The Colorado State Mining Bureau

BULLETIN NO. 1

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THE

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DENVER, JANUARY, 1896.

RECOMMENDATIONS

FOR

Safety Appliances in Mining

BY HARRY A. LEE,
Commissioner of Mines.

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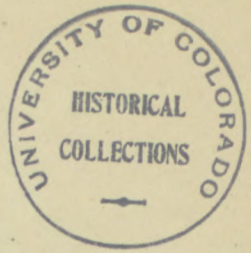

Bureau of Mines, Colorado,
Denver, January 6, 1896.

To His Excellency,
ALBERT W. McINTIRE,
Governor of Colorado:

Sir—I have the honor to transmit herewith Official Bulletin No. 1, entitled, "Safety Appliances in Mining." The object of the bulletin being to save human life, its importance need not be urged. The great number of mines being operated throughout the State precludes the possibility of personal inspection within a limited time by the officers of this bureau with its small force. It is therefore necessary that mine operators be reached by other methods; that they be made conversant with what safety devices and appliances this bureau demands; and further, that they be assured these demands will be enforced.

The uniform courtesy extended by the mine managers to the officers of this bureau in its labors up to date; the readiness with which all recommendations made have been complied with, are good grounds for the assumption that all who are not strictly complying with the requirements of this department will do so immediately upon receipt of this bulletin.

Respectfully yours,

HARRY A. LEE,
Commissioner of Mines.

BULLETIN No. 1.

The bill establishing the Bureau of Mines, in accordance with the constitutional edict, provides that the officers of this department "Shall inspect and determine the safety of devices and methods used in mining" * * * and "take necessary measures to make them safe." * * * "On receipt of notice * * * shall inquire into the cause of accidents." "Shall exercise sound discretion in the enforcement" of the act; shall give notice of any defect or practice found "to be dangerous," and "order the same to be remedied." It further provides a penalty for non-compliance with such orders and imposes a mandatory duty, viz.: "Any owner, agent, manager or lessee having charge or operating any metalliferous mine, whenever loss of life or serious accident shall occur connected with the workings of such mine, shall give notice immediately and report all facts thereof to the Commissioner of Mines."

Believing that all mine operators desire to strictly comply with legal requirements; to avoid fatal accidents and throw every safeguard around their employes, the following recommendations are made and an early compliance therewith expected:

EXPLOSIVES.

Explosives must be stored in magazine provided for that purpose alone. Said magazine to be placed far enough from working shaft, tunnel or incline to insure their remaining intact in event the whole stock exploded.

All explosives in excess of amount required for a shift's work must be kept in the magazine. Under no conditions will the storage of powder in underground workings where men are employed be permitted.

Each mine must have a suitable device for thawing powder and keeping it in condition for use. The water or steam bath is the only absolutely safe device. By a water bath is meant the surrounding of the vessel containing the powder with another vessel containing water which can be kept at desired temperature. The thawing of powder with dry heat is unsafe. Dry heat, under the most favorable conditions, may exceed a temperature of safety.

Miners should not be permitted to carry powder in their boot legs or elsewhere about their person. A suitable place or places should be provided for preparing charges. At these points there should be a box or cupboard for caps and fuse. This should be securely fastened and so arranged that the caps cannot be jarred out or anything fall into the caps. A cap-crimper should be attached to the side of the cupboard with a small chain.

OILS, CANDLES, ETC.

The storage of oils, candles and other inflammable substances demand the erection of a house for that purpose and at a safe distance from the main buildings. They must not be stored with the explosives. Their removal for use, like the explosives, should be only in such quantities as are necessary to meet the requirements of a day.

FIRE PROTECTION.

All plants using steam, and especially small ones where boiler, engine, blacksmith shop and shaft are all under one roof, must have a hose and hose connection to injector or feed pump and keep same ready for instant use. The line of hose should be sufficient to reach the furthest point of the plant. As a rule the water supply in small plants is limited and safety is largely dependent upon quick action. A few hand grenades hung about

the plant in convenient places are great safeguards and should be indulged in. Heating stoves placed in shaft houses should receive even more care in safety equipments than is common in dwelling houses.

TIMBERING.

Next to explosives, inadequate timbering causes more fatality than anything about a mine. The general inclination is the use of too frail and few timbers. No rule can be fixed for use of timber, the conditions must be met as they arise and economy in timbering lies in doing well what is done. Strange as it may appear, taking districts as a whole, the best-timbered mines are the most inaccesable and above timber line, and the poorest timbered mines are those located in the woods. Temporary work which endangers life is criminal, and mine operators who supply their timbermen with material below the standard asked for assume very grave responsibilities.

CODE OF SIGNALS.

1- Bell—Hoist (when not in motion).
1- Bell—Stop (when in motion).
1-1- Bell—Lower.
1-1-1--1 Bell—With care—Hoist (man on).
1-1-1--1-1 Bell—With care—Lower (man on).

Other signals to meet individual demands can be arranged, but the code in full must be plainly printed and placed in the engine room, at the collar of the shaft, and at each station or level, together with a notice and penalty for wrong or improper signals.

Wrong or improper signals should be treated vigorously. An employe ascending upon one bell or descending upon two bells should be discharged. In mines working more than one level, signal gongs or speaking tubes should be placed from level to level. The danger of an employe signalling the engineer without first knowing the location of cage or bucket is apparent. Where more than one level is being operated special signals from lower to higher levels should be estab-

lished. When established the stopping of an up-going cage or bucket should be abolished. To illustrate this point: A. signals to hoist from sixth to second level; as cage or bucket passes fourth level B. stops it. The engineer is at a loss to understand; before executing one he has received another order. Let this be repeated several times and he becomes nervous. A rattled engineer is a dangerous attachment. It should be borne in mind that one bell does not mean "hoist until stopped," but "hoist to surface." Down-going buckets, or cages, are always "slowed down" at each level, and can be stopped with impunity, but on up-trips no one knows what signal is being obeyed and should not interfere.

THE BELL LINE.

The bell line should be so constructed that signals can be sounded clearly and easily from any station. This essential device is much neglected and should receive more attention. A few iron shieve wheels or rollers so placed that the line will stand clear of timbers is often all that is required.

At stations or levels where the line is used from both sides of the shaft, an attachment should be made so that reaching across the shaft for the line is unnecessary.

HOISTING AND LOWERING MEN.

The hoisting or lowering of employes with a cage or bucket should be permitted or positively prohibited. If permitted, a notice must be posted near collar of shaft, stating the maximum number who may use cage or bucket at one time. This limit is not jeopardized when the men go "on shift," but, unless fixed, may be exceeded at the end of the day's work.

The handling of men with a bucket is very dangerous, and its use is discouraged by this department as much as possible. To issue an order stopping the use of the bucket for handling men would, at the present time, work a hardship in some districts upon both the miner

and mine owner. But should the work of the bureau demonstrate the necessity, action will be taken and the practice stopped.

It is to be hoped that the next Legislature will enact a law compelling all new enterprises to use a cage in shafts two hundred feet deep and over.

A strict compliance with the section of this bulletin entitled "Daily inspection," will be demanded of all mine operators hoisting and lowering employes.

DUMP GUARDS.

At the end of each dump track, when a car is used, there should be a device to prevent the car going over whether the load clears or not. It is generally supposed that a trammer can let go, but records show that while some do, the majority go over the dump with the car.

THE SHAFT COLLAR.

The shaft collar must be covered and so arranged that persons or foreign objects cannot fall in the shaft. When a cage is used a bonnet which raises with the cage, and falls back to place when the cage goes down, must be arranged. This bonnet or shaft cover need not be tight beyond what would stop a small animal from falling in, but the cage in turn must be supplied with a steel bonnet, oval in shape if solid, and if divided in the middle and hinged at the sides to admit sending down long timbers, the angles of the sides must not be less than forty-five degrees, nor the steel less than three-sixteenths of an inch thick.

When a bucket and wooden doors are used, the shaft must be housed in and covered with doors which stand at an angle not less than forty-five degrees pitch, hinged at the lower corners and opening upward or outward. These doors should not be less than four inches thick.

STATIONS.

All stations should have a passageway around the shaft, so that crossing over the working department can

be avoided. Where flat doors are used, a guard rail must be kept in place across the shaft and in front of the level, so that it will stop any one walking or pushing a truck or car into the shaft.

Across the track at some convenient distance an obstruction should be placed, so that cars or trucks cannot run by it and into the shaft, or trammers push cars by without removing same.

SINKING SHAFTS.

Shafts equipped with mechanical appliances must be of at least two compartments, and the timbering kept well up with the work.

When sinking and work upon levels above are being prosecuted at the same time, especial care must be taken to protect men in bottom of shaft by placing close-fitting and strong doors in the working compartment and covering the ladder compartment with a plat, which will insure protection.

THE LADDER WAY.

All shafts over fifty feet in depth should be divided into at least two compartments, and one compartment set aside for a ladder way. The ladders should be sufficiently strong for the purpose demanded, and in vertical shafts should have landings at not more than twenty feet apart. The landings should be closely covered, except an opening large enough to permit the passage of a man, and the ladders should be so arranged that by no means could a person fall from one ladder through the opening to the next ladder. The ladders should be firmly fastened and kept in good repair. In incline shafts the landings should be put in as above described, but a straight ladder on the incline used.

The ladders in "upraises" or "winzes" from level to level should be likewise provided and kept in repair. Winzes or upraises are, after abandonment, very essential for ventilation and, in case of accident, very essential as a means of escape. Just so long as they are neces-

sary for the one cause and may be needed for the other, they should be kept in repair and ready for use, if required.

MILL HOLES AND WINZES.

All winzes and mill holes running from level to level should be covered or surrounded with guard rails, so that persons walking along cannot step or fall in. Winzes, as a rule, are upon one side of the main drift, and usually timbered a few sets above the drift level. Guard rails are easily placed about these. Mill holes, on the other hand, are often in the center of the drift. These must be securely covered with a door and kept covered.

EXITS, VENTILATION, SANITARY CONDITION.

As soon as practicable, all mines should have double or triple exits. Levels driven each way from the shaft must be connected by upraises or winzes, equipped with ladders and kept in good condition. These connections aid ventilation and provide exits or means of escape in case of accident. Connections from first levels to surface should also be made, unless underground connection is made with adjoining properties.

Proper ventilation is of such vital importance to mine operators that it is well looked after, as a general rule.

The sanitary condition about mines should receive careful attention. The use of abandoned stopes or drifts for closets should not be tolerated, and, where meals are eaten underground, the scattering of scraps and refuse matter about levels or stopes should not be permitted.

At the isolated mine boarding house, arrangements should be made for the disposal of slops and refuse matter. It should be the duty of the foreman in charge to look well to the sanitary condition of the bunk house and the cleanliness of his men. A large proportion of the miners are cleanly, but some are not, and a few filthy men injected into a bunk house soon infect the whole, or cause the cleanly men to quit rather than submit to the filthiness of his enforced associate. The condition of

a bunk house is almost a sure index to the class of men employed. A cleanly and orderly condition predicts a thrifty, wide awake and healthful crew, and vice versa.

THE INDICATOR.

Upon all plants handling men, the engine should be supplied with a positive indicator. By a positive indicator is meant a device that is geared positively to the drum shaft and moves a target or indicator just as certain as the revolution of the drum raises or lowers the bucket or cage. Indicators arranged to move a target by the use of a string or wire cannot be depended upon, and are not as safe as marking the cable with a hemp wrapping or paint.

MINE VISITING.

The desire of persons to go underground, unaccustomed to mines and mining ways, should be discouraged. It is a novelty, an experience to relate to friends at home, but an experience in which the dangers are little appreciated, and of which it may be truly said, "ignorance is bliss." Were it within the province of this department to say who should and who should not enter mines, the line would be drawn sharply and no one but employes or those having business would be admitted. Such a law would meet the hearty approval of all large mine operators, who appreciate the danger, trouble and expense to a company to be courteous; while the superintendents of smaller mines, whose better judgment is often overcome by a desire to please, would gladly take refuge and not assume the risks entailed.

UNDERGROUND SURVEYS.

Each and every mine should keep an accurate plat of underground workings and have same brought up to date at least once a month by competent engineers. No greater false economy can be practiced in mining than working upon the supposition that those in charge know just where drifts are. Where mines are adjacent, or working upon same vein, and water is encountered, the necessity is apparent and imparative.

BOILERS.

The bill creating the office of State Boiler Inspector makes mandatory provisions regarding the care of boiler or boilers, and necessary reports to inspector. It further provides severe penalties for failure to comply with requirements. Mine operators using steam or other pressure should familiarize themselves with this law and its mandates and thereby insure the safety of all concerned.

THE MECHANICAL PLANT.

In the equipping of a mine with machinery safety is too often sacrificed to false economy. When the expense of stops and repairs are taken into consideration, the very best machinery of a given capacity to be had, regardless of first cost, is the cheapest. It is well to bear in mind that competition in the mechanical line is so close that skilled labor, iron and steel, have a fixed market value, and that in accepting a plant of a given capacity from one firm, because its bid is $500 or $1,000 cheaper than another firm, the purchaser is simply buying that much less material or skill, and endangering the success of his enterprise.

THE MINE SUPERINTENDENT.

The duties and responsibilities of a mine superintendent cover a scope of requirements unequalled in any other professional calling. One of his most important duties is the formulating of a set of standing orders, the compliance with which will insure the safety of all under him. Fatal accidents can be too often traced to lack of mine discipline. Laws governing the employes about a mine should be as inexorable as in the regular army. Let the fact become established that failure to comply with regulations, however trivial, means loss of position, without recourse, and the safety of all concerned is almost assured.

THE MINE FOREMAN.

The mine foreman is practically the working superintendent and upon him devolves the detail of practical mining. The welfare of his employers and the safety of their employes is largely dependent upon his good judgment, and he must of necessity be a thorough miner, a good timberman, and a fair mechanic.

THE ENGINEER.

Too much care cannot be exercised in the choice of this officer. His responsibilities are grave and his work more wearing upon the nerves than the muscles. His cargo travels an invisible track and must be guided by hearing and feeling. Safety demands that his whole senses be on the alert and concentrated on his work. His surroundings should be comfortable in a room by himself, and under no circumstances should he be permitted to converse with visitors while his engine is in motion. A law should be enacted compelling all engineers to undergo an examination, grading them by certificate according to ability. Engineers upon mines who handle men should all carry first-grade certificates.

DAILY INSPECTION.

All properties using mechanical appliances should be thoroughly inspected and reported upon daily. Some one man should be detailed to perform this duty at a given hour and make a written report. These reports should be filed and show that proper precautions are being taken. His duties should commence with the engineer, who will report the condition of the boiler, engine, cable, fire apparatus, etc. Then commencing at shieve wheel and testing all bolts and nuts on boxes and gallows frame. The cable fastenings and all things connected with cage, bucket, doors or bonnets. Descending shaft slowly, examine the bell line, timbers, lining boards, stulls, skids, rollers, guard rails at stations, doors, etc., etc. He should also ascertain the amount of powder

and condition of warmers. Ascending shaft by ladders, the same care as to detail should be exercised. Also the condition of winzes, upraises and ladder-ways, kept open for ventilation and exit in case of accident.

The observance of this provision will prevent accidents and prove economical. It does not debar those in charge from "keeping their eyes open," but they are less apt to see danger than one whose especial duty it is and whose position is dependant upon not overlooking it. This inspection can be made in comparatively short time and at a time not to discommode the working of the mine.

CONCLUSION.

To those who may feel the above recommendations too exacting, I desire to say there is nothing advised which is not in constant practice upon the older and best-managed mines in the State. Because a mine is not paying is no excuse for jeopardizing human life by makeshift or temporary safety appliances. The common rule and the source of most all accidents is the desire to first "strike it rich and then make safe."

The desire and duty of this department is to reverse the rule so it will read: "First make safe, and then strike it rich."

Any information desired regarding detail of matters herein set forth will be gladly furnished.