# Machine Mining.

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There is no question in mining of greater importance than "the practicability of machine mining." The great variety of machines patented, the large outlay of capital to give a machine fair trial, and the numerous failures attending these preliminary trials, has led many to harbor prejudice against anything bearing resemblance to coal mining machinery. From history, we learn that the first coal dug was by means of the pick. Since then the steam engine, with all its wonderful accompaniments, has revolutionized the old methods of transportation. Since then the spinning wheel has been succeeded by the loom, the sickle by the self-binder, the candle by the electric light, the messenger by the telegraph. Great has been the change in every branch of industry, and yet we are mining coal with the pick. Are we, as mining engineers, to be the last to keep pace with the moving world? If not, the pick and the hand drill must be relegated to the ranks of the past. What are the difficulties to be met with in machine mining, and why have they not been overcome? Space is too limited to dwell upon any of the minor difficulties encountered, and I will confine myself entirely to those that ever and anon, like the ghost of Hamlet, threaten destruction.

The first, the most important, and that upon which the final success or failure of every machine will finally depend, is the intelligence and practicability of the man or men in charge of the machine mine.

To illustrate, I would call your attention to one or two mines in which machines were in use and working successfully, notwithstanding the men in charge of the boilers had hung additional weights, such as grate bars, on the safety-valves to prevent steam leaking, the foundation of one of the largest Allison compressors was swaying an inch for every revolution of the fly-wheel. Two lines of air pipe, 6 inches in diameter, were carried 700 feet into the mine, and there each of the 6-inch pipes reduced to 3 inches and thence carried 6,000 feet to the face of the workings. Is it any wonder the mine boss found he could not work thirty Harrison machines at the end of these pipes? Friction alone had consumed over one-half his stored powers before it reached his mining machines. Compressors are expensive luxuries, and yet I have no doubt that a new compressor would have been added to the two already in use had not the mine boss been persuaded to cut off one line of 6-inch pipe and to extend the other 2,500

feet further into the mine. The friction once overcome, and enough compressors were found to be on hand.

The reckless extravagance of ignorance can nowhere be better exemplified than in this mine, at which I spent several months. During this time two boilers blew up, the compressor foundation gave way, the air pipes bursted, the boiler stacks blew down, the blacksmith shop burned down, the ventilation became unsatisfactory, and numerous incidents, called unforeseen accidents, took place. Why did these happen? The first boiler was taxed beyond its capacity to carry steam in unprotected pipes long distances. The second was improperly hung. The compressor foundation was neither deep nor wide enough. The air pipes were laid through a mass of burning slack and without expansion joints. The stacks were composed of sheet metal, wired in position. The smithy stood over the burning slack.

Is it any wonder that the mining machine has been so often condemned? Is it not the wonder that any ever succeeded? In short I would say ignorance and not the miner is the greatest enemy of the mining machine, and in support of this will cite an instance at a Shawnee mine, where the common laws governing ventilation were so poorly understood that a fan was run two years at the head of an air shaft, while nature was ventilating the mine. Can men who do not understand the simple laws of ventilating by a fan be expected to understand the more complex question of making compressed air serve as a motive power to drive the steel bit into the working face of the coal? and yet, in the majority of instances, these are the men intrusted with the care of mining machinery. These are the men who furnish boilers with water that will eat up a boiler plate in three months; who use the same sized pipe for conducting compressed air six miles as they would for one; who connect thousands of feet of pipe without an extension joint; who allow the valves of the compressor to work so tight that scarcely one-half its capacity is realized; who erect five sheet boiler iron stacks for ten boilers rather than one substantial brick stack; who use 8,000 feet of pipe where 4,000 would answer if economically used; who do not and can not understand the laws that govern compressed air; who gain experience as long as the operator can furnish money for experimental purposes.

W. P. Rend & Co., of Chicago, Ill., tried the machines at No. 5 mine, Corning, O., failing there then tried them at the Laurel Hill mines, Pennsylvania, where, after an immense outlay, they were finally proven to save from 10 to 15 cents per ton over pick mining. Encouraged by this they put machinery in the Jacksonville mine, Athens county, Ohio. Here advantage was taken of all former blunders, and while other pick mines were loading coal under similar conditions on railroad cars at a cost of from 75 to 85 cents per ton, the cost was reduced in this mine to a minimum of 63 cents, and a maximum of 75 cents per ton.

Before introducing machinery into a mine the mining engineer should make a thorough examination of the kind of coal he has to cut. If it be free from sulphur nodules, and of medium hardness and the roof good, or should the coal itself prove impenetrable and the floor be of shale or clay, through which the undercut can be made, the conditions are the best possible for the introduction of the Lechner or Legg machine. Should the roof be poor, the floor hard and the lower stratum of coal contain nodule masses or black band, the question at once is disposed of in favor of the Harrison machine.

The engineer must be governed by his own judgment in selecting machines when the conditions are not so well dfined as in the preceding. Both machines are seldom used in the same mine, owing to the great expense of keeping up two separate pipe lines and compressors, so that the difference of pressure required to run the machines can be obtained.

The supply of pure water for the boilers is a very important consideration. The kind of boilers found to be the most desirable under all conditions, are the plain two-flue boilers, with simple durable fittings. Grate-bars proportioned for slack and pea coal, and injectors for feeding boilers. The compressors should not be selected upon the evident merits of the compressors, as is generally customary, but here again the men in charge must be taken into consideration and the simplest, not the most efficacious chosen.