New Mexico Historical Review

Volume 64 | Number 2 Article 4

4-1-1989

Coal Mining, Safety, and Regulation in New Mexico, 1882–1933

James Whiteside

Coal Mining, Safety, and Regulation in New Mexico, 1882–1933

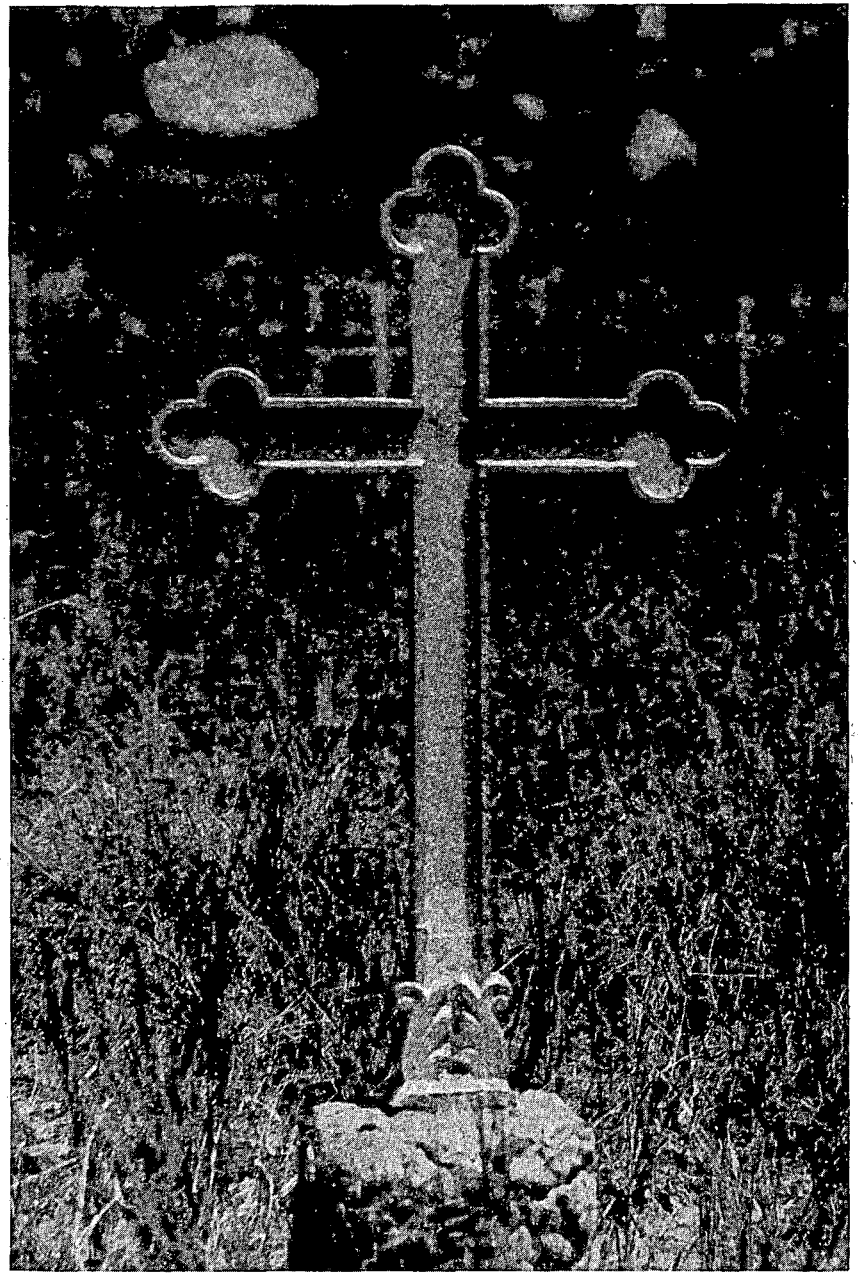
JAMES WHITESIDE

Row after row of identical crosses stand on the hillside at Dawson, marking the graves of victims of the worst coal mine disaster in the history of New Mexico and the Rocky Mountain West. On October 22, 1913, a blown-out shot ignited coal dust in the Phelps-Dodge Company's Stag Canyon Number 2 mine. The disaster killed 261 employees and 2 would-be rescuers. The state coal mine inspector concluded that a miner anxious "to load a few more cars of coal that day" fired the shot, illegally, while his fellow miners were still in the mine. The force of the shot ignited the dust, and the blast quickly spread throughout the mine. Although the mine was "a modern one in every respect," it was very dusty. Mining, blasting, and haulage operations, the state inspector noted, generated large amounts of dust, which the ventilating system spread throughout the mine.[1]

Other people offered different explanations. A report in the *New*

James Whiteside is an instructor of history in the University of Colorado, Boulder, and holds a doctorate from the same university. He is author of a book forthcoming from the University of Nebraska Press on safety and regulation in the Rocky Mountain coal mining industry, 1870–1970. He also is co-author of a study on energy resource development and utilization in the American West, forthcoming from Indiana University Press as part of the American West in the Twentieth Century series, Martin Ridge, editor.

1. New Mexico Inspector of Mines, *Second Annual Report, 1913*, pp. 5–7.



Rows of identical crosses on a hillside at Dawson, New Mexico, stand in silent tribute to many of the 263 men killed in a coal mine explosion at the mining community in October 1913. Photo taken and provided courtesy of the author.

Mexican suggested that use of coal mining machines may have led to the disaster. The company recently installed machines to increase production to meet the greater demand for Dawson's coal stimulated by a coal mining strike in Colorado. The machines may have generated more dust than the mine's ventilation fans could handle. Former employees blamed the disaster on economy measures instituted by the mine superintendent who, they claimed, cut back on gas, dust, and ventilation inspections, reduced sprinkling, and ignored reports of gas in the mine. The *United Mine Workers Journal* criticized Phelps-Dodge, charging that the Dawson tragedy was "another example of what depths greed can push human nature to." Against the desire to produce more and more coal, the lives of coal miners "mattered nothing." Nature, the union paper said, had given the industry "one more warning that she had a limit which could not be passed with impunity."[2]

At the time of the Dawson tragedy, New Mexico had a law that was supposed to prevent such disasters by requiring adequate ventilation and other safety precautions, but the law was ineffective. Clearly, the Dawson disaster, and a succession of coal mine explosions including another incident at Dawson in 1923 in which 120 people died, showed that the state law did not fulfill its major purpose. Worse, the law did not address, in any meaningful way, other major causes of injury and death in the mines. Horrible as the great mine explosions were, they did not account for the majority of fatalities in the industry. Historically, more mine workers died, by ones and twos, in accidents involving mine haulage, electricity and, especially, falls of roof, coal, and sides. In New Mexico, the records of federal and state mine inspectors reveal that in the ninety years between 1893 and 1983 1,132 miners died as the result of coal mining accidents. Of them, 508, or 45 percent, died in explosions. The remainder were killed in other types of accidents.

The percentage of explosion fatalities was higher in New Mexico than the national average, accounting for 45 percent of all fatalities versus 16 percent nationally. In most states, falls of rock and coal alone caused more than half of all coal mining deaths, while in New Mexico they accounted for "only" 36 percent. Significantly, 90 percent of New Mexico's coal mining fatalities occurred in the years before 1934, in the pick-mining and hand-loading era. In the period from 1893 through 1933 a total of 1,021 coal miners died at an average annual rate of 7.67 per thousand. In contrast, in the years from 1934 through 1983, 111 miners died at an average rate of 1.67 per thousand.

---

2. Santa Fe *New Mexican*, October 30, 1913, p. 3; *United Mine Workers Journal*, November 6, 1913, p. 4.

Blaming high fatality rates on greedy operators or careless miners was, and remains, easy and popular but oversimplifies a terribly complex industrial problem. The causes of danger in the mines, and answers to the question of why coal mining laws failed to remedy high death rates, are to be found in the total industrial, work, legal, and political environment of coal mining. Coal mining laws failed because they did not adequately address the major overt causes of death, and because they did not reach important underlying causes in the conditions of work in the pick-mining and hand-loading era. Compounding the failure of regulation were the attitudes of those responsible for enforcing the laws, attitudes which persistently held coal miners primarily responsible for their own safety, and for their own deaths. Ultimately, improvements in coal mine safety owed more to basic changes in the work environment than to laws and regulations.

Coal mining became a major industry in New Mexico with the arrival of the railroad. The early control exercised by the Atchison, Topeka and Santa Fe Railroad established a pattern of domination by major operators that has characterized the industry throughout its history. By the early twentieth century the Santa Fe, with a steady supply of coal assured, yielded its control and, in succeeding years, companies such as the St. Louis, Rocky Mountain, and Pacific Company, Phelps-Dodge, Victor-American, and the Colorado Fuel and Iron Company became leading operators. In more recent times the names have changed—Utah International, Kaiser Steel, Pittsburgh-Midway—but the pattern of consolidation has continued.

General economic growth made for sustained expansion in coal mining throughout the West and lasted through the first two decades of the twentieth century. Production in New Mexico peaked in 1917 at 4.1 million tons. After World War I, declining industrial activity and competition from other fuels made for two decades of decline in coal mining. World War II brought a brief comeback, but the general decline resumed in the post-war years. In 1954, when production fell to 255,399 tons, the state coal mine inspector pronounced coal mining in New Mexico a "dead industry" and expected it to "remain dead for a long, long time."[3] Since the 1960s, however, the industry has enjoyed a revival, with New Mexico production reaching twenty million tons by 1983. Much of the new demand for coal came from the coal-fired electrical plants built in recent years in the Four Corners area. The energy crisis of the 1970s also helped by encouraging industry and utility companies to convert from fuel oil to coal.

---

3. New Mexico Inspector of Mines, *Forty-Second Annual Report, 1954*, p. 10.

Coal mining was, and remains, a dangerous occupation. The risk of injury or death on the job owed as much or more, however, to the economic, technical, and human relations of work in the mines as to the inherent hazards in the physical environment. In the "room and pillar" system of mining, miners worked, usually in teams of two, in "rooms" turned off of main tunnels, or "entries." Before, and even after, the intrusion of machinery, the coal miner was considered to be a skilled tradesman, expected to perform most of the tasks necessary to produce coal. In the pick-mining and hand-loading days, the coal miner's basic task was to break down a quantity of coal from the seam and load it into a car for transport to the surface. That rather straightforward production goal belies the complexity of the miner's work and work environment.

Getting the coal out of the seam required explosives. Generally, miners prepared the coal for blasting by undercutting it with a pick, though occasionally they would "shoot off the solid" without undercutting. The miner then drilled a series of holes into the coal near the top of the seam and tamped explosive charges into them. After placing the charge, the miner inserted a long copper or iron needle into it and "stemmed" the hole by packing in dirt, mud, or clay. He then withdrew the needle, leaving a channel into the charge. Until reliable fuses were developed, miners used a "squib," a small tube of paper packed with powder and inserted it into the channel left by the needle to set off the charge. The miner lit the squib and ran for cover. Before the employment of shot firers, whose sole job was to inspect and set off charges after the mine was cleared of other workers, miners fired their shots whenever they were ready.

After the smoke and dust cleared, the miner returned to the room and began loading the broken coal into cars. Loading was something of an art, and a well "chunked up" car could carry two to three tons of coal piled several feet above the sides. Once loaded, the miner pushed the car to the entry where a driver picked it up to haul to the surface. There it was weighed and credited to the miner whose "check" (a small disk with a number inscribed on it) hung on the side.

Miners were paid according to how much coal they produced. Usually, they received a tonnage rate which, in the late nineteenth and early twentieth centuries, could vary from fifty-five cents to one dollar, according to quality of coal and the difficulty of mining it. Sometimes employers calculated wages on the "run of mine" basis so that miners were paid according to the total output of the mine.

In addition to undermining, drilling, shooting, and loading, there were a number of secondary tasks the miner had to complete as part

of his regular duties. As the working face advanced, he had to remove or "brush" the material above and below the seam so that men, cars, and in later years, machines could approach the face. The miner then had to remove the refuse from brushing and mining from the work area and store it in "gobs" (worked out areas). After brushing the floor of the room up to the face, the miner laid track so that he could push cars in close.

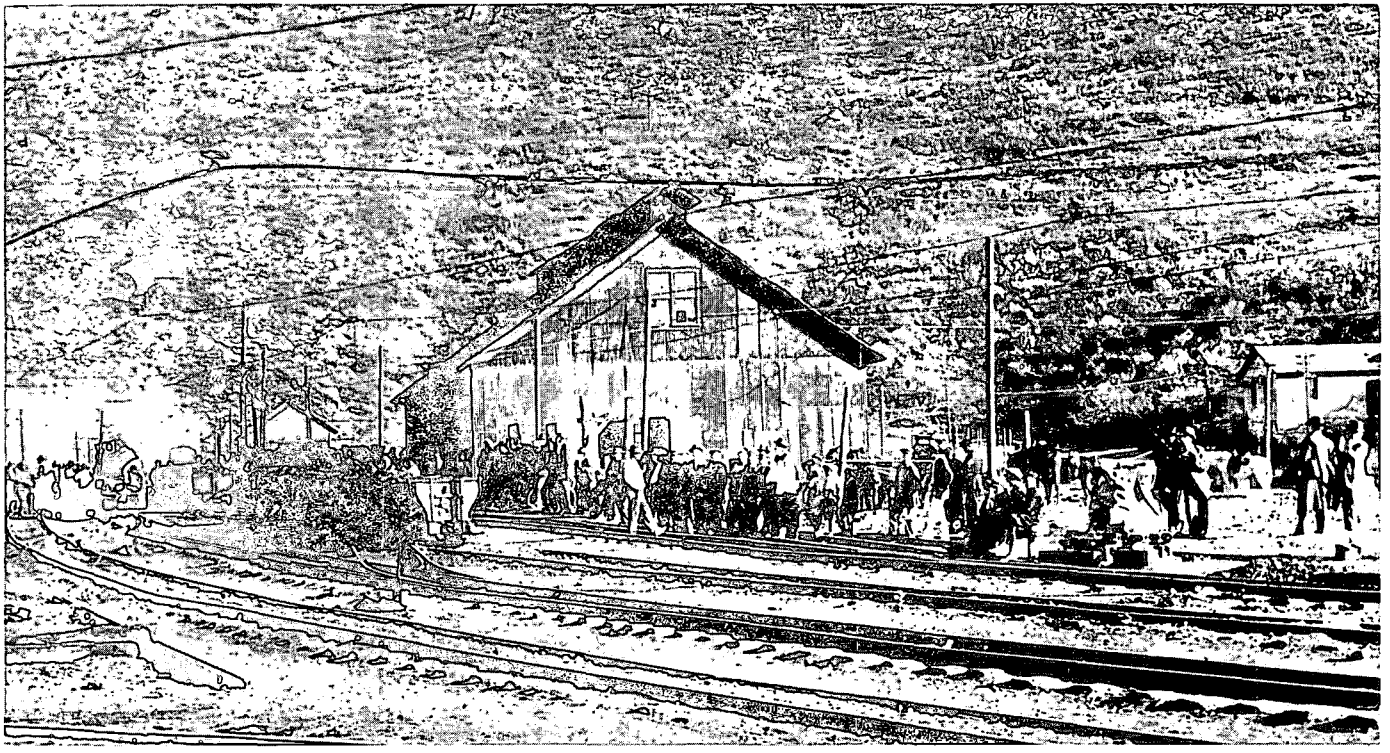
An extremely important part of a miner's work was taking care of the roof in his room. As the room advanced, and after each round of shots, the men used their picks to "sound" the roof to detect any loose rock, which they pried down and stored in the gob. Suspicious looking areas, or areas too large to take down safely, had to be supported by installing heavy timbers. Timbering might involve simply setting a single prop and cap piece, or putting up two or more timbers spanned by large cross pieces.

Although operators supposedly calculated tonnage rates to include brushing, track laying, and timbering, miners resented the long hours they devoted to this "deadwork." Especially maddening were delays caused when track and timber were not delivered. The question of pay for deadwork was a persistent irritant in labor relations. Miners claimed that tonnage rates did not adequately compensate them for their efforts. Deadwork and the tonnage rate also were underlying factors in the problem of mine safety.

In time, changes in the organization of work and in technology altered the cycle of work. By the second decade of the twentieth century shot firers were widely employed. When the miners arrived for work in mines using shot firers, they inspected rooms for bad roofs, set new props if needed, and repaired any other damage from the night's blasting. Only then could they load their coal and begin again the work of undercutting, drilling, and placing shots.

Undercutting was the first part of the miner's job to be mechanized, but mechanization came to New Mexico gradually. While machines were in use in some places in the West by the 1880s, New Mexico lagged in using machines. Only twenty-nine percent of New Mexico's coal was cut by machines in 1933. After 1933, however, coal mining in New Mexico mechanized rapidly. Machine operators and drivers exercised a kind of informal authority over miners. A miner who was disliked or who refused to provide bribes or favors on demand might find that the driver or the machine man by-passed his room. That meant that he could not shoot his coal, send it to the top, set props, or lay track.

Superintendents, foremen, and fire bosses exercised more formal



A crowd gathers above ground at the Phelps-Dodge Company's Stag Canon #1 mine in February 1923 and awaits word of the fate of those underground after an explosion rocked the coal mine. One hundred twenty men died in the blast. International Newsreel Photo, courtesy of Museum of New Mexico, Neg. No. 138143.

authority in the mine. Together, these officials formed not so much a chain of command as divisions of authority—divisions which materially affected the environment, including safety conditions, in which miners worked. The superintendent had overall responsibility for management of mine and camp. As business manager, he supervised the other officials, had general charge over mine personnel, oversaw the operation of camp stores, schools, and saloons, allotted housing to miners, prepared payrolls, and saw to it that mine equipment and supplies were maintained. Although the superintendent had general authority, his practical authority usually stopped at the mine portal. Underground, the foreman, or mine boss, had authority over hiring and firing, allotment of rooms, assignment of deadwork, and all other aspects of work in the mine.

The fire boss was the official nominally most responsible for safety conditions in the mine. Every morning, before the miners reported to work, the fire boss was supposed to inspect all working areas of the mine for hazardous conditions, particularly gas pockets and bad roofs. He reported hazards to the foreman, who then ordered the miners to correct them before they did any other work. If he found particularly dangerous conditions the fire boss could close an area until the hazard was corrected.

Miners, and all the other underground employees and supervisors, worked in an environment in which danger was a constant fact of life. The very process of mining coal could create an atmosphere of death. Coal is partially decomposed organic matter, and a by-product of that decomposition is explosive methane gas trapped in the coal. Mining the coal releases the gas into the atmosphere of the mine. Odorless and colorless, methane, or "fire-damp," could be detected only with a flame safety lamp, constructed with a fine screen or baffles to allow only a small quantity of air, or gas, to contact the flame. If ventilation currents were not adequate to dilute and carry the gas away, pockets of fire-damp could be detonated by the open flame of a miner's lamp, a "blown-out shot" (in which the force and flame of a shot fired out of the hole—usually the result of improper stemming), or by a spark.

Local explosions of fire-damp usually did little harm—it was said that most mine mules had singed ears. However, when exploding methane mixed with coal dust the result could be disaster. Once ignited, an explosion of coal dust seemed to set the very air on fire. Survivors of gas and dust explosions sometimes described a tongue of flame racing through the mine. On the surface, the report of an explosion might sound like a gigantic cannon, or it might be felt, more

than heard, as a muffled shudder. Usually, more men died of suffocation than from the actual flame and concussion of an explosion. As a blast moved through a mine it consumed all the oxygen and left behind a deadly mixture of carbon monoxide ("white-damp") and carbon dioxide ("black-damp"), known to miners as "after-damp." Men caught in the after-damp usually lost consciousness in a few seconds and died quickly. Rescuers would find them sitting with tools, or even food and drink, in their hands; kneeling as if in prayer; or lying down as though they had just gone to sleep.

It was this deadly environment that territorial, federal, and state laws were supposed to control. In the late nineteenth and early twentieth centuries, coal mining states and territories responded to rising fatality rates by enacting laws that usually included ventilation standards and rules—generally ineffective—pertaining to roof control and haulage. Such laws authorized a mine inspector to visit the mines and see to it that operators and miners followed the regulations. These inspections occurred as often as every three months or as infrequently as once a year. The federal government began inspecting coal mines in 1891 under a statute governing coal mining in the territories. In response to a series of disasters in 1907–1909 in West Virginia, Pennsylvania, and Illinois in which more than 1,000 miners died, Congress created the U.S. Bureau of Mines in 1910. Major coal operators in the eastern states favored establishing the bureau as a means of forestalling more stringent state regulation. The bureau's mandate included conducting research and education projects on mine safety, focusing especially on the problem of preventing explosion disasters. Congress gave the agency no regulatory authority, however.[4]

In the early years of the industry in New Mexico, territorial legislators, concerned with maintaining a hospitable business environment, spared New Mexico's coal operators from stringent regulation. New Mexico's first coal mining law, enacted in 1882, might charitably be called a weak measure. It was, in fact, a fraud. Not quite covering three pages in the *Session Laws* of 1882, the act set minimum ventilation standards and spelled out certain requirements for mine bosses. Coal mine operators were to provide ventilation at the rate of fifty-five cubic feet per minute for each fifty workers. Mine bosses were responsible

4. See K. Austin Kerr, "The Movement for State Regulation of Coal Mines in the Nineteenth Century," in Paul Uselding, ed., *Business and Economic History. Papers Presented at the Twenty-first Annual Meeting of the Business History Conference* (Urbana: Bureau of Economic and Business Research, College of Commerce and Business Administration, University of Illinois, 1975); and William S. Graebner, *Coal Mining Safety in the Progressive Period: The Political Economy of Reform* (Lexington: University of Kentucky Press, 1976).

for supervising ventilation, seeing to the maintenance of entries, overseeing timbering in the rooms, conducting daily inspections for gas, and seeing to the maintenance of equipment.[5] While it provided that mine bosses could be charged with misdemeanors for willful negligence, or manslaughter if their negligence led to a death, the act failed to specify any penalties.

Not only did the law omit penalties, it provided no means for enforcement of its few provisions. The act did not provide a mine inspector for the territory, nor did it grant the right of inspection to other persons. Mine employees were allowed to inspect mine maps only, not the mines themselves. Most surprisingly, section eleven of the law provided that "this act shall not apply to the opening of new coal mines." This ambiguous provision might be construed as waiving the provisions of the law during the process of driving entries and installing equipment in new mines. In fact, it was taken to mean that, just as New Mexico's coal industry entered its first major period of development, mines opened after the effective date of the law (June 1, 1882), including many of those controlled by the Santa Fe railroad, were exempt from its provisions.[6]

Coal mines in New Mexico were regulated, or not regulated, by this non-law for a decade, although an attempt was made in 1889 to appoint a mine inspector. One worried mine owner wrote to Governor Edmund G. Ross to express the concern of operators that such a law might be "injurious and malicious" and that they might be "compelled to submit to being blackmailed out of a fee" each time the inspector paid them a visit. Most revealing of the operators' fears, however, was the assertion that "we do not think that we in our infancy and weak state as mine operators should be subject to the rigid and severe restriction of older and more firmly established localities."[7] Coal operators in New Mexico, in short, feared that serious regulation of working conditions in the mines might put their infant industry at a competitive disadvantage.

In 1891 Congress finally took the matter out of the hands of the

---

5. New Mexico, *Session Laws, 1882*, pp. 96–98.

6. *Ibid.*, 98. In 1902 Governor Miguel A. Otero said that "Sec. 11 of the act of our legislature, [sic] expressly limits its operation to mines then in operation." Miguel A. Otero to Secretary of the Interior, April 20, 1902, letters received, Territorial Papers of New Mexico, microform M-364, reel 7, Record Group (RG) 48, National Archives, Washington, D.C.

7. C. W. Kennedy to Edmund G. Ross, January 4, 1889, letters received, Edmund G. Ross Papers, microfilm roll 101, frames 788-91, Territorial Archives of New Mexico, Santa Fe, New Mexico.

Straining to pull carts laden with coal, these mules and others like them spent most of their lives below ground. Intelligent and hard working, coal mine mules often knew their way around the tunnels better than the miners. Photo courtesy of CF&I Steel Corporation.

Picks and sledges in hand and faces blackened with soot, a group of miners pauses for the camera. A young driver, standing at center with his mule, is one of several who posed with his open-flame lamp lit. Photo courtesy of Colorado Historical Society, Negative No. F-43365.

territorial legislature by enacting a federal law for the "Protection of the Lives of Miners in the Territories." Originally intended to regulate all mines, the bill was revised to apply only to coal mines because it was feared that "too stringent regulation must have the direct effect of retarding the development of mining interests" in the territories. Because "the dangers to life are far greater in coal mines . . . and of a better defined and more clearly recognized character," Congress deemed it more practical to limit the law regarding coal mines.[8]

This first federal coal mining law was passed with surprisingly little debate, though some congressmen and senators worried that it would usurp the authority of territorial legislatures. The bill's sponsor said the measure was "very similar to regulations provided in the various States," and that "it only applies where there are no regulations."[9] Since all of the territories, except Indian Territory, already had coal mining laws, the effect of the new law supposedly would be minimal.

The federal law required an annual inspection of every mine by a territorial mine inspector who would examine ventilation and safety equipment, see that clean air reached all working areas and that all mines had escape shafts for emergency exit. The law required mine operators to provide 3,300 cubic feet of air per minute for every 50 men, or 66 cubic feet per minute for each man, so that all working areas remained free of gas. The act did not require daily inspections for gas or other hazards. The law held superintendents and other officials personally liable for compliance. Failure to comply with the law, or with orders to correct defects, was a misdemeanor punishable by fines.

The act's enforcement procedures were extremely cumbersome. When the mine inspector discovered unsafe conditions in a mine he was to report them to the Secretary of the Interior who then would notify the operator of the needed repairs and set a period of time for compliance. If the operator failed to comply within the time allowed it was unlawful for him to continue to operate the mine. To actually close a dangerous mine, however, it was necessary for the mine inspector, with the support of the secretary or the governor of the territory, to apply to the courts for an injunction prohibiting the mine

8. Act of March 3, 1891, chapter 564, secs. 1–19; 26 Stat. L. 1104; Supp. to Revised Statutes, vol. 1, pp. 948–50, in Daniel M. Barringer and John Stokes Adams, *The Law of Mines and Mining in the United States* (St. Paul: Keef-Davidson, 1897, 1900), 811–14; U.S., Congress, House Report 2588, 51st Cong., 1st Sess., 1890, pp. 1, 2.

9. *Congressional Record*, vol. 22, February 28, 1891, p. 3557.

operation until needed repairs were made. So cumbersome was this procedure that it was used only once during the two decades that the federal act was in force in New Mexico. In that case, which involved an order to open a second shaft, final compliance took two years.[10]

Because the federal law was intended to apply only in territories which had no laws protecting coal miners, it was not immediately clear whether it would apply in New Mexico because of the territory's 1882 law. The first territorial mine inspector, John C. Spears, did not receive his commission and begin work until August 29, 1892, eighteen months after the law was enacted. Even then, it was unclear whether the federal or the New Mexico law would prevail. One month prior to assuming his duties, Spears warned Governor L. Bradford Prince that "some of Santa Fe's business men who are interested in coal lands" would resist his appointment on the grounds that the law did not apply to New Mexico. Spears reminded Prince that the New Mexico law made "no provision for an inspector to enforce what law we have on the subject," meaning that it could not effectively protect coal miners and thus must be superceded by the federal statute.[11]

Late in 1892, territorial officials resolved the issue in favor of the federal law. Solicitor General Edward L. Bartlett gave his opinion that the 1882 law did not provide for safe operation of New Mexico's coal mines because it did not provide for a mine inspector to enforce it, nor any penalties for violations, "by reason of which failure the law is practically a dead letter, [and] has never been operative or enforced." Following Bartlett's advice, acting governor Silas Alexander informed the Interior Department that because the act of 1882 did not provide for the safe operation of coal mines in New Mexico the federal statute would supercede it. Governor Prince followed up by telling the territorial legislature that the 1882 law "had little or no effect." Prince added: "It is certain that the miners should be fully protected in some way," and that the mine owners were "to apt to neglect proper precautions which may be expensive." The governor concluded that the 1882 statute should either be "made fully effective by proper amendments, or should be repealed so as not to interfere with the benefits now secured to us under the U.S. statute."[12]

---

10. Letters received relating to Inspection of Coal Mines, microform M-364, reel 7, RG 48, National Archives.

11. John C. Spears to L. Bradford Prince, July 31, 1892, letters received, May–December, 1892, L. Bradford Prince Papers, microfilm 112, frame 523, Territorial Archives.

12. Edward L. Bartlett to Silas Alexander, December 16, 1892, Alexander to Secretary of the Interior, letters received, Territorial Papers of New Mexico, microform M-364, reel

The territorial legislature neither amended nor repealed the 1882 law, but it was a dead letter. In 1895, mine inspector John Fleming reported that "as there are no Territorial laws governing the working of coal mines I have been guided wholly by the act of Congress." Once the issue of the applicability of the federal law was settled, U.S. mine inspectors reported that most coal operators were cooperative in its implementation and that conditions in the mines were improving.[13]

Granting that most operators cooperated with the inspector and obeyed the law, the claim of improved conditions was, to say the least, optimistic. Fatality rates in the coal mines during the years that the federal act was in force in New Mexico were quite high and did not compare well with national rates. In the period from 1893 through 1912, a total of 287 coal mine workers died in New Mexico as the result of accidents. This represents an average annual fatality rate of 6.42 per thousand. Explosions caused 72 deaths at an average rate of 1.84 per thousand, while 146 died in falls of rock and coal at the rate of 3.27 per thousand. Haulage accidents killed 40 workers, a rate of 0.89 per thousand, and 29 died from other, mainly surface, accidents at the rate of 0.42 per thousand. Of the 72 explosion deaths, 50 occurred in accidents involving 5 or more fatalities, indicating that the federal coal mining statute did not achieve its principal goal of preventing major disasters. More significant, though, is the failure to prevent other accidents, especially falls of rock and coal which alone accounted for a fatality rate almost as high as the national rate of deaths from all causes.

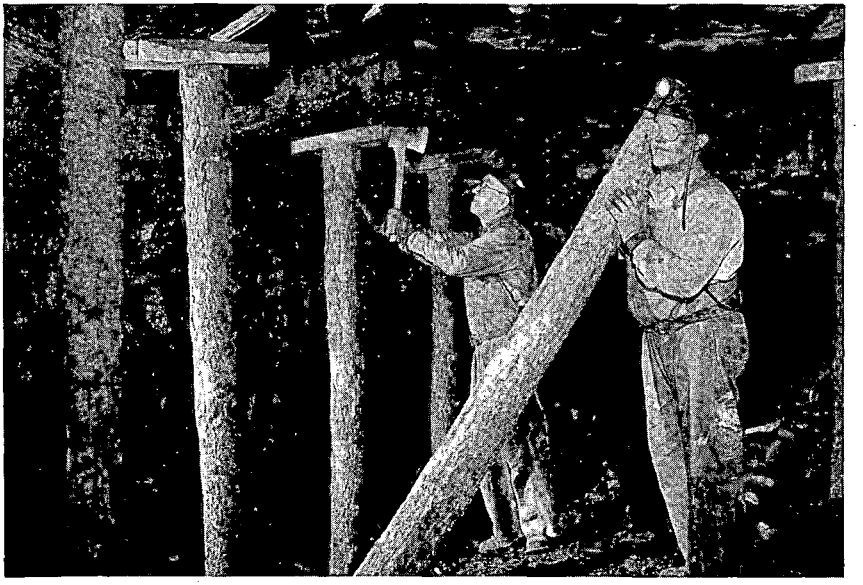
Coal mines in New Mexico and the West were more dangerous than in other regions during this period when compared to national averages. The total average annual fatality rate in the U.S. was 3.35 per thousand, slightly more than half the rate in New Mexico. Falls of rock and coal killed miners at the rate of 1.60 per thousand, explosions 0.65 deaths per thousand, and haulage accidents 0.40 per thousand. The territory's record is favorable only in comparison with neighboring states. Colorado had a total fatality rate of 6.82 per thousand and Wyoming, 6.52. Only Utah, with a fatality rate of 10.08 per thousand, was more dangerous than New Mexico.[14]

5, RG 48, National Archives; Governor's message, December 28, 1892, pp. xxiv–xxv, Prince Papers, microfilm 121, frame 418, Territorial Archives.

13. U.S. Inspector of Coal Mines for the Territory of New Mexico, *Third Annual Report, 1894–1895*, p. 673, Territorial Papers of New Mexico, microform M-364, RG 48, National Archives; U.S. Inspector of Mines, *First Annual Report, 1893*, p. 2.

14. *Explosions in New Mexico Coal Mines, 1895 to 1932*, circular 6760 (Washington, D.C.: Department of the Interior, 1933), 3. No data are available on New Mexico fatality rates prior to 1893. Fatality data is derived from the annual reports of the United States

Whip in hand, a coal car driver pauses with his team of mules. Drivers usually relied on voice commands to guide their animals but resorted to whips or sprags occasionally to muster a balky animal. Photo courtesy of Colorado Historical Society, Negative No. F-42847.



With hardhats and electric lamps, which had long since replaced caps and open-flame lamps, miners set timbers at the Colorado Fuel and Iron Company's Morely Mine in 1956. Photo courtesy of CF&I Steel Corporation.

With statehood, lawmakers in New Mexico got the chance to remedy this appalling record. The state's new coal mining law, passed in 1912, contained many new regulations governing operators, supervisors, and miners. The act raised the basic ventilation standard to one hundred cubic feet of air per man per minute and three hundred cubic feet per minute for each animal. In addition, it required operators of gassy mines to hire fire bosses to make daily inspections. The law forbade miners to enter their rooms before the fire boss made his daily inspection and, once at work, required them to take down all dangerous rock and coal and make their rooms safe by proper timbering. If a miner discovered his room to be dangerous he was forbidden to stay there except to remove the hazard. Miners also were forbidden to ride on coal cars unless they first notified the haulage operator. The act also banned shooting off the solid and required shot firers in mines employing more than twenty men.

The law had problems built into it. To enforce the law, the state mine inspector was authorized to notify operators of any violations, specify measures to correct them, and determine the time allowed for making corrections. The chance that the state inspector would detect hazards was diminished, however, because the law required only that he visit mines "as often as in his opinion may be necessary."[15] Moreover, the mine inspector had no authority to close dangerous mines or to remove workers from dangerous places, as was the case under the federal statute. Though it substituted the inspector's discretion for regular, annual inspections, thus risking less frequent government inspection, the law promised more daily supervision through the required daily inspections by fire bosses. Still, the act's emphasis on ventilation, inspection for gas, and shot firing indicates that the state's legislators were interested mainly in trying to prevent major explosion disasters. Provisions requiring miners to maintain roofs and limiting access to coal cars addressed the causes of most coal mining deaths, but did so inadequately.

The entire law proved to be inadequate. Coal mine death rates in New Mexico increased during the two decades it was in force. In the period from 1913 through 1933 the average annual rate of death from

---

Mine Inspector for the Territory of New Mexico, annual reports of the state coal mine inspectors of Colorado, Wyoming, and Utah, the U.S. Department of the Interior, Bureau of Mines, Bulletin 115, *Coal Mine Fatalities in the U.S., 1870–1914* (Washington, D.C.: Department of the Interior, 1916), and *ibid.*, Mine Enforcement and Safety Administration, *Injury Experience in Coal Mining, 1975*, report 1077 (Washington, D.C.: Department of the Interior, 1978).

15. New Mexico, *Laws, 1912*, p. 149.

all causes rose to 8.81 per thousand, with a total of 734 fatalities. The two disasters at Dawson, in 1913 and 1923, account for much of this increase, contributing 383 of the state's 430 explosion deaths. The explosion death rate in those years was 5.03 per thousand. Deaths from falls of rock declined to 2.49 per thousand, and the haulage death rate fell slightly to 0.81. Machinery and electrical accidents together caused a fatality rate of 0.18. Thus, the state law failed to prevent explosion disasters and was only marginally successful in reducing deaths from the other major causes.

Not surprisingly, coal mining death rates in New Mexico continued to outpace national and regional averages. Between 1913 and 1933 the U.S. rate of death from all causes was 2.96 per thousand, about one-third the rate in New Mexico. Falls of rock and coal led as the major cause of death in the mines, nationally killing miners at the rate of 1.46 per thousand. Explosions followed with the rate of 0.49 per thousand, and haulage accidents caused fatalities at the rate of 0.50 per thousand. Machinery and electrical accidents caused a fatality rate of 0.11. New Mexico's coal mines also continued to be more dangerous than those in neighboring states, including Utah. The average annual fatality rate in Colorado from 1913 through 1933 was 5.01 per thousand; in Wyoming, 4.72; and in Utah, 7.51.

That the early coal mining laws failed to prevent or remedy extremely high rates of death is obvious. Why they failed is a complex question. Disasters such as those at Dawson should not have occurred. Had mine officials seen to it that the level of coal dust in the mines was kept at a safe level those explosions might have been localized, whatever the source of ignition. Ultimately, the blame for such disasters must be laid at the feet of operators, supervisors, and government officials who failed to observe and enforce ventilation and dust control regulations adequately.

Why the laws emphasized explosion prevention is not difficult to explain. They protected the operators' interests and reflected basic attitudes on work relations in the industry, which helps explain the absence of operator opposition to the enactment of New Mexico's coal mining laws. Statutes requiring investment in equipment and procedures to insure adequate ventilation and dust control had the obvious beneficial goal, if not the result, of preventing financially ruinous disasters. A coal mine explosion not only killed but caused extensive damage to plant and equipment. A second, less obvious benefit for large operators was the competitive advantage such requirements gave them in relation to smaller operators who often could not afford to comply. Thus, the emphasis on explosions is explainable in terms of

the structure of the industry itself and the tendency toward consolidation.

More important to day-to-day safety in the mines, the laws also reflected prevailing attitudes on the basic relations of work in the industry; namely, that coal miners, as skilled tradesmen, were independent contractors. Implicit was the assumption that miners were primarily responsible for their own safety and for their own deaths on the job, a view expressed persistently by territorial and state mine inspectors and shared by operators.[16] Time after time, New Mexico's mine inspectors complained of the carelessness exhibited by coal miners—a carelessness that they believed explained most coal mining deaths. While complimenting operators for their willingness to comply with the federal coal mining law, territorial mine inspector John Fleming in 1895 complained that the main problem he confronted was "to get the miners impressed with the necessity of looking out for themselves and to use ordinary precaution in their own behalf." Carelessness, especially in the matter of timbering, created hazards not only for the individual man in his room, "but works to the injury of other miners and to the detriment of the management." Quite simply, a miner who inadequately timbered his room created a threat not only to himself, but to other workers and to the productivity of the mine. That led inspector Jo E. Sheridan to complain of the "gross absurdity" of a law "which imposes upon the mine owner the protection of the miner from physical danger, while the miner interposes his negligence as an obstacle to the process of protection."[17]

Judging from inspectors' comments, more than a quarter century of federal and state regulation made little impression on New Mexico's coal miners. In 1919 inspector Sheridan attributed a rising death rate to the "greater carelessness of the men in general," and to their "resentment at strict safety discipline in the mines." Sheridan claimed that frequently, when he pointed out to a miner the danger of some careless act, the miner would tell him, "I do not think it is anybody else's business but my own; if I want to take the chance of being hurt, it will not hurt you." An exasperated inspector, Warren Bracewell, concluded in 1925 that the state law requiring miners to look after their own safety,

16. James Whiteside, "Protecting the Life and Limb of Our Workmen: Coal Mining Regulation in Colorado, 1883–1920," *Essays and Monographs in Colorado History*, 4 (1986); and *ibid.*, "Protecting the Life and Limb of Our Workmen: Work, Death, and Regulation in the Rocky Mountain Coal Mining Industry" (doctoral dissertation, University of Colorado, 1986).

17. U.S. Inspector of Mines, *Third Annual Report, 1894–1895*, p. 699; *ibid.*, *Sixth Annual Report, 1897–1898*, p. 486; *ibid.*, *Ninth Annual Report, 1900–1901*, p. 719.

Inspecting a potential investment could be dirty business, as these investors discovered while touring a coal mine in Lincoln County, New Mexico, in 1904. Photo courtesy of Special Collections, Zimmerman Library, University of New Mexico.

especially in regard to roof control, had "no effect so far as the workman is concerned." In fact, he said, "very few of them know anything of the law."[18]

Why so many miners seemed hell-bent on killing themselves was no great mystery to mine inspectors. Noting that the majority of accidents involved roof and side falls, inspector Sheridan asserted that "in many instances familiarity with the danger, coupled with fortunate escapes," rendered the miner "absolutely indifferent to his peril." Inducing miners to protect themselves from falls was, said Sheridan, "a

18. New Mexico Inspector of Mines, *Annual Report, 1919*, p. 15; *ibid., Fourteenth Annual Report, 1925*, p. 6.

most ungracious task." Sheridan went on to explain that "procrastination appears to be the miner's great weakness." Instead of taking the time to properly clean his roof and sides and set timbers, the miner would "just drill another hole or two, pick down some loose coal, or load another car or two of coal."[19] Here, Sheridan touched upon the fundamental cause of the coal miner's supposed carelessness, the basic relation of work in the pick-mining and hand-loading era: the contract or tonnage rate.

Mine inspectors were at least dimly aware of the relationship between the tonnage rate and coal mine accidents early on, and the Hobson's choice that miners faced between safety and earnings. As early as 1895 John Fleming noted that the majority of accidents were "probably caused by the overanxious miner trying to get out as much coal per day as possible without regard for his own safety." The temptation to sacrifice safety for more coal was "too great."[20] Inspectors found that miners resisted deadwork, such as timbering, even when they were ordered to do the work. The result very often was that the men were injured or killed trying to load another car of coal before setting up timbers.

This incentive to "carelessness" built into the tonnage rate system was by no means unique to New Mexico. In its study of the coal industry in the 1920s, the U.S. Coal Commission found it to be a problem throughout the industry. The commission noted that "the miner naturally looks to his own self-preservation, but he considers also his wages, and when a tonnage or contract worker puts in an extra timber or takes an extra safety precaution he cuts down his earning power." Thus, the commission concluded, "he is likely to take perilous chances, and if he often takes them successfully his practice becomes a habit." The commission also found that miners suspected and resisted purported safety measures, believing they really only served to reduce their earnings or introduced "new conditions that are of advantage to the operator only."[21]

Just as they were aware of the underlying economic cause of miners' "carelessness," mine inspectors also seemed to recognize that the solution to the problem of death in the mines lay in changes in the industry and in working conditions beyond their control. One way to reduce accidents was through more and stricter supervision. Typical

---

19. U.S. Inspector of Mines, *Ninth Annual Report, 1900–1901*, p. 719.

20. U.S. Inspector of Mines, *Third Annual Report, 1894–1895*, p. 699.

21. "Report of the United States Coal Commission," Senate Exec. Doc. 195, 68th Cong. 2nd sess., part III, 1683–84.

was inspector W. W. Risdon's comment in 1923 that the best way to prevent roof falls was "frequent inspections of each place the men are at work and strict discipline." Risdon emphasized that miners were legally responsible for making their rooms safe and that mine bosses were legally responsible for seeing to it that they did so.[22]

Nevertheless, there were formidable obstacles to close supervision, not the least of which was the large scale of many operations. With workers scattered about in rooms through miles of entries, foremen and fire bosses were hard pressed to make even one visit per day to each working room. In addition, unless a supervisor stayed to see that his orders were obeyed, there was no way to insure that miners took the time to secure their roofs and take other measures to protect themselves. Constant supervision could require a force of supervisors nearly as large as the number of workers employed.

Moreover, even the most safety-conscious mine boss found himself in an ambiguous position. Responsible for enforcing the coal mining law, he was, nevertheless, an employee of the mine owner. A mine boss who rigidly enforced safety rules at the expense of production might soon find himself out of work. Miners were aware of this and insisted that "hired managers, hard driven by the knowledge that their jobs depend on their ability to produce coal cheaply, take chances in order that they may save expenses." A miner could do little to protest if a mine boss chose greater production over safety. Mine bosses had virtually absolute authority underground and could easily punish or get rid of a complainer. Such power meant that "the individual miners cannot insist on the enforcement of the laws, or even the well-known commonest safeguards," and allowed mine bosses to "take chances with human life that result in the deplorable percentage of casualties the statistics reveal." Mine inspectors were aware of this problem but even though they encouraged miners to come forward with complaints, they were helpless to do anything about it.[23]

What was the solution, then, to the problem of better coal mine supervision and safety? In 1925 inspector Warren Bracewell noted that falling demand and a shortage of experienced miners had "caused some companies to look to the mechanization of their mines so that the lesser experienced labor" could be employed. New methods of mining were being introduced, he noted, including the use of automatic conveyors

22. New Mexico Inspector of Mines, *Twelfth Annual Report, 1923*, pp. 6–7.

23. *United Mine Workers Journal*, December 17, 1914, p. 4; U.S. Inspector of Mines, *Third Annual Report, 1894–1895*, p. 699.

instead of cars to carry coal to the surface. With more extensive mechanization, workers could be "concentrated and kept under constant supervision." Moreover, deadwork, including timbering and other safety work, could be transferred to "company men" who received set daily wages. "It is believed," Bracewell said, "that with closer concentration of the workmen, better supervision can be maintained with a great saving in accidents."[24]

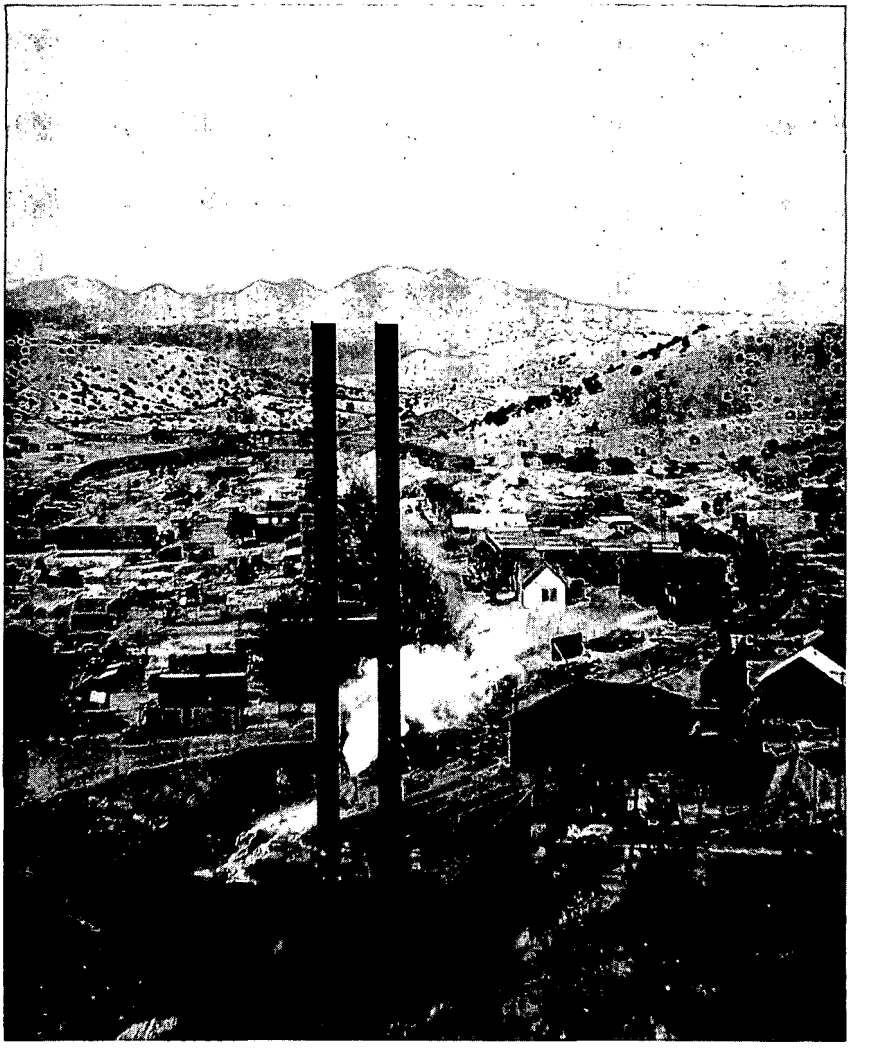
Bracewell described changes in the work environment associated with mechanization that would bring about safer conditions and significantly lower fatality rates. With mechanization, especially the introduction of loaders and conveyors, the pick miner's skills became less valuable. Eventually, continuous mining machines, which cut coal from the seam and loaded it onto cars or conveyors, made the pick miner obsolete. Ultimately, machines took the mine worker out of the darkness of the earth and put him at the controls of a huge earth mover.

While miners continued to work underground, they did so in a changed environment. Instead of working in pairs in rooms scattered throughout the mine, teams of machine operators and day men worked under the eyes of foremen, cutting and loading the coal, laying track, and timbering rooms and entries. And, they did so for set daily wages, not tonnage rates.

The change did not come immediately nor in all mines, but with mechanization the important elements in safety problems—inadequate supervision and the tonnage rate—gradually were eliminated. In New Mexico, the years of the Great Depression and World War II constituted an era of transition from pick mining and hand loading to mechanized mining. Mechanized mining spread during the 1930s as operators replaced humans with more productive machines. The stimulus of World War II and a shortage of skilled miners added further incentive to mechanize.[25] In 1942, machine production of coal exceeded hand mining, and in 1947, 84 percent of New Mexico's coal was produced by machines and at least 76 percent was loaded mechanically.

In the years between 1934 and 1947 New Mexico's coal mining fatality rates fell dramatically and to zero in 1947. The average rate for these years was 3.11 per thousand, with falls of rock and coal accounting for a rate of 1.81 and explosions 0.24 per thousand. Haulage accidents, at the rate of 0.64 per thousand, killed more workers than did

24. New Mexico Inspector of Mines, *Fourteenth Annual Report, 1925*, pp. 5–6.
25. *Ibid.*, *Thirty-first Annual Report, 1942*, p. 7.



Twin smokestacks dominate the vista of Madrid, New Mexico, a coal mining community twenty-four miles southwest of Santa Fe. Photo courtesy of New Mexico State Records Center and Archives, Neg. No. 23265.

explosions. Machinery and electricity together killed miners at the rate of 0.25 per thousand.

Though it rose only slightly, the rate of death from machinery and electrical accidents indicates a negative side of mechanization. While mechanization held the key to better mine safety, machines also introduced new hazards. New Mexico's first death from an accident in-

volving a mining machine occurred in 1922, and the state's first electrical fatality came in 1923, just as mechanization began to account for a significant percentage of the state's production. A spokesman for the United Mine Workers in 1939 told a U.S. Senate committee that "the rates of fatalities caused by transportation, hauling equipment and electrical equipment widely introduced with the mechanization of mines, show a definitely upward trend, so as practically to destroy the good effect in the increased safety in handling explosions and explosives."[26]

Noise and vibrations from cutting machines complicated the problem of roof control. The din of machines made it difficult for miners to sound roofs and detect dangerous loose rock. The vibrations from machines tearing into the coal seam sometimes loosened roof material that the miners thought secure. To make room for a machine the miners sometimes had to remove timbers and either take down loose roof or hope that it would not fall. Thus, mechanization helps to explain the continued high rate of falls of rock and coal between 1934–1947.

Mining machines also exacerbated ventilation and explosion problems. As they cut into the coal, machines generated enormous quantities of coal dust, taxing the capacity of ventilating systems and increasing the potential for explosions. Mining machines also were a potential source of ignition. Sparks from cutters striking a piece of rock or from improperly installed or poorly insulated electrical cable could easily set off a pocket of methane gas, which in turn could ignite a dust explosion. Indeed, a U.S. Bureau of Mines study found that in the period from 1931 through 1950 only open flame lights and smoking caused more explosions than did electric arcs.[27]

Fortunately, technological improvements and training have remedied most of the hazards associated with mechanization. Hazards have been minimized by better roof control methods, including roof bolting; longwall mining equipment with self-contained overhead protection; dust suppression methods including systematic sprinkling and dust barriers (containers of pulverized stone designed to empty in an explosion to suppress flames); guard devices and dead-man switches on machines; and more emphasis on training miners in the proper installation and use of machinery and electricity.

Because of the significant decline in coal mine fatality rates during the depression and war years it is worth considering what factors other

---

26. "Inspections and Investigations in Coal Mines," Senate Committee on Mines and Mining, 76th Cong. 1st sess., 6.

27. *Historical Summary of Coal Mine Explosions in the United States*, circular 7900 (Washington, D.C.: Department of the Interior, 1959), 43.

than mechanization contributed to improved fatality rates. One was the Great Depression itself, which caused lower employment and production, meaning that fewer workers were exposed to work hazards less often. During the decade of the 1930s the average annual fatality rate was 3.42 per thousand. In the war years, as activity in the industry increased, fatality rates rose, averaging 3.89 per thousand, suggesting that economic factors did play a role in rising and declining rates of death in the mines. It should be noted, however, that the Great Depression actually only extended and accelerated a pattern of declining production and employment in New Mexico's coal mines that began after World War I. During the decade of the 1920s, as activity in the industry fell off, the state nevertheless continued to experience very high fatality rates, averaging 7.29 per thousand. Thus, the economic decline of the 1930s at best only partly accounts for lower death rates.

Another factor that made conditions in the mines safer was a new coal mining law passed in 1933. The new law included improved regulations in the areas of inspection and enforcement, ventilation and dust control, explosives and shot firing, timbering, and haulage. It also took into account technological developments and included regulations governing the installation and use of machinery and electricity. It also required that foremen, assistant foremen, fire bosses, and shot firers be examined and certified by the state mine inspector.[28] Although the law attempted to address changing conditions in the industry, including mechanization, its basic goal remained the prevention of major explosion disasters. Most important, it did nothing to alter the basic relations of work, including the tonnage rate, or the attitude that miners were primarily responsible for their own safety and deaths.

Of more immediate importance in bringing about safer conditions in the mines perhaps was the unionization of coal miners during the 1930s. With the coming of the New Deal and the defeat of the radical National Miners' Union in the Gallup strike, the way was opened for the United Mine Workers of America to organize New Mexico's coal miners. In addition to fixing wage scales, defining rules for deadwork, and protecting workers from harassment from mine officials, union contracts included agreements to observe state mining laws and to implement other safety measures. Early contracts did not do away with the tonnage rate, however, and thus did not completely eliminate the economic incentive for miners to risk their lives for more coal.

In sum, while economic conditions, regulation, and unionization undoubtedly contributed to better safety conditions in New Mexico's

28. New Mexico, *Laws, 1933*, pp. 303–52.

coal mines, it was the fundamental change in work and work relations brought about by mechanization—better supervision and the end of the tonnage rate system—that best explains declining rates of death after 1933.