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## LONG-WALL MINING.

BY WM. DALRYMPLE.

There are various modes by which to work Long-wall. The one which is mostly practical is to take the coal all out as they advance. The others is to work it out in sections as they advance or drive the narrow-work to the boundary line or the distance intended to go and come back with all of it in a breast. To take it out as they advance can be done in all kinds of openings successfully. In shaft openings, the object is to get the shaft in the lowest place possible for the purpose of handling the water to advantage and at the same time to have down hill for the hauling of the loaded trains to the bottom which is quite an item, both in convenience and expense. A sump should be sunk at the bottom of such a size as to contain two or three days water which is made by the workings, so that in case anything should go wrong with the pumps work could continue on without interruption until mended.

The pillars at the bottom are left as a rule about forty yards all around in order to protect the shaft and bottom from any squeeze coming on after the excavation of all the coal has commenced, because the first break that comes on the workings has a tendency to bear down heavy on the bottom pillars. Airways have to be driven around these pillars for the purpose of allowing the air to circulate, after which the whole body of coal is taken in a breast wherever it is possible. Coal from 18 inches to 4 feet in thickness can be worked to good advantage and it is not necessary to take into consideration the kind of roof which has to be contended with, as all kinds can be handled and that with perfect ease if properly cared for at the right time. Of course it is much better to have a good top than bad in any system of mining; just so with this one. But I think that a slate roof is much the best, everything being considered, as it comes down in better shape and can be handled and put in buildings better than any other material. It also settles down more gradually on the buildings and is not so liable to break without giving warning as rock or soapstone or other material that could be named. Working places are driven about 20 yards wide or just as wide as desired and when the coal is thin it is hauled out to the main road by means of a little car or sled which holds two or three hundred pounds. The main roadways are brushed down and made just as high as wanted and just as wide, so as to give plenty room to get around with convenience, and on each side buildings are put up nine feet wide and properly built so as to protect the roadway and at the same time to assist in keeping the roof good and strong, so that it will settle down quietly. In along the place in the

gob little buildings are built nine feet from the main roadside buildings two by three feet and if it is a pretty good top these buildings don't have to be closer than four to six feet. If the roof is somewhat tender posts have to be put between them, but if it is not it does not require any at all. In real low veins it does not need anything but roadside buildings except a few posts put in once in awhile. As a rule there is always some stuff to gob with which answers the purpose of buildings. Where the coal is four feet the worst feature about it is to get building material to build the place with. However it is a very easy matter when this happens, to get back into the gob, and put in a shot or so and get plenty which can be brought up to the face very easily and the place made secure. After the first break when starting from the bottom it is not so hard to get material to build with as the roof is all the time settling down and gets very low by the time that it is necessary to brush or rip the roads then, it does not require so much to fill it up as would be expected. In mining by this plan it is best to keep it working every day or as near to it as is possible, because if allowed to stand idle it is liable to break along the faces and throw the places in more especially if they were not properly built; but as a rule there are never any very big falls. It depends a great deal on the nature of the coal whether it would be best and the most profitable to work it on the face or butts of the coal or half and half. Very often the latter plan is adopted when the coal is found to be of a tender nature. It makes better coal by working by this plan. In

other coal it would be better to work it on the face or butts; all three ways are practical and are worked very successfully in the way of making good coarse coal than could be made if worked otherwise.

No mine could be carried on to any success by this method unless there were miners to do the work that have had the experience at such work for years. It is not the same as taking hold of a drill to start to drill a hole, and when done to fill it up with powder. A miner that has had years of experience at this kind of work is a very good stone-mason as he generally has plenty building to do. It also requires some knowledge to know how to bring the weight on a place without letting it injure the roof, and then after getting it on to know how to keep it on. There is another way by which to open out the working. In leaving the bottom, levels are driven ahead in the solid coal just the same as narrow work in pillar and room work; sometimes they are driven as wide as the regular working places, and in some cases a pillar of coal is left alongside of the main level to protect the road which is always driven with the object of using it as a main thoroughfare, more especially if there is a large body of coal to be taken out. I don't consider it a very good plan as there is too much hard work for the miner to do in wedging or blasting his coal, and entirely too much expense in paying for this kind of work, when it can be done by the other plan just as well, and with the same results. When all the working places or a number of them, at least, are driven up about seventy-five yards, there

is another main road started along at the faces of the working places cutting them off, and as each one is cut off, their coal comes out on this new road; this is done for convenience in many respects; it makes the hauling shorter, and lessens the expense in track material, also in the roadway, etc.

It is not because of the depth that this plan of mining is practiced but because it gives better results, both to the owner and also the miner. I have seen it worked in moderately deep mines and also in very shallow ones, where it did not reach over fifty feet deep. It ought to be the object of all interested in mining to mine all the mineral, whatever it may be. It don't cost near as much to do so, and it looks so much more practical, especially where a seam is adapted for it. There are no entries to be driven by this system, only in making an air way around the bottom for air. There are mines running in this State that have been in operation for years, where there is one-third of the coal left as pillars to support the roof, both in rooms and entries that is never taken out. Any one understands that increases the cost of the coal as there are so many entries and narrow work to be paid for and track material also, and haulage. If that one-third had been taken along the cost would not have been near as great, as there would have been no use for so much narrow work or track stuff, and the hauling would have been much closer, which would have lessened the cost in getting it out.

The ventilation is perfect; it is always found sweeping along the front of the working places where

it ought to be. One-third of the air, required by law in this State, for the proper ventilation of mines would do more good in long-wall than is done under the present system. I notice in parts of England, where the pillar-and-room plan has been abandoned the long-wall plan has been started, all for the purpose of handling the air to keep the air clear of gas. There is not much room to admit of gas by this plan, the buildings and the roof settling down makes it almost as solid as when before the coal was taken out, so that there is not much to be feared from the accumulation of gas. One bad feature about pillar and room in mines where so much gas generates, is the open space which is made by taking the coal out and allowed to remain open, which becomes a regular magazine for gas. If the pillars be taken out it will break and fall and along close to the entry will be places that are just fitted to hold gas, and if these places are bratticed there will always be some leakage which will escape out into the entries, where it is liable to be ignited. In reading about explosions we always hear that there have been more than one, especially if the mine has been extended any distance. This is caused by the accumulation of gas in old workings or other parts, the flash of the first extending back to it. This can't be so in long-wall, as it settles down perfectly solid as they advance and prevents any such admittance of gas only at the faces, and it is soon cleared away by the air which is always found sweeping along at the faces.

There are but very few coal-fields in Ohio but what can be

worked by this system. I have seen parts of the No. 1 seam that could have been worked. It lay, as a rule, level, or at least in a good enough shape to admit of its being worked. Where an uneven floor is met with, the roadways are driven to suit it so as to make the hauling as easy as possible. It is a very easy matter to mine coal by this system if one understands it properly, but to the inexperienced it is a very difficult task as they do not know anything about how to bring on just a sufficient pressure on the place to make the coal work nicely. Of course all admit the more coal mined in a day by any one in any country or clime, the price is regulated accordingly. It does not need much argument to settle the price of mining with an experienced man who has worked in both systems, as any one knows full well that the long wall can be worked for much less per ton than pillar and room and the miner make more money. It is easily explained. The coal when properly worked, as the saying is, digs itself. The best posted men in the world on mining, admit and encourage this mode of working where it is found to be adapted for it; and as has been said from four feet in thickness down can be worked. I have never met with or saw any roof or bottom in this State, but what was good and strong enough in driving to the boundary line in order to bring all the coal back. This is the only way to work thick coal by long-wall either by this method or by taking one pair of entries at one time. The rooms when advancing can be turned off the entries just the same as at present and run up thirty

feet wide and can be made one hundred feet apart and connections made after they have been worked a certain distance, then it all can be brought back in a breast to the entry. The same way with the other that is worked to the boundary line before commencing to come back. There is quite a saving by this method, although there are but very few places where it is in practice, owing in a great measure to the outlay of money which has to be invested, before there are any returns. There would not need to be so many rooms turned off the entries which would be quite an item of itself; all the coal would be gotten out which would lessen the expense wonderfully in every respect than under the present system. If, after considerable of the coal has been taken out and there was a squeeze and likely to be a fall it would be a very easy matter to secure the place by one or two rows of props, about 2½ feet from the solid coal, which would break it off that distance and would not interfere nor bother the progress of the men any.

In taking one pair of entries as advancing is just as good a plan as any, and is much the best for all as all can start upon this system as well as the present. There is no company that I know of in the state that is operating at the present time but what could start by this plan and make money by the operation. Everything in the way of mining is in his favor by this plan, one-fifth of the expense in paying for turning rooms will only have to be paid for the expense, also in hauling the slate which is made in turning the rooms will be dispensed with. In taking into

consideration the close hauling, working by this plan compared to the other, the gain is just astonishing when figured up. There are no pillars left near the bottom of the shaft or slope that could have been hauled out at half the expense than can be done when extended a distance. There would not be any use for so much track material; everything else in proportion. It is decidedly the best plan for everyone interested; cheaper for the owner, and the miner can mine more coal, all will admit.

In sections I could name the coal mined by this plan is paid so much per ton in driving the room or narrow work, and so much when working on the pillars.

I have merely tried to give a clear explanation of the practical working of long-wall. Of course I consider it the best and the only way long-wall can be worked properly without having to drive any narrow work in advancing, which is the only long-wall. The other plans are not the long-wall, practically speaking.