

State inspector of coal mines reports

Section 43, Pages 1261 - 1290

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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KANSAS
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The Richardson & Woodward mine, located six miles north and two and a half east of Concordia, is a horse-power slope and has two openings. The mine was well ventilated. All roadways were dry and clean. Eight miners and 2 day men, working 240 days, produced 1950 tons of coal, valued at \$4631.25.

The Vermite & Heer mine, same location and address, is a horse-power shaft opening, 75 feet deep and 4x9 in size, and has been in operation five years. This mine has an air-shaft 300 feet from the hoisting shaft which also serves as an escapement shaft. The mine is equipped with a good windmill pump. Two cages are in use. Four miners, working 250 days, produced 800 tons of coal, valued at \$1900.

Concordia is the post-office address of all the operators in this county.

COFFEY COUNTY.

Most of the coal produced in this county is taken from strip pits in the vicinity of Lebo. During the year 1899, the county produced 39,740 tons, valued at \$99,350.00 and employed 276 men and 42 teams an average of 150 days.

G. H. Slead operates the only shaft in the county; it is located 2½ miles east of Neosho Rapids. Depth of shaft, 14 feet; size of same, 5x9 feet. The vein averages 12 inches in thickness, and is worked on the long-wall system. The mine was well ventilated when visited. Roadways dry and clean. The price paid for mining is \$1.87½ per ton; selling price, \$2.50 per ton. Six miners, 1 day man, working 150 days, produced 500 tons of coal during the year.

While the post-office address of Mr. Slead is Neosho Rapids, Lyon county, his mine is located over the line in Coffey county. The same can be said of Hendrickson & Bro. and J. M. Fry, who operate strip pits in Coffey county.

The names and post-office addresses of the strip-pit operators, with the amount of tons produced by each, will be found in the following table:

T. R. Jones, Lebo)	25,000 tons.	Griff Williams, Lebo.....	400 tons.
D. O. Jones, Lebo)		Bert Combs, Lebo.....	400 "
Watson Bros., Lebo.....	3,000 "	Evan Roberts, Lebo.....	300 "
William Dischen, Lebo...	2,000 "	Richard Schnider, Lebo..	200 "
Rollin Rickbaugh, Lebo..	1,500 "	William Morrows, Lebo ..	240 "
Frank Gaddis, Lebo.....	1,100 "	Monte Finney, Lebo.....	220 "
R. J. Stoper, Lebo.....	1,150 "	J. M. Fry, Neosho Rapids,	500 "
Farmer Bros., Lebo.....	980 "	Hendrickson & Bro.,	
Reese Loyd, Lebo.....	600 "	Neosho Rapids,	200 "
T. J. Bristowe, Lebo.....	500 "	G.H.Slead, Neosho Rapids,	500 "
Ben Ransome, Lebo.....	500 "		
Ame Ransome, Lebo.....	450 "	Total	39,740 tons.

Two hundred and sixty day men, six miners and fifty-two teams were employed an average of 150 days during the year.



OTHER KANSAS COAL-MINES.

Office No.	Name of operator or company.	Post-office address.	Name of mine or underground foreman.	Location of mine.	Has mine railroad connection?	Name of railway.	Kind of opening
Atchison County.							
1	W. T. Donald.....	Atchison	James Maynard.....	2½ miles south of Atchison.....	Yes.	Mo. Pac.....	Drift.
Chautauqua County.							
1	Elliott & Jones.....	Leeds	— Elliott.....	Leeds.....	No.	.....	Drift.
Cloud County.							
1	J. W. Marshall.....	Concordia.....	J. W. Marshall.....	Minersville.....	No.	.....	Shaft.
2	Lynn & Jackson.....	".....	— Jackson.....	".....	"	.....	"
3	Thomas Struthers.....	".....	Thomas Struthers.....	".....	"	.....	"
4	".....	".....	".....	".....	"	.....	"
5	".....	".....	".....	".....	"	.....	"
6	Richardson & Woodward.....	".....	— Woodward.....	".....	"	.....	"
7	Vermite & Heer.....	".....	— Vermite.....	".....	"	.....	"
Ellsworth County.							
1	C. W. Kelly.....	Wilson	Leu Taylor.....	Southwest of Wilson.....	No.	.....	Drift.
Elk County.							
1	C. P. Jenks.....	Howard.....	C. P. Jenks.....	5 miles southwest of Howard.....	No.	.....	Slope.
Franklin County.							
1	S. E. Richardson.....	Pomona.....	S. E. Richardson.....	Southwest of Pomona.....	No.	.....	Drift.
2	".....	".....	".....	".....	"	.....	"
3	Henry Kirkman.....	".....	H. Kirkman.....	Pomona.....	"	.....	"
4	Wm. Morris.....	Williamsburg.....	Wm. Morris.....	West of Ransomville.....	"	.....	"
5	Thomas Kearney.....	".....	Thomas Kearney.....	Ransomville.....	"	.....	"
6	David Price.....	".....	David Price.....	West of Williamsburg.....	"	.....	"
7	".....	".....	".....	".....	"	.....	"
8	George Caple.....	Ransomville.....	George Caple.....	Northwest of Ransomville.....	"	.....	"
9	John Morgan.....	".....	John Morgan.....	Ransomville.....	"	.....	"
10	Frank Ribau.....	Ottawa.....	Frank Ribau.....	Southwest of Centropolis.....	"	.....	"
11	Charles Cass.....	".....	Charles Cass.....	10 miles northwest of Ottawa.....	"	.....	"
12	— Babsby.....	Quenemo.....	— Babsby.....	4 miles southeast of Quenemo.....	"	.....	"
13	Wm. Hackett.....	Ottawa.....	Wm. Hackett.....	8 miles northwest of Ottawa.....	"	.....	Shaft.
14	George Melcher.....	".....	George Melcher.....	8 ".....	"	.....	"

Leavenworth County.							
1	Leavenworth Coal Company.....	Leavenworth	Grant Parker.....	North Leavenworth.....	Yes.	*	Shaft.
2	Home-Riverside Coal Mining Company.....	".....	John Paterson.....	Leavenworth	"	*	"
3	State of Kansas	Lansing.....	Thomas Graham	Lansing.....	"	*	"
Linn County.							
1	The Mine Creek Coal Company.....	Pleasanton	George S. Brown.....	2 miles east of Pleasanton	Yes.	Mo. Pac.....	Shaft.
2	Searight & Swanson.....	".....	Ed. Swanson.....	2½ miles east of Pleasanton	No.	.....	"
3	Ben Good.....	Orchard.....	J. S. Good.....	7½ miles east of La Cygne .....	"	.....	"
4	Amsterdam Coal Company	".....	G. H. Gage.....	7¾ miles east of La Cygne .....	"	.....	"
5	A. A. King.....	".....	A. A. King.....	7¾ miles east of La Cygne .....	"	.....	"
6	R. G. Pinkard.....	".....	G. Pullman.....	7 miles east of La Cygne .....	"	.....	"
7	Arthur Vantyle.....	".....	A. Vantyle.....	6¾ miles east of La Cygne .....	"	.....	"
8	J. T. Martin.....	La Cygne	J. T. Martin.....	1½ miles east of La Cygne .....	"	.....	"
9	Strip pits.....	".....	".....	".....	"	.....	"
Lincoln County.							
1	L. P. Nelson.....	Denmark	N. P. Nelson.....	6 miles north of Vesper.....	No.	.....	Shaft.
Republic County.							
1	S. F. Curtis.....	Concordia.....	S. F. Curtis.....	Minersville	No.	.....	Shaft.
Russell County.							
1	Nelson E. Warner.....	Bunker Hill.....	N. E. Warner.....	4½ miles northeast Bunker Hill.....	No.	.....	Slope.
2	W. T. Cushing.....	".....	W. T. Cushing.....	4½ ".....	"	.....	"
Shawnee County.							
1	W. A. Eaton.....	Topeka	W. A. Eaton.....	3¼ miles west of Topeka.....	No.	Shaft.

*All roads entering Leavenworth.

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Office No.	Kind of power used	Tons of coal produced (2000 pounds to the ton).				Number of days mine worked during year.	Average number of miners.	Average number of boys.	Average number of day hands.	Average number of employees.	Av. paid per ton for mining.		Av. selling price at mine.		Estimated value of output.	Casualties.		Average wages paid day men above ground.	Average wages paid day men under ground.	Number of bags of powder used during year.	Remarks.
		Lump.	Kutand slack.	Mine run.	Total.						Lump.	Mine run.	Lump.	Mine run.		Killed.	Injured.				
Atchison County.																					
1	Horse..	2,500			2,500	255	10		3	13	\$1 37½		\$3 50		\$8,750 00			\$1 25	\$1 25		
Chautauqua County.																					
1	Man ..			600	600	80	15			15				\$2 50	\$1,500 00						
Cloud County.																					
1	Horse..			396	396	66	4		4		\$1 47½		\$2 37½	\$840 50				\$1 50	\$1 50		
2	"			800	800	200		3	7		1 47½		2 37½	1,900 00							
3	"			1,200	1,200	100	10		15		1 47½		2 37½	2,500 00							
4	"			1,000	1,000	140	14				1 47½		2 37½	2,375 00				1 50			
5	"						8		10		1 47½		2 37½	4,631 25				1 50	1 50		
6	"			1,950	1,950	240		2	5		1 47½		2 37½	1,900 00					1 50		
7	"			800	800	250	4		1	5	1 47½		2 37½								
	Totals.			6,146	6,146	996	44		7	51				\$14,596 75							
Ellsworth County.																					
1	Man ..			105	195	65	3		3		\$2 00		\$3 00	\$585 00							
Elk County.																					
1	Horse..			120	120	50	3		3		\$2 25		\$2 50	\$300 00							
Franklin County.																					
1	Man ..			1,800	1,800	60	20		20		\$1 50		\$2 00	\$3,600 00							
2	"			2,625	2,625	180	24		24		1 50		2 00	5,250 00							
3	"			820	820	120	16		16		1 50		1 50	1,640 00							
4	"			600	600	195	3		3		1 50		1 75	1,050 00							
5	"			160	160	145	2		2		1 75		2 25	360 00							
6	"			390	390	180	2		2		1 75		2 25	877 50							
7	"																				
	Totals.			8,062	8,062	1,705	83	1	1	84				\$16,528 25							
Leavenworth County.																					
1	Steam.			116,196	116,196	235	288	24	58	370		\$0 68	\$1 59	\$184,751 64	1	6	\$2 00	\$1 75			State mine.
2	"	127,390	18,700	146,096	146,096	235	235		54	289			1 80	262,800 00							
3	"	27,199	8,669	46,668	46,668	310							1 75	81,669 00							
	Totals.	154,499	27,369	126,996	308,864	780	948	24	195	1,167				\$529,220 64	1	6					
Linn County.																					
1	Steam.	15,490		15,490	205	48	9	57	\$0 77½	\$1 13		\$17,503 70		\$2 00	\$1 50	50					
2	Horse.	1,628		1,628	200	5	2	7	75	1 25		2,038 00		2 00	1 50						
3	"	1,200		1,200	134	3	3	6	75	1 25		1,500 00		1 25	1 00	50					
4	"	1,000		1,000	150	4	4	8	75	1 25		1,250 00		1 25	1 00	60					
5	"	630		630	130	2	1	3	75	1 25		750 00				25					
6	"	340		340	103	2	1	3	75	1 25		425 00				13					
7	"	360		360	105	2	3	3	75	1 25		450 00				14					
8	"	2,000		2,000	250	6	1	9	75	1 37½		2,750 00		1 00	91	80					
9	"	3,000		3,000	127		15	15				3,750 00									
	Totals.	25,618		25,618	1,404	72	39	111				\$30,413 70									
Lincoln County.																					
1	Horse.		400	400	120	4		4		\$2 00		\$3 00	\$1,200 00								New shaft.
Republic County.																					
1	Horse.		1,696	1,696	260	3	1	4		\$1 37½		\$2 50	\$4,240 00					\$1 25			
Russell County.																					
1	Man ..	17.6		17.6	35	2		2						\$52 80							
2	"	10		10	20	1		1						30 00							
	Totals.	27.6		27.6	55	3		3						\$82 80							
Shawnee County.																					
1	Horse.	688	40	728	300	10	1	11	\$1 75			\$3 00	\$2,184 00								

*700 pounds of dynamite.

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ELK COUNTY.

C. P. Jenks's slope, located two and one-half miles south and two and one-half miles west of Howard, is the only mine Inspector could find in this county. This mine has been in operation ten years and has only been driven 500 feet from the mouth of the slope in all those years. The vein averages 18 inches in thickness, and is a fair quality of bituminous. When Inspector visited there, in October, the mine was full of water and the owner said he would not work it any more this year, at least. Three men, working 50 days, produced 120 tons of coal, valued at \$300.

ELLSWORTH COUNTY.

C. W. Kelly operated a small drift mine southwest of Wilson in this county a few months during the year. It gave employment to 3 miners for 65 days, and produced 105 tons of coal, valued at \$315. The vein averages about 14 inches in thickness. The work is done on the long-wall plan. All coal is sold to supply local trade.

FRANKLIN COUNTY.

The mines in this county are principally shafts and drifts, located in the vicinity of Pomona, Williamsburg, Ransomville, Centropolis, and Hackett's hill. The shafts are worked on the room-and-pillar system, and the mode of working is of the most primitive order. There is no provision made for ventilation, and none of them had a second opening. The Inspector insisted on them providing a second opening or he would shut them down. This they promised faithfully to do. As I have been unable to visit those mines since that time, I cannot state whether they have fulfilled their promise or not. The drift openings are worked on the long-wall plan. The vein averages fifteen inches in thickness. Nearly all the coal produced in the county is sold to supply local trade. Ottawa is the principal market place. There being no railroad connections to any of the mines, little, if any, coal is shipped. The total production of the county was 8062 tons of coal, valued at \$16,528.25. The mines of the county gave employment to 84 men and 1 boy, working an average of 141 days during the year.

RECORD OF INSPECTION.

S. E. Richardson drift No. 1, located at Pomona, employing 20 miners, working 60 days, produced 1800 tons of coal during the year. This mine was worked out and abandoned at the time Inspector visited the mines in that locality.

S. E. Richardson drift No. 2 is located three miles south and three-fourths of a mile east of Pomona. This is what is known as the "Dyer" mine, and is said to be the best quality of coal in the county. The work is done on the long-wall system. The miners are paid \$1.50 for mining. Coal is sold at the mine for \$2



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per ton. This mine has two openings. Natural ventilation. Twenty-four miners, working 180 days, produced 2625 tons of coal, valued at \$5250. S. E. RICHARDSON is lessee and pit boss.

The Henry Kirkman drift mine is located three miles south and one mile west of Pomona. The vein averages 14 inches in thickness. Ventilation natural. Roadway dry and clean. The general condition of the mine was good. Sixteen miners, working 120 days, produced 820 tons of coal, valued at \$1640. HENRY KIRKMAN is pit boss.

William Morris drift mine is located one and one-half miles west and one-fourth mile north of Ransomville. This mine has three drift openings. The ventilation is natural and good. All roadways dry and in good condition. The vein averages eighteen inches in thickness, but is slightly inferior in quality to that of the Dyer mine. Selling price at mine is \$1.75 per ton. Three miners, working 195 days, produced 600 tons of coal, valued at \$1050. WILLIAM MORRIS is mine boss. Post-office address, Williamsburg.

The Thomas Kearney drift mine is located one mile west of Ransomville. This mine was idle at the time of my visit there, and I did not inspect it. Two miners, working 145 days, produced 160 tons of coal, valued at \$360. THOMAS KEARNEY is mine boss, Williamsburg.

The David Price drift mine No. 1 is located one mile west of Williamsburg. The coal in this mine averages twelve inches in thickness. The ventilation of the mine was good. The roadways were wet. The price paid for mining is two dollars per ton. The selling price at the mine is \$2.25 per ton. This mine being nearest to Ottawa, the owners had no trouble in selling the coal at this figure. DAVID PRICE is mine boss, Williamsburg.

The David Price drift mine No. 2, located close to mine No. 1, is a new mine, which had just been opened up and connected to mine No. 1 shortly before I visited there. The connection to mine No. 1 serves as an air-shaft for both mines. The condition of the mine was good. Two miners, working 180 days, produced 390 tons of coal, valued at \$877.50.

The George Caple drift mine is located one-half mile north and one-half mile west of Ransomville. Coal is mined on a small scale at this mine. Two miners, working 100 days, produced 115 tons of coal, valued at \$258.75.

The John Morgan drift mine is located one and one-half miles south of Ransomville; like the Caple mine, this is operated on a very small scale. Two miners and 1 day man worked 180 days and produced 322 tons of coal, valued at \$724.50.

The Frank Ribeau drift mine is located two and one-half miles southwest of Centropolis. The vein here averages twelve inches in thickness. I received no returns from this mine for the year 1899. I am therefore unable to state the production. Estimated at 200 tons, worth \$450. FRANK RIBEAU is pit boss.

Charles Gass operates a small drift mine six miles west and four miles north of Ottawa. The vein here averages seventeen inches in thickness. Receiving no returns from this mine, I am obliged to estimate the production at 200 tons, worth \$450.

The William Hackett mine is located seven miles north and one mile west of Ottawa. This is a horse-power shaft opening, 36 feet deep and 4x6 in size; part of the main shaft is partitioned off and used as an air-shaft; one cage in use. The vein here averages eighteen inches in thickness, and is worked on the room-and-pillar system; fire-clay mining. The roadways were dry, and ventilation was fair. One dollar and seventy cents per ton is paid for mining, selling price



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at mine being \$2.25 per ton. Four miners, 1 day man, working 150 days, produced 480 tons of coal, valued at \$1080. WILLIAM HACKETT is pit boss. Address, box 176, Ottawa.

The Bagsby drift mine is located one mile south and three miles east of Quenemo. Although the post-office address of Mr. Bagsby is Quenemo, Osage county, the mine is situated in Franklin county. Two miners, working 125 days, produced 130 tons of coal, valued at \$292.50.

The George Melcher mine, same location and address as the Hackett mine, is a horse-power shaft opening, 38 feet deep and 5 x 4 in size. This mine has only been in operation since last May. The ventilation was fair. One miner, one boy, working 100 days, produced 220 tons of coal during the year, valued at \$495. BARRY DALE is pit boss.

LABETTE COUNTY.

All the coal produced in this county is taken from strip pits in the vicinity of Oswego and Chetopa. The vein averages fourteen or fifteen inches in thickness and is a fair quality of bituminous. I went all over the ground, and after measuring the space taken out by the different parties who operate the strip pits, I am able to place the total output at 7410 tons. This is the only way I could arrive at the correct production of the county, as few of the parties engaged in the business kept a record of the coal they took out. The following are the names of the strip-pit operators, with their location, post-office address, and the amount produced by each:

Name and post-office.	Tons.	Location.
Ora Dudgeon, Oswego.....	675.....1½	miles south of Oswego.
Mike Rutgeon, ".....	520.....4	" " "
Lee Harmon, ".....	580.....4	" southeast "
A. B. Olstead, ".....	605.....4¼	" south "
Stice & Clark, ".....	320.....2	" southeast "
George Stice, ".....	280.....2	" south "
San. Parks, ".....	80.....1	" north "
Chas. Rodenburg, ".....	700.....2	" northeast "
Gentry & Co., ".....	580.....3	" " "
Walker Coal Co., ".....	520.....3	" east "
Mr. Lamb, Chetopa.....	550.....	near Chetopa.
Nine others.....	2000	
Total	7410	

LINN COUNTY.

There were eight shaft mines and a number of strip pits in operation in this county during the year. They gave employment to 111 men and produced 25,618 tons of coal, working an average of 160 days. There is an extensive field of coal in this county, but it is not developed to any great extent on account of its proximity to the largest coal-producing counties of the state, where the coal, which is a better quality, can be mined and put on the market at a less cost.

RECORD OF INSPECTION.

The principal mine of the county is the Mine Creek Coal Company's mine No. 1, located two miles east of Pleasanton, on the Butler & Fort Madison branch

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of the Missouri Pacific railway. Is has two shaft openings, ninety feet deep. Steam power; mechanical ventilation, by fan eight feet in diameter with three-foot blades, fan making sixty revolutions per minute. The vein averages twenty-eight inches in thickness, and is worked on the long-wall plan. On account of the scarcity of men and the slack work during the summer, quite a number of the places were allowed to run behind. This made the coal hard to dig in these places, and the miners had resorted to shooting it. I questioned Mr. Brown, the superintendent, in regard to the matter, and he stated that the miners were doing this voluntarily, because it was a much easier way of getting the coal than by wedging and sledging it. He said it was of no benefit to the company; in fact, he claimed it was a detriment to them, as shooting the coal caused it to produce more slack than if it had been wedged down in the usual way. I answered that I did not object to the coal being shot or produced in any way that would make it easier and more profitable work for the miners, but I did object to the miners firing their own shots during working hours, as it was very dangerous; and besides, it was a direct violation of the best mining law on the statute-book. I therefore requested him to employ shot-firers to fire the shots, stating that the cost would only be nominal, as it would not take long until those places were up even with the face, and of course, when that was done, no shots would be required. He promised to do so, and I have since learned that the matter was adjusted. Forty miners were employed at that time. The ventilation was up to the requirements of the law. A stairway in air-shaft served as an escapement in case of necessity. Only one side of the mine was working; the other side has been abandoned for some time. This mine was equipped with a light double engine, of about thirty horse-power, to do hoisting; and one double-flue boiler, twenty-eight feet long by forty inches in diameter, furnishes sufficient steam to run machinery. There is a large tract of coal land here, but it is somewhat inferior in quality compared with the southeastern part of the state. Forty-eight miners, 5 underground day men and 4 overground day men worked 205 days, and produced 15,490 tons of coal during the year, valued at \$17,503.70. GEORGE S. BROWN is foreman and superintendent.

The Searight & Swanson shaft, located two and a half miles east of Pleasanton, is a horse-power and has no railroad connections. There are two openings, fifty feet in depth. Ventilated by furnace. Mine was in fair condition when visited by the Inspector. The shaft required to be retimbered. Mr. Swanson stated that he would commence retimbering same immediately. This is the same vein of coal as that of the Mine Creek Coal Company, and is also worked on the long-wall plan. All coal produced is sold to supply local trade. Five miners and two day men worked 200 days, and produced 1628 tons of coal during the year, valued at \$2035. Later this mine was leased by Ford & Bell. ED. SWANSON is pit boss and superintendent.

The Ben Good shaft is located seven and one-half miles east of La Cygne; is a horse-power. There are two openings, fifty-eight feet deep. This mine has been in operation thirteen years. The vein of coal which is being worked averages forty inches in thickness, and is entirely free from horsebacks and faults. The mine is operated on the room- and-pillar system. The manner of ventilating this mine is rather a novel one. A hole has been drilled from the bottom of the air-shaft down to what is called the second vein, which is forty feet below the one being worked, and is said to be three feet thick. A two-inch pipe is inserted in this drill hole, leaving one end protruding up the center of the air-shaft. A light has been applied to the open end of the pipe and a strong flame is the result. I am told this has burned ever since the light was applied to it, about two years ago. And

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it has been made to serve the same purpose as a furnace during that time. The above is evidence that the lower vein contains a large amount of gas, which is an invariable sign of a good body of coal. Six miners were employed at this mine at the time the Inspector visited there. Three cents per bushel is paid for mining. The coal is sold to supply local trade, the selling price being five cents per bushel. Three miners and three day men worked 134 days, and produced 1200 tons of coal during the year, valued at \$1500. J. S. Good is pit boss.

G. H. Gage mine is located one-fourth mile east of the Ben Good mine, and the same description applies to both, with this exception: the air-shaft is partitioned off the main shaft at this mine. A small grate fire is being used as a means of ventilation, with fair results. Four miners, three day men below and one day man on top worked 150 days, and produced 1000 tons of coal during the year, valued at \$1250. G. H. GAGE is mine boss.

The A. A. King shaft, located one-fourth mile west of the Ben Good shaft, or seven and one-fourth miles east of La Cygne, is a horse-power. Depth of shaft, 55 feet; size, 6x12. This mine had no second opening when visited, but a place is being pushed to connect with a shaft that was sunk on the Ben Good place. I ordered this place to be driven six feet wide, so as to make this connection as speedy as possible. This, I was told, was done, and the connection has been made. Two miners and one day man worked 130 days, and produced 600 tons of coal during the year, valued at \$750. A. A. KING is pit boss.

The R. G. Pinkard shaft is a horse-power, located seven miles east of La Cygne. At the time I visited the mines in that locality this mine was idle, on account of some disagreement between the lessee and owner. No report was turned in to this office from this mine. I am, therefore, unable to state the number of men employed or the number of tons of coal that were produced during the year at this mine. Two miners and one day man worked 103 days, and produced 340 tons of coal. G. PULLMAN is pit boss.

The Arthur Vantyle shaft is located six and one-half miles east of LaCygne. This mine was also idle when the Inspector visited there. I am obliged to estimate the production of this mine during the year, as I received no report from it. Two miners and 1 day man worked 105 days, and produced 360 tons. ARTHUR VANTYLE is pit boss.

The J. T. Martin mine, located one and one-half miles east of LaCygne, is a gin-power shaft opening, 50 feet deep and $5\frac{1}{2} \times 10\frac{1}{2}$ feet in size. No railroad connection. It gave employment to 6 miners, 2 pushers, and 1 dumper, worked 250 days, and produced 2000 tons of coal during the year. Miners are paid three cents per bushel, and selling price is five and six cents per bushel. Underground day men are paid one dollar per day, and overground day men are paid ninety-one cents per day. These day men are farmer boys who work in the mines during the winter months, and this accounts for the low rate of wages paid them; \$2750. J. T. MARTIN is mine boss and superintendent.

Considerable stripping was done in this county during the year by farmers who kept no account of the coal they produced. Most of the strip pits are located close to the Missouri line, east of Orchard, Kan. Other strip pits are located about four miles due east of Pleasanton. I am obliged to estimate the production of these strip pits at 3000 tons.

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LINCOLN COUNTY.

Mining is done on a small scale in this county. During the year 1899 there was only one mine in operation. It is located six miles north of Vesper, and operated by L. P. Nelson, of Denmark. The mine is a horse-power shaft opening, 40 feet deep and 4x10 feet in size. The vein averages about 16 inches in thickness, and is a lignite of very poor quality; yet it sells at \$3 per ton at the mine, and is eagerly bought by the residents of the county, as any coal that is shipped from other fields comes very high. The mine is worked on the long-wall system. It takes a good miner to average 1800 pounds of coal a day. The price paid for mining is \$2 per ton. Four miners worked 120 days and produced 400 tons of coal during the year, valued at \$1200.

REPUBLIC COUNTY.

S. F. Curtis operates the only mine in this county. This mine is located at Minersville, on the north side of the section road that divides Republic and Cloud counties, and is one and one-half miles east and six and one-half miles north of Concordia. The mine is a horse-power shaft opening, 90 feet deep, 4x8 feet in size. An air-shaft situated 45 feet from the main shaft is equipped with a horse-power fan which furnishes ventilation for the mine. Stairway in hoisting shaft. The mine was in fair condition throughout. Ventilation good. Roadways damp. The coal on the west side of shaft was all worked out and that side was abandoned, leaving only the east side of the mine to be worked. The vein, which is a lignite, averages 24 inches in thickness. The miners are paid \$1.40 per ton for mining. The selling price is \$2.50 per ton. Three miners, 1 day man, working 260 days, produced 1696 tons of coal, valued at \$4240. S. F. Curtis is mine boss. Address, Concordia.

RUSSELL COUNTY.

Coal is mined in this county on a very small scale, and only for local use. The vein averages twelve inches in thickness, and is an inferior quality of lignite. There were only two small mines in operation in the county during the year 1899, and they only worked a few days. The total production for the county for the year was 27½ tons, valued at \$82.80.

Nelson E. Warner operated a little slope, which is located four and one-half miles northeast of Bunker Hill. His two sons worked 35½ days in it, and produced 17½ tons of coal, valued at \$52.80.

W. F. Cushing operated the other mine a short time in the beginning of the year, and produced ten tons of coal, valued at \$30.



SHAWNEE COUNTY.

I could only find one coal-mine in operation in this county. It is operated by W. A. Eaton, box 74, Topeka, Kan. Located three and one-half miles west of Kansas avenue, on Sixth street. Depth of shaft, 31 feet; size, 6x8½ feet. The mine is a horse-power. The vein of coal averages about twelve inches in thickness, and is an inferior quality of bituminous. All coal produced is sold to supply local trade in Topeka. The mine employs about fifteen miners in winter, when there is a good demand for coal. In the summer months, when the coal trade is dull, there are only about four miners employed. The price paid for mining is \$1.50 per ton in summer, and \$1.75 and \$2 in winter. The total production of the mine for the year 1899 was 728 tons, valued at \$2184. Since the Inspector's visit to this mine an escapement shaft has been sunk, which he ordered done.

MINERS' EARNINGS IN THE FOUR PRINCIPAL COAL-PRODUCING COUNTIES.

There is no subject in which the miners are more greatly interested than that of wages or earnings, and it has been my earnest hope to be able to present a correct and comprehensive statement of the earnings of this body of wage-workers of our state. But this I find it difficult to do, for many reasons, two of which are as follows: First, by direction of the law, I am compelled to rely on the figures sent in by the coal companies themselves; and second, so many persons are mining coal as an adjunct to their other occupations that they cannot be fairly classed as miners, and to include them in this calculation would be a manifest injustice to those who are engaged in coal-mining as a sole means of support. I have, therefore, selected the principal shaft mines of the four greatest coal-producing counties in the state, eliminating all but those whose employees are actually engaged in mining coal as their sole means of subsistence. If these returns, as shown in the following tables, are correct, they will give a fair estimate of the average earnings of the miners of the state. However, the Inspector has reason to believe that a few of the returns from Crawford and Cherokee counties do not represent the facts, and that the actual earnings of the miners at those shafts are much less than represented by the returns. At first I hesitated to include these particular returns in this table, but afterward concluded to do so, as it will only require one glance from the miners, especially those employed at the particular shafts alluded to, to discover the returns referred to.

A short analysis of the tables as presented is herewith given:

CRAWFORD COUNTY.

The figures on which the table on page 83 is based are taken from returns sent to this office from the different operators. The result may be taken as fairly representative of the average earnings of all the miners in the county, providing the figures sent in by the coal companies are reliable. The powder used at each mine in the table is divided equally among the miners employed, and the amount is deducted from the gross earnings. Seven per cent. additional is deducted for other expenses, such as blacksmithing, squibs, oil, paper, soap, and repairing tools. This expense is incurred by every miner. There are a number of other shaft mines in operation besides those in the following table. Nearly all of these, however, pay their miners



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by the box, and not by the ton. The price paid per box makes it a matter of conjecture as to the amount paid per ton. For this reason they were omitted from the table. The strip pits are also omitted, as that work is all done by the day. In computing the miners' earnings, one of my predecessors adds one-fifth to the total earnings, to pay for piece-work, yardage, cutting faults, etc. Another adds eight cents per ton to the average price paid for mining for the same purpose. I believe that one-fifth of the amount paid for mining the coal is a little more than the miners in the county in general receive for this "dead work." On the other hand, I think that eight cents per ton is less than the amount so paid out. I have therefore added nine cents per ton to the average price paid for mining, for yardage, etc.

CHEROKEE COUNTY.

The remarks on the Crawford county miners' earnings apply as well to Cherokee county. The same deduction is made for expenses, and nine cents per ton is added to the average price paid for mining, for yardage, etc. None of the strip-pit production is included. The table on page 84 will show a fair estimate of all the miners' earnings in this county, providing the returns sent to this office are correct.

OSAGE COUNTY.

In the table of the miners' earnings in Osage county, found on page 85, nearly all the shaft mines in the county from which returns were received are represented. I did not consider it necessary to tabulate the drift and strip-pit openings of Rosemont, Arvonnia, Quenemo, and Carbondale, as the men employed at these places are principally farmers who do not entirely depend on their earnings in the coal-mines for a living. Two and one-half cents per ton is added in every case to pay for work, such as turning rooms. This no doubt will more than cover the amount paid to the miners for the extra work done. Four per cent. is deducted from the gross earnings for expenses, such as blacksmithing, oil, repairing tools, etc. A glance at the table will show the amount of tons produced at each mine during the year, the number of miners employed, the number of days worked, and the average price paid per ton for mining. It will also show the gross earnings of each miner for the year, the net earnings after the expenses are deducted, the average earnings of each miner for the days the mine worked; also for the 312 working days in the year, and for the 365 days, or every day in the year. The whole will present a fair estimate of the average earnings of all the miners in the county.

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TABLE OF MINERS' EARNINGS IN CRAWFORD COUNTY.

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TABLE OF MINERS' EARNINGS IN CHEROKEE COUNTY.

NAMES OF COMPANIES.	Production in tons of 2000 pounds.....	Av. price paid per ton for mining, including haulage, purchase, etc.....	Average number of miners.....	Number days mine worked during year.....	Number kegs of powder used, at \$3 per keg.....	Gross earnings of each miner.....	Amount deducted for expenses, including oil, powder, etc.....	Net earnings of each miner for year.....	Av. daily earnings for 312 days.....	Av. daily earnings for 312 days.....	Av. daily earnings for 365 days.....
Central Coal and Coke Company, mine No. 5.....	8,957	\$0 64	30	73	480	\$191 08	\$45 37	\$145 71	\$1 09	\$0 46	\$0 39
" " " " " " 6.....	117,195	66	140	279	7,492	352 48	92 18	460 30	1 64	1 47	1 26
" " " " " " 7.....	35,651	66	158	201	6,917	337 78	112 59	245 19	1 21	1 78	1 67
" " " " " " 11.....	119,383	66	100	273	6,804	787 92	191 23	596 69	2 18	1 91	1 63
Kansas & Texas Coal Company, mine No. 13.....	85,748	66	136	201	3,756	416 13	84 35	331 78	1 65	1 06	1 00
" " " " " " 23.....	45,118	66	63	139	1,784	472 66	59 55	383 11	2 03	1 22	1 05
" " " " " " 55.....	31,885	64	49	106	1,117	416 45	74 74	341 71	3 22	1 09	93
J. H. Durkee Coal Company, mine No. 1.....	111,735	66	200	250	6,008	368 72	85 89	282 83	1 13	1 90	1 77
" " " " " " 5.....	45,496	66	60	250	2,313	500 48	112 13	388 35	1 55	1 24	1 06
Hamilton Coal Company, mine No. 1.....	77,405	66	130	275	3,875	392 97	87 11	305 86	1 11	1 95	1 83
J. R. Crowe Coal Company, mine No. 1.....	101,672	66	165	236	5,004	406 68	59 11	317 57	1 34	1 01	87
" " " " " " 2.....	52,368	66	110	174	2,388	314 20	74 68	239 52	1 37	1 76	1 65
" " " " " " 3.....	5,240	69	50	85	360	72 31	19 46	52 85	62	16	14
J. C. Graham Coal Company, mine No. 1.....	31,233	69	50	228	1,700	431 84	98 22	333 62	1 46	1 06	90
" " " " " " 3.....	23,042	69	100	252	1,920	158 99	49 52	109 47	43	35	29
" " " " " " 4.....	11,609	69	60	135	532	133 50	27 07	106 43	75	34	29
Norton Coal Company, mine No. 3.....	2,500	69	20	90	300	86 25	26 03	60 22	66	19	16
Southwestern Coal and Improvement Co., mine No. 6.....	51,239	66	40	220	3,584	845 44	238 38	607 06	2 75	1 94	1 66
" " " " " " 7.....	118,945	66	160	275	8,190	490 64	136 71	353 93	1 28	1 13	96
Bennett & Crowe, mine No. 5.....	33,298	66	45	278	2,100	488 37	127 51	360 86	1 29	1 15	98
Humble Coal Company, mine No. 6.....	14,197	69	65	110	972	150 70	40 44	110 26	1 00	1 35	1 30



TABLE OF MINERS' EARNINGS IN OSAGE COUNTY.

NAMES OF COMPANIES.	Product, in tons of 2000 pounds.....	A. v. price paid for mining, includ- ing yardage, etc..	Number of miners employed.....	Number of days mine worked.....	Gross earnings of each miner for year.....	Amount deducted for expenses, including black- smithing, oil, etc.	Total earnings of each miner for year.....	A. v. daily earnings for days mine worked.....	A. v. daily earnings for 312 days.....	A. v. daily earnings for 365 days.....
Mount Carmel Coal Company, mine No. 10.....	32,180.5	\$1 20	97	255	\$397 86	\$15 92	\$381 95	\$1 49	\$1 22	\$1 05
" " " " " 24.....	37,506.8	1 20	102	262	441 25	17 65	423 60	1 61	1 35	1 18
" " " " " 27.....	23,980.9	1 40	97	221	346 11	13 84	332 27	1 50	1 06	91
" " " " " 28.....	14,133	1 40	60	223	329 74	13 18	316 56	1 41	1 01	86
Western Fuel Company, mine No. 2.....	4,891	1 40	34	79	201 39	8 05	193 34	2 44	61	52
" " " " " 6.....	5,350	1 40	30	200	277 66	11 10	266 56	1 33	65	73
" " " " " 23.....	2,408	1 40	25	80	134 73	5 38	129 35	1 61	41	35
Labor Exchange, Branch 233, mine No. 1.....	6,699	1 40	50	240	187 57	7 50	180 07	90	57	49
" " " " " 233, " 2.....	6,305.5	1 40	36	185	245 21	9 80	235 41	1 27	75	64
Murry Bros., mine No. 1.....	3,100	1 40	22	142	197 27	7 89	189 38	1 33	60	51
S. J. Carlson, mine No. 4.....	1,575	1 40	8	240	367 50	14 70	352 80	1 47	1 13	96
" " " " " 5.....	6,305	1 40	20	205	441 35	17 65	423 70	2 06	1 35	1 18
John A. Johnson, mine No. 1.....	1,300	1 40	12	100	151 66	6 06	145 60	1 45	46	39
Kansas Coal Company, mine No. 1.....	2,434	1 40	10	200	340 76	13 63	327 13	1 63	1 04	89
A. W. Granstrom, mine No. 5.....	6,890.5	1 40	25	260	385 86	15 43	370 43	1 42	1 18	1 01
Matthew Waddell, mine No. 1.....	8,434	1 40	36	151	327 99	13 11	314 88	2 08	1 00	86
Sunflower Coal Company, mine No. 1.....	980	1 40	5	251	274 40	10 97	263 43	1 05	84	72
Ryan & Co., mine No. 3.....	2,796	1 40	9	300	434 63	17 39	417 24	1 39	1 33	1 14
Chappell Coal Company, mine No. 3.....	5,507	1 20	25	189	264 33	10 57	253 76	1 34	81	69
Thos. Noble & Son's mine.....	9,262	1 20	27	240	428 79	17 15	411 64	1 71	1 31	1 13
James Taylor mine.....	4,198	1 15	18	144	268 20	10 72	257 48	1 78	82	70
Henry Isaacs.....	1,288	1 25	9	260	169 06	6 76	162 30	56	52	44
Thomas Whitcombe.....	1,692	1 25	9	225	235 00	9 40	225 60	1 00	72	61
Wm. Foster, mine No. 1.....	5,000	1 25	22	245	284 09	11 36	272 73	1 11	87	74
John Bell Coal Company, mine No. 1.....	2,150	1 25	15	210	179 16	7 16	172 00	81	55	47
John D. Jack Company, mine No. 3.....	3,611	1 25	15	250	300 91	12 03	288 88	1 15	92	79
Hotchkiss Coal and Mining Company, mine No. 1.....	3,992	1 25	15	230	332 66	12 30	319 36	1 38	1 02	87
Robert Simpson Coal Company, mine No. 1.....	7,400	1 25	22	290	420 45	16 81	403 64	1 39	1 29	1 10
Hugh McFarlane mine.....	4,000	1 25	16	250	312 50	12 50	300 00	1 20	96	82
Panther Long-wall Mining-machine Company, mine No. 5.....	3,300	1 25	14	220	294 64	11 78	282 86	1 28	90	77
Central Coal and Mining Company, mine No. 1.....	3,500	1 25	18	210	243 05	9 72	233 33	1 11	74	63
Bellville Coal Company mine (Bell Bros.).....	2,648	1 25	26	150	127 30	5 06	122 24	81	39	33
Wm. Menzies, mine No. 1.....	2,157	1 25	9	175	299 53	11 98	287 55	1 64	92	78
J. C. Harvey, mine No. 1.....	1,918.5	1 02 1/2	22	93	89 38	3 37	86 01	92	27	23
Coughlin Coal Company, mine No. 1.....	500	1 37 1/2	3	160	229 16	9 16	220 00	1 37	70	60
	2,900	1 45	22	140	191 13	7 64	183 49	1 31	58	50
	8,636	1 35	37	225	205 63	8 22	197 41	87	63	54

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LEAVENWORTH COUNTY.

The table of the miners' earnings in this county, found on page 87, is based on the production of the free or outside mines, taken from the operators' returns to this office. By referring to the table, it will be seen that the mines worked 235 days, or nine months in the year. During the first six months the price paid for mining was eighty cents per ton of 2,500 pounds, or sixty-four cents per ton of 2,000 pounds, mine run; in the last three months the price paid for mining was seventy-six cents per ton, mine run—an advance of twelve cents per ton over the former price. Taking the average, then, of six months at sixty-four cents per ton, and three months at seventy-six cents per ton, we have sixty-eight cents per ton as the price paid to the miner for all coal mined. In order to be fair to all concerned, I have added six cents per ton to the average price paid for mining for yardage, cutting fault, etc. Four per cent. is deducted from the gross earnings for expenses that have to be incurred by every miner, such as blacksmithing, oil, and repairing tools, picks, wedges, etc. The remainder represents the net earnings of the miner during the year. The table also shows the average earnings of each miner for the days the mine worked, the 312 working-days in the year, and for 365, or every day in the year.

In comparing the miners' earnings in Leavenworth county for the year 1899 with the figures given by Inspector Brown in 1895, and those given by Inspector McGrath in 1897, there is a startling discrepancy apparent. Mr. Brown's figures show the miners' daily earnings to average \$2.20 for the whole county in 1895, and Mr. McGrath gives the daily earnings of the miner at \$2.16 in 1897. (No analysis is made for 1898.) In 1899 the average daily earnings of the miner is less than \$1.11, as computed by me from returns that reached this office and which I believe to be correct. On again looking at the report for the year 1895, I find that Mr. Brown has given the miner credit for receiving 77 cents per ton for all coal mined at one of the company's mines and 80 cents per ton at the other mine. Mr. McGrath's report for 1897 shows that the miner received 80 cents per ton of 2000 pounds for all coal produced (mine run) in Leavenworth county. Believing that no such prices were paid for mining during those years, I wrote requesting information in regard to the matter, and the following extract from Superintendent Kierstead's reply explains the case fairly:

"During the years 1895, 1896, 1897, and 1898, and up to October 4, 1899, the price paid for mining in this district was 80 cents per ton for 2000 pounds of screened lump coal over a 12-foot screen, with one-inch mesh. The equivalent of this in mine run was figured and calculated to be 64 cents per ton for 2000 pounds of mine-run coal."



In all those years mentioned, it will be seen that the miners of Leavenworth have been represented as earning twenty-five per cent. more than they actually earned. This misrepresentation is unaccountable when we consider the manner in which the different Inspectors deplored the pitiable and poverty-stricken condition of the miners. Some of the Inspectors in reckoning from those enlarged figures, after deducting house rent and food, showed a margin of sixteen cents per day for the miners to clothe their families and educate their children, etc. If they had started their calculation with the correct figures, they would have found the margin on the debit side of the sheet, which would have sent the families forth without clothing, etc., etc. This misrepresentation of facts may have done the miners of Leavenworth an incalculable injury during the year 1899. There was a conference between the U. M. W. of A. and the operators at which a scale of wages was agreed on. This scale was based chiefly on calculation made from figures obtained from the Mine Inspector's report. Is it any wonder, then, that no change was made in the scale of prices for mining in Leavenworth. Had their true condition been known, I believe a scale could have been adjusted at that time and the strike which followed soon after would have been averted.

TABLE OF MINERS' EARNINGS IN LEAVENWORTH COUNTY.

	Leavenworth Coal Company's mine,	Home- Riverside Coal Mining Company's mines, Nos. 1 and 2.
Product in tons of 2000 pounds.....	116,196	146,000
Average price paid for mining, including yardage, etc.....	\$0 74	\$0 74
Number of miners employed, including boys.....	295	425
Number of days mine worked.....	235	235
Gross earnings of each miner for the year.....	\$291 47	\$254 21
Amount deducted for expenses, including oil, blacksmithing, etc....	11 66	10 16
Net earnings of each miner for the year.....	279 81	244 05
Average daily earnings for days mine worked.....	1 19	1 03
Average daily earnings for 312 days.....	89	78
Average daily earnings for 365 days.....	76	66



A MINE EXPLOSION.

An explosion occurred at the Mount Carmel Coal Company's mine No. 6, at Frontenac, on the evening of December 14, 1899. This dreadful catastrophe caused the death of four men who were employed at the mine as shot-firers. The victims of the disaster were: Elijah Dodson, Frank Vaverick, Louis Benedict, and Henry Zimmerman. Vaverick was the only man that was burned. The other three appeared to have been asphyxiated by the after-damp of the explosion. When a calamity of this kind occurs, the question naturally arises as to the cause, or causes, which led to it. The favorite theories advanced by a great many are: A blown-out shot coming in contact with a great quantity of coal-dust, or a blown-out shot relieving a pocket of gas; or both combined. The same theorists then claim that all that is necessary to prevent an explosion is to remove the coal-dust as much as possible and sprinkle the workings with water. This line of reasoning is all right as far as it goes, but there is one important factor omitted in it, and one which I believe was the most potent factor in this explosion, viz., pure, cold air, and too much of it. I know that this will be considered an absurd assertion by the average miner, but I will endeavor to give my reasons for my belief. To do this, it will be necessary to digress a little in order to describe the workings of the mine and the manner of ventilation.

To begin with, mine No. 6, where this explosion occurred, is the best arranged for ventilation of any mine in the state. It has an overcast on each side of the shaft bottom, and each side of the mine is ventilated independent of the other. The main north entry is the intake on the north side of the mine; the air dividing at the face, going east and west into the parallel entries to the main north, and from thence returning around the workings to the air-shaft on the west side by the regular air-course, and on the east by way of the overcast. The same description can be given of the south side of the mine, except that the air has a longer course, a large territory having been developed by mine No. 1 on that side which is now being worked by No. 6 mine. There is an average volume of 50,000 cubic feet of air per minute passing into the mine with the fan revolving at the rate of 55 revolutions per minute, which would give 12,500 cubic feet per minute to each quarter-section of the mine. This volume of air can be increased or decreased by increasing or decreasing the speed of the fan. While this amount of air is required when the miners are at work in the mine I consider it dangerous to fire shots with so large a

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volume in circulation, for various reasons, chief of which is the expansion of the air itself, when exposed to a fierce heat such as would be caused by the flame from a blown-out shot.

As every one knows, an explosion is anything which causes a sudden increase of pressure in the surrounding air or gases, from the sudden and violent expansion of any substance (gas, liquid, or solid) in their neighborhood; hence, it will be seen that, with a large volume of air, every aperture will be filled, and the pressure will be correspondingly greater than if the air current was reduced. When we consider that 50,000 cubic feet of air per minute is sufficient to ventilate the mine and supply the necessary oxygen for 250 miners, 10 drivers, and their mules, then 5000 cubic feet of air would be sufficient for six shot-firers and allow a decent margin to carry off the smoke and gases of the exploded shots. To make allowance for leakages, however, we will allow the volume of air to be increased to 10,000 cubic feet per minute. This would be 2500 cubic feet of air per minute for each quarter-section of the mine. If this were done it would leave room for expansion, and in that way would, in my opinion, diminish the danger from a blown-out shot.

As will be seen by the evidence at the coroner's inquest, the primary cause of the explosion was due to blow-outs from unlawful shots. It will also be seen by the evidence that a more dangerous shot, to all appearances, had been fired in the room where the explosion originated the day before without causing any serious results. What was the reason of this? Was it because there was a greater supply of carbureted hydrogen gas liberated by one shot than the other? I hardly think so, as there is not enough gas generated in any part of the mine, except on rare occasions, to be detected with a naked light, and, besides, the drill hole of the shot which was fired the day before the explosion occurred was in advance of the shot that caused the explosion; hence more likely to release a body of gas. Was it, then, because of a larger supply of coal-dust on that day than the day previous to that? I cannot believe that it was, nor do I think that the danger from the coal-dust is wholly due to its explosive qualities. But I do believe it is dangerous because it is easily ignited, and by speedy combustion adds to the fire, heat and flame of blown-out shots, thus in turn increasing the expansion, and consequently the pressure of the air.

We now come to the blown-out shot, which is caused by being charged with either too much powder or too little. While all shots throw more or less flame, a well-regulated shot will expend itself in its efforts to do the work assigned to it, and its flame is confined to the vicinity of the shot. A shot that is overcharged with powder

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dashes the coal with such force against the rib as to reduce it to a heap of slack. Its power not being spent in the effort, it generally fills the room full of flame, and may under certain conditions cause an explosion. Then there is the blown-out shot, or gunner, which is caused by having less powder in it than will move the coal which it is intended to move. This kind of shot acts like a gun or cannon. It blows the tamping out of the drill hole, throwing fire to a great distance in a straight line. One of the shots which originated this explosion might be placed in the latter category, to a certain extent. The hole was drilled six feet deep, and was three feet thick in a lateral direction from the mouth of the hole to the edge of the coal, and at the back or the end of the hole it was seven feet thick or wide. The powder being unable to move the heavier body of coal at the back of the shot, it flew to the lighter body on the heel of the shot, which it shot off, and, doubtless throwing considerable fire on to the entry to which it was directed, it originated the disaster which followed. Had there been more powder in this shot, the result would have been practically the same.

That both shots which were fired in this room that night were unlawful shots, is an unquestionable fact. This statement is not surprising when we consider that 80 or 90 per cent. of the shots fired in the mines of this district are unlawful, when judged by the strict letter of the law. The law calls for the same measurement (rectangular) at the mouth of the hole as at the back or "point," and to be "sheared or cut to the full depth of the drill hole." Instead of this there are "lifting" shots, "gripping" shots, and "cutting" shots, which are drilled obliquely and at every conceivable angle, and still they are considered to be perfectly safe by every one concerned. And now I believe I am safe in saying that there was scarcely a shaft mine in Crawford or Cherokee counties that did not have one or more blown-out shots on the night of this explosion. Some of these mines are very dusty, and one in particular generates a considerable quantity of carbureted hydrogen gas, yet there was no explosion at any of them. The temperature must have been nearly the same in all the mines; so that the only difference I can find, after looking over all the ground, is, that the place where the explosion originated was particularly adapted for such an occurrence, and the fire thrown out must have struck a larger volume of air than was found in any of the other mines; hence the explosion or underground tornado.

It may be well before closing to compare this explosion with the one that occurred in Chicopee on January 8, 1898. At the time of that occurrence I was about a mile away from No. 5 shaft, when the sound of the explosion reached me. I looked in the direction of the

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shaft, and saw the flames shoot up in vast volumes a distance of at least fifty feet above the sheave wheels. This would indicate the presence of coal-dust, gas, or other combustible. The ventilation of No. 5 mine at that time was almost perfect, as acknowledged by all who worked there, yet, in spite of this fact, or rather, as I contend, because of it, the explosion was of the most violent nature. Three men lost their lives in it. Mules were burned to death, and pit cars and other debris, such as slate or rock, and timbers, were carried a considerable distance to the pit bottom, all denoting, in my opinion, that the stronger the air-current the more violent the explosion.

When the explosion took place at mine No. 6 I was notified, and hastened to the mine, reaching there about three hours afterwards. On inquiring of a number of people who live near the shaft, I was told that the shock of the explosion was slight, and was followed by a roaring or hissing sound like that made by steam escaping through a large pipe, and that on looking towards the shaft they saw great black clouds of smoke, vapor or dust issuing from the mouth of it, but not a single flicker of flame. And afterwards when I examined the mine I could find little trace of fire anywhere except within a radius of 100 feet from where the explosion originated, thus showing that the flame of the powder from the blow-out shots had been but slightly augmented by either coal-dust or fire-damp; so that the principal elements in this explosion must have been the fire from the powder blasts and the air-current made dangerous by its low temperature and velocity. Under the head of recommendations I refer to this matter again.

By permission of Hon. John Verner, mine inspector for the second district of Iowa, I print a well written article from his pen, which is as follows:

EXPLOSIONS IN MINES.

The following article was published in the *Colliery Engineer and Metal Miner* some time ago. The views and conclusions presented herein are, as I believe, sustained by facts which were developed by close investigation of the more recent explosions in the mines in this country, and especially those situated in the Western states. It is deplorable that even now a dangerous ignorance as to their cause exists in this state among mine men, who ought to be better informed, and, as this report will probably reach every mining camp in the state, the republication of the article may help to clear away some of that ignorance, and thus correspondingly increase the safety of our mines.

It is not the object of this article to advance any new theories or to controvert those that have been fairly well established as true; its aim is to present some facts concerning coal-dust explosions that have been obtained through careful investigation, directed with the purpose to make them of practical value to the miner, and to clear away, in a measure, the mystery and doubt that as yet seemingly surround these explosions.

Experiments, carried on by men whose standing as scientists and mining ex-



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perts is sufficient guaranty of accurate and thorough research, have shown that the presence of coal-dust in any mine where powder is used for blasting purposes, or where fire-damp, even in small quantities, exists, may, under certain conditions, become a source of great danger to life and property.

We admit that these experiments, investigations and subsequent deductions have been of great value to the mining world, and it is not our intention to attempt to detract in the least degree from their merits, yet, in the light of facts now at our disposal, it seems to us that, in accounting for past explosions, which could not have been the result of fire-damp, undue prominence has been given to the presence of coal-dust in establishing the cause of these explosions, at the expense of another factor that, as we shall try to show, is of greater importance, because, without its presence, the dust will at once cease to be an element of danger. The reason these men had for making dust the prime factor can be accounted for by the fact that their experiments and investigations were mostly conducted with a view to establish the easy inflammability of coal-dust. This they did very successfully, but their success in this direction led them to the error of assuming too much in pronouncing dust the paramount factor in a so-called coal-dust explosion. We must consider that conditions, as they exist in an actual mine, necessarily differ materially from those surrounding experiments carried on in an artificial drift or shaft built at or near the surface, and, that being the case, it must be admitted that a proper conclusion cannot be arrived at, or a correct judgment formed, without due cognizance of these altered conditions.

It is generally claimed that blown-out shots were the original cause of nearly all dust explosions that have occurred in the past. While this statement is undoubtedly true, it must not be supposed that every blown-out shot is capable of causing an explosion, even if the mine is dusty and the dust easily inflammable. In Iowa, the Chicago & Iowa mine had been in operation sixteen years before a disastrous explosion occurred there. The mine was always free from gas. During all these years blown-out shots were of daily occurrence in this mine; dust was always present to a greater or less extent; the coal contained always a large amount of volatile matter, almost equaling the fixed carbon, and averaging nearly forty per cent. Yet under these conditions, looked upon as most favorable to the development of a dust explosion, this mine was worked, as stated, without serious mishap for sixteen years, a fact that should conclusively show that peculiar additional conditions must prevail before the danger of a coal-dust explosion becomes imminent.

We believe that enough data have been furnished by explosions that occurred during the last eight or ten years to determine, with a fair degree of accuracy, just what conditions must exist and what factors are necessary to cause an explosion, in the absence of fire-damp. In our opinion, the most essential factors required are:

First. Intense heat and considerable flame, furnished by a blown-out shot, so located and tamped in such manner that the intensely heated gases developed by the explosion of the powder in the hole will be projected into the passing air-current with the utmost force and without any appreciable decrease in their initial temperature.

Second. A rapidly moving current of pure air of great volume and low temperature.

Third. Coal-dust, floating in the air of the mine, of such fineness and composition as will promote easy and rapid ignition.

Next to the first factor mentioned, we consider the second of most importance,



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and we are emphatically of the opinion that the volume of air entering a mine, its purity and temperature, exert a more powerful influence in bringing about an explosion than the greater or less amount of coal-dust present. We believe that the greater the volume of air in a mine the greater will be the likelihood of an explosion, should the necessary initial force be furnished by a blown-out shot of the kind mentioned above; and we believe, further, that any material decrease in the volume of the ventilating current will also lessen the danger and have the tendency to make an explosion less severe, should one occur. We are aware that these assertions are looked upon by some as faulty, and that we have the theories and views of men against us who claim the very opposite as the truth. That their case may be fairly presented, we submit their excerpts:

In *The Colliery Engineer and Metal Miner* of June, 1893, page 255, a description of the explosion at Cedar Mines, Iowa, by Mr. J. T. Beard, is given, and in it we find the following: "Let us note here again that the burning will advance all the further in the pit, and cover a greater area, just in proportion as the supply of fresh air is lessened, as it will necessarily have to travel further before finding oxygen enough to burn it out."

An article on the Jack Oak mine explosion, published in the *Ottumwa Courier*, contains this statement: "It has been suggested that a lessening of the current, either by slowing down the fan or by partially opening the door previous to firing time, would act to destroy to a large extent the force of an explosion, should one occur. Let us see how this would be. We would have less air traveling upon the airways and throughout the workings, and a consequent decrease of pressure in the pit, on the one hand. We have, on the other hand, the same explosive force and expansive energy at the initial point; the same amount of dust will be stirred up and thrown in suspension upon the air in the region of the shot, and practically the same amount of gaseous material will be at hand, depending upon the supply of oxygen to burn it. This is fired from the flame of the shot and rolls out upon the entry, propelled by its expansive force; meeting the current, it feeds upon the oxygen there supplied, and continues thus advancing till the outward expanding energy and the inward pressure of the current, aided by the tendency toward a vacuum behind, neutralize each other, when the further progress of the flame is stayed. Now (not to say a wind, but), with the customary amount of air passing, the burning and advance of the flame will be more rapid, the tendency toward a vacuum correspondingly stronger, and opposing pit pressure will be higher; all of these influences will unite to stay the progress of the flames in the entries sooner than when the current of air has been reduced."

We believe the above views to be erroneous and in opposition to physical laws.

The writer of the first quotation certainly promulgates a strange doctrine when he tells the reader that the "burning" (fire, flame) will travel further, and, therefore, continue to burn longer, without a plentiful supply of oxygen than with it—a doctrine that will hardly be acceptable to the physicist.

In the second quotation, we are asked to believe that the same force (for nothing is said about it being augmented in any way) can overcome and remove a greater opposing force with more ease and rapidity than a smaller one. The writer also maintains that the formation of a vacuum behind the explosive force will proceed more rapidly if said force is opposed by a strong current of air, and he holds that such current will materially assist to limit the extent of an explosion. We readily admit that the quicker a vacuum can be formed back of an explosion the sooner will its advance be checked and the recoil take place, but we cannot admit that this result will be hastened through the inflow of a large volume of air, for a strong current will most certainly offer greater opposition to



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such advance than a weak one; a greater weight will have to be repelled; consequently the progress of an explosion will be less rapid; thus a strong current of air, instead of hastening the formation of a vacuum, will positively retard it, and we claim that this retardation, slight though it be, is absolutely essential to develop a dust explosion in its greatest intensity. It is only when the heat and flame travel at a comparatively low speed that the latent energy stored in the dust can be fully developed and become an important factor in propagating and intensifying an explosion, by allowing sufficient time for thorough and complete distillation and ignition of the gases it contains. As the force of an explosion gains in strength by this additional heat, the opposing air-current will be pressed back faster and faster, until, when finally overcome, the opportunity is given to allow the outward rush of the explosion to go on with such rapidity as to make possible the formation of a vacuum large enough and strong enough to check the explosion's advance and pull it back inward again.

A strong air-current is not only necessary to intensify the force of an explosion, but it is needed to make an explosion of any size possible at all. We know that, in order to fully develop the rendering properties of the heated gases generated by an explosion of powder, they must first be confined in a hole closed with a sufficient amount of tamping; and so to bring out the initial force of a dust explosion in its greatest strength, it is necessary to confine it at first to a limited space, in order to concentrate the force of heat and flame and prevent an immediate fragmentary scattering of its strength. The inflow of a large volume of air will do this effectually, furnishing, so to speak, the necessary tamping. It will yet do more. It will add to an explosion an energizing element by providing that vital nourishment to flame, a plentiful supply of oxygen.

We stated that the air in a mine, to become a prime factor in an explosion, besides being of large volume, must be pure and of low temperature, and we believe that these conditions are absolutely essential and must exist before a dust explosion can occur. There is not a case on record where such explosions ever occurred in a badly ventilated mine; on the contrary, we find that they invariably happened in mines where the ventilation was of superior character and then generally on the intake airway. That low temperature of the air must be regarded as an essential requirement is shown by the fact that these explosions occurred almost without exception in the colder months of the year. There are good reasons why the cold air of midwinter should be of so much greater assistance in the creation of a dust explosion than the heated atmosphere of the months of July and August.

Cold air, being much heavier than warm air, is by reason of its greater weight, and therefore greater opposing force, better adapted than the latter to concentrate and confine the heated gases and flame of a blown-out shot and to bring out their full force with greater effect. Again, cold air contains more oxygen per cubic foot than warm air, and more oxygen means easier, fiercer and more rapid combustion.

The warm air of midsummer, flowing through a mine, will act on the dust like a spray; it will saturate the latter with moisture and prevent its rising from the floor and sides and floating along with the air-current, while the cold air will absorb moisture, dry out the dust, and permit the finer particles to float readily in the air, providing the easily ignited fuel which feeds and extends a dust explosion.

The mode of ventilation has much to do with determining the severity and extent of a dust explosion. Such explosion occurring in a mine using a force-fan, will generally extend over more territory and be more destructive to property

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than one occurring in a mine ventilated by exhaust-fan or furnace. The reason for this is not hard to find. With exhaustive ventilation the supply of fresh air to the mine is not only immediately shut off as soon as an explosion is started, but the amount of air back of the starting-point of an explosion is steadily reduced by the action of the fan or furnace. The benefit derived is twofold. A powerful vacuum will be steadily formed, checking the explosion's advance, and on its recoil it will find a diminished supply of oxygen detracting from its force.

It is quite different should an explosion occur in a mine ventilated by a force-fan. Here a continuous supply of oxygen is furnished and thrown against the explosion in front, while back of it no agency is at work to diminish it, the speedy formation of a vacuum is delayed, heat and flame will be increased, and the explosion's force enhanced. The result is greater destruction, extending over a larger territory.

Very seldom indeed does an exhaust-fan suffer destruction from the effects of a dust explosion unaided by fire-damp. For the reason above given its force will be spent before it can reach the upcast. We know of only one instance where an exhaust-fan was destroyed at a non-gaseous mine by such explosion. This happened at Rich Hill, Mo., December 29, 1891; but in this case the mine was new, its workings were yet of limited extent, and the fan was erected in close proximity to the downcast shaft, the upcast and downcast being separated only by a wooden partition.

On the other hand, an explosion traceable to coal-dust, occurring in a mine ventilated by a force-fan, is almost sure to wreck the ventilator. As examples we mention the Pekay, Iowa, disaster of 1892, and the recent explosion at the Vulcan mine, in Colorado. In both instances the fans were wrecked, the explosion extended through either mine from downcast to upcast, and in both cases the destruction wrought was fearful.

The latter case seems to furnish a very strong argument in favor of the ground we have taken, that the greater the amount of air going into a mine the more pronounced will be the danger of a dust explosion in the presence of a blown-out shot. Originally the Vulcan mine was ventilated by a force-fan, producing about 34,000 cubic feet of air per minute; a few months before the explosion occurred the management added another fan, and the two, working together, forced into the mine from 54,000 to 60,000 cubic feet per minute. With the less volume the mine had been working in safety; with the greater came death and destruction. In this case the large volume of air present did not only add force to the explosion, but it became also the direct means by which all the men in the mine lost their lives. The excellent description of this disaster by Mine Inspector David Griffiths, of Colorado, leads us to believe that while the force gained through limited ignition of coal-dust and possibly small quantities of gas and added to the primary force developed by the blown-out shot was not very great, it was amply sufficient to hurl the great mass of air with such force and rapidity through the mine as to invest it with the violence and destructiveness of a tornado.

This article may appear to some an argument in favor of poor ventilation. It should not be so considered. It should be the aim of all to suppress the occurrence of dangerous blown-out shots, and thus eliminate the primary cause of these explosions. That accomplished, the air-current entering a mine, no matter how large its volume may be, can then fulfil its beneficent mission to preserve and sustain life, and there need be no fear that its dangerous forces will be awakened. The proposition to do away with the atmosphere surrounding the earth, to prevent the occurrences of cyclones and tornadoes, would be about as sensible as the suggestion of the idea of inefficient ventilation to prevent a dust explosion in a mine.

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INSPECTOR OF COAL-MINES.

INQUEST AND INQUIRY RELATING TO THE EXPLOSION IN MINE No. 6.

Testimony of witnesses taken the 15th day of December, 1899, at an inquest before J. J. Campbell, justice of the peace of the city of Pittsburg, Crawford county, Kansas, the regular coroner of said county being absent therefrom.

DR. CHARLES C. BRADLEY, being sworn as a witness, testifies as follows:

Q. Where do you live, Mr. Bradley?

A. Just at present here at Frontenac.

Q. Were you in Frontenac on the 14th of December of this year?

A. Yes, sir.

Q. Were you at mine No. 6 of the Mount Carmel Coal Company after the explosion occurred there yesterday?

A. Yes, sir.

Q. Did you examine the bodies of Frank Vaverick, E. Dodson, Louis Benedict, and Henry Zimmerman?

A. I saw those bodies.

Q. Did you make any examination of them?

A. I made no minute examination of them. I merely saw them as they came out, and was satisfied there was no life in the bodies.

Q. Did you make examination sufficient to tell whether the bodies were burned or not?

A. Only about the face and hands; I did n't take the clothes off.

Q. What did you find the condition of the face and hands to be?

A. Vaverick was quite badly burned on the face and hands; the other three were not burned to any extent.

Q. From the examination you made, doctor, and your knowledge as a practicing physician, could you tell in what way the deceased came to their death?

A. Well, I would n't swear to it; I have an opinion, of course.

Q. What, in your best judgment, doctor, caused the death of the bodies you examined?

A. Explosion and its results, the after-damp after the explosion.

Q. Did you make examination enough, doctor, of all of them, except Mr. Vaverick, to tell whether or not the hair was scorched and burned?

A. My recollection about the matter is that they were not; Mr. Dodson I could n't swear to.

Q. Did you make sufficient examination of the bodies you have described to tell whether or not they came to their death by being burned?

A. In my opinion, the immediate cause of death was not from a burn.

Q. There were no outward or visible marks or wounds from which you would judge they came to their death or they could possibly have come to their death than as stated by you?

A. No.

PETER MCCALL, being sworn as a witness, testifies as follows:

Q. Mr. McCall, what is your profession?

A. Miner.

Q. You live here, in Frontenac, Kan.?

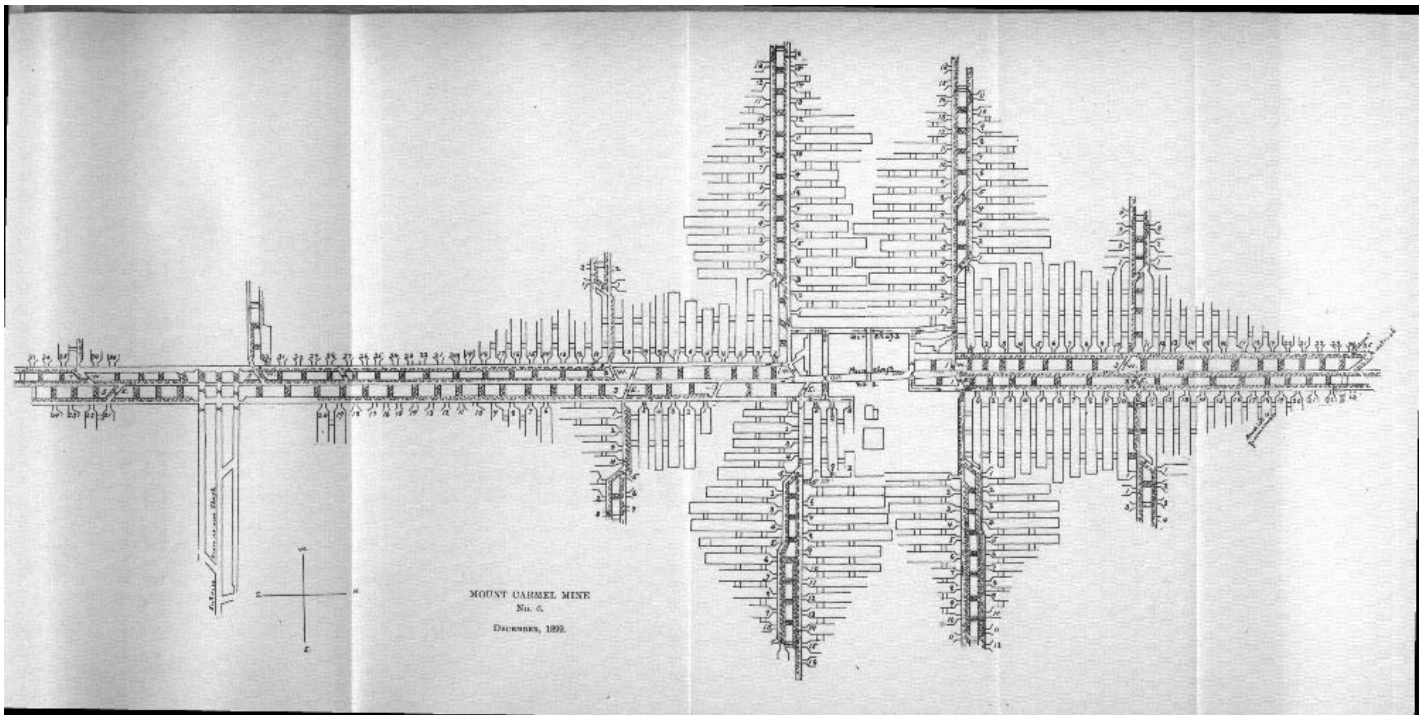
A. Yes, sir.

Q. Were you at mine No. 6 of the Mount Carmel Coal Company on December the 14th, 1899?

A. Yes, sir.

Q. Were you there at or near the time the explosion occurred yesterday evening?

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A. As near as I can judge, about thirty minutes after the explosion.

Q. Did you make any examination of the mine after the explosion?

A. Only that which was necessary to get the bodies.

Q. Just state what bodies and where they were found in the mine.

A. Mr. Campbell, Mr. Knight and myself found the bodies of Frank Vaverick and E. Dodson in the west parallel entry to the main north. The body of Frank Vaverick was lying near the face of the entry. The body of Dodson was laying south about forty or fifty feet, both in the same entry. Vaverick was burned about the face and hands. There did n't appear to be any burns on Dodson. Those were the only two that I helped to find. Those bodies were taken out and we proceeded to get the others, but they were got by another party.

Q. Were there any bruises or outward marks of violence on the bodies when you found them?

A. No, with the exception of Vaverick being burned on his face and hands. From the position that Dodson was lying in he appeared to have fell. It looked to me as if he had been traveling after the explosion had taken place and fell full length and lay in a natural position.

Q. Were there any bruises on Mr. Dodson's body?

A. None on the outside of his clothes, on his face, hands, or feet.

Q. What kind of work was Mr. Dodson and Mr. Vaverick engaged in?

A. In firing shots.

Q. How far were the bodies lying, when found, from the place where the last shot was fired, if you know?

A. I do n't know, because I did n't examine the places.

Q. How far were the bodies lying from the rooms where shots would naturally be fired?

A. Dodson's body was about six feet north of the last room turned in that entry.

Q. You are a miner of several years' experience, are you not, Mr. McCall?

A. Yes, sir. I have worked in them for about thirty-two years.

Q. From the experience you have had in and about the mines, and the condition of the mine when you went in after the bodies you have described, what, in your best judgment, Mr. McCall, caused the death of Mr. Vaverick and Mr. Dodson?

A. My opinion is Mr. Dodson was asphyxiated. I do n't know whether the burns on Mr. Vaverick would be sufficient to cause death or not.

Q. At the time you went into the mine after these bodies, Mr. McCall, do you think there was sufficient bad air or after-damp to cause death?

A. Yes, sir.

Q. From the examination you made of these two bodies, it is your best judgment that there were no wounds or bruises on the bodies sufficient to cause death?

A. Yes, sir; that's my opinion.

Questions by Morris Cliggitt:

Q. Have you been working in mine No. 6?

A. Yes, sir.

Q. How long?

A. About four months.

Q. What were you doing in there?

A. My work is assistant superintendent.

Q. Who is the pit boss?

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A. John O'Leary.

Q. How long has that mine been in operation?

A. About sixteen months, I guess.

Q. To what extent are the entries driven in the shaft?

A. The main north is about 1200 feet from the bottom of the shaft; the main south is about 2000 feet?

Q. All of these deaths occurred on the north side?

A. Yes, sir.

Q. Then I understand two of them on the west and two on the east of the main north?

A. Yes, sir.

Q. Were you in and around the mine sufficiently, after the accident, to notice the condition of the woodwork; whether or not that was burned in any way?

A. As far as I went I seen no evidence of fire, except on the door to the first west, on the south side.

Q. How much was that burned?

A. That was burning when we got down there. It was n't much. It was afire.

Q. How far was that from where you found the bodies?

A. That would be about 1500 feet.

Q. About south?

A. South.

Q. How many shot-firers were employed in the shaft?

A. Six.

Q. Were they working on both north and south?

A. Yes, sir.

Q. Was the mine apportioned out to the shot-firers? Or, if you know, state how they worked in firing the shots.

A. Each two men had a certain portion of the mine to fire—what the miners call "runs."

Q. Did they work separately or usually in pairs?

A. They work in pairs.

Q. How long have you had six shot-firers at work?

A. Since some time in the beginning of November—the 1st of December.

Q. Are you in the mine every day, right along?

A. Yes, sir.

Q. What, if any, knowledge or information have you as to whether or not there was gas in the mine?

A. I have never seen any gas in the mine.

Q. Have you had any information with respect to it?

A. No, sir; there has never been any reported to me.

Q. From where you say this door was burning, what would be the direction of the air-current from or toward the bodies which you found?

A. The air-current from that door would travel south and make its return to the air-course, and could never reach those bodies.

Q. Was any of the clothing on any of the bodies that you saw burned?

A. None, with the exception of Vaverick.

Q. How much was Vaverick's clothes burned?

A. I should judge it would be about the wristband of his shirt.

Q. Now, was there any noise accompanying this explosion?

A. I did n't hear any.

Q. Well, what is your opinion as to the fact of there having been an explosion, from what you saw?

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A. I have n't made a sufficient examination to justify me in giving any theory.

Q. Well, you know whether there is any portion of the woodwork in the hoisting or air-shaft burned?

A. In the hoisting shaft, so far as I could see, there was no indication of fire.

Q. Well, were there any timbers displaced, or props blown down, or doors blown off, or anything of that kind?

A. There was three timbers on the bottom blown out. The overcast on the south side is blown out, and the door on the east and the door on the west on the south side are blown down.

Q. Where were these timbers?

A. Near the bottom of the shaft.

Q. Well, what part of the work had they formed a part of?

A. Supporting the roof, near the bottom of the shaft.

Q. Well, now, on this north entry where Vaverick was found, was that still being driven?

A. Yes, sir.

Q. Do you know whether the shot at the face of the entry had been fired?

A. I believe not.

Q. Well, now, as I understand it, the air-current in this parallel entry of the main north would be south from the face of the entry?

A. Yes, sir.

Q. And the shot-firers in firing shots would work against the current; that is, in that entry, from south to north?

A. Yes, sir.

Q. Now, with these doors broken down, do you know of any way that an air-current could have reached from the south side to the entries where the bodies were found?

A. No, sir. I might explain that. Along the north and on the south is two separate currents. Each current makes its return to the air-shaft, and it's not possible to interfere with the other currents.

Questions by O. T. Boaz:

Q. The air-current in the main north and parallels went north in the main entry, crossed over to the parallel entries through break-throughs, and then went south to the air-course?

A. Yes, sir.

Q. How far was the break-through last north between the main entry and the west parallel from the face of the entry?

A. From the face of the west parallel to the break-through was about twelve feet.

Q. Now, is there any way in which any gas of a suffocating nature could have traveled from the face of the west parallel across the main entry to the east parallel, unless it had gone directly against the air course?

A. No, sir; there is no other way it could go.

Q. The other two men who were found dead, you know, were not found in the west parallel?

A. Yes, sir.

Q. The doors on the south side were blown down; some of the doors?

A. Yes, sir.

Q. That part of the mine which you speak of as the south side is the part lying south of the bottom of the shaft and any east or west entries which may be in a line or nearly on a line with the bottom of the shaft?

A. Everything south of the bottom of the shaft is called the south side.