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COAL-MINE FATALITIES IN THE UNITED STATES 1870–1914

WITH

STATISTICS OF COAL PRODUCTION, LABOR, AND MINING METHODS, BY STATES AND CALENDAR YEARS

COMPILED BY

ALBERT H. FAY

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CONTENTS.

ILLUSTRATIONS.

COAL-MINE FATALITIES IN THE UNITED STATES, 1870-1914, WITH STATISTICS OF COAL PRODUCTION, LABOR, AND MINING METHODS, BY STATES AND CALENDAR YEARS.

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PART I.—COAL-MINE STATISTICS FOR THE UNITED STATES BY CALENDAR YEARS.

INTRODUCTION.

The first data compiled by the Bureau of Mines relating to coal-mine accidents in the United States were published in Bulletin 69,[a] in which the total fatalities by years and States were tabulated from 1896 to 1912. Since the publication of Bulletin 69, further research has been conducted, with the result that the bureau is now able to publish for the first time all of the fatal accidents described in the State inspectors' reports by States, causes, and calendar years, from the beginning of inspection service to date. For the anthracite mines of Pennsylvania, there is a continuous record since 1870; the records of the Pennsylvania bituminous mines are continuous from 1877, and, with the exception of one year, the Ohio records are complete from 1874 to date. In fact, the records of all of the States, with few exceptions, are complete; and incomplete data for any year may generally be attributed to the fact that no report was published during that year.

The magnitude of the coal-mining industry in the United States is such that too much stress can not be placed on the need of safeguarding the three-quarters of a million men employed. Although the figures given herein show an appalling record for past years, they are not published for the purpose of proclaiming the high fatality rate of the past. They are a record of experience covering a period of 45 years, showing causes and results of many accidents in the coal mines of the United States. They represent a diagnosis of the hazard of the mining industry, pointing out the principal physical causes of accidents, and make available a body of uniform facts that will serve as a basis of preventive measures for use in future operations. It is with these great purposes in view that the Bureau of Mines presents the classified data in this report.

[a] Horton, F. W., Coal-mine accidents in the United States and foreign countries: Bull. 69, Bureau of Mines, 1913, 102 pp.

Classification and study of mine accidents on the basis of number of persons killed is common and very old, but fails to throw enough light upon the problem involved. Many serious accidents in mines have no fatal results, hence in a tabulation of fatalities they are overlooked and the real hazard of the industry is not made clear. An accident does not necessarily include an injury that may result therefrom. Such accidents as the breaking of a hoisting cable, an explosion of powder, gas, or dust, a runaway car or motor are all serious. Although no loss of life results, they should be recorded, investigated, and studied to prevent their repetition.

No accurate data for the United States are available showing how far the personal element as related to the miner and his co-worker, the mine foreman, or to the superintendent and others in authority, contributes to accidents. Many accidents are due to inexperience on the part of the miner, his failure to heed orders, a misunderstanding of instructions and last, but not least, carelessness of himself or his fellow worker. A foreman or superintendent may fail to give proper warning regarding the conditions of certain parts of the mine; he may not have inspected certain rooms or entries on the day of a mine accident; the mine may not be properly equipped, or the operator may neglect to comply with the inspector's recommendations. There is, therefore, a personal element on the part of both the operator and the miner that must be considered. Legislation and the enactment of compensation laws will make the operator realize the seriousness of the mine-accident situation, when fatalities and injuries are to be paid for in legal tender of the realm. The miner must be educated and made to realize the dangers he encounters; he must learn that self-preservation and the safety of his fellow workmen should receive his first attention; he should cooperate with his employer, his associates, and the State mine inspector to the end that the mine hazard may be reduced to a minimum. "Cooperation for safety" should be the watchwords of the operator, miner, State inspectors, and all others in any way interested in the mining industry.

SOURCES AND SCOPE OF STATISTICS.

The fatalities classified in the State tables have been compiled from the State mine inspectors' reports. The details relating to each individual fatality, as published by the inspectors, have been carefully reviewed and the fatality classified according to the cause of the death as reported. The date of the accident has also been taken into consideration, so that all of the tables have been prepared on the basis of a calendar year. Thus, for the first time, the coal-mine fatalities of all the States are placed on the same basis. It is hoped that those States that classify fatalities by fiscal years will realize the value of a uniform classification and will adopt the calendar year as their basis. Inasmuch as figures based on the calendar year have been used throughout this bulletin, it has not been possible to make the State tables check

absolutely with the published reports of the inspectors. Some of the States have years ending June 30, others in May, September, October, or November.

In the compilation of these tables, all fatalities that were not directly attributable to the mining industry have been eliminated, including coke-oven accidents, suicides, natural causes, and murders. In a number of the earlier reports accidents of this character were included in the inspectors' returns.

Data relating to the production since 1807, the number of men employed since 1889, the number of days worked, the number of mining machines in use since 1891, the percentage of coal mined by different methods since 1911, the spot value of the coal, and notes on the coal areas and distribution have been taken from the annual volumes of the Mineral Resources of the United States, published by the United States Geological Survey. The data relating to mining methods have been compiled from both the reports of the United States Geological Survey and the State mine inspectors. It is not feasible to indicate the source of each individual item by footnotes, as that would be both burdensome and confusing. The general statement as above given, it is hoped, will indicate plainly the source of the data herein. Wherever practicable, footnotes have been inserted, showing the source of tables and direct quotations.

Notes relating to the mine-inspection service were compiled from the State mining laws and submitted to the individual State inspectors for verification and comment, and their corrections or additions have been included.

ACKNOWLEDGMENTS.

Acknowledgments are due to the following persons for technical assistance that has made possible the completion of the data compiled herein, and for suggestions that have been used in the preparation of the tables and other data: Dr. J. J. Rutledge, mining engineer, E. S. Boalich, mine statistician, and W. W. Adams, clerk, of the Bureau of Mines; M. R. Campbell, geologist, of the United States Geological Survey, who revised the notes on the various coal fields of each State; and the State mine inspectors, who supplied missing data and revised notes relating to the mine-inspection service of their respective States.

NUMBER OF MEN EMPLOYED.

Although the majority of the State mine inspectors' reports give the number of men employed in the coal-mining industry for each year, many of the reports are based on fiscal years, and as the fatalities have been classified according to calendar years, the actual number of employees would not be in accordance therewith. Some of the inspectors have included coke-oven employees, and as coke-oven accidents have been excluded, these workers should be omitted. It seemed best, however, that the number of employees should be ob-

tained from one source, as in so doing the statistics relating to employees would be on the same basis for all the States. The bureau has, therefore, used the number of employees as reported by the United States Geological Survey since 1889 (except 1909 and 1911). As the figures have been collected by one bureau, they are on a uniform basis and, furthermore, they are for calendar years and do not include coke-oven employees. For comparative purposes the number thus reported employed will be much better than one based on reports from 25 or 30 sources and for varying fiscal years.

The number of employees in the coal-mining industry for the year 1909 was compiled by the mining division of the Bureau of the Census and was published by the United States Geological Survey in 1910, as 666,552. In 1912 State figures for 1909 were compiled by the same bureau and published by the Bureau of Mines in Technical Paper 48,[a] in Bulletin 69,[b] and in each of the monthly statements of coal-mine fatalities to date. These publications have had wide circulation and have been used by many mining companies, State officials, and insurance organizations, and for this reason the figures showing coal-mine employees in 1909 as previously published by the bureau have been used in this bulletin.

The final census figures for 1909, published in 1913, show the number of employees on December 15, 1909, as 743,293. That figure, however, includes a certain number of coking establishments and, furthermore, as the coal-mining industry employs the largest number of men at that season of the year, the number reported on that date is too high to represent a fair average.

The census report for 1909, page 196, also gives the number of employees on the 15th day of each month during the year, the average of which is 681,090. The same report also gives the number of men employed on the 15th of each month during the year by States, the average of which is 680,872, as compared with 666,552, published by the United States Geological Survey and the Bureau of Mines. These two census figures, although agreeing closely, seemingly include certain coke workers. Taking everything into consideration, it is believed that the Bureau of Mines is justified in adhering to its first published figures (666,552), although this fails to check with the final census figures by about 2 per cent.

For the year 1911 the bureau collected accident statistics and at the same time obtained direct from the operators the number of men employed, both on surface and underground. The number of employees thus obtained has been used throughout this bulletin.

UNDERGROUND AND SURFACE EMPLOYEES.

Complete statistics showing separately the total underground employees, as well as surface employees at coal mines are not avail-

[a] Horton, F. W., Coal-mine accidents in the United States, 1896–1912, with monthly statistics for 1912, 1913, 74 pp.

[b] Horton, F. W., Coal-mine accidents in the United States and in foreign countries, 1913, 102 pp.

able. The number employed since 1889, as reported by the Geological Survey, is combined as one item, but coke-oven employees are not included. As there are no separate data for these two classes of employees, Table 6 has been prepared, the underground and surface employees being calculated on the basis of the 1911 returns to the Bureau of Mines. In this year 122,513 surface employees were reported at coal mines (exclusive of coke workers) or 16.82 per cent of the total. The total number employed each year since 1895 has been separated on the above basis, with underground and surface fatality rates calculated independently. The 20-year period chosen is considered sufficiently long to be thoroughly representative and thus to throw a little more light on the real underground hazard. For example, the fatality rate in 1913, based on all employees, was 3.725 per 1,000, whereas the underground rate was 4.218, or 13 per cent higher than the combined rate. The surface rate for the same year was 1.283. Similar comparisons with other years may be made.

COAL-MINE FATALITIES IN THE UNITED STATES, 1839–1914.

Table 1 shows by calendar years the total number of fatalities recorded for the coal-mining industry of the United States as compiled from the State mine inspectors' reports, and from other authentic sources. This table shows that since 1839 to the end of 1914, 53,078 men have been killed in and about the coal mines in the United States. This number, however, is not complete, as mining was carried on in all of the coal-mining States several years prior to inspection service, and as the number of fatalities that occurred in the early period of the industry has not been recorded, except for a few of the larger disasters in which 5 or more men were killed.

The 49,733 fatalities given in Table 2 represent those occurring in 89.46 per cent of the industry as based on the tonnage from 1807 to the end of 1913. The fatality rate per million tons mined during the 10 years from 1870 to 1879 was 8.70. If this figure be taken as representative of the early stages of the industry and applied to the remaining 10.54 per cent of the production from 1807 to and including 1909, not represented by accident statistics, an estimated 9,000 fatalities should be added to the 49,733, making the total to the end of 1913 as 58,733. The total fatalities to the end of 1914 are, therefore, 61,187, of which number 53,078 are accounted for in Table 1.

The total number of fatalities shown in Table 1 does not necessarily agree with the totals shown in Tables 2, 3, and 4, because in the latter tables only those fatalities have been included for which the corresponding number of men employed was obtainable. In Table 1 the figures covering 1888 to the end of 1914 do check with the above tables. Prior to 1888 the table covers a number of mine disasters in States in which the number of men employed was not obtainable. In the subsequent discussion of mine accidents Table 1 is ignored and the lessons to be drawn are based on Tables 2, 3, and 4, which contain complete comparable data for 49,733 fatalities.

TABLE 1.—COAL-MINE FATALITIES IN THE UNITED STATES, BY STATES AND YEARS, 1839 TO 1914.[a]

Year.	Alabama.	Arkansas.	California.	Colorado.	Georgia and North Carolina.	Illinois.	Indiana.	Iowa.	Kansas.	Kentucky.	Maryland.	Michigan.	Missouri.	Montana.	New Mexico.	North Dakota.	Ohio.	Oklahoma.	Oregon.	Pennsylvania (anthracite).	Pennsylvania (bituminous).	Tennessee.	Texas.	Utah.	Virginia.	Washington.	West Virginia.	Wyoming.	Total.
1839	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*40*	.....	.....	.....	40
1847	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*7*	.....	.....	.....	.....	.....	.....	.....	.....	7
1854	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*19*	.....	.....	.....	19
1855	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*55*	.....	.....	.....	55
1860	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*179*	.....	.....	.....	.....	.....	.....	.....	.....	170
1870	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	211	.....	.....	.....	.....	.....	.....	.....	.....	211
1871	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	210	.....	.....	.....	.....	.....	.....	.....	.....	210
1872	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	223	.....	.....	.....	.....	.....	.....	.....	.....	223
1873	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	263	.....	.....	.....	.....	.....	.....	.....	.....	263
1874	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29	.....	.....	231	.....	.....	.....	.....	.....	.....	.....	.....	260
1875	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24	.....	.....	236	.....	.....	.....	.....	.....	.....	.....	.....	260
1876	.....	.....	*6*	.....	.....	.....	.....	.....	.....	.....	0	.....	.....	.....	.....	.....	15	.....	.....	227	.....	.....	.....	.....	*8*	.....	.....	.....	256
1877	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	31	.....	.....	194	*b 14*	.....	.....	.....	.....	.....	.....	.....	244
1878	.....	.....	.....	.....	.....	.....	*8*	.....	.....	.....	(*c*)	.....	.....	.....	.....	.....	*17*	.....	.....	187	48	.....	.....	.....	.....	.....	.....	.....	260
1879	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	*2*	.....	.....	262	55	.....	.....	.....	.....	.....	.....	.....	326
1880	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	3	.....	.....	.....	.....	.....	*25*	.....	.....	202	49	.....	.....	.....	.....	.....	.....	.....	280
1881	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	8	.....	.....	.....	.....	.....	30	.....	.....	273	57	.....	.....	.....	.....	.....	.....	*38*	418
1882	.....	.....	.....	.....	.....	*d* 40	(*c*)	*e*22	.....	.....	(*c*)	.....	.....	.....	.....	.....	25	.....	.....	291	92	.....	.....	.....	*32*	.....	.....	.....	502
1883	.....	.....	.....	6	.....	*d* 134	11	15	.....	.....	8	.....	.....	.....	.....	.....	22	.....	.....	323	54	.....	.....	.....	.....	.....	20	.....	593
1884	.....	.....	.....	64	.....	*f* 64	9	22	3	5	(*c*)	.....	.....	.....	.....	.....	32	.....	.....	332	119	.....	.....	.....	*112*	.....	(*c*)	.....	762
1885	.....	.....	.....	9	.....	50	7	16	9	1	(*c*)	.....	.....	.....	.....	.....	29	.....	.....	359	68	.....	.....	.....	.....	3	23	.....	574
1886	.....	.....	.....	6	.....	36	7	22	.....	1	.....	.....	.....	.....	.....	.....	42	.....	.....	278	74	.....	.....	.....	.....	4	47	*13*	530
1887	.....	.....	.....	12	.....	51	(*c*)	22	6	8	13	.....	.....	.....	.....	.....	30	.....	.....	314	84	.....	.....	.....	.....	2	11	.....	535
1888	.....	.....	.....	29	.....	57	17	30	*40*	14	(*c*)	.....	27	.....	.....	.....	32	.....	.....	364	90	.....	.....	.....	.....	(*c*)	28	.....	728
1889	.....	.....	.....	24	.....	41	(*c*)	22	12	12	5	.....	10	0	.....	.....	34	.....	.....	385	103	.....	.....	.....	.....	6	14	.....	668
1890	.....	.....	.....	16	.....	57	5	12	8	10	8	.....	18	1	.....	.....	39	.....	.....	378	145	.....	.....	.....	.....	7	20	.....	733
1891	.....	.....	.....	30	.....	49	5	27	11	16	6	.....	20	7	.....	.....	38	.....	.....	428	236	22	.....	.....	.....	14	47	.....	956
1892	.....	.....	.....	33	.....	69	19	21	(*c*)	8	6	.....	22	3	.....	.....	43	*100*	.....	418	134	13	.....	2	.....	55	45	.....	991
1893	17	.....	.....	46	.....	83	22	24	14	12	5	.....	18	1	4	.....	36	6	.....	455	131	13	.....	0	.....	9	62	.....	958
1894	21	.....	.....	19	.....	57	(*c*)	24	24	10	7	.....	19	6	11	.....	39	9	.....	445	123	14	.....	1	.....	50	79	.....	958
1895	39	.....	.....	23	*39*	78	23	23	11	13	9	.....	13	8	28	.....	51	9	.....	421	153	37	.....	1	.....	39	64	*60*	1,142
1896	25	.....	.....	68	.....	70	28	18	12	6	6	.....	8	(*c*)	9	.....	42	15	.....	501	178	22	.....	2	.....	8	65	.....	1,083
1897	39	*17*	.....	36	.....	73	16	23	6	12	5	.....	12	11	5	.....	39	28	.....	423	149	10	.....	2	.....	7	77	.....	990
1898	45	5	.....	23	.....	90	21	22	17	6	4	.....	10	7	8	.....	48	23	.....	411	199	19	.....	3	.....	11	90	.....	1,062
1899	40	(*c*)	.....	40	*23*	73	16	25	16	7	5	4	11	(*c*)	18	.....	56	28	.....	461	258	20	.....	0	.....	45	95	.....	1,241
1900	37	(*c*)	.....	31	.....	102	19	29	21	17	7	10	19	7	9	.....	71	35	.....	411	264	10	.....	209	.....	31	150	.....	1,489
1901	40	18	.....	55	.....	107	24	29	11	21	12	6	16	7	15	.....	64	57	.....	513	301	43	.....	8	*17*	27	133	*50*	1,574
1902	50	*18*	.....	73	.....	107	24	49	28	19	11	8	10	12	14	.....	86	42	.....	300	455	226	.....	8	.....	34	134	*21*	1,724

1903	57	*11*	....	44	....	158	52	27	33	27	12	8	17	5	22	....	124	42	....	518	395	26	....	7	....	25	147	*169*	1,928
1904	83	(c)	....	94	....	173	34	25	31	20	10	6	11	9	8	....	117	29	....	595	533	28	....	9	....	31	149	(c)	1,995
1905	187	8	....	65	....	203	46	37	41	31	15	9	11	8	7	....	126	41	....	644	475	29	....	7	....	12	212	*18*	2,232
1906	96	13	....	89	....	161	31	29	39	39	6	5	16	13	23	....	131	44	....	557	476	32	....	4	*35*	22	277	(c)	2,138
1907	154	13	....	107	....	192	53	40	37	32	*3*	7	8	13	34	....	154	39	....	708	799	30	....	5	*11*	37	736	*30*	3,242
1908	108	14	....	63	....	172	45	31	38	40	*6*	6	10	21	24	4	113	46	....	678	571	34	....	5	....	25	310	81	2,445
1909	129	15	*6*	97	2	458	49	39	32	34	20	9	21	11	14	0	110	48	1	567	500	29	4	15	27	39	336	30	2,842
1910	238	14	0	323	0	143	51	33	17	86	18	6	14	12	16	2	159	39	0	601	521	38	7	18	57	43	329	36	2,821
1911	209	12	0	88	0	172	46	38	42	44	15	7	8	14	11	1	107	27	1	699	515	111	8	13	68	27	341	32	2,656
1912	123	6	2	96	2	163	35	19	30	51	15	8	19	7	16	0	135	99	1	601	446	18	2	19	75	14	381	36	2,419
1913	124	12	2	108	3	164	66	26	28	48	13	3	10	20	272	6	165	23	0	618	609	35	4	17	24	22	337	26	2,785
1914	128	11	0	75	1	193	44	37	33	61	18	2	19	8	18	3	64	31	1	595	402	26	11	22	27	17	556	51	2,454
Total	1,989	182	16	1,892	70	3,840	843	881	650	711	294	104	397	211	588	16	2,574	860	4	18,497	9,875	885	36	377	607	666	5,324	691	53,078

a Figures in italics represent incomplete fatality records.
b Last three months of year only.
c Reports either not published or not available.
d Fiscal year ending June 30.
e Includes 1881.
f Includes last six months of 1883.

TABLE 2.—PRODUCTION, EMPLOYEES, AND FATALITIES, SHOWING PERCENTAGE OF COAL-MINING INDUSTRY FOR WHICH COMPLETE RETURNS ARE AVAILABLE, 1870 TO 1914.

[See figs. 1 and 2.]

Year.	Total United States.			Portion of United States under inspection service or reporting accidents.									
				Total for States reporting accidents.				Number killed.					
				Production.		Employees.						Average tonnage per man.[d]	
	Production, short tons.[a]	Value per ton at mine.[a]	Number employed.[a]	Short tons.	Per cent of total.	Number employed.[c]	Per cent of total.	Total.[b]	Per 1,000 employed.	Per 1,000,000 short tons mined.	Production per death, short tons.[d]	Days worked	Per year.	Per day.
1807–1869	410,395,133												
1870	33,035,580			15,664,275	47.42	35,600		211	5.93	13.47	74,238		440	
1871	46,885,080			19,342,057	41.25	37,488		210	5.60	10.86	92,105		516	
1872	51,453,399			24,233,166	47.10	44,745		223	4.98	9.20	108,669		542	
1873	57,602,480			26,152,837	45.40	48,199		263	5.46	10.06	99,440		543	
1874	52,605,920			28,086,375	53.39	67,152		260	3.87	9.26	108,025		418	
1875	52,348,320			27,350,625	52.25	85,005		260	3.06	9.51	105,192		322	
1876	53,280,000			26,293,245	49.35	85,474		242	2.83	9.20	108,650		308	
1877	60,501,760			30,910,316	51.09	81,142		225	2.77	7.28	137,379		381	
1878	57,935,600			36,809,682	63.54	89,751		235	2.62	6.38	156,637		410	
1879	68,105,799			46,447,793	68.20	96,133		317	3.30	6.82	146,523		483	
1880	71,481,570			53,083,570	74.26	123,736		274	2.21	5.16	193,736		429	
1881	85,881,030			56,304,138	65.56	116,128		340	2.93	6.04	165,600		485	
1882	103,551,189			78,326,909	75.64	162,883		448	2.75	5.72	174,837		481	
1883	115,707,525			82,356,134	71.18	162,248		542	3.34	6.58	151,949		508	
1884	120,155,551			87,264,984	72.63	192,369		538	2.80	6.17	162,203		454	
1885	111,160,295			92,922,981	83.59	213,178		549	2.58	5.91	169,259		436	
1886	113,680,427			94,538,058	83.16	219,699		494	2.25	5.23	191,373		430	
1887	130,650,511			103,774,783	79.43	228,777		504	2.20	4.86	205,902		454	
1888	148,659,657			129,763,086	87.29	285,517		728	2.55	5.61	178,246		454	
1889	141,229,513	$1.13	311,717	127,875,451	90.54	283,198	90.85	668	2.36	5.22	191,430		452	
1890	157,770,963	1.12	318,204	146,192,491	92.66	291,217	91.52	753	2.52	5.01	199,444	216	503	2.33
1891	168,566,669	1.13	332,147	157,654,975	93.53	310,683	93.54	956	3.08	6.06	164,912	215	507	2.36
1892	179,329,071	1 16	341,943	165,708,630	92.40	317,140	92.75	991	3.12	5.98	167,214	212	523	2.47
1893	182,352,774	1.14	363,309	177,616,520	97.40	355,091	97.74	958	2.70	5.39	185,403	201	500	2.49
1894	170,741,526	1.09	376,204	162,139,619	94.96	358,642	95.33	958	2.67	5.91	169,248	178	452	2.54
1895	193,117,530	1.02	382,879	190,104,270	98.44	376,024	98.21	1,142	3.04	6.00	166,466	195	505	2.59
1896	191,986,357	1.02	393,342	185,122,828	96.43	380,477	96.73	1,083	2.85	5.85	170,935	185	487	2.63
1897	200,229,199	.99	397,701	194,731,837	97.25	388,585	97.71	990	2.55	5.08	196,699	179	501	2.80
1898	219,976,267	.95	401,221	213,734,037	97.16	391,841	97.66	1,062	2.71	4.87	201,256	190	545	2.87
1899	253,741,192	1.01	410,635	243,993,172	96.16	395,607	96.34	1,241	3.14	5.08	196,610	214	617	2.88

1900	269,684,027	1.14	448,581	260,164,397	96.47	432,448	96.40	1,489	3.44	5.72	174,724	212	602	2.84
1901	293,299,816	1.19	485,544	291,449,047	99.37	480,807	99.02	1,574	3.27	5.40	185,165	216	606	2.81
1902	301,590,439	1.22	518,197	296,687,066	98.37	510,217	98.46	1,724	3.38	5.81	172,092	197	581	2.95
1903	357,356,416	1.41	566,260	352,064,631	98.52	556,581	98.29	1,926	3.46	5.47	182,796	220	633	2.88
1904	351,816,398	1.26	593,693	339,164,812	96.40	573,373	96.58	1,995	3.48	5.88	170,007	202	592	2.93
1905	392,722,635	1.21	626,045	386,379,243	98.38	615,368	98.29	2,232	3.63	5.78	173,109	212	628	2.96
1906	414,157,278	1.24	640,780	405,955,888	98.02	630,283	98.36	2,138	3.39	5.27	189,876	209	644	3.08
1907	480,363,424	1.28	680,492	477,892,536	99.49	674,613	99.14	3,242	4.81	6.78	147,407	231	708	3.06
1908	415,842,698	1.28	690,438	409,309,857	98.43	678,873	98.32	2,445	3.60	5.97	167,407	195	603	3.09
1909	460,814,616	1.20	[e] 666,552	460,807,263	99.99	666,535	99.99	2,642	3.96	5.73	174,416	.....	691	.....
1910	501,596,378	1.25	725,030	501,596,378	100.00	725,030	100.00	2,821	3.89	5.62	177,808	220	692	3.15
1911	496,371,126	1.26	[f] 728,348	496,371,126	100.00	728,348	100.00	2,656	3.65	5.35	186,887	220	682	3.10
1912	534,466,580	1.30	722,662	534,466,580	100.00	722,662	100.00	2,419	3.35	4.53	220,945	225	740	3.29
1913	570,048,125	1.33	747,644	570,048,125	100.00	747,644	100.00	2,785	3.73	4.89	204,685	238	762	3.20
Total	**9,844,247,843**	.....	.....	**8,808,855,193**	**89.48**	**14,966,511**	.....	**49,733**	**3.32**	**5.65**	**177,063**	.....	**688**	.....
1914	513,525,477	1.33	763,185	513,525,477	100.00	763,185	100.00	2,454	3.22	4.78	209,261	207	673	3.25

[a] Mineral Resources, U. S. Geol. Survey.
[b] Summation based on State mine inspectors' reports. (See Table 3.)
[c] Number employed 1870–1888 selected from State mine inspectors' reports; 1889–1914 (except 1909 and 1911), selected from Mineral Resources, U. S. Geol. Survey.
[d] Calculated on basis of production represented by inspection States.
[e] Bureau of Census.
[f] Bureau of Mines.

TABLE 2A.—NUMBER OF MEN EMPLOYED IN AND ABOUT THE COAL MINES IN THE UNITED STATES, BY STATES; 1889–1914.[a]

State.	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901
Alabama	6,864	10,642	9,302	10,075	11,294	10,859	10,346	9,894	10,597	10,733	13,481	13,967	17,370
Arkansas	677	938	1,317	1,128	1,559	1,493	1,218	1,507	1,990	2,556	2,313	2,800	3,144
California	253	364	256	187	158	125	190	177	381	284	363	378	428
Colorado	4,904	5,827	6,000	5,747	7,202	6,507	6,125	6,704	5,852	6,440	7,166	7,450	8,870
Georgia	733	425	850	467	736	729	848	713	469	534	507	681	791
Idaho		[b] 80	[b] 80	[b] 90	[b] 70	[b] 95	[b] 61	[b] 18	[b] 58	[c] 37	[d] 76		
Illinois	30,076	28,574	32,951	34,585	35,390	38,477	38,630	39,660	33,788	35,026	36,756	39,101	41,880
Indiana	6,448	5,489	5,879	6,436	7,644	8,603	8,530	8,806	8,886	8,971	9,712	11,720	12,968
Iowa	9,247	8,130	8,124	8,170	8,863	9,995	10,066	9,672	10,703	10,262	10,971	11,608	12,653
Kansas	5,956	4,523	6,201	6,559	7,310	7,339	7,482	7,127	6,639	7,197	8,000	8,459	9,928
Kentucky	6,144	5,259	6,355	6,724	6,581	8,083	7,865	7,649	7,983	7,614	7,461	9,680	10,307
Maryland	3,702	3,842	3,891	3,886	3,935	3,974	3,912	4,039	4,719	4,818	4,624	5,319	5,333
Michigan	261	180	223	230	162	223	320	320	537	716	1,291	1,704	2,276
Missouri	6,631	5,971	6,199	5,893	7,375	7,573	6,299	6,982	6,414	6,542	7,136	8,180	9,871
Montana	848	1,251	1,119	1,158	1,401	1,782	2,184	2,336	2,337	2,369	2,378	2,376	2,158
New Mexico	1,015	827	806	1,083	1,011	985	1,383	1,569	1,659	1,873	1,760	2,037	2,478
North Dakota	75			54	88	77	65	141	170	151	210	326	280
Ohio	19,343	20,576	22,182	22,576	23,931	27,105	24,644	25,500	26,410	26,986	26,038	27,628	32,111
Oklahoma	1,862	2,571	2,891	3,257	3,446	3,101	3,212	3,549	3,168	3,216	4,084	4,525	6,706
Oregon	160	208	100	90	110	88	414	254	254	199	124	141	187
Pennsylvania (anthracite)	123,676	126,000	126,350	129,050	132,944	131,603	142,917	148,991	149,884	145,504	139,608	144,206	145,309
Pennsylvania (bituminous)	62,084	61,333	63,661	66,655	71,931	75,010	71,130	72,625	77,272	79,611	82,812	92,692	101,904
Tennessee	4,031	5,082	5,097	4,926	4,976	5,542	6,120	6,531	6,337	6,643	6,949	7,646	9,046
Texas	543	674	787	871	996	1,062	1,642	1,953	1,766	2,130	2,410	2,844	3,051
Utah	551	429	621	646	576	671	670	679	704	739	743	1,308	1,712
Virginia	1,523	1,295	820	836	961	1,635	2,158	2,510	2,344	1,855	1,960	3,631	4,152
Washington	2,657	2,206	2,447	2,564	2,757	2,662	2,840	2,622	2,739	3,145	3,330	3,670	4,545
West Virginia	9,778	12,236	14,227	14,867	16,524	17,824	19,189	19,078	20,504	21,607	23,625	29,163	30,936
Wyoming	2,675	3,272	3,411	3,133	3,378	3,032	3,449	2,937	3,137	3,475	4,697	6,332	5,151
Total	**311,717**	**318,204**	**332,147**	**341,843**	**363,309**	**376,204**	**382,879**	**393,342**	**387,701**	**401,221**	**410,636**	**448,561**	**466,644**

State.	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
Alabama	16,439	21,438	17,811	19,595	20,555	21,388	19,197	17,760	22,230	22,003	22,613	24,552	24,042
Arkansas	3,595	4,157	4,580	4,192	4,298	5,085	5,337	5,266	5,568	5,338	4,536	4,652	4,339
California	207	203	168	135	41	32	34	15	14	45	52	35	36
Colorado	8,956	9,229	8,123	11,020	11,368	14,223	14,523	11,472	15,864	14,373	13,000	11,990	10,098
Georgia	755	681	881	801	737	808	670	460	386	510	450	500	355
Idaho	[d] 70	[d] 86	[e] 57	[f] 61	[c] 40	[g] 66	[c] 39	17	[c] 19	[c] 24	[h] 20	[i] 17	[k] 54
Illinois	47,411	50,596	54,685	58,053	61,988	65,581	68,035	69,425	72,645	75,656	78,098	79,529	79,499
Indiana	15,457	17,017	19,587	25,323	20,970	21,022	18,380	20,937	21,878	20,991	21,651	22,235	23,175
Iowa	12,434	14,162	15,629	15,113	15,260	15,585	16,021	17,286	16,666	16,852	16,370	15,757	16,057
Kansas	9,461	10,924	12,198	11,926	14,355	12,439	13,916	12,359	12,870	11,823	11,646	12,479	12,448
Kentucky	13,727	14,354	14,235	14,685	15,272	16,971	16,996	16,903	20,316	24,124	24,304	26,332	28,764
Maryland	5,827	5,859	5,671	5,948	6,438	5,880	6,079	8,004	5,809	6,079	6,162	5,645	5,403
Michigan	2,344	2,768	3,549	3,696	3,971	3,982	4,247	3,496	3,575	3,248	3,113	3,305	2,800
Missouri	9,739	9,544	10,137	8,962	9,557	8,448	8,988	9,188	9,691	9,607	9,704	10,418	9,549
Montana	1,938	2,155	2,505	2,181	2,394	2,735	3,146	4,535	3,837	3,864	3,440	3,630	3,350
New Mexico	1,849	1,789	1,849	2,108	2,070	2,970	3,448	3,317	3,585	3,700	3,928	4,329	4,178
North Dakota	402	486	554	626	488	562	631	972	534	760	622	641	558
Ohio	38,965	41,936	43,634	43,399	45,438	46,833	47,407	38,114	46,641	45,459	45,527	45,815	45,401
Oklahoma	5,574	7,704	8,487	7,712	8,251	8,398	8,651	8,689	8,657	8,729	8,785	9,044	8,078
Oregon	265	235	334	316	209	184	214	235	153	304	222	203	190
Pennsylvania (anthracite)	148,141	150,483	155,861	165,406	162,355	167,234	174,174	166,801	169,497	173,940	174,030	175,745	179,679
Pennsylvania (bituminous)	112,630	129,265	135,100	143,629	152,099	163,295	165,961	159,321	175,403	171,108	165,144	172,196	184,201
Tennessee	8,750	9,961	10,416	11,928	11,452	12,052	11,812	10,031	11,930	11,124	10,309	11,263	10,116
Texas	2,369	2,380	2,921	3,008	3,048	4,227	4,400	4,196	4,197	4,980	5,127	5,101	4,635
Utah	1,826	1,925	1,374	1,361	1,572	2,203	2,664	3,014	3,053	3,446	3,328	4,158	4,112
Virginia	3,912	5,608	5,165	5,730	5,131	6,670	6,208	6,191	7,264	8,107	8,678	9,162	9,133
Washington	4,404	4,768	5,287	4,765	4,529	5,945	5,484	5,992	6,314	7,236	5,519	5,794	5,805
West Virginia	35,500	41,554	47,235	48,389	50,960	59,029	56,861	55,433	68,663	66,800	68,248	74,786	78,963
Wyoming	5,250	4,993	5,660	5,977	5,934	6,645	6,915	7,123	7,771	8,118	8,036	8,331	8,117
Total	518,197	568,280	593,893	626,045	640,780	680,492	690,438	666,652	725,030	728,348	722,662	747,644	783,185

[a] Compiled from "Mineral Resources of the United States," U. S. Geol. Survey, except 1909, from Bureau of Census, and 1911, from Bureau of Mines.
[b] Includes North Carolina.
[c] Includes Alaska.
[d] Includes Alaska and North Carolina.
[e] Includes Nevada and North Carolina.
[f] Includes Alaska, Nevada, and North Carolina
[g] Includes Alaska, Nevada, and Nebraska.
[h] Includes Nevada.
[i] Includes Alaska and Nevada.
[k] Includes Nevada and South Dakota.

TABLE 3.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEARS 1870–1914, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE. (FOR STATES HAVING COMPLETE INSPECTION RECORDS.a)

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.	(For States making up total for each year, see table indicated below).
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).b	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.		Table No.
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22			
1870	12	45	15	10	.....	8	1	....	1	....	....	71	163	4	....	23	....	27	1	....	8	5	4	3	21	211	125
1871	18	44	28	31	.....	16	4	....	1	....	20	20	182	5	....	....	1	6	4	....	12	1	....	5	22	310	125
1872	48	49	24	29	.....	16	2	....	....	....	....	11	179	13	2	5	....	20	9	....	8	....	....	7	24	223	125
1873	47	64	36	32	.....	16	....	....	3	....	....	16	214	13	1	2	....	16	14	....	8	....	3	8	33	263	125
1874	60	42	37	28	.....	16	4	....	5	....	....	24	216	8	3	7	1	19	8	....	5	7	....	5	25	260	8
1875	61	28	28	17	.....	33	1	....	....	....	....	33	201	15	4	7	....	26	6	....	14	3	3	7	33	260	8
1876	54	43	36	27	.....	35	2	....	1	....	....	14	212	9	....	6	....	15	5	....	5	1	1	3	15	242	8
1877	73	64	27	16	.....	13	1	....	1	....	....	8	203	4	....	4	....	8	5	....	3	....	1	5	14	225	8
1878	75	42	30	22	.....	18	4	....	2	....	....	11	204	1	1	....	....	2	6	....	7	8	1	7	28	235	9
1879	112	58	47	33	.....	17	....	....	1	....	....	16	284	5	1	1	....	7	10	....	7	....	4	5	26	317	9
1880	99	39	47	22	.....	15	4	....	3	....	....	18	247	6	....	1	....	7	7	....	8	....	1	4	20	274	9
1881	102	42	66	28	.....	19	3	....	6	....	....	29	295	6	....	1	2	9	12	....	14	3	2	5	36	340	9
1882	150	55	61	34	.....	28	1	....	2	....	3	35	369	14	8	6	....	28	15	....	15	1	8	12	51	448	9
1883	170	43	59	37	.....	40	2	....	6	....	....	110	487	15	3	7	....	25	18	....	12	4	6	10	50	562	10
1884	184	59	82	44	.....	43	5	....	1	....	7	40	465	14	3	7	....	24	3	....	11	6	10	19	49	538	10
1885	197	66	44	30	.....	47	11	....	2	....	....	60	457	17	7	14	....	38	15	....	13	9	10	7	54	649	11
1886	173	62	54	60	.....	38	11	....	3	....	....	20	421	13	5	6	....	24	11	....	11	6	5	16	49	494	11
1887	180	96	79	22	.....	28	10	....	5	....	1	17	438	18	3	6	1	28	10	....	11	1	5	11	38	504	12
1888	255	81	82	22	84	65	3	....	6	....	....	48	646	17	7	14	....	38	8	....	9	4	9	14	44	728	13
1889	265	87	90	33	.....	46	8	....	3	....	....	36	568	9	1	27	4	41	16	....	11	8	10	14	59	668	14
1890	262	78	84	76	.....	48	7	....	8	....	34	27	624	21	4	20	....	45	21	....	10	9	9	15	64	733	15
1891	345	94	98	158	5	72	13	....	4	....	5	54	848	18	4	15	....	37	16	....	14	7	10	24	71	956	16
1892	349	108	110	111	104	60	....	....	3	....	2	55	802	20	4	11	....	35	20	....	12	....	7	15	54	891	17
1893	412	106	118	53	32	62	....	....	6	....	14	35	838	27	6	17	2	52	15	....	16	4	11	22	68	958	18

1894	395	79	109	41	14	86	3	....	6	....	50	34	817	29	10	19	....	58	16	....	16	15	12	24	83	958	19
1895	408	95	123	137	88	99	11	1	9	1	7	35	1,014	25	1	20	3	49	25	....	18	7	11	18	78	1,142	20
1896	490	93	119	63	65	72	5	3	6	1	1	44	982	21	3	16	1	41	10	....	19	12	12	27	80	1,083	21
1897	437	122	96	49	33	88	3	3	2	....	21	34	888	16	4	17	2	39	15	....	11	8	9	20	83	990	22
1898	498	103	132	61	8	75	4	5	6	2	13	37	944	18	11	12	....	41	18	....	22	4	11	22	77	1,082	23
1899	560	100	141	98	33	93	5	12	7	2	....	56	1,107	21	4	16	3	44	24	....	18	4	17	27	90	1,241	24
1900	557	105	157	115	205	121	8	7	3	1	11	43	1,333	26	11	24	....	61	35	....	10	2	18	30	86	1,489	25
1901	622	127	194	107	46	137	8	12	8	4	50	89	1,402	32	12	23	....	67	30	....	29	6	16	24	105	1,574	26
1902	609	117	188	184	249	130	1	13	3	4	14	63	1,575	27	7	26	....	80	28	1	22	10	7	21	89	1,724	27
1903	790	130	221	279	8	198	....	18	9	3	8	50	1,712	45	5	13	1	64	58	....	26	5	22	39	150	1,926	28
1904	779	156	215	66	235	190	3	20	6	7	7	65	1,749	57	14	28	....	99	51	....	27	6	21	42	147	1,985	29
1905	957	138	247	173	177	181	8	25	6	6	20	52	1,890	48	3	27	....	78	31	1	39	8	35	50	164	2,232	30
1906	902	138	256	189	76	197	2	53	6	6	8	35	1,868	44	11	36	1	92	62	3	36	2	16	59	178	2,138	31
1907	1,036	154	344	154	802	221	12	52	13	9	18	123	2,938	46	10	30	....	88	70	4	44	10	36	54	218	3,242	32
1908	945	168	312	89	286	203	4	54	12	7	39	90	2,209	42	10	25	....	77	59	7	36	4	23	30	159	2,445	33
1909	1,025	204	307	153	142	191	5	58	10	5	276	89	2,445	20	6	21	....	47	50	2	31	4	18	47	150	2,842	34
1910	1,092	222	380	145	352	195	13	79	9	11	10	49	2,557	39	3	34	4	80	83	2	40	9	12	38	184	2,821	35
1911	1,053	206	382	99	266	160	20	94	7	9	75	63	2,434	34	....	16	2	52	61	5	31	7	12	54	170	2,858	38
1912	975	211	371	185	105	147	6	80	6	7	11	55	2,159	33	5	20	3	61	78	8	33	5	14	61	199	2,419	37
1913	1,060	204	424	91	423	138	33	80	9	24	4	72	2,582	50	1	9	2	82	78	8	26	1	8	40	161	2,785	38
Total	**18,893**	**4,387**	**6,100**	**3,453**	**3,838**	**3,719**	**249**	**869**	**218**	**109**	**729**	**1,966**	**44,308**	**985**	**198**	**839**	**33**	**1,835**	**1,137**	**41**	**778**	**216**	**448**	**970**	**3,590**	**49,733**	
1914	985	146	380	332	17	146	14	89	7	20	7	67	2,200	70	5	12	1	88	68	11	26	5	13	43	166	2,454	39

[a] For percentage of the coal-mining industry represented, see Table 2.
[b] Prior to 1888 "coal dust" was not generally recognized as a cause of explosions, such disasters being attributed to "gas" only.

TABLE 4.—COAL-MINE FATALITIES IN THE UNITED STATES BY PRINCIPAL CAUSES, 1870–1914 (FOR INSPECTION STATES ONLY).

[See fig. 3.]

Year.	Falls of roof and pillar coal. (1 and 2)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives. (6)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 18)			Total surface fatalities. (17 to 22)			Grand total.		Number of men employed.[a]
	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	
1870	67	27.01	1.601	16	7.11	0.421	10	4.74	0.281	8	3.79	0.225	73	34.60	2.051	27	12.80	0.758	21	9.95	0.590	211	5.927	35,600
1871	62	29.52	1.654	28	13.33	.747	31	14.76	.827	16	7.62	.427	45	21.43	1.200	6	2.86	.160	22	10.48	.587	216	5.602	37,488
1872	97	43.50	2.168	24	10.76	.636	29	13.00	.648	16	7.18	.358	13	5.83	.291	20	8.97	.447	24	10.76	.536	223	4.984	44,745
1873	111	42.21	2.303	36	13.69	.747	32	12.17	.664	16	6.08	.332	19	7.22	.394	16	6.08	.332	33	12.55	.685	263	5.457	48,199
1874	102	39.23	1.619	37	14.23	.651	28	10.77	.417	16	6.15	.238	33	12.60	.492	19	7.31	.283	25	9.62	.372	260	3.872	67,152
1875	89	34.23	1.047	28	10.77	.329	17	6.54	.200	33	12.69	.388	34	13.08	.400	26	10.00	.306	33	12.69	.388	260	3.068	85,005
1876	97	40.08	1.135	36	14.88	.421	27	11.16	.316	35	14.46	.410	17	7.02	.199	15	6.20	.175	15	6.20	.175	242	2.831	85,474
1877	137	60.89	1.688	27	12.00	.333	16	7.11	.197	13	5.78	.160	10	4.44	.123	8	3.56	.099	14	6.22	.173	226	2.773	81,142
1878	117	49.79	1.304	30	12.77	.334	22	9.36	.245	18	7.66	.201	17	7.23	.189	2	0.85	.022	29	12.34	.323	235	2.618	89,751
1879	170	53.63	1.768	47	14.83	.489	33	10.41	.343	17	5.36	.177	17	5.36	.177	7	2.21	.073	26	8.20	.271	317	3.298	96,133
1880	138	50.37	1.115	47	17.15	.380	22	8.03	.178	15	5.47	.121	25	9.13	.202	7	2.55	.056	20	7.30	.162	274	2.214	123,736
1881	144	42.35	1.240	66	19.41	.568	28	8.23	.241	19	5.59	.164	38	11.18	.327	9	2.65	.078	36	10.59	.310	340	2.928	116,128
1882	205	45.76	1.258	61	13.62	.374	34	7.59	.209	28	6.25	.172	41	9.15	.252	28	6.25	.172	51	11.38	.313	448	2.750	162,883
1883	213	39.30	1.313	59	10.89	.364	37	6.83	.228	40	7.38	.247	118	21.77	.727	25	4.61	.154	50	9.22	.308	542	3.341	162,248
1884	243	45.17	1.263	82	15.24	.426	44	8.18	.229	43	7.99	.224	53	9.85	.275	24	4.46	.125	49	9.11	.255	538	2.797	192,369
1885	263	47.91	1.234	44	8.01	.206	30	5.46	.141	47	8.56	.220	73	13.30	.343	38	6.92	.178	54	9.84	.253	548	2.575	213,178
1886	235	47.57	1.070	54	10.93	.246	60	12.15	.273	38	7.69	.173	34	6.88	.155	24	4.86	.109	49	9.92	.223	494	2.249	219,699
1887	276	54.76	1.207	79	15.67	.345	22	4.36	.096	28	5.56	.123	33	6.55	.144	28	5.56	.122	38	7.54	.166	504	2.203	228,777
1888	336	46.16	1.177	82	11.26	.287	106	14.56	.371	65	8.93	.228	57	7.83	.200	38	5.22	.133	44	6.04	.154	728	2.550	285,517
1889	352	52.69	1.243	90	13.47	.318	33	4.94	.117	46	6.89	.162	47	7.04	.166	41	6.14	.145	59	8.83	.208	668	2.369	283,198
1890	340	46.38	1.168	84	11.46	.288	76	10.37	.261	48	6.55	.165	76	10.37	.261	45	6.14	.154	64	8.73	.220	733	2.517	291,217
1891	439	45.92	1.413	98	10.25	.315	163	17.05	.525	72	7.53	.232	76	7.95	.245	37	3.87	.119	71	7.43	.228	868	3.077	310,683
1892	457	46.12	1.441	110	11.10	.347	215	21.70	.678	60	6.05	.189	60	6.05	.189	35	3.53	.111	54	5.45	.170	991	3.125	317,140
1893	518	54.07	1.459	118	12.32	.332	85	8.87	.239	62	6.47	.175	55	5.74	.155	52	5.43	.146	68	7.10	.192	958	2.698	355,091
1894	474	49.48	1.322	109	11.38	.304	55	5.74	.153	86	8.98	.240	93	9.71	.259	58	6.05	.162	83	8.66	.231	958	2.671	358,642
1895	503	44.05	1.338	123	10.77	.327	225	19.70	.599	99	8.67	.263	64	6.60	.170	49	4.29	.130	79	6.92	.210	1,142	3.037	376,024
1896	583	53.83	1.532	119	10.99	.313	128	11.82	.336	72	6.65	.189	60	5.54	.158	41	3.78	.108	80	7.39	.210	1,083	2.848	380,477
1897	559	56.47	1.439	96	9.70	.247	82	8.28	.211	88	8.89	.227	63	6.36	.162	39	3.94	.100	63	6.36	.162	990	2.548	388,585
1898	601	56.59	1.534	132	12.43	.337	69	6.50	.176	75	7.06	.191	67	6.31	.171	41	3.86	.105	77	7.25	.196	1,082	2,710	391,841
1899	660	53.18	1.668	141	11.36	.357	131	10.56	.331	93	7.49	.235	82	6.61	.207	44	3.66	.111	90	7.25	.228	1,241	3.137	395,607

1900	662	44.46	1.531	157	10.54	.363	320	21.49	.740	121	8.13	.280	73	4.90	.169	61	4.10	.141	95	6.38	.219	1,488	3,443	432,448
1901	749	47.59	1.558	194	12.32	.404	153	9.72	.318	137	8.70	.285	169	10.74	.352	67	4.26	.139	105	6.67	.218	1,574	3.274	480,807
1902	726	42.11	1.423	188	10.91	.368	433	25.12	.849	130	7.54	.255	98	5.68	.192	60	3.48	.118	89	5.16	.174	1,724	3.379	510,217
1903	920	47.77	1.653	221	11.47	.397	287	14.90	.516	196	10.18	.352	88	4.57	.158	64	3.32	.115	150	7.79	.269	1,926	3.460	556,581
1904	935	46.87	1.631	215	10.78	.375	301	15.09	.525	190	9.52	.331	108	5.41	.188	99	4.96	.173	147	7.37	.256	1,995	3.479	573,373
1905	1,095	49.06	1.779	247	11.07	.401	350	15.68	.569	181	8.11	.294	117	5.24	.190	78	3.49	.127	164	7.35	.267	2,232	3.627	615,368
1906	1,040	48.64	1.650	256	11.97	.406	265	12.39	.420	197	9.22	.313	110	5.15	.175	92	4.30	.146	178	8.33	.282	2,138	3.392	630,283
1907	1,190	36.71	1.764	244	10.61	.510	956	29.49	1.417	221	6.82	.328	227	7.00	.337	86	2.65	.127	218	6.72	.323	3,242	4.806	674,613
1908	1,113	45.52	1.840	312	12.76	.460	375	15.34	.552	203	8.30	.299	206	8.43	.304	77	3.15	.113	159	6.50	.234	2,446	3.602	678,873
1909	1,229	46.52	1.844	307	11.62	.461	295	11.16	.443	191	7.23	.286	423	16.01	.635	47	1.78	.070	150	5.68	.225	2,642	3.964	666,535
1910	1,314	46.58	1.812	380	13.47	.524	497	17.62	.686	195	6.91	.269	171	6.06	.236	80	2.84	.110	184	6.52	.254	2,821	3.891	725,030
1911	1,259	47.40	1.729	382	14.38	.525	365	13.74	.501	160	6.03	.220	268	10.09	.368	52	1.96	.071	170	6.40	.233	2,656	3.647	728,348
1912	1,186	49.03	1.641	371	15.33	.513	290	11.99	.401	147	6.08	.204	165	6.82	.228	61	2.52	.085	199	8.23	.275	2,419	3.347	722,662
1913	1,264	45.39	1.691	424	15.22	.567	514	18.46	.687	138	4.95	.185	222	7.97	.297	62	2.23	.083	161	5.78	.215	2,785	3.725	747,644
Total...	23,260	46.76	1.554	6,100	12.27	.408	7,291	14.66	.487	3,719	7.48	.248	3,938	7.92	.263	1,835	3.69	.123	3,590	7.22	.240	49,733	3.323	.....
1914	1,131	46.10	1.482	380	15.48	.498	349	14.22	.457	146	5.95	.191	194	7.91	.254	88	3.58	.115	166	6.76	.218	2,454	3.215	763,185

[a] See also Table 2. For inspection States only.

TABLE 5.—COAL-MINE FATALITIES, BY STATES AND PRINCIPAL CAUSES, DURING PERIODS ENDING DEC. 31, 1913, FOR WHICH CONTINUOUS RECORDS ARE AVAILABLE.

[See Pls. I and II.]

State.	Period ending 1913.	Falls of roof and pillar coal. (1 and 2)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives. (6)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 16)			Total surface fatalities. (17 to 22)			Number killed.	
		Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Total.	Per 1,000 employed.
	Yrs.																							
Alabama	21	713	38.31	2.01	193	10.37	0.55	620	33.32	1.75	96	5.16	0.27	203	10.91	0.57	8	0.43	0.02	28	1.50	0.08	1,861	5.25
Arkansas	9	65	60.75	1.46	2	1.87	.05	2	1.87	.05	15	14.01	.34	20	18.69	.45	2	1.87	.05	1	.94	.02	107	2.42
Colorado	28	852	49.02	3.50	141	8.11	.58	517	29.75	2.12	60	3.45	.25	83	4.78	.34	36	2.07	.15	49	2.82	.20	1,738	7.14
Georgia	5	6	85.71	2.60	0	.....	.....	0	.....	.....	1	14.29	.43	0	.....	.....	0	.....	.....	0	.....	.....	7	3.03
Illinois	29	1,010	47.40	1.19	414	12.14	.30	170	4.99	.13	459	13.47	.34	350	10.27	.26	266	7.80	.20	134	3.93	.10	3,409	2.52
Indiana	10	306	45.07	.97	75	11.04	.24	57	8.39	.18	132	19.44	.42	22	3.24	.07	71	10.46	.23	16	2.36	.05	679	2.18
Iowa	26	426	59.00	1.31	76	10.53	.23	44	6.10	.13	74	10.25	.23	18	2.49	.06	65	9.00	.20	19	2.63	.08	722	2.22
Kansas	21	259	49.05	1.20	12	2.27	.06	33	6.25	.15	131	24.81	.61	26	4.93	.12	50	9.47	.23	17	3.22	.08	528	2.45
Kentucky	26	310	49.76	.98	46	7.25	.14	74	11.65	.23	89	14.02	.28	39	6.14	.12	24	3.78	.08	47	7.40	.15	635	1.98
Maryland	23	127	57.73	1.08	30	13.64	.25	0	.....	.....	5	2.27	.04	36	16.36	.31	0	.....	.....	22	10.00	.19	220	1.87
Michigan	14	51	52.04	1.13	2	2.04	.04	0	.....	.....	16	15.31	.33	15	15.31	.33	10	10.20	.22	5	5.10	.11	98	2.16
Missouri	26	235	62.17	1.10	19	5.03	.09	40	10.58	.19	43	11.38	.20	10	2.64	.05	27	7.14	.13	4	1.06	.02	378	1.78
Montana	14	88	55.34	2.15	23	14.47	.56	0	.....	.....	11	6.92	.27	27	10.38	.66	1	.63	.03	9	5.66	.22	159	3.89
New Mexico	21	160	28.17	3.22	43	7.57	.87	321	56.51	6.46	24	4.23	.48	16	2.82	.32	0	.....	.....	4	.70	.08	566	11.42
North Dakota	6	6	46.16	1.44	2	15.38	.48	0	.....	.....	3	23.08	.72	2	15.38	.48	0	.....	.....	0	.....	.....	13	3.12
Ohio	30	1,509	65.84	1.57	277	12.08	.29	64	2.79	.07	161	7.02	.17	115	5.02	.12	79	3.45	.08	87	3.80	.09	2,292	2.39
Oklahoma	21	153	20.99	1.14	78	10.70	.58	262	35.94	1.96	115	15.77	.86	79	10.84	.59	25	3.43	.19	17	2.33	.13	729	5.45
Oregon	5	1	33.33	.90	0	.....	.....	2	66.67	1.79	0	.....	.....	0	.....	.....	0	.....	.....	0	.....	.....	3	2.69
Pennsylvania (anthracite)	44	7,378	41.65	1.42	2,403	13.56	.40	1,344	7.59	.26	1,790	10.10	.35	1,637	9.24	.32	843	4.76	.16	2,321	13.10	.45	17,716	3.42
Pennsylvania (bituminous)	36	5,393	56.93	1.64	1,452	15.33	.44	1,309	13.82	.40	185	1.95	.05	512	5.40	.16	217	2.29	.06	405	4.28	.12	9,473	2.87
Tennessee	23	361	42.03	1.81	49	5.70	.25	339	39.47	1.70	49	5.70	.25	27	3.14	.13	1	.12	.....	33	3.84	.16	859	4.30
Texas	5	16	64.00	.67	2	8.00	.08	0	.....	.....	2	8.00	.09	3	12.00	.13	1	4.00	.04	1	4.00	.04	25	1.06
Utah	22	95	26.76	2.48	25	7.04	.65	205	57.75	5.34	5	1.40	.13	7	1.97	.18	3	.84	.08	15	4.23	.39	355	9.25
Virginia	5	131	52.19	3.33	32	12.75	.81	25	9.96	.63	10	3.98	.25	34	13.55	.86	1	.40	.03	18	7.17	.46	251	6.37
Washington	25	182	28.44	1.76	81	12.65	.78	195	30.47	1.87	32	5.00	.30	102	15.94	.98	13	2.03	.12	35	5.47	.33	640	6.14
West Virginia	29	2,452	51.64	2.57	557	11.73	.58	1,036	21.82	1.09	155	3.27	.16	202	4.25	.21	67	1.41	.07	279	5.88	.29	4,748	4.97
Wyoming	6	114	47.30	2.46	22	9.13	.48	67	27.80	1.45	13	5.40	.28	17	7.05	.37	1	.41	.02	7	2.91	.16	241	5.21
Total	.....	23,011	47.49	1.57	6,058	12.50	.42	6,728	13.88	.48	3,675	7.59	.25	3,602	7.43	.25	1,611	3.74	.12	3,573	7.37	.24	48,454	3.31

TABLE 6.—FATALITY RATES IN AND ABOUT THE COAL MINES IN THE UNITED STATES BASED ON UNDERGROUND AND SURFACE EMPLOYEES.[a]

Year.	Number employed.			Number killed.																	
				Underground.														Surface. (17 to 22)		Total.	
				Falls of roof and pillar coal. (1 and 2)		Mine cars and locomotives. (3)		Gas and dust explosions. (4 and 5)		Explosives. (6)		Miscellaneous underground. (7 to 12)		Shaft. (13 to 16)		Underground (total).					
	Underground.[a]	Surface.[a]	Total.[b]	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.
1895	312,777	63,247	376,024	503	1.608	123	0.393	225	0.719	99	0.317	64	0.205	49	0.157	1,063	3.399	79	1.249	1,142	3.037
1896	316,481	63,996	380,477	583	1.842	119	.376	128	.404	72	.227	60	.190	41	.130	1,003	3.169	80	1.250	1,083	2.846
1897	323,225	65,360	388,585	559	1.729	96	.297	82	.254	88	.272	63	.195	39	.121	927	2.868	63	.964	990	2.548
1898	325,933	65,908	391,841	601	1.844	132	.405	69	.212	75	.230	67	.205	41	.126	985	3.022	77	1.168	1,062	2.710
1899	329,066	66,541	395,607	660	2.006	141	.428	131	.398	93	.283	82	.249	44	.134	1,151	3.498	90	1.353	1,241	3.137
1900	359,710	72,738	432,448	662	1.840	157	.436	320	.890	121	.336	.73	.203	61	.170	1,394	3.875	95	1.306	1,489	3.443
1901	399,935	80,872	480,807	749	1.872	194	.485	153	.382	137	.343	169	.423	67	.168	1,469	3.673	105	1.298	1,574	3.274
1902	424,399	85,818	510,217	726	1.711	188	.443	433	1.020	130	.306	98	.231	60	.141	1,635	3.852	89	1.037	1,724	3.379
1903	462,964	93,617	556,581	920	1.987	221	.478	287	.620	196	.423	88	.190	64	.138	1,776	3.836	150	1.602	1,926	3.460
1904	476,932	96,441	573,373	935	1.961	215	.451	301	.631	190	.398	108	.226	99	.208	1,848	3.875	147	1.524	1,995	3.479
1905	511,863	103,505	615,368	1,095	2.139	247	.482	350	.684	181	.354	117	.229	78	.152	2,068	4.040	164	1.584	2,232	3.627
1906	524,269	106,014	630,283	1,040	1.984	256	.488	265	.506	197	.376	110	.210	92	.175	1,960	3.739	178	1.679	2,138	3.392
1907	561,143	113,470	674,613	1,190	2.120	344	.613	956	1.704	221	.394	227	.405	86	.153	3,024	5.389	218	1.921	3,242	4.806
1908	564,687	114,186	678,873	1,113	1.971	312	.553	375	.664	203	.359	206	.365	77	.136	2,286	4.048	159	1.392	2,445	3.602
1909	554,424	112,111	666,535	1,229	2.216	307	.554	295	.532	191	.345	423	.763	47	.085	2,492	4.495	150	1.338	2,642	3.964
1910	603,080	121,950	725,030	1,314	2.178	380	.630	497	.824	195	.323	171	.284	80	.133	2,637	4.372	184	1.509	2,821	3.891
1911	605,835	122,513	728,348	1,259	2.078	382	.631	365	.602	160	.264	268	.442	52	.086	2,486	4.103	170	1.388	2,656	3.647
1912	601,119	121,543	722,662	1,186	1.973	371	.617	290	.482	147	.244	165	.274	61	.101	2,220	3.693	199	1.637	2,419	3.347
1913	622,109	125,535	747,644	1,264	2.032	424	.681	514	.826	138	.222	222	.357	62	.100	2,624	4.218	161	1.283	2,785	3.725
1914	639,334	123,851	763,185	1,131	1.769	380	.594	349	.546	146	.228	194	.304	88	.138	2.288	3.579	166	1.340	2,454	3.215

[a] In 1911 the bureau collected statistics showing underground and surface employees as separate items. For this particular year the underground employees represented 83.18 per cent of the total and the surface employees 16.82 per cent. Inasmuch as there are no records prior to 1911 in which the surface and underground employees are shown separately, these items have been calculated on the basis of the 1911 returns as shown in this table. The 1914 figures were collected by the United States Geological Survey for both surface and underground employees.

[b] Mineral Resources, U. S. Geol. Survey, except 1909 (Bureau of Census) and 1911 (Bureau of Mines).

TABLE 7.—AVERAGE PRODUCTION, NUMBER OF MEN EMPLOYED, NUMBER OF FATALITIES AND RATES, AND DAYS WORKED IN THE COAL MINES IN THE UNITED STATES, BY STATES, FOR PERIODS DURING WHICH CONTINUOUS RECORDS ARE AVAILABLE.

State.	Period.	Production (short tons).	Number employed.	Number killed.				Production per death (short tons).	Days worked.	Average tonnage per man.		See Table No.
				Average per year.	For 1,000 employed.	Per 1,000 200-day workers.	For million tons mined.			Per year.	For day.	
Alabama	1893–1913	10,533,707	16,863	88.62	5.25	4.39	8.41	118,865	239	625	2.62	85
Arkansas	1905–1913	2,141,396	4,919	11.89	2.42	3.08	5.55	180,117	157	435	2.77	87
Colorado	1886–1913	6,008,413	8,693	62.07	7.14	6.21	10.33	96,798	230	691	3.00	91
Georgia	1909–1913	207,356	461	1.40	3.03	2.29	6.75	148,111	265	450	1.70	93
Illinois	1885–1913	29,611,311	46,707	117.55	2.52	2.50	3.97	251,900	202	634	3.14	95
Indiana	1895–1913	10,401,629	16,581	35.74	2.16	2.31	3.44	291,002	187	627	3.35	97
Iowa	1888–1913	5,675,758	12,508	27.77	2.22	2.10	4.89	204,390	211	454	2.15	99
Kansas	1893–1913	5,107,848	10,280	25.14	2.45	2.53	4.92	203,153	194	497	2.56	101
Kentucky	1888–1913	7,144,744	12,361	24.42	1.98	1.97	3.42	292,541	201	578	2.88	103
Maryland	1889–1906 1909–1913	4,392,277	5,106	9.57	1.87	1.54	2.18	459,193	243	860	3.54	105
Michigan	1900–1913	1,406,433	3,234	7.00	2.16	2.12	4.98	200,919	204	435	2.13	107
Missouri	1888–1913	3,337,180	8,185	14.54	1.78	1.83	4.36	229,541	195	408	2.09	109
Montana	1900–1913	2,115,567	2,921	11.36	3.89	3.26	5.37	186,276	239	724	3.03	111
New Mexico	1893–1913	1,771,859	2,366	27.05	11.43	9.45	15.27	65,509	242	749	3.10	113
North Dakota	1908–1913	439,876	693	2.16	3.12	2.90	4.93	203,020	215	633	2.94	116
Ohio	1884–1913	19,188,032	31,949	76.40	2.39	2.54	3.98	251,152	188	601	3.20	118
Oklahoma	1893–1913	2,468,508	6,366	34.71	5.45	5.71	14.07	71,111	191	388	2.03	120
Oregon	1909–1913	57,834	223	.60	2.69	2.32	10.37	96,390	232	259	1.12	122
Pennsylvania (anthracite)	1870–1913	50,316,598	117,851	402.64	3.42	3.42	8.00	124,968	200	427	2.14	124
Pennsylvania (bituminous)	1877–1913	69,596,423	89,076	256.03	2.87	2.51	3.68	271,832	229	781	3.41	126
Tennessee	1891–1913	4,454,854	8,689	37.35	4.30	3.77	8.38	119,280	228	513	2.25	128
Texas	1909–1913	2,061,793	4,720	5.00	1.06	.90	2.43	412,359	236	437	1.85	130
Utah	1892–1913	1,440,197	1,744	16.14	9.25	7.28	11.20	89,252	254	826	3.25	132
Virginia	1909–1913	6,959,917	7,880	50.20	6.37	4.92	7.21	138,644	259	883	3.41	134
Washington	1889–1913	2,396,305	4,167	25.60	6.14	4.95	10.68	93,606	238	575	2.32	136
West Virginia	1885–1913	26,299,767	32,955	163.72	4.97	4.52	6.23	160,635	220	798	3.63	138
Wyoming	1908–1913	6,820,359	7,716	40.17	5.21	4.49	5.89	169,801	232	884	3.81	140

Figures for the total production of coal in the United States from 1807 to the end of 1914, and the total number of men employed in the industry since 1889 are given in Table 2 and are plotted in figure 1. The table and the figure show the total number of men killed in and about the coal mines in the United States for which complete records are available. It will be noted that in 1870 the percentage of the industry covered by the mine-inspection service (fig. 2), based on the production, was 47.42 with 35,600 men employed. The figures for the total number of men employed are not available. In 1871 the percentage of the industry represented by the production was 41.25 with 37,488 men employed. The figures for the first four years, 1870 to 1873, include only the anthracite mines of Pennsylvania. From 1874 on, a number of other States adopted inspection service, so that by the close of 1888, 87.29 per cent of the production was from States having inspection and representing 285,517 men. The first complete record of the number of men employed in all of the coal-mining States was in 1889, when 311,717 men were employed. Of this number, 283,198, or 90.85 per cent, were employed under the inspection service. The percentage of the production represented by in-

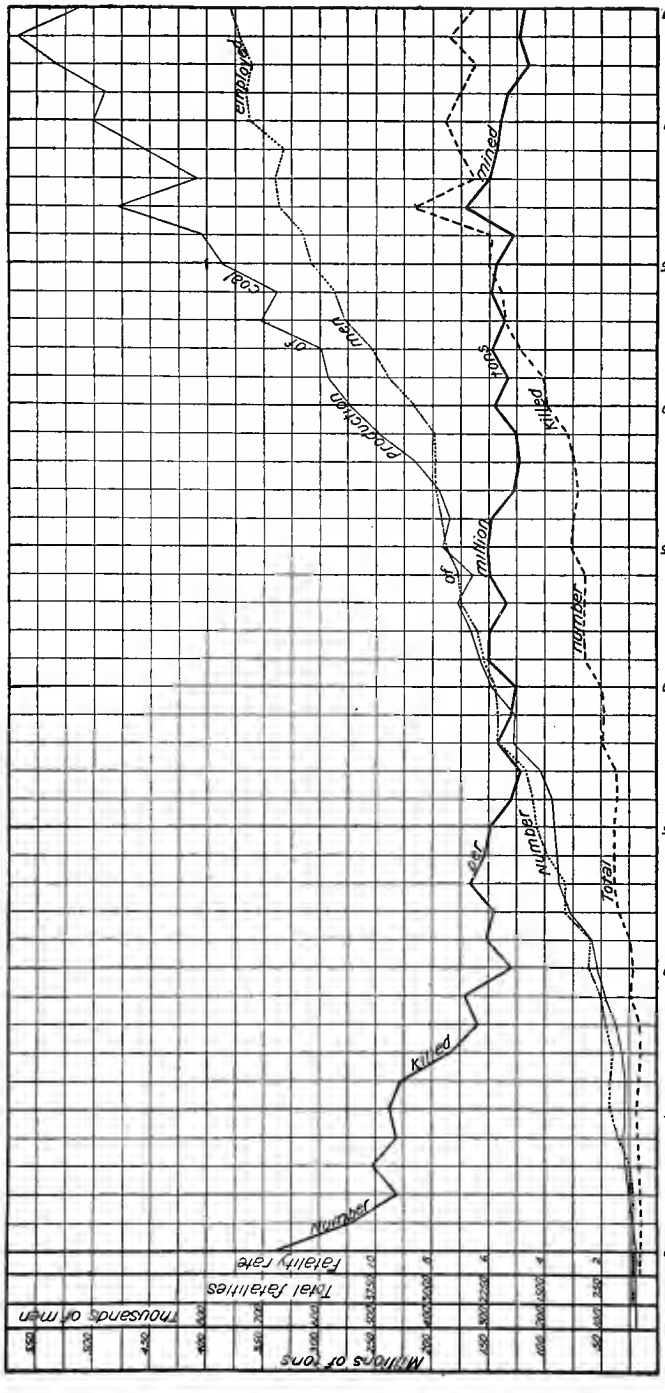

FIGURE 1.—Production, number of men employed, fatalities, and number killed per million tons mined, in coal mines of United States, for which complete returns are available 1870–1914. (Based on Table 2.)

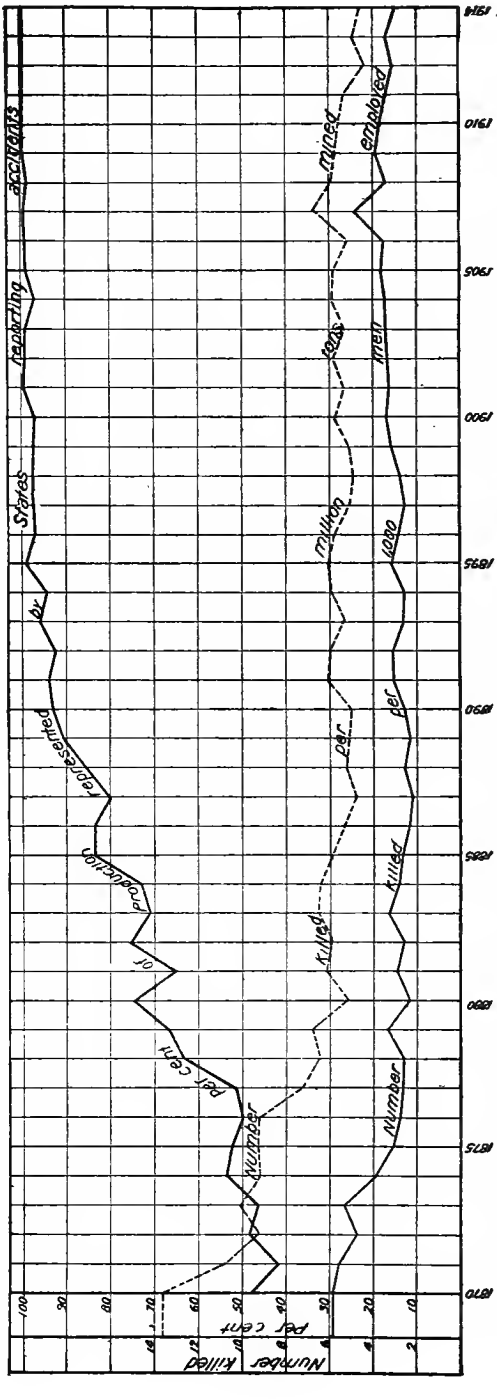

FIGURE 2.—Relation between coal mine fatality rates in United States and the percentage of industry covered by inspection service, 1870–1914. (Based on Table 2.)

spection States for the same year was 90.54. From 1889 to date the percentage of production and the number of men employed under inspection service agree with each other within less than 1 per cent. Beginning with 1910 complete figures are available for all of the States, thus representing 100 per cent of the industry. Beginning with 1870, the fatality rate per million tons mined was 13.47 (see fig. 2). This has been gradually reduced until in 1914 it was 4.78. The average amount of coal produced per man per year in 1870 was 440 tons, whereas in 1913 it was 762 tons, and in 1914, 673 tons. Although the figure for tons per man per year was less in 1914 than in 1913, the figure for tons mined per day per man was 3.25 in 1914 as compared with 3.20 in 1913.

Table 2A shows the number of men employed in and about the coal mines by States and calendar years from 1889 to 1914 inclusive.

Table 3 shows the total number of fatalities in the inspection States, for which reports were issued, by calendar years and causes, from 1870 to the end of 1914. This table is a summary of the State tables presented in Part II of this bulletin, as compiled from the State mine inspectors' reports.

Table 4 shows coal-mine fatalities by principal causes, the total number of fatalities, the percentage of the grand total, and the number killed per 1,000 employed (see fig. 3) for a period of 44 years, from 1870 to and including 1913. During this period 23,260 men were killed by falls of roof and pillar coal. The fatalities due to falls of roof and pillar coal in 1870 were 1.60 per 1,000 men employed, while in 1913 it was 1.69. There seems to be but little variation from these figures throughout the 44-year period, the average being 1.554.

Fatalities due to mine cars and locomotives (fig. 3) in the earlier years of inspection service show a slight decrease to about the year 1885. In 1885 the percentage of fatalities due to mine cars and locomotives was 8.01, or 0.206 per 1,000 men employed. Both the percentage and the rate per 1,000 men employed have increased until in 1913 the total percentage was 15.22, while the number killed per 1,000 employed was 0.567.

With reference to gas and dust explosions (fig. 3) both the percentage of the fatalities and the rate per 1,000 men employed are erratic. The lowest figure was in 1887, when 4.36 per cent of the total number of fatalities was due to gas and dust explosions, or practically one fatality per 10,000 men employed. This rate has increased in an irregular manner, reaching the highest point in 1907, when the total percentage of fatalities due to this cause was 29.49, or 1.417 fatalities per 1,000 men employed. Since 1907 there has been some reduction in both percentage and the rate per 1,000 men employed, but this is irregular and in all cases higher than it should be.

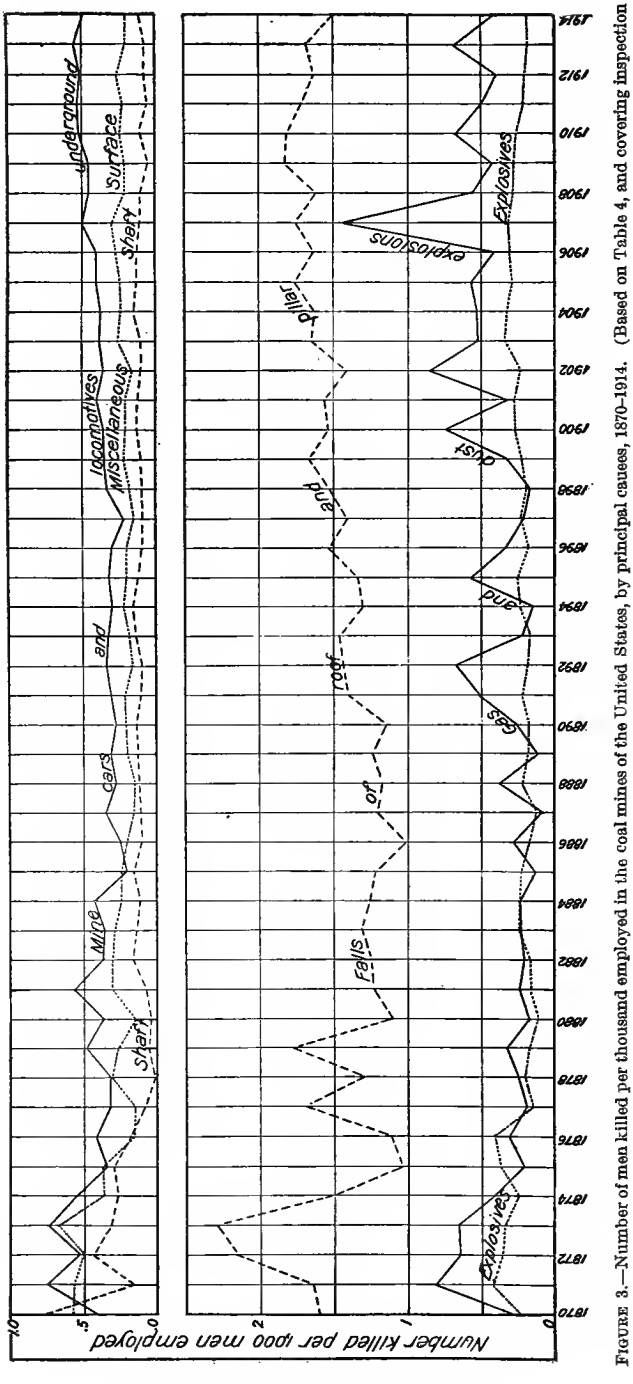

FIGURE 3.—Number of men killed per thousand employed in the coal mines of the United States, by principal causes, 1870–1914. (Based on Table 4, and covering inspection States only.)

Accidents due to explosives also show a decrease from the beginning of inspection to about 1887. From 1887 to 1903 there was an increase, and from 1903 to date the rate has gradually declined.

The fatalities due to shaft accidents (fig. 3) are gradually decreasing, the rate per 1,000 men employed in 1870 being 0.758, while in 1913 it was 0.083.

Table 5 contains the same grouping by causes as does Table 4. It, however, shows fatality rates by States for continuous periods for which records have been published. It contains 1,279 less fatalities than Table 4, by reason of the fact that intermittent records prior to the period of continuous records have been omitted. (See Pls. I and II.)

REDUCTION IN FATALITY RATES AND THE GROWTH OF MINE-INSPECTION SERVICE COMPARED.

The relation between mine-inspection service and the fatality rates at coal mines from 1870 to date is shown in figure 2. The upper curve represents the actual percentage of coal produced under inspection service to the close of 1909. From 1910 to 1914 the Bureau of Mines has received accident reports direct from the operators in those States wherein there is no mine inspection. These States are California, Georgia, Idaho, North Carolina, and Oregon. The coal produced in the noninspection States is less than 0.1 per cent of the total so that the curve from 1910 to 1914 may be accepted as representing the inspection service.

In 1869, 179 men were killed in a mine fire at Avondale, Pa. The following year a law provided for systematic inspection of the anthracite mines. Pennsylvania was therefore the first State to establish a mine-inspection system. From 1870 to 1873 the curve shown represents the anthracite fields only. The fatality rate in 1870 in the anthracite mines was 5.93 per 1,000 men employed, whereas the number of fatalities per million tons mined was 13.47. Corresponding figures for 1914 for the Pennsylvania anthracite field are 3.31 fatalities per 1,000 men employed, and 6.55 fatalities per million tons mined. There are no records to show what the fatality rate in anthracite mines was for years previous to 1870. It was, however, high in 1869, on account of the Avondale disaster. The year 1870 was apparently normal as shown by the actual number of men killed in the anthracite field during the next few years, so that the number of fatalities in 1869 must have been more than 350, with not to exceed 35,000 men employed.

The next State to appoint a mine inspector was Ohio, in 1874, and the first complete inspection year for the Pennsylvania bituminous mines was in 1878, so that after 1874 other States have been added to the inspection list.

Tables 8 to 39 show by years the number of inspection States for which complete records have been obtained, and it is upon these tables that the totals shown in Table 2 and the curves in figure 2 have been based.

During the first 10 years (fig. 2) of mine inspection the fatality rate per 1,000 men employed and the number of fatalities per million tons of coal mined declined rapidly. From 1880 to 1897 the fatality rate per 1,000 men employed remained practically stationary, while the number of fatalities per million tons mined showed a very slight reduction. From 1897 to 1907 the number killed per 1,000 employed increased considerably, reaching the highest point in 1907. Since that year there has been a marked decline.

The increase in the fatality rate from 1897 to 1907 is not necessarily due to less efficient mine inspection. The conditions under which mines were operated were changing. The mines were growing deeper; there were more old abandoned workings for accumulation of gas and dust; and more men were employed in the individual mines than in former years; so that in case of a gas or dust explosion, the likelihood of trapping more men was greater by reason of a larger number of men being employed. During this period there was an influx of foreign laborers, many of whom came from the agricultural districts of southeastern Europe. They had no experience in mining, did not know the English language, and hence were not capable of understanding and carrying out orders that were made in a tongue foreign to them. Although the inspection service has been increasing in efficiency from year to year, the various hazards, for the reasons mentioned, are also increasing.

The increasing fatality rate due to mine disasters, from 1897 and culminating with 1907, has been the means of the passage of more stringent laws concerning the operation of coal mines. Every disaster is thoroughly investigated by State and Federal authorities, as well as by the local engineers of the operating company, to determine the exact cause, so that similar disasters may be prevented in the future. States are establishing rescue and first-aid stations, and nearly every large mining company has its safety engineer and safety-first committees with the necessary rescue and first-aid equipment. An educational campaign on mine-accident prevention has been conducted since 1907 with the result that there is much closer cooperation of miner, foreman, operator, and inspector than in former years. Permissible explosives and improved types of safety lamps have been introduced into many of the mines. Explosibility of coal dust has been studied and precautions adopted to render the dust inert. The work of these various agencies has resulted in a gradual decline in the fatality rate from 1907 to 1914.

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COAL-MINE FATALITIES, BY YEARS AND CAUSES, FROM THE BEGINNING OF INSPECTION IN 1870 TO 1914.

Tables 8 to 39, inclusive, show by causes and calendar years all of the fatalities occurring in and about the coal mines in the United States by combining those States for which there are complete inspection records. In the compilation of these tables all fatalities have been omitted for which the corresponding number of employees was not given. Thus one State may appear in a certain year and not in another simply because the records were incomplete. With reference to fatalities from 1870 to 1873, inclusive, which are represented only by the anthracite mines of Pennsylvania, the reader is referred to Table 125 under that State. The percentage of the industry covered by these tables, the number of men employed, and the fatality rate per 1,000 men employed, and per million tons of coal mined are shown in Table 2

14355°—Bull. 115—16——3

TABLE 8.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEARS 1874–1877, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1874.[a]																										
Ohio	11	5	....	....	....	2	....	....	1	....	....	3	22	2	1	....	....	3	1	....	....	2	....	1	4	29
Pennsylvania (anthracite)	49	37	37	28	....	14	4	....	4	....	....	21	194	6	2	7	1	16	7	....	5	5	....	4	21	231
Total, 1874	60	42	37	28	....	16	4	....	5	....	....	24	216	8	3	7	1	19	8	....	5	7	....	5	25	260
1875.																										
Ohio	10	....	1	....	....	3	....	....	....	....	....	....	14	3	4	....	....	7	1	....	....	....	....	2	3	24
Pennsylvania (anthracite)	51	28	27	17	....	30	1	....	....	....	....	33	187	12	....	7	....	19	5	....	14	3	3	5	30	236
Total, 1875	61	28	28	17	....	33	1	....	....	....	....	33	201	15	4	7	....	26	6	....	14	3	3	7	33	260
1876.																										
Ohio	8	1	2	....	....	2	....	....	....	....	....	....	13	....	....	1	....	1	....	....	....	....	....	1	1	15
Pennsylvania (anthracite)	46	42	34	27	....	33	2	....	1	....	....	14	199	9	....	5	....	14	5	....	5	1	1	2	14	227
Total, 1876	54	43	36	27	....	35	2	....	1	....	....	14	212	9	....	6	....	15	5	....	5	1	1	3	15	242
1877.																										
Ohio	11	6	9	....	....	1	1	....	....	....	....	1	29	1	....	1	....	2	....	....	....	....	....	....	....	....	31
Pennsylvania (anthracite)	62	58	18	16	....	12	....	....	1	....	....	7	174	3	....	3	....	6	5	....	3	....	1	5	14	194
Total, 1877	73	64	27	16	....	13	1	....	1	....	....	8	203	4	....	4	....	8	5	....	3	....	1	5	14	225

[a] For fatalities by causes for 1870, 1871, 1872, and 1873 see Table 125.

TABLE 9.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEARS 1878–1882, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1878.																										
Pennsylvania (anthracite)	48	32	29	22	.....	17	2	.....	2	.....	.....	11	163	1	1	.....	.....	2	6	.....	7	1	1	7	22	187
Pennsylvania (bituminous)	27	10	1	.....	.....	1	2	.....	.....	.....	.....	.....	41	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	7	48
Total, 1878	75	42	30	22	.....	18	4	.....	2	.....	.....	11	204	1	1	.....	.....	2	6	.....	7	8	1	7	29	235
1879.																										
Pennsylvania (anthracite)	85	43	41	29	.....	17	.....	.....	1	.....	.....	13	229	5	1	1	.....	7	10	.....	7	.....	4	5	26	262
Pennsylvania (bituminous)	27	15	6	4	.....	.....	.....	.....	.....	.....	.....	3	55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	55
Total, 1879	112	58	47	33	.....	17	.....	.....	1	.....	.....	16	284	5	1	1	.....	7	10	.....	7	.....	4	5	26	317
1880.																										
Ohio	10	.....	4	.....	.....	4	.....	.....	.....	.....	.....	2	20	1	.....	1	.....	2	1	.....	.....	.....	.....	.....	1	23
Pennsylvania (anthracite)	64	26	38	21	.....	11	4	.....	2	.....	.....	14	180	5	.....	.....	.....	5	5	.....	8	.....	1	3	17	202
Pennsylvania (bituminous)	25	13	5	1	.....	.....	.....	.....	1	.....	.....	2	47	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	49
Total, 1880	99	39	47	22	.....	15	4	.....	3	.....	.....	18	247	6	.....	1	.....	7	7	.....	8	.....	1	4	20	274
1881.																										
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
Pennsylvania (anthracite)	73	36	54	25	.....	19	3	.....	2	.....	.....	17	229	6	.....	1	2	9	12	.....	13	3	2	5	35	273
Pennsylvania (bituminous)	29	6	12	3	.....	.....	.....	.....	4	.....	.....	2	56	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	57
Total, 1881	102	42	66	28	.....	19	3	.....	6	.....	.....	29	295	6	.....	1	2	9	12	.....	14	3	2	5	36	340
1882.																										
Illinois	3	.....	2	.....	.....	5	.....	.....	.....	.....	.....	29	39	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	40
Ohio	16	4	.....	1	.....	1	.....	.....	.....	.....	.....	.....	22	.....	.....	2	.....	2	.....	.....	1	.....	.....	.....	1	25
Pennsylvania (anthracite)	90	31	51	25	.....	20	1	.....	2	.....	3	5	228	12	8	2	.....	22	9	.....	13	1	7	11	41	291
Pennsylvania (bituminous)	41	20	8	8	.....	2	.....	.....	.....	.....	.....	1	80	2	.....	2	.....	4	6	.....	.....	.....	1	1	8	92
Total, 1882	150	55	61	34	.....	28	1	.....	2	.....	3	35	369	14	8	6	.....	28	15	.....	15	1	8	12	51	448

TABLE 10.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEARS 1883–1884, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1883.																											
Illinois	40	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	[a] 84	134	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		134
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		11
Pennsylvania (anthracite)	83	27	52	27	.....	40	2	.....	6	.....	.....	14	251	15	3	6	....	24	16	....	12	4	6	10	48		323
Pennsylvania (bituminous)	36	10	5	.....	.....	.....	.....	.....	.....	.....	.....	1	52	.....	.....	1	....	1	1	....	.....	.....	.....	.....	1		54
West Virginia	11	0	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	19	.....	.....	.....	....	.....	1	....	.....	.....	.....	.....	1		20
Total, 1883	170	43	59	37	.....	40	2	.....	6	.....	.....	110	487	15	3	7	....	25	18	....	12	4	8	10	50	542	
1884.																											
Illinois [b]	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		48
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		9
Ohio	13	5	4	1	.....	7	.....	.....	.....	.....	.....	.....	30	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....		32
Pennsylvania (anthracite)	95	32	68	7	.....	35	5	.....	1	.....	7	14	284	12	2	7	....	21	3	....	11	5	0	19	47		332
Pennsylvania (bituminous)	47	22	10	36	.....	1	.....	.....	.....	.....	.....	.....	116	....	1	.....	....	1	.....	.....	.....	1	1	....	2		119
Total, 1884	184	59	82	44	.....	43	5	.....	1	.....	7	40	485	14	3	7	....	24	3	....	11	6	10	19	49	538	

[a] Includes 69 fatalities due to inrush of water.

[b] Fiscal year ended June 30.

TABLE 11.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEARS 1885–1886, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1885.																										
Illinois	25	6	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	39	2	....	4	....	6	....	....	2	1	2	....	5	50
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
Kansas	2	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	7	.....	.....	2	....	2	.....	.....	.....	.....	.....	.....	.....	9
Kentucky	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Ohio	18	3	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	24	1	.....	1	.....	2	1	.....	.....	2	.....	.....	3	29
Pennsylvania (anthracite)	101	43	33	26	.....	30	11	.....	1	.....	.....	45	290	14	7	7	....	28	12	....	8	6	8	7	41	359
Pennsylvania (bituminous)	38	10	10	1	.....	1	.....	.....	1	.....	.....	5	66	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2	68
Washington	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
West Virginia	12	4	1	3	.....	.....	.....	.....	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	3	23
Total, 1885	**197**	**66**	**44**	**30**	.....	**47**	**11**	.....	**2**	.....	.....	**60**	**457**	**17**	**7**	**14**	....	**38**	**15**	....	**13**	**9**	**10**	**7**	**54**	**549**
1886.																										
Colorado	3	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	6
Illinois	18	7	5	.....	.....	2	.....	.....	.....	.....	.....	.....	32	1	1	2	....	4	.....	.....	.....	.....	.....	.....	.....	36
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
Ohio	23	8	1	.....	.....	6	.....	.....	.....	.....	.....	.....	38	1	.....	.....	.....	1	.....	.....	.....	1	1	1	3	42
Pennsylvania (anthracite)	87	37	31	15	.....	24	11	.....	3	.....	.....	13	221	10	4	4	....	18	10	....	11	5	2	11	39	278
Pennsylvania (bituminous)	38	10	15	6	.....	2	.....	.....	.....	.....	.....	.....	71	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	2	3	74
Washington	.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	3	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	4
West Virginia	4	.....	1	39	.....	.....	.....	.....	.....	.....	.....	.....	44	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	3	47
Total, 1886	**173**	**62**	**54**	**60**	.....	**38**	**11**	.....	**3**	.....	.....	**20**	**421**	**13**	**5**	**6**	....	**24**	**11**	....	**11**	**6**	**5**	**16**	**49**	**494**

TABLE 12.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1887, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	18	20	21	22		
Colorado	9	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	11	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	12
Illinois	25	9	7	1	.....	1	.....	.....	.....	.....	.....	.....	43	4	1	2	1	8	.....	.....	.....	.....	.....	.....	.....	51
Ohio	10	10	4	1	.....	3	.....	.....	.....	.....	.....	.....	28	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	30
Pennsylvania (anthracite)	95	54	50	15	.....	20	10	.....	5	.....	.....	15	284	10	1	1	.....	12	10	.....	11	1	5	11	38	314
Pennsylvania (bituminous)	31	21	17	5	.....	3	.....	.....	.....	.....	1	1	78	3	1	1	.....	5	.....	.....	.....	.....	.....	.....	.....	84
Washington	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
West Virginia	9	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
Total, 1887	180	99	78	22	.....	28	10	.....	5	.....	1	17	439	18	3	8	1	26	10	.....	11	1	5	11	38	504

TABLE 13.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1888, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama																										[a]
Alaska and California																										[a]
Arkansas																										[a]
Colorado	12	3	4	5	3	2							29													29
Georgia and North Carolina																										[a]
Idaho and Nevada																										[a]
Illinois	25	7	4			8						1	45	4	1	3		8			1	1	1	1	4	57
Indiana												17	17													17
Iowa	10	2	2			9						1	24	2	1	2		5					1		1	30
Kansas					40								40													40
Kentucky	9		1			4							14													14
Maryland																										[a]
Michigan																										[a]
Missouri [b]					24							3	27													27
Montana																										[a]
New Mexico																										[a]
North Dakota																										[a]
Ohio	16	9				2			1				28		1	3		4								32
Oklahoma																										[a]
Oregon																										[a]
Pennsylvania (anthracite)	126	41	60	16		37	2		4			24	310	10	4	4		18	7		8	3	6	12	36	364
Pennsylvania (bituminous)	39	14	9	1	17	3	1		1			2	87			1		1	1					1	2	90
Tennessee																										[a]
Texas																										[a]
Utah																										[a]
Virginia																										[a]
Washington																										[a]
West Virginia	18	5	2										25	1		1		2					1		1	28
Wyoming																										[a]
Total, 1888	255	81	82	22	84	65	3		6			48	646	17	7	14		38	8		9	4	9	14	44	728

[a] No inspection, or report not published.

[b] Fiscal year ending Oct. 15.

TABLE 14.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1889, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama																										(a)
Alaska and California																										(a)
Arkansas																										(a)
Colorado	5	4	3									11	23						1						1	24
Georgia and North Carolina																										(a)
Idaho and Nevada																										(a)
Illinois	22	5	5	2		3							37			4		4								41
Indiana																										(a)
Iowa	11	3	2			2							17	1		4		5								22
Kansas	6	2				3							11			1		1								12
Kentucky	9		1			2							12													12
Maryland	5												5													5
Michigan																										(a)
Missouri	6	1	1			1							9			1		1								10
Montana																										0
New Mexico																										(a)
North Dakota																										(a)
Ohio	17	7	6			1							31			3		3								34
Oklahoma																										(a)
Oregon																										(a)
Pennsylvania (anthracite)	128	41	60	24		32	8		3			18	314	6	1	12	1	20	11		11	6	10	13	51	335
Pennsylvania (bituminous)	48	22	10	6		2						2	90	2		2	3	7	4			2			6	103
Tennessee																										(a)
Texas																										(a)
Utah																										(a)
Virginia																										(a)
Washington	1			1								4	6													6
West Virginia	7	3	2									1	13											1	1	14
Wyoming																										(a)
Total, 1889	265	87	90	33		40	8		3			36	568	9	1	27	4	41	16		11	8	10	14	50	668

a No inspection, or report not published.

TABLE 15.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1890, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	6	4	1	1	.....	2	.....	.....	.....	.....	.....	.....	14	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	16
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	25	7	1	1	.....	7	.....	.....	.....	.....	3	.....	44	.....	2	6	.....	8	.....	.....	.....	2	2	1	5	57
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Iowa	4	1	1	.....	.....	3	.....	.....	.....	.....	.....	.....	9	1	.....	1	.....	2	.....	.....	.....	.....	1	.....	1	12
Kansas	4	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	5	.....	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	8
Kentucky	7	1	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
Maryland	4	1	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	10	.....	.....	1	.....	4	.....	.....	.....	.....	.....	.....	15	1	.....	1	.....	2	1	.....	.....	.....	.....	.....	1	18
Montana	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
New Mexico	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	23	7	3	1	.....	2	1	.....	.....	.....	.....	1	38	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	39
Oklahoma	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	98	34	57	70	.....	18	5	.....	7	.....	.....	17	306	15	2	7	.....	24	17	.....	10	7	5	9	48	378
Pennsylvania (bituminous)	62	19	16	.....	.....	5	.....	.....	1	.....	31	3	137	2	.....	1	.....	3	2	.....	.....	.....	.....	3	5	145
Tennessee	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	1	.....	1	2	.....	1	1	.....	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
West Virginia	18	3	1	.....	.....	3	.....	.....	.....	.....	.....	.....	25	.....	.....	.....	.....	.....	1	.....	.....	.....	1	2	4	29
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1890	262	78	84	76	.....	48	7	.....	8	.....	34	27	624	21	4	20	.....	45	21	.....	10	9	9	15	64	733

[a] No inspection, or report not published.

TABLE 16.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1891, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	17	5	2	.....	2	3	.....	.....	.....	.....	.....	1	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	22	8	1	3	3	4	.....	.....	.....	.....	.....	.....	41	2	.....	2	.....	4	.....	.....	.....	2	1	1	4	49
Indiana	2	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	5
Iowa	19	2	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	25	.....	.....	1	.....	1	.....	.....	.....	1	.....	.....	1	27
Kansas	7	.....	1	.....	.....	2	.....	.....	.....	.....	.....	1	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
Kentucky	10	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	1	.....	1	.....	2	1	.....	.....	.....	.....	.....	1	16
Maryland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	10	2	1	.....	.....	3	1	.....	.....	.....	.....	.....	17	.....	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	20
Montana	3	1	2	.....	.....	1	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
New Mexico	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	26	4	3	.....	.....	1	.....	.....	1	.....	.....	2	37	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	38
Oklahoma	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	123	44	59	39	.....	41	12	.....	3	.....	2	34	357	13	2	5	.....	20	8	.....	13	3	7	20	51	428
Pennsylvania (bituminous)	68	18	18	111	.....	5	.....	.....	.....	.....	3	4	227	1	2	3	.....	8	2	.....	.....	.....	.....	1	3	236
Tennessee	12	1	.....	.....	.....	5	.....	.....	.....	.....	.....	1	19	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	3	22
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	1	2	2	.....	.....	1	.....	.....	.....	.....	.....	5	11	1	.....	.....	.....	1	.....	.....	.....	.....	.....	2	2	14
West Virginia	25	6	6	5	.....	1	.....	.....	.....	.....	.....	.....	43	.....	.....	.....	.....	.....	2	.....	1	.....	1	.....	4	47
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1891	345	94	98	158	5	72	13	.....	4	.....	5	54	848	18	4	15	.....	37	16	.....	14	7	10	24	71	858

[a] No inspection, or report not published.

TABLE 17.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1892, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	11	10	2	2	1	3	.....	.....	.....	.....	.....	.....	29	1	1	2	.....	4	.....	.....	.....	.....	.....	.....	.....	33
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	29	12	6	2	.....	4	.....	.....	.....	.....	2	2	57	7	1	4	.....	12	.....	.....	.....	.....	.....	.....	.....	69
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19	19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19
Iowa	13	.....	1	.....	3	2	.....	.....	.....	.....	.....	.....	19	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	1	21
Kansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Kentucky	4	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	1	.....	.....	1	2	.....	.....	.....	.....	.....	2	8
Maryland	3	1	1	.....	.....	.....	.....	.....	1	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	12	2	1	3	.....	2	.....	.....	.....	.....	.....	.....	20	.....	.....	1	.....	1	.....	.....	.....	.....	.....	1	1	22
Montana	1	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
New Mexico	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	21	4	5	.....	.....	5	.....	.....	.....	.....	.....	2	37	3	.....	.....	.....	3	1	.....	.....	.....	1	1	3	43
Oklahoma	.....	.....	.....	.....	100	.....	.....	.....	.....	.....	.....	.....	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	142	48	54	57	.....	34	.....	.....	2	.....	.....	29	366	7	.....	3	.....	10	15	.....	11	.....	4	12	42	418
Pennsylvania (bituminous)	76	18	31	1	.....	2	.....	.....	.....	.....	.....	.....	128	1	.....	1	.....	2	1	.....	1	.....	2	.....	4	134
Tennessee	10	1	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	3	.....	3	46	.....	.....	.....	.....	.....	.....	.....	1	53	.....	1	.....	.....	1	1	.....	.....	.....	.....	.....	1	55
West Virginia	23	12	3	.....	.....	5	.....	.....	.....	.....	.....	2	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1892	349	108	110	111	104	60	.....	.....	3	.....	2	55	902	20	4	11	.....	35	20	.....	12	.....	7	15	54	991

a No inspection, or report not published.

TABLE 18.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1893, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	13	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	2	17
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	13	3	3	.....	24	1	.....	.....	.....	.....	.....	.....	44	.....	.....	1	.....	1	.....	.....	.....	1	.....	.....	1	46
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	42	9	5	1	.....	7	.....	.....	.....	.....	.....	.....	64	7	.....	6	1	14	1	.....	.....	1	2	1	5	83
Indiana	9	2	1	3	.....	5	.....	.....	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	22
Iowa	12	2	.....	.....	8	1	.....	.....	.....	.....	.....	.....	23	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	24
Kansas	3	.....	1	.....	.....	2	.....	.....	.....	.....	.....	5	11	1	.....	2	.....	3	.....	.....	.....	.....	.....	.....	.....	14
Kentucky	9	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	10	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	12
Maryland	2	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	13	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	16	1	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	18
Montana	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
New Mexico	2	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	20	2	5	.....	.....	3	.....	.....	.....	.....	.....	1	31	5	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	36
Oklahoma	2	1	1	1	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	143	46	72	46	.....	38	.....	.....	6	.....	10	23	384	10	6	4	.....	20	10	.....	14	2	8	17	51	455
Pennsylvania (bituminous)	86	19	16	1	.....	2	.....	.....	.....	.....	4	1	129	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	131
Tennessee	3	3	2	.....	.....	.....	.....	.....	.....	.....	.....	3	11	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	13
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	4	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	1	1	.....	.....	1	.....	.....	.....	1	8
West Virginia	35	13	7	.....	.....	.....	.....	.....	.....	.....	.....	2	57	3	.....	.....	.....	3	1	.....	.....	.....	.....	1	2	62
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1893	412	106	118	53	32	62	.....	.....	6	.....	14	35	838	27	6	17	2	52	15	....	16	4	11	22	68	958

a No inspection, or report not published.

TABLE 19.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1894, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	11	1	2	.....	.....	2	.....	.....	.....	.....	4	.....	20	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	21
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	11	2	1	1	.....	1	.....	.....	.....	.....	.....	1	17	1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	1	19
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	25	3	3	2	.....	14	1	.....	1	.....	.....	.....	49	2	1	2	.....	5	.....	.....	1	.....	1	1	3	57
Indiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Iowa	12	1	3	.....	.....	3	.....	.....	.....	.....	.....	.....	19	1	.....	1	.....	2	.....	.....	.....	2	1	.....	3	24
Kansas	10	.....	.....	.....	2	4	.....	.....	.....	.....	.....	.....	18	3	.....	2	.....	5	.....	.....	.....	.....	2	1	3	24
Kentucky	6	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	10
Maryland	5	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	10	1	.....	4	.....	1	1	.....	.....	.....	.....	.....	17	1	.....	.....	.....	1	.....	.....	1	.....	.....	.....	1	19
Montana	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
New Mexico	4	.....	.....	6	.....	1	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	20	3	2	1	.....	7	.....	.....	.....	.....	.....	.....	33	2	.....	3	.....	5	.....	.....	.....	1	.....	.....	1	39
Oklahoma	3	.....	2	1	.....	2	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	9
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	151	30	57	26	.....	44	1	.....	4	.....	7	30	350	15	8	8	....	31	13	....	13	11	7	20	64	445
Pennsylvania (bituminous)	66	25	22	.....	.....	4	.....	.....	.....	.....	.....	.....	117	3	....	3	....	6	.....	.....	.....	.....	.....	.....	.....	123
Tennessee	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	2	14
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	2	1	4	.....	4	.....	.....	.....	.....	.....	37	1	49	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	50
West Virginia	41	11	11	.....	8	.....	.....	.....	1	.....	2	2	76	1	.....	.....	.....	1	2	.....	.....	.....	.....	.....	2	79
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1894	395	79	109	41	14	86	3	.....	6	.....	50	34	817	29	10	19	....	58	16	....	16	15	12	24	83	958

a No inspection, or report not published.

TABLE 20.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1895, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	19	4	6	3	.....	2	2	.....	.....	.....	.....	.....	36	1	.....	.....	.....	1	.....	.....	1	.....	.....	1	2	39
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	6	6	3	4	.....	2	.....	.....	.....	.....	.....	.....	21	.....	.....	.....	2	2	.....	.....	.....	.....	.....	.....	.....	23
Georgia and North Carolina	.....	.....	.....	b 39	.....	.....	.....	.....	.....	.....	.....	.....	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	32	11	4	.....	.....	7	4	.....	.....	.....	.....	1	56	5	.....	8	1	14	1	.....	1	.....	2	1	5	78
Indiana	12	.....	3	.....	.....	3	.....	.....	.....	.....	.....	.....	18	3	.....	2	.....	5	.....	.....	.....	.....	.....	.....	.....	23
Iowa	11	2	1	.....	.....	.....	4	.....	.....	.....	2	.....	20	2	.....	.....	.....	2	.....	.....	.....	.....	1	.....	1	23
Kansas	5	.....	.....	.....	.....	1	.....	1	.....	.....	.....	1	8	.....	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	11
Kentucky	4	.....	2	.....	.....	6	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	13
Maryland	2	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	1	6	.....	.....	.....	.....	.....	2	.....	1	.....	.....	.....	3	9
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	6	.....	1	.....	.....	5	.....	.....	.....	.....	.....	.....	12	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	13
Montana	4	.....	.....	1	.....	2	.....	.....	1	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
New Mexico	3	1	.....	24	.....	.....	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	21	7	7	.....	.....	11	1	.....	1	1	.....	.....	49	.....	.....	1	.....	1	.....	.....	.....	1	.....	.....	1	51
Oklahoma	2	.....	2	4	.....	1	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	147	38	53	32	.....	40	.....	.....	6	.....	1	23	348	13	1	4	.....	18	17	.....	13	4	7	16	57	421
Pennsylvania (bituminous)	89	14	33	4	.....	5	.....	.....	1	.....	.....	3	148	1	.....	1	.....	2	.....	.....	1	.....	1	.....	2	153
Tennessee	5	2	.....	.....	28	2	.....	.....	.....	.....	.....	.....	37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	.....	1	1	26	.....	1	.....	.....	.....	.....	4	3	36	.....	.....	.....	.....	.....	.....	.....	1	2	.....	.....	3	39
West Virginia	46	8	4	.....	.....	5	.....	.....	.....	.....	.....	3	60	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	4	64
Wyoming	.....	.....	.....	.....	66	.....	.....	.....	.....	.....	.....	.....	66	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	66
Total, 1895	408	95	123	137	88	93	11	1	9	1	7	35	1,014	25	1	26	3	49	25	....	18	7	11	18	79	1,142

a No inspection, or report not published.

b Cumnock mine explosion, North Carolina.

TABLE 21.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1896, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	16	2	3	.....	.....	2	.....	.....	.....	.....	.....	2	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	14	2	2	.....	49	.....	.....	.....	.....	.....	.....	1	68	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	68
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	36	6	7	1	1	11	.....	.....	.....	.....	.....	.....	62	6	.....	1	.....	7	.....	.....	.....	.....	.....	1	1	70
Indiana	9	.....	3	9	.....	2	.....	.....	.....	.....	.....	.....	23	2	.....	3	.....	5	.....	.....	.....	.....	.....	.....	.....	28
Iowa	9	.....	2	.....	2	3	.....	.....	.....	.....	.....	.....	16	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	18
Kansas	5	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	10	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	12
Kentucky	4	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	6
Maryland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	8
Montana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
New Mexico	3	.....	3	.....	.....	3	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	24	7	5	1	.....	2	.....	1	.....	.....	.....	.....	40	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	42
Oklahoma	6	1	2	4	.....	2	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	210	36	57	42	.....	35	2	.....	6	.....	1	29	418	11	2	4	1	18	6	.....	18	9	12	20	65	501
Pennsylvania (bituminous)	83	31	26	6	13	1	3	2	.....	1	.....	1	167	.....	1	4	.....	5	2	.....	.....	2	.....	2	6	178
Tennessee	16	2	1	.....	.....	2	.....	.....	.....	.....	.....	.....	21	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	22
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	2
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	5	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
West Virginia	42	5	8	.....	.....	2	.....	.....	.....	.....	.....	4	61	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	3	4	65
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1896	490	93	119	63	65	72	5	3	6	1	1	44	962	21	3	16	1	41	10	....	19	12	12	27	80	1,083

a No inspection, or report not published.

TABLE 22.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1897, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	10	20	21	22		
Alabama	17	2	4	4	.....	3	.....	.....	.....	.....	5	3	38	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	39
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	1	1	1	.....	14	.....	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17
Colorado	15	4	3	.....	12	1	.....	.....	.....	.....	.....	1	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	33	11	.....	5	.....	12	1	.....	.....	.....	1	1	64	4	.....	.....	1	5	.....	.....	1	1	1	1	4	73
Indiana	9	.....	1	.....	.....	5	.....	.....	.....	.....	.....	.....	15	1	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....	16
Iowa	12	2	1	.....	.....	2	.....	.....	1	.....	.....	.....	18	3	.....	1	.....	4	.....	.....	.....	1	.....	.....	1	23
Kansas	3	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	5	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	6
Kentucky	5	1	2	.....	2	1	.....	.....	.....	.....	.....	.....	11	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	12
Maryland	3	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	7	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	10	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	12
Montana	3	3	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
New Mexico	2	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	25	4	3	.....	.....	3	.....	1	.....	.....	.....	.....	36	.....	.....	.....	1	1	.....	.....	.....	1	1	.....	2	39
Oklahoma	0	1	3	2	5	4	.....	.....	1	.....	2	.....	24	1	.....	2	.....	3	.....	.....	.....	1	.....	.....	1	28
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	146	53	41	35	.....	48	2	.....	.....	.....	13	26	364	5	2	10	.....	17	13	.....	9	.....	5	15	42	423
Pennsylvania (bituminous)	90	21	21	2	.....	4	.....	2	.....	.....	.....	.....	140	1	1	1	.....	3	.....	.....	.....	4	.....	2	0	149
Tennessee	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	7
West Virginia	47	14	7	1	.....	2	.....	.....	.....	.....	.....	.....	71	1	.....	.....	.....	1	2	.....	.....	.....	2	1	5	77
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1897	437	122	86	49	33	38	3	3	2	.....	21	34	888	16	4	17	2	30	15	....	11	8	9	20	03	980

a No inspection, or report not published.

TABLE 23.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1898, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	22	2	9	10	.....	.....	.....	.....	.....	.....	.....	1	44	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	45
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	3	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	5
Colorado	13	3	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	20	.....	.....	1	.....	1	2	.....	.....	.....	.....	.....	2	23
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	52	7	6	.....	.....	8	2	.....	.....	.....	1	.....	76	6	.....	4	.....	10	1	.....	2	.....	1	.....	4	90
Indiana	13	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	18	.....	1	1	.....	2	.....	.....	.....	1	.....	.....	1	21
Iowa	14	1	3	.....	.....	3	.....	.....	.....	.....	.....	.....	21	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	22
Kansas	7	.....	.....	.....	3	5	.....	.....	.....	.....	.....	2	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17
Kentucky	3	1	.....	.....	.....	1	.....	.....	.....	1	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Maryland	3	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Missouri	6	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	9	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	10
Montana	1	4	.....	.....	.....	1	.....	.....	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
New Mexico	4	.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	8
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	29	5	4	1	.....	3	.....	.....	.....	1	.....	.....	43	1	1	2	.....	4	.....	.....	.....	.....	1	.....	1	48
Oklahoma	4	1	4	4	5	4	.....	1	.....	.....	.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	145	41	48	34	.....	34	1	1	6	.....	9	28	347	9	9	2	.....	20	8	.....	15	2	4	15	44	411
Pennsylvania (bituminous)	110	21	31	11	.....	5	1	3	.....	.....	3	3	188	1	.....	.....	.....	1	2	.....	3	.....	3	2	10	199
Tennessee	13	1	1	1	.....	1	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	19
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	2	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	3	2	4	.....	.....	.....	.....	.....	.....	.....	.....	1	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	11
West Virginia	51	12	13	.....	.....	3	.....	.....	.....	.....	.....	1	80	.....	.....	1	.....	1	4	.....	1	.....	2	2	9	90
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1898	498	103	132	61	8	75	4	5	6	2	13	37	944	18	11	12	....	41	18	....	22	4	11	22	77	1,062

a No inspection, or report not published.

TABLE 24.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1899, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	13	3	5	5	.....	4	1	.....	.....	.....	.....	.....	38	1	.....	1	.....	2	.....	.....	.....	.....	.....	2	2	40
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	28	3	6	.....	.....	1	.....	.....	.....	.....	.....	.....	38	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	40
Georgia and North Carolina	.....	.....	.....	*b* 23	.....	.....	.....	.....	.....	.....	.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	32	7	7	.....	.....	15	.....	.....	.....	2	.....	.....	63	.....	2	2	1	5	.....	.....	2	.....	2	1	5	73
Indiana	6	.....	2	.....	.....	2	.....	.....	.....	.....	.....	3	13	1	.....	1	1	3	.....	.....	.....	.....	.....	.....	.....	16
Iowa	13	1	1	.....	.....	3	.....	.....	.....	.....	.....	.....	18	5	1	.....	1	7	.....	.....	.....	.....	.....	.....	.....	25
Kansas	8	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	1	14	.....	.....	1	.....	1	.....	.....	1	.....	.....	.....	1	16
Kentucky	4	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	7
Maryland	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	5
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Missouri	8	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
Montana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
New Mexico	9	1	2	5	.....	.....	.....	1	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	34	0	4	.....	.....	4	.....	1	.....	.....	.....	.....	40	.....	.....	4	.....	4	.....	.....	.....	.....	2	1	3	56
Oklahoma	7	2	2	4	.....	9	.....	2	.....	.....	.....	.....	26	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	28
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	183	32	57	28	.....	35	4	.....	7	.....	.....	41	387	11	1	4	.....	16	17	.....	13	1	10	17	58	461
Pennsylvania (bituminous)	140	23	38	20	.....	7	.....	5	.....	.....	.....	4	246	3	.....	2	.....	5	1	.....	2	2	.....	2	7	258
Tennessee	13	.....	3	.....	.....	2	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	2	20
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	4	4	1	1	31	1	.....	.....	.....	.....	.....	2	44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	45
West Virginia	51	15	12	3	.....	4	.....	3	.....	.....	.....	1	89	.....	.....	.....	.....	.....	2	.....	.....	1	1	2	6	95
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1899	580	100	141	98	33	93	5	12	7	2	.....	58	1,107	21	4	18	3	44	24	....	18	4	17	27	90	1,241

a No inspection, or report not published.

b Cumnock mine explosion, North Carolina.

TABLE 25.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1900, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	17	2	4	2	.....	3	.....	.....	.....	.....	.....	9	37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	19	6	2	.....	.....	1	.....	.....	.....	.....	1	.....	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	31
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	48	10	12	.....	.....	18	.....	.....	1	.....	1	1	91	3	1	4	.....	8	.....	.....	.....	.....	1	2	3	102
Indiana	11	.....	.....	.....	.....	3	.....	.....	1	.....	.....	.....	15	2	.....	1	.....	3	.....	.....	.....	.....	1	.....	1	19
Iowa	17	.....	5	.....	.....	2	.....	.....	.....	.....	.....	.....	24	2	1	1	.....	4	1	.....	.....	.....	.....	.....	1	29
Kansas	12	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	1	19	.....	1	1	.....	2	.....	.....	.....	.....	.....	.....	.....	21
Kentucky	12	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	15	1	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	17
Maryland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
Michigan	6	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	8	.....	.....	1	.....	1	.....	.....	.....	.....	.....	1	1	10
Missouri	16	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	18	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	19
Montana	1	3	1	.....	.....	2	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
New Mexico	4	2	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	40	5	15	3	.....	3	.....	.....	.....	.....	.....	.....	66	2	.....	.....	.....	2	.....	.....	.....	.....	1	2	3	71
Oklahoma	9	1	2	11	5	4	.....	1	.....	.....	.....	.....	33	.....	2	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	35
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	133	31	63	38	.....	42	4	.....	.....	.....	3	18	332	8	4	7	.....	19	17	.....	9	1	10	23	60	411
Pennsylvania (bituminous)	131	35	41	6	.....	9	1	6	.....	1	1	4	235	8	2	7	.....	17	10	.....	.....	.....	2	.....	12	264
Tennessee	8	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	3	.....	.....	4	200	1	.....	.....	.....	.....	.....	1	209	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	209
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	12	1	1	4	.....	.....	3	.....	.....	.....	5	2	28	.....	.....	.....	.....	.....	.....	.....	1	1	.....	1	3	31
West Virginia	58	7	9	47	.....	19	.....	.....	1	.....	.....	.....	141	.....	.....	.....	.....	.....	7	.....	.....	.....	2	.....	9	150
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1900	557	105	157	115	205	121	8	7	3	1	11	43	1,333	26	11	24	....	61	35	....	10	2	18	30	95	1,489

a No inspection, or report not published.

TABLE 26. NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1901, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	18	6	6	2	.....	6	.....	.....	.....	.....	.....	.....	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	40
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18
Colorado	25	3	8	2	8	1	.....	1	1	1	.....	2	52	.....	1	.....	.....	1	.....	.....	.....	2	.....	.....	2	55
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	52	8	12	1	.....	19	.....	.....	.....	.....	.....	.....	92	3	2	6	.....	11	1	.....	.....	.....	1	2	4	107
Indiana	11	1	3	.....	.....	4	.....	.....	.....	.....	.....	.....	19	2	.....	3	.....	5	.....	.....	.....	.....	.....	.....	.....	24
Iowa	14	7	2	.....	2	3	.....	.....	.....	.....	.....	.....	26	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	28
Kansas	4	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	1	7	1	1	2	.....	4	.....	.....	.....	.....	.....	.....	.....	11
Kentucky	5	2	5	.....	.....	4	.....	.....	.....	.....	.....	1	17	.....	2	.....	.....	2	.....	.....	.....	1	1	.....	2	21
Maryland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
Michigan	2	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Missouri	10	.....	1	.....	.....	5	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
Montana	3	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	2	6	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	7
New Mexico	6	.....	2	.....	3	2	.....	.....	.....	.....	.....	2	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	31	6	9	3	.....	8	1	1	.....	.....	.....	1	60	1	.....	1	.....	2	.....	.....	.....	2	.....	.....	2	64
Oklahoma	12	.....	7	8	12	6	.....	1	.....	.....	.....	.....	46	2	.....	8	.....	10	.....	.....	.....	.....	1	.....	1	57
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	175	30	97	30	.....	54	5	.....	3	.....	3	41	417	18	5	.....	.....	23	10	.....	20	1	11	19	73	513
Pennsylvania (bituminous)	155	34	40	20	1	7	.....	9	4	1	.....	4	290	1	.....	3	.....	4	4	.....	2	.....	1	.....	7	301
Tennessee	10	1	3	.....	20	1	.....	.....	.....	1	.....	1	43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	4	3	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	.....	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17
Washington	9	5	4	2	.....	2	.....	.....	.....	.....	1	.....	23	2	1	.....	.....	3	1	.....	.....	.....	.....	.....	1	27
West Virginia	70	12	14	11	.....	9	.....	.....	.....	1	1	4	122	1	.....	.....	.....	1	8	.....	.....	.....	1	1	10	133
Wyoming	.....	.....	.....	22	.....	.....	.....	.....	.....	.....	28	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50
Total, 1901	622	127	194	107	40	137	6	12	3	4	50	69	1,402	32	12	23	....	67	30	....	29	6	18	24	105	1,574

a No inspection, or report not published.

TABLE 27.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1902, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	29	.....	9	.....	.....	10	.....	.....	.....	.....	.....	.....	48	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	2	50
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
Colorado	37	5	2	8	14	3	.....	.....	.....	.....	2	.....	71	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2	73
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	42	12	16	.....	.....	24	.....	.....	.....	.....	.....	1	95	4	1	5	.....	10	.....	.....	.....	.....	1	1	2	107
Indiana	11	.....	3	.....	.....	7	.....	.....	.....	.....	.....	.....	21	.....	.....	2	.....	2	.....	.....	.....	.....	1	.....	1	24
Iowa	15	2	2	.....	22	5	.....	.....	.....	.....	.....	1	47	.....	.....	1	.....	1	.....	.....	.....	.....	1	.....	1	49
Kansas	12	.....	2	.....	.....	7	1	.....	.....	.....	.....	1	23	3	2	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	28
Kentucky	11	1	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	19
Maryland	3	4	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	11
Michigan	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	8
Missouri	5	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	8	1	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	10
Montana	2	1	1	.....	.....	1	.....	.....	.....	.....	.....	7	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
New Mexico	7	.....	4	.....	.....	1	.....	.....	.....	.....	2	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	53	5	13	3	.....	9	.....	.....	.....	.....	.....	.....	83	.....	.....	1	.....	1	.....	1	.....	1	.....	.....	2	86
Oklahoma	10	.....	8	4	2	5	.....	1	.....	.....	10	.....	40	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	2	42
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	77	38	44	20	.....	31	.....	.....	2	.....	.....	17	229	8	2	6	.....	16	15	.....	17	4	4	15	55	300
Pennsylvania (bituminous)	200	26	54	126	.....	9	.....	11	1	4	.....	2	433	5	1	8	.....	14	2	.....	2	3	.....	1	8	455
Tennessee	17	1	5	.....	200	3	.....	.....	.....	.....	.....	.....	226	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	226
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	5	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	8
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	7	5	5	.....	11	2	.....	.....	.....	.....	.....	.....	30	1	1	.....	.....	2	.....	.....	1	.....	.....	1	2	34
West Virginia	61	16	14	23	.....	5	.....	1	.....	.....	.....	.....	120	5	.....	.....	.....	5	6	.....	.....	.....	.....	3	9	134
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21	21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21
Total, 1902	609	117	188	184	249	130	1	13	3	4	14	63	1,575	27	7	26	.....	60	28	1	22	10	7	21	89	1,724

a No inspection, or report not published.

TABLE 28.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1903, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	26	2	6	18	.....	3	.....	.....	.....	.....	.....	8	57	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	57
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
Colorado	28	5	2	.....	1	4	.....	1	.....	.....	.....	1	40	2	.....	.....	.....	2	2	.....	.....	.....	.....	.....	2	44
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	68	7	20	10	.....	40	.....	1	.....	.....	.....	.....	146	2	2	3	1	8	.....	.....	1	.....	1	2	4	158
Indiana	16	2	4	1	.....	19	.....	1	.....	.....	1	1	45	4	.....	2	.....	6	.....	.....	.....	.....	1	.....	1	52
Iowa	16	2	3	.....	.....	3	.....	.....	.....	.....	.....	.....	24	3	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	27
Kansas	19	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	2	28	1	.....	1	.....	2	.....	.....	.....	.....	3	.....	3	33
Kentucky	17	1	.....	.....	.....	5	.....	.....	.....	.....	.....	2	25	1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	1	27
Maryland	4	1	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	2	18
Michigan	2	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	4	1	.....	.....	.....	1	.....	.....	.....	2	.....	1	3	8
Missouri	10	.....	1	3	.....	3	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17
Montana	4	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
New Mexico	10	1	1	.....	.....	7	.....	.....	.....	.....	3	.....	22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	75	12	13	4	.....	11	.....	2	.....	1	.....	1	110	1	1	2	.....	4	1	.....	.....	.....	.....	.....	1	124
Oklahoma	10	.....	3	13	4	9	.....	.....	1	.....	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	42
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	109	40	70	25	.....	58	.....	1	6	.....	4	27	400	22	1	3	.....	28	29	.....	22	2	10	29	92	518
Pennsylvania (bituminous)	217	31	71	23	.....	14	.....	9	1	1	.....	5	372	6	1	2	.....	9	5	.....	2	.....	5	2	14	395
Tennessee	15	.....	2	.....	.....	2	.....	1	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	6	26
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	3	2	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	7
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	10	4	6	.....	.....	2	.....	.....	.....	.....	.....	.....	22	1	.....	.....	.....	1	1	.....	1	.....	.....	.....	2	25
West Virginia	79	20	13	2	3	7	.....	2	1[b]	1	.....	2	130	1	.....	.....	.....	1	12	.....	.....	1	1	2	16	147
Wyoming	.....	.....	.....	169	.....	.....	.....	.....	.....	.....	.....	.....	169	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	169
Total 1903	780	130	221	278	8	190	.....	18	8	3	8	50	1,712	45	5	13	1	64	58	....	26	5	22	38	150	1,828

[a] No inspection, or report not published.

TABLE 29.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1904, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	8	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22			
Alabama	34	4	7	26	.....	3	.....	.....	.....	.....	.....	9	83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	83
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Colorado	43	10	10	.....	19	4	.....	1	.....	.....	.....	2	89	1	.....	1	.....	2	1	.....	.....	.....	1	1	3	.....	94
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	64	12	17	.....	.....	53	.....	1	.....	.....	.....	2	149	11	.....	6	.....	17	.....	.....	4	1	2	.....	7	173	
Indiana	13	.....	6	.....	.....	9	.....	1	.....	.....	.....	.....	29	2	.....	2	.....	4	.....	.....	.....	.....	1	.....	1	34	
Iowa	11	2	2	.....	2	1	1	.....	.....	.....	.....	.....	19	.....	2	3	.....	5	.....	.....	.....	.....	.....	1	1	25	
Kansas	15	.....	2	.....	.....	11	.....	.....	.....	.....	.....	.....	28	1	.....	2	.....	3	.....	.....	.....	.....	.....	.....	.....	31	
Kentucky	6	1	1	.....	5	3	.....	.....	.....	1	.....	.....	17	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	2	3	20	
Maryland	7	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	10	
Michigan	3	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	
Missouri	8	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	
Moutana	6	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	
New Mexico	5	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	64	10	13	.....	.....	13	1	2	.....	4	.....	1	108	4	1	.....	.....	5	2	.....	.....	.....	1	1	4	117	
Oklahoma	4	.....	7	3	10	3	.....	.....	.....	.....	.....	.....	27	.....	1	1	.....	2	.....	.....	.....	.....	.....	.....	.....	29	
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	172	66	71	30	.....	69	.....	.....	6	.....	6	40	460	29	9	2	.....	40	33	.....	19	4	10	29	95	595	
Pennsylvania (bituminous)	203	32	52	5	179	7	.....	12	.....	2	1	6	499	7	1	8	.....	16	4	.....	3	1	5	5	18	533	
Tennessee	19	.....	4	.....	3	2	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	4	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2	8	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	9	
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	5	2	2	.....	17	3	1	.....	.....	.....	.....	.....	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	31	
West Virginia	93	13	16	2	.....	3	.....	3	.....	.....	.....	2	132	2	.....	2	.....	4	10	.....	1	.....	1	1	13	149	
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1904	779	156	215	66	235	190	3	20	6	7	7	65	1,749	57	14	28	.....	99	51	.....	27	6	21	42	147	1,995	

a No inspection, or report not published.

TABLE 30.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1905, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	31	3	8	19	112	4	.....	1	.....	.....	.....	9	187	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		187
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Arkansas	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	2	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		8
Colorado	35	6	8	.....	.....	4	.....	4	.....	.....	.....	.....	57	2	.....	1	.....	3	2	.....	.....	.....	.....	3	5		85
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Illinois	66	15	19	51	.....	25	.....	2	.....	.....	6	2	186	5	1	5	.....	11	.....	.....	2	.....	3	1	6		203
Indiana	17	.....	3	2	9	8	.....	.....	.....	.....	.....	1	40	2	.....	3	.....	5	.....	.....	.....	.....	1	.....	1		46
Iowa	24	1	4	.....	.....	5	.....	.....	.....	.....	.....	1	35	1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	1		37
Kansas	23	.....	1	.....	2	13	.....	.....	.....	.....	.....	.....	39	1	.....	.....	.....	1	.....	.....	.....	.....	1	.....	1		41
Kentucky	19	.....	2	.....	.....	7	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	3		31
Maryland	11	2	1	.....	.....	1	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		15
Michigan	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	3	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		9
Missouri	7	1	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	10	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....		11
Montana	5	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		8
New Mexico	5	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		7
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Ohio	71	7	16	1	.....	4	.....	6	.....	4	.....	1	110	1	.....	2	.....	3	2	.....	1	4	1	5	13		128
Oklahoma	6	1	3	18	3	8	1	.....	.....	.....	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1		41
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Pennsylvania (anthracite)	243	51	82	34	.....	62	5	2	2	.....	.....	28	509	29	1	12	.....	42	13	.....	34	3	10	33	93		844
Pennsylvania (bituminous)	259	40	66	23	13	18	2	9	2	2	6	3	443	5	1	2	.....	8	5	1	1	1	10	6	24		475
Tennessee	18	.....	2	.....	.....	7	.....	1	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1		29
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Utah	2	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	1	.....	.....	.....	1	.....	.....	.....	.....	2	.....	2		7
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Washington	6	1	3	.....	.....	1	.....	.....	.....	.....	.....	1	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		12
West Virginia	99	7	25	7	38	10	.....	.....	2	.....	8	1	197	.....	.....	2	.....	2	6	.....	1	.....	5	1	13		212
Wyoming	.....	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		18
Total, 1905	857	138	247	173	177	181	8	25	6	6	20	52	1,990	48	3	27	....	78	31	1	39	8	35	50	164		2,232

(a) No inspection, or report not published.

TABLE 31.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1906, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	45	5	12	13	.....	7	.....	6	.....	.....	.....	2	90	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	6	96
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	6	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	3	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
Colorado	37	7	2	34	.....	4	.....	1	.....	.....	.....	.....	85	1	.....	1	.....	2	2	.....	.....	.....	.....	.....	2	89
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	66	17	23	3	2	20	.....	.....	.....	.....	.....	1	132	10	2	11	.....	23	.....	.....	.....	1	3	2	6	161
Indiana	19	.....	3	1	.....	4	.....	.....	.....	.....	.....	.....	27	1	.....	2	.....	3	.....	.....	.....	.....	1	.....	1	31
Iowa	14	1	6	.....	.....	5	.....	.....	.....	.....	.....	.....	26	2	.....	.....	.....	2	.....	.....	.....	.....	.....	1	1	29
Kansas	14	1	1	.....	.....	20	.....	.....	.....	.....	.....	.....	36	1	1	.....	.....	2	1	.....	.....	.....	.....	.....	1	39
Kentucky	17	3	2	1	.....	4	.....	1	.....	.....	.....	.....	28	2	1	2	.....	5	4	.....	.....	.....	.....	2	6	39
Maryland	2	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	6
Michigan	1	1	.....	.....	.....	.....	.....	1	.....	.....	.....	1	4	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	5
Missouri	12	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	14	1	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	16
Montana	2	2	.....	.....	.....	.....	.....	1	.....	.....	8	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
New Mexico	10	1	2	10	.....	.....	.....	.....	.....	.....	.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Ohio	75	5	12	3	.....	12	.....	9	2	.....	.....	.....	118	1	1	8	.....	10	3	.....	.....	.....	.....	.....	3	131
Oklahoma	7	.....	4	6	8	17	.....	.....	.....	.....	.....	.....	42	1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	1	44
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	168	46	67	46	.....	82	1	1	3	.....	.....	23	437	11	2	6	.....	19	30	1	23	1	7	39	101	557
Pennsylvania (bituminous)	269	35	90	10	.....	8	1	26	1	5	.....	2	447	5	2	2	1	10	5	2	4	.....	3	5	19	476
Tennessee	20	.....	3	.....	.....	3	.....	.....	.....	.....	.....	2	28	1	.....	.....	.....	1	2	.....	.....	.....	.....	1	3	32
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Virginia	.....	.....	.....	35	.....	.....	.....	.....	.....	.....	.....	.....	35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35
Washington	6	1	9	1	.....	.....	.....	1	.....	.....	.....	.....	18	.....	.....	1	.....	1	2	.....	1	.....	.....	.....	3	22
West Virginia	108	12	18	26	66	5	.....	6	.....	1	.....	1	243	7	1	2	.....	10	12	.....	2	.....	2	8	24	277
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Total, 1906	902	138	256	189	76	197	2	53	6	6	8	35	1,868	44	11	36	1	92	62	3	36	2	16	59	178	2,138

a No inspection, or report not published.

TABLE 32.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1907, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	21	3	11	5	57	3	.....	2	.....	.....	.....	52	154	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		154
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Arkansas	7	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	4	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		13
Colorado	51	5	9	1	25	2	.....	.....	.....	.....	7	.....	100	2	.....	1	.....	3	1	1	.....	.....	1	1	4		107
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Illinois	73	20	30	5	.....	31	.....	2	1	.....	.....	3	174	4	3	1	.....	8	.....	.....	3	.....	7	.....	10		192
Indiana	15	1	8	2	.....	18	.....	.....	1	.....	.....	1	46	1	.....	4	.....	5	.....	.....	.....	.....	2	.....	2		53
Iowa	21	7	2	1	1	2	.....	.....	.....	.....	.....	.....	34	1	.....	3	.....	4	.....	.....	.....	1	1	.....	2		40
Kansas	21	.....	1	1	3	6	.....	.....	.....	.....	.....	.....	32	1	.....	2	.....	3	.....	.....	.....	.....	1	1	2		37
Kentucky	11	1	4	.....	.....	7	.....	1	.....	1	.....	.....	25	3	.....	.....	.....	3	1	.....	1	.....	2	.....	4		32
Maryland	2	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		3
Michigan	2	.....	1	.....	.....	2	.....	.....	.....	.....	.....	1	6	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....		7
Missouri	6	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		8
Montana	7	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	2	4		13
New Mexico	12	1	5	.....	11	.....	.....	.....	.....	.....	3	.....	32	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....		34
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Ohio	95	3	17	3	.....	4	.....	10	.....	3	.....	5	140	1	.....	.....	.....	1	3	1	2	3	4	.....	13		154
Oklahoma	15	2	2	4	3	12	.....	1	.....	.....	.....	.....	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		39
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Pennsylvania (anthracite)	235	44	88	45	.....	87	12	3	9	.....	7	44	574	17	3	7	....	27	36	2	29	5	13	22	107		708
Pennsylvania (bituminous)	271	37	105	37	239	17	.....	24	1	4	1	7	743	12	2	12	....	26	11	....	4	1	3	11	30		799
Tennessee	19	1	3	3	.....	1	.....	2	.....	.....	.....	.....	29	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1		30
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		(a)
Utah	3	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		5
Virginia	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		11
Washington	10	1	2	10	.....	5	.....	3	.....	.....	.....	1	32	.....	.....	.....	.....	.....	3	.....	1	.....	.....	1	5		37
West Virginia	132	17	37	25	461	20	.....	4	1	1	.....	2	700	4	1	.....	.....	5	12	.....	1	.....	2	16	31		736
Wyoming	7	10	0	.....	2	1	.....	.....	.....	.....	.....	3	23	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1		30
Total, 1907	**1,036**	**154**	**344**	**154**	**802**	**221**	**12**	**52**	**13**	**9**	**18**	**123**	**2,938**	**46**	**10**	**30**	**....**	**86**	**70**	**4**	**44**	**10**	**36**	**54**	**218**		**3,242**

a No inspection, or report not published.

TABLE 33.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1908, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22			
Alabama	36	3	16	9	.....	12	.....	10	.....	.....	.....	22	108	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	108
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Arkansas	8	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	5	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
Colorado	33	5	9	5	.....	3	.....	.....	2	.....	.....	2	59	2	.....	.....	.....	2	1	.....	.....	.....	.....	1	1	2	63
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	61	21	27	3	.....	38	.....	1	.....	1	1	.....	153	6	1	1	.....	8	.....	1	2	.....	8	.....	11	172
Indiana	19	3	6	1	.....	10	.....	1	1	.....	.....	.....	41	1	.....	3	.....	4	.....	.....	.....	.....	.....	.....	.....	45
Iowa	16	3	4	.....	.....	3	.....	.....	.....	.....	.....	.....	26	2	1	2	.....	5	.....	.....	.....	.....	.....	.....	.....	31
Kansas	22	.....	.....	1	3	6	.....	.....	.....	.....	.....	.....	32	1	.....	3	.....	4	.....	.....	1	.....	.....	1	2	38
Kentucky	15	.....	3	.....	9	7	.....	1	.....	.....	.....	.....	35	.....	1	.....	.....	1	2	.....	.....	1	1	.....	4	40
Maryland	.....	3	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	6
Michigan	4	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	5	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	6
Missouri	8	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
Montana	3	4	2	.....	.....	1	.....	.....	.....	.....	9	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	21
New Mexico	15	1	6	.....	.....	1	.....	.....	.....	.....	.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	24
North Dakota	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Ohio	71	3	17	2	.....	6	.....	5	.....	1	.....	.....	105	1	1	.....	.....	2	1	.....	.....	.....	1	4	6	113
Oklahoma	3	.....	3	2	2	1	1	.....	.....	.....	29	4	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	46
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Pennsylvania (anthracite)	235	49	90	55	.....	94	3	1	5	.....	.....	40	572	15	5	4	.....	24	29	1	29	1	8	14	82	678
Pennsylvania (bituminous)	226	36	76	9	154	6	.....	20	.....	4	.....	2	533	4	1	11	.....	16	13	1	2	1	2	3	22	571
Tennessee	26	1	.....	.....	.....	1	.....	4	1	.....	.....	.....	33	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	34
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Utah	2	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Washington	13	1	8	1	.....	.....	.....	1	.....	.....	.....	1	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25
West Virginia	121	30	39	1	59	11	.....	10	3	1	.....	2	277	10	.....	.....	.....	10	12	4	2	.....	1	4	23	310
Wyoming	6	3	1	.....	59	1	.....	.....	.....	.....	.....	10	80	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	81
Total, 1908	945	168	312	89	286	203	4	54	12	7	39	90	2,209	42	10	25	....	77	59	7	36	4	23	30	159	2,445

[a] No inspection, or report not published.

TABLE 34.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1909, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	61	9	17	6	18	16	2	4	.....	.....	.....	2	129	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	129
Alaska and California	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Arkansas	9	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	4	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
Colorado	56	7	7	12	3	3	.....	1	.....	.....	.....	.....	89	.....	1	2	.....	3	1	.....	1	.....	1	2	5	97
Georgia and North Carolina	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)
Illinois	53	22	26	45	.....	34	.....	3	2	.....	259	2	440	.....	1	6	.....	7	.....	.....	2	1	5	3	11	458
Indiana	23	2	4	.....	6	5	.....	.....	.....	1	.....	1	42	2	1	3	.....	6	.....	.....	.....	.....	1	.....	1	49
Iowa	22	4	5	.....	.....	2	2	1	.....	.....	.....	1	37	1	.....	.....	.....	1	.....	.....	.....	.....	1	.....	1	39
Kansas	18	.....	1	3	.....	8	.....	.....	1	.....	.....	.....	31	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	32
Kentucky	26	.....	2	7	.....	2	.....	1	.....	1	.....	.....	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	34
Maryland	11	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	.....	.....	.....	.....	.....	5	.....	.....	.....	1	1	7	20
Michigan	5	.....	.....	.....	.....	1	.....	1	.....	.....	.....	1	8	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	9
Missouri	10	4	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	18	1	.....	2	.....	3	.....	.....	.....	.....	.....	.....	.....	21
Montana	6	2	2	.....	.....	1	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
New Mexico	5	4	3	.....	.....	.....	.....	.....	.....	.....	2	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Ohio	66	2	21	1	2	9	.....	2	.....	2	.....	.....	105	1	.....	.....	.....	1	2	.....	.....	.....	.....	2	4	110
Oklahoma	6	.....	6	15	4	10	.....	.....	.....	.....	.....	6	47	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	48
Oregon	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Pennsylvania (anthracite)	195	59	71	31	.....	69	1	6	6	.....	12	30	480	7	1	2	.....	10	23	.....	21	3	3	27	77	567
Pennsylvania (bituminous)	256	39	83	9	41	7	.....	22	1	1	3	6	482	7	2	4	.....	13	10	.....	6	.....	3	6	25	500
Tennessee	18	.....	4	.....	.....	3	.....	2	.....	.....	.....	.....	27	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	29
Texas	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Utah	7	6	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
Virginia	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
Washington	9	4	1	14	.....	3	.....	4	.....	.....	.....	2	37	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	2	39
West Virginia	142	36	52	4	67	14	.....	11	.....	.....	.....	3	323	1	.....	.....	.....	1	6	2	.....	.....	.....	4	12	336
Wyoming	11	9	5	.....	.....	4	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	30
Total, 1909	1,025	204	307	153	142	181	5	53	10	5	276	69	2,445	20	6	21	....	47	50	2	31	4	18	47	150	2,642

a No inspection.

TABLE 35.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1910, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	51	4	20	.....	139	10	.....	6	.....	.....	.....	7	237	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	238
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Arkansas	10	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
Colorado	62	11	18	79	131	5	.....	.....	.....	.....	10	2	318	2	.....	.....	2	1	1	.....	1	.....	.....	1	3	323
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Illinois	61	13	28	8	.....	9	.....	1	5	.....	.....	.....	125	4	3	6	.....	13	.....	.....	.....	1	3	1	5	143
Indiana	25	.....	6	4	.....	11	.....	1	.....	.....	.....	.....	47	2	.....	2	.....	4	.....	.....	.....	.....	.....	.....	.....	51
Iowa	20	1	3	.....	.....	3	.....	.....	1	.....	.....	1	29	3	.....	.....	.....	3	1	.....	.....	.....	.....	.....	1	33
Kansas	7	.....	1	.....	1	3	.....	.....	.....	.....	.....	.....	12	4	.....	.....	.....	4	.....	.....	.....	.....	.....	1	1	17
Kentucky	20	1	5	.....	40	16	.....	2	.....	.....	.....	1	85	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	86
Maryland	9	2	2	.....	.....	1	.....	.....	.....	.....	.....	1	15	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	1	3	18
Michigan	4	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Missouri	8	.....	3	.....	.....	1	.....	.....	.....	.....	.....	2	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
Montana	4	3	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
New Mexico	8	6	1	.....	.....	1	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
North Dakota	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Ohio	94	7	16	16	.....	5	.....	7	.....	2	.....	.....	147	1	.....	2	.....	3	5	.....	1	1	2	.....	9	159
Oklahoma	11	.....	3	.....	13	3	.....	.....	.....	.....	.....	1	31	.....	.....	2	3	5	.....	.....	1	.....	.....	2	3	39
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Pennsylvania (anthracite)	173	80	93	20	.....	82	13	3	1	.....	.....	24	489	11	.....	8	1	20	41	.....	29	1	.....	21	92	601
Pennsylvania (bituminous)	261	47	105	15	.....	10	.....	30	1	2	.....	2	473	9	.....	3	.....	12	11	2	6	5	4	8	36	521
Tennessee	22	.....	3	.....	.....	10	.....	2	.....	.....	.....	.....	37	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	38
Texas	4	.....	1	.....	.....	.....	.....	1	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
Utah	6	4	3	.....	.....	1	.....	.....	.....	.....	.....	1	15	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	3	18
Virginia	35	.....	1	.....	10	.....	.....	3	.....	3	.....	2	54	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	3	57
Washington	8	2	4	.....	18	4	.....	3	.....	.....	.....	2	41	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	2	43
West Virginia	173	31	55	3	.....	8	.....	20	1	4	.....	1	296	3	.....	11	.....	14	15	.....	1	.....	.....	3	19	329
Wyoming	15	10	3	.....	.....	6	.....	.....	.....	.....	.....	1	35	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	36
Total, 1910	1,092	222	380	145	352	195	13	79	9	11	10	49	2,557	39	3	34	4	80	83	2	40	9	12	38	184	2,821

TABLE 30.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1911, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	43	4	14	2	128	5	.....	6	.....	.....	.....	2	204	1	.....	.....	.....	1	.....	.....	.....	.....	2	2	4	209
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Arkansas	9	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	11	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	12
Colorado	40	6	10	.....	17	2	2	2	.....	.....	.....	2	81	.....	.....	2	.....	2	1	.....	.....	.....	1	3	5	88
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Illinois	60	17	41	9	.....	15	1	3	1	.....	.....	1	154	5	.....	7	.....	12	.....	.....	1	1	1	3	5	172
Indiana	17	2	4	1	2	11	.....	2	.....	1	.....	.....	40	3	.....	.....	.....	3	1	.....	.....	.....	1	1	3	46
Iowa	21	.....	12	.....	.....	1	.....	.....	.....	1	.....	.....	35	1	.....	1	1	3	.....	.....	.....	.....	.....	.....	.....	38
Kansas	20	.....	.....	7	3	3	3	1	.....	.....	.....	3	40	1	.....	.....	.....	1	.....	.....	.....	1	.....	.....	1	42
Kentucky	28	.....	5	.....	.....	4	.....	3	.....	1	.....	.....	41	.....	.....	.....	.....	.....	1	.....	1	.....	1	.....	3	44
Maryland	12	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	15
Michigan	3	1	.....	.....	.....	.....	.....	2	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
Missouri	6	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	8
Montana	7	3	2	.....	.....	2	.....	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
New Mexico	9	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
North Dakota	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Ohio	78	8	11	.....	.....	3	.....	3	.....	2	.....	.....	105	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	2	107
Oklahoma	9	.....	5	1	1	9	.....	1	.....	.....	2	.....	25	.....	.....	1	.....	1	.....	.....	.....	.....	.....	1	1	27
Oregon	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Pennsylvania (anthracite)	195	57	92	34	.....	88	14	2	3	.....	72	37	594	17	.....	4	.....	21	20	1	22	1	.....	34	84	699
Pennsylvania (bituminous)	248	60	90	21	8	6	.....	30	2	.....	.....	12	486	3	.....	1	.....	4	12	1	4	3	.....	5	25	515
Tennessee	14	.....	5	.....	84	1	.....	4	.....	.....	.....	.....	108	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	3	111
Texas	5	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
Utah	5	5	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	13
Virginia	35	.....	18	5	.....	.....	.....	2	.....	.....	.....	.....	90	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	4	8	88
Washington	6	4	8	.....	.....	2	.....	2	.....	.....	1	.....	23	1	.....	.....	.....	1	2	.....	1	.....	.....	.....	3	27
West Virginia	164	28	55	18	23	3	.....	22	1	4	.....	3	321	2	.....	.....	.....	2	10	3	2	.....	2	1	18	341
Wyoming	15	9	4	1	.....	1	.....	.....	.....	.....	.....	1	31	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	32
Total, 1911	1,053	269	382	99	289	199	20	94	7	9	75	63	2,434	34		16	2	52	61	5	31	7	12	54	170	2,656

TABLE 37.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1912, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on surface								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Felling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	6	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	56	6	15	26	.....	5	.....	8	.....	.....	.....	1	117	2	1	...	.....	3	.....	.....	.....	.....	3	.....	3	123
Alaska and California	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Arkansas	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	...	1	1	.....	.....	.....	.....	.....	.....	.....	8
Colorado	43	9	13	15	2	1	.....	6	1	.....	.....	3	93	.....	.....	1	.....	1	1	.....	.....	.....	1	.....	2	96
Georgia and North Carolina	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Illinois	65	19	41	3	.....	11	.....	2	2	1	.....	.....	144	6	1	5	.....	12	1	.....	.....	1	3	2	7	163
Indiana	20	.....	8	2	2	2	.....	.....	.....	.....	.....	.....	34	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	1	1	35
Iowa	9	2	3	.....	2	3	.....	.....	.....	.....	.....	.....	19	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	19
Kansas	13	.....	2	.....	1	11	.....	1	.....	.....	.....	.....	28	.....	.....	1	.....	1	.....	.....	.....	.....	1	.....	1	30
Kentucky	19	1	5	5	5	1	.....	5	.....	1	.....	.....	42	.....	.....	2	.....	2	3	.....	.....	.....	1	3	7	51
Maryland	8	4	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	14	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	1	1	15
Michigan	4	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	6	.....	1	...	.....	1	.....	.....	.....	.....	1	.....	1	8
Missouri	7	2	2	2	1	.....	.....	2	.....	.....	.....	.....	16	1	.....	2	.....	3	.....	.....	.....	.....	.....	.....	.....	19
Montana	2	1	2	.....	.....	2	.....	.....	.....	.....	.....	.....	7	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
New Mexico	8	2	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
North Dakota	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Ohio	91	8	16	2	.....	5	.....	2	.....	1	.....	4	129	1	.....	1	.....	2	.....	.....	2	.....	1	1	4	135
Oklahoma	6	1	3	75	2	1	.....	.....	.....	.....	11	.....	99	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	99
Oregon	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Pennsylvania (anthracite)	166	77	79	35	.....	77	5	5	2	.....	.....	30	476	18	2	2	.....	22	41	2	22	2	.....	36	103	601
Pennsylvania (bituminous)	206	43	106	1	.....	8	.....	18	1	.....	.....	17	400	4	.....	3	.....	7	16	2	7	2	.....	12	39	446
Tennessee	13	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	2	2	18
Texas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	1	1	1	.....	.....	.....	.....	.....	.....	2
Utah	5	9	2	.....	.....	.....	1	1	.....	.....	.....	.....	18	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	1	1	19
Virginia	33	.....	9	10	.....	10	.....	4	.....	1	.....	.....	67	1	.....	...	.....	1	3	1	.....	.....	1	2	7	75
Washington	3	3	3	.....	.....	1	.....	3	.....	.....	.....	.....	13	.....	.....	...	1	1	.....	.....	.....	.....	.....	.....	.....	14
West Virginia	176	18	45	8	83	8	.....	21	.....	2	.....	.....	361	.....	.....	2	.....	2	11	3	2	.....	2	.....	18	381
Wyoming	16	5	5	.....	7	.....	.....	1	.....	.....	.....	.....	34	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	36
Total, 1912	**975**	**211**	**371**	**185**	**105**	**147**	**6**	**80**	**6**	**7**	**11**	**55**	**2,159**	**33**	**5**	**20**	**3**	**61**	**78**	**8**	**33**	**5**	**14**	**61**	**199**	**2,419**

TABLE 38.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1913, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on the surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
Alabama	61	7	19	3	13	2	11	5	.....	.....	.....	2	123	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	124
Alaska and California	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2
Arkansas	5	1	1	.....	2	1	.....	.....	.....	.....	1	.....	11	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	12
Colorado	46	1	7	.....	37	4	3	2	1	3	.....	1	105	.....	.....	.....	.....	.....	1	.....	1	.....	.....	1	3	108
Georgia and North Carolina	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Illinois	59	21	38	8	.....	11	1	8	1	.....	1	5	153	2	1	1	.....	4	.....	.....	1	1	2	3	7	164
Indiana	24	5	8	7	8	4	.....	1	1	.....	.....	a 1	59	2	.....	2	1	5	1	.....	.....	.....	.....	1	2	66
Iowa	18	.....	6	.....	1	1	.....	.....	.....	.....	.....	.....	26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26
Kansas	17	.....	.....	1	2	4	.....	.....	1	.....	.....	.....	25	.....	.....	2	.....	2	.....	.....	.....	.....	.....	1	1	28
Kentucky	24	1	1	.....	.....	1	b 5	4	.....	2	.....	4	42	2	.....	.....	1	3	1	.....	.....	.....	.....	2	3	48
Maryland	6	.....	3	.....	.....	2	.....	.....	.....	.....	.....	1	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	13
Michigan	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	3
Missouri	8	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
Montana	9	4	2	.....	.....	2	.....	.....	.....	.....	.....	.....	17	.....	.....	1	.....	1	.....	.....	.....	.....	2	.....	2	20
New Mexico	3	1	2	.....	261	2	2	.....	.....	.....	.....	1	272	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	272
North Dakota	3	.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Ohio	90	3	32	15	.....	6	.....	9	.....	2	.....	2	159	3	.....	1	.....	4	.....	.....	.....	.....	1	1	2	165
Oklahoma	7	.....	6	2	1	4	.....	2	.....	.....	.....	.....	22	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	23
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Pennsylvania (anthracite)	192	65	85	50	.....	75	11	1	4	4	.....	36	523	30	.....	.....	.....	30	35	1	15	.....	.....	14	65	618
Pennsylvania (bituminous)	257	56	102	.....	97	4	.....	23	.....	6	.....	9	554	7	.....	.....	.....	7	26	5	6	.....	.....	11	48	609
Tennessee	20	5	6	.....	.....	.....	.....	1	.....	.....	1	1	34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	35
Texas	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Utah	3	.....	6	.....	.....	1	.....	.....	.....	.....	.....	1	11	1	.....	.....	.....	1	3	1	.....	.....	1	.....	5	17
Virginia	11	1	4	.....	.....	.....	.....	4	.....	.....	1	3	24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24
Washington	7	.....	4	5	1	2	.....	1	.....	.....	.....	1	21	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	22
West Virginia	170	30	86	.....	.....	8	.....	17	.....	6	.....	2	319	1	.....	1	.....	2	10	1	2	.....	.....	3	16	337
Wyoming	13	2	4	.....	.....	1	.....	2	1	1	.....	.....	24	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	2	26
Total, 1913	1,060	204	424	91	423	138	33	80	9	24	4	72	2,562	50	1	9	2	62	78	8	26	1	8	40	181	2,785

a Fatality in mine employing less than 10 men.

b Suffocated by entering an abandoned mine.

TABLE 39.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1914, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on the surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosion or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.		
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22			
Alabama	53	.....	24	37	.....	1	.....	11	.....	1	.....	.....	127	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	128
Alaska and California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Arkansas	3	.....	3	2	1	1	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	11
Colorado	40	2	13	1	.....	4	.....	6	.....	2	.....	4	72	.....	.....	1	.....	1	.....	.....	.....	.....	.....	2	2	75
Georgia and North Carolina	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Idaho and Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Illinois	49	20	38	55	.....	9	.....	2	.....	2	1	.....	176	4	2	1	1	8	.....	.....	2	.....	3	4	9	193
Indiana	18	3	4	2	1	6	.....	2	1	1	.....	2	40	.....	.....	2	.....	2	.....	.....	.....	.....	2	.....	2	44
Iowa	17	1	5	.....	5	3	1	.....	.....	.....	.....	.....	32	3	.....	2	.....	5	.....	.....	.....	.....	.....	.....	.....	37
Kansas	14	.....	.....	.....	8	1	.....	1	.....	.....	.....	1	25	6	1	.....	.....	7	.....	.....	1	.....	.....	.....	1	33
Kentucky	30	.....	13	.....	1	6	.....	2	.....	1	.....	.....	53	2	.....	.....	.....	2	2	1	1	.....	1	1	6	61
Maryland	15	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	18
Michigan	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Missouri	12	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	14	.....	.....	5	.....	5	.....	.....	.....	.....	.....	.....	.....	19
Montana	6	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	8
New Mexico	14	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	1	18
North Dakota	1	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
Ohio	44	1	10	1	.....	2	.....	1	.....	2	.....	1	62	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	64
Oklahoma	20	.....	3	1	1	2	.....	3	.....	.....	.....	1	31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31
Oregon	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Pennsylvania (anthracite)	166	62	76	44	.....	90	8	3	2	1	.....	34	486	47	.....	.....	.....	47	30	1	13	.....	.....	18	62	595
Pennsylvania (bituminous)	189	44	89	3	.....	7	5	25	1	3	.....	10	376	3	.....	.....	.....	3	13	2	3	1	.....	4	23	402
Tennessee	19	2	1	1	.....	1	.....	.....	.....	.....	.....	.....	24	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2	26
Texas	4	2	1	1	.....	1	.....	.....	.....	.....	.....	1	10	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	11
Utah	9	.....	6	.....	.....	.....	.....	1	.....	1	.....	.....	17	.....	.....	.....	.....	.....	.....	.....	2	2	1	.....	5	22
Virginia	12	1	1	.....	.....	.....	.....	1	.....	.....	.....	.....	15	1	1	.....	.....	2	5	5	.....	.....	.....	.....	10	27
Washington	6	2	3	1	.....	3	.....	1	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	17
West Virginia	220	.....	73	182	.....	5	.....	29	2	5	5	3	524	2	1	1	.....	4	9	2	1	1	4	11	28	558
Wyoming	22	5	9	.....	.....	4	.....	1	1	.....	1	.....	43	.....	.....	.....	.....	.....	5	.....	2	1	.....	.....	8	51
Total, 1914	985	146	380	332	17	146	14	89	7	20	7	57	2,200	70	5	12	1	88	88	11	26	5	13	43	166	2,454

CUSTOMARY BASIS FOR COMPUTING FATALITY RATES.

The customary basis for computing fatality rates is on the number of men employed in the industry. This basis is faulty to the extent that under existing conditions it is not possible to obtain the exact number of men at work, for the reason that all of the men do not work throughout the year. There are always a number of men who work a few days at one property and either quit or are discharged and go to other mines. The actual number of men on the pay roll is, therefore, much higher than the number of men really at work in the mines, and unfortunately it is the former figure that the operators too frequently report. It is also imperfect in that no distinction is made concerning the number of working hours per day. In some States the 8-hour day prevails, whereas in others 9 or 10 hours constitute a legal day.

The comparison of fatality rates on a percentage basis is far from being correct. For example, there may be 1,000 fatalities due to various causes in a certain group of mines, 50 per cent of which may be attributed to some one cause, as falls of rock, and 25 per cent to some serious gas and dust explosion. The difficulty with the percentage basis is that the number killed in a large disaster enters into the total number of men killed in that particular group of mines. When the total is thus abnormally increased the effect is to decrease the percentage rate of each of the other causes to balance the excess which is due to the one large disaster. In the assumed case above cited, in which 25 per cent of the fatalities were due to a gas and dust explosion, the elimination of the number killed (250) in this particular disaster from the total would leave only 750 fatalities, and the percentage of fatalities due to falls of rock, which in the first case was 50 per cent, would be increased to 66⅔ per cent, although the actual number, 500, killed by falls of rock remains the same, and roof conditions have not changed.

The tonnage basis for comparison is also open to some criticism in that mining conditions are not the same in all mines or States. One mine may be in a coal bed 7 or 8 feet thick, and another mine in a bed 2 feet 6 inches thick. It is evident that a miner working in thick coal can produce more tons per year than a miner working in thin coal. The first mine would show a lower fatality rate on the tonnage basis, although in each mine the men were exposed to the mining risk the same number of days per year, indicating that the thicker coal bed is safer than the thinner bed. As a matter of fact the thinner coal bed is the safer of the two, as shown by the low fatality rate in Iowa as compared with the rates of Illinois and Indiana and some other States.

For certain purposes, each method has its champion, and in order to meet the requirements of all, the three bases have been used throughout this bulletin. But for true hazard rates, that one serves

best which takes into account the number of men and the time they are engaged in a hazardous occupation. This necessitates reducing all labor to a standard year of a certain number of hours, 2,000 or 3,000 as the case may be, representing a definite number of days (shifts) of 8 or 10 hours each. The ideal method would be for the operators to report the actual number of hours' labor for which wages were paid during the year. This figure divided by 2,000 would give the number of 2,000-hour employees; that is, the actual number of men who were exposed to the mining hazard the full 2,000-hour period. They would, therefore, all be on the same time basis. The total number of hours divided by 3,000 would place the employees on a 300 (10-hour) day year, but inasmuch as coal mines are operated less than 2,000 hours per year, the shorter year is more nearly in keeping with actual conditions, and therefore preferable. Figures approximating this condition are given in Tables 40 and 41.

TABLE 40.—FATALITY RATES BASED ON THE NUMBER OF 2,000-HOUR WORKERS AS COMPARED WITH THE RATE BASED ON THE NUMBER OF MEN REPORTED AS EMPLOYED, 1903–1913, INCLUSIVE, EXCEPT 1909.

[See Plate III.]

State.	Days worked per year (10-hour).	Actual number of men employed (10-year period).	Number of 2,000-hour workers.	Fatalities for 10-year period.			Fatalities per 1,000 men.					
							Exceptional.		Common.		Total.	
				Exceptional accidents.	Common accidents.	Total.	Actual employees.	2,000-hour workers.	Actual employees.	2,000-hour workers.	Actual employees.	2,000-hour workers.
Alabama	225.5	211,382	238,316	474	905	1,379	2.24	1.98	4.28	3.80	6.52	5.78
Arkansas	131.4	[a] 39,006	24,611	.....	92	92	.....	.....	2.36	3.74	2.36	3.74
Colorado	217.2	123,713	134,371	367	710	1,077	2.97	2.73	5.74	5.29	8.71	8.02
Illinois	156.7	664,866	521,053	116	1,585	1,701	.17	.22	2.38	3.04	2.55	3.26
Indiana	148.7	209,054	155,453	16	443	459	.08	.10	2.12	2.85	2.20	2.95
Iowa	170.4	157,415	134,128	.....	305	305	.....	.....	1.94	2.27	1.94	2.27
Kansas	156.4	124,576	97,430	12	324	336	.10	.12	2.60	3.33	2.70	3.45
Kentucky	188.5	187,589	176,793	79	339	418	.42	.45	1.81	1.91	2.23	2.36
Maryland	242.8	[a] 47,611	57,957	.....	104	104	.....	.....	2.18	1.79	2.18	1.79
Michigan	162.0	35,454	28,725	.....	65	65	.....	.....	1.83	2.26	1.83	2.26
Missouri	153.9	95,056	73,154	.....	124	124	.....	.....	1.30	1.70	1.30	1.70
Montana	193.0	29,887	28,840	17	105	122	.57	.59	3.51	3.64	4.08	4.23
New Mexico	246.3	29,776	36,669	289	144	433	9.70	7.88	4.84	3.93	14.54	11.81
North Dakota	197.4	[b] 3,188	3,244	.....	13	13	.....	.....	4.08	4.01	4.08	4.01
Ohio	149.5	452,089	337,891	35	1,296	1,331	.07	.10	2.87	3.84	2.94	3.94
Oklahoma	140.6	84,418	63,009	150	279	429	1.77	2.38	3.31	4.46	5.08	6.81
Pennsylvania (anthracite)	198.5	1,668,725	1,655,961	240	5,979	6,219	.14	.14	3.59	3.62	3.73	3.76
Pennsylvania (bituminous)	203.4	1,573,200	1,599,843	838	4,502	5,340	.53	.52	2.86	2.82	3.39	3.34
Tennessee	210.0	112,247	117,869	84	297	381	.75	.71	2.65	2.52	3.40	3.23
Texas	210.1	[c] 19,405	20,043	.....	21	21	.....	.....	1.08	1.05	1.08	1.05
Utah	210.9	25,084	26,451	.....	104	104	.....	.....	4.15	3.93	4.15	3.93
Virginia	244.7	[c] 33,211	42,553	26	198	224	.78	.61	5.96	4.65	6.74	5.26
Washington	202.3	55,641	56,290	66	192	258	1.19	1.17	3.45	3.41	4.64	4.58
West Virginia	213.2	582,525	620,895	839	2,380	3,219	1.44	1.35	4.09	3.83	5.53	5.18
Wyoming	213.7	[b] 39,171	36,982	65	146	211	1.66	1.76	3.72	3.95	5.38	5.71
Total and average	190.9	6,604,289	6,288,531	3,713	20,652	24,365	.56	.59	3.13	3.28	3.69	3.87

[a] Employees and fatalities for 8 years only.
[b] Employees and fatalities for 5 years only.
[c] Employees and fatalities for 4 years only.

TABLE 41.—FATALITY RATES PER 1,000 MEN, BY STATES, COMPARED ON A UNIFORM BASIS OF 2,000-HOUR WORKERS.[a]

State.	1903	1904	1905	1906	1907	1908	[b]1909	1910	1911	1912	1913	Average.
Alabama	2.47	4.58	8.91	4.15	6.23	5.30	.....	8.82	8.77	4.62	4.07	**5.78**
Arkansas	.....	.....	2.09	4.58	3.35	4.52	.....	4.88	4.21	2.09	3.71	**3.74**
Colorado	3.98	9.40	4.99	6.49	6.28	4.43	.....	18.78	6.48	7.13	9.74	**8.02**
Illinois	3.40	3.70	4.33	3.37	3.32	3.40	.....	3.06	3.02	2.08	2.72	**3.26**
Indiana	3.86	2.44	2.99	2.10	3.15	3.51	.....	2.53	3.01	2.21	3.89	**2.95**
Iowa	2.08	1.87	2.89	2.11	2.78	2.24	.....	2.26	2.76	1.54	2.11	**2.27**
Kansas	3.47	2.96	4.01	4.04	3.26	3.73	.....	2.22	4.63	3.17	2.84	**3.45**
Kentucky	1.98	1.56	2.30	2.04	1.97	2.73	.....	4.19	1.98	2.26	1.86	**2.38**
Maryland	1.94	1.59	2.02	.75	.....	.....	.....	2.30	2.05	1.89	1.88	**1.79**
Michigan	3.04	2.24	3.23	1.82	1.88	1.71	.....	1.98	2.47	3.51	1.21	**2.25**
Missouri	2.06	1.31	1.56	2.23	1.10	1.63	.....	2.32	1.14	2.36	1.28	**1.70**
Montana	2.08	3.38	3.67	5.53	4.43	7.38	.....	3.24	4.12	2.31	6.60	**4.23**
New Mexico	9.77	3.85	2.87	9.32	8.65	7.16	.....	3.18	2.60	2.99	49.26	**11.81**
North Dakota	.....	.....	.....	.....	.....	7.55	.....	3.83	1.22	.....	8.78	**4.01**
Ohio	3.78	3.82	4.11	4.30	4.11	3.68	.....	4.18	3.28	3.67	4.37	**3.94**
Oklahoma	5.44	4.27	7.04	7.97	5.33	7.67	.....	7.80	4.92	16.01	3.21	**6.81**
Pennsylvania (anthracite)	3.71	4.24	4.02	3.91	4.28	4.33	.....	3.44	3.63	3.32	3.04	**3.76**
Pennsylvania (bituminous)	2.96	4.66	3.25	3.15	4.45	3.97	.....	2.89	2.99	2.48	3.07	**3.34**
Tennessee	2.46	2.69	2.37	2.62	2.35	3.01	.....	3.06	9.23	1.00	2.78	**3.23**
Texas	.....	.....	.....	.....	.....	.....	.....	1.62	1.03	.39	.71	**1.05**
Utah	3.29	5.56	5.20	2.21	2.18	2.06	.....	5.67	3.94	5.01	3.73	**3.93**
Virginia	.....	.....	.....	.....	.....	.....	.....	6.67	6.53	6.93	1.88	**5.25**
Washington	3.92	5.87	2.67	4.52	5.66	5.54	.....	6.63	4.03	2.79	3.65	**4.58**
West Virginia	3.55	3.33	4.43	5.16	11.40	6.09	.....	4.35	4.77	4.34	4.07	**5.18**
Wyoming	.....	.....	.....	.....	.....	13.46	.....	4.55	4.18	4.09	3.36	**5.71**
Average	3.31	3.97	3.91	3.72	4.87	4.28	.....	4.03	3.78	3.32	3.58	**3.87**

[a] For details from which this table is derived see special tables under each individual State.
[b] Complete data not available.

COMPARISON OF FATALITY RATES ON A UNIFORM TIME BASIS.

In the comparison of mine accidents the time element should be taken into consideration. In other words, the length of time that a man is exposed to the mining risk is an important factor in arriving at the true risk in the mining industry, and especially so when one State is compared with another. With this end in view, Tables 40 and 41 are based upon a uniform period of two hundred 10-hour shifts.

The tables under the various States show the number of 8, 9, and 10 hour men over a period of 10 years. There are also a number of men unclassified, but for this comparative study they have been taken as 9-hour men. Concerning the actual number of working hours E. W. Parker says: [a]

It should be remembered, however, that when the length of the working day is stated, reference is made to the number of hours the mines are supposed to have been in operation and not to the number of hours worked by the miners. In both the anthracite and bituminous fields practically all the coal is mined by contract at an agreed rate per ton or other basis of payment. The miner is an independent contractor and is not obliged to put in a certain number of hours at his working place. The figures in the following table really indicate the number of hours the men were given an opportunity to work and do not mean that all the employees worked 8, 9, or 10 hours, as the case might be.

[a] Mineral Resources of the United States for the calendar year 1913, U. S. Geol. Survey, 1915, p. 754.

Since the settlement of the anthracite strike of 1902 the mines in that region have been operated on a 9-hour basis, with the exception of engineers and pumpmen, who work 8 hours, and of the miners, who work by contract.

While these figures as previously stated, may not be strictly exact, it is certain that in an 8-hour State there will not be many 10-hour men. Yet it is believed that in a 10-hour State the majority of the men will work about two hours longer than in an 8-hour State. Inasmuch as these labor statistics were all collected by one bureau, the United States Geological Survey, they are all on the same basis, and for comparative purposes should serve nearly as well as exact figures. They are the only figures available by which it is possible to attempt a study of mine accidents in relation to the length of exposure to the many dangers attending the industry.

Exact data along these lines are desirable; and it is hoped that mining companies, State officials, and industrial-accident commissions will realize the importance of arriving at a true risk and cooperate in obtaining such information as may reveal the true accident hazard in the mining industry.

The State tables (see list of States in Tables 40 and 41) cover a 10-year period from 1903 to 1913 inclusive, except for the year 1909, for which complete data are lacking. This information is available for 24 States, and the varying hours, number of employees, and the working days have been given proper weight, with the result that the total number of working hours in each State has been computed for the 10-year period, and their sum gives the total number of working hours in all the States. This divided by the number of men reported working gives an average year of 1,909 hours for the United States as a unit. The working hours in each State divided by 2,000 gives the equivalent of 2,000-hour workers, upon which fatality rates may be based. The number of calculated 2,000-hour workers is given in parallel with a column showing the number of employees as reported.

Table 40 shows the number of working hours per year in each State as varying from 1,314 in Arkansas to 2,447 in Virginia. The Pennsylvania anthracite field works 1,985 and the Pennsylvania bituminous 2,034 hours per year. In view of the fact that this range varies from a few hours below to a few hours above 2,000, and that the average for the United States is 1,909, a 2,000-hour year has been adopted for calculations in the accompanying tables. It is more nearly in keeping with actual mining conditions to base the calculations on a 2,000-hour year than it would be to base them on a 3,000-hour year, as is frequently done in factories, metallurgical works, and in other industrial plants. Anyone desiring a 3,000-hour basis may obtain it by adding 50 per cent to all of the rates given in Tables 40 and 41.

Table 40 gives the number of fatalities that are due to *exceptional accidents* and those due to *common accidents*, the exceptional acci-

dent being one in which five or more men are killed at a time, and the common accident one that occurs in every-day mining operations, wherein usually one or two men but not more than four, may be involved at a time.

The length of time during which miners are exposed to the hazards of the industry varies in different States, due to both commercial requirements and labor organizations. The number of hours a day is largely regulated by labor organizations and State laws, and the number of days worked a year is regulated more or less by commercial conditions. When the demand for coal is slight the output is curtailed by working part of the time, or by closing the mines entirely for several weeks to await better market conditions.

The actual average number of days that the mines are operated each year is given in the State tables. The tables show that this number varies from year to year for the same State. For example, in 1906 Colorado averaged 268 working days, while in 1911 the mines were operated 207 days. Arkansas in 1903 operated 223 days, and in 1910 only 128 days. Ohio varied from 161 days in 1908 to 206 days in 1913. With such wide differences in the number of days that the mines are in operation, it is evident that the hazards in each State are not the same.

Another reason why they are not comparable is that the number of hours worked per day is not the same in each State. For example, Ohio, Indiana, Illinois, Iowa, and a number of other States are on an 8-hour basis with but few 9-hour and 10-hour men. On the contrary, in Alabama, Kentucky, West Virginia, Maryland, and a few others, the majority of the men work 9 hours and many of them 10 hours, as shown in the State tables.

It is not a fair classification to place the fatality rate of an 8-hour State on an equal basis with that of a 10-hour State, when the men of the latter State are exposed to the mining risk 25 per cent longer. Every hour adds $12\frac{1}{2}$ per cent to the hazard, as compared with an 8-hour day. As an example of unfair comparison Ohio and Montana may be cited. The fatality rate for Ohio (Table 40) is 2.94 per 1,000, based on the actual number of men working, regardless of the time element, and the rate for Montana is 4.08 per 1,000. When the rates are reduced to a common basis of 2,000 working hours a year, the Ohio rate becomes 3.94 and the Montana rate 4.23, so that the difference on the 2,000-hour basis is 0.29, as compared with 1.14 per 1,000 on the customary basis. The same comparison may be made for other States. In Virginia many of the mines are worked 10 hours a day and from 200 to 280 days per year, thus increasing the time of exposure and giving on the customary basis a fatality rate of 6.74, which, if reduced to the 2,000-hour year, becomes 5.26, comparing favorably with West Virginia at 5.18 per 1,000.

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Table 41 shows the fatality rate by States and calendar years, for a 10-year period wherein all rates are based on the number of 2,000-hour workers. The detail figures from which this table is derived will be found in the special tables in Part II under each individual State.

Plate III shows comparative fatality rates at the coal mines of the States in which coal is produced, based on a uniform period of 2,000 working hours per year, thus placing all of the States on a comparable basis, as indicated in Table 40. The circles represent the fatality rate per 1,000 men employed, wherein only the "common accidents" are considered. The solid circles represent the fatality rate per 1,000 men employed, for the "exceptional accidents." This chart represents the average of each State for a 10-year period, except where noted in Table 40. The common-accident hazard varies somewhat from one State to another, yet the difference is much smaller than usually shown where the time element is not taken into consideration.

PRINCIPAL CAUSES OF MINE ACCIDENTS.

COAL-MINE DISASTERS.

A summary of the coal-mine accidents in the United States in which 5 or more men were killed at one time, together with the number of such accidents, is given in Table 42. This table shows that since 1839 there have been 297 mine disasters in which 5 or more men were killed at one time, representing 7,590 fatalities. Of this number, 6,126 were killed by gas and dust explosions, 199 of the disasters falling into this class. There were 30 mine fires, claiming 809 victims. There were 144 accidents in which 5 to 9 men were killed at one time, representing 911 fatalities. Although this group represents the greatest number of accidents, the largest number of men killed is in that group in which from 100 to 199 fatalities resulted from a single disaster. There were 12 such disasters, resulting in 1,715 fatalities. Details relating to individual accidents classified in this table are given in Table 44.

TABLE 42.—COAL-MINE ACCIDENTS IN THE UNITED STATES IN WHICH FIVE OR MORE MEN WERE KILLED, CLASSIFIED ACCORDING TO CAUSE AND NUMBER KILLED.

Number of deaths resulting from accidents.	Gas and coal-dust explosions.		Mine fires.[a]		Explosives.		Inrush of water.		Falls of roof and coal.		Mine cars and locomotives.		Shaft accidents.		Other causes.		Total.	
	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.	Number of separate accidents.	Total number killed.
5 to 9	79	506	19	124	18	111	1	6	4	24	5	28	11	71	7	41	144	811
10 to 24	68	1,119	4	50	5	61	4	51	3	36	2	20	4	43	1	10	81	1,380
25 to 49	20	773	4	125	.....	.....	1	26	.....	.....	.....	.....	.....	.....	.....	.....	25	884
50 to 99	17	1,169	1	72	.....	.....	1	69	1	58	.....	.....	.....	.....	.....	.....	20	1,388
100 to 199	11	1,536	1	179	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	1,715
200 to 299	3	702	1	259	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	981
300 and more	1	361	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	361
Total	199	6,126	30	809	23	172	7	152	8	118	7	48	15	114	8	51	287	7,580

[a] Does not include mine fires in which an explosion of gas or coal dust was the principal destructive agent, as follows: Hanna mine No. 1, Hanna, Wyo., 169 killed, June 30, 1903; Zeigler mine, Zeigler, Ill., 26 killed, Jan. 10, 1908; Victor American mine No. 3, Delagua, Colo., 79 killed, Nov. 8, 1910.

TABLE 43.—FATALITIES IN AND ABOUT THE COAL MINES OF THE UNITED STATES CLASSIFIED ACCORDING TO COMMON AND EXCEPTIONAL ACCIDENTS.[a]

[See fig. 4.]

Year.	Number killed.			Number killed per 1,000 employed.		
	In exceptional accidents.	In common accidents.	Total.	In exceptional accidents.	In common accidents.	Total.
1870	21	190	211	0.59	5.34	5.93
1871	25	185	210	.67	4.93	5.60
1872	.....	223	223	.....	4.98	4.98
1873	10	253	263	.21	5.25	5.46
1874	.....	260	260	.....	3.87	3.87
1875	.....	260	260	.....	3.06	3.06
1876	.....	242	242	.....	2.83	2.83
1877	14	211	225	.17	2.60	2.77
1878	5	230	235	.06	2.56	2.62
1879	11	306	317	.12	3.18	3.30
1880	5	269	274	.04	2.17	2.21
1881	.....	340	340	.....	2.93	2.93
1882	5	443	448	.03	2.72	2.75
1883	79	463	542	.49	2.85	3.34
1884	40	498	538	.21	2.59	2.80
1885	52	497	549	.25	2.33	2.58
1886	65	429	494	.30	1.95	2.25
1887	10	494	504	.04	2.16	2.20
1888	83	645	728	.29	2.26	2.55
1889	20	648	668	.07	2.29	2.36
1890	78	655	733	.27	2.25	2.52
1891	141	815	956	.46	2.62	3.08
1892	170	821	991	.53	2.59	3.12
1893	53	905	958	.15	2.55	2.70
1894	77	881	958	.21	2.46	2.67
1895	191	951	1,142	.51	2.53	3.04
1896	133	950	1,083	.35	2.50	2.85
1897	52	938	990	.14	2.41	2.55
1898	28	1,034	1,062	.07	2.64	2.71
1899	88	1,153	1,241	.23	2.91	3.14
1900	273	1,216	1,489	.63	2.81	3.44
1901	140	1,434	1,574	.29	2.98	3.27
1902	406	1,318	1,724	.80	2.58	3.38
1903	227	1,699	1,926	.41	3.05	3.46
1904	265	1,730	1,995	.46	3.02	3.48
1905	312	1,920	2,232	.51	3.12	3.63
1906	235	1,903	2,138	.37	3.02	3.39
1907	918	2,324	3,242	1.37	3.44	4.81
1908	348	2,097	2,445	.51	3.09	3.60
1909	498	2,144	2,642	.74	3.22	3.96
1910	485	2,336	2,821	.67	3.22	3.89
1911	429	2,237	2,666	.58	3.07	3.65
1912	251	2,168	2,419	.35	3.00	3.35
1913	464	2,321	2,785	.62	3.10	3.72
Total	6,697	43,036	49,733	.45	2.87	3.32
1914	316	2,138	2,454	.41	2.81	3.22

[a] Exceptional accidents are defined as those in which 5 or more men are killed at one time. Common accidents are those in which less than 5 men are killed at one time.

Table 43 shows, in parallel columns, by years since 1870 the number of men killed in common accidents and those killed in exceptional accidents, with fatality rates for each. For the entire period the rate for the exceptional accidents was 0.45 per 1,000 men employed, and for the common accidents 2.87. The rates for 1914 are slightly below the average. In figure 4 the total fatality rate is represented by a solid line, the common-accident rate by a dotted line, and the exceptional-accident rate by dashes. These curves show the lowest total and common-accident rates between 1885 and 1890. Since then these rates have increased to 1907, from which year there is a decline in the

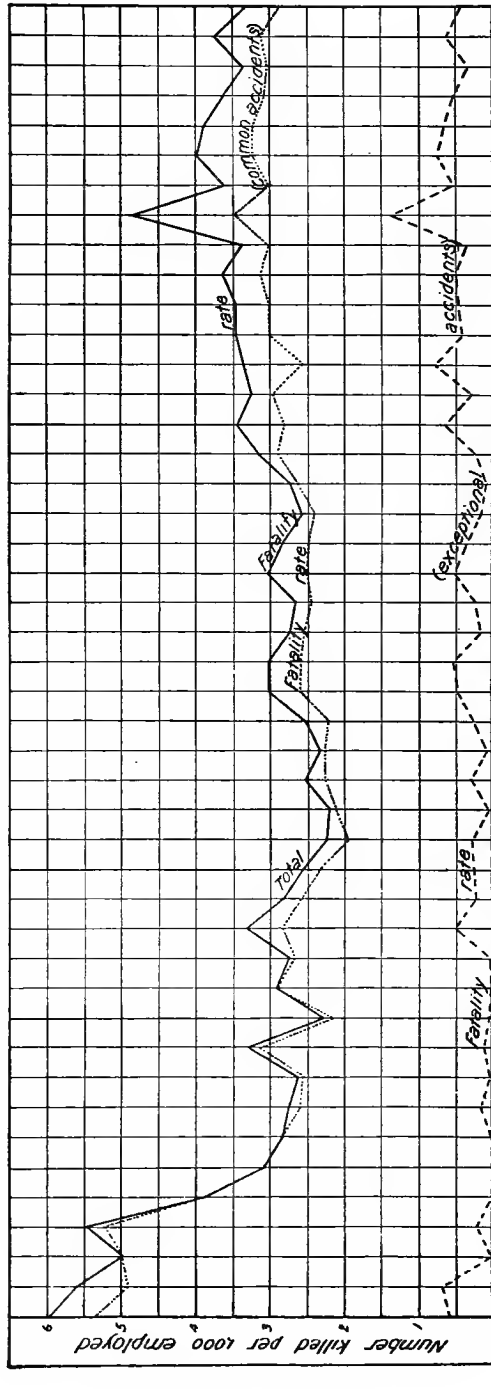

FIGURE 4.—Total number killed per 1,000 employed in coal mines of the United States; also number killed per 1,000 employed, in common and in exceptional accidents, 1870–1914. (Based on Table 43.)

fatality rate. This table shows that 6,692 men were killed in exceptional accidents since 1870, whereas the number killed in common accidents was 43,036. The number of fatalities represented in this table is based on those States for which complete inspection reports have been rendered.

Table 44 gives a *revised* list of all of the mine disasters[a] for which records are available from any source whatever since 1839 to and including 1915. This table presents details of the summary shown in Table 42.

TABLE 44.—COAL-MINE ACCIDENTS IN THE UNITED STATES IN WHICH FIVE OR MORE MEN WERE KILLED. (REVISED TO JAN. 1, 1916.)

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1839 Mar. 18	Black Heath	Near Richmond, Va	Mine explosion	40
1847 Feb. —	Spencer	Pottsville, Pa	do	7
1854	Chesterfield	Near Richmond, Va	do	19
1855	Midlothian	Coalfield, Va	do	55
1869 Sept. 6	Avondale	Plymouth, Pa	Mine fire	179
1870 Mar. 22	Potts	Potts Mine, Pa	Explosion of breaker boilers.	5
1870 Aug. 10	Heins & Glassmire	Middleport, Pa	Cage fell down shaft	9
1870 Aug. 29	Preston No. 3	Girardville, Pa	Cage fell down slope	7
1871 May 27	West Pittston	West Pittston, Pa	Smoke from burning breaker.	20
1871 Oct. 2	Otto Red Ash	Branch Dale, Pa	Mine explosion	5
1873 June 10	Henry Clay	Shamokin, Pa	do	10
1876 May 20	Midlothian	Coalfield, Va	do	8
1876 July 24	Black Diamond	Nortonville, Cal	do	6
1877 May 9	Wadesville	Wadesville, Pa	do	7
1877 July 11	Brookfield	Brookfield, Ohio	Suffocated by gases from mine locomotives.	7
1878 Jan. 15	Potts	Locust Dale, Pa	Mine explosion	5
1878 Nov. 21	Sullivan	Sullivan, Ind	do	8
1879 May 6	Audenried	Audenried, Pa	do	6
1879 Nov. 2	Mill Creek	Mill Creek, Pa	do	5
1880 May 3	Lykens Valley	Shamokin, Pa	do	5
1881 Feb. 10	Robbins	Robbins, Ohio	do	6
1881 Mar. 4	Almy	Almy, Wyo	do	38
1882 Feb. 3	Midlothian	Coalfield, Va	do	32
1882 May 24	Kohinoor	Shenandoah, Pa	do	5
1883 Jan. 9	Coulterville	Coulterville, Ill	do	10
1883 Feb. 16	Diamond	Braidwood, Ill	Inrush of surface water into workings.	69
1884 Jan. 24	Crested Butte	Crested Butte, Colo	Mine explosion	59
1884 Feb. 20	West Leisenring	West Leisenring, Pa	do	19
1884 Mar. 13	Laurel	Pocahontas, Va	do	112
1884 Aug. 21	Buck Ridge	Shamokin, Pa	Mine fire	7
1884 Oct. 27	Youngstown	Uniontown, Pa	Mine explosion	14
1885 Apr. 6	Cuyler	Raven Run, Pa	Fall of roof	10
1885 Aug. 11	West End	Mocanaqua, Pa	Gas from boiler fires in mine.	10
1885 Oct. 21	Plymouth No. 2	Plymouth, Pa	Mine explosion	6
1885 Dec. 18	Nanticoke No. 1	Nanticoke, Pa	Buried by inrush of quicksand.	26
1886 Jan. 13	Almy No. 4	Almy, Wyo	Mine explosion	13
1886 Jan. 21	Newburg	Newburg, W. Va	do	39
1886 Aug. 30	Fair Lawn	Scranton, Pa	do	6
1886 Sept. 13	Marvine	do	Suffocated by inrush of mine gas.	8
1886 Nov. 26	Conyngham	Wilkes-Barre, Pa	Mine explosion	12
1887 Apr. 27	Tunnel	Ashland, Pa	Suffocated by inrush of mine gas.	5
1887 Oct. 1	Bast	Big Mine Run, Pa	do	5
1888 Mar. 29	Keith & Perry No. 6	Rich Hill, Mo	Mine explosion	24
1888 Nov. 3	Kettle Creek	Clinton County, Pa	do	17
1888 Nov. 9	Shaft No. 2	Frontenac, Kans	do	40
1889 May 9	Kaska William	Middleport, Pa	Mine car fell on men in cage.	10
1889 Sept. 9	White Ash	Jefferson County, Colo	Inrush of water from old shaft.	10
1890 Feb. 1	Nottingham	Plymouth, Pa	Mine explosion	8
1890 Mar. 3	Shaft No. 3	South Wilkes-Barre, Pa	do	8
1890 Apr. 2	Susquehanna No. 4	Nanticoke, Pa	do	5
1890 May 15	Jersey No. 8	Ashley, Pa	do	26
1890 June 16	Hill Farm	Dunbar, Pa	Mine fire	31
1891 Jan. 27	Mammouth	Mount Pleasant, Pa	Mine explosion	109

[a] Horton, F. W., Coal mine accidents in the United States: Bull. 69, Bureau of Mines, 1913, p. 45.

TABLE 44.—COAL-MINE ACCIDENTS IN THE UNITED STATES IN WHICH FIVE OR MORE MEN WERE KILLED. (REVISED TO JAN. 1, 1916.)—Continued.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1891 Feb. 4	Spring Mountain No. 1	Jeanesville, Pa	Drowned by inrush of water from abandoned workings and asphyxiated by gas from fire built by imprisoned men.	13
1891 Oct. 23	Richardson	Glencarbon, Pa	Imprisoned by rush of coal and suffocated by mine gas.	7
1891 Nov. 8	Susquehanna No. 1	Nanticoke, Pa	Mine explosion	12
1892 Jan. 7	No. 11	Krebs, Okla	do	100
1892 Apr. 20	Lytle	Minersville, Pa	Drowned by water from old workings.	10
1892 May 10	Roslyn	Roslyn, Wash	Mine explosion	45
1892 July 23	York Farm	Pottsville, Pa	do	15
1893 Jan. 10	Como	King, Colo	do	24
1893 Feb. 14	Chicago and Iowa	Albia, Iowa	do	8
1893 Apr. 1	Neilson	Shamokin, Pa	Mine fire	10
1893 June 22	Susquehanna No. 1	Nanticoke, Pa	Mine explosion	5
1893 Sept. 21	Lance No. 11	Plymouth, Pa	do	6
1894 Feb. 13	Gaylord	do	Fall of roof	13
1894 July 17	East Sugar Loaf	Stockton, Pa	Dynamite explosion	8
1894 Aug. 24	Franklin	Franklin, Wash	Mine fire	37
1894 Oct. 8	Luke Fidler	Shamokin, Pa	do	5
1894 Oct. 11	Henry Clay	do	Boiler explosion	6
1894 Nov. 20	Blanche	Standard, W. Va	Mine explosion	8
1895 Jan. 22	Tate	Sturgis, Ky	Powder explosion	5
1895 Feb. 18	West Bear Ridge	Mahanoy Plane, Pa	Mine explosion	5
1895 Feb. 27	White Ash	Cerrillos, N. Mex	do	24
1895 Mar. 20	Red Canyon	Red Canyon, Wyo	do	60
1895 Apr. 8	Blue Canyon	Lake Whatcom, Wash	do	23
1895 Oct. 7	Dorrance	Wilkes-Barre, Pa	do	7
1895 Dec. 19	Cumnock	Cumnock, N. C	do	39
1895 Dec. 20	Nelson	Dayton, Tenn	do	28
1896 Feb. 18	Vulcan	New Castle, Colo	do	49
1896 Mar. 23	Berwind	Dubois, Pa	do	13
1896 June 28	Twin	Pittston, Pa	Fall of roof	58
1896 Oct. 29	Shaft No. 3	South Wilkes-Barre, Pa.	Mine explosion	6
1896 Dec. 26	Oswald	Princeton, Ind	do	7
1897 Jan. 4	No. 1	Alderson, Okla	do	5
1897 Jan. 13	Wadesville	Wadesville, Pa	Crosshead fell down shaft	5
1897 Mar. 4	Kansas & Texas No. 44	Huntington, Ark	Mine explosion	14
1897 Sept. 3	Sunshine	Sunshine, Colo	do	12
1897 Sept. 20	Belle Ellen	Belle Ellen, Ala	Mine fire	5
1897 Sept. 28	Jermyn No. 1	Rendham, Pa	do	5
1897 Oct. 30	Von Storch	Scranton, Pa	do	6
1898 May 26	Kaska William	Middleport, Pa	Drowned by water from old workings.	6
1898 Sept. 23	Umpire	Brownsville, Pa	Mine explosion	8
1898 Oct. 1	Midvale	Wilkes-Barre, Pa	Mine fire	5
1898 Nov. 5	Exeter	West Pittston, Pa	Mine car fell on men in cage.	9
1899 Feb. 21	Blocton No. 2	Blocton, Ala	Mine explosion	5
1899 Apr. 21	Cook & White	Madrid, N. Mex	do	5
1899 May 23	Cumnock	Cumnock, N. C	do	23
1899 July 24	Grindstone	Grindstone, Pa	do	5
1899 Dec. 9	Carbon Hill No. 7	Carbonado, Wash	do	31
1899 Dec. 23	Sumner	Sumner, Pa	do	19
1900 Mar. 6	Red Ash	Red Ash, W. Va	do	46
1900 May 1	Winter Quarters 1 and 4	Scofield, Utah	do	200
1900 Aug. 21	Issaquah No. 4	Issaquah, Wash	Smoke from burning air shaft.	5
1900 Nov. 2	Berryburg	Berryburg, W. Va	Powder explosion	15
1900 Nov. 9	Buck Mountain	Mahanoy, Pa	Mine explosion	7
1901 Feb. 25	Diamondville No. 1	Diamondville, Wyo	Mine fire	28
1901 Apr. 29	McAlester No. 5	Alderson, Okla	Blown-out or windy shot	6
1901 May 15	Chatham	Farmington, W. Va	Mine explosion	10
1901 May 27	Richland	Dayton, Tenn	do	20
1901 June 10	Port Royal No. 2	Port Royal, Pa	do	19
1901 Sept. 16	Spring Gulch	Spring Gulch, Colo	do	6
1901 Oct. 25	Buttonwood	Plymouth, Pa	do	6
1901 Oct. 26	Diamondville	Diamondville, Wyo	do	22
1901 Nov. 14	Pocahontas	Pocahontas, Va	Mine fire and explosion	9
1901 Nov. 22	do	do	Mine fire	8
1901 Dec. 28	No. 1	Hartshorne, Okla	Fell from cage	6
1902 Jan. 13	Milby & Dow	Dow, Okla	Mine fire	10
1902 Jan. 24	Lost Creek No. 2	Oskaloosa, Iowa	Mine explosion	20
1902 Mar. 6	Catsburg	Monongahela, Pa	do	5
1902 Mar. 31	Nelson	Dayton, Tenn	do	16
1902 May 19	Fraterville	Coal Creek, Tenn	do	184
1902 July 10	Rolling Mill	Johnstown, Pa	do	112
1902 Aug. 7	Bowen	Bowen, Colo	do	13

TABLE 44.—COAL-MINE ACCIDENTS IN THE UNITED STATES IN WHICH FIVE OR MORE MEN WERE KILLED. (REVISED TO JAN. 1, 1916.)—Continued.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1902 Sept. 15	Algoma No. 7	Algoma, W. Va	Mine explosion	17
1902 Sept. 22	Stafford	Stafford, W. Va	....do	6
1902 Oct. 1	Lawson	Black Diamond, Wash	....do	11
1902 Nov. 29	Luke Fidler	Shamokin, Pa	....do	7
1902 Dec. 9	South Wilkes-Barre	South Wilkes-Barre, Pa.	Dynamite explosion	5
1903 Mar. 15	Cardiff	Cardiff, Ill	Mine explosion	5
1903 Mar. 23	Athens No. 2	Athens, Ill	Windy shot	6
1903 Mar. 31	Sandoval	Sandoval, Ill	Blown-out shot	8
1903 Apr. 12	Central Slope 77	Carbon, Okla	Mine explosion	6
1903 June 19	Blossburg No. 3	Blossburg, N. Mex	Powder explosion	5
1903 June 30	Hanna No. 1	Hanna, Wyo	Mine explosion and fire	169
1903 Nov. 20	Bonanza No. 20	Bonanza, Ark	Mine explosion	11
1903 Nov. 21	Ferguson	Connellsville, Pa	....do	17
1904 Jan. 25	Harwick	Cheswick, Pa	....do	179
1904 Jan. 30	Maple Hill	Mabanoy City, Pa	Dynamite explosion	5
1904 Apr. 20	Stearns No. 5	Stearns, Ky	Mine explosion	5
1904 May 5	Lance	Plymouth, Pa	Dynamite explosion	5
1904 ...do....	Locust Gap	Locust Gap, Pa	Mine fire	5
1904 May 11	Big Muddy	Herrin, Ill	Powder explosion	10
1904 May 25	Williamstown	Williamstown, Pa	Suffocated by gases from locomotive.	10
1904 Oct. 28	Tercio	Tercio, Colo	Mine explosion	19
1904 Nov. 2	Auchinclos	Nanticoke, Pa	Fell down shaft	10
1904 Dec. 7	No. 5	Burnett, Wash	Mine explosion	17
1905 Jan. 16	Decatur	Decatur, Ill	Mine fire	6
1905 Feb. 18	Lytle	Minersville, Pa	Fall of roof	5
1905 Feb. 20	Virginia City	Virginia City, Ala	Mine explosion	108
1905 Feb. 26	Grapevine	Wilcoe, W. Va	....do	6
1905 Mar. 9	Clear Spring	West Pittston, Pa	Fell down shaft	7
1905 Mar. 18 Mar. 19	Rush Run and Red Ash	Red Ash, W. Va	Mine explosion	24
1905 Mar. 22	Oswald	Princeton, Ind	....do	9
1905 Apr. 3	Leiter	Zeigler, Ill	....do	49
1905 Apr. 20	Cabin Creek	Kayford, W. Va	Powder explosion	6
1905 Apr. 26	Conyngham	Wilkes-Barre, Pa	Fell down shaft	10
1905 Apr. 27	Eleanora	Duhois, Pa	Mine explosion	13
1905 Apr. 30	No. 19	Wilburton, Okla	....do	13
1905 July 6	Fuller	Searight, Pa	....do	6
1905 Oct. 13	Clyde	Fredericktown, Pa	Mine fire	6
1905 Oct. 29	Hazel Kirk No. 2	Monongahela, Pa	Mine explosion	5
1905 Nov. 4	Tidewater	Vivian, W. Va	....do	7
1905 Nov. 15	Braznell	Bentleyville, Pa	....do	7
1905 Dec. 1	Diamondville No. 1	Diamondville, Wyo	....do	18
1905 Dec. 4	Horton	Horton, W. Va	Mine fire	7
1906 Jan. 4	Coaldale	Coaldale, W. Va	Mine explosion	22
1906 Jan. 18	Detroit	Detroit, W. Va	....do	18
1906 Jan. 24	Poteau No. 6	Witteville, Okla	Dynamite explosion	14
1906 Feb. 8	Parral	Parral, W. Va	Mine explosion	23
1906 Feb. 19	Maitland	Walsenburg, Colo	....do	14
1906 Feb. 27	Little Cahaba	Piper, Ala	....do	12
1906 Mar. 22	Century No. 1	Century, W. Va	....do	23
1906 Apr. 22	Cuatro	Tercio, Colo	....do	18
1906 May 15	Shenandoah City	Shenandoah, Pa	Dynamite explosion	7
1906 June 7	Red Lodge	Red Lodge, Mont	Mine fire	8
1906 Aug. 6	Susquehanna No. 7	Nanticoke, Pa	Mine explosion	6
1906 Oct. 3	Pocahontas	Pocahontas, Va	....do	35
1906 Oct. 5	Dutchman	Blossburg, N. Mex	....do	10
1906 Oct. 24	Rolling Mill	Johnstown, Pa	....do	7
1906 Nov. 3	San Toy No. 1	Corning, Ohio	Fell down shaft	5
1906 Dec. 20	Fidelity No. 1	Stone City, Kans	Powder explosion	7
1906 Dec. 22	Breese-Trenton	Breese, Ill	Cage with men fell down shaft.	6
1907 Jan. 14	Deering No. 7	Clinton, Ind	Powder explosion	7
1907 Jan. 23	Primero	Primero, Colo	Mine explosion	24
1907 Jan. 26	Lorentz	Penco, W. Va	Powder explosion	12
1907 Jan. 29	Johnston City	Johnston City, Ill	....do	7
1907 ...do....	Stuart	Stuart, W. Va	Mine explosion	84
1907 Feb. 4	Thomas No. 25	Thomas, W. Va	....do	25
1907 Mar. 2	Holden	Taylor, Pa	....do	7
1907 Mar. 16	Bond and Bruce	Tacoma, Va	....do	11
1907 Apr. 26	Morgan	Black Diamond, Wash	....do	7
1907 May 1	Whipple	Scarboro, W. Va	....do	16
1907 May 19	Engleville	Engleville, Colo	Mine fire	5
1907 June 18	Johnson No. 1	Priceburg, Pa	Mine explosion	7
1907 Aug. 17	Sonman	Sonman, Pa	Fell down shaft	5
1907 Dec. 1	Naomi	Fayette City, Pa	Mine explosion	34
1907 Dec. 6	Monongah Nos. 6 and 8	Monongah, W. Va	....do	361
1907 Dec. 16	Yolande	Yolande, Ala	....do	56
1907 Dec. 19	Darr	Jacobs Creek, Pa	....do	239
1907 Dec. 31	Bernal	Carthage, N. Mex	....do	11
1908 Jan. 30	Backman	Hawks Nest, W. Va	....do	9

TABLE 44.—COAL-MINE ACCIDENTS IN THE UNITED STATES IN WHICH FIVE OR MORE MEN WERE KILLED. (REVISED TO JAN. 1, 1916.)—Continued.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1908 Feb. 10	Moody	South Carrollton, Ky.	Mine explosion	9
1908 Mar. 28	Hanna No. 1	Hanna, Wyo.	do	59
1908 May 12	Mount Lookont	Wyoming, Pa.	do	12
1908 May 13	Prospect	Midvale, Pa.	Fall of roof	5
1908 July 15	Williamstown	Williamstown, Pa.	Powder explosion	6
1908 Aug. 26	Hailey-Ola No. 1	Haileyville, Okla.	Mine fire	29
1908 Aug. 28	Warrior Run	Wilkes-Barre, Pa.	Mine cars	6
1908 Nov. 20	Red Lodge	Red Lodge, Mont.	Mine fire	9
1908 Nov. 28	Rachel and Agnes	Marianna, Pa.	Mine explosion	154
1908 Dec. 29	Jick Branch	Switchback, W. Va.	do	50
1909 Jan. 10	Zeigler	Zeigler, Ill.	Mine fire and explosion	26
1909 Jan. 12	Lick Branch	Switchback, W. Va.	Mine explosion	67
1909 Jan. 19	Stone Canyon	Chancellor, Cal.	do	6
1909 Jan. 25	Washington No. 5	Franklin, Md.	Mine cars (surface)	5
1909 ...do...	Orenda No. 2	Boswell, Pa.	Mine explosion	5
1909 Feb. 2	Short Creek	Short Creek, Ala.	do	16
1909 Mar. 2	No. 14	Pittston, Pa.	do	8
1909 Mar. 20	Sunnyside	Evansville, Ind.	do	6
1909 Mar. 31	Echo	Buery, W. Va.	Dynamite explosion	6
1909 Apr. 9	Eureka No. 37	Windber, Pa.	do	7
1909 June 23	Lackawanna No. 4	Wehrum, Pa.	Mine explosion	21
1909 July 6	Toller	Tollerville, Colo.	do	9
1909 Oct. 3	Northwestern	Roslyn, Wash.	do	10
1909 Oct. 21	Rock Island No. 8	Hartshorne, Okla.	do	10
1909 Oct. 31	Franklin No. 2	Johnstown, Pa.	do	13
1909 Nov. 9	Auchincloss	Nanticoke, Pa.	Mine fire	9
1909 Nov. 13	St. Paul No. 2	Cherry, Ill.	do	259
1909 Dec. 11	Baker No. 5	Clay, Ky.	Mine explosion	7
1909 Dec. 23	Mine A	Herrin, Ill.	do	8
1910 Jan. 11	Nottingham	Plymouth, Pa.	do	7
1910 Jan. 31	Primero	Primero, Colo.	do	75
1910 Feb. 1	Browder	Browder, Ky.	do	34
1910 Feb. 5	Ernest No. 2	Ernest, Pa.	do	12
1910 Feb. 8	Barthell No. 1	Stearns, Ky.	do	6
1910 Mar. 12	South Wilkes-Barre No. 5	Wilkes-Barre, Pa.	do	7
1910 Mar. 31	Great Western No. 2	Wilburton, Okla.	do	6
1910 Apr. 20	Mulga	Mulga, Ala.	do	40
1910 Apr. 21	Amsterdam	Amsterdam, Ohio.	do	15
1910 May 5	Palos No. 3	Palos, Ala.	do	83
1910 Oct. 8	Starkville	Starkville, Colo.	do	56
1910 Nov. 3	Yolande No. 1	Yolanda, Ala.	do	5
1910 Nov. 6	Lawson	Black Diamond, Wash.	do	16
1910 Nov. 8	Victor American No. 3	Delagua, Colo.	Mine fire and explosion	79
1910 Nov. 11	Shoal Creek No. 1	Panama, Ill.	Mine explosion	6
1910 Nov. 25	Providence No. 3	Providence, Ky.	Powder explosion	10
1910 Dec. 14	Greeno	Tacoma, Va.	Mine explosion	8
1910 ...do...	Leyden	Leyden, Colo.	Mine fire	10
1910 Dec. 31	Lick Fork	Thacker, W. Va.	Mine cars	10
1911 Jan. 20	Carbon Hill	Carbon Hill, Va.	Mine explosion	5
1911 Feb. 9	Cokedale	Trinidad, Colo.	do	17
1911 Mar. 18	No. 16	Mineral, Kans.	do	5
1911 Mar. 22	Hazel	East Canonsburg, Pa.	Fall of roof	9
1911 Apr. 7	Price-Pancoast	Throop, Pa.	Mine fire	72
1911 Apr. 8	Banner	Littleton, Ala.	Mine explosion	128
1911 Apr. 24	Ott No. 20	Elk Garden, W. Va.	do	23
1911 May 27	Cameron	Shamokin, Pa.	do	5
1911 July 13	Sykesville	Sykesville, Pa.	do	21
1911 Sept. 12	Marvine	Scranton, Pa.	Mine cars	5
1911 Oct. 3	Drifton No. 2	Freeland, Pa.	Cave-in	5
1911 Oct. 23	O'Gara No. 9	Harrisburg, Ill.	Mine explosion	8
1911 Nov. 9	Adrian	Punxsutawney, Pa.	do	8
1911 Nov. 18	Bottom Creek	Vivian, W. Va.	do	18
1911 Dec. 9	Cross Mountain	Briceville, Tenn.	do	84
1912 Jan. 9	Parrish	Plymouth, Pa.	do	6
1912 Jan. 16	Carbon Hill	Carbon Hill, Va.	Dynamite explosion	5
1912 Jan. 19	Central	Central City, Ky.	Mine explosion	5
1912 Jan. 20	Kemmerer No. 4	Kemmerer, Wyo.	do	6
1912 Feb. 22	Western No. 5	Lehigh, Okla.	Mine fire	9
1912 Mar. 20	San Bois No. 2	McCurtain, Okla.	Mine explosion	73
1912 Mar. 26	Jed	Jed, W. Va.	do	81
1912 Apr. 21	Coil	Madisonville, Ky.	do	5
1912 June 18	Hastings	Hastings, Colo.	do	12
1912 July 11	Panama	Moundsville, W. Va.	do	8
1912 July 16	Old Dominion No. 1	Carbon Hill, Va.	do	8
1912 July 24	Superba and Lemont	Evans Station, Pa.	Cloudburst flooded mine	[a] 18
1912 Aug. 13	Abernant	Abernant, Ala.	Mine explosion	18
1913 Feb. 19	Seagraves	Eldorado, Ill.	do	5
1913 Apr. 23	Cincinnati	Finleyville, Pa.	do	96
1913 May 6	Taylor	Hartford, Ky.	Overcome by gas	5
1913 May 17	Imperial	Belle Valley, Ohio	Mine explosion	15

[a] Not included in State inspector's statement of mine fatalities.

TABLE 44.—COAL-MINE ACCIDENTS IN THE UNITED STATES IN WHICH FIVE OR MORE MEN WERE KILLED. (REVISED TO JAN. 1, 1916.)—Continued.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1913 Aug. 2	East Brookside	Tower City, Pa	Mine explosion	19
1913 Oct. 22	Stag Canon No. 2	Dawson, N. Mex	do	263
1913 Nov. 18	Acton No. 2	Acton, Ala	do	24
1913 Dec. 16	Vulcan	New Castle, Colo	do	37
1914 Jan. 10	Rock Castle	Rock Castle, Ala	do	12
1914 Jan. 14	Spencer-Newland	Mulberry, Kans	Cage with men fell down shaft.	6
1914 Apr. 28	Eccles Nos. 5 and 6	Eccles, W. Va	Mine explosion	181
1914 Apr. 29	Union Pacific No. 2	Cumberland, Wyo	Mine cars	5
1914 May 29	Maryd	Maryd, Pa	Overwinding of cage	6
1914 June 30	Cinderella	Cinderella, W. Va	Suffocated by fumes from fire in fan house.	5
1914 Sept. 4	No. 1	Adamson, Okla	Cave-in	13
1914 Sept. 16	Lehigh No. 4	Lansford, Pa	Mine explosion	7
1914 Oct. 5	Mulga	Mulga, Ala	do	16
1914 Oct. 27	North or No. 1	Royalton, Ill	do	52
1914 Dec. 9	Tripp	Scranton, Pa	Collapse of bottom of cage	13
1915 Feb. 6	Carlisle	Carlisle, W. Va	Mine explosion	21
1915 Feb. 17	Prospect	Wilkes-Barre, Pa	do	13
1915 Feb. 18	Atlas	Rich Hill, Mo	Powder and mine explosion.	5
1915 Mar. 2	Layland No. 3	Layland, W. Va	Mine explosion	112
1915 Apr. 5	Shoal Creek	Panama, Ill	do	11
1915 May 24	Smokeless Valley No. 1	Johnstown, Pa	do	9
1915 July 27	United Coal No. 1	Christopher, Ill	do	9
1915 July 30	Patterson No. 2	Elizabeth, Pa	Mine cars	9
1915 Aug. 31	Orenda	Boswell, Pa	Mine explosion	19
1915 Nov. 16	Northwestern	Ravensdale, Wash	do	31
1915 Nov. 30	Boomer No. 2	Boomer, W. Va	do	23

GAS AND DUST EXPLOSIONS.

Table 45 shows the number of men killed by gas and dust explosions in the coal mines of the United States, by States, during indicated periods ending December 31, 1913, for which continuous records are available. This table takes cognizance of 6,726 fatalities in the coal mines of the United States due to this cause alone, including both common and exceptional accidents. In addition to these accidents a number of mine disasters occurred prior to the beginning of State mine inspection, which are not included in this table. During the periods covered, the fatalities due to gas and dust explosions were 13.88 per cent of the total number killed, or a fatality rate of 0.46 per 1,000 men employed.

Utah has the highest percentage of fatalities in important coal mining States due to this cause, the rate being 57.75 per cent of the total, or 5.34 per 1,000 men employed. Utah's high rate is due to one disaster at the Winter Quarters mine, in which 200 men were killed at one time. New Mexico has the next highest percentage, 56.51 per cent of the total fatalities for a period of 21 years, or 6.46 per 1,000 men employed. This high rate is due to the Dawson disaster, in which 263 men were killed at one time.

The percentage of fatalities due to gas and dust explosions in some of the States is much higher than in others, whereas the rate per 1,000 men employed may not be in accordance therewith. Here again is shown the fallacy of making fatality comparisons on the percentage basis. In Utah and New Mexico the percentage of fatalities due to

falls of roof, 26.76 and 28.17, respectively, indicates exceedingly safe roof conditions in the mines of these States, as this rate is about one-half the average for the United States, which is 47.49 per cent. But the fatality rate due to falls of roof, based on the number of men employed, in New Mexico is 3.22 and in Utah 2.48, both of which are much larger than the average for the United States, which is 1.57 per 1,000 men employed.

TABLE 45.—NUMBER OF MEN KILLED BY **GAS AND DUST EXPLOSIONS** IN AND ABOUT THE COAL MINES OF THE UNITED STATES, BY STATES, DURING PERIOD SHOWN ENDED DEC. 31, 1913, FOR WHICH CONTINUOUS RECORDS ARE AVAILABLE.

State.	Number of years in period ended Dec. 31, 1913.	Number killed.		
		Total.	Per cent.	Per 1,000 employed.
Alabama	21	620	33.32	1.75
Arkansas	9	2	1.87	.05
Colorado	28	517	29.75	2.12
Georgia	5			
Illinois	29	170	4.99	.13
Indiana	19	57	8.39	.18
Iowa	26	44	6.10	.13
Kansas	21	33	6.25	.15
Kentucky	26	74	11.65	.23
Maryland	23			
Michigan	14			
Missouri	26	40	10.58	.19
Montana	14			
New Mexico	21	321	56.51	6.46
North Dakota	6			
Ohio	30	64	2.79	.07
Oklahoma	21	262	35.94	1.96
Oregon	5	2	66.67	1.79
Pennsylvania (anthracite)	44	1,344	7.59	.26
Pennsylvania (bituminous)	36	1,309	13.82	.40
Tennessee	23	339	39.47	1.70
Texas	5			
Utah	22	205	57.75	5.34
Virginia	5	25	9.96	.63
Washington	25	195	30.47	1.87
West Virginia	29	1,036	21.82	1.09
Wyoming	6	67	27.80	1.45
Total[a]		6,726	13.83	.46

[a] This table is based on Table 5, and is for periods indicated, by States, for which continuous records are available. It does not necessarily check with Tables 3 and 4, for the reason that the latter tables include intermittent records prior to the period having continuous records.

It will be noted from figure 3 that the accidents due to gas and dust explosions were comparatively few from 1875 to 1890, the rate being about 0.30 per 1,000 men employed. Beginning with 1890 the fatality rate has been very irregular, owing to the irregular occurrence of large diasters. The climax was reached in 1907, when seven explosions occurred, in each of which more than 20 men were killed. The number killed by gas and dust explosions in 1907 was 1.417 per 1,000 employed in all coal mines, or 1.796 (Table 68) per 1,000 for the bituminous mines alone. As shown in Table 4, the fatality rate due to this cause has declined since 1907, being 0.457 per 1,000 in 1914 as compared with the average of 0.487 from 1870 to 1913.

In considering the number of men killed in recent gas and dust explosions, it must not be forgotten that the mines are becoming

deeper, contain more abandoned rooms and old workings, with the possibility of greater accumulations of gas and dust, are larger, and that more men are employed in the individual mines than in former years, so that when an explosion does occur, there is the possibility of trapping more men than would have happened in the same mine 20 or 25 years ago.

With deeper mines and the resultant old workings, ventilation is not as easy to maintain as in the newer mines, thus permitting the accumulation of gas and dust. The deep slope or shaft mines drain all of the water from the upper workings, leaving the haulage ways and rooms dry, with the result that coal dust will be produced and accumulate in them. Water also drains from the gob and waste piles and they become comparatively dry. Air will circulate through abandoned rooms, caved workings and gob, and in so doing the velocity of the air current is reduced and the suspended dust deposited. The air is actually filtered, leaving its deadly burden of dust to be ignited by an explosion of gas or a blown-out shot.

MINE FIRES.

Table 46 shows a list of the principal mine fires which have occurred in the United States since 1869, and in which 1,053 men have been killed. This table does not necessarily check with Table 3, for the reason that it includes one disaster in 1869 not shown in Table 3;

TABLE 46.—MINE FIRES IN THE UNITED STATES IN WHICH FIVE OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Killed.
1869 Sept. 6	Avondale	Plymouth, Pa.	179
1884 Aug. 21	Buck Ridge	Shamokin, Pa.	7
1890 June 16	Hill Farm	Dunbar, Pa.	31
1893 Apr. 1	Neilson	Shamokin, Pa.	10
1894 Aug. 24	Franklin	Franklin, Wash.	37
1894 Oct. 8	Luke Fidler	Shamokin, Pa.	5
1897 Sept. 20	Belle Ellen	Belle Ellen, Ala.	5
1897 Sept. 28	Jermyn No. 1	Rendham, Pa.	5
1897 Oct. 30	Von Storch	Scranton, Pa.	6
1898 Oct. 1	Midvale	Wilkes-Barre, Pa.	5
1901 Feb. 25	Diamondville No. 1	Diamondville, Wyo.	28
1901 Nov. 14	Pocahontas	Pocahontas, Va.	9
1901 Nov. 22	do	do	8
1902 Jan. 13	Milby & Dow	Dow, Okla.	10
1903 June 30	Hanna No. 1	Hanna, Wyo.	[a] 169
1904 May 5	Locust Gap	Locust Gap, Pa.	5
1905 Jan. 16	Decatur	Decatur, Ill.	6
1905 Oct. 13	Clyde	Fredericktown, Pa.	6
1905 Dec. 4	Horton	Horton, W. Va.	7
1906 June 7	Red Lodge	Red Lodge, Mont.	8
1907 May 19	Engleville	Engleville, Colo.	5
1908 Aug. 26	Hailey-Ola No. 1	Haileyville, Okla.	29
1908 Nov. 20	Red Lodge	Red Lodge, Mont.	9
1909 Jan. 10	Zeigler	Zeigler, Ill.	[a] 26
1909 Nov. 9	Auchincloss	Kingston, Pa.	9
1909 Nov. 13	St. Paul No. 2	Cherry, Ill.	259
1910 Nov. 8	Victor American No. 3	Delagua, Colo.	[a] 79
1910 Dec. 14	Leyden	Leyden, Colo.	10
1911 Apr. 7	Price-Pancoast	Throop, Pa.	72
1912 Feb. 22	Western No. 5	Lehigh, Okla.	9
Total			1,053

[a] Fire and explosion combined.

it also includes 3 disasters in which a mine fire and explosion were combined. Table 47 shows a list of mine fires at mines in the United Kingdom that were due to spontaneous combustion. This table brings out forcibly the dangers due to spontaneous combustion of waste material stored underground. Too much care can not be exercised in the matter of taking care of waste material, such as waste in engine rooms and pump stations, and old timbers, which may be easily ignited should they come in contact with oil-saturated waste. Timber should not be stored with the mine gob where oxidation is likely to take place, as it will add fuel to a fire which may be easily started. All inflammable material should be removed from the mines.

TABLE 47.—LOSS OF LIFE OCCASIONED BY FIRES DUE TO SPONTANEOUS COMBUSTION IN MINES IN THE UNITED KINGDOM, 1893–1912, INCLUSIVE.[a]

Date of accident.	Name of mine.	County.	Number killed.	Number injured.	Reported cause of death.
1894 Oct. 16	Harecastle and Woodshutts.	North Staffordshire	1	1	Skull fractured by explosion blowing out stopping.
1895 Oct. 29	Oldfield	do	2	1	Suffocated by fumes and smoke.
1896 Sept. 10	Shelton	do	1	.....	Carbon monoxide poisoning.
1898 Apr. 19	Whitwick	Leicester	35	6	Suffocated by fumes from burning timbers.
1899 Mar. 11	Cadeby Main	Yorkshire	2	2	Explosion ignited by gob fire while working in a "scouring."
1899 Oct. 20	Dalquharran	Ayrshire	1	.....	Suffocated by fumes; gob fire.
1901 Feb. 15	Hill of Beath	Fife	7	.....	Poisoned by carbon monoxide leaking through stoppings.
1901 Nov. 7	Talk o' the Hill	North Staffordshire	4	.....	Explosion ignited by gob fire.
1902 June 19	Hamstead	South Staffordshire	2	.....	Carbon monoxide poisoning.
1904 Aug. 28	Melgund	Fife	1	1	Suffocated by products of combustion.
1905 June 24	Coneygre, No. 126 pit.	South Staffordshire	1	.....	Carbon monoxide and black damp poisoning.
1905 June 25	Haden Hill	do	2	.....	Do.
1905 Aug. 28	Hamstead	do	1	.....	Carbon monoxide poisoning.
1906 Apr. 27	Lumphinnans, No. 1 pit.	Fife	2	.....	Do.
1906 May 26	Bog, Nos. 1 and 2 pits.	Lanark	2	1	Carbon monoxide suffocation.
1906 June 1	Court Herbert	Glamorgan	5	4	Shock of explosion ignited by gob fire.
1907 July 14	Aldridge	South Staffordshire	1	.....	Suffocated by fumes.
1907 Dec. 29	Lochhead	Fife	3	.....	Carbon monoxide poisoning.
1908 Dec. 23	Cakemore	Worcester	3	2	Severe burns.
1910 Apr. 17	Windmillend, No. 5 pit.	do	2	.....	Carbon monoxide poisoning.
1911 Nov. 25	Bignall Hill, Jamage pit.	North Staffordshire	6	14	Do.
1912 Feb. 2	Bentley	Yorkshire	8	4	Explosion ignited by gob fire.
1912 Feb. 24	Norton	North Staffordshire	1	1	Do.
1912 July 9	Cadeby Main	Yorkshire	88	.....	Do.
1912 Oct. 27	Cae Duke	Glamorgan	1	.....	Carbon monoxide poisoning.
Total			177	37	

[a] First report of the departmental committee on spontaneous combustion of coal in mines, Home Office, London, 1914.

EXPLOSIVES.

Table 48 shows by causes and States the total number of fatalities due to explosives, during periods of inspection service for which continuous records are available. The fatality rates due to explosives from 1870 to 1914 are shown in figure 3. In Table 48 are tabulated 3,675 fatalities due to the use of explosives underground. This table has been divided into 14 subheadings showing various causes of accidents while using explosives, and it will be noted that 24.87 per cent are due to premature blasts, 16.79 per cent to handling and transportation, 16.71 per cent to flying pieces of rock or coal. The number of fatalities due to striking unexploded charges in removing débris is small, only three being reported. The small number of fatalities due to thawing of explosives is largely accounted for by the fact that black powder is used to such a large extent in the coal mines. Dynamite is not used so extensively and hence there are not so many accidents due to thawing as in the metal mines, where dynamite is used almost exclusively. Of the 27 fatalities due to thawing explosives, 21 occurred in the anthracite mines of Pennsylvania, where a large amount of dynamite is used. The table presents a detailed study which has not heretofore been available, and it is hoped that it will be of some special use to safety engineers in forming rules and regulations concerning the use of explosives.

The table also gives the percentage of fatalities and the rate per 1,000 men employed. In Kansas and North Dakota nearly one-fourth of all coal-mine fatalities is due to the use of explosives. Although in Indiana 19.44 per cent and in Oklahoma 15.77 per cent are due to this cause, the average for the United States is 7.59 per cent.

Table 49 gives the number of fatalities due to explosives in and about the anthracite mines of Pennsylvania from 1870 to and including 1913. This table shows that 1,835 fatalities were due to this cause alone, of which 1,790 were underground, as indicated in Table 48. Table 49 also shows the fatality rate per 1,000 men employed as being 0.225 in 1870. This rate fluctuates more or less, but it has more than doubled in recent years, ranging from 0.414 in 1909 to 0.540 in 1908 and 0.427 in 1913. The average fatality rate per 1,000 men employed in the anthracite field during the entire period of 44 years is 0.354, as compared with 0.05 in the bituminous fields of Pennsylvania, in which there were 185 fatalities as compared with 1,790 in the anthracite field.

Anthracite coal being much harder than bituminous coal, more nearly approaches metal-mining operations, and of course larger quantities of more powerful explosives are required. Table 50 shows that the amount of explosives used in the anthracite field is practically three times the amount used in the bituminous mines of

TABLE 48.—NUMBER OF MEN KILLED BY **EXPLOSIVES** IN THE COAL MINES (UNDERGROUND ONLY) OF THE UNITED STATES, BY STATES, DURING PERIOD SHOWN ENDED DEC. 31, 1913, FOR WHICH CONTINUOUS RECORDS ARE AVAILABLE.[a]

State.	Number of years in period ended Dec. 31, 1913.	Handling and transportation.	Handling caps, detonators, squibs, and fuse.	Thawing explosives.	Tamping.	Premature blast and short fuse.	Blown-out or windy shot.	Flying pieces of rock or coal.	Returned too soon.	Delayed blast.	Shot breaking through pillar or rib.	Suffocation by powder gas.	Striking unexploded charge in removing débris.	Drilling into unexploded charge.	Unclassified.	Total.	Percentage of total killed in State.	Number killed per 1,000 employed.
Alabama	21	7			2	10	12	8	16	1	2	1			37	96	5.16	0.27
Arkansas	9														15	15	14.01	.34
Colorado	28	2	2			19	3	6	2	2	1	6		9	9	60	3.45	.25
Georgia	5														1	1	14.29	.43
Illinois	29	86	1		10	94	81	47	52	3	32	7		14	32	459	13.47	.34
Indiana	19	23			3	28	16	6	12	3	12	19		2	8	122	19.44	.42
Iowa	26	9	1			18	4	25	3		4	1		2	7	74	10.25	.23
Kansas	21	11	9		1	13	19	22	3		3	29			21	131	24.81	.61
Kentucky	26	13	4			11	17	3	13	1	7	6		4	10	89	14.02	.28
Maryland	23	2	1						1						1	6	2.27	.04
Michigan	14		1			6		2		1	1	1			3	15	15.31	.33
Missouri	26	3				4		8	8	2	5	8		1	4	43	11.38	.20
Montana	14	2		1				1	1		2	1			3	11	6.92	.27
New Mexico	21					4	5	5	1	3	1	1		2	2	24	4.23	.48
North Dakota	6					1									2	3	23.08	.72
Ohio	30	19	2			42	1	12	8	2	24	7			44	161	7.02	.17
Oklahoma	21	16	1			9	19	14	10	3	6	6			31	115	15.77	.86
Oregon	5															0		
Pennsylvania (anthracite)	44	318	10	21	88	583		420	126	9	77	10	3	26	99	1,780	10.10	.35
Pennsylvania (bituminous)	36	45	6	1	2	34	13	31	19	1	24	3		3	3	185	1.95	.05
Tennessee	23	3				2	5	2	4		3	5			25	49	5.70	.25
Texas	5														2	2	8.00	.09
Utah	22	1				3		1								5	1.40	.13
Virginia	5														10	10	3.98	.25
Washington	25	2	2	2		1			1	2	1	15		3	3	32	5.00	.30
West Virginia	29	54	4	2	3	30	6	2	7		10	1		1	35	155	3.27	.16
Wyoming	6	1				2			6		1			2	1	13	5.40	.28
Total[b]		**617**	**44**	**27**	**109**	**814**	**201**	**614**	**293**	**33**	**216**	**127**	**3**	**69**	**408**	**3,875**	**7.59**	**.25**
Percentage of total		16.79	1.20	0.73	2.97	24.87	5.47	16.71	7.97	0.90	6.88	3.45	0.08	1.88	11.10	100.00		

[a] Compiled from the annual reports of the State mine inspectors.

[b] This table is based on Table 5, and is for periods indicated by States for which continuous records are available. It does not necessarily check with Tables 3 and 4 for the reason that the latter tables include intermittent records prior to the period having continuous records.

Pennsylvania. In 1913 the bituminous fields used 14,652,931 pounds of black powder as compared with 44,001,660 pounds in the anthracite mines. The bituminous mines for the same year used 696,162 pounds of dynamite, whereas the anthracite mines used in the same period 16,093,035 pounds. The amount of permissible explosives used in the bituminous fields was 6,715,028 pounds as compared with 3,323,645 in the anthracite fields. Records showing the use of permissible explosives are not complete prior to 1909.

TABLE 49.—FATALITIES IN AND ABOUT THE ANTHRACITE MINES OF PENNSYLVANIA DUE TO EXPLOSIVES.

Year.	Number killed by—													Total.	Number killed per 1,000 employed.[a]
	Handling and transportation.	Handling caps, detonators, squibs, and fuse.	Thawing explosives.	Tamping.	Premature blast or short fuse.	Blown-out or windy shot.	Flying pieces of coal or rock.	Returned too soon.	Delayed blast.	Shot breaking through pillar or rib.	Suffocation by powder gas.	Striking unexploded charge in removing débris.	Drilling into unexploded charge.	Miscellaneous causes.		
1870	1	.....	.....	.....	2	....	4	.....	.....	.....	.....	.....	.....	1	8	0.225
1871	4	.....	.....	.....	4	....	5	1	.....	1	.....	.....	.....	1	16	.427
1872	4	.....	.....	.....	6	....	5	.....	.....	1	.....	.....	.....	.....	16	.358
1873	1	.....	.....	.....	9	....	4	2	.....	.....	.....	.....	.....	.....	16	.332
1874	2	.....	.....	2	4	....	3	1	.....	1	.....	.....	1	.....	14	.262
1875	9	.....	.....	1	7	....	10	2	.....	1	.....	.....	.....	.....	30	.429
1876	15	.....	.....	1	2	....	10	1	.....	1	1	.....	2	.....	33	.468
1877	3	.....	.....	1	1	....	5	.....	.....	1	1	.....	.....	.....	12	.179
1878	6	.....	.....	.....	5	....	4	1	.....	.....	.....	.....	1	.....	17	.266
1879	7	.....	.....	1	3	....	2	2	.....	1	.....	.....	1	.....	17	.247
1880	.....	.....	.....	1	6	....	1	2	.....	1	.....	.....	.....	.....	11	.150
1881	2	.....	.....	.....	5	....	7	3	.....	1	.....	.....	.....	1	19	.250
1882	5	.....	.....	1	3	....	7	2	.....	2	.....	.....	.....	1	21	.256
1883	9	.....	.....	2	20	....	4	3	.....	2	1	.....	.....	.....	41	.449
1884	3	.....	.....	.....	12	....	13	4	.....	2	.....	.....	1	.....	35	.346
1885	9	.....	.....	3	8	....	2	3	.....	3	.....	.....	2	.....	30	.299
1886	3	.....	.....	1	5	....	12	5	.....	.....	.....	.....	.....	.....	26	.252
1887	4	.....	.....	.....	6	....	9	.....	.....	.....	.....	.....	.....	1	20	.188
1888	6	.....	.....	3	17	....	6	2	.....	1	.....	.....	1	2	38	.311
1889	3	.....	.....	2	11	....	8	3	.....	2	.....	.....	.....	4	33	.267
1890	.....	.....	.....	1	7	....	4	3	.....	3	.....	.....	.....	.....	18	.143
1891	6	.....	3	3	22	....	3	4	.....	2	.....	.....	1	.....	44	.348
1892	6	.....	.....	.....	14	....	8	2	.....	5	.....	.....	1	.....	36	.279
1893	5	.....	1	1	14	....	11	4	.....	2	.....	.....	1	2	41	.308
1894	14	.....	1	6	12	....	10	2	.....	1	.....	.....	.....	.....	46	.350
1895	14	.....	2	1	16	....	5	1	.....	6	.....	.....	3	4	52	.364
1896	5	.....	.....	1	13	....	13	3	.....	3	.....	.....	.....	.....	38	.255
1897	7	1	.....	2	18	....	9	9	.....	4	1	.....	.....	.....	51	.340
1898	4	1	.....	1	12	....	11	2	.....	2	.....	.....	1	.....	34	.234
1899	4	.....	.....	2	14	....	10	4	.....	1	.....	.....	.....	.....	35	.251
1900	8	.....	2	.....	20	....	10	1	.....	2	.....	.....	.....	.....	43	.298
1901	10	.....	3	2	19	....	9	6	.....	2	.....	1	.....	2	54	.372
1902	7	.....	1	3	11	....	4	4	.....	1	.....	.....	.....	.....	31	.209
1903	13	1	1	.....	22	....	16	3	.....	.....	.....	.....	.....	4	60	.399
1904	19	1	2	3	14	....	13	6	.....	.....	.....	.....	1	11	70	.449
1905	9	.....	2	2	27	....	9	2	.....	6	.....	.....	2	6	63	.381
1906	19	.....	1	2	34	....	15	.....	1	1	1	.....	1	11	86	.530
1907	5	.....	1	16	31	....	13	7	.....	.....	.....	2	2	12	89	.532
1908	10	2	1	7	28	....	21	5	.....	3	2	.....	1	14	94	.540
1909	9	2	1	3	14	....	15	6	1	3	1	.....	.....	14	69	.414
1910	17	1	.....	2	24	....	26	3	4	1	.....	.....	.....	7	85	.502
1911	15	.....	2	6	27	....	18	9	1	4	.....	.....	2	4	88	.506
1912	18	1	.....	6	21	....	23	2	.....	3	.....	.....	1	5	80	.460
1913	5	.....	1	.....	21	....	35	1	2	1	2	.....	.....	7	75	.427
Total	325	10	25	89	591	....	432	126	9	77	10	3	26	112	1,835	.354
Surface	7	.....	4	1	8	....	12	.....	.....	.....	.....	.....	.....	13	[b] 45	
Underground	318	10	21	88	583	....	420	126	9	77	10	3	26	99	1,790	.....

[a] Based on total employees as given in Table 124.
[b] Included in the 2,321 surface fatalities, Table 5.

TABLE 50.—EXPLOSIVES USED IN THE COAL MINES OF PENNSYLVANIA.[a]

Year.	Quantity of explosives used in anthracite mines.			Quantity of explosives used in bituminous mines.		
	Black powder.	Dynamite.	Permissible explosives.	Black powder.	Dynamite.	Permissible explosives.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1899	34,317,275	3,649,417	.....	6,000,700	222,076	.....
1900	30,929,500	3,454,641	.....	7,409,925	243,517	.....
1901	33,020,100	4,155,685	.....	7,851,500	693,801	.....
1902	21,128,675	2,130,965	.....	9,966,725	921,149	.....
1903	42,529,400	5,317,422	.....	11,145,725	1,133,305	.....
1904	44,779,800	6,519,312	.....	12,026,275	1,330,161	.....
1905	47,570,500	8,353,594	.....	15,194,150	2,159,080	.....
1906	40,352,075	7,980,733	.....	13,119,050	2,425,073	.....
1907	47,636,700	10,544,781	.....	15,874,225	3,425,404	.....
1908	49,380,800	10,766,245	.....	12,738,800	2,193,944	.....
1909	41,191,857	10,724,616	666,827	12,221,214	694,129	3,291,400
1910	45,112,322	11,171,458	1,506,140	12,539,013	513,665	5,126,251
1911	47,846,483	13,369,056	2,122,204	12,925,731	658,330	4,462,416
1912	41,401,015	13,685,002	2,037,033	13,402,034	527,807	5,699,176
1913	44,001,660	16,093,035	3,323,045	14,652,931	696,102	6,715,028

[a] Ann. Rept. Department of Mines of Pennsylvania, 1913, pp. 59, 75.

PERMISSIBLE EXPLOSIVES.

The number of fatalities per 10,000 men employed, due to explosives used in the bituminous coal mines of the United States from

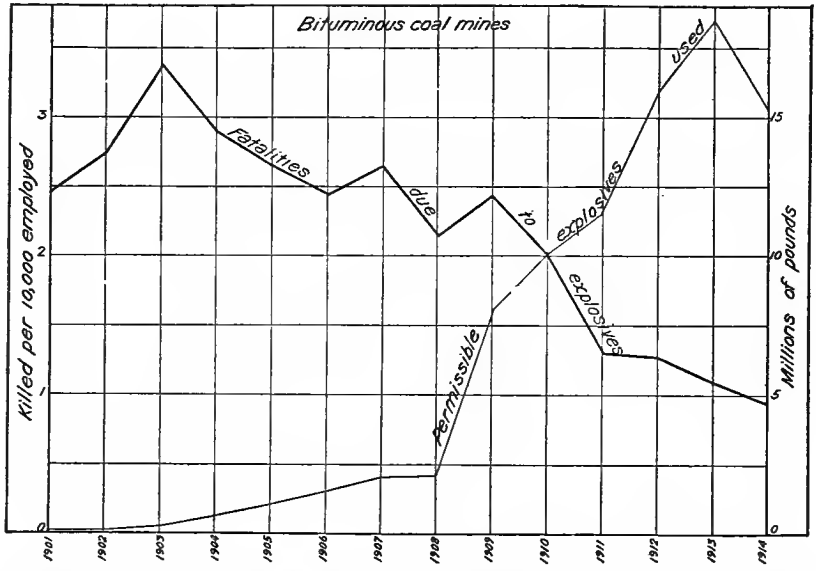

FIGURE 5.—Number of men killed per 10,000 employed, by explosives, in the bituminous coal mines of the United States, compared with the amount of permissible explosives used, 1901–1914. (Based on Table 68.)

1901 to 1914, inclusive, are shown in figure 5. The figure also shows the amount of permissible explosives used for the same period. This period is taken for the reason that in 1901 there were no permissible explosives used in the coal mines of the United States. In 1902 this

class of explosives was introduced, there being 11,300 pounds used during that year. In preparing this chart, the amount of permissible explosives used in the anthracite mines has been eliminated, leaving the figures for bituminous mines only. This chart shows the rapid increase in the use of permissible explosives and, at the same time, a corresponding decrease in the fatality rate. None of the serious mine disasters have been attributed to permissible explosives.

Table 51 shows the amount of black powder, high explosive other than permissible, and permissible explosive used in the coal mines of the United States, geographically grouped, wherein the mining conditions are more or less of a similar character. This table is for the two years 1913 and 1914.

TABLE 51.—QUANTITY OF EXPLOSIVES USED IN THE COAL MINES OF THE UNITED STATES DURING 1913 AND 1914.[a]

States.	Quantity of explosives used.					
	Black blasting powder.[b]		High explosives, other than permissible explosives.		Permissible explosives.	
	1913	1914	1913	1914	1913	1914
	Kegs.	*Kegs.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Maryland and Virginia	124,239	103,250	471,475	286,500	134,000	441,825
Pennsylvania	2,535,098	2,477,542	18,198,494	19,204,406	9,622,475	8,989,625
West Virginia	614,392	566,692	645,425	510,725	3,282,560	2,904,449
Georgia and North Carolina	7,900	5,400	5,680	2,800	.....	.....
Indiana and Kentucky	762,815	764,358	699,201	208,734	482,250	564,525
Illinois	1,269,974	1,195,026	172,300	143,450	1,569,175	1,327,575
Ohio	305,581	192,097	62,300	547,700	6,650	11,200
Alabama and Tennessee	315,942	247,327	722,610	913,775	4,481,975	2,982,363
Michigan	21,421	28,999	20,125	31,900	.....	.....
Iowa, Kansas, and Missouri	875,091	941,702	1,430,550	1,076,450	21,125	15,237
Arkansas, Oklahoma, and Texas	309,390	294,177	455,050	665,770	356,500	396,700
Montana, North Dakota, South Dakota, and Wyoming	161,082	158,270	145,975	154,150	252,625	261,850
Colorado, New Mexico, and Utah	82,416	84,541	615,670	243,760	1,381,950	1,534,900
Alaska, Idaho, Oregon, and Washington	9,940	13,115	473,568	225,825	167,600	163,643
California and Nevada	802	.....	24,650	.....	45,400	.....
Total	7,396,683	7,072,506	24,143,133	24,215,945	21,804,285	19,593,892

[a] Fay, A. H., Production of explosives in the United States during 1914, Tech. Paper 107, 1915, pp. 10–12.
[b] Kegs of 25 pounds each.

QUANTITY OF EXPLOSIVES USED IN THE COAL MINES OF WEST VIRGINIA.[a]

Year.	Number of operators reporting.	Black powder.	Dynamite.	So-called safety powder.
		Kegs.	*Pounds.*	*Pounds.*
1905	395	373,669	.....	.....
1906	409	447,306	.....	.....
1907	460	443,989	.....	.....
1908	498	425,342	788,049	453,074
1909	458	391,282	281,529	1,170,861
1910	580	459,273	303,646	1,661,861
1911	693	409,312	141,209	3,022,682
1912	678	409,540	114,680	3,430,759
1913	698	(b)	(b)	2,010,823

[a] Compiled from State mine inspectors' reports. [b] Not given.

YEARLY SALES OF SHORT-FLAME EXPLOSIVES USED IN COAL MINES IN THE UNITED STATES, 1901–1914.[a]

Year.	Quantity sold.	Year.	Quantity sold.
	Pounds.		*Pounds.*
1901	.....	1908	2,108,610
1902	11,300	1909	8,942,857
1903	288,661	1910	11,820,836
1904	608,270	1911	13,428,239
1905	1,031,300	1912	18,150,618
1906	1,533,575	1913	21,804,285
1907	2,095,244	1914	19,593,892

[a] Fay, A. H., Production of explosives in the United States during 1914: Tech. Paper 107, Bureau of Mines, 1915, p. 13.

QUANTITY OF PERMISSIBLE EXPLOSIVES USED IN DIFFERENT COAL FIELDS IN THE UNITED STATES, 1910–1914.[a]

Coal fields and regions.	1910	1911	1912	1913	1914
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1. Pennsylvania anthracite field	1,486,100	1,917,412	2,177,172	3,294,225	4,380,635
2. Northern Appalachian region [b]	5,967,216	6,350,272	9,190,025	9,744,810	7,966,464
3. Southern Appalachian region	3,188,785	3,377,268	3,995,485	4,481,975	3,510,013
4. Eastern interior field	165,975	337,012	751,005	2,058,075	1,364,450
5. Western interior field	196,560	255,050	440,825	377,625	411,937
6. Rocky Mountain region	808,200	1,177,075	1,473,129	1,634,575	1,796,750
7. Pacific coast region	8,000	14,150	122,977	213,000	163,643
Total	11,820,836	13,428,239	18,150,618	21,804,285	19,593,892

[a] Fay, A. H., Production of explosives in the United States during 1914: Tech. Paper 107, Bureau of Mines, 1915, p. 13.
[b] Not including Pennsylvania anthracite field.

FALLS OF ROOF.

Table 52 shows the number of fatalities due to falls of roof and pillar coal in and about the coal mines of the United States, by States, during periods ending December 31, 1913, for which continuous records are available. During these various State periods there were 23,011 fatalities due to falls of rock and coal alone. This represents 47.49 per cent of the total number of fatalities, or a fatality rate of 1.57 per 1,000 men employed. (See fig. 3. Pls. I and II.)

It is not always in the mines having the strongest roof where the least number of fatalities occur. When a mine is known to have a bad roof, the miner, foreman, and all others concerned will take special precautions to use plenty of timber to keep the roof in place. Furthermore, the roof will be tested frequently and the miner will be on the lookout at all times when he knows that roof conditions are bad. With a strong roof, however, such precautions are not taken. The miner and the foreman consider the roof safe and give it no further thought. This leads to negligence, and as a result many of the fatalities due to roof falls happen where roof conditions are considered the best.

TABLE 52.—NUMBER OF MEN KILLED BY **FALLS OF ROOF AND PILLAR COAL** IN THE COAL MINES OF THE UNITED STATES, BY STATES, DURING PERIOD SHOWN ENDED DEC. 31, 1913, FOR WHICH CONTINUOUS RECORDS ARE AVAILABLE. [a]

State.	Number of years in period ended Dec. 31, 1913.	Number killed.		
		Total.	Per cent.	Per 1,000 employed.
Alabama	21	713	38.31	2.01
Arkansas	9	65	60.75	1.46
Colorado	28	852	49.02	3.50
Georgia	5	6	85.71	2.60
Illinois	29	1,616	47.40	1.19
Indiana	19	306	45.07	.97
Iowa	26	426	59.00	1.31
Kansas	21	259	49.05	1.20
Kentucky	26	316	49.76	.98
Maryland	23	127	57.73	1.08
Michigan	14	51	52.04	1.13
Missouri	26	235	62.17	1.10
Montana	14	88	55.34	2.15
New Mexico	21	160	28.17	3.22
North Dakota	6	6	46.16	1.44
Ohio	30	1,509	65.84	1.57
Oklahoma	21	153	20.99	1.14
Oregon	5	1	33.33	.90
Pennsylvania (anthracite)	44	7,378	41.65	1.42
Pennsylvania (bituminous)	36	5,393	56.93	1.64
Tennessee	23	361	42.03	1.81
Texas	5	16	64.00	.67
Utah	22	95	26.76	2.48
Virginia	5	131	52.19	3.33
Washington	25	182	28.44	1.75
West Virginia	29	2,452	51.64	2.57
Wyoming	6	114	47.30	2.46
Total	.....	23,011	47.49	1.57

[a] This table is based on Table 5, and is for periods indicated by States for which continuous records are available. It does not necessarily check with Tables 3 and 4 for the reason that the latter tables include intermittent records prior to the period having continuous records.

Falls of roof form the principal cause of accidents in coal mines, a fact that should command the serious attention of the inspectors, operators, mine foremen, and the miners. Roof falls are bound to happen, yet with proper precautions, use of sufficient timber, and care on the part of the foremen and miners the number of accidents from this cause should be reduced to a considerable extent.

HAULAGE SYSTEMS.

Table 53 shows the number of men killed underground by mine cars and locomotives covering periods for which continuous records are available, including 1913. This class represents one-eighth of the total number of men killed in and about the coal mines, or 0.42 per 1,000 men employed. During the periods covered 6,056 men were killed by mine cars and locomotives. (See fig. 3. Pls. I and II.) This number, however, does not include accidents due to electricity on haulage systems nor injuries inflicted by animals. Details relating to haulage systems of all of the various States are not available, but as an example to show the character of haulage used it has been possible to prepare tables for Illinois, Ohio, West Virginia, and the anthracite and bituminous mines of Pennsylvania.

Table 54 shows the number of horses and mules and steam, electric, and compressed-air locomotives used in the Pennsylvania coal mines from 1898 to 1913. The number of animals used in anthracite haulage has not changed materially during this 15-year period. The number of steam locomotives has practically doubled, the number of electric locomotives has increased from 24 to 781, and the number of compressed-air locomotives has increased from 10 to 161. The number of horses and mules used in bituminous haulage in Pennsylvania has doubled during this period. The number of steam locomotives has increased but slightly, whereas the number of electric locomotives has increased from 122 in 1899 to 1,933 in 1913. The use of compressed-air locomotives has increased in about the same ratio as in the anthracite field, there being 13 in 1899 and 168 in 1913.

TABLE 53.—NUMBER OF MEN KILLED UNDERGROUND BY MINE CARS AND LOCOMOTIVES IN THE COAL MINES OF THE UNITED STATES, BY STATES, DURING PERIOD SHOWN ENDED DEC. 31, 1913, FOR WHICH CONTINUOUS RECORDS ARE AVAILABLE.[a]

State.	Number of years in period ended Dec. 31, 1913.	Number killed.		
		Total.	Per cent.	Per 1,000 employed.
Alabama	21	193	10.37	0.55
Arkansas	9	2	1.87	.05
Colorado	28	141	8.11	.58
Georgia	5			
Illinois	29	414	12.14	.30
Indiana	19	75	11.04	.24
Iowa	26	76	10.53	.23
Kansas	21	12	2.27	.06
Kentucky	26	46	7.25	.14
Maryland	23	30	13.64	.25
Michigan	14	2	2.04	.04
Missouri	26	19	5.03	.09
Montana	14	23	14.47	.56
New Mexico	21	43	7.57	.87
North Dakota	6	2	15.38	.48
Ohio	30	277	12.08	.29
Oklahoma	21	78	10.70	.58
Oregon	5			
Pennsylvania (anthracite)	44	2,403	13.56	.46
Pennsylvania (bituminous)	36	1,452	15.33	.44
Tennessee	23	49	5.70	.25
Texas	5	2	8.00	.08
Utah	22	25	7.04	.65
Virginia	5	32	12.75	.81
Washington	25	81	12.65	.78
West Virginia	29	557	11.73	.58
Wyoming	6	22	9.13	.48
Total		6,056	12.50	.42

[a] This table is based on Table 5 and is for periods indicated, by States, for which continuous records are available. It does not necessarily check with Tables 3 and 4 for the reason that the latter tables include intermittent records prior to the period having continuous records.

In 1900 of the total amount of coal mined in Illinois, 5.5 per cent was transported by electric haulage underground, 10.1 per cent by cable haulage, and 84.4 per cent by horse and mule haulage. In 1912 the electric haulage systems handled 67.7 per cent, the cable haulage 0.7 per cent, and horse and mule haulage 31.6 per cent. In figuring these percentages the amount of coal handled by hand and

TABLE 54.—TYPES OF HAULAGE SYSTEMS, AND NUMBER OF UNITS EMPLOYED IN EACH, IN AND ABOUT THE COAL MINES OF PENNSYLVANIA.[a]

Year.	Anthracite mines.						Bituminous mines.					
	Horses and mules.	Steam locomotives.	Electric locomotives.	Compressed-air locomotives.	Electric dynamos.	Air compressors.[c]	Horses and mules.	Steam locomotives.	Electric locomotives.	Compressed-air locomotives.	Electric dynamos.	Air compressors.[c]
1898	15,910	(b)	24	10	44	99	6,310	(b)	(b)	(b)	(b)	(b)
1899	15,690	352	29	24	45	116	8,013	110	122	13	156	160
1900	15,708	365	38	30	60	139	9,633	119	174	17	196	225
1901	16,059	362	40	51	66	140	10,108	134	231	23	241	255
1902	16,139	373	53	55	70	146	11,833	130	323	16	306	336
1903	16,872	405	84	71	81	166	12,899	162	435	23	391	446
1904	17,085	412	115	88	100	200	12,849	169	560	27	463	503
1905	17,500	454	184	98	117	217	13,710	161	660	31	479	553
1906	16,972	445	223	108	135	237	14,707	162	833	43	535	562
1907	17,125	492	338	111	148	286	15,323	174	1,014	50	623	638
1908	16,837	489	425	144	183	292	14,486	170	966	67	651	631
1909	16,122	529	459	128	196	285	14,722	163	1,169	109	717	635
1910	15,847	552	538	142	233	295	13,741	166	1,358	149	756	671
1911	15,625	573	635	148	249	298	13,774	145	1,438	165	754	653
1912	15,187	575	707	163	255	371	13,908	168	1,617	164	845	641
1913	15,109	607	781	161	261	332	13,868	148	1,933	168	889	620

[a] Compiled from annual reports of the Department of Mines, Harrisburg, Pa. [b] No report. [c] For haulage and other purposes.

TABLE 55.—PERCENTAGE OF COAL HANDLED UNDERGROUND IN ILLINOIS MINES BY ELECTRIC, ROPE, AND ANIMAL HAULAGE WITH FATALITIES DUE TO HAULAGE SYSTEMS.

Year.	Percentage of coal hauled by [a]—			Number of men killed in haulage accidents.	
	Electric haulage.	Rope system.	Animals.	Total.	Per 1,000 employed.
1900	5.5	10.1	84.4	13	0.332
1901	8.1	10.5	81.4	12	.287
1902	8.5	9.7	81.8	16	.337
1903	10.8	8.1	81.1	20	.395
1904	11.3	4.1	84.6	18	.329
1905	12.4	3.8	83.8	21	.362
1906	19.1	4.4	76.5	23	.378
1907	35.9	6.1	58.0	41	.625
1908	40.0	6.7	53.3	27	.397
1909	45.8	2.9	51.3	24	.346
1910	49.5	5.3	45.2	33	.454
1911	60.5	4.7	34.8	43	.568
1912	67.7	.7	31.6	44	.563

[a] Calculated from data published in the State mine inspectors' annual reports.

TABLE 56.—SUMMARY OF THE NUMBER OF MINE LOCOMOTIVES IN WEST VIRGINIA DURING THE FISCAL YEARS ENDING JUNE 30, 1899–1913, INCLUSIVE.[a]

Year.	Number of mines using locomotives.	Number of locomotives in use.				
		Electric.	Steam.	Compressed air.	Gasoline.	Total.
1899	63	24	64	3	.....	91
1900	72	43	69	4	.....	116
1901	96	78	60	3	.....	141
1902	109	107	64	2	.....	173
1903	145	154	74	3	.....	231
1904	168	206	77	6	.....	289
1905	243	253	90	3	.....	346
1906	281	335	83	3	.....	421
1907	333	439	76	4	.....	519
1908	404	590	81	5	.....	676
1909	402	723	78	10	.....	811
1910	483	888	72	7	.....	967
1911	447	921	54	33	.....	1,008
1912	480	1,194	62	38	17	1,311
1913	502	1,365	46	40	28	1,479

[a] Compiled from State mine inspector's annual reports.

other haulage was small and was therefore disregarded. Table 55 shows the percentage of coal handled by the three systems. The fatalities, shown in a parallel column, include in addition to those due to mine cars and locomotives underground, 13 fatalities due to animals and 8 fatalities from electric shock as being attributable to the haulage system. The table shows in general an increasing rate, which is due not so much to electricity as to the more rapid transit and the nearer approach to railroad operations.

Table 56 shows the number of mine locomotives in use in West Virginia from 1899 to 1913. The number of mines using locomotives in 1899 was 63, while in 1913 it was 502. The number of electric locomotives has increased from 24 in 1899 to 1,365 in 1913. The number of steam locomotives has decreased slightly, having dropped

from 64 in 1899 to 46 in 1913. The use of compressed-air locomotives has not increased and in 1912 gasoline locomotives were introduced, 17 being installed in that year and 28 in 1913.

TABLE 57.—MINING MACHINES AND ELECTRIC-HAULAGE MOTORS IN OHIO MINES.[a]

Year.	Mining machines.			Electric-haulage motors.
	Electric.	Compressed air.	Total.	
1889	4	(b)	(b)	1
1890	15	(b)	(b)	2
1891	25	89	114	2
1892	27	102	129	2
1893	41	107	148	2
1894	59	112	171	2
1895	82	82	164	2
1896	130	79	209	6
1897	166	67	233	10
1898	194	58	252	22
1899	236	44	280	28
1900	322	40	362	50
1901	389	40	429	62
1902	527	47	574	96
1903	696	78	774	143
1904	888	87	975	186
1905	1,001	145	1,146	214
1906	1,110	156	1,266	275
1907	1,272	124	1,396	359
1908	1,316	129	1,445	383
1909	1,267	128	1,395	405
1910	1,374	99	1,473	451
1911	1,457	85	1,542	485
1912	1,491	58	1,549	525
1913	1,604	49	1,653	612

[a] Compiled from the annual reports of the State mine inspector. [b] Not reported.

In Table 57 is shown the number of electric haulage motors used in Ohio from 1889 to 1913. In 1889 there was only one electric haulage motor; in 1913 there were 612. The table also shows the increase in the number of electric and compressed-air mining machines.

ACCIDENTS DUE TO ELECTRICITY.

Table 58 shows the number of fatalities by States in and about the coal mines due to electricity since its introduction into the mines. These include both surface and underground fatalities, of which there were 710. The largest percentage of this number of fatalities was due to direct contact with the trolley wire. This group represents practically 50 per cent of the total number of fatalities. The next largest group is that due to contact with machine feed wire, by which 131 were killed, representing 18.45 per cent. The miscellaneous column is unfortunately large, inasmuch as sufficient details were not given in the description of the individual accidents in order to enable a proper classification of these fatalities. Many of them were reported simply as "electrocuted," no details whatever being given; hence this column represents 128 fatalities, or 18 per cent of the total.

TABLE 58.—TOTAL FATALITIES DUE TO ELECTRICITY IN THE COAL MINES IN THE UNITED STATES, BY CAUSES AND STATES.

State.	Period.[a]	Direct contact with trolley wire.							Tool or iron bar striking trolley wire.	Contact with mining machine.	Contact with machine feed wire.	Contact with haulage motor.	Repairing line wires.	Miscellaneous.	Total.
		While climbing on car or motor.	While riding on car or motor.	Replacing trolley pole.	Falling or walking against wire.	Stepping on fallen wire.	Repairing guard boards.	Others.							
Alabama	1905–1913													48	48
Arkansas	1913														0
Colorado	1901–1913							9			3			8	20
Georgia	1913														0
Illinois	1903–1913	1	3		3	1		7		3	3	1		3	25
Indiana	1903–1913	1						3		1	1			1	7
Iowa	1909–1913													1	1
Kansas	1895–1913									1	1			1	3
Kentucky	1906–1913		2		3			12			1				18
Maryland	1913														0
Michigan	1906–1913									2				3	5
Missouri	1912–1913				1					1					2
Montana	1906–1913				1										1
New Mexico	1899–1913										1				1
North Dakota	1913														0
Ohio	1898–1913							28	4	2	21		1	7	63
Oklahoma	1898–1913		3							1	2		1	3	10
Oregon	1913														0
Pennsylvania (anthracite)	1898–1913	1	2		6	1	2	3	1		4	2	1	11	34
Pennsylvania (bituminous)	1898–1913	34	11	9	75		2	22	34	13	58	1	7	18	284
Tennessee	1903–1913		1					10		1	5				17
Texas	1909–1913													1	1
Utah	1911–1913								1					1	2
Virginia	1909–1913													14	14
Washington	1906–1913	3	1	1	1	1	1	6	3				1		18
West Virginia	1899–1913	8	11	5	4			48	9	3	30	4	3	8	133
Wyoming	1908–1913	1			1						1				3
Total		49	34	15	95	3	5	148	52	28	131	8	14	128	710
Percentage of total		6.90	4.79	2.11	13.38	.42	.70	20.85	7.33	3.94	18.45	1.13	1.97	18.03	100.00

[a] The first date indicates the first recorded fatality due to electricity and not the date of the introduction of electricity into the mines.

TABLE 59.—FATALITIES DUE TO ELECTRICITY IN THE COAL MINES OF GREAT BRITAIN, 1904–1913. [a]

Year.	Ignition of fire damp.	Mine fires.	Fatalities from electric shocks on surface.	Fatalities from electric shocks underground as a result of—							Total fatalities from electric shock.	Grand total.	Shock fatalities according to voltage.					
				Faults as regards grounding of outer coverings of apparatus.			Contact, direct or indirect, with live parts of cables.		Accidental contact with uninsulated live parts of apparatus.	Other causes.			250 volts or less.		250 to 650 volts.		Above 650 volts.	
				Total absence of connection to earth.	Break in continuity of earth connection.	Outer covering grounded, but connection inefficient.	Direct contact due to abrasion of insulation.	Contact with a conductor made live by its contact with cable.					Alternating.	Direct current.	Alternating.	Direct current.	Alternating.	Direct current.
1904	(b)	(b)	.....	.....	.....	.....	.....	.....	.....	7	7	.....	(b)	(b)	(b)	(b)	(b)	(b)
1905	(b)	(b)	2	.....	.....	.....	.....	.....	.....	5	7	.....	1	(b)	(b)	(b)	1	(b)
1906	(b)	(b)	3	.....	.....	.....	.....	.....	2	.....	5	.....	(b)	(b)	1	(b)	2	(b)
1907	(b)	(b)	.....	.....	.....	4	6	.....	.....	.....	10	.....	(b)	(b)	(b)	(b)	(b)	(b)
1908	(b)	(b)	4	.....	.....	.....	6	2	2	1	15	.....	(b)	(b)	(c)	(b)	(b)	(b)
1909	9	1	.....	.....	.....	6	.....	.....	3	4	13	23	5	.....	5	2	1	.....
1910	.....	1	4	1	2	3	1	4	3	2	20	21	2	.....	10	5	3	.....
1911	1	.....	2	2	1	3	.....	3	.....	.....	11	12	1	.....	7	3	.....	.....
1912	3	.....	4	3	.....	1	1	1	1	.....	11	14	.....	.....	8	2	1	.....
1913	.....	.....	3	1	3	3	3	1	2	.....	16	16	2	.....	11	2	1	.....

[a] Great Britain mines and quarries, general report and statistics, pt. 2. [b] Not given. [c] Report states "majority" of fatalities due to this voltage.

In Table 59 is given a classification of accidents due to electricity as compiled from the coal-mine inspectors' reports of Great Britain. The majority of the fatalities were caused by alternating current at voltages ranging from 250 to 650. It is to be expected that the majority of the accidents should be within this range of voltage, as it is used almost exclusively at the mines.

TABLE 60.—NUMBER OF MEN KILLED BY **SHAFT ACCIDENTS** IN AND ABOUT THE COAL MINES OF THE UNITED STATES, BY STATES, DURING PERIOD SHOWN ENDED DEC. 31, 1913, FOR WHICH CONTINUOUS RECORDS ARE AVAILABLE.[a]

State.	Period ending 1913.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total killed in shafts.	Percentage of total killed.	Number killed per 1,000 employed.
		13	14	15	16			
	Years.							
Alabama	21	5	2	1	.....	8	0.43	0.02
Alaska and California	4	.....	.....	.....	.....	0	.....	.....
Arkansas	9	.....	.....	.....	2	2	1.87	.05
Colorado	28	17	3	14	2	36	2.07	.15
Georgia and North Carolina	5	.....	.....	.....	.....	0	.....	.....
Idaho and Nevada	4	.....	.....	.....	.....	0	.....	.....
Illinois	29	115	28	117	6	266	7.80	.20
Indiana	19	31	2	36	2	71	10.46	.23
Iowa	26	35	6	22	2	65	9.00	.20
Kansas	21	19	6	25	.....	50	9.47	.23
Kentucky	26	10	5	9	.....	24	3.78	.08
Maryland	23	.....	.....	.....	.....	0	.....	.....
Michigan	14	2	2	6	.....	10	10.20	.22
Missouri	26	9	1	17	.....	27	7.14	.13
Montana	14	.....	.....	1	.....	1	.63	.03
New Mexico	21	.....	.....	.....	.....	0	.....	.....
North Dakota	6	.....	.....	.....	.....	0	.....	.....
Ohio	30	33	6	39	1	79	3.45	.08
Oklahoma	21	5	3	14	3	25	3.43	.19
Oregon	5	.....	.....	.....	.....	0	.....	.....
Pennsylvania (anthracite)	44	520	105	211	7	843	4.76	.16
Pennsylvania (bituminous)	36	104	19	90	4	217	2.29	.06
Tennessee	23	1	.....	.....	.....	1	.12	.....
Texas	5	.....	.....	.....	1	1	4.00	.04
Utah	22	2	.....	1	.....	3	.84	.08
Virginia	5	1	.....	.....	.....	1	.40	.03
Washington	25	6	3	2	2	13	2.03	.12
West Virginia	29	43	2	22	.....	67	1.41	.07
Wyoming	6	.....	.....	1	.....	1	.41	.02
Total	.....	958	193	628	32	1,811	3.74	.12

[a] This table is based on Table 5, and is for periods indicated, by States for which continuous records are available. It does not necessarily check with Tables 3 and 4 for the reason that the latter tables include intermittent records prior to the period having continuous records.

MINE SHAFTS.

Table 60 shows the number of fatalities, by States, due to accidents at shafts and subdivided into four different groups, as falling down shafts, objects falling down shafts, cages or skips, and miscellaneous. During the period represented 1,811 were killed by shaft accidents, of which number 843 occurred in and about the anthracite mines. The large number of fatalities at the anthracite mines is not exceptional for the reason that practically all of the mines are opened by

shafts, whereas in the bituminous mines, except some in the Central and Western States, the majority of the mines are opened by slopes and drifts. During 36 years only 217 were killed by reason of shaft accidents at the Pennsylvania bituminous mines, while in Illinois during the 29-year period 266 men were thus killed. The average number of men employed per year in the Pennsylvania bituminous mines is about twice the number employed at the Illinois mines (Table 7), showing that the high Illinois rate, which is more than three times as high as at the bituminous mines of Pennsylvania, is due to the fact that the mines are operated through shafts instead of slopes and drifts. The Illinois mines are more nearly comparable with the anthracite mines in this respect.

More than one-half of all fatalities at shafts are due to persons falling down the shaft, either from the surface or from the various landings. Cages and skips are responsible for slightly over one-third of the shaft accidents. These two causes offer a good field for safety work, and, as shown in Table 4 and figure 1, the accidents at coal-mine shafts are being reduced by reason of vigilance on the part of the inspectors and the installation of safety devices by the operators.

SURFACE SHOPS AND YARDS.

Table 61 shows the number of men killed at surface works about coal mines in the United States during continuous periods as indicated including 1913. The fatalities recorded in this table do not include accidents to coke-oven workers, as these have been eliminated in every case where sufficient information was given to identify the victim with the coking industry. The number of surface fatalities as shown is 3,573, representing 7.37 per cent of the total number killed in and about the mines. The rate per 1,000 men employed is 0.24. Of the total number killed 2,321 were at the surface workings of the anthracite mines and a large percentage of these were killed in the breakers. The accidents in the breakers have been included by reason of the fact that this is one of the branches of the industry which is absolutely necessary to prepare the coal for the market. The coke-oven fatalities of the bituminous field were eliminated for the reason that they are considered foreign to the preparation of the coal for market. It is a second step in which the coal, so to speak, is manufactured into another product.

Almost one-half of the surface fatalities are due to mine cars and locomotives and railway cars and locomotives, thus pointing out the need for closer supervision and better equipment of haulage systems. Boiler explosions and bursting steam pipes are responsible for 214 fatalities. Machinery claimed 775 victims, 629 of which were at the anthracite mines and include many breaker accidents.

TABLE 61.—NUMBER OF MEN KILLED BY **SURFACE ACCIDENTS** ABOUT THE COAL MINES OF THE UNITED STATES BY STATES, DURING PERIOD SHOWN ENDED DEC. 31, 1913, FOR WHICH CONTINUOUS RECORDS ARE AVAILABLE.[a]

State.	Period ending 1913.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total killed on surface.	Percentage of total killed.	Number killed per 1,000 employed.
		17	18	19	20	21	22			
	Years.									
Alabama	21	.....	.....	11	2	5	10	28	1.50	0.08
Alaska and California	4	.....	.....	.....	.....	.....	.....	0	.....	.....
Arkansas	9	.....	.....	1	.....	.....	.....	1	.94	.02
Colorado	28	21	1	3	3	7	14	49	2.82	.20
Georgia and North Carolina	5	.....	.....	.....	.....	.....	.....	0	.....	.....
Idaho and Nevada	4	.....	.....	.....	.....	.....	.....	0	.....	.....
Illinois	29	5	1	26	15	56	31	134	3.93	.10
Indiana	19	2	.....	.....	1	10	3	16	2.36	.05
Iowa	26	3	.....	.....	6	7	3	19	2.63	.06
Kansas	21	1	.....	2	1	8	5	17	3.22	.08
Kentucky	26	23	.....	2	3	9	10	47	7.40	.15
Maryland	23	12	.....	1	.....	4	5	22	10.00	.19
Michigan	14	.....	.....	.....	2	1	2	5	5.10	.11
Missouri	26	1	.....	1	.....	1	1	4	1.06	.02
Montana	14	.....	.....	3	.....	3	3	9	5.66	.22
New Mexico	21	2	.....	.....	1	.....	1	4	.70	.08
North Dakota	6	.....	.....	.....	.....	.....	.....	0	.....	.....
Ohio	30	22	2	6	18	20	19	87	3.80	.09
Oklahoma	21	4	.....	2	1	1	9	17	2.33	.13
Oregon	5	.....	.....	.....	.....	.....	.....	0	.....	.....
Pennsylvania (anthracite)	44	669	8	629	118	228	669	2,321	13.10	.45
Pennsylvania (bituminous)	36	161	14	57	35	46	92	405	4.28	.12
Tennessee	23	21	.....	1	1	3	7	33	3.84	.16
Texas	5	1	.....	.....	.....	.....	.....	1	4.00	.04
Utah	22	6	1	2	1	3	2	15	4.23	.39
Virginia	5	8	1	.....	.....	3	6	18	7.17	.46
Washington	25	12	.....	9	3	1	10	35	5.47	.33
West Virginia	29	156	13	19	2	28	61	279	5.88	.29
Wyoming	6	3	.....	.....	1	2	1	7	2.91	.15
Total	.....	1,133	41	775	214	446	964	3,573	7.37	.24

[a] This table is based on Table 5, and is for periods indicated, by States for which continuous records are available. It does not necessarily check with Tables 3 and 4, for the reason that the latter tables include intermittent records prior to the period having continuous records.

ACCIDENTS CLASSIFIED BY OCCUPATION.

Data for mine accidents as related to the occupation of the employee are far from complete. Many of the mine inspectors' reports give the occupation of the man who has been fatally injured, and from these reports it is an easy matter to actually compile figures for certain States showing the total number killed in each occupation. However, these reports, with but one or two exceptions, fail to give the actual number of men employed in the specified occupations, and since data of this character are lacking, it is not possible to arrive at any true comparative hazards for the various occupations. The fatality figures may show a larger number of men killed in one occupation, possibly ten times as many, than in some other class of work. At the same time, there may be twenty times as many men engaged in this particular work, so that the hazard would not be as great as indicated by the actual number of men killed. For example, there are rela-

tively few shot firers in the mines as compared with other underground employees, and the actual number of shot firers killed is therefore much smaller than in some other occupations, yet it is an extremely hazardous occupation. To obtain the relative hazard of each occupation the number engaged therein is necessary.

Mine inspectors' reports for the State of Pennsylvania from 1902 to 1913, inclusive, show both the number of men killed in certain of the principal occupations and the corresponding number of men employed therein. Table 62 shows fatalities by occupations in the anthracite mines from 1881 to 1913, inclusive. The corresponding number of men employed, however, is shown only for miners and

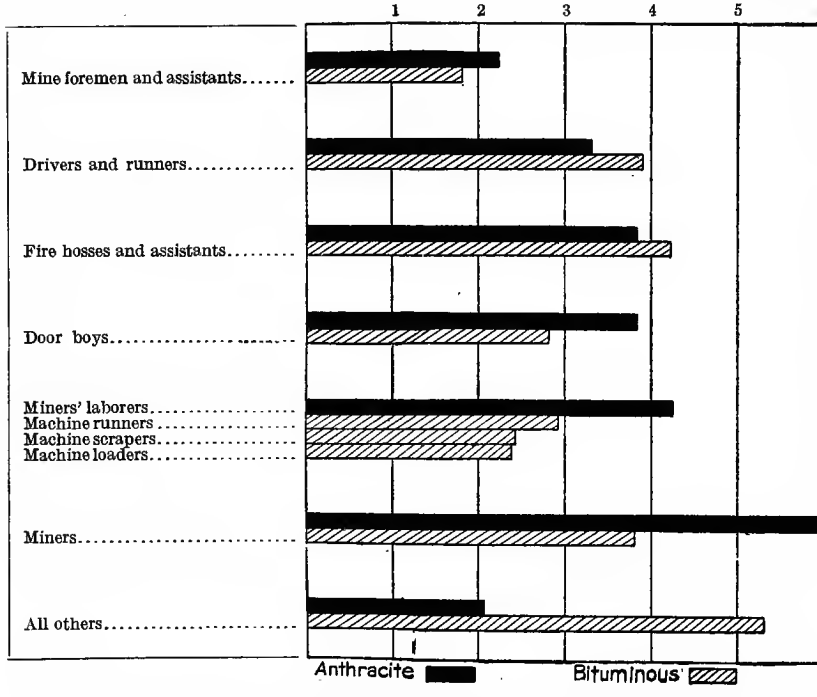

FIGURE 6.—Average number of men killed per thousand employed in anthracite and bituminous mines of Pennsylvania, by occupation, 1902–1913. (Based on Tables 62 and 63.)

miners' laborers. Beginning with 1900 complete figures to and including 1913 are given for the number killed, as well as the number employed in the various occupations. The highest fatality rate is for the anthracite miners, which averages for the period 1900 to 1913, 6 per 1,000 men employed. The fatality rate for the miners' laborers is 4.29 per 1,000 employed. The fatality rate for fire bosses and assistants is 3.86, as compared with 4.29 in the bituminous mines. The rate for mine foremen and assistants is also higher, being 2.28 as against 1.86 in the bituminous mines. The relative occupational hazards for the two periods covered, for both the anthracite and bituminous coal mines of Pennsylvania, are graphically shown in figure 6.

TABLE 62.—NUMBER OF MEN EMPLOYED, NUMBER KILLED PER 1,000 EMPLOYED, BY OCCUPATION, UNDER GROUND, IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1881 TO 1913, INCLUSIVE.[a]

[See fig. 6.]

Year.	Mine foremen and assistants.			Fire bosses and assistants.			Miners.			Miners' laborers.			Drivers and runners.			Door boys, etc.			All other underground employees.		
	Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.	
		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.
1881	.....	.....	.....	.....	5	.....	22,809	114	5.00	16,726	70	4.19	.....	28	.....	.....	17	.....	.....	4	.....
1882	.....	3	.....	.....	6	.....	22,843	135	5.91	15,229	56	3.68	.....	28	.....	.....	9	.....	.....	14	.....
1883	.....	2	.....	.....	1	.....	25,319	136	5.37	16,879	67	3.97	.....	47	.....	.....	18	.....	.....	3	.....
1884	.....	1	.....	.....	1	.....	27,100	132	4.87	19,006	81	4.13	.....	28	.....	.....	13	.....	.....	30	.....
1885	.....	.....	.....	.....	3	.....	28,305	160	5.65	20,128	86	4.27	.....	16	.....	.....	6	.....	.....	19	.....
1886	.....	2	.....	.....	2	.....	25,970	131	5.04	17,068	68	3.98	.....	18	.....	.....	6	.....	.....	9	.....
1887	.....	1	.....	.....	5	.....	29,558	102	3.45	17,548	57	3.25	.....	23	.....	.....	10	.....	.....	72	.....
1888	.....	1	.....	.....	2	.....	34,547	169	4.89	21,952	87	3.96	.....	33	.....	.....	9	.....	.....	16	.....
1889	.....	4	.....	.....	2	.....	30,504	194	6.36	19,368	79	4.08	.....	30	.....	.....	10	.....	.....	11	.....
1890	.....	1	.....	.....	5	.....	28,936	146	5.05	18,620	95	5.10	.....	37	.....	.....	8	.....	.....	31	.....
1891	.....	.....	.....	.....	6	.....	30,662	180	5.80	19,596	119	6.07	.....	38	.....	.....	7	.....	.....	22	.....
1892	.....	3	.....	.....	4	.....	30,779	189	5.85	22,110	111	5.02	.....	39	.....	.....	8	.....	.....	16	.....
1893	.....	3	.....	.....	1	.....	32,881	195	5.93	22,853	108	4.73	.....	47	.....	.....	12	.....	.....	22	.....
1894	.....	1	.....	.....	.....	.....	33,357	218	6.54	23,942	91	3.80	.....	38	.....	.....	5	.....	.....	15	.....
1895	.....	5	.....	.....	1	.....	34,553	179	5.18	24,638	115	4.67	.....	33	.....	.....	7	.....	.....	14	.....
1896	.....	3	.....	.....	4	.....	37,063	204	5.51	26,530	134	5.05	.....	46	.....	.....	10	.....	.....	29	.....
1897	.....	3	.....	.....	2	.....	36,932	210	5.69	27,277	99	3.63	.....	26	.....	.....	4	.....	.....	28	.....
1898	485	5	10.31	808	4	4.95	36,377	176	4.84	24,060	124	5.15	10,267	33	3.21	3,072	6	1.95	16,163	12	0.75
1899	.....	2	.....	.....	2	.....	36,421	199	5.46	23,946	114	4.76	.....	39	.....	.....	18	.....	.....	15	.....
1900	519	.....	.....	808	5	6.19	36,832	184	5.00	24,613	95	3.86	10,177	33	3.24	3,128	8	2.56	18,063	33	1.83
1901	539	5	9.28	830	2	2.41	37,804	224	5.93	26,265	122	4.64	10,894	45	4.13	3,148	6	1.91	18,951	37	1.95
1902	648	2	3.09	824	3	3.64	36,392	114	3.13	25,443	62	2.44	10,596	27	2.55	3,308	5	1.51	21,102	32	1.52
1903	666	3	4.50	841	2	2.38	36,823	204	5.54	27,533	110	4.00	11,251	46	4.09	3,087	12	3.89	21,854	51	2.33
1904	703	3	4.27	961	1	1.11	39,848	233	5.85	31,217	145	4.64	11,607	31	2.67	3,173	20	6.30	22,913	63	2.75
1905	734	1	1.36	932	2	2.15	42,078	308	7.32	31,967	148	4.63	12,069	31	2.57	3,284	14	4.26	25,307	47	1.86
1906	749	2	2.67	983	6	6.10	41,801	226	5.41	29,652	133	4.49	11,889	32	2.69	2,919	9	3.08	27,005	48	1.78
1907	868	2	2.30	017	2	2.18	43,035	309	7.18	29,984	136	4.54	11,810	46	3.90	2,711	18	6.64	28,524	88	3.09
1908	1,180	3	2.54	658	3	4.56	44,340	313	7.06	32,853	154	4.69	11,968	49	4.09	2,970	18	6.06	30,264	56	1.85
1909	1,203	1	.83	684	2	2.92	44,675	264	5.91	32,232	126	3.91	11,960	37	3.09	3,026	11	3.64	29,492	49	1.66
1910	1,252	2	1.60	707	2	2.83	43,651	254	5.82	32,040	147	4.59	11,580	40	3.45	2,432	6	2.47	29,871	58	1.94

1911	1,301	2	1.54	762	5	6.56	45,324	306	6.75	32,905	176	5.35	11,656	45	3.86	2,421	15	6.20	31,668	66	2.08
1912	1,299	1	.77	782	1	1.28	44,696	262	5.86	33,438	117	3.50	11,479	42	3.66	2,449	8	3.27	33,664	67	1.99
1913	1,510	3	1.99	778	8	10.28	44,346	286	6.45	33,973	148	4.36	11,463	33	2.88	2,611	7	2.68	33,986	72	2.12
Total (1900–1913)	13,171	30	2.28	11,407	44	3.86	581,645	3,487	6.00	424,115	1,819	4.29	180,407	537	3.35	40,667	157	3.86	372,664	767	2.06

[a] Compiled from annual reports of the Department of Mines, Harrisburg, Pa.

TABLE 63.—NUMBER OF MEN EMPLOYED AND NUMBER KILLED, CLASSIFIED BY OCCUPATION, IN THE BITUMINOUS MINES OF PENNSYLVANIA, 1902 TO 1913.[a]

[See fig. 6.]

Year.	Mine foremen and assistants.			Fire bosses and assistants.			Miners.			Machine runners.			Machine loaders.			Machine scrapers.			Drivers and runners.			Door boys and helpers.			All others.		
	Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.		Number employed.	Number killed.	
		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.		Total.	Per 1,000 employed.
1902	1,197	4	3.34	427	7	16.39	59,025	314	5.32	2,940	13	4.42	25,796	35	1.36	2,942	10	3.40	8,061	23	2.85	1,893	2	1.06	7,679	34	4.43
1903	1,327	1	.75	494	3	6.07	66,086	236	3.57	3,276	10	3.05	29,479	48	1.63	3,013	5	1.66	8,768	39	4.45	1,872	5	2.67	9,639	28	2.90
1904	1,307	1	.77	555	2	3.60	62,248	208	3.34	3,717	16	4.30	38,344	143	3.73	3,461	12	3.47	8,544	26	3.04	1,712	6	3.50	9,635	98	10.17
1905	1,372	2	1.46	591	5	8.46	66,814	261	3.91	3,816	13	3.41	38,156	77	2.02	3,671	7	1.91	9,421	38	4.03	1,831	3	1.64	10,218	38	3.72
1906	1,475	3	2.03	654	4	6.12	69,316	247	3.56	4,109	7	1.70	38,582	105	2.72	3,865	13	3.36	9,858	37	3.75	2,026	3	1.48	11,977	36	3.01
1907	1,556	2	1.29	741	8	10.80	72,169	362	5.02	4,191	19	4.53	40,879	172	4.21	4,001	8	2.00	10,649	79	7.42	2,172	22	10.13	14,013	94	6.71
1908	1,455	3	2.06	803	4	4.98	72,329	219	3.03	4,132	11	2.66	44,841	144	3.21	3,847	8	2.08	9,712	33	3.40	2,011	2	.99	13,406	126	9.40
1909	1,496	4	2.67	917	1	1.09	73,669	260	3.53	4,217	11	2.61	41,976	69	1.64	4,022	6	1.49	10,046	37	3.68	1,945	5	2.57	14,136	82	5.80
1910	1,541	3	1.95	1,036	1	.97	73,771	235	3.19	4,502	7	1.55	46,696	119	2.55	4,160	7	1.68	10,256	41	4.00	1,898	6	3.16	15,811	65	4.11
1911	1,813	0	.....	937	1	1.07	66,864	267	3.99	4,326	12	2.77	47,120	104	2.21	4,185	11	2.63	9,719	31	3.19	1,577	3	1.90	15,245	61	4.00
1912	2,036	4	1.96	968	2	2.07	60,964	215	3.53	4,315	7	1.62	47,660	43	.90	4,188	12	2.87	10,072	34	3.38	1,527	2	1.31	17,211	88	5.11
1913	2,220	8	3.60	975	1	1.03	59,986	254	4.23	4,608	15	3.26	54,026	134	2.48	4,312	13	3.01	10,659	41	3.85	1,387	4	2.88	18,101	91	5.03
Total	18,795	35	1.86	9,098	39	4.28	803,241	3,078	3.83	48,149	141	2.93	493,555	1,193	2.42	45,667	112	2.45	115,765	458	3.98	21,851	63	2.88	157,071	841	5.35

[a] Compiled from annual reports of the Department of Mines, Harrisburg, Pa.

Table 63 shows the number of men employed and number killed, classified by occupations, in the bituminous mines of Pennsylvania from 1902 to 1913, inclusive. During the 12-year period the fatality rate for miscellaneous employees was 5.35 per 1,000 men employed; fire bosses, 4.29; drivers and runners, 3.96; and miners, 3.83.

NONFATAL INJURIES IN COAL MINES IN THE UNITED STATES.

There are no complete records of the nonfatal injuries at the coal mines in the United States. In 1911 the bureau collected direct from the operators statistics relating to nonfatal injuries for that year. The number of serious [a] injuries reported was 9,106 and of slight injuries, 22,228. These reports were doubtless incomplete, as many of the mining companies were not keeping complete records of all accidents at their mines. Furthermore, there were but few compensation laws in effect which compelled the operators to keep records of nonfatal injuries.

The number killed per 1,000 employed in the metal mines is less than in the coal mines when compared on an equal time basis of 300-day workers. In view of this fact there is no reason to believe that the number of nonfatal injuries should be less in the coal mines than in the metal mines.

The best figures available on this subject are those collected by the United States Bureau of Mines for the metal-mining industry. The bureau has issued reports covering a period of four years, 1911 to 1914, in which the number of nonfatal accidents reported represent about 30 per 1,000 wherein the injured person was off duty 20 days or more by reason of disability. The bureau's reports show that approximately 150 men per 1,000 received minor injuries resulting in a disability varying from 1 to 20 days. These figures are based upon voluntary reports of the mining companies to the Bureau of Mines. Since there is no Federal law requiring these reports, it is believed that the above rates are too low. This view is supported by a special study of metal-mine accidents for 1914, which contains the reports of 258 companies whose accident records are reasonably complete. The study shows that 50 per 1,000 are seriously injured (disabled 20 days or more), while 270 per 1,000 are slightly injured (disabled 1 to 20 days). These injuries, however, apply only to, and are based on, 75,000 men employed either underground or in the open-pit mines, excluding all surface, shop, and mill men. Taking the average metal-mine rate for a period of four years as a basis of injuries in the coal mines, there would be approximately 22,900 persons seriously injured and 114,500 persons slightly injured each year.

[a] Serious injuries include those causing a loss of time of 20 days or more. A slight injury is one causing a loss of more than one day but less than 20.

In 1911 two-thirds of the serious and slight injuries in the coal mines were due to falls of roof and pillar coal and mine cars and locomotives. About one-half of the nonfatal injuries in the metal mines were due to these two causes, showing that there are more injuries in the coal mines from them than in the metal mines. The coal mines have a much larger area of roof exposed than do the metal mines, and in most cases the haulage system is more extensive by reason of the longer haul and the excess tonnage handled, thus increasing the coal-mine hazard as compared with metal mines. These being the principal causes of nonfatal injuries, there seems reason to believe that the above estimate is too low rather than too high.

Tables 64, 65, and 66 show the injuries as reported by the State mine inspectors in their latest published reports for the States indicated. These tables represent 6,719 injuries, which have been classified according to the part of the body injured, and also by causes. The accidents are also tabulated by States with reference to the part of the body injured and the cause of the injury. These tables are far from being complete, inasmuch as they represent only the more serious injuries. For example, the report for Illinois includes only those accidents in which the injury resulted in a loss of 30 days' time or more. In some of the States no time is specified and no statement given to indicate what class of injuries is included in the report.

These tables will be of some assistance to the hospital department of the various coal mines, inasmuch as they point out the part of the body receiving the most injuries and will give the surgeons and others an idea as to the surgical equipment necessary to properly take care of the injuries to be expected in and about the coal mines.

NUMBER AND PERCENTAGE OF INJURIES RECEIVED BY MEN EMPLOYED IN AND ABOUT COAL MINES, BY PARTS INJURED.

[See also fig. 7.]

	Number.	Percentage.
Head	427	6.36
Face	290	4.32
Shoulders	330	4.91
Arms	544	8.10
Hands	948	14.11
Body	1,190	17.71
Hip and pelvis	281	4.18
Legs	1,987	29.57
Feet	722	10.74
Total	6,719	100.00

With the enactment of compensation laws in the various States, it is hoped that in the near future there will be more complete data available to afford a basis for a detailed study of nonfatal injuries.

However, sufficient data concerning fatal injuries have been collected and tabulated herein to form a basis for an intensive study of the various accidents by causes. Any safety device, rule, regulation, law, or instruction to miners that will reduce fatal accidents will also reduce the nonfatal accidents. The difference between the two

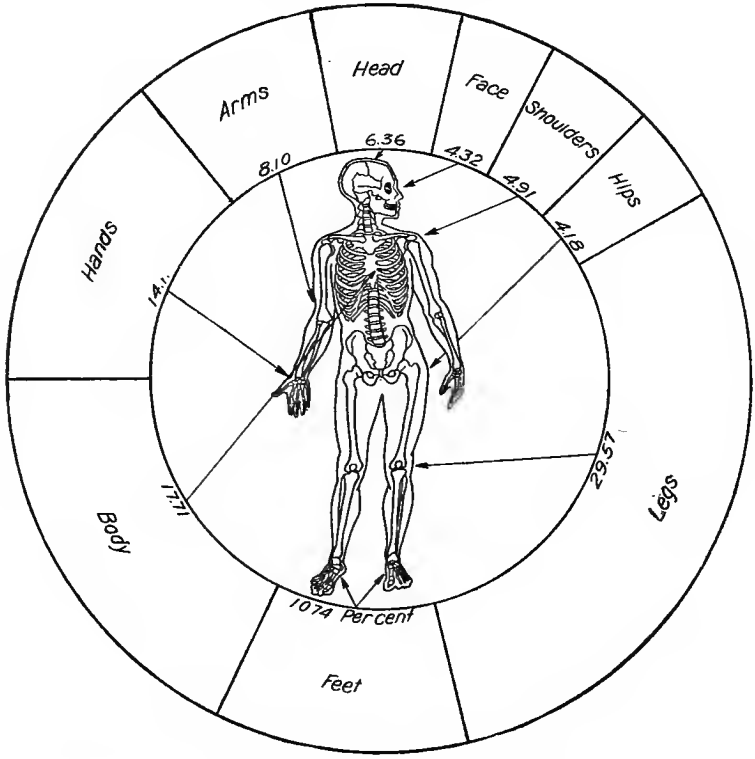

FIGURE 7.—Analysis of nonfatal injuries showing part of body injured and percentage for each location. (Based on Table 66.)

classes of accidents is only one of degree or severity. The cause still remains the same: fall of rock, mine car, or explosive. If a falling rock strikes a man on the head or body it may kill him, but if it strikes only his foot or hand, seriously injuring him, the cause, fall of rock, is the same. By removing the cause of fatal accidents, the number of nonfatal accidents will be greatly reduced.

TABLE 64.—NUMBER AND CAUSES OF NONFATAL INJURIES IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING 1913 OR NEAREST YEAR FOR WHICH RECORDS ARE AVAILABLE, BY STATES.[a]

[Data not available for States not listed.]

State.	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Falls of persons.	Falling objects (other than a and b).	Flying objects.	Rush of coal or gob in chute or bin.	Hand tools.	Machinery.	Ropes and cables.	Cages or skips.	Boilers and steam pipes.	Lifting (strains).	Timber.	Railroad cars.	Nails and splinters.	Running into or against objects.	Explosions of oil or gasoline.	Total.
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	
Arkansas	32	2	30	13	....	4	....	....	2	4	....	4	5	....	....	2	1	....	....	....	2	1	....	....	....	....	102
Illinois	145	144	161	11	....	9	....	2	22	18	....	22	13	21	....	14	4	....	13	2	13	28	....	1	4	....	647
Indiana	112	28	145	12	....	29	....	1	32	14	....	6	2	3	....	5	....	1	6	3	....	4	1	....	1	1	406
Iowa	67	18	52	....	....	3	....	....	10	2	....	3	3	....	....	....	1	....	2	....	....	2	....	....	1	....	164
Kansas	120	19	140	28	....	17	3	....	5	....	....	6	3	8	....	2	3	....	3	....	7	4	....	1	....	....	369
Maryland	46	15	48	....	....	1	....	....	4	....	....	5	3	....	....	7	2	....	1	....	7	4	....	1	....	....	144
Missouri	36	7	19	1	....	....	....	....	4	1	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	....	70
Montana	30	17	38	....	....	4	....	....	....	1	....	....	1	....	....	1	....	....	....	....	....	2	1	....	....	....	95
North Dakota	2	7	3	....	....	8	....	....	....	....	....	....	....	1	....	1	....	....	3	....	....	....	....	....	....	....	25
Ohio	240	45	173	5	....	13	....	4	10	47	....	5	2	3	....	8	8	....	1	3	....	6	1	....	4	....	578
Oklahoma	27	4	26	6	....	2	....	....	3	3	....	....	....	1	....	1	....	....	8	2	1	1	....	....	....	....	85
Pennsylvania (anthracite)	262	104	296	88	....	95	....	2	26	2	....	37	10	5	....	9	23	....	6	8	....	32	8	....	2	....	1,015
Pennsylvania (bituminous)	419	158	339	4	1	48	....	2	14	38	....	14	7	2	....	2	15	....	3	3	....	2	3	....	....	2	1,076
Texas	1	7	20	1	....	1	....	....	3	....	....	3	....	1	....	2	1	....	2	....	1	1	....	3	....	....	47
Utah	7	4	24	....	....	1	....	....	1	4	....	3	....	1	....	1	....	....	....	3	....	1	....	....	....	....	50
Virginia	81	25	114	2	....	6	....	18	3	2	....	8	13	3	....	19	22	....	....	....	1	16	....	12	2	....	347
Washington	225	89	124	28	2	8	....	4	7	....	....	56	12	59	11	70	12	15	2	2	32	52	3	13	2	2	830
West Virginia	243	72	240	6	....	32	....	1	7	31	....	9	5	....	....	4	6	1	1	....	1	2	6	1	....	1	669
Total	**2,095**	**765**	**1,892**	**205**	**3**	**281**	**3**	**34**	**153**	**167**	....	**181**	**79**	**108**	**11**	**149**	**98**	**17**	**51**	**26**	**65**	**159**	**23**	**32**	**16**	**6**	**8,719**

[a] Compiled from State mine inspector's reports. These figures represent only the more serious injuries, the minimum range of disability being 7 to 30 days. They are not uniform for the various States, simply being all that were published in the various inspectors' reports during a period of one year.

TABLE 65.—NUMBER OF NONFATAL INJURIES, SHOWING PARTS OF BODY INJURED, IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING 1913 OR NEAREST YEAR FOR WHICH RECORDS ARE AVAILABLE, BY STATES.[a]

[Data not available for States not listed.]

Part of body injured.	Arkansas.	Illinois.	Indiana.	Iowa.	Kansas.	Maryland.	Missouri.	Montana.	North Dakota.	Ohio.	Oklahoma.	Pennsylvania (anthracite).	Pennsylvania (bituminous).	Texas.	Utah.	Virginia.	Washington.	West Virginia.	Total.
Head injured	13	36	20	6	15	6	5	4	3	49	9	100	48	3	3	29	49	29	427
Face burned	2	3	10	.....	12	.....	.....	1	.....	4	2	26	7	.....	.....	5	15	7	84
Eye injured	.....	12	3	.....	17	.....	1	.....	.....	5	1	4	2	1	.....	13	60	2	121
lost	.....	7	3	.....	.....	.....	.....	.....	1	.....	1	2	2	.....	.....	.....	.....	3	19
Eyes injured	1	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	1	1	.....	2	10
lost	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	1	5
Nose broken	1	1	1	2	.....	.....	.....	.....	.....	.....	1	4	5	.....	.....	.....	2	1	18
Jaw broken	.....	3	1	2	.....	.....	.....	.....	.....	1	.....	6	4	.....	.....	.....	.....	6	23
Collar bone broken	.....	15	12	8	1	1	2	3	.....	9	1	16	48	1	3	.....	3	16	139
Arm injured	5	11	10	1	0	4	.....	1	.....	8	1	12	8	1	.....	16	22	6	115
burned	2	2	6	.....	6	.....	.....	.....	.....	1	1	14	4	.....	.....	3	5	3	47
broken	3	19	27	9	3	4	1	4	.....	17	.....	82	63	4	3	4	3	37	283
lost	.....	1	1	.....	.....	.....	.....	.....	.....	2	.....	1	6	.....	.....	.....	.....	3	14
Arms injured	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	3
broken	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	9	.....	.....	.....	.....	1	11
lost	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Wrist injured	1	6	.....	.....	3	.....	1	.....	.....	2	1	2	.....	.....	.....	5	9	4	34
broken	.....	3	3	1	2	.....	.....	.....	.....	3	.....	10	0	.....	1	3	.....	2	37
Hand injured	3	16	9	3	20	14	1	3	1	24	4	16	16	.....	4	19	74	5	241
burned	5	5	16	1	19	.....	1	1	.....	4	3	41	12	.....	.....	8	17	10	143
broken	.....	6	3	1	.....	.....	.....	1	.....	1	.....	2	.....	.....	.....	2	1	3	20
lost	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	4	4	.....	1	.....	.....	2	13
Hands injured	.....	1	1	1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	4	.....	9
broken	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
lost	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Thumb injured	1	13	4	1	8	2	.....	.....	.....	4	.....	.....	1	.....	.....	4	32	.....	70
broken	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	2	4	.....	9
lost	.....	8	3	1	.....	.....	.....	1	.....	3	.....	1	4	.....	.....	.....	1	2	19
Finger injured	.....	28	6	.....	42	8	2	1	.....	22	5	7	.....	.....	2	27	55	.....	205
broken	.....	6	.....	3	1	3	1	.....	.....	1	.....	4	1	1	.....	2	13	2	38
lost	.....	12	15	4	3	1	.....	.....	.....	4	1	8	15	1	.....	1	2	11	78
Fingers injured	6	4	5	1	4	3	.....	.....	.....	6	.....	3	3	.....	.....	6	9	2	52
broken	.....	1	2	.....	1	.....	.....	.....	.....	1	.....	2	4	.....	.....	2	1	1	15
lost	.....	1	2	2	.....	.....	.....	.....	.....	3	.....	6	12	.....	.....	1	2	6	35

Shoulder injured	4	15	11	5	7	4	4	2		27	1	7	10			11	32	11	151
broken		5	3	1					1	2		11	14			1		2	46
Body injured	6	53	9	5	5	3	6	5	12	24	8	39	44	5	1	10	43	19	297
burned	4	4	8	1	2			2		1	1	24	4	2	2	3	1	4	63
Rib broken	1	7	13	5	1	1	2			6	2	12	13	2	1	2	8	7	83
Ribs broken	3	9	16	8	2	8	5	3		12	4	40	33	1	2	1	10	19	176
Back injured	10	52	23	6	38	19	8	2		47	11	45	42	2	3	21	76	48	453
broken	1	4	2	1	1	1	2	1		1		8	17	1	1	1		11	53
Hip or hips injured	4	21	24	9	3	2	6	5		36	2	23	27	1		13	19	26	221
broken			3	3			2		1	2		3	5	1		1	2	3	26
Pelvis broken		4		1						1		9	8			1	2	8	34
Leg injured	8	49	21	14	33	15	6	7		59	8	27	47	1		20	69	18	402
burned												1	1			1			3
broken	3	67	53	28	8	6	5	26	1	62	7	285	357	6	9	16	14	196	1,149
lost		2								2		2	3		1	1		7	18
Legs injured		4	1	2		2		1		5			5	2	1	1	3		27
broken				1				3		3	1	12	16				1	4	41
lost																		1	1
Knee injured		11	3	2	20			4		6	1	4	3		1	7	34	5	101
Foot injured	8	50	23	10	39	22	4	8	2	63	4	24	34	9	4	60	73	34	471
broken	1	21	11	4	2		1	3		5		8	13			1	2	12	84
lost										1		3	7					10	21
Feet injured		1										3					1	4	9
broken																			0
lost																			0
Ankle injured	3	19	9	4	22	3	1	2		22	1	6	16		1	10	32	7	158
broken		8	3	2		1	1		3	2		19	26	1	2		1	18	87
Ankles injured																			0
broken																			0
Toe injured		4		1	3	2				5	1	2	5	1	1	6	10	1	42
broken		7		1	2					1		3	5			2	5	2	28
lost	1									1		2	3			1		6	14
Toes injured		7	1		1	1	1			2	1	1	7		2		2	1	27
broken		2	1	1		3	1					3						2	13
lost		1		1				1					5			1		4	13
Internal injuries	1		2	1	2					5	1	12	13			1	4	10	52
Rupture (hernia)		2	1		2	3											3	2	13
Total	102	647	406	164	369	144	70	95	25	578	85	1,015	1,076	47	50	347	830	669	6,719

[a] See footnote, Table 64.

TABLE 66.—NUMBER AND CAUSES OF NONFATAL INJURIES, SHOWING PARTS OF BODY INJURED, IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING 1913 OR NEAREST YEAR FOR WHICH RECORDS ARE AVAILABLE.[a]

Part of body injured.	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Falls of persons.	Falling objects (other than a and b).	Flying objects.	Rush of coal or gob in chute or bin.	Hand tools.	Machinery.	Ropes and cables.	Cages or skips.	Boilers and steam pipes.	Lifting (strains).	Timber.	Railroad cars.	Nails and splinters.	Running into or against objects.	Explosions of oil or gasoline.	Total.
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	
Head injured	179	37	52	4	....	55	3	....	20	2	....	17	8	5	1	4	7	1	4	3	....	19	2	....	4	....	427
Face burned	....	....	....	54	1	28	....	7	....	....	....	....	....	2	....	....	....	....	....	2	....	....	....	....	....	....	2	84
Eye injured	16	5	1	....	....	4	....	1	3	....	....	....	1	82	....	2	1	....	....	....	....	3	....	....	1	1	121
lost	1	....	....	....	....	7	....	....	....	....	....	....	....	8	....	3	....	....	....	....	....	....	....	....	....	....	19
Eyes injured	....	....	....	....	....	8	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	10
lost	....	....	....	....	....	3	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	5
Nose broken	8	1	1	....	....	1	....	....	2	1	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	18
Jaw broken	5	....	7	....	....	3	....	....	4	....	....	1	....	2	....	1	....	....	....	....	....	....	....	....	....	....	23
Collar bone broken	25	31	64	1	....	....	....	....	5	1	....	2	2	....	....	....	1	....	....	....	....	4	....	....	3	....	139
Arm injured	30	12	34	....	....	4	....	....	5	2	....	4	....	1	....	6	7	....	1	....	1	6	....	1	1	....	115
burned	....	....	....	27	....	15	....	4	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	47
broken	87	27	95	....	....	8	....	....	12	6	....	23	4	....	....	2	9	....	2	1	....	6	1	....	....	....	283
lost	3	1	5	....	....	2	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	14
Arms injured	2	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
broken	3	....	6	....	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	11
lost	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0
Wrist injured	7	2	12	....	....	....	....	....	....	....	....	4	....	....	....	7	....	....	....	....	1	....	....	....	1	....	34
broken	6	4	14	....	....	....	....	....	4	....	....	5	....	....	....	....	....	....	....	....	....	2	....	....	....	....	37
Hand injured	51	16	99	....	....	7	....	1	1	6	....	3	5	2	1	25	9	2	1	....	....	8	1	3	....	....	241
burned	....	....	....	80	2	44	....	12	....	....	....	....	....	....	....	....	1	....	....	4	....	....	....	....	....	....	1	143
broken	5	1	3	....	....	1	....	....	2	1	....	1	3	1	....	....	1	....	....	....	....	1	....	....	....	....	20
lost	1	1	4	....	....	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	13
Hands injured	1	....	3	1	....	1	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	1	....	....	9
broken	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0
lost	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1

Thumb injured	15	8	19	....	....	1	....	....	....	....	....	....	1	....	1	15	4	1	....	....	....	4	....	1	....	....	70
broken	1	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	1	....	....	....	....	9
lost	1	1	9	....	....	2	....	....	....	1	....	....	....	....	....	2	2	....	....	....	....	....	1	....	....	....	19
Finger injured	35	21	92	....	....	....	....	....	2	7	....	....	3	....	....	21	7	3	....	....	....	10	1	2	1	....	205
broken	10	7	10	....	....	....	....	....	....	2	....	....	1	....	....	3	1	....	....	....	....	4	....	....	....	....	38
lost	9	4	40	....	....	3	....	....	1	5	....	....	2	....	....	4	6	2	....	....	....	2	....	....	....	....	78
Fingers injured	1	4	31	....	....	....	....	....	....	6	....	....	1	1	....	2	2	1	....	1	....	....	....	2	....	....	52
broken	2	....	8	....	....	....	....	....	....	1	....	....	....	....	....	1	2	....	1	....	....	....	....	....	....	....	15
lost	2	1	15	....	....	5	....	....	....	4	....	....	....	....	....	....	6	....	....	....	....	1	....	....	....	1	35
Shoulder injured	63	16	45	....	....	2	....	....	4	....	....	6	1	....	2	1	....	....	1	....	....	8	1	....	1	....	151
broken	9	9	18	....	....	1	....	....	1	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	40
Body injured	79	35	109	....	....	13	....	4	17	4	....	10	3	....	....	2	4	....	2	1	6	5	3	....	....	....	297
burned	....	....	....	36	....	18	....	4	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	1	63
Rib broken	37	6	24	....	....	1	....	....	4	1	....	7	....	....	....	....	1	....	....	....	....	2	....	....	....	....	83
Ribs broken	64	14	66	....	....	2	....	....	7	....	....	11	1	....	....	3	2	....	2	....	....	4	....	....	....	....	176
Back injured	249	47	71	....	....	4	....	....	3	4	....	15	4	....	3	....	....	....	5	1	42	5	....	....	....	....	453
broken	42	6	4	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	53
Hip or hips injured	82	14	95	....	....	....	....	....	9	2	....	6	1	....	....	....	1	....	3	....	2	4	1	....	1	....	221
broken	13	3	7	....	....	....	....	....	....	....	....	2	....	....	....	....	1	....	....	....	....	....	....	....	....	....	26
Pelvis broken	12	6	13	....	....	1	....	....	1	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	34
Leg injured	109	58	157	....	....	6	....	....	18	13	....	7	4	....	2	9	3	3	1	2	....	10	....	....	....	....	402
burned	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	....	3
broken	474	212	327	1	....	17	....	....	14	26	....	26	7	....	....	3	6	1	5	4	....	20	5	....	1	....	1,149
lost	2	2	7	....	....	....	....	....	....	4	....	....	....	....	....	....	1	....	....	....	....	....	2	....	....	....	18
Legs injured	4	3	15	....	....	1	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	....	1	....	27
broken	18	8	13	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	41
lost	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Knee injured	30	18	26	....	....	1	....	....	2	1	....	11	....	1	....	3	....	1	2	....	1	....	3	1	....	....	101
Foot injured	123	57	172	....	....	....	....	....	6	28	....	7	14	....	....	22	4	1	5	....	....	11	2	19	....	....	471
broken	32	11	31	....	....	1	....	....	....	4	....	1	2	....	....	1	....	....	....	....	....	....	1	....	....	....	84
lost	6	....	9	....	....	....	....	....	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	21
Feet injured	4	1	2	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
broken	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0
lost	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0
Ankle injured	40	25	70	....	....	....	....	....	....	1	....	8	1	2	....	2	2	....	1	1	....	5	....	....	....	....	158
broken	35	15	21	....	....	....	....	....	2	4	....	1	1	....	....	....	....	....	4	....	....	4	....	....	....	....	87
Ankles injured	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0
broken	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0
Toe injured	12	2	11	....	....	....	....	....	....	4	....	....	5	....	1	2	1	....	1	....	....	3	....	....	....	....	42
broken	7	4	6	....	....	....	....	....	1	5	....	....	2	....	....	1	....	....	....	....	....	2	....	....	....	....	28
lost	3	....	5	....	....	....	....	....	....	3	....	....	1	....	....	....	....	....	....	....	....	1	1	....	....	....	14
Toes injured	9	2	13	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	27
broken	3	2	4	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	13
lost	6	1	3	....	....	....	....	....	....	2	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	13
Internal injuries	20	4	15	1	....	....	....	....	3	1	....	2	1	....	....	....	....	....	3	....	2	....	....	....	....	....	52
Rupture (hernia)	2	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9	....	....	....	....	....	13
Total	2,095	765	1,992	205	3	281	3	34	153	167	....	181	79	108	11	149	98	17	51	26	85	159	23	32	16	6	8,719

[a] See footnote, Table 64.

FATALITIES AT BITUMINOUS COAL MINES.

Inasmuch as bituminous coal mining differs so much from the mining of anthracite, Tables 67 and 68, covering the bituminous coal-mining industry from 1890 to and including 1914, have been compiled. Complete data prior to 1890 would be desirable, but for a study of present-day mine accidents it is believed that these tables go back sufficiently far to show the actual hazards of the bituminous mines.

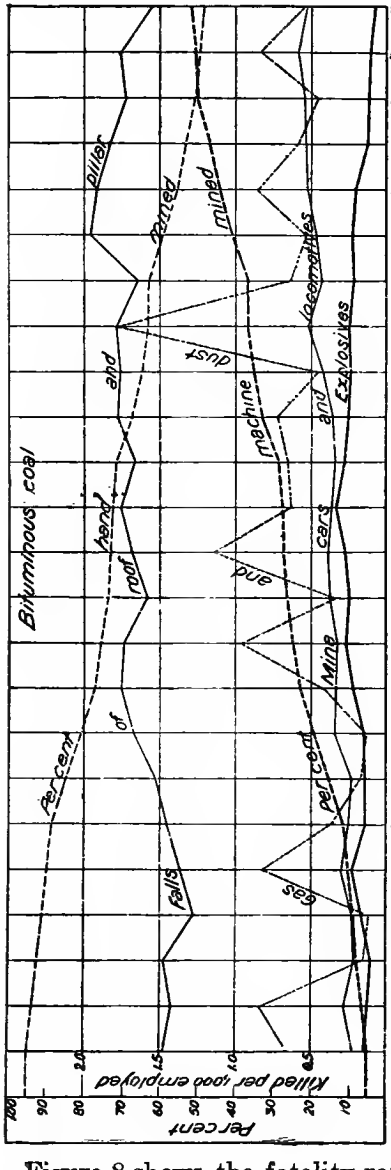

FIGURE 8.—Fatality rates, by principal causes, in bituminous coal mines of the United States, 1891–1914, as compared with the increase in the percentage of machine-mined coal. (Based on Table 68.)

The total production and the number of men employed in all bituminous mines of the United States are given in Table 67. In the second part of the same table are given the production and number of men employed in those States which are under inspection service and for which accident records are available. In 1890, 89.60 per cent was represented by inspection States, whereas for the same year 85.96 per cent of the employees were in the same group.

Table 68 shows the fatalities at bituminous mines by the same groups of causes as in Tables 4, 5, and 6, which include the anthracite mines. It also shows the actual number killed in each group and the percentage of fatalities due to each class, as well as the number killed per 1,000 men employed.

Figure 8 shows the fatality rates by principal causes from 1891 to 1914. In 1890 the number killed by falls of roof and pillar coal per 1,000 men employed was 1.259. This rate gradually increased until

TABLE No. 67.—PRODUCTION, EMPLOYEES, AND FATALITIES, SHOWING PERCENTAGE OF BITUMINOUS COAL-MINING INDUSTRY FOR WHICH COMPLETE RETURNS ARE AVAILABLE, 1890 TO 1914.

Year.	Total for United States.[a]					Total for States having inspection service, or reporting accidents.							
				Average tonnage.		Production.		Number employed.		Number killed.			Production per death.
	Production (short tons).	Number employed.	Days worked.	Per man per year.	Per man per day.	Short tons.	Per cent of total.	Number.	Per cent of total.	Total.	Per 1,000 employed.	Per million tons mined.	
1890	111,302,322	192,204	226	579	2.56	99,723,850	89.60	165,217	85.96	355	2.15	3.56	280,912
1891	117,901,238	205,803	223	573	2.57	106,989,544	90.75	184,333	89.57	528	2.86	4.94	202,632
1892	126,856,567	212,893	219	596	2.72	113,236,126	89.26	188,090	88.35	573	3.05	5.06	197,620
1893	128,385,231	230,365	204	557	2.73	123,648,977	96.31	222,147	96.43	503	2.26	4.07	245,823
1894	118,820,405	244,603	171	486	2.84	110,218,498	92.76	227,039	92.82	513	2.26	4.65	214,851
1895	135,118,193	239,962	194	563	2.90	132,104,933	97.77	233,107	97.14	721	3.09	5.46	183,225
1896	137,640,276	244,171	192	564	2.94	130,776,747	95.01	231,486	94.80	582	2.51	4.45	224,702
1897	147,617,519	247,817	196	596	3.04	142,120,157	96.28	238,701	96.32	567	2.38	3.99	250,653
1898	166,593,623	255,717	211	651	3.09	160,351,393	96.25	246,337	96.33	651	2.64	4.06	246,316
1899	193,323,187	271,027	234	713	3.05	183,575,167	94.96	255,999	94.46	780	3.05	4.25	235,353
1900	212,316,112	304,375	234	697	2.98	202,796,482	95.52	288,242	94.70	1,078	3.74	5.32	188,123
1901	225,828,149	340,235	225	664	2.94	223,977,380	99.18	335,498	98.61	1,061	3.16	4.74	211,100
1902	260,216,844	370,056	230	703	3.06	255,313,471	98.12	362,076	97.84	1,424	3.93	5.58	179,293
1903	282,749,348	415,777	225	680	3.02	277,457,563	98.13	406,098	97.67	1,408	3.47	5.07	197,058
1904	278,659,689	437,832	202	637	3.15	266,008,103	95.46	417,512	95.36	1,400	3.35	5.26	190,006
1905	315,062,785	460,629	211	684	3.24	308,719,393	97.99	449,962	97.68	1,588	3.53	5.14	194,408
1906	342,874,867	478,425	213	717	3.36	334,673,477	97.61	467,928	97.81	1,581	3.38	4.72	211,685
1907	394,759,112	513,258	234	769	3.29	392,288,224	99.37	507,379	98.85	2,534	4.99	6.46	154,810
1908	332,573,944	516,264	193	644	3.34	326,041,103	98.04	504,699	97.76	1,767	3.50	5.42	184,517
1909	379,744,257	[b] 499,751	.....	760	.....	379,736,904	99.99	499,734	99.99	2,075	4.15	5.46	183,006
1910	417,111,142	555,533	217	751	3.46	417,111,142	100.00	555,533	100.00	2,220	4.00	5.32	187,888
1911	405,907,059	[c] 554,408	211	738	3.50	405,907,059	100.00	554,408	100.00	1,957	3.53	4.82	207,413
1912	450,104,982	548,632	223	820	3.68	450,104,982	100.00	548,632	100.00	1,818	3.31	4.04	247,582
1913	478,523,203	571,899	232	837	3.61	478,523,203	100.00	571,899	100.00	2,167	3.79	4.53	220,823
1914	422,703,970	583,506	207	673	3.25	422,703,970	100.00	583,506	100.00	1,859	3.19	4.40	227,382

[a] Mineral Resources, U. S. Geol. Survey.

[b] Bureau of Census.

[c] Bureau of Mines.

TABLE 68.—FATALITIES IN BITUMINOUS COAL MINES OF THE UNITED STATES, BY PRINCIPAL CAUSES, 1890 TO 1914 (FOR INSPECTION STATES ONLY).

Year.	Falls of roof and pillar coal. (1 and 2)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives.[a] (6)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 16)			Total surface fatalities. (17 to 22)			Grand total.		Number men employed.[b]
	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.	
1890	208	58.59	1.259	27	7.60	0.163	6	1.69	0.036	30	8.45	0.182	47	13.24	0.285	21	5.92	0.127	16	4.51	0.097	355	2.149	165,217
1891	272	51.52	1.476	39	7.39	.211	124	23.48	.673	31	5.87	.168	25	4.73	.136	17	3.22	.092	20	3.79	.108	528	2.864	184,333
1892	267	46.60	1.419	56	9.77	.298	158	27.58	.840	26	4.54	.138	29	5.06	.154	25	4.36	.133	12	2.09	.064	573	3.046	188,090
1893	329	65.41	1.481	46	9.15	.207	39	7.75	.176	24	4.77	.108	16	3.18	.072	32	6.36	.144	17	3.38	.076	503	2.264	222,147
1894	293	57.12	1.290	52	10.14	.229	29	5.65	.128	42	8.19	.185	51	9.94	.225	27	5.26	.119	19	3.70	.084	513	2.266	227,039
1895	318	44.10	1.364	70	9.71	.300	193	26.77	.828	53	7.35	.227	34	4.72	.146	31	4.30	.133	22	3.05	.095	721	3.093	233,107
1896	337	57.90	1.456	62	10.65	.268	86	14.78	.371	37	6.36	.160	22	3.78	.095	23	3.95	.099	15	2.58	.065	582	2.514	231,486
1897	366	63.49	1.508	55	9.70	.230	47	8.29	.197	40	7.06	.168	22	3.88	.092	22	3.88	.092	21	3.70	.088	567	2.375	238,761
1898	415	63.75	1.685	84	12.90	.341	35	5.37	.142	41	6.30	.167	22	3.38	.089	21	3.23	.085	33	5.07	.134	651	2.643	246,337
1899	445	57.05	1.738	84	10.77	.328	103	13.20	.462	58	7.44	.227	30	3.85	.117	28	3.59	.110	32	4.10	.125	780	3.047	255,990
1900	498	46.19	1.728	94	8.72	.326	282	26.16	.978	79	7.33	.274	48	4.45	.167	42	3.90	.146	35	3.25	.121	1,076	3.746	288,242
1901	535	50.42	1.595	127	11.97	.378	123	11.59	.367	83	7.82	.247	117	11.03	.349	44	4.15	.131	32	3.02	.095	1,061	3.162	335,408
1902	611	42.91	1.687	144	10.11	.398	413	29.00	1.141	99	6.95	.273	70	5.55	.218	44	3.09	.122	34	2.39	.094	1,424	3.933	362,676
1903	711	50.50	1.751	151	10.72	.372	262	18.61	.645	138	9.80	.339	50	3.55	.123	38	2.70	.094	58	4.12	.143	1,406	3.467	406,098
1904	697	49.79	1.669	144	10.29	.345	271	19.36	.649	121	8.64	.290	56	4.00	.134	59	4.21	.141	52	3.71	.125	1,400	3.353	417,512
1905	801	50.44	1.780	165	10.39	.367	316	19.90	.702	119	7.49	.264	80	5.04	.178	36	2.27	.080	71	4.47	.158	1,566	3.529	449,962
1906	826	52.25	1.765	189	11.95	.404	219	13.85	.468	115	7.27	.246	82	5.19	.175	73	4.62	.156	77	4.87	.165	1,581	3.378	467,928
1907	911	35.95	1.796	256	10.10	.504	911	35.95	1.796	134	5.29	.264	152	6.00	.299	59	2.33	.116	111	4.38	.219	2,534	4.994	507,379
1908	829	46.91	1.643	222	12.56	.446	320	18.11	.634	109	6.17	.216	157	8.89	.311	53	3.00	.105	77	4.36	.152	1,767	3.501	504,699
1909	975	46.99	1.951	236	11.37	.472	264	12.72	.528	122	5.88	.244	368	17.74	.737	37	1.78	.074	73	3.52	.146	2,075	4.152	499,734
1910	1,091	47.79	1.910	287	12.93	.516	477	21.49	.859	113	5.09	.203	130	5.86	.234	60	2.70	.108	92	4.14	.166	2,226	3.986	555,533
1911	1,007	51.46	1.816	290	14.82	.523	331	16.91	.597	72	3.68	.130	140	7.15	.253	31	1.58	.056	86	4.40	.155	1,957	3.530	554,408
1912	943	51.87	1.719	292	16.06	.532	255	14.02	.465	70	3.85	.128	123	6.77	.224	39	2.15	.071	96	5.28	.175	1,818	3.314	548,632
1913	1,007	46.47	1.761	339	15.64	.593	464	21.41	.811	63	2.91	.110	166	7.66	.290	32	1.48	.056	66	4.43	.168	2,167	3.786	571,899
1914	903	48.58	1.548	304	16.35	.521	305	16.41	.523	56	3.01	.096	146	7.85	.250	41	2.21	.070	104	5.59	.178	1,859	3.186	583,506

[a] See also figures 5 and 8.

[b] See also Table 67.

in 1909 it was 1.951. Since 1909 the rate has been decreasing until in 1914 it was 1.548 per 1,000 men employed. With reference to mine cars and locomotives the fatality rate per 1,000 men employed in 1890 was 0.163. The rate increased quite uniformly to 0.593 per 1,000 employed in 1913. The rate for 1914 was slightly lower. The fatality rates due to gas and dust explosions have been very erratic, reaching the highest point in 1907, when the rate was 1.796 per 1,000 employed. Since the year 1907 this rate has decreased, although irregularly, to 0.523 per 1,000 employed in 1914.

The fatality rate due to explosives gradually increased from 1890, during which year the rate was 0.182 per 1,000 employed, to 1903, when it reached its highest point, 0.339 per 1,000. Since the introduction of permissible explosives and more strict rules concerning the handling and use of explosives, together with more efficient mine-inspection service, the fatality rate has gradually decreased until in 1914 the number killed per 1,000 employed was 0.096. This reduction is illustrated in figures 5 and 8.

The number of accidents at shafts has decreased slightly, whereas the number of those on the surface shows a gradual increase.

The percentage of coal mined by machines since 1891, when the first records are available, is shown in figure 10. In 1891 only 5.26 per cent of the bituminous coal was mined by machines. The quantity has steadily increased year by year until in 1914, 51.7 per cent of the coal was reported as machine mined. The upper curve in figure 10 includes all hand-mined coal as well as that shot off the solid as distinguished from the machine product. Details of accidents as related to machine mining follow.

MACHINE MINING.

A study of coal-mine accidents would not be complete without some reference to machine mining. It would be very desirable, indeed, if it were possible to tabulate data for a period of years, showing the actual number of men employed in machine-worked mines, together with the corresponding casualties occurring therein. Data of this character are not available, however, and hence it is impossible to make such a study. The United States Geological Survey, however, has for a number of years, 1896–1913, collected and published data showing the percentage of coal mined by machines in each State, and this information is used as a basis for the study of mine accidents as tabulated herein.

In comparing figures of production, number of men employed, fatalities, etc., for the 18-year period, those States have been included in which complete accident-fatality records and the number of employees are available. Inasmuch as details are lacking to show the number of mines where mining machines are used, the only other alternative whereby comparative results may be obtained is to group the States according to the percentage of coal mined by

TABLE 69.—NUMBER OF MACHINES USED IN THE VARIOUS COAL-MINING STATES.[a]

State.	Number of machines used in the year—																			
	1891	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
Alabama	.....	.....	45	37	53	54	82	66	98	141	213	238	197	197	283	317	272	353	377	362
Arkansas	.....	14	15	21	16	20	20	7	.....	.....	.....	.....	.....	.....	.....	12	14	9	27	28
California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	2
Colorado	20	34	37	43	63	90	62	98	157	125	121	141	175	211	253	256	242	304	300	306
Georgia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....
Idaho	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Illinois	241	307	320	382	440	430	464	508	553	643	882	1,048	1,080	1,217	1,260	1,361	1,402	1,654	1,845	1,812
Indiana	47	186	174	233	247	254	256	269	329	403	506	471	513	507	631	645	667	687	732	751
Iowa	9	45	49	56	41	40	53	31	10	39	32	34	33	28	5	17	20	24	28	46
Kansas	.....	.....	1	2	3	3	4	6	5	5	10	6	6	17	16	13	15	11	9	9
Kentucky	.....	.....	162	158	189	239	237	318	308	453	527	600	708	759	877	899	977	1,166	1,263	1,383
Maryland	.....	.....	.....	.....	8	16	15	25	36	38	42	45	43	39	39	38	37	53	13	10
Michigan	.....	.....	.....	7	25	33	31	58	46	85	106	110	103	120	101	100	113	126	130	107
Missouri	.....	4	3	4	9	15	24	20	33	31	30	46	62	57	96	96	92	86	104	88
Montana	.....	62	61	62	75	81	70	65	63	57	58	76	86	57	81	99	87	69	97	99
New Mexico	.....	.....	.....	29	14	21	6	17	12	12	.....	.....	3	7	4	3	10	25	44	45
North Dakota	.....	1	2	7	5	7	7	10	9	9	9	11	12	11	16	13	11	11	13	14
Ohio	114	209	224	245	278	341	376	559	724	885	1,041	1,255	1,326	1,343	1,433	1,452	1,536	1,547	1,681	1,669
Oklahoma	.....	56	54	75	74	58	47	23	36	16	29	29	11	17	34	13	26	60	103	116
Pennsylvania (bituminous)	72	454	690	1,085	1,343	1,786	2,058	2,620	3,310	3,645	4,254	4,515	4,940	5,103	5,616	5,505	5,719	6,176	6,301	6,326
Tennessee	.....	.....	8	19	22	18	21	38	51	85	89	128	137	122	197	178	179	227	252	194
Texas	.....	.....	5	5	.....	.....	8	8	8	9	8	12	13	6	11	14	15	21	24	13
Utah	.....	1	.....	.....	.....	.....	13	13	13	9	.....	2	5	.....	.....	7	7	13	50	68
Virginia	.....	.....	8	8	8	9	6	11	10	18	35	37	77	85	107	142	156	185	187	182
Washington	.....	3	.....	.....	2	2	4	.....	.....	.....	.....	1	.....	4	18	10	23	56	63	72
West Virginia	8	25	47	86	154	327	403	579	786	901	1,105	1,322	1,533	1,574	1,644	1,966	2,044	2,253	2,539	2,607
Wyoming	34	39	45	48	56	69	74	69	59	72	81	83	79	88	127	98	155	179	195	198
Total	545	1,440	1,950	2,622	3,125	3,907	4,341	5,418	6,858	7,683	9,184	10,212	11,144	11,589	13,049	13,254	13,619	15,298	18,379	18,507
Coal mined per machine (tons)	11,398	11,373	11,579	12,362	14,068	13,510	13,325	12,846	11,712	10,258	11,258	11,638	12,381	10,648	10,920	13,127	12,854	13,763	14,801	13,231

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

machines. Four groups have therefore been used as follows: Group I includes those States in which less than 20 per cent of the coal produced was mined by machines, leaving the other 80 per cent of the coal as mined by hand or shot off the solid. Group II includes those States in which 20 to 39 per cent of the coal produced was mined by machines. Group III includes those States in which 40 to 59 per cent of the coal produced was mined by machines. Group IV includes those States in which 60 per cent or more was produced by mining machines.

TABLE 70.—NUMBER AND TYPE OF COAL-CUTTING MACHINES IN OPERATION IN THE UNITED STATES, 1899 TO 1914, INCLUSIVE.[a]

Year.	Number of machines in use.					
	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.
1899	1,997	1,106	22	.....	.....	3,125
1900	2,350	1,509	48	.....	.....	3,907
1901	2,580	1,716	45	.....	.....	4,341
1902	3,185	2,182	51	.....	.....	5,418
1903	3,887	2,717	54	.....	.....	6,658
1904	4,483	3,102	78	.....	.....	7,663
1905	5,525	3,557	102	.....	.....	9,184
1906	5,911	4,144	157	.....	.....	10,212
1907	6,227	4,652	265	.....	.....	11,144
1908	6,380	4,992	197	.....	.....	11,569
1909	7,107	5,590	352	.....	.....	13,049
1910	6,716	5,973	518	47	.....	13,254
1911	6,535	5,943	481	777	83	13,819
1912	6,833	6,425	545	1,371	124	15,298
1913	6,327	6,936	791	2,208	117	16,379
1914	5,878	6,859	618	3,024	128	16,507

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

GROUPING OF STATES, ACCORDING TO PERCENTAGE OF COAL MINED BY MACHINES, FOR THE PERIOD 1896–1913, AND NUMBER OF YEARS EACH STATE IS REPRESENTED IN EACH GROUP.

[Group I, less than 20 per cent mined by machine; Group II, 20 to 39 per cent; Group III, 40 to 59 per cent; Group IV, 60 per cent or more.]

Coal-mining States.	Group.			
	I	II	III	IV
	Years.	*Years.*	*Years.*	*Years.*
Alabama	16	2	.....	.....
Arkansas	14	.....	.....	.....
California	5	.....	.....	.....
Colorado	16	2	.....	.....
Georgia	4	.....	.....	.....
Illinois	6	9	3	.....
Indiana	.....	12	6	.....
Iowa	18	.....	.....	.....
Kansas	18	.....	.....	.....
Kentucky	1	4	8	5
Maryland	18	.....	.....	.....
Michigan	3	8	3	1
Missouri	15	3	.....	.....
Montana	.....	7	8	1
New Mexico	17	1	.....	.....
North Carolina	2	.....	.....	.....
North Dakota	.....	4	2	.....
Ohio	.....	3	6	9
Oklahoma	18	.....	.....	.....
Oregon	4	.....	.....	.....
Pennsylvania (bituminous)	2	7	9	.....
Tennessee	17	1	.....	.....
Texas	4	.....	.....	.....
Utah	18	.....	.....	.....
Virginia	3	3	2	.....
Washington	18	.....	.....	.....
West Virginia	5	8	5	.....
Wyoming	5	5	1	.....

TABLE 71.—SUMMARY OF PRODUCTION, MEN EMPLOYED, AND NUMBER KILLED IN AND ABOUT THE BITUMINOUS COAL MINES, BY GROUPS, BASED ON PERCENTAGE OF COAL MINED BY MACHINES, 1896 TO 1913, INCLUSIVE.

[See fig. 10.]

Group.	Percentage mined by machine.	Grand total for group.			Total for States having accident statistics.												
		Production (short tons).	Men employed.	Tons mined per man.	Production (short tons).	Percentage mined by machine.	Men employed.	Days active.	Number killed.			Number killed per 1,000 employed.			Number killed per million tons mined.	Tons mined per man.	
									Total.	In exceptional accidents.	In common accidents.	Total.	In exceptional accidents.	In common accidents.		Per year.	Per day.
I	0 to 19	1,382,677,130	2,340,459	591	1,323,700,968	9.40	2,230,797	218	9,116	2,476	6,640	4.09	1.11	2.98	6.89	593	2.72
II	20 to 39	1,584,880,534	2,180,510	727	1,559,863,477	31.45	2,149,868	212	7,675	1,633	6,042	3.57	.76	2.81	4.92	726	3.42
III	40 to 59	2,100,257,254	2,542,583	826	2,098,210,230	46.96	2,539,165	227	8,394	967	7,427	3.31	.38	2.92	4.00	826	3.64
IV	60+	353,791,180	522,444	677	353,707,285	77.48	522,293	192	1,473	107	1,366	2.82	.26	2.62	4.16	077	3.53

TABLE 72.—PERCENTAGE OF FATALITIES AND RATE PER 1,000 MEN EMPLOYED, BY PRINCIPAL CAUSES, IN AND ABOUT THE BITUMINOUS COAL MINES, BY GROUPS, BASED ON PERCENTAGE OF COAL MINED BY MACHINES, 1896 TO 1913, INCLUSIVE.

Group.	Falls of roof and pillar coal. (1 and 2)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives. (6)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 16)			Total surface fatalities. (17 to 22)			Grand total.	
	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.
I	3,798	41.66	1.70	783	8.59	0.35	2,680	29.40	1.20	739	8.11	0.33	616	6.76	0.28	231	2.53	0.11	269	2.96	0.12	9,116	4.09
II	3,723	48.51	1.73	874	11.39	.41	1,423	18.54	.66	486	6.33	.23	578	7.53	.27	271	3.53	.12	320	4.17	.15	7,675	3.57
III	4,551	54.22	1.79	1,387	16.52	.55	974	11.60	.39	308	3.67	.12	536	6.39	.21	207	2.47	.08	431	6.13	.17	8,394	3.31
IV	897	60.90	1.72	177	12.02	.34	102	6.92	.19	80	5.43	.15	114	7.74	.22	32	2.17	.06	71	4.82	.14	1,473	2.82

The fatalities during this period have been divided into two classes, namely, common and exceptional. Common accidents are those of daily occurrence in which less than 5 men are killed at one time. Exceptional accidents are defined as those including mine disasters in which 5 or more men are killed at one time.

PRODUCTION.

Table 73 shows the production of coal for Group I from 1896 to 1913. The production of this group, 113,995,776 tons in 1896, has gradually declined until in 1913 it was only 39,509,308 tons. Group II (Table 76) produced in 1896, 16,780,981 tons and reached its highest point in 1902. In 1913 the production of this group was 41,373,914 tons. A number of States, in Group II, passed from this group into Group III (Table 79) in 1904, so that Group III, while not producing any coal in 1896, produced 340,591,068 tons in 1913. Group IV (Table 82), in which more than 60 per cent was mined by machines, does not make its appearance until 1900. It then dropped out for four years and appeared again in 1905 with 25,552,950 tons. In 1913 this group produced 57,048,913 tons.

NUMBER OF MEN EMPLOYED.

Tables 73, 76, 79, and 82 show the number of men employed in each group for the period covered (fig. 9). The number employed in Group I, 197,180 men in 1896, has gradually declined until in 1913 there were 67,714 employed in this class of mines. Group II began in 1896 with only 34,306 men and gradually increased to 207,976 men in 1904. At the close of 1904 a large percentage of this group passed into Group III, so that although Group III does not show any employees in 1896 there were 366,880 employees in 1913. The number of men in Group IV varies from none in 1904 to 75,452 in 1913.

EFFECT OF MACHINE MINING ON FATALITY RATES.

Table 69 shows by States and years the number of mining machines in use from 1891 to 1914. During this period the number of machines has increased from 545 to about 17,000, and the production per year per machine has increased from 11,398 tons in 1891 to 14,802 tons in 1913. Table 70 shows the number of each of five different types of machines in use since 1899.

As there has been an enormous increase in the use of mining machines, Tables 69 to 85 have been compiled for the purpose of analyzing accidents as related to this method of mining. When mining machines were first introduced, there were many who felt that they added another serious hazard to the coal-mining industry.

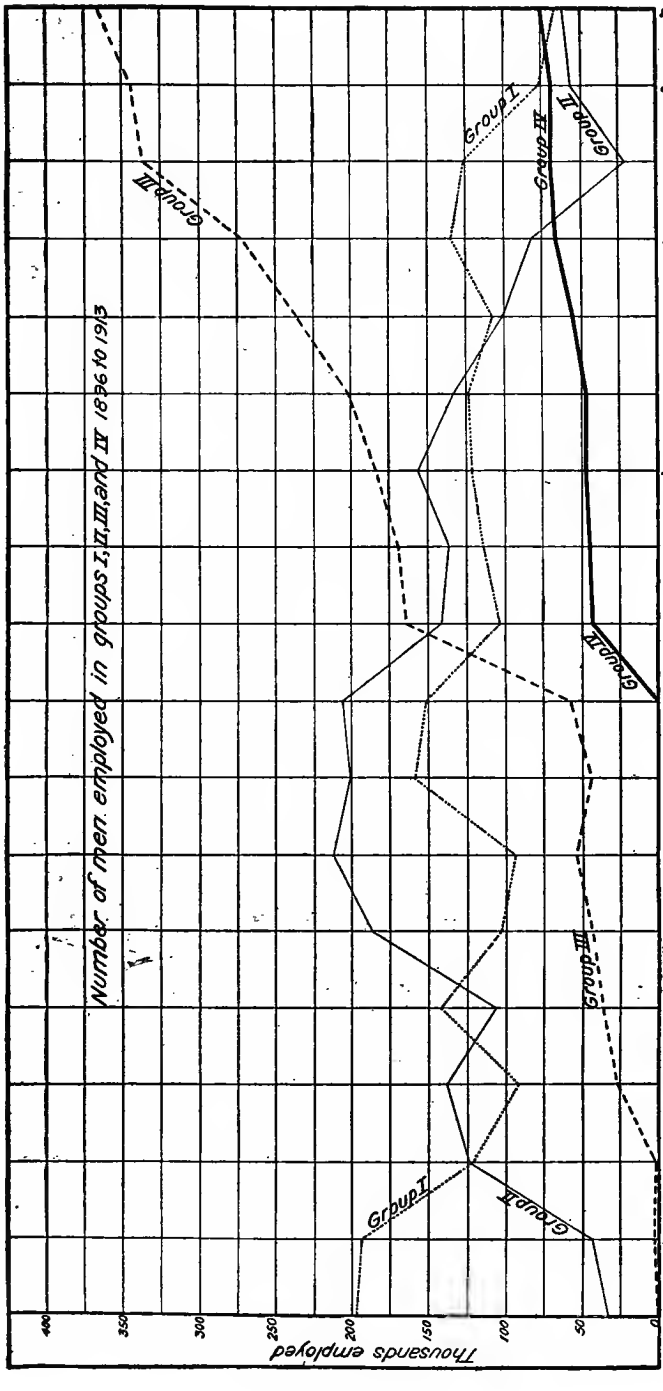

FIGURE 9.—Number of men employed in bituminous coal mines of the United States, by groups, based on percentage of coal mined by machines, 1896-1913. (Based on Tables 73, 76, 79, and 82.)

Although their use may have increased the number of accidents due to machinery and electricity, yet the results shown in Tables 69 to 85 and figures 10 to 15 do not seem to bear out the first impression. The increase of accidents due to machinery and electricity seems to be more than offset by the decrease in fatalities due to explosives, as shown in Table 5.

As indicated, the fatality rate, in those groups where the percentage of machine mining is largest, is lower than in those groups where the amount of coal undercut by hand or shot from the solid is the largest.

As indicated in Table 71 and figure 10, the first three groups are practically of the same rank, each employing slightly over 2,000,000 men during the 18-year period. Group IV is much smaller, employing only 522,293 men. The total production for the first three groups is nearly the same, so that comparisons for those groups may be made on an equal basis. The total number of men killed in exceptional accidents, in all of the groups, was 5,183, and in common accidents, 21,475. In Group I the number of fatalities due to exceptional accidents was 2,476, representing a rate of 1.11 per 1,000 employed. The exceptional-accident rates per 1,000 men employed are 0.76 for Group II, 0.38 for Group III, and 0.20 for Group IV. The rates for common accidents are 2.98 for Group I, 2.81 for Group II, 2.92 for Group III, and 2.62 for Group IV. There is a gradual decline in the total-fatality rate, ranging from 4.09 per 1,000 employed, in Group I, to 2.82 in Group IV. The number of fatalities per million tons mined in Group I is 6.89 for the entire period, and in Group III, which has the lowest rate, is 4.00, for Group IV it is 4.16.

In Table 72 (figure 11), the four groups are compared by principal causes of accidents, showing the percentage of fatalities and the number killed per 1,000 men for each group.

CAUSES OF ACCIDENTS.

The fatalities due to falls of roof (figure 11) are practically the same for each of the four groups, ranging from 1.70 in Group I per 1,000 men employed to 1.79 in Group III. The percentage of fatalities due to falls of roof is lowest in Group I, ranging from 41.66 in Group I to 60.90 in Group IV. The comparison on a percentage basis is not however as true as that based on the actual number of men employed. A sudden increase or decrease in one particular class of accidents affects the total, and percentages derived from this base will be more or less altered. When comparisons are made on the basis of actual number of employees, a large disaster due to one cause will not alter the comparisons for the other causes as the rates are derived from a base that remains unchanged.

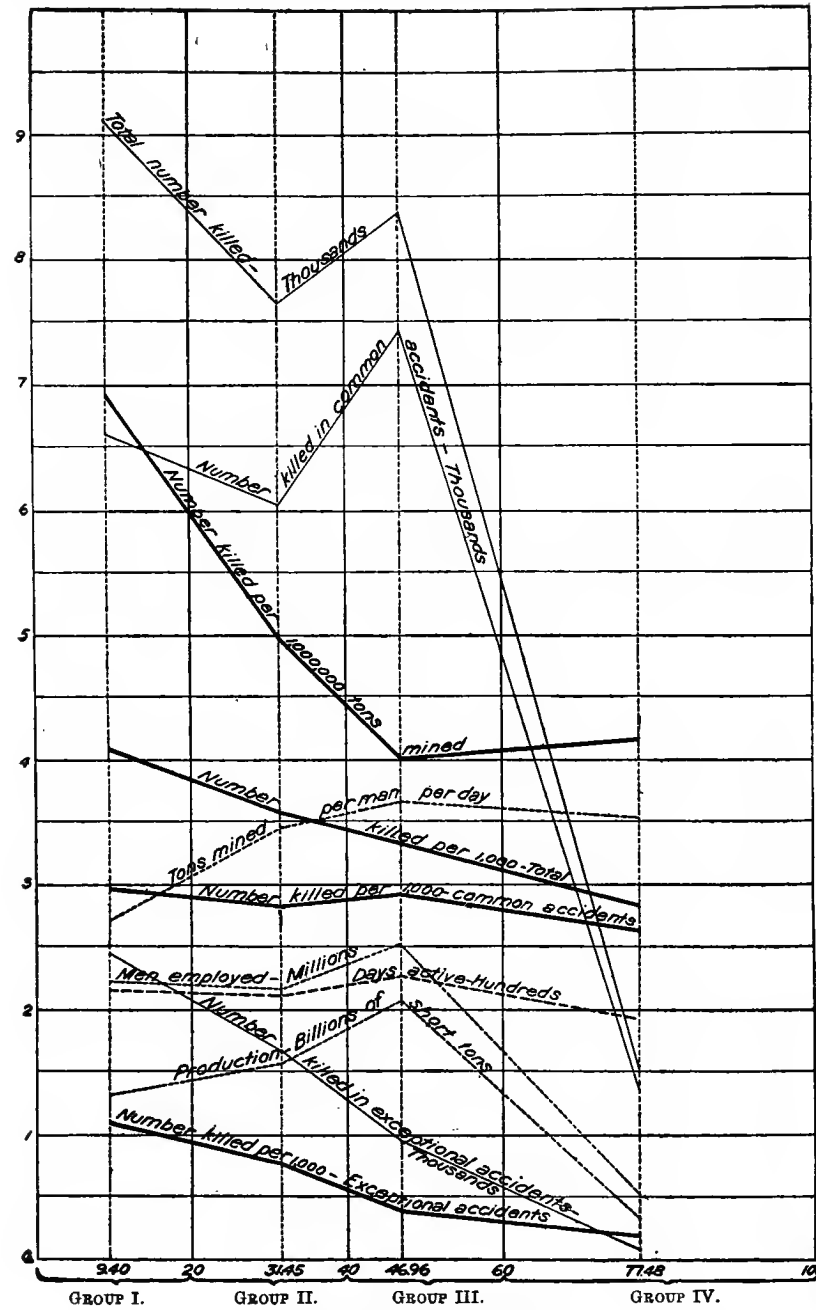

FIGURE 10.—Total number killed, fatality rates, men employed, tons produced, and days active at the bituminous coal mines of the United States, by groups based on the percentage of coal mined by machines, 1896–1913. (Based on Table 71.)

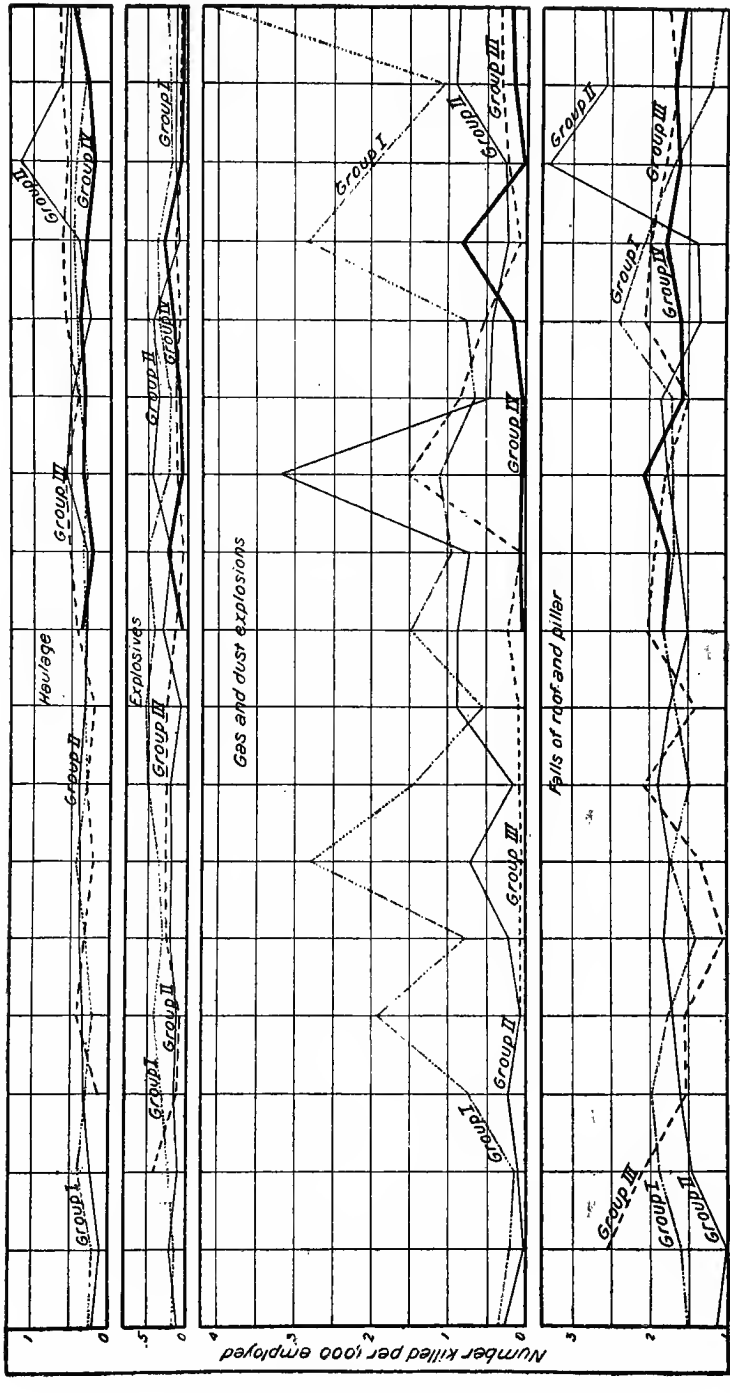

FIGURE 11.—Number of men killed per 1,000 employed in bituminous coal mines of the United States, by principal causes, by groups based on percentage of coal mined by machines, 1896–1913. (Based on Tables 74, 77, 80, and 83.)

There is but little difference in the fatality rate by reason of accidents due to mine cars and locomotives (fig. 11). In Groups I and IV the rates are practically the same, being 0.35 and 0.34 respectively, but in Groups II and III the rates are slightly higher.

GAS AND DUST EXPLOSIONS.

The most striking difference in the number of fatalities in the various groups is in accidents due to gas and dust explosions. It will be noted that 29.40 per cent of all of the fatalities in Group I were due to gas and dust explosions, and that the percentage due to this cause declines as the percentage of machine-mined coals, only 6.92 per cent of the total fatalities in Group IV being due to this cause. As stated above, the percentage comparison is not as fair as that based on the number of men employed. The fatality rate in Group I due to gas and dust explosions was 1.20 per 1,000 men employed during the 18-year period, in Group II the rate was 0.66, in Group III, 0.39, and in Group IV, 0.19 per 1,000 employed. These differences are shown in figure 11.

EXPLOSIVES.

As would be expected, the fatality rate due to explosives (fig. 11) is higher in Group I than in the other groups. In Group I the maximum amount of explosives is used and much of the coal mined is shot off the solid; its fatality rate is 0.33 per 1,000 men employed. In Groups II, III, and IV, where less explosives are used, the fatality rates are 0.23, 0.12, and 0.15 per 1,000 employed, respectively. In the latter two groups there is a minimum amount of explosives used in the coal mines.

With reference to miscellaneous underground, shaft, and surface accidents there is no variation of importance.

MINING CONDITIONS.

These figures are not absolute proof that lower fatality rates in Group IV as compared with Group I are due to the larger use of machines in the mines of Group IV. Many small mines are included in Group I in which hand mining prevails. The small mines do not always have the most improved equipment, and many times less attention is given to safety measures. The mines in Group I use a maximum amount of explosives, are operated under all classes of roof conditions, and include all types of coal beds ranging from thick to thin with various degrees of inclination, from horizontal to vertical.

The hand-mining mines are in most cases operated more hours a day and, as shown in Table 71, more days a year as compared with Group IV. The number of days active is 218 for Group I, 212 for Group II, 227 for Group III, and 192 for Group IV. With the excep-

tion of Kentucky, the employees in Group IV are all on an 8-hour basis. The other groups contain many 9 and 10 hour men.

As regards the mines in which the major part of the coal is mined by machine, they include but few small mines and hence have more systematic management. When a mine has reached the stage where the management is financially able to install machines, it is usually conducted on a more business-like basis than are the small and poorly financed properties, has better haulage systems, and more efficient ventilation. In machine mining a minimum amount of explosives is used and in a mine where machines are introduced it is essential that good roof conditions prevail and that the coal bed is of reasonably uniform thickness. Also machines are operated in the flatter lying beds and are seldom used in the steeply inclined measures. The majority of the States in which the largest percentage of coal is mined by machines are operated on an 8-hour basis and less days per year, hence the time of exposure to the dangers of mining is less.

FATALITY RATES ON BASIS OF COAL MINED BY MACHINE.

The total fatality rate at the four groups of mines, based on the percentage of machine-mined coal, from 1896 to 1913, is shown in figure 12. The upper part of the figure represents, as indicated, the total fatality rate at bituminous coal mines during this period. The second or middle part of the figure shows the fatality rate due to "common" accidents, that is, those in which less than 5 men are killed at one time. These rates are reasonably close together, Group IV showing the lowest and Group I, as a whole, the highest rate. The lower part of the figure shows the fatality rate due to "exceptional" accidents. Here again Group I is high, and is followed closely by Group II; Group IV is exceedingly low.

The amount of coal mined per day per man in the various groups of mines is given in figure 13. The curves show that in Group I, in which less than 20 per cent of the coal was mined by machine, the average number of tons mined per day is 2.72 (Table 73), while in Group III it ranges from 2.80 to about 3.90 tons per day. Group II is more erratic, and since 1910 many of the mines originally in this group have passed into Group III, so that since that year there has been a decrease in the amount of coal produced per man per day. Group IV remains practically stationary, with an average of 3.53 tons per day.

Figure 13 also shows the fatalities per million tons mined according to the four groups outlined above. In Group I the fatality rate is exceedingly high when based on the number of tons mined per fatality. This rate varies from 4.06 to 10.68, the average being 6.89 (Table 73). As would be expected, the number of fatalities per million tons produced in Groups III and IV are considerably lower than in the other two groups, the average being, respectively, 4.00 and 4.16.

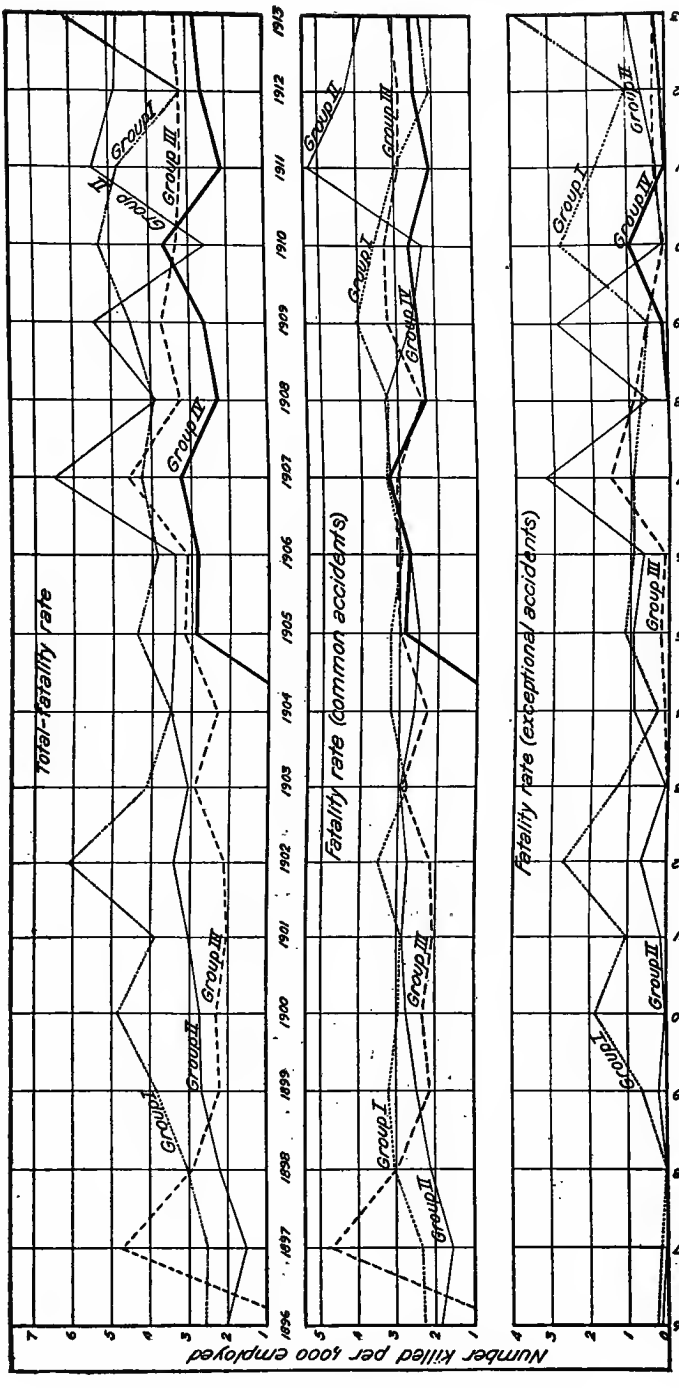

FIGURE 12.—The total number killed per 1,000 employed in bituminous coal mines of the United States; also number killed per 1,000 employed in common and in exceptional accidents, by groups based on percentage of coal mined by machine, 1896–1913. (Based on Tables 73, 76, 79, and 82.)

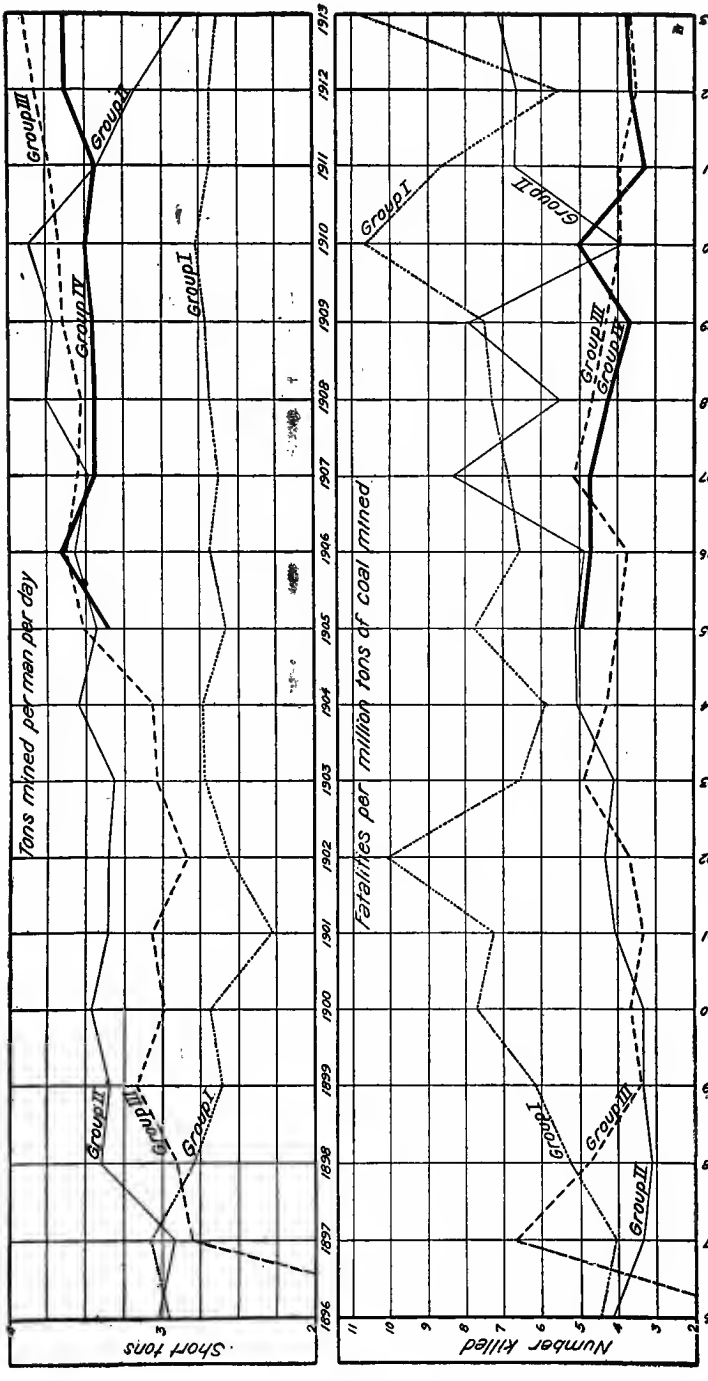

FIGURE 13.—Tons mined per man per day and number of men killed per 1,000,000 tons mined in the bituminous coal mines of the United States, by groups based on the percentage of coal mined by machine, 1896–1913. (Based on Tables 73, 76, 79, and 82.)

TABLE 73.—PRODUCTION, MEN EMPLOYED, AND NUMBER KILLED IN AND ABOUT THE BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH LESS THAN 20 PER CENT OF THE COAL WAS MINED BY MACHINES, 1896 TO 1913, INCLUSIVE, GROUP I.

[See figs. 9, 12, and 13.]

Year.	Grand totals, Group I.			Totals for States in Group I having accident statistics.												
	Production (short tons).	Men employed.	Tons mined per man.	Production (short tons).	Percentage mined by machine.	Men employed.	Days active.	Number killed.			Number killed per 1,000 employed.			Number killed per million tons mined.	Tons mined per man.	
								Total.	In exceptional accidents.	In common accidents.	Total.	In exceptional accidents.	In common accidents.		Per year.	Per day.
1896	119,315,850	207,710	574	113,995,766	9.70	197,180	196	512	62	450	2.60	0.32	2.28	4.49	578	2.95
1897	121,815,995	196,550	620	120,522,067	12.31	193,085	203	489	36	453	2.53	.19	2.34	4.06	624	3.07
1898	76,539,274	130,025	589	70,380,939	8.94	120,796	208	370	.....	370	3.06	.....	3.06	5.26	583	2.80
1899	62,888,180	101,950	617	56,821,211	5.90	91,470	238	352	59	293	3.85	.65	3.20	6.19	621	2.61
1900	99,031,453	158,249	626	89,641,706	11.82	142,442	234	690	266	424	4.85	1.87	2.98	7.70	629	2.69
1901	57,227,549	107,692	531	55,543,381	5.09	103,235	236	404	105	299	3.91	1.02	2.89	7.27	538	2.28
1902	61,646,924	101,682	606	56,970,062	5.14	94,104	236	579	254	325	6.15	2.70	3.45	10.16	605	2.56
1903	105,356,647	169,010	623	100,343,507	13.23	159,817	231	658	210	448	4.12	1.32	2.80	6.56	628	2.72
1904	97,343,516	165,773	587	90,142,414	11.60	151,667	217	532	46	486	3.51	.30	3.21	6.90	594	2.74
1905	65,505,874	114,681	571	59,480,024	7.40	104,630	219	460	121	339	4.40	1.16	3.24	7.73	568	2.89
1906	69,717,418	118,911	586	67,955,711	7.75	114,836	220	448	110	338	3.90	.96	2.94	6.59	592	2.69
1907	77,672,485	126,603	614	75,549,357	8.29	121,286	237	518	114	404	4.27	.94	3.33	6.86	623	2.63
1908	68,669,809	128,392	535	68,396,010	9.47	123,035	201	485	88	397	3.94	.71	3.23	7.30	540	2.69
1909	65,889,437	108,113	609	65,882,084	8.08	108,096	224	490	56	434	4.53	.52	4.01	7.44	609	2.72
1910	80,432,574	134,777	597	80,432,574	10.63	134,777	215	854	370	484	6.34	2.75	3.59	10.62	597	2.78
1911	70,259,469	126,173	557	70,259,469	10.58	126,173	207	610	234	376	4.83	1.85	2.98	8.68	557	2.69
1912	43,875,368	76,454	574	43,875,368	5.93	76,454	213	243	82	161	3.18	1.07	2.11	5.54	574	2.69
1913	39,509,308	67,714	583	39,509,308	6.72	67,714	220	422	263	159	6.23	3.88	2.35	10.68	583	2.65
Total	**1,382,677,130**	**2,340,458**	**591**	**1,323,700,958**	**9.40**	**2,230,797**	**218**	**8,116**	**2,476**	**6,640**	**4.09**	**1.11**	**2.98**	**6.89**	**593**	**2.72**

TABLE 74.—PERCENTAGE OF FATALITIES AND RATE PER 1,000 MEN EMPLOYED, BY PRINCIPAL CAUSES AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH LESS THAN 20 PER CENT OF THE COAL WAS MINED BY MACHINES, GROUP I.

[See fig. 11.]

Year.	Falls of roof and pillar coal. (1 and 2)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives. (8)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 18)			Total surface fatalities. (17 to 22)			Grand total.	
	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.
1896	297	58.01	1.51	54	10.55	0.27	76	14.84	0.38	33	6.45	0.17	21	4.10	0.11	17	3.32	0.09	14	2.73	0.07	512	2.60
1897	310	63.39	1.60	44	9.00	.23	45	9.20	.23	31	6.34	.16	21	4.29	.11	19	3.89	.10	19	3.89	.10	489	2.53
1898	228	61.62	1.89	49	13.24	.41	23	6.22	.19	26	7.03	.21	9	2.43	.07	14	3.78	.12	21	5.68	.17	370	3.06
1899	182	51.70	1.99	31	8.81	.34	69	19.60	.75	29	8.24	.32	14	3.98	.15	11	3.12	.12	16	4.55	.18	352	3.85
1900	253	36.67	1.78	38	5.22	.25	273	39.56	1.92	59	8.55	.41	34	4.93	.24	17	2.46	.12	18	2.61	.13	690	4.85
1901	145	35.89	1.40	34	8.42	.33	81	20.05	.79	32	7.92	.31	87	21.53	.84	19	4.70	.18	6	1.49	.06	404	3.91
1902	165	28.50	1.75	43	7.42	.46	261	45.08	2.77	37	6.39	.39	52	8.98	.55	10	1.73	.11	11	1.90	.12	579	6.15
1903	237	36.02	1.48	49	7.45	.31	229	34.80	1.43	82	12.46	.51	19	2.89	.12	17	2.58	.11	25	3.80	.16	858	4.12
1904	251	47.18	1.65	54	10.15	.36	80	15.04	.53	85	15.98	.56	19	3.57	.12	30	5.64	.20	13	2.44	.09	532	3.51
1905	189	41.09	1.81	33	7.17	.32	154	33.48	1.47	46	10.00	.44	20	4.35	.19	7	1.52	.07	11	2.39	.10	460	4.40
1906	194	43.30	1.69	41	9.15	.36	107	23.88	.93	62	13.84	.54	15	3.35	.13	11	2.46	.09	18	4.02	.16	448	3.90
1907	208	40.15	1.72	38	7.34	.31	137	26.45	1.13	34	6.56	.28	75	14.48	.62	10	1.93	.08	16	3.09	.13	518	4.27
1908	210	43.30	1.71	52	10.72	.42	82	16.91	.67	29	5.98	.23	92	18.97	.75	11	2.27	.09	9	1.85	.07	485	3.94
1909	263	53.67	2.43	47	9.59	.43	82	16.74	.76	41	8.37	.38	34	6.94	.31	5	1.02	.05	18	3.67	.17	490	4.53
1910	281	32.90	2.09	65	7.61	.48	381	44.61	2.83	52	6.09	.39	42	4.92	.31	14	1.64	.10	19	2.23	.14	854	6.34
1911	218	35.73	1.73	60	9.84	.47	243	39.84	1.92	26	4.26	.21	33	5.41	.26	10	1.64	.08	20	3.28	.16	610	4.83
1912	93	38.27	1.22	25	10.29	.33	81	33.33	1.06	17	7.00	.22	17	7.00	.22	4	1.64	.05	6	2.47	.08	243	3.18
1913	74	17.54	1.09	28	6.64	.41	276	65.40	4.08	18	4.27	.27	12	2.84	.18	5	1.18	.07	9	2.13	.13	422	6.23
Total	3,798	41.66	1.70	783	8.58	.35	2,680	29.40	1.20	739	8.11	.33	616	6.76	.28	231	2.53	.11	269	2.95	.12	9,118	4.09

TABLE 75.—FATALITIES, BY CAUSES, AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH LESS THAN 20 PER CENT OF THE COAL WAS MINED BY MACHINES, **GROUP I.**

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1896	247	50	54	11	65	33	3	2	....	1	....	15	481	8	1	8	....	17	3	....	1	3	....	7	14	512
1897	249	61	44	14	31	31	1	2	2	....	8	8	451	10	2	6	1	19	2	....	2	7	3	5	19	489
1898	197	31	49	15	8	26	2	1	....	....	1	5	335	7	....	7	....	14	8	....	4	1	3	5	21	370
1899	152	30	31	36	33	29	1	5	....	....	....	8	325	6	1	3	1	11	5	....	1	1	3	6	16	352
1900	223	30	36	68	205	59	3	1	2	....	7	21	655	5	5	7	....	17	8	....	1	1	4	4	18	690
1901	120	25	34	36	45	32	....	2	1	2	46	36	379	6	3	10	....	19	1	....	....	2	1	2	6	404
1902	147	18	43	12	249	37	1	1	....	....	14	36	558	5	3	2	....	10	4	....	3	2	1	1	11	579
1903	213	24	49	224	5	82	....	3	1	....	3	12	616	10	2	4	1	17	10	....	2	2	5	6	25	658
1904	219	32	54	29	51	85	2	2	....	....	....	15	489	13	3	14	....	30	1	....	4	1	3	4	13	532
1905	173	16	33	37	117	46	1	6	....	....	....	13	442	6	....	1	....	7	4	....	....	....	....	3	4	11	460
1906	177	17	41	99	8	62	....	8	....	....	....	7	418	7	2	2	....	11	8	....	7	....	....	....	3	18	448
1907	188	20	38	37	100	34	....	8	....	....	10	57	492	4	....	6	....	10	7	1	1	1	3	3	16	518
1908	188	22	52	18	64	29	1	15	3	....	29	44	465	5	1	5	....	11	2	....	1	1	1	4	9	486
1909	228	35	47	56	26	41	4	12	1	....	2	15	467	1	1	3	....	6	9	....	2	....	....	3	4	18	490
1910	241	40	65	79	302	52	....	12	1	....	10	19	821	9	....	2	3	14	9	....	3	1	1	5	19	854
1911	197	21	60	10	233	26	5	16	....	1	3	8	580	4	....	4	2	10	6	....	1	2	5	6	20	610
1912	71	22	25	76	5	17	1	5	....	....	11	....	233	....	....	1	3	4	1	....	....	....	1	4	6	243
1913	71	3	28	8	268	18	2	3	1	....	1	5	408	2	....	3	....	5	3	1	1	....	2	2	9	422
Total	3,301	497	783	865	1,815	739	27	104	12	4	135	334	8,616	108	24	88	11	231	91	2	34	25	42	75	269	9,116

TABLE 76.—PRODUCTION, MEN EMPLOYED, AND NUMBER KILLED IN AND ABOUT THE BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 20 TO 39 PER CENT OF THE COAL WAS MINED BY MACHINES, 1896 TO 1913, INCLUSIVE, **GROUP II.**

(See figs. 9, 12, and 13.)

Year.	Grand totals, Group II.			Totals for States in Group II having accident statistics.												
								Number killed.			Number killed per 1,000 employed.			Number killed per million tons mined.	Tons mined per man.	
	Production (short tons).	Men employed.	Tons mined per man.	Production (short tons).	Percentage mined by machine.	Men employed.	Days active.	Total.	In exceptional accidents.	In common accidents.	Total.	In exceptional accidents.	In common accidents.		Per year.	Per day.
1896	18,324,426	36,641	500	16,780,981	25.82	34,306	161	70	7	63	2.04	0.20	1.84	4.17	489	3.04
1897	24,153,642	48,930	494	19,950,208	30.91	43,279	158	67	.....	67	1.55	.....	1.55	3.36	461	2.92
1898	88,490,651	123,182	718	88,490,651	27.67	123,182	211	274	8	266	2.22	.06	2.16	3.10	718	3.40
1899	112,458,286	140,661	799	110,253,686	28.74	138,491	238	372	29	343	2.69	.21	2.48	3.37	796	3.34
1900	87,305,770	106,442	820	87,175,887	33.07	106,116	237	293	.....	293	2.76	.....	2.76	3.36	822	3.47
1901	140,790,726	187,967	749	140,624,125	29.89	187,687	223	565	29	536	3.01	.15	2.86	4.02	749	3.36
1902	166,722,219	213,744	780	166,495,708	30.35	213,342	232	728	140	588	3.41	.66	2.75	4.37	780	3.36
1903	150,787,143	202,190	746	150,787,143	34.17	202,190	225	621	17	604	3.07	.08	2.99	4.12	746	3.32
1904	149,067,543	213,636	698	143,888,087	34.12	207,976	195	731	189	542	3.52	.91	2.61	5.08	692	3.55
1905	95,513,969	142,064	672	95,196,427	28.44	141,438	196	488	133	355	3.45	.94	2.51	5.13	673	3.43
1906	104,649,035	144,311	725	98,209,352	32.40	137,889	199	474	92	382	3.44	.67	2.77	4.83	712	3.58
1907	122,031,050	156,821	778	121,683,290	32.88	156,259	223	1,018	512	506	6.51	3.28	3.23	8.37	779	3.49
1908	97,892,526	139,128	704	93,633,484	35.30	132,920	187	513	68	445	3.86	.51	3.35	5.48	704	3.76
1909	70,567,525	100,930	699	70,567,525	31.64	100,930	188	556	293	263	5.51	2.90	2.61	7.88	699	3.72
1910	55,329,213	83,746	661	55,329,213	37.75	83,746	171	212	14	198	2.53	.17	2.36	3.83	661	3.87
1911	17,088,517	20,849	820	17,088,517	34.33	20,849	240	115	5	110	5.52	.24	5.28	6.73	820	3.42
1912	42,334,379	57,415	737	42,334,379	25.27	57,415	232	281	36	245	4.89	.62	4.27	6.64	737	3.18
1913	41,373,914	61,853	669	41,373,914	24.69	61,853	234	297	61	236	4.80	.99	3.81	7.18	669	2.86
Total	**1,584,880,534**	**2,180,510**	**727**	**1,559,863,477**	**31.45**	**2,149,868**	**212**	**7,675**	**1,633**	**6,042**	**3.57**	**.76**	**2.81**	**4.92**	**726**	**3.42**

TABLE 77.—PERCENTAGE OF FATALITIES AND RATE PER 1,000 MEN EMPLOYED, BY PRINCIPAL CAUSES AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 20 TO 39 PER CENT OF THE COAL WAS MINED BY MACHINES, GROUP II.

(See fig. 11.)

Year.	Falls of roof and pillar coal. (1 and 2)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives. (6)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 18)			Total surface fatalities. (17 to 22)			Grand total.	
	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.
1896	40	57.14	1.17	8	11.43	0.23	10	14.29	0.29	4	5.71	0.12	1	1.43	0.03	6	8.57	0.17	1	1.43	0.03	70	2.04
1897	44	65.67	1.01	6	8.95	.14	2	2.99	.05	9	13.43	.21	1	1.49	.02	3	4.48	.07	2	2.99	.06	67	1.55
1898	182	66.42	1.48	35	12.77	.28	12	4.38	.10	14	5.11	.11	12	4.38	.10	7	2.56	.05	12	4.38	.10	274	2.22
1899	223	59.94	1.01	49	13.17	.36	34	9.14	.25	25	6.72	.18	15	4.03	.11	13	3.50	.09	13	3.50	.09	372	2.68
1900	183	62.45	1.72	41	13.99	.39	6	2.05	.06	14	4.78	.13	14	4.78	.13	21	7.16	.20	14	4.78	.13	293	2.76
1901	343	60.71	1.83	78	13.80	.41	39	6.90	.21	39	6.90	.21	24	4.25	.13	21	3.72	.11	21	3.72	.11	585	3.01
1902	373	51.24	1.75	87	11.95	.41	149	20.45	.70	46	6.32	.22	20	2.75	.09	33	4.53	.15	20	2.75	.09	728	3.41
1903	383	61.58	1.90	88	14.17	.44	29	4.67	.14	45	7.24	.22	27	4.35	.13	17	2.74	.08	32	5.15	.16	621	3.07
1904	365	49.93	1.76	76	10.40	.37	186	25.44	.89	20	2.74	.10	28	3.83	.13	24	3.28	.12	32	4.38	.15	731	3.52
1905	209	42.83	1.48	47	9.63	.33	125	25.61	.88	44	9.02	.31	25	5.12	.18	18	3.69	.13	20	4.10	.14	488	3.45
1906	224	47.26	1.62	44	9.28	.32	98	20.67	.71	29	6.12	.21	11	2.32	.08	37	7.81	.27	31	6.54	.23	474	3.44
1907	277	27.21	1.77	91	8.94	.58	496	48.03	3.17	72	7.07	.46	20	1.96	.13	19	1.87	.12	44	4.32	.28	1,018	6.51
1908	246	47.95	1.85	68	13.26	.51	63	12.28	.48	51	9.94	.38	30	5.85	.23	19	3.70	.14	36	7.02	.27	513	3.88
1909	138	24.82	1.37	27	4.86	.27	45	8.09	.44	44	7.91	.44	279	50.18	2.76	11	1.98	.11	12	2.16	.12	556	5.51
1910	116	54.72	1.38	34	16.04	.41	18	8.49	.21	9	4.25	.11	14	6.60	.17	13	6.13	.15	8	3.77	.10	212	2.53
1911	69	60.00	3.31	24	20.87	1.15	6	5.22	.29	4	3.48	.19	3	2.61	.15	.....	.....	.....	9	7.82	.43	115	5.52
1912	147	52.31	2.56	37	13.17	.64	53	18.86	.92	8	2.85	.14	22	7.83	.38	8	2.85	.14	6	2.13	.11	281	4.89
1913	161	54.21	2.60	34	11.45	.55	53	17.84	.86	9	3.03	.14	32	10.77	.52	1	.34	.02	7	2.36	.11	297	4.80
Total	3,723	48.51	1.73	874	11.39	.41	1,423	18.54	.68	488	6.33	.23	578	7.53	.27	271	3.53	.12	320	4.17	.15	7,675	3.57

TABLE 78.—FATALITIES, BY CAUSES, AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 20 TO 39 PER CENT OF THE COAL WAS MINED BY MACHINES, GROUP II.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	Grand total.
	1	2	3	4	5	6	7	8	8	10	11	12		13	14	15	16		17	18	19	20	21	22		
1896	33	7	8	10	.....	4	....	1	....	....	....	....	63	2	....	4	....	6	1	.....	.....	.....	.....	.....	1	70
1897	39	5	6	....	2	9	....	1	....	....	....	....	62	1	....	1	1	3	.....	.....	.....	1	1	.....	2	67
1898	155	27	35	12	.....	14	1	3	....	2	3	3	255	2	2	3	....	7	2	.....	3	1	4	2	12	274
1899	191	32	49	34	.....	25	....	6	....	2	....	7	346	4	2	5	2	13	2	.....	4	2	2	3	13	372
1900	148	35	41	6	.....	14	1	6	1	1	1	4	258	10	2	9	....	21	10	.....	.....	.....	3	1	14	293
1901	288	55	78	38	1	39	....	9	4	2	1	8	523	7	2	12	....	21	13	.....	2	.....	3	3	21	565
1902	319	54	87	149	.....	46	....	12	1	4	....	3	675	14	2	17	....	33	8	.....	2	3	2	5	20	728
1903	329	54	88	26	3	45	....	12	2	2	1	10	572	12	1	4	....	17	18	.....	2	1	7	4	32	621
1904	318	47	76	7	179	20	....	16	....	2	1	9	675	11	1	12	....	24	14	.....	4	1	7	6	32	731
1905	187	22	47	78	47	44	....	2	2	....	14	7	450	7	1	10	....	18	6	.....	3	.....	9	2	20	488
1906	194	30	44	30	68	29	....	7	....	1	....	3	406	18	3	16	....	37	12	.....	2	1	6	10	31	474
1907	229	48	91	32	463	72	....	6	3	1	....	10	955	9	5	5	....	19	12	.....	5	.....	11	16	44	1,018
1908	191	55	68	4	59	51	....	11	3	2	10	4	458	16	1	2	....	19	12	5	4	.....	10	5	36	513
1909	101	37	27	45	.....	44	....	4	2	....	259	14	533	1	1	9	....	11	.....	.....	2	1	5	4	12	556
1910	100	16	34	8	10	9	....	4	5	3	....	2	191	4	3	6	....	13	1	.....	.....	1	5	1	8	212
1911	57	12	24	6	.....	4	....	2	....	....	....	1	106	....	....	....	....	....	5	.....	.....	.....	.....	4	9	115
1912	124	23	37	43	10	8	....	17	1	....	....	4	267	3	1	4	....	8	2	.....	.....	.....	4	.....	6	281
1913	144	17	34	3	50	9	14	8	1	3	1	5	289	....	....	1	....	1	1	.....	1	.....	2	3	7	297
Total	3,147	576	874	531	892	486	16	127	25	25	291	94	7,084	121	27	120	3	271	119	5	34	12	81	89	320	7,675

TABLE 79.—PRODUCTION, MEN EMPLOYED, AND NUMBER KILLED IN AND ABOUT THE BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 40 TO 59 PER CENT OF THE COAL WAS MINED BY MACHINES, 1896 TO 1913, INCLUSIVE, **GROUP III.**

[See figs. 9, 12, and 13.]

Year.	Grand totals, Group III.			Totals for States in Group III having accident statistics.												
	Production (short tons).	Men employed.	Tons mined per man.	Production (short tons).	Percentage mined by machine.	Men employed.	Days active.	Number killed.			Number killed per 1,000 employed.			Number killed per million tons mined.	Tons mined per man.	
								Total.	In exceptional accidents.	In common accidents.	Total.	In exceptional accidents.	In common accidents.		Per year.	Per day.
1896																
1897	1,647,882	2,337	705	1,647,882	43.70	2,337	252	11	.....	11	4.71	.....	4.71	6.68	705	2.80
1898	1,479,803	2,359	627	1,479,803	46.06	2,359	216	7	.....	7	2.97	.....	2.97	4.73	627	2.90
1899	17,996,721	28,416	633	16,500,270	41.35	26,038	200	56	.....	56	2.15	.....	2.15	3.39	634	3.17
1900	24,317,114	37,308	652	24,317,114	45.96	37,308	218	88	.....	88	2.36	.....	2.36	3.62	652	2.99
1901	27,809,874	44,576	624	27,809,874	46.43	44,576	203	92	.....	92	2.06	.....	2.06	3.31	624	3.07
1902	31,847,701	54,630	583	31,847,701	49.86	54,630	205	117	.....	117	2.14	.....	2.14	3.67	583	2.84
1903	26,605,558	44,577	597	26,326,913	56.28	44,091	197	129	.....	129	2.93	.....	2.93	4.90	597	3.03
1904	32,248,630	58,423	552	31,976,702	54.97	57,869	180	137	5	132	2.37	0.09	2.28	4.28	553	3.07
1905	128,489,992	160,495	801	128,489,992	42.04	160,495	228	514	37	477	3.20	.23	2.97	4.00	801	3.51
1906	140,776,774	169,705	829	140,776,774	42.83	169,765	229	528	15	513	3.11	.09	3.02	3.75	829	3.62
1907	162,913,158	183,001	890	162,913,158	41.28	183,001	251	844	278	566	4.61	1.52	3.09	5.18	890	3.55
1908	139,740,970	201,337	694	139,740,970	45.80	201,337	197	656	174	482	3.26	.87	2.39	4.69	694	3.52
1909	204,650,270	235,691	868	204,650,270	41.91	235,691	238	885	125	760	3.75	.53	3.22	4.32	868	3.65
1910	232,516,368	270,053	861	232,516,368	45.73	270,053	234	909	22	887	3.37	.08	3.29	3.91	861	3.68
1911	273,749,384	337,803	810	273,749,384	47.17	337,803	217	1,081	93	988	3.20	.28	2.92	3.95	810	3.73
1912	312,875,987	344,932	907	312,875,987	49.93	344,932	236	1,108	117	991	3.21	.34	2.87	3.54	907	3.84
1913	340,591,068	366,880	928	340,591,068	53.38	366,880	238	1,232	101	1,131	3.36	.28	3.08	3.62	928	3.90
Total	**2,100,257,254**	**2,542,583**	**626**	**2,098,210,230**	**46.08**	**2,539,185**	**227**	**8,384**	**967**	**7,427**	**3.31**	**.38**	**2.92**	**4.00**	**626**	**3.84**

TABLE 80.—PERCENTAGE OF FATALITIES AND RATE PER 1,000 MEN EMPLOYED, BY PRINCIPAL CAUSES AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 40 TO 59 PER CENT OF THE COAL WAS MINED BY MACHINES, **GROUP III.**

[See fig. 11.]

Year.	Falls of roof and pillar coal. (1 and 2)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives. (6)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 16)			Total surface fatalities. (13 to 16)			Grand total.	
	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.
1896																							
1897	6	54.55	2.57	5	45.45	2.14																11	4.71
1898	5	71.42	2.11							1	14.29	0.43	1	14.29	0.43							7	2.97
1899	40	71.43	1.54	4	7.11	.15				4	7.14	.15	1	1.79	.04	4	7.14	.15	3	5.36	.12	56	2.15
1900	58	65.90	1.55	16	18.18	.43	3	3.41	.08	4	4.55	.11				4	4.55	.11	3	3.41	.08	88	2.36
1901	47	51.09	1.05	15	16.30	.34	3	3.26	.07	12	13.04	.27	6	6.52	.13	4	4.35	.09	5	5.44	.11	92	2.06
1902	73	62.39	1.34	14	11.97	.26	3	2.56	.05	16	13.68	.29	7	5.98	.13	1	.86	.02	3	2.56	.05	117	2.14
1903	91	70.54	2.07	14	10.85	.32	4	3.10	.09	11	8.53	.25	4	3.10	.09	4	3.10	.09	1	.78	.02	129	2.93
1904	81	59.12	1.40	14	10.22	.24	5	3.65	.09	16	11.68	.28	9	6.57	.15	5	3.65	.09	7	5.11	.12	137	2.37
1905	325	63.23	2.02	69	13.43	.43	36	7.00	.22	25	4.86	.16	24	4.67	.15	8	1.56	.05	27	5.25	.17	514	3.20
1906	328	62.12	1.93	92	17.43	.54	11	2.08	.06	12	2.27	.07	45	8.52	.27	15	2.84	.09	25	4.74	.15	528	3.11
1907	328	38.86	1.79	110	13.03	.60	276	32.70	1.51	24	2.85	.13	39	4.62	.21	29	3.44	.16	38	4.50	.21	844	4.61
1908	299	45.58	1.49	85	12.96	.42	173	26.37	.86	23	3.51	.12	29	4.42	.14	21	3.20	.10	26	3.96	.13	656	3.26
1909	486	54.92	2.06	139	15.71	.59	127	14.35	.54	26	2.93	.11	49	5.54	.21	20	2.26	.08	38	4.29	.16	885	3.75
1910	542	59.63	2.01	167	18.37	.62	22	2.42	.08	31	3.41	.12	62	6.82	.23	30	3.30	.11	55	6.05	.20	909	3.37
1911	606	56.06	1.80	190	17.58	.56	82	7.58	.24	35	3.24	.10	95	8.79	.28	21	1.94	.06	52	4.81	.16	1,081	3.20
1912	584	52.71	1.69	209	18.86	.61	109	9.84	.32	39	3.52	.11	71	6.41	.20	23	2.07	.07	73	6.59	.21	1,108	3.21
1913	652	52.92	1.78	244	19.81	.66	120	9.74	.33	29	2.35	.08	94	7.63	.26	18	1.46	.05	75	6.09	.20	1,232	3.36
Total	4,551	54.22	1.79	1,387	16.52	.55	974	11.60	.39	308	3.67	.12	536	6.39	.21	207	2.47	.08	431	5.13	.17	8,394	3.31

TABLE 81.—FATALITIES, BY CAUSES, AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 40 TO 59 PER CENT OF THE COAL WAS MINED BY MACHINES, GROUP III.

Year.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.		
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22			
1896																											
1897	3	3	5										11														11
1898	1	4				1						1	7														7
1899	34	6	4			4		1					49			4		4					2	1	3	58
1900	52	6	16	3		4							81	3		1		4					1	2	3	88
1901	39	8	15	3		12	1	1				4	83	1	2	1		4			1	3	1		5	92
1902	66	7	14	3		16						7	113			1		1	1	1		1			3	117
1903	79	12	14	4		11		2		1		1	124	1	1	2		4	1						1	128
1904	70	11	14		5	16	1	2		5		1	125	4	1			5	3				1	3	7	137
1905	283	42	69	23	13	25	2	9	2	2	6	3	479	5	1	2		8	8	1	1	1	12	6	27	514
1906	288	40	92	11		12	1	28	1	5	8	2	488	7	3	4	1	15	9	2	4		3	7	25	528
1907	289	39	110	37	239	24		25	1	5	1	7	777	15	2	12		28	12		7	1	5	13	38	844
1908	260	39	85	10	183	23		22	1	4		2	809	5	2	14		21	15	1	2	2	3	3	26	856
1909	415	71	139	13	114	26		33	1	2	3	10	827	10	3	7		20	16	2	6		4	10	38	885
1910	464	78	167	22		31		51	2	6		3	824	14		16		30	26	2	7	5	4	11	55	908
1911	498	108	190	49	33	35	1	68	4	5		17	1,008	13		8		21	23	4	7	4	4	10	52	1,081
1912	504	80	209	24	85	39		46	3	5		17	1,012	11	2	10		23	31	6	9	3	7	17	73	1,108
1913	537	115	244	15	105	29	1	55	3	13	2	20	1,139	12	1	4	1	18	38	6	9	1	3	18	75	1,232
Total	3,882	889	1,387	217	757	368	7	343	18	53	26	95	7,758	101	18	88	2	207	181	25	53	21	50	101	431	8,394

TABLE 82.—PRODUCTION, MEN EMPLOYED, AND NUMBER KILLED IN AND ABOUT THE BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 60 PER CENT AND OVER OF THE COAL WAS MINED BY MACHINES, 1896 TO 1913, INCLUSIVE, **GROUP IV.**

[See figs. 9, 12, and 13.]

Year.	Grand totals, Group IV.			Totals for States in Group IV having accident statistics.												
	Production (short tons).	Men employed.	Tons mined per man.	Production (short tons).	Percentage mined by machine.	Men employed.	Days active.	Number killed.			Number killed per 1,000 employed.			Number killed per million tons mined.	Tons mined per man.	
								Total.	In exceptional accidents.	In common accidents.	Total.	In exceptional accidents.	In common accidents.		Per year.	Per day.
1896																
1897																
1898	83,895	151	556													
1899																
1900	1,661,775	2,376	699	1,661,775	62.90	2,376	252	7		7	2.95		2.95	4.21	699	2.77
1901																
1902																
1903																
1904																
1905	25,552,950	43,399	589	25,552,950	66.10	43,399	176	126		126	2.90		2.90	4.93	589	3.35
1906	27,731,640	45,438	610	27,731,640	72.14	46,438	167	131	5	126	2.88	0.11	2.77	4.72	610	3.65
1907	32,142,419	46,833	686	32,142,419	77.30	46,833	199	154		154	3.29		3.29	4.79	686	3.45
1908	26,270,639	47,407	554	26,270,639	75.37	47,407	161	113		113	2.38		2.38	4.30	554	3.44
1909	38,637,025	55,017	702	38,637,025	74.04	55,017	203	144	7	137	2.62	.13	2.49	3.73	702	3.46
1910	48,832,987	66,957	729	48,832,987	78.32	66,957	208	245	65	180	3.66	.97	2.69	5.02	729	3.50
1911	44,809,689	69,583	644	44,809,689	79.77	69,583	187	151		151	2.17		2.17	3.37	644	3.44
1912	51,019,248	69,831	731	51,019,248	80.36	69,831	201	186	10	176	2.66	.14	2.52	3.65	731	3.64
1913	57,048,913	75,452	756	57,048,913	83.89	75,452	207	216	20	196	2.86	.26	2.60	3.79	756	3.65
Total	353,791,180	522,444	677	353,707,285	77.48	522,293	192	1,473	107	1,366	2.82	.20	2.62	4.18	677	3.53

TABLE 83.—PERCENTAGE OF FATALITIES AND RATE PER 1,000 MEN EMPLOYED, BY PRINCIPAL CAUSES AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 60 PER CENT AND OVER OF THE COAL WAS MINED BY MACHINES, **GROUP IV.**

(See fig. 11.)

Year.	Falls of roof and pillar coal. (1 and 20)			Mine cars and locomotives. (3)			Gas and dust explosions. (4 and 5)			Explosives. (6)			Miscellaneous underground. (7 to 12)			Total shaft fatalities. (13 to 16)			Total surface fatalities. (17 to 22)			Grand total.	
	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Percentage of total killed.	Number killed per 1,000 employed.	Number killed.	Number killed per 1,000 employed.
1896																							
1897																							
1898																							
1899																							
1900	4	57.14	1.69	1	14.29	0.42				2	28.57	0.84										7	2.95
1901																							
1902																							
1903																							
1904																							
1905	78	61.91	1.80	16	12.70	.37	1	0.79	0.02	4	3.17	0.09	11	8.73	0.25	3	2.38	0.07	13	10.32	0.30	126	2.90
1906	80	61.07	1.76	12	9.16	.26	3	2.29	.07	12	9.16	.26	11	8.40	.24	10	7.63	.22	3	2.29	.07	131	2.88
1907	98	63.63	2.09	17	11.04	.36	3	1.95	.06	4	2.60	.09	18	11.69	.39	1	.65	.02	13	8.44	.28	154	3.29
1908	74	65.49	1.56	17	15.04	.35	2	1.77	.04	6	5.31	.13	6	5.31	.13	2	1.77	.04	6	5.31	.13	113	2.38
1909	88	61.11	1.60	23	15.97	.42	10	6.95	.18	11	7.64	.20	6	4.17	.11	1	.69	.02	5	3.47	.09	144	2.62
1910	122	49.80	1.82	21	8.57	.31	56	22.86	.84	21	8.57	.31	12	4.90	.18	3	1.22	.05	10	4.08	.15	245	3.66
1911	114	75.50	1.64	16	10.60	.23				7	4.63	.10	9	5.96	.13				5	3.31	.07	151	2.17
1912	119	63.98	1.70	21	11.29	.30	12	6.45	.17	6	3.23	.08	13	6.99	.19	4	2.15	.06	11	5.91	.16	186	2.66
1913	120	55.56	1.59	33	15.28	.44	15	6.94	.20	7	3.24	.09	28	12.96	.37	8	3.70	.10	5	2.32	.07	216	2.86
Total	**897**	**60.80**	**1.72**	**177**	**12.02**	**34**	**102**	**6.92**	**.19**	**80**	**5.43**	**.15**	**114**	**7.74**	**.22**	**32**	**2.17**	**.06**	**71**	**4.82**	**.14**	**1,473**	**2.82**

TABLE 84.—FATALITIES, BY CAUSES, AT BITUMINOUS COAL MINES IN THE UNITED STATES IN WHICH 60 PER CENT AND OVER OF THE COAL WAS MINED BY MACHINES, **GROUP IV.**

Year.	Killed underground.													Killed in shaft.					Killed on surface.								Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	8	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1896																											
1897																											
1898																											
1899																											
1900	1	3	1			2							7														7
1901																											
1902																											
1903																											
1904																											
1905	71	7	16	1		4		6		4		1	110	1		2		3	2		1	4	1	5	13		126
1906	75	5	12	3		12		9	2				118	1	1	8		10	3						3		131
1907	95	3	17	3		4		10		3		5	140	1				1	3	1	2	3	4		13		154
1908	71	3	17	2		6		5		1			105	1	1			2	1				1	4	6		113
1909	86	2	23	8	2	11		3		3			138	1				1	2				1	2	5		144
1910	114	8	21	16	40	21		9		2		1	232	1		2		3	6		1	1	2		10		245
1911	106	8	16			7		6		3			146						1		1		3		5		151
1912	110	9	21	7	5	6		7		2		4	171	1		3		4	3		2		2	4	11		186
1913	116	4	33	15		7	5	13		4		6	203	6		1	1	8	1				1	3	5		216
Total	845	52	177	55	47	80	5	68	2	22		17	1,370	13	2	16	1	32	22	1	7	8	15	18	71		1,473

PART II.—COAL-MINE STATISTICS FOR EACH STATE BY CALENDAR YEARS.

INTRODUCTION.

The following pages give detailed information of the coal-mining industry by States, arranged in alphabetical order, and calendar years. Most of the information has a bearing on the accident hazard. Comments are made on the coal-bearing area of each State, the character of the coal beds, that is, whether the beds are thick or thin, flat or inclined, and data are given concerning the roof conditions. There are also notes on the methods of mining, whether long-wall, room-and-pillar, etc., with statements as to whether the coal is mined by hand, machine, or shot off the solid.

In the State tables are complete figures for the production of coal from the beginning of the industry to the end of 1914; also the number of men employed, the number of fatalities, and the fatality rates per 1,000 men employed and per million tons of coal produced since the beginning of inspection service. The tables also give the number of days the mines were operated each year, the number of tons of coal mined per man, per day, and per year, together with the number of mining machines in use since 1891, or since their introduction into the mines, if adopted at a later date.

There is also for each State one table showing all the fatalities by causes and calendar years, for which complete records are available, and with this as a start it should be an easy matter for each State to continue its records on the calendar-year basis. There will also be found under each State data as to the number of hours worked per day and the number of men employed in each group of 8, 9, or 10 hour workers. Fatality rates have also been calculated on the basis of a uniform year of 2,000 hours, so that true comparisons of one State with another may be readily made. Under each State will also be found a list of all of the mine disasters in which five or more men were killed at one time. The last table under each State gives data concerning strikes and lockouts, showing the number of men involved and the total amount of time lost.

While the area of the coal fields will be found under each State, the accompanying table shows, in addition, the estimated original supply, the production in 1913, and the total production to the close of 1913; and in the last column is shown the estimated available supply of coal in the various States at the close of 1913 as estimated by the United States Geological Survey.

AREAS OF THE COAL FIELDS BY STATES, ESTIMATES OF ORIGINAL AND PRESENT SUPPLY, AND THE PRODUCTION TO THE CLOSE OF 1913.[a]

	Area.	Estimated original supply.	Production in 1913.	Total production to close of 1913.	Total exhaustion to close of 1913.	Estimated available supply.
ANTHRACITE.	*Square miles.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*
Pennsylvania	480	21,000,000,000	91,524,922	2,446,696,010	4,847,000,000	16,153,000,000
Colorado and New Mexico	(b)	(b)	(b)			
Total	480	21,000,000,000	91,524,922	2,446,696,010	4,847,000,000	16,153,000,000
BITUMINOUS.[c]						
Eastern province.						
Atlantic coast region:						
Virginia	150	(d)	(d)	(d)	(d)	(d)
North Carolina	60	200,000,000		477,125	715,700	199,284,300
Appalachian region:						
Pennsylvania	14,200	112,574,000,000	173,781,217	2,731,945,059	4,100,000,000	108,474,000,000
Ohio	12,660	93,967,900,000	36,200,527	682,678,546	1,024,000,000	92,943,900,000
Maryland	455	8,044,000,000	4,779,839	175,653,679	263,500,000	7,780,500,000
Virginia	1,750	22,500,000,000	8,828,068	96,287,781	134,500,000	22,365,500,000
West Virginia	17,000	151,544,900,000	71,308,982	787,543,870	1,181,300,000	150,363,600,000
Eastern Kentucky	10,270	67,787,000,000	11,098,960	93,423,911	140,000,000	67,647,000,000
Tennessee	4,400	25,665,000,000	6,903,784	123,793,965	186,000,000	25,479,000,000
Georgia	167	933,000,000	255,626	9,425,298	14,200,000	918,800,000
Alabama	8,455	67,583,000,000	17,678,522	254,954,358	382,400,000	67,200,600,000
Total	69,357	550,598,800,000	330,835,525	4,955,706,467	7,425,900,000	543,172,900,000
Interior province.						
Northern region:						
Michigan	11,000	12,000,000,000	1,231,786	22,911,711	34,400,000	11,965,600,000
Eastern region:						
Indiana	6,500	53,051,000,000	17,165,671	251,632,098	377,500,000	52,673,500,000
Western Kentucky	6,400	55,540,000,000	8,517,640	114,704,743	172,000,000	55,368,000,000
Illinois	35,600	201,399,800,000	61,618,744	965,516,323	1,448,300,000	199,951,500,000
Total	48,500	309,990,800,000	87,302,055	1,331,853,164	1,997,800,000	307,993,000,000

[a] Mineral Resources, U. S. Geological Survey, 1913.
[b] Included in Rocky Mountain and Northern Great Plains provinces.
[c] Includes brown coal or lignite, semianthracite, semibituminous, etc., and scattering lots of anthracite.
[d] Included in production of Appalachian region.

AREAS OF THE COAL FIELDS BY STATES, ESTIMATES OF ORIGINAL AND PRESENT SUPPLY, AND THE PRODUCTION TO THE CLOSE OF 1913—Contd.

	Area.	Estimated original supply.	Production in 1913.	Total production to close of 1913.	Total exhaustion to close of 1913.	Estimated available supply.
BITUMINOUS—*continued.*						
Interior province—Continued.						
Western and southwestern regions: [a]	*Square miles.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*
Iowa	12,560	29,160,000,000	7,525,936	186,603,097	280,000,000	28,880,000,000
Missouri	23,960	84,000,000,000	4,318,125	120,168,472	180,000,000	83,820,000,000
Kansas	18,600	30,000,000,000	7,202,210	129,696,761	194,500,000	29,805,500,000
Arkansas	7,580	1,887,000,000	2,234,107	36,559,588	55,000,000	1,832,000,000
Oklahoma	10,000	54,951,500,000	4,165,770	59,474,164	89,200,000	54,862,300,000
Texas	68,500	31,000,000,000	2,429,144	26,649,290	40,000,000	30,960,000,000
Total	141,200	230,998,500,000	27,875,292	559,151,372	838,700,000	230,159,800,000
Rocky Mountain and Northern Great Plains provinces.						
Arizona	3,610	14,151,400,000				14,151,400,000
North Dakota	35,980	697,929,400,000	495,320	5,423,516	8,200,000	697,921,200,000
Montana	39,532	381,115,800,000	3,240,973	41,400,059	62,000,000	381,053,800,000
South Dakota	10,980	1,020,300,000				1,020,300,000
Wyoming	41,540	670,723,100,000	7,393,066	118,740,918	178,000,000	670,545,100,000
Utah	11,176	88,345,500,000	3,254,828	34,252,834	51,400,000	88,294,100,000
Colorado	19,754	317,852,600,000	9,232,510	175,361,698	263,000,000	317,589,600,000
New Mexico	14,220	191,840,100,000	3,708,806	41,496,606	62,200,000	191,777,900,000
Idaho	1,230	700,000,000	[b] 2,177	48,623	73,000	699,927,000
Total	178,022	2,363,678,200,000	27,327,680	316,724,254	624,873,000	2,363,053,327,000
Pacific coast province and Alaska						
Washington	1,800	63,873,100,000	3,877,891	64,459,440	96,700,000	63,776,400,000
Oregon	230	1,000,000,000	46,063	2,165,821	3,250,000	996,750,000
California	40	44,000,000	24,839	5,153,264	7,733,000	36,267,000
Alaska			2,072	47,969		
Total	2,070	64,917,100,000	3,950,865	71,826,494	107,683,000	64,809,417,000
Total production, including colliery consumption	[c] 450,839	3,553,383,400,000	570,048,125	9,844,247,843	15,877,071,700	3,538,506,328,300

[a] Including Arkansas and Texas lignite fields of Gulf province.
[b] Includes a little coal from Nevada.
[c] Includes 89,482 square miles supposed, but not definitely known, to contain usable coal, and 28,470 square miles in which the coal lies under cover 3,000 or more feet in thickness.

ALABAMA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The Alabama coal fields form the southwestern end of the Appalachian coal region, which extends from Pennsylvania to Alabama. There are four distinct fields: The Coosa field, on the southeast; the Cahaba field, somewhat west of the Coosa; the Warrior field, 7 to 10 miles west of the Cahaba field; and the Plateau field, in the northeast corner of the State and northeast of the Warrior field, and not entirely separate therefrom. These fields were originally connected, but have been separated since their formation by erosion along the lines of faults or anticlines. The total remaining area is now about 8,500 square miles not including the area, probably of considerable size, beneath younger rocks to the southwest of the visible margin of the coal-bearing rocks.

COOSA FIELD.

The Coosa field, or basin, is a structural trough 6 miles wide extending for 60 miles through Shelby and St. Clair counties and containing about 260 square miles. It is faulted along its southeast margin, so that in general only the western half of the trough remains. The coal beds dip to the southeast at angles varying with the locality from 10° to 50°. However, the structure is less simple than the above description indicates, for at the north end there are a number of small subordinate basins due to local faults and folds, and in the southern two-thirds, the structure, although it is rather more regular, is affected by internal faults and folds. The conglomerate, sandstone, and shale, which comprise the coal-bearing rocks, are of great thickness, probably not less than 10,000 feet as a maximum. The best known part of the field is the northeast, where there are 18 coal beds, each of which varies considerably in thickness from place to place, the minimum thicknesses varying from zero to 2½ feet and the maximum thicknesses from 8 inches to 5 feet 8 inches. These beds lie in the small subordinate basins above mentioned and in the upper 4,000 feet of the rocks, so that their total area is probably not over one-tenth of the area of the field, say 35 square miles. In the other parts of the Coosa trough the coal beds are not so well known but appear to be few and comparatively thin. Excepting two beds the character of the Coosa coals has not been adequately determined. So far as shown by the tests made, the coal is high-grade bituminous with low sulphur and medium ash contents and of about the hardness of the southern Appalachian coals generally. One bed is reported to yield good coking coal.

CAHABA FIELD.

The Cahaba field, or basin, like the Coosa field, is a synclinal trough lying a few miles west of the Coosa field. It is about 68 miles long and extends from the northeastern part of Bibb County through Shelby County into St. Clair County, its average width is about 6 miles except in the southwest third where it expands to twice that width, and its area is about 350 square miles.

Like the Coosa field the eastern half of the Cahaba trough is faulted, except for a few miles at the south end, where the southeast limb of the syncline in a vertical or slightly overturned attitude is preserved. Along the western margin of the trough the dip varies from 10° to 60° southeast. In the north half of the field this southeast dip prevails to the fault in the southeast, but extending along the middle of the southern half of the field the southeast dip is interrupted by a high anticline with a vertical dip on the northwest limb and a dip of 40° on the southeast limb near the crest, but diminishing gradually to a low dip southeastward to the boundary fault, except for the few miles where the southeast limb of the trough is preserved. In this area the rocks bend abruptly upward and stand vertical at the surface. In addition to these major folds, there are a number of subordinate basins along the southeastern margin, caused by transverse folds with dips of all degrees up to vertical. Several faults of varying magnitude are known, but apparently faults are few.

The coal-bearing strata, conglomerate, sandstone, and shale, are about 9,000 feet thick in the southern part of the field and about 5,000 feet in the northern part.

In the southern part there are at least 17 coal beds that in some part of their extent are 2 feet or over in thickness, the thickest bed being 5 to 6 feet. Most of the beds, with the exceptions of local thinning or thickening, range from 2 to 4 feet in thickness.

The coal is high-grade bituminous with a low to medium ash content, a generally low sulphur content, and, as a rule, is of average hardness. It is said to make a good quality of coke, but the yield is lower than the Warrior coals, so that the product is all consumed as domestic, steam or gas coal.

WARRIOR FIELD.

The Warrior coal field, or basin, lies 7 to 10 miles west of the Cahaba field and extends westward nearly to the State boundary. It is a quadrangular area, including all or parts of the following counties: Jefferson, Walker, Tuscaloosa, Fayette, Marion, Franklin, Lawrence, Winston, Cullman, Morgan, and Blount. The Warrior field is not

definitely separated from the Plateau field on the northeast, and their limits have not yet been definitely defined. The combined area of the two fields is about 7,600 square miles. Along the southeast edge of the Warrior field the strata dip 90° to 40°, or less, to the west; but throughout the remainder of the field are nearly flat or gently and broadly warped. The rocks, conglomerate, sandstone, or shale are about 3,000 feet thick.

The number of workable coal beds is about fifteen. They constitute the following groups from below upward: Black Creek, Mary Lee, Pratt, and Brookwood, each named from its most important coal bed. The bottom of the Black Creek group is about 900 feet above, and the top of the Brookwood is about 2,300 feet above, the bottom of the coal-bearing rocks, so that the main coal beds extend through about 1,400 feet of strata.

The Black Creek, the lowest and most extensive bed, averages about 3 feet thick and is an excellent domestic coal, for which it is mainly used. The Mary Lee group contains five beds, but at all points one "big seam," which possibly may be everywhere the same bed, or at different points may be one or another of the five beds. This "big seam" is of great areal extent, varies from 5 to 10 feet in thickness, and includes many thin or a few thick clay partings. The Pratt group likewise contains five coal beds, of which three are important, one of the three being the Pratt bed, which over large areas is 3 to 5 feet thick, with at some places a thin parting or two and at others being all clean coal. The Brookwood group includes three or four beds, of which the Brookwood bed is the most important, being 3 to 7 feet thick. This group, being high in the coal-bearing rocks, occupies only a relatively small area in Tuscaloosa County. The "Big seam," Pratt, and Brookwood beds are the thickest in the Warrior basin. In 1899 the Pratt beds yielded 65 per cent of the total coal production from the basin, and in recent years about 33 per cent.

The average composition of 23 samples of the different coal beds of the Warrior basin is approximately as follows: 2.4 per cent moisture, 28.4 per cent volatile matter, 59 per cent fixed carbon, 10.2 per cent ash, and 1.74 per cent sulphur. It is a high-grade bituminous coal of medium hardness and a domestic steam and coking coal. Practically all the coke consumed in the State is made from coal from the "Big seam," Pratt bed, and the beds of the Brookwood group, of which the principal one is the Brookwood.

PLATEAU FIELD.

The Plateau field comprises a long belt on Sand Mountain extending from the Warrior field, with which it is continuous on the south-

west, to the northeast corner of the State, a number of detached areas to the northwest of the Sand Mountain belt, the detached area of Lookout Mountain, and the semi-detached area of Blount Mountain on the southeast of Sand Mountain. These various areas lie mainly in Madison, Jackson, DeKalb, Etowah, Marshall, and Blount Counties.

The character of the rocks is the same as in the other fields, but their thickness and the number and thickness of coal beds are not well known. There are perhaps four or six different beds, more or less local in extent, which range from 2 to 4 feet in thickness.

Except on the western edge of Blount Mountain, where the rocks are vertical, the dip is slight and in most parts of the field the rocks are nearly flat.

MINING METHODS.

Coal mining was first begun in the Coosa basin in 1836, and in the Cahaba field in 1856. General uniformity in mining methods prevails throughout the Birmingham district with the exception of slight modifications which are rendered necessary by differences in the geologic structure. In the Coosa and Cahaba basins the coal-bearing strata generally dip from 5° to 30°, but, as on the southeastern margin of the Cahaba basin, the dip is 60° or in places even 90°. Practically all of the mines are opened by slopes, the main entry following the dip of the coal. From these slopes the coal is mined by the room-and-pillar system. In the central and western parts of the Warrior field, where the coal beds are nearly flat and the coal is above the drainage levels, the mines are opened almost exclusively by drifts. Along the southeastern margin of the Warrior basin, where the dip is 40° to 90°, the mines are opened by slopes; at a few mines shafts are employed for reaching the lower coal. Shafts are also used in the southern part of the basin where the coal-bearing formations pass below the drainage level. The room-and-pillar system of mining also prevails in this part of the district. In 1899 only one mine was reported as using the long wall system, and only 3½ per cent of the output was mined by machines, whereas in 1913 the machine-mined coal amounted to 23.3 per cent. The number of machines in operation in 1899 was 53, and in 1913, 377. In 1912, 35.1 per cent of the coal was shot off the solid, and in 1913, 39.9 per cent, an increase of 5.8 per cent. Tail rope, endless rope, electric, and mule haulage are employed.

ROOF.

So far as the character of the roof is concerned, whether sandstone or shale, it is generally strong. The roof of the Thompson bed

(southern part of the Cahaba field) is of shale 10 feet thick that slakes rapidly and falls badly, so that it is necessary to put in heavy timber in the main haulage ways. A fragile shale roof is reported in a few mines.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The office of inspector of mines of Alabama was created by an act approved February 18, 1891, applying to all coal, iron, or other mines where 20 or more men were employed underground. The inspector was appointed by the governor, and was required to examine every mine at least once every three months. By an act approved February 16, 1893, the operators were required to notify the inspector of fatal accidents, and the inspector, at the operator's request or the request of three miners, examined into the cause of such accidents, and preserved in his office a record of each accident of which he received notice. Biennial reports were rendered to the governor. The act of February 18, 1895, made it the duty of mine operators to report to the inspector serious as well as fatal accidents in and about the mines. A chief inspector and two associate mine inspectors were provided for by the act of February 16, 1897, the chief inspector to report biennially to the governor. The act of April 18, 1911, authorized the governor to appoint an inspector of coal mines for each 2½ million tons of coal mined, or majority fraction thereof, based on the output for previous years as compiled by the chief mine inspector, one of the inspectors so appointed to be designated chief inspector, and the others associate inspectors, and one of them to be a mining engineer. The law required the inspector to report to the governor before the legislature convened.

The practice of mine operators in Alabama is to report to the inspectors all accidents causing 10 days' disability. A serious injury is considered as one causing disability for 30 days, a slight injury being one which disables an employee 1 to 29 days. Only the serious injuries are published in the inspector's annual reports.

In 1915 there were one chief inspector and six district inspectors.

ACCIDENTS.

The accompanying tables show the number of fatalities by causes and calendar years since 1893 as compiled from the State mine inspectors' annual reports. These tables also show the percentage of accidents, classified by principal causes, and the fatality rate per 1,000 men employed over a period of 21 years for which continuous records

are available. The fatality rate during this period is 5.25 per 1,000 men employed. Since 1897 to the end of 1913 there have been 12 disasters in which 5 or more men were killed at one time, representing a total of 500 fatalities, or approximately 27 per cent of the total

FATALITIES IN **ALABAMA** COAL MINES, BY PRINCIPAL CAUSES, DURING 21 YEARS, 1893 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	713	38.31	2.01
Mine cars and locomotives	193	10.37	.55
Gas and dust explosions	620	33.32	1.75
Explosives	96	5.16	.27
Miscellaneous	203	10.91	.57
Shaft	8	.43	.02
Surface	28	1.50	.08
Total (21 years)	1,861	100.00	5.25

COAL-MINE ACCIDENTS IN **ALABAMA** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1897 Sept. 20	Belle-Ellen	Belle-Ellen	Mine fire	5
1899 Feb. 21	Blocton No. 2	Blocton	Mine explosion	5
1905 Feb. 20	Virginia City	Virginia City	do	108
1906 Feb. 27	Little Cahaba	Piper	do	12
1907 Dec. 16	Yolande	Yolande	do	56
1909 Feb. 2	Short Creek	Short Creek	do	16
1910 Apr. 20	Mulga	Mulga	do	40
1910 May 5	Palos No. 3	Palos	do	83
1910 Nov. 3	Yolande No. 1	Yolande	do	5
1911 Apr. 8	Banner	Littleton	do	128
1912 Aug. 13	Abernant	Abernant	do	18
1913 Nov. 18	Acton No. 2	Acton	do	24
1914 Jan. 10	Rock Castle	Rock Castle	do	12
1914 Oct. 5	Mulga	Mulga	do	16

killed from 1893 to 1913. Falls of roof are responsible for 38.31 per cent of all the fatalities since 1893; gas and dust explosions combined represent 33.32 per cent. The average production of coal per fatality was 118,865 tons, or there were 8.41 fatalities per million tons mined.

Since 1903 practically 62 per cent of the men employed in the mines of Alabama have been on a 10-hour basis. This alone partly accounts for the higher rate when compared with Iowa or Ohio, in which States all of the men are on an 8-hour day. The average number of hours worked a year per man is 2,255, as compared with 1,495 for Ohio or 1,704 for Iowa (Table 40). The fatality rate reduced to a 2,000-hour basis becomes 5.78 for the 10-year period 1903–1913, as compared with 6.52 per 1,000 men actually employed.

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN ALABAMA.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	20	935	34	7,665	61	10,746	2,092	21,438
1904	17	876	50	5,763	50	8,409	2,763	17,811
1905	24	1,069	32	3,570	65	11,279	3,677	19,595
1906	27	1,096	37	7,808	91	11,258	393	20,555
1907	31	1,994	34	2,339	84	13,942	3,113	21,388
1908	16	1,205	34	2,358	100	11,969	3,665	19,197
1909[b]								17,760
1910	18	766	36	2,633	134	17,306	1,525	22,230
1911	15	550	50	5,345	102	12,628	3,480	22,003
1912	11	338	46	4,145	107	13,938	4,192	22,613
1913	13	420	36	2,496	135	18,185	3,451	24,552

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN ALABAMA AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees.)	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	228	202,753	46,227,684	23,114	57	2.47
1904	216	167,832	36,251,712	18,126	83	4.58
1905	225	186,565	41,977,125	20,989	187	8.91
1906	237	195,157	46,252,209	23,126	96	4.15
1907	242	204,440	49,474,480	24,737	154	6.23
1908	222	183,537	40,745,214	20,373	108	5.30
1909						
1910	249	216,610	53,935,890	26,968	238	8.82
1911	227	210,105	47,693,835	23,847	209	8.77
1912	245	217,117	53,193,665	26,597	123	4.62
1913	255	238,733	60,876,915	30,439	124	4.07

Tables have been compiled showing the fatality rates for all the States both on the basis of actual employees and the number of 2,000-hour workers, so that by referring to Tables 40 and 41 a true comparison of Alabama with other States may be readily made. The tables of statistics for the State follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN ALABAMA.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	1,135	68,925	61	1907	80	3,600	45
1900	1,056	50,620	48	1908	8,397	373,513	44
1901	1,170	14,071	1[illegible]	1909			
1902	6,059	139,783	23	1910	25	1,250	50
1903	7,319	231,112	32	1911	210	1,260	6
1904	9,518	762,032	80	1912	384	12,323	32
1905	667	33,262	50	1913	1,048	27,041	26
1906	549	6,576	12	1914	320	3,940	12

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 85.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **ALABAMA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal line in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	6	9	10	11	12	13	14	15	16	17	18	19	20	21
1840–1886	10,944,018																				
1887	1,950,000							250													
1888	2,900,000	$1.15	6,900					420													
1889	3,572,983	1.11	6,864					248	521	2.10											
1890	4,090,409	1.03	10,642					217	384	1.77											
1891	4,759,781	1.07	9,302					288	512	1.91											
1892	5,529,312	1.05	10,075					271	549	2.03											
1893	5,136,935	.99	11,294	17	1.51	3.31	302,172	237	455	1.92											
1894	4,397,178	.93	10,859	21	1.93	4.78	209,389	238	405	1.70											
1895	5,893,775	.90	10,348	39	3.77	6.85	145,994	244	550	2.25											
1896	5,748,697	.90	9,894	25	2.53	4.35	229,948	248	581	2.34											
1897	5,893,770	.88	10,597	39	3.68	6.62	151,122	233	556	2.39		5.0								45	
1898	6,535,283	.75	10,733	45	4.19	6.89	145,229	250	609	2.44		4.6								37	
1899	7,593,418	1.09	13,481	40	2.97	5.27	189,835	238	563	2.37		3.4			41	10	2			53	
1900	8,394,275	1.17	13,967	37	2.65	4.41	226,872	257	601	2.34		4.4								54	
1901	9,099,052	1.10	17,370	40	2.30	4.40	227,476	236	524	2.22		3.2								82	
1902	10,354,570	1.20	16,439	50	3.04	4.83	207,091	256	630	2.46		2.9								66	
1903	11,654,324	1.22	21,438	57	2.66	4.89	204,462	228	544	2.39		5.0			89	9				98	
1904	11,262,046	1.20	17,811	83	4.66	7.37	135,687	216	632	2.93		6.6			119	22				141	
1905	11,866,069	1.21	19,595	187	9.54	15.76	63,455	225	606	2.69		13.4			171	42				213	
1906	13,107,963	1.34	20,555	96	4.67	7.32	136,541	237	638	2.69		12.5			177	61				238	
1907	14,250,454	1.29	21,388	154	7.20	10.81	92,535	242	666	2.75		12.4			152	42	3			197	
1908	11,604,593	1.26	19,197	108	5.63	9.31	107,450	222	605	2.73		15.4			142	51	4			197	
1909	13,703,450	1.19	17,760	129	7.26	9.41	106,228	(a)	772	(a)		15.0			192	74	17			283	198
1910	16,111,462	1.26	22,230	238	10.71	14.77	67,695	249	725	2.91		18.5			215	82	20			317	221
1911	15,021,421	1.27	22,003	209	9.50	13.91	71,873	227	883	3.01	31.1	19.6	44.1	5.2	184	53	13	22		272	211

1912	16,100,600	1.29	22,613	123	5.44	7.64	130,899	245	712	2.91	41.4	23.2	35.1	.3	222	60	12	59	.....	353	217
1913	17,678,522	1.31	24,552	124	5.05	7.01	142,569	255	720	2.82	35.7	23.3	39.9	1.1	249	42	20	66	.....	377	224
Total	254,954,358	.....	.....	1,861	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1893–1913)	10,633,707	.....	16,863	68.62	6.25	8.41	118,885	239	625	2.62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	15,593,422	1.34	24,042	128	5.32	8.21	121,824	226	649	2.87	32.9	31.7	35.3	.1	223	31	20	88	.....	362	207

[a] Not reported.

TABLE 86.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **ALABAMA**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1893 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1893	13	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	2	17
1894	11	1	2	.....	.....	2	.....	.....	.....	.....	4	.....	20	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	21
1895	19	4	6	3	.....	2	2	.....	.....	.....	.....	.....	36	1	.....	.....	.....	1	.....	.....	1	.....	.....	1	2	39
1896	16	2	3	.....	.....	2	.....	.....	.....	.....	.....	2	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25
1897	17	2	4	4	.....	3	.....	.....	.....	.....	5	3	38	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	39
1898	22	2	9	10	.....	.....	.....	.....	.....	.....	.....	1	44	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	45
1899	18	3	5	5	.....	4	1	.....	.....	.....	.....	.....	36	1	.....	1	.....	2	.....	.....	.....	.....	.....	2	2	40
1900	17	2	4	2	.....	3	.....	.....	.....	.....	.....	9	37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
1901	18	6	6	2	.....	6	.....	.....	.....	.....	.....	.....	38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	40
1902	29	.....	9	.....	.....	10	.....	.....	.....	.....	.....	.....	48	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	2	50
1903	20	2	6	18	.....	3	.....	.....	.....	.....	.....	8	57	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	57
1904	34	4	7	26	.....	3	.....	.....	.....	.....	.....	9	83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	83
1905	31	3	8	19	112	4	.....	1	.....	.....	.....	9	187	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	187
1906	45	5	12	13	.....	7	.....	6	.....	.....	.....	2	80	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	6	86
1907	21	3	11	5	57	3	.....	2	.....	.....	.....	52	154	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	154
1908	36	3	16	9	.....	12	.....	10	.....	.....	.....	22	108	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	108
1909	61	9	17	6	18	10	2	4	.....	.....	.....	1	128	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	129
1910	51	4	20	.....	139	10	.....	6	.....	.....	.....	7	237	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	238
1911	43	4	14	2	128	5	.....	6	.....	.....	.....	2	204	1	.....	.....	.....	1	.....	.....	.....	.....	2	2	4	209
1912	56	6	15	26	.....	5	.....	8	.....	.....	.....	1	117	2	1	.....	.....	3	.....	.....	.....	.....	3	.....	3	123
1913	61	7	19	3	[a] 13	2	[a] 11	5	.....	.....	.....	2	123	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	124
1914	63	.....	24	37	.....	1	.....	11	.....	1	.....	.....	127	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	128

[a] Explosion at Acton No. 2 mine, killed 24.

ARKANSAS.

AREA AND DISTRIBUTION OF COAL FIELDS.

The semibituminous coal field of Arkansas occupies the west-central part of the State, having a length from east to west of 75 miles. At the Oklahoma-Arkansas line it is about 50 miles wide and at the eastern extremity about 25 miles wide. It comprises about 1,580 square miles, of which 75 per cent is considered as productive. The coal-bearing rocks occupy the larger part of Crawford, Franklin, Sebastian, Johnson, and Logan counties.

The lignite field of Arkansas occupies the eastern part of the State and is possibly coextensive with the Tertiary rocks of the Mississippi Valley. The estimated area of these rocks is 6,000 square miles, but workable lignite has been discovered at only a few places, and at no place is it mined on a commercial scale.

SEMIBITUMINOUS FIELD.

The semibituminous field is the eastward extension of the Oklahoma fields, but in Arkansas there is only one coal bed of commercial importance, the Hartshorne, which lies just above the massive Hartshorne sandstone and at the base of the Spadra shale. This coal is mined extensively in the vicinity of Huntington, Midland, Greenwood, and Jenny Lind, in the western part of the field, and is from 3 feet to 8 feet thick. Where the bed is less than 4 feet thick, it is generally clean coal, but where the thickness increases to 6 or 8 feet the bed is broken by many soft shale partings.

The field as a whole is a broad, open synclinal basin or trough, with many minor folds and faults that break the regularity of outline and seriously interfere with economical mining. The Hartshorne coal bed outcrops around the rim of the basin, but only part of the exposed outcrop is thick enough to mine under present conditions.

The coal is of high rank, comparing favorably with the Pocahontas and New River coals of the Appalachian region. In the west end of the field it is semibituminous, but its rank increases eastward to semianthracite about Spadra and Russellville.

MINING METHODS.

The first records of coal production in Arkansas extend back to 1840, when 220 tons of coal were mined. The production has gradually increased to 1913, when 2,234,107 tons were produced. Most of the mines are opened by shafts, but a few are opened by slopes. The room-and-pillar method of mining prevails throughout the State. About 99 per cent of the coal produced comes from the Huntington field, from what is known as the Hartshorne seam of Oklahoma.

Coal-mining machines were used in Arkansas in 1896, at which time there were 14 machines in operation, producing about 3 per cent of the coal. Fifteen to 20 machines were kept in operation until the close of 1902, and from that year until 1910 no mining machines were used in the State. In 1911 there were 14 machines in use, producing a little more than 1 per cent of the coal mined. In 1913 there were 27 machines, producing slightly over 11 per cent of the coal. In 1912, 92 per cent of the coal was shot off the solid; in 1914, 78 per cent was thus mined.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

By an act approved March 7, 1889, the legislature of Arkansas established a Bureau of Mines, Manufactures, and Agriculture, under the supervision of a commissioner, whose duties included the collection and publication of statistics setting forth the extent of the mineral resources of the State, the purpose being to encourage immigration to Arkansas. The act made no provision for the investigation or reporting of mine accidents, but a subsequent law, approved April 4, 1893, which was still in force in 1914, provided for the appointment by the governor of a mine inspector, to whom all fatal or serious accidents in coal mines should be reported by mine operators. The inspector investigates all fatal accidents to determine the cause thereof. He is required to personally inspect all coal mines in the State where 20 or more men are employed underground, to insure the safety and health of the workmen, and to see that the provisions of the act are properly observed and enforced. The act is not applicable to mines employing less than 20 men. Annual reports are rendered to the governor on the 1st day of November of each year.

Mine operators report to the inspector all injuries resulting in at least two days' disability, and these are included in the annual reports which the inspector renders to the governor. Injuries involving 10 or more days' disability are classified as serious, all others being considered slight injuries.

In 1915 the inspector employed no assistants.

ACCIDENTS.

The accompanying tables (Nos. 87 and 88) give the production, number of employees, and number of men killed in and about the coal mines of Arkansas, compiled from the best records available. The accident records began with 1897, although the inspection service began at an earlier date. There are no records for the years 1899, 1900, and 1904, and the record for 1903 is incomplete. For the 9-year period for which continuous records are available, 1905 to 1913, inclusive, 107 men were killed, representing a fatality rate

FATALITIES IN ARKANSAS COAL MINES, BY PRINCIPAL CAUSES, DURING 9 YEARS, 1905 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	65	60.75	1.46
Mine cars and locomotives	2	1.87	.05
Gas and dust explosions	2	1.87	.05
Explosives	15	14.01	.34
Miscellaneous	20	18.69	.45
Shaft	2	1.87	.05
Surface	1	.94	.02
Total, 9 years	107	100.00	2.42

COAL-MINE ACCIDENTS IN ARKANSAS IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number of men killed.
1897 Mar. 4	Kansas and Texas No. 44.	Huntington	Powder and dust explosion.	14
1903 Nov. 20	Bonanza No. 20	Bonanza	Gas explosion	11

of 2.42 per 1,000 men employed. The production per fatality was 180,117 tons, or there were 5.55 fatalities per million tons mined. There have been two serious mine explosions since 1897, in which 25 men were killed.

The 8-hour day prevails in Arkansas and the actual number of hours worked per man a year is 1,314 (Table 40), as compared with 2,255 hours for Alabama and 1,539 hours for Missouri. A fatality rate for the 10-year period, 1903 to 1913 (except 1909), for which

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN ARKANSAS.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Number of men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	38	4,029	.....	.....	2	14	114	4,157
1904	42	4,472	.....	.....	.....	.....	108	4,580
1905	45	4,146	1	16	.....	.....	30	4,192
1906	55	4,282	.....	.....	.....	.....	16	4,298
1907	67	4,970	.....	.....	.....	.....	115	5,085
1908	67	5,325	.....	.....	.....	.....	12	5,337
1909[b]	.....	.....	.....	.....	.....	.....	.....	5,266
1910	63	5,312	.....	.....	.....	.....	256	5,568
1911	53	5,196	.....	.....	.....	.....	142	5,338
1912	48	4,198	.....	.....	.....	.....	340	4,538
1913	53	4,652	.....	.....	.....	.....	.....	4,652

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN ARKANSAS AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	223	33,398	7,447,754	3,724	.....	.....
1904	165	36,748	6,063,420	3,032	.....	.....
1905	177	33,582	5,944,014	2,972	8	2.69
1906	165	34,400	5,676,000	2,838	13	4.58
1907	190	40,795	7,751,050	3,876	13	3.35
1908	145	42,708	6,192,660	3,096	14	4.52
1909	.....	.....	.....	.....	.....	.....
1910	128	44,800	5,734,400	2,867	14	4.88
1911	133	42,846	5,698,518	2,849	12	4.21
1912	157	36,628	5,750,596	2,875	6	2.09
1913	174	37,216	6,475,584	3,238	12	3.71

complete data are available, is 2.36 per 1,000 men employed. This, however, reduced to a common basis of 2,000-hour workers, shows a rate of 3.74 per 1,000. Table 41 shows the other States worked out on a similar basis, so that comparisons may be readily made. The tables of statistics for the State follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN ARKANSAS.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	2,041	216,265	106	1907	1,185	35,835	30
1900	47	5,040	107	1908	4,037	387,841	96
1901	.....	.....	.....	1909	1,443	41,836	29
1902	14	140	10	1910	4,873	713,210	146
1903	398	2,078	5	1911	665	4,615	7
1904	76	1,424	19	1912	403	37,685	94
1905	625	7,806	12	1913	1,221	32,481	27
1906	3,828	291,095	76	1914	1,415	159,854	113

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 87.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **ARKANSAS**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 compiled from State mine inspectors' reports, except for years 1905 to 1909, inclusive, which are from Coal Mining in Arkansas, by A. H. Purdue, in Geological Survey of Arkansas, Part I, 1910. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated. Figures in italics represent incomplete fatality records.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1840–1887	539,798																				
1888	276,871	$1.50	650						426												
1889	279,584	1.42	677					156	413	2.65											
1890	399,888	1.29	938					214	426	1.99											
1891	542,379	1.19	1,317					214	412	1.93											
1892	535,558	1.24	1,128					199	475	2.39											
1893	574,763	1.34	1,559					151	369	2.44											
1894	512,626	1.22	1,493					134	343	2.56											
1895	598,322	1.25	1,218					176	491	2.79											
1896	675,374	1.12	1,507					168	448	2.67		3.1								14	
1897	856,190	1.06	1,990	*17*				161	430	2.67		10.2								15	
1898	1,205,479	1.03	2,555	5	1.96	4.15	241,096	163	472	2.90		12.6								21	
1899	843,554	1.17	2,313	(a)				156	365	2.34		17.4				16				16	
1900	1,447,945	1.14	2,800	(a)				219	517	2.36		14.8								20	
1901	1,816,130	1.14	3,144	18	5.73	9.91	100,896	221	578	2.62		5.6								20	
1902	1,943,932	1.31	3,595	*13*	3.62	6.69	149,533	188	541	2.88		.5								7	
1903	2,229,172	1.51	4,157	*11*				223	536	2.40											
1904	2,009,451	1.54	4,580	(a)				165	439	2.66											
1905	1,934,673	1.49	4,192	8	1.91	4.14	241,834	177	462	2.61											
1906	1,864,268	1.61	4,298	13	3.02	6.97	143,405	165	434	2.63											
1907	2,670,438	1.68	5,085	13	2.56	4.87	205,418	190	525	2.76											
1908	2,078,357	1.68	5,337	14	2.62	6.74	148,454	145	389	2.68											
1909	2,377,157	1.48	5,266	15	2.85	6.31	158,477	(b)	451	(b)											66

1910	1,905,958	1.56	5,568	14	2.51	7.35	136,140	128	342	2.67	.....	.7	.....	.....	6	6	.....	.....	.....	12	63
1911	2,106,789	1.61	5,338	12	2.25	5.70	175,566	133	395	2.97	6.2	1.3	90.4	2.1	.....	10	.....	2	2	14	59
1912	2,100,819	1.71	4,536	6	1.32	2.86	350,137	157	463	2.95	3.5	3.7	92.2	.6	.....	.....	.....	6	3	9	55
1913	2,234,107	1.76	4,652	12	2.58	5.37	186,176	174	480	2.76	9.2	11.2	79.5	.1	.....	23	.....	4	.....	27	53
Total	36,559,588	.....	.....	171	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1905–1913)	**2,141,396**	.....	**4,919**	**11.89**	**2.42**	**5.55**	**180,117**	**157**	**435**	**2.77**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	1,836,540	1.72	4,339	11	2.54	5.99	166,958	143	423	2.96	2.9	19.1	77.9	.1	.....	.....	.....	28	.....	28	56

a Reports either not published or not available.

b Not reported.

TABLE 88.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN ARKANSAS, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1897 TO 1914, INCLUSIVE.[a]

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1897	1	1	1	.....	14	.....	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*17*
1898	3	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	5
1899	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(b)
1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(b)
1901	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18
1902	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*13*
1903	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*11*
1904	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(b)
1905	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	2	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
1906	6	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	3	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
1907	7	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	4	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
1908	8	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	5	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
1909	9	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	4	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
1910	10	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
1911	9	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	11	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	12
1912	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	6
1913	5	1	1	.....	2	1	.....	.....	.....	.....	1	.....	11	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	12
1914	3	.....	3	2	1	1	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	11

[a] Figures in italics represent incomplete fatality records.

[b] Reports either not published or not available.

CALIFORNIA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The area and distribution of the coal fields of California are described by Parker[a] as follows:

There are in California a number of small, widely separated coal fields, chief among them the Mount Diablo field of Contra Costa County, the Corral Hollow field of Alameda County, a small area in Amador County, the Priest Valley and Trafton fields of San Benito County, and the Stone Canyon field of Monterey County. The first two, which are on the eastern border of San Francisco Bay, and consequently in the west-central part of the State, produce black lignite or subbituminous coal. The areas in Monterey County are more to the south and in or near a region which has been considerably distorted. The coals are of the same geologic age as those farther north, but they have been altered into true bituminous coals. The alteration in the San Benito County area has not progressed so far as in the case of the Monterey County coals, but they closely approach the bituminous grade. None of them possess coking qualities.

The records of the State Mining Bureau of California show a production of coal in that State as early as 1861. It was at that time one of the 16 coal-producing States, and, relatively, of some importance as a coal producer. During the latter part of that decade and throughout the following decade the coal production of California exceeded 100,000 tons annually and reached a maximum of 236,950 tons in 1880. Since 1881 the production has been irregular, having been influenced chiefly, up to the beginning of the present century, by the imports of Australian and British Columbian coals, the receipts of Australian coals depending principally upon the wheat production and shipments from the Pacific coast. Since 1900, with the great increase in the production and use of petroleum which began in that year, coal production in California has fallen to an insignificant quantity.

ACCIDENTS.

Tables 89 and 90 show the production of coal and the number of men employed since 1889, for which reasonably complete records are available. Records of fatalities, however, date back only to 1909. In 1876 there was one explosion at Nortonville, in which six men were killed, and in 1909 there was another at Chancellor, which also killed

COAL-MINE ACCIDENTS IN CALIFORNIA IN WHICH FIVE OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number of men killed.
1876 July 24	Black Diamond	Nortonville	Mine explosion	6
1909 Jan. 19	Stone Canyon	Chancellor	do	6

six men. As is shown by the table following, the coal-mining industry of California is small, hence little attention has been given to the collection of accident and labor records. With the passage of the compensation laws no doubt more complete records will be available in the future. The tables of statistics for the State follow:

[a] Parker, E. W., The production of coal: Mineral Resources of the United States for 1913, U. S. Geol. Survey, 1914, pp. 819–820.

TABLE 89.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **CALIFORNIA**, BY CALENDAR YEARS; ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Figures compiled from Mineral Resources, U. S. Geol. Survey, except figures in column 4, which were reported direct to the Bureau of Mines by the operators. Figures in columns 9 and 10 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1861–1885	2,980,671			*6*																	
1886	100,000	$3.00																			
1887	50,000	3.00																			
1888	95,000	4.00																			
1889	119,820	2.37	253						474												
1890	110,711	2.56	364					301	304	1.01											
1891	93,301	2.20	256					222	364	1.64											
1892	85,178	2.46	187					204	455	2.23											
1893	72,603	2.31	158					208	460	2.21											
1894	67,247	2.31	125					232	538	2.32											
1895	75,453	2.33	190					262	397	1.52											
1896	78,544	2.12	177					297	444	1.49											
1897	87,992	2.34	381					150	231	1.54											
1898	145,888	2.43	284					265	514	1.94											
1899	160,915	2.67	303					291	443	1.52											
1900	171,708	3.05	378					309	454	1.47											
1901	151,079	2.60	428					289	353	1.22											
1902	84,984	2.99	207					312	411	1.32											
1903	104,673	2.82	203					307	516	1.68											
1904	78,888	4.76	168					282	470	1.67											
1905	77,050	4.97	135					294	571	1.94											
1906	25,290	2.40	41					284	617	2.17											
1907	13,950	2.74	32					258	436	1.69											
1908	18,755	2.93	34					220	552	2.51											
1909	45,836	2.07	15	*6*				(*b*)													
1910	11,164	1.64	14	0				192	797	4.15											4
1911	10,747	1.50	45	0				254	239	.94		100.0									2

1912	10,978	2.15	52	2	.....	.....	.....	184	211	1.15	70.9	1.8	22.8	4.5	.....	.....	.....	.....	1	1	4
1913	24,839	3.38	35	2	.....	.....	.....	332	710	2.14	.....	4.8	95.2	.....	.....	.....	.....	.....	2	2	2
Total	5,153,264	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	11,692	2.93	36	.....	.....	.....	.....	279	325	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	2	.....

[a] Figures in italics represent incomplete fatality records. [b] Not reported.

TABLE 90.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **CALIFORNIA**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, 1910 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
1911	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
1912	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1913	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2
1914	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0

COLORADO.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Colorado comprise an area of about 19,700 square miles, but in 3,800 square miles of this territory the coal beds may be 3,000 feet or more below the surface.

The fields may be grouped geographically into three groups, known as the Eastern, Park, and Western groups. The fields of each group occupy more or less irregular synclinal basins along the foothills, and on the sides nearer the mountains the rocks are more or less upturned and disturbed.

The Eastern group includes the Trinidad, Canon City, and Boulder coal fields, which yield about two-thirds of the coal now mined in Colorado. The Park group includes the fields in the South, Middle, and North Parks in the north-central part of the State, and is not extensively developed.

The Western group is the largest in area. It includes the Yampa field in the northern part of the State, and, to the south of the Yampa, the Danforth Hills, White River, Grand Hogback, Glenwood Springs, Crested Butte, Grand Mesa, Book Cliffs, and Durango fields, the Durango being in the extreme southwestern part of the State. About one-third of Colorado's coal is produced in this group of fields.

CHARACTER OF COAL BEDS.

In the Trinidad field the coal beds are the same as those of the Raton field in New Mexico and range from 3½ to 9 feet in thickness. In some sections as many as 7 workable beds have been discovered, all of which are contained in the lower 900-foot level of the Vermejo (formerly called Laramie) formation. In the southern part of the field the measures lie nearly horizontal, but to the north the inclination increases slightly, varying from 3° to 10°. The Trinidad field contains a large amount of coking coal and manufactures about 600,000 tons of coke annually. In some mines in the vicinity of Starkville a thick sandstone forms a good roof; in other mines there is a "draw slate" between the coal and sandstone, making a poor roof. In the vicinity of Gray Creek the coal bed is almost level and is rather irregular, ranging from 4 to 14 feet thick.

The second field, as regards production, is the Boulder field, north of Denver. There the coal is much softer than that of the Trinidad field, being classed as subbituminous (black lignite). The associated rocks are also softer, rendering mining more difficult than it is where the rocks are harder and form a better roof. The coal beds range in thickness from 3 to 14 feet and generally are flat-lying, except near the west edge of the basin, where the coal and also the adjacent sandstone and shale beds dip strongly to the east.

In the Canon City field the rocks throughout most of the field dip west about 2° to 5°. Along the western margin of the strata is a thrust fault cutting across the coal measures, and near this fault the beds are sharply upturned, in some instances being practically vertical. The coal beds range in thickness from 2½ to 6 feet and generally are free from partings.

MINING METHODS.

The production of coal in Colorado dates back to 1864, when about 500 tons was mined. The production for 1913 was 9,232,510 tons. The total production for the State up to the end of 1913 is 175,361,698 tons. In 1911, of 140 of the principal mines 41 were shaft and 99 were slope and drift mines. In Las Animas County, which is the largest producer, over 40 mines are slope mines; only one or two are shaft mines. The room-and-pillar system of mining prevails largely throughout the State.

In the Canon City district, the long-wall system has been used to some extent in coal beds that vary from 3 to 4 feet thick and are tapped by shafts 300 to 400 feet deep. At the Radiant mine, where the coal bed is 3 feet to 3 feet 9 inches thick, a combination of the room-and-pillar and the long-wall methods is used, and the coal is undercut by electric machines. The coal is jointed and breaks into large lumps. At the Diamond mine, in the vicinity of Canon City, the coal beds dip 55° to 75°. At the Royal Gorge mine the dip is about 50° and the two coal beds mined are separated 5 feet to 7 feet. The lower bed is mined first by upward stoping from a horizontal level. The Littell mine is opened by a shaft 1,065 feet deep (1908), which is the deepest coal shaft in the State. The coal at this point dips about 5° to the west and is 5½ feet thick.

Coal-mining machines have been in use in Colorado since about 1891, at which time 20 machines were in operation. This number has gradually increased until in 1914 there were 306 machines in use, producing 25 per cent of the coal.

Shooting off the solid is practiced less in Colorado than in many other States, the coal thus mined in Colorado being 11 to 14 per cent of the total coal produced. About 60 per cent of the coal is produced by hand mining methods. The amount of coal mined per man per year in 1887 was 333 tons; in 1913 it was 770 tons.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The Legislature of Colorado, by an act approved February 24, 1883, provided for the appointment of an examining board, to examine applicants for the position of State inspector of mines. From the

list of eligibles thus established the governor was authorized to appoint a mine inspector for a term of four years. Section 12 provided that the act should apply to any coal mine where more than 12 men were employed underground. The inspector was required to examine at least once each quarter every mine employing more than 20 men, to make a record of such inspection, showing the number of employees, and number of accidents and deaths, and to file a report in the office of the secretary of state on the first Monday in November preceding the biennial sessions of the legislature. This report was included in the biennial report of the secretary of state.

All accidents causing loss of life or serious personal injury were reported by the operators to the inspector. An act of April 8, 1885, extended the inspection law to cover all mines employing more than 10 men, and required the inspector to examine such mines quarterly. On April 2, 1887, a law was approved directing the inspector to render a biennial report to the governor showing the number of persons employed and the number of accidents and deaths from injuries in and about the mines; the inspector was also authorized to employ clerical or other assistance not to exceed $1,500 per year.

An act approved April 4, 1913, authorized the governor to appoint a chief mine inspector and the chief thus selected to appoint five deputy inspectors. The chief and deputy inspectors are selected from a list of eligibles established by a board of examiners. The chief mine inspector divided the State into five districts and assigned one deputy inspector to each district. An annual report for the year ending December 31 is rendered to the governor, the report to enumerate all deaths and accidents causing disability for 5 days or more. Operators are required to render monthly reports of fatal and nonfatal accidents to the inspector, in addition to sending to the chief inspector immediate notice of all fatal accidents.

Accidents resulting in 5 or more days' disability, which under the law are reported to the inspector by mine operators, are published in the inspector's annual reports and are classified as serious or slight according to the judgment of the State mine inspector.

In 1915 the inspector was assisted by four deputies.

ACCIDENTS.

Tables 91 and 92 show the total number of fatalities by causes and calendar years since 1883 as compiled from State mine inspectors' reports. The accompanying tables show the percentage of accidents, classified by principal causes, and fatality rate per 1,000 men employed, over a period of 28 years, 1886–1913, for which continuous records are available. The fatality rate during this period is 7.14 per 1,000 men

FATALITIES IN **COLORADO** COAL MINES BY PRINCIPAL CAUSES DURING 1886 TO 1913, INCLUSIVE.

Causes.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	852	49.02	3.50
Mine cars and locomotives	141	8.11	.58
Gas and dust explosions	517	29.75	2.12
Explosives	60	3.45	.25
Miscellaneous	83	4.78	.34
Shaft	36	2.07	.15
Surface	49	2.82	.20
Total (28 years)	1,738	100.00	7.14

COAL-MINE ACCIDENTS IN **COLORADO** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1884 Jan. 24	Crested Butte	Crested Butte	Mine explosion	59
1889 Sept. 9	White Ash	Jefferson County	Inrush of water from old shaft.	10
1893 Jan. 10	Como	King	Mine explosion	24
1896 Feb. 18	Vulcan	New Castle	do	49
1897 Sept. 3	Sunshine	Sunshine	do	12
1901 Sept. 16	Spring Gulch	Spring Gulch	do	6
1902 Aug. 7	Bowen	Bowen	Powder and mine explosion.	13
1904 Oct. 28	Tercio	Tercio	Mine explosion	19
1906 Feb. 19	Maitland	Walsenburg	do	14
1906 Apr. 22	Cuatro	Tercio	do	19
1907 Jan. 23	Primero	Primero	do	24
1907 May 19	Engleville	Engleville	Mine fire	5
1909 July 6	Toller	Tollerville	Mine explosion	9
1910 Jan. 31	Primero	Primero	do	75
1910 Oct. 8	Starkville	Starkville	do	56
1910 Nov. 8	Victor American No. 3.	Delagua	Mine fire and explosion.	79
1910 Dec. 14	Leyden	Leyden	Mine fire	10
1911 Feb. 9	Cokedale	Trinidad	Mine explosion	17
1912 June 18	Hastings	Hastings	do	12
1913 Dec. 16	Vulcan	New Castle	do	37

employed. There were 19 accidents in which 5 or more men were killed at one time, representing slightly over 28 per cent of all of the fatalities due to mine accidents. Of the total number of fatalities 49.02 per cent were due to falls of roof and pillar and 29.75 per cent to gas and dust explosions. The average production of coal per fatality during this period was 96,798 tons, or there were 10.33 fatalities for each million tons mined.

Beginning with 1903 and including 1912 about 50 per cent of the men were on a 10-hour basis. In 1913 the 8-hour law became effective and only a few men were employed for a longer day than eight hours. The time element has been taken into consideration and tables compiled on this basis for comparison with other States. The fatality rate for the 10-year period, 1903–1913 (Table 40), based on the actual

NUMBER OF HOURS TO THE WORKING-DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **COLORADO.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Number of men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	24	488	17	692	70	7,743	306	9,229
1904	55	2,058	11	432	57	5,583	50	8,123
1905	61	3,660	4	189	40	6,551	620	11,020
1906	67	5,259	9	655	48	5,222	232	11,368
1907	60	3,420	8	312	54	7,439	3,052	14,223
1908	79	5,158	3	63	61	8,535	767	14,523
1909[b]								11,472
1910	61	2,935	8	303	49	5,913	6,713	15,864
1911	57	2,701	10	299	46	4,559	6,814	14,373
1912	61	2,923	5	173	50	4,631	5,273	13,000
1913	146	11,175	3	75	5	128	612	11,980

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **COLORADO**, AND THE FATALITY RATE, BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	245	90,316	22,127,420	11,064	44	3.98
1904	261	76,632	20,000,952	10,000	94	8.40
1905	255	102,071	26,028,105	13,014	65	4.99
1906	268	102,275	27,409,700	13,705	89	6.49
1907	258	132,026	34,052,708	17,031	107	6.28
1908	212	134,084	28,425,808	14,213	63	4.43
1909						
1910	236	145,754	34,397,944	17,199	323	18.78
1911	207	131,215	27,161,505	13,581	88	6.48
1912	227	118,708	26,946,716	13,473	96	7.13
1913	229	96,863	22,181,627	11,091	108	9.74

number of employees is 8.71, whereas on the number of 2,000-hour workers it is 8.02 per 1,000. During the 10-year period the men averaged 2,172 hours employment per year. Table 41 shows the fatality rate for each year on the 2,000-hour basis, 1903–1913, for each State, so that a true comparison of Colorado with other States may be readily made.

The tables of statistics for the State follow.

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN COLORADO.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	504	31,520	62	1907	215	6,378	30
1900	17	935	55	1908	768	16,646	22
1901	1,527	86,045	56	1909	55	1,250	23
1902	444	20,845	47	1910	2,044	195,558	96
1903	7,103	407,909	57	1911	150	32,375	216
1904	3,865	481,482	125	1912	.....	.....	.....
1905	.....	.....	.....	1913	7,324	552,082	75
1906	.....	.....	.....	1914	4,418	1,090,025	247

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 91.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **COLORADO**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal line in various columns selected from Mineral Resources, U. S. Geol. Survey. All items in column 4 and others above horizontal lines in columns 3, 8, 20, and 21 from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 for years prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man—		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1864–1882	3,410,445																				
1883	1,229,593			6																	
1884	1,130,024			64		56.64	17,657														35
1885	1,356,062	$2.25		9		6.64	150,674	(a)													
1886	1,368,338	2.35	3,500	6	1.71	4.38	228,056	(a)	391												
1887	1,791,735	2.20	5,375	12	2.23	6.70	149,311	(a)	333												
1888	2,185,477	2.20	5,575	29	5.20	13.27	75,361	(a)	392												
1889	2,597,181	1.54	4,904	24	4.89	9.24	108,216	(a)	530												
1890	3,077,033	1.40	5,827	16	2.75	5.20	192,313	220	528	2.40											
1891	3,512,632	1.37	6,000	30	5.00	8.54	117,088	(a)	585											20	
1892	3,510,830	1.62	5,747	33	5.74	9.40	106,389	229	611	2.67											
1893	4,102,389	1.24	7,202	46	6.39	11.21	89,182	188	570	3.03											
1894	2,831,409	1.24	6,507	19	2.92	6.71	149,022	155	435	2.81											
1895	3,082,982	1.20	6,125	23	3.76	7.46	134,043	182	503	2.76											
1896	3,112,400	1.16	6,704	68	10.14	21.85	45,771	172	464	2.70		10.2								34	
1897	3,361,703	1.17	5,852	36	6.15	10.71	93,381	180	574	3.19		10.5								37	106
1898	4,076,347	1.15	6,440	23	3.57	5.64	177,233	220	633	2.88		5.5								43	107
1899	4,776,224	1.12	7,166	40	5.58	8.37	119,406	246	667	2.71		11.0			37	26				63	110
1900	5,244,364	1.12	7,459	31	4.16	5.91	169,173	264	703	2.66		14.4								90	120
1901	5,700,015	1.13	8,870	55	6.20	9.65	103,637	253	643	2.54		5.6								62	98
1902	7,401,343	1.13	8,956	73	8.15	9.86	101,388	261	826	3.16		11.6								98	125
1903	7,423,602	1.23	9,229	44	4.77	5.93	168,718	245	804	3.28		17.1			88	65	4			157	
1904	6,658,355	1.31	8,123	94	11.57	14.12	70,834	261	820	3.14		14.2			67	56	2			125	
1905	8,826,429	1.22	11,020	65	5.90	7.36	135,791	255	801	3.14		14.1			74	42	5			121	175
1906	10,111,218	1.26	11,368	89	7.83	8.80	113,609	268	889	3.32		13.2			80	51	10			141	180

1907	10,790,236	1.40	14,223	107	7.52	9.92	100,843	258	759	2.94	.....	15.7	.....	.....	103	58	14	.....	.....	175	.....
1908	9,634,973	1.41	14,523	63	4.34	6.54	152,936	212	663	3.13	.....	17.3	.....	.....	137	56	18	.....	.....	211	.....
1909	10,716,936	1.33	11,472	97	8.46	9.05	110,484	(a)	934	(a)	.....	18.0	.....	.....	175	66	12	.....	.....	253	143
1910	11,973,736	1.42	15,864	323	20.36	26.98	37,070	236	755	3.20	.....	16.0	.....	.....	182	55	19	.....	.....	256	191
1911	10,157,383	1.45	14,373	88	6.12	8.66	115,425	207	707	3.42	57.3	19.5	12.4	10.8	157	26	34	17	8	242	169
1912	10,977,824	1.49	13,000	96	7.38	8.74	114,352	227	844	3.72	64.5	23.2	11.9	.4	187	33	16	57	11	304	159
1913	9,232,510	1.52	11,990	108	9.01	11.70	85,486	229	770	3.36	60.6	25.0	13.9	.5	168	35	12	80	5	300	171
Total	175,361,698	.....	.....	1,817	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1886–1913)	**6,008,413**	.....	**8,693**	**62.07**	**7.14**	**10.33**	**96,798**	**230**	**691**	**3.00**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	8,170,559	1.66	10,098	75	7.43	9.18	108,941	244	809	3.32	57.3	30.6	11.6	.5	168	35	11	87	5	306	163

[a] Not reported.

TABLE 92.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **COLORADO**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1883 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1883 [a]	4	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1884	1	1	3	59	.....	.....	.....	.....	.....	.....	.....	.....	64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	64
1885	4	.....	3	1	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	9
1886	3	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	6
1887	9	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	11	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	12
1888	12	3	4	5	3	2	.....	.....	.....	.....	.....	.....	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29
1889	5	4	3	.....	.....	.....	.....	.....	.....	.....	.....	11	23	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	24
1890	6	4	1	1	.....	2	.....	.....	.....	.....	.....	.....	14	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	16
1891	17	5	2	.....	2	3	.....	.....	.....	.....	.....	1	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30
1892	11	10	2	2	1	3	.....	.....	.....	.....	.....	.....	29	1	1	2	.....	4	.....	.....	.....	.....	.....	.....	.....	33
1893	13	3	3	.....	[b] 24	1	.....	.....	.....	.....	.....	.....	44	.....	.....	1	.....	1	.....	.....	.....	1	.....	.....	1	46
1804	11	2	1	1	.....	1	.....	.....	.....	.....	.....	1	17	1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	1	19
1895	6	6	3	4	.....	2	.....	.....	.....	.....	.....	.....	21	.....	.....	.....	2	2	.....	.....	.....	.....	.....	.....	.....	23
1896	14	2	2	.....	49	.....	.....	.....	.....	.....	.....	1	68	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	68
1897	15	4	3	.....	12	1	.....	.....	.....	.....	.....	1	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36
1898	13	3	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	20	.....	.....	1	.....	1	2	.....	.....	.....	.....	.....	2	23
1899	28	3	0	.....	.....	1	.....	.....	.....	.....	.....	.....	38	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	40
1900	19	6	2	.....	.....	1	.....	.....	.....	.....	1	.....	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	31
1901	25	3	8	2	8	1	.....	1	1	1	.....	2	52	.....	1	.....	.....	1	.....	.....	.....	2	.....	.....	2	55
1902	37	5	2	8	14	3	.....	.....	.....	.....	2	.....	71	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2	73
1903	26	5	2	.....	1	4	.....	1	.....	.....	.....	1	40	2	.....	.....	.....	2	2	.....	.....	.....	.....	.....	2	44
1904	43	10	10	.....	19	4	.....	1	.....	.....	.....	2	89	1	.....	1	.....	2	1	.....	.....	.....	1	1	3	94
1905	35	6	8	.....	.....	4	.....	4	.....	.....	.....	.....	57	2	.....	1	.....	3	2	.....	.....	.....	.....	3	5	65
1906	37	7	2	34	.....	4	.....	1	.....	.....	.....	.....	85	1	.....	1	.....	2	2	.....	.....	.....	.....	.....	2	89
1907	51	5	9	1	25	2	.....	.....	.....	.....	7	.....	100	2	.....	1	.....	3	1	1	.....	.....	1	1	4	107
1908	33	5	9	5	.....	3	.....	.....	2	.....	.....	2	59	2	.....	.....	.....	2	1	.....	.....	.....	.....	1	2	63
1909	56	7	7	12	3	3	.....	1	.....	.....	.....	.....	69	.....	1	2	.....	3	1	.....	1	.....	1	2	5	97
1910	62	11	18	79	131	5	.....	.....	.....	.....	10	2	318	2	.....	.....	.....	2	1	.....	1	.....	.....	1	3	323

1911	40	6	10	......	17	2	2	2	......	......	......	2	81	......	......	2	......	2	1	......	......	......	1	3	5	88
1912	43	9	13	15	2	1	......	6	1	......	......	3	93	......	......	1	......	1	1	......	......	......	1	......	2	98
1913	46	1	7	......	37	4	3	2	1	3	......	1	105	......	......	......	......	......	1	......	1	......	......	1	3	108
1914	40	2	13	1	......	4	......	6	......	2	......	4	72	......	......	1	......	1	......	......	......	......	......	2	2	75

a July 31 to Dec. 31.

b Report does not state whether "gas" or "dust."

GEORGIA.

AREA AND DISTRIBUTION OF COAL FIELDS.

Parker [a] describes the coal-productive area of Georgia as follows

The coal-productive area of Georgia underlies portions of two counties in the extreme northwestern corner of the State. The Walden Basin of Tennessee crosses Dade County, in Georgia, and extending southwesterly becomes the Blount Mountain and Warrior Basins in Alabama. The Lookout Basin, a narrow outlying area, extends from Etowah County, in Alabama, in a northeasterly direction into Walker County, Ga. The total area of the coal fields in Georgia is estimated at 167 square miles the smallest coal area of any Appalachian State. Not all of the field is workable. Extensive operations have been carried on in both counties, however, but all of the production in 1913 was by two companies operating in Walker County. On account of its high percentage (80 per cent) of fixed carbon and its low sulphur content, the Lookout Mountain coal (Walker County) gives a large product of excellent coke which is sold to the furnaces of Chattanooga and of other points in Tennessee and in Georgia.

The earliest report by the United States Geological Survey on the production of coal in Georgia is for 1860, when 1,900 tons were mined. The production gradually increased to its highest point in 1903, when 416,951 tons were produced, and since then has gradually declined to approximately 200,000 in recent years. No mining machines are used in the coal mines of Georgia. The reports of the United States Geological Survey show that all of the coal in 1913 [b] was shot off the solid. Of the total production, approximately one-third of the coal is washed.

ACCIDENTS.

Tables 93 and 94 show the total number of fatalities by causes and calendar years since 1909. They also show the percentage of accidents and fatality rate per 1,000 men employed. The average production of coal per fatality during this period was 148,111 tons, or there were 6.75 fatalities per million tons mined.

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[a] Parker, E. W., Production of Coal, Mineral Rescources of the United States for 1913, U. S. Geol. Survey, 1914, p. 825.

[b] Parker, E. W., op cit., p. 825.

FATALITIES IN GEORGIA COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1909 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	6	85.71	2.60
Mine cars and locomotives			
Gas and dust explosions			
Explosives	1	14.29	.43
Miscellaneous			
Shaft			
Surface			
Total (5 years)	7	100.00	3.03

There is no mine inspection in the State. The tables of statistics for the State follow:

TABLE 93.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **GEORGIA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Compiled from Mineral Resources, U. S. Geol. Survey, except figures in column 4, which were reported direct to the Bureau of Mines by the operators. Figures in columns 9 and 10 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed—			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	8	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1860–1887	2,284,259	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1888	180,000	.....	500	.....	.....	.....	.....	.....	360	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	225,934	$1.50	733	.....	.....	.....	.....	.....	308	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	228,337	1.04	425	.....	.....	.....	.....	313	537	1.72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	171,000	1.50	850	.....	.....	.....	.....	312	201	.64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1892	215,498	.99	467	.....	.....	.....	.....	277	461	1.66	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	372,740	.98	736	.....	.....	.....	.....	342	506	1.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	354,111	.85	729	.....	.....	.....	.....	304	486	1.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	260,998	.83	848	.....	.....	.....	.....	312	308	.99	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1896	238,546	.70	713	.....	.....	.....	.....	303	335	1.11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1897	195,869	.72	469	.....	.....	.....	.....	304	418	1.38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1898	244,187	.81	534	.....	.....	.....	.....	298	457	1.53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1899	233,111	1.00	567	.....	.....	.....	.....	302	411	1.36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1900	315,557	1.17	681	.....	.....	.....	.....	278	463	1.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1901	342,825	1.20	791	.....	.....	.....	.....	291	433	1.49	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1902	414,083	1.42	755	.....	.....	.....	.....	312	548	1.76	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1903	416,951	1.25	681	.....	.....	.....	.....	298	612	2.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1904	383,191	1.22	881	.....	.....	.....	.....	222	435	1.96	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1905	351,991	1.29	801	.....	.....	.....	.....	270	439	1.63	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1906	332,107	1.28	737	.....	.....	.....	.....	279	451	1.62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1907	362,401	1.38	808	.....	.....	.....	.....	262	449	1.71	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1908	264,822	1.38	670	.....	.....	.....	.....	261	395	1.51	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1909	211,196	1.41	460	2	4.35	9.47	105,598	(a)	459	(a)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1910	177,245	1.46	386	0	.....	.....	.....	265	459	1.73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
1911	165,210	1.49	510	0	.....	.....	.....	277	324	1.17	9.8	.....	.....	90.2	.....	.....	.....	.....	.....	.....	2

1912	227,503	1.49	450	2	4.44	8.79	113,752	254	506	1.99	65.0	.....	35.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1913	255,626	1.41	500	3	6.00	11.74	85,209	261	511	1.96	.....	.....	100.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Total	9,425,298	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1909–1913)	207,358	.....	461	1.40	3.03	6.75	148,111	265	450	1.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	166,498	1.44	355	1	2.82	6.01	166,498	207	469	2.27	.....	.....	100.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2

[a] Not reported.

TABLE 94.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **GEORGIA**,[a] WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1909 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1909	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
1911	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
1912	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1913	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
1914	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1

[a] Figures for 1909 are from Mineral Resources, U. S. Geol. Survey; others from reports of mine operators as received by the Bureau of Mines.

ILLINOIS.

AREA AND DISTRIBUTION OF COAL FIELDS.

The Illinois coal field is the western part of a broad and relatively flat basin which extends eastward into Indiana and southeastward into Kentucky. On the southwestern border of the field the coal beds are turned up perceptibly, and on the south the margin is marked by a much steeper fold, which is overturned and faulted near Shawneetown where it crosses Ohio River. On the north border the coal beds are bent into a low, though sharply defined anticline which extends from La Salle southeastward toward Clark County. Minor folds, local in extent, occur in different parts of the basin, but in general the beds dip gently from the margins of the field to a central deep area where the coal-bearing rocks have a thickness of about 1,500 feet.

CHARACTER OF COAL BEDS.

There are in the Illinois field a number of coal beds of varying thickness, each of which, however, is fairly regular and continuous over large areas. The coal production of Illinois is from six beds, Nos. 1 to 3 and 5 to 7. No. 6 is the most important and averages 6 feet thick. This bed produces over 50 per cent of the coal; No. 5 produces 25 per cent; and No. 2, 10 per cent.

The beds are practically horizontal and have been opened at different depths in the various counties. In Gallatin County two coal beds have been mined at depths of 60 and 180 feet, the upper being 5 feet thick and the lower 3 feet thick. In Macoupin County, near Virden, coal No. 5 is 7 feet 8 inches thick at a depth of 320 feet. In St. Clair County, near Belleville, coal No. 6 is 8 feet 4 inches thick at a depth of 380 feet. In Marion County, at Centralia, coal No. 6 is 7 feet thick at a depth of 569 feet and at Sandoval 6 feet thick at a depth of 603 feet. In Sangamon County the principal coal bed is 6 feet thick with a good limestone roof and is opened by shafts varying from 65 to 225 feet in depth. In Perry County the Belleville, or No. 6, coal bed is 5 to 6 feet thick at depths varying from 30 to 200 feet and dips slightly north. A shaft at Assumption, Christian County, is 1,003 feet deep, being the deepest in the State.

Illinois coal is bituminous, but has a moisture content as it comes from the mine of 7 to 16 per cent. The best coal contains 7 to 10 per cent of ash, one-half to 3 per cent of sulphur, and 40 to 50 per cent of fixed carbon.

MINING METHODS.

The record of coal-production for Illinois begins in 1833, during which year 6,000 tons were mined. The production for the State has gradually increased until in 1913 it amounted to 61,618,744 tons.

As in Indiana, the shaft mines largely predominate over slope and drift mines, which number less than 50. In 1897 only 52 out of 853 mines used the longwall method, and these were in the northeastern part of the State in the No. 2 bed, where the coal is only 3 feet thick. In the other mines the room-and-pillar system of mining prevails with slight alterations for individual mines or different coal beds. In 1897 only one-half of the coal was undercut before blasting, leaving about 50 per cent as shot off the solid. In 1912, 40 per cent of the coal was shot off the solid, but in 1913 this was reduced to 32.3 per cent. In 1888 there were 272 mining machines in the mines, producing 18.9 per cent of the coal, and in 1913 there were 1,845 machines, which produced 53 per cent of the coal, or 17,685 tons per machine. The coal, being horizontal and uniform, is well adapted to machine mining.

Most of the mines are dry, and but little pumping is required. The deeper mines are drier than the shallow ones and require sprinkling to prevent accumulation of dust.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The inspection of coal mines in Illinois was inaugurated by virtue of an act of the general assembly approved March 27, 1872, which became effective July 1, 1872. By section 11 of this act the county surveyors were constituted ex-officio inspectors of mines within their respective counties, each with authority to call to his aid a reputable practical miner. The act also provided that all accidents causing loss of life or serious personal injury at any coal mine or colliery should be reported to the county mine inspector, and that all fatal accidents should also be reported to the coroner of the county in which the accident occurred. It was made the duty of the inspector to investigate all accidents thus reported to him, and all expenses incident to his investigation were payable by the county in which the accidents occurred.

By an act approved June 18, 1883, effective July 1, 1883, the State was divided into five mining districts, and a State mine inspector for each district authorized. Each county was authorized to appoint an assistant mine inspector, if it so desired, such county inspector to perform his duties under the direction of the district mine inspector. The act directed that accidents should thereafter be reported to the district mine inspector instead of the county inspector, and that fatal accidents might be reported to a justice of the peace in the absence or inability to act of the county coroner.

Subsequent laws have made no change in the reportability of mine accidents as above set forth. There are now 12 inspection districts in the State.

ACCIDENTS.

Tables Nos. 95 and 96 show the total number of fatalities by causes and calendar years since 1885, and the total production of coal. They also show the percentage of accidents, by principal causes, and fatality rate per 1,000 employed over a period of 29 years, for which continuous records are available. During this period there were 3,409

FATALITIES IN **ILLINOIS** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1885 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	1,616	47.40	1.19
Mine cars and locomotives	414	12.14	.30
Gas and dust explosions	170	4.99	.13
Explosives	459	13.47	.34
Miscellaneous	350	10.27	.26
Shaft	266	7.80	.20
Surface	134	3.93	.10
Total, 29 years	3,409	100.00	2.52

COAL-MINE ACCIDENTS IN **ILLINOIS** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1883 Jan. 9	Coulterville	Coulterville	Mine explosion	10
1883 Feb. 16	Diamond	Braidwood	Inrush of surface water into workings.	69
1903 Mar. 15	Cardiff	Cardiff	Mine explosion	5
1903 Mar. 23	Athens No. 2	Athens	Windy shot	6
1903 Mar. 31	Sandoval	Sandoval	Blown-out shot	8
1904 May 11	Big Muddy	Herrin	Powder explosion	10
1905 Jan. 16	Decatur	Decatur	Mine fire	6
1905 Apr. 3	Leiter	Zeigler	Mine explosion	49
1906 Dec. 22	Breese-Trenton	Breese	Cage with men fell down shaft.	6
1907 Jan. 29	Johnston City	Johnston City	Powder explosion	7
1909 Jan. 10	Zeigler	Zeigler	Mine fire and explosion	26
1909 Nov. 13	St. Paul No. 2	Cherry	Mine fire	259
1909 Dec. 23	Mine A	Herrin	Mine explosion	8
1910 Nov. 11	Shoal Creek No. 1	Panama	do	6
1911 Oct. 23	O'Gara No. 9	Harrisburg	do	8
1913 Feb. 19	Seagraves	Eldorado	do	5
1914 Oct. 27	North or No. 1	Royalton	do	52
1915 Apr. 5	Shoal Creek	Panama	do	11
1915 July 27	United Coal No. 1	Christopher	do	9

fatalities or 2.52 per 1,000 men employed. There were 14 accidents in which 5 or more men were killed at one time, representing about 12 per cent of the total fatalities. These large accidents include the mine fire at Cherry in which 259 men were killed at one time. The average production of coal per fatality during this period was 251,900 tons or 3.97 fatalities per million tons mined.

Practically all of the mines in Illinois are operated on an 8-hour basis so that a comparison with 10-hour States on the basis of days worked is not a proper method. The time element has therefore been taken into consideration and a table compiled on the basis of the actual number of hours worked so that a true comparison with other

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **ILLINOIS.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	542	47,773	11	57	9	45	2,721	50,598
1904	547	53,500	17	121	10	52	1,012	54,685
1905	583	58,296	8	64	6	405	1,288	58,053
1906	482	60,081	9	610	1	30	1,267	61,988
1907	457	60,268	8	675	1	4	4,634	65,581
1908	491	65,289	5	510	.....	.....	2,236	68,035
1909[b]	.....	.....	.....	.....	.....	.....	.....	69,425
1910	521	69,575	7	137	1	4	2,929	72,645
1911	513	75,088	9	68	2	10	490	75,656
1912	480	75,411	10	67	.....	.....	2,620	78,098
1913	482	78,137	7	41	1	5	1,346	79,529

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **ILLINOIS** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day. (all employees.)	Total hours per year.	Number of 2,000 hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	228	407,636	92,941,008	46,471	158	3.40
1904	213	438,717	93,446,721	48,723	173	3.70
1905	201	466,586	93,783,786	46,892	203	4.33
1906	192	497,841	95,585,472	47,793	161	3.37
1907	218	529,965	115,532,370	57,766	192	3.32
1908	185	547,026	101,199,810	50,600	172	3.40
1909	.....	.....	.....	.....	.....	.....
1910	160	584,234	93,477,440	46,739	143	3.06
1911	188	605,826	113,895,288	56,948	172	3.02
1912	194	627,471	121,729,374	60,865	163	2.68
1913	189	637,629	120,511,881	60,256	164	2.72

States may be made. The fatality rate for the 10-year period, 1903–1913 (Table 40), for Illinois on the 2,000-hour basis is 3.26 as compared with 2.55 based on the actual number of men employed. During the 10-year period, the men averaged 1,567 hours per year as compared with 2,132 hours in West Virginia.

The tables of statistics for the State of Illinois follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **ILLINOIS.**[a]

Year.	Number of men affected.	Total number of days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total number of days lost.	Average number of days lost per man.
1899	7,133	267,171	37	1907	5,255	35,191	7
1900	3,909	134,433	34	1908	47,456	1,737,611	37
1901	3,740	79,245	21	1909	2,335	90,720	38
1902	3,916	65,231	17	1910	67,218	9,133,953	136
1903	3,772	70,731	19	1911	5,543	100,588	18
1904	16,983	156,528	9	1912	60,505	2,026,526	33
1905	15,289	321,967	21	1913	11,861	655,622	55
1906	49,792	2,900,525	58	1914	23,506	970,466	41

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 95.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **ILLINOIS**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES USED.

[Figures for total production and all items below horizontal line in various columns selected from Mineral Resources, U. S. Geol. Survey. All items in column 4 and others above horizontal lines in columns 2, 3, 8, 12, 20, and 21 from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1833–1881	73,341,123																				
1882	9,115,653		20,290	a 40	1.97	4.39	227,891	245	449	1.83											
1883	12,123,450		23,939	a 134	5.60	11.05	90,474	273	506	1.85											438
1884	12,208,075		25,575	a 46	1.80	3.77	265,393	200	477	2.38											479
1884b				18																	
1885	11,834,459	$1.17	25,946	50	1.93	4.22	236,689	225	456	2.03											492
1886	11,175,241	1.11	25,846	36	1.39	3.22	310,423	206	432	2.10										236	473
1887	12,423,066	1.09	26,804	51	1.90	4.11	243,590	213	463	2.17											481
1888	14,328,181	1.12	29,410	57	1.94	3.98	251,372	221	487	2.20		18.9								272	495
1889	12,104,272	.97	30,076	41	1.36	3.39	295,226	214	402	1.88		20.2								235	533
1890	15,292,420	.93	28,574	57	1.99	3.73	268,288	204	535	2.62		22.8								266	538
1891	15,660,698	.91	32,951	49	1.49	3.13	319,606	216	475	2.20		18.7								241	515
1892	17,862,276	.91	34,585	69	2.00	3.86	258,874	220	516	2.35		19.9								270	507
1893	19,949,564	.89	35,390	83	2.35	4.16	240,356	229	564	2.46		21.0								388	506
1894	17,113,576	.89	38,477	57	1.48	3.33	300,238	183	445	2.43		18.0								278	524
1895	17,735,864	.80	38,630	78	2.02	4.40	227,383	182	459	2.52		18.4								283	536
1896	19,786,626	.80	39,560	70	1.77	3.54	282,666	186	500	2.69		19.6								307	532
1897	20,072,758	.72	33,788	73	2.16	3.64	274,969	185	594	3.21		19.7								320	507
1898	18,599,299	.78	35,026	90	2.57	4.84	206,659	175	531	3.03		18.4								392	530
1899	24,439,019	.85	36,756	73	1.99	2.99	334,781	228	665	2.92		24.9			363	77				440	543
1900	25,767,981	1.04	39,101	102	2.61	3.96	252,627	226	659	2.92		19.7								430	580
1901	27,331,552	1.03	41,880	107	2.55	3.91	255,435	220	653	2.97		21.1								464	602
1902	32,939,373	1.03	47,411	107	2.26	3.25	307,845	226	695	3.08		21.6								508	601
1903	36,957,104	1.17	50,596	158	3.12	4.28	233,906	228	730	3.20		20.0			451	100	2			553	620
1904	36,475,060	1.10	54,685	173	3.16	4.74	210,838	213	667	3.13		19.5			541	102				643	631

1905	38,434,363	1.06	58,053	203	3.50	5.28	189,332	201	662	3.29	.....	22.6	.....	.....	758	123	1	.....	.....	882	669
1906	41,480,104	1.08	61,988	161	2.60	3.88	257,640	192	669	3.48	.....	27.9	53.1	.....	874	171	3	.....	.....	1,048	682
1907	51,317,146	1.07	65,581	192	2.93	3.74	287,277	218	783	3.59	.....	29.5	57.2	.....	836	243	1	.....	.....	1,080	673
1908	47,659,690	1.05	68,035	172	2.53	3.61	277,091	185	701	3.79	.....	31.6	55.8	.....	876	338	3	.....	.....	1,217	674
1909	50,904,990	1.05	69,425	458	6.60	9.00	111,146	(c)	733	(c)	.....	34.0	45.1	.....	845	405	10	.....	.....	1,260	620
1910	45,900,246	1.14	72,645	143	1.97	3.12	320,981	160	632	3.95	.....	38.6	52.5	.....	816	543	2	.....	.....	1,361	562
1911	53,679,118	1.11	75,656	172	2.27	3.20	312,088	188	710	3.78	13.3	43.0	38.1	5.6	780	555	20	47	.....	1,402	579
1912	59,885,226	1.17	78,098	163	2.09	2.72	367,394	194	767	3.95	12.8	44.9	40.3	2.0	847	701	22	81	3	1,654	552
1913	61,618,744	1.14	79,529	164	2.06	2.66	375,724	189	775	4.10	13.1	53.0	33.2	0.7	802	906	55	82	.....	1,845	526
Total	965,516,323	.....	.....	3,647	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average, 1885–1913	28,611,311	.....	46,707	117.55	2.52	3.97	251,900	202	634	3.14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	57,589,197	1.12	79,499	193	2.43	3.35	298,390	173	724	4.18	10.4	56.7	31.9	1.0	649	993	48	122	.....	1,812	492

a Fiscal year ending June 30.

b July 1 to Dec. 31.

c Not reported.

TABLE 90.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **ILLINOIS**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions.	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1882 *a*	3	.....	2	.....	.....	5	.....	.....	.....	.....	.....	29	39	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	40
1883 *a*	40	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	84	134	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	134
1884 *a*	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48
1884 (July 1 to Dec. 31)	5	2	1	.....	.....	1	1	.....	.....	.....	.....	.....	10	3	1	2	1	7	.....	.....	1	.....	.....	.....	1	18
1885	25	6	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	39	2	.....	4	.....	6	.....	.....	2	1	2	.....	5	50
1886	18	7	5	.....	.....	2	.....	.....	.....	.....	.....	.....	32	1	1	2	.....	4	.....	.....	.....	.....	.....	.....	.....	36
1887	25	9	7	1	.....	1	.....	.....	.....	.....	.....	.....	43	4	1	2	1	8	.....	.....	.....	.....	.....	.....	.....	51
1888	25	7	4	.....	.....	8	.....	.....	.....	.....	.....	1	45	4	1	3	.....	8	.....	.....	1	1	1	1	4	57
1889	22	5	5	2	.....	3	.....	.....	.....	.....	.....	.....	37	.....	.....	4	.....	4	.....	.....	.....	.....	.....	.....	.....	41
1890	25	7	1	1	.....	7	.....	.....	.....	.....	3	.....	44	.....	2	6	.....	8	.....	.....	.....	2	2	1	5	57
1891	22	8	1	3	3	4	.....	.....	.....	.....	.....	.....	41	2	.....	2	.....	4	.....	.....	.....	2	1	1	4	49
1892	29	12	6	2	.....	4	.....	.....	.....	.....	2	2	57	7	1	4	.....	12	.....	.....	.....	.....	.....	.....	.....	69
1893	42	9	5	1	.....	7	.....	.....	.....	.....	.....	.....	64	7	.....	6	1	14	1	.....	.....	1	2	1	5	83
1894	25	3	3	2	.....	14	1	.....	1	.....	.....	.....	49	2	1	2	.....	5	.....	.....	1	.....	1	1	3	57
1895	32	11	4	.....	.....	7	4	.....	.....	.....	.....	1	59	5	.....	8	1	14	1	.....	1	.....	2	1	5	78
1896	36	6	7	1	1	11	.....	.....	.....	.....	.....	.....	62	6	.....	1	.....	7	.....	.....	.....	.....	.....	1	1	70
1897	33	11	.....	5	.....	12	1	.....	.....	.....	1	1	64	4	.....	.....	1	5	.....	.....	1	1	1	1	4	73
1898	52	7	6	.....	.....	8	2	.....	.....	.....	1	.....	78	6	.....	4	.....	10	1	.....	2	.....	1	.....	4	90
1899	32	7	7	.....	.....	15	.....	.....	.....	2	.....	.....	63	.....	2	2	1	5	.....	.....	2	.....	2	1	5	73
1900	48	10	12	.....	.....	18	.....	.....	1	.....	1	1	91	3	1	4	.....	8	.....	.....	.....	.....	1	2	3	102
1901	52	8	12	1	.....	19	.....	.....	.....	.....	.....	.....	92	3	2	6	.....	11	1	.....	.....	.....	1	2	4	107
1902	42	12	16	.....	.....	24	.....	.....	.....	.....	.....	1	85	4	1	5	.....	10	.....	.....	.....	.....	1	1	2	107
1903	68	7	20	10	.....	40	.....	1	.....	.....	.....	.....	148	2	2	3	1	8	.....	.....	1	.....	1	2	4	158
1904	64	12	17	.....	.....	53	.....	1	.....	.....	.....	2	149	11	.....	6	.....	17	.....	.....	4	1	2	.....	7	173
1905	66	15	19	51	.....	25	.....	2	.....	.....	6	2	166	5	1	5	.....	11	.....	.....	2	.....	3	1	6	203
1906	66	17	23	3	2	20	.....	.....	.....	.....	.....	1	132	10	2	11	.....	23	.....	.....	.....	1	3	2	8	161
1907	73	20	39	5	.....	31	.....	2	1	.....	.....	3	174	4	3	1	.....	8	.....	.....	3	.....	7	.....	10	182
1908	61	21	27	3	.....	38	.....	1	.....	1	1	.....	153	6	1	1	.....	8	.....	1	2	.....	8	.....	11	172

1909	53	22	20	45	.....	34	.....	3	2	.....	259	2	440	.....	1	6	.....	7	.....	.....	2	1	5	3	11	458
1910	61	13	28	8	.....	9	.....	1	5	.....	.....	.....	125	4	3	6	.....	13	.....	.....	.....	1	3	1	5	143
1911	66	17	41	9	.....	15	1	3	1	.....	.....	1	154	5	.....	7	.....	12	.....	.....	1	1	1	3	6	172
1912	65	19	41	3	.....	11	.....	2	2	1	.....	.....	144	6	1	5	.....	12	1	.....	.....	1	3	2	7	163
1913	59	21	38	8	.....	11	1	8	1	.....	1	5	153	2	1	1	.....	4	.....	.....	1	1	2	3	7	164
1914	49	20	38	55	.....	9	.....	2	.....	2	1	.....	176	4	2	1	1	8	.....	.....	2	.....	3	4	9	193

[a] Fiscal year ending June 30. "Other Causes" doubtless include fatalities belonging under other headings, but no information is available for a more detailed classification. The 84 fatalities under "Other Causes" in 1883 include 69 deaths due to inrush of water at the Diamond mine, Braidwood, Ill., Feb. 16, 1883.

INDIANA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing area of Indiana amounts to about 6,500 square miles and includes 26 counties in the southwestern portion of the State. Nineteen of these counties are producing coal on a commercial scale. The coal measures contain over 20 horizons, in which coal beds of varying thickness have been found. Of these eight are of workable thickness over much or all of the field and several others are locally of workable thickness. In the center of the field as many as seven or eight beds are workable in a single area. Ordinarily over most of the field not more than three workable beds will be found.

The coal measures in Indiana have a total thickness of approximately 1,300 feet. Of these 1,300 feet there are 600 feet of barren beds at the top, a 500-foot interval which contains most of the workable coals, followed in descending order by 200 feet or more of rocks consisting mainly of sandstone.

CHARACTER OF COAL BEDS.

The eight different coal beds mined vary from 3 to 9 feet in thickness. The coal in the eastern part of the field is called block coal or semiblock because of its breaking into rectangular blocks. It is very pure, noncoking coal. The strictly "block coal" is found in Fontaine, Parke, Clay, and Owen Counties. South of that the coals in the easternmost counties are semiblock. The block coal occurs in small basins which vary in extent from a few acres to several square miles, owing to the irregular surface of the rocks upon which they were laid down. The coal may be 3 to 5 feet thick in the center of a basin but thins out gradually toward the edges. The western counties of the Indiana field contain bituminous coal. The bituminous beds vary from 3 to 10 feet in thickness, most of the workings being in beds over 5 feet thick. In 1910, 26 mines were mining coal from beds over 7 feet thick. These coals lie regularly with a slight pitch to the west and southwest, and in many parts of the field are regular in thickness. Practically all of the mines have a clay floor and shale roof. The No. 5 coal is overlain with black shale, commonly broken with pyrite concretions, that locally will hold up indefinitely over a 40-foot room without any posts. Most of the beds, however, have roofs of shale that tends to disintegrate rapidly in the summertime, especially in the air passages, and requires close posting.

MINING METHODS.

The earliest records of coal production in Indiana are for 1840, when 9,682 tons were mined. The production increased gradually until in 1913 it was 17,165,671 tons.

Most of the commercial mines are opened by shafts varying from 50 to 450 feet deep, only a few being opened by slopes and drifts. From the shafts the mines are opened by main entry and air course, each 8 feet wide, separated by a 12-foot pillar. The coal is mined almost exclusively by the room-and-pillar method, which varies in detail in different districts and even in different coal beds of the same district. The mines are usually well equipped with the latest appliances, including electric machines and self-dumping cages.

Mining machines were first used in 1884. The "block coal" was first successfully mined by machines in 1894. In 1891 there were 47 mining machines in operation and in 1913 there were 732 which produced 56.7 per cent of the coal mined during the year. Of the total number of machines used 365 were of the chain-breast type. The average production per machine in 1913 was 13,302 tons.

About 30 per cent of the coal mined is shot off the solid; hand mining produced only about 11 per cent of the total output in 1913.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

An act approved March 8, 1879, which became effective May 1, 1879, authorized the governor to appoint a mine inspector, whose duty was to inspect each coal mine in the State at least twice a year. The inspector was required to render annual reports to the governor and to state therein the number of mines operating, the production of each mine, and such other information as the inspector deemed necessary. On February 26, 1889, the department of geology and natural science was created and placed under the supervision of a director, who was also the State geologist. The department consisted of four divisions: Geology and natural science, mines and mining, mineral oils, and natural gas. The chief of each division was appointed by the geologist. The office of mine inspector was abolished, and the chief of the division of mines and mining, to be known as the inspector of mines, was directed to perform all duties previously performed by the mine inspector. Annual reports of the inspector were included in the annual reports of the department. The inspector was authorized to employ one assistant.

An act approved March 2, 1891, covering coal mines employing 10 or more men, made it the duty of mine operators to report, under penalty, all mine accidents causing death, and upon receipt of such a

notice the inspector and coroner were required to investigate the cause of the accident. The act of March 4, 1891, restricted the appointment of inspector of mines to persons who had passed an examination satisfactory to the State geologist. On March 6, 1897, an act was approved directing mine operators to report to the inspector all accidents which prevented the usual working of a mine for 24 consecutive hours, or resulted in injuries causing death or requiring the attendance of a physician or surgeon. On March 11, 1901, the number of assistants to the inspector was increased to two, and on March 9, 1907, the number was further increased to four. The latter act also required that each mine should be inspected at least three times each year.

An act approved March 6, 1911, created a bureau of inspection, to consist of three departments: Inspection of mines, inspection of boilers, and inspection of factories. The new bureau was placed under the supervision of a chief inspector appointed by the governor. The governor also appointed three deputies, one for each of the departments comprising the bureau. Each deputy inspector was authorized to appoint five assistants, with the approval of the chief inspector.

Up to 1915 it was the practice of operators of mines employing 10 or more men to report to the inspector all accidents causing death or requiring the attendance of a physician or surgeon, and all such accidents were published in the inspector's annual reports. Injuries causing disability for two weeks were classified as serious, all others being considered slight.

The legislature of 1915 passed a workmen's compensation act, effective September 1, 1915, to be administered by the Industrial Board of Indiana, which was also provided for by the act. The department of inspection of mines and mining was transferred to the industrial board. Under the compensation law all employers of labor are required under penalty to report to the board all accidents causing injury to an employee whereby the employee is incapacitated for work more than one day. The department of mines, under the jurisdiction of the industrial board, consists of one chief inspector and five assistants, who are appointed by the board with the concurrence of the governor.

ACCIDENTS.

The accompanying tables show the total number of fatalities by causes and calendar years since 1881 as compiled from State mine inspectors' reports. They also show the percentage of accidents, by principal causes, and the fatality rate per 1,000 men employed for a period of 19 years for which continuous records are available. The fatality rate during this period is 2.16 per 1,000 men employed.

FATALITIES IN **INDIANA** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1895 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	306	45.07	0.97
Mine cars and locomotives	75	11.04	.24
Gas and dust explosions	57	8.39	.18
Explosives	132	19.44	.42
Miscellaneous	22	3.24	.07
Shaft	71	10.46	.23
Surface	16	2.36	.05
Total, 19 years	679	100.00	2.16

COAL-MINE ACCIDENTS IN **INDIANA** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1878 Nov. 21	Sullivan	Sullivan	Mine explosion	8
1896 Dec. 26	Oswald	Princeton	do	7
1905 Mar. 22	do	do	Powder and mine explosion.	9
1907 Jan. 14	Deering No. 7	Clinton	Powder explosion	7
1909 Mar. 20	Sunnyside	Evansville	Mine explosion	6

Indiana has been fortunate in that it has had but few disasters (only four) during this period in which 5 or more men were killed at one time, the total number being 29 fatalities, or slightly over 4 per cent of the entire number. To offset this, however, there were 132 fatalities due to explosives, representing 19.44 per cent of the total. The average production of coal per fatality during this period was 291,062 tons, or 3.44 fatalities per million tons mined.

Indiana, like Illinois, is an 8-hour State, and in order to make it comparable with other States, where 9 or 10 hours are considered a working day, a table has been compiled whereby the time element has been taken into consideration. The fatality rate for the 10-year period 1903–1913 (Table 40) based on the actual number of employees

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **INDIANA.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	236	16,291	5	24	6	39	663	17,017
1904	244	18,727	7	44	4	16	800	19,587
1905	271	24,484	2	24	3	15	800	25,323
1906	230	19,842	2	100	.....	.....	1,028	20,970
1907	208	18,323	.....	.....	.....	.....	2,699	21,022
1908	207	18,040	.....	.....	1	5	335	18,380
1909[b]	.....	.....	.....	.....	.....	.....	.....	20,937
1910	215	20,783	4	16	3	14	1,065	21,878
1911	213	20,946	2	7	3	16	22	20,891
1912	211	21,220	1	6	5	109	316	21,651
1913	199	21,637	3	42	6	121	435	22,235

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **INDIANA,** AND THE FATALITY RATE, BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	197	136,901	26,969,497	13,485	52	3.86
1904	177	157,572	27,890,244	13,945	34	2.44
1905	151	203,438	30,719,138	15,360	46	2.99
1906	175	168,888	29,555,400	14,778	31	2.10
1907	197	170,875	33,662,375	16,831	53	3.15
1908	174	147,385	25,644,990	12,822	45	3.51
1909	.....	.....	.....	.....	49	.....
1910	229	176,133	40,334,457	20,167	51	2.53
1911	182	167,989	30,573,998	15,287	46	3.01
1912	182	173,748	31,622,136	15,811	35	2.21
1913	190	178,599	33,933,810	16,967	66	3.89
1914	.....	.....	.....	.....	.....	.....

is 2.20 as compared with 2.95 on the 2,000-hour basis. Table 40 gives all of the States on this basis for the 10-year period, so that a comparison with other States may be made. During this period the men worked 1,487 hours per year as compared with 2,034 hours for the bituminous fields of Pennsylvania.

The tables of statistics for the State of Indiana follow.

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN INDIANA.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	3,272	132,825	40	1907	3,176	42,842	13
1900	3,583	71,282	20	1908	7,076	157,899	22
1901	1,027	40,812	39	1909	36	720	20
1902	1,824	23,693	13	1910	12,638	423,894	34
1903	2,680	46,560	17	1911	4,577	146,636	32
1904	1,061	22,963	18	1912	15,400	795,887	52
1905	981	12,528	13	1913	2,657	44,143	17
1906	15,875	995,217	63	1914	8,052	302,855	38

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 97.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **INDIANA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and all items above horizontal lines in columns 2, 3, 20, and 21 from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1840–1878	11,150,832	.....	.....	*8*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1879	1,196,490	.....	3,459	.....	.....	.....	.....	.....	371	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62
1880	1,454,327	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1881	1,984,120	.....	4,567	10	2.19	5.04	198,412	.....	434	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882	1,976,470	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1883	2,560,000	.....	5,403	11	2.04	4.30	232,727	.....	474	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1884	2,260,000	.....	5,716	9	1.57	3.98	251,111	.....	395	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1885	2,375,000	$1.15	6,502	7	1.08	2.95	339,286	(*b*)	365	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	3,000,000	1.15	6,406	7	1.09	2.33	428,571	(*b*)	468	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1887	3,217,711	1.34	.....	.....	.....	.....	.....	(*b*)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1888	3,140,979	1.40	6,685	17	2.54	5.41	184,763	(*b*)	470	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	2,845,057	1.02	6,448	.....	.....	.....	.....	(*b*)	441	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	3,305,737	.99	5,489	5	.91	1.51	661,147	220	602	2.74	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	2,973,474	1.03	5,879	5	.85	1.68	594,695	190	506	2.66	.....	.....	.....	.....	.....	.....	.....	.....	.....	47	.....
1892	3,345,174	1.08	6,436	19	2.05	5.68	176,062	224	520	2.32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	3,791,851	1.07	7,644	22	2.88	5.80	172,357	201	496	2.47	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	97
1894	3,423,921	.96	8,603	.....	.....	.....	.....	149	398	2.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	3,995,892	.91	8,530	23	2.70	5.76	173,734	189	468	2.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1896	3,905,779	.84	8,806	28	3.18	7.17	139,492	163	444	2.72	.....	24.7	.....	.....	.....	.....	.....	.....	.....	186	.....
1897	4,151,169	.84	8,886	16	1.80	3.85	259,448	170	467	2.75	.....	24.7	.....	.....	.....	.....	.....	.....	.....	174	137
1898	4,920,743	.81	8,971	21	2.34	4.27	234,321	199	549	2.76	.....	28.7	.....	.....	.....	.....	.....	.....	.....	233	.....
1899	6,006,523	.82	9,712	16	1.65	2.66	375,408	218	618	2.83	.....	28.5	.....	.....	163	84	.....	.....	.....	247	.....
1900	6,484,086	1.03	11,720	19	1.62	2.93	341,268	199	553	2.78	.....	27.4	.....	.....	.....	.....	.....	.....	.....	254	160
1901	6,918,225	1.01	12,968	24	1.85	3.47	288,259	194	533	2.75	.....	26.8	.....	.....	.....	.....	.....	.....	.....	256	162
1902	9,446,424	1.10	15,457	24	1.55	2.54	393,601	205	611	2.98	.....	25.6	.....	.....	.....	.....	.....	.....	.....	269	166

1903	10,794,692	1.23	17,017	52	3.06	4.82	207,590	197	634	3.22	.....	30.9	.....	.....	110	219	.....	.....	.....	329	184
1904	10,842,189	1.11	19,587	34	1.74	3.14	318,888	177	554	3.13	.....	33.3	.....	.....	139	269	1	.....	.....	409	210
1905	11,895,252	1.05	25,323	46	1.82	3.87	258,592	151	470	3.11	.....	35.4	.....	.....	142	362	2	.....	.....	506	208
1906	12,092,560	1.08	20,970	31	1.48	2.56	390,083	175	577	3.30	.....	35.2	.....	.....	124	329	18	.....	.....	471	200
1907	13,985,713	1.08	21,022	53	2.52	3.79	263,881	197	665	3.38	.....	38.0	.....	.....	147	308	58	.....	.....	513	204
1908	12,314,890	1.06	18,380	45	2.45	3.65	273,664	174	670	3.85	.....	43.0	.....	.....	140	332	35	.....	.....	507	204
1909	14,834,259	1.02	20,937	49	2.34	3.30	302,740	(b)	709	(b)	.....	50.0	.....	.....	227	391	13	.....	.....	631	296
1910	18,389,815	1.13	21,878	51	2.33	2.77	360,585	229	841	3.67	.....	48.9	.....	.....	194	422	29	.....	.....	645	251
1911	14,201,355	1.08	20,991	46	2.19	3.24	308,725	182	677	3.72	7.7	49.6	38.0	4.7	166	426	30	45	.....	667	257
1912	15,285,718	1.14	21,651	35	1.62	2.29	436,735	182	706	3.88	13.7	54.7	30.2	1.4	198	348	99	42	.....	687	238
1913	17,165,671	1.11	22,235	66	2.97	3.84	260,086	190	772	4.06	10.9	56.7	30.1	2.3	166	365	105	96	.....	732	231
Total	251,632,098	.....	.....	799	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1895–1913)	**10,401,629**	.....	**16,581**	**35.74**	**2.16**	**3.44**	**291,082**	**187**	**627**	**3.35**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	16,641,132	1.10	23,175	44	1.90	2.64	378,208	168	718	4.27	10.6	56.2	29.9	3.3	176	391	69	115	.....	751	225

a Figures in italics represent incomplete fatality records.

b Not reported.

TABLE 98.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **INDIANA**, WITH FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1881 TO 1913, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1881 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
1882 *b*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1883 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
1884 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
1885 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
1886 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
1887 *c*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1888 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17
1889 *c*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
1891	2	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	5
1892 *a*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19	19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19
1893	9	2	1	3	.....	5	.....	.....	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	22
1894 *c*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	12	.....	3	.....	.....	3	.....	.....	.....	.....	.....	.....	18	3	.....	2	.....	5	.....	.....	.....	.....	.....	.....	.....	23
1896	9	.....	3	9	.....	2	.....	.....	.....	.....	.....	.....	23	2	.....	3	.....	5	.....	.....	.....	.....	.....	.....	.....	28
1897	9	.....	1	.....	.....	5	.....	.....	.....	.....	.....	.....	15	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	16
1898	13	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	18	.....	1	1	.....	2	.....	.....	.....	1	.....	.....	1	21
1899	6	.....	2	.....	.....	2	.....	.....	.....	.....	.....	3	13	1	.....	1	1	3	.....	.....	.....	.....	.....	.....	.....	16
1900	11	.....	.....	.....	.....	3	.....	.....	1	.....	.....	.....	15	2	.....	1	.....	3	.....	.....	.....	.....	1	.....	1	19
1901	11	1	3	.....	.....	4	.....	.....	.....	.....	.....	.....	19	2	.....	3	.....	5	.....	.....	.....	.....	.....	.....	.....	24
1902	11	.....	3	.....	.....	7	.....	.....	.....	.....	.....	.....	21	.....	.....	2	.....	2	.....	.....	.....	.....	1	.....	1	24
1903	16	2	4	1	.....	19	.....	1	.....	.....	1	1	45	4	.....	2	.....	6	.....	.....	.....	.....	1	.....	1	52
1904	13	.....	6	.....	.....	9	.....	1	.....	.....	.....	.....	29	2	.....	2	.....	4	.....	.....	.....	.....	1	.....	1	34
1905	17	.....	3	2	9	8	.....	.....	.....	.....	.....	1	40	2	.....	3	.....	5	.....	.....	.....	.....	1	.....	1	46
1906	19	.....	3	1	.....	4	.....	.....	.....	.....	.....	.....	27	1	.....	2	.....	3	.....	.....	.....	.....	1	.....	1	31
1907	15	1	8	2	.....	18	.....	.....	1	.....	.....	1	46	1	.....	4	.....	5	.....	.....	.....	.....	2	.....	2	53
1908	19	3	6	1	.....	10	.....	1	1	.....	.....	.....	41	1	.....	3	.....	4	.....	.....	.....	.....	.....	.....	.....	45
1909	23	2	4	.....	6	5	.....	.....	.....	1	.....	1	42	2	1	3	.....	6	.....	.....	.....	.....	1	.....	1	49

1910	25	......	6	4	......	11	......	1	......	......	......	......	47	2	......	2	......	4	......	......	......	......	......	......	......	51
1911	17	2	4	1	2	11	......	2	......	1	......	......	40	3	......	......	......	3	1	......	......	......	1	1	3	46
1912	20	......	8	2	2	2	......	......	......	......	......	......	34	......	......	......	......	......	......	......	......	......	......	1	1	35
1913	24	5	8	7	8	4	......	1	1	......	......	1	59	2	......	2	1	5	1	......	......	......	......	1	2	66
1914	18	3	4	2	1	6	......	2	1	1	......	2	40	......	......	2	......	2	......	......	......	......	2	......	2	44

a Causes not given in official report.

b No accidents included in published report.

c No report published.

IOWA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Iowa are in the Pennsylvanian series of the Carboniferous system and occupy the central and southern part of the State. The total coal-bearing area is about 20,000 square miles, of which 13,000 square miles include outcropping coal beds that are considered workable under the present economic conditions. In 1913, 21 counties were reported as coal producers.

The principal producing areas are in Marion, Mahaska, Monroe, and adjacent counties, which produced 43 per cent of the coal in 1913; Polk, Jasper, and Dallas counties of the same group produced 32 per cent; and Appanoose and Wayne counties, containing the Mystic or Centerville bed, produced 17 per cent. This bed is very persistent over a considerable area.

CHARACTER OF COAL BEDS.

The Iowa coal is bituminous, non-coking, and contains a high percentage of sulphur in the form of pyrite. The coal is used largely for steaming purposes. Practically all of the beds are horizontal or dip about 10 feet per mile. Most of the coal beds are opened by shafts of different depths, as follows: Lucas County, 321 feet; Appanoose and Wayne counties, 200 feet; Adams County, 400 feet; Polk County, 156 feet; Webster County, 16 to 100 feet; and Marion County, 150 feet. There are a few slope and drift mines.

The coal beds of the Des Moines group (the lower part of the Pennsylvanian series) vary from 3½ to 5 feet or more in thickness and, with the exception of the Mystic bed, are somewhat faulted and irregular. The thickest coal in the State occurs in Marion County, where beds 4 to 12 feet thick have been opened. The Mystic or Centerville bed is about 2½ feet thick, has a strong roof, and is adapted to longwall mining methods.

MINING METHODS.

Coal mining in Iowa began about 1840, for which year the records show a production of 400 tons. The production has gradually increased until in 1913 it was 7,525,936 tons.

Nearly all of the mines are operated through shafts and the coal is mined by the longwall and room-and-pillar methods. In 1891, 9 machines were introduced into the mines and the number gradually increased to 56 in 1898. Since that date the number of machines has been gradually reduced. Of 62 mines in Appanoose County in 1904, 16 used the room-and-pillar method and 46 the longwall method. Longwall mining machines are used rather extensively. A large amount of coal is shot off the solid,but records showing the extent to

which this is practiced are not available prior to 1911. In 1912, 69 per cent, and in 1913, 72.3 per cent of the total production was shot off the solid. The hand-mined coal amounts to about 20 per cent of the total, while that produced by machines is less than 2 per cent.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

Section 1567 of the Iowa Code of 1873 directed that the board of supervisors of each county in which coal or other minerals were found should appoint an inspector of mines, who, upon application of mine owners, operators, or employees, examined the atmosphere of such mines as affecting life or health. If gas was found in sufficient quantities to jeopardize life or health, the inspector was authorized to require the operator to provide additional shafts or entrances for proper ventilation, and a penalty was provided for failure to carry out such demands of the inspector.

On March 18, 1874, the foregoing provisions were superseded by a law requiring the county inspectors, who were appointed as under the previous law, to examine each mine twice a year, provided more than 10 miners were employed therein. Operators were required, under penalty, to notify the inspector of all fatal and serious accidents, and, if fatal, to notify the county coroner also. The inspector was required to examine into the causes of accidents and to preserve a record of his inspections. The law of March 30, 1880, consolidated the inspection service under the jurisdiction of one State mine inspector appointed by the governor. The act applied only to mines employing more than 15 men, and the inspector was required to make an annual report to the governor, enumerating therein all accidents in and about the mines. An act approved March 18, 1884, extended the inspection law to cover all mines employing more than five men, and required the inspector to render biennial reports to the governor on August 15 preceding the regular session of the State legislature.

On April 10, 1886, the governor was authorized to divide the State into three districts and appoint a mine inspector for each district, the inspectors to report to the governor as before. A law of April 12, 1888, provided for a board of examiners to examine candidates for the office of mine inspector. By an act approved May 6, 1911, mine operators were required to report on August 1 of each year to the district inspector, for the year ending July 1, the number of employees in and around the mines, in addition to sending to the inspector an immediate notice of fatal and nonfatal accidents.

All injuries, whether serious or slight, are reported to the district mine inspectors, but only those causing disability for at least 10 days are considered serious injuries and published in the inspectors' annual reports.

ACCIDENTS.

The accompanying tables, Nos. 99 and 100, show the total number of fatalities by causes and calendar years since 1880, as compiled from the State mine inspectors' reports. These tables also show the percentage of accidents, classified by principal causes, and fatality rate per 1,000 men employed, over a period of 26 years for which

FATALITIES IN **IOWA** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1888 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	426	59.00	1.31
Mine cars and locomotives	76	10.53	.23
Gas and dust explosions	44	6.10	.13
Explosives	74	10.25	.23
Miscellaneous	18	2.49	.06
Shaft	65	9.00	.20
Surface	19	2.63	.06
Total, 26 years	722	100.00	2.22

COAL-MINE ACCIDENTS IN **IOWA** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1893, Feb. 14	Chicago and Iowa	Albia	Mine explosion	8
1902, Jan. 24	Lost Creek No. 2	Oskaloosa	Do.	20

continuous records are available. The fatality rate during this period is 2.22 per 1,000 men employed. Iowa has been fortunate in that there have been but two disasters, in which five or more men were killed at one time. The fatalities represented by these two disasters are only 4 per cent of the total number killed during the above period. Of the total number of fatalities, 59 per cent were due to falls of roof and pillar coal, 10.53 per cent to mine cars and locomotives, and 10.25 per cent to explosives. The average production of coal per fatality during this period was 204,390 tons, or 4.89 fatalities for each million tons mined.

Since Iowa is an eight-hour State, the time element has been taken into consideration, and tables have been compiled on this basis for comparison with other States. The fatality rate for the 10-year period, 1903–1913 (Table 40), based upon the actual number of employees, is 1.94, whereas based on the number of 2,000-hour workers it is 2.27. During the 10-year period the men averaged 1,704 hours per year, as compared with 2,447 hours for Virginia. Table 41 shows

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN IOWA.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	237	12,689	3	27	.....	.....	1,446	14,162
1904	261	15,221	1	10	1	10	388	15,629
1905	186	13,569	5	56	3	22	1,466	16,113
1906	195	14,869	2	20	1	8	363	15,260
1907	175	15,171	1	10	.....	.....	404	15,585
1908	218	14,772	3	28	4	24	1,197	16,021
1909[b]	.....	.....	.....	.....	.....	.....	.....	17,286
1910	229	16,238	2	10	3	11	407	16,666
1911	196	16,095	3	16	.....	.....	741	16,852
1912	194	15,806	1	9	1	4	551	16,370
1913	185	15,248	2	16	1	12	481	15,757

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN IOWA AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day. (All employees.)	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	226	114,769	25,937,894	12,969	27	2 08
1904	213	125,450	26,720,850	13,360	25	1.87
1905	209	122,470	25,596,230	12,798	37	2.89
1906	224	122,479	27,435,296	13,718	29	2.11
1907	230	125,094	28,771,620	14,386	40	2.78
1908	214	129,441	27,700,374	13,850	31	2.24
1909[a]	.....	.....	.....	.....	.....	.....
1910	218	133,767	29,161,206	14,581	33	2.26
1911	203	135,573	27,521,319	13,761	38	2.76
1912	188	131,528	24,727,264	12,364	19	1.54
1913	195	126,577	24,682 515	12,341	26	2.11

[a] Census year.

the fatality rate for each year on the 2,000-hour basis (1903–1913) for each State, so that a true comparison of Iowa with other States may be readily made. The tables of statistics for the State of Iowa follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN IOWA.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	2,623	72,710	28	1907	1,621	8,265	5
1900	1,322	62,333	47	1908	5,248	121,087	23
1901	401	16,171	40	1909	2,036	12,504	6
1902	363	6,480	18	1910	9,209	408,563	44
1903	1,143	11,365	99	1911	1,622	31,870	20
1904	8,303	173,781	21	1912	8,455	370,449	44
1905	1,774	10,353	6	1913	721	13,538	19
1906	7,969	204,860	28	1914	2,642	76,791	29

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 99.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **IOWA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and all items above horizontal lines in columns 2, 3, 11, and 20 from State mine inspectors' reports. Figures for columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1840–1879	10,061,992																				
1880	1,461,116			3		2.05	487,039														
1881	1,960,000																				
1882	3,920,000			22		3.74	267,273														
1883	4,457,540			15		3.37	297,169														
1884	4,370,566			22		5.03	198,662														
1885	4,012,575	$1.20		16		3.99	250,786														
1886	4,315,779	1.25		22		5.10	196,172														
1887	4,473,828	1.34		22		4.92	203,356														
1888	4,952,440	1.30	9,600	30	3.13	6.06	165,081														
1889	4,095,358	1.33	9,247	22	2.38	5.37	186,153														
1890	4,021,739	1.24	8,130	12	1.48	2.98	335,145	213	495	2.32											
1891	3,825,495	1.27	8,124	27	3.32	7.06	141,685	224	471	2.10		1.1	(a)	(a)						9	
1892	3,918,491	1.32	8,170	21	2.57	5.36	186,595	236	480	2.03			(a)	(a)							
1893	3,972,229	1.30	8,863	24	2.71	6.04	165,510	204	448	2.20			(a)	(a)							
1894	3,967,253	1.26	9,995	24	2.40	6.05	165,302	170	397	2.34			(a)	(a)							
1895	4,156,074	1.20	10,066	23	2.28	5.53	180,699	180	413	2.19			(a)	(a)							
1896	3,954,028	1.17	9,672	18	1.86	4.55	219,668	178	409	2.30		2.1	(a)	(a)						45	
1897	4,611,865	1.13	10,703	23	2.15	4.99	200,516	201	431	2.14		3.9	(a)	(a)						49	
1898	4,618,842	1.14	10,262	22	2.14	4.76	209,947	219	450	2.05		4.7	(a)	(a)						56	
1899	5,177,479	1.24	10,971	25	2.28	4.83	207,099	229	472	2.06		2.2	(a)	(a)	22	13	6			41	
1900	5,202,939	1.38	11,608	20	2.50	5.57	179,412	228	448	1.96		2.6	(a)	(a)						40	
1901	5,617,499	1.39	12,653	29	2.29	5.16	193,707	218	444	2.04		2.0	(a)	(a)						53	
1902	5,904,766	1.47	12,434	49	3.94	8.30	120,505	227	475	2.09		1.9	(a)	(a)						31	

1903	6,419,811	1.65	14,162	27	1.91	4.21	237,771	226	453	2.00	.....	.9	(a)	(a)	.....	.....	10	.....	.....	10	244
1904	6,519,933	1.61	15,629	25	1.60	3.83	260,797	213	417	1.96	.....	2.7	(a)	(a)	11	10	18	.....	.....	39	267
1905	6,798,609	1.56	15,113	37	2.45	5.44	183,746	209	450	2.15	.....	2.7	(a)	(a)	9	9	14	.....	.....	32	.....
1906	7,226,224	1.60	15,260	29	1.90	3.99	250,559	224	476	2.13	97.3	2.7	(a)	(a)	11	14	9	.....	.....	34	.....
1907	7,574,322	1.62	15,585	40	2.57	5.28	189,358	230	486	2.11	98.6	1.4	(a)	(a)	16	9	8	.....	.....	33	.....
1908	7,161,310	1.63	16,021	31	1.93	4.33	231,010	214	447	2.09	99.0	1.0	(a)	(a)	19	9	.....	.....	.....	28	.....
1909	7,757,762	1.65	17,286	39	2.26	5.03	198,917	(b)	449	(b)	99.9	.1	(a)	(a)	5	.....	.....	.....	.....	5	309
1910	7,928,120	1.75	16,666	33	1.98	4.16	240,246	218	476	2.18	99.7	.3	(a)	(a)	11	6	.....	.....	.....	17	268
1911	7,331,648	1.73	16,852	38	2.25	5.18	192,938	203	435	2.14	15.2	.6	68.4	15.8	10	6	3	.....	1	20	237
1912	7,289,529	1.80	16,370	19	1.16	2.61	383,659	188	445	2.37	19.9	1.3	69.1	9.7	16	3	3	1	1	24	219
1913	7,525,936	1.79	15,757	26	1.65	3.45	289,459	195	478	2.45	20.2	1.6	72.3	5.9	3	7	8	8	2	28	203
Total	186,603,097	.....	.....	844	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1888–1913)	6,675,758	.....	12,508	27.77	2.22	4.89	204,390	211	454	2.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	7,451,022	1.79	16,057	37	2.30	4.97	201,379	204	464	2.27	19.5	4.1	74.4	2.0	2	4	18	21	1	46	190

a Included in hand mining, column 11.

b Not reported.

TABLE 100.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **IOWA**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1880 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1880 [a]	3												3													3
1881	9		2			0							17	2		3		5								22
1882																										
1883	8		1			1						1	11			3		3			1				1	15
1884	13		2								1	1	17			1	1	2			1	1	1		3	22
1885	10	1				1						2	14			2		2								16
1886	10	1	2			5							18			1		1				3			3	22
1887	13	1				4							18	1		2		3				1			1	22
1888	10	2	2			9						1	24	2	1	2		5					1		1	30
1889	11	2	2			2							17	1		4		5								22
1890	4	1	1			3							9	1		1		2					1		1	12
1891	19	2				4							25			1		1				1			1	27
1892	13		1		3	2							19	1				1						1	1	21
1893	12	2			8	1							23			1		1								24
1894	12	1	3			3							19	1		1		2				2	1		3	24
1895	11	2	1				4				2		20	2				2					1		1	23
1896	9		2		2	3							16	2				2								18
1897	12	2	1			2			1				18	3		1		4				1			1	23
1898	14	1	3			3							21									1			1	22
1899	13	1	1			3							18	5	1		1	7								25
1900	17		5			2							24	2	1	1		4	1							29
1901	14	7	2		2	3							28	1				1								29
1902	15	2	2		22	5						1	47			1		1					1		1	49
1903	16	2	3			3							24	3				3								27
1904	11	2	2		2	1	1						19		2	3		5						1	1	25
1905	24	1	4			5						1	35	1				1	1							37
1906	14	1	6			5							28	2				2						1	1	29
1907	21	7	2	1	1	2							34	1		3		4				1	1		2	40
1908	16	3	4			3							28	2	1	2		5								31

1909	22	4	5	......	......	2	2	1	......	......	......	1	**37**	1	......	......	......	1	......	......	......	......	......	1	......	1	**39**
1910	20	1	3	......	......	3	......	......	1	......	......	1	**29**	3	......	......	......	3	1	......	......	......	......	......	......	1	**33**
1911	21	......	12	......	......	1	......	......	......	1	......	......	**35**	1	......	1	1	3	......	......	......	......	......	......	......	......	**38**
1912	9	2	3	......	2	3	......	......	......	......	......	......	**19**	......	......	......	......	......	......	......	......	......	......	......	......	......	**19**
1913	18	......	6	......	1	1	......	......	......	......	......	......	**26**	......	......	......	......	......	......	......	......	......	......	......	......	......	**26**
1914	17	1	5	......	5	3	1	......	......	......	......	......	**32**	3	......	2	......	5	......	......	......	......	......	......	......	......	**37**

a 1880 figures are for 6 months only, July 1 to Dec. 31.

KANSAS.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing measures of Kansas comprise about 18,600 square miles, of which 3,100 square miles are known to contain workable coal beds. The coal-bearing area occupies a strip covering about 3 to 4 counties wide entirely across the eastern end of the State, but the best beds are found in Cherokee and Crawford counties in the southeast corner.

The coal beds of this State belong to the Carboniferous system and occur in the southwest extension of the coal-bearing rocks of the Iowa-Missouri field. About 90 per cent of the coal mined in the State is from the Weir-Pittsburgh beds in Crawford and Cherokee counties. About 6 per cent of the coal is produced in the Atchison-Leavenworth district from a depth of 700 feet to 1,150 feet.

CHARACTER OF COAL BEDS.

The coal beds of Crawford and Cherokee counties are practically horizontal, and occur at depths of 30 feet to 250 feet. The coal is bituminous, and produces a large amount of dust when mined. The beds vary in thickness from 3 to 10 feet, those in the Cherokee shale being very irregular. The thicker parts of the workable beds lie in "swamps" or basins of very irregular outline. Rolls in the floor and roof cause differences of level of 20 to 30 feet in many of the mines and a difference of as much as 60 feet has been observed in a single mine. It seems that these irregularities are due to unevenness of the original bottom upon which the coal was formed.

MINING METHODS.

The earliest statistics of coal production in Kansas are for 1869, when 36,891 tons were mined. In 1913, the production was 7,202,210 tons. Practically all of the coal is mined by the room-and-pillar system, but some longwall mining is done in Osage County. About 85 per cent of the mines are opened by shaft; 11 per cent are strip pits, and 4 per cent are drift mines. In southeastern Kansas considerable coal is mined by stripping with a steam shovel. In places as much as 40 feet of cover is removed in stripping.

Mining machines were introduced into Kansas about 1897 but their use has been confined to a limited number of mines. In 1908, there were 17 machines in use; in 1913, only 9 were used, producing 0.3 per cent of the coal mined in the State, 14.8 per cent was mined by hand, and 85.5 per cent was shot off the solid.

The State mine inspector in his report for 1913 states that in Crawford and Cherokee counties 982,546 12½-pound kegs of powder were

used, or one keg for every 7.22 tons of coal produced. In addition, he also estimates that 1,029,000 pounds of dynamite and 46,450 pounds of permissible powder were used.

He also states that:

> The extreme danger in the increased and excessive amount of explosives used is hereby made apparent and can not be gainsaid. Had these figures of dynamite and permissible powder been reversed the condition under which the mines were operated, in my opinion, would have been vastly improved as far as their safety is concerned. This may also account in a certain measure for the grade of coal produced at some of the mines.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The governor of Kansas was authorized by an act approved February 27, 1883, to appoint an inspector of coal mines for two years from June 30, 1883. Mine operators were required to report to the inspector all accidents causing serious or fatal injuries, and, if fatal, to the coroner of the county in which the mine was located. A monthly report by the inspector, showing the number of accidents and deaths from injuries and number of men employed, was required to be filed with the secretary of the State board of agriculture on or before the first Monday in each month. The act of March 13, 1885, required the inspector to render annual reports to the governor on the 1st day of February of each year. The mine operators were required by the act of March 13, 1897, to render quarterly reports of accidents to the State mine inspector. The method of selecting the mine inspector was changed by an act approved January 6, 1899. By this act an association of miners was authorized, consisting of a delegate from each organized body of five or more miners in any county, city, or mining camp in the State. The State association held annual meetings and elected a president, vice president, and secretary, and the secretary so elected succeeded to the duties of State mine inspector.

On February 5, 1913, an act was approved creating a department of labor and industry under the control of a commissioner of labor and industry. The commissioner was made ex officio factory and mine inspector, with authority to appoint an assistant of at least five years' experience in coal mining. In 1914 the inspection of coal mines was carried on by the assistant commissioner and five deputies.

All injuries, whether serious or slight, are reported to the inspector and are included in his annual reports, but no definition is given as to what constitutes a serious or slight injury.

ACCIDENTS.

Tables 101 and 102 show, by causes and calendar years, the total number of fatalities since 1884, excepting 1886, 1888, and 1892, for which years reports are not available. These tables also show the percentage of accidents, classified by principal causes, and fatality rate per 1,000 men employed for a period of 21 years for which continuous records are available. The fatality rate during this period is 2.45 per 1,000 men employed. Of the total number killed

FATALITIES IN KANSAS COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1893 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	259	49.05	1.20
Mine cars and locomotives	12	2.27	.06
Gas and dust explosions	33	6.25	.15
Explosives	131	24.81	.61
Miscellaneous	26	4.93	.12
Shaft	50	9.47	.23
Surface	17	3.22	.08
Total, 21 years	528	100.00	2.45

COAL-MINE ACCIDENTS IN KANSAS IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1888 Nov. 9	Shaft No. 2	Frontenac	Mine explosion	40
1906 Dec. 20	Fidelity No. 1	Stone City	Powder explosion	7
1911 Mar. 18	No. 16	Mineral	Mine explosion	5
1914 Jan. 14	Spencer-Newland	Mulberry	Cage with men fell down shaft.	6

(1893–1913), 49.05 per cent of the fatalities were due to falls of roof and pillar coal, and 24.81 per cent to explosives. The amount of coal mined by shooting off the solid is approximately 80 per cent of the total production. The average production of coal per fatality during the 21 years was 203,153 tons, or 4.92 fatalities for each million tons mined. The average production per man a year was 497 tons, or 2.56 tons per day.

During the period 1884 to 1913, inclusive, there were three mine disasters in which 52 men were killed, representing slightly less than $8\frac{1}{2}$ per cent of the total number killed in the coal mines of Kansas.

In Kansas, more than 95 per cent of the men are on an eight-hour basis, and for comparative purposes the time element has been taken into consideration and tables compiled. It will be noted that the fatality rate for the 10-year period, 1903–1913 (Table 40), based on actual number of employees, was 2.70 per 1,000 men employed, and reduced to a 2,000-hour basis was 3.45 per 1,000. Table 41 shows

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN KANSAS.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	145	9,965	9	447	8	62	450	10,924
1904	151	11,599	9	215	5	45	339	12,198
1905	121	11,004	6	129	5	54	739	11,926
1906	141	12,606	7	94	3	399	1,256	14,355
1907	134	10,980	10	156	1	10	1,293	12,439
1908	138	12,973	11	283	7	363	297	13,916
1909[b]								12,359
1910	126	12,255	9	115	1	5	495	12,870
1911	121	10,989	7	177			657	11,823
1912	132	11,186	7	380			80	11,646
1913	138	12,240	1	5			234	12,479

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN KANSAS, AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	215	88,413	19,008,795	9,504	33	3.47
1904	213	98,228	20,922,564	10,461	31	2.96
1905	212	96,384	20,433,408	10,217	41	4.01
1906	165	116,988	19,303,020	9,652	39	4.04
1907	225	100,981	22,720,725	11,360	37	3.26
1908	181	112,634	20,386,754	10,193	38	3.73
1909						
1910	148	103,580	15,329,840	7,665	17	2.22
1911	190	95,418	18,129,420	9,065	42	4.63
1912	202	93,628	18,912,856	9,456	30	3.17
1913	197	100,071	19,713,987	9,857	28	2.84

the fatality rate for each year on the 2,000-hour basis (1903–1913) for each State, so that a true comparison of Kansas with other States may be readily made.

The tables of statistics for the State follow.

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN KANSAS.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	1,986	88,798	45	1907	923	16,957	18
1900	157	3,590	23	1908	11,155	665,224	60
1901	60	300	5	1909	4,715	71,566	15
1902	334	17,256	52	1910	10,346	1,578,027	153
1903	328	2,516	8	1911	984	8,507	9
1904	186	1,214	7	1912	2,088	13,487	65
1905	1,482	14,686	10	1913	3,178	28,936	9
1906	11,827	709,422	59	1914	2,673	45,257	17

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 101.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN KANSAS, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and all items above horizontal lines in columns 2 and 3 from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1869–1883	5,068,071																				
1884	1,100,000			3		2.73	366,667														
1885	1,212,057		4,175	9	2.16	7.43	134,673		290												
1886	1,400,000																				
1887	1,596,879			6		3.76	266,147														
1888	1,850,000	$1.50	3,600	40					514												
1889	2,221,043	1.48	5,956	12	2.01	5.40	185,087	(b)	373												
1890	2,259,922	1.30	4,523	8	1.77	3.54	282,490	210	500	2.38											
1891	2,716,705	1.31	6,201	11	1.77	4.05	246,973	222	438	1.97											
1892	3,007,276	1.32	6,559	(b)				208	458	2.20											
1893	2,652,546	1.27	7,310	14	1.92	5.28	189,468	147	363	2.47											
1894	3,388,251	1.23	7,339	24	3.27	7.08	141,177	164	462	2.82											
1895	2,926,870	1.20	7,482	11	1.47	3.76	266,079	159	391	2.46											
1896	2,884,801	1.15	7,127	12	1.68	4.16	240,400	168	405	2.41											
1897	3,054,012	1.18	6,639	6	.90	1.96	509,002	194	460	2.37		0.2									1
1898	3,406,555	1.09	7,197	17	2.36	4.99	200,386	194	473	2.44		.3									2
1899	3,852,267	1.16	8,000	16	2.00	4.15	240,767	226	482	2.13		1.0				3					3
1900	4,467,870	1.22	8,459	21	2.48	4.70	212,756	232	528	2.28		1.0									3
1901	4,900,528	1.22	9,928	11	1.11	2.24	445,503	224	494	2.21		.8									4
1902	5,266,065	1.30	9,461	28	2.96	5.32	188,074	220	557	2.53		.9									6
1903	5,839,976	1.52	10,924	33	3.02	5.65	176,969	215	535	2.49		.2				3	2				5
1904	6,333,307	1.52	12,198	31	2.54	4.89	204,300	213	519	2.44		.2			3		2				5
1905	6,423,979	1.46	11,926	41	3.44	6.38	156,682	212	539	2.54		.3			10						10
1906	6,024,775	1.49	14,355	39	2.72	6.47	154,481	165	420	2.55		.5			6						6

1907	7,322,449	1.52	12,439	37	2.97	5.05	197,904	225	589	2.62	.....	.5	.....	.....	3	3	.....	.....	.....	6	.....
1908	6,245,508	1.49	13,916	38	2.73	6.08	164,355	181	449	2.48	.....	2.1	.....	.....	10	7	.....	.....	.....	17	.....
1909	6,986,478	1.44	12,359	32	2.59	4.58	218,327	(b)	565	(b)	.....	.9	.....	.....	14	2	.....	.....	.....	16	194
1910	4,921,451	1.61	12,870	17	1.32	3.45	289,497	148	382	2.58	.....	.7	.....	.....	11	2	.....	.....	.....	13	155
1911	6,178,728	1.53	11,823	42	3.55	6.80	147,113	190	523	2.75	5.6	1.7	78.6	14.1	15	.....	.....	.....	.....	15	159
1912	6,986,182	1.62	11,646	30	2.58	4.29	232,873	202	600	2.97	5.9	1.1	83.9	9.1	9	.....	2	.....	.....	11	153
1913	7,202,210	1.67	12,479	28	2.24	3.89	257,222	197	577	2.93	14.8	.3	80.5	4.4	5	1	3	.....	.....	9	152
Total	129,696,761	.....	.....	617	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1893–1913)	5,107,848	.....	10,280	25.14	2.45	4.92	203,153	194	497	2.56	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	6,860,988	1.63	12,448	33	2.65	4.81	207,909	192	551	2.87	16.4	.6	76.9	6.1	.....	.....	7	2	.....	9	129

a Figures in italics represent incomplete fatality records.

b Not reported.

TABLE 102.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN KANSAS, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1884 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1884						5						3	3			2		2								3
1885	2												7					1								9
1886 [a]					3								5	1												6
1887	2				40								40			1		1								40
1888 [a]						3							11			1		1								12
1889	6	2				1							5			3		3								8
1890	4					2						1	11													11
1891	7		1																							
1892 [a]																										
1893	3		1			2						5	11	1		2		3								14
1894	10				2	4							16	3		2		5					2	1	3	24
1895	5					1		1				1	8			3		3								11
1896	5					5							10			2		2								12
1897	3					2							5		1			1								6
1898	7				3	5						2	17													17
1899	8					5						1	14			1		1			1				1	16
1900	12					6						1	19		1	1		2								21
1901	4					2						1	7	1	1	2		4								11
1902	12		2			7	1					1	23	3	2			5								26
1903	19					7						2	28	1		1		2					3		3	33
1904	15		2			11							28	1		2		3								31
1905	23		1		2	13							38	1				1					1		1	41
1906	14	1	1			20							36	1	1			2	1						1	38
1907	21		1	1	3	6							32	1		2		3					1	1	2	37
1908	22			1	3	6							32	1		3		4			1			1	2	38
1909	18		1	3		8			1				31			1		1								32
1910	7		1		1	3							12	4				4						1	1	17
1911 [b]	20			7	3	3	3	1				3	40	1				1				1			1	42

1912	13	......	2	......	1	11	......	1	......	......	......	......	28	......	......	1	......	1	......	......	......	......	1	......	1	30
1913	17	......	......	1	2	4	......	......	1	......	......	......	25	......	......	2	......	2	......	......	......	......	......	1	1	28
1914	14	......	......	......	8	1	......	1	......	......	......	1	25	6	1	......	......	7	......	......	1	......	......	......	1	33

[a] No report issued. The 40 fatalities shown in 1888 are those resulting from the explosion at the Frontenac mine, Nov. 9.

[b] On July 7, 1911, the State records were burned before the inspector published his report. Hence no report was issued for the fiscal year ending June 30, 1911. Figures for 1910 and 1911 were compiled by the Bureau of Mines from operators' reports.

KENTUCKY.

AREA AND DISTRIBUTION OF COAL FIELDS.

The two coal fields of Kentucky are located in the extreme eastern and western parts of the State.

The Eastern coal field has an area of about 10,270 square miles, of which about 70 per cent may be considered as productive. The rocks in this field are practically horizontal, except those in Bell and Harlan counties, which lie in the great synclinal trough east of Pine Mountain. In the middle of this trough the coal beds are flat-lying, but on either rim they dip steeply toward the axis of the trough. The stresses which caused the great trough have produced several minor folds in its bottom and also a few faults, which cause considerable trouble and expense in mining. The principal producing counties are Bell, Floyd, Harlan, Johnson, Knox, Laurel, Lee, Letcher, Perry, Pike, and Whitley. In 1913, the field produced 11,098,906 tons, as compared with 8,517,640 for the Western field.

The Western field is a continuation of the Indiana-Illinois field and has a coal-bearing area of about 6,400 square miles, of which 65 per cent may be considered as productive. This field, which includes Butler, Daviess, Hancock, Henderson, Hopkins, McLean, Muhlenberg, Ohio, and Webster counties, is the southeastern part of the big flat basin that carries the coal of Indiana and Illinois, but the rocks are much more disturbed in the Kentucky part than they are in those parts lying in the other States. The line of disturbance, extending in an east-west line across southern Illinois, continues across the western Kentucky field. Along this line from Shawneetown, Illinois, to Litchfield in Grayson County, the rocks are tilted and broken by faults to such an extent that mining is difficult and expensive.

CHARACTER OF COAL BEDS.

The Eastern field belongs to the Pottsville group of the Allegheny formation and contains 12 or more coal beds of workable thickness and quality. The coal of these beds is usually of high-grade gas or coking quality and some of it is cannel coal. The Blue Gem and Jellico beds, which extend into Tennessee, average about 22 inches thick. This coal is extensively mined and finds a ready market as a domestic and steam fuel. Other coal beds contain 8 to 9 feet of workable coal. In Breathitt County one of the coal beds that is extensively worked is 30 inches thick and has a thin shale roof above which is a stratum of limestone. In Pulaski County, one of the important beds is 35 inches thick and has a dip of about 1 per cent. In Bell County, one of the most productive beds is 36 to 42 inches thick and is horizontal.

There are three important coal beds that are worked in various parts of the western district. Coal A (No. 12) is about 80 inches thick at the Pierce mine in Muhlenberg County, it is of excellent steaming quality and has been used to a limited extent for coking, but is not of commercial importance for this use. The thickness of this bed varies and in general the roof is fire clay and shale. Coal B (No. 11), known also as the Danville bed, is one of the principal sources of commercial coal. It varies in thickness from 12 to 84 inches and is cut by clay slips and disturbed by rolls. It is 40 to 100 feet below the surface and is 25 feet below the No. 12 coal. At the Pierce mine, Muhlenberg County, the coal is 78 inches thick, and in Hopkins County, is about 84 inches thick. At Madisonville there is a thin stratum of shale between the coal and a limestone capping, whereas at Nortonville the limestone rests directly on the coal. Bed D (No. 9, equivalent of No. 5, Illinois) is more regular than the other coal beds and produces about 75 per cent of the coal of the western district. It is 56 to 60 inches thick and extends throughout the larger part of 8 counties. It is about 300 feet below the surface and is opened by shafts. Coal Fb (No. 5), also known as the "Four-foot" coal, is extensively mined at De Koven, Union County, where it has a maximum thickness of 54 inches. The roof is black shale 1½ to 2 feet thick. There are a number of other coal beds in the State, varying in thickness from a few inches to 40 and 50 inches, some of which are worked.

MINING METHODS.

Coal mining in Kentucky began in a small way in 1828, during which year 328 tons were reported as the annual production. The production has gradually increased until in 1913 it was 19,616,600 tons. The majority of the coal is mined by the double-entry, room-and-pillar method. In the eastern part of the State practically all of the mines are opened by drift or slope, whereas in the western field there are a number of shaft mines. In 1900 there were 23 shaft mines in the State, the others being opened by slopes or drifts. The following description[a] given by Dr. C. J. Norwood covers the mining methods of the year 1889.

Almost without exception, the mines of Kentucky are worked on the "pillar-and-room" system, with either single (with parallel air course) or double entry, usually the former. Sometimes one portion of the bank will be worked with single entry and another portion with double. The only two instances, known to the writer, in which long wall was tried resulted in failure; and one instance in which square work was attempted resulted in crushed pillars. The rooms are usually turned every 30 or 33 feet, and widened to from 18 to 21 feet. The necks are usually 6 to 12 feet long by 6 to 8 feet wide in the western field, and 8, 12, 18, or 20 feet long by 6 to 9 feet wide in the eastern field. The lengths of the rooms vary so greatly that a general statement on

[a] Report of the inspector of mines of Kentucky, 1889.

that point can not well be given. Sometimes they are driven a distance of 600 feet from one entry through to the other; again, rooms are started from parallel entries to meet midway, and will be driven up only 200 to 250 feet.

In the western field the rooms are almost invariably single. In the eastern one they are often double, or two rooms are worked from a single "parting."

It is not uncommon for rooms to be turned from the main entry, in the eastern field; in the western one it is seldom done.

In both fields single entry, with parallel air-course (rooms sometimes being turned from the air-course), is the more common of the two systems followed. Double entry is oftener followed in the western field than in the eastern. Sometimes, when single entry with parallel air-course is adopted it is ultimately modified, in order to curtail expenses, by continuing room width what began as narrow work.

In the eastern field all of the openings, with one exception, (a short slope), are drifts, considerably above the level of drainage. (And the mines there are the wettest in the State). In the western one, the coals are reached by shafts, slopes and drifts.

These methods have not changed materially except possibly in the increased number of mining machines since their introduction in 1884. In 1893, there were 70 machines in operation in the Kentucky coal mines, which produced 20 per cent of the State's output. The number of machines has gradually increased until in 1913, 1,263 mining machines produced 73.2 per cent of all of the coal mined in Kentucky.

Shooting off the solid has been and still is prevalent in Kentucky, but with the increase in the number of mining machines, there is a slight decrease in the amount of coal shot off the solid. In 1911, 16.2 per cent of the coal was thus mined and in 1913, 15.7 per cent.

A large amount of the underground haulage is by mules, which are used largely for gathering the coal from the working face and delivering it to a rope haulage or electric haulage system.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The mine-inspection law of Kentucky was approved by the governor and became effective May 10, 1884. The law related only to mines in which more than 5 persons were employed at one time. The first State inspector was appointed May 12 and entered on duty May 14, 1884. He was required, among other things, to report to the governor not later than October 10 on the condition and operation of the coal mines and to enumerate in his report all accidents in or about the mines. The law, however, contained no provisions compelling operators to report accidents to the State inspector, and the official record of mine accidents in Kentucky from 1884 to 1888 is therefore somewhat incomplete. The defect in the original law was remedied by an act approved April 6, 1888, making it the duty, under penalty, of mine operators to furnish accurate information to the State inspector, on blanks supplied by him, as to all accidents in or about the mines.

An act approved March 23, 1914, designated the office of inspector of mines as the department of mines and changed the inspector's title to chief inspector of mines. The act applies to all coal mines in which 6 or more men are employed, and requires the superintendents of such mines to render to the chief inspector monthly reports of all fatal and serious accidents, showing the cause of such accidents, and such other information as the chief inspector may require. Fatal accidents are also required to be reported immediately to the district inspector. Each district inspector is required to examine each mine in this district at least once every four months. Monthly reports are rendered by the assistant inspectors to the chief inspector, and annual reports are rendered to the chief inspector within 60 days after the close of the calendar year. The act requires that the chief inspector shall prepare and file his annual report for printing within six months after the close of the calendar year.

The first assistant inspector was provided for by the acts of December 3, 1892, and June 9, 1893, and he entered upon his duties July 1, 1893. Since that time the inspection force has been further increased, so that in 1915 the force consisted of one chief inspector and five assistant inspectors.

It is the practice of mine operators to report to the inspector all accidents causing death or injury resulting in disability for at least 7 days, and all such accidents are published in the inspector's annual reports. Nonfatal injuries are classified into three classes: Serious, severe but not serious, and slight. The inspector has defined these classes as follows: Serious injuries include fractures, paralysis, dangerous injuries to internal organs, injuries permanently affecting muscles (as may come from burns, cuts, lacerations), dislocations, injuries necessitating amputation, crushed bones, and injuries of similar importance; severe but not serious injuries include those that, while they may be painful and cause loss of a week or more, leave no permanent effects or are not dangerous, such as bruises, cuts, and strains; slight injuries include bumps, scratches, strains and minor hurts that cause no cessation of work, or only for a few days (less than a week). Slight injuries are not recorded in the inspectors' annual reports.

ACCIDENTS.

The accompanying State tables (Nos. 103 and 104) show the total number of fatalities by causes and calendar years since 1884, as compiled from the State mine inspector's reports. They also show the percentage of accidents and fatality rates per 1,000 employed by principal causes, over a period of 26 years (1888–1913) for which continuous records are available. The fatility rate during this period is 1.98 per 1,000 men employed. There were 10 accidents in which 5 or more men

FATALITIES IN **KENTUCKY** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1888 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	316	49.76	0.98
Mine cars and locomotives	46	7.25	.14
Gas and dust explosions	74	11.65	.23
Explosives	89	14.02	.28
Miscellaneous	39	6.14	.12
Shaft	24	3.78	.08
Surface	47	7.40	.15
Total, 26 years	635	100.00	1.98

COAL-MINE ACCIDENTS IN **KENTUCKY** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1895 Jan. 22	Tate	Sturgis	Powder or mine explosion.	5
1904 Apr. 20	Stearns No. 5	Stearns	Mine explosion	5
1908 Feb. 10	Moody	South Carrollton	Blown-out shot	9
1909 Dec. 11	Baker No. 5	Clay	Mine explosion	7
1910 Feb. 1	Browder	Browder	Powder and mine explosion.	34
1910 Feb. 8	Barthell No. 1	Stearns	Mine explosion	6
1910 Nov. 25	Providence No. 3	Providence	Powder and mine explosion.	10
1912 Jan. 19	Central	Central City	Mine explosion	5
1912 Apr. 21	Coil	Madisonville	do	5
1913 May 6	Taylor	Hartford	Overcome by gas	5

were killed at one time, or a total of 91 men, representing 14 per cent of all fatilities. The average production of coal per fatality during this period was 292,541 tons.

During recent years about one-half of the men were on a 10-hour basis; one-fourth on 9 hours, and one-fourth on 8 hours. The time element has been taken into consideration and a table compiled on

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **KENTUCKY**.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	49	3,372	42	3,779	84	6,157	1,046	**14,354**
1904	58	3,870	60	4,208	141	5,952	205	**14,235**
1905	50	3,445	52	4,050	94	5,995	1,195	**14,685**
1906	60	4,171	65	3,972	79	5,941	1,188	**15,272**
1907	60	4,610	71	4,508	97	6,842	1,011	**16,971**
1908	56	4,636	52	2,072	132	9,166	1,122	**16,996**
1909[b]								**16,903**
1910	69	6,095	56	3,965	126	9,064	1,192	**20,316**
1911	79	6,103	46	4,789	144	10,289	2,943	**24,124**
1912	69	6,037	58	4,901	149	11,815	1,551	**24,304**
1913	68	5,754	84	7,389	147	12,390	799	**26,332**

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **KENTUCKY**, AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	207	131,971	27,317,997	13,659	27	1.98
1904	197	130,197	25,648,809	12,824	20	1.56
1905	200	134,715	26,943,000	13,472	31	2.30
1906	212	139,218	29,514,216	14,757	39	2.64
1907	210	154,971	32,543,910	16,272	32	1.97
1908	186	157,494	29,293,884	14,647	40	2.73
1909						
1910	221	185,813	41,064,673	20,533	86	4.19
1911	201	221,302	44,481,702	22,241	44	1.98
1912	201	224,514	45,127,314	22,564	51	2.26
1913	212	243,624	51,648,288	25,824	48	1.86

this basis for comparison with data on other States. The rate for the 10-year period (1903–1913) under consideration, based on the actual number of employees is 2.23 per 1,000, whereas on the number of 2,000-hours workers it is 2.36 per 1,000 (Table 40). During the 10-year period the men worked 1,885 hours per annum as compared with 2,447 hours per annum in Virginia. The tables of statistics for the State of Kentucky follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **KENTUCKY**.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	837	24,598	29	1907	1,325	53,916	41
1900	2,946	90,095	31	1908	1,002	26,941	27
1901	933	32,707	35	1909	275	16,500	60
1902	1,248	22,184	18	1910	1,475	15,197	10
1903	599	13,717	22	1911	1,080	34,008	32
1904	3,781	144,245	39	1912	2,759	79,685	29
1905	923	62,651	68	1913	1,029	18,638	18
1906	1,242	44,812	36	1914	2,250	82,919	37

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 103.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN KENTUCKY, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and all items above horizontal lines in columns 2, 3, 8, 12, 20, and 21 from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1828–1883	15,732,135	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1884	1,550,000	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	80
1885	1,600,000	$1.10	4,250	1	0.24	0.63	.....	(a)	376	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	86
1886	1,550,000	1.15	.....	1	.....	.65	.....	(a)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1887	1,933,185	1.15	.....	8	.....	4.14	.....	(a)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	86
1888	2,570,000	1.20	6,563	14	2.13	5.45	.....	168	392	2.33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	119
1889	2,399,755	.99	5,144	12	2.33	5.00	199,980	(a)	467	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	2,701,496	.92	5,259	10	1.90	3.70	270,150	219	514	2.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	121
1891	2,916,069	.93	6,355	16	2.52	5.49	182,254	225	459	2.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	119
1892	3,025,313	.92	6,724	8	1.19	2.64	378,164	217	450	2.07	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	118
1893	3,007,179	.86	6,581	12	1.82	3.99	250,598	202	457	2.26	.....	20.0	.....	.....	.....	.....	.....	.....	.....	70	121
1894	3,111,192	.88	8,083	10	1.24	3.21	311,119	145	385	2.66	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	138
1895	3,357,770	.86	7,865	13	1.65	3.87	258,290	146	427	2.92	.....	26.0	.....	.....	.....	.....	.....	.....	.....	115	138
1896	3,333,478	.78	7,549	6	.79	1.80	555,580	165	442	2.68	.....	30.0	.....	.....	.....	.....	.....	.....	.....	.....	148
1897	3,602,097	.79	7,983	12	1.50	3.33	300,174	178	451	2.53	.....	36.1	.....	.....	.....	.....	.....	.....	.....	162	133
1898	3,887,908	.79	7,614	6	.79	1.54	647,985	187	511	2.73	.....	35.2	.....	.....	.....	.....	.....	.....	.....	158	128
1899	4,607,255	.79	7,461	7	.94	1.52	658,179	224	618	2.76	.....	35.3	.....	.....	.....	.....	.....	.....	.....	189	123
1900	5,328,964	.92	9,680	17	1.76	3.19	313,468	227	551	2.43	.....	43.9	.....	.....	.....	.....	.....	.....	.....	239	124
1901	5,469,986	.95	10,307	21	2.04	3.84	260,476	213	531	2.49	.....	41.2	.....	.....	.....	.....	.....	.....	.....	237	.....
1902	6,766,984	.98	13,727	19	1.38	2.81	356,157	209	493	2.36	.....	45.7	.....	.....	.....	.....	.....	.....	.....	318	.....
1903	7,538,032	1.06	14,354	27	1.88	3.58	279,186	207	525	2.54	.....	37.7	.....	.....	202	105	1	.....	.....	308	202
1904	7,576,482	1.04	14,235	20	1.40	2.64	378,824	197	532	2.70	.....	47.5	.....	.....	336	112	5	.....	.....	453	.....
1905	8,432,523	.99	14,685	31	2.11	3.68	272,017	200	574	2.87	.....	51.4	.....	.....	381	144	2	.....	.....	527	.....
1906	9,653,647	1.02	15,272	39	2.55	4.04	247,529	212	632	2.98	.....	53.6	.....	.....	419	175	6	.....	.....	600	.....

1907	10,753,124	1.06	16,971	32	1.89	2.98	336,035	210	634	3.02	.....	51.2	.....	.....	475	205	28	.....	.....	708	.....
1908	10,246,553	1.01	16,996	40	2.35	3.90	256,164	186	603	3.24	.....	51.3	.....	.....	515	209	35	.....	.....	759	.....
1909	10,697,384	.94	16,903	34	2.01	3.18	314,629	(a)	633	(a)	.....	60.5	.....	.....	547	310	20	.....	.....	877	287
1910	14,623,319	.99	20,316	86	4.23	5.88	170,039	221	720	3.26	.....	64.0	.....	.....	536	325	37	1	.....	899	290
1911	14,049,703	.99	24,124	44	1.82	3.13	319,311	201	582	2.90	12.9	65.4	16.7	5.0	544	314	72	57	.....	987	306
1912	16,490,521	1.02	24,304	51	2.10	3.09	323,344	201	679	3.38	14.0	66.4	16.5	3.1	611	361	54	136	6	1,168	352
1913	19,616,600	1.05	26,332	48	1.82	2.45	408,679	212	745	3.51	9.0	73.2	15.7	2.1	574	377	98	13	1	1,263	331
Total	208,128,654	.....	.....	650	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1883–1913)	7,144,744	.....	12,361	24.42	1.98	3.42	292,541	201	578	2.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	20,382,763	1.02	28,764	61	2.12	2.99	334,144	187	709	3.79	9.8	77.2	11.6	1.4	590	369	40	367	17	1,383	355

a Not reported.

TABLE 104.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN KENTUCKY, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1884 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1884	1	3	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
1885	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
1886	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
1887	3	.....	1	.....	2	1	.....	.....	.....	.....	.....	.....	7	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	8
1888	9	.....	1	.....	.....	4	.....	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
1889	9	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
1890	7	1	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
1891	10	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	1	.....	1	.....	2	1	.....	.....	.....	.....	.....	1	16
1892	4	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	1	.....	.....	1	2	.....	.....	.....	.....	.....	2	8
1893	9	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	10	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	12
1894	6	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	10
1895	4	.....	2	.....	.....	a 6	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	13
1896	4	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	6
1897	5	1	2	.....	2	1	.....	.....	.....	.....	.....	.....	11	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	12
1898	3	1	.....	.....	.....	1	.....	.....	.....	1	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1899	4	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	7
1900	12	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	15	1	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	17
1901	5	2	5	.....	.....	4	.....	.....	.....	.....	.....	1	17	.....	2	.....	.....	2	.....	.....	.....	1	1	.....	2	21
1902	11	1	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	19
1903	17	1	.....	.....	.....	5	.....	.....	.....	.....	.....	2	25	1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	1	27
1904	6	1	1	.....	5	3	.....	.....	.....	1	.....	.....	17	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	2	3	20
1905	19	.....	2	.....	.....	7	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	3	31
1906	17	3	2	1	.....	4	.....	1	.....	.....	.....	.....	28	2	1	2	.....	5	4	.....	.....	.....	.....	2	6	39
1907	11	1	4	.....	.....	7	.....	1	.....	1	.....	.....	25	3	.....	.....	.....	3	1	.....	1	.....	2	.....	4	32
1908	15	.....	3	.....	9	7	.....	1	.....	.....	.....	.....	35	.....	1	.....	.....	1	2	.....	.....	1	1	.....	4	40
1909	20	.....	2	7	.....	2	.....	1	.....	1	.....	.....	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	34
1910	20	1	5	.....	40	16	.....	2	.....	.....	.....	1	85	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	86
1911	28	.....	5	.....	.....	4	.....	3	.....	1	.....	.....	41	.....	.....	.....	.....	.....	1	.....	1	.....	1	.....	3	44
1912	19	1	5	5	5	1	.....	5	.....	1	.....	.....	42	.....	.....	2	.....	2	3	.....	.....	.....	1	3	7	51
1913	24	1	1	.....	.....	1	a 5	4	.....	2	.....	4	42	2	.....	.....	1	3	1	.....	.....	.....	.....	2	3	48
1914	30	.....	13	.....	1	0	.....	2	.....	1	.....	.....	53	2	.....	.....	.....	2	2	1	1	.....	1	1	6	61

a Includes 5 fatalities at mine not under jurisdiction of inspector.

MARYLAND.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Maryland, a southward extension of those in Somerset County, Pa., occupy a strip along the western border of Allegany County about 20 miles long and averaging 5 miles in width and the greater part of Garrett County, comprising a total area of 455 square miles. The coal measures occupy broad, open, north and southwest synclinal folds, which are separated by eroded anticlines and are in the lower Carboniferous or Devonian rocks. There are five basins, known as Georges Creek, Upper Potomac, Castleman, Lower Youghiogheny, and Upper Youghiogheny. The present production of coal is almost exclusively mined from the first two basins. The prominence of the Georges Creek basin has led to the use of the name of Georges Creek coal, and until recent years practically all of this coal came from the Pittsburgh seam or "Big Vein." The coal beds are usually flat, seldom attaining a dip of 10°.

CHARACTER OF COAL BEDS.

The following description of the principal coal-producing beds of Maryland is taken from the report[a] of the Maryland Geological Survey on Allegany County for the year 1900:

The Elkgarden or "Big Vein" is more extensively developed in the Georges Creek basin, especially in the vicinity of Frostburg, than in West Virginia, where it derives its name. The "Big Vein" varies in thickness from 5 to 7 feet up to more than 20 feet, the latter thickness having, moreover, been exceeded at one or two isolated points where pockets of unusual thickness have been reached. Its usual thickness is from 10 to 12 feet, and in general it has been found to thicken southward. The coal is very clean and of the highest quality, affording a low percentage of both ash and sulphur. It is in most respects the finest steam coal known and is extensively used where the highest grade coals are demanded.

The Elkgarden coal occurs at the base of the Monongahela formation, and is probably the equivalent of the Pittsburgh vein of Pennsylvania and West Virginia, although on account of the structural conditions under which it is found it differs materially from the latter in its physical and chemical properties.

Thin, persistent bands of slate or dry partings subdivide the "Big Vein" coal into three definite members, each of which possesses special characteristics. These beds are known as Roof coal, Breast coal, and Bottom coal.

The Roof coal includes several more or less important layers of coal of varying purity and thickness, separated by thin beds of shale. Except in the northern part of the basin these roof coals are not removed in mining, since they are of particular importance as a support for the overlying strata.

The Breast coal is the thickest and the most valuable member of the "Big Vein" coal. North of Frostburg it seems to retain its purity through a thickness of scarcely more than 2 feet, while south of Lonaconing it is sometimes more than 7 feet thick and without impurities. Near the top there is a 2 to 8 inch layer of bony coal, but this is rarely sufficiently impure to necessitate its rejection. Near the bottom there is a

[a] Clark, W. B., and others, The mineral resources of Allegany County: Rept. Maryland Geol. Survey, 1900, pp. 177–178.

4 to 6 inch band of soft "mining ply," which is jet black, has a brilliant luster, and shows a strong tendency to break into small cubical blocks.

The Bottom coal is 2½ to 3 feet thick and generally contains two thin slate bands. Other impurities are sometimes present, but they are seldom of a very serious nature. On account of the slate bands the bottom coal for many years was not mined, but under an improved system of mining these thin slates are now easily removed and the coal readily taken up.

The Davis (6-foot coal bed) is one of the most important of the small-vein coals of the State. The report [a] describes it as follows:

Near Westernport, where the seam approaches 6 feet in thickness, the coal has been mined for a number of years, and although seldom put upon the market as a competitor of the "Big Vein" coal, it has nevertheless supplied a considerable part of the demand in Westernport and Piedmont and is now finding a wider market.

Throughout the lower Georges Creek Valley the Davis coal reaches a greater thickness and is more important than any other coal except the "Big Vein." This coal always contains partings of either shale or sandstone, while bone-coal is not infrequent. There is at times considerable sulphur in the lower bench. At some points in the lower Georges Creek Valley the Davis vein is quite clean and, in general, seems to improve in quality southward. The Davis vein in Allegany County generally has a roof composed of shale, overlain by heavy sandstone. The Davis coal is situated about 125–150 feet above the base of the Allegany formation. This vein is generally regarded as the approximate equivalent of the lower Kittanning coal of Pennsylvania.

The Thomas (3-foot coal) varies in thickness from 2 feet 6 inches to 3 feet 2 inches. The coal is clean and has been successfully opened north of Westernport. The bed has a characteristic shale roof and a fire-clay floor. The coal is generally regarded as the equivalent of the Upper Freeport.

MINING METHODS.

The earliest records of the production of coal in Maryland are for 1820, during which year 3,000 tons of coal was mined. The production has generally increased until in 1913, 4,779,839 tons was mined. Most of the Maryland mines are worked by the room-and-pillar method from drift entries, there being only a few slope mines. Tail-rope haulage is used to some extent, whereas mule haulage is used extensively. There are relatively few mining machines in use and these are of the pick or puncher type. In 1900 there were 10 machines in operation, producing 138,014 tons, or 3.4 per cent of the coal mined in the State. In 1904 the machine-mined coal amounted to 10 per cent of the total production. In 1913, 91.5 per cent of the coal was mined by hand, 1.7 per cent by machine, and 6.2 per cent was reported as being shot off the solid. Although the greater part of the Maryland production is mined by hand, the record of individual efficiency of the miners is high. The average production of each man in 1913 was 847 tons, or 3.42 tons for each working day.

[a] Clark, W. B., and others, op. cit., p. 173.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

An act approved March 30, 1876, authorized the governor to appoint a mine inspector for Allegany and Garrett counties whose duty it was to inspect every coal mine at least once each month. When notified by the coroner of either county, the inspector was required to attend inquests and to investigate the causes of fatal accidents at the mines. Annual reports were rendered to the governor and all mine accidents were enumerated therein. On March 24, 1902, a law was approved extending the inspection service to include clay and fire-clay mines, and directing the inspector to examine all mines as often as possible, but at least once every two months. All fatal and serious accidents in and about the mines were required to be reported to the inspector by mine operators.

It is the practice of the operators to report all accidents to the inspector, and all accidents thus reported are published in the inspector's annual reports. Injuries causing less than 7 days' disability are considered as slight.

Up to 1915 the mine inspector employed no deputy or assistant inspectors.

ACCIDENTS.

Tables 105 and 106 show the number of fatalities and men employed from the beginning of inspection service, 1876, to date, as compiled from the State mine inspectors' reports. The fatality rate for the years for which continuous records are available, 1889 to

FATALITIES IN **MARYLAND** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1889 TO 1913, INCLUSIVE.[a]

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	127	57.73	1.08
Mine cars and locomotives	30	13.64	.26
Gas and dust explosions			
Explosives	5	2.27	.04
Miscellaneous	36	16.36	.30
Shaft			
Surface	22	10.00	.19
Total, 23 years	220	100.00	1.87

[a] Excludes 1907 and 1908, for which the report for the fiscal year ending Apr. 30, 1908, was not available.

COAL-MINE ACCIDENTS IN **MARYLAND** IN WHICH 5 OR MORE MEN WERE KILLED.

Date	1909, Jan. 25.
Name of mine	Washington No. 5.
Location of mine	Franklin.
Nature of accident	Mine cars.
Number killed	5.

1906 and 1909 to 1913, inclusive, covering 23 years, is 1.87 per 1,000 men employed. The amount of coal produced per fatality was 459,193 tons, or there were 2.18 fatalities per million tons mined. During this 23-year period 220 men were killed, of which number 57.73 per cent was due to falls of roof and 13.64 per cent to mine cars and locomotives. Maryland has been remarkably free from gas and dust explosions; the fatality rate from explosives is also low, representing only 2.27 per cent of the total number killed.

The 10-hour day prevails in Maryland and for comparison with data on 8 and 9 hour States Tables 40 and 41 have been compiled. The fatality rate for the 8-year period 1903 to 1906, and 1910 to 1913,

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **MARYLAND.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	1	45	.....	.....	29	3,808	2,006	5,859
1904	2	72	6	974	43	4,531	94	5,671
1905	2	70	2	60	39	5,385	433	5,948
1906	.....	.....	1	50	45	6,358	30	6,438
1907	.....	.....	5	84	57	5,693	103	5,880
1908	1	80	3	59	49	5,905	35	6,079
1909[b]	.....	.....	.....	.....	.....	.....	.....	8,004
1910	3	9	6	71	61	5,717	12	5,809
1911	2	8	9	148	59	5,670	253	6,079
1912	2	53	4	41	57	6,000	68	6,162
1913	3	15	5	203	49	5,105	322	5,645

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **MARYLAND** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	219	56,494	12,372,186	6,186	12	1.94
1904	226	55,498	12,542,548	6,271	10	1.59
1905	252	58,847	14,829,444	7,415	15	2.02
1906	250	64,300	16,075,000	8,038	6	.75
1907	263	58,613	15,415,219	7,708	.....	.....
1908	220	60,536	13,317,920	6,659	.....	.....
1909	.....	.....	.....	.....	.....	.....
1910	270	57,989	15,657,030	7,829	18	2.30
1911	243	60,373	14,670,639	7,335	15	2.05
1912	259	61,405	15,903,895	7,952	15	1.89
1913	248	55,895	13,861,960	6,931	13	1.88

inclusive, based on the actual number of employees is 2.18, whereas if reduced to the basis of 2,000-hour workers, the rate becomes 1.79. The number of hours worked per year per man in the coal mines of Maryland is 2,428, as compared with 1,620 in Michigan and 2,034 in

the bituminous mines of Pennsylvania and 2,132 in West Virginia. The tables of statistics for the State of Maryland follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN MARYLAND.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	35	420	12	1907	510	13,770	27
1900	4,787	504,544	105	1908	.....	.....	.....
1901	.....	.....	.....	1909	25	175	7
1902	.....	.....	.....	1910	.....	.....	.....
1903	120	6,045	50	1911	.....	.....	.....
1904	.....	.....	.....	1912	347	3,228	9
1905	.....	.....	.....	1913	200	400	2
1906	30	300	10	1914	91	1,547	17

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 105.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **MARYLAND**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and items in columns 3, 15, and 20 from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	8	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1820–1875																					
1876	2,126,873		2,384																		
1877	1,939,575		3,000	5		2.58															
1878	2,068,925			(a)																	
1879	2,132,233		2,991	10		4.69															
1880	2,228,917			3		1.35															
1881	2,533,348		2,900	8		3.16															
1882	1,555,445			(a)																	
1883	2,476,075			8		3.23															
1884	2,765,617			(a)																	
1885	2,833,337			(a)																	
1886	2,517,577																				
1887	3,278,023			13		2.24															
1888	3,479,470			(a)																	
1889	2,939,715	$0.86	3,702	5	1.35	1.70	587,943	(a)	794												
1890	3,357,813	.86	3,842	8	2.08	2.38	419,727	244	874	3.58											
1891	3,820,239	.81	3,891	6	1.54	1.57	636,707	244	982	4.02											
1892	3,419,962	.89	3,886	6	1.54	1.75	569,994	225	880	3.91											
1893	3,716,041	.88	3,935	5	1.27	1.35	743,208	240	944	3.93											
1894	3,501,428	.77	3,974	7	1.76	2.00	500,204	215	881	4.10											
1895	3,915,585	.81	3,912	9	2.30	2.30	435,065	248	1,001	4.04											
1896	4,143,936	.80	4,039	6	1.49	1.45	690,656	204	1,026	5.03											
1897	4,442,128	.76	4,719	5	1.06	1.13	888,426	262	941	3.59											
1898	4,674,884	.76	4,818	4	.83	.86	1,168,721	253	970	3.83											
1899	4,807,396	.76	4,624	5	1.08	1.04	961,479	275	1,040	3.78		0.3			8					8	
1900	4,024,688	.98	5,319	7	1.32	1.74	574,955	203	757	3.73		3.4			10					10	

1901	5,113,127	.99	5,333	12	2.25	2.35	426,094	262	959	3.66	.....	3.5	.....	.....	15	.....	.....	.....	.....	15	.....
1902	5,271,609	1.06	5,827	11	1.89	2.09	479,237	242	905	3.74	.....	4.3	.....	.....	25	.....	.....	.....	.....	25	.....
1903	4,846,165	1.48	5,859	12	2.05	2.48	403,847	219	827	3.78	.....	8.3	.....	.....	36	.....	.....	.....	.....	36	.....
1904	4,813,622	1.19	5,671	10	1.76	2.08	481,362	226	849	3.76	.....	10.1	.....	.....	38	.....	.....	.....	.....	38	.....
1905	5,108,539	1.14	5,948	15	2.52	2.94	340,569	252	859	3.41	.....	9.2	.....	.....	42	.....	.....	.....	.....	42	.....
1906	5,435,453	1.19	6,438	6	.93	1.10	905,909	250	844	3.38	.....	7.9	.....	.....	45	.....	.....	.....	.....	45	.....
1907	5,532,628	1.20	5,880	*b* 3	.....	.....	.....	263	941	3.58	.....	8.7	.....	.....	43	.....	.....	.....	.....	43	.....
1908	4,377,093	1.17	6,079	*c* 6	.....	.....	.....	220	720	3.27	.....	4.8	.....	.....	39	.....	.....	.....	.....	39	.....
1909	4,023,241	1.11	8,004	20	2.50	4.97	201,162	(*a*)	503	(*a*)	.....	2.9	.....	.....	39	.....	.....	.....	.....	39	68
1910	5,217,125	1.12	5,809	18	3.10	3.45	289,840	270	898	3.33	.....	2.6	.....	.....	37	.....	1	.....	.....	38	73
1911	4,685,795	1.11	6,079	15	2.47	3.20	312,386	243	771	3.17	78.1	3.3	0.5	18.1	29	.....	1	6	1	37	79
1912	4,964,038	1.18	6,162	15	2.43	3.02	330,936	259	806	3.11	94.0	2.5	2.5	1.0	41	.....	5	7	.....	53	74
1913	4,779,839	1.24	5,645	13	2.30	2.72	367,680	248	847	3.42	91.5	1.7	6.2	.6	6	1	5	1	.....	13	67
Total	175,653,679	.....	.....	276	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1889–1906; 1909–1913)	4,392,277	.....	5,106	9.57	1.87	2.18	459,193	243	860	3.54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	4,133,547	1.27	5,403	18	3.33	4.35	229,642	241	765	3.17	93.4	2.7	3.0	.9	.....	.....	5	5	.....	10	64

a Reports either not published or not available.

b Jan. 1 to Apr. 30.

c May 1 to Dec. 31.

TABLE 106.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN MARYLAND, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1877 TO 1914, INCLUSIVE.

Year.	Killed underground.												Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions including gas and dust combined.	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1876																									
1877	3	1	1										5												5
1878 [a]																									
1879	4	4	2										10												10
1880	1	1	1										3												3
1881	5		3										8												8
1882 [a]																									
1883	6		1			1							8												8
1884 [a]																									
1885 [a]																									
1886	7	3	3										13												13
1887																									
1888 [a]																									
1889	5												5												5
1890	4	1	3										8												8
1891 [a]												6	6												6
1892	3	1	1						1				6												6
1893	2	2	1										5												5
1894	5	1	1										7												7
1895	2		3									1	6						2		1			3	9
1896												6	6												6
1897	3	1										1	5												5
1898	3	1											4												4
1899	2	2											4						1					1	5
1900												7	7												7
1901												12	12												12
1902	3	4	3										10						1					1	11
1903	4	1	5										10						1				1	2	12
1904	7	1				1							9											1	10

1905	11	2	1	......	......	1	......	......	......	......	......	......	15	......	......	......	......	......	......	......	......	......	......	......	......	15
1906	2	1	2	......	......	......	......	......	......	......	......	......	5	......	......	......	......	......	......	......	......	......	......	1	1	6
1907 b	2	......	1	......	......	......	......	......	......	......	......	......	3	......	......	......	......	......	......	......	......	......	......	......	......	3
1908 c	......	3	2	......	......	......	......	......	......	......	......	......	5	......	......	......	......	......	......	......	......	......	......	1	1	6
1909	11	1	1	......	......	......	......	......	......	......	......	......	13	......	......	......	......	......	5	......	......	......	1	1	7	20
1910	9	2	2	......	......	1	......	......	......	......	......	1	15	......	......	......	......	......	2	......	......	......	......	1	3	18
1911	12	......	2	......	......	......	......	......	......	......	......	......	14	......	......	......	......	......	......	......	......	......	1	......	1	15
1912	8	4	2	......	......	......	......	......	......	......	......	......	14	......	......	......	......	......	......	......	......	......	......	1	1	15
1913	6	......	3	......	......	2	......	......	......	......	......	1	12	......	......	......	......	......	......	......	......	......	1	......	1	13
1914	15	1	1	......	......	......	......	......	......	......	......	......	17	......	......	......	......	......	......	......	1	......	......	......	1	18

a Reports either not published or not available. *b* Jan. 1 to Apr. 30. *c* May 1 to Dec. 31.

MICHIGAN.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing area of Michigan comprises about 11,000 square miles and occupies a basin in the central part of the lower peninsula between Lake Huron and Lake Michigan. The field extends from Jackson County on the south to Roscommon County on the north and from Tuscola County on the east to Kent County on the west. The principal mining operations are in Bay and Saginaw Counties in the northeastern part of the field.

CHARACTER OF COAL BEDS.

The structure of the field is a comparatively flat basin modified by minor undulations. There are at least seven coal-bearing horizons in which coal may be considered as workable at certain places. The three principal coal beds are the Upper and Lower Verne and the Saginaw. The Upper and Lower Verne beds usually are close together and in a number of places are mined as one bed of coal. These beds vary in thickness from place to place, but the thickness of a single bed is not generally more than 3 feet. The combined thickness of the two beds within 10 feet of strata may be 7 feet. These coal beds are more or less undulating and in one instance a rise of 22 feet within 150 feet without faulting has been noted. In consequence of this irregularity many of the working plans of the mines in which the workings follow troughs are very irregular, and as most of the merchantable coal is less than 4 feet, some being less than 2 feet thick, large areas of this coal are left untouched. They are 100 to 150 feet below the surface. The Saginaw bed is somewhat deeper.

MINING METHODS.

The records for coal production for Michigan began in 1860, when 2,320 tons of coal were mined. The production in 1913 was 1,231,786 tons. Practically all of the mines are opened by shafts 100 to 150 feet deep. The room-and-pillar system of mining is the principal method in use. The longwall method was tried at one or two mines but it was abandoned for the reason that there was too much danger of shattering the roof and letting in water from the glacial overburden. Mining machines were first introduced in Michigan in the Bay City district and became an important feature in Michigan mines in 1899, when 25 machines produced slightly over 10 per cent of the coal. In 1913, 70 per cent of the coal was produced by machines and 29.5 per cent shot off the solid.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The legislature of Michigan, by an act approved May 2, 1899, authorized the commissioner of labor to appoint an inspector of coal mines, the inspector to examine all coal mines in the State and to report, from time to time, the results of his examinations to the commissioner of labor. The results of the inspector's examinations were incorporated in the regular annual report of the commissioner. The inspector was authorized to enter any coal mine at any time for the purpose of inspection or to collect statistics relating to "hours of labor, wages, industrial, economic and sanitary questions or matters, scales and oils." It was specified in an act approved May 10, 1905, that the law applied to "any shaft in process of sinking, and any opening projected for the purpose of mining coal." On June 2, 1909, a law was approved directing the commissioner of labor, under whose supervision the inspection of coal mines was carried on, to include in his annual reports beginning April 1, 1910, a statement showing the number of persons employed and the number and character of accidents in all departments of labor in the State.

All mine accidents are reported to the inspector and are published in his annual report to the commissioner of labor. Serious and slight injuries are neither segregated nor defined.

In 1915 the inspector employed no assistants.

ACCIDENTS.

Tables 107 and 108 show the total number of fatalities by calendar years and causes from 1899 to 1913, inclusive, as compiled from the State mine inspector's reports. Beginning with 1900 to and including 1913, for which continuous records are available, 98 men were killed,

FATALITIES IN MICHIGAN COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1900 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	51	52.04	1.13
Mine cars and locomotives	2	2.04	.04
Gas and dust explosions	0	.....	.....
Explosives	15	15.31	.33
Miscellaneous	15	15.31	.33
Shaft	10	10.20	.22
Surface	5	5.10	.11
Total, 14 years	98	100.00	2.16

representing a fatality rate of 2.16 per 1,000 men employed. Of the total number of fatalities 52.04 per cent was due to falls of roof-and-

pillar coal, 15.31 per cent to explosives, and 10.20 per cent to shaft accidents. Michigan has been fortunate in the matter of mine disasters, none having occurred in which 5 or more men were killed at one time. No fatalities are reported as due to gas and dust explosions. The average production per fatality during the 14-year period above referred to was 200,919 tons, or 4.98 fatalities per million tons mined.

Since 1905 practically all of the men employed in and about the mines of Michigan have been on an 8-hour basis. This, to a certain extent, accounts for the low fatality rate compared with other States, in which the men are employed 9 or 10 hours. The average number of hours worked per year per man in Michigan was 1,620

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN MICHIGAN.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	9	1,233	.....	.....	.....	.....	1,535	2,768
1904	20	2,627	.....	.....	.....	.....	922	3,549
1905	23	3,327	.....	.....	.....	.....	369	3,696
1906	27	3,941	.....	.....	.....	.....	30	3,971
1907	27	3,939	.....	.....	.....	.....	43	3,982
1908	31	4,224	.....	.....	.....	.....	23	4,247
1909[b]	.....	.....	.....	.....	.....	.....	.....	3,496
1910	27	3,511	.....	.....	.....	.....	64	3,575
1911	21	3,199	.....	.....	.....	.....	49	3,248
1912	20	3,107	.....	.....	.....	.....	6	3,113
1913	24	3,305	.....	.....	.....	.....	.....	3,305

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN MICHIGAN AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000 hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	222	23,679	5,256,738	2,629	8	3.04
1904	183	29,314	5,364,462	2,682	6	2.24
1905	186	29,937	5,568,282	2,784	9	3.23
1906	173	31,798	5,501,054	2,751	5	1.82
1907	234	31,899	7,464,366	3,732	7	1.88
1908	207	33,999	7,037,793	3,519	6	1.71
1909	.....	.....	.....	.....	.....	.....
1910	211	28,664	6,048,104	3,024	6	1.98
1911	218	26,033	5,675,194	2,838	7	2.47
1912	183	24,910	4,558,530	2,280	8	3.51
1913	188	26,440	4,970,720	2,486	3	1.21

during the 10-year period, 1903–1913, as compared with 2,172 in Colorado or 2,034 in Pennsylvania (bituminous) and 2,447 in Virginia. The fatality rate (Table 40) based on the actual number of

men employed, is 1.83 for the 10-year period, as compared with 2.26 based on the 2,000-hour workers. Table 41 shows the fatality rates for a period of 10 years based on the 2,000-hour year for all the States, so that by referring to this table a true comparison of Michigan with other States may be seen. The tables of statistics for the State of Michigan follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN MICHIGAN.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	487	9,547	20	1907	265	1,325	5
1900	81	1,514	19	1908	300	4,800	16
1901	.....	.....	.....	1909	527	23,002	44
1902	1,935	239,146	124	1910	1,663	86,789	52
1903	75	825	11	1911	.....	.....	.....
1904	564	2,402	4	1912	2,028	101,424	50
1905	.....	.....	.....	1913	180	1,260	7
1906	3,340	294,630	88	1914	.....	.....	.....

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 107.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN MICHIGAN, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and items above horizontal line in column 2 from State mine inspectors' report. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1860–1888	1,435,711																				
1889	67,431	$1.71	261					(a)	258												
1890	74,977	1.99	180					229	417	1.82											
1891	80,307	1.66	223					205	360	1.76											
1892	77,990	1.56	230					195	339	1.74											
1893	45,979	1.79	162					154	284	1.84											
1894	70,022	1.47	223					224	314	1.40											
1895	112,322	1.60	320					186	351	1.89											
1896	92,882	1.62	320					157	290	1.85											
1897	223,592	1.46	537					230	416	1.81											
1898	315,722	1.47	715					245	442	1.80		0.5								7	
1899	624,708	1.39	1,291	4				232	484	2.09		10.2			17	8				25	
1900	849,475	1.48	1,704	10	5.87	11.77	84,948	261	499	1.91		22.6								33	
1901	1,241,241	1.41	2,276	6	2.64	4.83	206,874	247	545	2.21		14.3								31	
1902	964,718	1.71	2,344	8	3.41	8.29	120,560	171	412	2.41		20.3								58	
1903	1,367,619	1.97	2,768	8	2.89	5.85	170,952	222	494	2.23		13.2			46					46	
1904	1,342,840	1.81	3,549	6	1.69	4.47	223,807	183	378	2.07		23.1			84	1				85	
1905	1,473,211	1.71	3,696	9	2.44	6.11	163,690	186	399	2.15		29.3			90	16				106	
1906	1,346,338	1.80	3,971	5	1.26	3.71	269,268	173	339	1.96		31.0			88	22				110	
1907	2,035,858	1.80	3,982	7	1.76	3.44	290,837	234	511	2.18		29.8			60	42	1			103	
1908	1,835,019	1.81	4,247	6	1.41	3.27	305,837	207	432	2.09		29.2			85	33	2			120	
1909	1,784,692	1.79	3,496	9	2.57	5.04	198,299	(a)	510	(a)		28.7			66	34	1			101	32
1910	1,534,967	1.91	3,575	6	1.68	3.91	255,828	211	429	2.03		45.5			51	42	4	3		100	32
1911	1,476,074	1.89	3,248	7	2.16	4.74	210,868	218	454	2.08	10.7	49.8	37.2	2.3	60	46		7		113	26

1912	1,206,230	1.99	3,113	8	2.57	6.63	150,779	183	387	2.11	10.0	52.7	36.7	.6	48	37	.....	41	.....	126	22
1913	1,231,786	1.99	3,305	3	.91	2.44	410,595	188	373	1.98	.2	70.0	29.5	.3	26	38	.....	66	.....	130	26
Total	22,911,711	.....	.....	102	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1900–1913)	1,406,433	.....	3,234	7	2.16	4.98	200,919	204	435	2.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	1,283,030	2.00	2,800	2	.71	1.56	641,515	201	458	2.28	.2	77.8	21.9	.1	17	18	.....	72	.....	107	19

[a] Not reported.

TABLE 108.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **MICHIGAN**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1899 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	6	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1899 [a]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
1900	6	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	8	.....	.....	1	.....	1	.....	.....	.....	.....	.....	1	1	10
1901	2	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1902	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	8
1903	2	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	4	1	.....	.....	.....	1	.....	.....	.....	2	.....	1	3	8
1904 [b]	3	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1905	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	3	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
1906	1	1	.....	.....	.....	.....	.....	1	.....	.....	.....	1	4	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	5
1907	2	.....	1	.....	.....	2	.....	.....	.....	.....	.....	1	6	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	7
1908	4	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	5	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	6
1909	5	.....	.....	.....	.....	1	.....	1	.....	.....	.....	1	8	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	9
1910	4	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1911	3	1	.....	.....	.....	.....	.....	2	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
1912	4	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	6	.....	1	.....	.....	1	.....	.....	.....	.....	1	.....	1	8
1913	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	3
1914	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2

[a] June 1 to Dec. 1.

[b] Causes of fatalities, 1904 to 1909, inclusive, not given in official reports. Classification here given based on description of each individual accident as published in local newspapers. The totals are from inspectors' reports.

MISSOURI.

AREA AND DISTRIBUTION OF COAL FIELDS.

The productive coal area of Missouri comprises much of the northern half of the State, and a strip on the western border. It extends north into Iowa and west into Kansas. As in Iowa, the terms Des Moines and Missouri groups are applied to the upper and lower coal-bearing measures, respectively, both of which are in the Pennsylvanian series of the Carboniferous system. The Des Moines, which includes nearly all the coal beds of present economic importance, outcrops in about 16,000 square miles and also underlies the Missouri group in about 8,000 square miles.

CHARACTER OF COAL BEDS.

In the north-central part of the State the coal beds are horizontal; in the western and northwestern part they dip northwest about 8 feet per mile.

The Missouri coal is low-grade bituminous, and more than 90 per cent is produced from the Des Moines group. The Bevier field in the north-central part of the State produces about 30 per cent of the coal from a bed varying 3 feet to 6 feet in thickness. The roof is sandy shale and sandstone of only moderate stability. The bed in the Lexington field is 14 to 26 inches thick and produces 25 to 30 per cent of the coal. The roof is a black, slaty shale with a strong limestone cap rock and is almost ideal for longwall mining.

The Southwestern field includes Henry, Barton, and Bates counties and produces about 20 per cent of the coal from a coal bed 3 to 4 feet thick. In these counties there are a few open-pit mines. The Novinger field (Adair County) produces about 10 per cent of the coal from a bed that is about 3½ feet thick. There are several smaller fields in other parts of the State.

MINING METHODS.

The earliest statistics of coal production for Missouri date back to 1840, when 9,972 tons of coal were produced. The production for 1913 was 4,318,125 tons.

In 1912 there were about 214 mines in operation of which 136 were opened by shaft, 36 by slope, 25 by drift, and 7 were strip pits. Of this number 102 used the longwall method, and 94 the room-and-pillar method of mining. The longwall method is used almost exclusively in the Lexington field, where the coal is thin and has a good roof. In the other fields various forms of room and pillar methods are used. Electric haulage is used in 13 mines; mule haulage in 94, and hand haulage in 41 mines. Fifty-eight mines were ventilated by natural draft, 52 by furnaces, and 88 by fans. Hoisting at 80 mines was by steam power, at 3 by electricity, at 64 by horsepower, and at 5 by hand power.

Mining machines have been used in Missouri since 1896, when 4 machines were operated, producing 2.6 per cent of the coal. The number of machines has gradually increased until in 1913 there were 104 machines producing 20 per cent of the coal. It is reported that 46.8 per cent is shot off the solid, and 23.6 per cent is mined by hand.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The first mine-inspection service of Missouri was provided for by the act approved March 23, 1881, authorizing the court of every county where coal mines were situated to appoint a county mine inspector. It was made the duty of mine operators to report to the inspector, under penalty, all fatal and serious accidents at their mines, and, if the accident was fatal, it was to be reported to the county coroner, or, in his absence or inability to act, to any justice of the peace in the county. If deemed necessary from the facts reported, the inspector was required to go to the scene of the accident, render assistance, investigate the cause of the accident, and preserve a record of his investigation with the other records of his office. The county inspectors rendered annual reports to the "Commissioner of Labor Statistics," showing causes of accidents, number employed in and about the mines, etc.

The law of March 30, 1887, consolidated the inspection service under the jurisdiction of a State mine inspector appointed by the governor on the recommendation of a board of examiners. The inspector thus appointed rendered annual reports on October 15 to the bureau of labor statistics.

The act of April 26, 1899, created a bureau of mines, mining, and mine inspection, and authorized the appointment of two mine inspectors—one for coal mines and the other for lead and zinc mines—the inspectors being given authority to appoint a secretary. The act of March 27, 1901, required the inspector to report to the governor by April 15 of each year. An assistant inspector was authorized by the act of March 30, 1907. The coal-mine inspection force was increased by the act of March 25, 1913, which authorized the appointment of a chief inspector and two assistants inspectors, the chief inspector to render annual reports to the governor on January 1 in accordance with existing laws.

It has not been definitely determined in Missouri when an injury is sufficiently serious to come within the requirement of the law that it shall be reported to the inspector, but it is the practice of the operators to report all injuries causing three or four days' disability, and these are published in the inspector's annual reports. Of the injuries reported to the inspector, those resulting in disability of an employee for at least 30 days are classified as serious, all others being considered slight injuries.

ACCIDENTS.

The number of accidents in the coal mines of Missouri, by causes and calendar years, is contained in Tables 109 and 110. These tables also show the total number and percentage of fatalities classified by principal causes, and the fatality rate per 1,000 men employed for a period of 26 years (1888–1913), for which continuous records are

FATALITIES IN MISSOURI COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1888 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	235	62.17	1.10
Mine cars and locomotives	19	5.03	.09
Gas and dust explosions	40	10.58	.19
Explosives	43	11.38	.20
Miscellaneous	10	2.64	.05
Shaft	27	7.14	.13
Surface	4	1.06	.02
Total, 26 years	378	100.00	1.78

COAL-MINE ACCIDENTS IN MISSOURI IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1888 Mar. 29	Keith and Perry No. 6.	Rich Hill	Mine explosion	24
1915 Feb. 18	Atlas	do	do	5

available. The fatality rate during this period is 1.78 per 1,000 men employed. During the 26 years there was only one serious mine disaster, in which more than 5 men were killed at one time. This was a mine explosion in 1888 in which 24 men were killed, representing slightly over 6 per cent of the total number of fatalities during the period covered. Falls of roof and pillar coal are responsible for 62.17 per cent; gas and dust explosions, 10.58 per cent; and explosives, 11.38 per cent. The average production of coal per fatality was 229,541, or there were 4.36 fatalities per million tons of coal mined.

About 97 per cent of the men employed in the coal mines of Missouri since 1903 have been eight-hour men. As there are a number of States in which men are employed 9 or 10 hours per day, the time element has been taken into consideration, and tables compiled on this basis for comparison with other States. The fatality rate for the 10-year period 1903–1913 (Table 40), based on the actual number of men employed, is 1.30 per 1,000, and on the number of 2,000-hour workers is 1.70. During the 10-year period the men averaged 1,539 hours per year as compared with 2,463 hours in New Mexico, 2,132

NUMBER OF HOURS TO THE WORKING-DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **MISSOURI.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	191	9,119	8	51	7	52	322	9,544
1904	198	9,886	10	72	8	65	314	10,137
1905	194	8,096	6	70	4	25	771	8,962
1906	134	8,645	6	58	6	80	774	9,557
1907	149	8,079	6	54	.....	.....	315	8,448
1908	149	8,464	10	83	.....	.....	441	8,988
1909[b]	.....	.....	.....	.....	.....	.....	.....	9,188
1910	166	9,027	10	100	1	17	547	8,691
1911	193	9,523	8	84	.....	.....	.....	9,607
1912	172	9,139	5	72	3	17	476	9,704
1913	179	10,200	4	79	.....	.....	139	10,418

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **MISSOURI** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	215	76,829	16,518,235	8,259	17	2.06
1904	206	81,612	16,812,072	8,406	11	1.31
1905	194	72,587	14,081,878	7,041	11	1.56
1906	185	77,448	14,327,880	7,164	16	2.23
1907	214	67,953	14,541,942	7,271	8	1.10
1908	169	72,428	12,240,332	6,120	10	1.63
1909	.....	.....	.....	.....	.....	.....
1910	154	78,209	12,044,186	6,022	14	2.32
1911	182	76,940	14,003,080	7,002	8	1.14
1912	206	78,214	16,112,084	8,056	19	2.36
1913	187	83,562	15,626,094	7,813	10	1.28

in West Virginia, and 1,704 in Iowa. Table 41 shows the fatality rate for each year on the 2,000-hour basis for each State, so that a true comparison of Missouri with other States may be easily made. The tables of statistics for the State of Missouri follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **MISSOURI.**[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	2,197	117,076	53	1907	777	8,222	11
1900	632	34,970	55	1908	6,350	355,138	56
1901	1,042	31,318	30	1909	957	6,593	7
1902	1,364	61,273	45	1910	7,774	1,218,599	157
1903	1,306	13,892	11	1911	504	24,216	48
1904	1,844	26,312	14	1912	952	55,022	58
1905	435	6,788	16	1913	918	31,251	34
1906	6,212	483,790	78	1914	1,162	56,536	49

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 109.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN MISSOURI, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Longwall.	Shortwall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1840–1886	30,191,886																				
1887	3,209,916		7,000						458												
1888	3,909,967		8,800	27	3.07	6.91	144,814		444												
1889	2,557,823	$1.36	6,631	10	1.51	3.91	255,782	(a)	386												
1890	2,735,221	1.24	5,971	18	3.01	6.58	151,957	229	458	2.00											
1891	2,674,606	1.23	6,199	20	3.23	7.48	133,730	218	431	1.98											
1892	2,733,949	1.23	5,893	22	3.73	8.05	124,270	230	464	2.02											
1893	2,897,442	1.23	7,375	18	2.44	6.21	160,969	206	393	1.91											
1894	2,245,039	1.17	7,523	19	2.53	8.46	118,160	138	298	2.16											
1895	2,372,393	1.12	6,299	13	2.06	5.48	182,492	163	377	2.31											
1896	2,331,542	1.08	5,982	8	1.34	3.43	291,443	168	390	2.32		2.6								4	
1897	2,665,626	1.08	6,414	12	1.87	4.50	222,136	191	416	2.18		2.2								3	
1898	2,688,321	1.07	6,542	10	1.53	3.72	268,832	198	411	2.07		2.0								4	
1899	3,025,814	1.20	7,136	11	1.54	3.64	275,074	212	424	2.00		1.8			1		8			9	
1900	3,540,103	1.21	8,180	19	2.32	5.37	186,321	214	433	2.02		3.1								15	
1901	3,802,088	1.24	9,871	16	1.62	4.21	237,631	223	385	1.73		4.0								24	
1902	3,890,154	1.38	9,739	10	1.03	2.57	389,015	202	399	1.98		5.8								20	
1903	4,238,586	1.61	9,544	17	1.78	4.01	249,329	215	444	2.07		7.4			4		29			33	
1904	4,168,308	1.63	10,137	11	1.09	2.64	378,937	206	411	2.00		9.0				1	30			31	
1905	3,983,378	1.58	8,962	11	1.23	2.76	362,125	194	444	2.29		9.4				2	28			30	
1906	3,758,008	1.63	9,557	16	1.67	4.26	234,876	185	393	2.12		11.2			4		44			48	
1907	3,997,936	1.64	8,448	8	.95	2.00	499,742	214	473	2.21		12.2			4	4	54			62	
1908	3,317,315	1.64	8,088	10	1.11	3.01	331,732	169	369	2.18		14.5			5	52				57	

1909	3,756,530	1.65	9,188	21	2.29	5.59	178,882	(a)	409	(a)	------	21.2	------	------	4	18	74	------	------	96	224
1910	2,982,433	1.79	9,691	14	1.44	4.69	213,031	154	308	2.00	------	18.6	------	------	23	------	73	------	------	96	208
1911	3,836,107	1.72	9,607	8	.83	2.09	479,513	182	399	2.19	19.9	19.6	49.4	11.1	17	------	75	------	------	92	232
1912	4,339,656	1.76	9,704	19	1.96	4.38	228,413	206	447	2.17	23.9	20.7	48.0	7.4	2	2	78	4	------	86	217
1913	4,318,125	1.73	10,418	10	.96	2.32	431,813	187	414	2.21	23.6	20.0	46.8	9.6	7	7	80	10	------	104	208
Total	120,168,472	------	------	378	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Average (1888–1913)	3,337,180	------	8,185	14.54	1.78	4.36	229,541	195	408	2.09	------	------	------	------	------	------	------	------	------	------	------
1914	3,935,980	1.73	9,549	19	1.99	4.83	207,157	179	412	2.30	22.2	19.0	46.6	12.2	2	1	79	6	------	88	178

a Not reported.

TABLE 110.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **MISSOURI**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1887 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1888 [a]					24							3	27			1		1								27
1889 [a]	6	1	1			1							9			1		1								10
1890 [b]	10			1		4							15	1		1		2	1						1	18
1891	10	2	1			3	1						17			3		3								20
1892	12	2	1	3		2							20			1		1					1	1	1	22
1893	13	1	1			1							16	1		1		2								18
1894	10	1		4		1	1						17	1				1			1				1	19
1895	6		1			5							12			1		1								13
1896	7												7			1		1								8
1897	7	1	1			1							10			2		2								12
1898	6	1	1			1							9	1				1								10
1899	8		1		2								11													11
1900	16		1			1							18			1		1								19
1901	10		1			5							16													18
1902	5	1	1			1							8	1		1		2								10
1903	10		1	3		3							17													17
1904	8					3							11													11
1905	7	1				2							10	1				1								11
1906	12					2							14	1	1			2								16
1907	6		1			1							8													8
1908	8	1	1										10													10
1909	10	4				4							18	1		2		3								21
1910	8		3			1						2	14													14
1911	6	1											7										1		1	8
1912	7	2	2	2	1			2					16	1		2		3								19
1913	8					1						1	10													10
1914	12		2										14			5		5								19

[a] Fiscal year ending Oct. 15.

[b] Includes Oct. 15 to Dec. 31, 1889, making 14½ months.

MONTANA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Montana are widely distributed over the eastern two-thirds of the State, and have an aggregate area of about 39,000 square miles. From a commercial standpoint there are only three important fields in the State. These are, according to production, as follows: (1) Red Lodge field in Carbon County, (2) Bull Mountain field in Musselshell County, and (3) the Great Falls field in Cascade County.

The Red Lodge field comprises an area of about 50 square miles, but the number and thickness of the beds compensate in large measure for the small size of the field. The beds dip to the southwest toward the Beartooth Mountain, from which they are separated by a great fault.

The Bull Mountain field has a known productive area of 630 square miles, being a great synclinal basin lying mainly between Yellowstone and Musselshell rivers. This field has developed since the building of the Chicago, Milwaukee & St. Paul Railway in 1908.

The Great Falls coal field, which contains about 1,500 square miles, is south and east of the town of Great Falls. This field is one of the first to be developed in the State, but owing to the heavy percentage of ash the coal can hardly compete with that from Red Lodge and Bull Mountain.

The Milk River field, in the northern part of the State, as well as the great lignite fields in the eastern part, cover large areas, but are only slightly developed.

CHARACTER OF COAL BEDS.

The coal beds of the Red Lodge field vary from 3 to 12 feet in thickness; the coal is high-grade subbituminous, slacks readily, and for this reason pillars will soon crush when left standing, and thus allow the roof to fall. The coal about Bridger, a little to the northeast of Red Lodge, is bituminous, but only a little of this coal is mined at present.

In the Bull Mountain field the coal beds occupy a synclinal trough. There are 10 to 16 feet of clean coal; the dip does not exceed 6°. The mines are opened by shafts ranging from 137 to 350 feet deep. The quality of the coal is about the same as that mined in the Red Lodge field.

In the Great Falls field the beds are 3 to 7½ feet thick, with a slight dip to the north. At Sand Coulee, the principal mining center of this field, the beds are flat and about 10 feet thick. The coal is bituminous and intrinsically of higher grade than from either of

the fields so far described, but the heavy percentage of ash detracts greatly from its commercial value, and the field, which up to 1907 held first place in the State's production, has now dropped to third place.

In the Milk River field the roof in most cases is a soft sandstone or carbonaceous shale, making it necessary to leave considerable coal to keep the entries from caving in. Extensive timbering will be necessary when mining is done on a large scale.

MINING METHODS.

The mines at Chestnut, Gallatin County, are the oldest in the State, having been opened in 1867, and coal hauled from them long distances by teams. The records show that the production of coal in Montana began in 1880, when 224 tons were reported as mined. In 1913 the production was 3,240,973 tons, of which Carbon County mined 1,187,270 tons. The mines are opened by drift, slope, and shaft, and are mined by the room-and-pillar and pillar-and-stall systems. At Stockett the roof is sandstone, and the coal is mined by machines. Machines are also extensively used at Belt. In 1896 there were 62 mining machines in use in the State, which produced 37.5 per cent of the coal; in 1913 there were 97 machines, producing 33.2 per cent of the coal, whereas 35 per cent was shot off the solid, and 31 per cent was reported as being mined by hand.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The first mine-inspection law of Montana was approved March 14, 1889, and provided for the inspection of all mines where 5 or more men were employed, except mines operated only by the owners or lessees. The inspector was authorized to employ an assistant to act in cases of emergency, as in cases of accidents, or in the absence of the inspector. The assistant's salary was on a per diem basis and his employment was limited to 100 days a year. Mine operators were required to report to the inspector or his deputy all fatal and serious accidents in and about the mines. The inspector was required, whenever possible, to go to the scene of the accident and investigate the cause thereof; and if it was not possible for the inspector to visit the mine, the person in charge was required to obtain written and sworn statements from persons who had witnessed the accident. The inspector rendered annual reports to the governor and enumerated therein all accidents of which he had received notice.

On March 4, 1897, an act was approved directing the deputy inspector to devote his entire time to his official duties. On March 18, 1901, an act relating exclusively to coal mines was approved, and

the governor was authorized to appoint a coal-mine inspector. An act approved March 4, 1913, created a department of labor and industry, consisting of a commissioner, boiler inspector, inspector of mines, and coal-mine inspector, and directed that the annual reports of these inspectors should be combined in one volume and published biennially. The authority to appoint the deputy inspector was transferred from the coal-mine inspector to the governor by an act approved March 31, 1913.

Mine operators in Montana report to the inspector only those accidents causing at least 14 days' disability, and these are published in the inspector's annual reports. Accidents causing disability for less than 14 days are not considered serious.

ACCIDENTS.

Tables 111 and 112 show the number of fatalities in and about the coal mines in Montana, classified by causes and calendar years since 1889, as compiled from the State mine inspector's reports. The years 1896 and 1899 are left blank, as reports for these years were not available. Continuous records for 1900 to 1913, inclusive, show that 159 men were killed in and about the coal mines in Montana,

FATALITIES IN MONTANA COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1900 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	88	55.34	2.15
Mine cars and locomotives	23	14.47	.56
Gas and dust explosions			
Explosives	11	6.92	.27
Miscellaneous	27	16.98	.66
Shaft	1	.63	.02
Surface	9	5.66	.23
Total, 14 years	159	100.00	3.89

COAL-MINE ACCIDENTS IN MONTANA IN WHICH 5 OR MORE MEN WERE KILLED

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1906 June 7	Red Lodge	Red Lodge	Mine fire	8
1908 Nov. 20	do	do	do	9

representing a fatality rate of 3.89 per 1,000 men employed. Of this number 55.34 per cent were killed by falls of roof and pillar coal and 14.47 by mine cars and locomotives. Montana has been free from disasters due to gas and dust explosions. The production per fatality was 186,276, or there were 5.37 fatalities per million tons of coal

mined. There have been two mine fires, in which 17 men were killed.

The 8-hour day prevails in Montana and the time element is, therefore, taken into consideration for comparison with other 8-hour and with 10-hour States (Table 40). The total number of hours worked per year is 1,930, as compared with 2,447 for Virginia or

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN MONTANA.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	13	449	5	1,635	1	3	68	2,155
1904	19	646	8	1,653	4	12	194	2,505
1905	23	[b] 1,707	.....	.....	2	6	468	2,181
1906	28	[b] 2,203	1	85	.....	.....	106	2,394
1907	29	2,732	1	3	.....	.....	.....	2,735
1908	36	2,903	1	2	.....	.....	241	3,146
1909 [c]	.....	.....	.....	.....	.....	.....	.....	4,535
1910	44	3,568	.....	.....	1	6	263	3,837
1911	44	3,862	.....	.....	.....	.....	2	3,864
1912	39	3,435	.....	.....	1	5	.....	3,440
1913	40	3,416	1	4	.....	.....	210	3,630

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.
[b] Including day men who work 10 hours.
[c] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN MONTANA AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	254	18,949	4,813,046	2,407	5	2.08
1904	243	21,911	5,324,373	2,662	9	3.38
1905	243	17,928	4,356,504	2,178	8	3.67
1906	243	19,343	4,700,349	2,350	13	5.53
1907	268	21,883	5,864,644	2,932	13	4.43
1908	224	25,411	5,692,064	2,846	21	7.38
1909	.....	.....	.....	.....	.....	.....
1910	239	30,971	7,402,069	3,701	12	3.24
1911	220	30,914	6,801,080	3,401	14	4.12
1912	220	27,530	6,056,600	3,028	7	2.31
1913	228	29,254	6,669,912	3,335	20	6.00

2,255 for Alabama. The total number of hours of labor performed has been converted to a 2,000-hour basis and fatality rates shown in Table 41, for comparison with other States. The fatality rate on the actual number of men employed during the 10-year period 1903 to 1913 (except 1909) is 4.08, as compared with 4.23 fatalities per 1,000 on the basis of 2,000-hour workers. The tables of statistics for the State of Montana follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN MONTANA.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	650	33,800	52	1907	30	600	20
1900	40	1,640	41	1908	556	9,201	17
1901	285	14,175	49	1909	110	1,110	10
1902	686	7,636	11	1910	345	38,260	111
1903	.....	.....	.....	1911	529	8,114	15
1904	792	37,140	47	1912	869	8,445	10
1905	200	36,000	180	1913	1,094	6,682	6
1906	230	7,030	31	1914	171	1,271	7

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 111.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN MONTANA, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1880–88	303,350																				
1889	363,301	$2.42	848	0				(a)	428												
1890	517,477	2.42	1,251	1	0.80	1.93	517,477	218	414	1.90											
1891	541,861	2.27	1,119	7	6.26	12.92	77,409	(a)	484												
1892	564,648	2.36	1,158	3	2.59	5.31	188,216	258	488	1.89											
1893	892,309	1.99	1,401	1	.71	1.12	892,309	242	637	2.63											
1894	927,395	2.04	1,782	6	3.37	6.47	154,566	192	520	2.71											
1895	1,504,193	1.89	2,184	b 8				223	689	3.09											
1896	1,543,445	1.47	2,335	(a)				234	661	2.82		37.5								62	
1897	1,647,882	1.76	2,337	11	4.71	6.68	149,807	252	705	2.80		43.7								61	
1898	1,479,803	1.57	2,359	7				216	627	2.90		46.1								62	
1899	1,496,451	1.57	2,378	1				238	629	2.64		56.4			65	10				75	
1900	1,661,775	1.63	2,376	7	2.95	4.21	237,395	252	699	2.77		62.9								81	
1901	1,396,081	1.44	2,158	7	3.24	5.01	199,440	231	647	2.80		53.6								70	
1902	1,560,823	1.57	1,938	12	6.19	7.69	130,069	270	805	2.98		44.3								65	
1903	1,488,810	1.64	2,155	5	2.32	3.36	297,762	254	691	2.72		46.6			61	2				63	
1904	1,358,919	1.61	2,505	9	3.59	6.62	150,991	243	542	2.23		35.5			56	1				57	
1905	1,643,832	1.72	2,181	8	3.67	4.87	205,479	243	754	3.10		45.8			55	3				58	
1906	1,829,921	1.77	2,394	13	5.43	7.10	140,763	243	764	3.14		53.2			70	6				76	
1907	2,016,857	1.94	2,735	13	4.75	6.45	155,143	268	737	2.75		48.8			76	10				86	
1908	1,920,190	1.96	3,146	21	6.68	10.94	91,438	224	610	2.72		37.1			53	4				57	
1909	2,553,940	1.97	4,535	11	2.43	4.31	232,176	(a)	563	(a)		32.9			72	9				81	60
1910	2,920,970	1.82	3,837	12	3.13	4.11	243,414	239	761	3.18		29.7			65	32	1	1		99	57

1911	2,976,358	1.79	3,864	14	3.62	4.70	212,597	220	770	3.50	25.7	39.4	39.4	1.0	56	18	.....	11	2	87	49
1912	3,048,495	1.82	3,440	7	2.03	2.30	435,493	220	886	4.03	30.3	32.3	36.9	.5	38	21	.....	8	2	69	49
1913	3,240,973	1.74	3,630	20	5.51	6.17	162,049	228	893	3.92	31.0	33.2	35.3	.5	53	22	.....	19	3	97	43
Total	41,400,059	.....	.....	204	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1900–1913)	2,115,567	.....	2,921	11.36	3.89	5.37	186,276	239	724	3.03	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	2,805,173	1.75	3,350	8	2.39	2.85	350,647	209	837	4.00	24.2	43.3	31.9	.6	57	21	.....	20	1	99	44

[a] Not reported.

[b] Figures in italics represent incomplete fatality records.

TABLE 112.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **MONTANA**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1890 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1889																										0
1890		1											1													1
1891	3	1	2			1							7													7
1892	1		2										3													3
1893	1												1													1
1894	5					1							8													8
1895 [a]	4			1		2			1				8													8
1890 [b]																										
1897	3	3	5										11													11
1898 [a]	1	4				1						1	7													7
1899			*c 1*										*1*													*1*
1900	1	3	1			2							7													7
1901	3		1									2	8								1				1	7
1902	2	1	1			1						7	12													12
1903	4		1										5													5
1904	6	1	2										9													9
1905	5	2	1										8													8
1906	2	2						1			8		13													13
1907	7	1	1										9								2			2	4	13
1908	3	4	2			1					9		19										1	1	2	21
1909	6	2	2			1							11													11
1910	4	3	5										12													12
1911	7	3	2			2							14													14
1912	2	1	2			2							7													7
1913	9	4	2			2							17			1		1					2		2	20
1914	6		1										7						1						1	8

[a] 11 months. [b] No report. [c] Figures in italics represent incomplete fatality records.

NEW MEXICO.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of New Mexico comprise about 13,000 square miles but most of this large area is undeveloped and the producing districts are small and widely scattered.

The most important field, both as regards quality of coal and amount produced, is the Raton field, which is the southward continuation of the Trinidad field of Colorado. It extends about 40 miles south of the State line to the Cimarron River, and from the base of the Rocky Mountain Range eastward about 50 miles. Its area is about 960 square miles.

The largest area is the San Juan River region in the northwestern corner of the State. Its area is about 10,000 square miles, but only two small districts in this great field are developed at present. These are Gallup, on the Santa Fe Railroad, at the southern end of the field, and Monero, or Lumberton, at the north end. The coal at Gallup is subbituminous, and at Monero bituminous. The Los Cerrillos field, in the central part of Santa Fe County, contains about 35 square miles, and is noteworthy as the only western field outside of Colorado that is producing anthracite. Operations in the White Oaks field of Lincoln County are small, and the production is limited to local consumption. Mining on a small scale is also carried on at Carthage, in Socorro County, in a small isolated field containing bituminous coking coal.

CHARACTER OF COAL BEDS.

Practically all of the coal mined in the Raton field comes from a few large mines working the lowest bed of coal. This bed varies from 4 to 12 feet thick. There are at least four other coal beds thick enough to be of economic importance, although comparatively little development has been done on them. The second bed from the bottom, known as the Sugarite coal, has been opened east of Raton at the Sugarite mine, and the third bed has been developed to some extent at Yankee, and is believed by some to be the same as the coal bed opened at Brilliant, which is situated in Dillon Canyon, northwest of Raton. No producing mines have been opened on the higher coal beds. The coal beds in the Raton field lie nearly flat, and mining is not particularly dangerous, except for gas in some of the mines.

In the Gallup district the coal beds, as a rule, lie nearly flat, except on the rim of the basin, 3 miles east of Gallup, where they sharply upturn. There are five coal beds in this district, ranging in thickness from 2½ to 7 feet.

The coal beds of the Los Cerrillos field dip about 18° east. There are three important beds, varying in thickness from 2½ to 7 feet with the higher grade of coal in the northern part of the field. The northern part also contains some anthracite coal which has been produced by an intrusion of igneous rock, and which gradually merges into coking and semicoking coals to the south.

The only other field in which active mining is carried on is a few miles east of Socorro. This field contains coking coal, but the beds are so broken by faults and covered by recent material washed in from the surrounding higher land that mining is expensive and uncertain.

MINING METHODS.

The records of coal production in New Mexico extend back to 1882, during which year 157,092 tons of coal were produced. The production has gradually increased until in 1913 the total amount was 3,708,806 tons. In 1898 the 29 mining machines in use produced 16.5 per cent of all the coal mined. During 1905 and 1906 there were no mining machines in operation, but in 1907 three machines were introduced, and the number has gradually increased until in 1914 45 machines produced 16 per cent of the coal. In 1911 31.2 per cent of the coal was shot off the solid, but with the increase in the amount of machine-mined coal the amount shot off the solid was reduced to 17.6 per cent in 1913. From 65 per cent to 75 per cent of the coal is mined by hand.

The coal mines of New Mexico are operated on single and double entry systems through slopes and drifts. One large company operates a triple-entry system. Coal is mined by the room-and-pillar method. In 1913 there were three longwall mines and three panel-system mines. Many of the mines are very dry, and humidifiers have been installed. Shot firers are employed. Mule, horse, and electric haulage are in use. The following extracts[a] are from the State mine inspector's report for 1910.

The Tocco mine, near Albuquerque, has the distinction of operating the thinnest coal seam developed in New Mexico, one of the thinnest worked in the United States, and one that ranks also with the thinnest mined in Europe. The seam is from 12 to 15 inches thick, with 1 to 3 inches of bony coal at the top, leaving 10 to 13 inches of clean coal to be mined. A slope has been sunk 355 feet, with an average dip of 25°, and cross entries have been driven about 30 feet apart. The props used are from 10 to 13½ inches long. The coal is bituminous, free from sulphur, and is a good blacksmith's coal. The product of the mine is hauled to Albuquerque, N. Mex., where it is sold for blacksmithing purposes at from $9 to $12 per ton of 2,000 pounds.

The mines at Dawson are worked as follows:

Triple main entry; double-cross entry; room-and-pillar, robbing on retreat. All main drift entries are 10 feet wide by 6 feet high; main cross entries, 8 feet by 6 feet.

[a] State mine inspector's report, 1910, pp. 17, 20.

Cross entries off cross entries are 8 feet wide by 5 feet 6 inches high; main air courses are 10 feet by 6 feet and other air courses 8 feet wide by 6 feet. All workings are substantially timbered and haulage ways and traveling roads are lighted by electricity. Main entry pillars are from 100 to 300 feet thick; main cross entry pillars, 50 to 100 feet. Average length of rooms, 350 feet; room centers, 60 feet; width of rooms, 20 feet; size of room pillars, 40 feet. The mines are ventilated by exhaust fans on the surface. Shots are fired by electricity after all persons are out of the mine.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

By an act of Congress approved March 3, 1891, official inspection of coal mines was authorized in all Territories where the aggregate annual production of such mines exceeded 1,000 tons. The appointment of the inspector was vested in the President of the United States. Under the provisions of this law, the first mine inspector for the Territory of New Mexico was appointed July 1, 1892, and entered upon duty August 30, 1892. Section 15 of the act provided that a full and written report of all fatal accidents should be made to the mine inspector within 10 days after such death shall have occurred. Annual reports for fiscal years ending June 30 were rendered to the Secretary of the Interior. New Mexico was admitted to the Union on January 6, 1912, and the former Territorial mine inspector was continued in office. The office of State mine inspector was created by an act approved June 13, 1912, and the first State inspector was appointed September 20, 1912. The State law requires mine operators to keep a record of all accidents at their mines, to which record the inspector shall have access, and to at once report to the inspector by telegraph or telephone all accidents resulting in death, such immediate report to be followed, within 10 days, by a full and complete written report of the accident. It was made the inspector's duty to proceed without delay to any mine within the State upon receipt of notice of any explosion or other accident resulting fatally or jeopardizing the lives of the men working in such mine. Annual reports are rendered to the governor for years ending November 30.

According to the State inspector, the number of nonfatal accidents published in his annual report is not complete, as the reporting of such accidents is not made compulsory by law, and some operators do not report all injuries at their mines.

In 1915 the State inspector had no clerical or other assistants.

ACCIDENTS.

Tables 113 and 114 show by causes and calendar years the total number of fatalities in and about the mines of New Mexico, since the beginning of inspection service in 1893 to the end of 1913, as compiled from the territorial and State mine inspectors' reports. The

21-year period from 1893 to 1913 shows 568 fatalities, of which 56.51 per cent was due to gas and dust explosions, 28.17 per cent to falls of roof and pillar coal, and 7.57 per cent to mine cars and locomotives. The fatality rate for New Mexico is exceedingly high by reason of the disaster at Dawson, in which 263 men were killed at one time.

FATALITIES IN NEW MEXICO COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1893 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	160	28.17	3.22
Mine cars and locomotives	43	7.57	.87
Gas and dust explosions	321	56.51	6.46
Explosives	24	4.23	.48
Miscellaneous	16	2.82	.32
Shaft	0		
Surface	4	.70	.08
Total, 21 years	568	100.00	11.43

COAL-MINE ACCIDENTS IN NEW MEXICO IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1895 Feb. 27	White Ash	Cerrillos	Mine explosion	24
1899 Apr. 21	Cook and White	Madrid	do	5
1903 June 19	Blossburg No. 3	Blossburg	do	5
1906 Oct. 5	Dutchman	do	do	10
1907 Dec. 31	Bernal	Carthage	do	11
1913 Oct. 22	Stag Canon No. 2	Dawson	do	263

The fatality rate during this period is 11.43 per 1,000 men employed. By referring to Table 40 it will be noted that the fatality rate for common accidents—that is, those in which less than 5 men were killed at one time—based on the actual number of employees is 4.84 per 1,000 men, for the 10-year period 1903 to 1913, inclusive, excepting 1909. The number of fatalities due to exceptional accidents—that is, those in which 5 or more men were killed at one time—is 9.70 for the same 10 years. The fatality rate due to common accidents is a little higher than in a number of other States. The one disaster at Dawson overshadows all others and for this reason the total rate is exceedingly high. Table 40 also shows that the number of hours worked per year per man is 2,463, as compared with 1,495 for Ohio and 2,034 for the bituminous mines of Pennsylvania. By reducing the fatality rate of common accidents to the basis of 2,000-hour workers, the rate becomes 3.93 as compared with 3.84 for Ohio and 2.82 for the bituminous mines of Pennsylvania.

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN NEW MEXICO.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	7	99	1	3	13	1,309	378	1,789
1904	6	78	1	31	15	1,680	60	1,849
1905	4	83	5	92	12	1,923	10	2,108
1906	8	78	2	24	16	1,856	112	2,070
1907	8	79	4	287	14	2,584	20	2,970
1908	5	30	6	356	14	3,015	47	3,448
1909[a]								3,317
1910	5	21	5	185	16	3,345	34	3,585
1911	2	5	6	167	22	3,516	12	3,700
1912	2	4	6	140	23	3,777	7	3,928
1913	16	2,335	8	401	10	1,590	3	4,329

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN NEW MEXICO AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day. (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	260	17,311	4,500,860	2,251	22	9.77
1904	228	18,243	4,159,404	2,080	8	3.85
1905	234	20,812	4,870,008	2,435	7	2.87
1906	242	20,408	4,938,736	2,469	23	9.32
1907	269	29,235	7,864,215	3,932	34	8.65
1908	197	34,017	6,701,349	3,351	24	7.16
1909						
1910	283	35,589	10,071,687	5,036	16	3.18
1911	230	36,811	8,466,530	4,233	11	2.60
1912[b]	274	39,125	10,720,250	5,360	16	2.99
1913	289	38,216	11,044,424	5,522	272	49.26

From 1903 to the close of 1912 practically all of the men in the mines of New Mexico were employed on a 10-hour basis, but in 1913 the majority of the men were employed 8 hours a day. Table 41 shows the fatality rates on the 2,000-hour basis for a period of years, so that a comparison with other States may be easily made. The tables of statistics for the State of New Mexico follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN NEW MEXICO.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899				1904	556	73,090	131
1900				1905 to 1912			
1901	766	32,949	43	1913	8	1,040	130
1902	470	9,820	21	1914			
1903	54	710	13				

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 113.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN NEW MEXICO, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and items above horizontal lines in columns 2 and 21 from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reporting.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1882–1888	2,301,182																				
1889	486,943	$1.79	1,015					(a)	480												
1890	375,777	1.34	827					192	454	2.36											
1891	462,328	1.68	808					265	574	2.17											
1892	661,330	1.62	1,083					223	611	2.74											
1893	665,094	1.47	1,011	4	3.96	6.01	166,274	229	658	2.87											
1894	597,198	1.57	985	11	11.17	18.42	54,291	182	606	3.33											21
1895	720,654	1.49	1,383	28	20.25	38.85	25,738	190	521	2.74											21
1896	622,626	1.49	1,569	9	5.74	14.45	69,181	172	397	2.31											
1897	716,981	1.38	1,659	5	3.01	6.97	143,396	208	432	2.08											24
1898	992,288	1.35	1,873	8	4.27	8.06	124,036	242	530	2.19		10.5								29	20
1899	1,050,714	1.39	1,750	18	10.29	17.13	58,373	257	600	2.33		24.8				14				14	25
1900	1,299,299	1.37	2,037	9	4.42	6.93	144,367	261	638	2.44		8.6								21	24
1901	1,088,546	1.42	2,478	15	6.05	13.81	72,436	224	438	1.96		.2								8	21
1902	1,048,783	1.43	1,849	14	7.57	13.35	74,912	217	567	2.61		6.8								17	
1903	1,541,781	1.37	1,789	22	12.30	14.27	70,081	260	862	3.32		9.4				12				12	
1904	1,452,325	1.31	1,849	8	4.33	5.51	181,541	228	785	3.44		6.9			2	10				12	
1905	1,649,933	1.33	2,108	7	3.32	4.24	235,705	234	783	3.35											
1906	1,964,713	1.34	2,070	23	11.11	11.71	85,422	242	949	3.92											
1907	2,628,959	1.46	2,970	34	11.45	12.93	77,322	269	885	3.29		.4			3					3	
1908	2,467,937	1.37	3,448	24	6.96	9.72	102,831	197	716	3.63		1.2			7					7	
1909	2,801,128	1.29	3,317	14	4.22	5.00	200,081	(a)	844	(a)						4				4	30
1910	3,508,321	1.39	3,585	16	4.46	4.56	219,270	283	979	3.46		2.0				2	1			3	31
1911	3,148,158	1.44	3,700	11	2.97	3.49	286,198	230	851	3.70	65.4	3.0	31.2	0.4	4	4	2			10	38

1912	3,536,824	1.42	3,928	16	4.07	4.52	221,052	274	900	3.28	74.7	8.1	16.9	.3	7	4	......	13	1	25	35
1913	3,708,806	1.46	4,329	272	62.83	73.34	13,635	289	857	2.97	68.7	13.4	17.6	.3	7	6	1	30	......	44	36
Total	41,496,606	......	......	568	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Average (1893–1913)	1,771,859	......	2,368	27.05	11.43	15.27	65,509	242	749	3.10	......	......	......	......	......	......	......	......	......	......	......
1914	3,877,689	1.61	4,178	18	4.31	4.64	215,427	283	928	3.28	65.0	16.0	18.8	.2	9	8	......	28	......	45	35

a Not reported.

TABLE 114.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **NEW MEXICO**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1893 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1893	2	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
1894	4	.....	.....	6	.....	1	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
1895	3	1	.....	24	.....	.....	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28
1896	3	.....	3	.....	.....	3	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
1897	2	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
1898	4	.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	8
1899	9	1	2	5	.....	.....	.....	1	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
1900	4	2	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
1901	6	.....	2	.....	3	2	.....	.....	.....	.....	.....	2	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
1902	7	.....	4	.....	.....	1	.....	.....	.....	.....	2	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
1903	10	1	1	.....	.....	7	.....	.....	.....	.....	3	.....	22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22
1904	5	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
1905	5	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
1906	10	1	2	10	.....	.....	.....	.....	.....	.....	.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23
1907	12	1	5	.....	11	.....	.....	.....	.....	.....	3	.....	32	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2	34
1908	15	1	6	.....	.....	1	.....	.....	.....	.....	.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	24
1909	6	4	3	.....	.....	.....	.....	.....	.....	.....	2	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
1910	8	6	1	.....	.....	1	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
1911	9	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
1912	8	2	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
1913	3	1	2	.....	[a] 261	2	[a] 2	.....	.....	.....	.....	1	272	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	272
1914	14	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	1	18

[a] Stag Canyon explosion, killed 263.

NORTH CAROLINA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing formations of North Carolina are contained in the Deep River and the Dan River fields and are of Triassic age. The Deep River field extends from the northern boundary in a southwesterly direction through Durham, Haywood, and Wadesboro, entirely across the State and a short distance into South Carolina. The field averages about 12 miles wide and contains 250 to 300 square miles. The Deep River coal is bituminous and in some places has been more or less coked by igneous intrusions.

CHARACTER OF COAL BEDS.

The coal beds dip about 15° southeast and vary from 1 foot to 8 feet in thickness. Mining has been conducted in this field in a desultory way since the early sixties. From 1860 to 1865 it is estimated that about 65,000 tons of coal was produced. One of the most important mines worked in recent years is the Cumnock, which is opened by a shaft 8 feet by 12 feet in cross section and 460 feet deep. This mine has been the scene of two serious mine explosions in which 62 men were killed.

The Dan River field consists of a small coal-bearing area in the north-central part of the State and is 50 or 60 miles northwest of the Deep River field. The Dan River field extends from the Virginia-North Carolina line in a southwesterly direction and is about 30 miles long and 4 to 7 miles wide. The coal beds are 2 to 7 feet thick and dip about 34°. A small amount of coal was mined from this field during the Civil War, but since that time little mining has been done there.

Tables 115 and 116 give further details concerning the number of men employed, coal produced, accidents, etc. These tables are meager and incomplete, but contain all the data available.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

There is official mine-inspection service[a] in North Carolina, but as the State is not a regular producer of coal, the occasional output is too small to place the industry on a commercial scale. The tables of statistics for this State follow.

COAL-MINE ACCIDENTS IN NORTH CAROLINA IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1895 Dec. 19	Cumnock	Cumnock	Mine explosion	39
1899 May 23	do	do	do	23

[a] Revised Statutes, 1905, sec. 4940.

TABLE 115.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **NORTH CAROLINA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Compiled from Mineral Resources, U. S. Geol. Survey.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reporting.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1862–1887	229,150																				
1888	250																				
1889	222																				
1890	10,262	$1.74	80						128												
1891	20,355	1.93	80					254	254	1.00											
1892	6,679	1.44	90					160	74	.46											
1893	17,000	1.50	70					80	243	3.04											
1894	16,900	1.78	95					145	178	1.23											
1895	24,900	1.66	61	*39*				226	408	1.81											
1896	7,813	1.50	18					220	434	1.97											
1897	21,280	1.34	51					215	417	1.94											
1898	11,495	1.25	(b)					(b)	(b)	(b)											
1899	26,896	1.30	70	*23*				210	384	1.83											
1900	17,734	1.32	84					151	211	1.40											
1901	12,000	1.25	25					300	480	1.60											
1902	23,000	1.50	40					285	575	2.02											
1903	17,309	1.47	49					264	353	1.34											
1904	7,000	1.50	25					240	280	1.17											
1905	1,557	1.50	15					60	104	1.73											
1906																					
1907																					
1908																					
1909																					
1910				0																	
1911	120			0																	
1912	200			0																	
1913				0																	
Total	477,125			*62*																	

[a] Figuree in italics represent incomplete fatality records.

[b] No record.

NORTH DAKOTA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal beds of North Dakota are lignitic, and occupy about 35,000 square miles, or practically the western half of the State. Ninety-seven townships contain at least one bed of lignite 7 feet thick, and at least 100 other townships contain beds 4 to 7 feet thick. The lignite beds are horizontal and occur at depths ranging from near the surface to a depth of at least 300 feet.

MINING METHODS.

Lignite has been mined in North Dakota by ranchers and others since the territorial days of the State, and the first records of production were obtained in 1884, when 35,000 tons of coal was mined.

The production in 1913 was 495,322 tons.

In 1911 there were practically 100 mines in operation, 20 of which were surface and 80 underground mines. Of the underground mines, 69 were opened by slope or drift and 11 by shaft. The mines are opened by single and double entry and the coal mined by the room-and-pillar method, the rooms being 12 by 100 feet to 22 by 300 feet; pillars are 8 to 20 feet wide. The length of entries varies from 100 to 5,000 feet. In 1911, there were 15 mines with entries over 1,000 feet long. The largest number of deep mines is in Ward County, where the mines vary from surface pits to 200 feet in depth; 21 mines are over 100 feet deep. In Adams County the deepeest mine in 1911 was 300 feet.

Ventilation is usually by an air shaft in connection with slope, drift, or entry.

Mining machines have been in use in a limited way since 1896. In 1914 there were 14 machines in operation, producing 41.1 per cent of the coal mined. Twenty-six per cent was shot off the solid and 6.3 per cent was mined by hand.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The State engineer of North Dakota was made ex-officio State coal-mine inspector by an act approved March 14, 1907, with power to employ necessary assistants. The engineer renders biennial reports to the governor, showing the condition of each mine, number of men employed, and such other information as he deems desirable.

The law does not require operators to notify the inspector of mine accidents, but the inspector has requested the operators to report all accidents, however slight. All accidents thus reported are published in the biennial reports of the inspector. No distinction is made between serious and slight injuries.

ACCIDENTS.

Tables 116 and 117 show the total number of fatalities in and about the coal mines of North Dakota from 1908 to the end of 1913, as compiled from the State mine inspectors' reports. During the 6-year period 1908 to 1913, inclusive, there were 13 fatalities, of which 46.16

FATALITIES IN NORTH DAKOTA COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1908 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	6	46.16	1.44
Mine cars and locomotives	2	15.38	.48
Gas and dust explosions			
Explosives	3	23.08	.72
Miscellaneous	2	15.38	.48
Shaft			
Surface			
Total, 6 years	13	100.00	3.12

per cent were due to falls of rock, 23.08 per cent to explosives, and 15.38 per cent to mine cars and locomotives. The production per fatality during this period was 203,020 tons, or there were 4.93 fatalities per million tons mined. North Dakota has been fortunate in that there have been no serious mine disasters in that State. The fatality rate during this period is 3.12 per 1,000 men employed.

Since 1903 practically one-half of the men have been employed on a 10-hour basis. By referring to Table 40 it will be noted that during this period the men averaged 1,974 hours per year. During the

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN NORTH DAKOTA.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, and 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines	Men employed.	Number of mines.	Men employed.		
1903	6	40	8	90	20	263	93	486
1904	8	66	11	117	20	292	79	554
1905	8	79	7	50	20	374	123	626
1906	6	47	4	38	20	323	80	488
1907	11	89	6	119	17	304	50	562
1908	11	103	5	114	14	275	139	631
1909 [b]								972
1910	11	94	6	75	16	327	38	534
1911	12	115	4	46	24	423	176	760
1912	12	59	4	51	23	415	97	622
1913	13	61	5	51	24	472	57	641

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **NORTH DAKOTA** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	198	4,597	910,206	455	.....	.....
1904	192	5,212	1,000,704	501	.....	.....
1905	187	5,929	1,108,723	555	.....	.....
1906	209	4,668	975,612	488	.....	.....
1907	223	5,273	1,175,879	588	.....	.....
1908	181	5,851	1,059,031	530	4	7.55
1909	.....	.....	.....	.....	.....	.....
1910	207	5,039	1,043,073	522	2	3.83
1911	229	7,148	1,636,892	818	1	1.22
1912	232	5,954	1,381,328	691	.....	.....
1913	221	6,180	1,365,780	683	6	8.78

5-year period 1908 to 1913 (exclusive of 1909) for which complete data are available, the fatality rate based on the actual number of employees is 4.08 as compared with 4.01 based on the number of 2,000-hour workers. Table 41 shows the figures on the 2,000-hour basis for a period of years by States, so that a comparison with other States may be readily made.

The tables for the State of North Dakota follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **NORTH DAKOTA.**[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	.....	.....	.....	1907	82	736	9
1900	.....	.....	.....	1908	104	1,620	16
1901	32	224	7	1909	75	525	7
1902	8	8	1	1910	.....	.....	.....
1903	35	340	10	1911	34	69	2
1904	175	6,300	36	1912	10	20	2
1905	.....	.....	.....	1913	.....	.....	.....
1906	37	92	2	1914	.....	.....	.....

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 116.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **NORTH DAKOTA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures for column 4 compiled from State mine inspectors' reports. Figures for columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reporting.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11.	12	13	14	15	16	17	18	19	20	21
1884–1888	141,425	.....	.....	.....	.....	.....	.....		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	28,907	$1.43	75	.....	.....	.....	.....	(a)	385	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	30,000	1.40	.....	.....	.....	.....	.....	(a)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	30,000	1.40	.....	.....	.....	.....	.....	(a)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1892	40,725	.96	54	.....	.....	.....	.....	216	764	3.49	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	49,630	1.13	88	.....	.....	.....	.....	193	564	2.92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	42,015	1.12	77	.....	.....	.....	.....	156	546	3.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	38,997	1.07	65	.....	.....	.....	.....	139	600	4.32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1896	78,050	1.09	141	.....	.....	.....	.....	166	554	3.34	.....	19.2	.....	.....	.....	.....	.....	.....	.....	1	.....
1897	77,246	1.08	170	.....	.....	.....	.....	168	454	2.70	.....	25.9	.....	.....	.....	.....	.....	.....	.....	2	.....
1898	83,895	1.12	151	.....	.....	.....	.....	187	556	2.97	.....	77.5	.....	.....	.....	.....	.....	.....	.....	7	.....
1899	98,809	1.19	210	.....	.....	.....	.....	154	471	3.06	.....	38.5	.....	.....	4	1	.....	.....	.....	5	.....
1900	129,883	1.22	326	.....	.....	.....	.....	142	398	2.80	.....	26.1	.....	.....	.....	.....	.....	.....	.....	7	.....
1901	166,601	1.29	280	.....	.....	.....	.....	198	595	3.01	.....	26.1	.....	.....	.....	.....	.....	.....	.....	7	.....
1902	226,511	1.44	402	.....	.....	.....	.....	213	563	2.64	.....	39.7	.....	.....	.....	.....	.....	.....	.....	10	.....
1903	278,645	1.50	486	.....	.....	.....	.....	198	573	2.89	.....	41.4	.....	.....	2	7	.....	.....	.....	9	.....
1904	271,928	1.43	554	.....	.....	.....	.....	192	491	2.56	.....	46.0	.....	.....	1	8	.....	.....	.....	9	.....
1905	317,542	1.34	626	.....	.....	.....	.....	187	507	2.71	.....	30.8	.....	.....	.....	9	.....	.....	.....	9	.....
1906	305,689	1.54	488	.....	.....	.....	.....	209	626	3.00	.....	31.7	.....	.....	.....	11	.....	.....	.....	11	.....
1907	347,760	1.61	562	.....	.....	.....	.....	223	619	2.78	.....	30.3	.....	.....	.....	12	.....	.....	.....	12	.....
1908	320,742	1.63	631	4	6.34	12.47	80,186	181	508	2.81	.....	32.7	.....	.....	.....	9	2	.....	.....	11	.....
1909	422,047	1.53	972	0	.....	.....	.....	(a)	434	(a)	.....	27.3	.....	.....	7	9	.....	.....	.....	16	58
1910	399,041	1.49	534	2	3.75	5.01	199,521	207	747	3.61	.....	41.4	.....	.....	4	9	.....	.....	.....	13	44

1911	502,628	1.43	760	1	1.32	1.99	502,628	229	661	2.89	13.3	38.4	26.6	21.7	.....	11	.....	.....	.....	11	60
1912	499,480	1.53	622	0	.....	.....	.....	232	803	3.46	14.2	33.8	36.4	15.6	.....	11	.....	.....	.....	11	51
1913	495,320	1.52	641	6	9.36	12.11	82,553	221	773	3.50	11.1	44.9	26.3	17.7	.....	4	.....	9	.....	13	55
Total	5,423,516	.....	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1908–1913)	439,878	.....	693	2.16	3.12	4.93	203,020	215	633	2.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	506,685	1.52	558	3	5.38	5.92	168,895	216	908	4.20	6.3	41.1	38.2	14.4	.....	14	.....	.....	.....	14	52

[a] Not reported.

TABLE 117.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **NORTH DAKOTA**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1908 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1908 [a]	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
1909	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
1910	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1911	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
1913	3	.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1914	1	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3

[a] From Mineral Resources, U. S. Geol. Survey.

OHIO.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing area of Ohio covers about 12,600 square miles, and occupies 30 counties in the southeastern part of the State. It is a part of the northwestern side of the great Appalachian coal basin which stretches from northern Pennsylvania to central Alabama. As it lies on the northwestern side of the basin the general dip of the beds is southeast toward the middle, but there are a few small folds which break up the continuity of the southeastward dip, and in some places cause a dip in the opposite direction. The most pronounced fold of this kind trends north to south and enters the State near Marietta. The coal beds and associated rocks extend to the northeast into West Virginia and Pennsylvania and to the southwest into Kentucky.

CHARACTER OF COAL BEDS.

The coal beds of Ohio are numbered from the bottom upward, coal No. 1 being the lowest bed. Coal No. 1 has been most extensively developed in the northern part of the State, but it occurs in isolated areas along the west side of the field. It is from 3 to 6 feet thick at Brier Hill and at Massillon. The roof is shale ranging from 5 to 40 feet in thickness. The coal is jointed, hence its name, block coal. It is noncoking, but of good steaming quality. The No. 2, or Wellston bed, is 45 to 75 feet above No. 1 and is seldom more than 2 feet thick, although at Wellston, Jackson county, it is 4 feet thick. The roof is shale and the coal non-coking.

The No. 5 bed, or Lower Kittanning, extends in an almost unbroken outcrop across the State. It is mined in almost every county of the Ohio coal field from southern Mahoning on the north to Hanging Rock on the south. It is generally less than 3 feet thick, but at Mineral Point, Zanesville, and New Castle, it is 4 to 5 feet thick. The coal is of good coking quality, but because of the thinness of the bed mining machines are not used extensively, the coal being largely mined by pick mining.

No. 6 bed, or the Middle Kittanning, also extends under a wide area. In the northern part of Columbiana County it is less than 1 foot thick. In the southern part of the county it is worked extensively, although it is only 20 to 30 inches thick. In Coshocton County, it attains a thickness of 3 feet to 4 feet 10 inches. At Shawnee it is known as the Hocking Valley seam, and in many places contains 10 feet of mineable coal. From 32 to 38 per cent of the State's production comes from this bed.

The No. 7, or Upper Freeport, is not so extensive as the lower beds and varies in thickness from 5 feet 4 inches to 6 feet 9 inches. This is one of the best steaming coals in the State.

The No. 8, or Pittsburgh, is the most important bed of the upper coal measures. The coal rests on a bed of fire clay and is 4 to 6 feet thick. This bed extends into West Virginia and into Pennsylvania.

MINING METHODS.

The accompanying table shows the number of mines opened by shaft, slope or drift, from 1892 to 1912, inclusive. At first the single-entry system of mining prevailed , but in the early eighties the double-entry system was introduced in a number of the larger mines, and now, although the single-entry system still prevails in some mines where the bed is thin, most of the mines are opened by the double-entry system, also some are opened by the three-entry system.

Mining machines are used extensively in coal beds Nos. 6, 7, and 8. Prior to 1877 all of the coal mined in Ohio was mined by pick. During this year the first mining machines were introduced in the State and the use of machines has steadily increased until in 1913 there were 1,681 machines in operation, producing 21,535 tons each, or in all 90.2 per cent of the coal of the State. The electric machines were introduced in Ohio in 1889 and their number has gradually increased to 1,604 in 1913. In 1891, 89 compressed-air machines were in use in Ohio mines and in 1905 the highest number, 145, was reached. There were only 49 in operation in 1913. Less than 4 per cent of the coal is reported as being shot off the solid, and slightly over 4 per cent as being mined by hand.

Prior to the introduction of mining machines in Ohio, the coal-mining work was performed principally by skilled miners from England, Scotland, and Germany. This class of miners has gradually been supplanted in the State by labor from southern Europe. The table on methods of opening and ventilation at Ohio mines follows:

NUMBER OF COAL MINES IN OHIO, CLASSIFIED BY TYPE OF OPENING AND METHOD OF VENTILATION FROM 1892 TO 1913, INCLUSIVE.[a]

Year.	Mines opened by—					Method of ventilation.						
	Drift.	Shaft.	Slope.	Small mines, kind of opening unknown.	Total.	Fan.	Furnace.	Fire baskets.	Steam jets and exhaust from pumps.	Natural.	Small mines, mode of ventilation unknown.	Total.
1892	303	91	40	458	892	127	253	11	30	205	266	892
1893	676	121	61	151	1,009	141	323	23	39	316	167	1,009
1894	657	149	61	296	1,163	139	264	32	43	378	309	1,165
1895	749	150	68	220	1,187	134	278	36	48	452	242	1,190
1896	821	149	66	167	1,203	134	281	38	52	528	179	1,212
1897	800	153	85	190	1,228	149	280	51	49	516	200	1,245
1898	921	143	145	46	1,255	149	317	45	47	636	73	1,267
1899	789	145	133	65	1,132	147	274	41	34	523	107	1,126
1900	696	122	140	114	1,072	171	264	48	33	453	103	1,072
1901	625	133	149	99	1,006	182	253	40	44	389	98	1,006
1902	589	140	142	96	967	219	222	57	45	336	88	967
1903	591	142	140	81	954	259	244	44	32	302	73	954
1904	638	153	142	85	1,018	282	254	50	34	320	78	1,018
1905	626	130	125	.....	881	289	239	36	13	304	.....	881
1906	696	163	144	.....	1,003	299	252	38	13	401	.....	1,003
1907	691	140	149	.....	980	322	235	37	19	367	.....	980
1908	742	140	171	.....	1,053	314	236	46	14	443	.....	1,053
1909	744	130	158	.....	1,032	302	240	42	19	429	.....	1,032
1910	726	110	147	.....	983	318	225	35	14	391	.....	983
1911	702	114	132	.....	948	345	191	26	14	372	.....	948
1912	703	113	125	.....	941	350	195	30	11	355	.....	941
1913	707	109	128	.....	944	355	187	35	14	353	.....	944

[a] State mine inspector's reports.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

By an act approved March 21, 1874, the Legislature of Ohio provided for the inspection of all coal mines in which more than 10 men were employed at one time. Under this act the first State inspector was appointed April 6, 1874, and entered upon his duties the following day. The act made it the duty of any person having charge of any mine to which the law was applicable to report forthwith to the State inspector and the county coroner any explosion or other accident causing loss of life. The inspector was required to render a report to the governor on or before the 1st day of January of each year, and to enumerate therein, among other things, all accidents in or about the mines.

On April 12, 1884, the State was divided into three districts, and the enforcement of the laws relating to mining was intrusted to a chief mine inspector and three district inspectors. The inspection service was also extended to include fire-clay, iron-ore, and other mines, as well as coal mines. The number of districts and district inspectors was increased by statute from time to time, until in 1913 there were 12 districts, each having an inspector. On March 12, 1913 a law was passed, and approved March 18, 1913, discontinuing

various State departments and offices, among them being the office of chief mine inspector, and transferring all powers and duties of the inspector to a newly created State industrial commission. Under the provisions of this law, the new commission assumed the duties and functions of the chief inspector of mines on September 1, 1913, and established the office of chief deputy and safety commissioner of mines.

All accidents are reported to district inspectors and are included in the annual reports of the industrial commission. Injuries involving disability for three weeks or more are classified as serious, and all other injuries are slight.

ACCIDENTS.

Tables 118 and 119 show the total number of fatalities by causes since the beginning of inspection service in 1874 with the exception of the fiscal year 1879, for which no report was published. These tables also show the percentage of accidents, classified by principal causes, and fatality rates per 1,000 men employed for a period of 30

FATALITIES IN **OHIO** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1884 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	1,509	65.84	1.57
Mine cars and locomotives	277	12.08	.29
Gas and dust explosions	64	2.79	.07
Explosives	161	7.02	.17
Miscellaneous	115	5.02	.12
Shaft	79	3.45	.08
Surface	86	3.80	.09
Total, 30 years	2,292	100.00	2.39

COAL-MINE ACCIDENTS IN **OHIO** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1877 July 11	Brookfield	Brookfield	Suffocated by gas from mine locomotive.	7
1881 Feb. 10	Robbins	Robbins	Mine explosion	6
1906 Nov. 3	San Toy No. 1	Corning	Fell down shaft	5
1910 Apr. 21	Amsterdam	Amsterdam	Mine explosion	15
1913 May 17	Imperial	Belle Valley	do	15

years (1884–1913), for which complete records of employees and fatalities are available. The fatality rate during this period is 2.39 per 1,000 men employed. Ohio has been fortunate in the matter of large disasters, there being only 3 during this period causing the death of more than 5 men at one time, representing only 1½ per cent

of the total number killed. Falls of roof and pillar are responsible for 65.84 per cent of the fatalities; mine cars and locomotives are second with 12.08 per cent. The average production of coal per fatality during this period was 251,152 tons, or 3.98 fatalities for each million tons mined.

Since 1903 more than 97 per cent of the men employed in the mines have been on an 8-hour day. The time element, therefore, has been taken into consideration and tables compiled on this basis for comparison with other States. The fatality rate for the 10-year

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **OHIO.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed otber than 8, 9, and 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	538	39,876	15	455	14	206	1,399	41,936
1904	574	42,845	9	296	7	77	416	43,634
1905	524	42,262	7	527	4	27	583	43,399
1906	461	44,003	8	174	3	76	1,185	45,438
1907	490	44,733	4	53	2	31	2,016	46,833
1908	510	45,742	8	1,004	3	35	626	47,407
1909 [b]								38,114
1910	587	45,001	12	249	1	5	1,386	46,641
1911	566	44,351	7	378	3	8	722	45,459
1912	581	44,180	11	474	1	10	863	45,527
1913	604	45,487	8	187	3	32	109	45,815

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **OHIO** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	194	337,754	65,524,276	32,762	124	3.78
1904	175	349,938	61,239,150	30,620	117	3.82
1905	176	348,356	61,310,656	30,655	126	4.11
1906	167	365,015	60,957,505	30,479	131	4.30
1907	199	376,795	74,982,205	37,491	154	4.11
1908	161	380,956	61,333,916	30,667	113	3.68
1909						
1910	203	374,773	76,078,919	38,039	159	4.18
1911	179	364,788	65,297,052	32,649	107	3.28
1912	201	365,573	73,480,173	36,740	135	3.67
1913	206	366,880	75,577,280	37,789	165	4.37

period 1903 to 1913 (Table 40) based upon the actual number of employees is 2.94, whereas based on the number of 2,000-hour workers it is 3.94. During the 10-year period the men averaged 1,495 hours of labor per man, as compared with 2,132 hours in West Virginia, and 2,034 hours in the bituminous mines of Pennsylvania. Table 41 shows the fatality rate for each year on the 2,000-hour

basis for each State, so that a true comparison of Ohio with other States may be readily made. The tables of statistics for the State follow.

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **OHIO.**

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	877	26,394	30	1907	6,367	110,324	17
1900	2,035	45,547	22	1908	21,084	567,450	27
1901	2,724	105,177	38	1909	2,375	139,434	59
1902	3,769	70,534	19	1910	24,746	1,334,631	54
1903	4,115	65,149	16	1911	9,530	350,039	37
1904	11,412	514,658	45	1912	27,200	895,777	32
1905	3,250	49,495	15	1913	10,029	263,234	26
1906	37,636	2,687,288	71	1914	40,577	6,452,762	159

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 118.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **OHIO**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and items above horizontal lines in columns 2, 3, 8, 11, 12, 20, and 21 from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1838–1873	45,727,704																				
1874	3,267,585		13,750	29	2.11	8.88	112,675		238												
1875	4,864,259		15,039	24	1.60	4.93	202,677		323												
1876	3,500,000		15,000	15	1.00	4.26	233,333		233												
1877	5,250,000		14,300	31	2.17	5.90	169,355		367												
1878	5,500,000			*a* 17																	
1879	6,000,000			*b* 2																	
1880	6,008,595		16,972	*a* 23																	
1881	9,240,000			30																	
1882	9,450,000		18,000	25	1.39	2.65	378,000		525												
1883	8,229,429			22																	
1884	7,640,062		20,101	32	1.59	4.19	238,752	199	380	1.91											
1885	7,816,179	$1.05	19,704	29	1.47	3.71	269,523	201	397	1.98											344
1886	8,435,211	.96	20,437	42	2.06	4.98	200,838	206	413	2.00											353
1887	10,300,708	.88	22,237	30	1.35	2.91	343,357	228	463	2.03											399
1888	10,910,951	.93	21,801	32	1.47	2.93	340,967	(*c*)	500												435
1889	9,976,787	.94	19,343	34	1.76	3.41	293,435	(*c*)	516		91.7	8.3									474
1890	11,494,506	.94	20,576	39	1.90	3.39	294,731	201	559	2.78	90.3	9.7									446
1891	12,868,683	.94	22,182	38	1.71	2.95	338,650	206	580	2.82	87.3	12.7								114	403
1892	13,562,927	.94	22,576	43	1.90	3.17	315,417	212	601	2.83	84.7	15.3								120	434
1893	13,253,646	.92	23,931	36	1.50	2.72	368,157	188	554	2.95	82.8	17.2								148	419
1894	11,609,856	.83	27,105	39	1.44	3.27	305,381	136	439	3.23	78.5	21.5								171	433
1895	13,356,806	.79	24,644	51	2.07	3.82	261,879	176	542	3.08	77.2	22.8								164	424
1896	12,875,202	.79	25,500	42	1.65	3.26	306,552	161	505	3.14	73.8	26.2								209	406
1897	12,196,942	.78	26,410	39	1.48	3.20	312,742	148	462	3.12	68.5	31.5								224	414

1898	14,516,867	.83	26,986	48	1.78	3.31	302,435	169	538	3.18	64.2	35.8	.....	.....	.....	.....	.....	.....	.....	245	425
1899	16,500,270	.87	26,038	56	2.15	3.39	294,648	200	634	3.17	58.7	41.4	.....	.....	18	268	.....	.....	.....	278	417
1900	18,988,150	1.02	27,628	71	2.57	3.74	267,439	215	687	3.20	53.5	46.5	.....	.....	.....	.....	.....	.....	.....	341	432
1901	20,943,807	1.00	32,111	64	1.99	3.06	327,247	198	652	3.29	52.7	47.3	.....	.....	.....	.....	.....	.....	.....	376	437
1902	23,519,894	1.15	38,965	86	2.21	3.66	273,487	200	604	3.02	48.6	51.4	.....	.....	.....	.....	.....	.....	.....	559	446
1903	24,838,103	1.29	41,936	124	2.96	4.99	200,307	194	592	3.05	43.6	56.4	.....	.....	51	673	.....	.....	.....	724	499
1904	24,400,220	1.09	43,634	117	2.68	4.80	208,549	175	559	3.19	42.7	57.3	.....	.....	88	779	.....	.....	.....	867	502
1905	25,552,950	1.04	43,399	126	2.90	4.93	202,801	176	589	3.35	33.9	66.1	.....	.....	128	878	35	.....	.....	1,041	464
1906	27,731,640	1.09	45,438	131	2.88	4.72	211,692	167	610	3.65	27.9	72.1	.....	.....	141	1,081	33	.....	.....	1,255	465
1907	32,142,419	1.10	46,833	154	3.29	4.79	208,717	199	686	3.45	22.7	77.3	.....	.....	109	1,213	6	.....	.....	1,328	481
1908	26,270,639	1.06	47,407	113	2.38	4.30	232,484	161	554	3.44	24.6	75.4	.....	.....	135	1,203	5	.....	.....	1,343	460
1909	27,939,641	.99	38,114	110	2.89	3.94	253,997	(c)	733	(c)	20.5	79.5	.....	.....	97	1,314	22	.....	.....	1,433	550
1910	34,209,668	1.05	46,641	159	3.41	4.65	215,155	203	733	3.61	15.6	84.4	.....	.....	104	1,319	24	5	.....	1,452	690
1911	30,759,986	1.03	45,459	107	2.35	3.48	287,477	179	677	3.78	6.9	86.3	2.8	4.0	92	1,343	54	47	.....	1,536	678
1912	34,528,727	1.07	45,527	135	2.97	3.91	255,768	201	758	3.77	6.8	87.0	3.9	2.3	77	1,362	2	106	.....	1,547	647
1913	36,200,527	1.10	45,815	165	3.60	4.56	219,397	206	790	3.83	4.4	90.2	3.7	1.7	56	1,421	17	187	.....	1,681	667
Total	682,678,546	.....	.....	2,510	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1884–1913)	19,188,032	.....	31,949	76.40	2.39	3.98	251,152	188	601	3.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	18,843,115	1.13	45,401	64	1.41	3.40	294,424	108	415	3.84	6.7	85.7	3.8	3.8	56	1,461	24	128	.....	1,669	599

a Jan. 1 to Nov. 15.

b Nov. 16 to Dec. 31.

c Not reported.

TABLE 119.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **OHIO**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1874 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1874	11	5	.....	.....	.....	2	.....	.....	1	.....	.....	3	22	2	1	.....	.....	3	1	.....	.....	2	.....	1	4	29
1875	10	.....	1	.....	.....	3	.....	.....	.....	.....	.....	.....	14	3	4	.....	.....	7	1	.....	.....	.....	.....	2	3	24
1876	8	1	2	.....	.....	2	.....	.....	.....	.....	.....	.....	13	.....	.....	1	.....	1	.....	.....	.....	.....	.....	1	1	15
1877	11	6	9	.....	.....	1	1	.....	.....	.....	.....	1	29	1	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	31
1878 [a]	10	.....	1	.....	.....	1	2	.....	.....	.....	.....	2	16	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	17
1879 [b]	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1880 [a]	10	.....	4	.....	.....	4	.....	.....	.....	.....	.....	2	20	1	.....	1	.....	2	1	.....	.....	.....	.....	.....	1	23
1881	9	3	1	6	.....	1	2	.....	.....	.....	.....	2	24	3	.....	1	.....	4	1	.....	.....	1	.....	.....	2	30
1882	16	4	.....	1	.....	1	.....	.....	.....	.....	.....	.....	22	.....	.....	2	.....	2	.....	.....	1	.....	.....	.....	1	25
1883	15	.....	1	.....	.....	3	.....	.....	.....	.....	.....	.....	19	1	.....	2	.....	3	.....	.....	.....	.....	.....	.....	.....	22
1884	13	5	4	1	.....	7	.....	.....	.....	.....	.....	.....	30	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	32
1885	18	3	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	24	1	.....	1	.....	2	1	.....	.....	2	.....	.....	3	29
1886	23	8	1	.....	.....	6	.....	.....	.....	.....	.....	.....	38	1	.....	.....	.....	1	.....	.....	.....	1	1	1	3	42
1887	10	10	4	1	.....	3	.....	.....	.....	.....	.....	.....	28	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	30
1888	16	9	.....	.....	.....	2	.....	.....	1	.....	.....	.....	28	.....	1	3	.....	4	.....	.....	.....	.....	.....	.....	.....	32
1889	17	7	6	.....	.....	1	.....	.....	.....	.....	.....	.....	31	.....	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	34
1890	23	7	3	1	.....	2	1	.....	.....	.....	.....	1	38	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	39
1891	26	4	3	.....	.....	1	.....	.....	1	.....	.....	2	37	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	38
1892	21	4	5	.....	.....	5	.....	.....	.....	.....	.....	2	37	3	.....	.....	.....	3	1	.....	.....	.....	1	1	3	43
1893	20	2	5	.....	.....	3	.....	.....	.....	.....	.....	1	31	5	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	38
1894	20	3	2	1	.....	7	.....	.....	.....	.....	.....	.....	33	2	.....	3	.....	5	.....	.....	.....	1	.....	.....	1	39
1895	21	7	7	.....	.....	11	1	.....	1	1	.....	.....	49	.....	.....	1	.....	1	.....	.....	.....	1	.....	.....	1	51
1896	24	7	5	1	.....	2	.....	1	.....	.....	.....	.....	40	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	42
1897	25	4	3	.....	.....	3	.....	1	.....	.....	.....	.....	36	.....	.....	.....	1	1	.....	.....	.....	1	1	.....	2	39
1898	29	5	4	1	.....	3	.....	.....	.....	1	.....	.....	43	1	1	2	.....	4	.....	.....	.....	.....	1	.....	1	48
1899	34	6	4	.....	.....	4	.....	1	.....	.....	.....	.....	49	.....	.....	4	.....	4	.....	.....	.....	.....	2	1	3	56
1900	40	5	15	3	.....	3	.....	.....	.....	.....	.....	.....	66	2	.....	.....	.....	2	.....	.....	.....	.....	1	2	3	71
1901	31	6	9	3	.....	8	1	1	.....	.....	.....	1	60	1	.....	1	.....	2	.....	.....	.....	2	.....	.....	2	64
1902	53	5	13	3	.....	9	.....	.....	.....	.....	.....	.....	83	.....	.....	1	.....	1	.....	1	.....	1	.....	.....	2	86

1903	75	12	13	4		11		2		1		1	119		1	1	2		4	1									1	124
1904	64	10	13			13	1	2		4		1	108		4	1			5	2				1					4	117
1905	71	7	16	1		4		6		4		1	110		1		2		3	2		1	4	1				13	126
1906	75	5	12	3		12		9	2				118		1	1	8		10	3	1	2	3					3	131
1907	95	3	17	3		4		10		3		5	140		1	1			1	3	1	2	4	1				13	154
1908	71	3	17	2		6		5		1			105		1	1			2	1			1					6	113
1909	66	2	21	1		9		2		2			105		1				1	2								4	110
1910	94	7	16	1		5		7		2			147		1		2		3	5		1	1	2				2	159
1911	78	8	11			3		3		2			105															2	107
1912	91	8	16	2		5		2		1		4	129		1		1		2			2		1				4	135
1913	90	3	32	15		6		9		2		2	159		3		1		4					1				2	165
1914 c	44	1	10	1		2		1		2		1	62											1				2	64

a Jan. 1 to Nov. 15. b Nov. 16 to Dec. 31. c Mines did not work full time on account of labor troubles, average days worked being 108, as compared with 206 in 1913.

OKLAHOMA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Oklahoma have an area of about 10,000 square miles. In general the rocks of these fields dip slightly west under the Great Plains, but in Oklahoma the regular westward dip is interfered with by many local folds. On this basis the coal fields of the State may be divided into two parts as follows: (1) that part north of Canadian River in which the rocks are only slightly disturbed, and (2) the part south of Canadian River in which there are many strong anticlines and synclines that make the coal beds dip in various directions and at different angles. The part north of Canadian River is the southward continuation of the Kansas fields, but with the coal beds in greatly reduced thickness. The part south of Canadian River is similar to and a continuation of the folded and faulted fields of Arkansas. Local faults occur in the McAlester anticline near McAlester.

On the northern slope of the McAlester anticline the coal-bearing rocks are tilted until the coal beds are almost vertical, and from Hartshorne to Atoka the beds are also steeply upturned. In this respect the Oklahoma coal fields are similar to those of Washington, certain parts of Colorado, and the anthracite fields of Pennsylvania. They differ from the coal fields of Washington in that the coal has not been crushed or changed in character by structural movement of the inclosing rocks.

The southern part of the coal field is the more important, as more than three-fourths of the coal mined in 1913 came from that section. The larger part of an area embracing Craig, Rogers, Tulsa, Wagoner, Okmulgee, Muskogee, McIntosh, Haskell, Sequoyah, Le Flore, Coal, Latimer, and Pittsburg counties, all in the eastern part of the State, is known to contain coal.

CHARACTER OF COAL BEDS.

There are seven coal beds in this field that are thick enough to be worked on a commercial scale. There are, however, two groups of beds from which most of the coal mined in the southern part of the field has been obtained. These are the Hartshorne coal beds, generally two in number, at the top of the Hartshorne sandstone, and the two McAlester coal beds near the top of the McAlester shale, and from 1,500 to 1,800 feet above the Hartshorne group. The Hartshorne beds are in places about 50 feet apart, and in other places they meet. West of Wilburton the upper bed is absent. The lower bed is 4 to 5 feet thick and the upper one is about 4½ feet thick. East

of Wilburton there are two beds about 2½ feet thick in the McAlester group; but about Hartshorne, McAlester, and Savanna there is only one bed, which ranges in thickness from 3 to 5 feet.

The Henryetta field in Okmulgee county was recently opened. It contains a bed of coal averaging 3 feet in thickness, and lying practically horizontal at depths varying from 100 to 200 feet, and is worked mostly by machines. The coal is not as good as other Oklahoma coals but serves as a good steam and railroad fuel, and can be produced more cheaply than the other coals to the south of Okmulgee County. Two important mining towns, Henryetta and Dewar, have recently been built as a result of the development of this coal field. The Henryetta coal field, unlike the southern coal fields, is not on segregated lands. The coal beds in Pittsburg, Coal, Latimer, and Le Flore counties and part of Haskell County, are on segregated coal lands belonging to the Choctaw and Chickasaw Indian Nations.

MINING METHODS.

The earliest records of coal production in Oklahoma are for 1880, when 120,947 tons of coal was produced. The production in 1913 was 4,165,770 tons. About 60 per cent of the mines are opened by slopes and drifts with lengths on the incline varying from 50 to 3,500 feet. The shaft mines number about one-third of the mines in the State, and vary in depth from 70 to 800 feet. The coal is mined entirely by the room-and-pillar method. Some of the mines are quite gaseous, and much dust is produced in mining.

In 1896 there were 56 mining machines in operation, which produced 14 per cent of the coal mined in the State. In 1898, there were 75, which produced 19.9 per cent of the coal. The use of mining machines gradually declined until in 1907 there were only 11 machines in operation, producing less than 1 per cent. Since that date, the number of machines has gradually increased until in 1913, there were 103 machines in operation, producing 16.1 per cent of the coal.

Shooting off the solid is practiced to such an extent in Oklahoma that in 1912, 86.4 per cent of the coal was thus produced. This proportion, however, was by the increase of machines in 1913 reduced to 80.9 per cent. The laws of the State compel the payment of wages on the basis of run-of-mine, hence a tendency to encourage the practice of shooting from the solid. Holes are usually drilled 6 to 10 feet deep, and sometimes as much as 14 feet with no undercutting nor channeling. Sufficient powder is charged to break the coal with the result that much fine coal is produced. In some instances

these long holes are charged with dynamite. Dust is scattered throughout the mine, the roof is loosened more or less, and at least 15 per cent of the coal shot down is thrown into the gob and lost. This method of mining produces unsafe conditions in the mine in addition to being wasteful, as much of the coal is so badly crushed that it is unfit for commercial uses.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The act of Congress establishing a mine-inspection service in all Territories where the output of coal exceeded 1,000 tons annually was approved March 3, 1891. Under this act the first inspector in Indian Territory (now Oklahoma) entered on duty March 20, 1893. Mine operators were required to report to the inspector all cases of fatal accidents at their mines, such report to be in writing and made within 10 days after such death occurred. Annual reports for fiscal years ending June 30 were rendered to the Secretary of the Interior.

A State department of mines and mining was created by an act approved April 6, 1908, and under the provisions of this law the appointment of a chief mine inspector and three district inspectors was authorized, the inspectors to investigate all accidents, injuries, and deaths at mines. The first report of the State inspector covers the period from November 16, 1907, to October 31, 1908, and annual reports since the latter date have been issued for fiscal years ending October 31.

It has been the practice of mine operators to report to the inspector all fatal and serious accidents. Since the enactment of the compensation law, all accidents causing a disability of one day or more are reported. All accidents reported are included in the inspector's annual reports and are classified as fatal or nonfatal, but no distinction is made between serious and slight injuries.

In 1915 the inspection force consisted of one chief inspector and three deputy inspectors.

ACCIDENTS.

Tables 120 and 121 show the production of coal, number of men employed, and the number of fatalities in and about the coal mines of Oklahoma. The fatalities as tabulated have been compiled from the Territorial and State mine inspectors' records, and are complete from 1893 to and including 1913. During this period of 21 years, there were 729 fatalities representing a rate of 5.45 per 1,000 men employed.

FATALITIES IN **OKLAHOMA** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1893 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	153	20.99	1.14
Mine cars and locomotives	78	10.70	.58
Gas and dust explosions	262	35.94	1.96
Explosives	115	15.77	.86
Miscellaneous	79	10.84	.59
Shaft	25	3.43	.19
Surface	17	2.33	.13
Total, 21 years	729	100.00	5.45

COAL-MINE ACCIDENTS IN **OKLAHOMA** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1892 Jan. 7	No. 11	Krebs	Mine explosion	100
1897 Jan. 4	No. 1	Alderson	do	5
1901 Apr. 29	McAlester No. 5	do	Blown-out or windy shot.	6
1901 Dec. 28	No. 1	Hartshorne	Fell from cage	6
1902 Jan. 13	Milby and Dow	Dow	Mine fire	10
1903 Apr. 12	Central Slope 77	Carbon	Mine explosion	6
1905 Apr. 30	No. 19	Wilburton	do	13
1906 Jan. 24	Poteau No. 6	Witteville	Dynamite explosion	14
1908 Aug. 26	Hailey-Ola No. 1	Haileyville	Mine fire	29
1909 Oct. 21	Rock Island No. 8	Hartshorne	Mine explosion	10
1910 Mar. 31	Great Western No. 2	Wilburton	do	6
1912 Feb. 22	Western No. 5	Lehigh	Mine fire	9
1912 Mar. 20	San Bois No. 2	McCurtain	Mine explosion	73
1914 Sept. 4	No. 1	Adamson	Cave-in	13

The amount of coal produced per fatality during this period was 71,111 tons, or there were 14.06 fatalities per million tons mined. Of the total number of fatalities during this period 35.94 per cent was due to gas and dust explosions, 20.99 to falls of roof and coal, and 15.77 per cent to explosives. Mine cars and locomotives claim 10.70 per cent of the fatalities. Since the beginning of inspection service March 20, 1893, to and including 1913, there were 12 mine disasters in which 5 or more men were killed at one time, as shown in the accompanying list.

Since 1903, the majority of the employees at the coal mines in Oklahoma have been on an 8-hour basis. Fatalities have, therefore, been calculated on the basis of a 2,000-hour year, showing that the rate for Oklahoma on this basis is 6.81 for the period of 1903 to 1913, except 1909. This compares with 5.08 based on the number of actual employees for the same period. The number of hours worked per year per man is 1,406, as compared with 1,564 for Kansas, and 2,132 for West Virginia. The Oklahoma rate based on the actual number

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **OKLAHOMA**.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, and 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	55	6,952	3	487	2	190	75	7,704
1904	59	8,251	2	95	2	75	66	8,487
1905	59	7,544	.....	.....	3	108	60	7,712
1906	70	7,824	3	167	4	81	179	8,251
1907	83	8,079	.....	.....	6	194	125	8,398
1908	64	8,258	.....	.....	4	118	275	8,651
1909[b]	.....	.....	.....	.....	.....	.....	.....	8,689
1910	89	8,472	.....	.....	2	50	135	8,657
1911	90	8,247	.....	.....	3	35	447	8,729
1912	82	8,105	.....	.....	3	120	560	8,785
1913	87	8,725	.....	.....	2	109	210	9,044

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **OKLAHOMA** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	247	62,574	15,455,778	7,727	42	5.44
1904	199	68,207	13,573,193	6,786	29	4.27
1905	188	61,972	11,650,736	5,825	41	7.04
1906	166	66,516	11,041,656	5,521	44	7.97
1907	216	67,697	14,622,552	7,311	39	5.33
1908	172	69,719	11,991,668	5,996	46	7.67
1909[a]	.....	.....	.....	.....	.....	.....
1910	144	69,491	10,006,704	5,003	39	7.80
1911	156	70,349	10,974,444	5,487	27	4.92
1912	174	71,080	12,367,920	6,184	99	16.01
1913	197	72,780	14,337,660	7,169	23	3.21

[a] Census year.

of employees appears to be slightly less than the fatality rate in West Virginia, but when reduced to the uniform basis of fatalities per 2,000-hour workers, the rate becomes 6.81 for Oklahoma, as compared with 5.18 for West Virginia. For comparative purposes, Tables 40 and 41 have been compiled so that it is an easy matter to compare Oklahoma with other States. The tables of statistics for the State of Oklahoma follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN OKLAHOMA.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	1,825	281,256	154	1907	669	17,092	26
1900	110	31,100	283	1908	6,929	398,251	57
1901	.....	.....	.....	1909	1,576	11,368	7
1902	150	9,000	60	1910	8,213	1,247,828	152
1903	448	1,928	4	1911	444	15,106	34
1904	488	5,175	11	1912	860	12,109	14
1905	397	3,509	9	1913	1,696	135,274	80
1906	7,372	535,504	72	1914	1,286	39,600	31

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 120.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **OKLAHOMA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 compiled from Territorial and State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in colums 9 and 10 prior to 1000 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1880–1887	2,966,438																				
1888	761,986	1.88	1,700						448												
1889	752,832	1.76	1,862					(b)	404												
1890	869,229	1.82	2,571					238	338	1.42											
1891	1,091,032	1.74	2,891					222	377	1.70											
1892	1,192,721	1.71	3,257	c 100				211	366	1.73											
1893	1,252,110	1.79	3,446	6	1.74	4.79	208,685	171	363	2.12											
1894	969,606	1.59	3,101	9	2.90	9.28	107,734	157	313	1.99											
1895	1,211,185	1.43	3,212	9	2.80	7.43	134,576	164	377	2.30											
1896	1,366,646	1.40	3,549	15	4.23	10.98	91,110	170	385	2.26		14.0									56
1897	1,336,380	1.34	3,168	28	8.84	20.95	47,728	176	422	2.40		19.7									54
1898	1,381,466	1.32	3,216	23	7.15	16.65	60,064	198	430	2.17		19.9									75
1899	1,537,427	1.43	4,084	28	6.86	18.21	54,908	212	376	1.77		18.0			52	16	6				74
1900	1,922,298	1.45	4,525	35	7.73	18.21	54,923	228	425	1.86		12.5									58
1901	2,421,781	1.62	6,706	57	8.50	23.54	42,487	208	361	1.74		7.3									47
1902	2,820,666	1.51	5,574	42	7.53	14.89	67,159	232	506	2.18		4.2									23
1903	3,517,388	1.82	7,704	42	5.45	11.94	83,747	247	457	1.85		2.1			16	18	2				36
1904	3,046,539	1.82	8,487	29	3.42	9.52	105,053	199	359	1.80		1.4			8	10					18
1905	2,924,427	1.76	7,712	41	5.32	14.02	71,327	188	379	2.02		1.4			25	4					29
1906	2,860,205	1.92	8,251	44	5.33	15.38	65,005	166	347	2.09		1.2			18	11					29
1907	3,642,658	2.04	8,398	39	4.64	10.71	93,401	216	434	2.01		.7			7	3	1				11
1908	2,948,116	2.03	8,651	46	5.32	15.60	64,089	172	341	1.98		1.1			15	2					17

1909	3,119,377	2.00	8,689	48	5.52	15.39	64,987	(b)	359	(b)	.....	1.5	.....	.....	28	4	2	.....	.....	34	99
1910	2,646,226	2.22	8,657	39	4.51	14.74	67,852	144	306	2.13	.....	1.1	.....	.....	12	.....	1	.....	.....	13	98
1911	3,074,242	2.05	8,729	27	3.09	8.78	113,861	156	352	2.26	5.5	2.8	78.8	12.9	5	6	5	2	8	26	112
1912	3,675,418	2.14	8,785	99	11.27	26.94	37,125	174	418	2.40	1.3	7.1	86.4	5.2	16	14	4	15	11	60	101
1913	4,165,770	2.05	9,044	23	2.54	5.52	131,120	197	461	2.34	2.2	16.1	80.9	.8	35	13	.....	45	10	103	95
Total	59,474,164	.....	.....	829	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average [1893-1913]	**2,468,568**	.....	**6,366**	**34.71**	**6.46**	**14.06**	**71,111**	**181**	**388**	**2.03**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	3,988,613	2.06	8,078	31	3.84	7.77	128,665	205	494	2.41	2.0	26.4	70.7	.9	29	8	20	57	2	116	9

[a] Oklahoma became a State in 1908. Figures for years previous refer to Indian Territory. [b] Not reported. [c] Figures in italics represent incomplete fatality records.

TABLE 121.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **OKLAHOMA**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1893 TO 1914, INCLUSIVE.

Year.	Killed underground.												Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1893	2	1	1	1	.....	1	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1894	3	.....	2	1	.....	2	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	9
1895	2	.....	2	4	.....	1	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
1896	6	1	2	4	.....	2	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
1897	6	1	3	2	5	4	.....	.....	1	.....	2	.....	24	1	.....	2	.....	3	.....	.....	.....	1	.....	.....	1	28
1898	4	1	4	4	5	4	.....	1	.....	.....	.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23
1899	7	2	2	4	.....	9	.....	3	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	28
1900	9	1	2	11	5	4	.....	1	.....	.....	.....	.....	33	.....	2	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	35
1901	12	.....	7	8	12	6	.....	1	.....	.....	.....	.....	48	2	.....	8	.....	10	.....	.....	.....	.....	1	.....	1	57
1902	10	.....	8	4	2	5	.....	1	.....	.....	10	.....	40	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	2	42
1903	10	.....	3	13	4	9	.....	.....	1	.....	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	42
1904	4	.....	7	3	10	3	.....	.....	.....	.....	.....	.....	27	.....	1	1	.....	2	.....	.....	.....	.....	.....	.....	.....	29
1905	6	1	3	18	3	8	1	.....	.....	.....	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	41
1906	7	.....	4	6	8	17	.....	.....	.....	.....	.....	.....	42	1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	1	44
1907	15	2	2	4	3	12	.....	1	.....	.....	.....	.....	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39
1908	3	.....	3	2	2	1	1	.....	.....	.....	29	4	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	46
1909	6	.....	6	15	4	10	.....	.....	.....	.....	.....	6	47	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	48
1910	11	.....	3	.....	13	3	.....	.....	.....	.....	.....	1	31	.....	.....	2	3	5	.....	.....	1	.....	.....	2	3	39
1911	6	.....	5	1	1	9	.....	1	.....	.....	2	.....	25	.....	.....	1	.....	1	.....	.....	.....	.....	.....	1	1	27
1912	6	1	3	75	2	1	.....	.....	.....	.....	11	.....	99	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	99
1913	7	.....	6	2	1	4	.....	2	.....	.....	.....	.....	22	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	23
1914	20	.....	3	1	1	2	.....	3	.....	.....	.....	1	31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31

OREGON.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal in Oregon is subbituminous. The Coos Bay field, which is the principal one in the State, occupies a small structural basin in the vicinity of Coos Bay and contains 230 square miles. It extends north and south and is about 30 miles long, with a maximum width of 11 miles. There are other coal fields in the State, but none of them has been worked to any extent, so do not enter into the question of mine accidents. The Coos Bay field may be divided into six parts, consisting of four basins and two arches. The basins containing workable coal are the Newport, Beaver Slough, Coquille, and South Slough. The arches contain no coal. The structure of these basins may be considered as simple, the dip being slight. There are a number of faults, but these are of little importance.

The Newport basin, the principal one that has been worked, contains about 6 feet of coal in three benches, yielding 5 feet of coal that can be mined. The roof is sandstone and requires comparatively little timbering. The top bench of coal is usually left with the upper parting to form the roof.

The Beaver Slough basin contains five beds, the most important being the lowest one, which contains over 6 feet of coal. This bed has been mined at Beaver Hill.

MINING METHODS.

The first records of coal production for Oregon are for the year 1880, when 43,205 tons was reported. Three mines have been opened by drifts and slopes in the Newport basin, and the coal is mined by the room-and-pillar method. In the Beaver Slough basin one or two mines have been opened by slopes and a small amount of coal has been mined by the pillar-and-chute system.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

No provision has been made by the State of Oregon whereby accidents in or about coal mines shall be reported to a State official. The coal production of the State since 1880 has averaged less than 64,000 tons annually. Reports of accidents have, since 1910, been voluntarily rendered to the Federal Bureau of Mines by the mine operators at the close of each calendar year.

ACCIDENTS.

The production of coal, number of men employed, and the number of fatalities, as far as complete records are available, are given in Tables 122 and 123. The fatalities at coal mines have been recorded

only since 1909, but the number of employees has been reported since 1890. For the five years for which continuous records are available, the accident rate in Oregon is comparatively low, being 2.69 per 1,000 men employed, but on the tonnage basis it is high, being 10.37 fatalities per million tons mined. There have been no serious coal-mine disasters in Oregon. The tables of statistics for the State follow:

FATALITIES IN OREGON COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEAR 1909 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	1	33.00	0.90
Mine cars and locomotives	2	67.00	1.79
Gas and dust explosions			
Explosives			
Miscellaneous			
Shaft			
Surface			
Total, 5 years	3	100.00	2.69

STRIKES AND LOCKOUTS.

During 1914, the first year in which there were labor troubles in Oregon, 21 men were on strike, resulting in the loss of 798 days, or an average of 38 days per man.

TABLE 122.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN OREGON, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and columns 2, 3, and 8 compiled from Mineral Resources, U. S. Geol. Survey. Figures in column 4 reported direct to the Bureau of Mines by the operators. Figures in columns 5, 6, 7, 9, and 10 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1880–1889	468,860																				
1890	61,514	2.89	208					305	296	0.97											
1891	51,826	3.00	100					125	518	4.14											
1892	34,661	4.29	90					120	385	3.21											
1893	41,683	3.57	110					192	379	1.97											
1894	47,521	3.87	88					243	540	2.22											
1895	73,685	3.36	414					69	178	2.58											
1896	101,721	2.90	254					191	400	2.09											
1897	107,289	3.09	254					171	422	2.47											
1898	58,184	3.65	199					142	292	2.06											
1899	86,888	3.00	124					238	701	2.95											
1900	58,864	3.74	141					273	417	1.53											
1901	69,011	2.52	187					228	369	1.62											
1902	65,648	2.44	265					234	248	1.06											
1903	91,144	2.43	235					258	388	1.50											
1904	111,540	2.18	334					149	334	2.24											
1905	109,641	2.58	316					242	347	1.43											
1906	79,731	2.66	209					224	381	1.70											
1907	70,981	2.34	184					231	386	1.67											
1908	86,259	2.74	214					249	403	1.62											
1909	87,276	2.69	235	1	4.26	11.46	87,276	(a)	371	(a)											10
1910	67,533	3.48	153	0				257	441	1.72											11
1911	46,661	2.32	304	1	3.29	21.43	46,661	179	153	.85											9
1912	41,637	2.60	222	1	4.50	24.02	41,637	239	188	.79											9
1913	46,063	2.53	203	0				283	227	.80											7
Total	2,165,821			3																	
Average (1909–1913)	57,834		223	0.6	2.69	10.37	96,390	232	259	1.12											
1914	51,558	2.78	190	1	5.26	19.40	51,558	266	271	1.02											3

(a) Not reported.

TABLE 123.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN OREGON, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1909 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1909					1								1													1
1910																										0
1911	1												1													1
1912				1									1													1
1913																										0
1914				1									1													1

PENNSYLVANIA (ANTHRACITE).

AREA AND DISTRIBUTION OF COAL FIELDS.

The anthracite coal fields of Pennsylvania occupy portions of Sullivan, Lackawanna, Luzerne, Carbon, Schuylkill, Dauphin, and Northumberland and Columbia counties in the northeastern part of the State. They comprise an area of 480 square miles, and form four distinct fields, as follows: The northern or Wyoming-Lackawanna field, in Luzerne and Lackawanna counties; eastern-middle or Lehigh field, in Luzerne and Carbon counties; southern or Schuylkill field, in Dauphin and Schuylkill counties; and western-middle field. A brief description of each field is given in the following paragraphs:

CHARACTER OF COAL BEDS.

The coal beds of the anthracite fields of Pennsylvania are described by Stoek [a] as follows:

NORTHERN FIELD.

From Forest City to Pittston and from Pittson to Nanticoke, north of the Susquehanna, the maximum dips are 10° to 20°, while between Pittston and Nanticoke, south of the Susquehanna, steeper dips, ranging from 60° to 70°, are found, and near Glen Lyon the measures are overturned and badly broken. There are numeous anticlines and synclines in the measures which can sometimes be traced on the surface, the synclines being often marked by ridges and the anticlines by valleys.

A marked feature of the northern field is the buried valley of the Susquehanna, extending from Pittston to Nanticoke. This is the bed of a former glacial stream which has cut down into the coal measures in places, thus cutting out large areas of the upper coal beds. The valley is now filled with sand, and there are numerous pot holes in it, which add an element of uncertainty and danger to the mining.

The Wyoming-Lackawanna basin is deepest (2,200 feet) midway between Wilkes-Barre and Nanticoke. About 4 miles above Pittston, near Lackawanna station, only 100 to 150 feet of the coal measures are left, but northeast from here, several miles above Scranton, the coal measures sink again to a depth of 700 feet, and then rise and spoon out beyond Forest City.

It is difficult to state the number of workable beds, as beds are now being worked in the upper end of the Lackawanna Valley which a very few years ago were neglected and considered unworkable. The splitting of a large coal bed into several smaller beds, which divide and are sometimes separated by as much as 200 feet of rock, renders it impossible to correlate beds in different parts of the field until continuous sections can be made by means of actual mine workings. As the result of measurements of 891 sections by the second geological survey of Pennsylvania, 81.8 per cent of the total coal in the Wyoming basin is or may be considered marketable coal, the remaining 18.2 per cent being interbedded slate, shale, and other refuse. The deposits in this section are particularly free from refuse, and the comparative freedom of this section from plication and folding gives a high percentage of marketable coal.

EASTERN-MIDDLE FIELD.

The structure of the eastern-middle field is simple, consisting of a succession of anticlines, usually with broad flat crests and shallow intervening basins only about

[a] H. H. Stoek, The Pennsylvania anthracite coal fields: 22d annual rept., 1900–1901, U. S. Geol. Survey, 1901, p. 69.

500 to 600 feet deep, the sides dipping 10° to 40°. This gives a large extent of outcrop, and the comparative shallowness of the basins has been very favorable to mining, so that the field has been extensively developed and its structure quite thoroughly determined. The Mammoth, Buck Mountain, Primrose, Parlor, Portland, and Gamma beds vary in thickness in different localities. The second geological survey of Pennsylvania estimated that from 75 to 77 per cent of the total thickness of coal was marketable.

SOUTHERN FIELD.

The southern field consists of a number of connected basins which grow gradually deeper from north to south, culminating along the foot of Sharp Mountain in very deep, highly upturned, and greatly contorted measures. The Pottsville conglomerate in this region is very thick, ranging from 1,100 to 1,475 feet. It is made up of coarse materials, and contains a number of valuable coal beds, especially at the western end. At the point where the main field subdivides into the two westwardly extending basins there are 6 Lykens Valley beds in the conglomerate, each 3 to 10 feet thick. The coal measures proper are at least 2,500 feet thick, and 20 different coal beds have been worked. From measurements of 275 sections the second geological survey estimated 72 per cent of the coal as marketable.

WESTERN-MIDDLE FIELD.

In the western-middle field the beds incline steeply, the average dip being 35 to 40 degrees. There has been much folding, sliding, and shifting of strata, which has crushed the coal in many places and mixed with it slate and bony coal partings. The coal measures are 1,200 feet thick, and contain from 10 to 12 different beds, many of them of great thickness and with comparatively small intervening barren intervals. The Lykens Valley beds are also found in the conglomerate, or No. 12, and toward the western end of the field these beds are mined; 1,144 sections throughout the field give 23 per cent of refuse in the coal, but it is not safe to estimate more than 75 per cent of the original deposit as marketable coal.

Fire damp is found in many of the deeper mines, particularly in the Wyoming region and in the western end of the Schuykill region. In a number of mines it is present in such quantities that the use of safety lamps is absolutely necessary.

MINING METHODS.

In each of the anthracite fields there are a number of places where the coal outcrops near the surface, and where conditions are favorable for mining the coal by open-pit methods. The overburden is stripped by hand labor, steam shovel, or wire-rope tramway and the coal quarried out and hauled by incline to the surface, or if the stripping pit communicates with the underground workings the coal may be taken through underground haulage ways to the bottom of the shaft or slope and then hoisted to the surface.

Most of the mines are shaft and slope mines, the slopes being driven in the coal from the outcrop, and the shafts being always vertical and usually so placed as to cut the coal at the lowest possible elevation on the property in question. The room-and-piller system is the one usually used for underground mining, but owing to the deposits being

steeply inclined and more or less irregular, the system has to be adapted to meet local conditions in mining the various beds. It is impossible to carry out a typical room-and-pillar system, as in the flat bituminous coal beds. The details of the system under different mining conditions vary so widely that a comparison of mining methods from different districts or localities gives the impression that the coal is mined by several systems having nothing in common. On close inspection, however, the fact is disclosed that they all have three features which are identical:[a] (1) The breasts, or rooms, or working places are all long and comparatively narrow; (2) they are driven nearly parallel to each other; and (3) they are separated by long narrow pillars of coal, broken only by small openings for ventilation.

These three features, which are common to all anthracite workings in Pennsylvania, are the identifying characteristics of the "pillar-and-breast," "pillar-and-room," "post-and-stall," "stoop-and-room," or "bord-and-pillar" system. The geologic peculiarities of the anthracite coal beds explain why the mining methods differ so radically in detail from those employed in other beds. Coal beds ranging from 3 or 4 feet up to 70 feet in thickness are worked on dips varying from horizontal to vertical.

From the bottom of the shaft or slope a gangway and a parallel airway are driven in opposite directions from the shaft or slope and along the strike of the bed. From these gangways rooms or breasts are turned either at right angles or obliquely, the angle of turning being dependent upon the dip of the seam.

"Flat workings" is a term applied to those coal beds which vary from horizontal to a dip of about 25°. When the coal bed is flat, it is usually opened by a shaft sunk through the overlying measures. Gangways are driven from the bottom of the shaft, and when they have reached a sufficient distance to permit a thick pillar of coal being left to protect the shaft, breasts are opened from the upper side of each gangway.

Where the inclination is more than 30°, the coal will slide without the use of sheet-iron chutes, and it then becomes necessary to stop up the lower end by a battery, built of logs or heavy planks. This acts as a support for the broken coal and allows the breast to fill to the face with coal, thus giving the miners a broken-coal platform on which to stand while working.

The battery workings may be divided into two general classes: (1) Where the coal is stored in the breast and the rock and refuse taken out through a chute, and (2) where the rock is stored in a breast and the coal taken out through chutes. Details of the various modifications of these systems are given fully by Chance.[b]

[a] Chance, H. M., Mining methods and appliances used in the anthacite coal fields: Second Geol. Survey of Pennsylvania, 1883, p. 129.

[b] Chance, H. M., loc. cit.

In the anthracite mines rotary drills are used and the coal is broken by the use of black powder. Dynamite or giant powder is used largely for rock work and sometimes for driving gangways in coal. Dynamite shatters the coal so badly that it is not used extensively for the mining of coal. The coal is not undercut as a general rule, and it is only recently that special mining machines have been developed for the anthracite field.

Table 50 shows the amount of explosives used in the anthracite fields from 1899 to 1913. It will be noted that the increase in the amount of dynamite used has been about fivefold since 1899, whereas the amount of black powder used has increased only about one-third. In 1909 permissible explosives were introduced into the anthracite mines and in five years the quantity used has increased from 666,807 pounds to 3,323,645 pounds in 1913. The fatalities due to the use of explosives in the anthracite mines are given in Table 49.

Every known form of haulage is to be found in the anthracite mines; the main ones are indicated in Table 54. The number of horses and mules used in the mines has remained practically the same since 1898, averaging about 15,000 per year. The number of steam locomotives used has almost doubled, whereas the number of electric locomotives has increased from 24 in 1898 to 781 in 1913. The number of compressed-air locomotives has increased from 10 in 1898 to 161 in 1913. Cars are usually gathered from the rooms by mules except where the grade is sufficient to run the cars out by gravity. The cars vary in size from 70 to 140 cubic feet and in capacity from $1\frac{3}{4}$ to 4 tons. They are usually built of wood with iron bands, although steel cars have been introduced in recent years.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The official inspection of coal mines in Pennsylvania was established by an act approved April 12, 1869, applicable only to anthracite mines in Schuykill County. The appointment of the inspector was vested in the governor, and the inspector was required to investigate the cause of every accident resulting in death or serious injury. Mine operators were required to report to the inspector within 24 hours all accidents resulting in death or personal injury. The inspector rendered annual reports to the governor and enumerated therein all accidents in and about the mines.

An act approved March 3, 1870, terminated the services of the inspector appointed under the act of April 12, 1869, and authorized the governor to appoint, upon the recommendation of the examining boards, six mine inspectors—three for the counties of Luzerne (including what is now Lackawanna County) and Carbon and three for the counties of Schuylkill, Dauphin, Northumberland, and Columbia.

Annual reports, in which all accidents were enumerated, were rendered to the governor. An act approved April 5, 1870, divided the inspection counties into two districts and authorized the appointment for each district of a clerk, to whom the inspectors were required to render monthly reports of deaths and injuries.

On May 9, 1871, an act was approved requiring coal companies in counties where there was no inspector to furnish a report of all accidents to the auditor general, who was required to publish an annual report and state therein the causes of such accidents. The auditor's report was published under the title of "Mineral Statistics of Pennsylvania." The act of April 25, 1873, transferred the authority to appoint the mine inspectors from the governor to a majority of the board of examiners provided for by the act of March 3, 1870, but the appointive power was again vested in the governor by an act approved May 18, 1878. On June 30, 1885, an act was approved applicable to all anthracite mines employing more than 10 men. The anthracite counties were divided into seven districts and the inspectors were required to render annual reports to the secretary of internal affairs. The number of inspection districts was increased to eight by an act approved June 2, 1891. An act of July 15, 1897, made it unlawful to employ as a miner any person not holding a certificate of competency from the miners' examining board established by the act. An act of July 15, 1897, established a bureau of mines in the department of internal affairs.

An act approved June 8, 1901, effective January 1, 1902, changed the manner of selecting the mine inspectors by making the office elective instead of appointive. The number of elective districts was reduced to 6, but the number of inspectors was increased to 15. It was provided that the inspectors should be elected from among a list of eligibles certified to the secretary of state by the examining board. The inspectors so elected rendered monthly reports to the chief of the Bureau of Mines and also rendered annual reports to the secretary of internal affairs.

An act of April 14, 1903, established the department of mines.

On May 3, 1905, an act was approved increasing the number of districts to 7, and the number of inspectors to 20, and requiring the inspectors to make annual reports to the chief of the department of mines. An act of May 5, 1911, provided for 8 elective districts and 21 inspectors, and an act of June 1, 1915, increased the number of anthracite inspectors to 25.

Under the inspection laws, it is the practice of the operators to report to the district inspectors all injuries causing disability for 6 days or more. The district inspectors, in their reports to the department of mines, omit accidents of a less serious nature, so that only the more serious injuries are published in the annual report of the

department of mines. The department has not officially defined a serious injury, and it is left to the descretion of each district inspector as to which of the accidents reported to him by mine operators may be eliminated from his report to the department.

ACCIDENTS.

Tables 124 and 125 show the total number of men employed and the number of men killed from the beginning of inspection service in 1870 to date. During the period 1870 to 1913, inclusive, 17,716 fatalities occurred in and about the anthracite mines, representing a rate of 3.42 per 1,000 men employed. The amount of coal mined per fatality was 124,968 tons, or there were 8 fatalities per million tons mined.

Table 125 shows the number of fatalities by causes, in conformity with the latest reports of the State mine inspector and so adapted as to conform with the standard form used by the Bureau of Mines. This classification gives much more detail than is ordinarily available, and it is believed will be of material assistance to operators, inspectors, and others, who are making a study of mine accidents, their causes, and their prevention.

Of the total number of fatalities that have occurred during this period, 41.65 per cent was due to falls of roof and coal; 13.56 per cent to mine cars and locomotives; 10.10 per cent to explosives; and 7.59 per cent to explosions of gas. The percentage of fatalities due to explosives in the anthracite mines is practically 5 times that in the Pennsylvania bituminous fields, given in tables relating thereto, whereas the rate per 1,000 men employed is 7 times as high as it is in the bituminous fields of the State.

Since 1869 to the end of 1914 there have been in the anthracite field 80 accidents in each of which 5 or more men have been killed at one time. A complete list of these disasters is shown in the accompanying table.

FATALITIES IN **PENNSYLVANIA ANTHRACITE** COAL MINES, BY PRINCIPAL CAUSES DURING THE YEARS 1870 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	7,378	41.65	1.42
Mine cars and locomotives	2,403	13.56	.46
Gas explosions	1,344	7.59	.26
Explosives	1,790	10.10	.35
Miscellaneous	1,637	9.24	.32
Shaft	843	4.76	.16
Surface	2,321	13.10	.45
Total, 44 years	17,716	100.00	3.42

ACCIDENTS IN **PENNSYLVANIA ANTHRACITE** MINES IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1847 Feb. —	Spencer	Pottsville	Mine explosion	7
1869 Sept. 6	Avondale	Plymouth	Mine fire	179
1870 Mar. 22	Potts	Potts mine	Explosion of breaker boilers.	5
1870 Aug. 10	Heine & Glassmire	Middleport	Cage fell down shaft	9
1870 Aug. 29	Preston No. 3	Girardville	Fell down slope	7
1871 May 27	West Pittston	West Pittston	Smoke from burning breaker.	20
1871 Oct. 2	Otto Red Ash	Branch Dale	Mine explosion	5
1873 June 10	Henry Clay	Shamokin	do	10
1877 May 9	Wadesville	Wadesville	do	7
1878 Jan. 15	Potts	Locust Dale	do	5
1879 May 6	Audenried	Audenried	Mine fire	6
1880 May 3	Lykens Valley	Shamokin	Mine explosion	5
1882 May 24	Kohinoor	Shenandoah	do	5
1884 Aug. 21	Buck Ridge	Shamokin	Mine fire	7
1885 Apr. 6	Cuyler	Raven Run	Fall of roof	10
1885 Aug. 11	West End	Mocanaqua	Gas from boiler fires in mine.	10
1885 Oct. 21	Plymouth No. 2	Plymouth	Mine explosion	6
1885 Dec. 18	Nanticoke No. 1	Nanticoke	Buried by inrush of quicksand.	26
1886 Aug. 30	Fair Lawn	Scranton	Mine explosion	6
1886 Sept. 13	Marvine	do	Suffocated by inrush of mine gas.	8
1886 Nov. 26	Conyngham	Wilkes-Barre	Mine explosion	12
1887 Apr. 27	Tunnel	Ashland	Suffocated by inrush of mine gas.	5
1889 May 9	Kaska William	Middleport	Mine car fell on men in cage.	10
1890 Feb. 1	Nottingham	Plymouth	Mine explosion	8
1890 Mar. 3	Shaft No. 3	South Wilkes-Barre	do	8
1890 Apr. 2	Susquehanna No. 4	Nanticoke	do	5
1890 May 15	Jersey No. 8	Ashley	do	26
1891 Feb. 4	Spring Mountain No. 1	Jeanesville	Drowned by inrush of water from abandoned workings and asphyxiated by gas from fire built by imprisoned men.	13
1891 Oct. 23	Richardson	Glencarbon	Imprisoned by rush of coal and suffocated by mine gas.	7
1891 Nov. 8	Susquehanna No. 1	Nanticoke	Mine explosion	12
1892 Apr. 20	Lytle	Minersville	Drowned by water from old workings.	10
1892 July 23	York Farm	Pottsville	Mine explosion	15
1893 Apr. 1	Neilson	Shamokin	Mine fire	10
1893 June 22	Susquehanna No. 1	Nanticoke	Mine explosion	5
1893 Sept. 21	Lance No. 11	Plymouth	do	6
1894 Feb. 13	Gaylord	do	Fall of roof	13
1894 July 17	East Sugar Loaf	Stockton	Dynamite explosion	8
1894 Oct. 8	Luke Fidler	Shamokin	Mine fire	5
1894 Oct. 11	Henry Clay	do	Boiler explosion	6
1895 Feb. 18	West Bear Ridge	Mahanoy Plane	Mine explosion	5
1895 Oct. 7	Dorrance	Wilkes-Barre	do	7
1896 June 28	Twin	Pittston	Fall of roof	58
1896 Oct. 29	Shaft No. 3	South Wilkes-Barre	Mine explosion	6
1897 Jan. 13	Wadesville	Wadesville	Crosshead fell down shaft.	5
1897 Sept. 28	Jermyn No. 1	Rendham	Mine fire	5
1897 Oct. 30	Von Storch	Scranton	do	6
1898 May 26	Kaska William	Middleport	Drowned by water from old workings.	6
1898 Oct. 1	Midvale	Wilkes-Barre	Mine fire	5
1898 Nov. 5	Exeter	West Pittston	Mine car fell on men in cage.	9
1900 Nov. 9	Buck Mountain	Mahanoy	Mine explosion	7
1901 Oct. 25	Buttonwood	Plymouth	do	6
1902 Nov. 29	Luke Fidler	Shamokin	do	7
1902 Dec. 9	South Wilkes-Barre	South Wilkes-Barre	Dynamite explosion	5
1904 Jan. 30	Maple Hill	Mahanoy City	do	5
1904 May 5	Lance	Plymouth	do	5
1904 May 5	Locust Gap	Locust Gap	Mine fire	5
1904 May 25	Williamstown	Williamstown	Suffocated by gases from locomotive.	10
1904 Nov. 2	Auchincloss	Nanticoke	Fell down shaft	10
1905 Feb. 18	Lytle	Minersville	Fall of roof	5
1905 Mar. 9	Clear Spring	West Pittston	Fell down shaft	7
1905 Apr. 26	Conyngham	Wilkes-Barre	do	10
1906 May 15	Shenandoah City	Shenandoah	Dynamite explosion	7

ACCIDENTS IN **PENNSYLVANIA ANTHRACITE** MINES IN WHICH 5 OR MORE MEN WERE KILLED—Continued.

Date.	Name of mine.	Location of mine.	Nature of accident.	Killed.
1906 Aug. 6	Susquehanna No. 7	Nanticoke	Mine explosion	6
1907 Mar. 2	Holden	Taylor	do	7
1907 June 18	Johnson No. 1	Pricehurg	do	7
1908 May 12	Mount Lookout	Wyoming	do	12
1908 May 13	Prospect	Wilkes-Barre	Fall of roof	5
1908 July 15	Williamstown	Williamstown	Powder explosion	6
1908 Aug. 28	Warrior Run	Wilkes-Barre	Mine cars	6
1909 Mar. 2	No. 14	Pittston	Mine explosion	8
1909 Nov. 9	Auchincloss	Nanticoke	Mine fire	9
1910 Jan. 11	Nottingham	Plymouth	Mine explosion	7
1910 Mar. 12	South Wilkes-Barre No. 5.	Wilkes-Barre	do	7
1911 Apr. 7	Price-Pancoast	Throop	Mine fire	72
1911 May 27	Cameron	Shamokin	Mine explosion	5
1911 Sept. 12	Marvin	Scranton	Mine cars	5
1911 Oct. 3	Drifton No. 2	Freeland	Cave-in	5
1912 Jan. 9	Parrish	Plymouth	Mine explosion	6
1913 Aug. 2	East Brookside	Tower City	do	19
1914 May 20	Maryd	Maryd	Overwinding of cage	6
1914 Sept. 16	Lehigh No. 4	Lansford	Mine explosion	7
1914 Dec. 9	Tripp	Scranton	Collapse of bottom of cage.	13
1915 Feb. 17	Prospect	Wilkes-Barre	Mine explosion	13

Since 1903, the Pennsylvania anthracite mines have been operated on a 9-hour working day, and, for comparison with other States in which the mines are operated 8 or 10 hours, Table 40 has been compiled. The table shows that the number of hours worked per year per man in the anthracite field is 1,985, as compared with 2,034 for the bituminous field. The fatality rate in the anthracite field based on the actual number of employees is 3.73, during the 10-year period 1903 to 1913, except 1909, whereas based on the number of 2,000-hour workers it is 3.76. The difference in this instance is slight, but for Ohio, where the hours worked per year are 1,495, the fatality rate

NUMBER OF HOURS WORKED IN AND ABOUT THE **PENNSYLVANIA ANTHRACITE** MINES AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day.[a] (all employees.)	Total hours per year.	Number of 2,000 hour workers.	Fatalities.	
					Total.	**Per 1,000 2,000-hour workers.**
1903	206	1,354,347	278,995,482	139,498	518	**3.71**
1904	200	1,402,749	280,549,800	140,275	595	**4.24**
1905	215	1,488,654	320,060,610	160,031	644	**4.02**
1906	195	1,461,195	284,933,025	142,467	557	**3.91**
1907	220	1,505,106	331,123,320	165,562	708	**4.28**
1908	200	1,567,566	313,513,200	156,757	678	**4.33**
1909[b]						
1910	229	1,525,473	349,333,317	174,667	601	**3.44**
1911	246	1,565,460	385,103,160	192,551	699	**3.63**
1912	231	1,566,270	361,808,370	180,904	601	**3.32**
1913	257	1,581,705	406,498,185	203,249	618	**3.04**

[a] Calculated on the 9-hour basis. [b] Census year.

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE **PENNSYLVANIA ANTHRACITE** MINES.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899				1907			
1900	[b] 100,000	[b] 3,500,000	[b] 35	1908			
1901				1909	771	8,016	10
1902	[b] 145,000	[b] 14,210,000	[b] 98	1910	2,853	15,739	6
1903				1911	5,900	36,958	6
1904	2,228	34,103	15	1912	151,958	6,913,475	45
1905	4,998	33,986	7	1913	64,086	481,678	8
1906	161,039	5,958,443	37	1914	26,115	179,743	7

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Approximate.

based on the actual number of men employed is 2.94, and on the number of 2,000-hour workers is 3.94. The fatality rate in Ohio on this basis more nearly equals the rate in the anthracite field than when based on the actual number of employees. From these tables, comparisons with other States may be readily made. The tables of statistics for the anthracite mines of Pennsylvania follow:

TABLE 124.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **PENNSYLVANIA (ANTHRACITE)**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Figures for total production and all items below horizontal lines selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and all items above horizontal lines in columns 3 and 8 from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1901, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1807–1869	232,705,704	.....	.....	*186*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870	15,664,275	.....	35,600	211	5.93	13.47	74,238	.....	440	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871	19,342,057	.....	37,488	210	5.60	10.86	92,105	.....	516	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1872	24,233,166	.....	44,745	223	4.98	9.20	108,669	.....	542	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1873	26,152,837	.....	48,199	263	5.46	10.06	99,440	.....	543	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1874	24,818,790	.....	53,402	231	4.33	9.31	107,441	.....	465	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1875	22,485,766	.....	69,986	236	3.37	10.50	95,279	.....	321	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1876	22,793,245	.....	70,474	227	3.22	9.96	100,411	.....	323	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1877	25,660,316	.....	66,842	194	2.90	7.56	132,270	.....	384	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1878	21,689,682	.....	63,964	187	2.92	8.62	115,988	.....	339	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1879	30,207,793	.....	68,847	262	3.81	8.67	115,297	.....	439	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880	28,649,812	.....	73,373	202	2.75	7.05	141,831	.....	390	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1881	31,920,018	.....	76,031	273	3.59	8.55	116,923	221	420	1.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882	35,121,256	.....	82,200	291	3.54	8.29	120,692	218	427	1.96	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1883	38,456,845	.....	91,421	323	3.53	8.40	119,061	232	421	1.81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1884	37,156,847	.....	101,073	332	3.28	8.94	111,918	192	368	1.92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1885	38,335,974	$2.00	100,324	359	3.58	9.36	106,785	204	382	1.87	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	39,035,446	1.95	103,044	278	2.70	7.12	140,415	196	379	1.93	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1887	42,088,197	2.01	106,517	314	2.95	7.46	134,039	208	395	1.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1888	46,819,564	1.91	122,218	364	2.98	7.81	128,076	218	381	1.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	45,546,970	1.44	123,676	385	3.11	8.45	118,304	194	368	1.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	46,468,641	1.43	126,000	378	3.00	8.13	122,933	200	369	1.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	50,665,431	1.46	126,350	428	3.39	8.45	118,377	203	401	1.98	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1892	52,472,504	1.57	129,050	418	3.24	7.97	125,532	198	407	2.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	53,967,543	1.59	132,944	455	3.42	8.43	118,610	197	406	2.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	51,921,121	1.85	131,603	445	3.38	8.57	116,677	190	395	2.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	57,999,337	1.41	142,917	421	2.95	7.26	137,766	198	406	2.07	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

1896	54,346,081	1.50	148,991	501	3.36	9.22	108,475	174	365	2.10											
1897	52,611,680	1.51	149,884	423	2.82	8.04	124,377	150	351	2.34											
1898	53,382,644	1.41	145,504	411	2.82	7.70	129,885	152	367	2.41											
1899	60,418,005	1.46	139,608	461	3.30	7.63	131,059	173	433	2.50											
1900	57,367,915	1.49	144,206	411	2.85	7.16	139,581	166	398	2.40											
1901	67,471,667	1.67	145,309	513	3.53	7.60	131,524	196	464	2.37											
1902	41,373,595	1.84	148,141	300	2.03	7.25	137,912	116	279	2.41											
1903	74,607,068	2.04	150,483	518	3.44	6.94	144,029	206	496	2.41											
1904	73,156,709	1.90	155,861	595	3.82	8.13	122,952	200	469	2.35											
1905	77,659,850	1.83	165,406	644	3.89	8.29	120,590	215	470	2.19											
1906	71,282,411	1.85	162,355	557	3.43	7.81	127,976	195	439	2.25											
1907	85,604,312	1.91	167,234	708	4.23	8.27	120,910	220	512	2.33											
1908	83,268,754	1.90	174,174	678	3.89	8.14	122,815	200	478	2.39											
1909	81,070,359	1.84	166.801	567	3.40	6.99	142,981	(b)	486												
1910	84,485,236	1.90	169,497	601	3.55	7.11	140,574	229	498	2.17											308
1911	90,464,067	1.94	173,940	699	4.02	7.73	129,419	246	520	2.11											292
1912	84,361,598	2.11	174,030	601	3.45	7.12	140,369	231	485	2.10											275
1913	91,524,922	2.06	175,745	618	3.52	6.75	148,099	257	521	2.03											278
Total	2,446,696,010			17,902																	
Average (1870–1913)	50,316,598		117,851	402.64	3.42	8.00	124,968	200	427	2.14											
1914	90,821,507	2.07	179,679	595	3.31	6.55	152,641	245	505	2.06											271

[a] Figures in italics represent incomplete fatality records.

[b] Not reported.

TABLE 125.—NUMBER OF MEN KILLED IN AND ABOUT THE **ANTHRACITE** MINES IN **PENNSYLVANIA,** WITH FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1870 TO 1914, INCLUSIVE.

Underground.

Year.	1. Falls of roof (coal, rock, etc.). a. *At face.*	1 b. *At pillar.*	1 c. *On gangway.*	1 d. *In chamber.*	1 e. *On slope.*	1 f. *In cross heading.*	1 Total.	2. Falls of face or pillar coal. a. *At face.*	2 b. *At pillar.*	2 c. *On gangway.*	2 d. *In chamber.*	2 Total.	3. Mine cars and locomotives. a. *On gangway.*	3 b. *In chamber.*	3 c. *On slope or plane.*	3 d. *At foot of slope or shaft.*	3 e. *At dump chute.*	3 Total.
1870	*10*	..	*2*	..	..	..	12	*40*	..	*5*	..	45	*11*	..	*3*	*1*	..	15
1871	*12*	..	*3*	*2*	*1*	..	18	*40*	..	*4*	..	44	*19*	..	*6*	*3*	..	28
1872	*45*	*1*	..	*2*	..	..	48	*48*	..	..	*1*	49	*13*	*1*	*10*	..	..	24
1873	*44*	..	..	*1*	*2*	..	47	*59*	..	*5*	..	64	*23*	*1*	*8*	*4*	..	36
1874	*43*	*1*	*3*	*2*	..	..	49	*31*	*4*	*2*	..	37	*26*	..	*10*	*1*	..	37
1875	*48*	..	..	*3*	..	..	51	*27*	..	*1*	..	28	*13*	..	*11*	*3*	..	27
1876	*40*	..	*2*	*4*	..	..	46	*38*	..	*1*	*3*	42	*16*	..	*13*	*5*	..	34
1877	*57*	..	*1*	*3*	*1*	..	62	*54*	*1*	*3*	..	58	*10*	..	*6*	*2*	..	18
1878	*42*	..	*3*	*1*	*1*	*1*	48	*26*	*4*	*1*	*1*	32	*16*	..	*6*	*7*	..	29
1879	*72*	*4*	*4*	*5*	..	..	85	*37*	*2*	*3*	*1*	43	*22*	*2*	*12*	*5*	..	41
1880	*55*	*3*	*6*	..	..	..	64	*23*	*2*	*1*	..	26	*29*	..	*5*	*4*	..	38
1881	*62*	*5*	..	*4*	*1*	*1*	73	*32*	*1*	*3*	..	36	*39*	*1*	*12*	*2*	..	54
1882	*83*	..	*2*	*1*	*3*	*1*	90	*30*	..	*1*	..	31	*41*	*1*	*7*	*2*	..	51
1883	*75*	*1*	*3*	*2*	*2*	..	83	*26*	*1*	..	..	27	*41*	..	*10*	*1*	..	52
1884	*94*	..	*1*	..	..	..	95	*29*	*1*	*2*	..	32	*48*	..	*17*	*3*	..	68
1885	*86*	*1*	*2*	*11*	*1*	..	101	*37*	*3*	*3*	..	43	*26*	..	*5*	*2*	..	33

Year.	4. Gas explosions and burning gas. a. *In chamber.*	4 b. *On gangway.*	4 c. *In old workings.*	4 d. *In heading, tunnel, or slope.*	4 Total.	5. Coal-dust explosions (including gas and dust combined).	6. Explosives.	7. Suffocation from mine gases.	8. Electricity (shock or burns).	9. Animals.	10. Mining machines.	11. Mine fires (burned, suffocated, etc.).	12. Other causes. a. *Crushed at batteries.*	12 b. *Machinery.*	12 c. *Rush of coal or gob.*	12 d. *Struck by coal or rock.*	12 e. *Falling timber.*	12 f. *Suffocation in chutes.*	12 g. *Fall of persons.*	12 h. *Miscellaneous.*	12 Total.	**Total underground.**
1870	*9*	*1*	..	..	10	....	8	1	..	1	..	..	..	*1*	..	..	*1*	..	*3*	*a66*	71	**163**
1871	*30*	*1*	..	..	31	....	16	4	..	1	..	20	*1*	..	..	..	*1*	..	*3*	*15*	20	**182**
1872	*27*	*2*	..	..	20	....	16	2	..	..	..	..	..	*1*	..	*1*	*1*	..	*3*	*5*	11	**179**
1873	*18*	*2*	*12*	..	32	....	16	..	..	3	..	..	..	..	..	*1*	*1*	..	*3*	*11*	16	**214**
1874	*26*	*1*	..	*1*	28	....	14	4	..	4	..	..	..	..	*1*	..	*7*	..	*2*	*11*	21	**194**
1875	*16*	..	*1*	..	17	....	30	1	..	..	..	..	..	..	*4*	..	*2*	..	*3*	*24*	33	**187**
1876	*22*	*5*	..	..	27	....	33	2	..	1	..	..	*3*	..	*1*	*2*	..	*3*	*1*	*4*	14	**199**
1877	*9*	..	*7*	..	16	....	12	..	..	1	..	..	*3*	*1*	..	..	..	..	*1*	*2*	7	**174**
1878	*14*	*7*	*1*	..	22	....	17	2	..	2	..	..	..	..	*2*	*2*	*2*	*1*	*3*	*1*	11	**163**
1879	*15*	*14*	..	..	29	....	17	..	..	1	..	..	*5*	..	*2*	*1*	..	..	*3*	*2*	13	**226**
1880	*20*	*1*	..	..	21	....	11	4	..	2	..	..	*5*	..	..	*1*	*3*	..	*3*	*2*	14	**160**
1881	*23*	..	*2*	..	25	....	19	3	..	2	..	..	*2*	*1*	*3*	*3*	*3*	..	*2*	*3*	17	**229**
1882	*20*	*1*	*2*	*2*	25	....	20	1	..	2	..	3	*1*	..	..	*2*	*1*	..	....	*1*	5	**228**
1883	*21*	*2*	*2*	*2*	27	....	40	2	..	6	..	..	*2*	..	*1*	*3*	*4*	..	....	*4*	14	**251**
1884	*7*	..	..	..	7	....	35	5	..	1	..	7	*2*	..	*4*	*2*	*4*	*1*	*1*	...	14	**264**
1885	*16*	*2*	*6*	*2*	26	....	30	11	..	1	..	..	*3*	..	*4*	*1*	*1*	..	*8*	*28*	45	**290**

Shaft. / Surface.

Year.	13. Falling down shafts or slopes.	14. Objects falling down shafts or slopes.	15. Cages or skips.	16. Other causes.	**Total shaft.**	17. Mine cars and locomotives.	18. Electricity (shock or burns).	19. Machinery.	20. Boiler explosions or bursting steam pipes.	21. Railway cars and locomotives.	22. Other causes. a. *Suffocation in chutes, bins, or culm.*	22 b. *Falls of persons.*	22 c. *Explosives.*	22 d. *Miscellaneous.*	22 Total.	**Total surface.**	**Grand total.**
1870	4	..	23	..	**27**	1	..	8	5	4	..	..	..	*3*	3	**21**	**211**
1871	5	..	..	1	**6**	4	..	12	1	..	..	*2*	..	*3*	5	**22**	**210**
1872	13	2	5	..	**20**	9	..	8	..	..	*1*	*2*	..	*4*	7	**24**	**223**
1873	13	1	2	..	**16**	14	..	8	..	3	*2*	*4*	..	*2*	8	**33**	**263**
1874	6	2	7	1	**16**	7	..	5	5	..	*2*	*1*	..	*1*	4	**21**	**231**
1875	12	..	7	..	**16**	5	..	14	3	3	*2*	*3*	..	..	5	**30**	**236**
1876	0	..	5	..	**14**	5	..	5	1	1	*2*	..	..	..	2	**14**	**227**
1877	3	..	3	..	**6**	5	..	3	..	1	*2*	*3*	..	..	5	**14**	**194**
1878	1	1	..	..	**2**	6	..	7	1	1	*2*	*1*	..	*4*	7	**22**	**187**
1879	5	1	1	..	**7**	10	..	7	..	4	*1*	*3*	..	*1*	5	**26**	**262**
1880	5	..	..	..	**5**	5	..	8	..	1	*1*	..	..	*2*	3	**17**	**202**
1881	6	..	1	2	**9**	12	..	13	3	2	..	*3*	..	*2*	5	**35**	**273**
1882	12	8	2	..	**22**	0	..	13	1	7	*2*	*3*	*1*	*5*	11	**41**	**291**
1883	15	3	6	..	**24**	10	..	12	4	6	*5*	*1*	*1*	*3*	10	**48**	**323**
1884	12	2	7	..	**21**	3	..	11	5	9	*4*	*8*	..	*7*	19	**47**	**332**
1885	14	7	7	..	**28**	12	..	8	6	8	*1*	*2*	..	*4*	7	**41**	**359**

1886	83	..	3	1	..	..	87	35	..	2	..	37	20	..	6	5	..	31	14	1	..	..	15	....	24	11	..	3	..	..	1	..	5	..	3	..	...	4	13	**221**	10	4	4	..	**18**	10	..	11	5	2	2	3	2	4	11	**39**	**278**
1887	94	..	1	..	..	..	95	53	..	1	..	64	49	..	1	..	..	50	14	1	..	..	15	....	20	10	..	5	..	..	1	1	6	..	3	..	2	2	15	**264**	10	1	1	..	**12**	10	..	11	1	5	3	4	..	4	11	**38**	**314**
1888	115	2	7	2	..	..	126	36	4	1	..	41	38	1	14	7	..	60	12	3	1	..	16	....	37	2	..	4	..	..	..	1	10	1	3	..	3	6	24	**310**	10	4	4	..	**18**	7	..	8	3	6	3	5	1	3	12	**36**	**364**
1889	111	1	15	..	1	..	128	38	2	1	..	41	46	..	13	1	..	60	15	5	4	..	24	....	32	8	..	3	..	..	1	..	6	4	1	1	3	2	18	**314**	6	1	12	1	**20**	11	..	11	6	10	4	1	1	7	13	**51**	**385**
1890	81	3	7	5	..	2	98	32	2	..	..	34	41	1	11	4	..	57	60	8	1	1	70	....	18	5	..	7	..	..	1	..	4	2	2	..	4	4	17	**306**	15	2	7	..	**24**	17	..	10	7	5	1	1	..	7	9	**48**	**378**
1891	109	1	7	3	2	1	123	44	..	..	..	44	40	4	15	..	..	59	24	15	..	..	39	....	41	12	..	3	..	2	2	..	3	2	3	2	4	18	34	**357**	13	2	5	..	**20**	8	..	13	3	7	1	5	3	11	20	**51**	**428**
1892	134	3	4	1	..	..	142	42	4	2	..	48	40	3	8	3	..	54	41	9	2	5	57	....	34	..	..	2	..	..	1	..	3	3	3	..	9	10	29	**366**	7	..	3	..	**10**	15	..	11	..	4	4	3	2	3	12	**42**	**418**
1893	132	1	2	2	4	2	143	44	2	..	..	46	48	1	16	7	..	72	33	11	2	..	46	....	38	..	..	6	..	10	1	..	5	1	1	1	7	7	23	**384**	10	6	4	..	**20**	10	..	14	2	8	3	2	3	9	17	**51**	**455**
1894	127	8	3	13	..	..	151	25	2	3	..	30	37	..	16	4	..	57	23	1	2	..	26	....	44	1	..	4	..	7	3	..	7	1	6	2	5	6	30	**360**	15	8	8	..	**31**	13	..	13	11	7	4	6	2	8	20	**54**	**445**
1895	132	3	9	..	..	3	147	33	2	3	..	38	38	3	7	4	1	53	23	..	9	..	32	....	46	..	..	6	..	1	2	2	7	2	2	..	4	4	23	**346**	13	1	4	..	**18**	17	..	13	4	7	1	3	6	6	16	**57**	**421**
1896	137	..	7	59	7	..	210	32	2	2	..	36	34	..	16	6	1	57	29	8	4	1	42	....	35	2	..	6	..	1	3	..	7	2	4	1	9	3	29	**418**	11	2	4	1	**18**	6	..	18	9	12	3	5	3	9	20	**65**	**501**
1897	135	2	4	3	2	..	146	42	4	7	..	53	27	1	12	1	..	41	25	3	5	2	35	....	48	2	..	..	..	13	1	..	7	1	3	1	8	5	26	**364**	5	2	10	..	**17**	13	..	9	..	5	2	3	3	7	15	**42**	**423**
1898	129	1	6	5	2	2	145	35	1	3	2	41	32	..	13	3	..	48	28	6	..	..	34	....	34	1	1	6	..	9	1	..	4	1	4	2	5	11	28	**347**	9	9	2	..	**20**	8	..	15	2	4	5	4	..	6	15	**44**	**411**
1899	155	7	10	9	1	1	183	29	..	3	..	32	38	2	12	5	..	57	18	2	8	..	28	....	35	4	..	7	..	..	2	..	10	5	4	1	11	8	41	**387**	11	1	4	..	**16**	17	..	13	1	10	8	5	..	4	17	**58**	**461**
1900	116	3	6	4	..	4	133	28	1	2	..	31	42	2	16	3	..	63	20	13	5	..	38	....	42	4	..	..	..	3	1	..	5	1	1	..	7	3	18	**332**	8	4	7	..	**19**	17	..	9	1	10	3	5	1	14	23	**60**	**411**
1901	142	4	15	6	5	3	175	35	2	2	..	39	43	1	18	4	1	67	10	4	10	6	30	....	54	6	..	3	..	3	2	..	11	2	4	..	11	11	41	**417**	18	5	..	..	**23**	16	..	26	1	11	3	4	..	12	19	**73**	**513**
1902	66	4	6	1	..	..	77	36	2	..	..	38	28	1	13	2	..	44	15	3	2	..	20	....	31	..	..	2	..	..	1	..	4	..	1	..	8	3	17	**229**	8	2	6	..	**16**	15	..	17	4	4	3	4	..	8	15	**55**	**300**
1903	143	1	16	5	1	3	169	33	3	3	1	40	55	1	9	5	..	70	18	6	1	..	25	....	58	..	1	6	..	4	..	1	4	..	2	3	7	10	27	**400**	22	1	3	..	**26**	29	..	22	2	10	6	7	2	14	29	**92**	**518**
1904	135	4	13	17	3	..	172	54	4	2	6	66	56	..	9	6	..	71	23	5	2	..	30	....	69	..	..	6	..	6	3	..	3	..	4	3	8	19	40	**460**	29	9	2	..	**40**	33	..	19	4	10	8	7	1	13	29	**85**	**595**
1905	208	6	12	9	6	2	243	46	3	2	..	51	64	2	10	6	..	82	31	2	1	..	34	....	62	5	2	2	..	..	4	..	1	2	1	1	15	4	28	**509**	29	1	12	..	**42**	13	..	34	3	10	11	8	1	13	33	**93**	**644**
1906	154	5	4	4	..	1	168	40	3	1	2	46	49	3	11	4	..	67	41	..	3	2	46	....	82	1	1	3	..	..	1	1	4	..	7	..	6	4	23	**437**	11	2	6	..	**19**	30	1	23	1	7	9	12	4	14	39	**101**	**557**
1907	191	10	19	10	2	3	235	34	7	3	..	44	59	3	21	5	..	88	37	5	3	..	45	....	87	12	3	9	..	7	1	2	7	2	6	2	11	13	44	**574**	17	3	7	..	**27**	36	2	29	5	13	2	5	2	13	22	**107**	**708**
1908	184	8	26	11	4	2	235	40	3	5	1	49	63	3	19	4	1	90	42	4	9	..	55	....	94	3	1	5	..	..	5	..	7	..	2	2	8	16	40	**572**	15	5	4	..	**24**	29	1	29	1	8	2	5	..	7	14	**82**	**678**
1909	148	18	18	7	2	2	195	46	6	7	..	59	42	2	15	12	..	71	16	1	5	9	31	....	69	1	6	6	..	12	5	..	4	2	3	..	9	7	30	**480**	7	1	2	..	**10**	23	..	21	3	3	12	5	..	10	27	**77**	**567**
1910	116	17	20	16	2	2	173	57	14	4	5	80	57	7	17	10	2	93	14	3	2	1	20	....	82	13	3	1	..	..	3	2	4	3	2	4	...	6	24	**489**	11	..	8	1	**20**	41	..	29	1	..	6	6	3	6	21	**92**	**601**
1911	130	31	19	12	1	2	195	36	13	2	6	57	51	11	19	9	2	92	13	14	3	4	34	....	88	14	2	3	..	72	5	4	4	6	8	..	3	7	37	**594**	17	..	4	..	**21**	26	1	22	1	..	8	14	..	12	34	**84**	**699**
1912	123	16	15	7	4	1	166	50	21	6	..	77	56	2	18	3	..	79	22	1	9	3	35	....	77	5	5	2	..	..	4	1	10	5	4	..	2	4	30	**476**	18	2	2	..	**22**	41	2	22	2	..	12	4	3	17	36	**103**	**601**
1913	..	..	..	..	..	..	192	..	..	..	..	65	..	..	..	..	..	85	..	..	..	..	50	....	75	11	1	4	4	..	..	..	..	..	..	..	..	..	36	**523**	30	..	..	..	**30**	35	1	15	..	..	..	..	..	..	14	**65**	**618**
1914	..	..	..	..	..	..	166	..	..	..	..	62	..	..	..	..	..	76	..	..	..	..	44	....	90	8	3	2	1	..	..	..	..	..	..	..	..	..	34	**486**	47	..	..	..	**47**	30	1	13	..	..	..	..	..	..	18	**52**	**585**

a Includes 48 fatalities previous to inspection service; no causes given.

PENNSYLVANIA (BITUMINOUS).

AREA AND DISTRIBUTION OF COAL FIELDS.

The bituminous coal fields of Pennsylvania are in the western and southwestern part of the State, and comprise the northern end of the great Appalachian series of coal measures. The fields include about 14,200 square miles, covering 12 counties and parts of 21 other counties. The structure conforms to the system of Appalachian folding in long northeast-southwest waves, locally modified more or less by minor cross folds. In the northwestern part of the area the strata gently undulate, with extremely slight dips, generally of but a few feet to the mile, but in passing eastward these undulations increase to well-marked folds along the eastern margin of the main body of the coal field.

CHARACTER OF COAL BEDS.

The bituminous coal fields of Pennsylvania are described by Parker[a] as follows:

The coal-bearing rocks all belong to the Pennsylvania series and have a total thickness in the southwest corner of the State of about 2,600 feet. The great bulk of the coal mined comes from the Allegheny and the Monongahela formations, formerly known as the "Lower" and the "Upper Productive Coal Measures." Below the Allegheny formation is the Pottsville, containing, in the western part of the State, the Sharon and the Mercer coals, which have been worked only in restricted areas. The Allegheny formation, with a thickness of 250 to 350 feet, contains at least seven coal horizons, all of which yield workable coal locally. They are called, beginning at the bottom, the Brookville, Clarion, Lower Kittanning, Middle Kittanning, Upper Kittanning, Lower Freeport, and Upper Freeport coals. It is now definitely recognized that the coals of these horizons do not occur in continuous beds, and in many cases not in exactly the same horizons; yet it is clear that the corresponding geologic horizons mark times of conditions generally favorable for coal formation, and that no coal of wide extent is found at other levels. As a rule, the coal beds are not characterized by details of section, roof, or floor by which they can be clearly recognized, except over limited parts of the field. No one of them is continuously workable, but the Lower Kittanning and the Upper Freeport coals are widely workable, and the Lower Freeport has a splendid development over several counties in the northeast part of the field. The Brookville or A coal is of workable thickness in spots over a large part of the marginal belt of the coal measures, especially in Jefferson, Clearfield, Center, Cambria, and Somerset counties. The Clarion or A′ coal reaches workable thickness in about the same belt, though the two are seldom of workable thickness in the same section. Both of these coals are apt to be impure when thick. The lower Kittanning or B coal is the most persistent, uniform, and reliable of the Allegheny coals, although it is thinner than the Freeport coals, seldom exceeding a thickness of 4 feet. It is exposed in workable thickness and purity in 11 of the counties. The Middle and the Upper Kittanning horizons, C and C′, contain but little workable coal, though the Upper Kittanning shows cannel coal at a number of points and stands fourth in productivity. The Lower Freeport coal, D, is finely developed in Clearfield, Jefferson, Indiana, and Cambria counties—in the well-known Moshannon (Clearfield), Reynoldsville-Punxsutawney, and Barnesboro-Patton basins. Over most of the rest of the territory this seam is either worthless or of too low grade for competition in the present market. The Upper Freeport or E coal is a variable and complex bed, extending in gross workable thickness over most of its area, although over a considerable

[a] Parker, E. W., Coal: Mineral Resources of the United States for 1910, U. S. Geol. Survey, pt. 2 p. 195.

part of this territory it is too much broken up and too impure for profitable mining. It appears to be entirely absent in some localities.

As a whole, the Allegheny formation yields about 40 per cent of the total output of bituminous coal in the State.

For about 600 feet above the Upper Freeport bed occurs the Conemaugh formation or "Lower Barren Measures." It contains six or more coals, which, however, are workable only in very restricted areas, their best development being found in the Berlin Basin in Somerset County.

Just above the Conemaugh formation lies the Pittsburgh coal, the most uniform in quality and thickness, and for a given area the most valuable coal bed in the bituminous field of Pennsylvania. Although not of as high a grade as the best Allegheny coals to the east, and although varying greatly in quality from east to west, on the whole the Pittsburgh coal, on account of its thickness, its regularity, its high grade, its adaptability for the production of coke and illuminating gas, has long been the most famous bituminous coal bed in America. It is confined to the southwestern part of the State. The bed gives 9 feet of available coal over large areas, and seldom runs under 4 feet. Above the Pittsburgh coal occur the Redstone, Sewickley, Uniontown, and Waynesburg coals, which are of good workable thickness locally, but in the presence of the great Pittsburgh coal are but little mined.

METHODS OF MINING.

The earliest records of the United States Geological Survey show that bituminous coal has been mined in Pennsylvania since 1840. Most of the bituminous coal mines of Pennsylvania are opened by drift from the outcrop, or by a gentle slope down the dip of the bed. There are but few relatively deep mines as compared with the deep coal mines of Europe, the anthracite fields of Pennsylvania, or the metal mines. In the earlier years of the industry many of the mines were opened by single entry, but in recent years the larger operations and newer mines are opened by double or triple entry. The room-and-pillar system is used throughout the bituminous fields of Pennsylvania.

In 1896 about 12 per cent of the coal was reported as being mined by machines. The amount of coal produced by machines has steadily increased until in 1914 it was 53.8 per cent. Shooting off the solid is not extensively practiced, the total amount of coal thus produced being less than 3 per cent. About 35 per cent of the coal is reported as being mined by hand. In 1914, there were 6,326 machines in operation.

Table 54 shows the increase in mechanical haulage in the bituminous mines from 1899 to the close of 1913. In 1899 there were 122 electric locomotives in operation and in 1913, 1,933. The number of compressed-air locomotives has also increased from 13 in 1899 to 168 in 1913. The number of mules and horses used in underground haulage has practically doubled since 1898. The amount of black powder (Table 50) used in the bituminous coal mines has a little more than doubled since 1899, whereas the use of dynamite increased gradually from 1899 to 1907. Since 1907 the amount of dynamite used has decreased rapidly, and has largely been replaced by the use of permissible explosives.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The first law providing for the inspection of bituminous mines in Pennsylvania, approved April 18, 1877, applied to all mines employing more than 10 men, except mines which did not generate fire damp, black damp, or other dangerous or noxious gases. A board of examiners was provided for the purpose of examining applicants for appointment as mine inspector. From a list of eligibles thus established the governor was authorized to appoint three inspectors, one for each of three districts into which the bituminous coal fields were to be divided by the examining board. Each inspector was required to examine all mines in his district as often as possible, to make a record of such examinations, showing the number of employees, number of deaths and injuries in and about the mines, and to file a record thereof each month in the office of the secretary of internal affairs, to be included by the secretary in the annual report of his department. Operators were required to notify the district inspector of all fatal and serious accidents, and on receiving such notice the inspector was required to visit the mine and investigate the cause of the accident.

An act approved May 25, 1878, repealed the provision in the law of April 18, 1877, which exempted from the inspection law those mines which did not generate fire damp, black damp, or other noxious or dangerous gases. The law of June 3, 1881, increased the number of inspection districts to four, and the number was further increased to six by an act approved June 13, 1883. The latter law also required the inspectors to make annual reports to the secretary of internal affairs.

On June 30, 1885, the examining board was authorized to divide the bituminous coal fields into eight districts, the governor to appoint a mine inspector for each district. An act approved May 15, 1893; authorized the examining board to further divide the bituminous fields into districts of not less than 60 mines nor more than 80 mines, and the governor was authorized to appoint an inspector for each district established by the board.

The number of inspectors was increased in 1894 to 10, in 1901 to 12, in 1903 to 15, in 1905 to 16, in 1906 to 18, in 1907 to 20, in 1909 to 21, in 1911 to 25, in 1912 to 26, in 1913 to 28, and in 1915 to 30.

Mine foremen were required to make monthly reports to the district inspector showing all accidents resulting in personal injury to mine employees. On June 9, 1911, an act was approved by which the State was divided into 25 bituminous districts and the chief of the department of mines was authorized to increase the number of districts with the approval of the governor. The district inspectors were directed to render both monthly and annual reports to the chief of the department of mines, and to enumerate all accidents in and about the mines.

Under the inspection laws it is the practice of the operators to report to the district inspectors all injuries causing disability for 6 days or more. The district inspectors, in their reports to the department of mines, omit accidents of a less serious nature, so that only the more serious injuries are published in the annual report of the department of mines. The department has not officially defined a serious injury, and it is left to the discretion of the district inspectors as to which of the accidents reported to them by mine operators may be eliminated from their reports to the department.

ACCIDENTS.

Tables 126 and 127 show the production of coal, number of men employed, and the number of fatalities in and about the bituminous coal mines of Pennsylvania. The record of the number of men employed and the fatalities is complete from the beginning of inspection service in 1877 to the end of 1913. The fatalities, as shown in the accompanying tables, have been compiled from the annual volumes of the State mine inspectors' reports. In a few instances slight changes have been introduced, owing to the fact that some of the earlier inspectors' reports included accidents at coke ovens, and others included deaths due to natural causes. In all cases where sufficient information was given, all fatalities that occurred which were foreign to the mining operations have been excluded from the tables.

During the 37-year period 1877 to 1913, inclusive, there were 9,473 fatalities attributed directly to the coal-mining industry. This represents a fatality rate of 2.87 per 1,000 men employed. The amount of coal mined per fatality, during the entire period, was 271,832 tons, or there were 3.68 fatalities per million tons mined. Since 1879, there have been 37 mine disasters in each of which 5 or more men were killed at one time, the total fatalities thus represented being 1,268, or about 13 per cent of the entire number since 1877. Of the total number of fatalities, 56.93 per cent was due to falls of roof; 15.33 per cent to mine cars and locomotives; and 13.82 per cent to gas and dust explosions. The fatality rate due to explosives is exceedingly low, being only 1.95 per cent of the total, as compared with 24.81 per cent in Kansas, 19.44 per cent in Indiana, 13.47 per cent in Illinois, and 3.27 per cent in West Virginia.

FATALITIES IN **PENNSYLVANIA BITUMINOUS** COAL MINES, BY PRINCIPAL CAUSES DURING THE YEARS 1877 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	5,393	56.93	1.64
Mine cars and locomotives	1,452	15.33	.44
Gas and dust explosions	1,309	13.82	.40
Explosives	185	1.95	.05
Miscellaneous	512	5.40	.16
Shaft	217	2.29	.06
Surface	405	4.28	.12
Total, 36 years	9,473	100.00	2.87

ACCIDENTS IN PENNSYLVANIA BITUMINOUS MINES IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1879 Nov. 2	Mill Creek	Mill Creek	Mine explosion	5
1884 Feb. 20	West Leisenring	West Leisenring	do	19
1884 Oct. 27	Youngstown	Uniontown	do	14
1887 Oct. 1	Bast	Big Mine Run	Suffocated by inrush of mine gas.	5
1888 Nov. 3	Kettle Creek	Clinton County	Powder and coal-dust explosion.	17
1890 June 16	Hill Farm	Dunbar	Mine fire	31
1891 Jan. 27	Mammouth	Mount Pleasant	Mine explosion	109
1896 Mar. 23	Berwind	Dubois	do	13
1898 Sept. 23	Umpire	Brownsville	do	8
1899 July 24	Grindstone	Grindstone	do	5
1899 Dec. 23	Sumner	Sumner	do	19
1901 June 10	Port Royal No. 2	Port Royal	do	19
1902 Mar. 6	Catsburg	Monongahela	do	5
1902 July 10	Rolling Mill	Johnstown	do	112
1903 Nov. 21	Ferguson	Connellsville	do	17
1904 Jan. 25	Harwick	Cheswick	do	179
1905 Apr. 27	Eleanora	Dubois	do	13
1905 July 6	Fuller	Searigbt	do	6
1905 Oct. 13	Clyde	Fredericktown	Mine fire	6
1905 Oct. 29	Hazel Kirk No. 2	Monongahela	Mine explosion	5
1905 Nov. 15	Braznell	Bentleyville	do	7
1906 Oct. 24	Rolling Mill	Johnstown	do	7
1907 Aug. 17	Sonman	Sonman	Fell down shaft	5
1907 Dec. 1	Naomi	Fayette City	Mine explosion	34
1907 Dec. 19	Darr	Jacobs Creek	do	239
1908 Nov. 28	Rachel and Agnes	Marianna	do	154
1909 Jan. 25	Orenda No. 2	Boswell	do	5
1909 Apr. 9	Eureka No. 37	Windber	Dynamite and mine explosion.	7
1909 June 23	Lackawanna No. 4	Wehrum	Mine explosion	21
1909 Oct. 31	Franklin No. 2	Johnstown	do	13
1910 Feb. 5	Ernest No. 2	Ernest	do	12
1911 Mar. 22	Hazel	East Canonsburg	Fall of roof	9
1911 July 13	Sykesville	Sykesville	Mine explosion	21
1911 Nov. 9	Adrian	Punxsutawney	do	8
1912 July 24	Superba and Lemont	Evans Station	Cloudburst flooded mine.	[a] 18
1913 Apr. 23	Cincinnati	Finleyville	Mine explosion	96
1915 May 24	Smokeless Valley No. 1	Johnstown	do	9
1915 July 30	Patterson No. 2	Elizabeth	Mine cars	9
1915 Aug. 31	Orenda	Boswell	Mine explosion	19

[a] Not included in State inspector's tabular statement of mine fatalities.

Table 127 showing the fatalities by causes has been amplified from the bureau's regular form by subdivisions under "Falls of roof and coal," "Gas and dust explosions," "Miscellaneous underground," and "Miscellaneous surface." This is in conformity with the State inspector's latest reports, and in no way does it conflict with the bureau's classification in comparing fatalities by causes with those of other States. The main headings have been maintained as indicated in the table by numerals; the subheadings are indicated by letters. This classification gives operators, inspectors, and others an opportunity to study the mine accidents more in detail.

Since 1903 practically one-half of the men in the bituminous coal mines of the State have been on an 8-hour basis, as shown in the accompanying table, the remainder being 9 and 10 hour men. In order to make a true comparison of Pennsylvania with other States Tables 40 and 41 have been compiled showing the fatality rate based on the actual number of men employed and also on the number of calculated 2,000-hour workers. The number of hours worked per year per man in the Pennsylvania bituminous fields is 2,034, so that

there is but slight variation in the fatality rate based on the actual number of employees during the 10-year period 1903 to 1913 (except 1909) which is 3.39 per 1,000, and that based on the number of 2,000-hour workers, which is 3.34. The number of hours worked in Virginia is 2,447, in West Virginia 2,132, and in Ohio 1,495. With such varying periods of exposure to the hazards of the mining industry, it is essential that the time factor be taken into consideration.

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE **PENNSYLVANIA BITUMINOUS** MINES.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	481	58,761	220	28,221	170	32,192	10,091	129,265
1904	637	77,960	223	24,972	187	30,286	1,882	135,100
1905	669	60,297	226	26,090	179	31,314	25,928	143,629
1906	744	92,082	233	25,695	190	30,895	3,427	152,099
1907	809	96,667	260	24,883	198	35,355	6,390	163,295
1908	764	99,406	241	24,828	197	38,125	3,602	165,961
1909[b]								159,321
1910	834	101,208	272	30,270	225	37,769	6,156	175,403
1911	842	99,522	273	28,204	213	37,586	5,796	171,108
1912	774	91,928	316	32,935	214	35,322	4,959	165,144
1913	849	100,568	312	32,064	242	38,671	893	172,196

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE **PENNSYLVANIA BITUMINOUS** MINES, AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	235	1,136,816	267,151,760	133,576	395	2.96
1904	196	1,168,226	228,972,296	114,486	533	4.68
1905	231	1,263,678	291,909,618	145,955	475	3.25
1906	231	1,307,704	302,079,624	151,040	476	3.15
1907	255	1,408,343	359,127,465	179,564	799	4.45
1908	201	1,432,368	287,905,968	143,953	571	3.97
1909						
1910	238	1,515,188	360,614,744	180,307	521	2.89
1911	233	1,478,036	344,382,388	172,191	515	2.99
1912	252	1,429,690	360,281,880	180,141	446	2.48
1913	267	1,487,867	397,260,489	198,630	609	3.07

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE **PENNSYLVANIA BITUMINOUS** MINES.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	15,131	636,160	42	1907	6,447	59,834	9
1900	7,574	223,093	29	1908	18,780	375,569	20
1901	2,541	125,116	49	1909	5,824	260,381	45
1902	12,580	264,862	21	1910	60,098	2,700,746	45
1903	12,805	321,925	25	1911	5,601	148,124	26
1904	9,336	576,353	62	1912	22,538	538,248	24
1905	5,686	186,250	33	1913	17,244	274,296	16
1906	59,593	3,941,835	66	1914	36,613	1,052,005	29

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 126.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **PENNSYLVANIA (BITUMINOUS)**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geological Survey. Figures in column 4 and items above horizontal lines in column 3 compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1840–1876	156,877,404	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1877	14,000,000	.....	16,627	*b* 14	*b* 3.37	*b* 4.00	*b* 250,000	.....	842	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1878	15,120,000	.....	25,787	48	1.86	3.17	315,000	.....	586	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1879	16,240,000	.....	27,286	55	2.02	3.39	295,273	.....	595	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880	18,425,163	.....	33,391	49	1.47	2.66	376,024	.....	552	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1881	22,400,000	.....	35,630	57	1.60	2.54	392,982	.....	630	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882	24,640,000	.....	42,393	92	2.17	3.73	267,826	.....	581	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1883	26,880,000	.....	35,091	54	1.54	2.01	497,778	.....	766	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1884	28,000,000	.....	39,904	119	2.98	4.25	235,294	.....	702	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1885	26,000,000	$0.95	44,145	68	1.54	2.62	382,353	(*c*)	589	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	27,094,501	.80	52,364	74	1.41	2.73	366,142	(*c*)	517	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1887	31,516,856	.90	57,868	84	1.46	2.07	375,201	222	545	2.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1888	33,796,727	.95	61,565	90	1.46	2.66	375,519	(*c*)	549	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	36,174,089	.77	62,084	103	1.66	2.86	351,205	(*c*)	583	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	42,302,173	.84	61,333	145	2.36	3.43	291,739	232	690	2.97	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	42,788,490	.87	63,661	236	3.71	5.52	181,307	223	672	3.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	72	.....
1892	46,694,576	.84	66,655	134	2.01	2.87	348,467	223	701	3.14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	44,070,724	.80	71,931	131	1.82	2.97	336,418	190	613	3.23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	39,912,463	.74	75,010	123	1.64	3.08	324,492	165	532	3.22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	50,217,228	.72	71,130	153	2.16	3.05	328,217	206	706	3.43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1896	49,557,453	.71	72,625	178	2.45	3.59	278,413	206	682	3.31	.....	12.3	.....	.....	.....	.....	.....	.....	.....	464	.....
1897	54,417,974	.69	77,272	149	1.93	2.74	365,221	205	704	3.43	.....	16.4	.....	.....	.....	.....	.....	.....	.....	690	.....
1898	65,165,133	.67	79,611	199	2.50	3.05	327,463	229	819	3.58	.....	25.3	.....	.....	.....	.....	.....	.....	.....	1,085	.....
1899	74,150,175	.76	82,812	258	3.12	3.48	287,404	245	895	3.65	.....	29.7	.....	.....	944	399	.....	.....	.....	1,343	.....
1900	79,842,326	.97	92,692	264	2.85	3.31	302,433	242	861	3.56	.....	33.7	.....	.....	.....	.....	.....	.....	.....	1,786	.....
1901	82,305,946	.99	101,904	301	2.96	3.66	273,442	230	808	3.51	.....	36.0	.....	.....	.....	.....	.....	.....	.....	2,058	.....
1902	98,674,367	1.08	112,630	455	4.04	4.62	216,647	248	875	3.53	.....	35.6	.....	.....	.....	.....	.....	.....	.....	2,620	.....

1903	103,117,178	1.18	129,265	395	3.06	3.83	261,056	235	798	3.40	.....	36.0	.....	.....	2,267	1,039	4	.....	.....	3,310	.....
1904	97,938,287	.96	135,100	533	3.95	5.44	183,749	196	725	3.70	.....	35.9	.....	.....	2,455	1,175	15	.....	.....	3,645	.....
1905	118,413,637	.96	143,629	475	3.31	4.01	249,292	231	824	3.57	.....	41.7	.....	.....	3,020	1,232	2	.....	.....	4,254	.....
1906	129,293,206	1.00	152,099	476	3.13	3.68	271,624	231	850	3.68	.....	41.9	.....	.....	3,103	1,393	19	.....	.....	4,515	.....
1907	150,143,177	1.04	163,295	799	4.89	5.32	187,914	255	919	3.60	.....	40.5	.....	.....	3,372	1,547	21	.....	.....	4,940	.....
1908	117,179,527	1.01	165,961	571	3.44	4.87	205,218	201	706	3.51	.....	44.8	.....	.....	3,436	1,659	8	.....	.....	5,103	.....
1909	137,966,791	.94	159,321	500	3.14	3.62	275,934	(c)	866	(c)	.....	41.7	.....	.....	3,847	1,731	38	.....	.....	5,616	1,492
1910	150,521,526	1.02	175,403	521	2.97	3.46	288,909	238	858	3.61	.....	45.5	.....	.....	3,534	1,872	86	13	.....	5,505	1,476
1911	144,561,257	1.01	171,108	515	3.01	3.56	280,701	233	845	3.63	34.3	47.8	2.6	15.3	3,556	1,874	82	188	19	5,719	1,486
1912	161,865,488	1.05	165,144	446	2.70	2.76	362,927	252	980	3.89	33.7	50.8	3.0	12.5	3,660	2,023	52	439	2	6,176	1,477
1913	173,781,217	1.11	172,196	609	3.54	3.50	285,355	267	1,009	3.78	35.4	53.2	2.6	8.8	3,341	2,086	137	736	1	6,301	1,503
Total	2,731,945,059	.....	.....	9,473	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1877–1913)	69,596,423	.....	89,076	256.03	2.87	3.68	271,832	229	781	3.41	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	147,983,294	1.07	184,201	402	2.18	2.72	368,118	214	803	3.75	37.2	53.8	2.0	7.0	3,140	1,927	96	1,156	7	6,326	1,482

a Figures in italics represent incomplete fatality records.

b Oct. to Dec. 31 only.

c Not reported.

TABLE 127.—NUMBER OF MEN KILLED IN AND ABOUT THE **BITUMINOUS** MINES IN **PENNSYLVANIA,** WITH FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1877 TO 1914, INCLUSIVE.

Year.	Killed underground.																																					Killed in shaft.					Killed on surface.												Grand total.
	Falls of roof (coal, rock, etc.). 1						Falls of face or pillar coal. 2				Mine cars and locomotives. 3						Gas explosions and burning gas. 4					5	6	7	8	9	10	11	Other causes. 12								13	14	15	16		17	18	19	20	21	Other causes. 22						
	a *At face.*	b *At pillar.*	c *On entry.*	d *In room.*	e *On slope.*	Total.	a *At face.*	b *At pillar.*	c *On entry.*	Total.	a *On entry.*	b *In room.*	c *On slope or plane.*	d *At foot of slope or shaft.*	e *At dump chute.*	Total.	a *In room.*	b *On entry.*	c *In old workings.*	d *In heading, tunnel, or slope.*	Total.	Coal dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	a *Machinery.*	b *Rush of coal or gob.*	c *Struck by coal or rock.*	d *Falling timber.*	e *Fall of persons.*	f *Miscellaneous.*	Total.	Total underground.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total shaft.	Mine cars and locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	a *Suffocation in chutes, bins, or culm.*	b *Falls of persons.*	c *Explosives.*	d *Miscellaneous.*	Total.	Total surface.	
1877[a]	8	..	..	..	..	8	3	..	..	3	2	..	..	..	..	2	....	....	..	..	....	....	..	..	..	..	..	....	..	..	..	..	..	..	..	13	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	14
1878	26	..	1	..	..	27	9	1	..	10	1	..	..	..	..	1	....	....	..	..	....	....	1	2	..	..	..	....	..	..	..	..	..	..	..	41	..	..	..	..	..	..	..	..	7	..	..	..	..	..	..	7	48
1879	26	..	1	..	..	27	15	..	..	15	6	..	..	..	..	6	4	....	..	..	4	....	..	..	..	..	..	....	..	..	..	..	..	3	3	55	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55
1880	23	..	..	2	..	25	13	..	..	13	5	..	..	..	..	5	1	....	..	..	1	....	..	..	..	1	..	....	..	..	..	1	..	1	2	47	..	..	..	..	..	1	..	..	..	..	..	1	..	..	1	2	49
1881	25	1	2	1	..	29	2	4	..	6	9	..	3	..	..	12	1	1	..	1	3	....	..	..	..	4	..	....	..	..	..	2	..	..	2	56	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	1	57
1882	25	3	4	9	..	41	18	2	..	20	7	1	..	..	..	8	7	1	..	..	8	....	2	..	..	..	..	....	..	1	..	..	..	..	1	80	2	..	2	..	4	6	..	..	..	1	..	..	..	1	1	8	92
1883	19	8	4	5	..	36	5	3	2	10	5	..	..	..	..	5	....	....	..	..	....	....	..	..	..	..	..	....	1	..	..	..	..	..	1	52	..	..	1	..	1	1	..	..	..	..	..	..	..	..	..	1	54
1884	40	4	3	..	..	47	22	..	..	22	9	..	..	1	..	10	21	14	..	1	36	....	1	..	..	..	..	....	..	..	..	..	..	..	..	116	..	1	..	..	1	..	..	..	1	1	..	..	..	..	..	2	119
1885	30	5	..	3	..	38	9	1	..	10	9	..	1	..	..	10	1	....	..	..	1	....	1	..	..	1	..	....	..	..	..	1	..	4	5	66	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	2	68
1886	31	6	1	..	..	38	9	1	..	10	13	..	1	1	..	15	6	....	..	..	6	....	2	..	..	..	..	....	..	..	..	..	..	..	..	71	..	..	..	..	..	1	..	..	..	..	..	2	..	..	2	3	74
1887	26	3	..	2	..	31	21	..	..	21	16	..	1	..	..	17	....	3	..	2	5	....	3	..	..	..	..	1	..	..	..	..	1	..	1	79	3	1	1	..	5	..	..	..	..	..	..	..	..	..	..	..	84
1888	31	5	1	2	..	39	13	1	..	14	7	..	1	1	..	9	1	....	..	..	1	17	3	1	..	1	..	....	..	..	..	..	..	2	2	87	..	..	1	..	1	1	..	..	..	..	..	..	..	1	1	2	90
1889	38	4	1	5	..	48	19	3	..	22	9	..	..	1	..	10	6	....	..	..	6	....	2	..	..	..	..	....	..	..	1	..	..	1	2	90	2	..	2	3	7	4	..	..	2	..	..	..	..	..	..	6	103
1890	48	7	2	5	..	62	18	1	..	19	13	..	2	..	1	16	....	....	..	..	....	....	5	..	..	1	..	31	..	..	..	1	..	2	3	137	2	..	1	..	3	2	..	..	..	..	..	1	..	2	3	5	145
1891	55	4	4	5	..	68	16	1	1	18	17	..	1	..	..	18	111	....	..	..	111	....	5	..	..	..	..	3	..	..	..	2	..	2	4	227	1	2	3	..	6	2	..	..	..	..	..	..	..	1	1	3	236
1892	59	9	2	6	..	76	12	6	..	18	30	..	1	..	..	31	1	....	..	..	1	....	2	..	..	..	..	....	..	..	..	..	..	..	..	128	1	..	1	..	2	1	..	1	..	2	..	..	..	..	..	4	134

1893	75	7	2	2		86	19			19	13	1	1	1		16	1				1		2					4						1	1	129			1		1	1											1	131
1894	53	6		7		66	24	1		25	22					22							4													117	3		3		6													123
1895	76	11	2			89	11	3		14	30		1	2		33	4				4		5			1						2	1		3	149	1		1		2			1		1							2	153
1896	73	10				83	30	1		31	23	1	2			26	6				6	13	1	3	2		1							1	1	167		1	4		5	2			2		2					2	6	178
1897	85	5				90	21			21	20		1			21	2				2		4		2											140	1	1	1		3				4		1				1	2	6	149
1898	98	3	7	2		110	20	1		21	29		1		1	31		3	8		11		5	1	3			3				1	2		3	188	1				1	2		3		3		1		1	2	10	198
1899	120	4	4	12		140	22		1	23	32	4	2			38	28	1			29		7		5							1		3	4	246	3		2		5	1		2	2			1		1	2	7	258
1900	121	5	4	1		131	35			35	39		2			41	6				6		9	1	6		1	1	1			2		1	4	235	8	2	7		17	10				2						12	264
1901	147	3	4	1		155	34			34	44	1	4			49	4	22			26	1	7		9	4	1		1	1		1		1	4	290	1		3		4	4		2		1						7	301
1902	175	20	2	2	1	200	26			26	49		5			54	2	115	9		126		9		11	1	4					1	1		2	433	5	1	8		14	2		2	3			1			1	8	455
1903	193	6	11	6	1	217	30		1	31	62		7	2		71	1	22			23		14		9	1	1		1			1	1	2	5	372	6	1	2		9	5		2		5		2			2	14	395
1904	180	9	9	4	1	203	32			32	47	1	4			52	5				5	179	7		12		2	1				4	1	1	6	499	7	1	8		16	4		3	1	5	3		2		5	18	533
1905	249	5	3	2		259	39	1		40	65		1			66	7			16	23	13	18	2	9	2	2	6	1			1		1	3	443	5	1	2		8	5	1	1	1	10		4		2	6	24	475
1906	253	8	8			269	30	5		35	86	1	3			90	10				10		8	1	26	1	5					1		1	2	447	5	2	2	1	10	5	2	4		3		3		2	5	19	476
1907	216	33	14	7	1	271	30	6	1	37	92	2	6	5		105	3	34			37	239	17		24	1	4	1				1	1	5	7	743	12	2	12		26	11		4	1	3	2	3	4	2	11	30	799
1908	183	25	14	4		226	32	4		36	62	2	11	1		76	9				9	154	6		20		4					1		1	2	533	4	1	11		18	13	1	2	1	2	1	2			3	22	571
1909	176	45	23	5	1	250	28	11		39	72	3	4	4		83	3	5	1		9	41	7		22	1	1	3	1			3	1	1	6	462	7	2	4		13	10		6		3		3	1	2	6	25	500
1910	159	65	25	11	1	261	28	12	7	47	89	6	7	3		105		12	1	2	15		10		30	1	2		1			1			2	473	9		3		12	11	2	6	5	4	1	3		4	8	36	521
1911	192	31	25			248	51	2	7	60	83	5	2			90		21			21	8	6		39	2			4			4	2	2	12	486	3		1		4	12	1	4	3			2		3	5	25	515
1912	108	68	27		3	206	30	13		43	88	13	4	1		106		1			1		8		18	1			7			4	2	4	17	400	4		3		7	16	2	7	2		1	6		5	12	38	446
1913	156	76	24		1	257	38	18		56	82	8	9	3		102						97	4		23		6		4			3	1	1	9	554	7				7	26	5	6				4	1	6	11	48	609
1914						189				44						89					3		7	5	25	1	3								10	376	3				3	13	2	3	1						4	23	402

a October to Dec. 31 only.

TENNESSEE.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Tennessee are from 50 to 70 miles wide and extend northeast and southwest across the State from Chattanooga on the south to Middlesboro, Ky., on the north. The coal-bearing areas comprise about 4,400 square miles, of which it is estimated about 47 per cent may contain coal of economic value.

The coal fields may for convenience be divided into a northern and a southern division. The northern area, which produces most of the coal mined, may be subdivided into the Jellico Basin, comprising parts of Campbell and Scott counties; the Wartburg Basin, including parts of Morgan, Anderson, and Scott counties; and the Middlesboro Basin, including Campbell and Claiborne counties. The southern division, which is known as the Chattanooga district, includes the Sewanee Basin, a part of the Cumberland plateau, the Walden Ridge Basin, and the Lookout Basin.

CHARACTER OF COAL BEDS.

The coal for the most part is bituminous throughout the State, but there is a limited area of cannel coal in the Jellico district. The beds, though reasonably uniform in thickness over limited areas, are relatively thin and the coal is variable in quality. The coal beds are nearly horizontal in most regions of extensive development except for local folds and rolls. The coals in the northern districts are a good grade of steam and domestic fuel, whereas in the southern districts the Sewanee coal is better adapted for coking purposes.

The Jellico coal in the Jellico district varies from 3 to 4 feet and the Blue Gem coal from 1½ to 2 feet. Many mines are operated in these two beds, but most of them are mines with a small output. The coal in the Middlesboro Basin varies from 4 to 5 feet in thickness and is extensively mined in Mingo Hollow and elsewhere. The coal in the Wartburg Basin is variable in thickness and quality, ranging from 3 to 5 feet in thickness.

The coal in the Chattanooga district is nearly horizontal except over local areas, as along Walden Ridge, where it is greatly disturbed. The Sewanee coal ranges from about 2½ to 4½ feet in thickness and is generally found badly crushed and contorted and sometimes intimately mixed with "rash," which in this crushed form is very difficult to separate from the coal.

MINING METHODS.

The earliest records for the production of coal in Tennessee are those of 1840, during which year 558 tons were mined. The production has gradually increased and in 1913 amounted to 6,903,784 tons. The mines are practically all opened by drifts, a few by slopes, and only two by shafts, and the coal is mined largely by the

room-and-pillar system. Few of the mines in the State are large producers and in many of them mule haulage alone is used. Roof conditions average fairly good when proper precautions are taken in timbering. About 57 per cent of the mines are ventilated by fans and about 30 per cent by furnaces. Most of the mines are wet and there is little chance for dust to gather, but some of them are very dry and considerable dust is produced in mining the coal. In a few of the dry mines adequate sprinkling cars are provided, but in two or three dry mines no attempt is made to sprinkle, and the mines are dangerously dusty.

There were 8 coal mining machines in use in 1897 and 252 in 1913. The amount of machine-mined coal for the latter year was 26.7 per cent of the total output, or 7,312 tons per machine. In 1912, 32.9 per cent of the coal mined was shot from the solid and in 1913, 37 per cent was mined by this method; 36.3 per cent was mined with hand picks.

As early as 1891 an agreement between mine operators and miners prohibited shooting coal off the solid, but this contract is too frequently broken in practice.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The first mine-inspection law of Tennessee was passed April 7, 1881. It required that all accidents at mines should be reported to the inspector of the district in which the mine was located, and, if fatal, to the county coroner. The enforcement of the law was intrusted to the geologist of the bureau of agriculture, statistics, and mines, with power to employ such assistants as were necessary. The inspector was required to preserve in his office a record showing the cause of all accidents in the mines. An act approved March 29, 1887, consolidated the inspection service and placed it under the jurisdiction of one mine inspector, whose office was maintained at Chattanooga, and to whom all accidents were to be reported by the mine operators. The inspector rendered annual reports to the governor on January 1 of each year. On March 23, 1891, an act was approved by which the office of mine inspector was consolidated with the bureau of labor and mining statistics, under the supervision of the commissioner of the bureau of labor, statistics, and mines. The scope of the work of the new bureau was made to include the inspection of all mines, collieries, mills, and factories, and all accidents at such establishments resulting in loss of life or serious personal injury were to be reported to the commissioner of the bureau, the commissioner to render annual reports to the Governor.

An act of April 3, 1903, separated the mine inspection service from the bureau of labor and mining statistics, established the office of chief mine inspector, and authorized the governor to appoint one

chief inspector and two district mine inspectors, the chief to specify the counties which should compose the two districts. The act applied to both coal and metal mines, and the chief inspector was required to render annual reports to the governor, and to enumerate therein all accidents, both fatal and nonfatal.

ACCIDENTS.

Tables 128 and 129 show the production, number of men employed, and number killed in and about the coal mines of Tennessee as compiled from the reports of the United States Geological Survey and the State mine inspector's reports. Continuous records of fatalities have been kept since 1891 to the end of 1913. During this period there were 859 fatalities, representing a rate of 4.30 per 1,000 men employed. The amount of coal produced per fatality was 119,280 tons, or there were 8.38 fatalities per 1,000,000 tons mined. Of the total number of fatalities 42.03 per cent was due to falls of roof; 39.47 per cent to gas and dust explosions, whereas mine cars and locomotives caused 5.70 per cent, and explosives a like percentage.

FATALITIES IN **TENNESSEE** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1891 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	361	42.03	1.81
Mine cars and locomotives	49	5.70	.25
Gas and dust explosions	339	39.47	1.70
Explosives	49	5.70	.25
Miscellaneous	27	3.14	.13
Shaft	1	.12	.....
Surface	33	3.84	.16
Total, 23 years	859	100.00	4.30

COAL-MINE ACCIDENTS IN **TENNESSEE** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1895 Dec. 20	Nelson	Dayton	Mine explosion	25
1901 May 27	Richland	....do	....do	20
1902 Mar. 31	Nelson	....do	....do	16
1902 May 19	Fraterville	Coal Creek	....do	184
1911 Dec. 9	Cross Mountain	Briceville	....do	84

Since 1895 there have been five disasters in which 327 men were killed. A list of these disasters is given in an accompanying table.

Since 1903 slightly over one-half of the men have been employed at the mines on a 9-hour basis. During the 10-year period 1903 to 1913, excepting 1909, the men were employed 2,100 hours during the year. The fatality rate based on the actual number of employees as shown in Table 40 is 3.40, but when computed on the basis of equivalent 2,000-hour workers becomes 3.23. By comparing Tenn-

essee with Ohio on the basis of actual number of employees, it will be noted that the Tennessee rate is much higher, being 3.40 as compared with 2.94 for Ohio. The men in Ohio were employed 1,495 hours per annum, so that reducing the fatality rate to 2,000-hour workers the Tennessee rate is 3.23 as compared with 3.94 for Ohio. A similar comparison may be made with other States in tables 40 and 41.

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES OF **TENNESSEE.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	1	9	54	5,614	23	3,415	923	9,961
1904	8	657	63	6,102	24	2,887	770	10,416
1905	8	876	62	5,693	33	4,463	896	11,928
1906	4	246	79	6,938	30	4,034	234	11,452
1907	13	1,561	75	6,968	27	3,379	144	12,052
1908	5	287	87	8,220	19	1,921	1,384	11,812
1909[b]								10,031
1910	5	451	86	7,566	32	3,395	518	11,930
1911	6	375	56	5,929	30	3,978	842	11,124
1912	5	317	77	5,720	29	3,980	292	10,309
1913	9	710	78	6,163	35	3,927	463	11,263

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **TENNESSEE** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	227	93,055	21,123,485	10,562	26	2.46
1904	217	95,974	20,826,358	10,413	28	2.69
1905	221	110,939	24,517,519	12,259	29	2.37
1906	229	106,856	24,470,024	12,235	32	2.62
1907	232	110,286	25,586,352	12,793	30	2.35
1908	209	107,942	22,559,878	11,280	34	3.01
1909						
1910	225	110,314	24,820,650	12,410	38	3.06
1911	232	103,719	24,062,808	12,031	111	9.23
1912	234	96,444	22,567,896	11,284	18	1.60
1913	241	104,584	25,204,744	12,602	35	2.78

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **TENNESSEE.**[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	1,595	37,085	23	1907	284	4,725	17
1900	1,559	67,308	43	1908	349	11,441	33
1901	1,705	82,730	49	1909	277	9,295	34
1902	1,904	136,347	72	1910			
1903	1,639	36,021	22	1911	163	1,630	10
1904	2,391	170,680	71	1912	670	20,011	30
1905	150	4,770	32	1913	857	42,966	50
1906	180	1,185	7	1914			

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 128.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **TENNESSEE**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and all items above horizontal lines in columns 2 and 3 compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial axe or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1840–1879	5,829,376	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880	495,131	.....	1,210	.....	.....	.....	.....	.....	409	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1881	840,000	.....	1,500	.....	.....	.....	.....	.....	560	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882	850,000	.....	2,075	.....	.....	.....	.....	.....	410	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1883	1,000,000	.....	2,285	.....	.....	.....	.....	.....	438	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1884	1,200,000	.....	3,500	.....	.....	.....	.....	.....	343	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1885	1,440,957	$1.10	3,783	.....	.....	.....	.....	.....	381	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	1,714,290	1.15	4,140	.....	.....	.....	.....	.....	414	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1887	1,900,000	1.30	4,260	.....	.....	.....	.....	.....	446	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1888	1,967,297	1.10	4,684	.....	.....	.....	.....	.....	420	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	1,925,689	1.21	4,031	.....	.....	.....	.....	(a)	478	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	2,169,585	1.10	5,082	.....	.....	.....	.....	263	427	1.62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	2,413,678	1.11	5,097	22	4.32	9.11	109,713	230	474	2.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1892	2,092,064	1.13	4,926	13	2.64	6.21	160,928	240	425	1.77	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	1,902,258	1.08	4,976	13	2.61	6.83	146,328	232	382	1.65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	2,180,879	.97	5,542	14	2.53	6.42	155,777	210	394	1.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	2,535,644	.93	5,120	37	7.23	14.59	68,531	224	495	2.21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1896	2,663,106	.86	6,531	22	3.37	8.26	121,050	211	408	1.93	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1897	2,888,849	.81	6,337	10	1.58	3.46	288,885	221	456	2.06	.....	1.6	.....	.....	.....	.....	.....	.....	.....	8	.....
1898	3,022,866	.77	6,643	19	2.86	6.29	159,100	234	455	1.94	.....	5.0	.....	.....	.....	.....	.....	.....	.....	19	.....
1899	3,330,659	.88	6,949	20	2.88	6.00	166,533	252	479	1.90	.....	6.0	.....	.....	16	6	.....	.....	.....	22	100
1900	3,509,562	1.14	7,646	10	1.31	2.85	350,956	242	459	1.90	.....	4.8	.....	.....	.....	.....	.....	.....	.....	18	114
1901	3,633,290	1.12	9,046	43	4.75	11.83	84,495	228	402	1.76	.....	6.1	.....	.....	.....	.....	.....	.....	.....	21	.....
1902	4,382,968	1.23	8,750	226	25.83	51.56	19,394	230	501	2.18	.....	6.9	.....	.....	.....	.....	.....	.....	.....	38	.....
1903	4,798,004	1.25	9,961	26	2.61	5.42	184,539	227	482	2.12	.....	6.4	.....	.....	45	6	.....	.....	.....	51	.....
1904	4,782,211	1.18	10,416	28	2.69	5.86	170,793	217	459	2.12	.....	9.2	.....	.....	71	14	.....	.....	.....	85	.....

1905	5,766,690	1.14	11,928	29	2.43	5.03	198,851	221	483	2.19	.....	8.3	.....	.....	77	12	.....	.....	.....	89	.....
1906	6,259,275	1.22	11,452	32	2.79	5.11	195,602	229	547	2.39	.....	11.9	.....	.....	112	14	2	.....	.....	128	.....
1907	6,810,243	1.25	12,052	30	2.49	4.41	227,008	232	565	2.44	.....	12.9	.....	.....	120	14	3	.....	.....	137	.....
1908	6,199,171	1.15	11,812	34	2.88	5.48	182,329	209	525	2.51	.....	12.7	.....	.....	96	18	8	.....	.....	122	.....
1909	6,358,645	1.09	10,031	29	2.89	4.56	219,264	(a)	634	(a)	.....	16.4	.....	.....	119	54	24	.....	.....	197	132
1910	7,121,380	1.11	11,930	38	3.19	5.34	187,405	225	597	2.65	.....	17.2	.....	.....	131	22	13	12	.....	178	129
1911	6,433,156	1.12	11,124	111	9.98	17.25	57,956	232	578	2.49	35.2	14.2	37.7	12.9	121	15	9	31	3	179	130
1912	6,473,228	1.14	10,309	18	1.75	2.78	359,624	234	628	2.68	41.8	18.6	32.9	6.7	154	17	15	39	2	227	119
1913	6,903,784	1.14	11,263	35	3.11	5.07	197,251	241	613	2.54	35.7	26.7	37.0	.6	176	21	4	50	1	252	134
Total	123,793,965	.....	.....	859	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1891–1913)	**4,454,854**	.....	**8,689**	**37.35**	**4.30**	**8.38**	**119,280**	**228**	**513**	**2.25**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	5,943,258	1.14	10,116	26	2.57	4.37	228,587	220	588	2.67	39.1	23.2	37.6	.1	126	9	5	54	.....	194	120

a Not reported.

TABLE 129.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **TENNESSEE**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1891 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	8	10	11	12		13	14	15	10		17	18	19	20	21	22		
1891	12	1	.....	.....	.....	5	.....	.....	.....	.....	.....	1	18	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	3	22
1892	10	1	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
1893	3	3	2	.....	.....	.....	.....	.....	.....	.....	.....	3	11	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	13
1894	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	2	14
1895	5	2	.....	.....	28	2	.....	.....	.....	.....	.....	.....	37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
1896	16	2	1	.....	.....	2	.....	.....	.....	.....	.....	.....	21	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	22
1897	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
1898	13	1	1	1	.....	1	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	18
1899	13	.....	3	.....	.....	2	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	2	20
1900	8	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
1901	16	1	3	.....	20	1	.....	.....	.....	1	.....	1	43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43
1902	17	1	5	.....	200	3	.....	.....	.....	.....	.....	.....	226	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	226
1903	15	.....	2	.....	.....	2	.....	1	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	6	26
1904	19	.....	4	.....	3	2	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28
1905	18	.....	2	.....	.....	7	.....	1	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	28
1906	20	.....	3	.....	.....	3	.....	.....	.....	.....	.....	2	28	1	.....	.....	.....	1	2	.....	.....	.....	.....	1	3	32
1907	10	1	3	3	.....	1	.....	2	.....	.....	.....	.....	29	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	30
1908	26	1	.....	.....	.....	1	.....	4	1	.....	.....	.....	33	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	34
1909	18	.....	4	.....	.....	3	.....	2	.....	.....	.....	.....	27	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	29
1910	22	.....	3	.....	.....	10	.....	2	.....	.....	.....	.....	37	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	38
1911	14	.....	5	.....	84	1	.....	4	.....	.....	.....	.....	108	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	3	111
1912	13	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	18
1913	25	1	0	.....	.....	.....	.....	1	.....	.....	1	.....	34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	35
1914	19	2	1	1	.....	1	.....	.....	.....	.....	.....	.....	24	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	26

TEXAS.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing rocks that carry bituminous coal comprise an area in northern Texas a little more than 200 miles long and 45 miles wide, but coal beds are limited to an area of about 8,200 square miles in Wise, Palo Pinto, Erath, and McCulloch counties. The structure of this field is a gentle monocline, the beds dipping northwest about 100 feet to the mile.

In the southern part of the State, near Eagle Pass, Maverick County, is a Cretaceous coal bed which is mined to some extent.

The Tertiary lignite beds extend entirely across the State from Mexico to Arkansas; the known workable areas cover about 2,000 square miles, and there are about 53,000 square miles that may contain workable beds. Of the total amount of coal mined, about one-half is lignite.

CHARACTER OF COAL BEDS.

In the bituminous field there are three workable beds, but the ones most largely mined are No. 1, which is the lowest, and No. 7, which is the highest. These coals are of Carboniferous age. No. 1 is continuous for at least 80 miles, and in Wise County is 14 to 26 inches thick; in Park County, 18 to 26 inches thick; in Palo Pinto County, 26 inches thick; and in Erath County, 28 inches thick.

With few exceptions the coal bed has a strong shale roof and shale floor. The No. 7 bed has the same structural features as No. 1 and is continuous for about 250 miles. It is 12 to 42 inches thick. Near Cisco the bed is 33 inches thick.

In the lignite field the beds that are worked are thick, generally ranging from 6 to 8 feet.

MINING METHODS.

The earliest coal-production report for Texas was in 1884, when 125,000 tons of coal was mined. The production for 1913 was 2,429,144 tons. Of the 48 mines in operation in 1913, 8 were opened by slopes, and 43 were opened by shafts varying from 45 to 418 feet in in depth. About one-half were opened by single entry and one-half by double entry. One-third of the mines are operated by the long-wall method, and two-thirds by the room-and-pillar method. Steam hoists are used at practically all of the mines. Electric and mule haulage are used underground, while 3 mines were using gasoline motors.

The majority of the mines are ventilated by fans and only two by furnaces. In 1897, there were 5 mining machines, and in 1913, 24 machines. In 1913, 61.5 per cent of the coal was mined by hand and 4.2 per cent by machines, and 25 per cent was shot off the solid.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The law enacted by the Texas Legislature April 30, 1907, authorized the governor to appoint a State mine inspector for all coal mines, upon the recommendation of an examining board, also provided for by the act. The first inspector was appointed September 30, 1909, and was directed to see that the provisions of the mining law were properly enforced. The law, however, did not require mine operators to report accidents to the State inspector.

ACCIDENTS.

Tables 130 and 131 show the production of coal and the number of men employed in the mines of Texas since 1889. Complete accident records, however, were not kept prior to 1909. During the 5-year period 1909–1913, there were 25 fatalities reported in and about the coal mines of Texas, representing a rate of 1.06 per 1,000 men employed. The amount of coal mined per fatality was 412,359 tons or 2.43 fatalities per million tons mined. Texas has been free from serious mine disasters.

FATALITIES IN TEXAS COAL MINES, BY PRINCIPAL CAUSES, DURING 5 YEARS 190 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	16	64.00	0.67
Mine cars and locomotives	2	8.00	.09
Gas and dust explosions			
Explosives	2	8.00	.09
Miscellaneous	3	12.00	.13
Shaft	1	4.00	.04
Surface	1	4.00	.04
Total, 5 years	25	100.00	1.06

Since 1903, practically one-half of the men in the State have been employed on an 8-hour basis. Tables 40 and 41 have been compiled for comparative purposes. It will be noted that the employees of Texas worked 2,101 hours per year. The fatality rate for the period 1903 to 1913, inclusive, except 1909, based on the actual number of employees, is 1.08 per 1,000 men employed, and based on the 2,000-hour days becomes 1.05. This rate may be readily compared with rates of other States by referring to Table 41. The tables of statistics for the State follow:

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **TEXAS**.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	3	71	6	1,185	6	573	541	2,380
1904	7	1,624	2	91	12	971	235	2,921
1905	11	1,442	3	[b] 125	13	1,135	306	3,008
1906	10	1,817	.....	.....	8	703	528	3,048
1907	5	1,453	1	60	16	2,202	512	4,227
1908	16	2,351	1	50	21	1,759	240	4,400
1909[c]	.....	.....	.....	.....	.....	.....	.....	4,196
1910	20	2,302	1	70	17	1,536	289	4,197
1911	16	3,007	3	179	18	1,649	145	4,980
1912	20	2,908	1	40	19	1,789	390	5,127
1913	19	2,727	8	525	11	1,299	550	5,101

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.
[b] Including daymen who work 10 hours.
[c] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **TEXAS** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day. (all employees.)	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000, 2,000-hour workers.
1903	242	21,922	5,305,124	2,653	.....	.....
1904	220	25,636	5,639,920	2,820	.....	.....
1905	238	26,765	6,370,070	3,185	.....	.....
1906	227	26,318	5,974,186	2,987	.....	.....
1907	244	38,792	9,465,248	4,733	.....	.....
1908	254	39,008	9,908,032	4,954	.....	.....
1909	.....	.....	.....	.....	.....	.....
1910	234	37,007	8,659,638	4,329	7	1.62
1911	226	43,462	9,822,412	4,911	8	1.63
1912	230	45,024	10,355,520	5,177	2	.39
1913	253	44,481	11,253,693	5,626	4	.71

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **TEXAS**[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	185	2,775	15	1907	270	1,610	6
1900	135	2,740	20	1908	169	338	2
1901	113	226	2	1909	80	4,800	60
1902	50	50	1	1910	1,776	108,230	61
1903	1,055	24,460	23	1911	60	300	5
1904	55	585	11	1912	238	1,724	7
1905	25	375	15	1913	.....	.....	.....
1906	1,260	9,245	7	1914	221	693	3

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 130.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **TEXAS**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10, prior to 1900, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1884–1888	490,000																				
1889	128,216	$2.65	543					(a)	236												
1890	184,440	2.53	674					241	274	1.14											
1891	172,100	2.40	787					225	219	.97											
1892	245,690	2.32	871					208	282	1.36											
1893	302,206	2.28	996					251	303	1.21											
1894	420,848	2.32	1,062					283	396	1.40											
1895	484,959	1.88	1,642					171	295	1.73											
1896	544,015	1.65	1,953					187	279	1.49											
1897	639,341	1.52	1,766					220	362	1.65		1.8								5	
1898	686,734	1.66	2,130					245	322	1.31		2.2								5	
1899	883,832	1.51	2,410					256	367	1.43											
1900	968,373	1.63	2,844					246	340	1.38											
1901	1,107,953	1.72	3,051					264	363	1.38		2.0								8	
1902	901,912	1.64	2,369					267	381	1.43		2.8								8	
1903	926,759	1.62	2,380					242	389	1.61		3.1			6	2				8	
1904	1,195,944	1.66	2,921					220	409	1.86		2.8			6		3			9	
1905	1,200,684	1.64	3,008					238	399	1.68		1.9			5		3			8	
1906	1,312,873	1.66	3,048					227	431	1.90		1.7			9		3			12	
1907	1,648,069	1.69	4,227					244	390	1.60		2.2			10		3			13	
1908	1,895,377	1.80	4,400					254	431	1.70		.8			6					6	
1909	1,824,440	1.72	4,196	4	0.95	2.19	456,110	(a)	435	(a)		.9			2	6	3			11	42
1910	1,892,176	1.67	4,197	7	1.67	3.70	270,311	234	451	1.93		1.1			8	6				14	43

1911	1,974,593	1.66	4,980	8	1.61	4.05	246,824	226	397	1.76	31.7	3.6	10.3	54.4	12	.....	3	.....	.....	15	45
1912	2,188,612	1.67	5,127	2	.39	.91	1,094,306	230	427	1.86	47.0	4.8	12.8	35.4	18	.....	3	.....	.....	21	45
1913	2,429,144	1.77	5,101	4	.78	1.65	607,286	253	476	1.88	61.5	4.2	25.2	9.1	20	.....	3	1	.....	24	47
Total	26,649,290	.....	.....	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1909–1913)	**2,061,793**	.....	**4,720**	**5.00**	**1.06**	**2.43**	**412,359**	**236**	**437**	**1.85**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	2,323,773	1.69	4,635	11	2.37	4.73	211,252	237	501	2.11	72.5	1.2	26.3	.....	9	.....	2	2	.....	13	53

[a] Not reported.

TABLE 131.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **TEXAS**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1909 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pip s.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1909	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
1910	4	.....	1	.....	.....	.....	.....	1	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
1911	5	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	.....	1	2
1913	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
1914	4	2	1	1	.....	1	.....	.....	.....	.....	.....	1	10	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	11

UTAH.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing areas of Utah comprise about 10,570 square miles, which are roughly divisible into three fields. The Wasatch field is the largest, and includes parts of Carbon, Emery, Grand, Uinta, and Wasatch counties. The next largest field is in the southern part of the State, and occupies the larger part of Garfield, Iron, and Kane counties. The other field is in Summit County, in northern Utah, and is relatively unimportant, although mining operations at Coalville have been carried on since 1870. The greatest amount of development has been in Carbon and Emery counties, Carbon County producing about 90 per cent of the coal mined in the State. The principal districts in Carbon County are Sunnyside, Kenilworth, Castlegate, Pleasant Valley, Spring Canyon, and Hiawatha-Black Hawk.

CHARACTER OF COAL BEDS.

The coal and the associated rocks in the Wasatch field have been subjected locally to serious folding and displacements, but in general the deformation has been uniform, resulting in regular structure and low dips. In western Carbon County and in Emery County the coal-bearing rocks are highly folded and cut by numerous faults, which render mining expensive and uncertain. But in the eastern part of the developed field the coal either lies nearly flat or dips only 3° to 7°.

The beds as a rule are thinner in the eastern than in the western part of the field. The coal in two beds, both of which are mined, in the Sunnyside district is about 14 feet thick, whereas in some of the western districts, as at Kenilworth and Hiawatha, the coal of a single bed ranges from 15 to 20 feet thick.

The coal beds in general are not uniform in thickness over large areas and in many places are known to be very lenticular. Rolls and "horsebacks" are common in some districts and in many places the latter oftentimes cut out a considerable part of the coal bed.

The southern coal field has never been exploited on a commercial scale, but the coal ranges in thickness from 4 to 8 feet.

MINING METHODS.

Coal was first mined on a commercial scale in Utah in 1870, when 5,800 tons was produced. The production in 1913 was 3,254,828 tons, and in 1914, 3,103,036 tons was mined. Most of the mines are opened by drifts, entries, or slopes, and the coal is mined by the room-and-pillar method. The principal mines are worked on the double-entry system and at one of the typical mines the rooms are 24 feet wide by 400 feet long, separated by 40-foot pillars. Wherever

the coal extends 7 to 9 feet in thickness the excess is left on the roof and is taken down only when the pillars are drawn. Most of the mines are comparatively dry and the coal yields considerable dust when mined. The State mining law requires extensive sprinkling systems in such mines and most of the operators rigidly observe the law. Coal is rarely shot from the solid and is usually undercut (by machine or hand pick) or sheared before being shot. Electric shot-firing systems are in common use.

Coal-mining machines were first introduced into Utah in 1896 and in 1913 there were 50 machines in operation. During 1913 the machine-mined coal equaled 19.2 per cent, coal mined by hand-pick methods equaled 74.2 per cent, and that shot from the solid equaled 4.2 per cent.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

An act of Congress approved March 3, 1891, authorized the President of the United States to appoint a mine inspector for each Territory in which the aggregate annual production of coal exceeded 1,000 tons. Under the provisions of this law the first mine inspector for Utah was appointed August 23, 1892. Section 15 of the act provided that a full and written report of every fatal accident should be made to the mine inspector within 10 days after such death should occur. Annual reports for fiscal years ending June 30 were rendered to the Secretary of the Interior. Utah was admitted as a State in January, 1896, and under a law approved April 5, 1896, the first State inspector was appointed April 6. The State inspection law covered all coal and hydrocarbon mines employing more than six men, and the inspector was required to examine all such mines at least quarterly, and to render an annual report to the governor. Mine operators were required to report to the inspector every fatal accident within 10 days after the accident, and every nonfatal accident involving disability for one week or more. An act approved March 20, 1911, authorized the employment of a deputy inspector and repealed the provision of the previous laws limiting the inspection service to mines employing more than six men.

All accidents reported to the inspector by mine operators are published in the inspector's annual report, but only those involving disability for at least 30 days are classified as serious accidents.

ACCIDENTS.

Tables 132 and 133 show the number of men employed, the production of coal, and the number of fatalities as compiled from the best records available. The State mine inspectors' reports show fatal accidents back to 1892, and are complete from that year to

date. The total number of men killed during the period 1892 to 1913, representing 22 years, was 355 or 9.25 fatalities per 1,000

FATALITIES IN UTAH COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1892 TO 1913, INCLUSIVE.

Causes.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	95	26.76	2.48
Mine cars and locomotives	25	7.04	.65
Gas and dust explosions [a]	205	57.75	5.34
Explosives [b]	5	1.40	.13
Miscellaneous	7	1.97	.18
Shaft	3	.84	.08
Surface	15	4.23	.39
Total, 22 years	355	100.00	9.25

[a] Includes Winter Quarters mine disaster at Scofield, May 1, 1900, in which 200 men were killed by a powder and dust explosion, representing 56.34 per cent of the fatalities, or 5.21 per 1,000 for the 22-year period.
[b] See footnote [a].

COAL-MINE ACCIDENTS IN UTAH IN WHICH 5 OR MORE MEN WERE KILLED.

Date	May 1, 1900.
Name of mine	Winter Quarters Nos. 1 and 4.
Location of mine	Schofield.
Nature of accident	Powder and mine explosion.
Number killed	200.

men employed, of which number 57.75 per cent was due to gas and dust explosions. This includes the explosion at the Winter Quarters mine in 1900, in which 200 were killed at one time. This one disaster represents 56.34 per cent of the total fatalities during the 22-year period. Falls of roof represent 26.76 per cent, or 2.48 fatalities per 1,000 men employed. The quantity of coal produced per fatalitity was 89,252 tons, or 11.20 fatalities per million tons of coal mined.

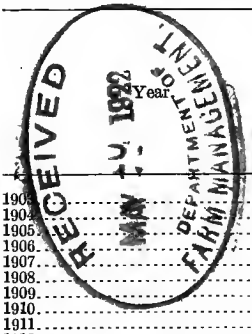
Since 1903, the mines have been operated on an 8-hour basis, and for comparison with States having 9-hour and 10-hour working days, Tables 40 and 41 have been compiled. It will be noted that during the period 1903 to 1913, except 1909, the men were employed 2,109 hours per year. The fatality rate based on the actual number of employees is 4.15 per 1,000, whereas, when reduced to the uniform basis of 2,000-hour workers, it becomes 3.93, which compares favorably with the rate in Ohio, where the rate on the same basis is 3.94. Similar comparisons with other States may be made by reference to Table 41. The tables of statistics for the State follow.

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **UTAH.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	12	158	4	1,747	3	9	11	1,925
1904	15	1,356	2	5	1	2	11	1,374
1905	13	1,352	.....	.....	2	6	3	1,361
1906	12	1,554	1	2	1	3	13	1,572
1907	16	2,046	.....	.....	.....	.....	157	2,203
1908	17	2,620	.....	.....	1	2	42	2,664
1909[b]	.....	.....	.....	.....	.....	.....	.....	3,014
1910	20	3,049	.....	.....	.....	.....	4	3,053
1911	21	3,056	.....	.....	.....	.....	390	3,446
1912	22	3,326	1	2	.....	.....	.....	3,328
1913	23	4,063	2	95	.....	.....	.....	4,158

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **UTAH** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.



Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	248	17,176	4,259,648	2,130	7	3.29
1904	294	11,012	3,237,528	1,619	9	5.56
1905	247	10,903	2,693,041	1,347	7	5.20
1906	288	12,597	3,627,936	1,814	4	2.21
1907	258	17,781	4,587,498	2,294	5	2.18
1908	227	21,358	4,848,266	2,424	5	2.06
1909	.....	.....	.....	.....	.....	.....
1910	260	24,428	6,351,280	3,176	18	5.67
1911	236	27,958	6,598,088	3,299	13	3.94
1912	285	26,626	7,588,410	3,794	19	5.01
1913	273	33,359	9,107,007	4,554	17	3.73

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **UTAH.**

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	.....	.....	.....	1907	148	592	4
1900	.....	.....	.....	1908	.....	.....	.....
1901	754	23,055	30	1909	.....	.....	.....
1902	.....	.....	.....	1910	.....	.....	.....
1903	350	9,800	28	1911	208	624	3
1904	.....	.....	.....	1912	.....	.....	.....
1905	6	6	1	1913	5	1,300	260
1906	.....	.....	.....	1914	150	1,800	12

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 132.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN UTAH, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and items above horizontal lines in columns 2, 3, and 21 from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1870–1887	1,383,689																				
1888	258,961	$2.10	500					518													
1889	236,651	1.59	551					(a)	429												
1890	318,159	1.74	429					289	742	2.57											
1891	371,045	1.80	621					(a)	597												
1892	361,013	1.56	646	2	3.10	5.54	180,507	230	559	2.43											
1893	413,205	1.48	576	0				226	717	3.17											
1894	431,550	1.40	671	1	1.49	2.32	431,550	199	643	3.23											
1895	471,836	1.31	670	1	1.49	2.12	471,836	203	704	3.47											
1896	418,627	1.20	679	2	2.95	4.78	209,314	202	617	3.05		0.2								1	9
1897	521,560	1.19	704	2	2.84	3.83	260,780	204	741	3.63											12
1898	593,709	1.27	739	3	4.06	5.05	197,903	243	803	3.30											11
1899	786,049	1.27	743	0				265	1,058	3.99											
1900	1,147,027	1.26	1,308	209	159.79	182.21	5,488	248	877	3.54											
1901	1,322,614	1.26	1,712	8	4.67	6.05	165,327	259	773	2.98		1.1								13	
1902	1,574,521	1.14	1,826	8	4.38	5.08	196,815	259	802	3.33		4.8								13	
1903	1,681,409	1.20	1,925	7	3.64	4.16	240,201	248	873	3.52		4.5			13					13	
1904	1,493,027	1.30	1,374	9	6.55	6.03	165,892	294	1,087	3.70		2.3			7		2			9	
1905	1,332,372	1.35	1,361	7	5.14	5.25	190,339	247	979	3.96											
1906	1,772,551	1.36	1,572	4	2.54	2.26	443,138	288	1,128	3.92		.1			1		1			2	
1907	1,947,607	1.52	2,203	5	2.27	2.57	389,521	258	884	3.43		.1			3	2				5	
1908	1,846,792	1.69	2,664	5	1.88	2.71	369,358	227	693	3.05											
1909	2,266,899	1.66	3,014	15	4.98	6.62	151,127	(a)	752	(a)											23
1910	2,517,809	1.68	3,053	18	5.90	7.15	139,878	260	825	3.17		1.0			7					7	22

1911	2,513,175	1.69	3,446	13	3.77	5.17	193,321	236	729	3.09	79.3	2.8	7.7	10.2	5	2	.....	.....	7	25
1912	3,016,149	1.67	3,328	19	5.71	6.30	158,745	285	906	3.18	93.0	3.8	3.1	.1	5	6	.....	2	13	23
1913	3,254,828	1.65	4,158	17	4.09	5.22	191,460	273	783	2.87	74.2	19.2	4.6	2.0	5	7	.....	38	50	27
Total	34,252,834	.....	.....	355	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1892–1913)	1,440,197	.....	1,744	16.14	9.25	11.20	89,252	254	826	3.25	.....	30.4	5.9	.1	.....	9	.....	59	68	24
1914	3,103,036	1.59	4,112	22	5.35	7.09	141,047	210	755	3.60	63.6									

a Not reported.

TABLE 133.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **UTAH**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE DURING THE CALENDAR YEARS 1892 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1892 [a]	1					1							2												2
1893																									0
1894	1												1												1
1895		1											1												1
1896	1												1							1				1	2
1897	1	1											2												2
1898	2		1										3												3
1899																									0
1900	3			4	[b] 200	1						1	209												209
1901	4	3	1										8												8
1902	5		2										7								1				8
1903	3	2				1							6											1	7
1904	4		2									2	8			1		1						1	9
1905	2	1	1										4	1				1					2		2	7
1906	4												4													4
1907	3		1	1									5													5
1908	2	1	2										5													5
1909	7	6	2										15													15
1910	6	4	3			1						1	15						3						3	18
1911	5	5	2										12									1			1	13
1912	5	9	2				1	1					18										1	1	1	19
1913	3		6			1						1	11	1				1	3	1			1		5	17
1914	9		6					1		1			17								2	2		1	5	22

[a] Sept. 28 to Dec. 31.
[b] Probably originated by an explosion of powder magazine underground.
[c] Inspector's report gives detailed description of 9 fatalities, while one table in his report shows 10 giving no details.

VIRGINIA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal-bearing area of Virginia comprises about 1,550 square miles in the Appalachian region, 200 square miles in the Brushy Mountain fields, and 150 square miles in the Atlantic Coast region. Of the latter, the larger part is in the Richmond Basin. This basin extends in a north and south direction through parts of Goochland, Henrico, Powhatan, and Chesterfield counties. It is about 30 miles long, with a maximum width of 10 miles, and its eastern edge is about 13 miles from Richmond. There are also one or two other isolated fields in the Atlantic coast region, but mining in these has been of little importance.

The Brushy Mountain fields include long narrow strips of coal-bearing rocks nearly across the State. These rocks are of lower Carboniferous age and are some of the oldest coal-bearing strata known in this country. Some of the coal is of the semianthracite rank.

The Appalachian region includes a large area in the southwestern part of the State, with the principal mines in Wise, Russell, Tazewell, and Lee counties. More than one-half of the coal mined in the State comes from Wise County. The coal-bearing rocks lie in a broad, flat, synclinal trough lying between the southeastern edge of the coal field and Pine Mountain. In the middle of the trough the beds are generally flat, except where they are disturbed by small folds and faults. On the edges of the trough the beds are strongly tilted, in some places even standing vertical.

CHARACTER OF COAL BEDS.

The coal in the Richmond Basin is a bituminous coking coal. The coal beds are steeply inclined and are 4 to 30 feet thick, and in a number of places have been cut by intrusions of diabase, producing natural coke. It has been estimated by Shaler and Woodworth that at a distance of one mile from the outcrop the depth of the beds is 2,500 feet, and it is possible that the beds may extend to a depth of 4,000 feet. The coal beds are broken by faults that make systematic mining difficult.

The coal beds in the Brushy Mountain fields range from 3 to 12 feet in thickness, but the beds contain many partings of shale which make mining expensive and the products of the mines difficult to market. Although desultory mining has been done on these coal beds for a long time, only a little coal has reached the market.

In the main bituminous field the coal beds are much more numerous and valuable. In Lee County 12 beds of coal are of workable

thickness, ranging from 2½ to 6 feet thick. In the Big Stone Gap district the most important coal bed is the Imboden, which ranges from 4 to 13 feet in thickness. There are also a number of beds from 4 to 8 feet thick lying above the Imboden.

On Toms Creek the Upper Banner coal, ranging from 5 to 8 feet thick, is the most important bed. This bed has a shale roof and a hard shale floor.

In Dickenson County the coal beds below the Gladeville sandstone are thin, but above that sandstone 10 beds are recognized, which range in thickness from 2 to 12 feet. The Lower Bolling bed is 4 feet thick with shale roof and clay floor. The Glamorgan bed is 4½ feet thick with shale roof and shale floor. The Pardee bed is about 9½ feet thick.

MINING METHODS.

Coal was first mined in the Richmond Basin in 1750. In 1789 regular shipments were made. Production records begin with 1822 with 5,400 tons. The larger mines are opened by slopes and vertical shafts, the latter being 400 to 500 feet deep. In the earlier days colored labor was employed under the supervision of English and Welsh miners, and the mining systems were largely adapted from English practices. In recent years Hungarian and colored labor is employed, largely under the direction of local or Pennsylvania managers. With the development of the southwestern Virginia field the Richmond Basin remained practically dormant after 1883. Renewed activity has prevailed during the last 4 years.

As in West Virginia, the room-and-pillar method of mining prevails largely throughout the Appalachian region with practically all of the mines opened by drift entries. In 1887 there were only 8 mining machines in operation, but in 1913 there were 187 machines, producing 47.6 per cent of the coal; 19.7 per cent was mined by hand, and 32.6 per cent shot off the solid. The production per man in 1913 was 964 tons.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The mine-inspection service of Virginia was established in accordance with an act approved March 13, 1912, applying to all coal mines in which five or more persons were employed in a period of 24 hours. The appointment of the inspector was vested in the commissioner of the bureau of labor and industrial statistics, to whom the inspector was required to render annual reports for years ending June 30. Mine operators were required to report to the inspector all accidents

causing loss of life or serious personal injury, stating the cause of such accident, and the inspector, if he deemed it necessary from the facts reported, was required to visit the scene of the accident and render such assistance and advice as he deemed necessary for the future safety of the men.

No rules have been adopted by the Bureau of Labor as to what constitutes a serious injury such as the law requires shall be reported to the inspector, but all accidents of which the inspector receives notice are included in his annual report to the commissioner.

In 1915 one coal-mine inspector was employed.

ACCIDENTS.

Tables 134 and 135 show the production of coal beginning with 1822, the number of employees beginning with 1888, and the number of fatalities from 1909 to date. Although Virginia was one of the first States to produce coal, yet systematic records of accidents in that State have not been kept until recent years. There have been a number of serious mine explosions, extending as far back

FATALITIES IN **VIRGINIA** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1909 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	131	52.19	3.33
Mine cars and locomotives	32	12.75	.81
Gas and dust explosions	25	9.96	.63
Explosives	10	3.98	.25
Miscellaneous	34	13.55	.86
Shaft	1	.40	.03
Surface	18	7.17	.46
Total, 5 years	251	100.00	6.37

COAL-MINE ACCIDENTS IN **VIRGINIA** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1839 Mar. 18	Black Heath	Near Richmond	Mine explosion	40
1854 ———	Chesterfield	do	do	19
1855 ———	Midlothian	Coalfield	do	55
1876 May 20	do	do	do	8
1882 Feb. 3	do	do	do	32
1884 Mar. 13	Laurel	Pocahontas	do	112
1901 Nov. 14	Pocahontas	do	Mine fire and explosion	9
1901 Nov. 22	do	do	Mine fire	8
1906 Oct. 3	do	do	Mine explosion	35
1907 Mar. 16	Bond and Bruce	Tacoma	do	11
1910 Dec. 14	Greeno	do	do	8
1911 Jan. 20	Carbon Hill	Carbon Hill	do	5
1912 Jan. 16	do	do	Dynamite explosion	5
1912 July 16	Old Dominion No. 1	do	Mine explosion	8

as 1839, as shown in the accompanying list. During the five years, 1909 to 1913, for which continuous records are available, there have been 251 fatalities, representing 6.37 fatalities per 1,000 men employed. The quantity of coal produced per fatality was 138,644 tons, or 7.21 fatalities per million tons of coal mined. Of the total number of fatalities during the 5-year period, 52.19 per cent was due to falls of roof-and-pillar coal, 12.75 per cent to mine cars and locomotives, and 9.96 per cent to gas and dust explosions.

Practically all of the men employed in and about the coal mines in Virginia are on a 10-hour basis, hence to permit comparisons with States on the 8-hour or the 9-hour basis, Tables 40 and 41 have been compiled. The number of hours worked per man a year in Virginia is 2,447 as compared with 2,132 hours in West Virginia, and 1,495 hours in Ohio. In order that true comparisons may be made with reference to the hazard of the mining industry, the time element has been taken into consideration and rates worked out on the basis of the number of 2,000-hour workers, as shown in Tables 40 and 41. Based on the actual number of employees, the rate for the 4 years 1910 to 1913 is 6.74 per 1,000. This reduced to the basis of 2,000-hour workers becomes 5.26 per 1,000, as compared with 5.18 for West Virginia, and 3.94 for Ohio. Table 41 shows figures for the other States worked out on a similar basis, so that comparisons may be readily made. The tables of statistics for the State follow.

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN VIRGINIA.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	2	250	4	21	21	5,032	305	5,608
1904	2	256	6	372	24	4,092	445	5,165
1905	2	522	7	591	25	3,999	618	5,730
1906	6	105	5	727	31	4,294	5	5,131
1907			7	849	42	5,791	30	6,670
1908	2	112	10	802	32	5,214	80	6,208
1909[b]								6,191
1910	1	189	10	1,021	45	5,710	344	7,264
1911	2	43	4	33	52	6,929	1,102	8,107
1912	2	24	3	41	49	8,181	432	8,678
1913	1	32	8	302	49	8,743	85	9,162

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **VIRGINIA** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	267	55,254	14,752,818	7,377	.....	.....
1904	238	50,321	11,976,398	5,988	.....	.....
1905	241	55,047	13,266,327	6,633	.....	.....
1906	250	50,368	12,592,000	6,296	.....	.....
1907	241	65,821	15,862,861	7,931	.....	.....
1908	200	60,974	12,194,800	6,097	.....	.....
1909	.....	.....	.....	.....	.....	.....
1910	241	70,897	17,086,177	8,543	57	6.67
1911	261	79,849	20,840,589	10,420	68	6.53
1912	251	86,259	21,651,009	10,826	75	6.93
1913	280	91,169	25,527,320	12,764	24	1.88

TABLE 134.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **VIRGINIA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 beginning with 1909 compiled from State mine inspectors' reports.. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated. Figures in italics represent incomplete fatality records.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1822–1887	14,567,029			*266*																	
1888	1,073,000	$1.00	2,400					(a)	447												
1889	865,786	.93	1,523					(a)	568												
1890	784,011	.75	1,295					296	605	2.04											
1891	736,399	.83	820					246	898	3.65											
1892	675,205	.86	836					192	808	4.21											
1893	820,339	.84	961					253	854	3.38											
1894	1,229,083	.76	1,635					234	752	3.21											
1895	1,368,324	.63	2,158					225	634	2.82											
1896	1,254,723	.68	2,510					198	500	2.53											
1897	1,528,302	.67	2,344					213	652	3.06		21.2								8	
1898	1,815,274	.59	1,855					230	979	4.26		13.5								8	
1899	2,105,791	.62	1,960					252	1,074	4.26		23.1			8					8	
1900	2,393,754	.89	3,631					239	659	2.76		9.7								9	
1901	2,725,873	.80	4,152	*17*				279	657	2.35		8.6								6	
1902	3,182,993	.80	3,912					293	814	2.78		4.2								11	
1903	3,451,307	.96	5,608					267	615	2.30		2.4				10				10	
1904	3,410,914	.86	5,165					238	660	2.77		7.2			3	15				18	
1905	4,275,271	.88	5,730					241	746	3.10		9.3			10	25				35	
1906	4,254,879	.98	5,131	*35*				250	829	3.32		10.0			10	27				37	
1907	4,710,895	1.02	6,670	*11*				241	706	2.93		16.7			26	51				77	
1908	4,259,042	.91	6,208					200	686	3.43		24.3			14	71				85	
1909	4,752,217	.89	6,191	27	4.36	5.68	176,008	(a)	768	(a)		27.9			21	82	4			107	62
1910	6,507,997	.90	7,264	57	7.85	8.76	114,175	241	896	3.72		35.1			14	118	4	6		142	63

1911	6,864,667	.91	8,107	68	8.39	9.91	100,951	261	847	3.25	27.2	37.1	35.6	0.1	.....	121	.....	35	.....	156	61
1912	7,846,638	.96	8,678	75	8.64	9.56	104,622	251	904	3.60	11.5	40.3	47.7	.....	5	128	1	51	.....	185	61
1913	8,828,068	1.01	9,162	24	2.62	2.72	367,836	280	964	3.44	19.7	47.6	32.6	.1	4	106	1	76	.....	187	60
Total	96,287,781	.....	.....	580	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1909–1913)	6,959,917	.....	7,880	50.20	6.37	7.21	138,844	259	883	3.41	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	7,959,535	1.01	9,183	27	2.94	3.39	294,798	235	867	3.69	18.0	51.4	30.5	0.1	4	75	5	98	.....	182	63

[a] Not reported.

TABLE 135.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **VIRGINIA**, [a] WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1909 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1909	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
1910	35	.....	1	.....	10	.....	.....	3	.....	3	.....	2	54	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	3	57
1911	35	.....	18	5	.....	.....	.....	2	.....	.....	.....	.....	60	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	4	8	68
1912	33	.....	9	10	.....	10	.....	4	.....	1	.....	.....	67	1	.....	.....	.....	1	3	1	.....	.....	1	2	7	75
1913	11	1	4	.....	.....	.....	.....	4	.....	.....	1	3	24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24
1914	12	1	1	.....	.....	.....	.....	1	.....	.....	.....	.....	15	1	1	.....	.....	2	5	5	.....	.....	.....	.....	10	27

[a] Figures for 1909 are from Mineral Resources, U. S. Geol. Survey; 1910, 1911, and 1912 from reports of mine operators as received by the Bureau of Mines.

WASHINGTON.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Washington comprise an area of about 1,800 square miles in the northwestern part of the State. They may be grouped into four fields, as follows: North Puget Sound, including Whatcom and Skagit counties; south Puget Sound, including King and Pierce counties; Roslyn Basin, in Kittitas County; and the southwestern field, including Lewis and Cowlitz counties. King, Kittitas and Pierce counties are the principal producers.

The north Puget Sound field extends from the coast south of Bellingham northeastward to the foot of Mount Baker. It is the south limb of a great syncline. The coal beds dip to the northwest at varying angles, ranging from 35° near the coast to 90° at Cokedale and 45° at Glacier. The quality of the coal ranges from coking bituminous coal at Cokedale and Blue Canyon to anthracite at Glacier.

The south Puget Sound field is characterized by a series of parallel folds, usually in a north-south direction. The principal mines at Wilkeson and Carbonado are on the west slope of an anticline, where there are a number of overthrust faults. The structure in this field is complicated by folding and faulting and the intrusion of igneous rocks.

The Roslyn field, in Kittitas County, is a more regular basin, with a slight pitch to the southeast. The dip of the coal-bearing rocks varies from 10° to 20°, and the basin is free from faults.

The southwestern field is in general a broad, flat basin, but on the east side, next the Cascade Range, the coal beds are badly covered by lava flows. Here the coal is of low rank, being classed generally as the lowest grade of subbituminous coal.

CHARACTER OF COAL BEDS.

The coals of Washington vary from lignite through semibituminous to bituminous coking coal. In a number of the districts the coal produces a large amount of slack or fine coal when mined.

Near Bellingham the coal bed that is now worked is 14 feet thick, whereas at Cokedale there are beds 20 feet thick. Gas is prevalent in these mines. The Blue Canyon bed has an average thickness of 7 feet, and at Glacier it is about 6 feet thick, but badly crushed and distorted.

The coal beds in the South Puget Sound field are more numerous, but the strata are so disturbed that coal beds can seldom be identified from mine to mine, even though the properties are contiguous and in some cases the mine workings connect. The center of production in King County is about Black Diamond. The principal beds here are the Upper McKay, which ranges from 4 feet 4 inches to 4 feet 9

inches, and the Lower McKay, which is 4 feet 7 inches to 6 feet 3 inches in thickness. At New Castle there are four productive beds, varying from 4 to 12 feet in thickness, some of which have been worked down the dip to a depth of about 2,000 feet. At Renton there are two beds, varying from 7½ to 8 feet in thickness. The most important producing area in Pierce County includes the mines on Carbon River from Wilkeson on the north to Montezuma on the south. At Wilkeson there are three coal beds, averaging each about 6 feet thick. At Carbonado at least 10 coal beds, which range in thickness from 2 feet to more than 8 feet, have been worked. The Wingate bed, about 5 feet thick, is the best in the mine. The Carbonado mine has considerable gas, especially on the west side of Carbon River.

In Kittitas County the mines are gaseous, one disastrous explosion occurring during 1910, in which 10 men lost their lives. Another explosion occurred in 1902. At Roslyn coal is being mined from beds 4 feet 6 inches thick from a shaft 604 feet deep. The roof consists of shale. At Clealum, in the same district, coal is being mined from a bed 4 feet 2 inches thick at a depth of 250 feet.

MINING METHODS.

The coal beds are faulted and upturned in many sections, so that it is necessary to mine coal from steeply inclined seams. The mines are opened by shafts, slopes, and drifts. In the Roslyn field the beds are very dry and require sprinkling to prevent the accumulation of dust. The double-entry room and pillar systems of mining are used. At Carbonado the mines are opened by slopes and drifts, some of which extend nearly 2 miles into the mountain side.

A number of the larger collieries in Washington have opened their mines by slopes and the coal is mined by the pillar-and-breast system, about 90 per cent of the coal being extracted. In the northern field the coal beds are opened by shafts and drifts and in some cases the coal seams are gaseous.

In 1896 there were three mining machines in use, producing only 3 per cent of the coal. The number of machines remained about the same until 1909, when there were 18 machines, and in 1913 there were 63 machines, producing 7.2 per cent of the total coal. Shooting off the solid is used for more than one-third the total production.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

An act approved November 28, 1883, effective January 1, 1884, authorized the governor of the Territory of Washington to appoint an inspector of coal mines for all mines employing more than 10 men. In addition to rendering an annual report to the governor, the inspector was required to make a special report on all accidents

causing loss of life or serious bodily injuries. Operators were required to notify the inspector and coroner of all fatal accidents, and upon such notice an investigation was conducted to determine the cause of the accident. The act of February 4, 1886, required operators to notify the inspector of all serious accidents as well as fatal accidents.

On February 2, 1888, an act was approved by which the Territory was divided into two inspection districts, with an inspector for each district appointed by the governor. The State legislature enacted a law which was approved March 5, 1891, relating to the inspection of coal mines, but the requirement as to the reporting of fatal and serious accidents was not changed. The inspectors were appointed by the governor upon the recommendation of an examining board, and were required to file annual reports with the secretary of state before February 1, covering the previous calendar year.

The act of March 6, 1897, provided that the inspection law should apply to all coal mines employing 10 or more men, but that operators of mines enploying less than 10 men should notify the inspector as soon as 10 men were employed.

On March 5, 1907, a law was approved providing one mine inspector for the entire State until there are 60 mines in operation, and dividing the State into districts, containing not less than 10 nor more than 60 mines each, and an inspector for each district, as soon as the number of operating mines in the State exceeds 60. An act approved March 13, 1911, authorized the State mine inspector to appoint, with the consent of the governor, a deputy inspector, who should hold office during the pleasure of the State inspector.

Prior to 1912 it was the practice of the operators to report only those injuries causing at least 30 days' disability, but since that year, when the workmen's compensation law became effective, the operators have reported all injuries resulting in disability for 5 days or more and these are published in the inspector's annual reports. Serious injuries are those resulting in 30 days' disability, all others being considered slight injuries.

In 1915 the inspector was assisted by one deputy.

ACCIDENTS.

Tables 136 and 137 show the production of coal, the number of men employed, and the fatalities in coal mines as compiled from the reports of the United States Geological Survey and the State mine inspectors' reports. Complete records of fatalities from the mine inspectors' reports are available from 1889 to 1913, a period of 25 years. During this time there were 640 fatalities, representing a rate of 6.14 fatalities per 1,000 men employed. The amount of coal produced per death was 93,606 tons, or 10.68 fatalities per

FATALITIES IN **WASHINGTON** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1889 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	182	28.44	1.75
Mine cars and locomotives	81	12.65	.78
Gas and dust explosions	195	30.47	1.87
Explosives	32	5.00	.30
Miscellaneous	102	15.94	.98
Shaft	13	2.03	.12
Surface	35	5.47	.33
Total, 25 years	640	100.00	6.14

FATALITIES DUE TO THE DIP OR PITCH OF COAL SEAMS IN **WASHINGTON** MINES, 1905 TO 1912, INCLUSIVE.[a]

Cause of accident.	1905	1906	1907	1908	1909	1910	1911	1912
Coal or rock sliding down pitch	3	1	4	2	1	1	2	2
Timber sliding down pitch			4	1				
Runaway cars, and men falling from cars or skips	2	7	3	5	1	3	5	
Cars on haulage planes		2					1	
Falling down slopes or chutes				1	2	2	3	3
Suffocated by gas outburst		1			2			
Total	5	11	11	9	6	6	11	5
All fatalities	12	22	36	25	39	43	27	14

[a] Compiled from State mine inspector's reports.

COAL-MINE ACCIDENTS IN **WASHINGTON** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1892 May 10	Roslyn	Roslyn	Mine explosion	45
1894 Aug. 24	Franklin	Franklin	Mine fire	37
1895 Apr. 8	Blue Canyon	Lake Whatcom	Mine explosion	23
1899 Dec. 9	Carbon Hill No. 7	Carbonado	do	31
1900 Aug. 21	Issaquah No. 4	Issaquah	Smoke from burning air shaft.	5
1902 Oct. 1	Lawson	Black Diamond	Mine explosion	11
1904 Dec. 7	No. 5	Burnett	do	17
1907 Apr. 26	Morgan	Black Diamond	do	7
1909 Oct. 3	Northwestern	Roslyn	do	10
1910 Nov. 6	Lawson	Black Diamond	do	16
1915 Nov. 16	Northwestern	Ravensdale	do	31

million tons of coal mined. During this period there have been 10 mine disasters in which 5 or more men have been killed at one time, making a total of 202 fatalities. Of the total number of fatalities during this 25-year period 30.47 per cent was due to gas and dust explosions; 28.44 per cent to falls of roof and coal; and 12.65 per cent to mine cars and locomotives.

Practically all of the mines in Washington are operated on an 8-hour basis, and for purposes of comparison with 9 and 10 hour States, Tables 40 and 41 have been compiled. The number of hours worked per year per man is 2,023. The fatality rate based on the actual number of employees is 4.64, as compared with 4.58 when

reduced to the equivalent of 2,000-hour workers. Table 41 gives similar data for all of the States, so that comparisons of one State with another may be readily made.

NUMBER OF HOURS TO THE WORKING-DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN WASHINGTON.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	5	342	17	2,245	6	2,180	.....	4,768
1904	24	4,152	4	70	.....	.....	1,065	5,287
1905	18	3,644	1	28	8	353	740	4,765
1906	29	4,179	4	106	2	13	231	4,529
1907	41	5,594	1	5	.....	.....	346	5,945
1908	39	4,665	1	20	.....	.....	799	5,484
1909 [b]	.....	.....	.....	.....	.....	.....	.....	5,992
1910	40	6,129	.....	.....	.....	.....	185	6,314
1911	45	5,642	.....	.....	.....	.....	1,594	7,236
1912	42	5,344	.....	.....	2	50	125	5,519
1913	52	5,794	.....	.....	.....	.....	.....	5,794

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN WASHINGTON AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	285	44,751	12,754,035	6,377	25	3.92
1904	243	43,431	10,553,733	5,277	31	5.87
1905	227	39,594	8,987,838	4,494	12	2.67
1906	266	36,595	9,734,270	4,867	22	4.52
1907	273	47,911	13,079,703	6,540	37	5.66
1908	202	44,691	9,027,582	4,514	25	5.54
1909	.....	.....	.....	.....	.....	.....
1910	256	50,697	12,978,432	6,489	43	6.63
1911	225	59,482	13,383,450	6,692	27	4.03
1912	226	44,377	10,029,202	5,014	14	2.79
1913	260	46,352	12,051,520	6,026	22	3.65

On account of the coal beds being badly upturned, necessitating working on steep pitches or dips, there is an unusual percentage of accidents due to coal, rock, or timber sliding down from a working face, from cars getting loose and running down an incline, and from men falling down chutes or slopes. About 30 per cent of the fatalities belong to this group, as shown in the accompanying table. In nearly all of the States, the bituminous coal beds are comparatively flat, but Washington is an exception in this respect. Outside of certain fields in Oklahoma and Colorado, and the anthracite fields in eastern Pennsylvania, there is not a district where the coal beds are as steeply inclined as in Washington. The tables of statistics for the State follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN WASHINGTON.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899				1907	484	8,544	18
1900	100	3,000	30	1908	226	67,800	300
1901				1909	123	2,300	19
1902				1910	101	303	3
1903	200	6,600	33	1911	2,099	22,215	10
1904	365	25,020	69	1912	807	31,347	39
1905				1913	1,239	60,145	49
1906				1914	459	25,410	55

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 136.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN WASHINGTON, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geological Survey. Figures in column 4 and items above horizontal lines in columns 2, 3, and 21 are from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1860–1884	1,759,083																				
1885	380,250		840	3	3.57	7.89	126,750		453												
1886	423,525		840	4	4.76	9.44	105,881		504												
1887	772,601		1,520	2	1.32	2.59	386,301		508												
1888	1,216,750	(a)	(a)	(a)																	
1889	1,030,578	$2.32	2,657	6	2.26	5.82	171,763	(b)	388												
1890	1,263,689	2.71	2,206	7	3.17	5.54	180,527	270	573	2.12											
1891	1,056,249	2.31	2,447	14	5.72	13.25	75,446	211	432	2.05											
1892	1,213,427	2.28	2,564	56	21.45	45.33	22,062	247	473	1.91											
1893	1,204,877	2.31	2,757	9	3.26	7.12	140,542	241	459	1.90											
1894	1,106,470	2.33	2,662	50	18.78	45.19	22,129	207	416	2.01											
1895	1,191,410	2.16	2,840	30	13.73	32.73	30,549	224	420	1.88											
1896	1,196,504	2.00	2,622	8	3.05	6.69	149,438	221	456	2.06		0.3								3	
1897	1,434,112	1.94	2,739	7	2.56	4.88	204,873	236	524	2.22											
1898	1,884,571	1.78	3,145	11	3.50	5.84	171,325	270	599	2.22											
1899	2,029,881	1.78	3,330	45	13.51	22.17	45,108	269	610	2.36		.7			2					2	21
1900	2,474,093	1.90	3,870	31	8.45	12.53	79,809	289	674	2.33		.4								2	24
1901	2,578,217	1.66	4,545	27	5.94	10.47	95,490	276	567	2.05		.3								4	19
1902	2,681,214	1.72	4,404	34	7.72	12.68	78,859	275	609	2.21											23
1903	3,193,273	1.89	4,768	25	5.24	7.83	127,731	286	670	2.35											32
1904	3,137,681	1.83	5,287	31	5.86	9.88	101,216	243	593	2.44											32
1905	2,864,926	1.70	4,765	12	2.52	4.19	238,744	227	601	2.65											47
1906	3,276,184	1.80	4,529	22	4.86	6.72	148,917	268	723	2.72		.4					1			1	48
1907	3,080,532	2.09	5,945	37	6.22	10.05	99,474	273	619	2.27											52
1908	3,024,943	2.21	5,484	25	4.56	8.26	120,998	202	552	2.73		.7			4					4	43

1909	3,602,263	2.54	5,992	39	6.51	10.83	92,366	(b)	601	(b)	.....	1.4	.....	.....	15	3	.....	.....	.....	18	46
1910	3,911,899	2.50	6,314	43	6.81	10.99	90,974	256	620	2.42	.....	1.4	.....	.....	10	.....	.....	.....	.....	10	48
1911	3,572,815	2.29	7,236	27	3.73	7.56	132,326	225	494	2.20	62.9	5.3	27.6	4.2	.....	.....	.....	.....	23	23	50
1912	3,360,932	2.39	5,519	14	2.54	4.17	240,067	226	609	2.69	59.3	7.7	32.8	.2	.....	.....	.....	.....	56	56	48
1913	3,877,891	2.38	5,794	22	3.80	5.67	176,268	260	669	2.57	54.7	7.2	37.8	.3	1	.....	.....	1	61	63	53
Total	64,459,440	.....	.....	649	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1889–1913)	**2,396,305**	.....	**4,167**	**25.80**	**6.14**	**10.68**	**93,606**	**248**	**575**	**2.32**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	3,064,820	2.20	5,805	17	2.93	5.55	180,284	191	528	2.76	41.8	10.7	47.1	.4	46	.....	.....	1	25	72	58

[a] Report not available.

[b] Not reported.

TABLE 137.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **WASHINGTON**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1885 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1885	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
1886	.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	3	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	4
1887	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1888 [a]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	4	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1890	1	.....	1	2	.....	1	1	.....	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
1891	1	2	2	.....	.....	1	.....	.....	.....	.....	.....	5	11	1	.....	.....	.....	1	.....	.....	.....	.....	.....	2	2	14
1892	3	.....	3	46	.....	.....	.....	.....	.....	.....	.....	1	53	.....	1	.....	.....	1	1	.....	.....	.....	.....	.....	1	55
1893	4	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	1	1	.....	.....	1	.....	.....	.....	1	9
1894	2	1	4	.....	4	.....	.....	.....	.....	.....	37	1	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	50
1895	.....	1	1	26	.....	1	.....	.....	.....	.....	4	3	36	.....	.....	.....	.....	.....	.....	.....	1	2	.....	.....	3	39
1896	5	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
1897 [b]	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	7
1898	3	2	4	.....	.....	.....	.....	.....	.....	.....	.....	1	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	11
1899	4	4	1	1	31	1	.....	.....	.....	.....	.....	2	44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	45
1900	12	1	1	4	.....	.....	3	.....	.....	.....	5	2	28	.....	.....	.....	.....	.....	.....	.....	1	1	.....	1	3	31
1901	9	5	4	2	.....	2	.....	.....	.....	.....	1	.....	23	2	1	.....	.....	3	1	.....	.....	.....	.....	.....	1	27
1902	7	5	5	.....	11	2	.....	.....	.....	.....	.....	.....	30	1	1	.....	.....	2	.....	.....	1	.....	.....	1	2	34
1903	10	4	6	.....	.....	2	.....	.....	.....	.....	.....	.....	22	1	.....	.....	.....	1	1	.....	1	.....	.....	.....	2	25
1904	5	2	2	.....	17	3	1	.....	.....	.....	.....	.....	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	31
1905	6	1	3	.....	.....	1	.....	.....	.....	.....	.....	1	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
1906	6	1	9	1	.....	.....	.....	1	.....	.....	.....	.....	18	.....	.....	1	.....	1	2	.....	1	.....	.....	.....	3	22
1907	10	1	2	10	.....	5	.....	3	.....	.....	.....	1	32	.....	.....	.....	.....	.....	3	.....	1	.....	.....	1	5	37
1908	13	1	8	1	.....	.....	.....	1	.....	.....	.....	1	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25
1909	9	4	1	14	.....	3	.....	4	.....	.....	.....	2	37	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	2	39
1910	8	2	4	.....	18	4	.....	3	.....	.....	.....	2	41	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	2	43
1911	6	4	8	.....	.....	2	.....	2	.....	.....	1	.....	23	1	.....	.....	.....	1	2	.....	1	.....	.....	.....	3	27
1912	3	3	3	.....	.....	1	.....	3	.....	.....	.....	.....	13	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	14
1913	7	.....	4	5	1	2	.....	1	.....	.....	.....	1	21	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	22
1914	6	2	3	1	.....	3	.....	1	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	17

[a] Report not available.

[b] Figures are from Feb. 2 to Dec. 31.

WEST VIRGINIA.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of West Virginia occupy all of the area on the Western slope of the Appalachian Mountains. The entire area of the State is 24,022 square miles, of which an area of approximately 17,000 square miles is coal-bearing. Thirty counties are important producers. The 6 counties heading the list, in the order of their production in 1913, are McDowell, Fayette, Marion, Harrison, Kanawha, and Logan, each of which mined more than 4,000,000 tons of coal.

There are seven important fields, the three in the northern part of the State being (1) Fairmont field, including Harrison and Monroe counties; (2) Elk Garden (Piedmont), or Upper Potomac field, including Mineral, Grant, and Tucker counties; (3) Phillipi field, including Preston, Barbour, and Randolph counties. The four fields in the southern part of the State are as follows: (1) New River field, including Fayette and Raleigh counties; (2) Kanawha field, including Kanawha and parts of Boone and Putnam counties; (3) Pocahontas field, including McDowell and Mercer counties, W. Va., and Tazewell County, Va.; and (4) Big Sandy field, which is a continuation of the Kanawha district into Logan and Mingo counties.

In general the coal beds and the associated sandstones, limestones, and shales of the West Virginia fields dip northwestward toward the axis of the great Appalachian trough, which passes through the northwestern part of the State from the southwest corner of Pennsylvania to Wayne County on Big Sandy River. Notwithstanding the general regularity of this great trough, the southeastern side, especially in northern West Virginia, is affected by a number of anticlinal folds trending in the same direction as the axis of the great trough. These smaller folds cause the dips in places to be much steeper than the normal, and on the southeast flank of the arch, to be toward the southeast. This is well illustrated in the synclinal trough in Preston County east of the Chestnut ridge anticline.

CHARACTER OF COAL BEDS.

All of the West Virginia coal is bituminous or semibituminous, the majority of which is of high rank.

The coal increases in rank from west to east across the State, the semibituminous coals being limited to small fields along the margin of the area. These fields of semibituminous coal are Pocahontas, New River, and Upper Potomac (Georges Creek). These coals are preeminently steam coals, going into the market as "smokeless," but they also are used to a limited extent in coke making.

The most important coal in the Fairmont and Elk Garden districts is the Pittsburgh (Elk Garden or 14-foot) bed, with an average

thickness of 8 feet 6 inches, of which 7 feet is usually mined. The Waynesburg and Sewickley coal beds occur in the Fairmont district, but are little worked. They vary in thickness from 5 to 10 feet. The Elk Garden district also contains the Thomas or Upper Freeport, 2½ to 3½ feet thick, and the Davis (Upper Kittanning or "Six-Foot") bed, varying from 4 to 11 feet in thickness. In the Kanawha district, the most important beds are "No. 2 Gas" and the Eagle (soft coking coal), varying in thickness from 3 to 5 feet, and the Coalburg and No. 5 (splint coal), varying from 4 to 6 feet thick.

In the New River field the principal beds are the Sewell, varying in thickness from 3½ to 5 feet; Fire Creek, averaging 3 feet, and the Beckley, varying from 4 to 6 feet. The Pocahontas field produces coal from the "No. 3" bed, which is 4 to 11 feet thick, averaging about 6 feet. In recent years considerable development work has been done on the "No. 4" and also on the Sewell bed.

MINING METHODS.

The earliest records showing coal production of West Virginia are for 1863,[a] during which year West Virginia became a State, and 444,648 short tons was mined. This tonnage has gradually increased until in 1913 the production amounted to 71,308,982 short tons.

As the majority of the beds outcrop at various places, nearly all of the mines are opened by drifts or slopes, few shafts being necessary for mining operations. The room-and-pillar method of mining is extensively used. In 1913, there were 1,479 locomotives in use in the mines, of which 1,365 were electric, 46 steam, 40 compressed air, and 28 gasoline.

Mining in the Elk Garden district began in 1881. In 1891, there were 8 machines used in the State of West Virginia, and this number has gradually increased until in 1913 there were 2,541 machines in use. The average production per machine in 1913 was 15,116 tons. About one-half of the machines used are of the chain-breast type. Of the total amount of coal mined, 55.3 per cent in 1913 was mined by machines; 43.6 per cent was mined by hand, and only 0.8 per cent was shot off the solid.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

An act approved March 11, 1879, authorized the judge of any circuit court in any county to appoint a mine inspector for such county, upon a petition signed by 100 voters showing that any coal mine employing more than 10 men was not sufficiently ventilated. Inspectors so appointed were required to report in writing on the first day of every term of said court the condition of all such mines and whether

[a] Prior to 1863 the production of coal in what is now West Virginia was reported as of Virginia.

any employee had been injured, and the cause of such accident. By an act approved February 26, 1883, the inspection service was placed under the jurisdiction of a State mine inspector, and applied to all coal mines employing 15 or more miners. The inspector was required to render an annual report to the governor, showing number of employees, and number of persons killed or injured. The act of February 20, 1890, divided the State into two inspection districts and authorized the governor to appoint a mine inspector for each district, each inspector to render annual reports to the governor for years ending June 30. A chief mine inspector was authorized by the act of February 17, 1897, assisted by four district inspectors, who rendered monthly reports to the chief inspector. The department of mines was created by the act of February 25, 1905, and placed in charge of the chief mine inspector. The act of February 27, 1907, changed the title of chief mine inspector to that of chief of the department of mines, and the inspection law was extended to cover all mines employing five or more men. Various laws have increased the number of district inspectors until in 1914 there were twelve such inspectors.

ACCIDENTS.

Tables 138 and 139 show the production of coal and number of men employed, together with the fatalities in the coal mines in the State. The fatalities have been compiled from the reports of the State mine inspectors and are based on a calendar year, and do not, therefore, necessarily agree with the inspectors' figures published for fiscal years. During the period from 1885 to 1913, for which continuous complete records are available, there were 4,748 fatalities, representing 4.97 fatalities per 1,000 men employed. The amount of coal produced per fatality during this period was 160,635 tons or 6.23 fatalities per million tons of coal mined. During this period there have been 30 mine disasters, in each of which 5 or more men were killed.

FATALITIES IN **WEST VIRGINIA** COAL MINES, BY PRINCIPAL CAUSES, 1885 TO 1913 INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	2,452	51.64	2.57
Mine cars and locomotives	557	11.73	.58
Gas and dust explosions	1,036	21.82	1.09
Explosives	155	3.27	.16
Miscellaneous	202	4.25	.21
Shaft	67	1.41	.07
Surface	279	5.88	.29
Total, 29 years	4,748	100.00	4.97

COAL-MINE ACCIDENTS IN **WEST VIRGINIA** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1886 Jan. 31	Newburg	Newburg	Mine explosion	39
1894 Nov. 20	Blanche	Standard	Powder and coal-dust explosion.	8
1900 Mar. 6	Red Ash	Red Ash	Mine explosion	46
1900 Nov. 2	Berryburg	Berryburg	Powder-smoke explosion.	15
1901 May 15	Chatham	Farmington	Mine explosion	10
1902 Sept. 15	Algoma No. 7	Algoma	do	17
1902 Sept. 22	Stafford	Stafford	do	6
1905 Feb. 26	Grapevine	Wilcoe	Powder and mine explosion.	6
1905 Mar. 18	Rush Run and Red Ash.	Red Ash	Mine explosion	24
1905 Mar. 19				
1905 Apr. 20	Cabin Creek	Kayford	Powder explosion	6
1905 Nov. 4	Tidewater	Vivian	Powder and mine explosion.	7
1905 Dec. 4	Horton	Horton	Mine fire	7
1906 Jan. 4	Coaldale	Coaldale	Mine explosion	22
1906 Jan. 18	Detroit	Detroit	do	18
1906 Feb. 8	Parral	Parral	do	23
1906 Mar. 22	Century No. 1	Century	Powder and mine explosion.	23
1907 Jan. 26	Lorentz	Penco	Powder explosion	12
1907 Jan. 29	Stuart	Stuart	Mine explosion	84
1907 Feb. 4	Thomas No. 25	Thomas	do	25
1907 May 1	Whipple	Scarboro	do	16
1907 Dec. 6	Monongah Nos. 6 and 8.	Monongah	do	361
1908 Jan. 30	Backman	Hawk's Nest	do	9
1908 Dec. 29	Lick Branch	Switchback	do	50
1909 Jan. 12	do	do	do	67
1909 Mar. 31	Echo	Buery	Dynamite explosion	6
1910 Dec. 31	Lick Fork	Thacker	Mine cars	10
1911 Apr. 24	Ott No. 20	Elk Garden	Mine explosion	23
1911 Nov. 18	Bottom Creek	Vivian	do	18
1912 Mar. 26	Jed	Jed	do	81
1912 July 11	Panama	Moundsville	do	8
1914 Apr. 28	Eccles Nos. 5 and 6	Eccles	do	181
1914 June 30	Cindrella	Cindrella	Suffocated by fumes from fire in fan house.	5
1915 Feb. 6	Carlisle	Carlisle	Mine explosion	21
1915 Mar. 2	Layland No. 3	Layland	do	112
1915 Nov. 30	Boomer No. 2	Boomer	do	23

Of the total number of fatalities during the 29-year period, 51.64 per cent were due to falls of roof and coal; 21.82 to gas and dust explosions; and 11.73 to mine cars and locomotives. Fatalities due to explosives were comparatively few, representing only 3.27 per cent of the total. The percentage of fatalities due to explosives in Oklahoma for a period of 21 years was 15.77; in Ohio, for a period of 30 years, 7.02; and in Illinois, for a period of 29 years, 13.47.

Since 1903, both the 9-hour and the 10-hour day have prevailed throughout the State, there being more than 50 per cent of the men employed on a 10-hour basis. For a true comparison with other States where an 8-hour or a 9-hour day prevails, the time element has been taken into consideration, and Tables 40 and 41 have been compiled on the basis of the actual number of men employed over a 10-year period, 1903 to 1913, inclusive, except 1909; also on the basis of 2,000-hour workers. The fatality rate during the 10-year period based on the actual number of employees is 5.53 per 1,000, and reduced to the equivalent of 2,000-hour workers becomes 5.18. The number of hours worked a year per man in West Virginia is 2,132, as compared with 1,495 for Ohio. The Ohio rate based on the

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **WEST VIRGINIA.**[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, and 10 hours per day.	Total number of men employed.
	Number of mines.	Men employed.	Number of mines.	Men employed.	Number of mines.	Men employed.		
1903	45	1,685	110	10,311	212	22,260	7,298	41,554
1904	53	1,870	137	11,855	271	30,751	2,759	47,235
1905	49	3,532	161	14,387	251	25,731	4,739	48,389
1906	43	2,510	190	15,208	308	31,531	1,711	50,960
1907	35	1,879	156	13,386	322	32,005	11,759	59,029
1908	30	1,242	180	14,426	403	39,550	1,643	56,861
1909[b]								55,433
1910	49	4,671	133	12,950	494	50,432	610	68,663
1911	49	4,242	126	11,477	527	49,996	1,085	66,800
1912	47	4,959	119	10,815	535	50,944	1,530	68,248
1913	29	1,864	369	35,123	365	37,094	705	74,786

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN **WEST VIRGINIA** AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000-hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	210	394,561	82,857,810	41,429	147	3.55
1904	197	453,996	89,437,212	44,719	149	3.33
1905	209	457,700	95,659,300	47,830	212	4.43
1906	220	487,661	107,285,420	53,643	277	5.16
1907	230	561,387	129,119,010	64,560	736	11.40
1908	185	550,057	101,760,545	50,880	310	6.09
1909						
1910	228	663,728	151,329,984	75,665	329	4.35
1911	221	646,954	142,976,834	71,488	341	4.77
1912	266	660,217	175,617,722	87,809	381	4.34
1913	234	708,304	165,743,136	82,872	337	4.07

actual number of employees is 2.94, and reduced to the equivalent number of 2,000-hour workers becomes 3.94, so that the difference between the figures for the two States is not so great as would appear when the rates are based on the actual number of employees. Similar comparisons in these details may be made with other States by referring to Table 41. The tables of statistics for the State follow:

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN **WEST VIRGINIA.**[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	3,468	76,829	22	1907	617	9,749	16
1900	1,883	44,318	24	1908	501	71,992	144
1901	1,438	45,161	31	1909	1,919	29,565	15
1902	18,129	1,362,054	75	1910	1,630	13,985	9
1903	1,524	63,212	41	1911	1,510	16,483	11
1904	3,682	167,343	45	1912	12,165	606,588	50
1905	462	12,111	26	1913	8,800	377,405	43
1906	4,101	123,724	30	1914	9,330	466,768	50

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 138.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **WEST VIRGINIA**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4 and all items above horizontal lines in columns 2, 3, 8, and 20 compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7, and averages in columns 9 and 10 prior to 1900, calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1863–1879	13,404,944																				
1880	1,829,844		3,726						491												
1881	1,680,000		4,470						376												
1882	2,240,000		5,214						430												
1883	2,335,833		6,394	20	3.13	8.56	116,792		365												
1884	3,360,000		6,351	(a)					529												
1885	3,369,062	$1.00	7,292	23	3.15	6.83	146,481		462												
1886	4,005,796	.95	7,262	47	6.47	11.73	85,230	(b)	552												
1887	4,881,620	.95	8,456	11	1.30	2.25	443,784	230	577	2.51											
1888	5,498,800	1.10	9,700	28	2.89	5.09	196,386	(b)	567												
1889	6,231,880	.82	9,778	14	1.43	2.25	445,134	(b)	637											(b)	
1890	7,394,654	.84	12,236	20	2.37	3.92	254,988	227	604	2.66										(b)	
1891	9,220,665	.80	14,227	47	3.30	5.10	196,184	237	648	2.73										8	
1892	9,738,755	.80	14,867	45	3.03	4.02	216,417	228	655	2.87										(b)	
1893	10,708,578	.77	16,524	62	3.75	5.79	172,719	219	648	2.96										(b)	
1894	11,627,757	.75	17,824	79	4.43	6.79	147,187	186	652	3.51										(b)	
1895	11,387,961	.68	19,159	64	3.34	5.62	177,937	195	594	3.05										(b)	
1896	12,876,296	.65	19,078	65	3.41	5.05	198,097	201	675	3.36		3.4								25	
1897	14,248,159	.63	20,504	77	3.76	5.40	185,041	205	695	3.39		4.7								47	
1898	16,700,999	.61	21,607	90	4.17	5.39	185,567	218	773	3.55		7.4								86	
1899	19,252,995	.63	23,625	95	4.02	4.93	202,663	242	815	3.37		9.3			55	99				154	
1900	22,647,207	.81	29,163	150	5.14	6.62	150,981	231	777	3.36		15.1								327	
1901	24,068,402	.87	30,935	133	4.30	5.53	180,965	219	778	3.55		20.0								403	
1902	24,570,826	1.00	35,500	134	3.77	5.45	183,364	205	692	3.38		23.4								579	

1903	29,337,241	1.17	41,554	147	3.54	5.01	199,573	210	706	3.36	.....	27.9	.....	.....	358	430	.....	.....	.....	788	.....
1904	32,406,752	.88	47,235	149	3.15	4.60	217,495	197	686	3.48	.....	29.4	.....	.....	410	491	.....	.....	.....	901	.....
1905	37,791,580	.86	48,389	212	4.38	5.61	178,262	209	781	3.74	.....	33.1	.....	.....	473	628	4	.....	.....	1,105	.....
1906	43,290,350	.95	50,960	277	5.44	6.40	156,283	220	849	3.86	.....	36.0	.....	.....	571	744	7	.....	.....	1,322	.....
1907	48,091,583	.99	59,029	736	12.47	15.30	65,342	230	815	3.54	.....	36.7	.....	.....	617	853	63	.....	.....	1,533	.....
1908	41,897,843	.95	56,861	310	5.45	7.40	135,154	185	737	3.98	.....	39.8	.....	.....	599	899	76	.....	.....	1,574	.....
1909	51,849,220	.86	55,433	336	6.06	6.48	154,313	(b)	935	(b)	.....	40.8	.....	.....	700	1,036	108	.....	.....	1,844	664
1910	61,671,019	.92	68,663	329	4.79	5.33	187,450	228	898	3.94	.....	45.4	.....	.....	680	1,081	199	6	.....	1,966	716
1911	59,831,580	.90	66,800	341	5.10	5.70	175,459	221	896	4.05	46.9	48.7	1.0	3.4	667	1,041	77	253	6	2,044	755
1912	66,786,687	.94	68,248	381	5.58	5.70	175,293	266	979	3.68	46.6	52.3	.7	.4	604	1,217	175	245	12	2,253	742
1913	71,308,982	1.01	74,786	337	4.51	4.73	211,599	234	954	4.08	43.6	55.3	.8	.3	562	1,364	231	363	19	2,539	788
Total	787,543,870	.....	.....	4,768	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
(Average 1885–1913)	26,299,767	.....	32,955	163.72	4.97	6.23	160,635	220	798	3.63	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	71,707,626	1.00	78,963	556	7.04	7.75	128,971	201	908	4.52	40.4	58.9	.5	.2	517	1,407	167	460	56	2,607	822

a No report published for 1884.

b Not reported.

TABLE 139.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **WEST VIRGINIA**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, DURING THE CALENDAR YEARS 1883 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1883	11	6	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	19	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	20
1884 [a]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1885	12	4	1	3	.....	.....	.....	.....	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	3	23
1886	4	.....	1	39	.....	.....	.....	.....	.....	.....	.....	.....	44	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	3	47
1887	9	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
1888	18	5	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	25	1	.....	1	.....	2	.....	.....	.....	.....	1	.....	1	28
1889	7	3	2	.....	.....	.....	.....	.....	.....	.....	.....	1	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	14
1890	18	3	1	.....	.....	3	.....	.....	.....	.....	.....	.....	25	.....	.....	.....	.....	.....	1	.....	.....	.....	1	2	4	29
1891	25	6	6	5	.....	1	.....	.....	.....	.....	.....	.....	43	.....	.....	.....	.....	.....	2	.....	1	.....	1	.....	4	47
1892	23	12	3	.....	.....	5	.....	.....	.....	.....	.....	2	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45
1893	35	13	7	.....	.....	.....	.....	.....	.....	.....	.....	2	57	3	.....	.....	.....	3	1	.....	.....	.....	.....	1	2	62
1894	41	11	11	.....	8	.....	.....	.....	1	.....	2	2	76	1	.....	.....	.....	1	2	.....	.....	.....	.....	.....	2	79
1895	40	8	4	.....	.....	5	.....	.....	.....	.....	.....	3	60	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	4	64
1896	42	5	8	.....	.....	2	.....	.....	.....	.....	.....	4	61	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	3	4	65
1897	47	14	7	1	.....	2	.....	.....	.....	.....	.....	.....	71	1	.....	.....	.....	1	2	.....	.....	.....	2	1	5	77
1898	51	12	13	.....	.....	3	.....	.....	.....	.....	.....	1	80	.....	.....	1	.....	1	4	.....	1	.....	2	2	8	90
1899	51	15	12	3	.....	4	.....	3	.....	.....	.....	1	89	.....	.....	.....	.....	.....	2	.....	.....	1	1	2	6	95
1900	58	7	9	47	.....	19	.....	.....	1	.....	.....	.....	141	.....	.....	.....	.....	.....	7	.....	.....	.....	2	.....	9	150
1901	70	12	14	11	.....	9	.....	.....	.....	1	1	4	122	1	.....	.....	.....	1	8	.....	.....	.....	1	1	10	133
1902	61	16	14	23	.....	5	.....	1	.....	.....	.....	.....	120	5	.....	.....	.....	5	6	.....	.....	.....	.....	3	9	134
1903	79	20	13	2	3	7	.....	2	1	1	.....	2	130	1	.....	.....	.....	1	12	.....	.....	1	1	2	16	147
1904	93	13	16	2	.....	3	.....	3	.....	.....	.....	2	132	2	.....	2	.....	4	10	.....	1	.....	1	1	13	149
1905	99	7	25	7	38	10	.....	.....	2	.....	8	1	197	.....	.....	2	.....	2	6	.....	1	.....	5	1	13	212
1906	108	12	18	26	66	5	.....	6	.....	1	.....	1	243	7	1	2	.....	10	12	.....	2	.....	2	8	24	277
1907	132	17	37	25	461	20	.....	4	1	1	.....	2	700	4	1	.....	.....	5	12	.....	1	.....	2	16	31	736
1908	121	30	39	1	59	11	.....	10	3	1	.....	2	277	10	.....	.....	.....	10	12	4	2	.....	1	4	23	310
1909	142	30	52	4	67	14	.....	11	.....	.....	.....	3	323	1	.....	.....	.....	1	6	2	.....	.....	.....	4	12	336
1910	173	31	55	3	.....	8	.....	20	1	4	.....	1	296	3	.....	11	.....	14	15	.....	1	.....	.....	3	19	329
1911	164	28	55	18	23	3	.....	22	1	4	.....	3	321	2	.....	.....	.....	2	10	3	2	.....	2	1	18	341
1912	176	18	45	8	83	8	.....	21	.....	2	.....	.....	361	.....	.....	2	.....	2	11	3	2	.....	2	.....	18	381
1913	170	30	86	.....	.....	8	.....	17	.....	6	.....	2	319	1	.....	1	.....	2	10	1	2	.....	.....	3	16	337
1914	187	33	73	182	.....	5	.....	29	2	5	5	3	524	2	1	1	.....	4	9	2	1	1	4	11	28	556

[a] No report published.

WYOMING.

AREA AND DISTRIBUTION OF COAL FIELDS.

The coal fields of Wyoming comprise an area of about 25,000 square miles. In addition to this area, in which the coal beds are fairly well known, there are a number of deep basins such as Bighorn Basin, Wind River Basin, and Green River Basin, aggregating 16,000 square miles, in which coal beds are doubtless present, but are at such a depth as possibly to be unavailable.

The most important region in point of quality of coal and quantity produced is the Green River Basin, including the belt of disturbed rocks in Lincoln and Uinta counties. This region comprises about 18,000 square miles underlain by coal-bearing rocks, but an area of only 8,000 square miles contains coal beds that are now accessible. This region includes the Kemmerer and Rock Springs districts, which produce practically all of the high-grade coal of the State. The production of this region in 1913 was about 4,500,000 tons.

The region of next importance is the Powder River region, which has an area of 74,000 square miles. Of this, an area of about 11,000 square miles is believed to be underlain by coal beds more than 3 feet thick. The coal in this field is subbituminous, and Sheridan is the chief center of production.

In the Bighorn, Wind River, and Hanna Basins and in the belt of disturbed rocks in Lincoln and Uinta counties the coal beds are considerably disturbed and in places dip at high angles, but in other fields the dips are low and regular, or the beds are practically flat.

CHARACTER OF COAL BEDS.

The general structure of the Rock Springs district of the Green River field is that of a dome, the axis of which is about 90 miles long extending north and south. The coal beds on the west of this anticlinal axis dip 5° to 30°, whereas those on the east vary from 5° to 10°. There are many normal faults of less than 100 feet in displacement. There are four coal-bearing groups, containing 20 beds 2 to 12 feet thick, aggregating 90 feet at Rock Springs, Sweetwater County, which produced in 1913 about 35 per cent of the State's output.

In the Kemmerer district, Lincoln County, there are three principal coal beds known as the Upper, Main, and Lower Kemmerer beds. These range from 4 to 14 feet in thickness and are generally considered as the best coals in the State. They dip 20° to 25° to the west. This district has the distinction of containing the thickest coal bed that has been mined in the United States. It is 84 feet thick in the old prospect entry, but as the coal slacked badly the mine was abandoned.

In the Powder River field, immediately east of Sheridan, there are 5 coal beds as follows: Healy, 10 to 15 feet thick; Felix, 6 to 30 feet thick; Arvada, 5 to 10 feet thick; Roland, 3 to 7 feet thick; and Smith, 4 to 10 feet thick. South of Sheridan is a small area, known as the Buffalo district, containing the Healy bed, which is about 15 feet thick, and the Walters bed, which is 35 feet thick. These beds are also horizontal. Sheridan County in this field produced 15 per cent of the State's 1913 output.

In the Little Snake River field the coal beds are inclined from horizontal to about 35°. The coal is 3 to 12 feet thick, with shale and sandstone roof.

In the Bighorn Basin the beds dip 3° to 56°, varying from 5 to 10 feet in thickness. Little coal has been mined from this area.

MINING METHODS.

The earliest statistics of coal production in Wyoming are for 1865, when 800 tons of coal was produced. In 1913 the production was 7,393,066 tons.

In most of the mines thus far developed in the Rock Springs district the roof and floor of the coal beds are firm and give little trouble. The majority of the mines are opened by slopes and a few by shafts. The room-and-pillar method of mining is used in coal beds varying from 4 to 8 feet in thickness. In the Rock Springs district a large percentage of the coal is mined by shooting off the solid. There is comparatively little gas in the mines.

In the northern part of the State, in Sheridan County, mines are opened by drifts and the coal is mined by room-and-pillar methods. The coal beds are thicker than in the Rock Springs district, varying from 10 to 19 feet, and in places are 25 to 30 feet thick.

Mining machines have been in use in Wyoming since about 1890. In 1913 there were 195 machines in use, producing 41 per cent of the coal; 36.7 per cent was mined by being shot off the solid; and 21.9 per cent by hand mining. A number of the mines are using electric coal-cutting machines, and haulage is by mules and electricity.

REPORTABLE ACCIDENTS AND ORGANIZATION OF INSPECTION SERVICE.

The inspection of coal mines was placed under the jurisdiction of a Territorial mine inspector by an act approved February 25, 1886, covering all coal mines in which 10 or more men were employed. Operators were required to render to the inspector immediate reports of all fatal and serious accidents. All fatal accidents were to be reported to the county coroner also, and upon such notice an investigation was conducted to determine the cause of the accident. The inspector rendered quarterly reports showing number of accidents

and deaths from injuries, number employed at the mines, etc., and published his report in at least one paper in each county in which there were any coal mines. The act of February 17, 1903, divided the State into two inspection districts and authorized the governor to appoint a mine inspector for each district, the inspector to render quarterly reports of accidents. By the act of February 27, 1909, the inspectors were required, within one week after the examination of each mine, to send a written report of such examination to the governor and also to file with the governor an annual report not later than December 1 of each year. There are no regular deputy or assistant inspectors, but the district inspectors are authorized to appoint temporary deputies to investigate accidents when it is impossible for the district inspectors to be present in person.

Prior to the enactment of the workmen's compensation law, mine operators reported to the inspectors only those injuries resulting in disability to an employee for at least 14 days, and these were published in the inspectors' annual reports. Under the compensation law, which became effective April 1, 1915, all accidents at mines are required to be reported.

ACCIDENTS.

Tables 140 and 141 show the production of coal and number of employees since 1889 to the end of 1913. The fatality records are not so complete, continuous records being available only from 1908 to the end of 1913. During this period of 6 years there were 241 fatalities in and about the coal mines, representing 5.21 fatalities per 1,000 men employed. The production of coal per fatality was 169,801 tons, or 5.89 fatalities per million tons of coal mined. Of the total number of men killed during the 6-year period, 47.30 per cent was due to falls of roof and coal; 27.80 per cent to gas and dust explosions; and 9.13 per cent to mine cars and locomotives.

FATALITIES IN **WYOMING** COAL MINES, BY PRINCIPAL CAUSES, DURING THE YEARS 1908 TO 1913, INCLUSIVE.

Cause of accident.	Number killed.		
	Total.	Per cent.	Per 1,000 employed.
Underground:			
Fall of roof and pillar (coal, rock, etc.)	114	47.30	2.46
Mine cars and locomotives	22	9.13	.48
Gas and dust explosions	67	27.80	1.45
Explosives	13	5.40	.28
Miscellaneous	17	7.05	.37
Shaft	1	.41	.02
Surface	7	2.91	.15
Total, 6 years	241	100.00	5.21

COAL-MINE ACCIDENTS IN **WYOMING** IN WHICH 5 OR MORE MEN WERE KILLED.

Date.	Name of mine.	Location of mine.	Nature of accident.	Number killed.
1881 Mar. 4	Almy	Almy	Mine explosion	38
1886 Jan. 13	Almy No. 4	do	do	13
1895 Mar. 20	Red Canyon	Red Canyon	do	60
1901 Feb. 25	Diamondville No. 1	Diamondville	Mine fire	28
1901 Oct. 26	Diamondville	do	Mine explosion	22
1903 June 30	Hanna No. 1	Hanna	Mine explosion and fire.	169
1905 Dec. 1	Diamondville No. 1	Diamondville	Mine explosion	18
1908 Mar. 28	Hanna No. 1	Hanna	do	59
1912 Jan. 20	Kemmerer No. 4	Kemmerer	do	6
1914 Apr. 29	Union Pacific No. 2	Cumberland	Mine cars	5

Since 1881 there have been 11 coal-mine disasters, in each of which five or more men were killed at one time, representing 428 fatalities. A list is given in the accompanying table.

Since 1907 the mines in Wyoming have been operated on an 8-hour basis, and for comparison with States having 9-hour and 10-hour days, the time element has been taken into consideration. The number of hours worked per annum per man in Wyoming for the 10-year period 1903 to 1913, except 1909, was 2,137. The fatality rate during the 5 years 1908, 1910, 1911, 1912, and 1913, for which complete records are available, is 5.38, based on the actual number of employees, whereas if based on the equivalent number of 2,000-hour workers it becomes 5.71. By referring to Tables 40 and 41, comparisons with other States may be readily made. The tables of statistics for the State follow:

NUMBER OF HOURS TO THE WORKING DAY, BY YEARS, IN AND ABOUT THE COAL MINES IN **WYOMING**.[a]

Year.	8-hour day.		9-hour day.		10-hour day.		Men employed other than 8, 9, or 10 hours per day.	Total number of men employed.
	Number of mines.	Number of men.	Number of mines.	Number. of men.	Number of mines.	Number of men.		
1903	2	289	2	583	20	4,024	.97	4,993
1904	5	19	1	491	17	5,087	63	5,660
1905	2	8	2	456	26	5,492	21	5,977
1906	2	8	2	25	29	5,500	401	5,934
1907	37	6,382	6	197	.....	.....	66	6,645
1908	51	6,802	.....	.....	2	17	96	6,915
1909 [b]	.....	.....	.....	.....	.....	.....	.....	7,123
1910	41	6,175	.....	.....	.....	.....	1,596	7,771
1911	60	6,571	2	5	.....	.....	1,542	8,118
1912	60	7,807	1	3	.....	.....	226	8,036
1913	56	8,321	2	6	1	4	.....	8,331

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey. [b] Census year.

NUMBER OF HOURS WORKED IN AND ABOUT THE COAL MINES IN WYOMING AND THE FATALITY RATE BASED ON THE NUMBER OF 2,000-HOUR WORKERS.

Year.	Days worked.	Total hours per day (all employees).	Total hours per year.	Number of 2,000 hour workers.	Fatalities.	
					Total.	Per 1,000 2,000-hour workers.
1903	252	48,672	12,265,344	6,133	.....	.....
1904	262	56,008	14,674,096	7,337	.....	.....
1905	236	59,277	13,989,372	6,995	.....	.....
1906	281	58,898	16,550,338	8,275	.....	.....
1907	275	53,423	14,691,325	7,346	.....	.....
1908	217	55,450	12,032,650	6,017	81	13.46
1909	.....	.....	.....	.....	.....	.....
1910	248	63,764	15,813,472	7,907	36	4.55
1911	230	66,491	15,292,930	7,647	32	4.18
1912	238	64,517	15,355,046	7,678	36	4.69
1913	232	66,662	15,465,584	7,733	26	3.36

STATISTICS OF STRIKES AND LOCKOUTS IN AND ABOUT THE COAL MINES IN WYOMING.[a]

Year.	Number of men affected.	Total days lost.	Average number of days lost per man.	Year.	Number of men affected.	Total days lost.	Average number of days lost per man.
1899	.....	.....	.....	1907	1,785	22,060	12
1900	.....	.....	.....	1908	4,658	99,576	21
1901	160	1,120	7	1909	.....	.....	.....
1902	.....	.....	.....	1910	1,196	12,792	11
1903	413	4,130	10	1911	.....	.....	.....
1904	.....	.....	.....	1912	360	3,425	10
1905	192	192	1	1913	.....	.....	.....
1906	231	5,775	25	1914	248	2,727	11

[a] Compiled from annual volumes of Mineral Resources, U. S. Geol. Survey.

TABLE 140.—PRODUCTION, NUMBER OF MEN EMPLOYED, AND NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **WYOMING**, BY CALENDAR YEARS. ALSO TONNAGE MINED PER MAN, AS WELL AS THE NUMBER AND KIND OF MINING MACHINES IN USE.[a]

[Figures for total production and all items below horizontal lines in various columns selected from Mineral Resources, U. S. Geol. Survey. Figures in column 4, beginning with 1905, compiled from State mine inspectors' reports. Figures in columns 5, 6, and 7 and averages in columns 9 and 10 prior to 1900 calculated.]

Year.	Production (short tons).	Value per ton at mine.	Number employed.	Number killed.			Production per death (short tons).	Days worked.	Average tonnage per man.		Percentage coal mined by—				Number and kind of machines.						Number of mines.
				Total.	Per 1,000 employed.	Per 1,000,000 tons mined.			Per year.	Per day.	Hand.	Machine.	Shot off solid.	Not reported.	Pick.	Chain breast.	Long wall.	Short wall.	Radial ax or post.	Total.	
	1	2	3	4	5	6	7	6	9	10	11	12	13	14	15	16	17	18	19	20	21
1865–1888	10,363,052	.....	.....	*51*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	1,388,947	$1.26	2,675	.....	.....	.....	.....	(*b*)	519	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	1,870,366	1.70	3,272	.....	.....	.....	.....	246	572	2.33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	2,327,841	1.53	3,411	.....	.....	.....	.....	(*b*)	682	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	34	.....
1892	2,503,839	1.27	3,133	.....	.....	.....	.....	225	799	3.55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	2,439,311	1.35	3,378	.....	.....	.....	.....	189	722	3.82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	2,417,463	1.31	3,032	.....	.....	.....	.....	190	797	4.19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	2,246,911	1.33	3,449	*60*	.....	.....	.....	184	651	3.54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1896	2,229,624	1.37	2,937	.....	.....	.....	.....	210	759	3.61	.....	18.8	.....	.....	.....	.....	.....	.....	.....	39	.....
1897	2,597,886	1.21	3,137	.....	.....	.....	.....	219	828	3.78	.....	21.4	.....	.....	.....	.....	.....	.....	.....	45	.....
1898	2,863,812	1.28	3,475	.....	.....	.....	.....	242	824	3.40	.....	22.1	.....	.....	.....	.....	.....	.....	.....	48	.....
1899	3,837,392	1.24	4,697	.....	.....	.....	.....	261	817	3.13	.....	18.1	.....	.....	42	14	.....	.....	.....	56	.....
1900	4,014,602	1.36	5,332	.....	.....	.....	.....	266	753	2.83	.....	16.3	.....	.....	.....	.....	.....	.....	.....	69	.....
1901	4,485,374	1.35	5,151	*50*	.....	.....	.....	248	871	3.51	.....	17.9	.....	.....	.....	.....	.....	.....	.....	74	.....
1902	4,429,491	1.18	5,250	*21*	.....	.....	.....	248	844	3.40	.....	13.1	.....	.....	.....	.....	.....	.....	.....	69	.....
1903	4,635,293	1.24	4,993	*169*	.....	.....	.....	252	928	3.63	.....	16.9	.....	.....	42	17	.....	.....	.....	59	.....
1904	5,178,556	1.30	5,660	(*b*)	.....	.....	.....	262	915	3.49	.....	20.4	.....	.....	46	26	.....	.....	.....	72	.....
1905	5,602,021	1.31	5,977	*18*	.....	.....	.....	236	937	3.97	.....	22.1	.....	.....	49	26	6	.....	.....	81	.....
1906	6,133,994	1.31	5,934	(*b*)	.....	.....	.....	281	1,034	3.68	.....	21.8	.....	.....	48	34	1	.....	.....	83	.....
1907	6,252,990	1.56	6,645	*30*	.....	.....	.....	275	941	3.42	.....	21.3	.....	.....	45	33	1	.....	.....	79	.....
1908	5,489,902	1.62	6,915	81	11.71	14.75	67,777	217	794	3.66	.....	19.5	.....	.....	47	40	1	.....	.....	88	.....
1909	6,393,109	1.55	7,123	30	4.21	4.69	213,104	(*b*)	898	(*b*)	.....	22.4	.....	.....	85	38	4	.....	.....	127	61
1910	7,533,088	1.55	7,771	36	4.63	4.78	209,252	248	969	3.91	.....	19.5	.....	.....	65	29	4	.....	.....	98	66

1911	6,744,864	1.56	8,118	32	3.94	4.74	210,777	230	831	3.61	29.0	28.9	39.8	2.3	55	[c] 77	1	12	10	155	69
1912	7,368,124	1.58	8,036	36	4.48	4.89	204,670	238	917	3.85	24.6	32.1	43.2	.1	68	77	2	19	13	179	72
1913	7,393,066	1.56	8,331	26	3.12	3.52	284,349	232	887	3.82	21.9	41.3	36.7	.1	61	84	11	27	12	195	61
Total	118,740,918	.....	.....	640	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average (1908–1913)	6,820,369	.....	7,718	40.17	5.21	5.89	169,801	232	884	3.81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1914	6,475,293	1.55	8,117	51	6.28	7.88	126,967	192	798	4.16	23.7	42.2	34.0	.1	56	78	2	48	14	198	56

[a] Figures in italics represent incomplete fatality records. [b] Not reported. [c] Includes 2 cutter-bar machines.

TABLE 141.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN **WYOMING**, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE, 1908 TO 1914, INCLUSIVE.

Year.	Killed underground.													Killed in shaft.					Killed on surface.							Grand total.
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17	18	19	20	21	22		
1908	6	3	1	.....	59	1	.....	.....	.....	.....	.....	10	80	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	81
1909	11	9	5	.....	.....	4	.....	.....	.....	.....	.....	.....	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	30
1910	15	10	3	.....	.....	6	.....	.....	.....	.....	.....	1	35	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	36
1911	15	9	4	1	.....	1	.....	.....	.....	.....	.....	1	31	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	32
1912	16	5	5	.....	7	.....	.....	1	.....	.....	.....	.....	34	.....	.....	1	.....	1	1	.....	.....	.....	.....	.....	1	36
1913	13	2	4	.....	.....	1	.....	2	1	1	.....	.....	24	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	2	26
1914	22	5	9	.....	.....	4	.....	1	1	.....	1	.....	43	.....	.....	.....	.....	.....	5	.....	2	1	.....	.....	8	51

TABLE 142.—NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES IN THE UNITED STATES DURING THE CALENDAR YEAR 1915, WITH THE FATALITIES CLASSIFIED ACCORDING TO CAUSE.

State.	Killed underground.													Killed in shaft.					Killed on the surface.							Total by States.	
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions.	Explosives.[a]	Suffocation from mine gases.	Electricity (shock or burns).	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cages or skips.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity (shock or burns).	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	1915	1914
Alabama	21	2	17	5	.....	7	....	8	....	....	....	....	60	....	.....	1	....	1	....	....	1	.....	.....	1	2	63	128
Alaska and California	.....	.....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	....	.....	....	....	.....	.....	.....	.....	.....	0	0
Arkansas	5	.....	.....	1	.....	.....	....	.....	....	....	....	....	6	....	.....	.....	....	.....	....	....	1	.....	1	.....	2	8	11
Colorado	40	1	8	3	.....	....	2	3	....	....	....	2	59	1	.....	.....	....	1	....	....	2	.....	.....	1	3	63	75
Georgia and North Carolina	.....	.....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	....	.....	....	....	.....	.....	.....	.....	.....	0	1
Idaho and Nevada	.....	.....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	....	.....	....	....	.....	.....	.....	.....	.....	0	0
Illinois	45	12	29	20	2	11	1	6	....	....	....	....	126	3	1	1	....	5	....	....	1	.....	1	.....	5	136	193
Indiana	17	2	7	2	.....	10	....	3	....	....	....	....	41	1	.....	1	....	2	....	....	1	.....	1	2	3	46	44
Iowa	23	.....	5	.....	.....	1	....	.....	....	....	....	1	30	1	.....	1	....	2	....	....	1	.....	.....	1	2	34	37
Kansas	10	.....	.....	2	4	6	....	.....	....	....	....	....	22	.....	.....	1	....	1	....	....	1	.....	.....	.....	1	24	33
Kentucky	35	3	14	.....	.....	2	....	5	....	....	....	....	59	1	.....	1	....	2	2	....	.....	.....	.....	1	3	64	61
Maryland	5	.....	1	.....	.....	2	....	1	....	....	....	....	9	.....	.....	.....	....	.....	....	....	.....	.....	1	.....	1	10	18
Michigan	2	.....	.....	.....	.....	.....	....	1	....	2	....	....	5	1	.....	.....	....	1	....	....	.....	.....	1	.....	1	7	2
Missouri	4	.....	.....	2	.....	6	1	3	....	....	....	....	16	.....	1	.....	....	1	....	....	.....	.....	.....	.....	.....	17	19
Montana	7	2	2	.....	.....	.....	....	.....	....	....	....	....	11	1	.....	.....	....	1	1	....	.....	.....	.....	.....	1	13	8
New Mexico	13	1	3	.....	.....	.....	....	2	....	....	....	....	19	.....	.....	.....	....	.....	....	....	.....	.....	.....	.....	.....	19	18
North Dakota	.....	.....	.....	.....	.....	1	....	.....	....	....	....	....	1	.....	.....	.....	....	.....	....	....	.....	.....	.....	.....	.....	1	3
Ohio	31	8	15	.....	.....	3	....	4	....	2	....	1	64	.....	.....	1	....	1	....	....	.....	.....	.....	.....	.....	65	64
Oklahoma	5	.....	3	1	2	5	....	.....	....	....	....	....	16	1	.....	.....	....	1	....	1	.....	.....	1	3	5	22	31
Oregon	.....	.....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	....	.....	.....	....	.....	....	....	.....	.....	.....	.....	.....	0	1
Pennsylvania (anthracite)	194	67	80	34	.....	79	11	4	1	1	....	45	516	10	.....	.....	....	10	28	1	11	2	.....	18	60	586	595
Pennsylvania (bituminous)	204	41	77	30	.....	9	....	24	2	5	....	8	400	8	.....	.....	....	8	10	4	5	.....	.....	11	30	438	402
Tennessee	15	.....	4	.....	.....	3	1	2	....	....	....	....	25	.....	.....	.....	....	.....	....	....	.....	.....	.....	.....	.....	25	26
Texas	.....	.....	.....	.....	.....	.....	....	.....	....	....	....	....	.....	1	.....	.....	....	1	....	....	.....	.....	.....	.....	.....	1	11
Utah	7	1	.....	.....	.....	1	....	.....	....	....	1	....	10	.....	.....	.....	....	.....	....	....	.....	.....	.....	.....	1	11	22
Virginia	30	1	8	.....	.....	2	....	2	....	....	....	3	40	.....	.....	.....	....	.....	1	1	.....	.....	.....	.....	2	48	27
Washington	5	3	1	.....	31	.....	....	2	....	....	....	....	42	.....	.....	.....	....	.....	....	....	2	.....	.....	1	3	45	17
West Virginia	184	12	72	53	112	6	....	17	....	2	....	2	460	2	.....	.....	....	2	29	2	1	3	1	2	32	494	556
Wyoming	15	4	1	.....	.....	2	....	1	....	....	....	....	23	.....	.....	.....	....	.....	....	....	.....	1	1	1	3	26	51
Total, 1915	**817**	**160**	**347**	**153**	**151**	**155**	**16**	**89**	**3**	**12**	**1**	**62**	**2,066**	**31**	**2**	**7**	....	**40**	**62**	**10**	**26**	**6**	**14**	**42**	**160**	**2,266**	.....
Total, 1914	**985**	**146**	**380**	**332**	**17**	**146**	**14**	**89**	**7**	**20**	**7**	**57**	**2,200**	**70**	**5**	**12**	**1**	**88**	**68**	**11**	**26**	**5**	**13**	**43**	**166**	.....	**2,454**

[a] Includes premature blasts, explosion of misfires, suffocation by gases from explosives, etc.

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INDEX.

R.

Y.

Z.