the most westerly exposure visited by me, the Sharp Bank, 4 feet 8 inches thick.

From averaged samples taken for the Kentucky Geological Survey, at Cumberland Gap, the following analyses were obtained:

Specific Gravity.	3.942	3.914
Iron Peroxide	77.380	73.935
Alumina / Manganese Oxide	3.941	5.776
Lime Carbonate	.420	4.510
Magnesia	tr.	.266
Combined Water	2.500	3.850
Silica and Silicates	15.960	11.730
Percentage of Iron	54.166	51.750
Percentage of Phosphorus	0.140	.140
Percentage of Sulphur	tr.	tr.

I regard the brown ore (Limonite) discovered on south slope of Cumberland Mountain as the Oriskany, as a more important ore than the red fossil, both on account of the quality of the ore and the quantity. I saw this ore along an outcrop of some miles on the lands of the "American Association." Southwest of Cumberland Gap the outcrop has been seen at twenty-one places along a line four miles in length, commencing immediately west from the Gap. The most important exposures are: the "Van" shaft, about two miles west of the Gap, where a shaft has been sunk showing 15 feet of excellent brown ore. In this depth four-fifths of the exposure is ore and one-fifth Ocrans clay, carrying much wash ore. Four miles west, the Russel Shaft passes through a thick deposit of this same ore. There was no means of descending into this shaft, but from the entrance I could see a thickness of from twelve feet to fifteen feet of ore. Masses of ore show on surface for 150 yards along crest of hill to an outcrop where over five feet of solid ore projects above surface. Several outcrops of the same ore were visited by me between the Russell Shaft and the Gap. I am convinced from the appearance of the ore that it will yield over fifty per cent. in the blast furnace, and its good quality is shown by analyses made on the same ores collected by me along this range to the east of the Gap. A railway extending along the Poor Valley, either to the east or west from the Gap, will have the brown ores on the one side and the red ores on the other parallel to the line, and nowhere over a quarter of a mile distant, and usually outcropping 100 feet above line of road, and most favorably situated for cheap mining.

The following ideal section will show the usual occurrence of these ores along a line of 100 miles in length—



The soft shales have decomposed above drainage, and much of the ore can be "stripped" and uncovered by ploughs and scrapers at small cost; and, as there are gaps in the ridges about every quarter mile, the ore can be mined on the incline and delivered to the cars at a very low price per ton.

One member of the sub-carbonate limestone is a thick limestone, easily quarried, and carrying over ninety-eight per cent. carbonate of lime.

THREE TOWN SITE LANDS.

I know of three important points for towns secured by your Company: Cumberland River above Pineville; Yellow Creek Valley (Middlesborough); and south side of Cumberland Gap (Dilwyn Springs). I believe all these will become places of some

importance, but I regard the Yellow Creek Valley as the place for an important city, for the following reasons :

Here is a level fertile valley of about 6,000 acres, surrounded with magnificent mountains, covered with most valuable timber, and containing stores of coal. Because of the peculiar features of the topography, this must become an important railway centre. The Great Pine Mountain to the north is an unbroken barrier for one hundred miles, save at three points : where the Big Sandy River cuts through at " The Breaks " on the east ; the Cumberland at the Great Water Gap at Pineville ; the Clear Fork of the Cumberland at the Narrows, near Jellico. Easy routes for railways from the waters of the Kentucky can be had by the several streams of Straight Creek, Left Fork of Straight and others, and from the northwest by Cumberland River. A road passing through " The Narrows " can find an easy grade up Clear Fork, and through a low gap at head of that stream into the valley of Little Yellow Creek to Cumberland Gap. The gap between head of Poor Fork of Cumberland and Pound Fork of Big Sandy is only 50 feet above water on either side, and a railway coming through " The Breaks " from the north will find a straight low grade line to Cumberland Gap. After passing through the Gap, good lines of road can be had to the northeast and southwest along the Poor Valley. Such a line will pass through the coals of Cumberland Valley, and along continuous outcrops of iron ores. Your Company is in possession of the surveys south to Knoxville and to Morristown, making at the former place direct connections with Chattanooga and the railway system of the South, and the direct lines now building into North Carolina and Georgia from Knoxville, and at Morristown with the entire Richmond and Danville System of Roads. In years past Cumberland Gap was the great gateway through which the hogs, horses, mules and horned cattle were driven from Kentucky to the southern markets, and through it passed the stage line carrying passengers between Cincinnati and Charleston, South Carolina. This great traffic was diverted by the construction of railways, but the construction of a railway through the Gap will place it again on the direct line connecting the great Northwest with the South Atlantic States.

In addition to the roads now under construction, roads are projected from Central Kentucky to Cumberland Gap ; a road has been placed under contract, I am informed, from a point on the Cincinnati Southern, near the State Line to Jellico. This will be extended to give the Cincinnati Southern System a shorter Eastern connection, and to furnish that road—what it so much needs—a good coking coal.

If the Virginia Western, in addition to the Norfolk and Western Road, can occupy the Poor Valley line to a connection with the Knoxville, Cumberland Gap and Louisville Road at Cumberland Gap, and with the Cincinnati Southern, through the Gap, it becomes at once a great road, giving the Knoxville, Cumberland Gap and Louisville Railroad and the Cincinnati Southern Railroad Eastern connections to the seaboard, and also with the Baltimore and Ohio System. This road will probably be enabled to build its line.

A road called the Virginia, Kentucky and Tennessee is being projected from a connection with the Baltimore and Ohio and Pennsylvania Railroad through West Valley and down the Cumberland Valley, to a connection with the Cincinnati Southern. I understand that strong parties are interested in the construction of this road. The route is practicable, and it is one of the probabilities of the future that

such a line will be built. Parties are now asking for a charter for the construction of a road from Cairo, through the southern tier of counties in Kentucky to Cumberland Gap. This would make a direct line to St. Louis. But whether any of the above projected lines are completed or not, the certain early completion of the Cumberland Valley extension of the Louisville and Nashville will give direct connection with a through line under one management to Louisville, Cincinnati and St. Louis, and connection with all the cities of the North and West.

The Yellow Creek Valley, where you propose to locate your principal manufacturing and commercial city of Middlesborough, is a valley of great beauty. Whether seen in the spring and early summer, when decked with the abundant bloom of the rhododendron, the kalmia, the azalia, and the cucumber magnolias; or in the autumn, when the mountains, from base to crest, are glorious in scarlet and gold; or in the winter, when the snows bring in relief the beautiful topography of vale and hill—this valley is a place of surpassing beauties. The clear streams of freestone waters, head high in the mountains, and by inexpensive dams any required pressure may be obtained, and by the expenditure of a small amount, Yellow Creek will afford ample drainage for any sized city you may build. Thus your location for a city combines: a most beautiful valley of fertile land; grand mountain scenery; a point of great importance as a future railway centre; the certainty of being located upon great through lines running north and south, and east and west; and lastly, a combination of coals, iron ores, limestones, clays, fine building stones, timbers in great abundance, immediately contiguous.

Taking it for granted that your Company is already sufficiently advised respecting the best policy to be pursued in the development to the best advantage of the magnificent domain of which you have become possessed, I will not obtrude any suggestions of my own on that subject. Nature has provided most bountifully, and an intelligent taking advantage of your favorable location and abundant resources must result in a wonderful development in this Cumberland Valley.

Very truly yours,

JOHN R. PROCTOR,
Director Kentucky Geological Survey.

ANALYSES OF SOME OF THE MINERALS FOUND ON THE COMPANY'S PROPERTY, AND ALONG ITS LINES OF RAILROAD.

Manganese Ores.

	Silica.	Metallic Mang.	Iron.
Madison County,	6.04	52.	9.
Cherokee County,	1.470	54.445	.825
Cocke County,	...	50.64	4.98

Specular Iron Ore.

	Metallic Iron.	Sulphur.	Phosphorus.	Silica.
Knox County, Tenn.	63.67	trace	.023	...
Knox County, "	66.35	trace	.029	...
Cherokee County, N. C.	69.18	trace	.057	1.53
Cocke County, Tenn.	51.95	trace	.034	11.00
Madison County, N. C.	57.	...	.005	16.00
Madison County, "	64.87	trace	trace	3.37
Madison County, 1st, N. C.	67.32	.39	...	3.40
Madison County, 2d, "	63.50	.15	trace	3.70
Madison County, 3d, "	64.90	.23	trace	4.00
Madison County, 4th, "	66.08	.01	.013	1.40
Greene County, Tenn.	68.37	.19	.097	1.68

Magnetic Iron Ore.

Tennessee.	Metallic Iron.	Phosphorus.	Silica.
Greene County,	68.37	.097	1.68
North Carolina.			
Madison County,	66.08	.013	1.40
Haywood County,	64.87	trace	3.37
Swain County,	67.32	trace	3.40
Mitchell County,	63.50	trace	3.70
Cherokee County,	64.90	trace	4.00
Cranberry,	66.22	trace	5.74

Comparative Analyses of Iron Ores.

Michigan.	Metallic Iron.	Phosphorus.	Silica.
Republic Mine,	68.48	.053	2.07
Champion Mine,	67.	.03	3.
Superior Mine,	64.831	.095	3.600
Menominee Mine,	60.470	.013	6.860

	Metallic Iron.	Phosphorus.	Silica.
MINNESOTA.			
Vermilion Lake, ...	67.180	.050	2.150
MISSOURI.			
Iron Mountain, ...	65.610	.033	3.750
Pilot Knob, ...	59.150	.015	13.270
PENNSYLVANIA.			
Cornwall Ore, ...	59.229	.032	11.082
NEW YORK.			
Chateaugay, ...	49.750	.025	20.890
Sterling, ...	64.24	.184	7.45
Columbia, ...	51.160	.029	9.200
ALABAMA.	47.83	.147	13.00
KENTUCKY.			
Bath County, ...	48.	.70	8.180

RED FOSSIL ORE.

	Iron.	Phosphorus.	Sulphur.	Silica.
Lee County, Va. . . .) Claiborne County, Tenn. } . . .	50.33	.042	.273	10.25
Campbell County, ")				

Average of eight openings.

ORISKANY ORE.

	Iron.	Phosphorus.	Sulphur.	Silica.
Lee County, Va. . . .) Claiborne County, Tenn. } . . .	55.82	.066	.121	6.12
Campbell County, ")				

Average of six openings.

The analyses of fire-clay, zinc, metallic paints, can be seen in the Company's offices upon application.

Specimens of all minerals and timbers, and photographs of the Company's properties are on exhibition in Knoxville, at Cumberland Gap, and in Manchester and London, England.

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CUTS REPRODUCED FROM PHOTOGRAPHS OF LATELY EXPOSED COAL SEAMS ON COMPANY'S PROPERTY.

A. Dishman, on Shade's Branch, Fork Creek.
B. Morrison No. 1, Head of Langley Hollow.
C. Buckeye Lick, No. 1.
D. " " No. 2.
E. Jack Turner, in Branch Stony Fork.
F. H. S. Parton, Big Clear Creek.
G. Grose Vein, Williams' Branch.
H. J. M. Robbins.
I. Fieling Green, Williams' Branch.
J. Morrison No. 2, on Mingo Mountain.
K. Carrol, Burril Waters.
L. Little Coal Gap No. 2, side of Mingo.
M. Gibson No. 1, up Sugan, on side Mt. Brison.
N. Turner and Colson, Bean's Spur.
O. Mosely Spur.
P. Burns, Left Fort, Bean's Branch.
Q. Red Paine's, in Slip.
R. Devil's Backbone, Bean's Spur, under cliff.
S. Cris. Turner & Sons.
T. " " "
U. Slick Rock Branch.
V. Right Hand Fort, Bean's Branch.
W. James Evans, Clear Creek.

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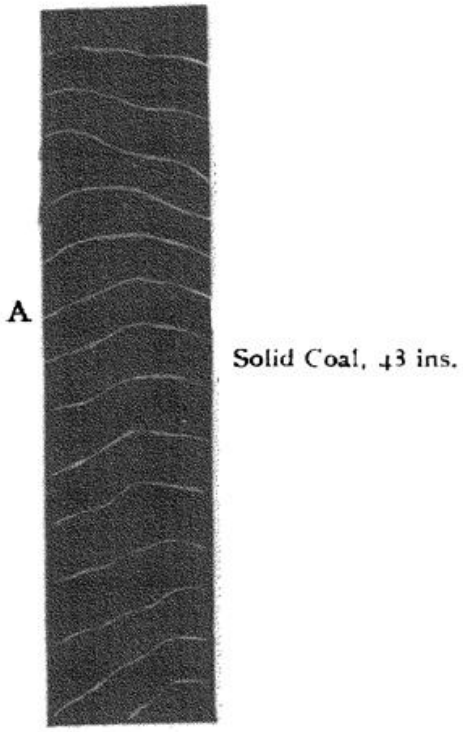
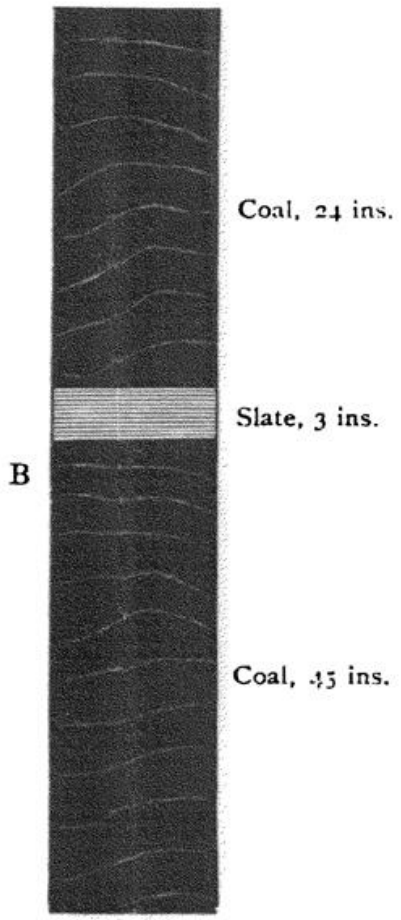
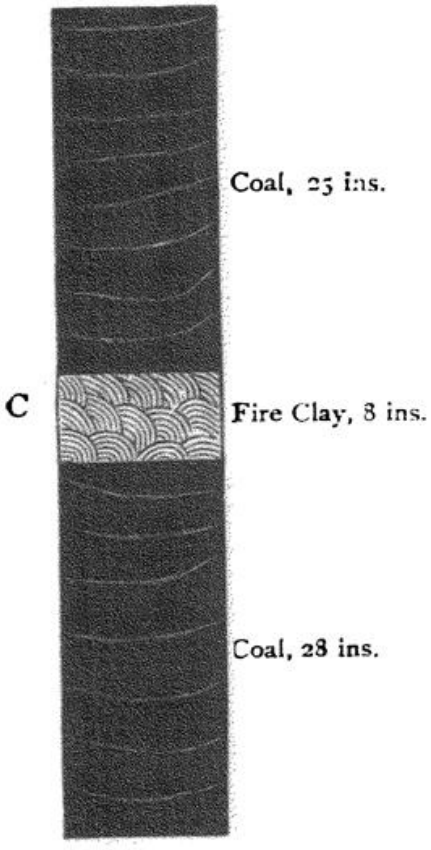
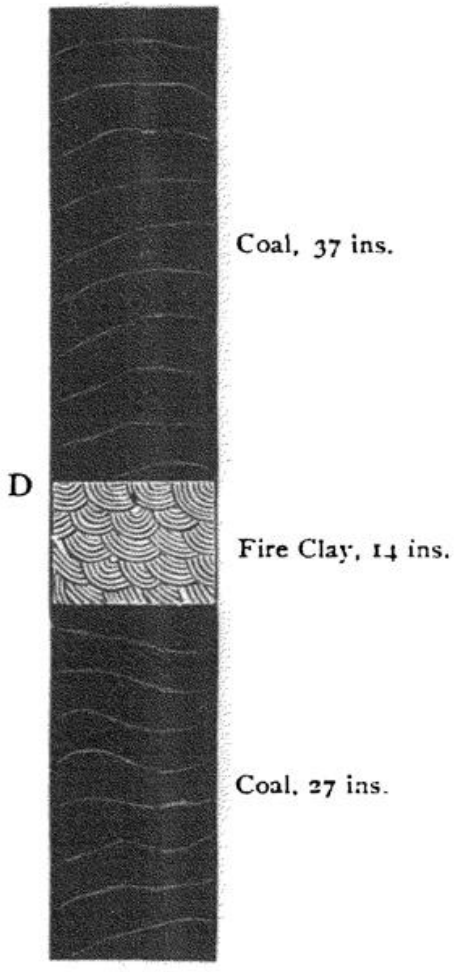
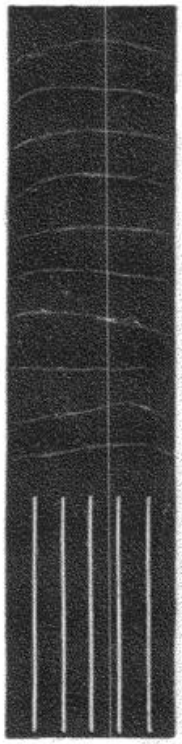

A
Solid Coal, 43 ins.


Coal, 24 ins.
Slate, 3 ins.
B
Coal, 45 ins.


Coal, 25 ins.
C
Fire Clay, 8 ins.
Coal, 28 ins.


Coal, 37 ins.
D
Fire Clay, 14 ins.
Coal, 27 ins.

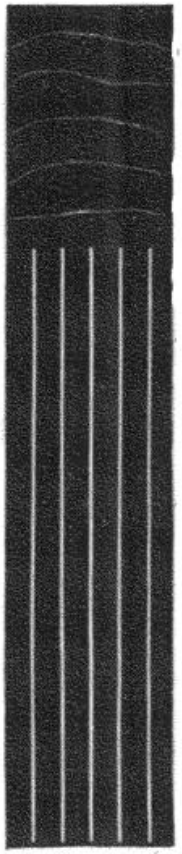
E



Coal, 36 ins.

Cannel Coal, 18 ins.

F



Coal, 16 ins.

Cannel Coal, 44 ins

G

Coal, 30 ins.

Mother Coal, 1 in.

Coal, 37 ins.

H

Coal, 36 ins.

Slate, 3 ins.

Coal, 29 ins.

I

Coal, 14 ins.

Fire Clay, ½ in.

Coal, 31 ins.

Fire Clay, 18 ins.

Coal, 17 ins.

J

Coal, 44 ins.

Mother Coal, 1 in.

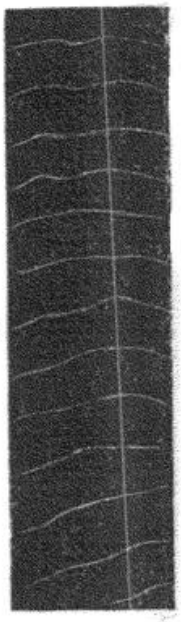
Coal, 18 ins.

K

Coal, 42 ins.

Fire Clay, 6 ins.

Coal, 20 ins.



L

Solid Coal, 42 ins.

M

Solid Coal, 64 ins.

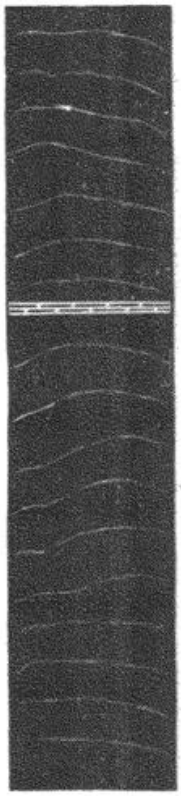
O

Coal, 20 ins.

Sandstone, 20 ins.

Coal, 34 ins.

N



Coal, 16 ins.

Mother Coal, 1 in.

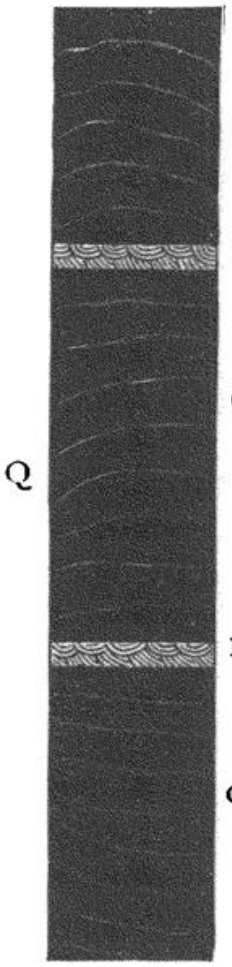
Coal, 36 ins.

P

Coal, 12 ins.

Fire Clay, 7 ins.

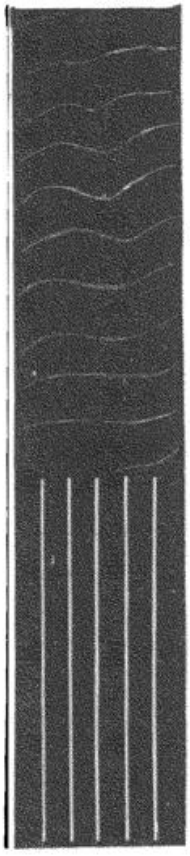
Coal, 36 ins.


Coal, 12 ins.
Fire Clay, 3 in.
Coal, 21 ins.
Fire Clay, 3 ins.
Coal, 13 ins.

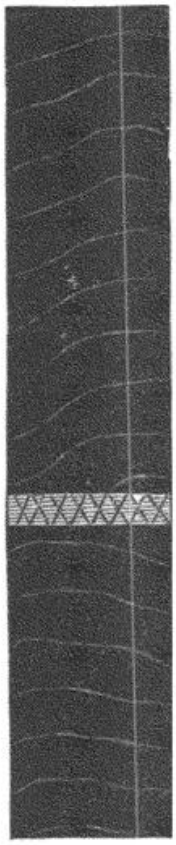
Q


Coal, 26 ins.
Fire Clay, 3 ins.
Coal, 36 ins.

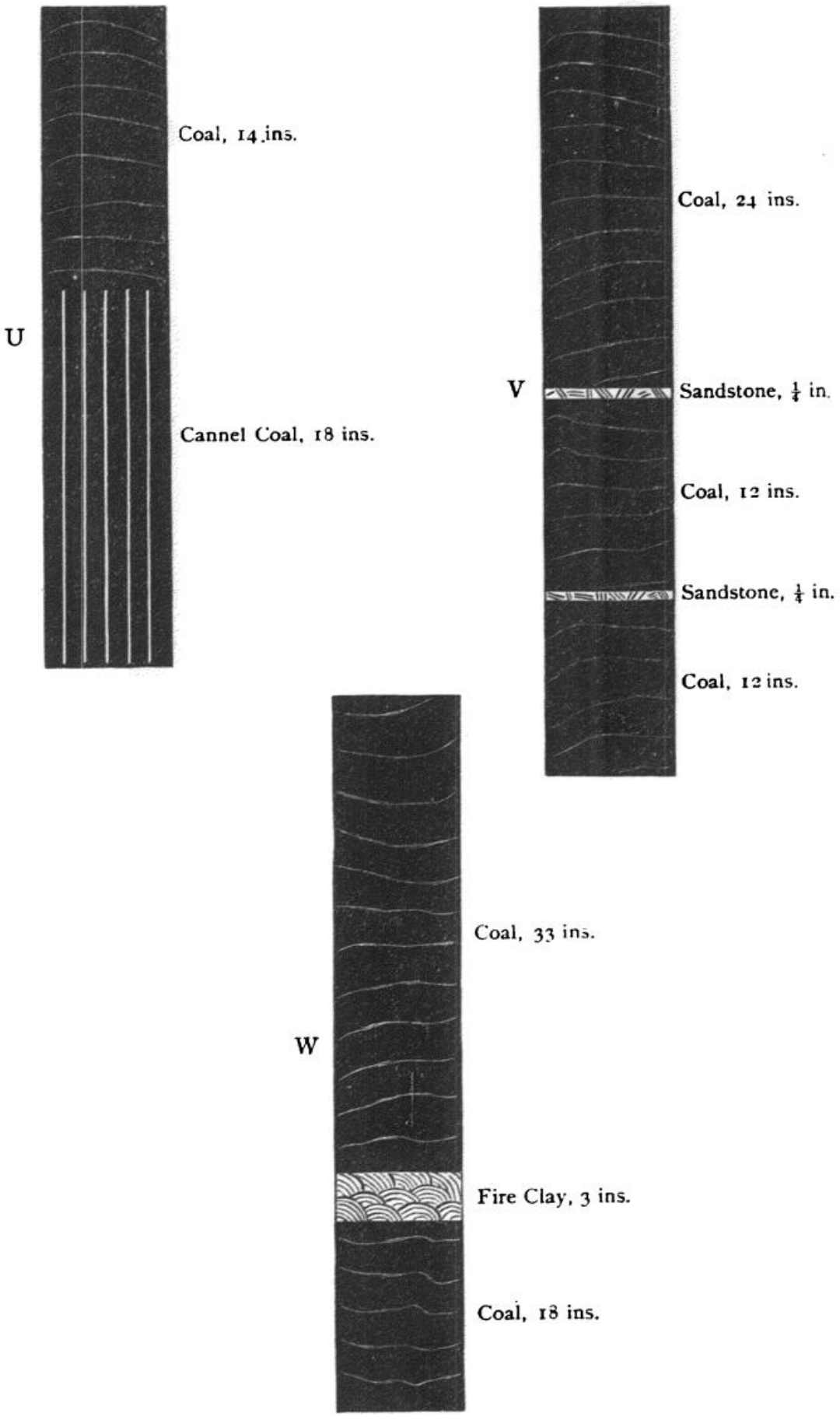
R


Coal, 16 ins.
Cannel Coal, 12 ins.

S


Coal, 37 ins.
Clay, 2 ins.
Coal, 7 ins.

T


U
Coal, 14 ins.
Cannel Coal, 18 ins.
V
Coal, 24 ins.
Sandstone, ¼ in.
Coal, 12 ins.
Sandstone, ¼ in.
Coal, 12 ins.
W
Coal, 33 ins.
Fire Clay, 3 ins.
Coal, 18 ins.

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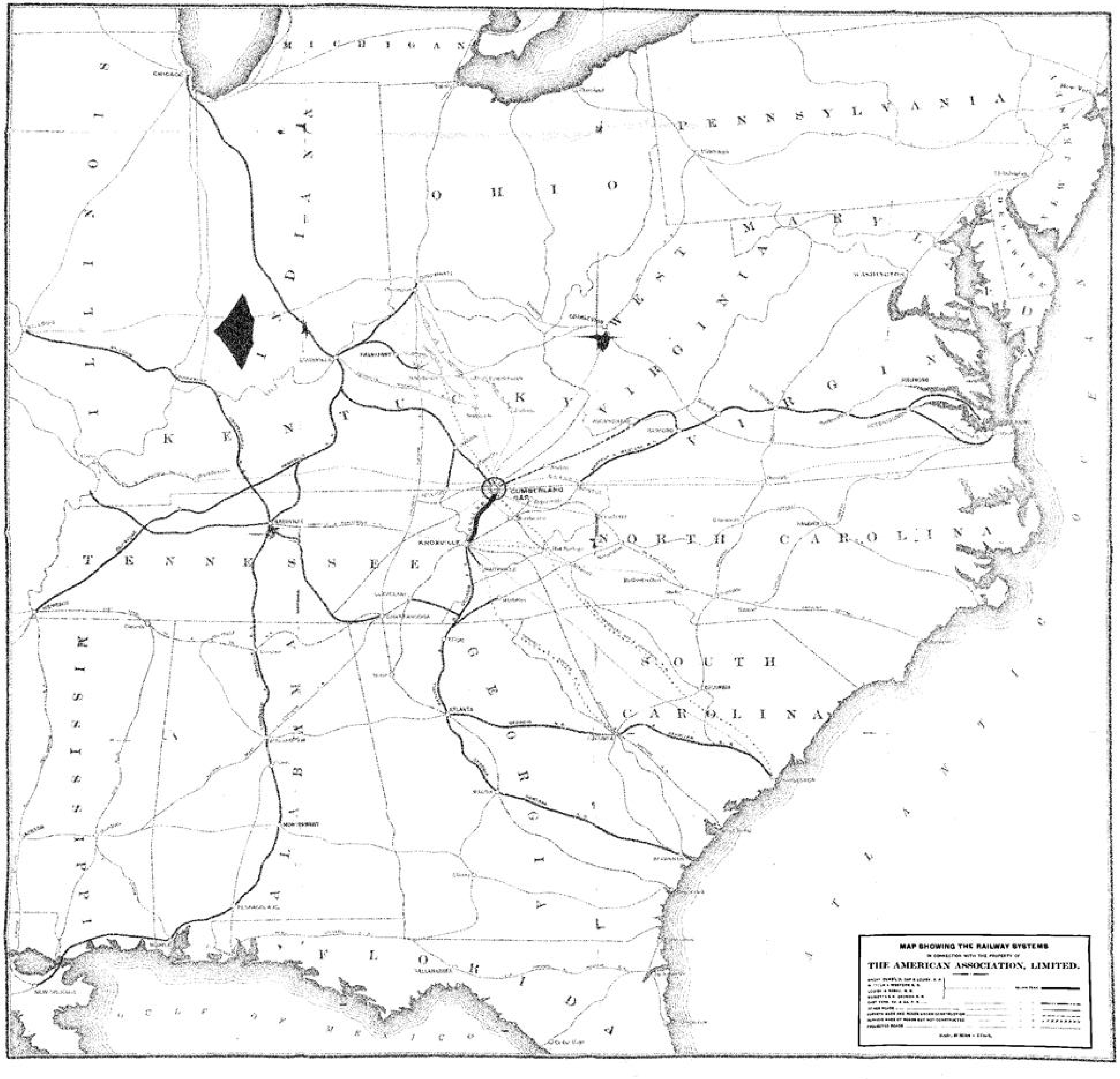
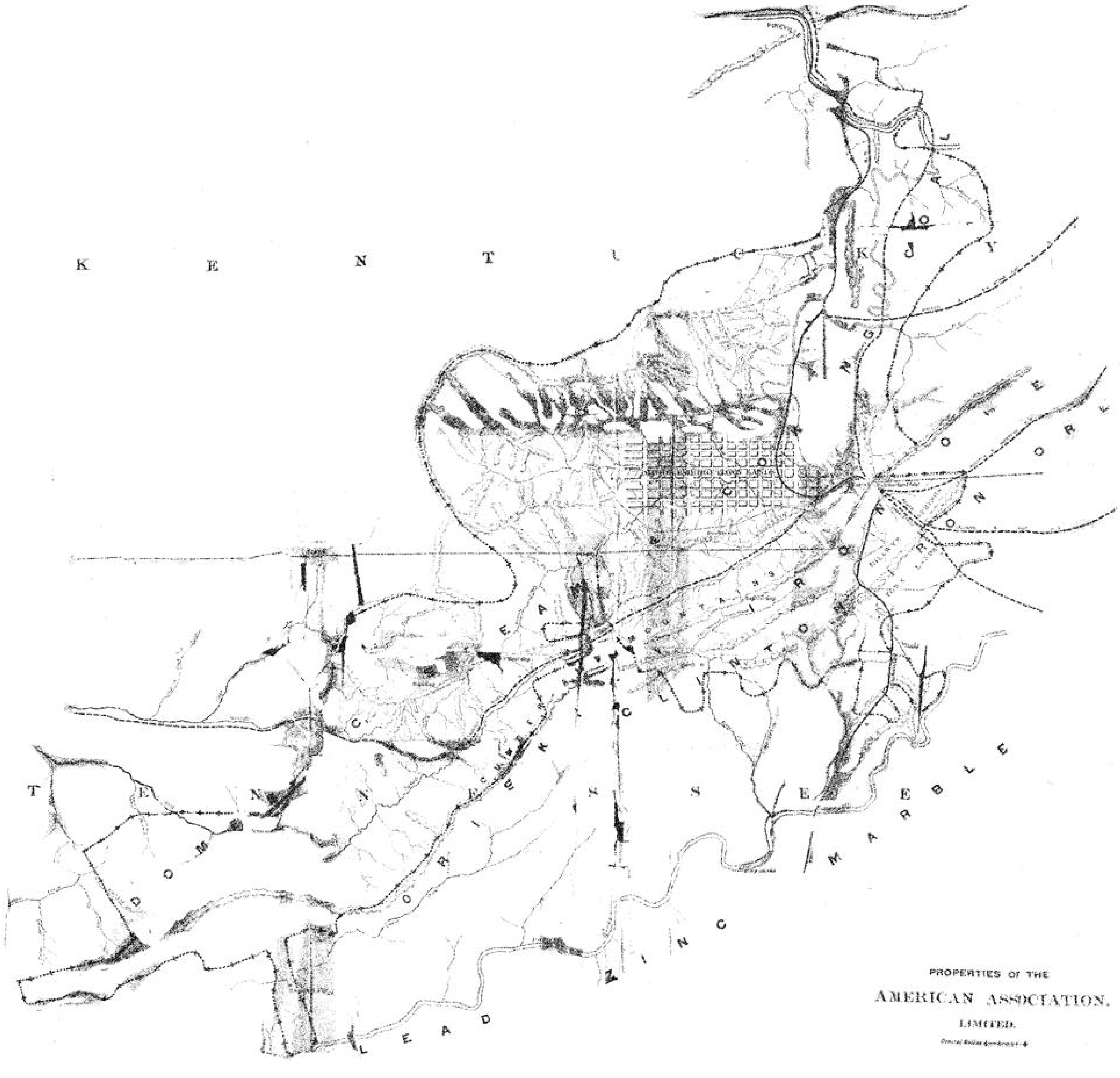

MAP SHOWING THE RAILWAY SYSTEMS
IN CONNECTION WITH THE PROPERTY OF
THE AMERICAN ASSOCIATION, LIMITED.
MICHIGAN
PENNSYLVANIA
OHIO
INDIANA
ILLINOIS
MARYLAND
WEST VIRGINIA
VIRGINIA
KENTUCKY
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
FLORIDA
GULF OF MEXICO
ATLANTIC OCEAN
CHICAGO
CUMBERLAND GAP
KNOXVILLE
ATLANTA
MONTGOMERY
NEW ORLEANS



PROPERTIES OF THE
AMERICAN ASSOCIATION,
LIMITED.