

The possibilities and also the limitations of the existing types of apparatus are being much more generally understood; recovery and rescue work after mine disasters is becoming largely systematized. At 19 of the 63 mining and other accidents investigated during the past fiscal year by bureau representatives, rescue apparatus (owned privately or by the Government) was worn during recovery and rescue work. There were two fatalities, one of a Bureau of Mines engineer, L. M. Jones, and one of an employee of a mining company. Bureau men wore apparatus for recovery and rescue purposes on 12 occasions.

ACCIDENTS IN WHICH LIVES WERE SAVED.

Summarized accounts of accidents at which lives were saved are given below:

JULY 11, 1916, EXPLOSION IN THE HITCHMAN MINE, BENWOOD, W. VA.

No one killed. There were 260 men in the mine, 11 of whom were injured; all except 1, who was thrown off his motor by the explosion and burned, were able to walk out of the mine.

JULY 24, 1916, EXPLOSION IN THE NEW WEST SIDE WATER TUNNEL UNDER LAKE ERIE, CLEVELAND, OHIO.

After a gas explosion in this tunnel the crib superintendent and four men entered the tunnel in an attempt to save men who had been at work. After going 100 feet they were overcome by afterdamp and dropped. Two men left at the lock near the tunnel entrance saw the superintendent drop; they dragged him to fresh air, where he revived, but the two men were made so weak by the afterdamp that they were unable to rescue the others, and subsequently all three, while in fresh air outside the tunnel, became unconscious for two hours. In the meantime the general superintendent and 7 men who entered the tunnel were overcome and lay untouched for about five hours. Then the tunnel air lock was broken and the pressure released. Subsequently it was found that the tunnel had caved when the explosion occurred. The superintendent and one other man had fallen near a three-fourth-inch hole in an air pipe and had been getting some fresh air. They revived and walked through the lock unassisted. The other men in the tunnel were dead.

SEPTEMBER 6, 1916, EXPLOSION IN NO. 2 MINE, UNITED COAL MINING CO., BUCKNER, ILL.

Gas was ignited by miners in old workings. The explosion blew out or damaged eight stoppings and three doors, but no one was injured. Between 30 and 40 men in the explosion area could not get out on account of the smoke. The company inspector, Mr. Laughron, who took charge of the rescue work, succeeded in about a half hour in restoring ventilation by temporary canvas brattices, so that the men could get to safety.

SEPTEMBER 23, 1916, CAVE-IN, BUFFALO MINE, WYOMING COAL CO., BUFFALO, WYO.

A cave-in liberated gas accumulating in old workings and trapped 2 miners, who escaped to an air shaft after putting up several brattices to hold gas back. They were hoisted to the surface by means of ropes.

OCTOBER 2, 1916, CLEVELAND WATERWORKS TUNNEL, CLEVELAND, OHIO.

Mr. Farrell, Director of Public Utilities of Cleveland, after making an inspection of the Cleveland waterworks tunnel, collapsed in the airlock while "locking out." W. J. German, safety engineer of the tunnel, on furlough from the Bureau of Mines, immediately started artificial respiration by the Schaefer method, and after half an hour's work brought him back to consciousness.

OCTOBER 22, 1916, EXPLOSION AT MARVEL NO. 2 MINE, RODEN COAL CO.,
MARVEL, ALA.

One man, a pumper, escaped with slight burns from this explosion. He crawled up the slope to within a few hundred feet of the mouth and was there met by rescuers without apparatus, who assisted him out.

NOVEMBER 4, 1916, EXPLOSION AT THE BESSIE MINE OF THE SLOSS-SHEFFIELD
STEEL & IRON CO., MABEN, ALA.

After the explosion the mine was explored by men wearing breathing apparatus. About 15 hours after the explosion a trained apparatus crew of 5 men found 3 men at a break in the air line. The party was then about 1,000 feet from fresh air, and the three men were able to proceed to safety with the aid of the apparatus crew. Thirty men were killed by the explosion, 5 escaped unassisted, and 3 were rescued as noted.

DECEMBER 15, 1916, EXPLOSION IN NO. 5 MINE OF DEGNAN & MCCONNELL COAL
CO., WILBURTON, OKLA.

Two shot firers, the only men in the mine at the time, lost their lives. Immediately after the explosion 4 men without apparatus who attempted to enter the mine through an old slope, were overcome before proceeding far; in getting them out 8 others (all without apparatus) were overcome. Eleven of the 12 were revived by the prompt administration of artificial respiration given by bureau-trained men; 1 man died in spite of all efforts to revive him. One of those revived had been unconscious for 6 hours.

DECEMBER 13, 1916, EXPLOSION, NO. 9 MINE, FIDELITY COAL & MINING CO.,
STONE CITY, KANS.

Twenty men were killed, 36 escaped unassisted, and 11 were partly overcome by afterdamp and were helped to safety by local men.

JANUARY 3, 1917, FIRE AT THE PITTSBURGH-IDAHO LEAD-SILVER MINE, GILMORE,
IDAHO.

Fire starting, it is said, from the ignition of a can of gasoline caused the death of 1 man and the imprisoning of 14 other men; 8 of these bulkheaded themselves in the dead end of a drift. The other 6 went into the dead end of another drift, but built no bulkhead. All 14 were rescued 12 hours after the fire started; apparently the mine air was then not bad, as the rescue was made by local men without rescue apparatus, led by Superintendent Ellard.

JANUARY 25, 1917, FIRE AT PRIMROSE COLLIERY, LEHIGH VALLEY COAL CO., NEAR MAHANAY CITY, PA.

Nine men wearing apparatus of a helmet type were overcome while exploring a fire area. Superintendent Wolfe, wearing no apparatus, was also overcome, but not before he had given orders to reverse the air. It was then possible to save all the men without the use of apparatus.

FEBRUARY 19, 1917, EXPLOSION AT No. 15 MINE, WESTERN COAL & MINING Co., FRANKLIN, KANS.

Of 3 shot firers in the mine, 2 were killed; the third traveled 3,700 feet by himself over falls to the bottom of the shaft, where oxygen was administered to him. A couple of days afterwards the man showed no ill effects from his experience.

FEBRUARY 23, 1917, FIRE IN THE LEONARD MINE OF THE ANACONDA COPPER MINING Co., AT BUTTE, MONT.

Mr. Boardman, formerly with the Bureau of Mines, in charge of rescue apparatus for the company, entered the mine. He took three sets of apparatus down with him on the cage to the 900-foot station. In the 900-foot level, at the end of the gaseous area, while wearing apparatus, he met the mine foreman crawling; about 100 feet farther in he saw a man partly overcome and assisted him to the shaft. Again entering the 900-foot level he met, at a point 250 feet from the shaft, another man crawling and assisted him to the shaft. These two men probably owed their lives to this assistance. Boardman then caused a man who had never worn apparatus to put on apparatus and accompany him to the manway in which a man overcome had been left with a rope attached to him. The man's light was found burning and Boardman's assistant held the rope on the 900-foot level while he went down into the raise through the two floors, placed the rope under the unconscious man's arms, and put the man into the timber chute. The man was brought to the level above, placed on a truck, and pushed to fresh air, a distance of 600 feet. The man was totally unconscious on reaching the station. Boardman and others used the Schaefer method of artificial respiration for 40 minutes before the man began to breathe; then the man was given oxygen; later he recovered completely.

MARCH 13, 1917, EXPLOSION AT HENDERSON No. 1 MINE, HENDERSON COAL Co., HENDERSONVILLE, PA.

Of 38 men in the mine at the time of the explosion, 14 were killed and 22 escaped unassisted. Two, who were prevented by the smoke and afterdamp from reaching safety, crawled upon a fall where they remained until a rescue party without apparatus reached them some hours afterwards.

MARCH 19, 1917, EXPLOSION AT No. 18 MINE OF THE CLEMENS COAL Co., NEAR PITTSBURG, KANS.

John Ferns, gas man, ignited a body of gas; he was severely burned and rendered unconscious. Mine foreman Keegan, James Ferns, and Marvin Sample entered the mine immediately. Sample, who had been trained in first aid by a Bureau of Mines representative, began artificial respiration on the injured man, who revived after about 15 minutes and was taken to the surface. The man died later as a result of his burns.

APRIL 27, 1917, EXPLOSION AT HASTINGS MINE, VICTOR AMERICAN FUEL CO.,
HASTINGS, COLO.

An explosion occurred resulting in the death of 121 out of 122 men known to be underground, the only survivor being a rope rider, who was going down the main slope on a trip of empty cars when the explosion occurred. The explosion disarranged and short-circuited the bell wires, thus causing a signal to be given to the holst man on the surface, the latter stopping the trip. The rope rider endeavored to ascertain the cause of the bell-wire trouble and encountered smoke, whereupon he hastily proceeded to the surface. During the progress of the recovery work an apparatus wearer met his death, bringing the total number of casualties to 122. Although the explosion was violent inside, there was no indication at the mouth of the mine. The fan continued to run, and the only indication of any unusual condition was the fact that smoke issued from the main slope and south manway. It was thought that a fire had started and mine officials immediately started an investigation. The work of recovering the bodies was much delayed on account of numerous falls and consequent obstruction of ventilation and prevention of passage through the entries. In all, 101 bodies were recovered, 20 being left in the mine not found. Some of these may never be recovered, as there are innumerable falls, many of which may not be moved. The last bodies were taken out of the mine on May 12, or 15 days after the explosion. Although no accurate record was kept, it is thought that at least 50 of the 101 bodies recovered were brought to the fresh-air base by men wearing breathing apparatus. Apparatus was worn by local rescue crews and Bureau of Mines men. The cause of the explosion is doubtful.

JUNE 2, 1917, REND NO. 2 MINE, REND COAL & COKE CO., NEAR HERRIN, ILL.

Nine men were killed and 2 injured by an explosion of gas. Eight men wore apparatus for about 3 hours in mine exploration and recovery of bodies. One of the injured men was resuscitated.

JUNE 8, 1917, DISASTROUS FIRE AT GRANITE MOUNTAIN SHAFT, NORTH BUTTE
MINES, BUTTE, MONT.

The oil-soaked insulating material of a lead-armored cable was ignited by a carbide lamp, the fire spreading rapidly to the shaft timbers and the mine. Some 214 or 215 of the miners escaped by another shaft and through communicating mines, but 201 were entombed. Of these, 25 men escaped two days later by a connecting shaft, after having bulkheaded themselves for more than 24 hours. A day later crews wearing apparatus rescued alive, but absolutely exhausted, 6 men who had bulkheaded themselves in the 2,200-foot level. Messrs. Harrington, Allen, Forbes, and Dickinson, of the Bureau of Mines, assisted in the rescue of these men. Apparatus was put on them and they were conveyed on trucks to fresh air. The remaining 170 men perished. In fighting the fire and in recovering the bodies 77 sets of rescue apparatus were used, worn by 119 men. Of the 151 bodies recovered, 125 were recovered by the use of apparatus. Cars 2 and 5 were called to the scene and the bureau employees were able to render aid promptly. Apparatus was in constant use for 5 days by the crews of the Anaconda Copper Co., the North Butte Co., and by the Bureau of Mines men present.

ACCIDENTS INVESTIGATED DURING THE YEAR.

The following table shows that 63 accidents were investigated by members of the Bureau of Mines during the fiscal year. In these

accidents 629 men were killed, 1,140 escaped unassisted, and 113 men were rescued through the efforts of volunteer miners, company officials, State mine inspectors, company rescue crews, and members of the bureau. Of the 629 men killed, 136 lost their lives in munitions-plant explosions. Of the 63 accidents investigated, 49 were in coal mines, 8 in metal mines, 3 in munitions plants, 1 in the Cleveland waterworks tunnel, 1 in railroad shops at Louisville, Ky., and 1 in a foundry at Pittsburgh, Pa.

The accidents may be classified by causes, as follows:

Classification of accidents investigated.

Gas and dust explosions.....	28	Misplaced or overcharged shots	
Mine-car accidents	2	(includes shot-firers' explosions	
Electric shock	1	due to "shooting off solid")...	8
Holting accidents	3	Oxygen-tank explosion.....	1
Cave-in.....	1	Suffocation from gas accumula-	
Gas-engine fumes	1	tion	1
Explosion of dynamite or other		Unknown	2
explosive	5	Coal rush.....	1
Fires.....	8	Boiler explosion.....	1