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COAL CUTTING MACHINERY IN OHIO MINES.

BY ANDREW ROY.

In this age of labor-saving machinery, the foundation of the power developed to start and keep the wheels of industry in motion is coal; yet so far as the mining of coal itself is concerned, less improvement has been made in the way of applying labor-saving machinery than in any other modern industry. Coal in every country in the world continues to be largely mined by the same methods, and by the same tools as it was mined at the time of the invention of gunpowder, 400 years ago. Labor-saving machines for mining coal have been invented and patented without number, but only a few of them have been found in practice to reduce the cost of getting the coal, which is the great desiderum.

Until a few years ago nearly all coal cutting labor-saving machines were invented in England, the great coal producing nation of the world. These iron miners, as soon as they appeared, were carefully and critically examined by the various English Mining Institutes, and by kindred societies. The North of England Institute of Mining Engineers, perhaps the most intelligent society of its kind in the world, has always taken a deep interest in coal cutting machinery, having at times commissioned committees to inves-

tigate and report upon this subject, and having also, at various times, offered prizes for the best coal cutting machine.

The Ohio Institute of Mining Engineers may then with propriety inquire into the methods of coal cutting machinery, more especially as one of the latest and best of these machines is the invention of an Ohio man. I refer to the Lechner machine, which was first introduced in the coal mines of this State in 1876. Another iron miner has also of late years found its way into the Ohio mines, known as the Harrison Coal Cutter, which deserves the pains-taking examination of this Institute. The Harrison machine, like the Lechner, is an American invention.

Only one or two of the numberless British coal cutters ever found their way to Ohio; in practice they did not work well and were soon discarded. The merits or defects of English machines will therefore not be discussed in this paper. Suffice it to say that the majority of them have, in practice, been found to lack the necessary requisites for extended application, and proved failures. Others have stood the severest tests, and are being successfully applied in a number of mining districts in the United Kingdom.

The Lechner machine was introduced in the mines of the Straitsville Central Mining Co., in Perry county, in 1876, and since that time it has been constantly at work in these mines, having in the interval been extended to other regions of Ohio, as well as to a number of the mining districts of Pennsylvania, West Virginia, Kentucky, Alabama, Illinois, and Colorado. It has also been recently introduced in English mining practice. This coal cutter, like all other coal cutting machines, is worked by means of compressed air. The coal is cut or undermined in the bottom of the vein by means of a horizontal, revolving bar, three feet in length, to which a number of sharp steel points are attached, which grind the undercuttings to dust. The undercutting is made five feet deep and four inches in thickness, the debris being removed by revolving chains, or scrapers, as fast as it is formed. As soon as an attack is completed, the cutting machine is withdrawn and shifted over three feet, and another depth of five feet undercut. This operation is repeated until the whole breadth of room has been undermined, when the machine is placed on a truck and hauled to an adjoining room. An undercutting of a hundred lineal feet, and five feet in depth, constitutes an average day's work of nine hours,

with the machine, but as many as 180 lineal feet have been cut in a single day.

For some time after the introduction of this machine it was found defective in some particulars; the knives would break, the chains would break, the cuttings would not discharge themselves, and otherwise time was lost with it; but the proprietors have kept on improving it, until a very excellent machine has been devised, doing all the work claimed for it. It is better adapted to some seams of coal than others. In some mines it cuts altogether in the fire-clay floor, and thus saves all the coal. In other mines it cannot be used in the floor at all, but, as only four inches of the bed is wasted in under-cutting, a great saving of coal is effected over hand mining even under the most adverse circumstances. As the lower part of a coal seam is usually the most valuable part, this is an important item. A saving of a very small part of a coal bed, or in the cost of the daily output, in no small degree, in these days of severe competition and low prices, very frequently determines the financial prosperity of a coal mine. This machine is only 20 inches in height, and has been so perfected that it can be used in beds no thicker than three feet. Liberating the compressed air at the working faces of the mines, it improves the ventilation, and lessens its cost by reducing the necessary number of airways.

Coal cutting machinery possesses marked advantages to the working miners over hand-mining, one great advantage being the ease and speed of undercutting. As this is done almost invariably on the bottom of the coal seam in hand-mining, the miner is required, in using the pick, to sit on the ground, which is often wet and always damp; and in reaching back with the pick, in holeing, he lies down on his side his shoulder resting on his thigh; rheumatism and lumbago attack him in consequence, while the work of undercutting itself, in this constrained position, is not only the most laborious, but it is the most exhausting work to which the human frame can be put.

During the mining troubles in the Hocking Valley a few years ago, a feeling prevailed outside of this mining region that the miners were fighting against the introduction of mining machines. This impression was all wrong. No intelligent miner will oppose, but will welcome, the use of machinery in coal mining, for it will come as the friend of the miner. There may be disputes in regard to wages with coal-cutting machines, as there are disputes now in

the old method of hand-mining, but no serious opposition will be placed in the way of a coal-cutting machine in Ohio or elsewhere by miners. Even if the miners should, in defiance of good sense and their own true interests, attempt to do so, they would simply attempt an impossibility, and throw away their labor—for, if coal-cutting machinery can be made to reduce the cost of getting the coal without reducing the wages, it will as surely supplant hand labor as labor-saving machinery has hitherto done in every other department of human industry. If, on the other hand, these coal-cutting machines cannot reduce the cost of coal getting, they will prove failures, no matter how ingeniously they may be gotten up.

The Harrison coal cutting machine, which has been in use in the coal mines of Illinois for seven or eight years and which is now in use in the mines of the Hocking Valley and Mahoning Valley regions of Ohio, is perseveringly at work in the effort to solve the problem of machine power in coal getting. This machine, called the "iron man" by the miners, was first introduced into the mines of the Diamond Coal and Mining Company in the State of Illinois in 1875. Since its introduction it has been greatly improved. During the summer of 1880 the Chicago, Wilmington and Vermillion Coal Company, one of the wealthiest mining corporations in the west, put ten of these machines at work in their mines in Illinois, fitting up a blowing engine of 50-horse power for supplying the coal-cutters with compressed air. The coal-cutter operated by a piston which works straight out from the cylinder, consists of a pick which has two points. The pick, which is about eight pounds weight and ten inches long, is made of solid steel. The pressure of air required for working the pick ranges from 40 to 60 pounds. There was some trouble experienced at first in regulating the length of stroke of the pick, and the number of blows per minute to be delivered on the coal. This matter, however, was soon regulated and no further trouble is now experienced from this cause.

Both of these machines are at work in adjoining mines in the Hocking Valley, the Lechner being employed at Longstreth's mines and the Harrison at the mines of W. B. Brooks & Sons, Nelsonville.

During the meeting of the Institute held in Nelsonville in May of last year, a party of visiting engineers, members of the Insti-

tute from the Mahoning Valley, among whom were my friends Messrs. R. M. Hazeltine and Jonathan Head, who paid a visit to both mines in which the machines were at work, but it was late in the day when the mines were reached; the miners had quit work, and a patient and painstaking inquiry touching the merits and defects of either machine could not be made.

I have thus briefly touched upon coal cutting machinery in Ohio mines rather for the purpose of calling the attention of the members of the Institute to these machines than for commending or condemning them. When we look at the success of labor-saving machinery in every other department of human industry it behooves us to encourage and facilitate whatever is calculated to advance inventive genius in the profession of mining engineering. The mining engineer, the mine owner, the working miner and the general public are all deeply interested in the success of coal cutting machinery, and it is with no small degree of pride that I record the general impression of those who have investigated the matter, that the best labor-saving machine for cutting coal yet invented, all things considered, is due to the genius of an Ohio mechanic, Francis M. Lechner, of Columbiana county.

THE PRESIDENT.—I have a communication from Col. Charles Whittlesey, of Cleveland, the veteran geologist, which I desire to read. The subject, however, more properly belongs to the State Institute of Surveyors, than to the Institute of Mining Engineers.

CLEVELAND, May 6, 1883.

Hon. Andrew Roy, President Association of Mining Engineers:

DEAR SIR:—When your request was received for a paper pertaining to the objects of your association, I intended to prepare one upon the *surveys of the public lands* in Ohio; and as a part of the subject to give a brief memoir of *Thomas Hutchins*, who originated the system in the year 1764. I have not been physically able to collect the historical references necessary to treat the American System of Surveys in a satisfactory manner, and must, therefore, postpone that part of the subject.

It would be a great pleasure to me to be present at your meeting in Youngstown, but it is not practicable.

To do full justice to the memory of *Hutchins* would require a separate discourse. I can now only refer to him as a practical surveyor, engineer, and man of science, who was conspicuous in the war of the revolution. He was the *geographer of the United States* from 1778 to the peace of 1783. In 1764 he was a Captain in the British Sixtieth Regiment of Foot, and military engineer to *Col. Bouquet*, in his expedition from Pittsburg to the forks of the Muskingum, at Coshocton. Here he conceived a plan for the establishment of *military colonies* in the West, on lands to be donated by the Crown, and surveyed into sections of *one mile square*, or 640 acres, by lines due north and south and east and west.

In 1785 an act was passed by the Confederate Congress directing the survey on his plan of the government lands west of the Pennsylvania line and north of the Ohio.

Hutchins was placed at the head of the surveys in the field, having nine assistants. He ran, in person, a base line from the north bank of the Ohio at the Pennsylvania line seven ranges west, terminating near Magnolia, in Stark county, and near Bouquet's route in 1764, from which point range lines were run south to the Ohio, the most westerly one coming to the river a few miles above Marietta. The Indians were so troublesome that the seven ranges south of the base were not fully subdivided until the early part of 1788. In October, of that year, Hutchins died at Pittsburg, and was buried in the cemetery of the First Presbyterian Church. With slight alterations and improvements his system of *square townships* of six miles on a side, and *square sections*, has been continued in the surveys of all Government lands to this day. Before the survey of the seven ranges I am not aware that there was such a system in any country. It is the simplest of all systems; but if it had occurred to any surveyor or mathematician, prior to 1764, it was never put in practice.

In the American Colonies, and throughout Europe, the rectangular system of boundaries and land grants was unknown. By the act of 1785 Hutchins was able to put a long cherished plan in practice in the field for the *first time* in the history of surveys. Its simplicity is the best evidence of his genius. As *Geographer General*, an office similar to that of *Surveyor General*, he lived barely long enough to demonstrate its value. In the United States this conception ranks with that of *John Fitch*, the builder of the first steam

engine, and the first steamboat in this country. Both of them were patriots in the Revolution, and both are substantially forgotten. I am sure that the members of your association will appreciate the memory and talents of Hutchins; and I venture to suggest, whether, in case his grave can be identified, you may not make an effort to have a monument erected over it.

Very respectfully yours,

CHARLES WHITTLESEY.

MR. PAUL.—This question has been discussed at some of the meetings of the State Surveyors Association, and the opinion obtains in that body that William Henry Harrison is entitled to the honor of being the inventor of the present system of surveying the public lands.

The paper of Col. Whittlesey was ordered printed in the OHIO MINING JOURNAL. The Institute then took a recess till Thursday.
