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Some Experiments in Blasting.

W. B. BROOKS, JR.

READ AT COLUMBUS MEETING.

When I consented to contribute a paper to be read at this meeting on the subject of blasting, I was deeply interested in some experiments in that line, and had plenty of time, as I thought, both to carry my experiments to surprising results, and also to write a paper on the subject, which, even if but poorly describing my experiences, would at least prove a subject for discussion, and perhaps throw some light on this dark, underground work in which most of us are engaged. But circumstances have crowded this experimental research on into the future, and rendered the writing of a worthy paper on the subject almost an impossibility. But if I can be the means of hastening the research in the direction of improvements in the methods of mining, or even rescuing myself or any other poor deluded mortal from hopes of success in experiments which can be shown here to be futile or old and worn out, I will not feel that I have written in vain.

With all the improvements which invention has brought us, very little advancement has been accomplished in the manner of digging coal. There are many fine and ingenious pieces of machinery for both drilling and digging coal, but the old methods of actually *digging the coal out* to make the "under-cut" is still maintained, and probably always will be, as the advantage gained by having as much "open end" as possible is self evident.

There are some coals which are mined entirely by drilling and blasting, but most of them require this undercut in order to make a marketable article, and get good results, for reasons which are too familiar to need any explanation. The idea of *shooting the undercut out* occurred to me from having often seen the *top seam* of this Hocking Valley vein shot out unintentionally without disturbing either the roof or the two lower strata, although the regular undercut had been made. This peculiar blast was caused partly by the extra thickness or toughness of the "middle slate," and partly, and I think *chiefly*, by the *position of the hole for blasting*. With the improved power drills, now quite common in mining districts, the matter of drilling is reduced to a very small item in the production of coal, and holes five to six feet deep can be drilled in from three to five minutes. Therefore, why not drill a number of holes in the bottom, along the entire face of the room, to the proper depth and in the proper position, charge them with the proper kind, grade and quantity of powder, connect all by wire, and shoot the entire undercut out by firing all at one time

by electricity. There was "millions in it," and fired by the thought, I resolved to try the experiment. But before I could get the necessary battery, wire, etc., to begin the experiment, I could not keep such a grand thought to myself, and selecting a few very intimate friends, whose opinions in such matters ought to be valuable, and in whom I felt that I could place the utmost confidence, I unfolded the scheme to them, and strange to say, no two came anywhere near together in their opinions, either in regard to position of the drill holes, grade of powder to be used, or the result. By the time I got all ready, I had gathered quite a crop of opinions on the subject, and with the help of these, I had resolved on making a *sure thing* on the first trial, by having the holes placed close together, and at an angle which seemed best adapted to produce the proper result, and using the highest grade of Hercules powder. Selecting a good room twenty-seven feet wide, we drilled eight holes, three feet apart, and five and a half feet deep along the face of the coal, slanting them all alike, starting from just above the bottom slate, about twenty-eight or thirty inches from the floor, and drilling to within a few inches of the floor at the back end of the hole, charging all the holes heavily with the highest grade of Hercules powder, tamping them all well, and connecting them together with enough leading wire to insure safety—for it seemed to me that we had power enough to almost lift the entire hill—I gave the handle of the electric battery a vigorous pump downward, holding my breath with fear and anxiety. There must have been some mistake, for only a very small, smothered sound reached our ears, and, after waiting a few moments, we knew not exactly what for, we cautiously advanced to examine the result, only to find our hopes much more blasted than the coal. The face of the room appeared exactly as we had left it. Taking a Harrison digging machine, we cut into it to see what the trouble was, and found the shots actually smothered, but the coal was very easily dug out, being somewhat demoralized with her efforts to retain her composure during all this excitement. The next time we tried our experiment, we cut out about a foot wide, and five and a half feet deep in both corners of the room, and used a much lower grade of powder—the common blasting powder. The result of this was much more satisfactory, the coal immediately around the shots not being broken up so badly, but the entire undercut was much more easily dug out. The desired result had not been attained, as the coal *still had to be dug out*. But our *hopes* stood this shock much better than they did the first one, and we were now thoroughly convinced that we *were on the right road*, and all that was needed was to obtain the *right grade* of powder, the *right quantity* of it, the right size and position of the drill holes, and the coal would almost mine itself. But much as I would have liked to continue my experiments, other duties have

occupied my time and prevented my doing so. But I hope this matter will be freely discussed, and that before the next semi-annual meeting I, or some one else, will either have made a success of this kind of blasting, or that an entire success is made in blasting all hopes in that direction.

DISCUSSION OF MR. BROOKS' PAPER.

Mr. Roy: Mr. Chairman, I see no reason why that could not be made a success in some veins. If the bottom was hard and smooth by drilling holes in the coal that way you ought to be able to put it all off at once, and that might be well adapted to the Massillon field so that they would not shoot off the solid. I know when I was digging in 1871, at Mineral Ridge, I believe it was, I tried that experiment. I do not know whether I ought to tell it, for I am afraid my friend Howells would give me fits for it. We applied that plan and I know he will say I was the beginner of it. The custom before that was to undermine. We were working by the yard and about two and a half dollars a day was an ordinary day's work by that system, but by blasting the result was over six dollars a day. In a room twenty-five or thirty feet wide if you were to drill a series of holes where there was a smooth floor, you certainly would get that coal out that way, just what kind of coal would depend on the amount of powder you put in.

A member: I will say that system of mining is carried on in Iowa almost altogether. They have a six foot vein and they drill the holes sloping and shoot it off. They shoot off the solid; they shoot the bottom out and then shoot the top down.

Mr. Howells: In some places that plan would be practical but in others it would not. Very nice coal can be made in the Massillon district without any undermining; better, however, if you use a little, and the time the men lie around they could do it and save powder, but it can be done without any undermining.

Mr. Morris: I listened to Mr. Brooks speaking about his experiment. It might do in some places, but in others it will not. For instance, it would never do in our No. 6 seam. There we have a soft bottom. In the first place, in putting a series of holes of that kind to knock the bottom out, half of the fire clay would come out with it, and consequently the miner would be in trouble with the operator for mixing the coal and fire clay together. In other places where the No. 7 seam is worked I have no doubt it would do. Some two years ago I was one day in Mathew's mine down in Cambridge, and it is mostly Germans that are working there, and there was a German boss, and he was a very particular fellow. He made them all undermine the coal, and there was a little fellow working who happened to be a Welshman, and

I went into his room and happened to be by myself, the boss was somewhere else, so I caught him putting his shot in the bottom. He pulled his drill out quicker than lightning when he saw me, but I saw what he was doing, and I asked him "Davy, what are you doing?" Said he, "do not say a word or the boss will stop me right away." Said I, "What are you doing?" "Putting a shot in here." Said I, "Will that work?" Said he, "It will come out like snuff." "Well" said I, "the boss is not around; put it in and see what it will do." It worked very successfully, and he was digging about as much again as the others. Well, after a little while some other fellow went in there and saw him doing that, and he got on him sooner than he thought, so that fellow did not say anything, but he got to doing it the same, and to-day they are all doing it. In a place like that this new mode that Mr. Brooks speaks of no doubt will work very well. That coal is pretty hard to under-mine, but there is a hard, smooth bottom, and consequently it will work very well. Concerning our accidents, I thought I would just mention a word or two. Now what can be done? Well now that is a pretty hard thing to resolve. Ever since mines have been, accidents have happened in them, and no doubt always will. It is not always the fault of the miner when an accident happens him. It is very rare to see a miner come to an accident that he does not know something of the danger before it comes. In the fourth district last year we lost four men. Three of them came to their death knowing of course that there was danger. One of them was working in an entry and the rule there was for two to work in an entry, and they are working double shift; each one makes a cut in the shift and blasts it down, and then the other shift comes in, loads the coal, and makes another cut. This night, the two that were working on the night shift made their cut and were ready to put the shots off, but they found that there was a stone hanging there, that they were afraid would come down with the coal and mix with the coal, so they put two props under it and of course puts props behind them so that the shots would not knock these two props down. Every thing went on just right. The next morning the other two went in there and one happened to be before the other, and he saw the two props there of course, and no doubt he had a little more thought about him than his partner, and so he went at it and loaded one car before his partner came in. That was gone out and the other pushed in ready to start again, when his partner came in and says, "Miller, what do you want to fool your time away loading between them props?" He says, "That roof is bad or the boys would not have put them up." He says, "Tut, tut, let's take them out." The other says, "I will go back here," and he took a sledge and knocked the two props out, that had been put there but his partner stayed behind the car, and he had not half loaded it until the whole thing came

down and killed him. That was a suicidal act; he knew there was danger, or the props would not have been put there. Another one was killed by commencing to sheer right after a standing shot in the smoke, without waiting until the smoke cleared away and the roof came down and killed him. Another was killed by going through into an adjoining room to wait for a shot, and stood by an opening into the room where the shot was, and was struck and killed. Another was killed by a stone falling, while he was preparing to prop it up. It is not always the carelessness of the miners. It is of no use to talk, ever since there have been mines, there have been accidents, and no doubt there will always be, but if we can do something, or think of something, that will prevent these accidents it will be a grand thing, and I hope before we are through, that some one will advance something that will lead us to that conclusion.