

The Coal Measures ~~and~~ Coal Veins
of
Kansas

A Review of the Geology
of Kansas Coals

By

William Lee Harvey

Class of 1902.

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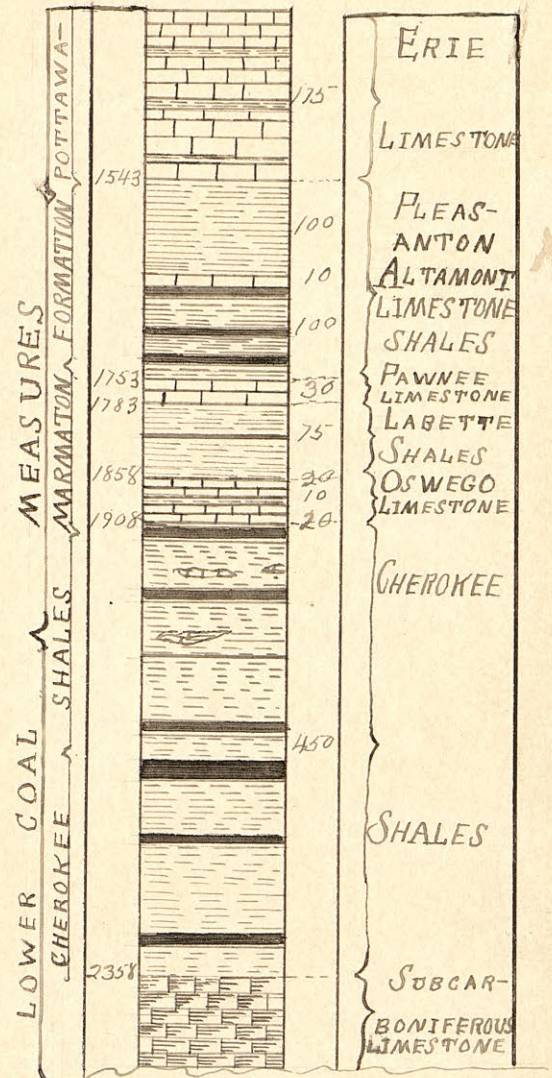
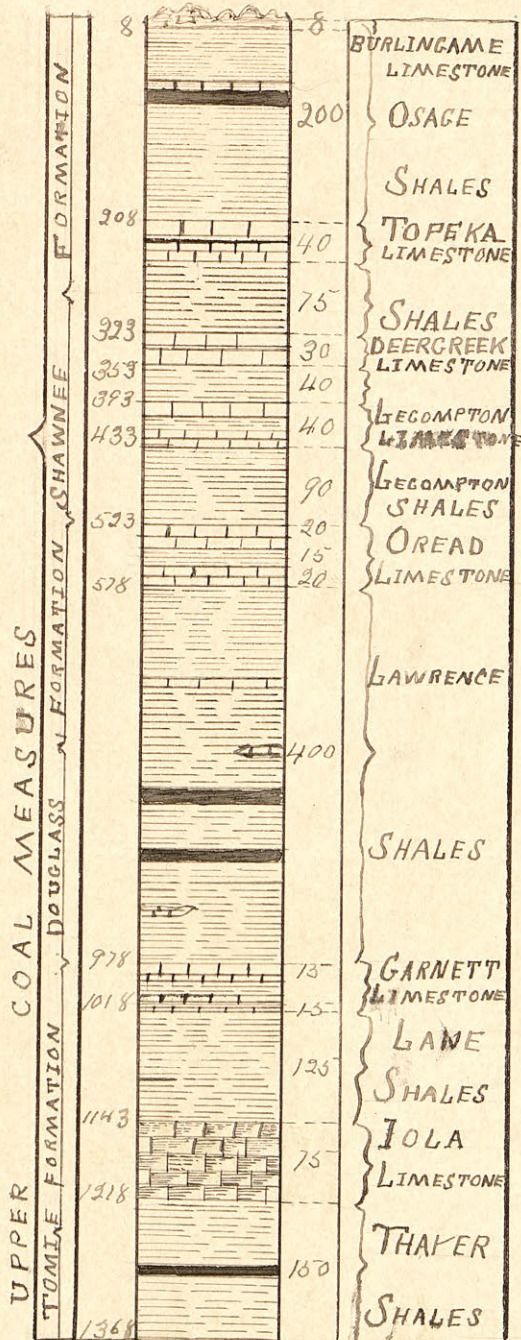
Outline

1. Geography of the Kansas coal measures,
and Coal veins.
2. Stratigraphy of Coal measures.
 - (a) Limestone.
 - (b) Sandstone.
 - (c) Shales.
3. Stratigraphy of Kansas Coals.
 - (a) Cherokee Shales.
 - (b) Pleasanton "
 - (c) Shaver "
 - (d) Lawrence "
 - (e) Osage "
 - (f) Cretaceous "
4. Clay formations in Kansas Coals.
 - (a) Horsebacks.
 - (b) Belts.
5. Conclusions.

The Coal Measures and Coal Veins of Kansas.

In the eastern part of Kansas covering about one fourth of its area or 2,000 square miles, lays the Kansas coal measures. The western line of the coal deposits forms an irregular line crossing the state from eastern Brown county to western Chautauqua county. In addition we have the Cretaceous coal area in the North-central part of the state. For the counties that produce coal the reader is referred to plate VIII.

GENERALISED SECTION OF COAL MEASURES



Stratigraphy of Coal Measures.

The Kansas Coal Measures comprise a mass of alternating beds of limestones, sandstones and shales approximately 3000 feet thick. There are hardly enough distinguishing characteristics in the various beds of limestone to warrant a different name; however the lower the limestone the finer the texture and the more highly crystalline. Also the upper layers are lighter in color, sometimes almost pure white.

The shales are also very much alike; yet there are certain differences which may be detected by the experienced eye sufficiently to discriminate between the older and younger formations. But it is impossible to tell the age of the shale by its color, or position for shales of different ages occurs irregularly.

However there is a greater difference between the various formations of sandstone than in either the formations of limestones or shales.

the lower bed of sandstone being more firmly cemented, and more valuable for building stone than is the upper sandstone.

As the Kansas coal measures rest on a subcarboniferous limestone floor, a description of the coal measures may properly begin with a description of this floor after which the various subdivisions will be taken up in the ascending order.

The area covered by the outcropping of the Mississippian rocks is confined to the southeastern corner of the southeastern county of Kansas. They were undoubtedly formed under ocean water. The upper surface of the floor of these rocks dip to the west, and northwest from 14 to 22 feet to the mile. This has been ascertained by drilling deep wells at various points. There is a slight ridge in the Mississippian floor trending east and west through the middle part of the state, passing to an unknown distance west. Consequently there is a

thickening of the coal measures in the south diminishing until the Mississippian ridge is reached when it gradually thickens toward the north.

Resting on the subcarboniferous floor just described is the first division of the coal measures called the Cherokee shales. They have an average thickness of from 400 to 500 feet. This bed of shales is the heaviest and most extensive in the coal measures. They cover the surface of the greater part of the three south-east counties of the state, representing approximately an area of 865 square miles. They extend west at least 200 miles before they are seriously altered in general character. The ^{color} varies from a gray to ebony black. Of all the coal measures the Cherokee shales are by far the most important coal bearing divisions, producing more than three fourths of all the

coal that has thus far been mined in Kansas.

Just above the Cherokee shales lies two distinct beds of limestone separated by a black shale, all of which are called the Oswego limestone. They do not cover the surface of a very wide area of territory, but soon pass beneath the overlying strata to the west. At Cherryvale these limestones have a thickness of 30 to 40 feet. From the lower bed of limestone the Fort Scott hydraulic cement is manufactured. They are of a light gray color, and fine texture. The upper bed consists of a single stratum from 10 to 14 feet thick. On long exposure to the weather this limestone breaks up into irregular fragments. However, it is a fairly good building stone.

The outcroppings of the various limestones are shown in Plate II. The black line in the very south-eastern part of the state marks the outcropping

of the Oswego limestone. The other lines will be referred to in their turn.

First above the Oswego limestone lies a bed of shales varying in thickness from 30 to 60 feet called the Labette shales. So far as known they carry but little coal. However at a few points south-west of Prescott a six to eight inch bed of coal is mined locally by the so called "strip pit" process.

Still above the Labette shales is a bed of limestone called the Pawnee limestone. It is found capping the hills near Fort Scott. The dotted purple line of Plate II marks its outcropping. At Fort Scott this limestone is from 25 to 30 feet thick. Sometimes it forms great boulders from 5 to 15 feet across, and 2 to 4 feet thick. These boulders are white having a crystalline appearance.

Next above the Pawnee limestone lies an unusually heavy bed

of shales called Pleasanton shales. Stratigraphically they are very important as they mark the divisions between the upper and lower coal measures. They carry a large amount of coal, especially in the lower parts. They produce also a great deal of flagging stone.

Immediately above the Pleasanton shales is found a system of limestone and shales called the Erie limestone. These limestone increase in thickness and massiveness of character toward the west, as shown by wells drilled through them. They average about 175 feet in thickness. No other limestone in ^{the} Kansas coal measures produce as much flint. The red dotted line in Plate II marks the outcropping of the Erie limestone.

Resting on the Erie limestone is a bed of shales known as Thayer shales. They resemble the Cherokee, and Pleasanton shales. They carry a large

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quantity of coal and sandstone. The coal is near the surface and mined by the strip pit process.

Just above the Weyer shales is the Iola limestone. No limestone in the state is more important stratigraphically, or reaches a greater thickness, or has a greater lateral extent. It extends westward to Howard, Toronto, and other points, and some geologists think it extends much farther west than this. This limestone is from 30 to 200 feet thick. It has no vertical fissures within it, but by breaking there are large blocks of the limestone on the hill sides where they have fallen by the undermining process of decay. It is highly crystalline, is valuable as a building stone, and carries a great many fossils. The red line in Plate II represents the outcropping of this limestone.

Above the Iola limestone lies a heavy bed of shales called the Lane shales. They are from 10 to 100 feet in

thickness, and grow thicker toward the north. They carry a small amount of sandstone, and practically no coal. These shales are of minor importance both geologically and economically.

Resting upon the Lane shales the Garnett limestone is found. It consists of two strata separated by a thin bed of shale. Their thickness varies greatly along their outcropping. (See green line plate II). They vary in thickness from 10 to 65 feet and are rich in fossils of invertebrates.

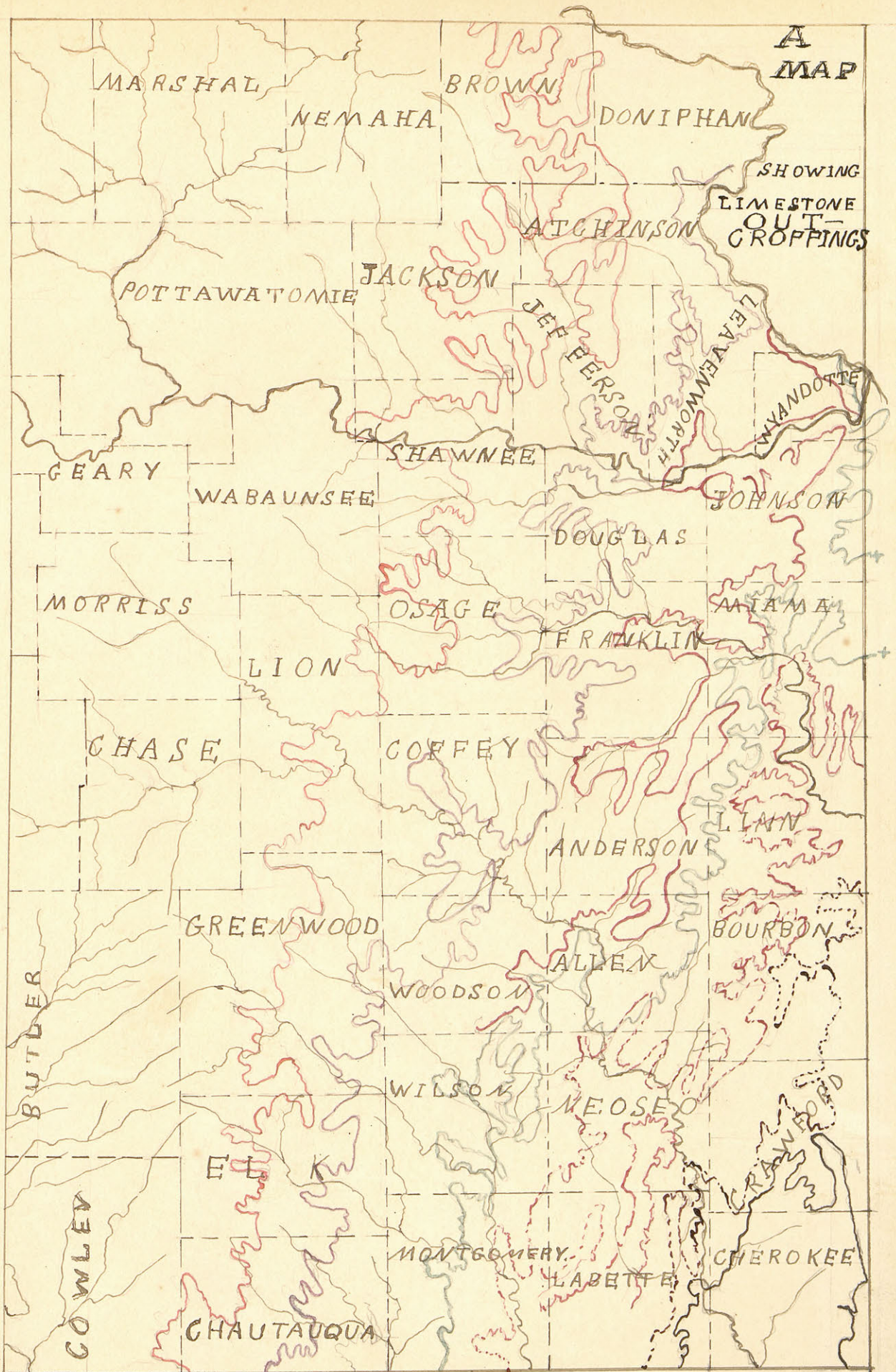
Just above these limestone is a very heavy bed of shales called the Lawrence shales. They extend entirely across the state from north to south with a maximum thickness of 600 feet. They contain local limestone beds, and coal is mined from them commencing with Atchison going southward through Douglas and Franklin counties to the south side of the state.

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Still above the Lawrence shales are two beds of limestone separated by a thin bed of shale. These together are called the Oread limestone, which at Lawrence are 15 feet thick. They decrease in thickness until the middle of the state is reached, when they thicken all the way to the south line of the state. These limestones are of a buff color with a light greenish blue on a freshly broken surface. They are highly crystalline, and some may be polished almost like marble. They contain a great many fossils. (See purple line, Plate II for outcropping).

Immediately above the Oread limestone lies a shale bed called Decorupton shales. At Decorupton they are 100 feet thick. This shale bed can be traced entirely across the state from north to south. It is pretty closely intermingled with beds of sandstone, and other shale beds.

After the Leconypton shales the remainder of the coal measures are made up of promiscuously arranged beds of limestones and shales several hundred feet thick. In the southern part of the state the shale beds separating the beds of limestone are thinner, thus terraces are formed, not high but close together. Of these various beds the Burlingame limestone is more easily traced. See red line Plate II for outcropping.



Stratigraphy of Kansas Coals.

The Kansas coals are found in various shales from the Cherokee shales to the Osage shales more than 2000 feet above.

Of all the coal bearing divisions in the coal measures, the Cherokee shales situated at the base are by far the most important; as they have produced more than three fourths of all the coal mined thus far in Kansas. Cherokee, Crawford, Labette, and Bourbon counties are the great producers of coal from these shales. At the base of these shales lies a thin vein of coal, but it has not been mined for twenty years, ~~except~~ locally. Above this lies a bed from 12 to 18 inches thick called the Columbus coal. This coal is of fair quality. It is mined principally by the "strip pit" process. Just above this is the Wier-Pittsburg upper and lower beds; which

are the heaviest in the state. The lower bed averages 40 inches in thickness; while the upper is about 30 inches. The geographical limits of these heavy coals are to the southwest of Columbus, and do not extend north as far as Girard. It is therefore a long elliptical area with the major axis trending north-east, and south-west. This coal is mined principally in Cherokee and Crawford counties. There are some beds of coal just above the Weir-Pittsburg coals. They are found in the north-western part of Cherokee county.

Almost at the summit of the Cherokee shales is a bed of coal averaging from 15 to 20 inches in thickness. It is extensively mined in the vicinity of Fort Scott by the "strip pit" process. The Leavenworth coals are also in the Cherokee shales. There are three beds averaging each 24 inches

in thickness, and lie at a depth of 988, 748 and 720 feet respectively from the surface. The upper bed only is mined.

The next shale to produce coal to any extent is the Pleasanton shales. They carry a large amount of coal, especially in the lower parts. The coal varies from 16 to 30 inches in thickness, but in some places it is reported to be as much as three feet thick. It is of good quality, and easily obtained. Cherokee, Crawford, Lynn, and Bourbon counties produce this coal. It is mined by the "strip pit" process, by shafting, and sometimes by drifting.

The Lawrence shales are the next to produce coal. In these shales coal is found in at least two horizons. The lower one in the vicinity of Lawrence,

being about 150 feet below the Oread limestone. The upper one in the vicinity of Atchison and the southwest corner of Franklin county is 30 to 50 feet below the Oread limestone. The veins are very thin being from six to sixteen inches thick. It is mined in Douglas and Franklin counties by the "strip pit" process, or shafting. They have probably produced 100,000 tons to the present time.

The next shale bed to produce coal is the Osage shales. It is by far the most important coal producer above the Cherokee shales. The coal veins in Osage county averages from 22 to 23 inches in thickness. It is mined principally in Osage county, however some is mined in Shawnee, Jefferson, Atchison and Brown counties. The total amount of coal

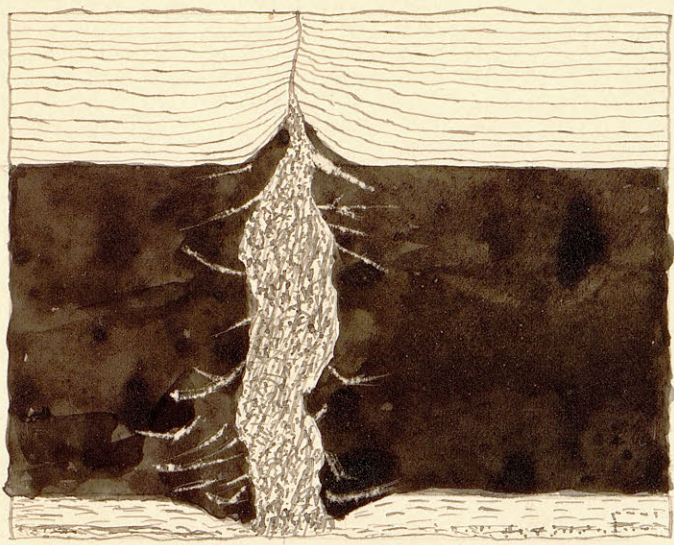
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taken from these shales doubtless
reaches into the hundreds of
thousands of tons.

There are peculiar formations
detected in all coal veins called
"horsebacks", "bells" etc.. Geologically
these formations belong with the
coal veins. Hence we will give
them a cursory view. The reader
is referred to the figures on
plates III and IV illustrating the
various types.

A clay filled fissure is
a horse back, or it may be a
dipping down, or a bulging up of
the strata, above or below the
coal. The downward extensions is
unknown, but the lateral reaches
half a mile or more. They are about
five feet across with walls rough
and rugged; yet some of the
walls are smooth and polished.
Their origin (it is believed) is

HORSEBACK, SHOWING UPWARD AND
DOWNWARD DISPLACEMENT OF COAL AND
ACCOMPANYING STRATA.

FIG. 1.



HORSEBACK, SHOWING DISPLACEMENT OF
COAL AND SHALE AND FRACTURE
OF
COAL,
FIG. 2.



FIG. 3.

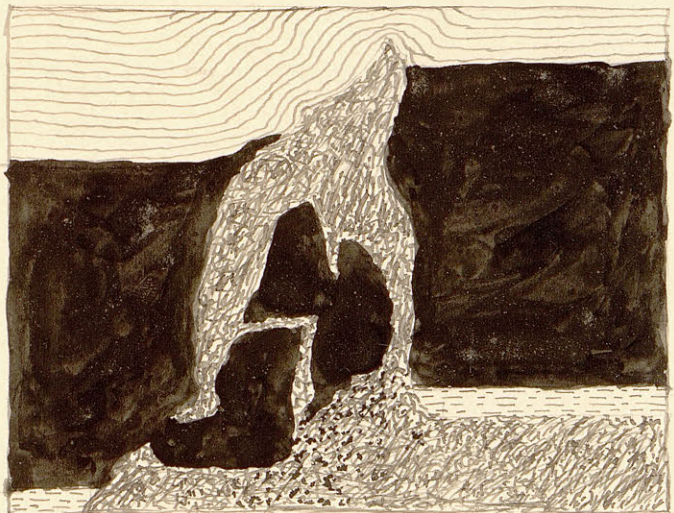
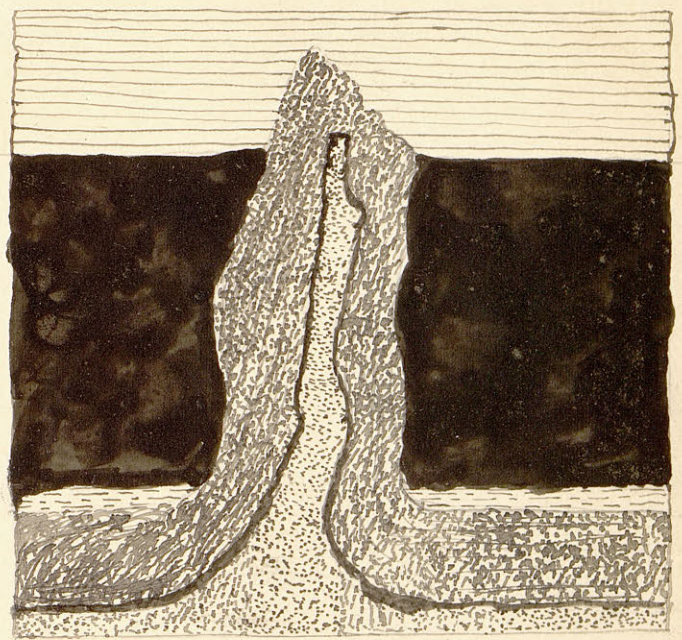


FIG. 4.



HORSEBACK, SHOWING, FAULTING
OF COAL, AND ACCOMPANYING LOWER
STRATA OF SHALE

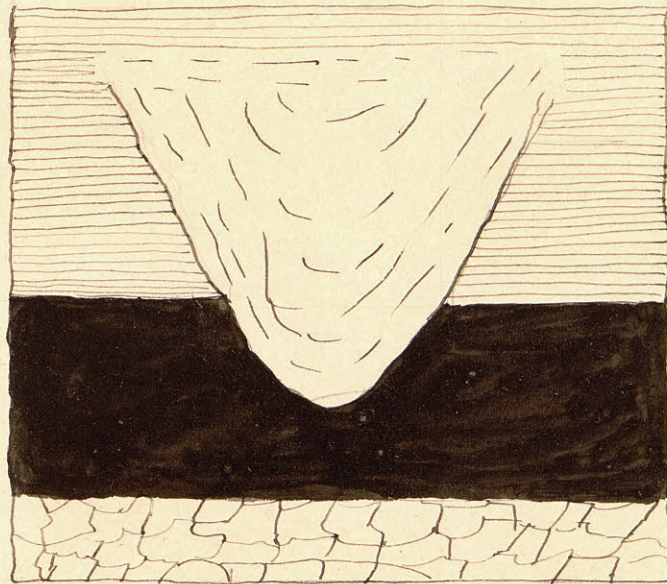
HORSEBACK, MADE UP OF TWO
VARIETIES OF FIRE CLAY

closely associated with folding or faulting, after the coal was formed. After a fissure, by this means was formed, the adjoining clay would quite naturally be forced up filling the fissures. They are found in the Cherokee, and Osage Coals to some extent, but are not very numerous, and consequently of little inconvenience to the miners.

The "bells" of the coal measures are structures circular in form, and occur in the shale or roof over the coal. They are not found very abundantly in the coal fields; yet some are found in the Cherokee shales, and have a great tendency to cause the roof of the mines to cave in. Thus they are dangerous formations. They are rather small; averaging perhaps

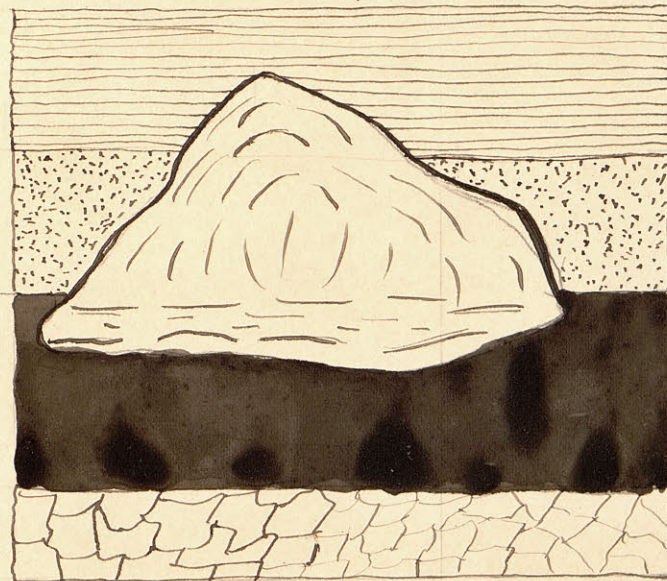
five feet in diameter. They pass down from above, protruding into the coal several inches; after a foot or two, and sometimes even through the coal. The sides of the bell are generally smooth and polished. The matrix of the bell is filled with shale of the same character as that forming the roof. The most probable theory in regard to the origin of these bells is the one advanced by Dr. Haworth. In substance it is that during the accumulation of the coal forming material certain conditions caused irregularities in the accumulated material, and consequently when the sediments forming overlying strata were deposited, they covered all such irregularities and the pressure from above depressed the roof strata into the openings of the coal.

FIG. 1.



TYPICAL BELL

FIG. 2.



INVERTED TYPE
OF
BELL

In conclusion the writer wishes to call attention to plates V, IV and VII as they show graphically something of the output of the Kansas Coal measures in the ^{last} fifteen or twenty years. Plate V shows the ratio of coal output from 1880 to 1899. In 1880 the output was 550,000 tons, while in 1899 it reached over 4,000,000 tons. Plate VI shows the ratio of the yearly receipts from Kansas coals, from 1880 to 1899. The receipts for 1880 was \$715,000. While those of 1899 reached over five millions dollars. Thus we see that during a period of twenty years, there was an increase in the output of about 800%; while the receipts increased a little over 700%.

Only a small portion of the total area of productive coal

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fields (15000 square miles plus the
cretaceous area) known at the
present time, is producing. Hence
the future of Kansas coal product-
ion is very encouraging to
all, and especially those who
fear a coal famine some-
time in the near future.

William Lee Harvey.

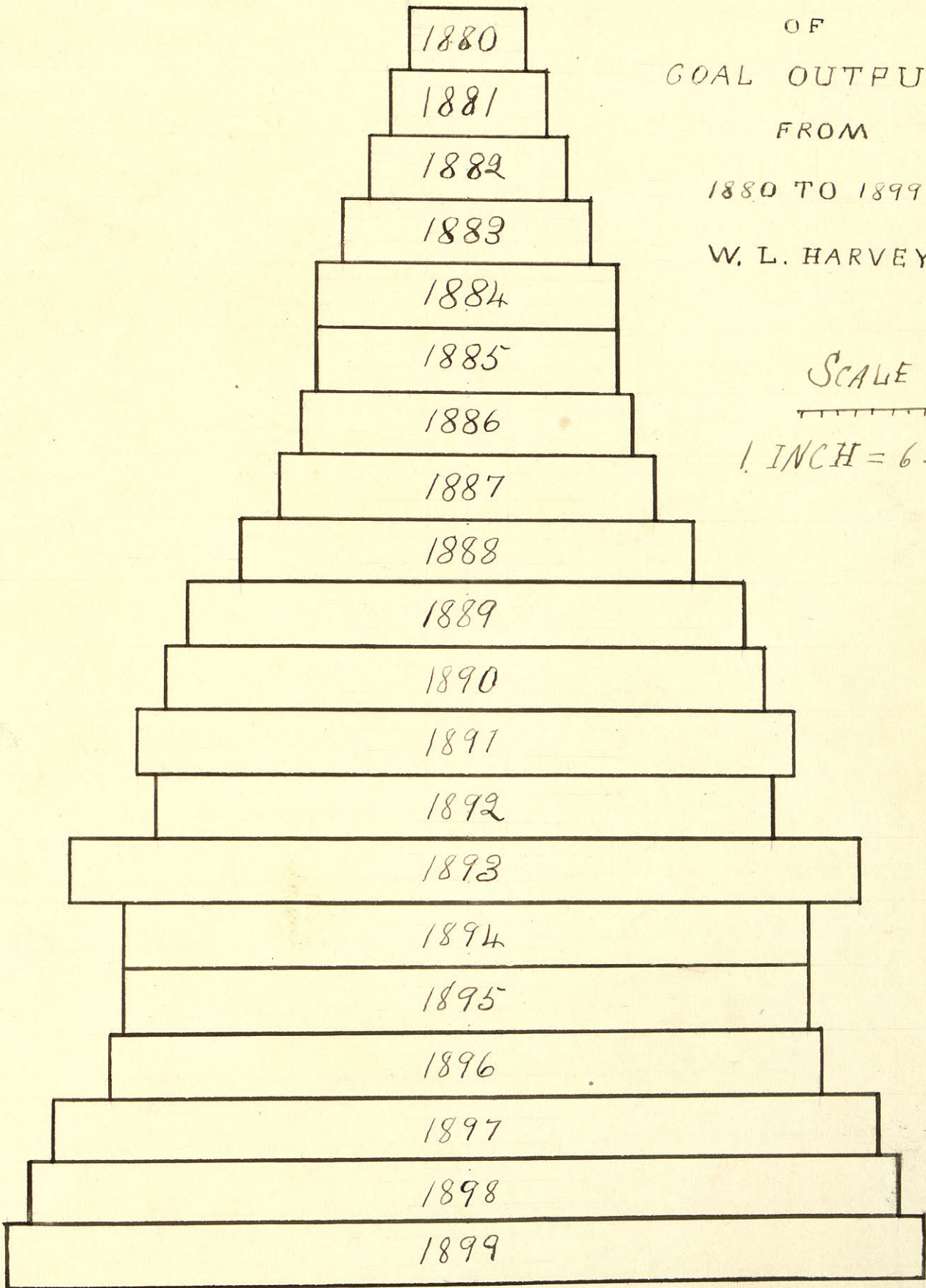
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RATIO
OF
GOAL OUTPUT
FROM
1880 TO 1899
W. L. HARVEY

SCALE

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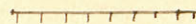
1 INCH = 628,000 T.



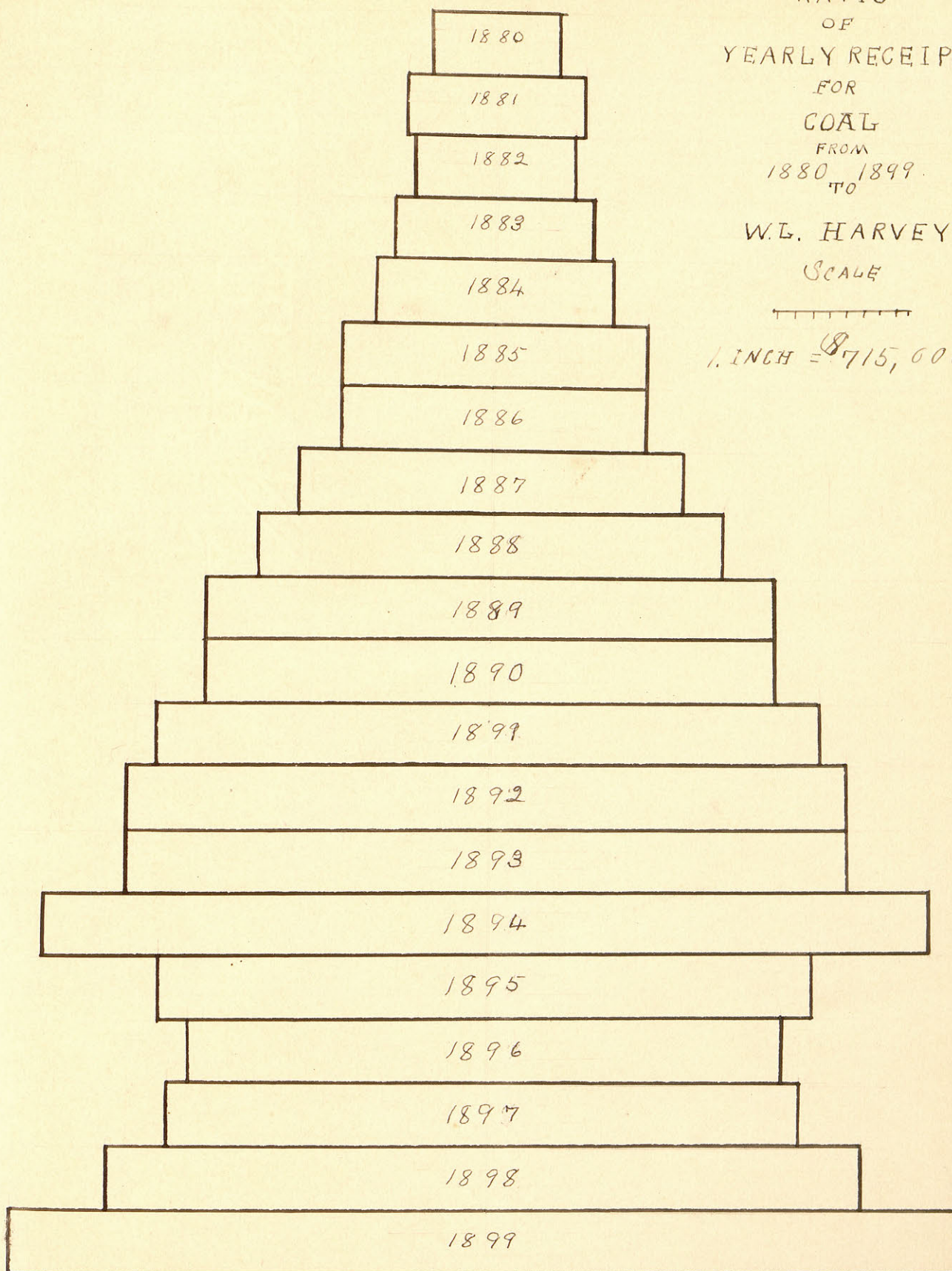
RATIO
OF
YEARLY RECEIPTS
FOR
COAL
FROM
1880 TO 1899.

W.L. HARVEY

SCALE



1 INCH = \$715,000



PERCENT OF TOTAL OUTPUT	GEOLOGICAL FORMATION	COUNTY	AVERAGE OUTPUT PER. YEAR	PERCENT OF TOTAL OUTPUT	AVERAGE PRICE PER. TON
82.5 %	CHEROKEE SHALES	BOURBON	21,040 TONS	0.78 %	
		CHEROKEE	925,000 "	32.01 "	
		CRAWFORD	1,359,000 "	50.87 "	
		LABETTE	800 "	0.35 "	
		LEAVENWORTH	300,000 "	8.07 "	
1.625	PLEASANTON SHALES	LINN	22,500 "	0.74 "	
.45	THAYER SHALES	MONTGOMERY			
		NEOSHO			
		WILSON			
		FRANKLIN	13325 "	0.15 "	
		DOUGLAS			
8.77	OSAGE SHALES	ATCHISON	1040 "	0.12 "	
		BROWN	2525 "	0.08 "	
		CHAUTAUQUA	2500 "	0.05 "	
		COFFEY	2500 "	0.45 "	
		ELK	1150 "	0.017 "	
		LYON	560 "	0.02 "	
		OSAGE	240,250 "	5.92 "	
		SHAWNEE	5400 "	0.02 "	
.32	CRETACEOUS AREA	CLOUD	4,125 "	0.08 "	
		ELLSWORTH	2,300 "	0.45 "	
		LINCOLN	3,500 "	0.065 "	
		MITCHELL	*(3,000) "		
		REPUBLIC	3,000 "	0.45 "	
		RUSSELL	925 "	0.02 "	

TABLE SHOWING:

AVERAGE OUTPUT PER YEAR, AND PERCENT OF TOTAL
OUTPUT BY COUNTIES, ALSO PERCENT OF TOTAL OUTPUT BY
GEOLOGICAL FORMATIONS.

* SHOULD BE BLANK.