Joseph A. Holmes: He gave birth to modern mine safety—Part 2

By Robert D. Johns

Some 1,500 people felt the first faint rumble of the earth shortly after dusk on Halloween night, 1911. Within seconds, a huge ball of fire and smoke belched from the mouth of the mine. The explosion in the experimental mine at Bruceton, Pa., had all the earmarks of one more disaster in the coal fields of Appalachia.

It was something else entirely: injuries, none; fatalities, none.

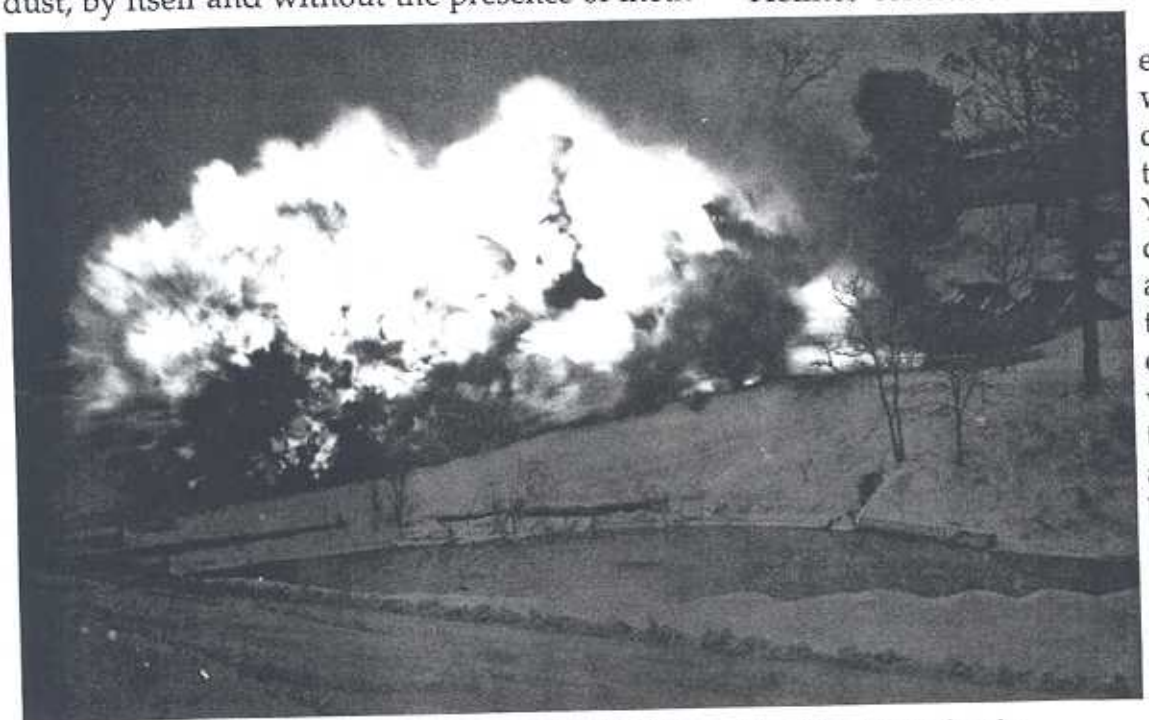
It was no accident that this was a different kind of mine explosion with a decidedly different outcome than usual.

The 1911 explosion at the Bruceton Mine, about 20 miles south of Pittsburgh, was one of the more dramatic demonstrations by Dr. Joseph A. Holmes, a man who earned the reputation of "founding father of modern mine safety."

Holmes had gathered more than 1,500 miners, mine operators, engineers and news people at the Bruceton Mine to demonstrate once and for all to a previously skeptical public that ordinary coal dust, by itself and without the presence of methane, has enormous explosive qualities. Before the demonstration was over, however, even Holmes himself might have been feeling a bit skeptical. An assistant tried twice to set off the explosive charge which had been planted in the mine. Nothing happened. Finally Holmes stepped forward, personally set off the explosives, and no one ever again doubted the danger of coal dust.

Commenting later on the significance of the experiment, Holmes said, "The great value of this experiment to the mining industry was in demonstrating to more than 1,500 people from every coal mining district of the United States the fact that ordinary bituminous or soft coal dust will explode from a charge of black powder badly placed in a mine; and that poisonous gases are given off from such an explosion in sufficient quantities to suffocate and poison any person in the mine.

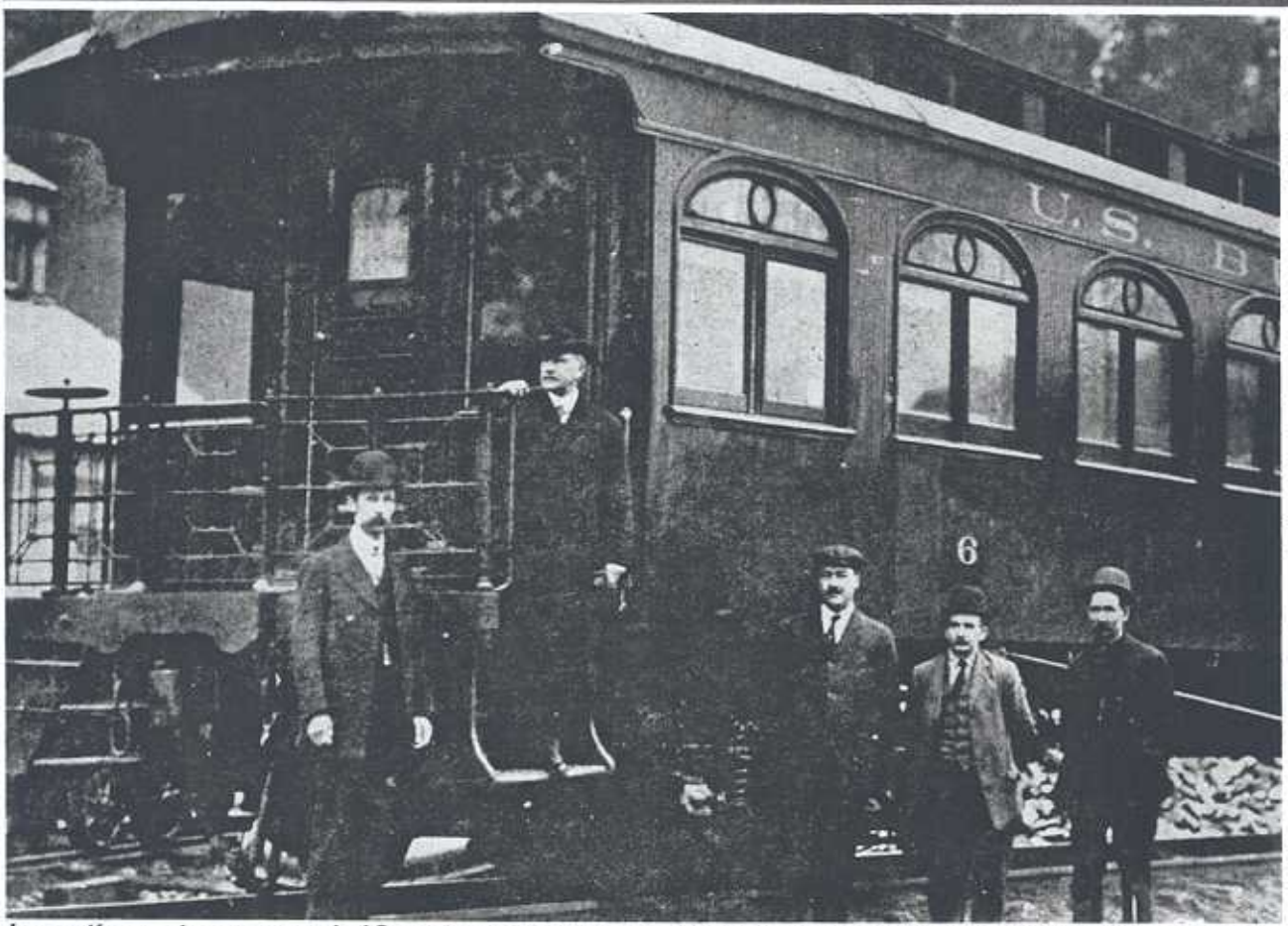
"No amount of writing or talking could be so forcible in the teaching of such a great lesson," Holmes concluded.



Coal dust explosion from main entry, Experimental Mine, Bruceton, Pennsylvania.

Witnesses to the explosion groped for words to describe the destructive force of the blast. One New York Times reporter described it, for example, as "terrifying to the layman." No one needed to ask what would happen to a man inside a mine at the time of such a blast.

Although Holmes and a few others had preached it for some time, it took a practical demonstration to make the mining in-



Inspection party, composed of Secretary of the Interior Ballinger; Director of the Bureau of Mines, Joseph A. Holmes; Dr. J.J. Rutledge and others in front of a Bureau of Mines rescue rail car at Marianna, Pennsylvania.

dustry fully understand the lethal characteristics of coal dust. This experiment, of course, involved only the particular type of coal dust present in the Bruceton Mine, but it was followed by experiments to determine the explosiveness of coal dusts from hundreds of mines across the U.S.

Under Holmes, direction, research was conducted to determine the effects on coal dust of humidification and wetting, incombustible materials' methane and oxygen. These experiments underlined two important facts: 1) The flammability of coal dust is appreciably increased by the presence of gas and 2) rock dust is an effective and practical means of preventing the spread of an explosion, better and possibly cheaper than wetting the coal dust.

Holmes, who is credited with making popular the slogan, "safety first," was responsible for many major improvements in mine safety. Among his other significant achievements he arranged for the importation of oxygen-breathing devices for mine rescue teams. Until he purchased several of these units for the Bureau of Mines, their use was extremely limited in American mines.

Holmes also negotiated for the donation of four railroad cars from the Pullman Company for use in mine rescue work at a time when the Bureau of Mines' budget would not permit their purchase. Pullman prepared the cars for mine rescue operations under Holmes direction and they were put on continuous standby for mine emergencies. If an explosion did occur the cars and personnel attached to them were immediately dispatched to the disaster area to provide mine rescue assistance with a measure of efficiency that was previously thought impossible.

Holmes was not one to waste his safety resources however, so instead of letting the rescue cars sit idle when there were no disasters, he arranged for them to be sent to the field with instructors assigned to each car to teach first aid and mine rescue. Literally thousands of miners and operators utilized the expertise of these nomadic instructors to improve the skills of their in-house rescue teams.

Holmes work eventually resulted in eight mine rescue cars being put into operation and four mine

rescue stations being established. He then proceeded to cement the methodology of mine rescue and directed attention to the need for specific first aid procedures.

Born in Laurens, S.C., in 1859, Holmes typified the zeal of early America. He saw problems in the mining industry, and put forth a determined effort to solve them.

He was graduated from Cornell University in 1881 and became a professor of geology at the University of North Carolina. After working to establish the North Carolina State Geological Survey, he became its director in 1891. In 1905 he became chief of the Technologic Branch of the U.S. Geological Survey. From that vantage he got a first-hand view of the tremendous waste of natural resources and the tragic death rate in the mines. He quickly began marshalling arguments for creation of a separate bureau of mines. With the help of James F. Callbreath, executive secretary of the American Mining Congress, and United Mine Workers President, John L. Lewis, Holmes arguments finally won out. On May 16, 1910, Congress created the U.S. Bureau of Mines and made it a branch of the Interior Department.

The *Mining and Engineering Journal*, five years later in its July 17, 1915, edition left no question about Holmes impact on the Bureau: "The Bureau of Mines became his child. He practically created it organized it and laid out its course. There is scarcely anything in it whereof the inception is not owed to him."

Holmes' appointment as the first director of the Bureau did not come as quickly as might have been anticipated. Initially President Taft wavered, but as reported in the July-December 1912 issue of *Coal Age* Magazine, "The wishes of mining men in all parts of the country prevailed over the personal desires of a few politicians and Dr. Holmes was appointed as the first head of the Bureau of Mines. His selection met with instant approval and the hearty cooperation which has been accorded him by all in the mining industry has proved without doubt the wisdom displayed in starting the initial work of the new bureau under his able direction."

Once installed at the helm of the Bureau, Holmes set out in earnest to find solutions for the disgracefully high fatality rate in the mining industry.

Holmes said at the time: "Both directly and indirectly, one of the important causes of injury and death in coal mines is the use and misuse of explosives or the use of explosives that ought not to be used." Consequently, Holmes had research done into the properties of explosives which resulted in major discoveries and improvements in their use. The black powder and dynamite that was used extensively in the mines of 1910 were found to produce a hot, relatively long-lasting flame which could cause an ignition of gas and dust. "Permissible" explosives were introduced during this era, and as the type and number of explosives used in the mining industry increased, the Bureau's testing facilities also increased to include for the first time an elaborate and scientific evaluation of each explosive.

Holmes explained that the purpose of developing "permissible" explosives was to "reduce the danger of disastrous explosions in mines where gas or dust is found. The flame from the explosion of black powder lasts 2,500 to 3,000 times longer than the flame from these permissible explosives; it is also hotter, and is therefore more likely to ignite gas or dust."

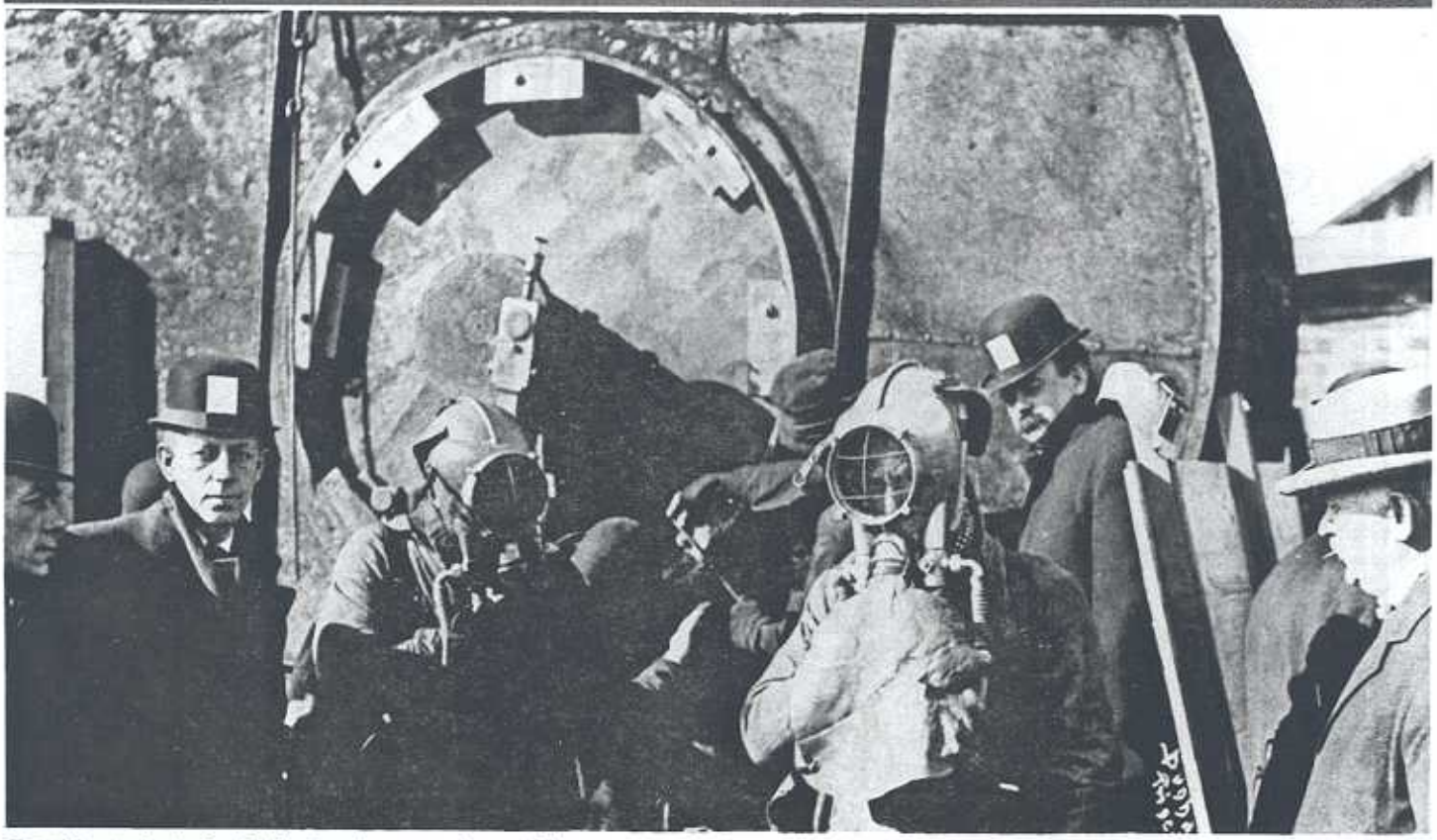
To properly conduct experiments on coal dust and explosives, Holmes realized that he needed more than a laboratory.

Obviously, no mine operator was willing to volunteer his mine for explosions, so Holmes arranged to acquire 38 acres of coal land near Bruceton, Pa. After years of work, the mine was developed to a point where large-scale tests could be undertaken, and the Bruceton Mine still is used today for important health and safety experiments.

In 1910 a new element of danger, electricity, was being widely introduced into the U.S. mining picture. Seeing the hazards involved in the unregulated use of electricity, Holmes initiated schedules for testing and approving electrical equipment for mine use. These schedules and earlier tests resulted in the manufacture of the first explosion-proof motor in the United States.

How did one man do so much?

Coal Age Magazine tried to answer that question in one of its 1912 editions:



Top of wrecked air shaft showing members of the press and mine officials with "helmet men" at the Cherry Mine where 400 men were entombed, November 13, 1909.

"Many men have weight; Dr. Holmes has momentum. Lots of people know what to do; he knows how to do it. His diplomacy is the sort that enables a man,without deception or hypocrisy, to be seemingly the same to all men, yet varying with each, according to his peculiarity and according to the mind of the man at the time."

Holmes died from tuberculosis on July 12, 1915, following a strenuous minerals exploration trip into the wilderness of Alaska. His death evoked many words of praise for both the man and his contributions.

The Mining and Engineering Journal wrote; "He was never willing . . . to relieve himself of arduous duties by delegating them to his assistants. Their purpose, in his mind, was solely to enable his Bureau to do more work, and he devoted himself indefatigably to finding it for them to do. With all of this, he made the Bureau of Mines a great thing in remarkably few years, but in doing it he killed himself, leaving the mining and metallurgical industries of this country his eternal debtors."

On July 14, 1915, the New York Times carried a less emotional testimonial which summed up in a single sentence the meaning and importance of Holmes work:

"Under Dr. Holmes direction, great progress was made in perfecting methods of saving lives in mine accidents and for lessening the dangers to which underground workers are exposed."

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REMINDER: The Winter Alert is still in effect!

- *Rockdust*
- *Preshift and onshift checks*
- *Check for methane frequently*
- *Keep equipment maintained*
- *Check the roof—especially near mine entrances*
- *Check ventilation often*
- *NEVER smoke underground!*