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WEST VIRGINIA, KENTUCKY, AND TENNESSEE.

THE GREAT COAL, IRON AND TIMBER REGION OF AMERICA.

FROM GEOLOGICAL REPORT ON VIRGINIA,

BY

PROF. WM. B. ROGERS—1836.

THAT enormous area of nearly horizontal strata, which we have designated as the fifth great geological subdivision of Virginia, * * * the large territory lying between the western limits of the State and an irregular line of mountain ranges * * * nearly coinciding with the eastern front ridge of the Alleghany, the Greenbrier, and the Great Flat Top Mountain. * * * No section * * * holds out richer promise of valuable practical results. * * * By far the greater portion, if not all, of its strata belong to a group of formations distinguished not only in America but throughout the world as being the chief depositories of bituminous coal. * * *

The western section of Virginia is characterized throughout by geographical features of great simplicity. The surface of the region is undulating, and, towards its southeastern limit, mountainous; but the loftiest hills rise in gently swelling outlines, and no very prominent peaks tower in acute and rugged lines to denote that the strata have been subjected to violent convulsions and upheaving forces. Everything bespeaks it to have been at a time an expanded plain, gently tilted from the horizontal position, so that the surface, and the rocks beneath, decline into a slight but very uniform depression, very generally towards the northwest, to the valley of the Ohio.

The form, direction and character of both hills and valleys give evidence that its inequalities of surface were caused by the furrowing action of a mighty and devastating rush of waters, which, by a rapid drainage, scooped out enormous valleys and basins in the upper strata, the remnants of which are consequently traceable across the widest valley, from hill to hill, holding the same elevation, thickness and inclination to the horizon. It is from the deep excavation of the strata by natural causes, combined with the other important circumstances of a nearly horizontal position, that we are to draw an estimate of the prodigious resources of a mineral kind possessed by the region before us. Whatever valuable materials lie included in the strata of the district, coal, salt, limestone, or iron ore, the horizontal position alluded to keeps them near the surface, or at an accessible depth, over enormously wide spaces of country; while the trough-like structure of the valleys, and their great depth, exposes the edges of many of these deposits to the day, under positions in which mining is the easiest possible, and with an extent of development not less accommodating to the researches of the scientific geologist than bountiful to the wants of the community. * * *

It is in these widely spreading strata of sandstone that nearly all the boundless treasures of this country are enclosed, and the continuous character exhibited by them give the strongest possible assurance of a like uninterrupted extension of the various beds of valuable materials which they include. In this view, how magnificent is the picture of the resources of this region, and how exhilarating the contemplation of the happy influences upon the enterprise, wealth and intellectual improvement of its inhabitants, which are rapidly to follow the successful development of its inexhaustible mineral possessions. In this country, where the channels of nearly all the principal rivers have been scooped out in part through beds of coal, where some of them are paved with the richest ores of iron, and where the very rock itself, the sterile sandstone of the cliffs and mountains, is enriched at certain depths with abundant stores of salt, what more is needed to fulfill the happy and glorious destinies

that await it than to awaken enterprise to a due appreciation of the golden promises it holds out, and to direct industrious and active research to the thorough investigation of the character, position and uses of the treasures it contains?

DADDOW & BANNAN,
COAL, IRON AND OIL.

(P. 338.) West Virginia contains a larger portion of the Alleghany coal field than any of the States enumerated through which it extends. Over 16,000 square miles of this great coal field lie in Western and Eastern Virginia; of this area, however, only a few miles exist in old Virginia, on the eastern edge of the field, in the southwest—perhaps less than 150 square miles—of available coal. But the best and most available portion of the Alleghany coal field lies in West Virginia. * * *

In no other portion of our country, North or South, are there more inviting prospects to labor, enterprise and capital than is now presented in the Great Kanawha Valley. * * *

(P. 339.) The coals of the great Kanawha Region are of various constituencies, and are adaptable to all the requirements of the trades and manufactures. The hard and coking, with the fat and gaseous bituminous, the variable splint, and the rich and oily cannel, are all found in the same mountain, and are all accessible to the miner * * * through the agencies of the eroding waters, which have exposed coal in a thousand places. The avenues to markets afford the cheapest and most available transportation on navigable rivers; while the markets themselves are unlimited in extent, and rapidly increasing their consumption. * * *

(P. 340.) This is, therefore, the natural mining and manufacturing centre, not only of West Virginia, but of the Great Alleghany Coal Field; and had the Virginians any share of free enterprise and energy, Charleston would long ago have been a formidable rival

to Pittsburg. * * * Looking to the natural results of location and availability, now that this magnificent region is open to free labor and a corresponding development, we may anticipate for Charleston the dignity of being the metropolis of the mining and manufacturing interests of the West. * * *

The coals of this region generally, are better, purer, and more available for all the requirements of trade and manufacture than the coals of any other portion of the Alleghany coal field. The seams of coal are more numerous, and their thickness greater than in any other portion of this coal field; it can be mined cheaper, and with more economy generally * * * than in any other region in this country, without exception. * * * Charleston is 200 miles nearer to Cincinnati than Pittsburg, and always open to navigation, while the Ohio to Pittsburg is frequently closed by ice in the winter and interrupted by low water in the summer * * * The geological reports on the coals of West Virginia make the number of workable seams to be 13; but 14 have been developed on the dividing (p. 341) ridge between the waters of the Great Kanawha, on a line with Lewis' creek, and in all probability these are all below the Pittsburg seam. * * * The number of workable seams are greater than those found within the same measures in Pennsylvania. * * *

The seams which we give in the following table exist, we have reason to believe, under the Pittsburg seam, and do not, therefore, represent all the productive coal measures of West Virginia. There are still several seams found in the higher grounds back from the river. * * *

A short distance above the conglomerate a small seam exists, not considered workable. But about fifty feet from the conglomerate a variable seam is found, ranging from five to ten feet in thickness. This coal, in all probability, lies below the level of Lewis' creek, at the forks, and is not found above water level. Above this exists the large seam of iron ore, to be noticed further on. The third seam of coal appears to be small, but varies from two to four feet. The fourth is a cannel coal of about four feet, but varies from three to

six feet. The fifth seam is a (p. 342) hard bituminous, ranging from two to four feet in thickness. The sixth is likewise bituminous, but not generally over three or four feet thick, and is sometimes smaller. The seventh seam, sometimes cannel coal, ranges from three to five feet thick. The eighth and ninth are hard bituminous seams, from thirty inches to four feet thick. The tenth seam is generally large, ranging from seven to ten feet, but is divided by fire clay, which, sometimes, in practical effect, makes two workable seams of the one. The eleventh is a fine cannel seam, known as the "Peytona" cannel, five to six feet thick. The twelfth, thirteenth and fourteenth are not opened or developed, but, from appearances, are known to be seams of good workable dimensions, and one of them is supposed to be cannel. * * *

IRON ORES.

(P. 343). This region is a *terra incognita* to the iron masters. Two prominent seams of iron ore exist—one as shown by figure 124, on its proper geological level over B, as found and worked at Johnstown (p. 344), Cambria County, Pennsylvania. * * * In some places it is rich and productive, while in others it is lean and worthless. Here, however, it appears at the surface as a brown oxide of great richness, yielding 60 per cent. of metal in the furnace; but the bed is naturally a calcareous ore, when not oxidized, yielding here from 40 to 45 per cent. of metallic iron. Its size is from 3 to 4 feet when in its best condition, accompanied, however, by leaner shales or argillaceous ores. The second seam of ore is generally argillaceous and not very rich. * * * * (p. 348). Under such circumstances, the Great Kanawha Valley assumes an importance not hitherto noticed or discussed since the days of Washington, who first called attention to this subject and projected and predicted what the present writer now only reiterates.

* * * By far the greatest quantity of the coal used by the western steamers, and in the cities on the (p. 349) Ohio, is mined in Pennsylvania, though the coals of West Virginia are more accessible and may be supplied with more economy. * * *

The Great Kanawha Valley is not only a great natural mining and manufacturing region, but one that may enjoy the greatest trade that ever flowed from the mountains or the inland plains and valleys to the sea. The coal, iron, oil and salt of this region are inexhaustible, and may be produced with the minimum of labor and expense, and, consequently, the maximum of profits. We have long beheld the vast mineral resources of this part of the Great Alleghany Coal Field with professional admiration, and have frequently called attention to their value. If we now *seem* partial to West Virginia, we can *prove* that our affections have always turned towards her unlimited stores of coal and iron with an ardent desire to be able to pronounce the "open sesame" which should expose her treasures to the world.

THE ALLEGHANY COAL FIELD IN KENTUCKY.

(P. 350.) * * * The coal area occupies all or part of twenty counties in Eastern Kentucky, and embraces an extent of 10,000 square miles. The western margin of the field enters Kentucky near Portsmouth, on the Ohio, and leaves it near Monticello, a short distance below, and east of which it crosses into Tennessee, the general course being southwest.

The Big Sandy is navigable through Eastern Kentucky, a distance of 100 miles, when the streams are high, and the coal is found either below or above water-level the whole distance. Below, and in the vicinity of Louisa, at the confluence of the Tug Fork of Big Sandy, most of the coal lies below the bed of the river; but farther up it commences to rise above the river, and the seams of coal which may lie one hundred feet deep at Louisa, are five hundred feet above the river at the Russell Fork.

The dip is therefore general and gradual from the east to the west until the Ohio is reached, and from thence it is reversed, and from the west to the east. (p. 351) * * * The evidence of regularity and uniformity in the coal seams of this field is too great to be doubted.

Our exploration of this portion is too limited to enable us to locate the iron ores and limestones which accompany the principal seams, but an investigation left no doubt on our mind that they existed "in place," and in order on the same geological horizon with the measures of Virginia and Pennsylvania. * * *

THE ALLEGHANY COAL FIELD IN TENNESSEE.

* * * The coal measures are confined to a narrow boundary and occupy the high mountain plateaus which terminate abruptly on the east, above the escarpments of the huge Cumberland Mountains—a continuation of the Alleghanies—and are cut off with almost equal abruptness by erosion to the west. * * * The coal area of Tennessee is about 3,700 square miles. * * *

THE COAL MEASURES OF OHIO.

(P. 359.) The coal measures of Ohio, lying immediately west of the Ohio river, contain the same coal seams which the corresponding measures contain on the opposite side in Pennsylvania, West Virginia and Kentucky. * * *

EXTRACTS FROM REPORT OF MAJ. A. H. CAMPBELL, C. E., OF CHARLESTON, W. VA., AGENT OF THE BOARD OF PUBLIC WORKS IN CHARGE OF THE SURVEYS LOOKING TO STATE INTERNAL IMPROVEMENTS, UPON THE COUNTRY FROM THE KANAWHA RIVER TO THE PENNSYLVANIA STATE LINE.

The Northern and Southern West Virginia Railroad is projected through a region where coal may be said to abound throughout its entire length. * * * There is scarcely a mile where coal seams of workable thickness may not be found more or less closely adjacent to the line, and of greater variety, perhaps, than can be found on any other route within the limits of the State, or any other State. Along the Monongahela river we have the Pittsburg coals; along its west fork, in Marion and Harrison and Lewis Counties, we have the cele-

brated gas coals, and on the Elk river we have bituminous, splint and cannel coal. * * *

The first notable seam of coal on the line of the road (north of the Kanawha river) is a bituminous one, 30 inches thick, near grade, and seven miles from Charleston. One mile further up, about Cooper's creek, on both sides of the river, are three workable seams. The upper one is the "Peacock" seam, $2\frac{1}{2}$ feet thick, and 35 feet above grade; 18 feet below it is a good 6 feet seam, and 12 feet below this is a 4 feet seam of very good splint coal, with indications of a change to cannel. These veins alternately crop out as far as Little Sandy creek, ten miles. * * *

On Falling Rock creek, eighteen miles from Charleston, is found, perhaps, the finest quality of cannel coal in the world.

Cannel coal is found on Blue creek, 13 miles, and * * doubtless connects the Mill creek cannel, 9 miles, with the Falling Rock vein.

From Big Sandy, 21 miles, to O'Brien's creek, 74 miles, coal is rarely out of sight. The seams which have been prospected along the Elk for this distance, are numerous; the principal of them are as follows, though many more have been discovered since I visited the line. Excellent bituminous coal, in workable thickness, crops out above Big Sandy, 21 miles, a few feet above grade. At the foot of Queen shoals, $24\frac{1}{2}$ miles, the Snyder vein, about 4 feet 6 inches thick, an excellent bituminous coal, is opened. * * *

The "Stockton vein" (Cannelton, on Kanawha) crops out at the river's edge, at the head of Queen shoals, 25 miles. This seam is 7 feet thick, and underlies the Black Flint ledge, which is the dividing line between the upper and lower measures of the Kanawha coal fields.

A small vein of splint coal, a half mile above the latter, crops out 30 feet above grade.

A short distance up Barren creek, 27 miles, there is said to be a fair seam of cannel coal. * * Cannel coal is also reported on the opposite side of the river, near this point; *also iron ore.*

At Porter's creek, 28 miles, on both sides of the river, under and above the Black Flint, are several seams of good coal.

The "Snyder" vein, 20 feet above grade, is 4 feet thick at this point.

The Black Flint coal seam is 6 feet thick, and 5 feet below grade.

Cannel and bituminous coal abound up Porter's creek. Veins of good coal are found at Masten's, 33 miles; at Samples, 35 miles, and at Big Laurel creek, 37 miles.

Splint and bituminous coal seams, 6 feet and 5 feet, have recently been opened, I am informed, at this point, on each side of the river.

At Lower Birch Run, 39 miles, there is a vein of coal outcropping on the south side, about 40 feet above the river, which is said to be 6 feet thick. It is probably the vein above mentioned, opposite Big Laurel. * * *

At Big and Little Sycamore creeks, 40 miles, on both sides of the river, and in the mountains which form the peninsula called "Jack's Bend," there is a fine seam of coal, 7 feet thick.

At Pierson's, 44 miles, near the line of the railroad, there is a fine $5\frac{1}{2}$ foot seam. * * * From this point to Clay Court House, 52 miles, coal seams are found on both sides of the river, at the two Philadelphia creeks; at Little and Big Beechy creeks; at Salisbury's, $48\frac{1}{2}$ miles, it is 8 feet thick, and good splint; at Camp creek, 50 miles, the "Twin Splint" vein, as it is called, is 11 feet thick, and on the opposite side of the river it is 12 feet thick; at Pisgah creek, on both sides, it measures 11 feet; one mile below Clay Court House it measures the same, and is about 30 feet above grade. * * * At Clay Court House it measures 11 feet, and is about 40 feet above grade; and about 40 feet above this coal the cannel shale seam, $2\frac{1}{2}$ feet thick and rich in oil, crops out.

Coal crops out on both sides of the river from Clay Court House to O'Brien's creek, 72 miles, at the following places, viz.:

Buffalo Creek, - - - -	53 miles,	- - -	11 feet thick.
Wild Goose Island Shoals, -	55 "	- - -	11 " "
Big Spread Shoals, - - -	58 "		
Standing Rock Shoals, - -	61 "		
Grove's Mill, - - - -	71 "		above and below water.
O'Brien's Creek, - - - -	72 "		8 feet, Dry Splint, Semi-Cannel.

This I regard as one of the finest coals found in the whole West Virginia Coal Field.

A short distance below Duck creek, $74\frac{3}{4}$ miles, these veins have been opened and show 8 feet of similar coal.

There are many outcrops and prospectings intermediate to the above localities, which have been opened and examined since I visited the upper portion of the line, but there has been no regular examination made, except of the region lying on the south side of the river, between Lower Birch Run, 39 miles, to Grove's Creek, $71\frac{1}{2}$ miles. Many private inspections have been made which have not been made public. From Big Sandy, 21 miles, to O'Brien's creek, 72 miles, on both sides of the Elk, the adjacent lands cover from 3 to 7 veins of coal, varying in thickness from 2 to 12 feet, all having their outcrop near to the grade of the railroad and the water level, affording easy access for shipment.

IRON ORE.

In my report to the Board of Public Works on Preliminary Surveys, &c., 1872, I made the following remarks on the iron ores along the projected route of the N. and S. W. Va. Railroad :

“ This ore is said to be abundant throughout the entire route of the survey. It is to be seen scattered more or less over the whole country, but I believe it has been rarely found in sufficiently large quantities to make it profitable to mine, or to collect it under present circumstances. I am satisfied, however, that much of this valuable ore does exist, and when roads and railroads and other improvements are made throughout the land, it will be profitable to have it collected and concentrated upon the line of railroad for shipment. Very many beds of it, in some of its varieties, are said to exist on Cedar creek and its tributaries. Indications of iron ore are met with everywhere ; the shoals of Elk contain large quantities of it.”

Since that date many private examinations have been made on Elk river, in reference to iron ores, and the results have been most satisfactory. * * *

The sample of pig iron I sent you is from the furnace at Strange creek, Braxton County, and is claimed as equal, if not superior, to the best charcoal car wheel iron of Hanging Rock, on the Ohio river, and the specimen sent will speak more for the capabilities of Elk than a volume written. The ore from which this iron is made is very abundant; it is a rich oxide of iron, and develops three feet thickness. * * *

SALT.

Salt water, of superior quality, is found abundantly on Elk and Little Kanawha rivers, in Braxton County, and the salt manufactured * * is of excellent quality, in every respect equal to the Kanawha salt. * * * *

TIMBER.

It is almost superfluous to state anything concerning the timber of West Virginia, which is, *par excellence*, the Forest State. The growth along the route of the railroad in Kanawha, Clay, Braxton and Lewis, and, I may add, Harrison, Counties, is of all kinds indigenous to the latitude, consisting of *Oak*, white, red, black and chestnut; *Hickory*, black and white; *Walnut*, black and white; *Poplar*, white and yellow; *Ash*, *Chestnut*, *Wild Cherry*, *Maple* and *Beech*, with occasional groves of *Hemlock*. And there are other varieties, such as *Buckeye*, *Linden*, *Cucumber*, *Dogwood*, and black and sweet *Gum*. There are many localities where fine Locusts are found.

A railroad through these regions would rescue millions of feet of valuable timber which are yearly given to the elements for destruction, being *belted* by the woodman's axe, and left to perish as they lie.

SOIL.

The soil of West Virginia is proverbial for its fertility. The tops of the hills, and even the steep slopes, are covered with a rich, mellow soil that yields kindly, wheat, corn, rye, oats, grass, potatoes, all

the root crops, the rice and tobacco. Cattle and sheep flourish on the herbage and undergrowth, with little care. The northern tier of counties through which the line passes, viz.: Braxton, Lewis, Harrison, particularly, are producing great quantities of beef cattle annually from the extensive grazing farms. "With this fertile soil, with a good climate, with excellent water, that always belongs to coal strata, and with unsurpassed healthfulness, this country, mountainous and hilly as it is, would have been filled with a hardy, industrious and thrifty population, instead of the few settlements now met with, were it not for two causes; the principal one of which has been want of communication and market, the other the magnificent growth of timber with which the land is covered." * * *

Steamers with barges can leave * * the Kanawha river at Charleston and elsewhere, and proceed unobstructed to Cincinnati, Louisville, Memphis, New Orleans, Nashville, Little Rock, Leavenworth, Omaha, Sioux City, St. Paul and Pittsburg, &c., &c. * * *

Another important view is to be taken as to the traffic of this road, particularly as to coal and iron ores. Crossing the main line and Parkersburg Branch of the Baltimore and Ohio Railroad, and having connection with Pittsburg, it will transport these valuable products *in both directions*. * * *

SUMMARY.

Some of the most important resources and advantages of this railroad route are as follows:

1st. The great coal fields, containing the best cannel, splint and bituminous coals, in veins of remarkable thickness and purity, near grade of railroad.

2d. Forests of the best oak, poplar, walnut, chestnut and other valuable timber, fine climate, rich soil, choice farm and timber lands at moderate prices.

3d. Iron ores in extensive deposits, and limestone and all other conditions for profitable manufacture of iron.

4th. Salt wells, fire clay, hydraulic limestone and superior advantages for the manufacture of the chemical products of salt.

5th. Favorable locations, and the materials accessible, cheap, for every variety of manufacture and mechanical industry, &c.

EXTRACTS FROM REPORT OF M. F. MAURY, FELLOW OF GEO. SOC. OF LONDON; MEMBER AMERICAN INSTITUTE OF MINING ENGINEERS; ASST. ROYAL SCHOOL OF MINES, ENGLAND; AND DIRECTOR IN CHARGE STATE BOARD OF CENTENNIAL MANAGERS, ON THE IRON ORES OF A DISTRICT OF ELK RIVER.

"Oxide of iron constitutes, so far as has been discovered, the workable ore of this district. Its geological position is in the upper coal measures, that is, above the Black Flint ledge. * * Openings in seams of this ore have been made in Clay and Braxton Counties, at various places on both sides of the Elk river.

"On Hamrick's 75-acre reservation, at Standing Rock run, 246 feet (barometric observation) above the river, a deposit has been well opened, showing 5 feet and 6 feet high in the breast. The ore is a nodular brown oxide, having sometimes very rich ochre, and sometimes mud, in the interior of the lumps, which are so thickly embedded in a soft gray clay or shale as to make a valuable workable bed. It will yield about 35 @ 40 % of metallic iron, and, being soft and often cellular, will work well in the furnace. * * * This vein shows by outcrop many miles up and down Elk.

"About 15 feet below this seam is a very encouraging outcrop, but not sufficiently opened to test its thickness.

"Across the river from Friend's, on Hay's lands, a valuable bank, showing 7 feet in the breast.

"The Elk River Iron and Coal Company, on Strange creek, Braxton Co., at their bank on the hill behind the furnace, have very fine ore.

"Openings have been made at several places in this region, but the company has seen so much iron in this section that they are now content to find the blossoms, feeling assured that the seams will lie below."

Mr. Savage, president of the company, tells me "he has noticed one or more of these seams at various points on either side of the river, along the whole frontage of the 96,000 acres, and feels convinced that workable beds can be obtained anywhere in that distance." * * I know that at certain points good workable seams have been already proven. * *

"A fourth seam is found above any of these yet mentioned. It consists of a series of very red shales, in which are pockets of extremely rich red oxide of iron, which would work well with the ores from below. * * *

"Mr. Savage estimates $2\frac{1}{2}$ tons of ore and 180 bushels of coal to the ton of pig metal. * * Charcoal will be used on account of the abundance of timber and the higher priced iron made by it, and not on account of any lack of superior stone coal for smelting purposes."

The president of the furnace company at Strange creek, Braxton Co., said:

"I can safely say that the mineral resources of Elk river are very valuable, *provided there was transportation*. I think it will be one of the best iron districts in the United States. * * We have found ore veins that cannot be excelled either in quantity or quality. We have ore enough within one mile of our furnace to run it for the next fifty years, and stock in a railroad up Elk river, I think, would pay better than any railroad stock in the State. I do not think the time far hence when the lands along Elk river will be worth one hundred dollars per acre."

FROM AN ELABORATE ARTICLE ON THIS SECTION OF COUNTRY, BY
EDWARD ATKINSON, OF BOSTON, PUBLISHED IN HARPERS'
MAGAZINE, JUNE, 1881.

The mountain sides and valleys of Eastern Kentucky and Tennessee, Northern Georgia, Western North and South Carolina and Southwestern Virginia, in many regards a *terra incognita*, is a territory larger than Great Britain, and contains more and purer iron and coal, equal deposits of copper, lead, zinc and salt, beside corundum and gold, in its mines. It enjoys what is, probably, the finest climate on this continent. It is permeated by the most fertile valleys, and bears upon its hills and mountain sides the heaviest growth and greatest variety of hard wood timber. * * *

The Blue Grass (*Poa Pratensis*), which gives the name to a considerable section of the State of Kentucky, is not confined to that State or section, but thrives in many other places; but this particular section is its special home, because the soil is underlain with rotten limestone, constantly disintegrating and furnishing the elements of fertility.

* * * The rotten limestone belongs to the Cincinnati and Trenton groups of the lower silurian formation and is very rich in fossils. The soils formed from this rock are exceptionately rich in phosphates of lime. Thin bands of phosphatic limestone from Fayette County have been found, upon analysis, to contain as much as 31.8 per cent. of the weight of rock of phosphoric acid. No wonder this soil should bring forth such bone producing food. * * *

The trees, consisting mainly of white oak, blue ash, walnut, hard maple and hickory on the uplands, with the addition of sycamore and elm on the streams, are as grand as any in the country.

This limestone region, known as Blue Grass, comprises 10,000 square miles, or 6,400,000 acres. The area of land now under cultivation in wheat in all Great Britain is less than 5,000 square miles, or under 3,000,000 acres.

East of this Blue Grass region lies the Kentucky section of the *terra incognita*. The portion of the mountain, interior valley, and

plateau region in the State comprises about 10,000 square miles, and is of untold wealth. * * * The soil is the disintegrated rock of the mountain, rich in all the elements of fertility. The hillsides are covered with forests of oak, yellow poplar, chestnut, ash, hickory, cherry, pine, &c., &c. * * *

The coal measures of this section reach a thickness of 2,000 feet above the drainage level of the country, containing many beds of very superior quality. The deposits of the best quality of cannel coal are more extensive than elsewhere, and iron ore beds of great richness, extent and purity, are very favorably located with reference to the coal. * * *

TESTIMONY TAKEN BY A CONGRESSIONAL COMMITTEE, CONSISTING OF SENATORS WINDOM, CONKLING, SHERMAN AND OTHERS, "TO INVESTIGATE AND REPORT UPON THE SUBJECT OF TRANSPORTATION BETWEEN THE INTERIOR AND THE SEABOARD," ON OCTOBER 22, 1873, AT RICHMOND, VA. (See Report, p. 448, *et. seq.*)

Genl. J. D. Imboden testified: * * * West of the Pottsdam sandstone outcrop in the Blue Ridge you come into the purely hematite formations of iron ore, as rich, perhaps, as any in the world. These are in the Blue Ridge and west of it. The great hematite formation extends from New Jersey, through Pennsylvania and Maryland into Virginia, and along with the Blue Ridge range on into Tennessee, Georgia and Alabama. These ores are, however, chiefly on the west side of the Blue Ridge, and are found parallel with the mountains, and cropping out almost everywhere. It is literally true that you may strike the western base and side of the Blue Ridge anywhere and find iron. * * *

The first point at which coal is reached is in the Sewell mountain below the mouth of Greenbrier river or New river, some distance, where you strike the lower series of the great Alleghany coal field. The upper seam of that series is probably 1,200 feet below the water level of the Kanawha, as low down as Charleston,

and when you get to the Ohio river it is too deep ever to be worked, being, perhaps, over 2,000 feet under the surface of the Ohio. That lower series is a formation that has some seams of very excellent coking, bituminous coal, rich in carbon, but too friable and too tender a coal. I examined a specimen of it within the last fortnight, in company with, probably, the most eminent living mineralogist in the world—Professor Ansted, of England, for a long time President of the Royal Geological Society, who is now in the Kanawha valley. * * * It is a very rich coal, and when coked is an exceedingly valuable fuel for iron smelting. * * * Beyond that you come, first, to what is generally understood by “the Great Alleghany Coal Field,” upper series, with an intervening sandstone dividing it from the lower, of perhaps 1,200 feet in thickness. You go down to the Gauley and fairly enter the cannel formations. * * * I think, and that is, I believe, the opinion of Professor Ansted and others, who have investigated the subject, that its maximum thickness is now ascertained to be up the Gauley river and its tributaries * * * and extending across to Elk river. * * * The thickness of the cannel seam I am acquainted with is a little over five feet. * * * The coal formation on the Kanawha and the Big Sandy is the same. It is the same field precisely, and substantially the same formation. That field extends as far down as Alabama, where it is finally lost on the Black Warrior river. * * * The cannel bed is far above the water level. * * * The coal is in nearly horizontal strata, * * * you find a seam of coal on one side of the mountain; take your barometer, go over the mountain and get the same elevation on the other side, allowing for the dip, and you find the same seam, * * * thus clearly running through it. * * * The ascertained extent of the cannel coal field there is 1,200 square miles, from Coal river up to the edge of Webster.

AT CHARLESTON, W. VA., October 24, 1873.

Professor David T. Ansted testified—we cite therefrom: “I have been occupied in practicing engineering, as connected with geology, for the last twenty-eight years. I have been accustomed to visit different coal fields, and iron fields especially, in all parts of Europe, I may say, and in some parts of Asia and America. I have seen most of the important coal and iron fields in the world.” * * * The proposed line of communication to Richmond being under consideration, he said: “I find on the line of this proposed communication one of the most remarkable iron fields that exists in any part of the world, as at present known. It contains every variety of the most valuable ores, and these ores are distributed in such a manner as to be more accessible than, I think, in any other districts. These ores extend over a wide range of country, ranging from east to west, intersected nearly at right angles by the railroad. They include the most valuable of all the known iron ores, magnetic oxide. They include a very large quantity of the red hematites; a very large quantity of the peculiar ore known here as the fossil ore, which is exceedingly valuable for iron making; a very large quantity of brown hematite, and, I believe, other ores.” * * *

“With regard to coal, the most important of the American coal fields crosses the line of the railway.” * * * “In England, we are now mining about a hundred and twenty million of tons per annum, and the manufacturing of iron would increase the consumption of coal very largely.” * * * “There can be no doubt whatever that the general coal fields west of the Alleghanies will have to supply all the manufacturing parts of America before very long. I do not mean to limit to the Kanawha river, but the western coal field of the Alleghanies is the great coal field of America, and the Kanawha gives, I may say, the very best means of access to the coal field as it exists.” * * *

“With regard to the mining of the iron ores, that can be done at a cost below the price of mining similar ores in any part of the world which I have ever visited.” * * * “The cost of the manufactur-

ing of the best qualities of iron, which ought to be made from ores of such very high values, would not be much more than one-half at the present prices of labor here. The actual cost of making Bessemer steel, for instance, would be considered below half the cost in any part of England at the present time." * * * "There are no workable coal fields in England, of the ordinary kind, in which 40,000 @ 50,000 tons per acre could be taken out without going to a very much greater depth than here, and the total thickness of seams in the English coal fields in any one district is not so great as it is here." * * * "The quality of the coal is quite unexceptionable. There are three kinds. The kind which is called bituminous is remarkably free from any troublesome ash. It has a certain quantity of ash, and, perhaps, a little more than the most of the English coals, but it is capable of being coked, I am quite sure." * * * "Besides this, there are seams of splint coal—a hard coal—very valuable for household purposes, and valuable, also, in the manufacture of iron, because it is so singularly free from those things which are injurious in the making of iron. It is a coal, I believe I may say, that is used * * * in furnaces in Eastern Virginia which have been erected for charcoal iron, and it has been used to replace the charcoal, and the iron made from it has been found just as good as the iron made with charcoal. It is a perfectly good coal, used in the furnaces raw for the making of the best qualities of pig iron."

"There is another, called cannel coal, which is exceedingly valuable, * * * is the most valuable of coal for the making of gas. It has a very high gas-producing power—a very high illuminating power. It is quite equal to our best English coals for gas, and I should think the better qualities of it are superior to our qualities of coal, say the Wigan cannel, which has always been regarded as the most useful and available of the cannel coals which have been exported. There is one coal, which is hardly a coal, either, found in Scotland, called the bog head, a sort of shale, containing an enormous quantity of gas, which yields, perhaps, a thousand cubic feet of gas per ton more than any other cannel known. That is the only exception. This would, I think, compete with the Wigan coal,

which has been used generally in New York, and in large cities on the coast. This coal could be transported to any place on the Eastern coast on terms much more favorable than any English coal at the present time. There is no doubt about that." * * * *

"The iron bed, of which I spoke, runs from a hundred miles or more north of the Chesapeake and Ohio Railway, down south to Alabama, * * * from the northern coal fields, near Cumberland, through the whole of Virginia, the western side of the Alleghanies, and into Tennessee." * * *

"In the eastern part of the coal district * * * there are fourteen seams, all of them probably workable. * * * I cannot state the exact thickness, but when I say a workable seam I mean something more than 30 inches. * * * Above the flint ledge—a peculiar bench of silica that is found throughout this country—there are * * * four seams. Below the flint ledge there comes in the cannel, 10 feet below. A bed of splint and cannel, 8 feet thick and 50 feet below. * * * A crop of coal, probably bituminous, 140 feet below the flint ledge. Another crop at 160 feet. A mixed seam, splint, cannel and bituminous, 7 feet thick, of coal, 220 feet below. There is also a bench, which I am informed is splint, and I know it is coal, about 330 feet below the flint ledge. Next to that is a cannel seam * * * 380 feet below. A seam below that at 500 feet. At 650 feet below, a 7-foot vein of bituminous. Below that a 4-foot seam, 675 feet below. Another seam, the quality of which I do not know, 750 feet. Another seam at 760 feet; and below that is a good seam of splint and bituminous at 870 feet; and below that a seam at 1,010 feet below the flint ledge. This section is just in the neighborhood of Hawk's Nest. * * * Below that again there are three seams of bituminous coal, all fair coal, * * * that belong to the lower series. These others * * * to what geologists call the middle series. The other three that I mentioned, above the flint ledge, belong to the upper series. * * * These statements are strictly made upon personal observations. * * *

* * * "There is a continuous layer of this coal throughout the extent, northeast and southwest, which I have mentioned, lying

very nearly horizontal. There is a little irregularity." * * *
 "Judging from observation, from analysis, and from reports of actual experiment, no better coal than the splint coal in question exists in America, and certainly none can exist under circumstances more favorable for rapid and economical production."

NOTE.—For more detailed information on the wealth of this region, see testimony taken before the Windom Committee—Report to Congress on "Transportation Routes to the Seaboard," 1874. See, also, Dr. David Dale Owen's Report on the First Geological Survey of Kentucky. Mr. L. H. De Friese, "Report on the Timbers of the North Cumberland." Prof. J. P. Lesley's Report, read before the American Philosophical Society, April 21, 1871. Prof. N. S. Shailers, Report of Geological Survey. "Resources of the North Cumberland Valley." Geological Survey of Kentucky, Prof. John R. Proctor, Director. Troost's Report of the First Geological Survey of Tennessee. "Tennessee, Its Agricultural and Mineral Wealth," Nashville, 1876. Dr. Safford's Geology of Tennessee, Nashville, 1869. Mr. P. N. Moore's report, "On the Iron Ores in the Vicinity of Cumberland Gap. Prof. E. B. Andrews (Asst. Geologist of the Ohio Geological Survey), Report on the Twelve Pole (Guyandotte) Section.

KENTUCKY GEOLOGICAL SURVEY AND
 BUREAU OF IMMIGRATION,
 JOHN R. PROCTOR, DIRECTOR. }

FRANKFORT, KENTUCKY, January 12, 1882.

Dear Sir,—I have been so very busy that I have had no time to write the report promised; and, as it may be some days before I can hope to do this, I make the following brief statement, which must serve you for the present:

I am satisfied that two practicable routes can be secured through Eastern Kentucky. You will find a straight and, I am informed, an easy grade on the following line: Up Elkhorn fork of Big Sandy river, and over a low divide to the waters of the Kentucky river, and from the waters of the Kentucky to the head of Straight creek; down the latter to the Cumberland river, at Pineville, and down the Cumberland to the crossing of the Louisville and Knoxville Railway at Williamsburg, and up Jellico creek, or Marsh creek, to the Cincinnati Southern.

Or, there is a good line up Clear fork of Cumberland, and through Pine Mountain, at a water gap, and up one of the south

branches of Clear fork to the top of the table lands of Tennessee, thence to the Cincinnati Southern, south of Huntsville.

A favorable line could be had further north, as follows: Crossing the Eastern coal field from about Louisa, in Lawrence County, to Stanford (on the Cincinnati Southern), in Lincoln County; from Stanford to Liberty, in Casey County; from there to Columbia, Ed-
 monton, Glasgow, Scottsville, Gallatin and Nashville, Tenn. From Glasgow to Gallatin your route would be on the abandoned line of the Cumberland and Ohio, where much heavy grading has been done, and I think the present Legislature will turn that portion of the road over to the respective counties, as the work was paid for from the sale of county bonds, and has since been abandoned. If this is done, the counties will donate the same to any company that will build the road.

There are great resources on this latter route, which would pass through much country unprovided with railways, and would give the shortest eastern route from Nashville and a large portion of Kentucky. On the route you pass through the great coking coal of Eastern Kentucky, where the coal is (the coking bed, there are others) from 7 feet to 8 feet thick, and has been traced through three counties, above drainage.

The following are analyses recently made by the chemist of the Geological Survey, Dr. Robt. Peter, from carefully averaged samples taken from the face of the beds. Nos. 1, 2 and 3 are from Letcher County; Nos. 4 and 5 from Pike, and Nos. 6 and 7 from Floyd County.

	1	2	3	4	5	6	7	9
Specific Gravity.....	1.335	1.319	1.291	1.271	1.282	1.302	1.281	
Moisture.....	8.00	2.86	3.26	2.00	2.60	2.04	2.10	1.260
Volatile Combustible Matter	30.06	31.54	32.24	33.50	34.10	37.42	37.16	30.107
Fixed Carbon.....	57.60	62.10	61.60	60.54	61.80	56.34	54.74	59.616
Ash.....	4.34	3.50	2.90	3.96	2.40	4.20	3.00	8.233
Sulphur.....	0.494	0.535	0.656	0.429	.412	1.475	0.596	0.784

You will see that the above is a remarkable coal.

No. 9 is from analysis of lump coal from Frick & Co.'s mine, near Connellsville, Penna. (see vol. M. M., p. 22, Penna. Geol. Survey), and is given for purpose of comparison of these Kentucky coals with the celebrated Connellsville.

By reference to the North Cumberland report, which you have, you can form an idea of the value of these coals in relation to iron ores.

You will also in that report see the value of the timber along the line. I can truly say that I know of no line in America which will pass through a region of like extent, comprising such wealth of coal, timber, iron ores, &c., and good agricultural lands.

I will be pleased to give you what information I can, and aid you, as I wish to see that region developed.

I can plant colonies along such a line, and a great development in the manufacture of iron will follow.

The timber will give a road all the freight required for many years.

Yours truly,

JOHN R. PROCTOR,
State Geologist.

GEO. T. STEARNS, Esq.

STATEMENT OF ALBERT H. CAMPBELL, C. E., UPON THE PROBABILITIES OF EARNINGS OF A RAILROAD THROUGH THE STATE OF WEST VIRGINIA, FROM THE STATE LINE OF PENNSYLVANIA, VIA CHARLESTON, THE CAPITAL OF THE STATE, TO THE STATE LINE OF KENTUCKY.

CHARLESTON, KANAWHA COUNTY, }
W. VIRGINIA, March 31, 1882. }

One of the most difficult things to be undertaken is an estimate of the probable earnings of a new railroad through an undeveloped country. This great fact must be impressed, that this contemplated route is through the entire coal belt of West Virginia, from the Penn-

sylvania line, to the Virginia and Kentucky line, at the head of the Guyandotte and Big Sandy rivers, and abounds in all the indigenous timbers and much carboniferous iron ore, of excellent quality, as has been successfully tested at the furnace, on Strange creek, of Elk, in Braxton County.

The total length of this route, with branches, is about 350 miles.

Coal exists for about 225 miles, and timber for about 200 miles, taking a section of 10 miles on each side of a location as a basis of estimate.

The timber section estimated for lies between Lewis and Kanawha Counties, and between the latter county and the Virginia or Kentucky line. In Lewis, Harrison, Marion and Monongalia Counties there are large quantities of timber accessible, which will supply a very considerable amount of traffic, but I have no means of estimating the amount per acre, hence I do not include it.

The Elk river will also feed a very large amount of timber to the road from the Counties of Braxton, Webster, Randolph and Pocahontas, large amounts of walnut, cherry, gum, pine, poplar and oak; and a Branch Road up the Elk river, from the point where the line diverges from the same, will develop a very large coal area. The same remarks will apply to the Guyandotte and Big Sandy rivers, in case either the one or the other be selected for the location of the road.

A section of 10 miles on each side of the road for 225 miles gives 4,500 square miles of coal area, or 2,880,000 acres.

Prof. Maury estimates the average thickness of the coal in seams over 3 feet thick on Elk river at ten feet, which, I think, is too small by a considerable amount, for there is one seam 12 feet thick in Clay County of good coal, partly excellent splint; and there is a vein below Clarksburg of 12 feet of gas coal; and south of the Kanawha on Guyandotte and Big Sandy rivers several seams exceeding 4 feet; but, assuming his average of 10 feet, an acre will yield some 10,000 tons of merchantable coal, and deducting one-third for valley erosion, outcrops and careless mining, we have 6,666 tons per acre, and 2,880,000 acres by 6,666 gives upwards of 19,198,080,000 tons, worth \$1 per ton at the mines.

We have coal enough here to furnish transportation for over a century. It may be safely estimated that the traffic in coal annually on this route will amount to 400,000 tons, very soon after a road is built and mines opened, and will be constantly increasing with the increase of population and consequent demand. From this source we safely look for an income, *early*, of at least \$800,000.

The Baltimore and Ohio Railroad carried in the year ending Sept. 30, 1880, 1,831,890 tons coal, paying freight. The present output of coal in the United States is between 70 and 80 millions tons; census year it was 71 millions.

The contemplated road traverses a more extensive and better coal field than the Baltimore and Ohio Railroad.

Taking the timber belt along this line also at ten miles on each side for 200 miles, and we have 4,000 square miles, or 2,560,000 acres. The quantity of merchantable timber per acre for the whole State is estimated by Professor Fontain—"Resources of West Virginia"—as a moderate one at 8,000 feet board measure. It is quite certain that this estimate is small for the 200 miles under consideration; it would be nearer 12,000 feet; but taking these figures of Professor Fontain's, we have 20,480,000,000 board measure of timber immediately accessible.

The average value of timber and lumber at Charleston for all kinds is at present time \$36. This gives the value of this timber at \$737,280,000.00. Add to this the value of the probable quantities above referred to as off the line, and this sum will be considerably increased. We have timber for traffic for a very long period of time.

About 500 feet board measure is equivalent to an average ton of 2,000 lbs. The timber traffic on the Norfolk and Western Railway for 9 months, in 1881, was 54,435 tons, equivalent to 27,217,500 feet board measure (see *The Virginias*, September and November, 1881). We may safely assume double the traffic in lumber as that on the Norfolk and Western Railway as our basis, for we shall occupy a heavier timber region—say, 12,000 tons per month, or 6,000,000 feet board measure, and for a year 72,000,000 feet, equivalent to

12,000 car loads; which, at \$50 per car load, will yield \$600,000.00 annually.

In regard to iron ores, Professor Maury says: That we have all the coal measure ores on the Elk river, and in greater development than those in any other part of West Virginia, and he estimates its value as *equal* to that of the coal. We may, at least, from this showing expect an increase from this source of \$225,000.00 annually. And from miscellaneous sources—passengers, cattle and goods—we may expect at least \$100,000.00 annually.

RECAPITULATION.

Income from coal traffic,	\$800,000 00
“ “ timber traffic,	600,000 00
“ “ iron ores traffic,	225,000 00
“ “ miscellaneous traffic,	100,000 00
	<hr/>
	\$1,725,000 00
Deduct 60 % for operation of road and expenses,	1,035,000 00
	<hr/>
Net income for 350 miles,	\$690,000 00
	<hr/>
“ “ per mile	\$1,971 00

This estimate is for a *young* railroad in the early years of its operation. The influence of railroads in opening up new avenues of business of all kinds and increasing population, thereby steadily and permanently increasing its local traffic, is too well known to require demonstration here. The wonderful increase of population and business along the lines of the Chesapeake and Ohio Railroad in this State may be adverted to as an illustration. It has opened the way for others.

The coal traffic of the Chesapeake and Ohio Railroad for 1881 is given in the February *Virginias* at 773,426 tons, an increase of over 27 per cent. of the traffic of 1880. There are about 30 coal

mining plants and many and increasing coking establishments along the line of this road.

In summing up the lumber articles published in several numbers of the *Virginias*, the showing is that in 1881 over 70 saw mills were operated along the line of this road. The output was 25,000,000 feet, and for 1882 it is estimated at 45,000,000 feet. The lumber business is of more recent growth than the coal, and is rapidly increasing.

One great fact is patent, the coal and lumber business is wonderfully increasing in this State, and the *greater* the facilities for transportation the *greater* will be the increase.

By the census of 1870, Kanawha County, without railroads, had a population of 22,349, and by that of 1880 it had 32,466, an increase of about 50 per cent. This increase mainly due to the Chesapeake and Ohio Railroad.

Cabel County in 1870, without railroads had a population of 6,459; in 1880 it had 13,744, an increase of 133 per cent., due to the Chesapeake and Ohio Railroad. Other counties along this road show equally interesting signs of increase.

The net earnings of the Baltimore and Ohio Railroad for the year ending Sept. 30, 1880, was \$9,455.28 per mile. Your line traverses *a far better country in every respect for developing coal, timber and iron ore, also grazing and agricultural industries. It is a notable fact that the Baltimore and Ohio Railroad traverses the most inferior portion of this State.*

The Norfolk and Western Railroads' net earnings per mile for the year ending June 30, 1880, were \$2,204.24. This road does not touch the coal measures at all, nor the great timber regions of the southwestern part of West Virginia. Its coal traffic is, therefore, *nil*, and its lumber traffic comparatively light.

It requires no very great measure of sagacity to see that West Virginia presents the best field for development in the United States. The wonderful tide of progress that is sweeping throughout the whole country is crowding in upon her from all sides, and those who, taking advantage of opportunities offering, *first* cut through the

very heart of her greatest coal and lumber region, from northeast to southwest, will have their reward.

Respectfully, &c., &c.,

(Signed)

ALBERT H. CAMPBELL.

THE PROPOSED
WEST VIRGINIA, KENTUCKY AND TENNESSEE RAILWAY.

AMERICAN IMPROVEMENT COMPANY,
TEMPORARY OFFICE, 39 Broadway, Room 34,
NEW YORK, April, 1882. }

TO CAPITALISTS:

The testimony adduced in the foregoing pages is for the purpose of drawing your attention to that vast unimproved region lying between the western slope of the Alleghany mountains and the valley of the Ohio and Mississippi rivers, embracing West Virginia, Western North Carolina, Eastern Kentucky, Eastern Tennessee and Northern Alabama. Greater in area, richer in fertile, agricultural lands, and far richer in coal, iron and other minerals, than the entire Kingdom of Great Britain. A climate that is claimed to be superior to any in America; fertilized and vitalized by rivers and streams of water of great magnitude, and exceptional purity; and holding in its confines the most valuable growth of hard wood timber that exists in this country, east of the Rocky mountains. To be an instrument in the development of the vast treasures of this region, that await the inspiration of enterprise and capital, this company has been inaugurated, and for the consummation of its purposes and aims your co-operation is invoked; and invoked with a firm and positive belief, that upon no portion of the American continent does the promise of such sure and positive beneficial results, by the judicious investment of capital, exist, as in this locality. The future of the great coal, iron and timber industries of the nation, lie here. Sooner

or later, these magnificent results will come. That less favored sections have heretofore been developed, and this great field ignored; that enterprises upon the border land of civilization, the very wilderness itself, should have found ready and unnumbered millions of capital for the advancement of schemes based principally upon "Ophir holes, Gopher holes and Loafer holes," and that a country rich in the products requisite in every community—essentials of living in every home, in close proximity to markets upon every hand, in the very heart of the country, should stand undeveloped, almost unknown, is indeed a marvel. Verily, "distance lends enchantment to the view."

THE RAILWAY.

The plan of the undertaking is to construct a railway from the State line of Pennsylvania, where connections for Pittsburg and the great cities of the seaboard are available through the great systems of Pennsylvania Railways, midway through the State of West Virginia, to the State line of Kentucky; thence by one of three practicable routes, each of which presents peculiar advantages, to the Tennessee line; and thence, upon the table lands of Tennessee—nominally through the Cumberland valley—to the City of Nashville.

That the best results may follow for the long future, and the country "possessed," the plan further contemplates a road through the rich fields of Eastern Kentucky, in a southeast and northwest direction, at right angles to the main road, through the blue grass country, having in view connections with the North Carolina roads, and the transportation of the products of this section to the markets of consumption upon the Ohio river, to intervening points and elsewhere. The aggregate of roads in this system, will be in the neighborhood of 1,000 miles.

THE ROUTE.

The route cuts midway the great coal, iron and timber region from its inception at the Pennsylvania line, through West Virginia, through Kentucky, and, largely, in Tennessee. To a road so con-

structed, the entire region will be laid under contribution, and secured for all time. Its feasibility of construction is demonstrated by the reports of engineers who have made it a study. From the Pennsylvania line it would follow the Monongahela river to Lewis County; from which, to the waters of Elk river, in Braxton County, a low divide of some thirty miles is to be surmounted, but which presents no formidable difficulties. It would follow the banks of the Elk to Charleston, the capital of the State, situate at the confluence of the Elk and the Kanawha rivers; a city which has all the elements of a prosperity which should make it the formidable rival of Pittsburg,—the Birmingham of America. At this point crossing the Kanawha, the waters of the Coal, Guyandotte and Big Sandy rivers would largely carry the road over the divide, to the head waters of the Kentucky and Cumberland rivers. Some fifty miles of heavy work presents in this section, but once upon the waters of the Cumberland, and the way is clear to Nashville.

THE CONNECTIONS.

The great systems of Pennsylvania would distribute the products of this region in all directions, and the tonnage of the road would be a vast auxiliary to their traffic and income. Enough has already been secured from the executives of some of the "Great Corporations" to realize their estimate of the magnitude of what is here offered. Both the Pennsylvania and the Baltimore and Ohio roads open communication with Pittsburg, and, as well, with the markets of the East. The Pennsylvania Low Grade—the extension of the New Jersey Central system—will, it is indicated,—be looking for business and connections in that neighborhood ere long. In Marion County, at Fairmount, the main line (to Wheeling) of the Baltimore and Ohio would be intersected, and the Parkersburg Branch of the same road, at Clarksburg, in Harrison County. The business now furnished by these counties, as well as Lewis County, on the south, midway through which the line is surveyed, is large and increasing.

At Charleston, we cross the Chesapeake and Ohio Road ; also the system of the Richmond and Alleghany ; and the Ohio Central, which is to make a continuous line of road from Richmond, Virginia, to the great lakes of the northwest.

Here at Charleston, or some point contiguous to the Kanawha, the company would have its great docks, for shipping its products to the inland markets of the Ohio, Mississippi, Missouri and other rivers—a system embracing over 16,000 miles of navigation. What this indicates may be inferred from the fact that one port—Cincinnati—now consumes more than 75,000,000 bushels of coal per annum (about 3,000,000 tons), and the consumption, according to the statistics of the Cincinnati Chamber of Commerce, is increasing at the rate of $24\frac{1}{2}$ per cent. per annum ; and coal, which we could put into Cincinnati at a cost of 8 cents per bushel, has been selling the past winter at 18 cents per bushel.

In Eastern Kentucky intersection would be made with the northern links of the Eastern Tennessee and Georgia (Cole-Seney) system, and, some distance further west, with the Cincinnati Southern Road, the northern end of the Erlanger system of the South and Southwest. To this system of roads the proposed West Virginia, Kentucky and Tennessee would be a most valuable coadjutor. Not only would the productions of the new road thereby find distribution throughout the new South, but, combined in interest, they would make the direct air line between the cities of the seaboard and the great southwest of Texas and Mexico, where, in the next generation, a development of wonderful magnitude is surely foretold.

At Nashville a junction with the Louisville and Nashville system is consummated ; to which system the foregoing remarks are equally applicable. A reference to the map of the United States will show these statements to be well founded and indisputable.

RESOURCES OF THE COUNTRY.

The vast wealth of the country, so ably and vividly discussed by the able and disinterested authorities which are quoted in the

HEADLESS

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preceding pages, renders further extended discussion in reference thereto quite unnecessary. With such abounding testimony we may well refrain from argument, contenting ourselves with the belief that whoever reads and ponders can but be convinced that nowhere is such a field unoccupied.

Two or three special points however, unnoticed, may be adverted to.

COKE.

The growth of the coke business of Pennsylvania and Virginia is one, and highly suggestive. Heretofore, Pennsylvania has enjoyed almost a monopoly, and the Connelsville coke not only has run the iron furnaces of Illinois, Wisconsin and Missouri, but, as well, the smelting furnaces of Colorado, standing transportation and transportation charges of 2,500 or 3,000 miles. The last two or three years have produced a marked change in this respect, and the coke from the coals of West Virginia stands its competitor whenever avenues of transportation open the way to points of consumption. To test this statement by existing facts is but to prove its accuracy. With the increase of iron production comes increase of coke consumption, with new markets, greater demands, and the opening of the Kentucky fields will add a large and fruitful source of business.

BLACK BAND ORE.

South of the Kanawha river, on the general line of the road, lies a well distributed deposit of Black Band Iron Ore, believed to be of unusual richness, and a source of large wealth. Its limits are as yet undefined; it is known to cover a large area of country. A portion of it has received attention and investigation from Prof. N. S. Shailer and Prof. T. P. Sharpless. In a report in 1881 on property in this section, Prof. Shailer says: "The iron ores consist of several different beds, varying widely in their character. In the upper part of the ridges we find beds of iron oxide in the shape of the well-known block ores, which have been the basis of the iron industry of the Hanging Rock district for half a century. * * They seem to me to be as well developed as in the district about the mouth of the Big

Sandy river, where they have been used for making car-wheel iron for many years. They contain, in a raw state, about forty per cent. of metallic iron, and the phosphorus carry is always low." * * * "The above named iron ores would of themselves afford as good a basis for an iron industry as is possessed by many of the furnaces in the Ohio Valley." * * * "Considerable as they are, they seem insufficient to be compared with the main iron ore of the property, the Black Band." * * "This Black Band ore is essentially a carbonaceous shale, or impure coal, containing a large percentage of iron." * * "The quality of the ore, as determined by the assays of Mr. S. P. Sharpless, one of the most competent of our living assayers, is extremely good." * * *

And Prof. Sharpless says, "The bed, at the points at which I examined it * * * was from four to six feet thick." * * * "This ore, when roasted, will yield 2,000 tons per foot per acre, or five feet of the ore will yield 10,000 tons per acre." * * * "The analysis of the above ore is as follows. For the purpose of comparison I have given the analyses of two other Black Band ores :

ANALYSIS.

	Davis Creek, South of Kanawha.	Hocking Valley.	Llannelly Welsh.
Silica.....	3.60	4.93	7.20
Phosphorus.....	.25	.87	.295
Sulphur.....	.41	1.07	.26
Metallic Iron.....	31.46	36.43	33.68

ROASTED ORE.

Metallic Iron.....	64.	50.80	56.00
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"Besides the Black Band ore, all the ridges on this tract are topped with one or two beds of oxide of iron, each of which is about twelve to eighteen inches in thickness. This ore runs from forty per cent. to fifty per cent. of metallic iron, and contains from three to four-tenths of a per cent. of phosphorus."

FURNITURE

TENNESSEE.

The coal measures of Tennessee form the top of the Cumberland table lands, and are coextensive therewith. The two go together, and cover an area of about 5,000 square miles.

The nearness of the very pure ores of East Tennessee and Western North Carolina, extending from the northern to the southern boundary, to the pure coals in the upper Cumberland Valley, are an assurance that, with transportation secured, that region will be one of the great iron and steel producing centres of the world. These ores consist of Magnetic, Hematite, Limonite, Fossil and other varieties. Troost, in his Fourth Geological Report on Tennessee, makes special reference to an extensive vein of rich magnetic iron ore, similar to that of some parts of Sweden, situated at the foot of Roan Mountain.

Prof. Kerr, of the North Carolina Geological Survey, says of the Magnetic ore, near Cranberry, "In quality this ore is unsurpassed by any ore in the world, and, in regard to quantity, the bed much exceeds the great deposits of Missouri and Michigan." Weigh this with the fact that the furnaces of the East, in 1880, were forced to go to Lake Superior alone, for some 1,500,000 tons, and that from the ore mines of Lake Superior and Missouri to the coal of Pennsylvania, the distance is 1,000 miles, and the cost of transportation upon ores from mine to furnace aggregates not less than \$5 per ton, probably more.

ANALYSIS OF CRANBERRY ORE.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Magnetic Oxide of Iron.	94.37	91.45	85.59	80.77	91.89
Oxide of Manganese.	0.29	0.06	0.24	1.42	0.32
Alumina.	0.42	0.77	0.11	0.52	1.03
Lime	0.43	1.01	0.72	1.06
Magnesia	0.36	0.53	0.33	0.23
Water	0.44	1.53	8.21	1.15
Silica, Pyroxene, &c.	4.16	5.74	11.48	9.08	4.02
Metallic Iron	68.34	66.22	61.98	58.49	66.58

The first four of these are by Dr. Genth, who says: "The first three samples contain neither titanitic acid nor phosphorus and sulphur. The fourth contains a trace of phosphoric acid." No. 5 was analyzed by Prof. Chandler, of the Columbia College School of Mines, who said, "This is the best iron ore I have ever analyzed."

The great limestone region of the State furnishes not only, in immediate vicinage, unfailing stores of flux for the furnace, but embraces some of the finest quarries of marble known. Fire clay, galena and other minerals abound.

LANDS.

Contiguous to the line of the road, the scheme contemplates the acquisition of large bodies of carefully selected lands. Coal lands in the Pittsburg section are worth \$200, \$500, and \$1,000 per acre. In Ohio, where the mineral lands work lean ores and coal, only reached by deep shaft mining, similar prices are not unusual. It is no stretch of probabilities to assume that if this company is enabled, by securing the capital, to mature and carry out projects now in hand, the property underlying and in its control in the States of West Virginia, Kentucky and Tennessee, ere maturity of its bonds, will be worth at least \$100,000,000.00, and at a cost of a quarter of that sum.

LEGISLATION.

It is proposed to carry out the construction of this road by a consolidation of companies, organized under special charters vested with unusual powers and privileges, and for which ample authority exists.

The general railroad law of Tennessee is sufficient to build under in that State, and the new general law of West Virginia, passed at the session of 1881, which is exceedingly liberal in its provisions, authorizes the reorganizing of companies organized by special charter, and to carry thereunder all their previous acquired rights and privileges.

C I R L

STATISTICS.

It is shown by the United States census of 1880, that in 1857, Great Britain's production of pig iron was 3,659,447 tons, smelted from 9,573,281 tons of ore, in 628 blast furnaces. Of which 333 were in England, 170 in Wales, 124 in Scotland, and 1 in Ireland.

In 1872, the product was 6,741,929 tons.
 " 1880, " " " " 7,749,233 "

The production of iron and steel in the United States,

In 1870, was 3,655,215 tons.
 " 1880, " 7,265,140 "

In 1882, the production of the United States will exceed that of Great Britain, making it the first iron and steel producing country in the world.

The production of coal in England (in tons of 2,240 lbs.), was,

In 1855, 64,661,401
 " 1877, 136,179,968
 " 1880, 146,818,122

The production of coal in the United States, for the year ending June 1, 1880 (ton of 2,000 lbs.):

Bituminous.

Appalachian field,	29,842,240
Western field (Illinois, Indiana, &c.),	8,721,101
Michigan field,	100,800
Triassic field,	46,246
Iowa and Kansas,	2,232,458
All fields west of the 100th meridian,	1,447,736
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	42,420,581

Anthracite.

Pennsylvania,	28,640,819
Rhode Island,	6,176
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	28,646,995
Total product, tons,	71,067,575
Hands employed in coal mining,	170,585

What will be the demand for these products when in the near future the wants of a hundred million of people are to be supplied?

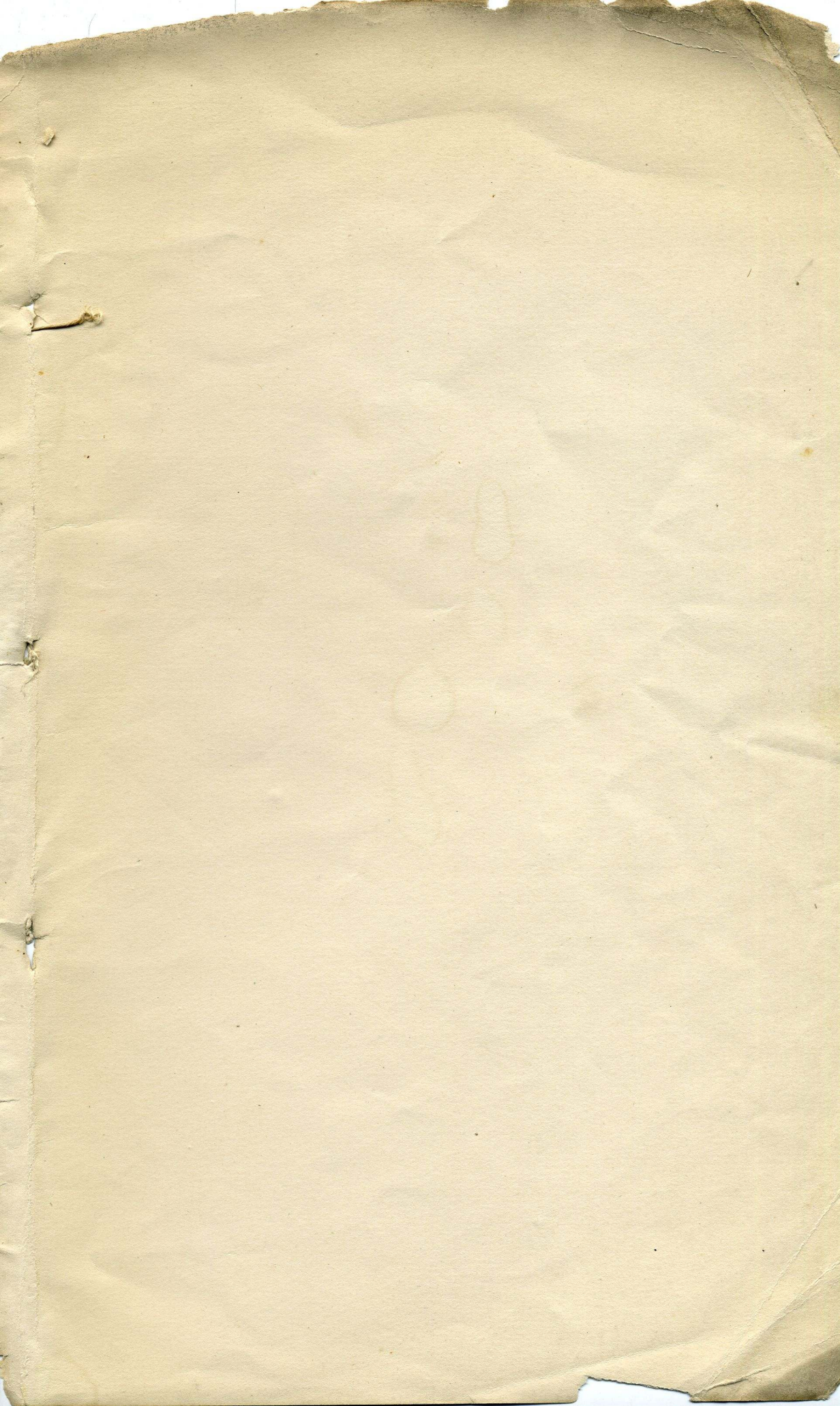
CONCLUSION.

An eminent Senator and Secretary of the Treasury of this country,—eminent as a statesman and as a political economist,—remarked to the writer, many years since, “The proximity of coal and iron within her borders has made Great Britain the foremost nation of the world.” This proposition holds true. As has been stated heretofore, here is a region larger than Great Britain, and far richer than she in the elements which have given to her her prestige and power in the world’s history. Add thereunto the vast timber resources, genial climate, lands, that “tickled with the hoe, make the husbandman laugh,” and a geographical position surrounded with markets for all her products, and, more than this, so situated that over this proposed railway, trade and travel, which always seeks the shortest line of intercommunication, should make the great highway, the great trunk line, from the seaboard to the great Southwest, Texas and Mexico,—are these not elements of assured prosperity, and success of most unusual character?

Reader, will you not be of those who will aid in the consummation of this great work, and share in the reward—not the reward that comes from ephemeral and vicious speculation, but which, while promising large dividends upon the capital invested, carries also the satisfaction that comes from the fostering and perpetuation of fundamental industries, which strengthen national greatness and increase national wealth?

GEORGE T. STEARNS,
President.

HALF-GROWN
GIRL



A D Y