The Movement for State Regulation of Coal Mines in the 19th Century

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In the attempt to understand American industrial society, business historians have directed attention to the compatible themes of organization building, bureaucratization, and professionalization which constitute the core of "the organizational synthesis," thus furthering knowledge of the Progressive Era [18]. One contrast between the organizational interpretation and earlier "liberal historiography" lies in differing judgments concerning continuity and change in the past. Although the earlier interpretation emphasized the continuities in reform ideology throughout American history, the organizational view notes a sharp shift in attitude around 1900. This shift represented an adjustment to rather than a rejection of the new industrial system and the development of bureaucratic approaches to socioeconomic problems as opposed to the panaceas offered by 19th century reformers [54 and 23]. This essay does not challenge the organizational synthesis, but suggests reemphasis on continuity in conceptualizing the development of organizational ideologies which seem a product of evolving experiences and reactions to the changing conditions of industrial society.

The struggle to achieve government regulation of health and safety conditions in coal mines during the 1870s came when the industry was in a formative, not mature, stage of development, yet revealed nascent themes commonly found in the Progressive Era. The mine regulatory movement was led by men who combined advocacy of financial panacea and cooperative enterprise for national economic problems with an incipient class consciousness and a developing notion of applying nonpartisan expertise embodied in bureaucratic agencies to ease the day-to-day hardships of work in deep mines. It involved the migration of men and ideas across the Atlantic and the nation's earliest efforts at trade union organization. It concerned the newly formed profession of mine engineering. Although vigorously opposed by coal operators and political leaders who espoused a doctrine of strict government parsimony and an organic (as opposed to class or interest group

segmented) view of society and polity, the mine regulation movement achieved no little political success in the 1870s.

By 1882 some eight states had responded to miners' demands for government regulation, though not necessarily in the form the miners desired.[1] In large part this legislation was the product of agitation by immigrant miners who combined their sense of practical wisdom with the experience of the British mine safety movement. The migrants who quit the British fields to seek opportunity elsewhere brought mining techniques and political experience.[2] Repelled by the failure of the Chartist movement to achieve its goals, some refugees led the long struggle to organize a viable American coal miners union [5]. But apart from this well-documented trans-Atlantic connection, thousands of Welsh, English, Scottish, and Irish miners benefited the American industry with their practical experience and skills.

When mining began in the United States, digging coal was an uncomplicated procedure which simply required prodigious quantities of human and animal labor. The technology and ingenuity required for the actual mining operation was simple. In the antebellum years shafts, if required at all, were shallow, posing few problems of ventilation, reinforcement, drainage, or maintenance. But as demand for coal grew and shipping problems eased, investors, eager to exploit their holdings, sank deeper and deeper mines. By the end of the Civil War there were mines in eastern Pennsylvania with 1,600-foot shafts. In such mines entrepreneurs prized the experience and skills of immigrant miners; and the miners, as opposed to operators, began to perceive a need for strict controls on mine operations and maintenance enforced by state intervention [64, pp. 26-28, 108-24, 166, and 172-73; and 49, p. 244].

Deep mines posed serious technical and human problems. Flooding was a constant hazard. Steam-driven pumps could extract water but presented fire dangers in timber-supported shafts, rooms, and roofs. Ventilation, however, was of greatest concern, air having to be supplied through complex underground mazes. Miners worked with a pick, undercutting a seam of coal and blasting it loose with explosives. Dust and smoke were partly overcome by blasting only at the end of a work day.[3] Above all else, ventilation was a concern because coal seams frequently were accompanied by toxic and explosive natural gases of which methane, called "fire-damp" in the jargon of the miners, was the most common. Mine safety required large currents of air to dilute and remove these gases. Nor were these the only safety-related problems. Elevators could not be overloaded, places of refuge from mine cars in passageways were desirable, and safety lamps supplied and inspected. But ventilation remained the most awesome task faced.[4]

Engineers in the 19th century experimented with a variety of techniques for providing the needed volume of air. Fans, air

compressors, and steam jets which heated and moved air were tried. The most common ventilation method in deep-shaft mines, however, was the ventilating furnace. Double shafts were sunk, with a furnace placed at the bottom of the upcast shaft to heat air and expand it; the result, with properly placed air passages and trap doors, was a volume of air thought sufficient for safe operation of the mine.

The use of ventilating furnaces posed additional hazards. Fires had to be properly maintained and sparks could be dangerous. Improper use of ventilating furnaces led to spectacular tragedies in Britain and America which caused miners to quicken agitation for government regulation and prompted the public on both sides of the Atlantic, not yet numbed by the horrors of life in the 20th century, to respond in emotional support of the miners in their dangerous occupation. Mine operators, acting either in haste to exploit their holdings or out of ignorance, or both, sometimes constructed the furnace shafts of wood rather than masonry.[5] The great Avondale tragedy of 6 September 1869 occurred when a furnace ignited a wooden shaft, destroying it and filling with debris the only means of egress for the 110 men and boys working in the mine. The suffocation of the trapped Avondale miners provided a rallying cry repeatedly heard in agitation to secure state regulation of the industry (see, for instance, [49, pp. 134-37]).

Both the labor movement and the mining engineering profession, each in their infancy, concerned themselves with these problems. American mining engineers began to publish papers in 1867 on the problems of ventilation and safety in coal mines and to promote mining schools to furnish skilled technicians for the management of the mineral industry (for example, see [21; and 2, pp. 267-359]). The American Institute of Mining Engineers was organized in 1871 to promote, among other matters, a greater concern with mine safety. Before the Avondale disaster the *American Journal of Mining* distributed knowledge about the safer usage of ventilating furnaces and of other devices. After the tragedy Eckley B. Coxe, trained in Europe as an engineer, spoke to the American Social Science Association to engender a greater application of disinterested expertise to the entire problem of working conditions in the industry but so far as the available record shows, engineers provided no sustained effort to encourage government regulation of the industry by experts [9]. Although concerned with technical problems and the promotion of improved management of mines, they also expressed attitudes conducive toward the rapid and profitable exploitation of mineral resources. Under the leadership of Rossiter W. Raymond, the AIME and the *Engineering and Mining Journal* consistently expressed attitudes of hostility toward organized labor [27, p. 48, n. 1].

The activities of the labor movement contrasted sharply with those of the mining engineers and their promotion of the industry.

Although the mining engineers were beginning to express a concern with safety and welfare, the miners were drawing upon a generation of British experience and agitating for government regulation in this county. Mine regulation and inspection had begun in Britain as a product of an 1842 law which sought to regulate the employment of women and children in the industry. From the ensuing reports of working conditions, studies of the scientific community, and the complaints of miners, knowledge of mine hazards grew. In 1850 Parliament established a regular inspectorate which, although it did not enjoy substantial coercive powers, developed information and provided a major impetus for government-sponsored reform of the industry in 1872 [28 and 6]. Paralleling these governmental developments and in part responsible for them the British miners were organizing unions and pressing for regulation. The most famous and long-lived of these unions was the Miners' National Association led by Alexander McDonald of Scotland, a miners' hero on both sides of the Atlantic [52, p. 219].

This British experience was a key element in the three states where the American mine safety movement began. American miners, who benefited from McDonald's visits to this country, shared the developing British knowledge of safety problems and sought to replicate the British political situation. Their efforts were only partly successful. Although after 1852 the British miners enjoyed sustained support from the scientific community, such support on this side of the Atlantic was lacking in the Gilded Age. Nevertheless American miners struggled to establish trade unions, a central purpose of which was to press for government regulation of the industry. Although the American unions of the 1860s and 1870s were not long-lived, their formation involved the notion that functional organization was a desirable means of controlling working conditions, and their goals prominently included establishing governmental and bureaucratic systems to ensure safer mines. As miners' leaders developed the idea of state regulation in the 1870s, they expressed a desire to have the regulatory system function in a nonpartisan manner, enmeshed in state systems of education and scientific research which combined the practical skills of experienced miners with the academic abilities of geologists, chemists, and engineers.[6]

The first state intervention came in Pennsylvania where anthracite miners petitioned the legislature for state-wide safety regulation. In 1869, statements from Luzerne County (the location of the Avondale fire in 1870) that mines there were not dangerous, led the legislature to limit safety regulation to Schuylkill County. The 1869 statute, though it failed to require at least two shafts into each coal seam, had some language identical to the statute passed three years later in Britain.

Spurred on by the Avondale tragedy, in 1870 the legislature expanded coverage of the law to all of the anthracite counties.

The new statute required a minimum of two outlets for each coal seam being worked but its procedure for selecting the six inspectors revealed an antielite bias. To fill the three-year terms, an examining board of three miners and two mining engineers chose men with at least five years of practical experience, a familiarity with the problems of mine ventilation, and knowledge of noxious gases. Appointment was by the governor. The miners thus were in control of the appointment procedure and there was no assurance of the application of disinterested expertise or, as experience later proved, of keeping patronage considerations out of the appointment process [53, pp. 32-49].

Soon after passage there were objections to the law. Companies, complaining of the burdens imposed, unsuccessfully tested it in the courts. Mining engineers objected not to state inspection but to the apparently close ties between the inspectors appointed and the labor movement. Eckley B. Coxe argued that the fault of the 1870 statute was that its authors, in considering the plight of the miner, failed to account adequately for the interests of the owner and "the general public." He argued that regulations designed by a representative, expert commission would produce more harmonious and efficient results [9, pp. 27-28]. His colleague in the AIME, Rossiter W. Raymond, though sympathetic to the idea of inspection, scorned the style of the reports of the Pennsylvania inspectors and criticized some of their technical information. His chief complaint was that the inspectors were not trained mining engineers, though he offered no means of remedy [10, 11, and 12].

Neither man followed through on his criticism by attempting to influence changes in state regulation either in Pennsylvania or elsewhere. In Illinois miners were agitating for state regulation while the two engineers were complaining of the shortcomings of Pennsylvania's law. During the 1860s the American Miners' Union in Illinois was rebuffed by the legislature. The miners turned to the 1870 Constitutional Convention for redress where they obtained a clause requiring the legislature to enact safety regulations [55, pp. 75 and 204-5].

In the debate, the Illinois miners couched their arguments in the familiar labor reform rhetoric of the day. Social classes, labor and capital, had arisen; labor created wealth while capital was a social drone; thus the two were in frequent conflict. Social harmony, however, was desirable and safety legislation was a means toward that end. It was a first step toward the social justice only out of which harmony could arise. Their opponents complained that the measure was expensive special interest legislation embodied in the Constitution. Supporters countered that the clause addressed a need demonstrated by an important group of citizens. Thus as early as 1870 the advocates of regulation were arguing from the premises of the labor theory of value that the systematic application of expertise to a social problem could provide a means toward achieving social harmony [24].

Success in the Constitutional Convention, however, did not automatically produce the desired law in the next legislative session. In 1871 John Hinchcliffe, a miners' leader and former Chartist, proposed a law modeled on British experience to provide ventilation, escape shafts, and a state inspectorate staffed by qualified experts. The 1873 legislature debated the issues. As miners packed the galleries, opponents asserted that a half million laborers in the state were complaining that the law would raise the price of coal. Coal operators argued that the legislation would cripple or destroy the still nascent industry. Senator Hinchcliffe's recitation of European and British data on the causes of mining accidents, and his emotional appeal to prevent a future Avondale disaster in the state, proved unpersuasive [58]. A compromise measure provided for escape shafts and ventilation but the respective county surveyors empowered to appoint practical miners on an ad hoc basis to assist them were to administer it. Both operators and miners disliked the "Hinchcliffe law," as it was known. While the operators sought unsuccessfully to have it repealed, the miners continued to press for a state inspectorate. They were supported later in the decade by the county surveyors and by gubernatorial reports that the system was ineffective. But success came only after the drowning of 69 men near Braidwood in 1883. The 1883 law provided for a board of examiners, appointed by the Bureau of Labor Statistics and consisting of two operators, two miners, and one engineer, to nominate candidates for the five offices of state mine inspector [3, pp. 309-15 and 333].

The idea of regulation by public experts functioning in a bureaucratic setting was most fully expressed in Ohio where agitation for a state inspection law began shortly after the Avondale accident. Andrew Roy, who eventually became Ohio's first mine inspector and whose writings circulated widely, led the movement. A Scottish immigrant, Roy had worked in mines on both sides of the Atlantic before enlisting in the Union cause during the Civil War. After suffering a nearly mortal wound in 1862, he studied mining engineering on his own. He settled near Youngstown at the end of the war and in the autumn of 1869 began publishing newspaper articles on mine safety and ventilation, earning the attention and respect of Mahoning Valley miners. Closely involved with their unions, for four years he lobbied to establish a state inspectorate.[7]

Roy was a student not only of the technical aspects of mining but of the history of the industry and of the British experience with safety regulation. In the infant Ohio mining industry many workers believed management was ignorant of proper ventilation and safety procedures, avoiding catastrophe only because their mines were still too shallow to have encountered methane.[8] In this environment Roy developed a view of state involvement which eventually included inspection by experts, a statewide system of mining education, and a process of certification for mine supervisors supported by organized engineers and scientists.

Ohio miners and Roy urged an inspection bill upon the legislature in 1871. It defined two inspection districts and described a board of examiners consisting of a state geologist, two practical miners, one mining engineer, and a chemist to administer examinations and determine qualified applicants for the posts. The inspectors, appointed by the governor, were to serve a three-year term during which they were to have no financial interest in any aspect of the industry. The bill defined ventilation and safety procedures and provided for enforcement by the inspectors issuing indictments through the courts. They were to maintain files of mine maps, develop statistics relating to accidents and their causes, visit mines, and from their knowledge recommend desirable changes in the statute.[9]

The coal operators were hostile. In their view meddlesome inspectors would cause rather than ease discontent among workmen, as Roy claimed. The operators viewed the coal mine as a community, in which each party, with its separate responsibilities, was mutually dependent on the other. They asserted that mining in the state was safe, ventilation adequate, and the health of miners better than that of other laborers. Each miner was an individual contractor capable of earning an excellent annual income, and discontent was a product either of the outside influences of miners' unions or of the intemperance of grumbling personalities. Thus the intervention of a needlessly expensive inspector from an outside agency, the state, would serve as another source of agitation. Only miners in communication with the owner's agents could fully know each mine's individual characteristics and problems; only the local mine "community," thus, was capable of determining whether or not ventilation was sufficient and excavation of coal safe. This local system was self-enforcing, moreover, for it was in the firms' self-interest to adjust complaints and provide a salubrious working place lest their qualified workmen seek employment elsewhere. A system of state inspection, on the other hand, would simply give the miners an unfair advantage, upset local harmony, and obstruct the operation of "the natural social laws." The proposal, in short, was nothing less than an effort of a few demagogues to secure sinecures at taxpayer expense.[10]

Roy recognized that such arguments were difficult to dispute without establishing a factual basis for legislation. So the miners proposed and the legislature authorized a tripartite commission "to visit" and "inspect" mines, report their condition, note the causes of labor unrest, and recommend legislation. Governor Rutherford B. Hayes appointed Roy, Charles Reemelin, and B. M. Skinner. Reemelin, a Cincinnati Democrat long prominent in state politics and German-American affairs, was part owner of a mining firm though he protested ignorance of the industry. Skinner, a Republican functionary, was a Pomeroy merchant. Roy was the "practical miner" the legislature required. During the summer and autumn of 1871 the commission visited coal regions, heard testimony

from company and miner representatives, read mining engineering literature, and studied the mining laws of Prussia and Britain. When mine owners testified about salubrious working conditions, Roy entered their mines, measuring air currents and sampling atmospheres.[11]

The commission's *Report* revealed sharply conflicting views. The majority, Reemelin and Skinner, engaged in elaborate theoretical and legal analysis which was intended to convince the legislature that the establishment of a mining inspectorate was improper. In their view society was an organic whole and changing social and economic conditions, although susceptible to legislative direction, required even and uniform treatment by the government. Echoing the arguments of the coal operators, they asserted that the miners' attitudes of class consciousness stemmed from an improper transferal of European experience to the American setting where upward mobility was an ever present reality. Just as it was improper to think of American class lines as fixed, so was it undesirable to enact any legislation which segmented society and treated one part of it in some special fashion. Moreover, such laws were unreasonably expensive for they created the possibility of duplicate effort and the likelihood of an expanding bureaucracy burdening future generations with added tax costs. Thus they rejected the miners' propositions and recommended three alternative bills [36, pp. 27-51 and 169-73]. One defined industrialists' obligation to ventilate places of work; the second their liability, to be enforced in civil suits, for accidents. The third bill created a system of county sanitation boards designed to preserve community control, avoid a "class" approach to industrial problems, and prevent growth of an expensive bureaucracy. These boards could be established upon the petition of 1,000 citizens residing in a particular county. If the governor agreed with the petitioners he could appoint the county surveyor, sheriff, and two local physicians to police the health and safety, not just of mines, but of all factories and workshops.

In his minority report Roy argued for a state inspectorate. "Any recommendation as to legislation upon the subject of mining," he wrote, "must be based upon the facts in the premises, to command the thoughtful consideration of the legislature."[12] He surveyed the coal regions of the state, reported on his inspection of selected mines, and showed that ventilation was much poorer than in Britain. Roy's rejection of the majority recommendations flowed from his pragmatic approach. He pointed out that the members of the proposed sanitary boards would not enjoy expertise in the technical matters of mining. "No worse system of legislative interference could possibly be conceived. It is a call, for the prevention of danger, which might increase the danger, but could not prevent it; it is an attempt to make the blind lead the blind" [36, pp. 92-96]. He reasserted his conviction, based upon his observation and study, that what Ohio required, as European nations

had discovered, was nonpartisan regulation by disinterested full-time experts, enjoying a long term in office, supported by a complete system of state education in the practical and scientific aspects of mining.

Roy and the miners were bitterly disappointed in the 1872 legislative session. The lawmakers scoffed at the commission's majority *Report* and the Senate unanimously adopted a miners' bill without major modifications. But the House was another matter. A coal operator in that body successfully emasculated the bill by having all provisions for inspection stricken. The miners accepted this "compromise" on the grounds that it established the principle of state intervention and could be amended at a future date.[13] Their next step, in 1873, was to urge the state's constitutional convention to adopt a clause which directed the legislature to provide for inspection. They were successful, but in 1874 the voters rejected the proposed constitution, which aroused the ire of temperance forces [8 and 19].

But the constitutional referendum was of little consequence to the miners, for in 1874 the legislature enacted state inspection, though the law failed to provide for a merit system of appointment, something which would cause the miners no little trouble in the future. Roy, again in Columbus on behalf of the miners, reported that Governor William Allen had studied British reports and was knowledgeable in the safety problems of coal mines. Immediately after passage of the new law, and in the face of opposition from coal operators, he appointed Roy state inspector of mines [61]. Roy served in the post for eight years, 1874-77 and 1880-83.

Of all the 19th century American mine inspectors, Andrew Roy was the most articulate and best known. His *Annual Reports*, widely read and admired, described the Ohio coal fields at length, reported on the technical problems of development, and sought to educate operators, their agents, and legislators in proper safety and ventilation procedures.[14] While maintaining close associations with the miners' unions and the national labor reform movement, Roy expanded his contacts with scientists and engineers as well. In 1881 he helped found the Ohio Institute of Mining Engineers and served as the group's first president. It enlisted scientists, engineers, and educators in the cause of improving safety and government regulation. Convinced that it was wise to combine practical and scientific knowledge in the management of mines, in the 1880s Roy promoted a state school of mines and a system of examination and certification for mine management [39, 43, 46, 32, and 50].

Though mining remained a hazardous occupation at best, the men who agitated for state regulation felt a sense of achievement. Though Ohio's coal statistics were too inaccurate for a true measure, Roy was confident before he left office that the accident and death rate compared favorably with the British standard [50,

pp. 141-42; 44; and 45]. After a bitter experience in 1878 and 1879 when coal operators succeeded in having an inspector appointed who refused to carry out the functions of his office, the state devised a means for ensuring that future appointees were qualified.[15] The Illinois, Iowa, and Colorado laws showed the influence of Roy's notion of applying disinterested expertise. Though Ohio failed to do so, Illinois, Pennsylvania, and West Virginia enacted laws in the latter part of the century for the education and certification of mine foremen and superintendents. The concept of professional disinterest, however, was not fully developed or widespread. After a long and acrimonious struggle, Pennsylvania extended inspection to its bituminous fields in 1877. But the Pennsylvania miners' conception remained one of placing "practical men" in positions of authority, and the posts became objects of patronage.

Thus the 19th century movement for mine regulation did not fully follow the model for reform suggested by historians studying the early 20th century. The desires of rank-and-file miners to insist on men of their own kind as the regulators, as opposed to disinterested outside experts, remained politically potent especially in Pennsylvania. The national organization of mining engineers failed to exert continual pressure for the establishment of professional and bureaucratic procedures for regulating the industry. Nor were other elite groups adequately organized to agitate for regulation on the progressive model.

Coal firms remained organizationally splintered until World War I and there was no systematic impetus for regulation from that source [20]. The labor leaders who advocated regulation, moreover, did so while maintaining favorable attitudes toward reform panaceas. At the same time as he advocated inspection, Roy devoted attention to arbitration, cooperation, self-improvement, and temperance as the ultimate solutions to the miner's plight. Leaders of early miners' unions supported some of the same measures.

Nevertheless certain parallels between the mine regulation movement of the 1870s and the impulses toward reform in the Progressive Era suggest a reemphasis on continuity in the adjustment to industrialism. Clearly the ideology of the application of disinterested expertise administered in a bureaucratic setting is one such parallel. So was the expressed motivation behind the proposals for state regulation. As in the Progressive Era, in the 1870s there was concern about the extent of class conflict and a search for some means of achieving a more orderly and harmonious society. Some paths commonly offered toward such a goal were panaceas, but not that of mine inspection. Coal miners suffered a reputation in the 1860s and 1870s of being more strike-prone than other workers, giving their leaders a powerful argument in persuading state legislatures to impose inspection. In their view, social harmony could arise only out of a sense of social justice; labor reformers suggested that the best means toward such justice

was through abandonment of the wages system. But short of achieving that social rearrangement, the state governments must bring to bear expert knowledge to ameliorate the worst working conditions among miners. Laws supporting their cause would not only enhance a sense of citizenship among miners, but would eliminate one complaint, poor working conditions, which caused strikes, violence, and social disruption. You cannot "preach to miners of the relations of capital and labor," Roy advised his readers in 1875, and expect agreement amidst breaths of foul air. Better working conditions, the eight-hour day, improved educational opportunities, procedures for conciliating disputes, together with a recognition that, short of violence, miners had a right to strike were all elements leading toward social justice within the framework of a capitalist, as opposed to cooperative, economy. Moreover, the application of expertise would wisely lead to greater conservation of a most valuable natural resource [40; 41; 17; and 49, pp. 110-11].

Finally, we know that reform sentiments in the Progressive Era often arose among persons holding a cosmopolitan view of society. Commonly in the 20th century social change was directed by cosmopolitan persons in business and technical fields, with reformers encountering opposition from members of particularistic, local communities. The mine regulation movement of the Gilded Age saw a reversal of the economic position of the reform leaders. The coal firms and their political allies argued from a local perspective and the labor leaders provided the broadest available social vision and the most comprehensive integration of the several specialties which could be brought to bear on the problems at hand. Unlike the next generation of labor leaders, they did not hesitate to seek redress of workingmen's problems through political action. But like the next generation of miners' leaders they were developing a vision of a more rationalized, less competitive, and more humane organizational scheme for the coal industry [26].

Perhaps the impulses behind the mine safety movement of the Gilded Age were simply exceptional, a product of the peculiar circumstances of a group of workers enjoying a common British experience. But the suspicion remains that such was not the case. The reform ideologies of the Progressive Era seem most likely a product of a gradual experiental process. Business historians have shown the evolution of technical systems and functional organizations in their field. Other specialists can now follow the lead, question notions of discontinuity in the adjustment to industrialism, and provide a fuller exposition of the processes by which modern systems of social control and their underlying ideologies emerged.

NOTES

1. The dates of the first laws were Pennsylvania, 1869; Ohio, 1872; Illinois, 1872; Maryland, 1876; Indiana, 1879; West Virginia, 1879; Iowa, 1880; and Colorado, 1883. Details for three states can be found in [52, pp. 32-35 and 41-49; 3, pp. 290-333; and 30].

2. On the general pattern see [63, pp. 123-41; and 4, pp. 47-58]. Katherine A. Harvey [22, pp. 18-21] carefully explains the general pattern of miner migration from Great Britain to the Maryland coal regions.

3. Pick mining is graphically described in the historical fiction of Ben Ames Williams [56]. For a more contemporary account, see [51, pp. 108-14].

4. The information in this and the next paragraph comes from [49]. See the Mining Law of Ohio, pp. 360-64, especially sec. 9. The British law of 1872 simply required "an adequate amount of ventilation."

5. The *Workingman's Advocate*, 9 October 1869, blames the practice on avarice; the *American Journal of Mining*, 13 April 1868, a magazine for engineers, on simple mismanagement and ignorance.

6. The *Miners Journal*, an Ohio union paper (unfortunately not preserved in any library), reprinted English testimony on the benefits of inspection [59].

7. [25 and 60]. For early articles by Roy, see [29].

8. The views of miners are included as testimony in [36].

9. The bill is published in [36, pp. 173-79]. Roy recounts the episode in [50, pp. 112-23].

10. No direct testimony of the operators remains on the historical record except that provided in *Report of the Mining Commission* [36] and I have drawn upon pp. 110-11, 132-35, 156-59, and 161-66 in composing this perspective even though it was recorded after the legislative session. Roy [50, pp. 113-14] preserves his recollection of the operators' arguments.

11. [36, p. 3 and passim]. For an analysis of Reemelin's social thought see [65, pp. 32-34]. At the time of his appointment Reemelin was president of a Cincinnati firm which had mines in Muskingum County [16]. In his autobiography [48, p. 200], which reports dates inaccurately, Reemelin recalled that Hayes selected him because of his investment in mining, but he assured the governor that he really knew little about the subject. Hayes was assured that Roy was a "practical miner" by the president of the state union and the editor of its journal [15]. Hayes urged the commission to hear testimony from a variety of persons [13].

12. [36, p. 92]. Roy sampled the atmosphere of three mines where workmen complained of foul air. Analysis at the Cleveland Medical College showed that each sample was incapable of supporting life [26, pp. 55-92].

13. [7]. A sympathetic Columbus newspaper commented, "An Avondale disaster may furnish an argument before another winter" [47].

14. [14 and 17]. The *Reports* were published separately and included in *Ohio Executive Documents*.

15. Roy and his supporters fought off an attempt in 1876 to remove him by expanding the office to include arbitration. He repeatedly spoke for a single-purpose agency [31 and 62]. When Richard M. Bishop was elected governor in 1877, in league with coal operators, he appointed James Poston as inspector. He made no visits, sued no firms, and even failed to submit an annual report for his second year in office. The miners' clamor helped bring Roy back into the Statehouse in 1880 [33, 35, and 37]. Poston was a local Democratic official involved in the development of mining in the Hocking Valley. See [38 and 34]. An empty file envelope in his papers suggests that Governor Bishop was interested in stopping litigation to enforce the mining law.

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