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GEOLOGICAL RECONNOISSANCE

OF OSAGE RIVER AREA

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1889

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HENRY KING

## APPENDIX TO ENGINEER'S REPORT.

*REPORT of a Geological Reconnoissance of that part of the State of Missouri adjacent to the Osage River, made to William H. Morell, Chief Engineer of the State, by order of the Board of Internal Improvement, by Henry King, M D., Geologist, President of the Western Academy of Natural Sciences, &c. &c. &c.*

SAINT LOUIS, Mo., December, 1839.

TO WILLIAM H. MORELL, *Chief Engineer of the State of Missouri*—

SIR: On the 1st day of July last, I received a communication from you, requesting me to make a Mineralogical and Geological Reconnoissance of the country adjacent to the Osage River, in accordance with an order made by the Board of Internal Improvement on the 4th of May preceding.

On the 3d of July I replied, expressing the honor I felt you had done me, in confiding to me so important a trust—the pleasure I had in accepting of it, and the assurance that I would proceed with the greatest possible despatch to make arrangements for its speedy commencement and completion. Early in August these arrangements were made, and I then gave you notice thereof, and that my services were at your disposal.

At your suggestion, I addressed Mr. B. F. Robinson (Commissioner) immediately, for funds, &c., necessary for the outfit. Circumstances prevented my receipt of any answer thereto until the meeting of the Board in September. Every thing having then been arranged, I commenced my tour.

Anxious to ascertain the connexion, if any, between the mineral regions so well known, in the Southern part of the State, and that reported to exist on the Osage River, I directed my course first towards the Lead Mines of Washington County, and the Iron Deposits of Madison and St. Francois.

From thence I passed in a north-westwardly direction to Massie's Iron Works, in Crawford County, and thence across the Gasconade and Osage Rivers, to Jefferson City. Having made some additional preparations, that were necessary, in Jefferson City, I departed for the mouth of the Osage River.

thence following its general course, I traversed in a zig-zag manner the whole region bordering upon it on both sides as far as the State line, commencing first with the north or left side, and returning with the south or right.

The Mineralogical, Geological, Agricultural and other characters of the whole, were examined and ascertained, as far as the limited time and other circumstances would permit. A Report, as the result of this tour, I have herewith the honor of submitting.

With the respects, Sir, of your obedient servant,

H. KING, M. D.

### REPORT:

The Osage River (a) is formed by the Marais des Cygnes and Marmataw Rivers. The junction of these two takes place in township 33 North, Range 30 West of the fifth principal meridian. They both rise beyond the western line of the State—the Marais des Cygnes flowing in a southeastwardly direction—the Marmataw in a north eastwardly direction. The former receives several small creeks—the largest of which is La Mine creek—the latter, a few miles from the junction, receives the little Osage—a stream not much inferior to either of the two principal branches, and flowing through the triangular space which they form. It is about *seventeen* miles from their junction to the western line of the State. From thence to the mouth in Township 44 North, Range 10 West, the general course of the Osage river is North of East. On the left or north side, it receives Panther, Big and Little Monga creeks, Grand river, Cole Camp, Buffalo, Proctor, Little and Big Gravois, Saline, Little Tavern, and Bois-Brule creeks.

On the right or south side Clear creek, Sac river, Bois Blanc, (c) Bear and Hoyle's creeks, Big and Little Pomme des Terre, Turkey, Deer, Knobby creeks, Niangua river, Lynn, Glaice, and Big Tavern creeks, and Mary's river, together with many other streams too small to mention. It passes through or bounds Bates, St. Clair, Benton, Morgan, Pulaski, Miller, Gasconade and Cole counties. Its tributaries stretch into Van Buren, Henry, Johnson and Pettis on the north, and Jasper, Barry, Polk and Green counties on the south. Thus receiving its waters from an area of eight or ten thousand square miles.

**PHYSICAL ASPECT OF THE COUNTRY.**—From the mouth of the Osage to some distance above the mouth of the Sac, the country in the vicinity of the river—say from *two* to *ten* miles on either side—is much broken. The river itself cuts its channel deep through the solid rock, presenting a constant series of perpendicular bluffs—reaching sometimes above one hundred feet in height. Within the trough or channel which it has thus cut, however, there is always on one side or the other, and sometimes on both, a broad, level and fertile bottom, covered with a heavy growth of timber.

In Cole county, the hills are generally gradual enough in their slope to admit of cultivation. They constitute a large part of the superficial area of Miller, and of that part of Gasconade lying next the Osage. In these two latter counties they are generally too precipitous to be of much value for farming purposes. In ascending the river, they gradually lessen in height, and extent until they are finally lost in the prairies of the West. The streams that cut their way through these hills to the river, almost invariably present valuable, and often large tracts of bottom lands.

The extent of this hilly region is generally exaggerated in the minds of citizens of the State; it is well, therefore, to call particular attention to it.

On both sides of the river, to within twenty or thirty miles of its mouth, these hills gradually lose themselves in a rich prairie or woodland. On the north the prairies commence within 15 or 18 miles of Jefferson City. As might be expected, from the contiguity of the Missouri and its tributaries, they are here narrow—westwardly they widen progressively, but, from the same cause, irregularly, until they terminate in the vast plains of the interior.

On the south, but little prairie presents itself east of the Niangua. E this and the mouth of the Osage, the uplands are generally covered heavy growth of timber. West of the Niangua the great Kickapoo puts down its finger like projections between nearly all the water courses east of the Sac river. Through their connection with what are here called the prairie bottoms of the smaller water courses, these prairies often reach to the river bottom itself. These prairies are not, however, as is frequently supposed, a perfect level. On the contrary, they are commonly rolling, and in some instances, as on their approach to the river, are decidedly hilly. But it is very rare that these hills are so steep as to impede cultivation. They relieve the prairies of the monotonous character which they in other places often assume, and present delightful situations for the dwellings of the future settlers.

Another agreeable, as well as useful feature in the aspect of this country, is the contiguity of abundance of timber. Besides the belt of forest covering the hills and bottoms on both sides from the Mouth to Sac river, the smaller branches of the various tributaries, not only of the Osage, but of the Missouri, push their wood-fringed banks into the midst of the plains. (c)

Some miles above the mouth of Sac river, the country gradually assumes a more regular and unbroken prairie aspect. The hills and bluffs decrease in height until the banks of the river become the termination of the adjacent prairies, and timber ceases to show itself, except upon or near the river and creek bottoms.

**GEOLOGICAL CHARACTER.**—Speculations on the origin and formation of the earth, have occupied the attention of the philosophers of every civilized nation, with which history makes us acquainted—but it is only within the present and the latter part of the last century that these speculations have assumed a character entitling them to the name of a science; and the principles upon which this science is founded, been made subservient to the discovery of facts useful to the human family. As this science—Geology—has not yet become a subject of popular study, it is not to be expected that the developments which may be made through it can be well understood and appreciated by the generality of readers, without premising some of its general principles. I shall, therefore, proceed to state them as briefly as possible.

**GEOLOGY** in its widest extent embraces in its investigation the whole earth; but more particularly that portion constituting the surface or crust.

The most casual observer must notice the apparently great irregularities in that surface—here land, there water; here a mountain, there a plain; here a hill, there a valley. The waters irregular in their distribution and outlines; the mountains broken, contorted, and covered with fragmentary rocks; the valleys generally the reverse, smooth, level or gently rolling, and covered with an unbroken surface of soil. Whence these irregularities and differences? Was it so in the beginning, or has it been the effect of causes operating on the earth's surface since its creation? Have these causes been simultaneous in their action over a great extent of the earth, or have they been local? Did they produce or were they coeval with the production of any thing valuable to the human family? It is the province of the science of Geology to answer, or endeavor to answer these and many other such important questions.

The most natural division of the solid matter comprising the crust of the earth, is into *unstratified* and *stratified*. So far as Geological investigations have gone, we are authorized in believing that the first solid coating it possessed after its creation, was some condition of unstratified rock; and that the stratified have since been formed out of these and other materials existing upon or encompassing it.

Unstratified rocks still continue to be formed, or thrown up to the surface of the earth, but always under such circumstances as to show their immediate connection with the original nucleus. Stratified rocks also continue to be formed, but as palpably from these materials already on or near the surface. These two great natural divisions present themselves under various forms and



conditions in various countries, and have given rise to many names indicative of their distinctive characters.

I might, as is commonly the case, make my own divisions and description but as it is possible this report may fall into the hands of some who would like to prosecute their enquiries beyond the limited information it can give, would be better to adopt the classification of some popular and approved author, to whom the reader may be referred for more detailed general information. I will therefore avail myself of the arrangement used in De la Beche Geological Manual—a work which I find as generally diffused through the country as any other, and as well adapted to the present advanced condition of the science. This author, following the natural indication as above laid down, divides the solid matter, composing the earth's surface, in the same way, that is, into *unstratified* and *stratified*. He arranges the whole into eleven groups—the ten first belonging to the stratified—the eleventh to the unstratified division.

He again divides the stratified into *fossiliferous* and *non-fossiliferous*—giving the last name to the last or lowest group of the stratified rocks. The propriety of the last name is somewhat questionable, as among many other reasons it will be seen that one of the formations which we shall examine—entirely different from that to which he gives the same name—has never yet given any evidence of containing fossils. I shall not stop here, however, to discuss this matter, but proceed at once to make the necessary extracts.

"Group (*modern*) seems at first sight natural and easily determined; but in practice it is often very difficult to say where it commences. When we take into consideration the great depth of many of the ravines and gorges which appear to originate in the cutting power of existing rivers—the cliffs even of the hardest rocks, which more or less bound any extent of coast, and the immense accumulation of comparatively modern land, such as those which constitute the deltas of great rivers, and the great flats such as those on the western side of South America, there is a difficulty in referring these phenomena to the duration of a comparatively short period of time. Geologically speaking, the epoch is recent; but according to our ideas of time, it appears to reach far beyond the dates commonly assigned to the present order of things."

This constitutes the first group I shall have occasion to describe.

"Group 2—(Erratic Blocks)—is exceedingly difficult to characterize. It may however be considered, merely for convenience, as comprising those superficial gravel, breccias and transported materials which occur in places where causes, similar to those now in action, could not have placed them. The most extraordinary feature of this group is the distribution of those enormous blocks or boulders, found so singularly perched on mountains or scattered over plains far distant from the rocks from whence they appear to have been broken."

"Group 3—(Supercretaceous)—comprises the rocks usually termed *tertiary*. They are exceedingly various, and contain an immense accumulation of organic remains—terrestrial, fresh water and marine. This group has lately been shown to approach more closely than was supposed, to the existing order of things on the one side, and to the following group on the other."

Group 4—(Cretaceous)—contains the rocks which, in England and the North of France, are characterized by chalk in the upper part and sands and sand-stones in the lower. The term *cretaceous* is perhaps an indifferent one; for probably the mineralogical character of the upper portion, whence the name is derived, is local; that is, confined to particular parts of Europe, and may be represented elsewhere by dark compact sand-stones and even sand-stones. As, however, geologists are perfectly agreed as to what rock is meant, when we speak of the chalk, there seems no objection to retain it for the present."

Neither one of the last three groups has been found on the Osage river.

Of the existence of the "erratic block group" north of the Missouri river, there can be no doubt; and I have seen it in the form of granite boulders in

St. Louis county—on the south. A more careful examination may, therefore, detect it in the region we are describing. There is a general impression among American Geologists, that there is a vast deposit in the great prairies at the foot of the eastern slope of the Rocky mountains, belonging to the supercretaceous and cretaceous formations. But there is no evidence of their existence this far east.

"GROUP 5—(*Oolitic*) comprises the various members of the Oolite, or Jura limestone formation—including *lias*.

"The term *Oolitic* has been retained on the same principle as that of *cretaceous*. In point of fact the mineralogical character is found only in an insignificant part of the rocks known as the Oolitic formation in England and France, and moreover is not confined to the rocks in question, but is common to many others. In the Alps in Italy, the Oolitic formation seems replaced by dark and compact marble limestone, so that the mineralogical structure is of little value."

I am not sure that any evidence of the existence of this group has yet been discovered any where in the Mississippi valley—I am certain that it is not to be found on the Osage. I have before me a beautiful specimen of Oolitic (mineralogically considered) limestone, from the Upper Mississippi, but it belongs to the 7th or last oniferous Group. This example will be sufficient to show the necessity of great care in designating the formation to which a rock belongs, and the little confidence to be placed upon lithological characters in the stratified rocks.

The term *Oolitic* is derived from the resemblance of the rock to the roe of a fish.

"GROUP 6—(*Red Sandstone*) contains the red or variegated marls (manes iris—keaper) the muschel-kalk, the new red, or variegated sandstones (gies bigaric; brenter sandstein) the Zeckstein or magnesian limestone, and the red conglomerate (rothe todle leigende, gies rouge). The whole is considered as a mass of conglomerates, sandstones and marls generally of a red color, but most generally variegated on the upper parts. The limestones may be considered subordinate—sometimes only one occurs, sometimes the other and sometimes both are wanting. There seems no good reason for supposing that other limestones may not be developed in this group in other parts of the world."

A gentleman (Professor Shepard) deservedly celebrated for his scientific, and particularly for his mineralogical knowledge, mentions in a communication to Silliman's Journal, that he found magnesian limestone in the upper part of Illinois, near the termination of the coal series, and again in another communication that he had met with the same in the lower part of this state in the vicinity of Mine La Motte.

That he met with a limestone of this character, mineralogically speaking, I have little doubt, having found such myself near the same place (if I can trust external evidences, not having had an opportunity to analyse it yet,) and again upon the Osage river. But in neither instance did it belong to the formation now under consideration. On the contrary it lay under the coal, constituting or belonging to what I shall describe as the lower series of the Carboniferous formation; and I am not sure if it will not eventually be found to belong to the next, the *Greywacke*—so far as my examinations have gone, I have not found any member of the red sandstone group in Missouri.

"GROUP 7—(*Carboniferous*.) Coal measures, Carboniferous Limestones, and old red sandstone of the English. The former would appear in the greater number of instances to be naturally divided from the group [6] above it, but the latter, though disconnected from group [8] beneath in the north of England, is apparently so united with it in many other situations, that the old red sandstones may be considered as little else than the upper part of the greywacke series in these places."

It is this (*the carboniferous formation*) that constitutes the most important

deposit of the Mississippi valley. It extends from the Alleghany Mountain on the east to a distance not yet definitely ascertained, west of the states of Missouri and Arkansas. On the south, to the northern parts of the states of Alabama and Mississippi—and on the north, perhaps to the falls of St. Anthony, on the Mississippi river. On the Osage, if the lead or Galeniferous limestone formation properly belong to it, no other formation presents itself to observation below.

"GROUP 8—[*Greywacke*.]—This may be considered as a mass of sandstones, slates and conglomerates in which limestones are occasionally developed. Sandstones which mineralogically resemble the old red sandstone of the English, not only occupy the upper part, but frequently other situations in the series."

"GROUP 9—[*Lowest fossiliferous*.]—Slates of various kinds, among which stratified compounds, resembling some of the unstratified rocks are by no means unfrequent. Organic remains very rare."

The "*Inferior or Non-fossiliferous stratified rocks*" constitute the next [THE 10TH] GROUP of this author—"comprising slates of different kinds, and various crystalline compounds arranged in strata—such as Saccharine marble, in which other minerals may or may not be imbedded, gneis, protogine, &c.—THE 11TH AND LAST GROUP, consists of unstratified rocks" as before remarked, and although found in the lower Mississippi countries, in the form of Porphyry Sienite, &c. present themselves no where on the Osage, within my observations.

The Missouri river may be taken as a line to represent the most depressed portion of a valley, whose transverse line extends from the Ozark mountains or Kickapoo prairies, to the high ridge dividing the waters of the Mississippi from those of the Missouri, and known commonly as the Coteau de Prairie. This valley is continuous with the Missouri river, through the state, widening on the east as it joins the great proper valley of the Mississippi; and, again on the west to be dispersed over the vast plains between the state of Missouri and the Rocky Mountains. From the Missouri river to the Ozark mountains, as they are commonly called, but which is most probably but an elevated plateau, the surface of the country taken as a whole, has a general rise, producing something of a regular inclined plain. The height of the plateau of the Ozark mountains, above the level of the Missouri, has never, I believe, been measured; but, I think, may be set down at about 1000 or 1200 feet. Along this inclined plane the Osage cuts its course to the great recipient of waters, the Missouri river. The bluffs on each side, show the depth to which this channel had to be excavated to reach this lowest level of the great valley. To reach the level which the Osage had thus made for itself, its tributaries have had to produce for themselves the same effect upon the rocky strata of this great inclined plane. To these again, their tributaries have had to cut their courses, and thus do we see the origin of these numerous hills that the region in some places presents. Some of the causes producing this condition still exist, but it is probable that the maximum of intensity of their operation has long since passed away.

Not a hill or ridge from the mouth of the Osage to the western line of the state, presented itself to which I could attribute a volcanic or other eruptive origin. All the irregularities now existing in this once great inclined plane, are attributable to denudating causes operating upon the surface.

This important fact will be confirmed by the regularity of the Geological formations, (as will be presently seen,) and should be borne in mind by all who shall have occasion to explore this country for its various mineral resources.

Having then a clear geographical and physical view of the country, and a correct understanding of the Geological relationship which the solid materials, presenting themselves during this reconnoissance, bear to the same in other countries and with each other, we are prepared to make more minute local divisions.

THE MODERN GROUP has been divided by some Geologists into *alluvial* and *diluvial*, a natural and often advantageous distinction; for the useful purposes of this report, however, this is not necessary. I shall therefore consider the whole as one.

For the benefit of the general reader it is always best, if possible, to make use of terms in ordinary usage, if such exist; provided they have a meaning similar, or nearly so, to the scientific ones. In this instance we have one in the term "soil," that so nearly answers our purpose—provided that it be understood in a general sense to mean all the loose material found to be lying upon the fixed rocks below—that it will be adopted as a substitute for the term "modern group" in this report.

The soil of the creek and river bottoms, like that of the Mississippi and Missouri rivers, often obtains great thickness. On the Marais des Cygnes, Mar-mataw and little Osage, these bottoms are from half a mile to a mile wide. On the Sac, Grand, and Big Poudre des Terre rivers, they are little, if any less extensive. Even the smallest streams often present them in sufficient quantities for valuable farms. They are found on one side or the other, and sometimes on both sides of the Osage, from the source to the mouth of the river. They generally lie high, and are rarely subject to inundation. A few years ago, a freshet swept over almost the whole, but I could not learn that another such an occurrence had taken place within the memory of the oldest settler. They suffer but little from the abrasive influence of the water, generally. They are almost every where covered with a dense growth of timber—walnut, oak, hickory, &c., of the largest kind. On the upper streams, where the prairies become more extensive than below, nature seems to have given to this timber a redundancy of quantity and luxuriance of growth, adapted to the future wants of the region.

The soil covering the prairies and other high levels, is somewhat different from that of the bottoms, and more properly belongs to that division of the *modern group* to which others have given the name of *diluvian*. It partakes strongly of the character of the underlying rocks, and in many instances it is easy to determine from its character, whether it rests upon limestone or on sand stone, although the rock itself be hid from view. On the contrary the soil of the bottoms, made up of the minutely divided particles of all the mineralogical materials of the vast region from which the streams and rivers receive their waters, possesses no such distinctive traits.

In the soil of the bottoms there is a large dose of vegetable matter mixed up apparently with the whole deposit.

On the high grounds, on the contrary, this vegetable admixture penetrates only to a limited depth, between which and the underlying rock, there is often a large deposit entirely destitute of it. Still there is such an admirable and extensive admixture of all the necessary materials, even in the highest places that are not too precipitous, as to give to it, with proper care in cultivation, the highest value for agricultural purposes that soil need possess.

Between the Moreau and Osage, for several miles above the mouth of the latter, the soil is of a character much above what it would seem to be generally thought, if I am to judge from the yet partially cultivated condition of the country. On the slopes facing north of east, and west, this is more particularly the case. There is a good growth of timber covering most of this neck of land; and its contiguity to the Capitol and the Missouri river, must before long give to it a value now not estimated.

Progressing westwardly, or south-westwardly, the character of the country on this side of the Osage, gradually changes, until at the distance of about twenty miles from the mouth, we are saluted with the sight of a prairie.

This, occupying the high ground between the river and the Moreau creek, stretches away, with occasional interruptions, westwardly through Miller, Morgan and Benton counties, to mingle with those, still more extensive, lying between the Missouri and the Osage. This prairie is bounded, on the Osage



side by a belt of timbered land, covered also in places with a good agricultural soil. But within this timbered land lies a strip of a broken and unpromising character, to which the appropriate name of "Barrons" has been given. In many places this tract shows the denuded surface of the underlying rocks; and is here and there dotted with a stunted growth of oaks. These barrons embrace the head waters of little Tavern, Bois Brule and Saline creeks, passing from Cole into Miller county.

They certainly present little attraction to the agriculturist or common observer, and would have scarcely been worthy of more than a passing notice, if it were not that they are covered with a soil or deposit rich in mineral treasures. Already flattering discoveries have been made here, and indications justify the hope of more.

The prairie which, as before mentioned, originating in Cole, stretches through the north-west part of Miller, and thence into Morgan, presents a soil of the ordinary character of limestone lands, with little diversity until having passed into Benton—when it begins to assume a more sandy appearance, in accordance with the underlying sandstone. Thence westwardly through Henry and Van Buren, this sandy character prevails to a greater or less extent—generally without injury to its agricultural character, and sometimes apparently to its decided advantage. When this silicious portion blends with a ferrugineous character, giving to the soil a brown, or what is here called a mullato color, the effect seems to be decidedly beneficial. This character of soil has attained for itself a well established reputation for fertility throughout the whole of this region of the State.

The hills and ridges on the south side of the Osage, near the mouth are too narrow and their sides too steep to retain any valuable quantity of soil. A few miles back from the river towards the sources of the Big Tavern, Glaice and Mary's river, there is much valuable farming land. Based upon similar rock, the soil of the prairies on the south side of the river, assume the same appearance, and will doubtless be found as prolific as that of a like character on the south.

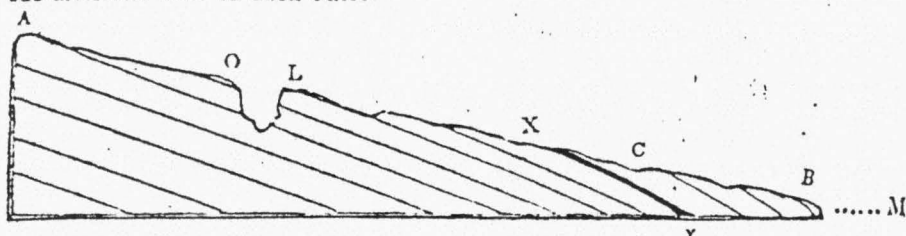
The thickness of this "soil" or "modern group" is, as might be expected, very variable. In some places it has been found from 30 to 40 feet. Sometimes it disappears entirely, leaving exposed the rock below; this, however, is rare in the prairies or level woodlands.

I regret that I had no facilities for making an analysis of the various kinds of soil that presented themselves. Such an analysis would not only have conveyed valuable information to the farmer, enabling him to economise its present productiveness and prevent the deterioration that so rapidly takes place from bad management, but it would also have thrown some light perhaps upon what frequently presents itself as remarkable, in what we shall subsequently point out as the mineral portion of the State. The appearances to which I refer, are small barren belts, points and spots frequently met with on the north side of the river, as high as the mouth of Grand, and on the south, still further up. This barren belt is often seen stretching in a horizontal line around the head of a ridge or point of a ridge—the timber above coming down to a certain line, then interrupted entirely, and again setting in below with the same regularity, and with equal luxuriance above and below. Sometimes it assumes the appearance of a patch in the midst of a dense growth of timber. This peculiar species of barrenness, I have found only in the mineral region, and it would be an interesting inquiry to ascertain if it be attributable to any poisonous influence existing in the soil. (note d.) Were I writing a purely scientific essay, I should proceed from the soil or modern group, with geological regularity down to through the next—the carboniferous formation presenting itself in this region. But in a report where utility is the most important consideration, I cannot hesitate to adopt that arrangement which is most likely to secure this object, deprecating at the same time, any thing like scientific criticism, as to this procedure.

The Carboniferous formation of this region readily arranges itself into at least two sub-divisions. One of which I shall call the Galeniferous or lead—and the other, the coal series.

This will be found to be an important as well as useful division, as these minerals so far as my examination has gone, exist in distinct portions of the great carboniferous series of this region. Other interesting scientific differences also exist, particularly the abundance of organic remains in one, the Coal, and their scarcity, if not entire absence in the other; but these differences will present themselves in the course of the description of the component parts of each.

The annexed drawing or section will serve to show the relation that these sub-divisions bear to each other.



Let the dotted line at M, represent the average height of the water in the Missouri river. B, a bluff of the Missouri river near Boonville. A, a point directly south of B, and thirty miles more or less, south of the Osage river. O, the channel or trough of the Osage cut in the rock of L, the lead series. C, the coal series overlying—in geological language—the lead series L, but on a lower level than some of the latter. The black line at X y is intended to show the place of junction, or more properly speaking, constitute the dividing line between the two sub-divisions. The apparent dip of the strata in the section is much too great, but this could not be well avoided in such a sketch.

This dip or inclination I have rarely found to exceed 2 or 3 degrees.

If we were to trace the line here indicated by X, on a map of this portion of the State, we should find it commencing on the Missouri river, about 6 or 8 miles west of the city of Jefferson, thence passing through the northern part of Morgan county, into the north eastern corner of Benton, and thence to the Osage a few miles west of Warsaw. Here, following the southern course which this river takes for several miles at this place, it would stretch up the big Pomme de Terre a short distance, thence across in nearly a west line to the Osage again near Osceola, and from that point, follow the Sac river for some distance, sweeping round in a somewhat curved line to the western boundary line of the state.

This is an important line, and for reasons that will present themselves in the course of this report, when speaking on the resources &c. of this county, should be particularly noticed.

I shall commence my description of the particular strata, with the Upper one of the lead series, proceeding from thence downward, and then return to the lower strata of the coal and proceed up. I shall pursue this irregular course for various reasons. 1st. The upper stratum of the lead is very regular in its character and appearance. 2d. It is well known, constituting the chief material used in building the Capitol at Jefferson city. 3d. It contrasts strongly with the bed above; the lowest of the coal series, and finally no other fixed point presented itself above or below—as I was unable to reach the extreme of the Carboniferous formation in either direction.

The following table will serve to show the beds of the lead series, as they are superimposed on each other, and their various thicknesses. The measurements of all from No. 1 to No. 9 inclusive, were made in a well at Versailles, in Morgan county. No. 10 presented itself in a bluff on Niangua river under such circumstances as to enable me to judge very correctly of its thick-

ness. All below 10 is an estimate made on the Niangua river, the only place in which I found it:

NO.	CHARACTER, ETC.	THICKNESS.
1	Yellow silicio-argillaceous Limestone, with associated flints,	12 feet.
2	Sandstone,	2 ft. 6 in's
3	Limestone with associated Flints,	12 feet.
4	Light brown colored Limestone with Flint,	3 feet.
5	Limestone (thin strata) with shale,	6 inches.
6	Limestone—very hard,	14 feet.
7	Shale,	2 inches.
8	White Limestone,	1 foot.
9	Limestone—darker than No. 8,	3 feet.
10	White Sandstone,	24 feet.
11	Limestone—various characters without Flint,	90 feet.

The first bed of 12 feet presents many valuable qualities. As a building material, the beautiful structure now progressing at Jefferson city, for the accommodation of the Legislature, speaks beyond the power of language in its favor. Its strata varies from 2 to 3 inches, to a foot in thickness. Beautiful natural sections present themselves in the quarries, that are being worked on the river bluff at Jefferson city. It is easily excavated and works with great facility. It is found underlying the soil of the Prairies and high ridges almost every where from the mouth of the Osage to Warsaw, and even above the latter place on the south side. I have found some of the strata so finely grained and compact as to resemble exactly the German Lithographic stone, and have little doubt that it will answer practically all its purposes. In all the *diggings* for *patch* or *float* mineral, (lead ore) that I have yet seen on this river, this rock in fragments or reduced to a pulverulent mass, is found accompanying the ore. My examinations impress me with the conviction, that it is the upper bed in which Galena may be expected to be found in any valuable quantities. That it existed or does exist more extensively in this, than any other regular bed below or above, and that it is to the destruction of it chiefly, and the consequent removal of its contained mineral that all or nearly all of the lead ore in the condition of what is called *Patch* or *Float* mineral, is attributable. If further examinations should prove these opinions to be correct, the extensive existence of this bed *in situ*, and the consequent retention of its contained mineral in its natural position of veins or beds, must cause this portion of the state to create a new era in our lead business.

Beneath this lies a bed of sandstone, (No. 2,) marked 2 feet 6 ins. This is generally of a light yellow color, and sometimes white. It is often *friable*, yielding to the compression of the finger, but frequently compact and adapted to building purposes, grindstones, &c. None of the beds below, until reaching No 10, another sandstone stratum, present any very valuable qualities in themselves. The hardness of several of them is so great that they occasionally made fire with the steel face of my hammer. They would doubtless receive a very high polish, and where their cavernous or porous character did not interfere, would answer well for building material. One of them has a beautiful peach-blossom or flesh color tint, that would give it additional advantages for ornamental purposes. No. 8 burns into a tolerably good lime, and may be readily known from the others by its whiteness. The others are very impure. I have not had an opportunity of examining them chemically, but think they are more or less magnesian. The faces of many of these beds, when exposed to the weather for some time, present a reticulated or cavernous appearance, much like wood that has been worm eaten, or as if there had been a disengagement of gas within them at the time of their consolidation. On more careful examination, this appearance will be found to be owing to loose sand which the rock contains, and which on exposure washes out. This in-

jures the character of these beds for building purposes, as the absorption of moisture by the sandy cavities exposes it to fracture by frosts. This silicious deposit often becomes largely developed in these limestones, and by chrysalization forms the beautiful plates and masses to which the name of *mineral blason* is commonly given in the mineral region. This tendency to chrysalization seems remarkably prevalent in the vicinity of those places in which lead ore is found.

The great quantity existing loose in many places is owing to the decomposition of the limestone that once contained them. The indestructible quality of these chrysalized masses enabling them to resist the same influences.—These limestones, though often so very hard, seem to yield rapidly to meteoric or atmospheric agents. In many places this tendency to decay gives a singularly knobby appearance to the points and brows of the hills. I have traced veins of lead ore through nearly or quite all of these beds down to the 24 feet sandstone—and I think it little less than certain that regular and valuable veins or leads of the mineral will be found to penetrate the whole of them—when more extensive and minute examinations of this country shall be made.

Immediately below the mass of limestone lies another bed of sandstone, 21 feet thick, beautifully white wherever I have seen it, and so friable, most frequently, as to yield easily to the finger. This bed shows itself most distinctly on Niangua river.

Below the sandstone lies another mass of limestone, much resembling that above, which I have estimated at 90 feet, (although it may be much thicker,) this being all that I have seen of it. No lead ore, I believe, has yet been found in this portion of the series, but its resemblance to the beds above justifies the expectation of its existence in this also.

There is, however, one remarkable difference between the portions above and that below the 24 feet sandstone in this series. Above, almost every bed has associated with it a large deposit of flint or cherty matter, besides the permeating sand before referred to. Below, little or none of this appears.—This flint or chert often forms regular strata to itself; but, for the sake of convenience, I have associated it with the predominating rock. It is the fragments of these strata that constitute the covering and give the name to the *Flint Hills* of these regions. The prevailing color of this flint is milk white, but it often presents itself of almost every conceivable tint, and sometimes beautifully variegated.

Having thus descended through the *lead* or *lower* division of the carboniferous lines, or at least as far into it as it presents itself on the Osage river, we are prepared to return to the point from which we started, (x of the section,) and ascend through the coal series.

The place at which I first met with any portion of this series was near Warsaw, in Benton county, at the abandoned site of the town which was called Osage, and is so named on Wetmore's map of Missouri. Here I found the yellow limestone which I have just described as the upper bed of the lead series, overlaid by a very pure limestone, different from any I had before seen on this river, and thickly studded with organic remains, some of the strata composing the bed apparently consisting of little else than the remains of Encrinural columns, with occasionally fine specimens of *Terebratula*, *Spirifers*, &c.

The sudden transition from a bed—the yellow limestone, in and below which the most diligent search could detect no trace of any such thing—to one so full of these remains, was a striking and unexpected circumstance; and although, as I subsequently proved, the coal every where rests quietly upon the lead series, presenting no where any evidence of a convulsive effort of nature in the interval of the deposition; yet the mineralogical and Palaeontological of the two are so dissimilar as almost to justify their entire disseverment, and authorize their classification into different groups. I have not, however, thought it prudent at present to adopt such a course for the want of more extensive acquaintance with them in other parts of the great Mississippi



Valley, and because to do so might be at variance with the generally adopted classification of authors.

I regret that circumstances did not permit me to make so minute an investigation of the various beds of this as of the *lower* division. The section or table which I present will, I fear, need correction upon more careful observation; but as it is, it will serve to show at least the relationship of some of the more important members to each other.

The information I received causes me to have little doubt of the existence of other beds of coal than these I have set down; but as I could not locate them in the series, I prefer leaving them out.

NO.	CHARACTER, ETC.	THICKNESS.
8	Blue Limestone	50 ft.
7	Blue and Yellow Limestone,	20 "
6	Blue Limestone,	15 "
5	Ferrugineous Sandstone,	45 "
4	Coal,	5 "
3	Shale, Clay, &c.,	10 "
2	Coal,	2 " 6 in
1	Limestone, (Encrinital,)	20 "

No. 1. The Encrinital Limestone or lower bed of the coal series, presents itself in patches or outlines, on many of the hills near Warsaw, and just at the close of my examinations, I found it on the dividing ridge between the Osage and Moreau creek, a few miles S. W. of Jefferson City. It is generally to be found in a continuous bed within a few miles of these patches. It is very constant and uniform in its appearance, and seems, with the yellow Limestone of the lead series, to mark, in a very distinct manner, the line of demarcation between the two to which we have before referred.

It may be proper to call attention again to this very important line, (x y,) and particularly to the fact, that *no satisfactory indications of the existence of lead ore in quantities sufficient for exploration have been found above it, and that no coal or salt springs have yet been seen below it*; at places where the two divisions come together, as in the vicinity of the mouth of Grand river, there would appear to the casual observer an exception to this, or some confusion; both lead ore and salt springs—perhaps coal—occurring in the same neighborhood—sometimes in the same ravine or creek. An examination will show, that this apparent anomaly is attributable to the fact of the stream having cut through, in its descent, at least two of these beds—the lower of the Coal, and the upper of the Lead series. (Note E.)

Numbers 2, 3, and 4 might with propriety be considered as one bed consisting of Coal, Shale and Clay, alternating. As before observed there is little doubt of the existence of other beds of *Coal* than these I have marked. This Coal shows itself in innumerable places on Grand river, Marais des Cygnes, Marmataw, Little Osage, and their tributaries and undoubtedly underlies Henry, Johnson, Van Buren, Bates and a large portion of St. Clair counties.

I have marked the thickness of the two beds of whose existence there is no doubt, at 24 and 5 feet. I found them on the bank of the Marmataw river, just above the junction of the Little Osage. As I had no other opportunity of measuring, this may or may not be the average thickness. I learned on good authority that a bed, perhaps one of these, shows itself on the bank of the Osage, 15 or 20 miles above the mouth of Sac river (note f.) I was also informed that in some places the Coal beds had been penetrated as much as ten feet without passing through them. (note g.)

The Sandstone—No. 5 is important on account of the Iron ore connected with it. It seems to overlie the Coal and Shale, though it is possible that further investigation may prove it to embrace similar deposits. It is of various shades of yellow and red, and often passes into good and extensive beds

of Iron ore. I shall have occasion to speak of the importance of this ore and the Coal near it more fully under the head of minerals. This sandstone constitutes many of the hills of the vast prairies lying on both sides of Grand river in Henry and St. Clair counties, but finally disappears under the overlying Limestone (No. 6) in Van Buren and Bates. It is this sandstone that gives the Sandy character to the soil, or Morden Group, of this region. (Note h.)

The three beds of limestone, 6, 7 and 8, are sufficiently distinct to attract the attention of the geological inquirer, and to serve as guides to indicate the position of others; but for all useful purposes they may be classed as one. I am not sure that the yellow colour which I found in No 7, is constant, or if it may not occur in all. The organic remains and mineralogical character, color excepted, seemed very similar.

Before concluding this part of the subject, it will be well to caution the uninstructed in the principles of geology, against supposing the above measurements, even when made under the most favorable circumstances, to be the invariable thickness of the several beds throughout the whole region. Many causes might have tended to modify their deposition over so extensive a surface.

Thus the sandstone, No. 2, of the lead series, which is set down at 2 feet 6 inches, and which actually measured that in the well at Versailles, becomes as much as 6 or 8 or 10 feet thick in other places. I think I have seen the lowest bed of the coal, No 1, thicken up to at least 40 feet! Doubtless all may have occasionally undergone similar changes, and in explorations for lead, coal, salt, water, &c., this should be particularly borne in mind.

The general dip of the strata is, as before observed, between about 2 or 3 degrees. The direction in accordance with the general dip of the basin, that is, west of north, about the mouth of Sac river, north in Morgan county, and perhaps a little east of north in Cole. The maximum dip is near the outcrop of the strata, whilst lower down in the basin, as in the northern part of Benton, Morgan, &c., it is scarcely perceptible.

Besides this general dip, there are many local ones which, though limited, and produced by local causes, are sometimes so extensive as to produce some apparent confusion. This is remarkably the case on the Big Gravois and Niangua.

**MINERALS.—LEAD.**—The only ore of lead that I have met with in this region, is the sulphuret or Galena. This is very pure, and generally pure from admixture with other metals. Therefore from analysis and its yield in other countries, it ought to produce at least 75 per cent. of pure metal.

It presents itself in two conditions—in *patch*, and in *vein* or *lead*. I have not found it in caves as in some of the Mississippi counties of this State; but there is such a similarity in the character of some portions of the Osage region to that, as to justify the expectation of its existence also in this condition. It is also very probable that it is occasionally disseminated without any regular vein-like character.

If the remarks made on the physical and geological characters of this country be understood, there will be no difficulty in explaining the formation of the *patch* from the *vein*. The patch may in fact be considered as a part of the modern group; and, where not protected by a covering of sulphate of barytes or other matrix, always shows a water-worn aspect. In other words *patch mineral* is but the remains of what was once a regular vein, and owes its existence in its present condition to the denuding operation to which we have referred the general cutting up of this country. Consequently, patch mineral may exist alone, or with a vein beneath or near it, because the cause operating may have destroyed the whole or only a part of the containing rock.

All the patch mineral that I have yet seen, is in the soil and among the rocks belonging to some of the beds above, the whole deposited irregularly together.

The geological character of the country proves that this is but a continuation of the mineral region of this State, that has been so long known. On the east and south-east, I have traced its connection through Gasconade, Crawford and Franklin into Jefferson, Washington and St. Francois counties. It will thus be seen that, instead of running north and south, as is generally believed, this great mineral belt forms a large curve, its eastern extremity resting on the three counties last mentioned, if—which is very probable—it does not sweep around and embrace the counties on the south side of the Ozark ridge.

From the information I have obtained, there is no doubt that the other, or western extremity of this belt, extends down into the south-west corner of this State. The northern line of this belt crosses the Missouri, most probably, in Franklin county, near Labadie creek, and again recrosses it at the point which I indicated in the geological part of the report, as the dividing line of the lead and coal division of the carboniferous formation, and follows that, or really is that line, throughout the rest of this region. It is probable that it reaches but a short distance north of the Missouri river.

During the last 15 or 20 years, many persons have made attempts at digging in the vicinity of the Osage river, for lead ore, and although there appears to be no doubt that their prospects were flattering, from some cause—perhaps the unsettled condition of the country—no arrangements for a continued series of operations seem to have been made until recently. (note i.)

Within the present year, another effort has been made, about 20 miles from Jefferson City, by several private companies, and under such auspicious circumstances as to justify the hope that it will be successfully prosecuted.

These operations are chiefly confined to a small vicinity, most of the diggings being at present on one eighty acre tract. About 30 or 40 thousand pounds of ore had been raised by the latter part of November, 1839, out of the few holes that had been sunk.

The average depth of these holes, was perhaps 12 to 15 feet. The mineral all what is called patch. From some of the holes two hands were throwing out from 1000 to 1500 pounds a day. (note j.) The scarcity of exploration throughout this region, necessarily threw me upon my own resources, and the natural developments of the country. But these were sufficient to satisfy me that this portion of the great mineral belt was at least equal if not superior to any other part of it in the State.

There is scarcely a creek or ravine, from a few miles south-west of Jefferson City to Warsaw, on the north side, and from thence to within a few miles of Osceola, on the south, in which lead ore may not be picked up in considerable quantities. Masses are often found weighing several pounds, and I have seen them just pulled from the side of a ravine that would exceed one hundred pounds. In some instances, I could have loaded my horse, in a few minutes, with what I saw around me. These indications present themselves to a greater or less extent, on all the following streams, and their tributaries. Bois Brule, Little Tavern, Saline, Little and Big Gravois, Buffalo, Cole Camp, Glaice, Lynn, Little Niangua, Deer, Turkey, Little and Big Pomme de Terre, Hoyle's and Bear Creeks.

Where such a vast field presents itself, and so few satisfactory explorations have been made, it would be presumptuous to attempt to point out particular localities. There is not a neighborhood throughout this whole region into which an inquirer can go, that he will not hear of some person or persons who have made what are here called *discoveries*. All, or nearly all of these he will find to be patch, because that is the condition in which some portions of the mineral are most likely to be found in the ravines or on the surface.

But, as before observed, every geological indication justifies the belief that the same mineral still exists here extensively, in veins or leads, and needs but the eye of the scientific miner, and the money of the capitalist, to realize from

these hidden resources individual and State wealth, of which it is not now easy to form a proper conception.

**IRON.**—This mineral is even more extensively diffused throughout this portion of the state than lead. It is not like the latter confined to one division of the great Carboniferous formation. On the south side of the Osage, east of the Niangua, it exists in great abundance. The Ores of the various conditions of the Brown and Red Oxides—and the practical experience of those who have used the iron manufactured at Massie's iron works on the Maramec, made of similar ore to that found in some places in this region, proves that none better need be desired. These ore beds, with inexhaustible supplies of timber and unfailing water power, often exist together and but a few miles from the Osage river.

In the vicinity of the river further west, other valuable deposits of the same ore exist. Near Bear creek (note K) I found two beds amply sufficient to supply a furnace for an indefinite length of time. I received from many sources information of its existence in great abundance on the Niangua near the Big Spring—though I was not fortunate enough to find it so extensively there as further east. Other places were mentioned by various persons to which time did not permit me to give a satisfactory examination, as at the Horse Shoe Bend of the Osage; the point at the mouth of Grand river; Hoyle's Creek, &c. (note 6.)

In the Coal series of the Carboniferous formation, another condition of Iron Ore presented itself under circumstances of the most favorable kind, and in quantities amply sufficient for the greatest demand. I had occasion to refer to this, when speaking of the Geology of this part of the state. I regret that the means with me did not permit me to make a satisfactory quantitative analysis of this ore. It is associated with, or more properly assumes the place of the Sandstone overlying the Coal. Like the sandstone it is often thinly stratified, and as it lies near or upon the surface, is easily explored. Its great importance consists in its apparently inexhaustible quantities and contiguity to the vast Coal beds that lie below it. It is a somewhat similar condition of things that has given to Great Britain most of her advantages in the manufacture of this metal, over the rest of the world. Mr. De La Beche says—"to this substance of Coal and the Iron ore found in the same deposit, England owes a great part of her commercial prosperity—for to the abundance and cheapness of both these substances in various districts, we are indebted for a large portion of our manufactories; the same series of beds not only furnishing the fuel for making the Steam Engines, but also Iron for their construction." It would be a subject worthy the attention of those who may have to legislate upon the development of the resources of our state, to inquire into the immense national advantage this fortunate co-existence of these two minerals in the same place has been to Great Britain. In the latter country explorations are made at a great depth in the earth, necessarily requiring great expense in the machinery. Here no such thing can occur. Hills of Iron ore may be seen, within a few hundred yards of which Coal beds are exposed by the creeks and ravines.

Sulphuret of Iron or Iron Pyrites exist in many parts of the lead region, and has here as elsewhere more than once created brilliant hopes of sudden fortune in the finder.

**COPPER.**—In the condition of a Ferreuginous Sulphuret or Copper Pyrites presented itself in several places in the lead series. On descending one of the pits then being excavated on Bois Brule, I found this mineral in considerable masses accompanied by Sulphate of Baryta. The exploration was being made for lead ore, but the prospects for copper were equally as favorable.

Further up the Osage, near Warsaw, I again met with traces of this ore in several places. This together with the discovery of this ore in the south eastern portion of this mineral belt, encourages the hope, that it will be ultimately found in sufficient quantities to justify its exploration.



**SULPHURET OF ZINC** is a frequent attendant on the lead ore of this region, and is often found in considerable quantities. It is of too little value however, at present, to attract much attention.

That there exist other ores of the metals already noted as well as of others, there can be no doubt. But unless means be devised to institute a more rigid inquiry, than my limited time, and other circumstances would permit, they must be left to the slow process of accident or private enterprise for their discovery.

**COAL.**—I have already had occasion to speak freely on the subject of coal. Strictly speaking it lies as a body on the outside of the curved line of demarcation between the divisions of the carboniferous formation. There are however, small anomalous deposits of this mineral, largely mixed with shale at the heads of some ravines in the lead division. Whether this be the remains of the regular coal formation washed here, and thus like the patch lead ore becoming a part of the modern group, or a deposit *sui generis*, I am not prepared to say. This much however is certain, it lies upon or against, but does not become inter-stratified with the regular beds of the lead series. It is necessarily very limited in its extent, and should not deceive those interested, into any false hopes or great expense in its explorations. I deem this caution the more necessary as I have already seen persons ignorant of the subject, imposed upon by its specious appearance.

The coal of the true coal series may be considered as undefinable in extent and quantity. I have stated positively the existence of two beds near each other, because I saw and measured them myself. I spoke not so positively of more, because I have to place my faith of their existence in part upon the statements of others. But that faith is strong and corroborated by many circumstances. It was impossible for me to verify by actual examination, all that I have heard in relation to the productions of this region. But no statement was received as *probable* unless vouched for on such authority as would have been considered *positive* proof in the ordinary matters of life. Further, I found this mineral in positions that prevented me from referring them with certainty to either one of the two seams I measured. Coal may therefore, be considered as existing in this portion of the state in quantities commensurate with the wants of the present, and an indefinite number of future generations.

The importance of this fact in one point of view I had occasion to refer to when speaking of the iron ore of the same region. There is another which cannot fail to call forth an expression of our admiration at the wisdom, and grateful thanks for the beneficence of that Providence who has created nothing wrong or in vain.

Immense prairies spread themselves out over these coal beds. The weary traveller rides for miles without finding a tree or shrub sufficiently large to yield him a blaze that will protect him from the keen blast of winter; and were it not for the inexhaustible store of fuel hid beneath, years must pass before man, by cultivation, would supply himself with enough of this necessary of life, in this climate, to venture an abode in these inviting plains.

This coal is bituminous and of a good quality; blacksmiths throughout the country use it, and their experience speaks highly in its favor.

**SALT.**—Aware of the immense tax paid by the people of this part of the State for this article, and the impositions practised upon them in the quality of that which they are forced to purchase, it became an object of great importance to find other means of supplying the demand for it, and if possible, of manufacturing it at home amongst the consumers. I am gratified in being able to express the belief that few years will have passed before all that portion of the country lying west of Warsaw, on the north side of the river, and Osceola, to the south, will have been able to accomplish this desirable object. Salt springs present themselves in many places in this region—particularly near the river and large water courses—and serve at the present time to meet the wants of their immediate neighborhood for stock purposes. Many circumstances

justify the belief that the saline contents of these waters are obtained from the lower beds of the coal division of the carboniferous formation.

If so, there are few farmers who could not have their own salt well, by sinking from 10 to 60 feet through the superimposed beds. This is certainly worth the experiment, particularly in Henry county, Pettis, Van Buren, Bates, and part of St. Clair. The making of salt from salt water, is as simple a process as making sugar from the sap of the maple, and could therefore be easily made a portion of domestic economy. In sinking such wells it is better to select a ravine, creek side, or other low place.

The principal salt springs that I visited were: one a few miles west of Warsaw, just above the mouth of Grand river; one on Salt creek, a few miles west of Osceola, and another called the Moniga springs, a few miles west of the latter. There are several others in this portion of the State, and mostly on the north side of the river. The Moniga springs are the most important, and discharge a large supply of water. By turning the course of the creek from which they get their name, and this could easily be done, the whole could be collected. Salt was manufactured here many years ago. The water is not very strong in saline matters, but this could not be expected in the present condition of the springs. Those near Warsaw would also supply extensive works, and seem about the same in quality as those at Moniga. (Note m.)

Many other minerals of much value, such as alabaster, lithographic limestone, sandstone, chrysalized and other conditions of quartz, millstones, sulphate of barytes, and limestone, which I think is hydraulic, presented themselves. The alabaster is found in a cave near the lower Niangua spring. The lithographic limestone, I have already mentioned. A beautiful bed of limestone shows itself in a bluff of Niangua river, 8 or 10 miles above its mouth. It resembles that found in the lower part of the State, near Ste Genevieve, and for the manufacture of glass, would be very valuable.

The mill stone of the Osage is peculiar, and deserving particular attention. It is often called here "Osage Buhr," but it resembles the true French buhr, no more in its mineralogical than its geological characters. It is, strictly speaking, a breccia formed of comminuted quartz, agglutinated by a calcareous cement. The quartz is in angular fragments sufficiently uniform in size to enable the manufacturer to make a stone entirely in one piece. It is very probable that the quality of the stone might be improved by selecting smaller portions, and uniting them as in the true buhr.

This stone is extensively used, and found to answer the purpose well. In its mechanical arrangement of parts, it very nearly resembles an artificial mill stone, composed of sand and cement, for which a patent is said to exist.

#### CONCLUDING REMARKS.

The climate of the country bordering on the Osage river, is highly propitious to agricultural and mining pursuits. The winters are short and so mild that many farmers pay little or no attention to their stock during its continuance,—the river and creek bottoms furnishing food sufficient for their sustenance. As a consequence, mining operations might be continued the whole year. (Note n.)

This country is generally well watered, and presents the finest water power in the State. There are many springs amply sufficient for milling and manufacturing purposes on the most extensive scale. The Big Niangua springs burst forth a creek at once—falls 19 or 20 feet in about 500 yards, and then expands into a beautiful lake half a mile long and 200 yards wide.

The agricultural productions of this country are similar to those in the same latitude in the rest of the Great Valley. The soil is prolific, yielding in the prairies from 20 to 30 bushels of wheat, or from 40 to 60 bushels of corn to the acre. The bottoms produce perhaps one-half more. Cotton is cultivated by almost every family, for their domestic uses. Tobacco is found to be well adapted to the climate and soil. (Note o.)

Extensive collections of geological and mineralogical specimens were made during the tour, and are now deposited at Jefferson City for arrangement on or before the sitting of the next Legislature. In putting them in order, an opportunity will be afforded me to make more minute examination into their chemical and economical characters than time and the want of instruments has now done. It will be a favorable opportunity to give to our Legislature and citizens generally, visual evidences of some of the resources yet scarcely known, of our vast and rapidly improving State.

Finally, when it is recollected that the territory here described equals in extent some of the States of the Union—that the distance travelled over was 800 or 1000 miles—that the country is so little settled that I had often to travel without road or path to direct my way—that little or no correct information had been obtained previous to my starting, of its geological character—that I had many difficulties to contend with in the fancies or suspicions of many of those few who could give me information—and that under all these circumstances, with only a single attendant, and the two horses on which we rode, the whole reconnoissance was made since the early part of September, I trust that a liberal allowance will be made for any omissions or defects that may be found in it.

St. Louis, Mo., December 24th, 1839.

## APPENDIX TO GEOLOGICAL REPORT.

Note *a*, page 507. The original Indian name of this river is "Nesha"—white or clear water. When first visited by the whites, the tribe of Indians occupied its banks that are now called Osages. The true name of this tribe is "Washashee," from whence, through the French, we derive the name of the river "Osage."

The origin of many of the names of the streams of this country is interesting, and sometimes amusing. The Indian names are generally much more agreeable than the American or French, and convey some striking natural characteristic, or are connected with some historical event: thus, *Mardis des Cygnes*, *Anglice*, Lake of Swans, *Osage*, *Meha-schotsec*, which conveys nearly the same meaning, and is derived from the fact that the lakes along the courses of this river—and there are many in the bottoms—abounded in swans. "*Eaugua*," improperly spelt "*Niaugua*" and "*Yeaugua*" on the maps, derives its name from an Indian woman of distinction, who was buried, or rather entombed on one of the high bluffs overlooking this tributary.

Note *c*, page 507. The name of this creek (*Bois Blanc*) has been tortured into "*Warblo*," by the present inhabitants. *Bois Brule* is commonly pronounced *Bob Ruly*; and *Tavern* is a corruption of *Cavern*, (French) acquired from the existence of a cave at its mouth.

Note *c*, page 508. The origin of these prairies is an object of much speculative interest. My own observation tends to confirm the generally received opinion of the settlers on the subject. It is very clear that the fires in the prairies, by approaching the timber, causes more or less destruction of the latter every year. By this means the prairies are constantly increasing, and the woods decreasing. If we stretch the fancy back to an indefinite time, when this country might have been ever so thickly wooded, and allow the existence of a few grassy, low spots, which even now are found, free from timber, and the surface of the timbered land near these savannas, covered with shrubby or grass, we need but the addition of that element, which is annually supplied—fire—to insure the final devastation of the whole country, and the gradual spread of the savanna-like territory over the whole region. There is no other appreciable reason for the present condition of things—for there is no other geological or mineralogical difference between the hills of the woods and those of the prairies. But there is a great difference in the abundance and luxuriance of the grass in the two. If this were not the case, a single fire

would make a sweeping destruction of the whole. As it is, the outer trees are killed the first year by the heat, and from the burning of those already dead, and the grass which has pushed itself to their trunks. The next year they, in their leafless condition, offering no obstruction by their shade to the thick sward of prairie grass. The next fall or spring their dried trunks and branches become an easy prey to the devouring element—their ashes are scattered to the winds—their roots rapidly decay, and in a few years the whole is gone, leaving not a trace behind.

Thus fall the mightiest forests before the puny power of a spear of grass.

Note d, page 513. Many of the hills and ridges of this country present a covering which cannot be called, in common language, *soil*. This consists of angular fragments of quartz matter, and so envelopes the whole surface as to give to the casual observer the appearance of being the constituent of the entire hill or ridge. An examination of the nearest natural section or bluff will, however, explain the matter. The inhabitants give to them the significant name of Flint Hills. They originate from the destruction of certain strata of the carboniferous series. The limestone with which the quartz ore matter has been associated having yielded to the influence of aqueous, atmospheric, or other agents, has entirely disappeared, whilst the quartz, from its indestructible character, remains.

Note e, page 517. On sinking a well at White's ferry on Grand river, (town. 40 North, range 25 West, sec. 7.) a bed of red marl, 14 feet thick, was passed through next after the soil, and resting upon the Encrinital Limestone: No. 1. This is a very common deposit among the muriatiferous rocks of the eastern side of the Mississippi Valley; but not having met with it elsewhere on the Osage, I felt some reluctance to assigning it a place in the regular formation of the country.

Note f, page 517. I was credibly informed that at a locality, through which the Osage cuts its way, in town. 38 N., range 29 West, at particular stages of the water, boats could lie along side the bed and take in a cargo. It is also found on Gallinipper and Turkey creeks, near Osceola.

Note g, page 517. The clay connected with this coal and shale would, I have no doubt, make good free brick. I also found, associated with this bed, a stratum of remarkably fine-grained silicious slate, evidently well adapted to fine cutlery. An intelligent gentleman of the neighborhood informed me that he had an excellent hone made from it. It is of various colors, from black to light brown.

Note h, page 518. This sandstone contains many vegetable impressions.

Note i, page 519. Pierre Chouteau, sen., now of St. Louis, was one of the earliest, I believe, who explored for mineral in this region of the State.—About 13 or 14 years ago, Evans and Campbell made some very promising discoveries in Little Niangua—the remains of their furnaces are still to be seen. Near the same time a gentleman named Fuqua, from Kentucky, commenced operations at Big Gravois, but unfortunately these were cut short by death in a few months.

The evidences of former operations are often met with, but it is plain that those who undertook them were playing a game of chance, and were without the light of science to direct them.

Note j, page 519. Near Mining Point, in Morgan county, several pits had been sunk during the present fall, in search of lead ore. Considerable had been found. The Osage Mining and Smelting Company and a German company of St. Louis have entered considerable mineral land, on which very favorable prospects have been found. Their land lies chiefly in Morgan and Cole counties.

Note k: page 520. Town. 38 N., range 24 W., sec. 8.

Note l: page 520. Half a mile west of Warsaw I found a deposit of iron of an excellent quality. The State road passes immediately over it, and being but a few hundred yards from the river, it will be valuable, if, on more careful



examination, the quantity should be considerable. There are also two valuable and extensive deposits in town. 38 N., range 24 west.

Note m, page 522. Moniga Springs are in town. 38 N., range 26 west, sec. 30. Salt Creek Springs in town. 38 N., range 26 W., sec. 27 (?) Hoffman's Spring in town. 37 N., range 26, sec. 30.

Temperature of Salt Creek Spring water, 61 degrees—that of Moniga, 66 degrees; atmosphere, 80 degrees—Fahrenheit.

Note n, page 522. Natural causes susceptible of explanation tend to give this portion of the State an equanimity of climate not perhaps equalled by any other. The gradual slope of the country towards the north lessens the influence of the sun's rays during summer. The direction of the Osage, and many of its principal streams, nearly east and west, fringed on both sides with a heavy growth and broad belt of timber, protects the bottoms and a large portion of the prairies from the influence of the cold north winds of winter. The reader must not consider this a matter of trifling consideration. Such causes produce astonishing changes in the climate of places in the same latitude with each other in every part of the world. "Tokey produces what are called the finest mines in Europe, and is only one degree south of Poland, where there is no species of mine. It owes this to the Carpathian mountains running east and west, and protecting Hungary from the region of the north winds."—*Maclane's Geology of the United States*, p. 94, note.

Note o, page 522. The temperature of the well at Versailles, at 80 feet depth, at 3 P. M., was 67 degrees—the surface temperature at the same time, 59° Fahrenheit.

OFFICE OF THE SECRETARY OF STATE, December 4th, 1840.

To the Hon. the Senate of Missouri:

GENTLEMEN:—I have the honor to transmit to the Senate the accompanying abstract, prepared in compliance with a resolution adopted by your body on the 1st inst., requesting the Secretary of State to furnish the Senate with a statement of the fines and forfeitures remitted in the last four years, by the Executive, stating the counties in which they occurred, &c.

The abstract includes only the fines and forfeitures remitted since November, 1837, as the burning of the State House in that month destroyed every record in this office, containing the information (anterior to that period) required by the resolution.

I am respectfully, your obedient servant,

JAS. L. MINOR, Sec'y of State.

ABSTRACT of the number, amount and date, of Fines remitted from the 28th Nov., 1837, to the 14th November, A. D. 1840, by the Governor of the State of Missouri, together with the names of the persons in whose favor, and the nature of the fines remitted.

Persons in whose favor.	Date.	Counties.	Am't.	Nature of Fine remitted.
Abner Ingart	Dec. 18	Clinton	\$20 00	selling liquors without license
Thos & H White & Co	" 19	Chariton	50 00	" goods " "
J W Hamm & W Wersham	" "	Lincoln		failure to do militia duty
William Thomas	" 30	Jackson	41 00	assault on J G McIlhenny
James Reid	Nov 28	Lincoln	15 00	failure to do military duty
Total amount for the year 1837.			\$126 00	
James U Littell	Jan 1	St Louis	50 00	offence not stated
Moore & Hancenkamp	" 17	Chariton	50 00	selling goods without license
Thornton Sandford	" 25	Jackson	40 00	assaulting L G Edwards
Aaron W Lane	Feb 19	Monroe	81 25	breach of the peace
Owen Edwards	" 24	Jackson	25 00	do
John V Webb	Mar 13	La Fayette	37 00	failure to do military services
William Taylor	" 24	Howard	199 99	permitting gambling in his house
Lewis H Scruggs	Apl 3	Cole	200 00	assaulting H Shadwick
Jas E Shaine	" 26	Clay	10 00	failure to do duty as road overseer

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Office

GEOLOGICAL RECONNOISSANCE

OF OSAGE RIVER AREA

MISSOURI

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1889

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HENRY KING