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METAL-MINE ACCIDENTS
IN THE
UNITED STATES

DURING THE CALENDAR YEAR 1938

BY

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METAL-MINE ACCIDENTS IN THE UNITED STATES DURING THE CALENDAR YEAR 1938¹

By WILLIAM W. ADAMS² and MARY E. KOLHOS³

INTRODUCTION

A new record in accident prevention was made by the metal-mining⁴ industry of the United States in 1938, as signalized by a lower fatality rate than in any previous year. The rate was less than half as high as in 1911, the earliest year for which figures are available. A good safety record was also established in the prevention of non-fatal injuries, as the injury rate was lower than in any other years except 1931 to 1935, a 5-year period notable for its unusually low injury rates.

Employment was more limited in 1938 than in 1937, both in number of men employed and total number of man-hours worked. The number of workdays per man also was smaller than in 1937.

Operating companies reported that 7,233 mines were active in 1938 or some part of the year and that the total number of men employed was 103,027. This figure represents the summation of the average number of men employed as reported by the companies, the average for each mine being that for the period during which the mine was active. The number of employees at all mines in 1938 was 15,402 less than in 1937. Reports covering all mines indicated a total of 188 million man-hours worked during the year, or 21 percent less than the nearly 240 million man-hours worked in 1937. In the performance of this work accidents occurred that resulted in the death of 156 employees and the injury of 12,722, each injured employee being disabled for more than the remainder of the day on which he was hurt. The fatality rate for 1938 was 0.83 per million man-hours worked, which was 9 percent more favorable than the rate of 0.91 for 1937. Nonfatal injuries occurred at the rate of 67.61 per million man-hours worked, an improvement of 10 percent compared with the injury rate of 75.37 for 1937.

Although California was the leading metal-mining State based upon number of men employed (12,821), it ranked tenth from best in fatality rate and twenty-first in injury rate per million man-hours of employment of States having 1,000 or more men employed at metal and nonmetal mines. Among these larger States, New York, Tennessee, and Virginia had no fatal accidents and ranked first, second, and third, respectively, in number of man-hours worked.

¹ Work on manuscript completed September 1940.

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⁴ Excluding coal mining.

Accidents to mine workers are due to numerous causes, but most accidents reported from year to year may be grouped into a relatively small number of classes. The Bureau of Mines standard classification for causes of accidents arranges all accidents in four main groups—those that occur underground, in shafts, in open-pit or surface mining, and in surface work connected with mining. Each group is subdivided to show the main causes of accidents within the group. Most accidents in the four groups can be charged to 40 general causes. Although some of the causes vary in importance from year to year, the chief causes retain their relative importance with little change. For example, accidents due to falls of roof or wall are always more numerous than those due to any other cause underground, and nonfatal injuries as a result of accidents involving haulage equipment, handling materials, drilling, and loading rock or ore are always more numerous than most other causes. The complete list of accident causes covered by the Bureau of Mines standard classification is given in tables 6 and 7, which show the number of fatal and nonfatal injuries attributed to each cause in 1938.

Table 1 indicates the relative standing of the more important mining States. The States are arranged (1) according to the number of men employed, (2) according to the frequency of fatal accidents compared to the number of man-hours worked at the mines, and (3) according to the number of nonfatal injuries compared to the number of man-hours worked.

TABLE 1.—*Relative standing of States having 1,000 or more men employed at mines in 1938, classified according to the number of men employed and fatality and injury rates per million man-hours of labor performed*

Relative standing	State	Number of men employed	Relative standing	State	Fatality rate ¹	Relative standing	State	Injury rate
1	California	12,821	1	New York	0.00	1	Minnesota	8.92
2	Montana	10,117	2	Tennessee	.00	2	Alabama	15.61
3	Arizona	8,460	3	Virginia	.00	3	Missouri	22.90
4	Michigan	7,929	4	New Mexico	.35	4	Michigan	24.79
5	Minnesota	6,387	5	Minnesota	.42	5	Florida	38.34
6	Colorado	5,954	6	Alabama	.46	6	Texas	40.18
7	Idaho	5,821	7	Texas	.52	7	Tennessee	40.55
8	Utah	5,214	8	Florida	.56	8	Virginia	49.22
9	Alaska	5,057	9	Oregon	.56	9	New York	50.11
10	Nevada	4,859	10	California	.56	10	Alaska	50.29
11	Alabama	4,023	11	Arizona	.56	11	South Dakota	55.71
12	New Mexico	2,621	12	Kansas	.73	12	Kansas	69.05
13	Missouri	2,446	13	Montana	.77	13	Arizona	72.44
14	Oklahoma	2,340	14	Alaska	.82	14	Colorado	78.36
15	South Dakota	1,992	15	Washington	.84	15	Utah	79.60
16	Texas	1,632	16	Idaho	.90	16	Oklahoma	80.67
17	Tennessee	1,612	17	Michigan	.93	17	Washington	84.46
18	Kansas	1,515	18	Nevada	1.06	18	Montana	91.70
19	New York	1,349	19	Utah	1.13	19	Nevada	92.10
20	Oregon	1,241	20	South Dakota	1.23	20	New Mexico	94.70
21	Washington	1,215	21	Missouri	1.40	21	California	100.29
22	Virginia	1,071	22	Oklahoma	1.49	22	Idaho	110.38
23	Florida	1,047	23	Colorado	2.23	23	Oregon	111.07
	United States total	103,027		United States average	0.83		United States average	67.61

¹ Number of deaths or injuries per million man-hours of exposure.

ACKNOWLEDGEMENTS

As accident-prevention programs can be conducted most efficiently and economically through an intensive study of accidents that have occurred in the past, the Bureau of Mines gratefully acknowledges the cooperation of mining companies that have voluntarily furnished the reports of accidents and employment that formed the basis of the statistical tables presented in this bulletin. No Federal law requires that operators submit such reports to the Bureau; however, by so doing the mining companies contribute substantially to the promotion of safety in the mining industry of the United States.

Grateful acknowledgment is also made to the mining officials of Alaska, Arizona, and Idaho for the collection of reports for mines in those States.

RELATION OF STATISTICS TO CALENDAR YEAR

This and other statistical reports published regularly by the Bureau of Mines relate to calendar years. The data contained herein are intended to show the number of deaths and injuries resulting from accidents that occurred during the calendar year 1938. For accident-prevention studies it is believed that accidents should be charged to the year in which they occurred so that they may be examined in connection with the causes and conditions that produced them.

SCOPE OF STATISTICS

The tables in this paper are based on reports covering 7,233 mines that were operated all or part of 1938. Data for mines in Alaska were furnished by the Territorial mine inspector; figures for all States were received directly from the operating companies, except those for Arizona and Idaho, which were received from the companies through the offices of the State mine officials. Reports cover mines employing any men, whether the mines were productive or nonproductive; many prospects also are included, but many others are omitted as it is impossible to obtain complete reports for all prospects by mail.

CLASSIFICATION OF INJURIES

Statistics of accidents and employment at metal mines and all other mines except coal mines have been compiled by the Bureau of Mines since 1911. From 1911 to 1914, inclusive, the Bureau's classification of nonfatal injuries covered two groups, "serious" injuries disabling a workman for more than 20 days, and "slight" injuries causing disability not exceeding 20 days but longer than the remainder of the day of accident. From 1915 to 1929, inclusive, a "serious" injury, as used in Bureau reports, signified, in addition to a permanent disability, a temporary injury that disabled an employee more than 14 days. Beginning with 1930 all temporary injuries have been included in a single group, which comprises all temporary injuries causing disability for more than the remainder of the day on which the accident occurred.

CLASSIFICATION OF MINES

Tables on the following pages represent five divisions of the mining industry, as follows:

Copper mines.—This group comprises all mines reported in operation in which copper was the principal mineral produced.

Gold, silver, and miscellaneous metal mines.—This group comprises gold mines (both lode and placer), silver mines, lead-silver mines, gold-silver mines, lead and zinc mines other than those in the Mississippi Valley, and mines working ores of quicksilver, manganese, manganiferous iron, tungsten, vanadium, chromium, etc. Pyrite mines are included, as the cinder is used in some metallurgical works for its iron and copper content, and bauxite mines because bauxite is the main source of metallic aluminum.

Iron mines.—All iron mines are included in this group except those whose ores are valuable chiefly for their manganese content.

Lead and zinc mines (Mississippi Valley).—This group comprises the lead and zinc mines of the Mississippi Valley only, but it also includes fluorspar mines in Illinois and Kentucky.

Nonmetallic-mineral mines.—The nonmetallic-mineral mines include those that produce asbestos, asphaltum, barite, borax, emery, feldspar, flint, fluorspar (except in Illinois and Kentucky), garnet, graphite, gypsum, lithia, magnesite, mica, mineral paint, phosphate rock, quartz, salt, soapstone, sulfur, talc, and tripoli. Coal mines are not included, and the records do not cover properties that produce stone, clay, or sand and gravel.

ACCIDENT STATISTICS, BY STATES AND CAUSES

Comparative figures covering accidents and employment at mines, classified according to general type of mineral produced, are given in table 2. Tables 3 to 10 present similar figures for the various metal-mining States.

TABLE 2.—All mines: Number of active mines, men employed, man-days, man-hours of employment, and number killed and injured,¹ by kind of mine, during the year ended Dec. 31, 1938

Kind of mine	Number of operators	Men employed		Man-days of employment		Average hours of employment per man per day		Man-hours of employment		Total	
		Underground		Surface		Underground		Surface			
		Open-cut	Surface	Total	Open-cut	Surface	Total	Open-cut	Surface		
Copper	96	10,743	2,697	4,172	17,552	2,393,774	761,728	1,173,786	4,329,288	8,00	
Iron, Lead and zinc (Mississippi Valley)	(2)	184	10,729	3,311	3,966	18,006	2,071,746	605,452	1,878,481	3,555,679	
Gold, silver, and miscellaneous	146	194	5,994	51	391	6,436	1,228,809	10,495	91,091	1,350,395	
Gold, silver, Lode	(3)	6,136	31,643	3,243	16,591	51,477	7,934,947	483,656	3,620,614	12,039,217	
Gold, Placer	(2)	2,724	3,164	288	727	7,219	36,295	7,081,889	148,449	1,733,847	
Miscellaneous	(2)	248	2,736	512	8,860	11,299	11,4,060	219,447	1,750,231	2,063,738	
Nonmetal	557	623	2,685	3,981	9,526	2,860	613,189	773,912	885,184	2,251,285	
Total, 1938	(4)	7,233	61,794	13,263	27,980	103,027	14,242,465	2,641,243	6,622,156	23,505,864	
Total, 1937	(4)	9,040	72,271	15,619	30,539	118,420	18,639,206	3,585,970	7,611,434	20,856,610	

¹ Not available.² Undetermined number of small pits in Alabama and Missouri.

TABLE 2.—All mines: Number of active mines, men employed, man-days, man-hours of employment, and number killed and injured, by kind of mine, during the year ended Dec. 31, 1938—Continued

Kind of mine	Average days active	Average hours per man per year	Number killed	Number injured	Rates per million man-hours																						
					Underground			Surface																			
					Total	Open-cut	Underground	Total	Open-cut	Underground																	
Copper	223	286	246	1,782	2,285	2,251	1,970	20	2	24	1,725	149	224	2,098	10	14	1,04	0.33	0.21	0.69	90.09	24.45	23.86	60.58			
Iron	193	183	222	197	1,545	1,486	1,770	16	3	1	20	388	42	26	496	15	16	.97	.61	.14	.70	23.41	8.53	3.70	15.99		
Lead and zinc (Mississippi Valley)	205	206	233	207	1,632	1,688	1,866	1,646	15	15	20	578	3	27	608	13	23	1.53	—	—	1.42	59.08	34.84	37.21	57.38		
Gold, silver, and miscellaneous	251	149	234	200	1,269	1,772	1,877	87	2	2	91	7,504	170	1,160	8,524	46	86	1.37	.51	.07	.94	118.58	39.46	51.45	39.46		
Gold, silver, Lode	250	204	244	248	1,997	1,675	1,952	1,981	77	1	78	7,067	79	700	7,866	46	86	1.36	—	—	.07	1.09	125.45	64.87	49.69	109.56	
Gold, Placer	182	121	156	183	1,436	1,613	1,613	1,502	—	1	2	30	53	413	496	—	—	—	—	.07	.12	33.27	29.94	28.89	39.23		
Miscellaneous	271	164	245	249	2,161	1,323	1,981	1,988	10	1	11	387	38	47	472	—	—	1.70	1.07	—	—	1.40	65.68	40.75	46.34	60.21	
Nominal	228	196	300	236	1,820	1,601	2,297	1,871	1	4	1	6	242	306	178	726	3	—	—	20	.63	.15	.34	49.52	48.02	27.10	40.72
Total, 1938	230	199	228	1,840	1,614	1,898	1,826	1,39	11	6	156	10,537	670	1,615	12,722	87	139	1.22	.51	.11	.83	91.81	31.32	30.41	67.61		
Total, 1937	238	230	249	252	2,062	1,869	2,008	2,023	187	12	20	219	14,755	864	2,436	18,055	117	220	1.25	.41	.33	.91	90.02	29.59	35.72	75.37	

¹ Number of widows and orphans not completely reported by mining companies.

TABLE 3.—All mines: Number of active mines, men employed, man-days of employment, and man-hours of employment, by States, during the year ended Dec. 31, 1938

State	Number of operators	Men employed			Man-days of employment			Man-hours of employment					
		Under-Ground	Open-cut	Surface	Under-Ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	
Alabama 1	35	407	3,359	286	4,023	640	498	105,500	800,828	5,123,975	844,094	6,471,130	
Alaska	(2)	607	1,067	779	3,211	5,057	1,310	1,068,750	1,068,750	2,485,224	623,840	8,556,080	
Arizona	433	5,284	1,034	2,142	8,460	1,437	973	271,735	513,272	11,498,103	2,221,885	4,102,661	
Arkansas	19	1,700	6,520	1,063	5,238	1,282	1,693	451	188,422	1,191,677	2,187,562	2,143,097	
California	572	679	4,448	237	1,269	1,269	1,285	5,954	1,128,659	3,078,550	13,538,826	5,107,883	
Colorado	27	—	641	406	1,047	122	426	101,821	101,821	1,460,873	8,990,738	3,316,378	
Florida	35	41	73	150	52	284	—	15,776	122,426	1,223,827	998,048	801,529	
Georgia	781	802	3,988	258	1,580	5,821	3,020	992	354,865	7,806	60,447	116,300	
Idaho	30	37	218	80	34	332	—	988	354,921	1,376,444	8,074,319	2,839,577	
Illinois	42	114	13	4	131	20,873	73	272	60,873	731,073	119,552	65,556	
Iowa	46	1,360	28	127	1,515	309,691	3,285	317,176	24,603	2,449,312	164,729	195,020	
Kansas	5	503	204	79	786	95,770	35,325	132,229	135,770	686,533	282,600	106,357	
Kentucky	46	54	204	303	126	—	85	88	107,135	136,128	225,269	850,260	
Louisiana	24	24	—	—	—	—	—	—	12,836	112,826	—	103,488	
Maine	35	56	5,125	2,634	2,586	9,792	1,110,589	—	598,126	1,745,043	8,890,027	4,788,649	
Michigan	32	73	2,779	1,454	6,387	421,454	450,542	318,959	1,190,956	3,372,457	3,611,312	13,995,369	
Minnesota	49	64	1,840	580	26	2,446	324,967	120,622	5,722	2,669,223	965,008	9,532,736	
Missouri 1	464	802	61	1,964	10,117	1,356	750	8,277	410,479	1,775,506	10,847,183	4,457,777	
Montana	660	2,944	661	1,254	4,859	748	535	163,682	277,791	1,190,008	5,898,513	65,240	
Nevada	17	17	107	18	160	10	10	15,931	5,145	33,576	84,000	1,307,056	
New Hampshire	7	786	3	186	975	186,	906	720	46,445	238,174	1,483,381	146,694	
New Jersey	78	78	1,640	363	618	2,621	460,103	93,720	173,724	727,607	5,766,722	1,866,722	
New Mexico	21	28	1,068	57	224	1,349	232,757	13,583	62,862	309,202	3,638,371	1,377,200	
New York	123	128	2,000	277	43	480	36,218	5,625	95,103	1,804,334	112,344	5,765,308	
North Carolina	3	86	4	90	17,282	1,200	—	—	302,334	400,027	71,873	2,414,601	
Ohio	39	60	1,939	263	138	2,340	422,763	46,047	1,775,506	10,847,183	3,285,940	14,198,373	
Oklahoma	300	502	291	448	1,241	114,528	32,552	98,642	240,483	1,775,506	2,210,144	9,424,713	
Pennsylvania	10	12	181	222	77	480	65,336	68,872	146,200	426,650	241,505	272,499	
South Carolina	53	63	1,227	68	27	127	6,624	21,495	3,835	32,004	67,039	1,377,581	
South Dakota	24	31	441	470	1,612	176,514	95,576	203,991	608,668	3,096,929	149,988	1,353,847	
Tennessee	28	31	455	164	1,013	1,632	128,117	34,159	359,544	397,464	814,330	1,635,845	
Texas	197	225	3,217	1,090	907	5,214	769,197	325,243	290,682	1,325,122	6,140,589	2,727,022	
Utah	5	13	86	18	117	2,117	5,904	16,035	4,269	26,716	182,808	1,159,165	
Vermont	4	458	271	342	1,071	106,008	51,041	83,498	240,547	1,804,628	415,130	3,10,428	
Virginia	32	181	742	130	343	1,215	197,819	23,669	73,876	295,384	1,584,599	189,313	
Washington	178	8	487	6	183	105,539	450	42,988	149,944	36,007	842,376	3,600	
Wisconsin	7	15	18	25	90	44	297	21,061	5,944	14,811	168,488	47,882	
Wyoming	28	31	173	25	135	5,430	9,381	10,002	43,440	43,440	79,298	288,336	
Other States 3	15	18	65	—	—	—	—	—	—	—	—	122,738	
Total, Total, 1938.	(1)	7,233	61,794	13,253	27,980	103,027	14,242,465	2,641,243	6,622,156	23,505,364	113,677,308	53,998,941	188,170,166
Total, 1937.	(1)	9,040	72,271	15,619	30,539	18,429	18,659,206	3,585,970	7,611,434	29,856,610	149,016,616	61,333,281	236,544,432

1 Undetermined number of small iron pits in Alabama and Missouri.

2 Not available.

3 Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

TABLE 4.—All mines: Average length of workday (hours), average days active, average hours per man per year, by States, during the year ended Dec. 31, 1938

State	Average length of workday (hours)				Average days active				Average hours per man per year			
	Underground		Open-cut		Underground		Open-cut		Underground		Open-cut	
	Underground	Open-cut	Surface	Total	Underground	Open-cut	Surface	Total	Underground	Open-cut	Surface	Total
Alabama.....	8.00	9.17	8.00	8.08	191	192	279	199	1,525	1,759	2,233	1,609
Alaska.....	8.00	8.00	8.00	8.00	291	100	212	211	2,329	801	1,694	1,691
Arizona.....	8.00	8.00	7.99	8.00	272	269	240	263	2,176	2,149	1,915	2,107
Arkansas.....	8.05	8.02	8.28	8.08	254	213	246	246	2,044	1,706	2,039	1,988
California.....	7.97	8.00	8.34	8.12	260	177	228	240	2,077	1,418	1,808	1,949
Colorado.....	7.97	7.96	8.66	7.98	254	189	226	245	2,021	1,508	1,825	1,959
Florida.....	8.15	7.90	8.04	-----	191	250	214	-----	1,557	1,974	1,719	-----
Georgia.....	8.44	8.73	8.99	8.70	189	244	150	213	1,593	2,133	1,349	1,851
Idaho.....	8.13	8.02	8.60	8.10	249	111	225	236	2,027	891	1,797	1,914
Illinois.....	8.17	8.00	8.00	8.11	174	187	234	183	1,423	1,494	1,869	1,486
Iowa.....	7.89	8.16	8.00	7.93	183	211	248	188	1,445	1,721	1,980	1,489
Kansas.....	7.91	7.91	7.94	7.91	228	117	245	227	1,801	928	1,949	1,797
Kentucky.....	8.06	8.00	8.05	8.04	169	173	167	170	1,365	1,385	1,346	1,368
Louisiana.....	7.80	-----	7.94	7.91	229	-----	354	317	1,788	-----	2,806	2,507
Maine.....	8.06	-----	8.06	-----	146	-----	146	-----	1,176	-----	-----	1,176
Michigan.....	8.00	8.10	8.01	8.01	217	179	231	220	1,735	1,453	1,852	1,765
Minnesota.....	8.00	8.02	7.99	8.00	185	170	219	186	1,480	1,361	1,753	1,493
Missouri.....	7.91	8.00	8.00	7.93	177	208	220	185	1,396	1,664	1,761	1,464
Montana.....	7.99	7.88	8.01	8.00	168	136	209	175	1,340	1,070	1,673	1,403
Nevada.....	7.88	7.99	7.99	7.92	254	248	222	245	2,004	1,977	1,770	1,940
New Hampshire.....	8.00	8.18	8.13	8.12	300	168	286	210	2,400	1,371	2,323	1,703
New Jersey.....	8.01	8.00	8.00	8.01	237	240	250	239	1,895	1,920	1,998	1,915
New Mexico.....	7.91	8.00	7.93	7.92	281	258	281	278	2,219	2,065	2,229	2,200
New York.....	7.75	8.27	7.92	7.81	218	238	281	229	1,689	1,971	2,223	1,790
North Carolina.....	8.35	7.96	8.33	8.14	226	181	201	198	1,890	1,444	1,671	1,613
Ohio.....	8.02	8.00	-----	8.02	201	300	-----	205	1,612	2,400	-----	1,647
Oklahoma.....	7.98	8.05	7.95	7.98	218	175	248	215	1,740	1,409	1,971	1,716
Oregon.....	6.91	8.13	7.97	7.49	228	112	209	194	1,572	910	1,667	1,451
Pennsylvania.....	8.00	7.98	7.62	7.93	295	310	312	305	2,357	2,476	2,375	2,415
South Carolina.....	10.12	9.75	8.71	9.70	267	316	144	252	2,096	3,081	1,254	2,444
South Dakota.....	8.00	8.08	8.02	8.01	315	193	305	306	2,524	1,562	2,445	2,451
Tennessee.....	8.03	8.52	8.36	8.25	252	217	267	247	2,022	1,847	2,231	2,035
Texas.....	8.20	8.19	7.10	7.44	282	208	355	320	2,308	1,706	2,520	2,379
Utah.....	7.98	8.00	7.96	7.98	239	298	254	254	1,909	2,387	2,024	2,029
Vermont.....	10.27	9.79	9.24	9.74	200	186	237	196	2,057	1,826	2,191	1,908
Virginia.....	8.16	8.13	8.03	8.11	231	188	244	225	1,888	1,532	1,961	1,821
Washington.....	8.01	8.00	8.04	8.02	267	182	215	243	2,130	1,456	1,732	1,949
Wisconsin.....	7.98	8.00	8.00	7.98	217	75	235	220	1,730	600	1,879	1,760
Wyoming.....	8.00	8.00	8.05	8.01	122	113	135	121	974	900	1,088	971
Other States ¹	8.00	8.45	-----	8.29	217	144	-----	165	1,738	1,220	-----	1,364
Total 1938.....	7.98	8.10	8.02	8.01	231	199	237	228	1,840	1,614	1,898	1,826
Total 1937.....	7.99	8.14	8.00	8.02	258	230	249	252	2,062	1,869	2,008	2,023

¹ Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

TABLE 5.—All mines: Fatalities and injuries and rates per million man-hours, by States, during the year ended Dec. 31, 1938

State	Number killed			Number injured (time lost, 1 day or more)						Rates per million man-hours									
										Killed			Injured						
	Underground	Open-cut	Surface	Underground	Open-cut	Surface	Total	Widows	Orphans	Underground	Open-cut	Surface	Total	Underground	Open-cut	Surface	Total		
Alabama	3	1	3	88	11	2	101	3	9	0.59			0.46	17.17	21.86	2.37	15.61		
Alaska	5	1	7	286	8	136	430	(1)	(1)	2.01	1.60	.0.18	.82	115.08	12.82	25.00	50.29		
Arizona	9	1	10	1,151	19	121	1,291	7	17	.78		.24	.56	100.10	8.55	29.49	72.44		
Arkansas				28	4	7	39							25.75	18.75	32.70	25.75		
California	14		14	1,996	69	441	2,506	11	19	1.03			.56	147.43	45.77	44.37	100.29		
Colorado	26		26	791	16	107	914	6	11	2.89			2.23	87.98	44.78	46.19	78.36		
Florida	1		1	61	8	69				1.00			.56		61.12	9.98	38.34		
Georgia				2	3	6	11							17.20	8.84	85.53	20.93		
Idaho	10		10	1,095	11	124	1,230	6	11	1.24			.90	135.62	47.85	43.68	110.38		
Illinois				8	3	1	12							25.78	25.09	15.73	24.32		
Iowa				12			12							72.85			61.53		
Kansas	2		2	169	1	18	188	2	5	.82			.73	69.00	38.49	72.71	69.05		
Kentucky	3		3	47	32	6	85	3	6	4.37			2.79	68.46	113.23	56.41	79.03		
Louisiana				8		14	22							35.51		16.47	20.46		
Maine	1		1							9.66									
Michigan	12	1	13	306	3	38	347	9	4	1.35		.21	.93	34.42	9.47	7.94	24.79		
Minnesota	2	2	4	58	22	5	85	4	2	.59	.55		.42	17.20	6.09	1.96	8.92		
Missouri	4	1	5	55	26	1	82	2	1	1.56	1.04		1.40	21.41	26.94	21.85	22.90		
Montana	10	1	11	1,180	5	117	1,302	(1)	(1)	.92		.30	.77	108.78	76.64	35.61	91.70		
Nevada	8	2	10	675	89	104	868	6	5	1.36	1.53		1.06	114.44	68.09	46.86	92.10		
New Hampshire				2	9	3	14							23.81	61.35	71.76	51.38		
New Jersey	3		3	84		4	88	2	1	2.01			1.61	56.40		10.76	47.14		
New Mexico	1	1	2	425	48	73	546				.27	1.33		.35	116.81	64.02	53.00	94.70	
New York				103	8	10	121							57.08	71.21	20.08	50.11		
North Carolina				21	4	1	26							69.46	10.00	13.91	33.58		
Ohio				1		1								7.22			6.75		
Oklahoma	6		6	288	28	8	324	6	11	1.78			1.49	85.36	75.57	29.41	80.67		
Oregon		1	1	176	7	17	200						1.34	.56	223.01	26.44	22.76	111.07	
Pennsylvania		1	1	27	9	1	37						1.82		.86	63.28	16.38	5.47	31.92
South Carolina				5	13	3	21							74.56	62.05	88.63	67.65		
South Dakota	6		6	233	10	29	272	6	12	1.94			1.23	75.24	66.67	17.73	55.71		
Tennessee				59	46	28	133							41.63	56.49	26.71	40.55		
Texas	1	1	2	86	14	56	156	2	2	.95			.39	.52	81.91	50.04	21.93	40.18	
Utah	11	1	12	730	35	77	842	8	21	1.79	.38		1.13	118.88	13.45	41.94	79.60		
Vermont				5	15		20							186.94	95.54		89.61		
Virginia				50	26	20	96							57.83	62.63	29.82	49.22		
Washington	2		2	162	10	28	200	1	1	1.26			.84	102.23	52.82	47.13	84.46		
Wisconsin	1		1	18			18	1	1	1.19			.84	21.37			15.13		
Wyoming				7	3	1	11							41.55	41.66	20.90	38.15		
Other States ²				2		2	2								25.22		16.29		
Total, 1938	139	11	6	156	10,437	670	1,615	12,722	(1)	(1)	1.22	.51	.11	.83	91.81	31.32	30.41	67.61	
Total, 1937	187	12	20	219	14,755	864	2,436	18,055	(1)	(1)	1.25	.41	.33	.91	99.02	29.59	39.72	75.37	

¹ Number of widows and orphans not completely reported by mining companies.² Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

TABLE 6.—All mines: Fatalities by causes and States, during the year ended Dec. 31, 1938

State	Underground		Shaft		Total, shaft
	Fall of rock or ore from roof or wall	Fall of rock or ore while loading at ore working face	Other causes	Overwidging of buckets	
Alabama	3				
Alaska	2				
Arizona	6				
California	9				
Colorado	4				
Florida	3				
Idaho	2				
Kansas	3				
Kentucky	2				
Maine	1				
Michigan	6				
Minnesota	1				
Missouri	2				
Montana	4				
Nevada	2				
New Jersey	1				
New Mexico	3				
Oklahoma					
Oregon					
Pennsylvania					
South Dakota					
Texas	1				
Utah	4				
Washington					
Wisconsin					
Total, 1938	52	1	6	12	24
Total, 1937	61	1	36	16	25

TABLE 6.—All mines: Fatalities by causes and States, during the year ended Dec. 31, 1938—Continued

TABLE 7.—All mines: Injuries, by causes and States, during the year ended Dec. 31, 1938

State	Open-cut										Surface												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	
Texas	10	10	13	1	11	9	3	11	3	18	7	—	—	15	104	121	719	8	85	—	1	2	
Utah	36	41	—	106	30	25	65	1	1	—	—	—	—	4	—	—	—	4	—	—	11	1	
Vermont	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Virginia	9	3	2	8	3	3	4	—	2	—	—	—	—	1	5	6	50	4	—	—	1	1	
Washington	6	10	1	26	11	3	2	—	20	1	—	—	—	4	18	29	156	1	—	—	4	1	
Wisconsin	27	2	1	4	1	1	—	—	—	—	—	—	—	2	4	17	7	—	—	—	—	6	
Wyoming	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
Other States ¹	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Total, Total, 1938	2,085	938	765	57	1,232	447	1,06	27	278	9	43	1	225	1,187	1,464	10,199	19	47	3	87	79	238	
Total, 1937	2,853	1,281	1,130	150	1,712	656	658	1,523	61	404	1	3	3	315	1,594	2,115	14,420	26	67	11	6	110	115
																						335	

¹ Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

TABLE 7.—All mines: Injuries, by causes and States, during the year ended Dec. 31, 1938—Continued

State	Open-cut										Surface											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10
New Hampshire																						
New Jersey																						
New Mexico	3	4	2	2	1	1	1	1	3	1	9	7	11	48	6	3	2	7	1	13	1	1
New York	1																					
North Carolina																						
Ohio																						
Oklahoma																						
Pennsylvania																						
South Dakota																						
Tennessee																						
Texas																						
Utah	12	2	3	3	6	2	2	2	1	2	2	1	2	14	2	2	1	1	5	11	14	6
Vermont	4		2																		21	17
Virginia	3		3																			
Washington	2	1																				
Wisconsin																						
Wyoming																						
Other States ¹																						
Total, 1937	63	9	47	25	82	3	6	54	6	86	147	142	670	85	22	25	240	44	191	21	237	386
Total, 1938	87	12	58	34	110	3	10	78	7	92	194	179	804	146	31	53	347	83	321	29	290	599
Grand total																						

¹ Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

TABLE 8.—*All mines: Accidents, by States and severity of injury, during the year ended Dec. 31, 1938*

State	Killed	Nonfatal			Total nonfatal	Grand total
		Perma-nent total ¹	Perma-nent partial ²	Tempo-rary ³		
Alabama	3	27	74	101	104	
Alaska	7	5	425	430	437	
Arizona	10	54	1,237	1,291	1,301	
Arkansas			39	39	39	
California	14	37	2,469	2,506	2,520	
Colorado	26	3	882	914	940	
Florida	1	3	66	69	70	
Georgia		1	10	11	11	
Idaho	10	35	1,195	1,230	1,240	
Illinois			12	12	12	
Iowa			12	12	12	
Kansas	2	7	181	188	190	
Kentucky	3	4	81	85	88	
Louisiana		1	21	22	22	
Maine	1				1	
Michigan	13	1	9	337	347	360
Minnesota	4	1	8	76	85	89
Missouri	5		9	73	82	87
Montana	11		5	1,297	1,302	1,313
Nevada	10		26	842	868	878
New Hampshire				14	14	14
New Jersey	3		12	76	88	91
New Mexico	2	1	5	540	546	548
New York			5	116	121	121
North Carolina			3	23	26	26
Ohio				1	1	1
Oklahoma	6		13	311	324	330
Oregon	1		2	198	200	201
Pennsylvania	1		1	36	37	38
South Carolina				21	21	21
South Dakota	6		5	267	272	278
Tennessee			4	129	133	133
Texas	2		8	148	156	158
Utah	12		34	808	842	854
Vermont				20	20	20
Virginia		2	7	87	96	96
Washington	2		5	195	200	202
Wisconsin	1		1	17	18	19
Wyoming			2	9	11	11
Other States ⁴				2	2	2
Total, 1938	156	8	367	12,347	12,722	12,878
Total, 1937	219	9	432	17,614	18,055	18,274

¹ Permanent total disability: Loss of both legs or arms, 1 leg and 1 arm, total loss of eyesight, paralysis, or other condition permanently incapacitating workmen from doing any work of a gainful occupation.

² Permanent partial disability: Loss of 1 foot, leg, arm, hand, eye, 1 or more fingers, 1 or more toes, any dislocation where ligaments are severed, or any other injury known in surgery to be a permanent partial disability.

³ Disability for more than the remainder of day of accident.

⁴ Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

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TABLE 9.—All mines: Accidents by causes and severity of injury, during the year ended Dec. 31, 1938

Cause of Accident	Killed	Nonfatal			Total nonfatal	Grand total
		Perma-nent total ¹	Perma-nent partial ²	Tempo-rary ³		
Underground:						
1. Fall of rock or ore from roof or wall.	52	1	73	2,011	2,085	2,137
2. Rock or ore while loading at working face.			16	902	918	918
3. Hand tools.	1		25	740	765	766
4. Explosives.	6	4	8	45	57	63
5. Haulage.	12	1	44	1,187	1,232	1,244
6. Falling down chute, winze, raise, or stope.	24	1	12	442	455	479
7. Run of ore from chute or pocket.	5		8	439	447	452
8. Drilling.	3		25	981	1,006	1,009
9. Electricity.	3			27	27	30
10. Machinery.			21	257	278	278
11. Mine fires.	2			9	9	11
12. Suffocation from natural gases.	4			43	43	47
13. Inrush of water.				1	1	1
14. Stepping on nail.				225	225	225
15. Handling materials (other than rock or ore).	3		21	1,166	1,187	1,190
16. Other causes.	6		24	1,440	1,464	1,470
Total, underground.	121	7	277	9,915	10,199	10,320
Shaft:						
17. Falling down shaft.	7		1	18	19	26
18. Objects falling down shaft.	4		1	46	47	51
19. Breaking of cables.	1			3	3	4
20. Overwinding.			2	1	3	3
21. Skip, cage, or bucket.	4		3	84	87	91
22. Other causes.	2		2	77	79	81
Total, shaft.	18		9	229	238	256
Open-cut:						
1. Falls or slides of rock or ore.	3		1	62	63	66
2. Explosives.				9	9	9
3. Haulage.		1	4	42	47	47
4. Power shovels.	1		2	23	25	26
5. Falls of persons.			1	81	82	82
6. Falls of derricks, booms, etc.				3	3	3
7. Run or fall of ore in or from ore bins.				6	6	6
8. Machinery.	1		5	49	54	55
9. Electricity.	3			6	6	9
10. Hand tools.			4	82	86	86
11. Handling materials.			3	144	147	147
12. Other causes.	3		5	137	142	145
Total, open-cut.	11	1	25	644	670	681
Surface:						
1. Mine cars, mine locomotives, gravity or aerial trams.			4	81	85	85
2. Railway cars and locomotives.	1		1	21	22	23
3. Run or fall of ore in or from ore bins.	1		1	24	25	26
4. Falls of persons.	1		5	235	240	241
5. Stepping on nail.				44	44	44
6. Hand tools.			8	183	191	191
7. Electricity.			2	19	21	21
8. Machinery.	1		20	217	237	238
9. Handling materials.			7	379	386	386
10. Other causes.	2		8	356	364	366
Total, surface.	6		56	1,559	1,615	1,621
Grand total, 1938.	156	8	367	12,347	12,722	12,878
Grand total, 1937.	219	9	432	17,614	18,055	18,274

¹ Permanent total disability: Loss of both legs or arms, 1 leg and 1 arm, total loss of eyesight, paralysis, or other condition permanently incapacitating workmen from doing any work of a gainful occupation.² Permanent partial disability: Loss of 1 foot, leg, arm, hand, eye, 1 or more fingers, 1 or more toes, any dislocation where ligaments are severed, or any other injury known in surgery to be permanent partial disability.³ Disability of more than the remainder of day of accident.

TABLE 10.—All mines: Causes of fatalities and injuries, showing percentage due to each cause and corresponding rates per million man-hours during the year ended Dec. 31, 1938

Cause of accident	Number killed				Number injured			
	Percent of—		Per million man-hours		Percent of—		Per million man-hours	
	Grand total	Class total	Grand total	Class total	Grand total	Class total	Grand total	Class total
Underground:								
1. Fall of rock or ore from roof or wall.....	33.33	42.98	0.28	0.46	16.39	20.44	11.08	18.34
2. Rock or ore while loading at working face.....					7.22	9.00	4.88	8.07
3. Hand tools.....	.64	.83	(¹)	.01	6.01	7.50	4.07	6.73
4. Explosives.....	3.85	4.96	.03	.05	.45	.56	.30	.50
5. Haulage.....	7.09	9.92	.06	.11	9.68	12.08	6.55	10.84
6. Falling down chute, winze, raise, or stope.....	15.38	19.83	.13	.21	3.58	4.46	2.42	4.00
7. Run of ore from chute or pocket.....	3.21	4.13	.03	.04	3.51	4.38	2.38	3.93
8. Drilling.....	1.92	2.48	.02	.03	7.91	9.86	5.32	8.85
9. Electricity.....	1.92	2.48	.02	.03	.21	.27	.14	.24
10. Machinery.....					2.18	2.73	1.48	2.45
11. Mine fires.....	1.28	1.65	.01	.02	.07	.09	.05	.08
12. Suffocation from natural gases.....	2.57	3.30	.02	.03	.34	.42	.23	.38
13. Inrush of water.....					.01	.01	.01	.01
14. Stepping on nail.....					1.77	2.21	1.20	1.98
15. Handling materials (other than rock or ore).....	1.92	2.48	.02	.03	9.33	11.64	6.31	10.44
16. Other causes.....	3.85	4.96	.03	.05	11.51	14.35	7.78	12.88
Total, underground.....	77.56	100.00	.64	1.06	80.17	100.00	54.20	89.72
Shaft:								
17. Falling down shaft.....	4.48	38.89	.04	.06	.15	7.98	.10	.17
18. Objects falling down shaft.....	2.57	22.22	.02	.03	.37	19.75	.25	.41
19. Breaking of cables.....	.64	5.56	(¹)	.01	.02	1.26	.02	.03
20. Overwinding.....					.02	1.26	.02	.03
21. Skip, cage, or bucket.....	2.57	22.22	.02	.03	.69	36.56	.46	.76
22. Other causes.....	1.28	11.11	.01	.02	.62	33.19	.42	.69
Total, shaft.....	11.54	100.00	.10	.16	1.87	100.00	1.27	2.09
Open-cut:								
1. Falls or slides of rock or ore.....	1.92	27.27	.02	.14	.50	9.40	.33	2.95
2. Explosives.....					.07	1.34	.05	.42
3. Haulage.....					.37	7.01	.25	2.20
4. Power shovels.....	.64	9.09	(¹)	.05	.20	3.73	.13	1.17
5. Falls of persons.....					.64	12.24	.44	3.83
6. Falls of derricks, booms, etc.....					.02	.45	.02	.14
7. Run or fall of ore in or from ore bins.....					.05	.90	.03	.28
8. Machinery.....	.64	9.09	(¹)	.05	.42	8.06	.29	2.52
9. Electricity.....	1.92	27.27	.02	.14	.05	.90	.03	.28
10. Hand tools.....					.68	12.84	.46	4.02
11. Handling materials.....					1.15	21.94	.78	6.87
12. Other causes.....	1.92	27.27	.02	.14	1.12	21.19	.75	6.64
Total, open-cut.....	1.05	100.00	.06	.52	5.27	100.00	3.56	31.32
Surface:								
1. Mine cars, mine locomotives, gravity or aerial trams.....					.67	5.26	.45	1.60
2. Railway cars and locomotives.....	.64	16.67	(¹)	.02	.17	1.36	.12	.41
3. Run or fall of ore in or from ore bins.....	.64	16.67	(¹)	.02	.20	1.55	.13	.47
4. Falls of persons.....	.64	16.67	(¹)	.02	1.89	14.86	1.28	4.52
5. Stepping on nail.....					.35	2.72	.23	.83
6. Hand tools.....					1.50	11.83	1.02	3.60
7. Electricity.....					.16	1.30	.11	.40
8. Machinery.....	.64	16.67	(¹)	.02	1.86	14.68	1.26	4.46
9. Handling materials.....					3.03	23.90	2.05	7.27
10. Other causes.....	1.28	33.33	.01	.03	2.86	22.54	1.93	6.85
Total, surface.....	3.85	100.00	.03	.11	12.69	100.00	8.58	30.41
Grand total, 1938.....	100.00	-----	.83	-----	100.00	-----	67.61	-----
Grand total, 1937.....	100.00	-----	.91	-----	100.00	-----	75.37	-----

¹ Less than 0.01 percent.

CLASSIFICATION OF ACCIDENTS, BY KIND OF MINE

Copper mines.—A 17-percent reduction in number of employees and a 33-percent reduction in number of man-hours worked were revealed for the copper-mining industry of the United States in 1938 compared with 1937. Mines to which these figures relate include all mines that were operated chiefly for the copper content of the ores produced. Active mines of this class numbered 96 in 1938. The figures do not cover mines that may have produced some copper but whose operations were conducted chiefly because the ore contained metal or metals other than copper.

Montana and Arizona were the principal copper-producing States in 1938. Utah was the leading State in mining copper ores by open-pit methods, and Arizona ranked second with a slightly smaller number of open-pit employees. Employees at all copper mines in all States numbered 17,582, and they performed 34.6 million man-hours of work in 1938 compared with 52.0 million in 1937.

Accidents caused the death of 24 employees and injury of 2,098. More than four-fifths of all accidents occurred in underground mining, which represented 55 percent of the total man-hours worked. Thus underground mining was obviously more hazardous than open-pit mining. Figures for 1938 showed an accident-frequency rate of 91.13 per million man-hours worked underground and 24.78 per million man-hours worked in open-pits; these figures cover both fatal and nonfatal injuries. Similar figures for 1937 showed an accident-frequency rate of 130.81 for underground mining and 35.84 for open-pit mining.

The 30-percent decrease in the rate of accidents underground in 1938 compared with 1937 was due largely to lower rates for accidents caused by haulage, handling materials, and drilling. The rate for shaft accidents and injuries caused by falling down chute, winze, raise, or stope rose slightly in 1938, but this slight gain was more than offset by the lower rates prevailing in all other hazards. The copper rate (90.09) was 2 percent lower than the United States rate of 91.81 for all underground accidents in metal and nonmetal mines. The accident rate for surface mining of copper was 24.45 in 1938 compared to 35.47 in 1937.

Tables 2, 11, and 12 contain detailed figures on accidents and employment at copper mines for the calendar year 1938.

TABLE 11.—Copper mines: Men employed and man-days of employment, by States, during the year ended Dec. 31, 1938

State	Number of operators	Number of mines	Men employed			Man-days of employment			Average hours of employment per man per day			Average days active			
			Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	
Arizona	23	26	2,515	950	1,017	4,482	770,264	262,935	316,070	1,349,289	8.00	8.00	8.00	306	
Michigan	3	3	1,183	581	361	1,499	388,452	99,639	240,023	608,475	8.00	8.00	8.00	277	
Nevada	4	4	557	86	183	607	173,079	91,233	91,984	51,537	8.00	8.00	8.00	309	
New Mexico	3	3	44	44	1,017	351	1,412	9,165	307,095	105,631	174,754	8.00	8.00	8.00	276
Utah	5	5	164	1	101	266	53,223	25	35,833	421,891	8.00	8.00	8.00	363	
Washington and Colorado	4	4	93	—	—	98	16,694	—	89,141	8.40	8.00	8.00	8.00	308	
Montana and Idaho	8	35	5,719	—	—	1,065	6,784	881,066	245,196	1,126,292	8.00	8.00	8.00	154	
Alaska, North Carolina, and Tennessee	3	9	348	—	—	108	456	90,568	—	27,808	118,376	8.00	8.00	8.00	260
Total, Total, 1938	60	96	10,743	2,667	4,172	17,582	2,383,774	761,728	1,173,766	4,329,288	8.00	8.00	8.00	223	
Total, Total, 1937	145	13,078	2,895	5,202	21,175	3,984,098	986,839	6,497,762	8.00	8.00	8.00	8.00	301	246	

TABLE 12.—Copper mines: Number of man-hours of employment and number killed and injured, by States, during the year ended Dec. 31, 1938

State	Man-hours of employment			Average hours per man per year			Number killed			Number injured			Wid-ows	Or-phans
	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total		
Arizona	6,162,119	2,103,640	2,528,565	10,794,324	2,450	2,214	2,486	2,408	3	—	1	4	445	11
Michigan	2,947,616	—	1,920,180	4,867,796	2,471	2,209	2,431	2,445	4	—	4	167	26	400
Nevada	1,384,632	767,352	1,213,024	3,335,008	2,383	2,265	2,178	2,265	3	—	3	218	57	193
New Mexico	2,299,866	755,867	412,209	3,458,032	2,905	2,177	2,263	2,339	1	—	1	64	31	48
Utah	1,733,316	2,456,760	845,048	3,075,124	1,686	2,416	2,408	2,390	1	—	1	15	37	55
Washington and Colorado	425,784	210	287,144	713,138	2,536	210	2,843	2,436	2	—	2	22	9	22
Montana and Idaho	133,552	—	—	133,552	1,436	—	1,841	1,328	7	—	1	8	729	60
Alaska, North Carolina, and Tennessee	7,045,546	—	1,960,426	9,005,972	1,232	—	2,060	2,077	—	—	28	8	36	(1)
Total, Total, 1938	19,146,972	6,083,529	9,389,141	34,629,942	1,782	2,285	2,251	1,970	20	2	24	1,725	149	224
Total, Total, 1937	31,472,780	7,895,221	12,614,103	51,982,104	2,407	2,727	2,425	2,455	45	3	1	4,072	280	586

¹ Not available.

Gold, silver, and miscellaneous metal mines.—This group covers both lode and placer properties and includes all mines that produce metallic ores except those of iron and copper in any State or lead or zinc in the Mississippi Valley States.

The number of men employed at these mines totaled 51,477 in 1938, about 8 percent less than in 1937. Man-hours worked totaled 96.6 million, about 9 percent less than in 1938. Of the total number of workers, placer mines had 11,299 men, lode mines producing ores containing gold, silver, copper, lead, or zinc, 36,235 men, and mines producing tungsten, mercury, manganese, or other minor metals 3,943 men. The group as a whole averaged 1,877 work-hours per man, compared with 1,906 work-hours per man in 1937.

Ninety-one men were killed by accidents during 1938, a reduction of 24 from 1937; and 8,834 employees were injured, or 1,157 less than in 1937. Accidents to these employees resulted in a fatality rate of 0.94 per million man-hours of exposure to risk, which was slightly more favorable than the rate of 1.08 for 1937, and a nonfatal-injury rate of 91.45, which also was slightly better than the rate of 93.90 for 1937. The figures for 1938 are shown in tables 2, 13, and 14.

In underground mining the chief causes of accidents were falls of rock or ore from the roof or wall, haulage, handling materials other than rock or ore, and drilling. Accidents at open-pit mines were due mainly to handling materials, falls of persons, and falls or slides of rock or ore. These and other causes of accidents are shown in table 21.

In underground mining the accident-frequency rate in 1938 for gold, silver, and miscellaneous metals exceeded the rates for other metals or for nonmetals. The rate of 118.58 was 3.06 higher than the corresponding rate of 115.52 for 1937 and 29 percent higher than the total accident-frequency rate for underground work at metal and nonmetal mines in 1938. The higher rate in 1938 was due chiefly to an increase in the number of injuries caused by rock or ore during loading, handling materials, and run of ore from chute or pocket. In surface mining the rate of 43.36 in 1938 was much higher than the 1937 rate of 28.93 owing to greater accident frequency in all the chief hazards of open-cut mining.

TABLE 13.—Gold, silver (lode and placer), and miscellaneous metal mines: Men employed and man-days of employment by States, during the year ended Dec. 31, 1938

State	Number of operators	Men employed			Man-days of employment			Average hours of employment per man per day			Average days active			
		Under-ground	Open-cut	Surface	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	
Alaska	(1)	602	989	779	3,196	4,984	287,253	77,980	675,627	1,040,860	8.00	8.00	8.00	
Arizona	399	445	2,754	61	1,125	3,940	665,463	9,921	197,202	872,586	7.99	7.98	7.99	
Arkansas	16	18	532	123	505	750	135,086	26,394	187,342	8.05	8.02	8.28	8.08	
California	1,589	1,633	6,150	5,157	12	147	1,446,791	146,756	1,172,145	2,937,692	7.97	8.01	8.35	8.12
Colorado	548	647	4,436	141	269	846	1,127,758	31,367	287,332	1,446,458	7.97	8.06	8.06	7.99
Georgia	16	21	444	5	43	92	6,638	1,010	5,122	12,700	8.08	10.60	9.15	8.65
Idaho	772	782	3,902	256	1,569	5,727	966,820	28,518	351,439	1,346,777	8.14	8.02	8.00	8.10
Minnesota	3	3	45	203	67	315	3,510	12,401	13,458	29,349	8.00	8.00	8.00	8.00
Montana	456	478	2,320	56	904	3,280	457,870	7,627	166,781	632,278	7.99	7.87	8.01	7.99
Nevada	638	662	2,332	196	693	3,221	571,126	42,321	125,203	738,850	7.84	8.01	7.97	7.88
New Mexico	61	1,287	1	305	1,563	354,936	42,301	83,984	439,020	7.88	8.00	7.85	7.87	
Oregon	297	303	502	285	448	1,295	114,268	31,614	93,643	299,525	6.91	8.13	7.49	7.49
South Carolina	7	7	23	64	27	114	5,487	20,895	8,885	30,247	10.19	9.89	8.71	9.73
South Dakota	32	32	1,224	3	688	1,895	386,386	750	203,691	590,887	8.00	10.00	8.02	8.01
Tennessee	3	3	42	7	3	52	7,242	630	22,115	8,394	8.72	8.00	8.60	8.72
Texas	8	261	7	342	74	610	75,633	600	112,827	98,348	8.33	8.26	7.93	8.31
Utah	172	195	3,066	40	504	3,610	731,513	11,360	112,836	855,700	7.99	7.95	7.96	7.99
Virginia	16	17	347	67	57	471	79,966	12,836	11,257	104,659	8.21	8.49	8.24	8.25
Washington	162	163	551	41	223	815	140,055	10,740	35,015	185,810	8.01	8.00	8.03	8.03
Wyoming	27	27	34	46	29	109	3,563	4,562	3,995	12,130	8.00	8.00	8.08	8.02
Alabama, Illinois, Missouri, and North Carolina	13	13	89	18	27	134	18,883	4,724	5,446	29,053	8.66	8.04	8.53	8.53
Maryland, New Jersey, New York, and West Virginia	4	6	713	4	98	815	176,640	400	23,874	200,914	7.73	8.00	7.83	7.74
Total, Total, 1938	(1)	6,136	31,643	3,243	16,591	51,477	7,934,947	488,656	3,020,614	12,039,217	7.98	8.11	8.12	8.18
Total, Total, 1937	(1)	7,932	36,240	3,054	16,520	55,814	9,144,641	486,000	3,617,963	13,245,604	7.97	8.18	8.16	8.03

¹ Not available.

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TABLE 14.—*Gold, silver (lode and placer), and miscellaneous metal mines: Number of man-hours of employment and number killed and injured by States, during the year ended Dec. 31, 1938*

State	Man-hours of employment				Average hours per man per year				Number killed				Number injured			
	Under-ground		Open-cut	Surface	Under-ground		Open-cut	Surface	Under-ground		Open-cut	Surface	Under-ground		Open-cut	Surface
	Under-ground	Open-cut			Total	Under-ground	Open-cut		Total	Under-ground	Open-cut		Total	Under-ground	Open-cut	
Alaska.....	2,298,024	623,840	5,405,016	8,326,880	2,324	801	1,691	1,677	5	1	7	271	7	130	408	(1)
Arizona.....	5,318,018	79,366	1,574,096	6,971,480	1,301	1,769	1,769	1,769	6	1	6	702	5	97	804	3
Arkansas.....	1,087,186	211,552	214,097	1,512,835	2,044	2,039	1,981	1,981	14	1	14	28	4	7	39	7
California.....	12,992,255	1,175,658	9,794,017	23,862,130	2,098	1,400	1,897	1,894	14	1	14	1,943	61	12	430	11
Colorado.....	8,954,401	249,610	2,316,378	11,550,389	2,025	1,770	1,925	1,925	26	1	26	791	12	107	910	6
Georgia.....	7,833,664	128,087	46,840	10,110,604	1,220	2,020	1,889	1,889	10	1	10	1,073	11	121	1,205	6
Idaho.....	7,869,261	228,087	2,812,389	10,910,337	2,017	883	1,792	1,792	10	1	10	1,073	2	2	505	11
Minnesota.....	28,080	99,214	107,502	234,796	624	488	1,605	1,605	10	1	10	1,073	3	3	525	0
Montana.....	3,656,152	60,040	1,336,363	5,052,555	1,776	1,072	1,478	1,478	3	1	3	445	5	5	383	2
Nevada.....	4,479,941	340,120	998,440	5,818,801	1,921	1,737	1,807	1,807	5	1	5	344	6	6	39	3
New Mexico.....	2,707,514	257,240	659,451	3,457,205	2,174	240	2,162	2,162	2	1	2	170	7	7	177	200
Oregon.....	759,200	257,110	766,768	1,755,078	1,572	902	1,667	1,652	1	1	1	176	7	7	17	200
South Carolina.....	35,889	204,722	33,847	294,258	2,421	3,199	1,254	1,251	1	1	1	176	5	5	21	21
South Dakota.....	7,500	1,633,528	4,732,197	2,525	2,500	2,445	2,447	6	1	6	233	6	6	232	12	
Tennessee.....	63,120	5,040	5,760	1,520	1,503	1,520	1,422	1,422	10	1	10	7	7	7	17	6
Texas.....	630,108	4,400	182,566	817,074	2,414	629	2,467	2,389	1	1	1	61	1	1	62	1
Utah.....	5,845,301	90,280	807,983	6,833,564	1,906	1,833	1,833	1,833	10	1	10	708	1	1	766	21
Virginia.....	6,656,294	108,634	92,797	858,925	1,801	1,626	1,628	1,628	1	1	1	123	5	5	147	2
Washington.....	1,122,385	86,919	285,273	1,491,677	2,037	1,806	1,720	1,822	1	1	1	123	2	2	123	2
Wyoming.....	28,424	36,656	32,260	97,340	836	797	1,112	893	1	1	1	123	5	5	147	2
Alabama, Illinois, Missouri, and North Carolina.....	163,464	37,983	46,448	247,895	1,837	2,110	1,720	1,850	1	1	1	91	1	1	95	1
Maryland, New Jersey, New York, and West Virginia.....	1,364,676	3,200	186,956	1,554,831	1,914	800	1,908	1,908	1	1	1	91	2	2	95	1
Total, 1938.....	63,284,226	3,920,671	29,396,774	96,601,871	2,000	1,209	1,772	1,877	87	1	1	7,505	169	160	8,834	1
Total, 1937.....	72,888,230	3,975,566	29,538,412	106,403,208	2,011	1,302	1,788	1,906	99	1	1	8,420	115	115	9,991	1

1 Not available.

Iron mines.—With 18,006 men working 28.5 million man-hours, employment at iron-ore mines in 1938 was considerably less than in 1937; the number of workers represented a loss of 22 percent and the number of man-hours a reduction of 38 percent. Accidents also decreased; the record for 1938 showed 20 employees killed and 456 injured compared with 33 killed and 1,383 injured in 1937. The main causes of accidents were falls of roof, haulage, and handling materials in underground mining and handling materials, hand tools, and falls of persons in open-pit mining.

Of the total number of men employed, 10,729 worked underground, 3,311 in open pits, and 3,966 on surface work at the mines. Michigan, Alabama, and Minnesota were the leading States in the mining of iron ore by underground methods, according to the number of men working underground. Minnesota was the leading State in open-pit mining, with a far larger number of open-pit workers than any other State. (See tables 2, 15, 16, and 21.)

Of all metal and nonmetal mines, iron mines had the best safety record in 1938, both in underground and open-cut mining. The underground rate of 23.41 represented a 48-percent decrease from the 1937 rate of 45.11. Although the rates from all mining hazards were reduced, the most outstanding drop was made in the rate for loading rock or ore at the working place. No one cause was responsible for the lower rate in surface mining in 1938, as reduction of accidents from most of the principal causes brought the rate to 8.53, or 31 percent below the 1937 figure and 73 percent lower than the corresponding United States rate for all metal and nonmetal mines.

TABLE 15.—Iron mines: Men employed and man-days of employment, by States, during the year ended Dec. 31, 1938

State	Men employed			Man-days of employment			Average hours of employment per man per day			Average days active		
	Number of operators	Number of mines	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut
Alabama	1,332	3,342	238	370	3,950	637,745	44,324	1,038,823	785,892	8,00	9,41	8,00
Michigan	46	3,788	108	1,734	5,710	711,406	6,072	417,944	1,084,777	8,00	8,01	8,00
Minnesota	20	70	2,234	2,451	1,387	96	305,521	1,161,606	8,00	8,02	7,99	8,00
New Jersey and Pennsylvania	4	4	393	3	96	432	73,820	101,469	372	8,00	7,99	8,00
Georgia, Tennessee, and Virginia	5	8	432	201	177	810	113,816	64,522	50,488	8,01	8,00	7,82
California, New Mexico, Utah, Washington, and Wyoming	5	6	2	52	—	54	150	4,710	—	4,860	10,00	9,66
Missouri and Wisconsin	10	10	143	57	17	217	18,027	7,981	2,449	28,457	8,00	8,03
Total, 1938	(1)	1,77	395	141	165	701	98,838	19,080	41,682	159,600	8,00	8,00
Total, 1937	—	—	1,184	10,729	3,311	3,966	18,006	2,071,746	605,452	8,00	8,13	7,99
	—	—	1,269	12,225	6,026	4,706	22,957	3,169,165	1,285,512	1,232,257	8,00	8,10

¹ Excludes an undetermined number of small pits in Alabama and Missouri.

TABLE 16.—Iron mines: Number of man-hours of employment and number killed and injured, by States, during the year ended Dec. 31, 1938

State	Man-hours of employment			Average hours per man per year			Number killed			Number injured		
	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total
Alabama	5,101,951	416,833	830,598	6,349,322	1,527	1,752	2,245	1,607	3	9	88	11
Michigan	5,689,654	210,877	2,779,681	8,680,412	1,502	1,525	1,885	1,520	8	1	124	12
Minnesota	3,344,377	3,512,058	2,441,565	9,268,000	1,487	1,433	1,760	1,531	2	2	56	22
New York	590,556	2,976	219,460	812,982	1,503	992	2,286	1,652	—	—	47	4
New Jersey and Pennsylvania	911,857	516,179	394,872	1,822,908	2,111	2,568	2,231	2,251	2	1	3	47
Georgia, Tennessee, and Virginia	1,500	45,502	—	47,002	750	875	—	870	—	—	7	2
California, New Mexico, Utah, Washington, and Wyoming	144,212	64,070	19,592	227,874	1,008	1,124	1,152	1,050	—	—	9	2
Missouri and Wisconsin	790,708	152,640	333,462	1,276,810	2,002	1,083	2,021	1,821	1	1	17	1
Total, 1938	16,575,015	4,921,185	7,019,230	28,515,430	1,545	1,486	1,770	1,584	16	3	20	388
Total, 1937	25,602,017	10,417,630	9,894,492	46,914,195	2,094	1,729	2,000	2,000	26	6	1	1,155

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Lead and zinc mines (Mississippi Valley States).—Ores containing lead and zinc are produced in various parts of the country; but because of the complex nature of the ores in many localities the figures for lead and zinc mining, as given in this bulletin, are only for those mines that produced lead and zinc in the Mississippi Valley States, chiefly Oklahoma, Kansas, and Missouri. With the figures are incorporated data covering fluorspar, as well as lead and zinc, in two States, Illinois and Kentucky; this is done for two reasons—because it permits publication of State totals for those two States and because mining methods are similar from the standpoint of accident hazards.

Fewer men were working in 1938 than in 1937, the reduction amounting to 24 percent. A 28-percent drop was reported in the number of man-hours worked. Reports from producing companies for 1938 revealed 6,436 men employed for an average of 207 days, the total volume of labor performed being 10.6 man-hours. Fifteen men were killed and 608 injured by accidents; the principal causes of accidents were loading ore at the working face and haulage equipment. (See tables 2, 17, 18, and 21.)

The underground accident-frequency rate rose from 54.78 in 1937 to 59.08 in 1938. Although the rate was higher in 1938 than in 1937, it was still 36 percent lower than the average underground rate for all metal and nonmetal mines. Proportionately more accidents caused by fall of roof or wall, hand tools, and machinery increased the total accident-frequency rate.

TABLE 17.—*Lead and zinc mines¹ (Mississippi Valley): Men employed and man-days of employment, by States, during the year ended Dec. 31, 1938*

State	Number of operators	Number of mines	Men employed			Man-days of employment			Average hours of employment per man per day			Average days active		
			Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total
Illinois	21	28	164	20	9	193	26,445	4,300	1,842	32,587	7.99	8.00	8.00	7.99
Kansas	19	26	95	1,332	286	832	263,023	91	270	7.91	232	232	232	169
Kentucky	44	52	443	7	47	83	125	525	7,620	8.06	8.08	8.06	8.06	233
Missouri	23	27	1,791	15	23	1,829	314,989	4,680	5,122	7,94	8.00	8.00	7.95	162
Oklahoma	32	52	1,935	9	138	2,072	421,779	990	32,229	454,988	7.98	10.16	7.94	176
Tennessee	3	4	418	106	106	106	106,497	11	49	123,446	8.00	8.00	8.00	176
Wisconsin	4	5	61	124	9	145	1,306	10	451	7.74	-----	8.00	7.78	84
Total, 1938	194	5,994	51	391	6,436	1,228,809	10,495	91,091	1,330,386	7.96	8.20	7.97	7.96	265
Total, 1937	252	7,627	61	778	8,466	1,645,803	11,285	175,226	1,832,314	8.02	8.00	8.10	8.03	225

¹ Includes fluor spar mines in Illinois and Kentucky.TABLE 18.—*Lead and zinc mines¹ (Mississippi Valley): Number of man-hours of employment and number killed and injured, by States, during the year ended Dec. 31, 1938*

State	Man-hours of employment			Average hours per man per year			Number killed			Number injured			Widows orphans		
	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	Surface	Total	Under-ground	Open-cut	
Illinois	211,172	34,400	14,740	260,312	1,288	1,720	1,638	1,349	-----	-----	-----	5	1	7	5
Kansas	2,087,772	182,320	2,270,692	1,836	1,919	1,843	1,343	2	145	145	145	2	14	159	2
Kentucky	669,753	4,200	61,557	735,510	1,512	600	1,310	1,480	3	3	3	3	3	3	6
Missouri	2,502,049	37,440	40,977	2,580,466	1,397	2,496	1,782	1,411	4	4	4	4	53	2	1
Oklahoma	3,366,176	10,062	256,022	3,632,260	1,740	1,118	2,000	1,753	6	6	6	6	288	8	11
Tennessee	875,974	10,448	153,596	1,035,570	2,996	2,248	2,118	2,118	-----	-----	-----	2	1	56	2
Wisconsin	70,820	10,448	81,268	668	580	655	580	580	-----	-----	-----	2	38	296	6
Total, 1938	9,783,716	86,102	725,660	10,595,478	1,632	1,688	1,656	1,646	15	15	15	15	578	3	27
Total, 1937	13,198,653	90,280	1,419,789	14,708,722	1,731	1,450	1,825	1,737	9	9	9	9	608	5	28

¹ Includes fluor spar mines in Illinois and Kentucky.

Nonmetallic-mineral mines.—As previously stated, this group of mines includes those that produced various nonmetallic minerals such as rock salt, gypsum, phosphate rock, and sulfur. Statistics for the group are included in the bulletin on metal-mine accidents, largely as a matter of convenience, because the number of men employed at most classes of nonmetal mines is small and the total working force of the entire group is only about 10,000 men annually, the actual number reported for 1938 being 9,526. In 1937 it was 10,017. The number of employees in 1938 included 2,685 men working underground and 3,981 in open-pit mines. The working time for all employees was 17,827,445 man-hours, a 13-percent decrease from 1937. Six men were killed and 726 injured by accidents in and about the mines in 1938, the chief causes of the accidents being loading at working places and falling roof or wall in underground mining and handling materials in open-pit mining.

In the extraction of nonmetallic minerals by underground mining methods the principal States, from the standpoint of number of men working, were New York, California, New Mexico, and Kansas. On the other hand, reports from open-pit mines showed that the leading States were Florida, Missouri, and Tennessee.

The nonfatal accident-frequency rate for underground nonmetal mines decreased in 1938. The rate of 49.52 was 25 percent lower than the rate of 65.77 for 1937 and 46 percent lower than the total underground rate for all metal and nonmetal mines in 1938. A lower rate was apparent in most of the mining hazards, especially rock or ore during loading and haulage. Accidents caused by drilling increased slightly. The rate for surface mining (48.02) was higher than that for any of the metals but differed little from the corresponding rate in 1937. Hand-tool accidents showed the only increase in accident-frequency rate.

TABLE 19.—*Nonmetallic-mineral mines: Men employed and man-days of employment, by States, during the year ended Dec. 31, 1938*

State	Number of operators	Number of mines	Men employed			Man-days of employment			Average hours of employment per man per day			Average days active				
			Under-ground		Sur-fac-e	Under-ground		Open-cut	Sur-fac-e		Total	Under-ground		Open-cut		
			Under-ground	Open-cut	Sur-fac-e	Total	Under-ground	Open-cut	Total	Under-ground	Total	Under-ground	Open-cut	Total		
California	58	62	281	209	81	571	63	254	40,425	19,532	123,211	7,90	7,96	8,00	7,98	
Colorado	22	30	8	641	406	1,047	104	613	13,514	14,127	6,65	7,97	7,91	7,77	7,91	
Florida	20	27	—	18	136	9	172	6,968	122,426	101,401	—	8,15	8,68	8,04	8,04	
Georgia	17	18	—	18	52	5	59	18,767	2,684	44,327	—	8,77	8,57	8,61	8,61	
Idaho	3	3	—	2	60	10	84	3,540	10,644	3,102	17,286	9,92	8,00	8,00	8,00	
Illinois	8	8	—	7	14	60	52	2,285	8,153	57,300	7,88	8,16	8,00	8,39	8,39	
Iowa	15	16	—	7	114	13	4	131	20,873	2,740	24,603	7,89	7,93	7,93	7,93	
Kansas	5	5	—	2	223	28	32	383	45,862	3,285	136,928	7,80	7,94	7,91	7,91	
Louisiana	24	24	—	126	88	303	429	28,933	12,836	107,135	—	8,66	8,66	8,06	8,06	
Maine	7	7	—	144	50	42	236	30,981	12,756	11,164	54,791	8,15	8,30	8,03	8,03	
Michigan	6	6	—	30	30	1	88	442	6,574	92,482	—	98,056	6,09	8,00	8,00	8,00
Missouri	20	20	—	412	52	5	1	25,052	650	352	26,054	8,00	8,00	8,00	8,00	
Montana	6	6	—	82	5	1	139	4,330	21,492	960	26,782	7,84	7,88	7,87	7,87	
Nevada	16	16	—	31	104	4	160	10,500	17,931	5,145	33,575	8,00	8,18	8,13	8,13	
New Hampshire	17	17	—	35	107	21	130	418	73,874	38,189	112,833	8,00	8,00	8,00	8,00	
New Mexico	13	13	—	267	52	504	115	673	110,487	13,711	165,143	7,92	8,28	7,96	7,96	
New York	16	22	—	222	104	274	19	397	21,695	50,162	21,504	74,361	8,01	7,96	8,00	7,98
North Carolina	117	122	—	304	90	17	282	10	268	1,200	18,482	8,02	8,00	8,02	8,02	
Ohio	3	3	—	86	4	4	254	4,507	45,057	2,000	48,044	8,00	8,00	8,00	8,00	
Oklahoma	7	8	—	90	90	10	268	984	17,811	720	300	18,531	8,00	8,00	8,00	8,00
South Dakota	30	31	—	93	1	97	722	93,446	86,078	179,524	—	8,52	8,53	8,52	8,52	
Tennessee	15	18	—	401	321	—	52	584	35,559	337,429	423,472	8,00	8,21	7,93	7,94	7,94
Texas	20	23	—	194	157	939	1,390	185	11,437	11,724	45,680	7,78	8,00	8,00	8,00	
Vermont	18	23	—	107	28	60	186	18	117	2,604	16,035	4,269	22,908	10,27	9,74	9,74
Virginia	4	5	—	13	86	18	285	26,042	38,175	72,241	136,458	8,00	8,01	8,00	8,00	
Washington	15	20	—	111	203	19	123	3,872	12,310	9,968	19,150	8,00	8,00	8,00	8,00	
Connecticut, Maryland, Massachusetts, New Jersey, and Pennsylvania	6	8	—	21	83	17	52	—	—	—	—	14,573	8,00	8,20	7,69	8,16
Alabama, Arkansas, Kentucky, and South Carolina	19	20	—	18	72	1	91	2,766	11,781	26	56,018	8,65	8,05	8,01	8,08	
Arizona, Nebraska, Oregon, Wisconsin, and Wyoming	8	8	—	69	248	37	354	3,257	45,890	6,871	11,458	8,00	8,05	8,04	8,04	
Total, 1938	623	645	—	2,685	3,981	17	69	2,396	9,062	—	8,17	7,97	7,65	7,92	7,92	
Total, 1937	—	—	—	3,101	3,533	—	10,017	735,489	816,334	1,009,163	2,560,996	7,96	8,35	8,02	8,02	8,02

METAL-MINE ACCIDENTS IN THE UNITED STATES—1938

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TABLE 20.—Nonmetallic-mineral mines: Number of man-hours of employment and number killed and injured, by States, during the year ended Dec. 31, 1938

State	Man-hours of employment			Average hours per man per year			Number killed			Number injured			Wid-ows Or-phans	
	Under-ground		Open-cut	Surface	Total		Under-ground	Open-cut	Sur-face	Total	Under-ground	Open-cut	Sur-face	
	Under-ground	Open-cut												
California.....	505,323	321,927	156,219	983,469	1,798	1,540	1,029	1,722						
Colorado.....	4,078	107,112	801,529	111,930	510	1,122	1,075	1,075						
Florida.....		988,048		1,799,577		1,557	1,974							
Georgia.....	297,297	23,310	381,743	2,264	2,186	2,590	2,119							
Idaho.....	150,136	13,056	164,392	2,887	600	2,611	2,786							
Illinois.....	35,100	85,152	24,816	145,068	2,507	1,419	2,482							
Iowa.....	164,729	22,371	7,920	195,020	1,445	1,721	1,980	1,489						
Kansas.....	301,530	25,982	66,223	422,735	1,921	928	2,038	1,600						
Louisiana.....	225,269	850,260	1,075,529	1,88	2,806	2,307	2,806							
Maine.....		103,483		103,488		1,176	1,176							
Michigan.....	252,557	105,816	88,788	447,161	1,754	2,116	2,114	1,895						
Missouri.....	40,022	739,888		779,910	1,334	1,796	1,765							
Montana.....	200,417	5,200	2,816	208,433	2,444	1,040	2,816	1,727						
Nevada.....	93,940	169,284	7,680	210,904	1,095	1,628	1,920	1,517						
New Hampshire.....	94,000	146,994	41,805	305,510	222,499	1,040	2,222	1,703						
New Mexico.....	590,991	6,160	109,368	902,661	2,213	293	2,360	2,159						
New York.....	874,626	399,052	20,029	1,284,909	1,735	2,025	2,182	1,835						
North Carolina.....	173,754			592,835	1,671	1,456	1,054	1,493						
Ohio.....	138,598	9,600		148,198	1,612	2,400								
Oklahoma.....	7,872	360,453	16,000	384,325	1,968	1,419	1,600	1,434						
South Dakota.....	5,760	142,483	2,400	150,648	1,920	1,532	2,400	1,553						
Tennessee.....		739,094	1,580,082	2,370,481	3,065,721	2,164	1,985	2,287	2,119					
Texas.....	419,871	275,369	43,496	588,952	3,354,103	2,074	1,553	2,524	2,377					
Utah.....	229,626	157,009	39,438	223,193	2,057	1,826	2,191	1,916						
Vermont.....	26,746	305,796	1,092,058	1,877	1,506	2,028	1,823							
Virginia.....	208,334	98,480		1,153,206	1,475	1,187	1,250	1,246						
Washington.....	30,982													
Connecticut, Maryland, Massachusetts, New Jersey, and Pennsylvania, and Arkansas, Kentucky, and South Carolina, Arizona, Nebraska, Oregon, Wisconsin, and Wyoming.....	19,166	72,953	200	118,976	1,229	1,342	200	1,307						
Total, 1938.....	4,887,179	6,372,130	6,568,136	17,827,445	1,820	1,601	2,297	1,871	1	4	1	242	178	3
Total, 1937.....	5,833,936	6,815,782	7,866,485	20,536,203	1,888	1,902	2,360	2,050	8	3	3	336	266	9

TABLE 21.—*All mines. Fatalities and injuries, classified by kind of mine and severity of injury, during the year ended Dec. 31, 1938*

Kind of mine and severity of injury											Shaft			Underground			
Fall of rock or ore from roof or wall											Total, undergrounD			Other causes			
Killed:											19			1	1		
Copper	9											1	1				2
Iron	8											15					
Lead and zinc (Mississippi Valley)	10											13					
Gold, silver, miscellaneous	24											73	7		3	1	14
Gold, silver; Lode	23											63	7		2	1	14
Gold; Placer															3	10	
Miscellaneous	1														3	1	
Nominal																	
Total	52											3	3		6	121	7
Permanent total:															4	1	18
Copper																	
Iron	1														1		
Lead and zinc (Mississippi Valley)																	
Gold, silver, miscellaneous																6	
Gold, silver; Lode																6	
Gold; Placer																	
Miscellaneous																	
Total																	
Permanent partial:																	
Copper	17	2	8	1	7	2	1	4			9			6	3	51	
Iron	2	3	6	2	11	7	1	1			3			5	1	30	
Lead and zinc (Mississippi Valley)	9	3	6	2	7	1	1	4			9			4	1	2	

Gold, silver, miscellaneous	43	8	8	7	19	8	6	17	9	9	.....	.....	8	16	149	.....	.....
Gold, silver: Lode	42	8	8	7	19	6	4	17	9	9	.....	.....	8	15	143	.....	.....
Copper	1	1	1	1	2	2	2	2	3	3	.....	.....	1	1	1	1	1
Miscellaneous	2	1	1	1	2	2	2	2	3	3	.....	.....	1	1	8	2	9
Total	73	16	25	8	44	12	8	25	21	21	.....	.....	21	24	277	1	1
Temporary:													204	268	1,626	5	14
Copper	426	62	144	6	177	67	63	123	1	45	.....	.....	50	289	1,340	1	16
Iron	71	17	18	1	51	19	20	26	3	25	.....	.....	3	10	533	1	2
Lead and zinc (Mississippi Valley)	77	115	42	2	99	16	4	54	2	8	.....	.....	10	173	7,188	11	5
Gold, silver, miscellaneous	1,399	648	512	36	837	336	351	768	19	168	9	42	1	161	807	1,027	16
Gold, silver: Lode	1,341	613	476	33	800	311	339	739	17	157	8	42	1	161	945	6,790	13
Copper	4	4	3	3	3	1	1	24	12	29	2	8	1	1	5	24	53
Miscellaneous	54	33	31	24	23	4	1	10	2	11	.....	.....	12	50	3	1	1
Nonmetal	38	60	24	23	24	1	10	2	11	.....	.....	21	34	228	1	1	6
Total	2,011	902	740	45	1,187	442	439	981	27	257	9	43	1	225	1,166	1,440	84
Total nonfatal:													210	271	1,677	5	14
Copper	443	64	152	7	184	69	64	127	1	45	.....	.....	39	210	1,677	5	14
Iron	74	20	24	1	62	20	21	27	3	34	.....	.....	3	55	380	1	16
Lead and zinc (Mississippi Valley)	86	118	44	2	106	17	4	54	2	11	.....	.....	10	30	79	563	13
Gold, silver, miscellaneous	1,442	656	520	47	857	345	357	575	19	177	9	42	1	173	870	1,043	15
Gold, silver: Lode	1,382	621	484	44	820	318	343	786	17	166	8	42	1	161	960	6,939	15
Copper	4	4	3	3	3	1	1	26	14	29	2	8	1	5	4	27	64
Miscellaneous	55	33	31	25	23	4	1	13	2	11	.....	.....	12	50	79	377	2
Nonmetal	40	60	25	23	24	1	13	2	11	.....	.....	22	36	226	1	2	1
Total	2,085	918	765	57	1,232	455	447	1,006	27	278	9	43	1	225	1,187	1,464	87
Total fatal and nonfatal:													39	211	1,696	5	14
Copper	452	64	152	7	189	72	66	127	1	45	.....	.....	3	56	395	1	17
Iron	82	20	24	1	64	23	21	27	4	34	.....	.....	10	30	80	576	13
Lead and zinc (Mississippi Valley)	82	118	44	2	107	18	4	54	2	11	.....	.....	11	173	871	1,048	17
Gold, silver, miscellaneous	1,486	656	521	53	861	362	361	788	21	177	11	46	1	161	816	1,962	16
Gold, silver: Lode	1,406	621	484	49	824	334	344	759	19	166	10	46	1	161	816	7,002	27
Copper	4	4	3	3	3	1	1	27	17	29	2	8	1	5	5	27	4
Miscellaneous	56	31	34	25	23	4	1	13	2	11	.....	.....	12	50	82	387	2
Nonmetal	41	60	25	23	24	1	13	2	11	.....	.....	22	36	226	1	2	1
Total, 1938	2,137	918	766	63	1,244	479	452	1,009	30	278	11	47	1	225	1,190	1,470	81
Total, 1937	2,914	1,281	1,130	185	1,728	581	636	1,524	55	465	1	14	4	315	1,597	2,119	119
													26	51	4	3	2
													37	72	11	6	118
													-19	47	3	3	228

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TABLE 21.—All mines: Fatalities and injuries, classified by kind of mine and severity of injury, during the year ended Dec. 31, 1938—Continued

Gold, silver, miscellaneous		2	4	6	3	1	1	2	1	2	3	28	190
Gold, silver: Lode		1	2	2	3	1	1	2	1	2	3	21	173
Gold: Placer		1	2	2	3	1	1	2	1	2	3	6	10
Miscellaneous		1	2	1	1	1	1	1	1	1	2	7	1
Nonmetal		1	1	2	1	1	1	1	1	1	5	2	24
Total		4	2	1	5	4	3	5	25	4	1	5	367
Temporary:													
Copper	21	8	20	6	23	1	7	2	14	18	19	139	18
Iron	1	2	1	2	1	1	5	1	6	9	6	38	3
Lead and zinc (Mississippi Valley)	1	6	6	20	2	19	16	1	2	3	2	53	8
Gold, silver, miscellaneous	25	1	1	4	5	3	1	1	2	1	2	18	163
Gold, silver: Lode	16	1	14	14	14	6	1	8	7	25	77	47	6
Gold: Placer	5	2	1	3	1	5	5	5	6	6	6	50	14
Miscellaneous	15	14	10	31	2	4	18	3	46	9	7	37	3
Nonmetal	15	9	42	23	81	3	6	49	6	82	144	137	644
Total	62	9	24	6	24	1	8	2	15	20	20	149	18
Total nonfatal:													
Copper	21	8	24	6	24	1	8	2	15	20	20	149	18
Iron	1	3	2	7	6	1	7	9	6	42	3	1	2
Lead and zinc (Mississippi Valley)	1	6	6	20	2	21	16	31	42	3	2	19	166
Gold, silver, miscellaneous	25	1	1	4	5	3	1	8	7	27	50	6	15
Gold, silver: Lode	16	1	1	3	3	1	8	7	7	27	50	6	15
Gold: Placer	5	2	1	1	3	1	6	5	15	8	8	53	3
Miscellaneous	16	14	11	31	2	4	19	3	48	86	72	306	6
Nonmetal	16	9	47	25	82	3	6	54	6	86	147	142	670
Total	63	9	24	6	24	1	8	3	15	20	20	151	18
Total fatal and nonfatal:													
Copper	22	8	24	6	24	1	8	3	15	20	20	151	18
Iron	2	3	2	7	6	1	7	9	6	45	3	2	3
Lead and zinc (Mississippi Valley)	25	1	6	6	20	2	22	16	31	43	172	56	8
Gold, silver, miscellaneous	16	1	4	5	3	1	8	7	7	27	50	6	16
Gold, silver: Lode	4	2	1	1	4	14	8	5	15	8	54	3	16
Gold: Placer	5	2	1	3	1	6	1	6	4	9	8	39	3
Miscellaneous	17	14	12	31	2	4	19	3	48	86	74	310	6
Nonmetal	17	9	47	26	82	3	6	55	9	86	147	145	681
Total	90	13	61	35	111	3	10	79	8	92	194	180	876
Total 1937	90	13	61	35	111	3	10	79	8	92	194	180	876

366 1,621 12,878
337 607 2,456 18,274

386 1,615 12,722
321 237 386 364
31 191 237 386
296 43 40 178
8 9 8 47
8 9 8 47
8 9 8 47
7 10 103 414
8 8 9 47
40 43 40 178
57 62 57 226
4 8 4 226
8 7 7 27
166 266 266 226
145 145 145 226
95 95 95 226
90 6 45 8 88 151 1,498 1,498 1,498
45 8 8 8 8 8 8 8 8 752

REVIEW BY STATES

To set forth a complete picture of the effect of the principal mining hazards in underground work and open-cut mines, for the leading metal and nonmetallic mining States, individual accident-frequency State rates are presented in table 22 for each hazard; total underground and open-cut rates also are given, as well as a comparison with the United States rate for each hazard. The rates in table 22 apply to nonfatal injuries only.

The year 1938 showed progress along safety lines in underground mining, as the accident rate for all underground work in the United States decreased 7 percent from the 1937 figure. The accident-frequency rate for open-cut mines, although maintaining a low level, was slightly higher for 1938 than for 1937. Accidents occurred at the rate of 91.81 for each million man-hours of employment underground and 31.32 for each million man-hours worked in surface mines. A definite improvement in the rate for drilling accidents affected the total underground rate favorably, and a slightly lower rate was apparent for all causes of accidents except falling down chute, winze, raise, or stope.

By far the greatest cause of accidents in underground mines was falls of roof or wall. Accidents occurred from this hazard at a rate of 18.34 for the United States as a whole, but rates for individual States ranged from 1.56 in Missouri to 29.48 in Idaho. Next in importance as a cause of injury was haulage, with a United States rate of 10.84; Minnesota had the lowest rate for accidents from this cause (2.08) and Utah the highest (17.26). Accidents resulting from handling of materials occurred at a rate of 10.44 in the United States; Missouri had the lowest rate (0.78), whereas Idaho had the highest (20.06). Drilling ranked next in importance as a cause of accident with a United States rate of 8.85; Alabama claimed the lowest rate (0.39) and California the highest rate (17.65). The loading of rock or ore at the working place showed a rate of 8.07 for the United States, but the State rates ranged from 0.59 in Minnesota to 22.53 in Oklahoma. Hand-tool injuries held sixth place as a serious cause of accident, averaging 6.73, with a low of 0.30 in Minnesota and a high of 15.12 in New Mexico. The average rate for falling down chute, winze, raise, or stope was 4.00, the State rates ranging from none in Missouri to 6.72 in California. Run of ore from chute or pocket injured 3.93 men on an average; Alabama and Missouri claimed no accidents from this cause, but the California rate was 8.20. The United States rate for machinery was 2.45, the lowest rate being 0.30 for Minnesota and the highest 4.99 for New York. Shaft accidents averaged 2.09, with none in New York and Missouri and 5.08 per million man-hours worked in Idaho. The accident rate for all other causes underground was 16.07 for the United States, with a low of 0.98 for Alabama and a high of 25.71 for California. Judged by accident rates underground, the State with the best safety record was Alabama, with a total rate of 17.17. California had the highest total rate (147.43) which, however, was considerably lower than the highest rate for 1937 (165.25).

TABLE 22.—All mines: Nonfatal-injury rates per million man-hours worked underground and in open-cut mines, by principal causes, for important States during the year ended Dec. 31, 1938

UNDERGROUND											
Cause	Alabama	Minnesota	Missouri	Michigan	New York	Kansas	South Dakota	Oklahoma	Colorado	United States	
Fall of rock or ore from roof or wall.....	2.93	3.56	8.10	8.87	8.98	14.53	6.22	17.91	18.34	25.13	29.13
Rock or ore while loading at working face.....	1.76	2.33	3.26	7.76	18.37	11.30	22.53	5.23	8.07	5.48	18.97
Haulage.....	4.20	5.84	3.16	4.43	14.70	7.43	14.82	10.12	10.84	12.00	12.81
Hand tools.....	1.36	.78	2.48	2.21	4.49	6.78	3.56	4.00	6.73	8.52	7.56
Drilling.....	.39	.59	1.56	3.04	7.76	4.49	7.43	10.37	10.45	8.85	8.35
Handling materials (other than rock or ore).....	2.15	4.74	2.14	9.00	3.55	4.74	8.23	10.44	9.31	17.24	12.38
Falling down chute, winze, raise, or slope.....	.19	2.96	1.36	4.44	2.04	1.94	3.26	4.78	4.00	4.62	6.05
Run of ore from chute or pocket.....	.59	1.57	3.32	.41	.32	.59	4.34	3.93	4.35	3.90	4.58
Machinery.....	2.93	.30	2.72	1.12	4.99	.41	3.88	.89	2.45	1.83	1.19
Shaft.....	.19	.30	1.12	.82	.97	.56	2.00	2.09	1.91	3.50	1.86
All other underground.....	.98	1.19	5.84	7.09	8.31	9.39	17.11	14.82	18.47	16.07	16.69
All causes (underground, including shaft).....	17.17	17.20	21.41	34.42	57.08	69.00	75.24	85.36	87.98	91.81	100.10
OPEN-CUT											
Cause		Minnesota	Arizona	Utah	Missouri	United States	California	Tennessee	Florida	New Mexico	Nevada
Handling materials.....		1.93	1.80	1.15	7.25	6.87	11.28	19.65	12.03	9.34	12.24
Hand tools.....		.55	—	1.77	3.11	4.02	9.95	7.36	7.01	12.00	3.06
Falls of persons.....		1.11	2.25	2.31	7.25	3.83	5.97	1.23	11.02	8.00	9.95
Falls or slides of rock or ore.....		.28	.45	4.61	3.11	2.96	2.66	—	2.00	4.00	8.42
Machinery.....		.83	.45	4.15	2.52	4.64	1.52	6.01	—	4.00	6.88
Haulage.....		.28	.90	1.15	2.20	.66	—	—	—	2.67	16.83
Power shovels.....		1.11	2.25	2.31	2.07	1.17	1.99	1.23	5.01	2.67	2.30
All other causes.....		—	—	—	7.76	8.62	25.79	18.04	21.34	8.41	—
All causes (open-cut).....		6.09	8.55	13.45	26.94	31.32	45.77	56.49	61.12	64.02	68.09

Alabama.—The metal-mining industry of Alabama reduced its accident rate 35 percent in 1938 by lowering the nonfatal-injury rate from 24.20 in 1937 to 15.61 in 1938. The rate for accidents underground was reduced from 27.19 to 17.17. Greatest reductions were made in the rates for accidents from falls of rock or ore from roof or wall, haulage, and handling materials other than rock or ore. Accidents caused by machinery increased in frequency, the rate rising from 1.61 in 1937 to 2.93 in 1938 per million man-hours worked underground. The position of Alabama was most favorable compared with that of the United States as a whole. About 83 percent of all metal miners in Alabama work underground.

Arizona.—Exceeded in employment only by California and Montana, Arizona ranked thirteenth in injury rate and eleventh in fatality rate among States employing 1,000 or more men. (See table 1.) Comparison of underground accident-frequency rates for 1937 and 1938 reveals a 29-percent decrease in 1938. According to table 22, which shows major causes of accidents, a marked drop in the rates for accidents resulting from use of hand tools, drilling, and run of ore from chute or pocket was chiefly responsible for the lower rate. The accident-frequency rate for surface mining decreased definitely in 1938, being 80 percent lower than the 1937 rate and 22.8 points lower than the average 1938 rate for the United States.

California.—Although California ranked first in employment in metal and nonmetal mines in the United States in 1938, it stood twenty-first among 23 leading mining States in injury rate. (See table 1.) In underground mining, where 51 percent of the men are employed, the accident-frequency rate of 147.43 was 24 percent higher than the 1937 rate of 119.31. A general increase in accidents from most of the usual causes is responsible for this high rate, but handling materials (other than rock or ore), fall of roof or wall, and fall of rock during loading at the working places showed the greatest increases. Less accidents occurred in the shaft and in the use of machinery and hand tools in 1938 than in 1937.

Colorado.—Underground operations, which account for 75 percent of the total employment in metal and nonmetallic-mineral mines of Colorado, reported a favorable accident-frequency rate for 1938. The rate of 87.98 was 19 percent lower than that for 1937 and below the average rate for the United States. Of primary importance was the 48-percent decrease in the accident-frequency rate for drilling accidents, which was partly offset by a slight increase in the rate per million man-hours for injuries caused by run of ore from chute or pocket.

Idaho.—Although one of the leading metal and nonmetal mining States in number of men employed, Idaho had a high accident-frequency rate (135.62) for underground mining which lowered its position from a safety standpoint. Nevertheless, fewer accidents from drilling, haulage, and hand tools in 1938 reduced the rate 9 percent below the 1937 figure. The rate for shaft accidents increased slightly.

Kansas.—In 1938 Kansas stood eighteenth among mining States employing 1,000 or more men in employment and twelfth in accident-frequency rate. (See table 1.) Although the nonfatal-accident rate of 69.00 for underground mining was higher than the 1937 rate of 62.25, it was still 25 percent lower than the average United States

rate for underground accidents. A comparison of 1937 and 1938 reveals a higher accident-frequency rate in 1938 for injuries resulting from haulage, handling materials, and falls of rock or ore from roof or wall.

Michigan.—The frequency of nonfatal injuries at mines in Michigan increased slightly in 1938, the rate being 24.79 compared with 23.88 in 1937 for each million man-hours worked in and about the mines. The rate for underground accidents, based upon the number of man-hours of exposure to underground risks, increased from 30.73 in 1937 to 34.42 in 1938, or 12 percent. This increase was due to higher rates for several classes of accidents, chiefly those caused by loading ore at the face, haulage equipment, drilling, persons falling down chutes or stopes, and run of ore from chutes. Nearly all mining operations in Michigan are conducted underground; only 218 men were reported as employed in open-pit mining in 1938 compared with 5,125 underground. In addition, 2,586 men were employed on the surface, virtually all of whom worked at underground mines.

Minnesota.—About 36 percent of the employees in Minnesota mines worked underground in 1938 and about 42 percent in open-pit mines; the remainder were employed on the surface. Accidents at all mines occurred at a rate of 8.92 per million man-hours worked in 1938, or 37 percent below the rate of 14.07 in 1937. The rate for underground operations decreased from 25.18 to 17.20 and that for open-pit mining from 10.28 to 6.09. Much of the improvement in the rate for underground accidents was due to a reduction in accidents from falls of rock or ore, hand tools, and machinery. Slight increases occurred in the rates for haulage accidents and persons falling down chutes, winzes, raises, and stopes. In open-pit mining, progress was made in preventing accidents from machinery and haulage. Metal and non-metal mining in Minnesota had a much better safety record than that for metal mining in the United States, the rate of 8.92 for Minnesota in 1938 being far below the rate of 67.61 for the United States.

Missouri.—Metal mining in Missouri is conducted about three-fourths underground and one-fourth in open pits from the standpoint of number of men employed. The injury rate from accidents was only 22.90 in 1938, a reduction of 32 percent from the rate of 33.48 for 1937. Although the rate for machinery accidents increased, progress was made in reducing accidents from falls of rock or ore, loading ore at the working face, haulage, drilling, and handling materials. Accident frequency in Missouri in 1938 was only about one-third as great as in the United States as a whole.

Montana.—With 80 percent of the 10,000 men employed in metal mining and the extraction of nonmetallic minerals working underground, Montana had a better safety record in 1938 than five other leading mining States. The accident-frequency rate of 108.78 was 17 percent below that in 1937. A noticeable decrease in accidents due to haulage and handling materials (other than rock or ore) was the most apparent cause of the lower rate, but fewer accidents from several other mining hazards contributed to the better safety record. In spite of a decreased injury rate compared to 1937, Montana still had an accident-frequency rate 18 percent higher than the average underground rate for the United States.

Nevada.—Ranking tenth in employment in the metal-mining industry of the United States, Nevada mines, both underground and open

cut, showed higher accident-frequency rates for 1938 than 1937. The underground accident-frequency rate of 103.35 in 1937 was raised to 114.44 in 1938, owing to increases in the rates for accidents from virtually all underground causes, particularly handling materials. Slight decreases were reported in the rates for accidents caused by rock or ore during loading at the working place and machinery. The accident-frequency rate in underground mines in Nevada was 25 percent higher than that for the United States, as shown in table 22.

New Mexico.—Although the accident rate in New Mexico for underground work was higher in 1938 than the average for the United States, it decreased 8 percent from the 1937 rate. Fewer accidents from hand tools were the chief cause of the lower rate.

New York.—As shown in table 1 covering States that had 1,000 or more employees at mines, New York ranked nineteenth in number of workers, ninth in nonfatal-injury rate, and first and best in fatality rate. The State had a strikingly better record in 1938 than in 1937, as its nonfatal-injury rate was reduced 63 percent. Nearly all mining in New York is underground, and reports for 1938 showed that progress was made in reducing accidents from all classes of hazards underground. The rates for the principal classes of accidents are shown in table 22.

Oklahoma.—Although the rate for underground accidents per million man-hours worked in Oklahoma in 1938 (85.36) was lower than the United States rate, compared to 1937 it rose 20 percent. Proportionately greater increases in accidents from drilling and from rock or ore during loading than from any other causes were mainly responsible for the higher rate.

South Dakota.—Underground mining predominated in the metal-mining activity of this State. The accident-frequency rate for underground operations rose from 62.08 in 1937 to 75.24 in 1938, a rate definitely better than the average for the United States. Injuries from the use of hand tools figured prominently in the total increase over 1937, but a higher rate from virtually all causes tended to raise the rate. However, the rate for accidents from run of ore from chute or pocket was lower.

Utah.—Although more than 60 percent of the employees in Utah metal and nonmetallic-mineral mines work underground, Utah is also one of the leading States in open-pit or surface mining. The frequency rate for accidents underground maintains a high level, but the rate of 118.88 in 1938 was slightly lower than the corresponding rate of 119.56 in 1937. According to table 1 Utah ranks eighth among States employing 1,000 or more men in the metal-mining industry. Table 22 indicates that Utah stands fourteenth among 16 States in underground accident-frequency rate. Slight decreases in the rates for falls of rock or ore, falling down chute, and shaft accidents are apparent when the 1938 rates are compared with similar figures for 1937. In surface mining Utah showed a favorable rate of 13.45, a decrease from 1937 and considerably lower than the United States average rate of 31.32.

ACCIDENTS CLASSIFIED BY MINING METHODS

The classification of mining methods employed in this bulletin was originated by the Mining Division of the Bureau of Mines for use in its studies of the relative efficiency of various mining methods from the standpoint of productivity and costs. The classification was used

first in this series of statistical bulletins for accidents covering the calendar year 1929; it is as follows:

A. Underground methods:

1. Open stope, including room-and-pillar method and sublevel stoping.
2. Shrinkage.
3. Cut-and-fill.
4. Square-set.
5. Block caving.
6. Sublevel caving.
7. Top slicing.

B. Surface methods:

8. Open-cut with power shovel.
9. Open-cut with power scraper.
10. Open-cut; hand loading only.
11. Hydraulicking.
12. Dredging.

From the standpoint of number of companies and mines represented and number of men employed in the mines the most widely used operating method in metal and nonmetal mines employing 25 or more men is the open-stope method, including the room-and-pillar method and sublevel stoping.

In 1938 top slicing had the lowest combined accident-frequency rate for fatalities and injuries in underground mining. The next lowest accident rate was that for sublevel caving. The highest rate was reported by mines using shrinkage methods.

It should be stated that a mining company is not free to choose any method of mining that officials of the company may prefer or to adopt any method solely from the standpoint of safety. The method to be used is determined mainly by the type of deposit, the character and value of the ore, and the possibility of extracting the ore at an economically sound price.

Table 23 shows the number of employees in mines using each of the various methods and the comparative accident-frequency rates of these mines for fatalities and nonfatal lost-time injuries. Each mine is classified according to its principal mining method, as shown in the company report to the Bureau of Mines.

The figures for open-stope methods relate chiefly to the iron-ore mines in Alabama and Michigan, the lead-zinc mines in Kansas, Missouri, and Oklahoma, and the gold and silver mines in Arizona, California, and Nevada. Shrinkage methods were reported mainly for gold and silver mines in some Western States. Cut-and-fill methods were shown for gold and silver mines in Idaho and California and for several copper mines in Arizona. Mining by square-set methods was reported chiefly by gold-silver-copper-lead-zinc mines in the Western States. The figures for block caving represent the experience of a few metal mines in Arizona, Colorado, and several other States. Most figures for sublevel caving were reported by iron-ore mines in Michigan and Minnesota. The data for top slicing are mainly for iron-ore mines in Michigan and Minnesota. Figures for open-pit mining with power shovels represent the experience of iron-ore mines in Minnesota and copper mines in the Western States. Data for open-pit mining with hand loading are shown for several mines producing nonmetallic minerals, chiefly in the Eastern States. The number and cause of accidents for each mining method are shown in tables 24, 25, and 26.

TABLE 23.—Metal-mine accident data, grouped by mining methods, during the year ended Dec. 31, 1938, for selected companies, with figures for 1937¹

Method of mining	Number of mines	Number of States	Average days active	Man-days	Men employed	Man-hours of employment	Number killed	Number injured	Rate per million man-hours	
									Killed	Injured
1938										
Open stope, including room-and-pillar and sublevel										
Stoping	153	22	238	3,872,585	16,279	30,731,667	42	2,698	1,37	87.79
Shrinkage	42	12	294	1,005,308	3,414	8,035,271	12	1,081	1,49	134.33
Cut-and-fill	38	10	280	1,516,441	5,422	12,081,182	19	1,300	1,57	107.61
Square-set	40	10	286	1,647,772	5,758	13,226,440	12	1,603	91	121.20
Block caving	5	4	303	459,261	1,514	3,674,092	9	351	2,45	95.53
Sublevel caving	14	4	216	441,839	2,043	3,534,713	5	103	1,41	20.14
Top slicing	196	1	233	546,558	2,795	4,271,674	3	89	.69	20.36
Open-cut, with power shovel	42	12	155	1,301,650	5,583	10,496,689	4	188	.38	18.01
Open-cut, hand loading only	2	2	1430	93	115,440	---	1	---	8.66	
Total	356	252	10,805,544	42,902	86,207,168	106	7,414	1,23	86.00	
1937										
Open stope, including room-and-pillar and sublevel										
Stoping	132	24	266	3,465,963	13,088	27,595,012	30	2,103	1,09	76.21
Shrinkage	37	16	290	808,221	2,736	6,472,389	21	1,145	3,24	176.91
Cut-and-fill	26	8	298	1,391,566	4,674	11,131,430	10	1,085	90	97.47
Square-set	37	10	306	1,673,239	5,478	13,385,915	14	1,835	1,05	138.58
Block caving	8	6	341	1,085,302	3,180	8,684,009	18	1,473	2,07	169.62
Sublevel caving	12	3	274	591,186	2,156	4,729,449	5	172	1,06	36.37
Top slicing	20	3	267	885,114	3,311	7,080,988	6	145	.85	20.48
Open-cut, with power shovel	63	14	262	2,315,381	8,825	18,647,508	9	356	.48	19.09
Open-cut, hand loading only	9	8	244	103,361	424	868,137	1	58	1.15	66.81
Total	344	280	12,319,532	43,921	98,594,817	114	8,392	1.16	85.12	

¹ Underground and open-cut only. No reports used for mines where less than 25 men were employed.

TABLE 24.—*Fatalities, classified by principal causes and mining methods, at metal mines, during the year ended Dec. 31, 1938, for selected companies*¹

Method of mining	By falls of rock: 1 and 2		By run or fall of ore while loading: 2, 7, and 7		Explosives: 4 and 2		By haulage: 5 and 3		By falls of per- sons: 6 and 5		Miscellaneous: 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 4, 6, 8, 9, 10, 11, and 12		In shaft: 17, 18, 19, 20, 21, and 22		Total					
	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total		
Open stope, including room-and-pillar and sublevel stoping	19	45.24	0.62	1	8.33	0.12	6	14.29	0.20	11	26.19	0.36	1	2.38	0.03	511.90	0.16	42100.00	1.37	
Shrinkage	3	25.00	.38	1	5.26	.08	1	8.33	.12	1	8.33	.12	2	16.66	.25	325.00	.38	12100.00	1.49	
Cut-and-fill	6	31.58	.50	1	16.67	.15	2	10.53	.16	3	15.79	.25	3	42.05	.25	421.05	.33	19100.00	1.37	
Square set	2	11.11	.27	3	33.33	.82	2	16.67	.15	1	8.33	.08	2	16.67	.15	325.00	.23	216.67	.15	
Block caving	1	40.00	.57	1	33.33	.23	1	11.11	.27	2	40.00	.67	1	20.00	.23	133.33	.23	5100.00	2.45	
Sublevel caving	2	50.00	.19	1	33.33	.23	1	11.11	.27	1	33.33	.23	2	50.00	.49	1300.00	.69	3100.00	1.42	
Top slicing	1	33.33	.23	1	33.33	.23	1	11.11	.27	1	33.33	.23	1	33.33	.23	133.33	.23	4100.00	.38	
Open-cut, with power shovel	2	50.00	.19	1	33.33	.23	1	11.11	.27	1	33.33	.23	2	50.00	.49	1300.00	.69	3100.00	1.42	
Open-cut, hand loading only	1	33.33	.23	1	33.33	.23	1	11.11	.27	1	33.33	.23	2	50.00	.49	1300.00	.69	3100.00	1.42	
Total	36	33.96	.42	5	4.72	.06	4	3.77	.04	12	11.32	.14	18	16.98	.21	17	16.04	.20	141321	.16
																			106100.00	1.23

¹ Underground and open-cut only. No reports used for mines where less than 25 men were employed.

TABLE 25.—Injuries, classified by principal causes and mining methods at metal mines, during the year ended Dec. 31, 1938, for selected companies.¹

Method of mining	By falls of rock: 1 and 2		Explosives: 4 and 2		By haulage: 5 and 3		By falls of persons: 6 and 5		Miscellaneous: 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 4, 6, 8, 9, 10, 11, and 12		In shaft: 17, 18, 19, 20, 21, and 22		Total											
	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total	Number	Rate per million man-hours	Percent of total									
Open stope, including room-and-pillar and sublevel stoping	349	12.94	11.36	529	19.61	17.21	13	0.48	0.42	371	13.75	12.07	121	4.48	3.94	1.255	46.52	40.84	60	2.22	1.95	2.698	100.00	87.79
Shrinkage	169	15.63	21.03	134	12.40	16.68	14	1.30	1.74	150	12.02	16.18	70	6.48	8.71	536	49.58	66.71	28	2.59	3.48	1.081	100.00	134.53
Cut-and-fill	289	22.23	23.92	162	12.46	13.12	3	.23	.25	152	10.15	10.93	55	4.23	4.55	632	48.62	52.31	27	2.08	2.23	1.360	100.00	107.61
Square-set	307	19.15	23.21	198	12.35	14.97	7	.44	.53	153	9.55	11.57	69	4.30	5.22	830	51.75	62.75	30	2.43	2.95	1.663	100.00	121.20
Block caving	75	21.37	20.41	24	6.84	6.53	4	1.14	1.00	24	6.84	6.53	17	4.84	4.63	207	58.97	56.94	—	—	—	—	351.100.00	35.33
Sublevel caving	26	25.24	7.36	5	4.85	1.41	1	.97	.28	18	17.48	5.03	7	6.80	1.98	44	42.72	12.46	2	1.94	—	.57	103.100.00	29.14
Top slicing	19	21.35	4.35	8	8.99	1.88	—	—	—	7	7.86	1.60	6	6.74	1.37	47	52.81	10.75	2	2.25	.46	.46	89.100.00	20.36
Open-cut, with power shovel	24	12.76	2.30	—	—	—	9	4.79	.86	27	14.36	2.59	30	15.96	2.87	98	52.13	9.39	—	—	—	—	158.100.00	18.01
Open-cut, hand loading only	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100	100.00	8.66	—	—	—	—	1.100.00	8.66
Total	1,258	16.97	14.59	1,060	14.30	12.30	51	.69	.59	862	11.63	10.00	375	5.06	4.35	3,650	49.23	42.34	158	2.13	1.83	7,414	100.00	86.00

¹ Underground and open-cut only. No reports used for mines where less than 25 men were employed.

TABLE 26.—Accidents in 1938, by causes and mining methods, for selected companies

TABLE 26.—Accidents in 1938, by causes and mining methods, for selected companies—Continued

PLACER MINING

Placer mining is represented in this publication by reports covering properties at which 11,299 men were employed in 1938. These men were employed an average of 183 days each and worked nearly 17 million man-hours during the year, as shown in table 27. Accidents connected with the work of the employees caused 2 deaths and 496 nonfatal lost-time injuries among the workers, revealing a fatality rate of 0.12 and an injury rate of 29.23 per million man-hours worked.

Operation of placer deposits by underground mining methods had the highest accident-frequency rate, the reports showing 33.27 accidents per million man-hours of work performed underground. Hydraulicking had the next highest rate, each million man-hours worked being accompanied by 0.56 fatality and 29.94 injuries. Dredging had an injury rate of 29.37 for each million man-hours worked. The lowest injury rate (27.95) was for surface operations, chiefly hand work, including sluicing.

Dredging employed more men than the other classes of placer workings covered by the reports—4,641 in all. Surface work, chiefly hand-operated, came next, with 4,219 employees. Hydraulicking properties employed 1,811 men. Only 628 employees were reported by underground placers.

In underground work handling materials caused the largest number of accidents. In surface work two classes of accidents—handling materials and falls of persons—were most prominent. The chief cause of accidents at dredging operations and in hydraulic work was falls of persons. (See tables 27 to 29.)

TABLE 27.—*Placer mines: Men employed, man-days of employment, and number killed and injured during the year ended Dec. 31, 1938*

	Under-ground	Surface	Dredg-ing	Hydrau-licking	Total
Men employed.....	628	4,219	4,641	1,811	11,299
Man-days.....	114,060	597,171	1,133,060	219,447	2,063,738
Average days active.....	182	142	244	121	183
Man-hours of employment.....	901,763	4,794,353	9,500,170	1,770,236	16,966,522
Number killed.....	—	1	—	1	2
Number injured.....	30	134	279	53	496
Killed per million man-hours.....	33.27	0.21	29.37	0.56	0.12
Injured per million man-hours.....		27.95		29.94	29.23

TABLE 28.—*Placer mines: Severity of injury during the years ended Dec. 31, 1937 and 1938*

	1937						1938					
	Killed	Permanent total disability	Permanent partial disability	Temporary	Total non-fatal	Grand total	Killed	Permanent total disability	Permanent partial disability	Temporary	Total non-fatal	Grand total
Underground.....	—	—	5	44	49	49	—	—	1	29	30	30
Surface.....	—	—	2	66	68	68	1	—	1	133	134	135
Dredging.....	4	—	3	378	381	385	—	—	5	274	279	279
Hydraulicking.....	—	—	1	29	30	30	1	—	3	50	53	54
Total.....	4	—	11	517	528	532	2	—	10	486	496	498

The figures relating to placer mines should not be accepted as covering all such mines in the United States. It is not practicable to obtain reports from all of the many individuals working individually or in groups of two or three in various sections of the country who often devote but brief periods to such work. The figures in tables 27 to 29 cover only properties for which data could be collected by mail and are intended chiefly to show the principal causes of accidents at placer mines.

TABLE 29.—*Placer mines: Number killed and injured, by causes, during the year ended Dec. 31, 1937 and 1938*

	1937		1938	
	Killed	Injured	Killed	Injured
Underground:				
1. Fall of rock or ore from roof or wall.....		8		4
2. Rock or ore while loading at working face.....		13		4
3. Hand tools.....		8		3
4. Explosives.....				
5. Haulage.....		5		3
6. Falling down chute, winze, raise, or stope.....		2		1
7. Run of ore from chute or pocket.....				
8. Drilling.....				
9. Electricity.....				
10. Machinery (other than locomotives or drills).....		1		3
11. Mine fires.....				
12. Suffocation from natural gases.....				
13. Inrush of water.....				
14. Stepping on nail.....		2		
15. Handling materials (other than rock or ore).....		1		5
16. Other causes.....		5		4
Total, underground.....		45		27
Shaft:				
17. Falling down shaft.....				2
18. Objects falling down shaft.....				
19. Breaking of cables.....				
20. Overwinding.....				
22. Other causes.....		4		1
Total, shaft.....		4		3
Surface:				
1. Mine cars, mine locomotives, gravity or aerial trains.....				3
2. Railway cars and locomotives.....				
3. Run or fall of ore in or from ore bins.....				
4. Falls of persons.....		18		23
5. Stepping on nail.....		1		6
6. Hand tools.....		18		21
7. Electricity.....				2
8. Machinery.....		5		23
9. Handling materials.....		12		19
10. Other causes.....		14	1	37
Total, surface.....		68	1	134
Dredging:				
1. Machinery.....	1	51		66
2. Electricity.....		6		6
3. Boiler explosions or bursting steam pipes.....	2			
4. Falls of persons.....		81		67
5. Hand tools.....		51		24
6. Handling materials.....		54		51
7. Other causes.....	1	138		65
Total, dredging.....	4	381		279
Hydraulicking:				
1. Cave of bank.....			1	4
2. Explosives.....				
3. Hydraulic giants.....			1	5
4. Falls of persons.....		3		14
5. Rock while handling.....		5		10
6. Hand tools.....		3		5
7. Machinery, derricks, etc.....			1	2
8. Handling materials (other than rock or ore).....		5		5
9. Other causes.....		12		8
Total, hydraulicking.....		30	1	53
Grand total.....	4	528	2	496

MINES OPERATED WITHOUT FATAL ACCIDENTS

All of the 156 fatal accidents at metal and nonmetal mines in 1938 occurred at 110 mines. Reports from operating companies revealed that 7,123 individual mines were operated during the year without a fatal accident. Mines without fatal accidents employed 74 percent of the total number of men engaged in mining metallic and nonmetallic minerals in the United States and represented 68 percent of the total number of man-hours worked in the entire industry. The 110 mines at which 156 men were killed by accidents were much larger, on the average, than those that had no fatalities; they averaged 245 men per mine compared with 11 per mine for the fatality-free properties. The fatality rate of mines having fatal accidents was 2.62 per million man-hours of employment compared with 0.83 for the industry as a whole. Their nonfatal-injury rate was 73.31 compared with 64.98 for mines that had no fatalities and 67.61 for the entire industry. (See table 32.)

The States that had fatal accidents and those that had no fatal accidents during 1938 are shown in tables 31 and 32. Of the States that had fatal accidents, Maine reported the highest percentage of its mine employees working in mines that operated without a fatality; 99 percent of its mine workers were employed in fatality-free mines. Tables 31 and 32 show the relative standing of the States according to percentage of mine workers and man-hours represented by mines that had no fatal accidents.

TABLE 30.—*Comparative fatal and nonfatal accident data for metal and nonmetal mines (other than coal mines) in the United States in 1938*

	Mines that had no fatal accidents	Mines that had fatal accidents	All metal and non-metal mines
Number of mines.....	7,123	110	7,233
Number of employees.....	76,101	26,926	103,027
Proportion of total employees..... percent.....	74.0	26.0	100.0
Number of employees per mine.....	11	245	14
Man-days of employment.....	16,082,505	7,423,359	23,505,864
Average worked per man..... days.....	211	276	228
Man-hours of employment.....	128,726,426	59,443,740	188,170,166
Average worked per man..... hours.....	1,692	2,208	1,826
Number of men killed.....		156	156
Number of men injured.....	8,364	4,358	12,722
Death rate per million man-hours.....		2.62	.83
Injury rate per million man hours.....	64.98	73.31	67.61

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TABLE 31.—*Metal and nonmetal mines (other than coal mines): Number of men employed in 1938*

State	At mines that had fatalities	At mines that had no fatalities	Employees represented by mines that had no fatalities (percent)	State	At mines that had fatalities	At mines that had no fatalities	Employees represented by mines that had no fatalities (percent)
Tennessee		1,612	100.0	Oregon	190	1,051	84.7
New York		1,349	100.0	Nevada	829	4,030	82.9
Virginia		1,071	100.0	Washington	226	989	81.4
Arkansas		762	100.0	New Mexico	605	2,016	76.9
North Carolina		480	100.0	Kentucky	200	586	74.6
Louisiana		429	100.0	Alaska	1,297	3,760	74.4
Illinois		332	100.0	United States	26,926	76,101	73.9
Wyoming		297	100.0	Idaho	1,691	4,130	71.0
Georgia		284	100.0	Colorado	1,794	4,160	69.9
New Hampshire		160	100.0	Arizona	2,662	5,798	69.2
Iowa		131	100.0	Texas	504	1,128	69.1
South Carolina		127	100.0	Missouri	761	1,685	68.9
Vermont		117	100.0	Montana	3,522	6,595	65.2
Ohio		90	100.0	Alabama	1,479	2,544	63.2
Other States ¹		90	100.0	Pennsylvania	201	279	58.1
Maine	2	86	97.7	Utah	2,252	2,962	56.8
Kansas	70	1,445	95.4	Michigan	3,509	4,420	55.7
Florida	61	986	94.2	New Jersey	621	354	36.3
Minnesota	374	6,013	94.1	Wisconsin	438	238	35.2
Oklahoma	285	2,055	87.8	South Dakota	1,654	338	17.0
California	1,699	11,122	86.7				

¹ Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

TABLE 32.—*Metal and nonmetal mines (other than coal mines): Number of man-hours worked in 1938*

State	At mines that had fatalities	At mines that had no fatalities	Man-hours represented by mines that had no fatalities (percent)	State	At mines that had fatalities	At mines that had no fatalities	Man-hours represented by mines that had no fatalities (percent)
Tennessee		3,280,086	100.0	Nevada	1,966,546	7,458,167	70.1
New York		2,414,601	100.0	Oregon	403,548	1,397,194	77.6
Virginia		1,950,483	100.0	New Mexico	1,397,200	4,388,198	75.8
Arkansas		1,514,595	100.0	Washington	659,280	1,708,793	72.2
Louisiana		1,075,529	100.0	Missouri	1,084,888	2,495,120	69.7
North Carolina		774,234	100.0	United States	50,443,740	128,726,426	68.4
Georgia		525,647	100.0	Idaho	3,882,183	7,261,133	65.2
Illinois		493,380	100.0	Alaska	3,085,648	5,484,432	63.9
South Carolina		310,428	100.0	Alabama	2,335,671	4,135,459	63.9
Wyoming		288,356	100.0	Arizona	6,618,985	11,203,664	62.9
New Hampshire		272,499	100.0	Texas	1,446,324	2,436,471	62.8
Vermont		223,193	100.0	Colorado	4,491,223	7,173,260	61.5
Iowa		195,020	100.0	Pennsylvania	516,179	642,986	55.5
Ohio		148,198	100.0	Kentucky	488,562	586,948	54.6
Other States ¹		122,738	100.0	Montana	6,455,016	7,743,357	54.5
Maine	960	102,528	99.1	Michigan	7,128,978	6,866,391	49.1
Kansas	134,272	2,588,555	95.1	Utah	5,424,151	5,153,753	48.7
Minnesota	511,380	9,021,416	94.6	New Jersey	1,171,574	695,148	37.2
Florida	151,280	1,648,297	91.5	Wisconsin	936,315	253,571	21.3
Oklahoma	597,231	3,419,354	85.1	South Dakota	4,195,793	687,052	14.1
California	4,360,553	20,626,192	82.5				

¹ Includes Connecticut, Maryland, Massachusetts, Nebraska, and West Virginia.

SUMMARY TABLES

During the past 5 years, less than 2 out of every 100 lost-time accidents at metal and nonmetal mines in the United States resulted fatally. In actual figures, 1.33 percent of all lost-time accidents resulted in the death of the injured workers; that is, for every employee killed by accident, 75 employees were injured, as may be computed from the figures in table 33.

The number of accidents and the number of men employed at metal and nonmetal mines for a period of 28 years (1911 to 1938) are summarized in table 34. The table shows clearly the downward trend in number of workers from the early part of the period to 1932 and the gain in employment since 1932. Comparative accident rates for each year of the 28-year period are shown in table 35, classified according to principal kinds of mines.

Employment and accident data for all of the mineral industries for which the Bureau of Mines publishes Nation-wide accident statistics annually are summarized in table 36, which covers the calendar year 1938. Byproduct coke ovens had the most favorable accident rate during 1938. The highest rate was reported by anthracite mines.

TABLE 33.—*All mines: Number of fatalities and injuries and fatality and injury rates per thousand 300-day workers, classified by severity of injury, 1929–38*

NUMBER OF ACCIDENTS							
Severity of injury	Average 1929–33	1934	1935	1936	1937	1938	Average, 1934–38
Fatal	196.2	116	164	199	219	156	170.8
Permanent total ¹	14.8	2	7	5	9	8	62.0
Permanent partial ²	304.4	191	246	290	432	367	305.2
Temporary ³	11,347.6	7,699	9,953	14,355	17,614	12,347	12,393.6
Total	11,863.0	8,008	10,370	14,849	18,274	12,878	12,875.8

RATES PER THOUSAND 300-DAY WORKERS							
	1929–33	1934	1935	1936	1937	1938	Average, 1929–38
Fatal	2.83	2.36	2.42	2.37	2.20	1.99	2.25
Permanent total ¹	.21	.04	.10	.06	.09	.10	.08
Permanent partial ²	4.39	3.89	3.63	3.45	4.34	4.68	4.03
Temporary ³	163.75	156.88	146.71	170.82	176.99	157.58	163.58
Total	171.19	163.17	152.86	176.70	183.62	164.36	169.94
Average number of 300-day workers per year	69,297.8	49,077	67,841	84,033	99,522	78,353	75,765.4

¹ Permanent total disability: Loss of both legs or arms, 1 leg and 1 arm, total loss of eyesight, paralysis, or other condition permanently incapacitating workman from doing any work of a gainful occupation.

² Permanent partial disability: Loss of 1 foot, leg, arm, hand, or eye, 1 or more fingers, 1 or more toes, any dislocation where ligaments are severed, or any other injury known in surgery to be permanent partial disability.

³ Disability for more than remainder of day of accident.

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TABLE 34.—*Number of men employed, man-days of employment, and number of men killed and injured at all mines (except coal mines) in the United States, 1911–38*

Year	Aver-age days active	Men employed		Total shifts	Number killed		Number injured	
		Actual number	Equiva-lent in 300-day workers (calcu-lated)		Total	Per thousand 300-day workers (calcu-lated)	Total	Per thousand 300-day workers (calcu-lated)
1911	282	165,979	156,088	46,826,573	695	4.45	26,577	170.27
1912	287	168,550	161,059	48,317,800	661	4.10	30,734	190.82
1913	288	191,276	183,594	55,077,855	683	3.72	32,971	179.59
1914	271	158,115	142,620	42,785,840	559	3.92	30,216	211.87
1915	280	152,118	141,997	42,599,015	553	3.89	35,295	248.56
Average for 5 years	282	167,208	157,072	47,121,417	630	4.01	31,159	198.37
1916	282	204,685	192,455	57,736,425	697	3.62	48,237	250.64
1917	287	200,579	192,085	57,625,811	852	4.44	46,286	240.97
1918	297	182,606	181,006	54,301,748	646	3.57	42,915	237.09
1919	279	145,262	134,871	40,461,350	468	3.47	31,506	233.60
1920	296	136,583	134,540	40,361,893	425	3.16	32,562	242.02
Average for 5 years	288	173,943	166,991	50,097,445	618	3.70	40,301	241.34
Average for 10 years	285	170,576	162,031	48,609,431	624	3.85	35,730	220.51
1921	238	93,929	74,509	22,352,702	230	3.09	18,604	249.69
1922	276	105,697	97,133	29,141,293	344	3.54	26,080	268.48
1923	297	123,279	121,866	36,559,805	367	3.01	32,563	275.41
1924	290	123,128	119,113	35,734,008	418	3.51	33,118	278.04
1925	293	126,713	123,908	37,172,359	371	2.99	35,132	283.53
Average for 5 years	281	114,549	107,307	32,192,033	346	3.23	29,299	273.04
Average for 15 years	284	151,933	143,790	43,136,965	531	3.69	33,586	233.58
1926	291	127,823	123,870	37,160,978	430	3.47	30,350	245.01
1927	284	119,699	113,447	34,033,963	352	3.10	25,133	221.54
1928	288	113,866	109,345	32,803,610	273	2.50	22,483	205.61
1929	292	118,735	115,394	34,618,120	350	3.03	23,092	200.11
1930	270	103,233	92,900	27,869,982	271	2.92	15,594	167.86
Average for 5 years	285	116,671	110,991	33,297,330	335	3.02	23,330	210.20
Average for 20 years	284	143,093	135,590	40,677,056	482	3.55	31,022	228.79
1931	231	80,940	62,405	18,721,486	158	2.53	8,709	139.56
1932	208	53,288	36,984	11,095,167	107	2.89	5,014	135.57
1933	204	57,016	38,807	11,642,113	95	2.45	5,925	152.68
1934	221	66,645	49,077	14,723,215	116	2.36	7,892	160.81
1935	220	92,314	67,841	20,352,372	164	2.42	10,206	150.44
Average for 5 years	219	70,041	51,023	15,306,871	128	2.51	7,549	147.95
Average for 25 years	271	128,482	118,677	35,603,019	411	3.46	26,328	221.85
1936	250	100,932	84,033	25,209,905	199	2.37	14,650	174.34
1937	252	118,429	99,522	28,856,610	219	2.20	18,055	181.42
1938	228	103,027	78,353	23,505,864	156	1.99	12,722	162.37

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 TABLE 35.—*United States metal and nonmetallic mineral mines: Accident rates per thousand 300-day workers, 1911–38*

Year	Copper		Gold, silver, miscellaneous		Iron		Lead and zinc (Mississippi Valley)		Nonmetallic mineral		Total	
	Killed	In- jured	Killed	In- jured	Killed	In- jured	Killed	In- jured	Killed	In- jured	Killed	In- jured
1911	5.18	225.3	4.28	80.3	4.64	252.3	4.03	139.4	2.01	34.0	4.45	170.3
1912	4.53	258.4	4.32	93.0	3.96	241.8	4.28	158.3	1.66	66.4	4.10	190.1
1913	4.08	230.8	3.83	70.4	3.29	268.3	3.90	133.5	3.02	84.9	3.72	179.6
1914	3.85	312.2	4.06	126.9	3.78	224.1	4.32	189.0	3.73	99.9	3.92	211.9
1915	3.72	322.0	4.79	201.5	2.88	233.5	5.37	238.3	2.43	107.8	3.89	248.6
1916	3.64	319.6	4.05	190.8	3.41	240.2	3.14	263.1	3.00	144.7	3.62	250.6
1917	5.88	313.4	4.03	172.5	3.54	227.5	4.09	273.0	2.48	123.6	4.44	241.0
1918	3.45	322.1	4.27	185.2	3.45	185.5	3.58	319.5	1.67	104.7	3.57	237.1
1919	3.54	309.6	4.41	191.3	3.09	202.4	4.13	292.3	1.65	139.3	3.47	233.6
1920	3.43	323.2	4.20	204.8	2.34	200.5	3.27	328.0	2.89	161.9	3.16	242.0
1921	3.70	317.5	3.29	225.5	3.04	210.9	2.58	379.7	1.98	215.5	3.09	249.7
1922	3.00	320.8	5.35	260.3	3.00	177.4	2.64	464.2	2.39	247.5	3.54	268.5
1923	3.11	349.1	3.93	298.9	2.38	150.2	2.73	495.7	2.67	212.5	3.01	275.4
1924	3.55	347.8	4.99	297.8	2.95	151.0	2.76	464.2	1.94	178.7	3.51	278.0
1925	2.94	350.6	3.83	307.4	2.54	159.4	3.32	468.1	1.71	165.4	2.99	233.5
1926	3.45	288.3	3.27	299.5	4.23	133.9	3.05	304.2	2.62	190.7	3.47	245.0
1927	3.46	261.2	3.91	279.8	2.45	114.6	2.64	297.7	2.19	171.2	3.10	221.5
1928	3.03	221.0	2.60	268.7	2.16	98.1	1.62	295.7	2.13	168.6	2.50	205.6
1929	3.03	223.8	3.66	269.4	2.98	89.6	2.08	238.3	2.29	168.1	3.03	200.1
1930	2.76	193.5	4.49	239.7	2.68	81.4	1.63	176.6	.75	138.3	2.92	167.9
1931	3.01	152.5	2.88	190.0	1.91	52.7	2.56	176.6	1.63	124.3	2.53	139.6
1932	3.01	112.5	3.66	179.3	1.18	44.6	3.95	164.8	1.56	117.6	2.89	135.6
1933	2.49	130.3	3.20	204.0	1.82	50.6	.85	147.6	1.39	129.3	2.45	152.7
1934	1.96	109.0	3.33	229.5	1.59	48.3	.91	196.1	1.23	121.3	2.36	160.8
1935	2.05	157.8	2.86	182.7	2.15	42.9	2.26	166.0	1.01	116.9	2.42	150.4
1936	2.62	194.2	2.70	224.8	2.01	60.3	3.33	135.5	.45	116.5	2.37	174.3
1937	2.26	228.0	2.60	226.2	1.73	72.6	1.47	123.8	1.52	115.6	2.20	181.4
1938	1.66	145.4	2.27	220.1	1.69	38.5	3.38	137.1	.80	96.7	1.99	162.4

TABLE 36.—*Accident data, including rates for different branches of mineral industries in 1938*

Industry	Average days active	Men employed	Man-days	Man-hours	Weighted average length of shift	Man-hours per man per year	Killed	Injured	Number killed or injured per million man-hours
							Killed	Injured	Killed
1. Coal mines.									
163	541,528	88,275,518	621,168,448	7.04	1,147	1,106	51,314	1,78	82,61
161	445,246	71,747,050	505,316,161	7.04	1,135	880	36,794	1,74	72,81
172	96,282	16,528,468	115,852,287	7.01	1,203	225	14,520	1,94	125,33
228	103,027	23,505,964	183,170,166	8.01	1,826	156	12,722	.83	67,61
246	17,582	4,329,288	34,629,942	8.00	1,970	24	2,098	.69	69,58
294	51,477	12,039,217	96,601,871	8.02	1,877	91	8,894	.94	91,45
187	18,006	3,555,679	28,515,430	8.02	1,884	20	436	.70	15,99
207	6,438	1,330,395	10,595,478	7.96	1,646	15	608	1,42	57,38
236	9,526	2,251,285	17,827,445	7.92	1,871	6	726	.34	40,72
223	77,497	17,255,328	133,756,111	7.75	1,726	82	5,027	.61	37,58
255	25,520	6,515,860	48,507,624	7.44	1,901	14	470	.29	9,69
214	8,305	1,798,915	14,944,932	7.81	1,673	25	578	1,78	41,15
187	22,352	4,174,475	33,512,948	8.03	1,699	22	1,862	.69	56,46
Limestone (chief product lime)									
Marble	260	153	2,375,326	7.62	1,977	14	936	.77	51,74
234	3,414	799,985	6,538,562	8.20	1,921	1	382	.16	38,24
182	2,907	528,519	4,333,529	8.20	1,491	-----	232	-----	58,15
195	2,615	510,719	4,277,687	8.38	1,636	1	243	-----	58,81
176	3,141	551,929	4,439,266	8.04	1,413	5	274	1,13	61,72
199	33,344	6,622,911	52,158,050	7.87	1,564	60	3,158	1,15	59,97
241	44,153	10,631,917	81,608,061	7.68	1,848	22	1,899	.27	23,27
292	39,048	11,382,864	90,018,277	7.91	2,306	20	2,273	.22	26,25
265	12,048	3,074,324	24,535,906	8.00	2,042	9	848	.37	34,49
310	14,237	4,417,013	34,423,078	7.79	2,418	3	684	.09	19,87
305	12,763	3,891,327	31,009,293	7.97	2,430	8	741	.26	23,90
326	13,799	4,636,801	36,606,723	7.89	2,653	6	282	.16	27,70
145	1,049	1,052,257	1,059,891	6.96	1,010	29	-----	27,36	
352	12,750	4,484,644	35,546,832	7.98	2,788	6	258	.17	7,12
Total	187	774,894	145,056,875	7.37	1,380	1,369	71,618	1,28	66,95

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