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THE DIFFERENCE BETWEEN MINING COAL AND IRON ORE.

BY P. F. SCHMIDT, OF POST BOY, O.

Mr. President and fellow Members of the Ohio Institute of Mining Engineers :

This is my first effort to write an article to be read in public. I therefore ask you to give me your attention while I try to explain to you the difference in mining *coal* and *iron ore*.

There is a great difference in mining *iron ore* and *coal*.

What is called Black Band Iron Ore lays in blocks. Between these blocks are good sized seams. In working entries we have to follow these blocks, which make the entries look rough and very irregular ; where in coal we can drive entries straight, and smoother, which helps the looks of a mine very much. It is also much harder to keep up the roof in mining ore, for the reason that ore is heavier than coal, and, being in blocks, will draw heavy on the roof after it is mined. The ore lies on the No. 7 coal, and it runs from 16 inches to 2½ feet. This coal has to be mined from under the ore in order to get the latter down.

There are also many difficulties in the circulation of air in ore mines : one is, that it takes a great deal more powder to work ore than is required to mine coal, therefore we must have more air to remove the smoke ; also, the air has many crooks and short turns to make, caused by the projecting blocks which we have to leave as we work our entries, where in a coal mine the air has a smoother course. It requires more work and attention to circulate air in an ore than it does in a coal mine—a few of the reasons I have stated above.

I have noticed practical coal miners making poor headway, the first month, while working in ore. The main drawback is in blasting the coal. A miner must first learn to blast the coal which lies under the ore, and also to bore his holes in such a way that the shot will throw the coal back to the seam in the ore. Here we find our greatest danger in mining ore, if the hole is not bored as it should be ; consequently, the coal will not be blasted out to the slip. In such cases the miner has to cut the coal back to the seam, which is very dangerous, as the ore blocks rest upon the coal, and have no other support. Sometimes these blocks drop so suddenly that you cannot tell when you are in danger while cutting the coal.

MR. WILEMAN: There is one matter which has not been attended to yet, that has usually been done. I move that the Chair appoint a committee to wait upon the Legislative Committee in reference to the appropriation for the short mining course.

THE CHAIR: I have another committee to appoint concerning this resolution. I see it requires the chair to appoint the committee. I would re-appoint the committee that drafted the resolution, Mr. Roy, Mr. Haseltine and Mr. Wileman.

PROF. SPERR: I move that a committee be also appointed to present a resolution with reference to a tax for the support of the University to the Legislature.

THE CHAIR: How many members, three or one?

PROF. SPERR: I would leave that to the chair.

THE CHAIR: Well, I will appoint Prof. Sperr and Prof. Lord.

PROF. LORD: I would like to be excused from that committee. I don't particularly care to go before the Legislature as a member of the committee recommending appropriations for the University. I think you should get a committee from other sources.

THE CHAIR: Well, I will appoint Mr. Haseltine and Prof. Sperr. I guess that will be sufficient.

PROF. SPERR: I might urge the same objection as Prof. Lord; but, as an alumnus of the Ohio State University, I am expected at all times to do all I can for the University.

THE CHAIR: The question now comes upon the motion made by Mr. Wileman to appoint a committee to confer with the legislative committee relative to the appropriation for the short mining course.

The question coming upon the motion of Mr. Wileman, is declared carried, and the Chair appointed on the committee Secretary Haseltine and Prof. Sperr.

PROF. SPERR: I think there are decided objections to my acting as a member of that committee, being interested in that. It will become of more force to appoint disinterested persons.

THE CHAIR: I will draft Mr. Haseltine and Prof. Orton.

SECRETARY HASELTINE: Do you know of any reason, Prof. Lord, why Prof. Orton would not serve?

PROF. LORD: If the Institute wishes to appoint a committee—I am very anxious to see it done—appoint a committee to meet the Legislature in reference to urging the appropriation which has now been made for three years for a Mining School in the State University, I think that in appointing such a committee it should be a committee of the Institute who are not connected with the school. Prof. Sperr, Prof. Lord, and Prof. Orton are all connected with the institution and are directly interested.

THE CHAIR: Is there any person here, at Columbus, Prof. Sperr?

PROF. SPERR: I suppose this is intended to be attended to immediately. I would suggest Mr. Roy.

THE CHAIR: I will make the committee Mr. Roy and Mr. Haseltine, and I trust that Mr. Roy will be here.

MR. ROY: It is a mere matter of form, anyhow. The appropriation is going to be passed, anyhow.

THE CHAIR: We have another paper now. The next paper is by Prof. Sperr, on the subject of "Mine Ventilation as Taught in the School of Mining."

PROF. SPERR: Mr. President, there is only one thing which induces me at this late hour to inflict a speech upon this Institute, and that is that I want to show you how much can be accomplished in two years' time by these young men that come in from the mines with practically no education whatever. As we have heard a great deal on that subject to-night and some imagine that miners cannot get an education, or that miners cannot learn, I want to say a few words on the subject. My experience leads me to believe both that miners can learn and that many of them can get a pretty fair education. I believe that every miner can obtain an education if he will work for it. I find that miners, so far as my experience with them

goes, are more alert mentally than other classes of laborers. Their occupation necessarily makes them so, and when they undertake to learn the things that will help them in their occupation, they study with an object in view, and the rapidity with which they learn surprises me, and I think it will surprise all of you.

The subject of ventilation has been chosen to illustrate our general methods of instruction. Some other subject might perhaps have been equally well chosen for this purpose.

We have a map here which has been made by a student. This is his first attempt at mapping a mine and he has made a very creditable drawing. This map is made from the actual notes and practically from an actual survey, as all the motions are gone through with of surveying the mine, setting up instruments in their proper places, putting up sights, etc.; and then, after they have taken the notes, they make a map and each student coloring his work a certain color. Next year another class will find this mine worked further. They will make monthly surveys and map the workings. Now, all the questions of operating, ventilating, hauling, etc., come up and are disposed of as in actual practice they should be. Miners naturally take a lively interest in that kind of work.

We shall now consider the question of ventilating the mine. We can ventilate it here by passing a continuous current with a fan or a furnace, or we can use what is called the split-air system. We shall first consider the relative merits of the two different methods, and we find that in point of first cost, the method by continuous current has the advantage, but in ultimate cost, convenience, and possibilities, the split-air system is to be preferred. The over-casts and regulators are then put in; each "split" is assigned its proper volume of air, and the power necessary to carry the air for each split and for the whole mine is calculated. The amount of opening in each regulator is also calculated.

For the experimental verification of our calculations we have put in a mine at the university that we can get at. Here is a tracing of the plan of this mine, which we will say, is on a scale of 200 feet to the inch and represents an airway 10 feet by

10 in area, and the different splits are 10,000 feet, 6,000 feet, 5,000 feet, 4,000 feet, and 3,000 respectively, in length of air-course. We have this arranged so that we can throw it into a continuous current, or use the split-air system, by closing certain doors and opening others, and adjusting the regulators. Now we can handle the currents and study them in their practical application. For the means of producing the current, we study the action of the fan and the action of the furnace. There is no small degree of mathematical ability required to handle these questions; but we find that enough is acquired in the first year of the course to enable the students to do the work of the second year of the course.

This work of educating miners was an experiment with us, and was brought about largely through the influence of this Institute. Those of us engaged in the teaching are gratified with, if not indeed surprised at, the results attained. We aim first and always to teach the men to reason rather than to work by rule; they know what they are working for, and they do their work well.

They come to us, many of them, without a fair common school education—some of them hardly able to perform the operations of division; and yet they go through and do the work. We have not had many students as yet who have finished this course. In fact, of the three men who came to us the first year, in the fall of 1888, one returned to work after he had been with us four terms, and is meeting with success as a mine manager.

MR. ROY: Was that Dixon?

PROF. SPERR: Yes sir. Another remained until in the beginning of the spring term of the second year, and he now has charge of a number of mines of one of the largest mining companies in the State of Colorado. The third is still with us.

As has been stated here to-night, education gives them an ambition. They are not satisfied with being mine bosses, but they are going to make the mining engineers of the country. They get a start in the right direction and they go on and build themselves up. Some of them will remain in school longer

than two years, and obtain a more advanced mathematical training, which is necessary for a mining engineer, and a more thorough knowledge of metallurgy, mechanics, etc.

PROF. LORD: I want to say one or two things in continuation of what Prof. Sperr has said, and possibly one or two things which modesty has forbidden his alluding to. I want to call attention to this drawing. This drawing represents a mine which Prof. Sperr has designed for the use of the mining department. These galleries are made of metal and are made to represent cross-cuts and entries. They are anywhere from 50 to 100 feet long. The central place here is a large chamber big enough to go into and move around in and take a safety lamp in, and this is all connected, or will be, as soon as the machine is made, with a fan which is to supply an air current so that every student in the mining course will be enabled to get inside of this machine and turn the air on and do what he could do in an actual mine, turn that air in in any way and send it out through the whole length of the mine, send it across, split it, sub-divide it, carry it over, under or anywhere else, take his anemometer and measure the air velocity in any branch of the whole system, see how much goes through here and how much through there, see how much the resistance of friction is in a long entry way, as compared with a short entry way, and in short, everything that can be done in a large mine can be done in this mine, made in metal, and everything that is done in the handling of a mine can be represented here on a scale sufficiently large to make it perfectly satisfactory as an illustration. In fact, a demonstration of all the results in actual practice. Prof. Sperr has devised this apparatus and put it up there, and he is the man who knows how to use it. I can tell what it will do, but I have passed over to my associate the detailed knowledge of the subject, and I am pleased with what he has done.

MR. ROY: I move we adjourn.

The motion being seconded, was carried.