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A PRACTICAL SYSTEM OF MINING COAL IN OHIO.

BY THOS. H. LOVR.

The subject of my paper has, no doubt, been repeatedly brought to the minds of the members of the Ohio Institute of Mining Engineers, and yet a more practical system than those in use at present has never been put in practice.

The double and single entry systems are the principal ones used in our best coal fields. These are, undoubtedly, productive of a great waste of coal and timber, and do not afford the protection to the life and health of the miners that the laws of our state require they should. I am glad to say, however, that much has been done in this direction since the creation of our mining laws, but a perfect system of ventilation cannot be obtained under the present system without adding a much greater expense to the operators.

In my opinion, before the system of mining coal in Ohio is improved to the satisfaction of all concerned, we must conclude upon one of two rules: To take all the coal out as we advance with the mining, or to leave enough in the pillars to resist the weight of the roof without damaging them. The latter is worked quite successfully in and around Steubenville, and is known in that vicinity as the "County of Durham" system, and by which only half the coal is taken out until the final robbing of the pillars preparatory to the abandonment. When the blocks are drawn the excavation will be entirely closed. The former plan spoken of, that of removing all the coal, is known as the "Longwall" system, which, no doubt, is better known to some of you than to myself. This system of mining has not yet been introduced in Ohio, to my knowledge, except in an experimental way, and by persons who lack experience, for the following reasons: First, there is plenty of coal in the great state, and we can afford to lose about thirty per cent., and we are not going to provide for future generations so long as we can mine coal at a low margin. Second, the cost of production would be so great that we could not compete in the market, owing to the large

fields of coal which are so easily opened and convenient to market in the state. The operators feel that they can afford to lose about thirty per cent. of their coal, and by so doing be able to place their product on the market at a price that will give them an advantage over their competitors, thus ignoring the claims of future generations to a just share of the treasures in nature's store house.

The operators' objection to either of the above systems being that the cost of production would be so great as to prevent their entering the markets of the country, and that as long as large fields of coal remain undeveloped from which to draw the supply it is cheaper to destroy one-third of the coal than to incur the expense necessary to mine it in an economical manner.

Another objection brought forward by the operators of the state is that the strata overlying the coal are so soft as to preclude their use for pack walls, which are necessary in Longwall mining, in order to properly secure the roadways over which to transport the coal from the working faces to the mouth of the mine. To these arguments I will say that if either the Longwall or the County Durham systems are properly conducted, the cost of production would be little, if any, greater than by the present methods of mining. It is firmly believed that if the amount of timber as now used in securing the rooms was used in making the packs solid, that the roadways would be more secure than they are under the present system.

It is the writer's opinion that after the roof has firmly settled the timber can be removed and used again, which, would be a saving instead of a loss.

By either of these systems the operator will be enabled to remove all the coal and thus avoid leaving behind an opening supported by one-half crushed pillars which will fill with water and gas. Again, the overlying slate at the coal face would be so softened by the weight as to render it harmless, and it could be readily removed with a shovel. The lack of these advantages often results in destruction of property and sends many miners to untimely graves.

The miner would receive a great benefit from dispensing with the excessive use of explosives which now render the air impure and unwholesome, at the same time removing the causes of many fatal and serious accidents which annually occur from their excessive use. Perhaps some difficulty would be met with in the latter system when there is a strong top and soft bottom. This will, no doubt, occur at times, but if pack walls are properly put up the gobs would soon close and the weight would be taken from the roadways and little or no expense would be added.

Considering the advantages which I have shown you by these systems, which are not only my own conclusions but are verified by some of the best practical miners of this state, I think the early adoption of these systems for economy and security would be of great value to those who are interested in mining coal.

It goes without argument that should this slaughter of our coal go on, it will be but a few years until we will not have sufficient coal for the uses of the present generation.

At this point Prof. Lord took the chair.

THE CHAIR: Gentlemen, you have heard the paper Mr. Love has presented. It is before us for discussion.

CAPTAIN MORRIS: I have not much to say, but I will say something to draw these fellows out. The paper was a good one, and, I have no doubt, Mr. Love was very conscientious when he was writing it, and, no doubt, he has studied the problem thoroughly before he would undertake to tell us things of that kind. As far as the long-wall system is concerned, I think it is time to commence about future generations. I think it is time for us to think of saving more coal than we do at present. We know that the system that we have leaves a great deal of our coal in the hills that we ought to have in the market; but the great point that we want to arrive at is, which is the best method for us to adopt to accomplish that great object. As far as the long-wall system is concerned in Ohio, I am under the impression that it is not one kind of a long-wall system that we need in Ohio. We have several seams, and there is hardly one of these seams lying in such a shape that we can work a long wall with one the same as the other. Some of our seams have a very soft fire clay underneath them. Other seams have a very poor roof, and, of course, we know that it is not the same system of long-wall work that would do the work in those two seams of coal. Consequently, I think it is necessary that some of our most practical men at the Institute should make it a study in the next six months, and try to find out which is the best system of long-wall work for us to adopt in the future. There are several places in the State that we know of that are trying the operation. About fifteen years ago,

I tried it in Morristown, Ohio, and it worked very nicely. I accomplished the object that I desired, and by so doing saved a good deal of timber and a great deal of coal. I took a plan that is not often done. I drove 150 yards wide, just to try the experiment, and drove it all in one breast; kept a turntable at the end of the road, and turned my track up at the front of the working face all the time. So, instead of having four or five tracks back into that space, I had only one. Each miner had seven yards wide, and only one had a fast end. Each one was coming behind that with a cut all the time, so that we had the whole thing loose. I commenced to try to keep my roof up, but I found out in a very short time that I couldn't do it. I put gobs in when I commenced it, to try to keep the roof up. I saw I could not do it, and so I abandoned that, and kept four rows of props from the face back all the time, and, as I advanced all the time, I kept one row, the further row out in the gob, knocked out, and moved them on to the next place. Consequently, my roof broke right along behind me, and that eased a great deal of the weight off the coal, but there was enough weight on the coal all the time to cause it to mine very easy. I worked on that way for about three months, and I was about to open another place on the same plan, when we had to stop, and, consequently, that was all we did with that long wall. It worked first-rate as far as we went. Our roof would break behind us right along, and we kept only four sets of props between the working face and the gob. As far as putting up gobs was concerned, it is no use at all. It would throw weight too much on the coal, and it would break it all to pieces, and it would cause our road-way to yield so much that we had to keep two or three men on it all the time to keep it in repair. But, when we got it broke once, once a month would do for us to keep the road open. Now I say that if our best men in the institute, and you know we have good ones here, would make a study for the next six months and figure out and bring us plans here so that we can find out by that time which is the best mode of long wall work so that we can adopt it in the future. We must think of these little ones that are coming behind us. We are young in years of course, but at the same time we will get

old and we have some other ones to come behind us and I think we must look for them and prepare the way for them and save some of these riches that we have under our feet now so that they can get their living when we are gone.

MR. HAUGHEE: Mr. Chairman, for information I would like to know what seams in Ohio would be the most practical to be worked on the long wall system, whether all of them or just certain seams. Then another question, in long wall system, in sinking a shaft, if you take all the coal out at the bottom and then have to put in wood pillars, can you hold the roof? Why wouldn't it be better to leave the solid coal to prevent the roof from ever giving in the first place, if it has to be timbered after the roof is taken out.

MR. RENNIE: I can answer that by saying that it is a matter of expense, that it is cheaper one way than another, a good deal.

MR. HAUGHEE: Another question, Mr. Chairman. If the shaft settles after being timbered, isn't there danger of throwing the timbers out of plumb?

MR. RENNIE: I have never known it to throw the timbers out of plumb, because they have eight feet square of space, eight feet apart and could not get away.

MR. LOVE: Mr. President, with regard to the different seams in Ohio, I am not acquainted with all the seams of coal in Ohio and I would have to except the big coal in the Hocking Valley. That might be worked very successfully by long wall, but I don't have reference to that. I don't know that I would undertake a nine foot seam by the long wall plan, but if I did not I would work it on the County of Durham plan. I did not explain that plan and I suppose all of you who are miners know as much about that as I do. There is a little less than one-half of the coal taken out. Its map looks a good deal like a checker board and when they are finally done, they can draw the blocks and that part of the mine closes.

Concerning the packs at the bottom, now there is a good deal of difference of opinion about that. I know that the members of the institute are somewhat divided. My plan would be to take it all out, right from the bottom of the shaft back. If your packs are equally strong, when you get enough of excavation beyond that it is bound to throw the weight into the gob until the bottom and top meet. Your shaft of course will settle, but it settles equally and I don't think you would notice the difference on your slides, and you will notice it there if anywhere. I am satisfied that has been worked successfully, not only in this country but in other countries. I have not seen very much of it myself. I never saw London city, yet I believe there is such a place, and I have just as good a right to believe that the long wall system has been more successful there than any other system. Take the majority of the seams, and I would risk a four foot seam or a four and a half foot seam and I think there is no risk about it. There may be a little extra expense in starting it, but it will come back. It will be that much cheaper after while.

PROF. BROWN: I would like to call attention to an experiment in long wall some years ago at Aetna Furnace. I think it was some ten or twelve years ago. I visited the mine and only went through it with the manager and do not remember a great deal about it. The hanging rock lies just above the ferriferous lime-stone. The mine boss or superintendent was brought from Scotland. He had worked the long wall system in coal there and they brought him to carry on the mine, but after a year or two the thing was abandoned. I don't know exactly why. I don't know that I can state, but I know that some of the troubles that were experienced and probably the more important ones were from the miners themselves. The miners in southern Ohio usually each fellow digs for himself in a little bit of ground, for himself and by himself. They don't like the idea of working all in the same mine, working under rules where they have to work in regular order, as they did in that way and they wouldn't do it, and in that way the working face was not kept even. Some would work regular and their part of the face would be carried

ahead and others held back and in that way the air could not be kept up to the face. The furnaces that now mine that way none of them use the long wall system. They use the entry and room system.

PROF. LORD: I remember that mine the entry ran clear through the hill eventually.

PROF. BROWN: I have forgotten the gentleman's name who was manager.

PROF. LORD: It appears to me this is an interesting paper. There is no question but that in the mining of coal we should adopt a correct system, so as to get out not only the most coal but in the best condition. That is the problem of the miner and every discussion of that which comes from men who are familiar with the working of mines should be put on record. I hope this discussion will be continued.

SECRETARY HASLITINE: Mr. President, I cannot speak from a practical point of view of long wall mining, as it has not been my lot to see much of it done. The County of Durham system is used at Steubenville and I have examined that quite carefully and I am firmly convinced that in that vein of coal there is no system that I am familiar with in practice anywhere that will reclaim all the coal or as near all the coal as it does in the mines there as they are now operated. I think it is equal'y applicable to many others, if not all the mines of the state. It may be some of them will work better on the long wall system than on the County of Durham system. That I don't know, because I am not familiar, as I said before, with the long wall system, but it is time and high time that something was being done to protect the vast deposits of coal in our state from the shameful waste that is being carried on. I had a conversation not long ago with a gentleman, a member of this institute, one of the old ones, a man who has knowledge upon the question of mining and whose knowledge upon that question will not be questioned by any man in Ohio, and he told me that in and about Corning, for the purpose of making a boom for the railroad, in

the early mining there, that more than fifty per cent. of the coal was lost. I have been told repeatedly by miners and superintendants that mines in that vicinity were pronounced abandoned and exhausted that employed 190 men the day before. Now my knowledge of mining is sufficiently accurate to inform me that no mine can be wiped out employing any such number of men the day preceding. It generally runs down to twenty, ten or probably eight men for a long time previous to abandonment, when the work is done in a mechanical manner.

Another operator of equal skill told me that in the Hocking Valley, fully fifteen or twenty per cent. was lost in the early mining and previous to the last very few years. He is superintendent of a large number of men and he told me that now they mean to lose not more than twelve per cent. Now twelve per cent. of Hocking coal, in the quantity that is mined annually, means a great many tons. I think in a paper I prepared a year ago or about that, I stated that twelve per cent. means that every ten years they waste one years production of the Hocking Valley coal. Now it is a well known fact that the counties of Athens, Perry and Hocking produce sixty-six per cent. of the output of the state annually, and that Perry County produces as much as the other two. Now when you come to figure on the amount of coal that is wasted, they are leaving more in than the benefits we derive from what is taken out. This is a serious matter not only to the people who are engaged in mining, that is, miners who make it their daily occupation and to the operators, but it affects the value of every man's home, the value of every man's business, the value of every railroad, the value of everything that is tributary to our mining regions. I know that in some of the other districts the waste of coal is not so great, but still, it is more than five times what it ought to be. In the Massillon district, they think they waste not more than ten per cent. Their peculiar deposits preclude the laying out in advance, a mode by which the mine will be conducted except upon general principles and for that reason a skillful operator may misjudge his basin and lose good coal by so doing, but even that is not a very large waste. If the same slaughter had gone on over the state that has in some

of the localities, I have spoken of, you will see that at best the life of our coal fields are shortened from thirty to fifty per cent. from one-third to one-half of their life time. While it is not our individual business, it has occurred to me that it was a question that the State of Ohio should take hold of by its legislation and control what nature has but in our store-house for our use and not allow foreign syndicates and large corporations who live in other countries to come in and take the choice cuts of our coal and sell them for what they can get and waste what is to us an inheritance.

I am glad that my friend, Love, has prepared this paper and I hope it will be brought to the attention and excite the interest of all the people who are interested in mines and mining throughout the State of Ohio and will result in saving to the state the life of our coal fields for at least thirty or forty years.

MR. DALRYMPLE: Mr. Chairman, just one word. I am in favor of the long wall system. I think that Mr. Love has read us a number one paper. I think also that the long wall system will be used in this country before a very great number of years roll by, because just as Mr. Haseltine says, in nearly all the coal fields of the state, to use a rough expression, the coal is just hogged out, butchered and wasted and will never be got, and the time is near at hand when we will have to economize in getting our coal. Now in this state there are quite a number of seams and in fact I believe nearly all the seams of the state, except the No. 1 seam, can be worked successfully by long wall system, that is the real practical long wall system, and there is only one, only one practical system. Take for instance the Jackson No. 2, and I don't know a coal seam in any country that is better adapted to be worked by the long wall system than that. It has a splendid roof, a slate, that would bend like rubber and never break. There is no use of breaking the roof-working by that system at all. If it is worked properly it will never break, it will remain solid, and it don't make so much difference what kind of a bottom you have got, whether it is of the soft fire clay nature or rock. Of course it is better to be solid, but it don't make any material difference. We will say we have a pair of entries parallel with a thirty foot

pillar between entries and thirty feet on either side. When the coal is mined out between that and a six foot pillar left between the rooms, the weight comes on and it just keeps grinding and grinding and the weight comes down on these pillars and heaves up the bottom, and the stronger the roof the more the bottom will heave. But in long wall mining, if it is worked properly, you will scarcely ever see the bottom heave. I suspect you can find places standing in Scotland to-day that were worked fifty years ago and you can go all through them. The proper way to work by that system is to shoot road-ways and build on either side of the road, say nine foot buildings and throw the loose stuff on the inside of the buildings. It is built up square along the road-way and the long roof will gradually settle down and with a two and a half foot seam, that roof will settle down eighteen inches. It won't break. It will stay there. That is, if it is worked properly. There is no use of letting it break. Consequently, the bottom has got a better chance to remain compact than it has where you are working by the pillar and room system, much better. You can mine the coal much better but it requires a miner that understands how to keep his place in shape. You have to know just how much weight to keep on the coal. You just want weight sufficient after you get your coal mined to knock out the blocks six feet apart. Keep your coal solid in front and throw the weight over back and when you knock these blocks out let your coal drop, that is all that is needed.

Now for the adaptibility of long walls in the State of Ohio. There would be several obstacles in the way I know. In the first place, it would be a hard matter to find miners that are acquainted with that method of mining. If you were to put a man who never was used to long wall mining on long wall, he would not know anything about it, and if he was left to go, he would work away until he would get run out. Mr. Simpson was a very practical man and probably one of the best mining engineers we ever had in the state. He knows that system and would have made a success of it, but there were so many things interfered and the poor miners that he had, they were scared out, I understand they threatened to lynch him because they said they were

going to lose all their miners, they would be killed and covered up. There is not as much danger as there is in working by the pillar and room system, because you have to protect yourselves. In long wall, while you have your buildings up close to the face, when you go home in the evening you have your buildings erected so that it is perfectly safe. Of course it keeps grinding a little but it is all right. I have not thought anything of the cost of getting the coal out here by long wall, but it seems to me, when everything is considered, it would be cheaper. You could not mine it out as fast, it would take longer to mine and reach the same distance than it would by working by the pillar and room system and your hauling and the cost of hauling will be lighter and the cost of rails and material and all such matters as that will be much less than working by this other system, because you are bound to lose fifteen or twenty per cent. and probably as high as twenty-five per cent. working by pillar and room. I know in Jackson County there is thirty per cent. lost. They are mining better in the Hocking Valley but I believe there is fifteen or twenty per cent. lost there, but that system they use down there is, I believe, as good as the system at Steubenville. It is about the same. They leave large pillars between the rooms and work them back, but they can't help but lose. I know I have lost pillars. I worked there a good bit and had a splendid roof and when it would squeeze it would fall back past the end of the pillar and we would lose that much because the miner could not get back there after it. But there is one thing I was going to say, and it is this, talk is cheap. You can make anything appear nice on paper, but the practice of anything is the thing to stand by.

Now so far as the mining of the coal from the bottom is concerned, I don't see anything to be gained in that. I can say this much, that it is going to make an enormous expense in securing that shaft. You take a shaft fifteen or twenty feet wide, and they want them some places in this country twenty-four feet long and eight or ten wide, well now we will suppose we are starting from the bottom of the shaft. We mine all the coal around and we will say we take out six feet. Then there is an excavation of six

feet all around that shaft. That won't affect the shaft. We will still go a little more until we get forty feet all around that shaft. The shaft is not much affected yet. It depends upon the kind of strata that is overhead. If it is rock, it won't be affected at all. If fire-clay or soapstone roof, it will be giving a little bit. We will say for seventy-five feet out from the shaft, that it is bad material, hard to hold, lies in slips and faults of all kinds, just as a soapstone roof always is. Now suppose that vein is three feet thick or two and a half feet thick. When the roof comes down to its lowest point, as much as it is possible for it to squeeze, after you have put your buildings up in good shape, it will be down to about a foot from the bottom. It will settle eighteen inches anyhow. Now you have your buildings there and I would sooner trust to building slate than timbers, every time, because they will give and the timbers won't give. The timber will hold there until something right close to it will quit and break. Now do you think, when that strata has settled eighteen inches that it is not going to affect that shaft. Do you think that the walls of that shaft will remain in as good condition as if you had started away from the bottom of the shaft and left solid coal to protect it. It don't look logical. I heard of a case once in Scotland where they undertook that and they got so sick of it, (the company did,) that they never tried it any more. Around in the district where I came from, there are thirty or forty thousand miners working. There are shafts by the hundred and in all of them the miners don't know anything but long wall mining. They would not know anything about pillar and room. They would get lost if they were to start in a place like that, and I never saw a shaft yet, shallow or deep, that the coal was taken right away from the bottom of it. In deep mines or shallow mines, leave your shaft secure. After you get a sufficient distance from the bottom, proceed to take your coal as you advance and then you will make a success of it.

Mr. Rennie followed with an address maintaining that it was cheaper to take the coal out from the bottom of the shaft than to leave it. He also maintained that Mr. Dalrymple was mistaken in saying that in long walls the roof would not break, stating

that in all his experience he never saw the long wall system worked that the roof would not break every three months at least.

MR. BENTZ: I desire to ask a question. If the present mining machines now introduced for mining coal and the appliances for taking power to the machines would not be in more or less danger of being lost by the long wall system.

Mr. Dalrymple followed in an address in response to Mr. Rennie in which he claimed that there was no occasion for permitting the roof to break in the long wall system and that he had never seen a break in the roof, although he had seen this system worked in a large number of mines except where it was caused by the carelessness of the miners.

MR. LOVE: I want to answer Mr. Bentz's question by saying this, that in most of the seams of coal in Ohio that I am acquainted with, there would be no machines needed, because the natural way to mine coal in a great many of them a boy could dig more coal with a pick by merely scraping out the soft fire-clay that would be crushed by the weight, than two ordinary miners could mine under the present system. But I am not going to discuss that. I am opposed to Mr. Dalrymple's plan of leaving a pillar at the bottom of the shaft. However, I believe this, that there is a difference in the mining in different seams of coal. But if I was going to sink a shaft in any seam of coal, I would not leave a pillar there, because coal will naturally crush and packs will gradually settle and I assure you if these packs are put in properly, the weight will come on equally and no harm will come from it. I am just as confident as Mr. Dalrymple is, although there seems to be room for dispute there. But I believe the roof has a great deal to do with the overlying strata and the softness at the bottom. But it all means long wall work. We are all driving at the same system, and yet some of us have seen it quite different in different seams of coal. I think, taking it all in all, you will find that the best results will be derived from beginning at the bottom of the shaft and taking the whole thing as you go and let it go. It won't do any harm I assure you. If the seam is not too thick, it won't even throw the slides out of gear, and

you all know if anything is affected about a shaft, it will be the slides.

MR. BENTZ: Mr. Chairman, I think if Mr. Dalrymple, the gentleman on my left, would invent some means by which we could modify the surroundings of the mines of Ohio, we might be successful. Now I know roofs in Ohio that will even fall in an eight foot entry. I have known where it has fallen in rooms and in a roof of that kind I don't see how a long wall would be successful. Individually, I am in favor of the double entry system.

MR. DALRYMPLE: I want to say this, that machines can be used in long wall, and I have seen them used. You want to keep your coal solid so that you could mine it with a machine. You could not use these machines very easily. You could use the Harrison. You could not use the Jeffries very well, because the buildings would have to be too close to the face.

Another thing I want to say to Mr. Bentz. It is not necessary to move the Scotland roof over onto the Ohio coal. You have just as good a roof in Ohio as in Scotland and it don't make much difference about the kind of roof. I would not want to go over four feet. I would not want to work in a vein over four feet thick. But I understand they are working it even thicker than that, about two and a half or three feet or four feet they can work it very nicely. In working by long wall, we will say you start in the hill mine and as you advance the roof will keep settling down and it will settle plumb to the top. You would not see a place scarcely when you go on the hill, only it is settled, but it will settle down just regular and seems to keep the soil on top even. It would not have any more opportunity to rain through the cracks as it does now, because when pillars are left and a fall comes, it extends from there to the surface and leaves a crack and all the rain that comes runs right down through. It would not do that work by long wall. It would run right off as before the coal was mined out.

SECRETARY HASELTINE: Mr. Dalrymple, you don't think

the long wall system would be applicable to the coal of the Hocking Valley?

MR. DALRYMPLE: I would not want to try it.

SECRETARY HASELTINE: How much coal is wasted in the Hocking Valley?

MR. DALRYMPLE: I think thirty-five per cent.

SECRETARY HASELTINE: Do you think it is better now?

MR. DALRYMPLE: Oh yes. You take these mines it has been better ever since the C. and H. C. & I. introduced their mining engineer, and we are advancing right along. We are advancing down in Jackson too.

MR. MORRISON: The gentleman asks about working the machines in long walls. I worked in the old country faces 200 yards long with machines. That is, with the..... saw carried on a track in front of the face of the coal and you start at one end and the rotary arm goes in until it is at right angles and then goes right along. I have cut 200 yards in eight hours. I never knew of the coal coming down and interfering with the machine except in the north of France. I went over there once to see them mining and they were working coal 9 feet thick in long-wall, but the coal was so soft it naturally fell out of itself and buried the machines. It was very much broken up. I would not be afraid to work a six foot vein with a good roof and work it with the machines. It is possible to work it to advantage. I always got eighty-eight per cent. of large coal with the machines. Some years ago in Staffordshire, I was getting out some work there and we carried on long wall. We carried the face in something like that, the center a little ahead of a straight line and at either end we had our main roads cut in the gob and we had no trouble at all. We kept lines of props. We had four lines of props about a yard apart and broke the roof off at the fourth line of props, because if we had not we would have got such a weight that we never could have worked the coal, and all the places I

have ever seen long wall worked, it has to be worked on that system. In Scotland, all the collieries I know of have exceptionally fine roofs. I have been in mines there where you would not see a stick in for three or four acres. You could almost drive a carriage through there. I remember of being in a pit there where I walked for miles without seeing a prop, the most extraordinary roof I ever saw.

I simply got up to make the remarks about whether the machines could be profitably worked.

MR. RENNIE: Gentlemen, it is well kown that a machine cannot get buried up, it would be as safe as in this room here. When I spoke about breaking every three months, it did not spoil the work, it settled down gradually, but it did break and I think every man who has worked long wall will agree with me.

MR. DALRYMPLE: How much of a body does it take to break it?

MR. RENNIE: Well, I don't know. They could not have taken out much where you were working, but about Glasgow it would break every three or four months.

MR. DALRYMPLE: How far would that be?

MR. RENNIE: Well, probably thirty or forty yards.

SECRETARY HASELTINE: Mr. William Turner is here from Cambridge. He has charge of Belmont, Guernsey and some of those counties down there where they make no pretense at drawing room pillars at all. I would like to have Mr. Turner substantiate my statements as to the waste of coal.

MR. TURNER: Mr. Chairman, I have been enjoying the discussion without any idea of being called upon. I have not been preparing any argument, but I can verify our chief's statement in regard to the mining of coal in Belmont County. They make no effort whatever in that county to save their pillars, although I believe that when he first made his visit in that county he found some of these mines were not leaving much pil-

lar to save, but they have changed that system some in regard to arrangement and ventilate more properly than they were doing at that time. They are leaving heavier pillars now and are making no effort in any respect to draw them. In Guernsey County I think I called his attention to some of their system of taking out pillar work the last and only time he has been down there, in the old Nicholson mine. They worked room and pillar work, double entry, twenty-two foot room and they left about twenty feet of pillar, meantime leaving sufficient entry stump to break the strata in drawing the pillars home. After the room is worked up to the line they go back and bring up the pillar until they get up to the head of the room again, then they break through the other end and draw that back. Now taking the No. 7 seam, I believe conscientiously if the mine is laid out right and the entries driven the proper distance apart and the rooms driven uniformly and the pillars drawn at the proper time, without leaving them stand too long, it is about as profitable a way as the coal can be worked. I did some long wall work in that seam at one time and I believe Captain Morris can verify that, as he was inspector then. We did not do a very extensive business at that time. We were only completing a small corner of coal there that belonged to a man by the name of Smith. Now we found that to be a pretty successful way of working that coal. But when you commence talking this to operators who are just opening mines, it isn't every one that is able to drive to the limits of their coal territory to commence work. They want to get money right at the start, and that has been the great trouble. There has been more coal destroyed in my experience by men being too anxious to get a return at the opening of the mine. But I can verify Mr. Haseltine's statement in regard to the loss of coal. I believe that while it has improved somewhat in one respect or in some of the mines, in Belmont County at least forty per cent. of it has been lost.

SECRETARY HASELTINE: That coal is about six feet thick.

MR. TURNER: Yes sir, from five feet four to six feet. In driving the rooms up, they always lost a breast of clear coal in

there by leaving the pillars too small, by driving the rooms up they would get a crush on and lose the coal. In the old Wheeling Creek mine years ago, it never worked out all the coal between a pair of entries. Sometimes now since they have increased the thickness of the pillar they get the rooms to meet.

Now I have seen some of the long wall system myself in low coal where they kept following the line where they had a proper roof and got it started to settle, that they could work it successfully, but I have no idea that No. 8 in Belmont County could be worked by holding up the roof in the long wall system. No. 7 has fire-clay under it but No. 8 has fire-clay on top. Now this clay is being successfully worked in manufacturing brick in that county. They are taking it out of the Robinson mine and are manufacturing good fire-clay brick from it. The only way that could be worked, in my opinion, would be worked as these gentlemen say, so that it could be kept breaking down behind. Now I don't know whether it will decrease the loss of life in working coal that way. I rather incline to believe that that would be more dangerous than room and pillar system. Take No. 7, and No. 8 seams, and I quite agree with both Mr. Haseltine and friend Love in regard to the County of Durham system or the present system of room and pillar, leaving sufficient pillar as you go ahead and bring out the coal coming back. Now I believe that method in the high coal, either the County of Durham system or the room and pillar system is the best. I quite agree with Mr. Haseltine in regard to a more economical way of taking out coal. I believe it is the duty of the present generation to look after that, but not that we need to fear freezing to death in our day.

MR. LOVE: Mr. President, are you willing to conclude these remarks, or allow them to go on. I want to say a word in reply to Mr. Turner. While he says he don't believe that No. 8 would work long wall, I believe it will. That is one of the seams I have had in view. I have had more experience with that seam than with any other seam in that part of the country and I am satisfied that that is one of the seams that would work long wall.

I did not try it long wall, but I tried it another way. We hadn't any pillars and the soft shale over this roof coal, as we call it, there is a shale from four to seven feet thick that has got to come if you let the water get to it, because it seems to contain a large percentage of lime and comes down. Over that is strong lime-stone. In that part of the mine that I refer to, we had a terrible squeeze. Now when it is squeezed sufficient that all this shale comes down and it could rest on that shale, it left that lime-stone for the roof and it was unbroken entirely. Well now that proves to me that that seam especially would work successfully by long wall and this draw slate that has killed so many miners down there, where there is one every once in a while gets killed, it would be all broken up and softened as I said in my paper and come down like saw-dust and be perfectly harmless and could be thrown back with the shovel. I don't think that seam would work successfully on the County of Durham system, and for reasons that I won't state. This discussion has been pretty lengthy and I have been very glad it has been. I am glad I could advance something here or produce something that would bring forth such a discussion, if we had to be drummed up to get these papers out.

MR. TURNER: One more word, if you please. I think friend Love misunderstood me. I made the remark that I did not think it could be worked successfully on No. 8 seam unless on the system that these gentlemen refer to by breaking. Now whether it would pulverize that substance sufficient to make it harmless, that is a question I am not able to decide. I had an idea that the weight would loose that up and as friend Love knows, it don't take a piece bigger than that spittoon to knock the life out of a man.

MR. DALRYMPLE: Just one word. We don't want to take any theories nor ideas. We want practical experience in every thing. Now I am well pleased with Mr. Love's paper. I am sorry that Mr. Love butchered up his long wall system in this style. I make a motion that we tender Mr. Love a vote of thanks for his valuable paper.

The motion being seconded, prevailed.

SECRETARY HASELTINE: Mr. Chairman, I know the next paper is good and we will have a discussion. Before we get onto it I have two things I want to dispose of so they will be off my mind. I have been handed a resolution which I will read: "Resolved, that the thanks of the members of the institute be tendered to Prof. M. W. Lord, of the Ohio State University for this very excellent demonstration of the properties and combination of gasses encountered in mines." The motion being seconded, prevailed.

SECRETARY HASELTINE: Now gentlemen, I have in my hands the petitions for membership which I desire to offer.

On motion of Captain Morris, the secretary was instructed to cast the ballot of the association for the election of the following members whose names were presented, except the gentleman from Dudley, England, who was elected an honorary member:

- H. V. Carl, Coal Operator.....Carlton, O.
- David Davis, Coal Operator.....Conesville, O.
- O. V. Dibble, Mine Superintendent.....Wadsworth, O.
- F. N. Barnes, Mine Superintendent.....Franklin Station, O.
- Lewis E. Bryant, Mining Engineer.....Harriman, Tenn.
- Lucien S. Johnson, Mining Engineer.....Louisa, Ky.
- John P. Jones, District Mine Inspector.....North Lawrence, O.
- Walter C. Gayhart, Mining Eng. & Chemist.....Austin, Nev.
- Robert H. Miller, District Mine Inspector.....Shawnee, O.
- Alex. Beattie, District Mine Inspector.....Nelsonville, O.
- E. J. Huston, C. & M. E. & Atty.....Monroeville, O.
- Henry M. Morrison, Mining Engineer.....Cleveland, O.
- J. A. Hanlon, C. & M.....Coshocton, O.

THE CHAIR: Gentlemen, the next paper on our programme is by Mr. William B. Rennie, of New Philadelphia, on "Miners' Sunshine and its Uses."