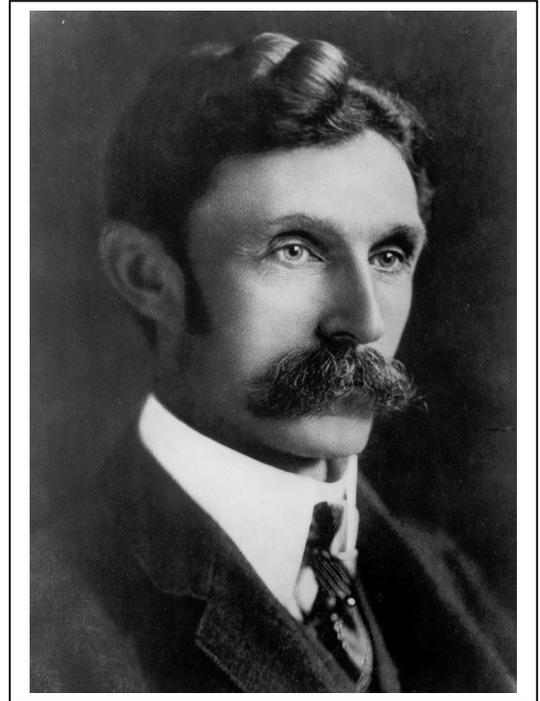


## Joseph A. Holmes - Part 1 of 2

Joseph Austin Holmes, first Director of the Bureau of Mines and originator of the slogan, "Safety First," was born at Laurens, S.C., on November 23, 1859, the son of a Presbyterian minister. He attended the Laurens Academy, noted in its day for the thoroughness of its curriculum, and then entered Cornell University. There he gave special attention to the natural sciences, chemistry, and surveying, and received the degree of bachelor of agriculture in 1881.



After graduation, he became professor of geology and natural history at the University of North Carolina. There he began an active campaign for the establishment of the State Geological Survey and for building good roads.

The State Geological Survey was established in 1891, with Dr. Holmes as State geologist, and through his efforts, the annual tax for public roads was increased from \$10,000 in 1885 to \$750,000 in 1900, with the result that more than 1,000 miles of macadamized roads were built.

Two grave problems in the Nation's mineral industries that were beginning to receive public attention appealed particularly to Dr. Holmes' imagination and sympathies - a tremendous waste of natural resources, and the death rate in mines, which was attaining frightful proportions. Their solution became his one great ambition, and remained so until his death. When he had the opportunity to take charge of the department of mining and metallurgy of the Louisiana Purchase Exposition St. Louis in 1903, he seized it eagerly. His plan in organizing the exhibits of Fuels was to show how their utilization could be improved, and he was

able to persuade the great fuel interested to spend larger sums in demonstrating fuel economies, and, in obtaining equipment for investigations to be carried on after the close of the exposition. The impression made by these studies persuaded Congress in 1904 to authorize a general investigation into fuel economics, and early in 1905, as chief Technologic Branch of the Geological Survey, he was placed in charge of them.

Feeling that the problems were too great and pressing to be entrusted to a branch of a Government agency concerned mainly with other subjects, Dr. Holmes marshaled arguments for creation of a separate Bureau, which led in 1910 to establishment of the Bureau of Mines. Although the Technologic Branch of the Geological Survey was transferred to the new Bureau, Dr. Holmes was not at first named Director, and as name after name was discussed for the post, he despaired and informed a friend that if the regents of the West Virginia State University offered him the presidency, which was then vacant, he would accept.

However, after the post had remained unfilled for several months, President Taft announced his selection as Director of the Bureau.

At a memorial session of the American Mining Congress in San Francisco on September 21, 1915, shortly after Dr. Holmes' death, Van H. Manning, who succeeded him as Director, said:

"Dr. Holmes' work as Director of the Bureau of Mines was characterized by the same spirit that marked all his previous endeavors.

"His achievements are matters of the Nation's industrial, economic, and sociological history. Even briefly to enumerate a few of them requires some little time. In the short period of its existence the Bureau of Mines has assisted in reducing materially the death and accident rate in the Mines.

"Completely demonstrated the explosibility of coal dust.

"Put into operation eight mine-safety cars and established six mine-safety stations in the various mining fields.

"Standardized mine-rescue and first-aid methods.

"Reduced the testing and selection of mining explosives to a scientific basis.

"Encouraged the various States of the Union to extend greatly their mine inspection and accident prevention systems.

"Demonstrated the practicability of an American radium industry and reduced the cost of production of this mineral.

- Brought about the saving of millions of dollars' worth of natural gas.
- Led the way in the adoption of scientific practices in the combustion of coal instead of the wasteful, haphazard methods heretofore employed.
- Demonstrated the practicability of the elimination of the smoke nuisance.
- "Discovered a commercial method for the conversion of petroleum into gasoline.
- Shown the practicability of the successful utilization by briquetting of the lignites of the West and South.
- Standardization methods of the analysis of coal, and established the feasibility of the purchase of coal under specifications.
- Determined, tabulated, and published the analyses and steaming and gas-producing qualities of thousands of American coals.

- Obtained authorization from Congress for the establishment of mining experiment stations in the different mining fields of the country.
- Compiled and annotated the multitudinous Federal mining laws.
- Assisted in simplifying the smelter-fume problem.
- Arranged cooperative agreement with various State institutions for the utilization of low grade ore deposits hitherto considered as waste; and published 250 reports relating to these various investigations.

Dr. Holmes arranged for the importation of oxygen breathing apparatus and training of men in their use; at the time, there were only three sets of apparatus in the United States; and subsequently for improving the design of such apparatus. In the Bureau's early days, when there were not funds for purchasing mine-rescue railroad cars, he persuaded the Pullman Company to donate cars, later replaced by steel ones. He also directed the incorporation in the Bureau's safety program of first-aid training, which up to that time was almost non-existent in this country except in the Pennsylvania anthracite region. He also was instrumental in organizing the American Mine Safety Association; and the germ of the present National Safety Council, which later absorbed the Mine Safety Association as its mining section, was sown at a meeting of the Institute of Iron and Steel Electrical Engineers at Milwaukee, Wisconsin in 1912 in which he participated. He presided over a full session devoted to safety in the industries; it was the first time that any industry other than mining had held a great safety conference.

Dr. Holmes had the faculty of making everyone he met feel that he was a personal friend, and the ability to impart his own enthusiasm to others so as to get them stirred up to help carry on projects in which he was interested. He

won the confidence of both management and labor in the mining and allied industries, and held it; both recognized his deep interest in increasing safety and efficiency and reducing waste of resources, as well as his absolute neutrality regarding their disputes.

Dr. Holmes was a tireless worker, and he wore himself out traveling to attain the objectives of safety and conservation to which his life was dedicated. He visited Europe to confer with scientists and technologists of other lands conducting research on problems of mine safety and efficiency. He spent much time visiting various mining regions in the United States and Europe, and a strenuous trip into the interior of Alaska contributed to the development of tuberculosis, of which he died in 1915. Of this latter trip, W. R. Maloney, then Territorial mine inspector, who accompanied him, later said:

"I knew him on the trail to be a man who did his duty and his part of the work, and more. He was handicapped from the start of our trip to the Alaskan Range by a horse stepping on his foot. From that time on he had to ride, making it very uncomfortable to the Doctor, as anyone who knew him knows how well he liked to walk around and see the surrounding country wherever he might stop, but nevertheless he was an indefatigable worker in the camp. He would cut wood and build fires and do anything he could to make things pleasant. At the time most of us in the party recognized that his constitution would hardly stand the trip, lying on the ground at night and traveling under difficult conditions in the day time.

"We had to go through the snow and storm the better part of the time, and because of the snow and the thawing, and because of chills, it was a most disagreeable trip. We were making forced journeys of 35 and 40 miles a day, where ordinarily 15 miles was considered a good day's travel."

Another friend and associate, Dr. A. E. Ledoux of New York, recalls of Dr. Holmes that:

"While he was interested in the conservation of American natural resources and endeavoring to assist our citizens in the business of mining or agriculture, the human side of it all was always to the front; lifesaving and the uplift of poor and ignorant employees were the things which seemed nearest to his heart.

"Nor was his interest bounded by the area of the United States. He looked further afield, and was active in securing cooperation with foreign governments for the betterment of labor conditions throughout the world. It was my privilege to be appointed by the Secretary of the Interior as one of the consulting engineers of the Bureau of Mines, and to be sent as a special emissary of the Bureau and of the State Department for the investigation of a certain problem in the hope of establishing one more point of contact and usefulness between the governments of the civilized world. Although Dr. Holmes was at that time in failing health, and had to absent himself from his post, by letter and by cable he kept in touch with men, showing his keen interest in all these things."

Carl Sholz, then president of the American Mining Congress, recalled of him in 1915:

The first introduction to a President of the United States which was afforded me was under the guidance of Dr. Holmes, at the time when I invited Mr. Taft to speak at the Chicago convention of the American Mining Congress in 1911, and at that time Mr. Taft very generously said, "What do you want of me? You have Holmes; he can tell you more about the work than I know."

**A tribute to Dr. Holmes by President Wilson, reads:**

"In the death of Dr. Holmes the country lost a public servant of unusual character and of singular devotion to duty. We are often called upon to note the career of some public benefactor, but we do not often enough note the services of the devoted men who, with little compensation and little public gain, seek to advance the interest of their fellow-countrymen through services of the department

of the federal government at Washington, D.C., Dr. Holmes was one of the most disinterested and most serviceable of these. He devoted his whole time and thought to turning science to human and generous use."

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## **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, Pennsylvania, had all the earmarks of one more disaster in the coalfields 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.

Witnesses to the explosion groped for words to describe the destructive force of the blast. One New York Times reporter it, 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 a few others preached it for some time, it took a practical demonstration to make the mining industry 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 from hundreds of mines across the U.S.

mine rescue teams. Until he purchased several of these units for the Bureau of Mines, their use was extremely limited in American mines.

Under Holmes, direction, research was conducted to determine the effects on coal dust of humidification and wetting, incombustible material, 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 and operators utilized the expertise of these no- the slogan, "safety first," was responsible for many major improvements in mine safety

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 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:

"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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