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**Creators:** [Middleton, Thomas](#)

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*PAPER ON THE WORKING AND VENTILATION OF  
THE COAL MINES IN THE POMEROY  
DISTRICT.*

BY THOMAS MIDDLETON.

Before going into the general subject, I wish to call to your attention that I shall address myself more particularly to the younger members of the Institute.

You all know of the different means used to produce a current of air in a mine. It is by means of the furnace that the current is produced in this district. The whole of the air, after ventilating the different working places in the mine, is brought over the furnace, and rarified in proportion to the heat given off from the furnace.

I would also call your attention to the fact that the Double Entry system, that will be spoken of in this paper, and put in practice some years ago in the Pomeroy Coal Company's mines, is a very old plan in England, and that we lay no claims to inventing the plan. But we do claim that the Pomeroy Coal Co., was one of the first in adopting the system in the State of Ohio.

Pomeroy is situate two hundred and eighteen miles above Cincinnati, and two hundred and forty-nine miles below Pittsburgh. The coal mines in the Pomeroy District are situated up and down the Ohio River for a distance of sixteen miles.

The Ohio Coal Company's mine, at Antiquity, is on the extreme end up the river, and the Cheshire Bank, in Gallia county, the extreme end down the river. The coal at Antiquity, ten miles above Pomcroy, is won by a shaft 200 feet in depth. The coal at the mouth of the Peacock Bank, at Pomeroy, is fifty-nine feet above high water mark and fifty-eight and one-half feet above Lake Erie.

In that distance of sixteen miles, including the mines on the West Virginia side of the river, there are twenty-four coal mines in operation, twelve on each side of the river, employing from nine to ten hundred miners. Of these twenty-four mines, fourteen of them supply Salt Furnaces, and ship coals to the various markets down the Ohio River. Ten supply Salt Furnace, a Rolling Mill and a Nail Factory.

I shall now proceed to explain, in a brief manner, the mode of ventilation and working from the earliest date to the present time,

by the plans which I have prepared on a large scale. We will take first

PLAN NO. 1.

The first system of working the mines in this district with any practical method was in or about the year 1833. Plan No. 1 shows that a single entry was driven on the face and butts of the coal. Rooms were opened out on each side of the butt entry, alternately, and worked on the face of the coal for a distance of one hundred yards or more, just as the case might require it and ventilation admit. The pillars between the rooms were somewhat irregular in regard to their thickness, for the rules were not very definite nor strict in regard to the width of rooms or thickness of pillars. The system of working away the pillars was not practiced at that time. The ventilation was in just proportion with the system of working and was conducted on the plan of natural ventilation, that is by the air passing in and out of some hole made in a ravine or hollow, and was regulated according to the state of the atmosphere and direction of the wind outside.

PLAN NO. 2.

We now arrive at a time when a slight improvement in the ventilation was made, but the method of working is about the same. In this plan, it will be observed that a pair of parallel entries are driven on the face of the coal and a single butt entry is started off the main entry, and rooms opened out along it on each side alternately. The rooms were started off the entry at two yards wide and driven in at that width for a distance of five yards, when the miner begins and widens out his room three yards on each side to make his room eight yards wide, and leaves a pillar five yards thick between each room. The rooms were worked up for a distance of one hundred yards, the tramroad was carried up in the middle of the room and the pillars left standing. The improvement in the ventilation spoken of above, was done by making along one side of the butt entry windways through the pillar between the rooms at a distance of five yards from the entry, by doors placed at the mouth of the rooms and a small furnace placed at one of the the main openings. As slight an improvement as this appears it was a step of advancement in the mining industry.

PLAN NO. 3.

It will be observed in this plan that the first room on the left

hand side of the entry is started off the entry and widened out exactly as the first room is done on Plan No. 2. But the first windway, five yards from the entry, is driven through the pillar for a distance of thirteen yards instead of five, and room No. 2 opened out off the windway its full width of eight yards. No. 3 room is started off the entry as No. 1 room was done—and so on all along the entry. The coal from No. 2 room is hauled along the windway, and on to the points of No. 1 room and from every second room in the same manner. This plan, however, forms stronger pillars next the butt entry and the putting up of only half the required doors.

Also an improvement is made in the ventilation by making a windway through the pillar of the first room on the right hand side into the main entry at A, and the placing of doors at B and C on the main and butt entries.

It will be observed by this mode of ventilation, as in the former plan, a great number of doors are required to regulate the ventilation and keep the air current in its proper course. It will be readily seen that by any disarrangement of any one of these doors the air will rush through it and take the shortest course to the ventilating furnace, and leave every other part in the entry unventilated.

This faulty method of working continued for a number of years, and it will be evident to everyone that by not extracting the remaining pillars, including losses from other causes, the loss of coal must have been from 40 to 45 per cent. Not only was there a great sacrifice of coal, but the miner was a sufferer from the loss of time and health on account of the defective ventilation. The frequent complaints of the miners about bad ventilation and the whisperings of a few of the better informed about the great waste of coal, left in the remaining pillars, caused the coal owners and managers to look about for a better system of mining. Subsequently, about eighteen years ago, the double entry plan of working commenced at the mines of the Pomeroy Coal Company.

#### PLAN NO. 4.

This plan represents the double entry system of ventilation, and the system of working. It will be observed that this system of ventilation does away with the doors at the room ends, as in plans Nos. 1 and 2, and that a pair of cross or butt entries are driven parallel to each other, in the same manner as the face or main entries are driven.

Windways every forty yards are holed through the pillars between the parallel entries, to carry the current of air up to the face of the advancing entries. As soon as a new windway is holed through the pillar, a stopping is inserted into the old one.

When the present plan was first adopted, the rooms were driven up for a distance of one hundred yards, and the pillars brought back for a distance of fifty yards, and the remaining fifty yards left standing.

Finally it was determined to drive the rooms up a distance of eighty yards, and work all the pillars back, which now is the present system.

As soon as the rooms have advanced half way, or forty yards, a windway is holed through the pillars between the rooms.

It will be observed that when the unbroken current of air on the main entry, is turned or taken into the cross entry, by means of the door placed on the main entry at A, that the air current is set at liberty to spread itself in a broken current into the different working places, and that the greatest quantity of air will be found rushing along the entry towards the wind-way at B, where it is taken into the parallel entry, and coursed along the same, and through the various rooms until it comes to the main entry again at C.

Sometime ago when the writer of this paper was assistant mining engineer, we proposed (as we think) an improvement to this plan of ventilation.

The proposed method is to take the current of air off the main entry, through a windway at E, as soon as the first rooms are up forty yards, and bring the current back on the main entry at F.

By this plan we would have the current of air forty yards nearer the working face of the rooms, and reduce the frictional resistance of one hundred and sixty yards in each pair of entries.

We also proposed an improvement by placing doors on each pair of cross entries at G, and H, then the whole current of air would be forced up the first room at G, and the last one at H, and coursed through the windways with the same good results as above, except in reducing the frictional resistance of the air current.

It will be observed, by this arrangement of doors, we can always have the air current taken up the first working room in one entry, and the last one in the parallel entry. For instance, suppose the first three rooms are worked out, and stoppings inserted into the

room ends, the door can be removed from G, and placed between the fourth and fifth rooms at I, and the current of air turned into the fourth room, and coursed through the windways.

The system of working is to start a pair of cross or butt entries, to the right and left off the main entry every one hundred and sixty yards, leaving a block of coal to be worked out by rooms being driven north and south to meet each other.

The pillar left between each pair of entries is from ten to twenty yards thick, depending altogether upon the thickness of the overlying strata above the entries.

The first room in each entry is opened out at a distance of thirty yards from the main entry, to protect it, should a heavy pressure or squeeze take place in the cross entry or rooms. The rooms are opened out along the cross entry at a distance of thirteen yards from each other, and as a general thing at two yards wide, and are driven in at that width for a distance of five yards, when the miner begins to widen out his room on one side to the required width, which is seven yards, leaving a pillar between each room six yards thick.

The tramway is carried up on one side of the room and as soon as the room is worked up to the required distance of eighty yards, the miner attacks the pillar next the tram-road, and works it back within ten yards of the entry.

The pillars are brought back in *eschelon* order to throw the pressure off the pillars in the goaf or exhausted area. As soon as the cross entries are driven to their boundary, and their innermost rooms worked up, and the pillars brought back, the entry pillar and room stumps are attacked, and as a general thing successfully taken out. In the pillar workings we cannot say that all of the coal is recovered, but will be safe in saying that 85 per cent. of the whole is won.

Of the plans spoken of in this paper, it will be evident at a glance that the present system of ventilation and working, is far superior to the former systems, and in the end will be found to be the cheapest plan. In my experience, I have known bad, and I may say serious results, from the system of working on the single entry plan, in the way of loss of coal, from squeezes, etc., and a continual extra expenditure was created.

While I would call to your attention as to the improvements made in the ventilation by the present plan, allow me to make a

few remarks, as to the great improvement that would be made in the ventilation of our coal mines by splitting the air, accomplished by air crossings, that is, carrying one current of air over another. By regulators, we can put a more or less quantity of air in any part of the mine, just as the case may require it.

This would be a great advantage over the present system of taking an unbroken current of air, through the different parts of the mine for a distance of three or four miles.

If two splits or divisions are made in this current of air, and each split permitted to travel only half the distance, then the frictional resistance has been reduced to about half what it was before.

I must, however, bring my remarks to a close. I have done to the best of my ability in my hurriedly arranged paper, to bring to the notice of the younger members of our Institute, the advances that have been made in the mining industry of our State, and however imperfect I may have done it, I hope it will have a tendency to stimulate them to use their endeavors to better and further improvements in mining engineering.\*

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\*NOTE.—Mr. Middleton, owing to the press of business, was unable to be present at the meeting of the Institute, and forwarded his paper and maps by a friend to Columbus, to be read by the President. But by inadvertance they were not delivered until after the meeting had adjourned, and too late to have maps made for publication in this issue of the MINING JOURNAL. As the paper was written to be illustrated with plans, it loses much of its thoroughness in consequence, but the subject matter is so important that it was deemed proper to print the paper without the cuts.

Mr. Middleton, whose knowledge and experience as a practical mining engineer extends over many years, will, it is hoped, prepare other papers on the subject, as such literature is a valuable acquisition to the columns of the MINING JOURNAL.

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