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These reports of the Kansas State Mine Inspector mostly concern coal mining, though by 1929 the scope of the reports broadens to include metal mines. The content of individual reports will vary. The reports address mining laws and mining districts; industry production and earnings; fatal and non-fatal accidents; accident investigations and transcripts of oral interviews; labor strikes; mine locations; mining companies and operators; and proceedings of mining conventions. The reports document the political, economic, social, and environmental impacts of more than seventy years of mining in southeastern Kansas.

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LEAVENWORTH COUNTY.

This is the deepest coal mined in the State, being 720 feet at Leavenworth city, and reaching 811 feet at the Brighton Coal Company's mine southwest of the city about five miles. The vein is 22 inches thick, of good quality, and has a good top for long-wall work, requiring very little timber in the roadways after the mine has been in operation a few years, and has got properly settled around the bottom of the shafts. The city drilled to a depth of over 2,000 feet in 1888 with the expectation of getting gas or oil in paying quantities, but were stopped by water before reaching the depth originally intended—3,000 feet. It is the opinion of many who have studied the matter closely that both oil and gas will be found near Leavenworth in the near future. Below is a record of the strata passed through by the drill kept by Mr. Reed, who had charge of the work:

	Depth of strata.	*Total.*
Loam and clay	20	
Shale	10	30
Limestone	40	70
Shale	25	95
Limestone	20	115
Shale and limestone	75	190
Hard limestone	20	210
Shale and limestone	140	350
Hard limestone	20	370
White shale	35	405
Dark sand-rock	15	420
Shale	135	555
Limestone	5	560
Shale	25	585
Limestone	10	595
Shale	25	620
Sand-rock	5	625
Shale	50	675
Sand-rock	3	678
Shale	10	688
Sand-rock	5	693
Shale	27	720
Coal	2	722
Clay and shale	25	747
Coal	2	749
Fire-clay and shale	81	830
Dark sand-rock	15	845
White shale	20	865
White sand-rock	30	895
Gray shale	10	905
Dark hard sand-rock	15	920
Gray shale	30	950
Dark sand-rock	18	968
Black shale	20	988
Coal	2	990
Fire-clay	10	1,000
Sharp white sand-rock	40	1,040
Dark shale	20	1,060
White sand-rock	10	1,070
Dark shale	20	1,090
Dark sand-rock	15	1,105
Soft black shale	40	1,145
Hard gray sand-rock	25	1,170
Black shale	5	1,175
Hard white sand-rock	375	1,550
Brown limestone	20	1,570
Iron pyrites	5	1,575
White shale	75	1,650
Brown limestone	30	1,680
Light-gray limestone	30	1,710
Hard gray sand-rock	102	1,812
Soft sharp sand-rock	18	1,830
White pebble sand-rock	40	1,870
Hard white rock	50	1,920
Soft blue sand-r'k, turning white,	90	2,010
Lower Helderburg limestone	106	2,116

SHAWNEE, OSAGE, LYON AND COFFEY COUNTIES.

Shawnee, Osage, Lyon and Coffey counties may be considered as one coal field, attaining its largest extent and thickness in Osage county, running in a southwestern direction from the vicinity of Topeka. The Atchison, Topeka & Santa Fé Railroad runs through the center of this coal field in Osage county. The vein dips to the north and west as usual throughout the coal measures of the State. It ranges from 12 inches thick, west of Topeka, until it reaches 22 inches at Scranton, gradually getting thinner, when it again gets to 11 or 12 inches thick at Lebo, in Coffey county. At Burlingame, where it is mined furthest to the northwest, the deepest shafts are to be

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found, some of them being over 100 feet deep. There seems to be no scarcity of coal in this field. It is mined from strippings, drifts, and shafts. The supply seems to be inexhaustible, the only question of securing the coal being one of depth.

Thirty-six miles northwest of Burlingame, at Alma, the county seat of Wabaunsee county, the Alma Coal and Mining Company drilled two holes about 2,000 feet deep with a diamond drill. The company claims to have found at least two veins of anthracite coal. The first was 1,680 feet from the surface, and 40 inches thick; the second was 1,885 feet deep, and 48 inches thick. Four other veins were found between the above, the thickest of which was 26 inches. An analysis of the coal taken out in the core of the drill was made by Prof. Church, chemist, of Topeka, with the following result:

ANALYSIS OF COAL.

Moisture	3.74 per cent.	Coke	50.30 per cent.
Volatile carbon	46.13 per cent.	Sulphur	.06 per cent.
Fixed carbon	46.02 per cent.	Phosphorus	none.
Ash	4.11 per cent.	Specific gravity	1.30
		One cubic foot weighs	81.25 lbs.
Total	100.00 per cent.	Character of coke	good.
		Color of ash	light gray.

This is "extra good" coal for manufacturing and domestic purposes. It is hard, compact and clear, and contains over 92 per cent. total carbon. The ash is about equal in amount to that found in Pennsylvania anthracite, and is fine and light. It is free from sulphur and phosphorus, and much superior to any coal heretofore found in the State of Kansas. It is also very valuable for the manufacture of clear, white gas, free from odor. W. D. CHURCH, P. C.

This company sank a shaft which is now over 600 feet in depth. It has been stopped for some time, owing to financial difficulties. At a depth of 450 feet the shaft passed through a vein of bituminous coal 18 inches thick which resembled the Osage county coal in some particulars, but could not be mined profitably, as it stuck to both the roof and bottom, both being very hard. Should the efforts of this company be crowned with success, and a good quality of anthracite coal be found here, it would be of great advantage to large communities along the line of the Chicago & Rock Island Railroad. The coal company also operates large stone quaries and hydraulic cement works in the vicinity, which does a good shipping business.

Cloud, Russell, Ellsworth, Lincoln, Mitchell, Republic, Jewell, and Nemaha counties, all contain more or less quantities of a lignite or brown coal which is mined and sold to local consumers. It burns very well, with little smoke, and creates no soot, but makes a large amount of ashes. It is mined by drift along the Smoky Hill river south of Wilson, in Ellsworth county. It ranges from 8 inches to 36 inches in thickness, the average being about 22 inches. It is worked by shafts near Denmark and Ingalls, in Lincoln county. At Homer, in Russell county, it is mined by a shaft over 100 feet in depth, and at Omio, in Jewell county at 150 feet deep; but this shaft has been stopped for some time on account of too much water for the ma-

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chinery to operate successfully. There are many openings by shaft, or drift, in the vicinity of Minersville, Cloud county, where the coal is 22 inches thick, with a clay or brown-stone band, varying from 1 to 4 inches thick in the center of the seam. A shaft is being sunk 8 miles southwest of Concordia, which, it is claimed, will strike coal at 110 feet. There is also a shaft in course of sinking at Scandia, Republic county, now down about 200 feet. It is troubled with very heavy water, keeping two pumps constantly at work, and then, hardly able to keep the shaft clear of water. There are two small places taking out coal at or near Berne, in Nemaha county, near the Nebraska State line.

In 1888 Professor E. H. S. Bailey, of the State University at Lawrence, made an analysis of the different coals, from samples of the different sizes of coals mined, in order to get the average of the coal sent to the consumer. He says:

"The ordinary method in use among chemists for the analysis of coals has been followed. The actual amounts of carbon, hydrogen, etc., present in the coals, are not determined, but by the process we do determine the actual amounts of substances driven off under similar conditions, so the method is a valuable one for the comparison of coals."

In the analyses which follow, it will be noticed that the average for each region is given in the line below each variety. In the summary of averages, the analyses of some other coals are given for comparison.

COMPOSITION OF KANSAS COALS.

A.—CHEROKEE.

Number.	*Water.*	*Volatile.*	*Fixed carbon.*	*Ash.*	*Color of ash.*
1	1.54	38.06	53.44	6.96	Gray.
2	1.26	35.60	52.20	10.94	Drab.
3	1.37	37.19	50.23	11.21	Reddish gray.
4	2.59	39.12	51.54	6.75	Brownish.
5	1.35	36.11	50.94	11.60	Gray.
6	2.49	34.59	54.11	8.81	Light gray.
7	2.76	36.21	54.91	6.12	Light gray.
8	2.75	36.76	53.08	7.41	Gray.
9	1.33	37.33	51.59	9.75	Brownish gray.
Average	1.94	36.77	52.45	8.84	

B.—CHEROKEE (UPPER VEIN).

1	2.25	34.17	49.51	14.07	Grayish brown.
2	2.07	34.37	50.21	13.35	Grayish brown.
3	1.91	37.44	46.19	14.46	Gray.
Average	2.08	35.32	48.64	13.96	

C.—FORT SCOTT.

1	2.35	42.79	45.00	9.86	Reddish.
2	2.21	43.89	45.15	8.75	Reddish brown.
3	4.27	38.61	52.49	4.63	Reddish brown.
Average	2.94	41.76	47.55	7.75	

COMPOSITION OF KANSAS COALS — CONCLUDED.

D.—LEAVENWORTH COUNTY.

Number.	Water.	Volatile.	Fixed carbon.	Ash.	Color of ash.
1	3.22	41.55	49.32	5.91	Dark red.
2	2.25	36.49	47.27	13.99	Light red.
3	2.61	39.58	45.65	12.16	Brick color.
Average	2.69	39.21	47.41	10.69	

E.—LINN COUNTY.

1	1.61	38.25	48.76	11.38	Dark brown.
2	2.36	40.14	48.88	8.62	Reddish brown.
3	2.39	42.19	42.05	13.37	Yellowish brown.
4	1.92	37.11	47.87	13.10	Red.
Average	2.07	39.42	46.89	11.62	

F.—OSAGE COUNTY.

1	7.19	40.03	41.13	11.65	Brown.
2	7.71	41.56	39.92	10.81	Light brown.
3	9.29	42.05	40.89	7.77	Red.
4	4.70	44.86	42.11	8.33	Dark brown.
5	6.75	42.79	40.97	9.49	Dark brown.
6	7.27	41.45	41.35	9.93	Dark red.
7	5.56	42.79	39.32	12.33	Dark red.
8	5.83	43.26	41.75	9.16	Reddish brown.
9	7.36	38.33	38.54	15.77	Dark brown.
10	4.91	39.58	43.17	12.34	Yellowish brown.
11	7.77	40.85	40.29	11.09	Light brown.
Average	6.76	41.59	40.86	10.79	

G.—FRANKLIN COUNTY.

1	7.55	44.40	37.68	10.37	Gray.

H.—CLOUD COUNTY.

1	13.70	46.14	28.52	11.64	Dark gray.

The *averages* as given above are collected in the following table:

Name.	Water.	Volatile.	Fixed carbon.	Ash.
Cherokee	1.94	36.77	52.45	8.84
Cherokee, (upper vein)	2.08	35.32	48.64	13.96
Fort Scott	2.94	41.76	47.55	7.75
Leavenworth county	2.69	39.21	47.41	10.69
Linn county	2.07	39.42	46.89	11.62
Osage county	6.76	41.59	40.86	10.79
Franklin county	7.55	44.40	37.68	10.37
Cloud county	13.70	46.14	28.52	11.64
Pittsburgh, Pa	1.31	36.61	54.17	7.91
Nebraska	4.93	38.17	49.44	7.46
Warren county, Missouri	6.75	36.40	45.75	11.10

"If the water and ash are eliminated in the calculation from the above results, as is suggested in a recent report of the Pennsylvania Geological Survey, the coals of Kansas will be divided into five groups. In the first group are included the Cherokee coals; in the second, Fort Scott, Leavenworth and Linn counties; in the third, Osage county; in the fourth, Franklin county; and in the fifth, Cloud county.

"The coals found in the extreme southeast are richer in fixed carbon or coke, and this diminishes as we go toward the northwest. On the other hand, the volatile mat-

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ter is more abundant compared with the fixed carbon in the upper or northern coals. There is uniformly more water in the Osage county coals and in those above it, than in the lower coals. In regard to ash, Cherokee and Fort Scott contain the least; the others contain from 10 to 12 per cent.

"As the sulphur is so unevenly distributed, an analysis for this was not made. Previous examinations, however, show that there exists from 2 to 5 per cent. of sulphur. A part of this may be present in sulphate of lime, but much of it is united with iron in iron pyrites."—*From the Transactions of the Twenty-first Annual Meeting of the Kansas Academy of Science.*

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LEAD AND ZINC PRODUCT.

PRODUCTION OF MINES AND VALUE OF LEAD AND ZINC PRODUCT FROM THE GALENA AND EMPIRE CITY DISTRICT, CHEROKEE COUNTY.

The showing in total number of pounds, and in money value, is somewhat less than the output for the two years previous. Up to October, 1888, the price of lead had been maintained by the efforts of the Corwith syndicate to corner the lead market, but on the failure of this concern lead went down to so low a price, owing to the importation of foreign ore, that the further mining of lead ore was almost wholly abandoned until June and July, 1890, when the price advanced by the prospect of the cessation of importation of ore. In August and September of 1890, lead reached the highest price known for four years. The lead mines were then reopened and the yield increased rapidly. The position of spelter, the product of zinc ore, is the strongest of almost any of the metals in this country; foreign mines having weakened, prices advanced rapidly. Our market, following it, reached 6 to 6¼ cents per pound in New York, in December, 1890. Zinc ore at present is subject to the demands of the smelters, the production being much in excess of the smelting capacity. Satisfactory prices for ore must wait until the smelting capacity is sufficiently increased to handle all the ore produced. During the last three months of 1890, nearly three thousand tons of this ore has been sold, partly from this district, and shipped abroad to be smelted at the works in Europe. Arrangements are now being made for extensive smelting plants in the immediate vicinity of the mines.

The following report shows the number of pounds of lead and zinc ores produced and sold from the Galena and Empire City, Kansas, mines during the year 1890. Many of the companies reported have been running but a short time, which accounts for the output not being any larger in these instances. Others have not reported at all on account of the output being too small. These, with individual lots, make up the report credited to sundry sales. The sum total is the correct statement of the amount shipped from this district, and is credited to the company selling to the shipper:

Names of companies.	*Zinc ore, pounds.*	*Lead ore, pounds.*
Galena Lead and Zinc Co.	8,908,216	1,389,860
Southside Mines and Mining Co	3,977,890	1,091,140
Perry Crusher	7,092,292	357,072
James Murphy, Crusher No. 1	4,572,960	77,100
Windsor Mining Co.	1,215,060	967,680
Boice & Emmons Crusher	2,672,868	132,392

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Names of companies.	Zinc ore, pounds.	Lead ore, pounds.
Murphy & Murphy	1,341,790	71,796
Illinois Lead and Zinc Co	1,851,936	126,924
Empire Mining Co	1,093,548	51,252
Vest & Co	725,244	255,492
Templar	696,888	9,024
James Murphy, Crusher No. 2	983,780	51,218
Conner & Brewster	2,280,340	428,335
A. Cohen	234,624	10,968
J. Brown Mining Co	196,572	302,364
Moll, Weber & Co	423,240	221,616
Fahlenbock, English & Co	398,496	8,024
Gevilla Mining Co	237,200	72,000
Pond & Stevenson	455,904	5,952
Pond & Louderback	384,552	6,240
Rockingham	102,216	2,400
Blaker Co	242,544	75,456
Midland	375,605	5,316
Ohio Lead and Zinc Co	120,540	25,808
Maggie Taylor	100,440	127,332
Ol. Sparks	16,656	51,468
Pond & Bryant	66,732	7,800
Johnson & Prehm	63,600	42,000
Central mine	2,064	66,516
Cornwall mine	13,200	5,820
Bonanza mine	73,548	3,468
Wyandotte	89,592	9,600
Splitlog	27,658	.....
State Line	969,024	.....
Sundry sales	1,344,069	686,177
Totals	43,350,888	8,347,927

Value of zinc ores	$200,352
Value of lead ores	433,510
Total value of output of 1890	$633,862

Average value of lead ore, per thousand pounds, $24.
Average value of zinc ore, per ton, $20.

The year 1890 has been paradoxical. It has been both the worst and the best year of ore production in the history of Galena. On account of the low price of both lead and zinc ore until the close of the year, many of the large companies, particularly the Southside Mining and Manufacturing Company, shut off their production as much as possible. Had this company been running to its full capacity it would have increased the total output of the Kansas mines at least one third. The cause of this is the development of new territory, there being more than three times the area developed at the close of the year than there was at the beginning. The gradual increase in the consumption of both ores, particularly the zinc, has caused a corresponding increase in the demand, and the outlook for 1891 shows a continued increase in the consumption and demand for both these ores. On this account, the prices of ores are considerably higher at the close than at the beginning of the year, and the indications are that the output of lead and zinc ores, from the Galena and Empire City district of 1890, will be doubled in 1891. These zinc and lead mines are pronounced the most valuable in the country, and Galena is recognized in all the markets of the world, as one of the largest producers of lead and zinc ores. Turning out annually, as it does, ore of the value of almost a million dollars, it must be an industry of no small importance to the State.

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Because of its being a comparatively new industry in Kansas, and having apparently so small an area, it has been somewhat neglected by the State, and has not received the attention that it should. As an ore-producing district, it is a large one; there being several thousand acres of ore-bearing lands already developed, with every indication that the developments have only begun. Southeast Kansas will be the greatest wealth-producing district in the State, and being surrounded as it is by extensive coal fields, its ores will, no doubt, in the near future, be reduced in the district where they are produced, and made ready for the consumer before they are shipped from the mines.

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SALT MINES AND SALT WELLS.

It has long been known that there were salt beds underlying the central portion of the State. Where wells have been sunk the flow of salt water was often abundant, and in some places the salt, or its brine, appeared on the surface. Within the last five years wells have been drilled at Hutchinson and Kingman, producing large quantities of good, pure salt. One well in operation at Kingman forces the water down a two-inch pipe, to a depth of 950 feet, by a duplex Blake pump; it comes up outside the pipe, saturated with 25 per cent. of salt which is run into a large evaporating-pan, where the salt falls to the bottom of the pan, and is drawn to each side with scrapers, thence into a bin, ready for packing and shipping. The Kingman Rock Salt Company are operating a shaft 807 feet deep, one mile north of the city of Kingman, where they have a vein 11 feet thick, taking out rock salt for shipment, and have a good hoisting-engine and machinery for preparing the salt in proper sizes for the requirements of the trade.

The Kingman Crystal Rock Salt Company are sinking a large shaft, one and one-half miles northeast of Kingman, and are down over 800 feet. They passed through one vein 11 feet thick, and will sink to a depth of 1,000 feet, to a 40-foot vein. When in operation this shaft will have a capacity of 2,000 tons per day. This company will build a soda ash factory, and use a good deal of the salt for that purpose. There is also a shaft sinking to the same veins of salt at Lyons, in Rice county. At Kanopolis, in Ellsworth county, a shaft has been sunk, which recently passed through two veins of salt, one 50 and the other 90 feet thick, making a total thickness of 140 feet. The salt is hard, dry, and crystalline, containing 97½ per cent. pure salt, and compares favorably with the best quality of manufactured salt. This company also intends to manufacture soda ash. This industry will employ a large number of workmen and miners, when in full operation.

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RECOMMENDATIONS—THE MINING LAW.

For the better protection of the miners, and other workmen employed in and about the mines, it is necessary that legislative action be had on the present incomplete mining law. The law needs revision, and some essential additions thereto are required.

At every session of the Legislature, with one exception, changes have been made in section 2, chapter 117, Session Laws of 1883. Every change has made it worse and more complicated. The amendments made at the session of 1889 to the above section exempts shafts which are seven hundred feet deep, or over, from the operation of the law. The final provision of the section leaves the responsibility of the number of men to be employed in such mines on the Mine Inspector. Another material change in the same section is the one changing the depth that an escapement-shaft shall be sunk during each six months from 100 to 50 feet. Such changes as noted above are retrogressive, and not in accordance with the mining and mechanical engineering knowledge of the last quarter of the century; when it is a well known fact that shafts have been sunk in the State over 800 feet deep in six months. No doubt the cost of sinking a shaft to a depth over 700 feet is considerable; but what is cost compared with the lives of the workmen? Such examples as the Hartley disaster in England, where 204 lives were lost, and the Avondale holocaust in Luzerne county, Pennsylvania, with many similar cases where so large numbers were not involved, should be a bar to all legislation even tacitly favoring the working of single shafts—except that necessary to make the proper communications.

Section 6 of chapter 143, Session Laws of 1885, repealed section 4, chapter 117 of Session Laws of 1883, read as follows:

"SEC. 4. Where the natural strata are not safe, every working, pumping and escapement-shaft shall be securely case-lined or otherwise made secure, and all escapement-shafts shall be provided with ladders securely fastened, so as to bear the combined weight of not less than ten men ascending or descending the same; and where ladders cannot be conveniently used, other safe means of hoisting the persons employed in any such coal mine shall be kept ready, so as to be available in case of any accident to the regular hoisting-shaft, or to the machinery in use at the same."

The repealing of this section left no provision nor means of escape by a second opening in case of accident to the main hoisting-shaft, thus rendering two of the principal provisions of the law nugatory. This section, or one similar, should be enacted into law as soon as possible.

Section 2, chapter 143, Laws of 1885, added the following amendment to section 7, chapter 117, Laws of 1883, as follows:

"No miner, workman, or other person, shall take into any mine more than five

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pounds of powder at one time, and this shall be used before taking any more into the mine; and all powder, or other explosive substance, shall be kept in a close, tight vessel."

When the above was enacted into law, the shots in the mines were fired twice each day. In fact, this part of the law was a dead letter until the explosions at Fleming and Frontenac drew the attention of the operators and miners to the large quantities of powder which were always in the mines when each man took down a twenty-five pound keg of powder as he required it. The above should be changed, giving each miner twelve and one-half pounds of powder, and no more until that is used, and make the operators and their officers equally responsible with the workmen for compliance with the law.

The 17th section, chapter 117, Laws of 1883, requires a boy to be twelve years of age before he is allowed to be employed in the mines; however, I am of the opinion that this provision, in some cases, is violated by parents stating that their boys are of lawful age. It would be advisable to add a provision in this section requiring the parents of boys applying for employment to make affidavit as to the son's age before he is given work by the superintendent or mine boss.

Section 4, chapter 143, Laws of 1885, provides that it shall be the duty of the Inspector to visit each mine in the State at least twice each year. As there are 200 mines in the State, and to make even a cursory inspection of each one would take the greater part of one day, it would require 400 days to comply with the law. As some of the mines in the State are 400 miles apart, and a great many over 200 miles, it can be plainly seen that it is a physical impossibility for one individual to fulfill this requirement of the law as Mine Inspector.

As no provision is made for any assistance, or for office, or for expenses of any kind, not even for postage, which of itself is quite an item, I have (although not empowered to do so) employed assistance in the inspection of the mines, which had to be paid out of my salary, besides traveling expenses, including livery hire. The correspondence with this office is steadily increasing. During the last year there has been a growing demand for information concerning mining property of all kinds, lead, zinc, coal, and salt mines being inquired after, to all of which I endeavored to give the best information in my possession. This, of course, was an additional burden, over the regular routine of the office. If the Legislature would provide for clerk hire, or an assistant mine inspector, with some provision for traveling expenses, postage, and express charges, it would aid the Inspector in keeping up with the ever-increasing duties of the office.

During the year 1890, a new development in mining took place, namely, that of salt mining. It has been suggested to me by some of the workmen engaged therein that salt mines should be placed under the provisions of the mining laws which could be made applicable thereto. True, salt mines do

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not generate carburetted hydrogen, or fire-damp; yet as a large amount of explosives are used in mining salt, which generate deleterious gases and vitiate the air, no argument is necessary to prove the fact that if the State protects the lives and health of one class of workmen in coal mines, it should extend the same protection to those engaged in salt mining, as the dangers to all are nearly in the same ratio.

PART II.

RULES.

In answer to frequent inquiries for rules governing coal mines, I herewith append the printed rules of the Cherokee and Pittsburg Coal and Mining Company, at Frontenac, Crawford county, the Kansas and Texas Coal Company, and the Osage Carbon Company, at Osage City, Osage county, Kansas:

CHEROKEE AND PITTSBURG COAL AND MINING COMPANY.

Hereafter the following rules and regulations will be observed by all employés of this company:

1. *Signals from Cager to Engineer.*—To hoist coal—one stroke of bell. To stop cage when in motion—one stroke of bell. To hoist cage when stopped in shaft—one stroke of bell. To lower cage—two strokes of bell. To hoist men—three strokes of bell. To hoist rock—four strokes of bell.

Signals from Topman to Engineer.—The topman will use the same code of signals as the cager, but they will be struck upon a separate bell in engine-house.

Hoisting or Lowering Men.—When the engineer receives the signal for hoisting men (three strokes of the bell), he will at once prepare to hoist, and, when ready, will signal back to cager through speaking-tube. The cager will then place the men on the cage, and, when all are ready, signal engineer to hoist by one stroke of bell. The engineer will then hoist the men at a slow speed, keeping his engine carefully under control and engine-brake ready to apply at any moment. All signals must be distinctly given.

2. The engineer will sound the whistle at 5 A. M., 6 A. M., 7 A. M., 12 M., 1 P. M., and 6 P. M. The cages will be run for the accommodation of employés between 6 and 7 A. M. and 6 and 7 P. M.; at 7 A. M. and 7 P. M. the hoisting of coal will commence, and employés will not be permitted to ride up or down after that hour, except in case of accident. After 4 P. M. and 4 A. M. employés in parties of six may be hoisted by permission of the pit boss.

3. In no case will more than six persons be permitted to ride on a cage. Employés will not be permitted on a cage with tools, with empty or loaded pit wagons, or opposite a loaded cage. Employés having tools to send up or down will deliver them to the cager or topman who will provide for their transportation. The cager and topman will be held strictly responsible for the enforcement of this rule.

4. The pit boss has the sole and immediate charge of the shaft, the workings, and all the employés connected therewith, and will be held responsible for the same. It is his duty to know that the shaft, mine-workings, pit cars and all machinery are in good order; that all entries and rooms are properly driven, and that air-ways, roads and doors are kept in good order.

5. The weighmaster has charge of the top works, subject to the pit boss. He will carefully weigh all coal, will see that every man is at his post, and all work so handled as to insure the best results.

6. The fire boss will visit all parts of the mine before 6 A. M. and 7 P. M., daily, and mark the day and month on the face of each room and entry. He will then return to the bottom of the shaft and report to the mine boss the exact location of gas or dangerous places, if any exist; he will remain at the bottom of the shaft until all

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employés have entered the mine, and no one will be permitted to enter the workings until he has seen the fire boss, and knows that his place is safe. If the fan stops, the pit boss will send all employés out of the mine, and put out all lights.

7. The topman must know that the hoisting-ropes, chains, cages, and all other apparatus connected with the shaft or top works are in good and safe condition. If found otherwise, he will immediately stop hoisting and report the facts to the pit boss; no more hoisting, either of men or coal, will be done until the same is repaired and made safe. The topman is the only person authorized to attend the lowering of employés and to give the signals to the engineer for that purpose; he will also see that no person goes on the cage until the engineer is ready. The topman shall see that a sufficient supply of props and caps are continually on hand; he will not, under any circumstances, throw any timber down the shaft, nor permit it loaded on cars after they are on the cage. Tracking or long timber must be sent down on an empty cage; the topman must see that it is properly tied in place. The topman will be held strictly responsible for the enforcement of the rules in this section, and will not leave his post without permission of the weighmaster.

8. The cager must know that the pit bottom and all connected works and machinery are in good order; if found otherwise, he will immediately stop hoisting and report all facts to the pit boss. The cager is the only person authorized to attend to the hoisting of employés, and to give signals to the engineer for that purpose; he will also see that no person goes on the cage until the engineer is ready. The cager will be held strictly responsible for the enforcement of the rules in sections 1 and 8, and will not leave his post without permission of the pit boss.

9. No person or persons except those employed therein will be permitted to enter the engine-room or weigh-office, or to speak to engineers or weighmaster while on duty. None but employés will be permitted to enter the mine without a written permit from the superintendent, and not then if intoxicated or otherwise unfitted to enter. Quarrelsome or intoxicated persons will not be permitted in or about the works.

10. All persons are required to carefully close ventilating doors after passing through them. Any person observing any ventilating door open or an air-way in any way damaged so as to injure the ventilation of the mine or its safety in any way, must immediately inform the pit boss, so that the same may be repaired with as little delay as possible. Employés passing through doors in an entry or air-way, and neglecting to close the same will be discharged.

11. Any employé taking tools, timber, or other material of any kind, not belonging to him, will, for the first offense, be charged with the article or articles so taken, and the cost of their recovery; for the second offense he will be discharged from the company's employ. The abuse of mules and the destruction or waste of company property will not be permitted.

12. Every miner will be held strictly responsible for the condition of his working-place, whether in room or entry, and will be required to prop and work the same properly. No miner or other workman will be permitted to take possession of any room or entry without permission of the pit boss. No person will be allowed to stow or deposit anything in an old room, entry, road-way or air-way, without permission of the pit boss. The company will not be responsible for any accident occurring at any working-face of room or entry, nor at any other part of the mine, if caused by carelessness or neglect of the party injured.

13. Any employé discharged from the works will be required to leave his place in good condition, to deliver any company property in his possession to the mine boss; and, if he occupies a company house, to vacate the same before a final settle-

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ment and payment of his services is made. Any employé neglecting or refusing to keep his place in good and safe condition will be discharged from the works, and the cost of putting his place in proper shape deducted from any balance due.

14. All disputes between miners or other employés, and all other cases of dissatisfaction, shall be promptly referred to the pit boss, whose duty it shall be to hear and adjust the same, failing in which the matter may be referred to the superintendent.

KANSAS AND TEXAS COAL COMPANY.

1. Miners, or other workmen engaged at the mines, shall read, and such as cannot read, shall have these rules read to them; and all persons engaging in the service of the company must be governed by these rules and regulations.

2. Every employé of the company will be required to be ready for duty when the whistle blows for work every morning, and will be expected to perform a full day's work of ten hours, in his respective line of employment, unless the foreman of his department orders less time to be worked. Engineers are strictly forbidden to lower any miner, or underground laborer, into any pit after seven o'clock A. M., without orders from the superintendent or pit boss.

3. No suspension of work shall take place during working-hours, except in case of actual necessity, and no meeting of any character shall be held in the pit.

4. Any employé feeling aggrieved in any respect must present his complaint to the pit boss in person; if he fails to adjust the matter in a manner satisfactory to the employé, it may be referred to the superintendent, whose decision, upon the hearing of both sides of the question, shall be final.

5. No person, miner or other workman, where a stairway or other passage is provided, in mines not over sixty feet in perpendicular depth from the surface of the ground, shall be lowered or hoisted with the cage or car, into or out of the mine.

6. As each shaft is provided with a pass-way around the shaft at the bottom, all persons employed in the mines, or others, are strictly forbidden to cross over from one side of the shaft to the other, either on the cage when resting on the bottom or under it when ascending or descending in the shaft, and it shall be the duty of the pit boss to see that all pass-ways from one side of the shaft to the other are kept clear of obstructions.

7. Miners and other workmen employed in the mines, having any knowledge of noxious gases or bad air generated from the explosion of powder, insufficient ventilation, or other causes, which will render his place or the mine unsafe to work in, will notify the pit boss at once; and under no circumstances must he enter his room, or place, until it is cleared of such foul air or gases.

8. To avoid accidents from mines being in an unhealthy condition, no miner or other workmen will be permitted to enter or remain in the mine at night after working-hours, for any purpose whatever, without first obtaining permission of the pit boss.

9. All persons employed in the mines, knowing of any failure on the part of the pit boss to properly ventilate the mines, or in any way to neglect to take every precaution for the safety of the company's employés, must report the same at once to the superintendent, or in his absence, to the office of the company.

10. Miners are strictly forbidden, when firing a shot, to go into the next room for safety, but are required to go to a safe distance on the entry, in order to be out of all danger arising from the explosion of the shot.

11. Miners are strictly forbidden to fire a shot, without first giving warning of their intention to other workmen in the immediate neighborhood, and must wait until all are at a safe distance.

12. All coal must be mined and cut on the rib before shooting down the same; no shots allowed on the solid.

13. In mines not generating fire-damp, or other dangerous gases, the time for firing shots shall be at twelve o'clock noon, and half-past five o'clock in the evening, and in no case will an employé be permitted to fire a shot later than fifteen minutes past twelve o'clock noon, thus avoiding the danger of workmen, on their return to work after dinner, being overcome by noxious gases arising from the explosion of powder from said shots. This section does not apply to mines where shot-firers are used, or where it is a rule to only fire once per day.

14. It shall be the duty of every miner working in the mines to keep his room in the mine well propped, in good order and repair, to keep them perfectly safe in every way, and any miner who shall willfully, negligently, or carelessly suffer his room to get out of order and repair, and who shall not, upon request, immediately put same in repair, the company may put such room in repair at the expense of the miner in default, and may retain the amount of such expense from the next or any future payment to which said employé would be otherwise entitled, until fully reimbursed for such expense.

15. In working-places where the roof is dangerous and sufficient timber cannot be procured, it shall be the duty of the workman or miner to notify the pit boss at once, and stop work until timber can be obtained. All timber and rails will be furnished each working-place at the point of delivery of empty cars to be loaded by the miner after the same have been ordered by him.

16. No miner who has left the employ of the company, whether voluntarily or by discharge, will be entitled to receive any arrearages of pay due him for labor performed, whether on the regular pay-day or during the interval preceding pay-day, until he shall have put his room in perfect working order, as required by the company. All miners leaving said employment will be required to procure the certificate of the pit boss that they have complied with the requirements of the rule as aforesaid, before making application at the company's office for final payment.

17. If any miner or other workman should leave an empty pit-car in his room over-night, and the car should be lost or destroyed by the caving in of the room, or the firing of a shot, the full value of said pit-car will be charged to him.

18. The engineer, or person for the time being, having charge of the engine and boiler, must keep a sufficient depth of water in his boiler under all circumstances, and in case he fails to do so, he must immediately dampen the fires, and report the exact situation to the person in charge over him. In no instance shall a fire be started under the boiler until the person employed for that purpose shall have first ascertained that the boiler contains an ample supply of water.

19. All loitering, loafing or idling in the engine room or on the pit-top is strictly forbidden, and no one will be allowed in the engine room except those having charge of the same.

20. Every employé in the mine, except those whose duty it is to attend to that part of the work, is strictly forbidden to meddle in any way with the signal bells at any time; and in no case must anyone, except the cager, who is in charge at the bottom of the shaft, ring off the cage.

21. It shall be the duty of the topman to examine daily the ropes, chains, cages and all attachments to ropes and cages on shafts or slopes, to see that they are secure, and in case that any defect is discovered, to report to the superintendent or other person in charge at that time, and if the defect be of such nature as to jeopardize the lives of the workmen in and about the shaft or slope, he shall notify the engineer, who shall use all precaution until such defects are repaired.

22. All drivers having charge of mules and the hauling of the coal from the miners,

must be in the mines and have their mules fed, cleaned and harnessed, and be ready for work not later than fifteen minutes before 7 o'clock A.M.; and any driver known to have abused or mistreated his mules shall be discharged at once.

23. Any miner or other workman taking tools or powder not belonging to him shall be discharged from the service of the company.

24. In mines where gas, commonly known as fire-damp, is generated, all miners or other underground workmen are strictly prohibited from entering their working-place or roadway at starting-time in the morning, until they have been notified by the fire boss, or person acting in that capacity, that there is no standing gas therein and that it is safe for them to enter the same. The fire boss, or person acting in that capacity, shall examine every working-place in the morning for standing gas before any miner or other underground employé shall enter the same; and he shall mark the day of the month at some conspicuous point in each working-place with chalk, which will be evidence that he has made the examination. After he has made the examination he shall ring an agreed number of bells to the engineer, which will signify that it is safe or not safe, as the case may be, for him to lower the underground employés into the mine. The mine being reported to the engineer as safe to enter, the fire boss shall station himself at the entrance of the mine, and shall notify and acquaint the workmen with the condition of their working-places. If he should find any dangerous quantity of gas in any working-place, he shall notify the parties expecting to work therein not to enter, and he shall also notify the pit boss or superintendent as to the result of his examination, and they will assist him in removing the same in a careful manner and avoid accidents to workmen in other portions of the mine.

25. Any miner, workman, or other person who shall intentionally injure any safety lamp, instrument, air-way, brattice, or obstruct or throw open air-ways, or carry lighted lamps, pipes or matches into places worked by the light of safety lamps, or shall move or disturb any part of the machinery, or open a door and not close it again, or enter any place of the mine against caution, or disobey any order given in carrying out the provisions of this act, or shall intimidate, hinder, prevent or attempt to intimidate, hinder or prevent any person from performing any labor in or about said mine or mines by consent of owner or operator, or who shall do any willful act whereby the lives or health of persons, or the security of the mine, or the machinery is endangered, shall be deemed guilty of a misdemeanor and be discharged at once.

THE OSAGE CARBON COMPANY.

1. The pit boss has the sole and immediate charge of the shaft, the workings, and all the employés connected therewith, and will be held responsible for the same. It is his duty to know that the shaft, workings, pit-cars, and all machinery are in good order; that all entries and rooms are properly driven, and that air-ways, roads and doors are kept in good order.

2. The topman must know that the hoisting-ropes, chains, cages, and all other apparatus connected with the shaft, or its top works, are in good and safe condition. If found otherwise he will immediately stop hoisting, and report the fact to pit boss; no more hoisting, either of men or coal, will be done until the same is repaired and made safe. The topman is the only person authorized to hoist or lower employés; no person will be permitted to go on a cage, or place anything thereon, until he is ready; he will not permit any person to be hoisted or lowered opposite a loaded cage, nor to ride on a loaded cage, nor more than three persons to ride on any cage at any time. No person shall go on the cage at the pit-bottom until the topman shall signal that all is right. No tool or tools of any kind shall be carried

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on a cage with men, nor opposite a cage loaded with men. The topman shall see that a sufficient supply of props and caps are continually on hand; he will not, under any circumstances, throw any timber down the shaft, nor permit it loaded on cars after they are on the cage. Tracking or long timber must be sent down on an empty cage; the topman must see that it is properly tied in place. The topman will be held strictly responsible for the enforcement of the rules in this section.

3. Every miner will be held strictly responsible for the condition of his working-place, whether in room or entry, and will be required to prop and stow the same properly. Any miner sending out dirt or rock when he has room to stow it in his place will be dismissed. Any miner having more than three feet of brushing in his place will not be allowed to send up any more coal until such brushing is done, and the place put in proper shape. No miner or other workman will be permitted to take possession of any room or entry without permission from the pit boss. No person will be allowed to stow or deposit anything in any old room, entry, roadway or airway without permission from the pit boss. All persons are required to carefully close ventilating doors after passing through them. Any person observing any ventilating door or an airway in any way damaged, so as to injure the ventilation of the mine, or its safety in any way, must immediately inform the pit boss and roadmen, so that the same may be repaired with as little delay as possible.

4. All disputes between the miners or other employés, and all other cases of dissatisfaction, shall be promptly referred to the pit boss, whose duty it shall be to hear and adjust them; failing in which, the matter may be referred to the superintendent. None but employés will be permitted to enter the mine without a written permit from the superintendent, and not then if intoxicated or otherwise unfitted to enter.

GLOSSARY OF TECHNICAL MINING TERMS.

The following is a glossary of the terms most frequently used by miners throughout the States:

After-Damp.—The mixture of gases remaining in a mine after an explosion of fire-damp, which may consist of carbonic-acid gas, carbonic-oxide, water-vapor (quickly condensed), nitrogen, oxygen, and in some cases, free hydrogen, but usually consists principally of carbonic-acid gas and nitrogen, and is therefore irrespirable.

Air-Pipe, or Air-Box.—Square boxes made of wooden boards in sections, eight to sixteen feet long, for the conveyance of air into tunnels, etc.; also, iron pipes used for conveyance of compressed air.

Air-Stack.—A ventilating chimney.

Air-Way.—Any passage used for passage of air for ventilation.

Anemometer.—An instrument used for measuring the velocity of the ventilating current of air.

Arenaceous.—Sandy rocks are arenaceous when they contain a considerable percentage of sand.

Argillaceous.—Clayey. An argillaceous rock is one that contains a considerable percentage of clay, or has some of the characteristics of clay.

Band.—Interstratified rock in coal.

Brushing.—To cut down the roof of an entry, or passageway in the mine, after the coal has been mined away, to make height for mules, etc.

Bank.—A word often used amongst miners in referring to the coal mine.

Battery.—Any structure built of timber or plank to keep the coal in the room, or prevent it from sliding down a chute when not wanted. This is used on pitching veins.

Bear; to bear in.—Usually applied to underholing or undermining.

Bed.—A regular member of a stratified series deposited or formed after the underlying and before the overlying rock.

Bed-rock.—The solid rock underlying the soil drift or alluvial deposit.

Bench.—A natural terrace marking the out-crop of any stratum; a division of a coal-seam separated from the remainder by a parting of slate, shale, iron pyrites, sulphur, or other foreign matter.

Bit.—A drilling-chisel.

Black-Damp, Choke-Damp.—Carbonic acid gas = CO^2; thus distinguished from white-damp or carbonic oxide = CO.

Blossom.—Out-crop of a coal bed or mineral deposit.

Blower.—A strong discharge of gas from a fissure.

Blow-out; to blow out.—A blast is said to blow out when it acts like a cannon, throwing out the tamping without bringing down the rock or coal.

Bone coal; bone.—Slaty or argillaceous coal, or carbonaceous shale, occurring in coal seams.

Bottom-Lift.—The lowest or deepest lift.

Bottom.—The landing at the bottom of the shaft or slope; the lowest point of mining operations; the floor-bottom rock, or stratum, underlying a coal-bed.

Brattice.—A board or plank lining or partition, in any mining passage, to confine

air and force it into the working-places. Its object is to keep the intake air from finding its way by a short route into the return air-way.

Brattice Cloth.—A heavy cloth or canvas, often covered with some water-proof material, for temporarily forcing air into the face of the room or entry; also used in place of doors at the entrance of rooms. They are then frequently called "sheets.' Such brattice cloth should be uninflammable in gaseous mines; this is not so, however, in many instances.

Bridle Chains.—Safety chains to support the cage if the middle link should break; when two chains are used in a slope, (instead of attaching the rope by a single chain to the draw-bar of a car,) they are also called bridle chains.

Bucket.—The piston of a lifting pump; or a bucket used in sinking shafts.

Buntins.—Timbers placed horizontally across a shaft to carry the cage guides and column pipes, also to strengthen the shaft-timbering.

Butty.—A partner or comrade working with another in the coal mine.

Cage.—A platform on which men and cars are raised to the surface from the mine.

Cap, Cap-piece.—A piece of plank put on the top of a prop next the roof.

Cap.—The pale bluish elongation of the flame of a safety-lamp, caused by the presence of gas; fire-damp.

Carbonaceous.—Coaly; containing carbon of coal.

Carboniferous.—Containing, or carrying coal; thus: carboniferous rocks, the carboniferous formation.

Cave; to cave in.—Falls from the roof, or sides of the entries or rooms of a mine.

CH^4.—The chemical notation for carburretted hydrogen or fire-damp.

Chain Pillar.—A pillar left to protect the top of entry and air-way, and running parallel between these passages.

Charge.—The amount of powder used in one blast or shot.

Chocks.—Shanties; a building built with logs or props crossing one another to support the roof in a place where an extra creep of the stratum takes place.

Clanny Lamp.—Safety lamp invented by Dr. Clanny. This lamp differs from the Davy in having the lower portion of the covering made of glass, instead of being wholly gauze.

Clinometer.—A small pocket instrument, provided with a spirit-level and graduated arc, for measuring the angle of a dip.

Coal Measures.—The carboniferous formations.

Cleavage.—The property of splitting more readily in some directions than others.

Collar.—The horizontal timber resting upon two upright or inclined legs or props, for the support of the roof in an entry or air-way.

Colliery.—This term is used to denote not only the mine, but includes also all the structures that make up the plant of the surface: the mine and all its adjuncts.

Column Pipe.—Cast-iron or wrought-iron pipes through which the water is conveyed from the mine pumps to the surface.

Conglomerate.—The rock formation, consisting of pebbles and fragments of various rocks cemented together.

Creep.—A squeeze or crush, forcing the pillars down into the floor or up into the roof, which often gives the miner the impression that the floor is rising.

Crevice.—A fissure in rock or coal.

Crib-Work.—A structure composed of horizontal frames of timber laid one upon another, built like a log-cabin.

Cribbing.—Timbering a shaft with crib-work; it commonly extends from the surface down to bed-rock.

Crop.—To come to the surface, and crop out.

Cross-Cut or Cross-Heading.—A passage driven for ventilation through the pillar between entry and air-way.

Davy Lamp.—A safety-lamp, invented by Sir Humphrey Davy, with a fine wire gauze inclosing the flame; 784 apertures to the square inch; frame-work, brass.

Dead-Air.—The air of a mine is said to be dead or heavy when it contains carbonic acid gas (black-damp), or when the ventilation is sluggish.

Dead-Work.—Work not in itself productive of enough coal to pay the cost of driving, or producing nothing at all.

Derrick.—The structure erected for drilling or hoisting process.

Dip.—The angle of inclination of the coal seams or mineral bed or vein, measured from a horizontal line.

Door.—Doors are placed in the passages of mines to prevent the ventilating current from taking a short cut to the up-cast shaft.

Door Trapper.—A boy whose duty it is to open and close a mine door before and after the passage of a mine car.

Down-Cast.—The passage or air-way through which the ventilating current passes into a mine.

Draw.—To draw the pillars; robbing out the pillars after the room is exhausted.

Drift.—A level tunnel driven in on the bed from the surface.

Driving.—Excavating horizontal passages.

Dump.—The tipple by which the cars are dumped on the slate or slack-dump.

Entry.—A level used for a haulage-road, from which rooms are turned.

Face, or Working-Face.—The place at which work is being done in a room-entry or air-way.

Fault.—The place where the stratum is broken by some upheaval, and disappears from the continuous line.

Feeder.—A spring of water encountered in mining operations, or a small blower of gas.

Fire Board.—A board on which the fire boss indicates by chalk-marks where gas is found in different parts of the mine.

Fire Boss.—A man whose duty it is to examine the workings of the mine for accumulations of explosive gas.

Fire-damp.—CH^4, light carburetted hydrogen, an inflammable gas, explosive when mixed with air in certain proportions.

Floor.—The rock underlying the coal-seam.

Free Coal.—Coal is said to be free when it is loose and easily mined.

Gang.—A set of miners—a shift.

Gas.—Fire-damp.

Gob.—A space from which the coal has been mined, and refuse or waste left therein.

Gob-Fire.—Fires originating spontaneously from the heat of decomposed gob.

Guide.—Vertical timbers fastened to the buntins to steady and guide the cage in a hoisting-shaft.

Head-Frame.—A structure erected over a shaft to carry the sheaves and steady the cage.

Head-Gear.—That portion of the winding-machinery attached to the head-frame.

Heading.—A term usually given to an entry going to the rise of the vein or cross-heading.

Hog-Back.—A short anticlinical axis of limited extent.

Holding Through.—Driving a passage through to make connections with another part of the working, or with those of an adjacent mine.

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Incline.—A slope; any inclined plane, whether above or beneath the surface.

Indicator.—An instrument or device for indicating the position of the cage in the shaft.

Intake.—A passage by which air enters the mine or down-cast.

Keeps, or Keps.—Catches or rests to hold the cage when it is brought to rest at the top, or any intermediate landing, (commonly called shuts or fans.)

Lagging.—Small round timbers, slabs or planks driven in behind the legs and over the collars, to prevent pieces of roof from falling through.

Landing.—Any place where cars are taken off or put on a cage or slope.

Latches.—Synonym for switch, applied to split rails or hinge switches.

Leg.—Props on which the collar rests in entry or other timbering.

Level.—A horizontal passage in a mine.

Lift.—The number of entries from which coal is raised in a colliery. This term refers to the number of pump-lifts also.

Long-Wall.—A method of working coal where no pillars are left, and the roof is supported by pack-walls, gob, etc. This method is often adopted where the coal vein does not exceed four feet.

Loose-End.—A place mining along side of a place previously worked out.

Man-Hole.—A small place cut back into the side of self-acting planes, slopes, or entries, for the safety of the miners during the passage of the mining-cars.

Man-Way.—A small passage-way used as a traveling-way for the miner; also used as an air-way for rooms on a pitching vein.

Measures.—Rocks, or a series of rocks having some attribute in common; thus, coal measures, containing coal, etc.

Narrow Work.—Entries and air-ways, cross-cuts and cross-headings.

Needle.—An instrument or tool placed in a drill-hole during the tamping of a charge, to leave on its withdrawal an opening through which the charge can be fired by a squib.

Outcrop.—That portion of a vein-bed, or any stratum, appearing at the surface or occurring immediately beneath the soil or alluvial debris.

Outlet.—A passage furnishing an outlet for air (up-cast, out-take) for miners, for water, etc.

Output.—The product of a mine sent to market.

Overcast.—A passage through which the ventilating-current is conveyed over an entry or air-way.

Pack Wall.—A wall or pillar built of gob to support the roof.

Parting.—A layer of slate or other matter dividing two benches of a coal seam.

Pillar and Room.—Pillar and stall, stoop and room, etc., a method of mining or working out coal.

Pillars.—A mass of coal left to support the roof.

Plane.—Usually applied to self-acting inclines, but any slope or incline on which coal is raised or lowered may be called a plane.

Plat or Plot.—A map of the surface and workings underground, or of either.

Post.—Any upright timber applied to timbers used for propping.

Prop.—A timber set upright, or at right angles to the dip, to support the roof-rock.

Regulator.—A frame with a sliding door to regulate the air passing into any part of the workings.

Rend-rock.—A variety of dynamite.

Rib.—To take out the pillars, or to reduce by skipping the side of the pillars left to support the roof.

Safety Cage.—A cage provided with an automatic safety catch.

Safety Lamp.—A lamp surrounded by a wire gauze, to prevent the direct contact of the flame with explosive gases.

Sand Pump.—A sludger; a cylinder provided with a stem (or other) valves lowered into a drill-hole to remove the pulverized rock.

Scraper.—A tool used for cleaning out drill-holes.

Sheave.—A wheel with a grooved circumference, over which a rope is turned, either for the transmission of power or for winding or hauling.

Sheets.—See Brattice Cloth.

Siliceous.—Containing or having the characteristics of quartz.

Slack.—Small coal or dust from coal.

Slides.—See Guides.

Slope.—An inclined passage driven in the bed or vein opening up the surface.

Soapstone.—A term incorrectly applied to an unctuous rock.

Split.—Any division or branch of the ventilating current.

Sprag.—A short billet of wood or iron used to block the wheels of a mine-car in place of a brake.

Spring Latch.—A spring or automatic switch.

Slopping.—A brattice, or more commonly, a masonry or brick wall built in a cross-cut, to confine the air or direct it to face of workings.

Stratum.—Any bed or layer; plural, strata.

Stump.—A small pillar of coal left between the entry and the rooms to protect these passages.

Sump.—An excavation in the coal or rock made below the level of the entry or shaft-bottom to collect the mine water; the ditches or drains empty into it, and the pump draws it from thence.

Swamp.—A local depression in the coal bed in which the water collects.

Trapper.—A door-tender in the mine; almost always a boy.

Trouble.—A dislocation or fault; any irregularity in a coal-seam.

Upcast.—The opening or passage through which the air goes out of the mine.

Vein.—This term is often applied to stratified beds, but its use should be restricted to mineral deposits.

Water-Gauge.—An instrument for measuring the ventilating pressure; the term is also used to denote the ventilating pressure in inches.

Whim.—A horse gin used for hoisting.

White-Damp.—CO (carbonic oxide), a gas that may be present in the after-damp of a fire-damp explosion, or in the gases given off by a mine fire; rarely met with in mines under other circumstances.

Winding.—Hoisting coal, etc.

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ERRATA.

On page 15, line 7 from bottom of page, "southeast" should read *southwest.*
On page 24, line 3 from bottom of page, "southeast" should read *southwest.*
On page 27, "Robert W. Herscke" should read *Robert W. Herrcke.*
On page 34, line 15 from bottom of page, read *carburetted hydrogen* for "carbonated hydrogen."
On page 46, line 3 from top, read *Rosa Brunner* for "Rosa Bumer."
In table of fatal accidents, page 7, the date of William Holvey's death should be *March 15* instead of "March 10."
On page 81, line 23 from top of page, read *Davy lamp* instead of "Darry lamp."
On page 83, read *lithrolite* for "lithrotite."
On page 84, read *roburite* for "rolemite."
On page 85, line 8 from bottom, read *stripped* for "shipped."

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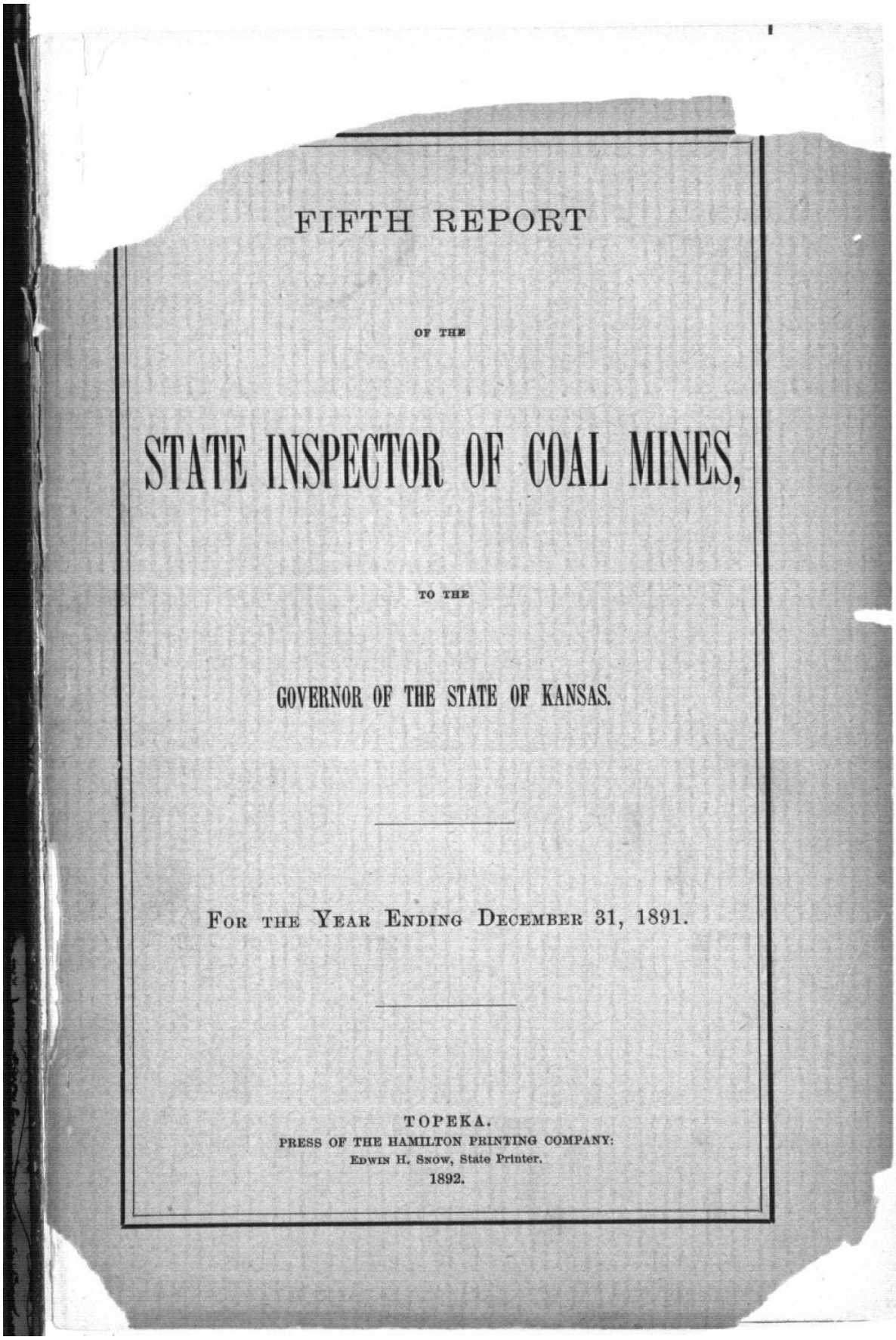


FIFTH REPORT

OF THE

STATE INSPECTOR OF COAL MINES,

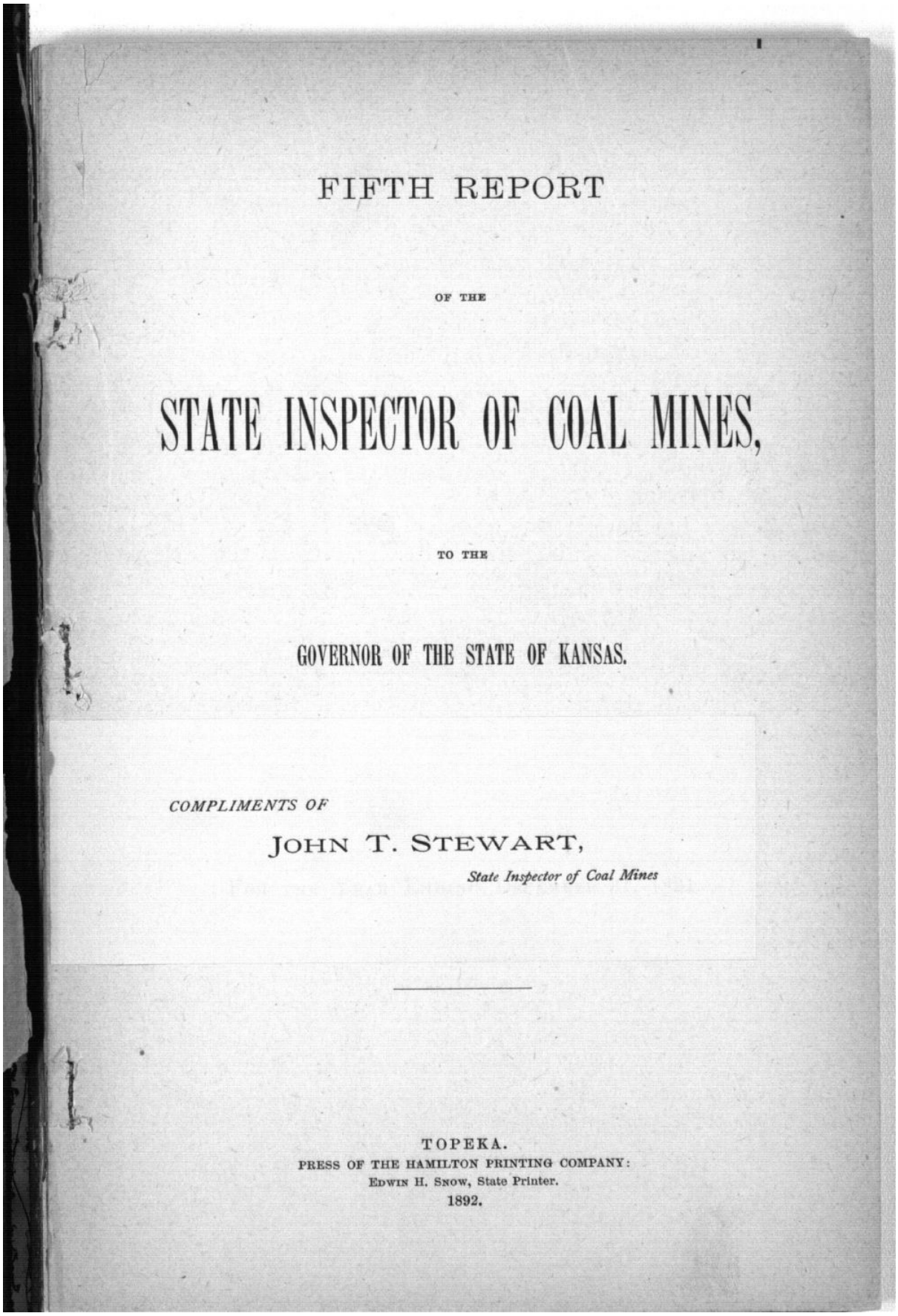
TO THE

GOVERNOR OF THE STATE OF KANSAS.

FOR THE YEAR ENDING DECEMBER 31, 1891.

TOPEKA.
PRESS OF THE HAMILTON PRINTING COMPANY:
EDWIN H. SNOW, State Printer.
1892.

State inspector of coal mines reports



FIFTH REPORT

OF THE

STATE INSPECTOR OF COAL MINES,

TO THE

GOVERNOR OF THE STATE OF KANSAS.

COMPLIMENTS OF

JOHN T. STEWART,

State Inspector of Coal Mines

TOPEKA.
PRESS OF THE HAMILTON PRINTING COMPANY:
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