

Kansas Coals

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Coal was one of the first "mineral resources" to attract attention in Kansas and now is among the most important. With little or no market at first there was no incentive to develop the mining business, but when railroads and manufacturing establishments were built, then mines were opened in earnest. But even then the coal from other states was imported in large quantities, because the most extensive coal beds in Kansas had not yet been discovered. At present, although the home market consumes a large percent. of the coal mined, a very considerable amount is taken to foreign markets.

Occurance of Coal Measures.

The coal measures in Kansas are in the eastern part of the state and cover about 20,000 square miles. There are twenty three counties known as coal producers namely: Atchison, Bourbon, Brown, Chataingua, Cherokee, Coffey, Crawford, Douglas, Elk, Franklin, Greenwood, Jackson, Jefferson, Labette, Line, Lyon, Montgomery, Neosho, Osage, Shawnee and Wilson.

An irregular line drawn across the state from eastern Brown County to western Chautauqua County would give the area where coal is found, but only a small portion of this is productive at the present time. More than two-thirds of all the coal mined in the state is mined in Cherokee Crawford, Chicopee Counties. A little north west of this area are the mines of Fort Scott, Pleasanton and Mound City. Another large and productive area extends north west from Chautauqua County by way of Eureka, Osage City and Burlingame and extending across into Jefferson, Atchison, Doniphan and Brown counties. Mining is most active in Burlingame and Osage City, but mines are operated at many other places in this territory.

Kinds of Coal.

There are three kinds of coal found in this state: (1) Bituminous. (2) Semi-Anthracite, (3) Lignite. The Bituminous (known as soft coal) is found in the lower coal measures and yields most of the coal in Kansas markets. The semi-anthracite

series of strata called coal measures.

Under most coal is found clay which is evidently an ancient soil and is filled with fossils roots, the stumps of the trees extending up into the coal. The rock which lies just above the coal is called a shale.

The Coal Measures.

Kansas coal is found in many shale beds, from the Cherokee at the base to the Osage shale two thousand feet above. Larger quantities are taken from the Cherokee shales than from any other in the coal measures. It is from this bed that we get the coal from Cherokee, Crawford, Bourbon, and Leavenworth Counties, besides many others in the eastern part of the state. The Cherokee shale is the greatest coal producing horizon in the Mississippi valley.

Above the Cherokee shales is the Labette shales, which have considerable bituminous matter in them, but there are no good beds of coal although it has been mined to a limited extent.

The Pleasanton shales are next above the Labette shales and in it large amounts of

is a variety of coal much harder than the bituminous, is found only in small quantities and that near the Missouri State line. The lignite or brown coal is found in north central Kansas and is consumed mostly by local trade.

Coal has been proved by microscopical examinations, to be of vegetable origin and that the formation was at a time when there were gigantic ferns, palms and other luxuriant vegetation, more than ever again occurred is shown by the fact that the lower strata are much thicker. Not more than 2% of the thickness of the coal measures consists of workable coal, but of sandstone, shales and clay, with coal of varied thickness.

It is probable that coal was formed in peat bogs, with perhaps some drifted material, but as the coal is of uniform thickness and purity it is not probable that it could have drifted together without gathering much sediment. In the process of formation the vegetative matter is reduced in bulk.

The subsidence of the bogs and the sediments upon them built up a

coal are found, more than in any of the shales except the Cherokee.

Above the Pleasanton shales are the Thayer shales in which considerable coal is found, especially between Thayer and Independence.

The Lane shales which are next above the Thayer are not known to have coal but in the Lawrence shales which are next above that, large amounts of coal are found and the coal in these strata has been mined in Atchison, Jefferson, Douglas and Franklin Counties.

Next above the Lawrence shales are several which have no coal till the Osage is reached and here it averages about 200 feet thick and extends across the state from north to south and has been mined in scores of places especially in Shawnee, Coffey, Greenwood, Elk and Chautauque Counties. While the coal in the Osage shales is similar, it is not uniform in quality or quantity. Above these shales, no real coal has been found, but some shales rich in carbon have been called coal.

Aside from the true coal measures just named, the only other coal in the state is the Cretaceous (lignite) coal found in North-central Kansas, and there enough coal is found to supply the local trade in Ellsworth, Lincoln, Mitchell, Republic and Russell Counties.

A peculiar formation called "Horsebacks" found in Kansas coal measures are of geological interest as well as in the economical side of coal mining. The name "horsebacks" was probably given because of their peculiar shape. They are not confined to Kansas, but are found in all mining localities in America. In Kansas the term is applied to vertical fissures filled with clay which pass into the coal. The direction is irregular, often extending near the surface, but it is not known how far down they extend and the lateral extent can hardly be determined, because mining is confined to such comparatively small distances, but some are known to extend half a mile or even more.

The fissures contain a low grade of fire clay which sometimes contain fragments of coal and sandstone. The color of this clay varies from pale yellow to light blue. Its appearance indicates that it was once moist or semi-liquid and that the excess of water has drained away. Before being exposed to the air the clay is hard and is a formidable obstacle to miners.

Some theories given as to their formation are that they were formed by water channels or that they were formed at the same time as the coal, but these do not correspond with facts observed by Mr. Crane who gave as a probable origin, that after the coal was formed that the fissures were made by the vibratory movements and clay released from pressure came up and filled the fissures. The general direction of the horsebacks is parallel with the fissures in the lead and zinc mining districts and were probably made at the same time.

The "bells" in the coal measures are also structures which are disadvantageous to mining are found in the shale above

the coal and from their circular form are given the name "bells". They are not found over a very large area, the principle places being Leavenworth and vicinity. The bells are holes worn by flowing water they have an average diameter of about four feet and usually extend vertically down into the coal. The contents of the bells are shale - the same as that composing the roof, except that it contains more fossils and does not seem to be in layers. The theory given by Mr. Crane as to their formation is that there was an irregularity in the amount of coal forming material and so the pressure from above would force the upper strata into these crevices where there was no coal.

Calorific Value.

The value of coal differs much in what it is to be used for. There is a great difference in the cost of mining as well as in the heat producing quality of coal, so the value is far from uniform. For this reason coal is tested by producing perfect combustion and having the conditions during the tests

the same. The problem is to find how many pounds of water can be converted into steam by one pound of a given coal.

Tests of this kind made of the different coals in the United States, excluding the anthracite, the coal of the greatest heating power was found to be in Cito, Kansas.

Systems of Mining Employed.

There are three systems of mining employed namely: Long Wall System, Room and Pillar System and the Strip Pit System. Most of the coal in Kansas is mined by the Room and Pillar System; although the Long Wall System is used over a larger areal extent.

The Long wall System is used in thin coal beds, where the roof is soft or brittle and where sufficient amount of waste material is found to support the roof. The coal is hauled from the face of the coal shaft; on cars holding from 4-10000 pounds. Sometimes the miners look after their own cars but more generally they are put in the hands of a general hauling crew. In the Long Wall System the cost of removing coal

or the amount paid to miners is from 3-5 cts. per bushel for lump coal while the finer coal is only from 25-40 cents per ton.

Room and Pillar System is used where the coal strata is thick, because there is but little waste, and it has been found less expensive to leave columns of coal (7-16 feet wide and 50-100 feet long) as a natural support than to bring material in for that purpose. Double and Single entry methods are employed in this system. The former is used more extensively and in this method a shaft is sunk as in the Long Wall System and on the roof of the coal an entry is driven in each direction. This entry is known as the main entry and is the center of the whole system. A single entry is then made on each side, parallel to the main entry. The space between the main and side entries is used as pillars. On the walls of the side entry and at intervals of 100 feet, two parallel entries are made 32 feet apart and at right angles to the side entries and extend in straight lines as far as the coal is worked.

Cross entries for hauling ways and air passages are made between the double entries and the inner entries.

On the side of the double entry opposite the pillars, rooms are opened which are 35 feet from center to center and 200 feet long. The side and main entries are connected by double hauling roads at an angle of 45° so the entrance of the main entry and of the double hauling road, are several feet from the entrances, on the side entry end of the road.

The single entry method has only one main entry and this is generally developed with the mine. From both sides of it and at intervals of 100 feet, other entries are made at right angles, those on one side set back about twenty feet.

The method of driving the entries in the Room and Pillar System is similar to that in the Long Wall System. In the entry work the miner begins by cutting the coal on one side of the entry, a space about 2 feet wide, 3 feet into the coal and about the thickness of the coal bed. This space is

called a cutting and it generally requires about a day to make one, but it depends some on the kind of coal. A drill hole is then made in the other side of the entry and a charge of powder is put in, which when fired loosens the coal between the drill hole and the cutting.

For coal "in the rough" miners get about thirty cents per ton and for lump coal fifty to seventy five cents.

The Strip Pit System is used considerably in Southeastern Kansas where the coal is close to the surface and where the expense of removing the roof is less than mining by the other methods.

Machinery.

The Machinery used in mining has improved within the last few years as well as that used in other lines of work. There are many different kinds of machines as for drilling, hoisting, hauling, sorting, pumping and ventilating.

These are operated by mules, electricity, steam power or compressed air, and will be found fully described in "The University Geological

Survey of Kansas. Vol III Pages 241-269.

Uses of Coal.

Newberry says "Coal is entitled to be considered as the main-spring of civilization." Without coal the world would be very much changed.

Coal is used to carry on commerce to all parts of the world, to keep the great manufacturies in motion, to produce gas, for all kinds of domestic purposes and in the operating of coking establishments.

Table showing the production of coal
by counties

County	1885	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897
Atchison								3500	1200	4592	5,152
Cherokee	371930	450000	549873	724861	832289	825531	697521	948142	918944	985132	1,061,409
Coffey			18272	12200	1218	3664	1720	475	120		10,000
Crawford	221741	425000	827159	900464	997759	1309246	1195868	1554253	1394614	1271434	1,590,000
Franklin	14518	25000	37771	9045	10277	11150	11768	17418	17047	12861	6452
Labette			2541	4000	800	800	800	440	250	600	2000
Leavenworth	120561	200000	245616	319846	380142	330166	309237	398967	259060	284700	367141
Lincoln	5556	17500	25345	10474	38934	43913	46464	25847	14051	14534	26775
Osage	370552	415000	446018	179012	355286	372846	276168	322187	241584	190948	181857
Smallwood	107199	307500	68448	100000	100000	110000	110000	120000	120000	120000	40399
Total	1,212,057	1,850,000	2,221,043	2,259,922	2,716,705	3,007,276	2,652,546	3,588,131	2,926,870	2,884,801	3,391,806

Table showing the average price for Kansas coals since 1889, by counties producing 10000 Tons or over.

County	1889	1890	1891	1892	1893	1894	1895	1896	1897
Cherokee	\$1.20	\$1.22	\$1.19	\$1.22	\$1.15	\$1.13	\$1.22	\$1.23	\$1.30
Crawford	1.20	1.24	1.09	1.08	1.10	1.07	1.02	.97	1.30
Franklin	2.18	2.00	1.90	1.85	1.84	1.88	1.84	1.80	
Leavenworth	1.69	1.60	1.40	1.60	1.55	1.49	1.49	1.30	1.30
Linn	1.32	1.34	1.23	1.27	1.22	1.20	1.10	.97	
Osage	2.03	1.35	2.04	2.04	1.85	1.89	1.45	1.65	1.75
State	\$1.48	\$1.30	\$1.31	\$1.31½	\$1.27	\$1.23	\$1.20	\$1.15	



