

ton, Logan, Longacre, Marting, Milburn, Monaville, Omar, Putney, Slagle, Standard, Ward, Widen, Wilder, and Winifrede.

Wisconsin.—Hurley, Montreal, and Platteville.

Wyoming.—Acme, Cambria, Carneyville, Crosby, Cumberland, Diamondville, Dietz, Elkol, Frontier, Gebo, Gunn, Hanna, Kirby, Kool, Lion, Monarch, Reliance, Rock Springs, Sheridan, Sublet, and Superior.

RESCUE AND RECOVERY WORK AFTER MINE EXPLOSIONS AND FIRES.

It is increasingly evident that the value of oxygen rescue apparatus is becoming more and more appreciated for rescue and recovery purposes after explosions and for fighting mine fires. This is borne out by the fact that there has been a steady growth in the establishment of rescue stations throughout the country. Particularly is this true in the eastern coal fields.

The possibilities and the limitations of the existing types of apparatus, which are being gradually improved, are becoming more thoroughly understood from year to year.

There were two noteworthy instances during the year where men engaged in combating mine fires donned the apparatus with presumably little or no previous training in its use. One instance is recorded where an apparatus crew consisting of only two men undertook to make an exploration of considerable length; one was overcome and lost his life. Until such practices as that of having less than five men in a rescue party are discontinued, the dangers incident to wearing apparatus in irrespirable atmospheres will not be reduced to the minimum.

Some wearers of the apparatus fail to properly appreciate the fact that, owing to the added weight of the apparatus, they become exhausted much more quickly than when working without it and may suddenly collapse when the apparatus is used up to the limit of its capacity.

Systematic methods of recovery and rescue work following mine disasters are being improved each year, and it is believed that the increased efficiency of such methods is largely due to the work of the men trained by the bureau, and those receiving training at State and privately-owned rescue stations.

During the past fiscal year representatives of the bureau^a attended and investigated 89 accidents of various kinds throughout the country and in six instances the bureau's men wore apparatus for rescue or recovery purposes. There were three fatalities (all employees of mining companies), during the fiscal year, among men wearing rescue apparatus.

^aL. M. Jones, a mining engineer of the bureau, was asphyxiated while assisting in recovery work after a mine disaster at Barrackville, W. Va., on October 20, 1916. He was the fourth member of the Bureau of Mines rescue corps to meet death while on duty.

ACCIDENTS IN WHICH LIVES WERE SAVED.

The following are summarized accounts of mine accidents at which lives were saved:

JULY 17, 1915, EXPLOSION AT No. 7 MINE, ARMA, KANS.

A miner named Obe Dray entered the mine 15 minutes after the explosion and rescued a miner named Lamberton, who was overcome at the shaft bottom. Lamberton was given artificial respiration on top and revived. The accident was caused by ignition of gas from an open light.

AUGUST 7, 1915, SUFFOCATION IN SHAFT, BOLEN-DARNALL No. 16, AT CRAIG, OKLA.

A miner, Edward Lewis, was overcome by damp while shaft sinking. J. W. Stephenson, the mine foreman, and R. C. Foster, a miner working in an adjoining slope, were overcome while attempting his rescue, Foster falling from the bucket as they were being hoisted to the surface. Hugh McCoubrey, mining engineer, then tied himself to the bucket and was lowered to the bottom. As Foster apparently was dead he brought Lewis to the surface, then returned and brought Foster to the surface, and later revived Lewis by means of artificial respiration. Lewis was overcome at 7.30 a. m. and was resuscitated before rescue apparatus arrived. At 9.30 an engineer from the bureau's station at McAlester reached the scene and gave Foster artificial respiration, but it was discovered later that he had suffered a fracture of the skull, which, no doubt, caused instant death.

SEPTEMBER 6, 1915, SUFFOCATION AT ALBION MINE, NEAR SALT LAKE CITY, UTAH.

Two men, Andrew Ekrem, of the Salt Lake City fire department, and James Hendrickson, mining engineer, entered the Quincy Tunnel and went into a drift, which led to the Albion mine. Each wore a mine rescue apparatus of the helmet type. Hendrickson was overcome shortly after entering the drift and lost his life. It is reported that Hendrickson had not received a complete course in rescue training. Had there been five men in the crew, as recommended by the bureau, Hendrickson probably would have been rescued.

SEPTEMBER 27, 1915, BLAST AT RAHN COLLIERY, NEAR COALDALE, PA.

A blast caused a rush of water and coal which cut off and entombed 11 men. Two of the men were rescued 12 hours after the disaster, but the others were not reached until October 3, after an imprisonment of 6 days and 5 hours, during which time they had no food except that in six dinner buckets, which they carried. No lives were lost and all of the men fully recovered from their experience. Three hundred men working three shifts per day drove the tunnel through which the rescue was effected. There were many delays in this work, owing to the dangerous character of the ground through which the tunnel was driven and the quantity of black damp encountered. Sixteen of the company's rescue men were on duty throughout the work.

OCTOBER 4, 1915, RUN OF COAL AT CONTINENTAL COLLIERY, CENTRALIA, PA.

John Tomaszefski, a miner, was rescued after 187 hours' imprisonment by a cave-in in the Continental Colliery. This was one of the most thrilling and successful rescue attempts in the annals of American mining. Tomaszefski was caught behind a run of coal at noon, September 26. The first attempt

to reopen the manway leading to his working place was abandoned when the rescuers had reached a point where they could call to the entombed miner. It was found that the coal was very free here and it was feared that further excavating might again start the coal to run and probably result in the death of the imprisoned man. A 2-inch diamond-drill hole was then drilled 50 feet through a pillar to the miner's working place, and through this hole liquid and solid food and dry clothing were sent. This hole was completed 85 hours after the accident. After he was provided with food and clothing experienced miners drove by pick mining a 4-foot by 4-foot passageway along the line of the drill hole to the working place and rescued him. It required four days to accomplish this.

NOVEMBER 1, 1915, AUTOMOBILE ACCIDENT NEAR POCAHONTAS, W. VA.

H. L. Scott, a salesman, was thrown from an automobile and an artery in his leg was severed. F. J. Bailey, a bureau-trained first-aid man and a contestant on the Louisville team at San Francisco, Cal., arrived on the scene a few minutes later and controlled the bleeding. The work was commended by the local and hospital physicians, who stated that Scott owed his life to the prompt treatment by Bailey.

NOVEMBER 30, 1915, EXPLOSION AT BOMMER No. 2 NORTH MINE, BOMMER, W. VA.

Two explosions occurred, approximately 40 minutes apart, resulting in the loss of 23 lives. • About 19 hours after the second explosion 5 men were rescued, 1 dying several hours later. Following the second explosion the assistant mine foreman conducted a body of 27 men to a point in the mine where the air was good and erected a barricade against the afterdamp. All were later rescued.

DECEMBER 21, 1915, SUFFOCATION AT No. 38 MINE, ALDERSON, OKLA.

Ed Gallimore, a fire runner, was overcome by smoke. He was dragged to fresh air by Messrs. Reddell and Kirkpatrick and revived after 40 minutes' treatment by artificial respiration. Both Reddell and Kirkpatrick were trained in first aid by a bureau representative.

JANUARY 8, 1916, FIRE IN CALUMET No. 5 SHAFT, CALUMET, MICH.

Nine men, none of whom had been trained in the use of breathing apparatus, were either partly or entirely overcome by smoke and fumes while building bulkheads during the active work of fighting the fire. They were all rescued and resuscitated. Artificial respiration was administered by a Bureau of Mines representative and others.

JANUARY 14, 1916, CAGER SHOCKED AND OVERCOME, No. 6 MINE, LEHIGH, OKLA.

A cager was shocked and overcome by coming in contact with an electric power line. He was revived after 30 minutes' work by Messrs. Ogilvie and Strang, each of whom was trained in first aid by bureau representatives, and each of whom was a member of the Lehigh first-aid team which contested at the San Francisco meet.

FEBRUARY 8, 1916, EXPLOSION AT LANCE COLLIERY, PLYMOUTH, PA.

An explosion occurred in the bottom lift of the Bottom Ross seam in newly opened territory. The extent of damage was limited. While attempting rescue work without apparatus, J. H. Davis, foreman, was partly overcome, but was rescued and resuscitated.

FEBRUARY 14, 1916, FIRE IN PENNSYLVANIA MINE, BUTTE, MONT.

Two men wearing rescue apparatus lost their lives. One of these was said to be in bad physical condition to wear apparatus. Two others were overcome, but were rescued and revived. In the rescue and recovery work 58 men wearing rescue apparatus participated, of whom 15 are known to have received Bureau of Mines training.

MARCH 28, 1916, EXPLOSION IN KING NO. 98 MINE, VIVIAN, W. VA.

Two men who had been overcome were rescued and revived by artificial respiration.

ACCIDENTS INVESTIGATED DURING THE YEAR.

As shown by the following table, in the 89 accidents investigated by bureau employees 285 men were killed, 3,015 escaped unassisted, and 75 were rescued through the efforts of volunteer miners, company officials, State mine inspectors, and company rescue crews.

Of the 89 accidents investigated, 68 were in coal mines, 14 in metal mines, 1 in a hydraulic pit, 1 a dynamite explosion in the St. Louis sewer tunnel, 1 in a quarry, 1 a cave-in in a New York City subway, 1 in a strip pit, 1 a boiler explosion, and 1 in the new city sewer of Pittsburgh, Pa.

The accidents may be classified by causes, as follows:

Mining and other accidents investigated during fiscal year 1916, showing number of men killed, injured, rescued, etc.

Name of mine.	Location.	Date.	Num- ber killed.	Num- ber injured	Num- ber of men res- cued.	Es- caped un- as- sisted.	Num- ber wearing breath- ing ap- para- tus.	Hours wearing breath- ing ap- para- tus.	Died wearing breath- ing ap- para- tus.	Nature of accident.	Investigated by—
Husted-Semans.....	East Millsboro, Pa.	1915.	1	5	3	3	5	0	0	Gas explosion.....	J. W. Paul.
West Frankfort No. 1 ^a	West Frankfort, Ill.	July 10	0	1	1	1	2	2	0	Gas ignition.....	H. J. Smith.
McCormick No. 7 ^a	Arma, Kans.	July 17	1	5	3	3	0	0	0	Gas explosion.....	A. I. Young, J. J. V. Forbes.
Berwind-White Shaft No. 3.....	Elton, Pa.	July 18	1	5	1	1	0	0	0	Dynamite explosion.....	W. J. German.
Federal Coal & Coke Co. shaft.....	Grant Town, W. Va.	July 25	2	1	1	1	0	0	0	.....do.....	D. J. Parker.
Western No. 18.....	Franklin, Kans.	July 26	2	2	2	2	0	0	0	Explosion.....	A. I. Young, J. J. V. Forbes.
Rock Island No. 8.....	Hartshorne, Okla.	.....do.....	1	0	1	1	7	2	0	.....do.....	J. W. Koster.
United No. 1 ^a	Christopher, Ill.	July 27	9	8	8	8	0	0	0	Gas explosion.....	H. J. Smith.
Patterson No. 2.....	Elizabeth, Pa.	July 30	9	17	1	1	0	0	0	Haulage accident.....	J. W. Paul, H. D. Mason, Jr., G. E. McElroy.
Sample Run.....	Clymer, Pa.	Aug. 2	0	0	0	0	0	0	0	Flooded mine.....	G. E. McElroy.
Central No. 45.....	Ringo Jct., Kans.	.....do.....	0	0	1	1	0	0	0	Explosion.....	A. I. Young, J. J. V. Forbes.
Bolen-Darnell No. 16.....	Craig, Okla.	Aug. 7	1	1	1	1	0	0	0	Shaft accident.....	J. J. Rutledge, J. W. Koster.
Quarry No. 3.....	Hillsville, Pa.	Aug. 11	1	0	1	1	0	0	0	Premature blast.....	T. C. Atterbury.
Rock Island No. 8.....	Hartshorne, Okla.	Aug. 16	1	0	1	1	0	0	0	Blown-out shot.....	J. J. Rutledge, J. W. Koster.
Happy Thought (silver).....	Crede, Colo.	Aug. 27	0	0	0	0	0	0	0	Fire.....	(Car 2) J. W. Paul, C. O. Roberts, G. A. Burrell, K. H. Chisholm, J. H. East (X. Henderson and W. E. Gibbs).
Sample No. 2.....	McAlester, Okla.	Aug. 30	1	1	30	30	0	0	0	Gas ignition.....	J. J. Rutledge, J. W. Koster.
Orenda No. 2.....	Boswell, Pa.	Aug. 31	18	8	10	10	0	0	0	Gas explosion.....	D. Harrington, H. D. Mason, Jr.
Archibald Colliery.....	Archibald, Pa.	Sept. 8	0	1	4	4	0	0	0	Cave-in.....	Charles Enzian.
Banner.....	Banner, Ala.	Sept. 11	1	4	1	1	0	0	0	Explosion.....	E. B. Sutton, W. T. Burgess.
Crown Hill No. 3.....	Clinton, Ind.	Sept. 12	1	4	1	1	0	0	0	.....do.....	W. W. Fleming
Alta-Quincy Tunnel ^a	Salt Lake City, Utah.	Sept. 16	1	0	1	1	2	1	0	Apparatus exploration.....	W. A. Lynott, G. E. McElroy.
Zoller packing plant ^a	Pittsburgh, Pa.	Sept. 19	1	0	0	0	1	0	0	Ammonia pipe burst.....	G. E. McElroy.
York.....	Reynoldsville, W. Va.	Sept. 21	1	0	0	0	0	0	0	Explosion.....	Charles Enzian, S. P. Howell.
Subway cave-in.....	New York City	Sept. 22	9	90	1	1	0	0	0	Cave-in.....	Do.
Continental Colliery.....	Centralia, Pa.	Sept. 25	0	0	11	11	0	0	0	Rush of culm and water.....	H. J. Smith.
Coaldale No. 11.....	Coaldale, Pa.	Sept. 27	0	0	3	3	0	0	0	Gas ignition.....	Edwin Higgins.
Spaul Well No. 2.....	Terre Haute, Ind.	Sept. 29	0	3	25	25	0	0	0	Shaft fire.....	J. R. Fleming.
Bessemer, Mich.....	Bessemer, Mich.	.....do.....	0	0	0	0	0	0	0	Powder explosion.....	J. W. Koster.
Geneva Shaft.....	Hanna City, Ill.	Sept. 30	2	0	0	0	0	0	0	.....do.....	
Empire.....	Hanna City, Ill.	Sept. 30	2	0	0	0	0	0	0	Powder ignition, sur- face.	
Rock Island No. 7.....	Hartshorne, Okla.	Oct. 7	1	0	0	0	0	0	0	.....do.....	

^a Breathing apparatus was used.

Mining and other accidents investigated during fiscal year 1916, showing number of men killed, injured, rescued, etc.—Continued.

Name of mine.	Location.	Date.	Num- ber killed.	Num- ber injured.	Num- ber of men res- cued.	Es- caped un- as- sisted.	Num- ber wearing breath- ing ap- para- tus.	Hours wearing breath- ing ap- para- tus.	Died wearing breath- ing ap- para- tus.	Nature of accident.	Investigated by—
Minshalla.	Fontanet, Ind.	1915.									
Spencer Colliery.	Dunmore, Pa.	Oct. 11-15	0	3			10	18	0	Fire.	(Car 3) H. I. Smith, G. T. Powell, Charles Enzian.
Harold Mine.	Hibbing, Minn.	Oct. 12	2	0			0			Rock fall.	J. H. East, Jr.
Granite Mountain.	Butte, Mont.	Oct. 13	16	3	1					Mine cave.	Edwin Steidle.
New city sewer.	Pittsburgh, Pa.	Oct. 19	1	0						Dynamite explosion.	H. D. Mason, Jr.
Sanford No. 2.	Sanford, Ind.	Oct. 25	1	1			0			Dynamite smoke.	H. I. Smith, Jr.
Rock Island No. 40.	Gowen, Okla.	do.	2	0			0			Misplaced shot.	J. J. Rutledge, J. W. Koster.
Rock Shaft.	Peckville, Pa.	Oct. 26	0	8						Black powder explo- sion.	(Car 1) J. Henson, J. V. Berry, H. D. Mason, Jr.
Francis.	Curtisville, Pa.	Nov. 1	1							Gas ignition (on surface).	John Boardman.
Girard No. 7a.	Radley, Kans.	Nov. 5	1	14			4	$\frac{1}{2}$	0	Fall of roof.	
Kali Inla.	Cambria, Okla.	Nov. 6	1							Gas and powder explo- sion.	J. J. Rutledge, J. W. Koster.
Fleming No. 3, strip pit.	Skidmore, Kans.	Nov. 15		1						Electric shock.	John Boardman.
Ravensdale No. 1a.	Ravensdale, Wash.	Nov. 16	31				22	20	0	Dynamite explosion.	H. M. Wolfen, Edwin Higgins.
Carolina.	Hutchinson, W. Va.	do.	2				2			Dust explosion.	R. H. Kudlich.
United No. 2.	Buckeye, Ill.	Nov. 17		7			500			Boiler explosion on surface.	
Mount Hope (iron mine)	Mount Hope, N. J.	Nov. 19					100			Gas ignition.	I. R. Fleming.
Sanford No. 2.	Sanford, Ind.	Nov. 22	0	2			0			Fire.	Charles Enzian.
Packer No. 5.	Lost Creek, Pa.	Nov. 27	2	0						Misplaced shot.	H. I. Smith.
Boomer No. 2.	Boomer, W. Va.	Nov. 30	23	11	33	273	0			Explosion.	Charles Enzian.
Flat Top.	Flat Top, Ala.	Dec. 2	2							Haulage accident.	(Car 8) J. W. Paul, D. J. Parker, H. D. Mason, Jr., H. D. Jones, G. W. Grove, D. W. Cooke.
Carbonado Slope.	Carbonado, Wash.	Dec. 11	2				26			Outburst of gas.	E. B. Sutton.
Lattimer No. 9, slope 7.	Lattimer Mines, Pa.	Dec. 13		23						Fire.	J. J. Corey.
Rock Island No. 5.	Alderson, Okla.	Dec. 20	1	0						Explosion.	Charles Enzian.
Jackson Hill No. 6.	Libertyville, Ind.	Dec. 21	1	0						Explosion.	J. W. Koster.
Brandy City hydraulic pit.	Brandy City, Cal.	Dec. 23	4	4						Fumes from detonation of 11 tons of explosives.	H. I. Smith, Edwin Higgins.
Benham.	Benham, Ky.	Dec. 28	1	0						Explosion of detona- tors.	E. B. Sutton.
Western No. 15.	Franklin, Kans.	Dec. 30	1	0						Explosion.	John Boardman.
Total, including Dec. 31, 1915.			162	225	70	2,198	53	41	1		

Conglomerate No. 5 a.	1916.	Calumet, Mich.	Jan. 8	9	76	240	Fire.	(Car 7) J. H. East. E. H. Denny. R. H. Seip, L. C. Hsley. Charles Enzian, S. P. Howell. John Boardman, R. H. Seip. Charles Enzian, R. H. Seip. (Car 6) H. M. Wollfin, H. D. Mason, Jr., E. H. Denny, A. J. Strane, H. J. Rahilly.
Murphys Shaft.	Jan. 12	Claysville, Pa.	2	5			Gas ignition.	E. H. Denny.
North Mahonoy.	Jan. 10	Mahonoy City, Pa.	2	5			Dynamite explosion.	R. H. Seip, L. C. Hsley.
Appollo.	Jan. 21	Fayette City, Pa.	2	25	223		Powder explosion.	Charles Enzian, S. P. Howell.
Fidelity No. 8.	Feb. 8	West Mineral, Kans.	1	2	1		Blown-out shot.	John Boardman, R. H. Seip.
Lance Colliery.	Feb. 8	Plymouth, Pa.	7	2	1		Gas explosion.	Charles Enzian, R. H. Seip.
Ernest No. 2.	Feb. 11	Ernest, Pa.	27	4	60		Explosion.	(Car 6) H. M. Wollfin, H. D. Mason, Jr., E. H. Denny, A. J. Strane, H. J. Rahilly.
Western No. 14.	do.	Fleming, Kans.					Mine fire.	John Boardman.
Pennsylvania (copper) a	Feb. 14	Butte, Mont.	21	3	2	9	Fire.	D. Harrington.
Johnson No. 1 Colliery.	Feb. 19	Dickson City, Pa.	2	3	200	58	Rib fall.	R. H. Seip.
Sanford No. 2.	Feb. 25	Sanford, Ind.	2	1			Misplaced shot.	H. I. Smith.
St. Louis sewer tunnel.	Feb. 28	Maplewood, Mo.	2	65			Dynamite explosion.	S. P. Howell.
Davis No. 42.	Feb. 29	Kempton, Md.	15	3	47		Explosion.	(Car 6) H. M. Wollfin, H. D. Mason, Jr., C. O. Roberts, J. W. Koster, A. J. Strane, W. J. German.
Hollenback Colliery.	Mar. 8	Wilkes-Barre, Pa.	6	1	5		Explosion and fire.	Charles Enzian, R. H. Seip.
United No. 2 (North).	Mar. 9	Christopher, Ill.		16			Cage accident.	J. R. Fleming.
Paradise No. 2.	Mar. 16	Du Quoin, Ill.	2	1			Keq of powder ignited.	Do.
Sutro (copper).	Mar. 23	Kennett, Cal.	1	1			Misfire.	Edwin Higgins.
Western No. 18 mine.	do.	Franklin, Kans.	1		1		Coal-dust explosion.	J. J. Rutledge, J. F. Davies.
King No. 98.	Mar. 28	Vivian, W. Va.	6	18	2	193	Gas or black-powder (explosion).	H. M. Wollfin, Edwin Steidle, C. J. McKee, J. W. Koster.
Crown Hill No. 3.	do.	Clinton, Ind.	1	1			Gas and powder explosion.	G. T. Powell.
Robindale a.	Mar. 31	Seward, Pa.	8		12	2	Probably ignition of gas.	L. M. Jones, E. H. Denny, W. J. German.
South Eureka (gold).	do.	Sutler Creek, Cal.	1				Fall of ore.	Edwin Higgins.
New Almaden (quick-silver).	Apr. 15	New Almaden, Cal.	2				Fall of rock.	Do.
Malones (gold).	Apr. 18	Calaveras County, Cal.	1				Misfire.	Do.
Mountain King (gold).	Apr. 20	Mariposa County, Cal.	1				Electric shock.	Do.
South Eureka (gold).	Apr. 27	Sutler Creek, Cal.	1				Mine car.	Do.
Yellow Jacket (gold).	May 23	Gold Hill, Nev.	4		5	18	Mine fire.	Daniel Harrington.
Carswell Shaft.	May 27	Kimball, W. Va.	4		8		Gas explosion.	D. I. Parker, Jesse Henson, W. B. Plank.
Sybil.	June 1	French Gulch, Cal.	1				Gasoline explosion.	Edwin Higgins.
Coalmont.	June 15	Coalmont, Ala.	2	5	83		Explosion.	E. B. Sutton, W. T. Burgess.
Oak Ridge No. 2.	June 16	Red Oak, Okla.	1				Fall of coal.	J. J. Rutledge.
Gebo.	June 18	Gebo, Wyo.	1				do.	H. J. Rahilly.
Totals for 1916 (to June 30).			123	160	5	817		
Totals for 1915 (July 1 to Dec. 31).			162	225	70	2,198		
Totals for fiscal year.			285	385	75	3,015		

b Several days.

c Apparatus was used.