A

GENERAL ACCOUNT

OF THE

RICULTURAL, COMMERCIAL, & MINERAL RESOURCES

OF THE

COMMONWEALTH OF KENTUCKY.

PILED FOR FREE DISTRIBUTION TO EMIGRANTS AND EMIGRATION SOCIETIES,

BY THE

BUREAU OF AGRICULTURE, &c., &c.

FRANKFORT, KY.:
PRINTED AT THE KENTUCKY YEOMAN OFFICE.
S. I. M. MAJOR, PUBLIC PRINTER.
1877.

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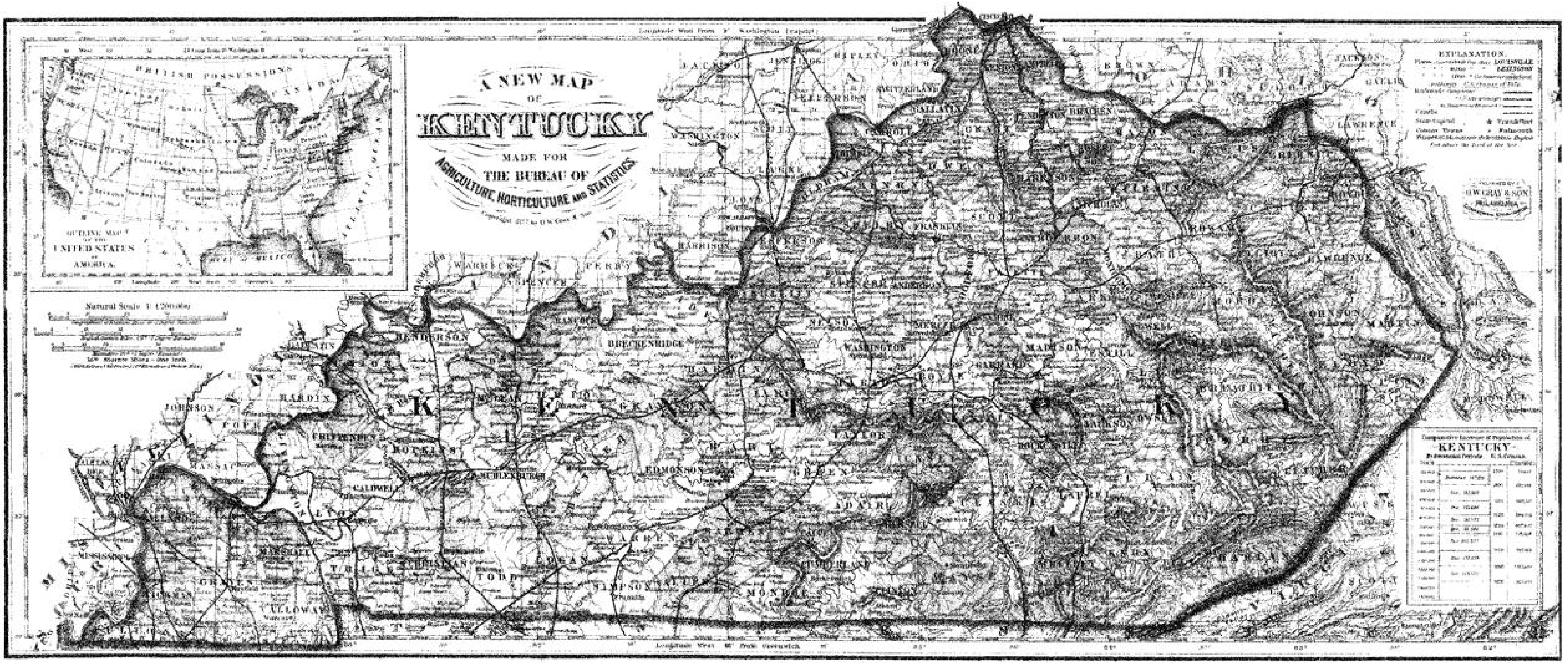
A NEW MAP
OF
KENTUCKY
MADE FOR
THE BUREAU OF
AGRICULTURE, HORTICULTURE AND STATISTICS
OUTLINE MAP OF THE UNITED STATES OF AMERICA
BRITISH POSSESSIONS
EXPLANATION
KENTUCKY

THE

RESOURCES AND CONDITION

OF THE

COMMONWEALTH OF KENTUCKY,

PREPARED BY

THE STATE BUREAU OF AGRICULTURE, HORTICULTURE, AND STATISTICS.

FOR GENERAL DISTRIBUTION.

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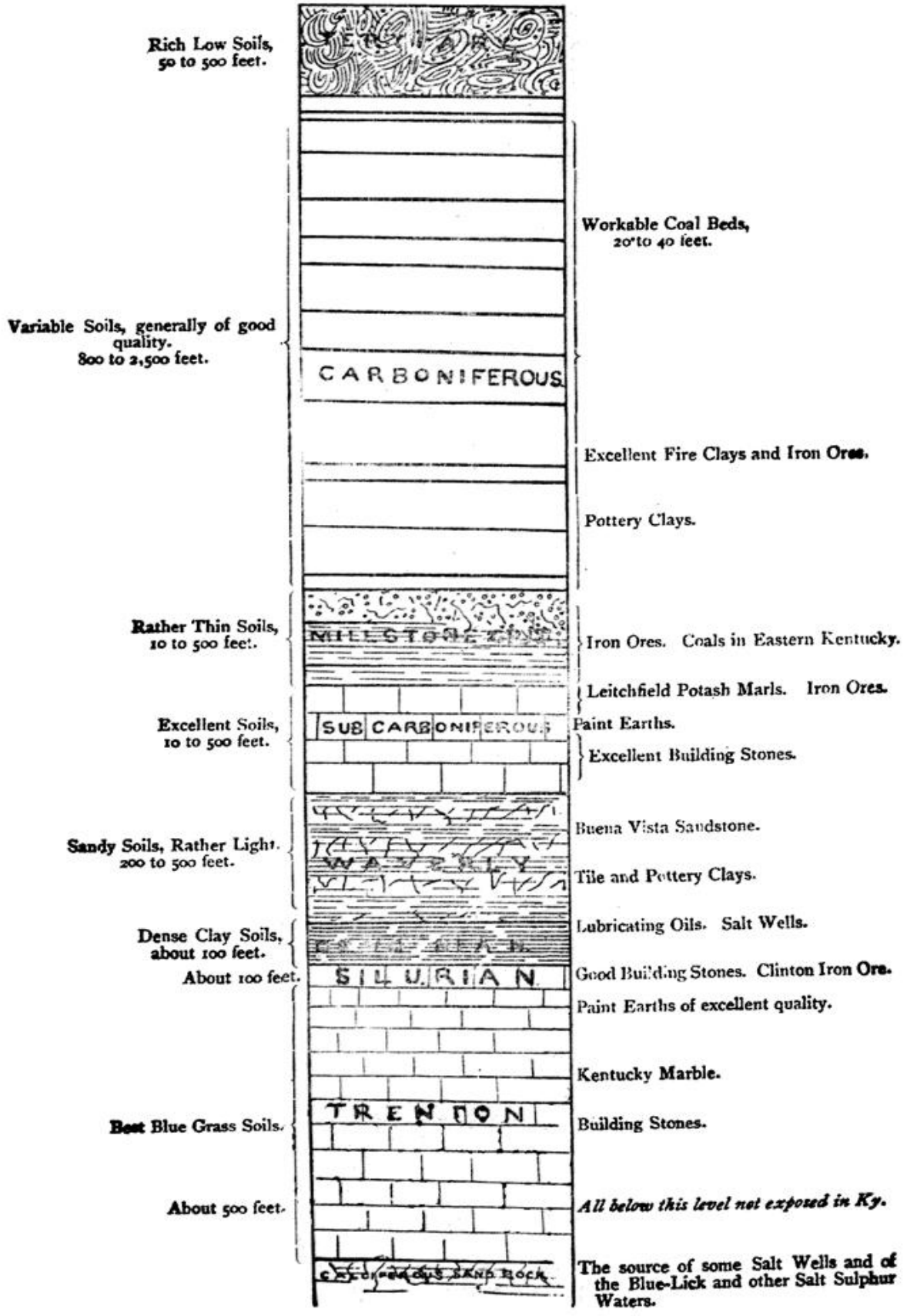
Rich Low Soils, 50 to 500 feet.
Variable Soils, generally of good quality. 800 to 2,500 feet.
CARBONIFEROUS
Workable Coal Beds, 20 to 40 feet.
Excellent Fire Clays and Iron Ores.
Pottery Clays.
Rather Thin Soils, 10 to 500 feet.
Iron Ores. Coals in Eastern Kentucky.
Leitchfield Potash Marls. Iron Ores.
Excellent Soils, 10 to 500 feet.
SUB CARBONIFEROUS
Paint Earths.
Excellent Building Stones.
Buena Vista Sandstone.
Sandy Soils, Rather Light. 200 to 500 feet.
Tile and Pottery Clays.
Dense Clay Soils, about 100 feet.
Lubricating Oils. Salt Wells.
About 100 feet.
SILURIAN
Good Building Stones. Clinton Iron Ore.
Paint Earths of excellent quality.
Kentucky Marble.
Best Blue Grass Soils.
TRENTON
Building Stones.
About 500 feet.
All below this level not exposed in Ky.
The source of some Salt Wells and of the Blue-Lick and other Salt Sulphur Waters.

To His Excellency JAMES B. MCCREARY, *Governor of Kentucky:*

Sir: Section sixth of the act creating this Bureau, passed at the last session of the Kentucky Legislature, and approved March 20th, 1876, in enumerating the duties of the Commissioner, says: "It shall be the duty of the said Commissioner to prepare, as soon as he may be possessed of the proper information, a condensed statement of the present condition and capacity of the State as regards its agriculture, horticulture, mining, manufacturing, and domestic arts; the average price of lands and labor in its different sections; its traveling, exporting, and educational facilities; a brief view of its climate; its geographical position and general topography, and other suitable subjects designed to induce immigration to this State; which statement, in the form of a report, when presented to the Governor, and approved by him, the said Commissioner shall cause to be printed, in cheap pamphlet form, in the English and German languages, and distributed free through immigration socities, or otherwise, as he may deem best to promote immigration into this State."

In accordance with this section, I have the honor to submit for your approval the following account of the resources, capacity, and condition of Kentucky.

As a similar work for a similar purpose was required to be prepared and printed by the Geological Survey, to be used at the Centennial Exposition last year at Philadelphia, covering the same requirements in part, and as the stereotype plates of this work are owned by the State, I have, to save cost in printing and to reproduce the valuable information there succinctly given, adopted the first seventy-four pages of said work as a part of this, and have added other chapters to fill the requirements of the law, and also to popularize the information for the use of every class of emigrants seeking new homes in the Mississippi Valley.

I am, very respectfully,

W. J. DAVIE,

Commissioner of Agriculture, Horticulture, and Statistics.

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A

GENERAL ACCOUNT

OF THE

COMMONWEALTH OF KENTUCKY.

GEOGRAPHY.

Position. — The Commonwealth of Kentucky — situated between latitude 36° 30′ and 39° 06′ north, and longitude 5° 00′ and 12° 38′ west, from Washington — includes about forty thousand square miles of area, extending for six hundred and forty-two and a half miles along the south bank of the Ohio River, from its junction with the Mississippi to the mouth of the Chatterawah or Big Sandy. This river forms the northern, north-western, and north-eastern borders of the State. A part of its north-eastern border, one hundred and twenty miles, is formed by the Chatterawah River; a south-eastern face of about one hundred and thirty miles has a natural boundary in the several ranges which receive the common name of Cumberland Mountains. The southern face alone is an arbitrary line of two hundred miles in length. The western boundary of about fifty miles is formed by the Mississippi River.

A glance at the accompanying map will make it plain that the region occupied by this Commonwealth has a position of peculiar importance with reference to the great feature-lines of the continent. The Mississippi-River system is the key to the continent. Those parts which lie beyond its borders are, by their limited area or their severe conditions of climate, relatively of minor importance. In this system the State of Kentucky, all things being considered, occupies a most important place. Its western border is only one thousand and

seventy-five miles* from the mouth of the Mississippi, and its eastern boundary is within five hundred miles of the Atlantic ports.

The special features of position to be considered in measuring the importance of this Commonwealth are its central place with reference to the Valley of the Mississippi, and the advantages it has from its extended contact with the river system of that valley. More than any other State in America it abounds in rivers. Including the Ohio and Mississippi Rivers, where they bound its borders, the State has within its limits rather more than four thousand miles of rivers, which are more or less completely navigable. Improvements of small cost will give this amount of navigation with complete permanency, except for an average of about fifteen days per annum, when they are ice-bound.

GENERAL GEOLOGY.

Just as the State of Kentucky is geographically but a part of the Mississippi Valley, so it is geologically composed of a series of rocks which extend far and wide over the same region. On the eastern line, between Cumberland Gap and Pound Gap, it is generally in sight of the old crystalline rocks of the Blue Ridge, or original axis of the Appalachian Chain, and is closely bordered by rocks of the middle Cambrian or Potsdam age; but the lowest exposed rocks of the State are those found at a point on the Ohio River, about twenty miles above the Licking River, where we come upon Cambrian rocks answering to the base of the Trenton period in New York, and probably to the Bala or Carodoc beds of England. This series is about six hundred feet thick, and consists principally of the remains of organic life laid down in a continually shallowing sea, interrupted by occasional invasions of coarser sediment, derived from the northward. At the close of this Cincinnati section of the Cambrian, there came the invasion of a heavier sand-flow, probably coming from the south-east, that arrested the life and formed some thick beds of rock, known in the reports

* It is 528 miles from Columbus to New Orleans by railroad, and 472 miles to Mobile.

of the Kentucky survey as the Cumberland Sandstone. After this the floor of the sea was sparingly peopled with life, during the whole of the Clinton and Niagara epochs, when it was probably deep water. This deep sunken condition of the ocean floor continued in the Devonian time, when this section seems to have been the seat of a deposition such as is now going on beneath the Sargassa Sea of the Atlantic of to-day. The decaying sea-weed and other organic matter made a bed from three hundred feet thick along Lake Erie to forty feet thick in Southern Kentucky, averaging about one hundred feet in Kentucky. This bed furnishes the rich lubricating oils of the Cumberland Valley. After this came again shallow water, and quick successive sand-invasions moving from the north, which formed several hundred feet of beds. These beds probably represent but a fraction of the time required to form the Black Shale which lies below. This part of our section is called the Waverly, and is commonly regarded as being more nearly related to the Carboniferous than to the Devonian series of rocks. After this period came a repetition of subsidence, and a cessation of the sand-invasions. During this time there was such a development of sea-lilies or stemmed Echinoderms, that this time deserves to be called the period of crinoids. This accumulation ranges in depth from a few feet along the Ohio River to five hundred or more feet under the Western Coal-field. It marks a period of tolerably deep still water, filled with lime-secreting animals. It is probably to the unbroken character of this succession of life, and especially to the crinoids with their upright stems, that we owe the uniformly massive character of many of the beds of this Subcarboniferous Limestone.

Next in the ascending series we come on the coal-bearing rocks. Their deposition was begun by the sudden shallowing of the water over this region, bringing the old sea-floor near the surface of the water, and subjecting it to alternating invasions of sand borne by strong currents, and exposures in low-lying flats covered by a dense swamp vegetation. Each of these swamp-periods answers to a coal-bed; each recurring subsidence, to the deposits of sands and shales that lie between the coals.

After the Carboniferous period, we are warranted in believing that this region was but little below the sea, and with this change it became essentially subjected to land conditions alone. The wear incident to these conditions has swept away a large part of the exposed rocks, and reduced the Carboniferous series to less than half of its original thickness.

Near to the present time there came a sudden subsidence of this whole region, that brought the low-lying western part of the State beneath the level of the sea, and retained it there while the Tertiary deposits were being formed out of the waste of the higher parts of the Mississippi Valley that still remained above the sea.*

The disturbances that have changed the position of the rocks in Kentucky have been few and far between, though they have materially affected the general structure of the State. From the mouth of the Licking south a little westerly, through Monroe County, extends a ridge or axis of elevation, the beds dipping gently, rarely over ten feet in a mile, in either direction away from it. This was in part formed during the deposition of the Lower Cambrian, but probably was completed at a much later date. This has caused the limitation of the Carboniferous beds of this region. To it in fact we owe the abundant diversity of the rock outcrops within the State. In the south-east corner of Kentucky there is a region between Straight Creek and Clear Creek, tributaries of the Cumberland, and the Virginia border, where the Appalachian disturbance has thrown the rocks into mountain folds. Here are some fine exposures of the deeper rocks brought up by the great faults of the region.

No glacial traces of the last period are known within the State, nor are the indications of the more ancient ice-periods at all distinct. This area has probably remained south of all those profound disturbances of temperature that have so greatly affected more northern regions.†

* The appended generalized section on second page of cover will give a general idea of the successions of the Kentucky rocks. Further facts can be found in the Reports of the Survey, for which see list at the end of this pamphlet.

† For further information on this subject, see the Biennial Report of N. S. Shaler for 1874–5, Kentucky Geological Survey, now in press.

Surface. — The whole of Kentucky lies within the Mississippi Basin, and within the special division of the Ohio Valley. Its principal feature-lines have been given it by the river excavations. A small area on the south-east, containing not more than four thousand square miles, lies within the disturbed region of the Alleghanies, and has a true mountain-folded structure. The remainder is essentially a plain or table-land, sloping from the south-east towards the north-west, and little broken, except by the deep-cutting river excavations. In the eastern half this table-land has an average height of about one thousand feet above the sea; the ridges often reaching to fifteen hundred, and the valleys down to seven hundred feet. The greatest difference between the bottom of any one excavation valley and the borders of the divide does not exceed about seven hundred feet, and is usually about half this amount. Eight degrees west of Washington the country begins to sink down rapidly to the west. The cause of this change will be explained in the geological description of the State. Its effect is to carry the upper surface of this table-land gradually downwards, until along the Mississippi its average height is not more than three hundred feet above the sea, and the average difference between the bottoms of the valleys and the tops of the ridges is not over fifty feet. This considerable height of the State above the sea is of great advantage in securing it against fevers, from which it may be said to be practically exempt, except in a narrow belt in the extreme western district, near the borders of the swamp regions.

Although the general surface of the State is that of a table-land sloping towards the Ohio River, and consequently towards the north-west, it has many subordinate features which should be separately described. All that part of its surface indicated as Tertiary on the accompanying map is rather imperfectly drained, the rivers having low banks, and during the winter and early spring being subject to overflow from the floods. The remainder of the State, saving a strip a few hundred feet wide along some of the larger streams, is absolutely free from this danger. The remainder of the State, to the east of this line, has only the variety which comes from the difference in the

wear of the streams in the rock. The nature of this difference will be discussed under the head of geology. It is only necessary to say here that the whole of the area described on the map as Cambrian is characterized by broad flat-topped ridges, with steep-banked rivers between; the general character being that of a much cut up table-land. The part marked as Devonian has broad valleys and steep-sided, tower-like hills. That marked Subcarboniferous, especially in the region west of the Cincinnati Southern Railway, is characterized by having all its smaller streams underground, usually only the rivers over fifty feet wide at low water having their paths open to the sky. All this region wants the small valleys which we are accustomed to see in any country, but in their place the surface is covered by broad, shallow, cup-like depressions or sink-holes, in the centre of which is a tube leading down to the caverns below. All this region is completely honey-combed by caverns one level below the other from the surface to the plane of the streams below. In one sense, this set of underground passages may be regarded as a continuous cavern as extensive as the ordinary branches of a stream when it flows upon the surface. The sink-holes answer to the smallest extremities of the branches. Some idea of the magnitude of these underground ways may be formed from the fact that the Mammoth Cave affords over two hundred miles of chambers large enough for the passage of man, while the county in which it occurs has over five hundred openings leading far into the earth, none being counted where it is not possible to penetrate beyond the light of day.

The Carboniferous formation is characterized by being cut into very numerous valleys, mostly rather narrow and with steep-sloped, narrow-topped ridges on either side. The relatively narrow valleys, and the general absence of any large areas of flat land on the top of the ridges, cause this region to have less land well fitted for cultivation than any other part of the State. Every part of the surface of the State not permanently under water may be regarded as fitted by its surface for the uses of men, not one thousandth of it being so precipitous as to be unfit for cultivation in some fashion. The writer knows

of no equal area in Europe that has as little waste on account of its contour.

RIVER SYSTEMS.

Reference has been made to the fact that the whole of this Commonwealth lies within the basin of the Mississippi, and over ninety per cent. of its area within the Ohio Valley, the remainder pouring its waters directly into the Mississippi. There are, however, a number of large streams which are the property of the State; and two, the greatest tributaries of the Ohio, gather a part of their waters in the State.

Big Sandy. — Beginning at the eastern end of the State, we have the Big Sandy or Chatterawah River, which separates for forty miles, by its main stem and then by its eastern fork, the State of Kentucky from West Virginia. This stream is the only river of its size in America all the basin of which is in the coal-bearing rocks. It drains a valley of about four thousand square miles. Its name of Sandy is derived from the very large amount of moving sand in the bed, coming from the rapid wear of the sand rocks which compose the beds of all its tributaries. The valley consists of a narrow belt of level, arable land bordering the streams, and a great extent of hill land of a good quality of soil, but only fit for permanent cultivation on the more gradual slopes. The greatest value of soil-products in this valley is to be found in its timber resources, which will be found specially mentioned under the head of timber. It may be said here that the valley contains, next to the Upper-Kentucky and the Cumberland Valleys, the largest amount of original forest found in any part of the State, and more than any other valley is especially fitted for the continued production of timber of varied quality. The forests throughout this region readily and rapidly reproduce themselves in the same species, after being cut away. The soil of this valley is very well fitted for the growth of fruits of all kinds. The season is rather later than that of the other river basins of the State, and the liability to frosts possibly rather less than in the central region. Owing to difficulties of transportation, fruits have been as yet but little grown for exportation.

The whole of the cereals are produced in the valley. The soil is usually of a light sandy nature, with generally enough clay to give it a fairly lasting quality. The principal disadvantage arises from the steepness of the slope of the hills.

Mineral Resources. — The coal resources of this valley are, in proportion to its total area, greater than any other in the State, scarcely an acre of its area but probably has some workable coal beneath it. These coals are mostly of the ordinary bituminous qualities; some cannel coal occurs therein of workable thickness. A full account of these coals, with illustrative sections, will be found in the general description of the eastern coal-field. Little effort has been made to find iron ores in this valley. The dense forests and the softness of the rocks prevent the occurrence of trustworthy surface indications. In the lower part of the valley very important ores have recently been discovered, of which the precise areas and character are yet to be determined. (See the reports of A. R. Crandall and N. S. Shaler for further details.)

The Little Sandy Valley. — The general character of this small valley is much the same as that of the Big Sandy. The river is altogether within the Carboniferous formation. The early utilization of the iron ores of this valley has led to a knowledge of its mineral resources superior to that yet obtained for any other equal area in the State. About thirty-five feet of workable coals are known in the several beds of the valley. (See p. 42.)

Tygert's Creek. — Here the coal resources are more deeply cut down by the stream, which in good part flows upon the Subcarboniferous Limestone. Though wanting some of the best coals, it has many of the best iron ores of the State. Some beautiful caverns are found along its banks in Carter County. The general surface is much as in the valleys before described. In its upper part, the Limestone rocks give occasional areas of more enduring soils than are furnished by the Sandstones of the country to the eastward. The timber and other soil products are much the same.

The stream is not navigable, but can easily be made so by locks and dams, giving continuous navigation for about forty miles along the meanders of the stream

The streams from the mouth of Tygert's Creek to the mouth of the Licking or Nepemini are all quite small, and drain a region of limited mineral resources. Kinniconick Creek gives access to a region abounding in admirable Sandstone for building purposes, and to some iron ores of undetermined richness, but of considerable promise. It can be made navigable at small expense. The whole of this valley abounds in excellent oak timber.

The Licking. — This stream, the fourth in size of the rivers of the State, ranking next to the Big Sandy, passes over all the formations found in the State except the Tertiary. From its source to near the mouth of Blackwater Creek it runs on the Carboniferous rocks. As far as Duck Creek, it is still bordered by these beds containing excellent coals, both cannel and bituminous. On the Subcarboniferous Limestone, which crosses the river near Blackwater Creek, is an excellent iron ore. On Slate Creek, near Owingsville, is an admirable mass of ore, the richest of the State, having at places a depth of fifteen feet or more.

Triplett and Salt-Lick Creeks afford excellent building-stones, and the same series of rocks (the Waverly) furnish some stones which give great promise for lithographic purposes.

From the mouth of Fox Creek to the end of the river the stream is entirely in the lower Blue Limestone or Upper Cambrian rocks, which afford excellent building-stones, but no other marketable underground products.

The soil of the valley varies greatly, — light sandy loam in the Carboniferous and Waverly series; rather wet clays on the Black Shale and Silurian; rich, loamy clays giving soils of the first quality over the lower or Cambrian half of the stream.

The Blue Limestone lands of the counties drained by the North Fork are noted for their large yield of a tobacco highly prized by the manufacturers of "fine cut," and well known in the markets under the name of "Mason County tobacco."

The Kentucky.—Sixty miles below the Licking, the Kentucky discharges into the Ohio. This stream is the second of the Kentucky streams in volume, and the first in length.

Its head-waters, from Sturgeon Creek east, lie altogether with the coal-bearing rocks. At least four hundred miles of water-front, open to vessels able to carry three hundred tons of coal, can be made on the three forks of this river. The coal holds along the hill-sides as far as Station-Camp Creek. The upper half of the Red-River branch contains also an abundance of coal. The entire drainage of the Kentucky River, above its forks in Lee County, is in the Carboniferous rocks. No portion of the State exceeds the Upper Kentucky region in number, thickness, or quality of coals. A preliminary section, made by Mr. P. N. Moore, of the Kentucky Geological Survey, from Red River in Wolfe County to the mouth of Troublesome Creek in Breathitt County, establishes the fact that up to the latter point there are at least five workable coal-seams above the Conglomerate Sandstone. The following analyses, from carefully averaged samples, will show the excellent quality of these coals: —

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Specific Gravity	1.300	1.294	1.297	1.290	1.289
Moisture	2.50	3.50	3.56	2.76	2.10
Volatile Combustible Matter .	41.10	35.20	33.56	36.60	36.20
Fixed Carbon	49.22	56.70	58.38	56.50	58.20
Ash	7.18	4.60	4.50	4.06	3.50
Coke	56.40	61.30	62.88	60.56	61.70
Sulphur	0.818	1.189	1.381	0.865	0.836

No. 1 is a coal from Frozen Creek, Breathitt County.
No. 2 is a coal 5′ 7″ thick, from Devil Creek, Wolfe County.
No. 3 is a coal from Spencer's Bank, Breathitt County.
No. 4 is a coal 6′ thick, from Wolfe Creek, Breathitt County.
No. 5, from near Hazard, Perry County.
Analyses by Dr. Robert Peter and Mr. Jno. H. Talbutt, chemists for the Kentucky Geological Survey.

The cannel coal of the Upper Kentucky is to be found over an extensive area, and is of a remarkably good quality, as will be seen from the following analyses by the chemists of the survey, made from average samples: —

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Specific Gravity	1.280	1.265	1.280	1.180	. . .
Moisture	0.94	1.30	3.40	1.20	1.20
Volatile Combustible Matter .	52.38	47.00	34.40	58.80	40.86
Fixed Carbon	35.54	44.40	46.96	35.30	46.44
Ash	11.14	7.30	6.24	4.70	9.50
Coke	46.68	51.70	53.20	40.00	57.94
Sulphur	1.423	1.574	0.630	not est.	0.634

No. 1. Georges' Branch Cannel Coal, Breathitt County.

No. 2. Haddock's Cannel Coal, mouth of Troublesome Creek, Breathitt County.

No. 3. Robert's Coal, Perry County.

No. 4. Frozen Creek, Breathitt County.

No. 5. Salt Creek, Perry County.

Three of the best gas-coals in Scotland and England are: (No. 1), Lesmahago Cannel; (No. 2), Ramsay's Newcastle Coal; (No. 3), Weym's Cannel Coal. Compare with the above the following analyses, taken from Dr. Peter's Report, Vol. II. First Series Kentucky Geological Survey:—

	No. 1.	No. 2.	No. 3.
Specific Gravity	1.228	1.29	1.1831
Volatile Matter	49.6	36.8	58.52
Fixed Carbon	41.3	56.6	25.28
Ash	9.1	6.6	14.25
	100.0	100.0	98.45

Sulphur not determined.

The indications are that the coal-measures thicken, and the number of workable coals increase south-easterly from the mouth of Troublesome Creek. This, however, can only be determined by detailed survey.

In addition to the numerous workable coals above the Con-

glomerate Sandstone in this region, there are two workable coals below the Conglomerate. The excellent quality of these coals can be seen from the analysis, No. 1601, p. 81.

Just below the coal the Carboniferous Limestone bears upon its top the ore known as the Red-River iron ore, which has long furnished a very celebrated cold-blast charcoal iron, well known as Red River car-wheel iron. There is probably about one hundred miles of outcrop of this ore within a short distance of the tributaries of the river, and within twenty miles of the main stream. Salt, fire-clay, and hydraulic cement abound in the Black Shale and Upper Silurian rocks. From Burning Creek to the mouth the Kentucky Valley runs entirely within the Upper Cambrian or Blue Limestone.

The soils in this valley have the same character as in the Licking, ranging from the light loamy soils of the Carboniferous, through the clays of the Silurian and Devonian to the exceedingly rich blue-grass soils of the Cambrian and Cincinnati Limestone rocks. The navigation of the Kentucky River has been improved by locks and dams as far up as a point about twenty-five miles above Frankfort. The stream is admirably adapted for the extension of this method of navigation, until over six hundred miles of navigable water is secured. As in the case of the Licking and the Green, it has the peculiar advantage of having a very great variety of soil and natural products within a narrow compass.

The timber resources of the part of this valley that lies within the coal-bearing area are very great; all the important timber trees of Kentucky, except the cypress, are found within the valley. The black walnut is found in abundance on the hill-sides throughout this section, the finer qualities of oak, much yellow pine, some white pine, &c.

Salt River. — This stream is the only considerable river in the State that has little in the way of mineral resources. It will be seen that it follows the line of the outcrop of the Subcarboniferous Limestone throughout its whole extension, being the only river in the State that does not run across the general trend of the stratification. The valley abounds in good Limestone for building purposes, the whole of the Subcarboniferous

Limestone being exposed along its banks. The underlying Sandstones of the Waverly also furnish excellent building materials. Iron ores occur in the Waverly Shales, and perhaps also in the Subcarboniferous. The salt-bearing rocks of the lower Waverly and the Black Shale are doubtless accessible from the line of the surface of the valley. The flow of water is rather more steady than in the other rivers to the eastward, on account of the cavernous nature of the rocks along its banks. It will, therefore, furnish excellent water-powers along its whole course.

The soil of this valley is of pretty even excellence throughout. The head-waters drain a region of Blue or Cambrian Limestone, and the main stream takes the soils of the Waverly which are rather sandy, and the Carboniferous Limestone which affords very good soil.

The river has a more than usually rapid fall, descending about six hundred feet in its course of about one hundred miles from the head-waters, — probably the most rapid fall of any stream of its size in Kentucky. This will make the improvement of the stream more difficult than of other rivers of the State.

The Green. — This, on many accounts the finest of the rivers that have their whole course within the State, differs in many striking regards from the other streams. It is at its lowest stage about one-third larger than the Kentucky. The Kentucky and Licking streams have their mineral belts at their head-waters, while the lower part of their course lies in districts having their greatest value in their agricultural resources. The Green, however, has its lower half within the western coal-field, and its upper waters in the older rocks. This western coal-field is described in another section of this pamphlet, to which the reader is referred for details. In a general way it may be said that it is exceeding rich in coals of varied quality, and abounds in iron ores of high grade. Muddy River, Bear Creek, and Nolin, are peculiarly rich in iron ores, the district between Bear Creek and Nolin being one of the richest in America in the ores of the Carboniferous period.

Soils. — The soils of this valley have throughout a high order

of merit when they lie on the Subcarboniferous Limestone. They are clay loams with a perfect underground cavern drainage, excellent for all grains and for fruits. The coal-bearing rocks give soils of a much higher quality than is usual in such formations, nearly the whole of the area occupied by these rocks giving good grain crops and tobacco of a high quality and of a large yield to the acre.

The whole of this valley is peculiarly fitted for furnishing water-power. Rough Creek, Pond River, Muddy River, Bear Creek, Nolin River, Big Barren River and its tributaries, and all the other streams heading in the Subcarboniferous or lower Limestone are singularly steady in their flow, owing to their underground reservoirs of water. To these underground sources they owe as well their comparative immunity from freezing, the Green rarely freezing in the winter season. The whole of this valley is singularly well fitted for fruit culture, on account of its immunity from winter killing and destructive spring frosts, and its neighborhood to Chicago, Cincinnati, Louisville, and other great markets.

Nearly the whole of this valley abounds in excellent timber, principally hard-wood. The upper waters have large quantities of valuable cedar timber; the Carboniferous district abounds with the several species of oak, great quantities of valuable hickories, walnut, tulip-tree (or poplar), some holly of large size, sometimes over fifteen inches in diameter. There is also a good deal of hemlock along the cliff borders of the streams, and some cypress in the lower swamps in the Pond River district.

Tradewater River. — This stream bears about the same relation to the western mineral field that the Little Sandy does to the eastern coal-field. Excepting a few of the less important head-waters, the whole of its basin lies within the coal-bearing rocks. Its soil is very fertile and well fitted for the growth of cereals and tobacco. An abundant growth of hard-wood timber of varied species compose its forests; for its area it is one of the richest fields for the oaks, hickory, poplar, that exists within the State.

The coals accessible in this valley are, in part, only above

the drainage level. They represent some of the best coals in the western district. Iron ores exist in abundance, but have never been worked.

The Cumberland. — This river has the upper half and lower sixth of its course within Kentucky. The upper region lies within the coal-field and traverses some of its richest sections. The part above Cumberland Ford is in a great mountain valley between Cumberland Mountain and Pine Mountain. This valley is about twelve miles wide, and is a fertile region abounding in excellent timber, with the land, so far as arable on account of its steepness, of excellent quality. About one-third of the surface is fit for culture with the plow. Below Cumberland Ford the river bottom widens, and the mountains sink down. The land along the river is very rich indeed, and that back on the hills is of good quality. At about two hundred miles from its source, the stream cuts down into the lower rocks, and from near the Kentucky line throughout most of its current in Tennessee runs on the Upper Cambrian or Blue Limestone formation; when it reënters Kentucky it is back to the rocks of the Subcarboniferous age, and the valley is an exceedingly fertile district. The line of this valley brings its southern edge near to the Tertiary formation of the western part of the State. Its proximity to the Tennessee on the west and to the Green on the east narrows the valley to small size; all the tributaries on the lower waters are small, but the upper confluents of this stream contain some of the finest rivers of the State. Martin's Fork, Clear Creek, Straight Creek, Rockcastle River, and Big South Fork are all considerable rivers, and afford excellent water-powers. They are all streams of great steadiness of flow, and all the conditions are favorable to the formation of valuable water-powers. They all traverse regions of very great resources in the way of iron and timber, and have soils of fair quality.

It is probable that no other valley in the West possesses so great a body of valuable timber as the Cumberland and its tributaries. Poplar, the several varieties of oak, beech, maple, sweet and sour gum, walnut, and other deciduous trees abound. Red cedar, yellow and white pine, are found in certain districts in considerable quantities.

The Cumberland is nearly equal to the Kentucky in the area and richness of its mineral districts. The coal section in the valley between Pine Mountain and the Cumberland Mountains has a depth of two thousand feet, and about twenty distinct beds of coal,* of which half-a-dozen are workable. The iron ores have not been examined or sought for. They may be expected to occur at several points in the coal-bearing rocks and on the top of the Subcarboniferous Limestone. The rich Clinton ores of the Cumberland-gap district,† though not in the drainage area of the Cumberland River, are in necessary commercial relations with it, inasmuch as they must be smelted by the charcoal and stone-coal of this valley. It is also most probable that these same ores are accessible along the hundred miles of the Pine-Mountain fault, by means of adits or galleries above the drainage, or by shafts of shallow depth. Detailed reports concerning this region may be expected in the fifth and eighth volumes of the Reports of the Survey. Beneath a large part of the upper Cumberland region the formation, commonly called the "Black" or "Devonian" Shale, is filled with a lubricating oil of great value. Experience has shown that these wells are practically inexhaustible, and that the oil is of a very superior quality, especially fitted for use in high latitudes, where other oils congeal. From one of these wells on Otter Creek, in Wayne County (see map), the oil is exported by wagon to Cumberland City, thence by rail to the river, thence by a precarious navigation to Nashville; even with these hindrances the business is

* Analysis of an average sample taken from a coal-bank forty-four inches thick, on Yellow Creek, Bell County: —

Specific gravity	1.282
Moisture	1.36
Volatile combustible matter	35.80
Fixed Carbon	59.54
Ash	3.30
Coke	62.84
Sulphur	0.975

† See Report of P. N. Moore, in fourth volume, and the Biennial Report of N. S. Shaler, third volume, in second series.

found to be profitable. With effective transportation a very large industry could be founded on this product; for, unlike the light burning oils, those heavy lubricating petroleums are of rare occurrence, and find a market that is scarce supplied by the present production.

This river is navigable for steamboats for a part of the year as far as the crossing of the Cincinnati Southern Railway. The great falls offer an obstacle to improvement of navigation into the upper waters, but not an insuperable barrier. Except this fall and the rapids immediately above it, the stream offers great facilities for improvement; it would be possible to make at least four hundred miles of slack-water navigation within the mineral belt on the upper waters of this stream.

The Tennessee. — This river debouches into the Ohio, within Kentucky, and has the last sixty miles of its magnificent course within the State. This part of the valley is among the lowest lands of the State; on the east side the river is bordered by the Subcarboniferous Limestone, rich in iron ores; on the other, it extends into the low Tertiary lands which reach to the Mississippi River. The land along this stream is very fertile.

The limitations of this brief sketch make it impossible to speak of many lesser streams of great economic importance, some of them capable of being made navigable by simple canalization. Nor has reference been made to the resources of the main Ohio. The mineral resources available in this valley are only in part derived from Kentucky, so they will not be discussed here. The alluvial soils within the valley of the Ohio are of a high order of fertility throughout its course. From the mouth of the Chatterawah, or Big Sandy, downwards to the mouth, the valley is distinctly bounded by cliffs, which gradually diminish from about six hundred feet to less than thirty feet near its mouth; no part of alluvial plains have any distinct swamp character until we come below the mouth of the Tennessee, though they, in part, are liable to winter overflows. This strip of arable land on either side of the stream widens from an average of about one-half of a mile near the Big Sandy to about one and a half miles near the mouth of the Tennessee. Its fertility becomes the greater the further it is removed to the west.

WATER-POWERS.

The very numerous rivers of the State supply a large number of water-powers of great value. Although the soils want the retentive power which belongs to regions where they were formed by the glacial period, and extensive lakes are wanting, owing to the absence of the action of the same agent in this region, yet the freedom from closure by ice, and the excellent character of the foundations for dams and mills, goes far to balance the advantages. It is impossible to consider these mill powers in detail. The following points may be noted: —

The main Ohio at the falls at Louisville offers a very great but unused water-power; the flow at the lowest stage of water exceeds that of any water-power used in this country. A very valuable power exists at Cumberland Falls, in Pulaski County, where a stream as large as the one named falls about sixty feet. This point is near the Cincinnati Southern Railroad. The various slack-water dams now building and to be built in the State all afford admirable water-powers where the power itself and the transportation of the manufactured products are both well assured. As a general rule, the other water-powers are best where the waters drain from the Subcarboniferous Limestone; next in order of merit when their supply is from rocks of the Waverly or Subcarboniferous Sandstones. Next in value are the streams in the Blue Limestones, or Upper Cambrian; and, least of all, the streams from the coal-bearing rocks, which are generally largely composed of dense Sandstones and impervious Shales, having little in the way of water-storage spaces. The deficiency in the storage of water in the soil can be easily remedied by use of storage reservoirs, which, from the depth of the upper valleys and the generally good foundations, can be readily made.

SOILS AND AGRICULTURE.

All the Kentucky soils except the strip of alluvial land along the banks of the rivers have been derived from the decay of the underlying rocks. They may be called soils of

immediate derivation, as distinguished from the soils made up of materials that have been borne from a distance by water, or which deserve the name of soils of remote derivation. This feature of immediate derivation gives the Kentucky soils a more local character dependent on position than those of any State north of the Ohio. In that region the intermingling of materials due to the last ice period has reduced the soils to a more nearly equal character. Beginning with the lowest rocks, the soils of the Blue or Cambrian Limestone are those of the first quality, and are surpassed by no soils in any country for fertility and endurance. These soils are derived from a Limestone very rich in organic remains, which decays with great rapidity, and continually furnishes its *débris* to the deeper-going roots. This soil varies considerably in different districts, and at some few points, where the underlying rocks are locally rather sandy, it falls from its usual high quality. The best soil may be known by the growth of blue ash, large black locust, and black walnut. Many other trees are found in its forests, but these are characteristic, and are never found together save on best soils.

The most advantageous crops on this soil are grass, it being a natural grass land, all the grain crops, and on the richer parts hemp. Fruits of all kinds belonging in this climate do quite well on this soil. The steep slopes along the valleys are well suited for grape culture. The peculiar features of the soil are its endurance under culture. This region having been the first settled in the State, the extraordinary capacity of this soil for withstanding bad methods of farming led to the general opinion that soils of less inexhaustible properties were not worthy of notice; hence the comparative neglect of the soils of the lower rocks, which, though generally fertile, can be wasted by careless agriculture far more easily than those of the blue-grass region.

The soils of the Silurian (commonly called Upper Silurian Limestone) are much less fertile than those of the underlying rocks. When not too cherty, they make good grain and grass lands. There is generally such a mixture of the decayed matter of the underlying and overlying rocks that this thin formation, which does not exceed about one hundred feet thick, gives

but little soil which can properly be called its own. As this formation ranges from forty to one hundred feet thick in the outcrop, there is only a small area, not exceeding eight hundred square miles, occupied by these soils.

The soils of the Black or Devonian Shale have even less importance than those of the formation last mentioned; not over four hundred miles of the area of the State is covered by them. When found, they are generally a tough clay which only needs drainage to have very valuable qualities.

The Waverly or Subcarboniferous Sandstone has a thickness of several hundred feet, and furnishes an area of about five thousand square miles. Its soils are generally light clay loams, becoming more sandy as we go towards the north-east. They are throughout excellent fruit-soils, and yield fair crops of all the grains.

Next higher in the geological succession we find the Subcarboniferous Limestone, or Cavern Limestone, as it is commonly called. This rock makes a larger area of soil than any other formation except the coal-measures and the Blue Limestone (Cambrian), and may slightly exceed the latter in area. These soils are generally excellent enduring soils, ranking next to the best of the Blue Limestone soils. They are excellent grain and fruit lands, and in the western region are well suited for tobacco. Their drainage is generally excellent, on account of the cavernous character of the Limestone beneath.

The soils of the Carboniferous belt occupy by far the largest single area in the State, covering not far from fourteen thousand miles of surface. The soils in it are exceedingly variable in character, but are generally a sandy loam. On the conglomerate or lowermost part of the coal-measures, the soils are usually the poorest, — about the only really infertile soils of the State being the small strips of the soils formed on this rock.

These strips are usually very narrow, and do not include altogether more than three hundred or four hundred square miles. The remainder of the Carboniferous area is composed of fairly fertile light lands, interspersed with areas of great fertility.

Some of the best lands of the State are upon the summits of the Carboniferous mountains of Eastern Kentucky; it is safe to say that, wherever the shape of the surface admits of cultivation, the Carboniferous rocks of Kentucky furnish fair soils adapted to a varied range of crops. The considerable part of its surface that is not fit for agriculture is admirably suited for the production of hard-wood timber of the most valuable varieties, and will doubtless have in this fitness a source of wealth scarcely less than tillage of the best lands could give.

As a whole, the surface of Kentucky includes a larger area of very fertile land and a less area of barren soil than any other equal area in a State so rich in mineral wealth. The prize of wealth hidden beneath the earth is generally bought by conditions that do not favor agriculture; but, despite the fact that Kentucky has resources of coal and iron that exceed those of Great Britain, she has scarcely a square mile of surface that cannot give a constant return from its soil.

The production of these soils includes the whole of the crops of the Mississippi Valley, except the sugar-cane. Indian corn, wheat, oats, rye, barley, buckwheat, flax, flourish over its whole surface. Sorghum, for making molasses and sugar, is grown over its whole area. The conditions favor the making of sugar from beet-roots. All the ordinary fruits attain their perfection here. Cotton is raised as a crop in the south-western region of the State. Tobacco is more extensively cultivated here than in any other State in the Union. The best natural grass lands of the continent are found in the Cambrian or Blue Limestone district. Hemp is extensively grown in the same area. The blooded horses of the State are perhaps the most famous of its exports. Its remarkable superiority in this regard is doubtless in part due to the care given thereto, but, in the opinion of the best judges, is in the main the result of the peculiarly favorable effects of a combination of conditions in which soil, climate, and water all have their place. Horned cattle and sheep also do well here.

Climate. — That this State is peculiarly well fitted for the European races is shown by the fact that in no region is there a greater degree of physical vigor than in the population

within its limits. The statistics of the United States Sanitary Commission distinctly show that this is the largest-bodied native population in this country or Europe, as in the table on the opposite page.

The climatic conditions, as far as they can be described here, are as follows:* The average temperature is about 50° Fahr. As in all America, the range of temperature throughout the year is considerable; it is, however, much less in Kentucky than in the States further to the north. It is rare to have the thermometer below the zero of Fahrenheit, and it never happens that it remains for twenty-four hours below that point. The summers, though warm, are less oppressive than along the lowlands near New York for instance, owing to the considerable elevation above the sea and the relative dryness of the air. The summer heats do not at all interfere with the labor of northern-born people in the open sun. There is much experience to show that in this respect the climate is not more trying than that of New York State. Open-air work is generally possible during the whole winter, the ground rarely being so frozen as to impede construction-work or even ploughing. Cattle are not generally fed more than three to four months, and are often left in the pasture for the whole winter.

The rainfall is about forty-five inches per annum along the Ohio River, increasing towards the south-east to about sixty inches at Cumberland Gap. This is distributed with fair regularity throughout the year, — the summer droughts not being sufficient at any time to destroy crops well planted on well ploughed ground, and rarely sufficient in any way to embarrass

* The following, compiled from the United States Census Reports for 1870, shows the healthfulness of Kentucky: —

In population, Kentucky ranked as the eighth State in the Union.

In percentage of deaths to population, Kentucky ranked as the twenty-eighth State; that is, there were twenty-seven States having a greater death rate than Kentucky.

Population, in 1870, 1,321,011. Deaths, from all causes, 14,345, — or 1.09 per cent. of the population. The health of the State has increased, since 1850, as follows: —

Death to population was, in 1850, 1.53 per cent.
" " " " " 1860, 1.42 " "
" " " " " 1870, 1.09 " "

TABLE OF MEASUREMENTS OF AMERICAN WHITE MEN,

COMPILED FROM REPORT OF THE SANITARY COMMISSION, MADE FROM MEASUREMENTS OF THE UNITED STATES VOLUNTEERS DURING THE CIVIL WAR. By B. A. GOULD.

Mean Height by Nativities.			Mean Weight by Nativities.	Mean Circumference of Chest.		Mean Dimensions of Heads.	Proportional Number of Tall Men in each 100,000 of same Nativity.	Ratio of Weight to Stature.
Nativity.	No. of Men.	Height in inches.	Pounds.	Full Inspiration in inches.	After each Expiration.	Circumference around the Forehead and Occiput in.		Pounds to Inch.
New England	152,370	67.834	139.39	36.71	34.11	22.02	295	2.075
New York, New Jersey, Pennsylvania	273,026	67.529	140.83	37.06	34.38	22.10	237	2.102
Ohio and Indiana	220,796	68.169	145.37	37.53	34.95	22.11	486	2.153
Michigan, Missouri, and Illinois	71,196	67.822	141.78	37.29	34.04	22.19	466	2.106
Seaboard Slave States			140.99	36.64	34.23	21.93	* 600	2.094
Kentucky and Tennessee	50,334	68.605	149.85	37.83	35.30	22.32	848	2.192
Free States West of Mississippi River	3,811	67.419		37.53	34.84	21.97	184	2.136
British Provinces, exclusive of Canada	6,320	67.510	143.59	37.13	34.81	22.13	237	2.126
Canada	31,698	67.086	141.35	37.14	34.35	22.11	177	2.114
England	30,037	66.741	137.61	36.91	34.30	22.16	103	2.056
Scotland	7,313	67.258	137.85	37.57	34.69	22.23	178	2.086
Ireland	83,128	66.951	139.18	37.54	35.27		84	2.096
Germany	89,021	66.660	140.37	37.20	34.74	22.09	106	2.123
Scandinavia	6,782	67.337	148.14	38.39	35.37	22.37	221	2.158

* Slave States not including Kentucky and Tennessee.

agriculture. The number of days of sunshine is relatively very large, considering the amount of rainfall.

MEAN TEMPERATURE.

	October.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	Annual Mean.
1870–71.	*	*	*	*	*	*	*	*	*	*	*	*	*
Louisville. .	59.08	46.4	33.4	36.7	39.5	50.7	59.1	64.	75.	77.2	79.	6.67	57.3
1871–72.													
Louisville. .	60.5	44.0	38.0	30.8	36.0	38.7	59.1	67.6	74.3	79.0	78.2	69.8	56.3
1872–73.													
Lexington .	....	38.2	27.9	30.4	35.6	40.9	53.1	64.7	73.7	76.5	73.7	66.8	....
Louisville. .	56.6	39.5	29.4	31.1	36.8	43.3	54.6	67.	78.	79.	78.	69.5	55.23
1873–74.													
Lexington .	53.8	40.7	39.6	36.5	39.2	44.3	46.9	63.6	77.9	77.8	75.1	70.9	55.5
Louisville. .	54.	41.5	38.7	37.5	39.5	45.6	48.8	68.2	80.7	80.7	79.3	72.2	57.2

RAIN-FALL. — Inches.

1870–71.													
Louisville. .	3.89	2.40	2.20	3.05	5.74	7.29	20.6	5.97	3.86	2.22	3.06	1.23	42.95
1871–72.													
Louisville. .	1.85	2.51	3.29	(*)	(*)	1.41	8.40	4.49	6.19	3.67	2.45	4.41	38.67†
1872–73.													
Lexington .	....	1.21	3.53	2.53	4 05	3.73	2.88	6.05	4.54	3.37	2.94	1.60	....
Louisville. .	3.92	0.56	2.58	2.93	5.42	3.39	3.05	5.73	3.87	3.43	3.04	2.56	40.42
1873–74.													
Lexington .	5.47	2.09	4.41	5.41	4.89	5.90	6.81	0.79	3.55	6.26	1.57	2.89	50.04
Louisville. .	3.26	2.19	6.99	2.39	5.18	6.63	6.01	1.17	2.95	2.71	3.23	0.62	43.33

Average Annual Mean for thirty years, 55.9° Rain-fall, 50.30 inches.

* Rain-Guage not in position.
† Ten Months.

The healthfulness of this region is not exceeded by any State in this country. Epidemic diseases have never been destructive outside of some of the towns. The experience of the city of Lexington has shown that even in the towns such diseases are curable by the use of pure drinking-water. Miasmatic diseases are not known on the table-lands, being limited to the low regions near the large rivers; at least seven-eighths of the State enjoy an absolute immunity from such diseases. Consumption is rare, compared with the northern and eastern States. Yellow fever never occurs. This region is remarkable for the number of persons in extreme old age, who retain their faculties quite unimpaired and a large share of bodily vigor. The writer, who has made this subject of longevity a

matter of much inquiry, is satisfied that the region from the Big Sandy to the Cumberland, especially the higher parts of the table-land, and where Limestone soil is found, is peculiarly fitted by its conditions to retain the vigor of the body to an extreme old age, deserving, in this regard, to rank with the Canton de Vaud in Switzerland and the few other favored spots where longevity is a characteristic of the people. He is also satisfied that the proportion of bodily deformities and diseases of imperfect development, — such as curvature of the spine, rickets, &c., — is smaller within this area than among any equally large native population in this country or in Europe. Of the whole population of whites and blacks, about eleven hundred thousand of the former and three hundred thousand of the latter have been on the soil for three generations (these numbers are approximate). It needs only inspection to show that there has been no degeneration during this time, and that the world-wide reputation for vigor which the State has acquired is not likely to be lessened in the time to come.

Natural Beauties of Scenery.—In all those features of natural beauty which go to lend attractiveness to a fertile region, this State is much favored. Above any other State it is rich in rivers, and these have an incomparable variety of loveliness. Their head-waters lie around the stately mountains of the Cumberland range, their middle distances course through gorges often cut into deep cañons, and their lower waters verge gently into the great valleys of the Ohio and Mississippi. The valley of the Upper Cumberland lies in a broad mountain trough, affording some of the finest scenery of the whole Appalachian chain. Big South Fork of the Cumberland, Rockcastle River, Red River, of the Kentucky the whole of the Upper Kentucky, Tygert's Creek, the upper part of the Big Sandy, — all present that mingling of clear stream, steep cliff, and beautiful vegetation, which is the great charm of a mountain country. The cañon of the Kentucky, between Frankfort and Boonesburg, is perhaps the most charming scenery of its kind in the region east of the Mississippi. The deep gorges of Green River and its tributaries, Nolin and Barren

Rivers, abound in exquisite scenery; cliffs, in the semblance of castles, towering hundreds of feet above the streams, their faces pierced by caverns, and hung with a foliage of almost tropical luxuriance.

The cultivated district of Central Kentucky, commonly known as the Blue-grass District, is perhaps for its area the most beautiful rural district in America. The surface is undulating; large areas of the original forests have been cleared of their undergrowth and produce a fine close sod, and in these wood-pastures are some of the finest flocks and herds in the world. It has happened to the writer to pass on several occasions from this region to the richest lands of Middle England, or *vice versa*, and he has always been struck by the singular likeness of the two countries. There is probably a closer resemblance between the surface of the country, the cattle, horses, the agriculture, and even the people of these two areas than any two equally remote regions in the world.

The western part of the State abounds in natural beauties; the rich forests and the noble rivers, the Mississippi, Ohio, Tennessee, Cumberland, and the Green, give it a most attractive surface. Even the deep swamps of the lowest regions have a sombre charm that deserves the attention of the tourist. No region ever visited by the writer exceeds in weird beauty the environs of Reel Foot Lake, where the great earthquakes of 1811–13 formed a lake some fifty miles in area. All over its surface stand the trunks of the cypresses that grew in the swamp before the convulsion. These are now reduced to tall columns blackened and whitened by decay. The surface of the lake is a mass of water-plants, in summer a perfect carpet of flowers; Nymphæas, a half-foot or over, and the Nelumbium, water-chenquepin, or American lotus, a golden flower often exceeding a foot in diameter, cover its surface with their blossoms and fill the air with their perfume.

Caverns. — The subterranean beauties of the State are already famous. The Mammoth Cave is, however, only a noble specimen of a vast series of caverns, to be numbered by the tens of hundreds, that occupy nearly all of the Subcarboniferous Limestone area of the State. This cavern-belt extends

in a great semicircle from Carter County, where there are several beautiful caves and two remarkable natural bridges, to the Ohio below Louisville. These caverns have as yet been but little explored, and their beauties are mostly undiscovered. There are probably many thousand miles of these cavern-ways accessible to man. The Indian tribes knew them better than our own race; for it is rarely that we find any part of their area which does not show some evidence of the presence of ancient peoples.

MARKETS AND TRANSPORTATION.

As regards proximity to markets, this State has peculiar advantages, which only await the completion of transportation routes already begun to render its position unequalled among American States. Reference to a map will show that it is the most centrally placed in the group of States east of the Rocky Mountains. From the geographical centre of Kentucky it is about an equal distance to Central Maine, Southern Florida, Southern Texas, and Northern Minnesota. The State of Colorado, the Great Lakes, and the mouth of the Mississippi fall in the sweep of the same line.

The river system of the Mississippi has its centre within the borders of Kentucky, and her lands are penetrated by more navigable rivers than any other State in the Union. Her territory includes about fifteen hundred miles of streams that are navigable at all stages of water, and about four thousand miles of other streams that can be made navigable by locks and dams. These streams give access to the whole Mississippi system of inland navigation, which includes about twenty-five thousand miles of streams now navigable, or readily rendered so by the usual methods of river improvement. The State has at present connection by water transportation with at least twenty millions of people, occupying an area that will probably contain near two hundred millions within a century from this date. There is a proposition now under discussion to use the convict labor of the State on the improvement of the rivers, which if carried to success is likely to make their complete canalization an accomplished fact within twenty-five years.

The existing railways of the State form a system which wants but a few connecting links to give it an admirable relation to the rest of this country. The north and south lines consist of the following roads, beginning on the east: The Eastern Kentucky, from Riverton in Greenup County to Willard in Carter County; thirty-five miles of road built to develop the coal and iron district of this section, with the expectation of eventual continuation to Pound Gap, and connecting with the south-eastern system. The Maysville and Lexington Railway, running south as far as Lexington, and connecting there with the system of roads about to be described. Third in the series on the west we have the Kentucky Central Railway, now extending to Lexington along the banks of the Main Licking Valley and its South Fork. The continuation of this road, by either Pound Gap or Cumberland Gap, to the railway system of Eastern Tennessee and the valley of Virginia, is likely to be accomplished at an early day. The Cincinnati Southern Railway, from the mouth of the Licking directly south to Chattanooga, will be completed during the present year, and afford an admirably built road traversing the State on its longest south and north line, and crossing the Blue-grass lands on their longest and best section. This road is likely to be of incalculable value to the State, forming as it does a main line to the South and South-east.

The Lexington and Big Sandy Railway is completed, as far as Mount Sterling in Montgomery County. This road when finished will give Kentucky cheaper and more direct communication, by way of the Chesapeake and Ohio Railroad, with the Atlantic ports. The Mount Sterling coal-road, now almost completed, extends from the latter place to the border of the eastern coal-field, in Menifee County. The extension of this road will greatly facilitate the development of the coal and iron region through which it is proposed to continue it.

The Kentucky and Great Eastern Railway is a proposed road on which considerable work has been done; extending up the south bank of the Ohio River from Newport, Kentucky,

to the Big Sandy River. The completion of this road will add greatly to the wealth of river line of counties, and will give the State a shorter road to the Atlantic ports than she now has.

The Louisville, Frankfort, and Lexington Railroad extends through the Counties of Jefferson, Oldham, Shelby, Franklin, and Fayette. From Lagrange in Oldham County a branch extends from this road to Cincinnati, known as the Louisville and Cincinnati short line, — that line, passing through the counties of Oldham, Henry, Grant, Carroll, Gallatin, Boone, and Kenton.

The Cumberland and Ohio Railroad, narrow-guage, now building, when completed, will pass through the counties of Henry, Shelby, Spencer, Nelson, Washington, Marion, Taylor, Green, Metcalf, Barren, and Allen. Its length in Kentucky will be 165 miles.

The Louisville and Nashville Railroad extends, with its branches, a distance of 356.4 miles through Kentucky in different directions. The Main Stem, from Louisville to Nashville, has a length within the limits of the State of 139.6 miles, running through the counties of Jefferson, Bullitt, Nelson, Hardin, Larue, Hart, Edmonson, Barren, Warren, and Simpson. The Memphis Branch runs through the counties of Warren, Logan, and Todd, having a length in the State of 46 miles. The Lebanon Branch extends into Southeastern Kentucky, running through the counties of Nelson, Marion, Boyle, Lincoln, and Rockcastle; it has a completed length within the State of 109.9 miles, and its extension to the State line is projected, and its completion only a matter of time; it will then connect with a road leading to Knoxville in the State of Tennessee. The Richmond Branch runs through the counties of Lincoln, Garrard, and Madison for 33.4 miles, to within a short distance of the rich iron region of Kentucky. The Bardstown Branch runs through the county of Nelson, a distance of 17.3 miles. The Glasgow Branch, 10.2 miles long, runs to Glasgow, the county-seat of Barren County. The Louisville and Nashville Railroad is undeniably one of the most important thoroughfares of this continent; it is second only to the Mississippi River as a way for the com-

merce between the Northern and Southern States. By means of the magnificent railway bridge over the Ohio River at Louisville it connects with all the great northern roads, and at Nashville and Memphis, its southern termini, it connects with all the important roads of the South.

The Louisville, Paducah, and South-western Railroad extends from Louisville to Paducah, a flourishing city situated on the banks of the Ohio River, fifty miles from its junction with the Mississippi, and is the principal market-town of Western Kentucky. This railroad penetrates Western Kentucky in such a manner, therefore, as to afford easy access to a large portion of that section. It runs through the counties of Hardin, Grayson, Ohio, Muhlenberg, Hopkins, Caldwell, Lyons, Livingstone, Marshall, and McCracken. It passes directly through that section of the valuable coal-fields of Western Kentucky which lies within the area of the counties of Ohio, Muhlenberg, Hopkins, and Grayson. The entire length of the Louisville, Paducah, and South-western Railroad is 225 miles, all of which is within the territory of Kentucky.

The Paducah and Memphis Railroad runs through the counties of McCracken and Graves, connecting at Memphis all of the south-western railroads.

The Owensboro, Russelville, and Nashville Railroad is completed from Owensboro, on the Ohio River, to Owensboro Junction on the Louisville, Paducah, and South-western Railroad, passing through the counties of Daviess, McLean, and Muhlenburg.

The Evansville, Henderson, and Nashville Railroad, from Henderson on the Ohio River to Nashville, Tenn., passes through the counties of Henderson, Webster, Hopkins, Christian, and Todd. At Henderson a ferry takes cars to the northern system of roads. It forms the most important link in a great trunk line known as the St. Louis and South-eastern Railway. The New Orleans, St. Louis, and Cairo Railroad passes through the counties of Ballard and Hickman. The Mobile and Ohio Railroad, connecting the city of Mobile on the Gulf of Mexico with the Ohio River, penetrates Kentucky through the counties of Hickman and Fulton.

At Columbus, in Hickman County, a ferry fitted for the carriage of trains gives passage to cars from St. Louis directly through to the south-eastern cities. Of the ten before described north and south railways, four have northern connections; two (the Cumberland and Ohio and the Cincinnati Southern), now under construction, will have southern connections. The others all look to the same end, but have not yet succeeded in accomplishing it.

It is in roads with eastern connections that the State lacks most. There is not yet a single railway crossing the eastern line of the State. It is to this difficulty of access from the seaward that the State owes the small share it has had in the immigration of capital and labor that has filled the lands of less attractive regions. Three routes have been begun, which, when complete, will fully remedy this grave defect; namely, a road from Louisville to the south-east *via* Cumberland Gap, completed to Livingston, and requiring a continuation of about one hundred miles to connect with roads leading from Morristown, Tenn., to Charleston, S. C.; a road from Mount Sterling to Abingdon, Va., *via* Pound Gap, requiring about one hundred and sixty miles of road to complete the connection; a road from Lexington to connect with the Chesapeake and Ohio, requiring about eighty miles to bring it to completion. The northernmost and southernmost of these roads are likely to be carried forward to completion within a few years. There is a project for building up, east and west, a road along the northern range of counties of the State, giving a continuous route from Henderson, and the roads connecting at that point, to the connections with Charleston and Savannah from Morristown, Tenn.; also a project for a road from Chicago to Charleston, crossing Kentucky from Gallatin County to Cumberland Gap.

It will be seen from this brief sketch that the railway system of Kentucky is on the whole good, and wants but little to make it, as a system of trunk lines, exceedingly well adapted to the development of her resources. Taken in connection with the river system, it is clear that, within a generation, we may expect here a transportation system excelled by no State on the continent.

With reference to markets, it will be seen, by consulting the census tables, that the State has at present access to a larger number of markets than any other Western State: although there is but one large city within her limits, the cities of Cincinnati, St. Louis, Nashville, and Indianapolis lie upon her borders. Her principal export products have a special value that makes them sought on her own soil by purchasers enough to take any product that can be furnished; on the borders of the State, a host of manufacturing towns are rising that will certainly make a market for all the food, fuel, and raw products from her soil, quarries, and mines.

PRICE OF LANDS.

In no other State having any thing like the same advantages can lands be bought at so low a price. The best agricultural lands, or those commanding the highest price, are found in the Limestone regions and along the principal rivers; these, when cleared and not worn, bring from thirty to one hundred dollars per acre. The same, uncleared, will be about half these rates. The second-rate lands in the same regions bring from ten to forty dollars per acre. The lands on the coal-bearing beds, though often exceedingly fertile, are generally very cheap. When contiguous to transportation they may generally be estimated at about ten dollars per acre, but the tracts of good tobacco lands, with excellent timbering and great mineral resources, can often be purchased for two to four dollars per acre in tracts suitable for ordinary farming, within ready access of permanent transportation. Vast tracts of timber land, suitable for grazing, with much excellent land in the *coves*, or other level places, can be bought for from fifty cents to one dollar and a half per acre.

As a general thing, it may be said that the lands in this State are much cheaper than in any State north of the Ohio River. This is owing to the fact that, destitute of eastern communication, the State has hitherto had but a small share of the tide of immigration of capital and labor that has poured past her borders to fill the favored fields of the far West.

Nearly all the products of Kentucky have their prices

determined by the cost of transportation to the great centres of population along the Atlantic seaboard or beyond the sea. Its tobacco, pork, grain, and some of the costlier native woods, and some other products find their principal markets in Europe; cattle, and to a certain extent the other agricultural products of the State, have their values determined by the cost of transportation to the American Atlantic markets. Hitherto, this access to the domestic and foreign markets of the Atlantic shores has been had by way of the railway systems which traverse the region north of Kentucky, and from which the State has been divided by opposing interests and the physical barrier of the Ohio River. All the development of the State has taken place under these disadvantages. A comparison of the tables of cost given below will show that the complete opening of the mouth of the Mississippi to ocean ships will result in the enfranchisement of the productions of Kentucky in an extraordinary way.* At the present time, the freight-rates from the lower Ohio to Liverpool would permit the profitable shipment of the cannel coal

* "The following are taken from published freight-rates, and give time and cost of transit from St. Paul's, two thousand miles above New Orleans, to Liverpool by the two routes: —

	Cost per bushel. Cents.	Time. Days.
From St. Paul's to Chicago	18	4
Lake from Chicago to Buffalo	8	6
Canal from Buffalo to New York	14	24
New York to Liverpool	16	12
Elevator or trans-shipment charges, Chicago	2	2
" " " Buffalo	2	2
" " " New York	4	2
Total	64	52

	Cost per bushel. Cents.	Time. Days.
From St. Paul's to New Orleans (*via* river)	18	10
New Orleans to Liverpool	20	20
Elevator charges, New Orleans	2	1
Total	40	31

Here is a saving by direct trade of twenty-four cents per bushel, or eight shillings per quarter, and a saving of twenty-one days in time. To be fair, I have taken the extreme point: *but the nearer the grain is to the Gulf, the cheaper the transportation.*"

and native woods of many different species to Europe with one trans-shipment at New Orleans. It is impossible, on account of limited space, to give a detailed statement on this point; but evidence can be furnished to those desiring it. It is to be noticed that it is possible for several months each year to bring ships of large draught of water to the loading points on the Ohio River, and load them for direct trade with Europe. The tonnage of such vessels both ways from New Orleans would be at the lowest rates for such work current in any region. It will be seen that the State of Kentucky has the most extensive shore on the navigable waters of the Mississippi Valley, and that even in the present incomplete development of her navigation system she will have over fifteen hundred miles of frontage on continuously navigable waters. There can be no doubt that the market expenses of the products of the State will be reduced nearly one-half when the far-reaching consequences of the development of water-transportation are attained. It will not be amiss to notice that the costs of transportation by water, far lower than by rail in most countries, is peculiarly cheap on the Mississippi and its principal tributaries; coal is lower than in any other country, as is also timber for boat-building; there are no tolls on the streams, and the currents are generally slow near the shores, admitting of tolerably easy ascent.

FITNESS FOR INVESTMENTS OF CAPITAL AND LABOR.

For all the important branches of agriculture and manufacture, so far as they depend on cheap and fertile soils, good climate, and a great abundance and low price of coal, iron, and hard-wood timber, and last, but not least, low taxation, — Kentucky offers unsurpassed advantages for the creation of industries. It will be impossible to name these opportunities in detail, but some of the most important may be suggested. The growing industries of the Ohio-River Valley and the neighboring regions offer continued opportunities for the increase in the export of the raw products of the State. Coal, iron, salt, timber, cements, building-stones, can all be produced at great profits, even in the present depressed state of the industries of the

world. The Ohio Valley probably gains in population at an average rate of not less than five per cent. per annum. This great elasticity of demand insures a successful result in any discreet industrial venture. Besides the coal and iron mines, the attention of capitalists is requested to the production of other articles of equally steady demand. Salt can be produced over a large area at the cheapest possible rate,— the water hardly requiring pumping from the shallow wells, and the gas furnishing fuel. The great amount of fire-clays should be considered. The tile-clays are admirable in quantity and quality. An area of several thousand square miles in the State is rich in marls, containing large quantities of potash and soda, fitted for the production of fertilizers. The western section of the State is admirably fitted for ship-building; excellent ship-timber can be had cheaper than in any other country, and there is ample water to take ships drawing twenty feet to the sea for half the year. Besides the enormous possibilities of business derived from the working of raw products, finding their market in the great and growing States of the Mississippi Valley, there are most important opportunities derived from its relation to the regions beyond the sea. The natural outlet to the Atlantic ports for these products is by way of the Mississippi to the sea. The freights from Western Kentucky to New Orleans are less than one-half of the rate from the same region directly to New York. Until the success of the Eades-Jetty project, this method of carriage to the sea was practically impossible. At present it is practicable to load timber-ships and colliers at the ports from the western coal-field, and send them directly to the Atlantic ports, or to any markets beyond the sea. Already a large trade in wine-cask staves exists between this region and Europe. These staves pass through six hands before coming to the consumer. These exchanges could be readily reduced to three by direct shipment. The demand seems to be practically inexhaustible, and the timber exists in very great quantities. To this industry there could be readily added a business in the manufacture and shipment of spokes, felloes, and other carriage-parts, the parts of railway-carriages, agricultural implements, &c. Building-stones of admirable quality

exist all along the tributaries of the Ohio, and their export to the Atlantic ports is already a considerable commerce.

As will be seen from the accompanying map, the State of Kentucky lies, as a region of peculiar mineral resources, in the centre of the region now holding, and destined always to hold, the mass of American population. The present centre of population is adjacent to the northern border of Kentucky, and it is practically certain that in centuries to come it must remain within or on the borders of Kentucky. This makes it sure that manufactures will from this region always command the widest markets with the least carriage.

The advantages of this district to the agriculturist are known by the cheap land, good climate, and abundant variety of crops. These crops are near to a great and growing set of markets. Among the new ventures in agriculture must be placed fruit-culture for the northern markets, — a business that is now taking a very important place in the industries of the State. The poorer lands of the southern part of the State have a peculiar fitness for this purpose.

The following table, compiled from the United States census report, proves that Kentucky is susceptible of a greater variety of production than any other State. It will be observed that it is in each census the first State in the production of some one or more staple articles: —

	1840.	1850.	1860.	1870.
Wheat	First.	Ninth.	Ninth.	Eighth.
Swine	Second.	Second.	Fourth.	Fifth.
Mules		Second.	Second.	Third.
Indian Corn	Second.	First.		Sixth.
Tobacco	Second.	Second.	Second.	First.*
Flax	Third.	First.	Third.	Eighth.
Rye	Fourth.		Fifth.	Fifth.
Hemp		First.	First.	First.
Cotton	Eleventh.			Twelfth.
Value of Home Manufactures	Third.		Second.	Third.

* In 1870 Kentucky produced near one-half of all the tobacco produced in the United States, and more than half of all the Hemp. The production of Tobacco increased from 105,305,869 pounds in 1870, to 158,184,929 pounds in 1873.

The high rank of Kentucky as an agricultural State can best be appreciated when it is remembered that more than one-

half of the State is in forest, and that the State is only exceeded in area of woodland by three States. Yet, with less than half the land in cultivation, the State ranks eighth in the value of agricultural products.

Building and other Economic Stones.— The building-stones of this State are limited to Limestones and Sandstones. Within these limits, however, there is a most abundant variety of color, hardness, and other qualities. The Limestones of the Upper Cambrian, or so-called Lower Silurian, are excellent stones of exceedingly varied qualities. Usually they afford a gray marble of admirable resisting powers against wear, especially fitted for buildings when their courses of rocks are suitable. Along the Kentucky River this series of rocks affords a beautiful buff and cream-colored marble, admirably fitted for detailed sculpture work, the Clay Monument at Lexington being made of this stone. This stone can be quarried on the banks of the river in any quantity and at small expense, and transported by boat to the Ohio River. Next above this level we have the equivalent of a part of the cliff-limestone of Ohio, which has received the local name of Cumberland Sandstone in the Kentucky reports. This Sandstone is thin, and passes into a cherty Limestone in the northern part of the State; but in the basin of the Cumberland it is of a peculiar greenish color, affording a very handsome and durable building-stone, resembling in many regards the Buena Vista Sandstone of Ohio. This stone will doubtless have considerable value in the time to come, as it is peculiar in its color among all the building-stones of the Ohio Valley. No other good building-stones occur until, after passing above the Black Shale, we come to the beds of Sandstone of the Waverly period. The beds of this section afford the only Sandstones of the State that have been extensively worked for building purposes. These beds, commonly known as Buena Vista stone, are the only source of the Sandstones used in Cincinnati and Louisville, and in most of the other western cities. At present they are worked along the Ohio and south-east of Mount Sterling in Montgomery County;, but they can be had where the Licking, Kentucky, Salt, and Green Rivers cross the Waverly, and at the points where the railroads of the State pass over the same formation. 401

It is, however, in the Subcarboniferous or Mountain Limestone that the greatest variety and area of economic stones occur. Here we have Limestones (carbonates) which are the finest known in this country; Oölites which, for beauty of grain and endurance of time and other forms of wear, are unsurpassed; Dolomites that have all the fine qualities belonging to those Magnesian Limestones; and, finally, a series of more or less Argillaceous Limestones, some of which are already in use as lithographic stones, and promise good results. These Oölites have been in use for forty years in the town of Bowling Green, and retain all their tool-marks as when dressed, having hardened very much since their working. Stones for furnace-hearths abound throughout the whole mineral district. Some millstones have been worked for local purposes, but have had no extensive test. Grindstones are made from the Waverly Sandstone, which is admirably fitted for this use. Some good grindstones have been made from the Carboniferous Sandstones of Western Kentucky.

GOVERNMENT, POPULATION, TAXES, EDUCATION, FUTURE.

The government of Kentucky is at present modelled in part on that of New York, and in part on that of Virginia, — the legal framework being essentially that of the former State. The legislative machinery differs somewhat from that of the other States, in that the senate is re-elected one-half each two years, while the lower house is simply renewed each two years by election. There is no actual State debt, — the school-fund debt being such only in appearance, in fact only an obligation to pay a certain sum for the support of schools. No State debt can constitutionally be contracted, and during the last ten years, while other States have been steadily increasing their obligations, Kentucky has paid off the debt which was left by the war, and now is debtless, and with considerable assets. The last legislature (1876) reduced the taxes by one-eighth, after a careful inquiry going to show that it could be done with safety. The following statement summarizes the condition of the State in 1875: —

"It will thus be seen, that in the last two years we have redeemed and paid off $347,000 of the public debt, and there now only remains of bonds outstanding and unredeemed $184,394. The residue of these bonds are not due and redeemable until 1894–5–6."

To meet this indebtedness we had, on the 10th of October, 1875, the end of the fiscal year,* —

To the credit of the Sinking Fund	$153,559.07
230 United States 5–20 gold-bearing interest bonds, worth not less than 20 per cent. premium . . .	246,000.00
Making	$399,559.07

The whole traditions of the State are strongly in favor of economy and honesty in every branch of public affairs. No loss by defalcation has ever occurred to the State. Debts cannot be incurred by counties, cities, or towns without special authority from the legislature. This permission is now given only in rather rare cases, and is subject to great limitations from the organic law. The result of these conditions is an immunity from the danger of destructive taxation, such as does not exist in any other State in this country.

Education. — The State now gives from the general treasury the sum of one million dollars to the purpose of common school education; this is, *per capita*, as large a contribution from the general fund as is given in any State; as yet, this has been inadequately supplemented by local aid, but much progress is now making towards the creation of graded schools in every village where the population admits of it. The laws allow the imposition of a considerable local tax for schools. There is no State with an equally scattered population where so much has been done for the elementary education.

Universities and colleges do not now receive the aid of the State. There are, however, a number of excellent institutions of this grade in the State. The first collegiate institution west of the Alleghanies was Transylvania University, at Lexington. Kentucky University, Georgetown College, Centre College, and a number of other similar schools of newer date, many of

* In a report made by the State Treasurer, January, 1876, the State debt was shown to have been much less than the above, and the surplus in the Treasury had increased to near one million of dollars. This report will appear in next edition of this pamphlet.

them excellent in their methods, and provided with considerable endowments, furnish the higher education of the State.

The charitable institutions, nominally so called, are sufficiently furnished by the State. A very high place is held by the asylums for the deaf and dumb and for the feeble-minded, in both of which recognized advances have been made in the methods of dealing with these forms of human infirmity.

It remains to speak of the most important element in the State, its population.* Probably no other State in this Union contains a people as purely English in descent as this. At this date (1876) the population numbers 1,600,000; of these only 200,000 are of African descent, or about one-eighth of the total. There is a steady decrease in the black population, and an equally steady increase of the white, so that the negro now makes but an inconsiderable fraction of the State; by far the greater part of the blacks are gathered about the towns in light labor of the domestic class. The relations between the two races are those of entire harmony. Separate schools are founded for the two races.

In 1870, the foreign-born population in Kentucky amounted to 63,398 (is probably at the present time less than 100,000); of these 31,767 were Germans, and the remainder from various other European countries. The greater part of this foreign population is settled along the Ohio River, but it exists in almost every county. The honest and self-supporting citizen of every country has always received a warm welcome in Kentucky; no jealousy has ever shown itself towards the foreigner. The government of the State has for years always had a number of conspicuous members from beyond the sea; one of the United States senators and several of the members of the legislature are also from other countries.

Without indulgence in excessive claims, which would be quite foreign to the sober tone of this Commonwealth, we may reasonably expect for Kentucky, in the time to come, a substantial growth proportioned to her natural advantages. As at the present moment, when the country generally is under

* In 1790, Kentucky was the fourteenth State in population, having a population of 73,677. In 1870, Kentucky was the eighth State in population, having 1,321,011

a heavy burden, the result of its commercial extravagances, the State of Kentucky is actually prosperous in a fair degree, so we may expect in the future a consistent and conservative progress that will not be attended by those periods of commercial depression that so generally accompany a growth of an excessive kind. The unequalled blessings of the Ohio Valley, its wealth of mineral stores, fertility of soil, goodness of climate, and facilities for transportation, are all shared in large measure by Kentucky. Another century will doubtless see this Valley the greatest seat of those productions that require cheap power and cheap food for their making, bringing a population equal to that of the equal areas in the great European States; when this comes, this Commonwealth will contain within her borders probably not less than eight millions of people, and sources of wealth and power unsurpassed on this continent.

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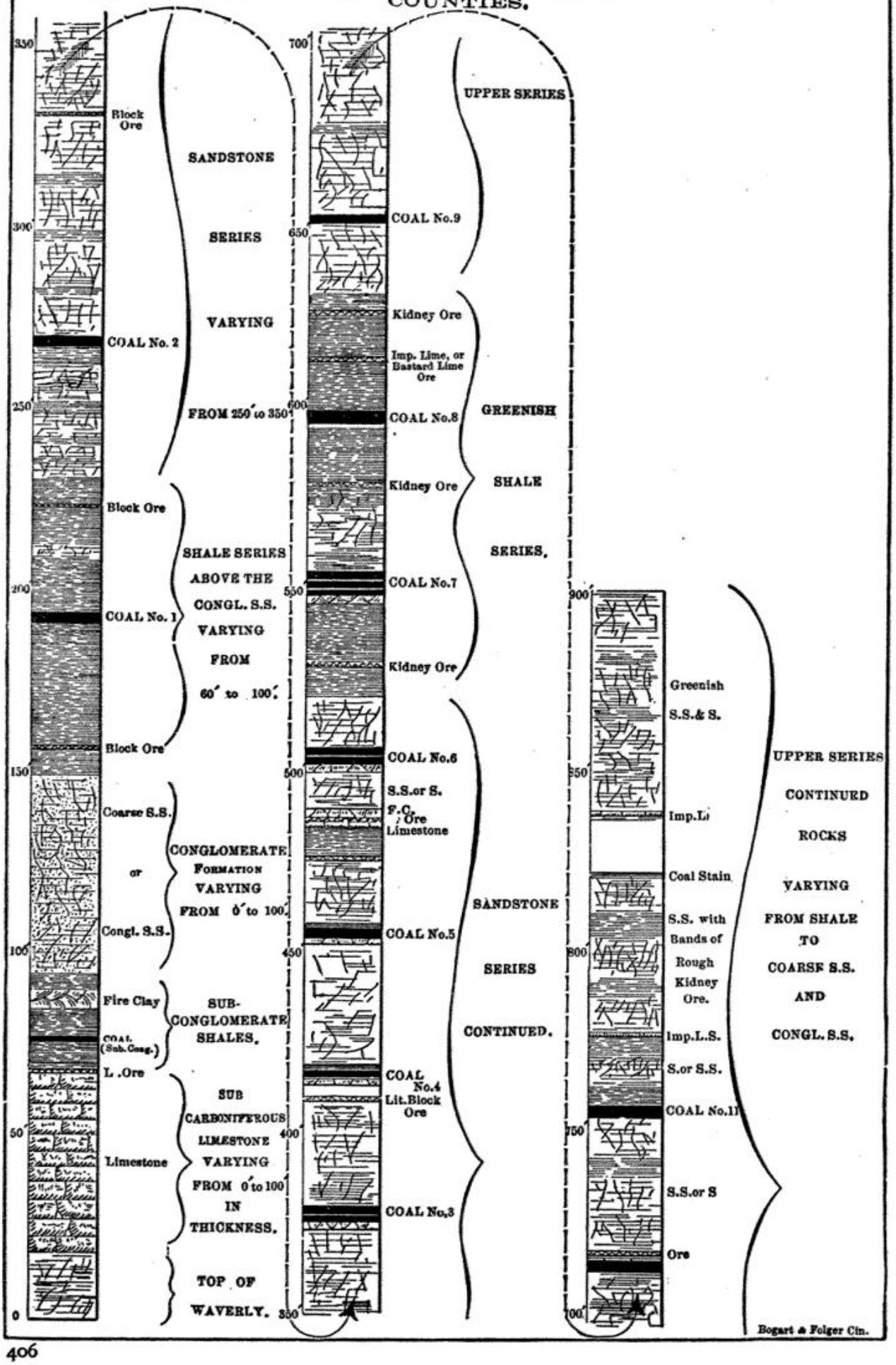
Plate No. 1.

GENERAL SECTION FOR GREENUP, BOYD, CARTER, & Part of LAWRENCE COUNTIES.



BRIEF STATEMENT OF THE ECONOMIC GEOLOGY OF THE BIG-SANDY VALLEY.

THE valley of the Chatterawah or Big-Sandy River is entirely within the limit of the coal-measures, and, with perhaps one or two exceptions, where the Subcarboniferous Limestone is brought to the surface, the rocks exposed on the waters of the Big Sandy are those of the coal-measures proper.

The number of distinct beds of coal known to be present in this valley is twelve. Iron ores are found at about an equal number of levels. The accompanying general section, from report of A. R. Crandall on the geology of Greenup, Carter, Boyd, and Lawrence Counties, shows the order of the beds, both of coal and of iron ore, near the Ohio River. Further southward changes occur in the general character of the rocks above coal No. 3, so changing the general section as to render any identification of beds from the little that is now known of them quite untrustworthy. Fuller investigation will doubtless discover most of the coals as found near the Ohio, and the thickening of beds as found southward gives promise of richer fields than those already developed.

The following table shows the thickness of the beds that have been fully identified as seen in the localities where mined: —

	Minimum.	Maximum.
Coal, No. 1.	3 ft. 0 in.	5 ft. 0 in.
" " 2.	2 " 0 "	3 " 8 "
" " 3.	2 " 6 "	6 " 6 "
" " 4.	2 " 0 "	4 " 6 "
" " 5.	3 " 6 "	9 " 0 "*
" " 6.	3 " 0 "	4 " 0 "
" " 7.	3 " 0 "	6 " 0 "
" " 8.	2 " 6 "	8 " 0 "
" " 9.	2 " 0 "	2 " 6 "
" " 10.		3 " 6 "
" " 11.	2 " 0 "	2 " 6 "
" " 12.		†

* Coal 5 is generally slaty in part where found in great thickness.
† Not opened.

The following table of analyses of samples, taken from the whole thickness of beds as mined, will serve to indicate the character of the beds included, and of the coals of this field generally: —

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
	Graham Bank.	Kibby's Bank.	Peach Orchard.	Cannel Hunnewell.	Buena Vista.	Keye's Creek.	Coalton.	Head of Nat's Cr'k.
Specific Gravity . .	1.267	1.289	1.317	1.306	1.360	1.279	1.320	1.367
Moisture	2.50	4.10	3.26	1.50	3.20	2.94	5.00	3.50
Volatile Com. Mat.	36.00	34.60	34.22	52.20	32.30	32.50	34.50	31.90
Fixed Carbon . .	57.30	55.25	55.36	40.60	53.00	56.76	55.40	52.06
Ash	2.90	4.77	7.16	5.70	11.50	7.74	5.10	12.50
Sulphur	1.148	1.414	0.901	0.782	1.999	1.972	1.285	0.873

Coal No. 8, as represented in this table, is from the head of Nat's Creek, in the north-eastern corner of Johnson County, where it is fully eight feet in thickness, with slight partings. The only average sample from this locality was necessarily taken from near the outcrop, giving too large a percentage of ash, and probably too small a percentage of sulphur.

The thickness of the measures, which include the coals of this table, is about four hundred feet in the regions best known. Coal No. 1 is exposed along the Big Sandy, southward from Peach Orchard and Warfield, at a level which is in general slightly above high-water mark. The hills along the river and the main creeks rise to the height of six and seven hundred feet, including the equivalents of the accompanying general section from coal No. 1 upward. What beds are present in these hills is yet to be ascertained.

GENERAL RESOURCES

OF THE

WESTERN COAL-FIELD AND BORDERING TERRITORY.

I.

SUBCARBONIFEROUS BEDS.

THE coal-field is bordered by Subcarboniferous beds, which are, in succession, those forming the Chester group, and those included in the St. Louis group.

The Chester series are rich in stores of potash-marls, while the St. Louis group yields a number of beds of very admirable building-material.

It is also in the region underlaid by the Subcarboniferous beds that the excellent Limonite iron-ore, so highly esteemed by iron-manufacturers, is found.

As the group is of especial interest, the following typical section of the Chester group, as it occurs on the eastern outskirts of the coal-field, is given: * —

No. 1.	Shale, with thin beds of Limestone	15 feet.
2.	Heavy-bedded, cherty Limestone	13 „
3.	Red and green Shale	5 „
4.	Rhomboidally-jointed Sandstone, frequently charged with Brachiopoda	0 to 10 „
5.	Limestone	2 „
6.	Shale	10 „
7.	Limestone and Shale	20 „
8.	Green, red, purple, and blue, marly Shales; the Leitchfield marls	25 to 60 „
9.	Shale and thin-bedded Limestone	5 „
10.	Shaley Sandstone	0 to 20 „
11.	Heavy-bedded, dark-gray, and blue Limestone	15 to 45 „
12.	Massive Sandstone; the "big-clifty" Sandstone	60 to 130 „

* Described in detail in Part VI., Vol. I., Second Series Kentucky Geological Reports. N. S. Shaler, Director.

This section is frequently modified. The economic values of the different beds are dependent, in a measure, on their persistency. Space forbids any detailed discussion of the question here. It may be remarked, however, that none of the beds are found to be trustworthy over large areas, unless it be the marls. The persistency of the marls, however. as *individual* beds, is not a settled question. The strata are exceedingly variable in their lithological features, and lateral changes are very frequent, both in their composition and thickness. It is not uncommon for Limestone or Sandstone-beds to be, either in whole or in part, replaced by Shales. Hence beds occurring at some certain locality that would, from their color and composition, be referred to the horizon of the Leitchfield marls, may really belong at a lower or higher level, having replaced some more solid bed. This, however, does not militate against the fact that the Leitchfield marls proper extend over a great area.

The St. Louis group is distinctly separated by the physical characters of its strata into two divisions. The upper or gray Limestone division is formed of a series of gray and drab beds, among which are included two well-marked varieties. One variety, a white Oölite, is quite characteristic of the division. Usually associated with the Oölite are beds of dense drab to cream-colored stone, which breaks with a smooth, conchoidal fracture, and resembles lithographic stone.

The upper division furnishes some of the best building-stones and materials for lime that are to be found in the State. The lower division includes beds of dark-blue to bluish-gray Limestone. The rock is frequently fetid from carbonaceous matter, such as bitumen, held in it, and nests of massive calcite and fluor spar are not infrequent in it. The study of this group is especially interesting on account of its being the repository of the lead deposits of Western Kentucky.

* A section of the beds forming the group, and other matters concerning it, will be found in Part VI., Vol. I., Second Series Kentucky Geological Reports. N. S. Shaler, Director.

II.

THE COAL-FIELD.

In studying the resources of the area occupied by the Carboniferous beds in Western Kentucky, the greatest interest naturally belongs to that section underlaid by the coal-measures.

In form the coal-field is somewhat basin-like; that is, the beds incline from the margins towards the centre. The border of the field has never been completely traced with accuracy; but its course may be approximately delineated as follows:* —

Commencing at the Ohio River, in Crittenden County, it follows up the valley of the Tradewater River into Caldwell County; thence crossing into Christian County at a point about five or six miles above Tradewater station (on the Louisville, Pacudah, and South-western Railroad), it keeps in a south of easterly course towards the head-waters of the Pond River. From a point about two and a half or three miles south of Petersburg, Christian County, the southern boundary makes a south-eastwardly curve, passing by the head-waters of the Pond River to the Muddy River, which stream it crosses somewhere near its forks. Thence it passes through the southern part of Butler County, crossing Barren River below the mouth of Gasper River, thence eastwardly along the divide between those rivers, crossing Green River above the mouth of Nolin River, and extending north-eastward to the head-waters of Casey Creek in Hart County. Thence it curves to the north-west, crossing Nolin River near the mouth of Dog Creek; passing a point between Millwood and Leitchfield in Grayson County, — an outlier or tongue extending north-eastwardly, on the north side of Nolin River to the

* These outlines have been mainly obtained from Vol. I. Kentucky Geological Reports, First Series; D. D. Owen, Director. They are quite imperfect, so far as regards details, but are sufficiently accurate for present general purposes. The faithful delineation of the outline of the coal-field has been made part of the work of the present survey.

head-waters of Hunting Fork, of Rock Creek, — and thence on to the Ohio River, to a point not far below Cloverport in Breckenridge County.

In the space thus included lie the whole of nine counties, and parts of five more, making an approximate total of nearly four thousand square miles for the area of the coal-field.

The Number of Coal-beds, &c. — Twelve coal-beds have been identified in the space between the Conglomerate (the base of the coal-measures) and the summit of the series.

It is believed as not improbable, however, for reasons unnecessary to discuss here, that, when sufficient data have been gathered to warrant a generalization concerning the number of beds, it will be found expedient to designate a less number of coals in the general section for the coal-field. For the present, therefore, a letter is used to designate each bed.

The results of the work of the Survey, so far, point to eight as the number of beds that may prove sufficiently trustworthy to receive final numbers. The total thickness of the coal-measures is as yet only approximately known. The thickness is variable, as is the number of coal-beds, and is greater at some localities than at others. It does not seem probable, however, that it will anywhere exceed one thousand (1,000) feet, and there are districts in which it is less than eight hundred (800) feet.

On the map of Kentucky will be found a section showing the position and number of these coals as determined by Dr. Owen's Survey, as well as some modifications made by the present Survey.

The thickness indicated for each bed, and the included space, are strictly in accordance with Dr. Owen's statement.

1. Anvil Rock Sandstone	20	feet.
2. Coal, No. 12 (Coal A)	3	"
3. Space	21	"
4. Coal, No. 11 (Coal B)	5	"
5. Space	46	"
6. Coal No. 10 (Coal C)	3	"
7. Space	68	"
8. Coal No. 9 (Coal D)	5	"
9. Space	50	"

10. Coal No. 8 (Coal E)	2½	feet.
11. Space	43	„
12. Coal No. 7 (Coal F?)	2	„
13. Space	84	„
14. Coal No. 6 (Coal G?)	3	„
15. Space	65	„
16. Coal No. 5 (Coal H?)	4	„
17. Space	95	„
18. Coal No. 4 (Coal I)	4	„
19. Space	154	„
20. Coal No. 3 (Coal J)	2½	„
21. Space	71	„
22. Coal No. 2 (Coal K?) No thickness given.		
23. Space	82	„
24. Coal No. 1 B (Coal L)	5	„

The preliminary arrangement adopted in the present survey differs in some particulars from the foregoing. In some instances the distances between the coals are increased, and in others diminished; and several of the beds are represented at a greater or smaller thickness than they are in Dr. Owen's Section.

The irregular distribution of the coal necessitated the separation of that part of the coal-field thus far examined into three divisions. The first extends from the eastern border of the field to the Green River; the second is approximately bounded by the Green and Pond Rivers; and the third extends from the Pond River to the western margin of the field.*

In the first division are found coals A, B, C, D, E, H, K, and L; proving eight of the twelve beds to be present.

In the second division are found coals A, B, C, D, E, F, G, and H; the number here also being eight. This, however, does not represent all of the coals that may be found, as the base of the coal-measures was not reached; it represents only those coals that come to the surface, or that have been reached in pits; no doubt, most of the lower beds are present.

* The region in question is that which is traversed by the Louisville, Paducah, and South-western railroad: none of the country bordering the Ohio River is included; nor yet that lying near the southern margin of the field. None of that region has yet been sufficiently studied to report on the number of beds. See Part VI. Vol. I., Second Series Kentucky Geological Reports, page 374.

In the third division most of the coals are found, the absent ones probably being C, F, G, and K (?).

Generalizing from the results obtained in each of these divisions, it is found that the average distances between the coals from A to H inclusive, in the region examined, are about as follows: —

1. Coal A		5	feet.
2. Space		5	"
3. Coal B		6	"
4. Space		15	"
5. Coal C	Nothing to	2	"
6. Space		75	"
7. Coal D		5	"
8. Space		75	"
9. Coal E		1½	"
10. Space		20	"
11. Coal F		1½	"
12. Space		50	"
13. Coal G		½	"
14. Space		100	"
15. Coal H		4½	"

From coal H to coal L the spaces between the beds are very variable, and sufficient data have not been obtained to warrant the making of an average. As an instance of the changes, it may be mentioned that the distance from coal I to coal J varies from fifty to eighty-three feet.

Were all of the coals united in one bed, the deposit would be about thirty-five feet thick. As far as our examinations now show, coals K, G, F, E, and C may prove to be only local beds.

Quality of the Coals. — As a consequence of the very imperfect knowledge hitherto had concerning the coals of this field, the percentage of sulphur in the coals of Western Kentucky has been rated by many not only as inordinately high, but greater than in the coals of neighboring regions. This has been an error. It is true that in some of the beds the percentage of sulphur is large; but as a class the coals will compare favorably with those in any section of the Western coal-field. The matter of sampling coals for a representative analysis has not always received the attention that should be given it; what may be termed "hand" or

picked specimens have in the largest number of cases been used for analysis, and analyses made under such conditions cannot be fairly compared with ours, that were in every case made from samples *mechanically* taken and faithfully averaged.

It has been known for some years that the coals of the Western coal-field carry, as a class, more sulphur than do those in the Appalachian field; and less than do those in the Missouri and Iowa coal-field. It is not, therefore, with the coals of the States in the Appalachian coal-field that the Western Kentucky beds are to be compared as a class, but with those in the West; and when such comparison is impartially made, the Kentucky coals, as a class, are not excelled by those in other sections of the Western coal-field.

In Indiana and Illinois there are certain beds that have won a high reputation, a better one indeed than has hitherto been accorded the Kentucky coals; but later investigations have developed the fact that here, too, are exceptionally good beds, unexcelled, perhaps, by the most famous of those States. They have hitherto escaped general notice, from the fact that they do not lie in what has been the district of active mining operations, although within convenient reach of transportation facilities. Following are averaged analyses of those beds which so far have been deemed the most important: —*

	Number of Coal.						
	A.	B.	D.	J.	L.*	L?†	?‡
Moisture	3.43	3.27	3.37	3.70	4.85	3.30	1.30
Volatile Comb. Mat.	39.26	38.80	36.66	32.56	32.22	36.00	59.60
Fixed Carbon . .	50.23	51.23	51.97	50.04	55.03	57.88	27.00
Ash	7.08	6.70	8.00	13.70	7.90	2.82	12.10
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Sulphur	2.753	2.548	2.806	3.716	1.373	1.024	1.896
Specific Gravity .	1.383	1.309	1.354	1.398	1.319	1.241	1.213

* From the Coaltown Banks, Christian County.
† From near Wrightsburg, McLean County.
‡ The "Breckenridge" Cannel Coal, from near Cloverport, Breckenridge County.

* Some of the beds as yet insufficiently studied for judgment to be passed on them may prove fully as important, so far as regards quality, as those now wrought.

For comparison with the analyses of coal L, the following analyses of the Indiana "block" coal, and the "Big Muddy" coal of Illinois are given. These coals are considered to be among the best in the Western coal-field: —

	Number of Analysis.			
	No. 1.	No. 2.	No. 3.	No. 4.
Moisture	2.70	2.68	2.62	3.44
Volatile Combustible Matter .	36.38	36.32	32.04	31.86
Fixed Carbon	55.64	53.58	58.58	59.54
Ash	5.28	7.42	6.76	5.16
Sulphur	1.664	1.802	2.472	1.376
Specific Gravity	1.313	not est.	1.310	1.310

Numbers 1 and 2 are analyses of the Indiana "block" coal; numbers 3 and 4, of the "Big Muddy" coal of Illinois.

The analyses were made in the laboratory of the Kentucky Geological Survey of carefully averaged samples collected in the same manner that the Kentucky coals are sampled.* Special attention is directed to the analyses of the Coaltown and Wrightsburg coals. These are what are known as "blocking" coals, and withstand weathering remarkably well.

The Wrightsburg coal is remarkably good, containing less than three per cent. of ash, a small proportion of water, and but little more than one per cent. of sulphur. There is reason to hope that the Wrightsburg and Coaltown coal may prove serviceable as an iron-making fuel.

The Breckenridge Cannel is already well known for its remarkable properties.

Coal D seems to be the most trustworthy of all of the beds, and is the one most generally wrought throughout the coal-field. It is most useful as a household fuel.

Coal B is usually divided about the middle by a clay parting. The upper sixteen inches serves admirably for gas-making; several analyses show it to contain very little sulphur, and a large proportion of volatile combustible matters. At some points the coal yields an admirable coke.

* See page 177 of the Chemical Report of the Kentucky Geological Survey; Vol. I. Second Series. N. S. Shaler, Director.

III.

WATER-WAYS AND RAILWAYS.

THE coal-field is crossed by three railroads, and is so drained by several streams that, were they all prepared for navigation (a work of no very serious difficulty), no part of it would suffer for means of transportation.

All of the streams drain towards the Ohio River, which offers cheap transportation to the sea.

The streams that have already been made navigable for part of their extent are the Green, the Tennessee, and the Cumberland Rivers; those streams whose partial improvement is both feasible and desirable are the Tradewater and Pond Rivers, Rough Creek, Nolin River, Muddy River, and Bear Creek.

The Green River and its tributaries is navigable by locks and dams for two hundred and sixty-eight miles. The Tennessee is navigable from its mouth to Florence, Alabama, a distance of about two hundred and fifty miles; and the Cumberland River is navigable from its mouth to a point about one hundred miles above Nashville.

Regular lines of steamers ply on these rivers. Large shipments of coal are sent south by the Tennessee River.

The Pond River flows into the Green River, and during high stages of water is navigable for about fifteen miles; it may be rendered navigable by a system of locks and dams, as far up as Bakersport, a distance of about thirty miles.

The Tradewater River is ascended by light-draught boats during the spring freshets as far up as Belleville; it is quite practicable for it to be rendered navigable for forty miles, or more.

Prior to the building of the Louisville, Paducah, and Southwestern Railroad, Rough Creek (which empties into Green River), was regularly plied by light-draught steamers as far up as Hartford, Ohio County, having been rendered navigable by locks and dams. It will be seen that it is a mere question

of enterprise whether or not the streams may be used as roads for carrying out produce, &c.

The railways are the St. Louis and South-eastern Railway (connecting St. Louis, Mo., and Nashville, Tenn.), which passes north and south through Henderson, Webster, Hopkins, and Christian Counties; the Evansville, Owensboro', and Nashville railroad (not yet completed), which (so far as built) passes north and south through Daviess and McLean Counties into Muhlenburg County; and the Louisville, Paducah, and South-western railroad which passes westwardly through Grayson, Ohio, Muhlenburg, Hopkins, and Caldwell Counties intersecting the north and south running railroads; one at Owensboro' Junction, and the other at Nortonville.

The total number of miles of railroads in the coal-field is about one hundred and eighty-five.

Thus it will be seen that transportation is, or can easily be, furnished to nearly all of the workable coal-beds. The Green, Pond, and Tradewater Rivers and their tributaries (some of them of considerable size), and Rough Creek drain a large portion of the coal-field; while other portions are reached by the several railroads. Some of the best coals are found on the Green and Tradewater Rivers; but as yet comparatively little mining has been done in them.

So far nearly all of the important mines have been opened along the paths of the railroads, a plan which has resulted in giving them a more rapid, although more costly, transportation than was offered by the rivers.

IV.

NUMBER OF COAL MINES, &c.

In all there are about thirty collieries of importance in the coal-field.

The mines are worked on a general plan modelled on the post and stall-system. About fifteen of them are located along the Louisville, Paducah, and South-western Railroad; six along the St. Louis and South-eastern Railway; and two

on the Evansville, Owensboro', and Nashville Railroad. Others are located in the neighborhood of Owensboro', bordering the Ohio River; at Airdrie on the Green River; and several in Crittenden and Union Counties, in the vicinity of Caseyville.

The Coal Trade. — It is difficult to determine the precise amount of coal raised in this field, as the records are very imperfect. The product of the Kentucky collieries, however, has operated greatly in regulating the amount of foreign coal brought into the State and into the Southern markets.

Louisville, of the home markets, has especially been benefitted by these mines, as the following will show: —

In the winter of 1871–72, on account of low water, the Pittsburgh coal reached the price of $7.00 per load of twenty-five bushels, while the Kentucky coal sold at $5.00 and $5.50 per load.* In the succeeding winter (1872–73), the Ohio River was again at a low stage; but the highest price paid for Pittsburgh coal was $5.00, the average being $4.50; the Kentucky article selling at $4.50 and $4.00 per load. In the winter of 1873–74, there was a good stage of water in the Ohio River, and at the same time plenty of Kentucky coal, and the Pittsburgh coal sold at $3.50 and $4.00 per load. In 1874–75, there was a still greater reduction in prices, the Pennsylvania coal selling at $3.00, and that from Kentucky at $2.75 per load.

This season, the Kentucky collieries have suffered in common with those of other regions, and also from internal complications; hence their product may fall behind that of former seasons, or at most not go beyond it.

According to the census reports of 1870, when few collieries were in operation in this field, the production of the mines amounted to about 115,094 tons of coal; of which 67,466 tons were raised in Union County, and 23,600 tons in Crittenden County.

The product of the mines on the Louisville, Paducah, and South-western Railroad alone, from October 1872 to October 1874, amounted to 270,000 tons,† and at least half as much

* A ton of coal contains about twenty-five bushels.

† A number of the largest collieries were not in operation until 1873, hence for some of them the statement does not represent a business of two years. Scarcely any of the mines had been opened longer than two years when the statistics were obtained.

more may be estimated for the product of the other mines for that time, placing the probable product at 405,000 tons.

V.

BUILDING MATERIALS.

Wood. — The larger portion of the region west of Salt River, especially that lying within the limits of the coal-field, is supplied with forests of valuable timber.

In different sections of the region bordering the Green River fine white oak, chestnut, oak, yellow poplar, and black-walnut trees are found. In Daviess, and some other Counties, large-sized chestnut trees are not infrequent. The forests of Hopkins County and neighboring regions are noted for their growth of large-sized oaks and poplars.

Stone. — The St. Louis group furnishes admirable building-stone and material for lime. Some important quarries have been opened in its beds. At Bowling Green the Oölite is quarried very extensively, and the exportation of the stone in dressed blocks has grown into an important industry. At Glasgow Junction, in Barren County, the "lithographic" beds have also been largely quarried and dressing-works erected.

The Oölite and "lithographic" stone are both very valuable as building material, being unexcelled, perhaps, for nice work by any of the Subcarboniferous beds. The Oölite is especially esteemed by builders for its durability and beautiful appearance after dressing. Large quantities of it are sent to St. Louis and other western cities and to the south, and even to the Atlantic States. The dark blue beds of the St. Louis group, and a few of the Chester group, serve very well for heavy work.

Few of the Sandstones in the coal-measures are of much value as building material. They are, as a class, too soft and incoherent; hence liable to disintegrate when set in a wall. They are occasionally found suitable for ordinary purposes. The great sand-rock at the base of the Chester group is in a number of places a fairly good building stone.

Gravel Beds. — Between the Cumberland and Tennessee Rivers are large deposits of gravel, the shipment of which to cities in which gravelled streets are used may prove a source of profit. The gravel covers a considerable area, and in many places seems to have formed into ridges. The beds seem to be practically almost inexhaustible, and may be accounted among the valuable deposits stored in Western Kentucky.

The material is largely used on the streets of Paducah, and has also been tried in Louisville.

Paint Materials. — It is possible that some of the red earths found associated with the St. Louis beds may prove useful as materials for paint; their merit, however, is as yet only conjectural.

The Chester group, however, furnishes deposits of undoubted value for paint material. Southwardly from Leitchfield, Grayson County, beds are found of two colors, — red and light blue. The material has been locally used, and with very favorable results. The Shales overlying Coal A frequently furnish an abundance of ochre.

VI.

OTHER MATERIALS.

Marl Beds. — One of the most interesting results of the geological survey was the discovery of potash and soda in some of the marls of the Chester group, in such quantities as to prove them valuable as fertilizers.

Attention was first directed to the deposits near Leitchfield, Grayson County, and now they are searched for with interest wherever the Chester group is known to occur. They have been found in Grayson, Edmonson, Breckenridge, Caldwell (?), Christian (?), and Livingston Counties. Their entire extent is unknown, but it is not improbable that further explorations may prove their existence wherever the Chester group is fully developed.

Scarcely too high an estimate can be placed on these marls in Kentucky, as we have therein a ready and cheap fertilizer

for tobacco lands, — the properties of the marl being to renew the vigor of the soil as it is impoverished by the tobacco. The infertility of much of the land is largely due, not to original poorness, but to the exhaustion produced by tobacco; these potash marls are expected to serve in placing the lands once more in a fertile condition.

Following, is the analysis of a sample of the marl collected from Haycraft's Lick, Grayson County: —

Composition, dried at 212° Fahrenheit: —

Alumina, iron, &c., oxides	27.811
Lime carbonate	.880
Magnesia	.824
Phosphoric acid	.109
Potash	5.554
Soda	.657
Water and loss	4.245
Silica and insoluble silicates	59.920
	100.000

Lead. — In nearly all of the regions where the St. Louis group is fully developed more or less lead has been found. The only mining that has been done for the metal, however, has been in Livingston, Crittenden, and Caldwell Counties. In Livingston and Crittenden Counties a number of pits and excavations of various sorts have been dug for the purpose of working the deposits; with possibly one exception, however, the work has so far proven unprofitable. In Crittenden County considerable lead has been found at a point known as the Columbia mines, leading to the supposition that, economically managed, they may be wrought at a small profit. So far these lead-mines have had to contend with the production from the mines in the Rocky Mountains, where a large quantity of this metal has been produced, almost without cost, in the reduction of ores for their silver. Should this competition be in time removed, they would become more important sources of profit.

Zinc. — Zinc is frequently found in the form of the sulphide (Black-Jack) accompanying the lead; it has never been found in sufficient quantities for working.

Iron Ore. — As hitherto mentioned, some of the regions underlaid by the Subcarboniferous beds furnish admirable Limonite ore.

Towards the base of the coal-measures the Shales frequently carry good beds of the Carbonate ore; in general, however, the beds of the coal-measures are unproductive, save near their base, where some of the best ores of the Ohio Valley are found.

Fluor Spar. — Fluor spar is found in more or less quantities throughout the lead region. In Crittenden County, northwardly from the Columbia mines, fluor spar is found in great abundance. Considerable deposits of the massive variety, very white and apparently free from impurities, are found at the Memphis mines and vicinity. It is not unlikely that other important deposits may be found.

Mineral Springs. — Springs of sulphur and chalybeate water are not uncommon in regions where the Subcarboniferous series come to the surface.

The ones most frequented are the Grayson and Rough Creek Springs in Grayson County, the Ohio Springs in Ohio County, and the Sebree Springs in Webster County.

The Grayson and Rough Creek Springs are watering-places of considerable popularity in Kentucky and the South; the Grayson Springs being, perhaps, the most generally known. There are a number of other springs resorted to, and whose waters are esteemed by many; they have, however, more of a local reputation. The Sebree Springs have many visitors from the western part of the State and contiguous regions during the summer.*

The coal-measures also furnish mineral waters in some regions. The most interesting are in Daviess County, and are known as Hickman's Springs. Several of the waters are remarkable for the amount of alum they contain.

* Analyses of the waters from the various springs will be found in the Chemical Report, Vol. I., Second Series, Kentucky Geological Reports.

VII.

GENERAL REMARKS ON AGRICULTURE.

Soil. — There are three general varieties of soil found in the region of the Carboniferous rocks.

The soil of the coal-measures, originating as it does from Sandstones and Shales, is a light, sandy mixture, usually yellowish in color; or a rather dense, dark-colored material becoming waxy and unmanageable after rains, — according to localities. The soil resulting from the beds of the coal-measures seems especially adapted for the growth of tobacco. This may be due to the fact that nearly all of the Sandstones are micaceous, and that upon disintegration the mica furnishes the mixture with the potash required by the plant.

In the Chester group we get a mingling of sandy, calcareous, and aluminous materials, producing in some regions a fairly good soil. In general, however, Shale predominates largely, and produces, when unmingled with other materials, a poor and stubborn soil.

The finest soil for general purposes is furnished, perhaps, by the St. Louis group. It is a deep-red earth, rich in iron and other desirable matters. This soil is very characteristic of the St. Louis group, and is almost invariably found where the limestones are the first beds below the surface.

Crops. — Tobacco is the staple agricultural product of Western Kentucky; the other crops, such as wheat, oats, corn, and hay, are raised more for home consumption than as an article for exportation.

The following are the yields per acre of the several products, so far as past observation would indicate: —

	Lowest Yield.	Highest Yield.	Average Yield.
Corn *	10	60	30
Wheat *	8	35	10
Hay, (Timothy) †	1½	2	1½
„ (Red Top) †	1	2	1½
Tobacco ‡	300	1500	800

* Yield in Bushels. † Yield in Tons. ‡ Yield in Pounds.

In her tobacco yield, Kentucky now stands first among the States, and the western part of the State furnishes by far the larger portion.

The principal tobacco-growing counties east of the Tennessee River are Caldwell, Christian, Daviess, Henderson, Hardin, Hopkins, Muhlenburg, and Ohio; Daviess County is said to be the largest producer, Christian County standing second.

The principal shipping points are Henderson, Owensboro', and Hopkinsville; Princeton and Eddyville are also depots for the handling of tobacco, — the former place doing a considerable business.

Owensboro', it is said, is the largest "strip" market in the world; Henderson falls but little behind it, and was until within the last year or two the largest market.

The time has been too limited wherein to obtain complete statistics of the trade at the different shipping points; the following statements, however, of the market at Owensboro' and Hopkinsville for a period of years will serve to show the magnitude of the tobacco interest.

The statistics concerning the Owensboro' market were kindly furnished by Captain R. L. Triplett.

Statement of the Amount of Tobacco exported from Daviess County for six years previous to 1876.

	From Owensboro'.	From other Points.	Hhds.	Pounds.
Product of 1868	5,000	500	5,500	8,250,000
" " 1869	5,500	500	6,000	9,000,000
" " 1870	6,500	500	7,000	10,500,000
" " 1871	6,000	500	6,500	9.750,000
" " 1872	7,500	500	8,000	12,000,000
" " 1873	9,000	500	9,500	14,250,000
" " 1874 *	3,000	500 †	3,500	5,250,000
" " 1875 ‡	8,000	500	8,500	12,750,000

* A short crop year.
† Not quite that much, but a fair enough estimate.
‡ Product not yet gone forward, but will reach as much.

Statistics concerning the Hopkinsville market are taken from the Annual Circular of Messrs. J. K. Gaut & Son: —

In 1870, there were sold 2,468 hogsheads.
" 1871, " " " 5,970 "
" 1872, " " " 6,711 "
" 1873, " " " 9,155 "
" 1874, " " " 13,047 "

These sales are up to Nov. 1 of each year, and include all the sorts of tobacco that are sent from the place.

Statistics of the Henderson market have failed to come to hand.

It must be borne in mind that Louisville and Paducah also receive large amounts of tobacco from this region;* hence the foregoing show but a small proportion of the yield.

The following Table, extracted from a late circular from Liverpool, may be of interest, as it shows the number of hogsheads of Virginia and Kentucky tobacco on hand, March 1, for a series of years: —

VIRGINIA.	Leaf.	Strips.	KENTUCKY.	Leaf.	Strips.
1872	2,402	1,820	1872	8,436	9,754
1873	2,372	1,363	1873	6,449	4,228
1874	3,206	3,517	1874	8,024	10,817
1875	2,706	4,353	1875	9,039	14,032
1876	3,313	3,824	1876	9,204	7,740

This table serves as an approximate means of measuring the exports from the two States.

* Much of the Puducah exports, however, are of the tobacco grown west of the Tennessee River.

THE IRON ORES OF KENTUCKY.

THE iron resources of Kentucky are extensive and varied. At a few localities a considerable development of them has been attained; but, taking the State as a whole, it has hardly reached a fraction of the possibilities of production. The greater portion of the ore territory of the State is as yet untouched by the pick of the miner; but enough has been done in most of the ore districts to learn the quality and something of the extent of the ores.

Geographically the ore districts of the State may be divided into the eastern and western.

Geologically the ores of most importance may be divided into three classes, as follows: —

1. The Clinton ore of the Silurian period. This is the equivalent of the Dyestone ore of Tennessee and Virginia.

2. The unstratified Limonites of the Subcarboniferous Limestone.

3. The stratified Carbonates and Limonites of the coal-measures.

There are also ores associated with the Waverly and Devonian Shales in many parts of the State, which have been worked to some extent; but they are of minor importance in comparison with the other varieties of ore. Of the three classes of ore above named the first and the third are found in Eastern and the second and third in Western Kentucky. It may be said also that the ores of the coal-measures are the best developed and of the most importance in Eastern, while the unstratified Limonites of the Subcarboniferous Limestone are of the greatest value in Western Kentucky.

It is also proper to state here that the State has been imperfectly prospected, and that it is altogether possible, and indeed probable, that the ores of one or another of these varieties will be found to be much more extensive and valuable than at present supposed.

The Iron Ores of Eastern Kentucky. — The ore districts of Eastern Kentucky, where the ores have been manufactured, are two, known as the Red River and the Hanging Rock iron regions. The Red River iron region embraces portions of Estill, Lee, Powell, Menifee, and Bath Counties.

The ores found in this region are the Clinton ore, and an ore, stratified, resting upon the Subcarboniferous Limestone at the base of the coal-bearing Shales. It is found both as Carbonate, or clay Ironstone, and as Limonite, or Brown Hematite. It is this ore which has been most largely worked, and upon which the excellent reputation of the iron from this region has been made.

The Clinton ore has not been so extensively worked; but the principal deposit of it is situated geographically near this region, and may be said to belong to it.

The best known deposit of this ore in Kentucky is in Bath County, on the waters of Slate Creek, and is known as the Slate Furnace Ore-bank. It is a stratified deposit of Oölitic Fossiliferous Limonite, capping several hills in the vicinity. It reaches a thickness of fifteen feet at places. The area covered by the ore at this point is somewhat over forty acres, and the total amount of ore about one and a half million tons. The ore bears evidence of having been formerly a Hematite, similar to the Dyestone ore of the same geological horizon along the great valley from New York to Alabama, but it has lain so long, unprotected by any thing except a slight covering of earth, that it has absorbed water, and been converted into a Limonite.

This deposit seems to be somewhat local, — at least of this thickness, — as it grows thin, and finally disappears in this neighborhood. The Limestone which bears the ore is, however, present in a narrow rim all round the central part of the State, and it is probable that, when thorough examination is made, other deposits of the ore will be found.

The following analysis by Dr. Peter and Mr. Talbutt, of the Kentucky Geological Survey, of a sample of ore from this deposit, shows the composition of the ore: —

Iron Peroxide	70.060
Alumina	4.540
Lime Carbonate	.040
Magnesia	.021
Phosphoric Acid	1.620
Sulphuric Acid	.031
Silica and Insoluble Silicates	11.530
Combined Water	12.300
	100.142
Metallic Iron	49.042
Phosphorus	.707
Sulphur	.012

The Dyestone ore, a Fossiliferous Hematite, extends along the flank and foot-hills of the Cumberland Mountain in Virginia, just across the State line from Kentucky, the crest of the mountain forming the line for about forty miles. It lies in two or three beds, ranging from six inches to three feet or more in thickness, and forms in the aggregate an enormous mass of cheaply-obtainable ore. This ore, although situated in Virginia, is of the greatest importance to Kentucky, as it is destined to be smelted with Kentucky coals, which lie on the opposite side of the mountain, and are the only coals accessible to the ore, as there is no coal to the south of the mountain.

This ore, although somewhat phosphatic, is easily worked, and yields from forty to fifty per cent. of iron. From this ore, smelted with stone-coal, iron will probably be made as cheaply as in any region of the country.

The great Pine-Mountain fault, which extends from some distance south of the Kentucky line in Tennessee, in a course about north thirty degrees east through Kentucky to the Chatterawah or Big-Sandy River, at many places is of sufficient uplift to have brought the rocks of the Clinton or Dyestone group above the drainage; and it is probable that on exploration the ore will be found in Kentucky. It has been found at the foot

of the Pine Mountain in Tennessee. In Kentucky the place of the ore is usually covered deeply by the talus from the overlying rocks, which probably accounts for its not having been discovered. Should it be found along the foot of Pine Mountain in Kentucky, it will be most favorably situated for cheap iron-making, as on the opposite side of the stream, which flows at the base of the mountain, there is found excellent coal in great abundance.

The Limestone ore of the Red River iron region, from which the iron is manufactured which gives to the region its reputation, rests upon the Subcarboniferous Limestone, and from this association takes its name. It lies in a bed of irregular thickness, ranging from a few inches to three feet or more in thickness, but probably averaging, where found in any quantity, about one foot thick, or a little less. It is occasionally irregular and uncertain in its distribution; but, in general, it may be said that it is found in its proper position almost wherever the Subcarboniferous Limestone is above the drainage, along the edge of the coal-measures from the Kentucky to the Ohio River. South of the Kentucky River the ore is known to extend a short distance, as far as it has been explored; but its limit in this direction is as yet unknown.

The Red River region embraces, however, only that portion between the Licking and the Kentucky Rivers. This region has been little developed, except in a portion of Estill County, where four charcoal-furnaces have been in operation. There are many eligible sites for charcoal-furnaces in this region, where timber and ore are both in abundance and as yet untouched. The development of this region has been retarded by the lack of transportation facilities, as the iron had to be hauled a long distance in wagons to railroad or river. This difficulty is likely to be remedied in the near future by the construction of one or two projected railroads into or along the edge of this region, and we can then look for a largely-increased production of the excellent iron from this region. The iron is of great strength, and ranks very high in the markets of the West. It is used principally for car-wheel purposes, as it is of very great strength and chills well.

The following analyses show the character of the ore of this region: —

	No. 1.	No. 2.	No. 3.	No. 4.
Iron Peroxide	66.329	63.535	74.127	65.591
Alumina	12.532	2.798	3.542	5.762
Lime Carbonate	trace.	.450	.390	trace.
Magnesia	.173	1.073	.461	.248
Phosphoric Acid	.709	.537	.601	.447
Silica and Insoluble Silicates	9.720	20.480	9.580	16.230
Combined Water	9.580	9.800	11.270	11.060
Total	99.043	100.673	99.971	99.914
Metallic Iron	46.440	45.874	51.889	45.914
Phosphorus	.309	.234	.262	.195

No. 1. From the Richardson Bank, Clear Creek, Bath County.
No. 2. From Logan Ridge, Estill Furnace, Estill County.
No. 3. From Thacker Ridge, near Fitchburg, Estill County.
No. 4. From Horse Ridge, Cottage Furnace, Estill County.

The above analyses were made by Dr. Peter and Mr. J. H. Talbutt, chemists of the Kentucky Geological Survey, from samples selected by the writer.

THE HANGING ROCK IRON REGION.

The Kentucky division of the Hanging Rock Iron Region at present embraces the whole, or parts, of Greenup, Boyd, Carter, and Lawrence Counties. The ores are stratified Carbonates and Limonites, occurring in the lower coal-measures, beginning with the ore just described, resting upon the Subcarboniferous Limestone, and extending through six hundred to seven hundred feet of the coal-measure strata. The ores are mineralogically similar, but differ somewhat in their physical character and circumstances of deposition. They are popularly known as Limestone, Block, and Kidney ores. They usually occur at well defined geological levels, but do not always form connected beds. They also differ in thickness, ranging from four to eight inches in some of the thinner beds to fourteen feet in one local deposit. This latter is the Lambert ore of Carter County. The most common thickness is from six inches to one foot. There are from ten to twelve ore

beds which are of more than local extent in this region. In addition there are numerous local beds, one or more of which is found at nearly every furnace. This region supports eleven charcoal and two stone-coal furnaces. The Hanging Rock iron bears a reputation for excellence for general foundry purposes, which is unsurpassed by any iron in the United States. The iron produced is mostly hot-blast charcoal iron; but some of the furnaces are worked with cold-blast for the production of car-wheel iron. The reputation of the iron of this region is, however, chiefly founded upon its excellence for castings of all sorts. The iron combines in a remarkable degree great strength with fluidity in casting, and non-shrinkage on cooling.

The stone-coal iron of this region is used almost entirely for the manufacture of bar iron and nails.

The stone-coal iron is made from the ores of this region mixed with a considerable proportion of ore from other States. The fuel used is the celebrated Ashland, or Coalton coal. It is a dry-burning, non-coking coal, which is used raw in the furnace, and is of such excellent quality that no admixture of coke with it in the furnaces is necessary, as is the case with most of the other non-coking furnace coals of the West.

The charcoal iron is manufactured exclusively from the native ores, which yield, as shown by the books at a number of the furnaces, for periods ranging from one to four years, an average of between thirty-one and thirty-two per cent. of iron. The ores of the region are known as Limestone, Block, and Kidney ores. These names are due to peculiarities of structure or position, rather than to any essential difference in chemical composition. As a rule, however, the Limestone ores are the richest and most uniform in quality. The Kidney ores are next in value; while the Block ores present greater variations in quality than any other, some of them being equal to the best of this region, and some so silicious and lean that they cannot be profitably worked.

The following analyses by Dr. Peter and Mr. Talbutt, of the Kentucky Geological Survey, show the composition of some of the ores of each class in this region: —

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Iron Peroxide. . .	67.859	71.680	54.530	68.928	61.344	66.200
Alumina	1.160	4.155	2.120	2.768	4.236	3.907
Mang. Brown Oxide	.980	.090	1.380	.290	. . .	.030
Lime Carbonate . .	.120	.380	.040	.680	.750	.430
Magnesia	1.275	.050	1.823	.641	.208	.345
Phosphoric Acid .	.143	.084	.908	.249	.795	.130
Sulphuric Acid . .	. . .	.270	.336	.748	.041	.182
Silica and Insoluble Silicates. . . .	15.560	12.650	28.360	15.240	21.480	16.530
Combined Water .	*12.903	10.800	10.900	11.100	11.200	11.730
Total . . .	100.000	100.159	100.397	100.643	100.054	99.484
Metallic Iron . . .	47.501	50.176	38.171	48.249	42.941	46.340
Sulphur	. . .	.108	.134	.298	.016	.072
Phosphorus . . .	.062	.036	.428	.098	.347	.057

* And loss.

No. 1. Lower Limestone Ore, Kenton Furnace, Greenup County.
No. 2. Upper Limestone Ore, Graham Bank, near Willard, Carter County.
No. 3. Lower Block Ore, Kenton Furnace, Greenup County.
No. 4. Upper or Main Block Ore, Laurel Furnace, Greenup County.
No. 5. Yellow Kidney Ore, Buena Vista Furnace, Boyd County.
No. 6. Yellow Kidney Ore, Mount Savage Furnace, Carter County.

THE IRON ORES OF WESTERN KENTUCKY.

The most extensive and best developed ore region of Western Kentucky is called the Cumberland River iron region. It embraces the whole, or parts of, Trigg, Lyon, Livingstone, Crittenden, and Caldwell Counties. The ores of this region are Limonites found resting in the clay and chert above the St. Louis or Subcarboniferous Limestone. They occur in deposits of irregular shape and uncertain extent, but in the aggregate the amount of ore is immense. The ores are distributed with great irregularity throughout this region, but they seem to be found in greatest abundance and quantity where the Limestone has been most extensively worn away, and where, as a consequence, the clay and chert which are the result of its decomposition are of greatest thickness.

The ores are, perhaps, found in greater abundance in the country between the Cumberland and Tennessee Rivers than in any other portion of this region, although there

are extensive deposits on the east side of the Cumberland River which have been largely worked. As a rule, however, the deposits decrease in size and frequency in going from the Cumberland River toward the east, and, after a few miles' distance from the river is reached, they are scattering and small. The ores are of excellent quality, being almost entirely free from sulphur, and containing but a small amount of phosphorus; but they are sometimes mixed with chert and sand. The quality in this respect is as variable as the size of the deposits; the ore in the same deposit frequently showing all degrees of admixture with chert, from a chert breccia, to a rich, pure ore with only an occasional lump of chert enclosed.

The average yield of iron from the ore at the furnaces of this region, where it is not very carefully selected previous to roasting, is between thirty and thirty-five per cent. With careful sorting the yield can be brought much higher, from forty to fifty per cent.

The iron produced from these ores is of a very high grade. There are three active furnaces in this region which use charcoal fuel exclusively for the production of pig-iron. From this iron is manufactured the celebrated Hillman's boiler-plate, of which it is said, by the manufacturers, that no boiler constructed of this iron has ever exploded. This iron ranks equal, or superior, to any other boiler-plate manufactured in the United States. It is used largely for steamboat and locomotive boilers, for which latter purpose it finds an extensive market, even as far as the Pacific slope.

Considerable ore from this region has been shipped to furnaces at a distance; but within the past two years the depressed condition of the iron market has rendered this unprofitable. This region is well situated as regards transportation facilities, — it being drained by the two navigable rivers, the Cumberland and Tennessee, and on the lower border by the Ohio, so that the iron manufactured here can be very cheaply placed in market.

The following analyses of two samples of ore from the Suwannee furnace-lands, Lyon County, will show the charac-

ter of the ore from this region. The analyses are by Dr. Peter and Mr. Talbutt of the Kentucky Geological Survey: —

	No. 1.	No. 2.
Iron Peroxide	59.370	70.518
Alumina	1.622	.045
Manganese	.090	.190
Lime Carbonate	.170	.090
Magnesia	.100	trace.
Phosphoric Acid	.179	.275
Sulphur	.212	.045
Silica and Insoluble Silicates	30.000	18.910
Combined Water	8.400	9.850
Total	100.053	99.923
Metallic Iron	41.559	49.363
Phosphorus	.077	.120

This same variety of ore is found, in greater or less quantity, in many other counties where the St. Louis Limestone is the prevailing rock formation, but in none of them, save those mentioned, has any extensive iron industry been established. In the Cumberland-River iron region there are many furnace-sites unoccupied where iron can be cheaply and profitably manufactured.

This region is capable of, and destined to, a much greater development than it has yet attained. The charcoal-iron manufacture will always be an important and extensive industry, for over a large part of the region the most profitable use that can be made of the land is the production of timber for charcoal. There is destined at no far-distant day to be a large stone-coal or coke iron industry established here, using the ores of this region with the coals of the Western Kentucky coal-field, either raw or coked. The best known of the Western coals at present are too sulphurous for use in iron-making, without previous separation from sulphur by washing and coking. It is through the introduction of modern machinery and ovens, by which these operations can be cheaply and thoroughly effected, and a coke fit for iron-smelting produced, that the coal and iron ore of Western Kentucky will be most profitably and extensively developed. The Louisville, Paducah, and

South-western Railroad affords direct communication between the coal and ore fields. Already measures are in progress for the erection of extensive coke-works on the line of this railroad, which will doubtless prove but the first step in the successful development of a different form and more extensive iron industry than any yet established in Western Kentucky.

THE NOLIN-RIVER DISTRICT.

In Edmonson and Grayson Counties, north of Green River, between Nolin River and Bear Creek, is an area of considerable size called the Nolin-River District. The ores of this region are stratified Carbonates and Limonites, found near the base of the coal-measures. The ore of most value occurs above the Conglomerate. It is about four feet thick, and, so far as present developments indicate, underlies an area of large extent. It is almost wholly undeveloped. A number of years since a small charcoal furnace was established on Nolin River, but it was so far from market, and transportation of the iron was so uncertain and expensive, that the enterprise soon failed. It ran long enough, however, to establish the fact that an excellent iron could be made from these ores.

The following analyses, by Dr. Peter and Mr. Talbutt, show the quality of a sample of this ore from near the head of Beaver-Dam Creek in Edmonson County: —

Iron Peroxide	52.926
Alumina	4.792
Manganese	.210
Lime Carbonate	.180
Magnesia	.425
Phosphoric Acid	.355
Sulphuric Acid	.143
Silica and Insoluble Silicates	30.580
Combined water	10.400
Total	100.011
Metallic Iron	37.048
Phosphorus	.154
Sulphur	.057

In addition to the great amount of timber available for charcoal, stone-coal in abundance occurs in the same region. This coal is the lowest of the series, and is of most excellent quality, — analyses showing it to be far superior to the higher coals of Western Kentucky, which are the ones more generally mined. This region is now more accessible than formerly, as it lies within fifteen miles of the Louisville, Paducah, and South-western Railroad; but the lack of transportation facilities directly to it has prevented its development. The aggregate amount of ore, coal, and timber suitable for charcoal in this region, is immense, and it offers great opportunities for development. It is one of the most richly endowed undeveloped iron regions of the State.

In many other localities in the Western coal-field iron ores have been found, but they have not been thoroughly prospected, and little is known of their extent. One of the best-known localities of this sort is in Muhlenburg County. In this county are found, at Airdrie Furnace, on Green River, and at Buckner Furnace, near Greenville, deposits of so-called black-band iron ore, — a ferruginous bituminous Shale, yielding about thirty per cent. of iron. At Airdrie Furnace this ore rests immediately above an excellent coking coal, and the two can be mined together very cheaply. At this place iron can be produced very cheaply by bringing ore from the Cumberland-River region, and using it in admixture with the native ore. For a more detailed description of this locality, see Report in the second volume, new series, "Kentucky Geological Reports, on the Airdrie Furnace."

The above described localities embrace all the most important iron-ore districts of the State. There are numerous ore deposits at other places, some of which have been worked, but, in comparison with the others, to a small extent only.

For more detailed information in regard to some of these districts, the reader is referred to the volumes, first series, "Kentucky Geological Reports;" to the "Report on the Iron Ores of Greenup, Boyd, and Carter Counties," in the first volume, second series; to the "Report on the Geology of the

Nolin-River District," in the second volume, second series; to the forthcoming reports on the iron ores in the vicinity of Cumberland Gap, and on the iron ores of the Red-River iron region, in the fourth volume, second series, " Kentucky Geological Reports."

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SECTIONAL ADVANTAGES OF KENTUCKY FOR AGRICULTURE, HORTICULTURE, AND FRUIT-GROWING.

The peculiar advantages which Kentucky possesses, through her topographical position, render her adaptability for agriculture, horticulture, and fruit-bearing purposes equal to any, if not superior to most, countries on the globe. She is located in the heart of the North American continent, in the heart of the north temperate zone, in the heart of the great Mississippi river valley, in the heart of the Ohio river valley, in the heart of that immense farming region extending from the Alleghenies to the Rocky Mountains, in the heart of the United States, and in the very heart of American civilization.

Being from 400 to 4,500 feet above the sea level, and on the same latitude as Italy and Spain, but distant from the ocean, Kentucky produces every vegetable, cereal, or fruit indigenous to the temperate zone, in its greatest perfection, although on account of the different classes of soils, caused by various geological formations, some parts of the State excel in one class of productions, while other parts become noted for other staples which find here their native plant food.

For the convenience of persons unacquainted with the varieties of the soils in the State, a brief description of the peculiar local productive powers of the different sections or counties will here be given.

Beginning in the southwest corner of Kentucky, we find, west of the Tennessee river, seven counties—Fulton, Hickman, Ballard, McCracken, Graves, Calloway, and Marshall—with a territory of about 1,300,000 acres, and a population of 85,000 persons. The geological formation of this section is altogether tertiary or quartenary, with no rocks, except a few stones intermixed with the more sandy soils. The upper surface of the lands is composed generally of a rich vegetable loam, particularly adapted to the production of fine tobaccos, corn, and the cereals.

The bottom lands on the rivers and creeks grow Indian corn (maize), all kinds of vines, and hay in great perfection, while the uplands produce the finest quality of peaches, grapes, and other fruits. All garden vegetables and smaller fruits, nuts and berries, flourish well in every locality. Game and fish are most plentiful, and stock is easily kept on the native grasses.

This soil is very easy of cultivation, and timber is abundant for all purposes of the farm. There is less than one third of the land cleared of the native growth, two thirds of the country as yet being in its virgin richness. These lands are capable of supplying food for ten times their present population without reaching the maximum of the more densely populated countries of Europe or Asia.

The people are frank, generous, noble, and patriotic, and would welcome the arrival of immigrants with true Kentucky hospitality. The lands vary in price from $2 to $25, according to improvements, location, &c.

Between the Tennessee and Cumberland rivers is a small strip of country, embracing about 200,000 acres, in Trigg, Lyon, and Livingston counties, that abounds in the finest timber and iron ores, but much of it too broken to be of great agricultural value, except that portion along the river bottoms and parts of Trigg and Livingston counties, which are exceedingly fertile.

These lands, however, are well adapted to the cultivation of fruits and vegetables, and will in the future be filled with excellent gardens, vineyards, and orchards. The iron ores and timber of this section are practically inexhaustible, and can no doubt be made as profitable as any portion of the iron region, similarly situated, between these two rivers in Tennessee. At the present time these lands can be purchased at from one to ten dollars per acre.

The counties of Livingston, Crittenden, Lyon, Caldwell, Trigg, Christian, Todd, Logan, Simpson, Warren, Allen, Monroe, Barren, and parts of Butler and Edmonson, lie upon what is known as the "sub-carboniferous or cavernous limestone" formation, and contain much of the finest agricultural lands in the Mississippi valley. These counties aggregate about 5,000,000 acres of land, with a population of about 220,000 persons. The northern parts of some of these counties underlie large areas of what is known as the West Kentucky or Illinois coal field, in which are many valuable mines of the best quality of bituminous coals. The timber of these coal lands is of excellent quality, and in quantities such as are to be found in but few localities in the Western States.

The soil of the best lands, formerly called "the barrens" or prairie, consists of a rich black vegetable mould, with a subsoil of deep red or yellowish-red and chocolate-colored clay, very firm, solid, and tenacious when dry, in which are to be found in large quantities lime, iron oxides, soluable potash, nitrogen, silex, and nearly all the essential elements of

plant food needed by the cereals, tobacco, flax, garden vegetables hard timber, grapes, and other fruits. This is the great reservoir for fertilizers applied to these lands, wherein all kinds of manures, applied to the soil, is stored by nature until needed for the use of vegetation. The native or "barren grass" has been killed out by fire, cattle, and the growth of young timber, but orchard grass, millet, red top, clover, timothy, and various other grasses grow as well here as in any portion of the State.

The tobaccos grown in these counties are the richest, heaviest, and best for shipping purposes of any grown on the continent, and are known in commerce as the "heavy Hopkinsville," or "heavy Clarksville," "African shippers" and "Mexican bailers" taking the names from the market places.

Nowhere in the United States can a man support his family with more ease and less labor, and furnish them with more luxuries, than on these Kentucky "barren lands," and nowhere else can be found so large a tract of level, rich, lasting, and well-drained soil in one continuous body. Truly, nature has here exerted herself to form for man's use a "farmer's garden land," blest with every requisite for prosperity and comfort, without the want of any essential necessity.

Previous to the war this section was rich and prosperous, and the people are fast recovering from the ravages of that disastrous conflict, and the country again beginning to teem with plenty. No part of the country possesses a more intelligent, or industrious, thriving population, or is more noted than this for its high-toned chivalry and true hospitality. Lands in many localities, previous to the late war were sold as high as $75 to $80 per acre; they are now worth from $5 to $50 per acre.

The counties of Union, Henderson, Webster, Hopkins, Muhlenburg, McLean, Daviess, Hancock, Ohio, Grayson, Breckinridge, and parts of Butler and Edmonson, are situated on the carboniferous rocks that form the basis of the western coal fields of Kentucky. They contain about 3,200,000 acres of land, with a population of about 160,000.

The soil of these counties is most varied, owing to the peculiar geological formations. Union, Henderson, Daviess, and McLean, lying immediately upon the Green and Ohio rivers, will average as rich in soil as any other counties in the entire Mississippi valley, while the mixture of good and poor lands, to be found elsewhere, will enable a farmer to settle on any formation he chooses. The noted "Yellow Banks" stemming tobacco grows everywhere in this section of Kentucky, while corn, wheat, oats, flax, hemp, potatoes, hay, &c., flourish as well as in any other part of the Ohio valley.

The timber in these counties, for manufacturing purposes, staves, carpenter's work, or ship-building, is superior to any other portion of the West, both in quality and quantity. There is no plant or cereal indigenous to the north temperate zone that will not grow to perfection in these counties. The coal mines and iron ores are inexhaustible, and can be worked as cheaply as in any other part of the world. The population is thrifty, industrious, and hospitable, and are fast becoming rich through the natural resources of the country.

The counties of Meade, Hardin, Bullitt, Adair, Metcalfe, Green, Taylor, Larue, Hart, Marion, Nelson, and Spencer are located mostly on the sub-carboniferous formation, though in many places intermixed with other formations. They contain about 2,800,000 acres of land, with a population of about 150,000 persons.

This section of the State presents a great variety of soils, some very rich in plant food, and others of a poorer quality. Some of these lands are peculiarly suited for the production of a very fine class of tobacco, cereals, and all kinds of fruits, nuts, and berries. The "Knobby Hills" that pass through these counties afford excellent soil for vineyards and orchards, and will no doubt some day present the people of the Ohio valley with brands of wine equal to any in France or Germany. The whisky known as "Nelson County" is justly celebrated as being but little if any inferior to the old established, world-famed "Bourbon Whiskies" of the blue grass section of Kentucky. Sheep husbandry appears well adapted to the soil and climate of these counties, and nowhere do sheep come to a higher degree of perfection, either as wool-bearers or for mutton. With a kind, intelligent, and hospitable population, these counties, owing to cheap lands and their general adaptability for the culture of fruits, vines, the cereals, and stock, and their proximity to the city of Louisville and other large cities by railroad and river communication, afford great inducements for immigrants seeking homes in the West. Lands are worth from $3 to $40 per acre, according to quality, improvements, and location.

The counties bordering on and adjacent to the Ohio river from Louisville to Cincinnati present a mixed soil. The general face of the country is undulating, the hills in some places being quite abrupt but not mountainous, while in others the surface is nearly level. These "hilly knobs" are very fertile, and produce most excellent blue grass, cereals, fruits, vegetables, and the finest quality of "cutting tobacco." Here, too, grapes grow to perfection, and apples flourish equal to anywhere

else in the State, while stock of all kinds, particularly sheep, and cattle, thrive and obtain exceeding large growths—many sheep weighing from 400 to 450 pounds without extra attention, and cattle weighing as much as in the best grass-growing counties of England. The extra facilities for selling the produce of these counties, either in the Louisville or Cincinnati markets, give superior advantages to the farmers not enjoyed by the agricultural population of the far Western States, and make the clear profits of the farm, the dairy, the garden, the orchard, or the vineyard greatly larger than the income from a like amount of labor in any of the trans-Mississippi States. Immigrants can find in many of these and other counties rich virgin lands, as yet uncleared of the native forest trees, in accessible and eligible localities, to be purchased in fee-simple, at from five to fifty dollars per acre, which will amply repay the investment and labor of putting them in cultivation, and afford a home among a cultivated and refined people, where can be enjoyed all the comforts and luxuries of any European country, at probably one third of the cost and less than one half of the labor there required.

Jefferson county, in which Louisville, the metropolitan city of the State, is situated, is richer in all respects than its immediate neighbors. All the lands are fertile, valuable, productive, and in demand at high prices, not only for farms, but also for vegetable gardens, orchards, and vineyards. The markets furnished the owners of these lands by the growing city make them cheap at almost any price.

The "Blue Grass Region" proper of Kentucky consists of the following counties: Fayette, Bourbon, Scott, Woodford, Clark, Jessamine, Madison, Garrard, Mercer, Franklin, Anderson, Owen, Trimble, Carroll, Gallatin, Boone, Kenton, Campbell, Grant, Pendleton, Bracken, Mason, Robertson, Harrison, Nicholas, and parts of Montgomery, Bath, Fleming, Lewis, Oldham, Henry, Shelby, Spencer, Washington, Boyle, and Lincoln, all of which is located on the blue limestone or Lower Silurian formation. This geological formation is productive of the richest soils on the globe, and although these counties lie on this rock, yet they are not all equally fertile, owing to some parts of the country being more hilly or broken than others, and also to the "faults" in the formation, whereby there are frequent intrusions of the Upper Silurian, with occasional strips of the Devonian, and Waverly groups of rocks, with their accompanying clays and soils.

In Fayette, Woodford, Scott, Bourbon, Mason, Madison, Clark, and Jessamine counties are the best hemp lands to be found in the United

States, except some spots in other counties within this same "Blue Grass Region."

These best lands are worth from $75 to $140 per acre, the farms being generally from 100 to 300 acres; second-rate lands in these counties sell at from fifty to sixty dollars per acre; wages are from $12 to $18 per month for farm hands, with board, and from $1 50 to $4 00 per day, for mechanics, according to skill and the character of work.

The prevalent growth of timber in this region includes ash, oak, walnut, locust, maple, wild cherry, hickory, hackberry, gum, beech, poplar, and elm. All cereals grow most luxuriantly on the soil. Indian corn, wheat, rye, oats, barley, millet, flax, hemp, vegetables, and fruits all are produced in most abundant crops. Tobacco is cultivated on the second-rate lands, and in the counties bordering on the Ohio and lower Kentucky rivers, and is produced in large quantities, and of a quality superior to any other for "cutting leaf;" but the lands suitable for hemp produce tobacco of too coarse a testure. Blue grass here reigns supreme, although clover, timothy, Hungarian grass, orchard, red top, and various other grasses, are grown with profit.

Franklin, Mercer, Garrard, Shelby, Harrison, Nicholas, Boyle, Montgomery, and Lincoln are all very fine counties, containing much first-class lands, which are worth $100 per acre, while second-class are rated at from $10 to $35. The other counties, though not altogether so rich, have a great deal of excellent lands, and are capable of producing very large crops of all kinds of cereals, tobacco, and grasses. The price of lands vary exceedingly, from $8 to $50, according to quality, location, and improvements.

The disintegration of the blue limestone and magnesian rocks and marls of this section of Kentucky gives a soil almost black, and so filled with carbonaceous plant food as to appear almost unctious. The subsoil is a clay, of deep red or yellowish hue, which, when exposed to the atmosphere, becomes itself good soil, and produces first-class crops. The beauty of this region is remarkable, whether seen in the spring and summer, when carpeted with its covering of rich feathery turfs of blue grass, two and three feet high, in perfect meadow, even among the forest groves, where it grows most luxuriantly, or in the winter, when these same pastures are clothed in rich yellow and green verdure that seems never to entirely stop growing. Water percolating through the clay and rocks becomes impregnated with those peculiar chemical elements that give the distinguishing characteristics to the "Bourbon Whisky," so

celebrated throughout the world. The water, and also the grain raised on these lands, so act on the animal economy as to produce the firmest, hardest, and most solid bones, and the toughest and most elastic muscles, with the capacity of taking on the largest possible amount of fat. These causes make the "Blue Grass Stock" the finest in the world, and give that power of endurance to the horse, and that solid flesh to the cattle and mutton, not to be found elsewhere. The turf registers of the country exhibit the fact that nearly three fourths of all the noted races, whether in running or trotting, in the United States, have been won by horses bred in this section of Kentucky. The richest and best milk, butter, and cheese on the continent, also come from this central section of the State.

Railroads and turnpikes thread every portion of this Blue Grass section; so that, practically, markets are at every man's door for all the varied products of his farm, his garden, his orchard, or his vineyard. The late David Dale Owen, the distinguished State Geologist, says in his report: "In presenting these chemico-agricultural results to the farming community of the Commonwealth of Kentucky, I cannot help believing that, while they form one of the most valuable contributions which the united labors of the geologist and chemist have ever presented to agriculture, they must advance the science of agricultural chemistry, and supply hints to the agriculturist and owners of landed estates of the highest practical importance, and they must, at the same time, impress the public generally, most forcibly, with the extraordinary fertility of a very large portion of the area of Kentucky, especially that based on the blue limestone formation, most of the soils of which *will compare favorably with the richest lands on the face of the earth*, and surpass, in elements of permanent fertility, the far-famed prairie lands of the West, except where those prairie soils are based on the same description of highly fossiliferous limestones and marly earths and calcareous clays."

All that part of the country lying east of the "Blue Grass Region," and east of the central southern counties, is known as the hilly or mountainous counties of Kentucky, and covers an area of about 8,000,000 of acres, nearly all of which is underlaid by one continuous bed of coal and iron ores. This is known as the Eastern Kentucky coal field, to distinguish it from the Illinois coal field in the western part of the State. The geological formation of this section embraces sandstone, shale, iron-

stone, millstone grit, freestone, conglomerates, limestone, marble, &c., from which are derived soils by no means unproductive, if properly and skillfully treated.

The cereals, flax, tobacco, grapes, fruits, and all kinds of vegetables, grow well wherever the land is not too hilly or abrupt for cultivation. The timber of these counties is practically inexhaustible, and consists of every variety known in the North American forests. Mineral springs here abound of excellent quality, and also coal oil wells in many localities, producing the best grades of lubricating and burning oils and bitumen tar. The climate and healthfulness of these mountain counties cannot be excelled, while the scenery, in many places, is equal to any in Europe. Sheep husbandry can nowhere be followed with greater success than in this part of Kentucky, where the native grasses, and blue grass on the ridge lands, afford a perpetual pasture for all kinds of stock. Wild fruits, nuts, grapes, game, and fish everywhere abound, and give employment for those seeking amusements in hunting and fishing, as well as the most delicate of food to the inhabitants.

The immense beds of iron ores and coal will make this region, within a few years, the best mining district in the west, and cause new industries to be opened up which will enrich all who have the enterprise and capital to engage in mining and manufacturing ventures.

Immigrants from the hill countries of Europe will find here homes suited to their fancy, with lands susceptible of producing large crops by skillful cultivation, and capable of supplying food, clothing, and all luxuries to his family, with less than half the labor required in his fatherland. This country is developing steadily, and at no very distant day must be one of the most delightful mountain sections for residences and health in the United States. The people are kind, intelligent, hospitable, and anxious to have the resources of the country developed as fast as capital and skilled labor can be brought into the State.

Grapes flourish here as well as they do in the mountainous countries of Switzerland, France, Spain, or Germany, and wine-making might be as cheaply conducted on these highly fertile calcareous limestone soils as on any other part of the earth. The warm climate, too, imparts to the grape a richness that is rarely met with even in the south of France. No portion of the United States presents cheaper lands, with such favorable surrounding, than does this mountain section of Kentucky.

MANUFACTURING CAPACITY AND DOMESTIC ARTS.

It seems strange to say that a State, endowed by nature with such immense agricultural resources as Kentucky, should at the same time be one of the most advantageously located for mechanical and manufacturing trades of any other equal-sized territory on the globe. Yet such is the fact, as the statistics of the raw materials, climate, cheap fuel, water-power, and centrality of position will show. Situated midway between the Gulf of Mexico and the northern lakes, and also between the eastern and western ranges of the North American mountains, Louisville, the largest city in the State, becomes the focal point of the great Mississippi Valley. Here, by easy water communication and railroad facilities, can be concentrated the cheapest iron, coal, hard timber, as well as cabinet timber, potter's clay, kaolin, fire-clay, marble, lithographic stone, fine-grain building stone, cement, glass sand, marl, and fluor-spar to be found on the continent.

There is scarcely a spot favorably situated in the State that has not, most convenient and surrounding it, all kinds of workable timber, iron, and coal, the greatest variety of earths and sands, besides inexhaustible supplies of every class of agricultural products and raw material, such as corn, wheat, rye, oats, barley, flax, hemp, wool, cotton, tobacco, sorghum, hides, tan bark, high wines, alcohol, honey, grapes, fruits, berries, nuts, and medicinal plants. In addition to these things, the climate is such as never to stop machinery, either through the debilitating effect of the summer's heat or the excessive cold of winter.

The articles of food for operatives and their families, whether in breadstuffs, vegetables, fruits, fish, or meats, can be supplied here cheaper by fifty per cent. than in any part of Europe, and of better quality; for this State is the central location of good beef, good pork, good mutton, good butter, good milk, good cheese, good poultry, good wheat, good barley, good corn, good garden vegetables, and good fruit.

In water-power Kentucky excels any other State in the North American Union, when we take into consideration the freedom from winter freezes. The people of this State have always been mainly an agricultural community, as is shown by the production of the staple crops grown on her soil. The Auditor's Report for 1876 shows the following productions for that year of some of our staple crops, which is far

below the real amount, viz: Tobacco, 156,136,910 pounds; corn (maize) 68,944,114 bushels; wheat, 5,031,469 bushels; hemp, 14,923,519 pounds; hay, 122,696 tons; barley, 148,004 bushels; all of which is available at home for manufacturing purposes, besides the large stocks of the same and other articles received from neighboring States.

The variety of new manufacturing industries, springing up all over the State since the close of the late civil war, is unprecedented, even in the American States, and yet they form but a tithe of what is needed to supply the increasing wants of our own people and our neighbors.

What we most need is more skilled laborers and more capital to develop the resources of the mineral, coal, timber, agricultural and manufacturing wealth; and when this is acquired, the centre of the machinery labor of the American nation will be in the State of Kentucky.

At the late Centennial Celebration at Philadelphia there was exhibited by Kentucky nothing from her factories. A collection of minerals, ores, specimens of coals, &c., were nearly all that were put on exhibition; yet these were sufficient to show how immense were our facilities for furnishing the raw material for manufacturing all kinds of goods and wares when the necessary capital and labor were once introduced into the State.

Our Geological Survey has established the fact that Kentucky, for factory purposes, has more coal, iron, and timber than Pennsylvania or any other State of the Union, and more of each than England, Scotland, Wales, and Ireland combined, or any one of the central countries of Europe.

With these resources, it is impossible to tell what will be the extent of the mechanical and manufacturing interests that will be developed within the next century, or how these developments will influence the future of the country.

We will mention in this connection, because it will hereafter have a great bearing on the iron manufactories in the United States, the peculiar qualities of what is known as "Block Coal," which is found in quantities practically inexhaustible, within fifty to eighty miles of Louisville, on the Indiana side of the river, and which, no doubt, also exists in even greater quantities in Kentucky, as it is found in an extension of the same great coal field that crops out so richly in the counties bordering on the Ohio river below Louisville.

This "Block Coal" is pronounced by ironmasters equal to the best in the world for iron-smelting, and all other purposes of iron and steel man-

ufacture, and none of it superior to that which is situated within fifty miles of the Falls of the Ohio, immediately along the line of the "Louisville and St. Louis Air-line Railway," from which mines this coal is now supplied to almost every iron furnace in Indiana, and also to the Bessemer Steel Works at Cleveland, Ohio, at Chicago, and at St. Louis, as well as to the iron manufactories of Cincinnati, Indianapolis, New Albany, and Louisville.

Prof. De Lafontaine, the eminent Swiss Geologist, pronounces the "Block Coal" of this coal field the best in America, and equal, in every respect, to the best Welsh coal. Prof. Foster, the State Geologist, says: "To the purity of splint it unites all the softness and combustibility of wood; and the effect produced by it in the blast furnace, either as to the quality or quantity of the iron, *far exceeds* anything known in the manufacture of that metal with charcoal."

Prof. Cox, the State Geologist, pronounces the "Block Coal" of this field "the best mineral fuel yet known in the world for the manufacture of pig metal, bar iron, or steel."

This "Block Coal" can be used cheaper in Louisville than anthracite can in Philadelphia; is freer of sulphur and phosphoric acid, more deleterious to iron-making, than even charcoal itself. From this and other sources, along her various lines of railway and river routes, Louisville can be supplied with *cheaper fuel* for factory purposes than any other large city in America, while the inexhaustible beds of iron ores, in various parts of the State, are so convenient to her that she will in the future, as she is doing at the present time, be able to manufacture and supply both iron and steel cheaper, and equal in quality, to any made on the continent; and this is why the best iron is now made in Louisville, and can be had cheaper than in any other American city for making locomotives and steamboat boilers, bridges, car-wheels, and all classes of work requiring the toughest metal.

What is here said of the iron factory business may be said also, as far as the same is applicable, of cotton and wool factories, glass factories, edge tools factories, tanneries, and all classes of machinery works.

The mechanic trades and unions exist in all our larger cities as they do elsewhere; but so great is the demand for this class of laborers, and so remunerative are the wages paid them, and so cheap are the rents and provisions, that we are never bothered about strikes and mobs, as is the case in many of the older countries at the north and in Europe.

Perhaps no country on earth is more blest than Kentucky in having mechanics and laboring men who own their residences, and have their

own homes unencumbered with rent debt. This is a notable feature in Louisville, Covington, Newport, Lexington, Paducah, and elsewhere, and has been the subject of frequent and gratifying reference. It speaks more favorably of this country as a desirable location and home for industrious, frugal, and thrifty mechanics and laborers than any thing that can be written in its praise. Ample room is here for machine-shops of all kinds, and a superabundance of the best, the richest, and the cheapest of food for the mechanics and laborers who may occupy them, with good water, and a most salubrious climate everywhere to be found. More than this cannot be said of any other country, and less would not be doing justice to the great manufacturing resources of Kentucky.

EDUCATIONAL FACILITIES.

The territory that now forms the State of Kentucky one hundred years ago was an unbroken wilderness, uninhabited except by wild beasts and savage Indians. This was the favorite hunting-ground and general battle-field, where met in deadly strife the tribes of the North-west and the numerous nations of the South. The wild war-whoop and the painted warriors were heard and seen among the heavy forests and beautiful savannahs where now are the happy homes of an independent yeomanry.

These Indian savages, by mutual consent, had probably for centuries designated all that country lying between the Ohio on the north and the Tennessee river on the south to be one grand park, wherein might roam at will the buffalo, the elk, the deer, the bear, the turkey, the grouse, and every other species of game, in immense droves or flocks, increasing without limit, in a land the richest on the continent in native grasses, fruits, and berries, and with a climate so genial and mild in winter as not to cause them to emigrate South, and so cool in summer as not to require them to go North.

From this park all the adjacent tribes procured yearly their winter food, and often most sanguinary and deadly conflicts ensued in case one party intruded upon the hunting-grounds of another, and was overtaken in their poaching expeditions.

When the white races attempted to occupy these lands, all the neighboring tribes joined in one common cause in attempting to expel, from their beautiful hunting-ground, the common enemy. This produced terrible deeds of bloodshed and slaughter in the early settlement of the country, and caused many brave and fearless pioneers to lose their lives in defense of their new-made homes and in the protection of their families. But these days of trouble have long since passed away; the Indian tribes that formerly made this their hunting-ground have melted away before the advancing civilization and unparalleled energy of the nineteenth century, and the remnant of the proud and stubborn savages, once so fierce and powerful on the war-path, and so dreaded by the early settlers, has been pushed west to the base of the Rocky Mountains. The mighty forests, too, have fallen, and the beautiful savannahs have been changed, and in their places are now to be found prosperous villages, flourishing towns, well-built cities, and cultivated farms, bearing an abundance of the fruits, the grains, and riches of honest labor.

The wilderness indeed now blossoms as the rose, and the hum of machinery and busy notes of enterprise and industry ring out from thousands of manufacturing and mechanical establishments. The Indian trail and the buffalo paths have given place to the iron-bound railroads, whereon the locomotive, with its long train of cars, sweeps with lightning speed to ready markets with the bountiful productions of our fertile State.

On that portion of this grand park lying within the limits of Kentucky now dwell not less than a million and a half of free people, living under a democratic State government, one of the most liberal known in history, where every citizen, without respect to parentage, color, or condition, bears an equal part in making the laws, and receives the same protection from them in his life, liberty, and property, and where the school-house, filled with happy children, can be found in every neighborhood.

Kentucky has a Treasury overflowing with money, and no State debt continually pressing for payment; pays interest on no vast amount of borrowed capital, like many of her sister States; yet she collects less taxes pro rata from her citizens than any country, among the civilized communities of man, wherewith to pay the annual expenses of her government.

The entire State tax is but forty cents on the one hundred dollars' worth of property, of which amount twenty-five cents on the hundred

dollars, or largely over one half, go to the public school fund, in order to educate the children of the State, and the other fifteen cents on the one hundred dollars' worth of property, estimated at a very low rate, go to pay the running expenses of the State in its public capacity.

With the State, the general education of her children is a subject of paramount importance. Her system of public schools, now in operation, supplies to the children of the Commonwealth over six years of age nearly six thousand teachers, and with about two millions of dollars' worth of school-houses, thus affording to every child in the State, white or black, whose parents will accept of the advantages, a chance to obtain a good common school education.

This system of education is entirely free of any religious sectarianism, either in regard to teachers or text-books, and by law must so remain without regard to the religious views or sectarian prejudices of parents or guardians.

Besides the common schools, all the cities and larger towns, as well as many of the smaller villages and country neighborhoods, have school systems of their own, by which the children within their limits can be educated free, or by the joint application of the State and local funds. The cities (Louisville and Henderson, for instance), in addition to their common schools, have also a grade of "high schools," in which the languages and the higher branches of literature and science are taught to students who have successfully passed through the primary departments.

There is a State "Agricultural and Mechanical College" at Lexington, endowed by the Commonwealth, to which each county can send, free of tuition, three times as many students as she has members in the legislative body of the State. At this institution are taught, in addition to the general routine of classical literature and common school studies, mathematics, the ancient and modern languages, military drill according to the tactics used by the United States army, and also the application of science to agriculture and mechanical pursuits.

There are in the State some ten to twelve other male universities and colleges, all managed by highly educated and scientific faculties, and well patronized by highly advanced intellectual students. Several of these institutions have military drill after the manner of the National Military Academy at West Point. There are also between ninety and one hundred male and female academies, high schools, seminaries, and select schools, of superior rank, in the different counties of the State, besides numerous private schools, all well patronized by citizens of Kentucky and other States.

There are separate State institutions, supported entirely by the Commonwealth, for the education of the deaf, the dumb, the blind, and the feeble-minded children, in elegant public buildings, and convenient to all of her citizens who are so unfortunate as to have children thus afflicted.

The poor and unfortunate lunatics and idiots of the State are taken care of and provided with comfortable homes and medical attention at the three large, elegantly built, and well provided "Lunatic Asylums" that now adorn our good old Commonwealth. These asylums are among the largest, and are said, by competent experts, to be the best arranged and appointed, and the most skillfully managed, of any similar institutions in the world. The State pays the entire charges of all the patients, including traveling expenses and clothing.

While Kentucky possesses all these facilities for good schools at which to educate her children, and asylums in which to take care of the unfortunate of her people, she is well provided with churches and with benevolent and social societies, embracing among their number nearly every order known in America or Europe.

The people of the entire State are distinguished for their intelligence, generous hospitality, genial social characteristics, and chivalrous bearing. There is no caste here, founded on long lists of ancestral names, on religion, on politics, or on wealth, and nothing of that haughty aristocracy arising from these causes. Men and women are not ostracised from society because they may happen to be poor, but are admitted upon their real merits in mental, moral, and social culture, without regard to wordly position or possessions. Among our foreign-born population, or those whose parents, one or both, were foreign-born, there remain all those generous characteristics and social customs of the fatherland that were wont to be practiced in the "old country," and these make immigrants of the same nationality feel at home immediately upon coming among us.

The native-born citizens of other sister States, as well as people from foreign lands who come here, will be pleased with the educational facilities of our State, and will find all the advantages of the most refined society, and will receive a cordial welcome from all native-born Kentuckians.

CITIES AND TOWNS.

The rich virgin soil of Kentucky naturally caused the first settlers to become agriculturists, and to concentrate their energies in developing the farms, whereon could be produced everything needed, either for food or clothing. Domestic economy had early taught every family to become the home manufacturers of articles made from the native products—wool, cotton, hemp, flax, corn, wheat, barley, oats, &c.—so that from the very beginning of the settlement of the country we find the "domestic arts" in active operation to supply the wants of the people.

This created an independence among the citizens that prevented them from congregating in towns and cities, or engaging in such trades or pursuits as would require them to live in compact communities; therefore, we find that few large metropolitan centres have grown up in the State, although no country ever offered greater facilities for a large manufacturing population or better employment for concentrated capital.

There are within the State some dozen or more cities containing a population from four thousand and upwards, besides hundreds of towns and villages with a less number of inhabitants. A brief synopsis, descriptive of the localities and peculiar advantages of a few of these larger places, may not be uninteresting.

Louisville, the chief metropolitan city of the State, is situated in Jefferson county, at the Falls of the Ohio river, four hundred miles from its mouth, and is without doubt the most beautifully located city in the Western States. It now contains about 160,000 people, and is fast increasing both in wealth and population. This city is remarkable for its healthfulness, as is evidenced by the reports of the National Medical Association of the United States, wherein it appears that, in nine years out of twelve, she exhibited the least mortality, in proportion to population, of any city in the world. This can be readily accounted for on account of the naturally temperate climate, pure air, fine water, ample supply of fresh, well-developed vegetables, good healthy meats, rich milk and butter, well-matured cereals, and the thorough system of drainage. The population are mostly of the native Kentucky and Virginia stock, largely intermixed with the German, English, Welsh, Irish, Scotch, French, and Swedes. So numerous has the German element become

within the city and its suburbs, that it is found necessary to have the German language taught in all the public schools.

Water-power.—The immense water-power at the "Falls of the Ohio," where that large and beautiful river flows over the ancient coral beds of the Upper Silurian Group, if properly utilized, can be made to drive five times as much machinery as is now active in the city of Manchester, England. This can be done either by making a canal from above the city, thence running south beyond the southern limits, and emptying again into the bed of the Ohio below the city, or probably at less expense, though not so effective, entirely within the corporation limits, by using the present canal and branching it so as to empty the water below Portland. Besides this immense water-power, now almost entirely unused at Louisville, the coal fields of Kentucky and Indiana lie so convenient that the best manufacturing fuel can be delivered at her door as cheaply as the same can be done at Manchester, London, Paris, or any other place on the continent of Europe.

Being at the centre of the tobacco region, she has already become the largest tobacco market in the world. Her iron interest will, within a few years, be as great as any other city of her size in the country. She is now producing bar iron of the finest quality, and at a cheaper rate than any other place in the Union. The same may be said in regard to other industries and factories, such as tanneries, cotton and wool factories, shoe factories, glass factories, and all classes of agricultural implements and furniture, as well as steamboat and ship-building. She even now employs several thousand persons in her various manufacturing industries. The commerce of the city is over $100,000,000 per year, and rapidly increasing, besides the immense amounts shipped through her to other ports.

Her public free schools, medical, law, and academic colleges, libraries, water-works, gas-works, public buildings, theatres, churches, and eleemosynary institutions are equal to any in the United States, proportioned to the wants of her people.

The society is first-class in every particular—genial, social, hospitable, educated, and refined, there being no caste recognized except that belonging to true intellectual merit. There is no industry, consistent with the welfare of a large city, that may not be exercised here both with honor, advantage, and profit.

The slightest glance at the map of the United States will at once show that nature has indicated three triangular points, where large manufac-

turing and commercial cities are bound to arise and control the destinies of the great Mississippi valley. These are St. Louis, Missouri, Chicago, Illinois, and Louisville, Kentucky, of which the latter place has greatly the advantage over the other two in climate, the richness of the adjacent country, raw materials for factories, water-power, and cheap fuel. Here there is never trouble interfering with the running of machinery, on account of the incompatibility of climate, in summer or winter. Large capitalists, either of our sister States or Europe, seeking places for the establishment of paying enterprises, should never overlook the great advantages presented by the city at the "Falls of the Ohio."

The next city in population is Covington, situated on the Ohio river, in Kenton county, immediately opposite to Cincinnati; and next to Covington is Newport, situated in Campbell county, also opposite to Cincinnati, and separated from Covington by the Licking river. The former contains about 30,000 and the latter about 20,000 people, and each are in fact almost a part of the great city of Cincinnati, although located in a different State.

Whatever can be said of Cincinnati as a great commercial centre, can with equal truth be said of both Covington and Newport, with this addition, that either of the latter cities has a finer location and better adjacent country than Cincinnati, and the two combined will, no doubt, at some time in the great future, equal if not surpass Cincinnati in wealth, population, and importance.

Like all other Kentucky cities, these are peculiarly well located for manufacturing industries, both on account of cheap fuel, and the proximity of all kinds of raw material. Their railroad facilities, of course, are the same as those of Cincinnati, to which they are connected by two most elegant bridges, besides numerous ferries.

Hundreds of factories of all kinds are springing up every year both in Covington and Newport, supplying millions of dollars' worth of various kinds of goods and wares, which are sold in Cincinnati. The small space of territory between the Ohio river and the hill, on which Cincinnati is built, has now become very crowded with houses, so that the redundant population will naturally seek better and cheaper homes on the opposite side of the river. This insures, to each of these suburban places, a population sufficient to make them more desirable localities for either factories or residences than Cincinnati itself; accordingly, we find much of the Cincinnati immigration is now locating, and in the future will wisely locate, in these beautiful and healthful Kentucky cities.

Lexington, an elegant city of about 20,000 inhabitants, in Fayette county, stands in a central garden spot of Kentucky, about the middle of the "Blue Grass Region." Possibly no other place of the same size can be found in any country where all the necessaries and luxuries of life can be had with less labor. Here are concentrated the finest stock, and the best pedigrees of horses, cattle, sheep, hogs, and poultry, that can be found on the continent; here, and in the counties adjacent, is made that most noted whisky, known throughout the world as "Old Bourbon;" here are the largest hemp factories and some of the best mills in the State, and various small factories of other articles used by the people of Kentucky and the Southern States. The climate, water, and healthiness of Lexington cannot be surpassed, and her public schools, academies, and colleges are equal to any in the western States. Turnpikes radiate in every direction, and three distinct railroads pass through the city, going north, east, south, and west, while several others are in contemplation.

The lands around Lexington are higher in price, and probably richer and more productive, than in almost any other portion of the United States. She has been styled the "Athens of Kentucky," and rightfully deserves the name of the "garden spot of the West."

Paducah, "the growing city of Southwestern Kentucky," is most beautifully situated on the Ohio, immediately below the mouth of the Tennessee river, and contains about 10,000 inhabitants. She is the county seat of McCracken county, and is most advantageously located to become a large commercial and manufacturing city. Iron, coal, lead ores, fluor-spar, and the best of building rock, glass-sand, fire-clay, and potter's earth are mined in her immediate neighborhood, while timber, cotton, tobacco, flax, grain, and all kinds of raw materials, are produced in endless supply in all the adjacent counties of Kentucky, Tennessee, and Illinois.

Being the largest city between Louisville and Memphis on the Ohio and Mississippi rivers, she naturally attracts the commere of a large belt of country from three different States, and by the aid of her never-failing river navigation and railroad connection, is enabled to contend with St. Louis and other northwestern cities for the trade of the southern States. Already several mills and factories are in successful operation, and others in contemplation, the local advantages being such that time, skilled labor, and capital alone are wanting to make this the manufacturing centre on the lower Ohio river. Immigrants from the North or Europe to this place would find good free common and high schools,

fine churches and public buildings, a hospitable and generous people, a climate unsurpassed, and every kind of food and worldly comforts, as cheaply to be obtained as elsewhere in the western States.

Frankfort, the Capital of the State, and the county seat of Franklin county, is situated in a beautiful cove on the banks of the Kentucky river, immediately on the line of railroad from Louisville to Lexington, 65 miles from the former and 28 miles from the latter place. The population, of nearly seven thousand, is remarkably energetic, industrious, and thrifty; nowhere on the globe can be found, in a city of the same size, a more intelligent, kind, and hospitable people, better public and private schools, finer churches, or more wealth. There are also good water-works and gas-works, and several mills, factories, and distilleries, in which are manufactured goods, wares, and liquors equal to any similar productions made in the State.

The Kentucky river is navigable the entire year by steamboats, and the railroad trains are coming and going at all hours of the day.

The State House and other public buildings are beautifully located on the central square of the city, and make quite a handsome appearance, and although they may not look altogether so massive, grand, and imposing as the State Houses and public buildings of our National Capital, or some of our sister States, yet they form an elegant and beautiful picture, and every Kentuckian, as he looks on them, can say: "Here is the Capital of ONE free and independent State, at least, with a Treasury containing millions for the benefit of her people and her common schools, but that *owes not one cent* to the capitalists of New York, London, Paris, or Frankfort-on-the-Main."

The officers of the State government are by law required to live at the Capital, and to transact all their public business at this point. The Supreme Court of the State also holds its sessions at Frankfort, which frequently concentrates at this point the best legal talent of the State.

The scenery in the immediate neighborhood is grand and beautiful, and every comfort needed by man is here to be had at the cheapest rate. Nature has truly done much to make this a most desirable spot for those seeking a home or business where capital can be employed to advantage in almost any kind of mechanical or manufacturing industry.

Maysville stands on the south bank of the Ohio river, at the mouth of Limestone creek, about sixty-one miles above Cincinnati; is the county seat of Mason county, and contains a population of about six

thousand; situated on an elevated plateau, above all high-water marks. This is one of the most elegant and noted cities in Kentucky, from its having been the first place settled in Northern Kentucky, and the birth-place and home of many of the most distinguished men in the history of the State.

There are several factories and mills now in successful operation, producing large quantities of goods, wares, and agricultural implements, which find ready sale at home and in Cincinnati. The public and private schools are unsurpassed, and the churches and public buildings excellent in design and finish.

The people of Maysville are truly Kentuckian in hospitality, intelligence, and thriftiness, and nowhere is true worth and intellectual superiority more cherished than in this "Athens of Northern Kentucky." As a manufacturing and commercial centre, Maysville has all the requisites, except an abundance of capital and skilled labor. Coal, iron ore, hard timber, tobacco, grain, flax, wool, hemp, and the finest clay and stone, are within easy reach, and only await the enterprise of a healthy immigration to make this one of the most populous and flourishing commercial and manufacturing cities on the Ohio river.

Bowling Green is most beautifully located on Barren river, in Warren county, in the central southern portion of the State, and contains a population of six thousand people. Here nature has been lavish in combining many advantages for a large city. Every kind of raw material and product of the farm can be centred here as cheaply as at any other point in the west. Cotton, wool, flax, hemp, tobacco, coal oil, coal, iron ore, all kinds of timber, fine stone, fire-clays, lithographic and marble quarries, are profusely plentiful around Bowling Green as a centre, while the facilities of water carriage and railroads, reaching to all parts of the South and West, are uninterrupted throughout the year. Like other Kentucky cities, surrounded by rich agricultural districts, she is just beginning to develop a few of the many resources at her command. Already there are several mills, factories, distilleries, and machine-shops actively at work; but these are not a tenth part of what are needed to supply the immense trade she might concentrate from all the vast agricultural areas lying south and west along the lines of her railroads and navigable rivers. An infusion of northern or foreign capital and enterprise could here be made to produce most wonderful results in any class of factory business, while wealth would fill the coffers of the skilled laborer and mechanic. The people are intelligent, hospitable, and

refined; the public buildings are very superior, the churches large and commodious, the public and private schools excellent; good water-works, and a healthfulness of location equal to any in the State.

Henderson, a city of some five thousand inhabitants, situated in the county of the same name, on the Ohio, about midway between Louisville and its mouth, has one of the most eligible sites to be found along the banks of this queenly river. Its business, compared with its size, is exceedingly large, owing to the immense amount of tobacco that concentrates at this point. From here and Owensboro are shipped a majority of the strips sold in the English markets. The people are mostly native Kentuckians, and remarkably hospitable, intelligent, and enterprising; the public free schools are probably the best of any similar-sized city in the Western States, and are supported with more pride by the citizens; the public buildings and churches are large and well-built, and everything about the city shows a spirit of thrifty progress towards wealth and population. The manufactories and stemmeries of tobacco are very numerous and well-conducted, giving employment to a large number of laborers and several millions of dollars of capital; other mechanical and manufacturing and milling establishments are being built, and several are now in active operation.

Iron ores, coal, the best of timber, fire-clay, potter's clay, excellent stone, besides every kind of agricultural product, are conveniently to be had; in fact, the city itself is located over a coal field of not less than an average combined thickness of some 35 feet or more.

River navigation and railroad facilities for freight and travel, uninfluenced by cold or heat, connect Henderson with every part of the Mississippi valley, and afford her the means, if properly utilized, in connection with her other advantages, of becoming one of the cheapest manufacturing cities in America.

Owensboro, situated on the Ohio river, 150 miles below Louisville, on a level plain, in one of the richest sections in Kentucky, contains about five thousand people. It is nearly in the centre of the great "Illinois coal field," and is surrounded by every advantage needed to build up and support a large commercial and manufacturing city.

Daviess county, of which Owensboro is the county seat, is one of the richest, most productive, and best timbered counties in the State, and produces as much tobacco as any other county in the United States, with half a dozen exceptions.

Of course this makes Owensboro a large tobacco centre, and employs her population extensively in manufacturing, stemming, and shipping

this staple; other industries, however, have not been neglected, but are springing up and flourishing in this growing, enterprising city; manufactories of various kinds are coming into active operation, and capitalists, influenced by the many natural facilities of the location, are beginning to invest in numerous mechanical and manufacturing employments, all of which will make bountiful returns, no doubt, on the investments.

The population are well educated, generous, and hospitable and are endowed with a spirit of progressive energy. The public buildings are large and substantially built, the churches numerous and elegant while the schools, public and private, are first-class in all their arrangements.

With labor and capital to develop the natural resources of the adjacent counties, and to establish new branches of industry within her limits, nothing could prevent Owensboro from being what nature has destined her, one of the most populous, thriving, and energetic commercial and manufacturing cities on the Ohio river Nowhere can the seekers for new and profitable homes be better suited than in this enterprising place.

Hopkinsville, a city of about five thousand population is located on the waters of Little river, in the county of Christian, about the centre of the Sub-carboniferous formation, in one of the richest sections of the State, and in the centre of the largest wheat-growing county in the State, and the largest tobacco-raising county in the world Her population is nearly all of the native Kentucky, Virginia, or North Carolina stock, and are noted for their chivalry intelligence, hospitality, and industry. One of the best tobacco markets in the West is located at this point, where from ten to twelve thousand hogsheads of tobacco, and that the best shipping leaf on the continent, known as the "Hopkinsville Shippers," "African Shippers," or "Mexican Bailers," are sold yearly on the "Breaks." These sales are all made at auction, the buyers (who are from all parts of the United States and Europe) bidding on the samples, drawn from the hogsheads by sworn public inspectors, as is done at Louisville, Kentucky, and at Richmond, Virginia, can see, before they buy, every package uncased and stripped. There are many stemmeries and factories of this important staple, besides several mills, machine shops, factories of carriages, plows, agricultural implements, wood-work, and various other mechanical industries.

The schools, both private and public, are first-class, consisting, besides those teaching the common branches, of several academies and high

schools for both males and females. The public buildings and churches are large and elegantly built, and near the city is the Second Kentucky Lunatic Asylum, which is said, by competent experts, to be the most complete, well-arranged, and successfully managed institution of the kind in the world. The railroad passing north and south through this place connects it directly with the entire southern country, and all the principal cities of the northern States.

The proximity to the western coal fields (to which her system of railroads reaches at less than twenty miles), and the fine timber of Christian and the adjacent counties, together with the vast iron ore deposits of the Sub-carboniferous group lying near her, in addition to the tobacco, cotton, wool, wheat, and other agricultural products at her very door, make Hopkinsville one of the most advantageously located places for manufacturing enterprises in the western States, and will no doubt, in the near future, cause her to rank among the commercial and manufacturing centres of the Union. What she now lacks is more capital and skilled laborers in order to develop her natural resources. Capitalists and immigration, seeking good and pleasant homes, and profitable points for business, would do well to settle here.

Kentucky has scores of other cities and towns, numbering from four thousand population and downward, which are destined in the future to become places of great wealth, commercial and manufacturing importance, and population, which we would like to describe specifically did our space permit; but these, for the present, we must pass over, with the remark that, before fifteen more years pass, several of them will become so large in population as to astonish immigrants who might locate in them now.

LIVE STOCK.

Under this head we include particularly horses, mules, cattle, sheep, goats, hogs, and poultry.

Kentucky seems destined by nature as the place where live stock of all kinds might arrive at the highest perfectability on our globe. Long before the white races had discovered this continent, the aboriginal Indians, by common consent, appropriated the State of Kentucky and a part of Tennessee to be a grand central pastoral park, in which all animals fit for food could graze, fatten, and multiply without limit, in order to supply the wants of the numerous tribes surrounding it with food for winter. The native grasses grew here as they did nowhere else on the continent, and the numerous rivers, creeks, and springs, here afforded the most ample supply of good, fresh, wholesome water at all seasons of the year, not freezing up in winter or drying out in summer.

The native forests here produced acorns, nuts, wild plums, cherries, grapes, persimmons, papaws, haws, and all kinds of small fruits, berries, and grass-nuts, in almost countless varieties and profusion.

The climate was mild and salubrious, and the scenery grand and beautiful. Wild herbage and lovely flowers bedecked the hills and valleys in summer, and the evergreen cane, blue grass, and native wild rye and oats, gave an abundance of provender in winter. Truly this Heaven-favored spot was the "Garden of Eden" for all kinds of animal life to concentrate and flourish in its native perfection. Accordingly, we find among the remnant of prehistoric animal fossils the largest mammoth bones in the world at Blue Lick Springs and other places, and the bones of the elephant and mastodon in size such as is nowhere else to be found. We also find here the largest skeletons of the bison, the buffalo, the elk, the deer, the wild ox, the antelope, the bear, and other quadrupeds which seem to have disappeared before the country was inhabited by the aboriginal savages. But like causes always produce like effects, and the salubrious climate, succulent grasses, and native nuts, fruits, and berries that caused the super-excellence of these prehistoric animals, continue to stimulate their present domesticated representatives into the most perfect specimens of their kinds on the globe.

When the first settlers came to the State from Virginia and North Carolina, and brought with them their horses, cattle, sheep, hogs, and poultry, they soon discovered that they had come to an Eden for live stock—that here the horse, the cow, the sheep, the hog, the turkey, the duck, the chicken, and other mammals and poultry, thrived and flourished as they had never known them to do elsewhere. This suggested the idea of improving the breeds brought with them over the Allegheny mountains by the laws of selection and adaptability.

The Conestoga stock of horses of Pennsylvania and Virginia were in a few generations changed to the hardy, tough, active stock of Kentucky. Soon importations of the best breeds of Arabian and English horses, and Spanish and Moorish jacks and jennets, were introduced, which clearly showed their superiority, when crossed with our improved natives, to the stock of the older States.

The trials on the turf and the road exhibited the fact that there was something in the food and the water of the "Blue Grass Regions of Kentucky" that gave hardness of bone, fineness of hair, toughness of muscle, and power of lungs, which was not possessed either by the horses or mules of other States. The turf registers began, in the second quarter of this century, to record a majority of races and the best time to Kentucky horses; and now, after a continuous record of about fifty years, Kentucky stands preeminent as the acknowledged centre from whence comes the finest and fleetest racers on the American continent, and the best natural blood next to Arabia in the world.

The Kentucky mules also have become equally famous with her horses, and known throughout the entire Union for their great excellence in size, cleanness of limbs, toughness of muscle, power of bodily strength, and endurance of fatigue.

As it is with horses and mules, so has it been with cattle, only more marked. The "Kentucky Short Horns" are known throughout the civilized world, and are sought after by parties seeking to improve their native herds even in England, the mother country of fine cattle, whither are now sent every year some of our finest breeds in order to enrich the noted pedigrees of that country.

Many of our cattle fanciers have for years been searching the best pedigrees in England and Europe to find all the good points needed for milk, butter, cheese, and beef; and whenever they have discovered some point of superior prominence, have imported the stock and ingrafted on our native improved breed, until now it seems almost impossible to

improve further; yet the contest is progressing as if they were determined to advance the cow into some kind of higher grade of mammal. Already immense prices are paid for these select specimens, ranging from $1,000 to $40,000, which would seem to our ancestors to be fabulous, and even so with us, were it not that we know and see these trades making every year.

With sheep, too, wonderful improvements have been made by importations, selections, and judicious breedings, until now it is no very uncommon thing to find sheep among our sheep fanciers weighing from 400 to 460 pounds, and shearing fleeces of fine wool of from 25 to 38 pounds. Since the late civil war, a great stimulus in improvements of the breeds of all kinds of stock is going on, and most of the old scrub breeds of sheep are giving away to the Merino, Cotswold, Southdown, Shropshiredown, and other highly-prized pedigrees. We will here say, by way of parenthesis, that no part of the world probably affords better native and domestic pastures for sheep than Kentucky, and the day is not far distant when the very finest American wools will be most profitably exported from the table-lands of our mountain counties, as well as from different other sections of the State.

Wherever corn, grass, and clover grow to perfection, as it does here, hogs flourish and become a most profitable crop. No part of the world has finer stock of this mammal than is found everywhere in Kentucky. The Berkshire (red and black), the Poland-China, the Chester White, the Woburn, Essex, the "Long Red," &c., are some of the favorite breeds that have been brought to such perfection in taking on muscle and fat, that it is now quite common to see droves, not exceeding ten to twelve months old, average 350 to 400 pounds. All parts of the United States look to Kentucky as the headquarters for fine pedigrees of hogs, and send here to procure breeders.

The breeding of goats for their fleece is a new industry, which bids fair to become quite popular and lucrative in many parts of the State, the greatest drawback being the trouble given by the goat in doing injury to fruit trees.

Poultry raising, although practiced on every farm in the State, has latterly taken a new impetus, owing to the rapid growths of our villages, towns and cities, the citizens of which require eggs and fowls in greatly increased quantities. The introduction of many foreign breeds of chickens, particularly those of Asiatic origin, has greatly increased the size of the native stock, though we are not so certain that they

have not injured the health of the fowls, and shortened the pro rata profits in eggs. Ducks, geese, guineas, turkeys, pigeons, &c., are largely on the increase, and our Poultry Associations show that the quality of each is improving with every decade of years, both in profits from eggs and size of the bird.

Few domestic rabbits or hares are raised in Kentucky, owing to the great abundance of wild game, which are considered preferable for the table.

The rank which the State has taken as a stock-raising country can never be lost to her, because there are but few places in the world where the grasses are so succulent, the grain so nutritious, and the water so peculiarly adapted to the deposition of the hard solid bone, upon which can be built the physical body of animals, in just such perfection as is done here. By referring to table on page 23 of this book, it will be seen how these same causes act upon the physical development of our human population, and make our soldiers and citizens larger and more muscular than those of any other country.

WHY EMIGRANTS SHOULD SELECT KENTUCKY FOR A HOME.

Daniel Boone, the famous western pioneer, said, in his old age: "I have traveled over many new countries in the great Mississippi Valley; I have critically examined their soils; their mineral wealth; their healthful climates; their manufacturing situations; and the commercial advantages given them by nature. I have discovered where these endowments were given most bountifully in many localities, singly and in groups, *but I have never found but one Kentucky—a spot of earth where nature seems to have concentrated all her bounties.*"

So thinks almost every dweller in this highly favored land, and so will feel every emigrant, who, coming from other parts of America, or from Europe, will locate upon our soil. Probably no other portion of the earth of equal size presents to man more inducements for a permanent home, when we consider the value of health, the vigor of mind

and muscle, the richness of soil, the temperate and uniform climate, the number of navigable rivers, the abundance of timber, the rich native grasses and fruits, the vast deposits of coal and mineral ores, and the great facilities for agriculture, commerce, manufactures, and education.

The manners, customs, and habits of a country are influenced to a great extent by the natural conformation of soil, water, timber, scenery, climate, minerals, and vegetable growth. A country, where nature works on a grand scale for man's comforts, naturally responds, by producing a physical development of man commensurate with these superior gifts. Pure air gives strong lungs; rich food gives stout bodies; fine, sparkling water gives solid bones; grand scenery gives noble thoughts, and temperate, uniform climate gives long life. So, too, a bountiful food-producing soil gives hospitality and a generous philanthropy, while poor sterile lands dwarf the kindlier feelings of manhood.

Whenever a sensible man determines to seek a home in a new country, there are, or should be, certain facts regarding the new land which he should know, before he can fix upon the place where he is willing to remove his family, and where he is satisfied that he can better the condition of himself, his wife, and his children, and where they can all live in good health, in peace, contentment, and happiness.

First. He must look to the government, to see that it is free, liberal, and stable; that it is not oppressive in its system of taxation, and that it properly protects the lives, the liberties, and the property of its citizens, and that no castes of favored classes or religious societies control the law-making or law-executing powers.

Upon these points Kentucky makes as fair an exhibit as any other country on the earth, being a central State of the free and popular North American Union of States, acting under its own local laws, made by its own male citizens, every one of whom stands equal in their sovereign capacity as citizens—all voting and all eligible to any office in the land, from the lowest to the highest. Her taxes are only forty cents on the one hundred dollars' worth of property, assessed at a low valuation, of which amount more than half, or twenty-five cents on the hundred dollars, go to the public school fund to pay for the education of the children of the Commonwealth.

There is *not one cent of State debt* more than she has cash in the Treasury, but, on the contrary, she has a surplus of several millions of dollars on hand, now held in trust and invested in interest-bearing bonds and other securities for the benefit of the public schools.

In Kentucky, the child of any immigrant can become, if found worthy, a legislator, a Senator, a State Governor, a member of the United States Congress or Senate, or even President of the United States. Every place of honor and trust, as well as every class of business, and every industry known to man, can here be followed by any citizen, and no religious, sectarian, or family castes stand in his way to preferment or fortune. Even a non resident alien can acquire real estate in Kentucky by descent or devise, and can hold, sell, alienate, or convey the same, as if he or she were a citizen of the United States; but the time during which such alien may thus hold, sell, convey, or alienate such estate, expires eight years from the time of the final settlement of the decedent's estate. Other laws, liberal and philanthropic in their operations, have been long in operation, so as to give to all men, of all nationalities, every possible right which justice and circumstances can admit.

Second, The immigrant should seek for good soil, good water, and a healthy climate. In these three requirements no part of the North American continent can excel our State, as will become evident to any one who has attentively read the foregoing pages, and will look at the geological and geographical position of the country, and who will study the structure of soils that originate from the formations which are prevalent in this portion of the continent. The lowest formation that comes to the surface in this State is the Lower Silurian, with its rich deposits of shelly limestones and marly stratifications, deposited at a very early period among the sedimentary rocks; above this we find every other group (including such immense beds of iron ore and coal as are to be found on no other spot of equal size), until we arrive at the Tertiary and Quartenary, that are even now in the act of formation. Of course, then, every variety of soil and water that usually accompany these stratifications exist in this State, dependent upon the locality of the various underlying rocks. The climate, too, is exceptionally good —among the best of climates, even of the north temperate zone, in countries of parallel latitudes. The climate is about such as is found in France and Germany in Europe, or in parts of China and Asia.

Third. The immigrant wants good society and good schools. Society is an outgrowth of conditions. A free people, good laws, rich lands, a healthy climate, and easy means of travel, always make good society, and produce a high order of intelligence, that builds up a civilization that cannot be circumscribed by prejudices or religious fanaticisms. These conditions exist in a marked degree of perfection in this

State; therefore "Kentucky chivalry" and "Kentucky hospitality" are known wherever the English language is spoken, and the frank, genial, proud, generous, and hospitable bearing of our people is as "native to the manor born" as are the stout, robust physical bodies that make our people fear no danger and shrink from no labor or responsibility.

Our public free school system is working well, and the school-houses are, in every neighborhood, easy of access to all the minor children in the State. High schools, seminaries, academies, and colleges are scattered throughout the Commonwealth, so that every one desirous of obtaining a higher grade of education can do so here as cheaply and as thoroughly as in any other part of the world. Every denomination of Christian churches are also scattered throughout the various counties, supported each by its own members, and not by the State.

Fourth. The immigrant wants good markets and easy facilities for travel and transportation. An examination of the maps will show that we have a larger number of navigable rivers and turnpike roads than any other State in the American Union, and a system of railroads that now penetrates every section of the country, and that new roads are building which will, before many years, reach every neighborhood, and this, too, as soon as the demands of the country require. In markets, we have our own large cities and towns as commercial points, besides close connection by water and railway communication with all the towns and cities of the other States of this continent and Europe.

Fifth. The manufacturer, the mechanic, or the merchant, before he emigrates, wishes to know whether the field is suitable for his special industry. To satisfy him, look at the rich mineral ores, greater in quantity than they are in Pennsylvania, England, France, or any of the German States; the fine timber, the ample supply of food, and the bountiful supply of every raw material grown from the earth; the temperate climate; the salubrious atmosphere; the cheap fuel, both from wood and coal; the immense water-power of our rivers, and the easy and free communication with the rest of the world, and then say, upon what other spot on earth can you find more advantages for the employment of mechanical and manufacturing labor, brain-work, or capital, than here in Kentucky. Here is room amply sufficient to give work to the single laborer, or the largest association of concentrated capital, without fear of exhausting the supply of the raw materials. The labors of the merchant and the professional man follow those of the agriculturalist,

the mechanic, and the manufacturer; and where these are successful, there commerce and the professions prosper.

These and many other advantages are offered by Kentucky to persons seeking new homes in the Mississippi valley, who are invited to come and settle among us, and to share with us the great benefits arising from the immense resources of our State; and, as Kentuckians, we offer a hospitable reception to all, whether natives of America or Europe, who may be willing to immigrate and stay with us.

INSTRUCTIONS TO EMIGRANTS.

On account of the impositions of many hotel-runners, railroad drummers, and "confidence men," who are ever ready to deceive and swindle the unsuspecting traveler, we will here give a few instructions to emigrants seeking homes in Kentucky.

In removing from any one of the United States to this State, a person can buy through tickets to all the principal towns in the State from any leading railroad or steamboat line. It is best to get these through tickets to the nearest possible point to the place you are going; from this point you will have no difficulty in getting to the place desired, either by public or private conveyance.

The great trouble to those coming from Europe, especially when they cannot speak the English language with fluency, is, that, on landing in New York or elsewhere, from aboard of ships, they will be met by sharpers, who will, under pretense of assistance, overcharge, misdirect, delay, mislead, and swindle the unsuspecting emigrant out of all his money.

It is best in a strange city not to make friends with, or listen to the advice of, or accept assistance from, any person unknown to the emigrant, unless he is satisfied that such person is regularly connected with the Commission of Emigration. In case an emigrant has acquaintances in the city at which he lands, it is best to go to them and get posted regarding his contemplated journey.

If, however, he lands in New York, where more than three fourths of the emigrants do land, then he will find some one at the "Office of Commissioner of Emigration," at Castle Garden, who will start him properly on his journey westward.

There are some of the steamship lines from Europe that sell through tickets to Louisville, Kentucky. In case you buy these tickets, you will have no difficulty at all in reaching your destination, according to the tenor and instructions printed on the tickets.

Mr. J. D. O'Leary, a reliable agent at Louisville, Kentucky, of steam ship lines, gives the following excellent advice to emigrants coming West: "Castle Garden, New York, the chief landing place for emigrants in the United States, is constituted under the laws of the State of New York, and supported by a commutation tax of about $1 50 on each emigrant arriving at that port, and the benefits accruing to emigrants are their *right, not a favor,* as many suppose; for this tax is included in cost of passage. The managers are styled "Commissioners of Emigration." The amount of tax is about $500,000 annually. The business at Castle Garden is divided into bureaux, each having an officer in charge. The chief railroads have their representatives to direct the emigrant, who, *secure against improper influences, may begin from the wharf at Castle Garden his journey to any part of the United States.*

The Information, Landing, and Forwarding Bureaux conduct correspondence and telegrams, receive remittances intended to defray expenses of the emigrants, and conduct their departure for the interior in safety and dispatch. A Medical Bureau, in charge of the hospital, has care of the sick, and when convalescent, sends them to their destination. The hospital is visited by the Irish and German societies. Stringent police regulations protect the emigrant at Castle Garden; runners and boarding-house keepers are excluded from the premises.

There are two points to be observed by emigrants, that would relieve themselves and friends of much anxiety, viz:

1st. As soon as the emigrant has decided on the date of departure from Europe, and has ascertained the name of the ship, which he will do eight days previously through the agent, he should communicate the facts to his friends in America. The latter can ascertain, through the American local agent, when any given ship has landed.

2d. By requesting the telegraph operator at "Forwarding Bureau," Castle Garden, to send a dispatch (by *night line*, at half rates) to his friends in the interior of the hour of departure by railroad to his destination.

Emigrants should not submit to extra charge for baggage by railroad companies, unless satisfied that it exceeds the weight allowed, but should keep the baggage checks, and settle at the end of the journey.

As intended, the emigrants can select the time and ship at their own pleasure. It is advisable that they should engage by a vessel of large tonnage, and thereby gain light, ventilation, and height between the decks. If these precautions are observed, the journey from any port in Europe to the State of Kentucky is not only free from hardships, but a pleasure. Many foreigners, availing themselves of the cheap rates daily to revisit their old homes, have found their journey comfortable and safe."

After the emigrant arrives at Louisville or any other city of the State, he will find no difficulty, either through citizens from his own fatherland or from the mayor or policemen of the city, to get instruction and assistance in reaching any place in the Commonwealth.

In the United States, the decimal count of money is universally used, which has by law fixed values as compared with foreign coins—some of which we will here give:

Dollar, United States currency (marked $), - -	equals	100	cents.
Florin of Germany, - - - - -	"	40	"
Florin of Austria, - - - - - -	"	48½	"
Marco Banco of Hamburg, - - - -	"	35	"
Thaler of Germany, - - - - -	"	69	"
Rix-dollar or Thaler of Bremen (gold), - -	"	78¾	"
Mark, - - - - - - - -	"	23	"
Dollar of Norway and Sweden, - - -	"	106	"
Dollar of Denmark, - - - - - -	"	105	"
Ruble of Russia, - - - - - -	"	75	"
Ducat of Naples, - - - - -	"	80	"
Real of Spain, - - - - - - -	"	10	"
Franc of France, - - - - - - -	"	$18\frac{6}{10}$	"
Pound sterling of Great Britain - - -	"	484	"