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REPORT OF THE STATE BUREAU OF MINES
DENVER, U. S. A.

HARRY A. LEE, COMMISSIONER

C. N. CROWDER, } INSPECTORS
E. H. NYE, }

COLORADO



FOR THE YEAR 1898

REPORT OF THE STATE BUREAU OF MINES
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FOR THE YEAR 1898

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1895

LETTER OF TRANSMITTAL.



Bureau of Mines,
State of Colorado.

TO HIS EXCELLENCY,
ALVA ADAMS,
GOVERNOR OF COLORADO.

Sir—I have the honor to transmit herewith the official report of the operations of the State Bureau of Mines for the year ending November 30, 1898.

Respectfully submitted,

HARRY A. LEE,
Commissioner of Mines.

Denver, Colorado, January 1, 1899.



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THE BUREAU OF MINES.



The Bureau of Mines as now constituted is entitled to a report of "not more than one hundred pages," nor to exceed "two hundred and fifty copies." This prescribed limit will only permit of the treatment of subjects allied to the mining industry in a general way, which means a repetition in brief of what has been before compiled. The total number of copies permitted to be published (two hundred and fifty) will barely supply the demands of the incoming legislature and state officers. For these reasons the present report will be brief and largely confined to subjects deemed worthy of consideration by the members of the twelfth general assembly.

STATUS OF THE OFFICE.

The establishment of a department to be known as "The Bureau of Mines of the State of Colorado" by the tenth general assembly, approved March 30, 1895, was a somewhat tardy recognition of the mining industry of the state. While previous attempts had been made by former legislatures, the different acts were made inoperative through various causes that need not at this time be enumerated. Following the establishment of the Bureau of Mines as now constituted, the status of the office was attacked through the state board of equalization at its meeting in September, 1895. The state auditor, complying with the recommendations of said board at said meeting, suspended the appropriation provided for the maintenance of the bureau.

Article XVI., section 1, of the Constitution of the state of Colorado reads as follows:

"Article XVI., section 1. There shall be established and maintained the office of Commissioner of Mines, the duties and salaries of which shall be prescribed by law. When said office shall be established, the governor shall, with the advice and consent of the senate, appoint thereto a person known to be competent, whose term of office shall be four years."

Acting upon the theory that the establishment of the bureau was in pursuance of a constitutional mandate embodied in section 1, article XVI., of our Constitution, as above quoted, mandamus proceedings were had by the Commissioner of Mines against the state auditor in the district court. The decision of said court was in favor of the Bureau of Mines and in effect the auditor was thereby commanded to recognize the constitutional character of the office and to duly audit its accounts.

An appeal from this decision was taken to the supreme court, where it was discussed and affirmed in the following language:

"In the case of Harry A. Lee, Mining Commissioner, it appears that the office was created in pursuance of a constitutional mandate; that when the incumbent was appointed he became, by virtue of the constitution, a member of one of the three departments of the government, and as such was entitled to have his salary and those of his assistants, etc., paid by the state as part of the expenses of such departments, without reference to the date at which the act took effect. * * * In the case of the Mining Commissioner, the judgment of the district court is affirmed."

The above decision of the supreme court makes the Bureau of Mines a constitutional office and the Commissioner of Mines a constitutional officer and a "member of one of the three departments of government." The abolishment of a constitutional office may only be accomplished by constitutional amendment. Whether or not the framers of the state Constitution acted wisely in attempting to provide for the mining industry of Colorado, whether or not the mining industry is of sufficient importance to the state to be worthy of recognition; whether or not this recognition through the Bureau of Mines, its legal agent, should be of a character substantial enough to insure

efficiency and the building up of the mining industry, and indirectly the state at large, are questions respectfully submitted to the consideration of the twelfth general assembly.

ACKNOWLEDGMENTS.

Acknowledgment of the courtesy and public spirit of the Colorado railroads in furnishing transportation for the officers of the bureau is made herewith. No provisions having been made for transportation by the statute establishing the bureau, the results attained by the department are largely due to the liberality of the Denver and Rio Grande, Gulf, Union Pacific, South Park, Florence and Cripple Creek, Midland Terminal, Midland, Atchison, Topeka and Santa Fe, Silverton, Rio Grande Southern, Rio Grande Western, Rock Island, Burlington and Missouri, and Missouri Pacific railroad companies.

The Colorado Telephone Company has, with usual liberality, given the bureau a frank, "good on all lines." This, with its extensive service throughout the state, has been invaluable and enabled the bureau to take immediate action upon many matters.

The bureau is under additional obligations to Dr. William P. Headdon, of Fort Collins, for the determination of a number of minerals forwarded him for that purpose.

The following papers and periodicals have been forwarded free to the library of the bureau during the past year, and to the editors and publishers of the same the bureau is greatly obligated:

The Ophir Mail, the Loveland Reporter, the Loveland Register, the Ouray Herald, the Boulder News, the Fort Collins Express, the Fort Collins Courier, the Saw Pit Hammer, the Gunnison Tribune, the Leadville Herald-Democrat, the Leadville Miner, the La Plata Miner, Mining Gazette, Weekly Register-Call, the Silver Lance, the San Miguel Examiner, Silverton Weekly Miner, Summit County Journal, the Como Record, the Evening Telegraph, Colorado Springs; the Rocky Mountain

Herald, Denver; the Denver Republican, the Rocky Mountain News, the Denver Times, the Evening Post, the Daily Mining Record, the Engineering and Mining Journal, New York; the Mining Investor, Colorado Springs; the United States Investor, Boston; the Inter-Mountain Mining Review, Salt Lake City; the Mining Journal, London; the Mining and Scientific Press, San Francisco; American Manufacturer and Iron World, Pittsburg; New Zealand Mining Record, Wellington, N. Z.; Mines and Minerals, Scranton; American Inventor, Washington, D. C.; Mining Industry of Great Britain, London; the Western Miner and Financier, Denver; Ores and Metals, Denver; Anglo-American Mining Guide, London; the Lake City Phonograph.

In addition to the above, the atlases and reports of the United States Geological Survey, issued during 1898, have been added to the library.

STATEMENT.

Bureau of Mines for 1897-1898—

To appropriation for Commissioner of Mines, inspectors (2), salaries, clerical help and expenses	\$17,103 49	
By vouchers filed with state auditor.....		\$17,092 49
By unexpended balance.....		11 00
	<u>\$17,103 49</u>	<u>\$17,103 49</u>

APPOINTMENTS.

On June 1, 1897, Louis N. White, of Ouray county, and Frederick H. Nye, of El Paso county, were appointed inspectors.

On December 1, 1898, Louis N. White resigned and Charles N. Crowder, of Pitkin county, was appointed to fill the vacancy thus created.

THE MINERAL COLLECTION.

The first duty prescribed by the statute establishing the bureau provides that the Commissioner of Mines shall collect specimens of mineralogical and geological interest, mark, arrange, classify and record same, and that such collections made shall be opened to public inspection, examination and study. Notwithstanding the meagre appropriation of \$1,000.00 made by the tenth general assembly for the years 1895-1896, to defray the general expenses of the office of the bureau, and the failure of the eleventh general assembly to make any appropriation to this end whatever, the Commissioner of Mines, through the energy of his able assistants and the generosity of the mine operators, has been able to gather together a collection now recognized as one of the "points of interest" to visitors to the capital city.

The arrangement of the collection appears to meet the desires of the scientist, miner and sightseer alike. In the centre of the rooms the flat cases contain the well known scientific collection of Dr. John Elsnor, and additions of the officers of the bureau, all arranged to conform to Dana's latest system of mineralogy. Around the outer walls are uniform, handsome wall cases, displaying the economic ores of the various counties. These wall cases are surmounted by panoramic pictures of the various leading mining centres of the state. The whole produces a pleasing effect and affords visitors an opportunity to follow their own inclination in research for both pleasure and profit.

The flat show cases in the mineral exhibit were purchased by the state board of capitol managers. The wall cases were donated to the state by the various counties through their commissioners. The panoramic pictures are donations from both county and city boards, or loyal residents of the different counties. In addition to those donated, Col. S. K. Hooper, of the Denver and Rio Grande Railroad, has with his usual liberality loaned the bureau a number of views, that not only add

much to the department but aid materially in giving a correct idea of Colorado scenery.

In Colorado, a mineral collection can not at the present time of mining activity reach either perfection or completion; but with care it can be gradually extended and the standard of excellence constantly elevated. During the past year 2,734 specimens have been added to the collection. Much more could have been done had only funds sufficient to meet expenses of packing and transporting been available. A large proportion of the specimens added during the past year has been received from visitors, who, after a critical examination of the collection, evidence their approval by contributing to same. To all those who have in this manner shown their interest and approval, the bureau desires to express its high appreciation and thanks.

During 1898, four additional county wall cases have been added by the county commissioners of Lake and Fremont counties, acknowledgment of which is herewith made.

The following letter is self-explanatory:

“Denver, Colo., November 19, 1898.

“To His Excellency,

“ALVA ADAMS,

“Governor of Colorado.

“Sir—I have the honor to report that agreeable to your request of June 1, a large portion of Bureau of Mines collection was removed from this department, and same was placed upon exhibition at the Trans-Mississippi exposition at Omaha from June 15 to November 1, inclusive, being at all times under the supervision of this department. That the same has been returned to this department, free from incumbrance, without loss or damage, and will soon be reinstalled in its proper place. The mineral collection was awarded a medal for all entries made, among which was a gold medal for the best exhibit of ores and minerals.

“Respectfully submitted,

(Signed)

“HARRY A. LEE,

“Commissioner of Mines.”

In order that a good collection might be maintained at this office as well as at Omaha, a number of choice specimens were

borrowed, acknowledgment of which is herewith made. Among those who responded to this request were:

John A. Porter, Smuggler-Union mine.....	Telluride
N. T. Mansfield.....	Telluride
F. D. Margowski.....	Telluride
David Swickhelmer.....	Telluride
Edward I. Field.....	Telluride
The Haberl Lapidary and Jewelry Company.....	Denver
W. J. Chamberlain.....	Denver
George Bell.....	Denver
J. H. Porter.....	Denver
Charles A. Keimly.....	Denver
Dr. John Elsner.....	Denver
H. M. Orahoad.....	Denver
George Taylor.....	Denver
Colorado Fuel and Iron Company.....	Denver
Denver Fire Clay Company.....	Denver
John Campion.....	Denver
Denver Onyx and Marble Company.....	Denver
Jackson & Smith.....	Denver
Howard F. Pierson.....	Denver
Syl T. Smith.....	Denver
Denver and Rio Grande Railroad Company.....	Denver
Union Pacific, Denver and Gulf Railroad Company.....	Denver
Samuel Field.....	Anaconda
Samuel McDonald.....	Cripple Creek
Elkton Cons. M. and M. Company.....	Cripple Creek
W. S. Montgomery.....	Cripple Creek
Gold Coin Mining Company.....	Victor
Mollie Gibson Consolidated Mining Company.....	Colorado Springs
W. S. Stratton.....	Colorado Springs
C. H. Pearce.....	Aspen
D. R. C. Brown.....	Aspen
J. M. Downing.....	Aspen
J. F. McMillan.....	Aspen
E. M. Rodgers.....	Aspen
George W. Crowe.....	Breckenridge
F. W. Fuller.....	Irwin
The Cerussite Mg. Company.....	Custer County
Dr. W. W. Rowan.....	Ouray

State School of Mines.....	Golden
Little Jonny Mine.....	Leadville
Guy Fairhurst.....	Boulder
J. A. Spaulding.....	Boulder
Mrs. A. D. Clemmer.....	Boulder
F. L. Bartlett.....	Canon City
Colorado Onyx Company.....	Steamboat Springs

In no instance was a request from the bureau for specimens refused, but in all cases from past experience doubts as to their return were freely expressed. Receipts from the bureau were issued for all specimens borrowed, and it is very gratifying to be able to report that all specimens so kindly loaned have been duly returned, and without exception received with the declaration, "the first specimens I ever got back."

The Colorado collection at Omaha covered 1,000 square feet of floor space, and all districts of the state were represented and so arranged that ores or minerals from any section could be pointed out upon request. This collection was under the immediate charge of Harry C. Smith, of Denver, a graduate of the State School of Mines at Golden, who with two assistants looked after the welfare of the collection both day and night.

In the competition for awards, twenty-eight entries were made by Colorado, and the following return was made by the jury of awards:

Colorado State Bureau of Mines, gold medal, for best consolidated exhibit and display of minerals and ore and installation.

Colorado Onyx Company, silver medal, for polished and dressed onyx.

W. S. Stratton, silver medal, for calaverite "Telluride of Gold" from Independence mine.

Denver Onyx and Marble Company, silver medal, for marble and onyx.

Denver Fire Clay Company, gold medal, for fire clay products.

Colorado Fuel and Iron Company, gold medal, for consolidated exhibit of coal, coke, iron ore and manufactured iron.

Harry A. Lee, bronze medal, for fossils.

F. W. Fuller, bronze medal, for breccia containing ruby and brittle silver.

J. A. Spaulding, bronze medal, for sylvanite from Lady Franklin mine.

W. S. Montgomery, bronze medal, for free gold in fluorite from the Hull City placer.

Hon. J. M. Downing, bronze medal, for wire silver.

Jackson & Smith, silver medal, for water color photographs.

Howard F. Pierson, silver medal, exhibit of photographs finished in oil.

Mrs. H. A. Lee, silver medal, for wire silver and ruby silver.

Mrs. A. D. Clemmer, silver medal, for sylvanite.

Dr. John Elsner, silver medal, for Colorado minerals.

Guy Fairhurst, silver medal, for sylvanite specimens from Graphic mine.

Elkton Gold Mining Company, silver medal, for gold-silver tellurides, from the Elkton mine.

Mollie Gibson Mining Company, silver medal, for native silver nugget from the Mollie Gibson mine.

F. M. Wood, silver medal, for gold-silver tellurides from the Gold Coin mine.

Hon. Syl T. Smith, silver medal, for sylvanite specimens, showing cross of gold raised on surface with blow pipe.

John A. Porter, silver medal, for free gold in quartz from Smuggler-Union mine.

John Campion, silver medal, for display of native gold from the Little Jonny mine.

F. L. Bartlett, silver medal, for exhibit of the Bartlett concentrator.

Horace B. Patton, silver medal, for zeolites.

J. G. Hiestand, silver medal, for polished azurite and malachite.

Haberl Lapidary and Jewelry Company, bronze medal, for gems cut and polished.

James T. Hayward, gold medal, for working model of gold mine.

It may be safely asserted that at no exposition has the mineral wealth of the United States been so satisfactorily shown. The display would not compare with the World's Fair in magnitude, but as a whole was of a higher standard of excellence. All of the western states and territories were well represented and the decision of the jurors was a matter of no little uncertainty during the pending of their findings. That Colorado was successful is first due to the liberality of loyal citizens who advanced the funds necessary to meet contingent expenses of exhibit, and next to the tenth general assembly in ordering a mineral collection made and providing for its display at expositions either within or without the state.

Attention is again respectfully called to section 19 of the statute creating the bureau, which reads as follows:

"Sec. 19. The mineral specimens heretofore collected by the bureau of immigration and statistics and the World's fair commissioners, are hereby transferred to the custody of the Bureau of Mines."

This section refers to the collection of ores exhibited at the St. Louis exposition, and later loaned to the Pueblo mineral palace at Pueblo. This collection did contain a large amount of valuable material, and should be added to the present mineral collection.

The following extracts from the minutes of a meeting of the board of World's Fair managers, held in the office of the governor at 1:30 p. m., June 1, 1891, are self-explanatory:

"Present Governor John L. Routt, A. B. McKinley, J. A. Thatcher and O. C. French. The secretary read a communication from John Livezey, secretary of the Colorado mineral palace, dated Pueblo, Colorado, May 25, 1891, 'making application for the use of ores and specimens which were collected by the different counties of Colorado for the St. Louis exhibit.' After full discussion of the matter, the following resolution was offered by Mr. Thatcher and unanimously adopted:

"Resolved, That the secretary is hereby instructed to inform Mr. John Livezey, secretary of the Colorado mineral palace at Pueblo, that the ores and specimens now stored in Denver, known as the St. Louis exhibit, are yet under control of the state bureau of immigration; that before the World's fair board can receive them, it will be necessary to

classify them and check them off with the records of the state bureau, and that this board is unable to provide for the taking over of said exhibit at this time, owing to the fact that no part of its appropriation has yet been paid over.

"And that the secretary in said communication is further authorized to propose to the Colorado mineral palace that if it will defray all the expenses of all the necessary employés in opening, classifying and arranging the said St. Louis exhibit in the warehouse where the same is now stored, in shipping it to Pueblo, in caring for it while on exhibition and returning it to Denver to this board, that said exhibit may be displayed on such terms."

The above proposition was accepted by the officers of the mineral palace, and the collection removed and arranged in the building of the mineral palace company at Pueblo.

In pursuing this matter, the services of an attorney were required to look up the condition and ownership of the mineral palace, and the courtesy extended the bureau by Hon. W. L. Hartman, of Pueblo, is here acknowledged, the following being self-explanatory:

"Pueblo, Colorado, March 21, 1896.

"HON. HARRY A. LEE,

"Commissioner of Mines, Denver, Colorado.

"Dear Sir—In answer to your favor of the 18th inst., will say that I have just concluded examination of the records and making inquiries regarding the mineral palace property, and especially the exhibits.

"I find that a deed of trust was given on the real estate only and the franchises to the Stockgrowers' National bank, April 1, 1891, recorded in book 107, page 208, to secure an issue of bonds amounting to \$50,000. This deed of trust was foreclosed and conveyed to John T. Higgins by trustee's deed, dated June 4, 1894, recorded in book 155, page 259. It simply conveys the real estate by proper description, and the franchises to the company. A careful examination of the indexes fails to show that any mortgage or other lien or conveyance of exhibits, or of any personal property of the company, was ever given by The Mineral Palace Company.

"Mr. John T. Higgins died about a year ago and, though the real estate still stands of record in his name, we are reliably informed that he gave a declaration of trust at the time he received the title, and afterwards executed a deed. We understand that the property is now really owned by the First, the American, the Pueblo and the Stockgrowers' National banks, or possibly by the officials of those banks; and they claim to own all the specimens and exhibits, with

a few exceptions of minor importance. These we understand are cabinets of specimens belonging to individuals. Mr. D. R. Green, president of the Pueblo National bank, is in charge and control of the property.

"I will be glad to be of any service to you.

"Very truly yours,

(Signed)

"W. L. HARTMAN."

The bureau respectfully recommends that the honorable attorney general be directed to bring suit, if necessary, to recover this collection and enforce the contract upon which the same passed from the immediate control of the state.

INSPECTION.

Acknowledgment is here made of the uniform courtesy extended the inspectors in the discharge of their official duties by mine owners throughout the state.

The policy of the bureau to discharge the duties of inspection without a useless display of authority, and in a manner least liable to retard the regular work of the mine being inspected, is still continued. The examination of shafts and other parts compel temporary stops, which has in every instance been cheerfully complied with. The practice of refusing to make statements about mines or districts for publication is still adhered to. This course meets the hearty approval of mine owners inclined to run their own affairs without the advice or consent of the general public; but is as heartily disapproved by mine owners who desire the officers of the bureau to give their holdings publicity by interviews and unofficial utterances to the press.

Numerous complaints are filed by miners, specifying properties and alleging unsafe conditions. As a rule these complaints request that their names be not divulged through fear of being discharged. Investigation demonstrates that while a few of these complaints are well founded and signed by *bona fide* miners, the majority are signed with fictitious names, are wholly unfounded and evidently emanate from parties hoping to use the bureau for working a hardship upon the mine owner.

From the letters it is impossible to determine whether the complaint is one of merit or not. While the miner is entitled to be protected by the bureau, the bureau is likewise entitled to protection from the alleged or revengeful miner.

In large mining plants, inspection is more often requested than resented. In small mines, however, opposition to alleged "official interference" is often encountered. This is especially true upon mines let or rented out in portions to lessees. For a lessee to take a "block of ground," abandoned by the mine owner through inability to make same yield a profit, and not only make it yield wages but in addition enough more to pay rental or "royalty," does not augur well for safety. To accomplish this, the lessee must do more work per shift, work more hours, or neglect the outlay in material and labor essential to safety. Investigation shows the latter to be the universal rule, and that men of long experience assume risks when working for themselves that are criminal.

The work under control of "lessees" or "tribute workers" is the great source of improper mining and, as a natural result, accidents. The responsibility for accidents to employés of lessees is a matter under present laws not easily determined. The question of whether the lessee or the lessor is responsible for accidents occurring is often propounded to the bureau. Where consulted by the lessor prior to making a lease, a stipulated contract, detailing the requirements for safety and the avoidance of the general term "all work to be done mine fashion and in workmanlike manner" has been advised. This question is one of vital importance to lessee, lessor and employé, and should receive careful attention and revision at the hands of the legislature.

Systematic mine inspection is greatly retarded by the investigation of accidents. At no time since the establishment of the bureau have its officers been able to take up a camp, district or county and finish it up systematically. With only two inspectors to inspect mines and investigate accidents, as much time is consumed in travel from camp to camp as in systematic field work. The result is not only unsatisfactory but is also

false economy. Both inspection to prevent and investigation to ascertain the cause of accidents are essential, but two inspectors can not cover the state and do both. The efficiency of the bureau could be greatly added to by empowering the Commissioner of Mines to appoint local inspectors when deemed necessary to examine into, investigate and report upon accidents, allowing them a per diem for services. With the bureau thus equipped, the regular inspectors could pass from county to county and systematically inspect all working mines, and thereby make efficient the work of this branch and reduce very materially the number of casualties.

The following is a summary of recommendations made by the inspectors during 1898 for the protection and safety of employés:

Regarding explosives.....	319
Regarding timbering.....	236
Regarding ladders and plats.....	143
Overloading with men.....	84
Place guard rails at shaft.....	52
Place guard rails at winzes.....	27
Trap doors to shaft.....	25
Partition off man-way to shaft.....	28
Exits	72
Sanitary conditions.....	18
Connection for air.....	54
Fire protection.....	204
Total	1,362

NUMBER OF MEN EMPLOYED AND ACCIDENTS, 1898.

ACCIDENTS.

County.	Men Employed.	Fatal.	Non-Fatal.	Total.
Arapahoe	1,604	....	....	....
Archuleta	23	....	....	....
Boulder	1,687	5	7	12
Chaffee	722	1	3	4
Clear Creek.....	1,816	5	11	16
Conejos	7

REPORT BUREAU OF MINES.

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County.	Men Employed.	Fatal.	Non-Fatal.	Total.
Costilla	85
Custer	363
Dolores	414	2	3	5
Douglas	86	....	....	....
Eagle	241	1	1	2
El Paso.....	5,764	38	63	101
Fremont	395	....	....	....
Garfield	12	....	....	....
Gilpin	2,517	11	23	34
Grand	53	....	....	....
Gunnison	624	1	3	4
Hinsdale	397	1	1	2
Huerfano	11	....	....	....
Jefferson	37	....	....	....
Lake	3,780	10	17	27
La Plata.....	419	....	2	2
Larimer	92	....	....	....
Las Animas.....	17	....	....	....
Mesa	12	....	....	....
Mineral	867	2	4	6
Montrose	22	....	....	....
Montezuma	55	....	....	....
Ouray	1,214	4	7	11
Park	374	1	2	3
Pitkin	1,363	4	14	18
Pueblo	1,712	....	....	....
Rio Blanco.....	14	....	....	....
Rio Grande.....	156	....	....	....
Routt	124	....	....	....
Saguache	247	7	7	14
San Juan.....	1,087	3	4	7
San Miguel.....	1,344	5	11	16
Summit	474	7	1	8
Total	30,231	198	184	232

ACCIDENTS PER 1,000 MEN EMPLOYED.

PROPORTION PER 1,000 MEN.

County.	Fatal.	Non-Fatal.	Total.
Arapahoe .....	....	....	....
Archuleta .....	....	....	....
Boulder	2.96	4.14	7.11
Chaffee	1.38	4.15	5.54
Clear Creek.....	2.75	6.05	8.80
Conejos .....	....	....	....
Costilla .....	....	....	....
Custer .....	....	....	....
Dolores	4.83	7.24	12.07
Douglas .....	....	....	....
Eagle	4.15	4.15	8.29
El Paso.....	6.59	10.93	17.52
Fremont .....	....	....	....
Garfield .....	....	....	....
Gilpin	4.37	9.14	13.50
Gunnison	1.60	4.80	6.41
Hinsdale	2.51	2.51	5.03
Huerfano .....	....	....	....
Jefferson .....	....	....	....
Lake	2.64	4.49	7.14
La Plata.....	....	4.74	4.74
Larimer .....	....	....	....
Las Animas.....	....	....	....
Mesa .....	....	....	....
Mineral	2.30	4.61	6.92
Montrose .....	....	....	....
Montezuma .....	....	....	....
Ouray	3.29	5.77	9.06
Park	2.67	5.34	8.01
Pitkin	2.93	10.27	13.20
Pueblo .....	....	....	....
Rio Blanco.....	....	....	....
Routt .....	....	....	....
Saguache	28.34	28.34	56.68
San Juan.....	2.75	3.68	6.43
San Miguel.....	3.72	8.18	11.90
Summit	14.74	2.11	16.87

CAUSE OF ACCIDENTS.

	Fatal.	Non-Fatal.	Total.
Caught between cage and side of drift.....	1	6	7
Caught in drum of hoist.....	2	1	3
Trying to get off and on bucket or cage at station while in motion.....	2	3	5
Material falling from overloaded bucket.....	..	3	3
Caught while unloading machinery.....	1	1	2
Machinery accidents.....	1	5	6
Cable of windlass rope broke, letting bucket down shaft.	2	5	7
Caught in chute with running ore.....	2	1	3
Struck with hammer by helper.....	..	2	2
Pushing car into open shaft and going down with same..	3	5	8
Pulling cage and bucket through sheave wheel.....	..	5	5
Suffocation, burning house at mouth of shaft.....	3	..	3
Suffocation, burning house at mouth of tunnel.....	3	..	3
Bad air from powder smoke	1	2	3
Falling from gravity tram bucket.....	2	1	3
Falling down shaft, caused by defective brake.....	2	4	6
Falling down ore chute.....	1	4	5
Falling down man-way from stope.....	..	2	2
Falling down shaft.....	5	1	6
Falling down upraises and winzes.....	3	5	8
Falling into ore bin with car.....	1	1	2
Falling from bucket while being hoisted.....	4	4	8
Falling from staging.....	4	10	14
Falling from ladder.....	7	8	15
Material falling down shaft.....	5	6	11
Falling rock and earth.....	4	12	16
Falling rock down man-way.....	..	6	6
Cave in of rock and earth, breaking timbers.....	11	4	15
Overloading and breaking staging.....	2	8	10
Falling rock in stope.....	2	3	5
Falling rock from drift and shaft.....	6	13	19
Falling timbers while timbering.....	..	2	2
Slide of ice and dirt.....	..	2	2
Caught in shaft while being hoisted.....	1	2	3
Thawing powder over candle.....	..	2	2
Thawing powder over stove.....	..	2	2
Thawing powder over hot sand.....	..	1	1

	Fatal	Non-Fatal	Total
Picking out missed shots.....	5	10	15
Drilled into bottom of old hole.....	2	7	9
Drilled into missed hole.....	4	6	10
Blast exploded while loading hole.....	6	4	10
Returned to see why shot did not go off when blast exploded	2	2	4
Trying to light too many holes.....	3	3	6
Remained too long after lighting and spitting fuse.....	1	3	4
Handling caps.....	..	6	6
Defective signals.....	2	..	2
Cause unknown.....	2	1	3
	108	184	292
Number of men employed in 1898.....	30,231		
Number of accidents investigated.....	292		
Proportion injured or killed per 1,000 men employed.....	9.658		
Proportion killed per 1,000 men employed.....	3.572		
Proportion injured per 1,000 men employed.....	6.086		

Attention is called to the fact that the above percentages are estimated upon the total number of men employed in mining and milling, i. e.: Workmen both above ground and under ground. Were these segregated, and the underground accidents reduced to percentage basis, the proportion of fatal accidents underground would be nearly six in every one thousand persons employed. From this it would appear that the occupation of metalliferous mining was even more dangerous than is generally supposed, or else that Colorado miners are wantonly sacrificed.

Authoritative metalliferous mining statistics compiled for a number of years in Great Britain, Germany and other countries show the death rate per annum (from accidents), per 1,000 persons employed, to vary from 1.07 to 1.79. Colorado's record as compared with this is certainly odious. The only apparent reason is that in the foreign countries above mentioned mining is conducted under rather stringent laws regulating same. In Colorado, custom is the only law and public censure about the only penalty.

Metalliferous mining is properly classed as a hazardous business, and immunity from death can not be attained through legislative enactments. The death rate, however, can be materially reduced and many lives saved by the enactment of a set of regulations defining as near as possible the duty of the mine owner, the duty of the miner, the responsibility of mine owner, the responsibility of the miner, what the miner owner shall and shall not do, and what the miner shall and shall not do.

Colorado has so long mined ad libitum that any governmental restriction will be resented by many as interference with personal rights. The right of the legislature to interfere is, however, too well established to require argument. The duty of the legislature to interfere is apparent and necessary upon the score of humanity, and it can, by proper legislation, so equip the Bureau of Mines that many lives will be saved each year.

It is not the desire of the bureau to recommend a number of legal provisions that will in any manner deter legitimate mining, but it is the desire and the duty of the bureau to recommend such provisions that the small operator and miner, when operating for themselves, upon their own property or as lessees, shall be compelled to follow practices demanded by them of large companies when working for same for day's wages. As a rule large corporations look well after the safety of their employés. This is in no manner to be construed that large companies are philanthropists or worry about the welfare of their employés. Experience has demonstrated that the safety of employés is one of the great factors to financial success in mining, and mainly for this reason safety appliances and stringent rules are enforced by the larger operators. Carelessness, not ignorance, is the cause of at least ninety per cent. of all accidents that occur, and lack of discipline breeds carelessness upon the part of both the miner and the management.

Regulations that are deemed essential by private corporations can certainly work no hardship upon individuals. The Colorado field for mining is so extended and the number of small properties operated so large that a visit to all each year

by an officer of the bureau, as the same is now constituted, is a physical impossibility. It is, therefore, essential that regulations, with penalties attached, be enacted so that all may be compelled to coöperate and each contribute their proportion to safety in mining.

To the end, therefore, that the Bureau of Mines may do more toward promoting safety in mining, and be made a more useful agent in advancing the material welfare of the state, the following recommendations are respectfully submitted:

RECOMMENDATIONS.

Providing for the storage of explosives in a magazine provided for that purpose alone. Said magazine to be far enough from works to insure safety in event the entire stock in magazine be exploded; restricting the amount of explosives removed from magazine for use to a quantity not in excess of requirements for one shift's work; not permitting the storage of powder underground where men are employed; requiring a suitable device for thawing or warming powder; prohibiting the storage of caps, fuse, oils, candles or other combustible substances in same magazine with explosives; requiring that magazines bear in letters not less than eight inches the word "Explosives" or "Powder;" and providing a severe penalty for failure to comply with any of the provisions.

Providing the Commissioner of Mines with authority to regulate and limit or remove the amount of explosives kept in or adjacent to general supply stores in places where there is no municipal or other laws governing the storage of same, and providing a penalty for failure to comply with orders given.

Providing for the storage of oils, candles and other inflammable materials in a building or magazine erected for that purpose alone at a safe distance from powder magazine, and at a safe distance from the main buildings. Said materials to be removed for use in quantities sufficient for a day only, and providing a penalty for non-compliance.

Providing a severe penalty for the use of any steel, iron or metal tamping bar in charging a hole with nitro-powder or other high explosives. Said penalty to be visited upon the miner for using same and also upon shift boss, foreman, superintendent, manager or mine owner for permitting use of same. The Commissioner of Mines shall upon receipt of information order same stopped and begin suit immediately.

Providing that all hoisting plants operated by any motive power and used for hoisting and lowering employé's shall be equipped with a positive indicator, with penalty for non-compliance.

Providing a penalty for employing as engineer upon a hoisting plant where employé's are handled any person under eighteen (18) years of age.

Providing a penalty for an engineer, mine superintendent or owner, who shall hoist or lower or permit to be hoisted and lowered more than one cage or skip at one and the same time, when said cage or skip is loaded with employé's.

Providing, under penalty, for a person known as "cager," when hoisting material from two or more levels. The duties of the cager shall be to load and unload all cages and skips at the different levels and give all signals to the engineer.

Providing penalty for miners riding and for owners or managers for permitting miners to ride upon any cage, skip or bucket loaded with tools, timber or powder, except for the purpose of assisting in passing same through the shaft and then only upon special signal.

Providing penalty for all persons giving false signals or riding upon cage, skip or bucket upon signals that designate to the engineer that no employé's are aboard.

Empowering the Commissioner of Mines to establish a uniform code of mine signals and enforce their use under penalty.

Providing that all shafts sixty (60) feet deep and over, equipped with hoisting machinery, shall be divided into at least two compartments, one of which shall be used for a ladder-way.

The ladders to be inclined at most convenient angle, with landings not more than twenty-five (25) feet apart.

Providing that all mines having but one exit, and the same covered with a building containing a mechanical plant, furnace room or blacksmith shop, or all, shall have fire protection.

Providing that all shaft collars be properly housed, and when cages are used the same shall be equipped with safety clutches and covered with steel hood or bonnet not less than three-sixteenths (3-16) of an inch thick.

Providing that hereafter all shafts equipped with buildings and machinery, with but the shaft for exit, shall be divided into at least two compartments. One of which shall be tightly partitioned off and used as a ladder-way, as heretofore provided for. Further, that said ladder-way be securely bulk-headed at a point at least ten (10) feet below the collar of the shaft, and that below this bulk-head a drift be run to surface, if on side hill, or well outside the buildings and upraised to surface, if upon a level. Providing, further, that said ladder-way and landings shall be at all times in good repair and afford easy mode of escape in event of fire.

Providing that tunnels or adit levels, having no other exit, shall at safe distance from mouth of tunnel upraise to surface and thus afford a means of exit in case of fire destroying buildings over mouth of tunnel.

Providing for chain or other kind of ladder that shall be at all times within reach by men in sinking shafts, and providing penalty.

Providing all stations or levels with passage way around working shaft, so that crossing over the working compartment can be avoided. Equipping all shaft stations with guard rails around shaft so arranged as to prevent persons from walking into shaft. Where levels open up direct from working shaft and loaded and empty cars are pushed direct from the level into the cage, the said levels shall be equipped with an additional safeguard or "dead-man" across the track or tracks, so arranged that cars can not of their own accord run into the shaft or a

trammer push car into the shaft without first lifting up said "dead-man" and guard rails at shaft. A severe penalty should be provided for mine operators who refuse to so equip their mines, and this penalty should extend to the trammer or any other person who fails to drop guard rails and keep "dead-man" in place.

Prohibiting stoping up to a shaft and providing for a pillar to be left that will insure the safety of the shaft, with penalty.

Providing a penalty for failure to cover and securely fence all non-operative shafts, pits, cuts or other excavations that endanger life of man or beast.

Providing a severe penalty for any person or persons removing or destroying any covering or fencing placed around any shaft, pit, cut, etc., by the owners.

Providing a severe penalty for any wilful misrepresentation to any officer of the Bureau of Mines with intent to mislead said officer in drawing conclusions regarding safety of property under consideration.

Providing that strangers or visitors be not permitted under ground in any mine, unless accompanied by an owner, manager or authorized agent.

Providing, with penalty, that all owners, agents, lessees or managers operating any metalliferous mine, mill or reduction works in which more than two men are employed, shall report same to the Bureau of Mines. Blanks for said report shall be furnished upon application, but same shall contain the date when work commenced and when stopped each season, with number of men employed and total days worked. Said report to be filed on or before December 1 of each year, and shall show the name of the owner, manager and lessee, if any, name of claim or plant, county and mining district, together with men employed directly or indirectly, the same being classified to their several vocations.

Providing, with penalty, for a set of working maps, both plan and section, to be compiled at least once every six months

by a competent mining engineer, and in the event of indefinite abandonment, tracing of maps brought up to date of closing mine to be filed with the Bureau of Mines.

Providing for the rate of speed at which employés shall be hoisted from and lowered into the mine, with penalty attached.

Providing for the posting of a notice stating the maximum number of employés permitted to ride up or down at any one trip, and making all employés, as well as the owners, liable to a severe penalty for violation of notice.

Empowering the Commissioner of Mines and inspectors to appear at coroner's inquests, and if deemed necessary, to call, examine and cross-examine witnesses and to exercise such other powers as are necessary for carrying the act into effect.

Fixing a time when such portion of these recommendations as may be enacted into law shall go into full force and effect.

Providing the Commissioner of Mines with power to alter or annul such general rule as shall, upon investigation, show clearly to be detrimental to that particular plant, and to promulgate such additional special rules as may be shown necessary to protect life. Said changes and special rules to be reported in detail to each incoming legislature for consideration or enactment.

Providing a general penalty for non-compliance with the provisions of the act and stipulating that all the fines paid shall be credited up to the Bureau of Mines' fund, and the same to be used to defray the general expense of the department.

Authorizing the secretary of state to provide a seal for the Bureau of Mines.

Empowering the Commissioner of Mines to appoint special assistants for specific duties, when appropriation to meet expense of same is available.

Directing the Commissioner of Mines to report to the governor biennially and transmit copies of same to the general assembly at each biennial session.

Providing for the printing of at least one thousand (1,000) copies of said report, without limitation as to number of pages, and further authorizing the Commissioner of Mines, with the consent of the governor, to publish additional bulletins when appropriation to meet expense is available.



