A STANDARD GRADE OF POWDER NECESSARY FOR USE IN THE MINES.

BY JAMES W. HAUGHEE.

Ordinary blasting powder is composed of nitrate soda, brimstone and charcoal. The proportions of these ingredients vary somewhat with different manufacturers. A great deal of experience and careful observation are necessary in order to determine just the proper proportions necessary to meet the requirements of mining, as slight variations will produce marked changes in results.

Formerly, saltpetre was used exclusively in the composition of blasting powder, as it is now used in sporting powder. This came in crude form from East India, and was purified by the powder makers after getting to their works, though for blasting purposes it was ordinarily used in its crude state. For the past fifteen or twenty years, nitrate of soda has been used almost entirely in the composition of blasting powder. This comes in bags, weighing about three hundred pounds each, from Chili and Peru. It comes to this country already purified and ready for use. The great bulk of saltpetre now used in this country is manufactured by chemical process from this article. Nitrate soda comes in granulated form, and resembles coarse salt. It has to be thoroughly pulverized before mixing with the other ingredients, as, indeed, they have to be.

When nitrate soda first began to be used, though greatly reducing the cost of powder, strong prejudices existed against it. It was thought that the powder was not so strong and would not stand storing. But, as the Peruvians or Chilians improved in its manufacture, freeing it more and more from impurities, and as powder makers improved in their method of treating it and incorporating it in powder, these objections were removed.

No one now, in mining operations, thinks of using anything but "soda blasting." It has proved a great benefit to miners in reducing the price of the article so necessary to their work. It has also had the effect of reducing the price of coal to the consumer.

PROCESS.

It is not possible for one not engaged in the actual work of making powder to know all the details of the process. Besides, each powder maker who has had years of experience, has little secrets of his own which he will not divulge. But in general, after the raw materials have been properly prepared, they have to be mixed, ground together till they become one substance, pressed into cakes till this substance becomes like flint, broken then into grains, dried (for it has to be worked in a moist state to prevent explosion), rubbed, polished, separated into the different sizes, and then packed. Great care has to be used in selecting the raw material, in getting the right proportions of ingredients, thoroughly and evenly mixing them, thoroughly incorporating them in giving the right pressure, and properly finishing.

Many, while free to acknowledge that the manufacture of sporting powder, in the high grade to which it has been brought, is a very difficult thing to do, and none but the most experienced should undertake it, yet think the manufacture of ordinary blasting powder a very simple thing. And so all sorts of inexperienced people are rushing into the business, and miners are being imposed upon by inferior and dangerous stuff. All this is a great mistake. Powder is a dangerous thing at best, and none but experienced hands should be allowed to make it. No one knows the many serious mine accidents directly traceable to inferior powder. Mining is becoming more and more scientific, and is becoming more and more complicated as new conditions arise and new varieties of coal are being opened up. The right kind of powder is daily becoming a more important question. There is getting to be as much science in its use as in the firing of arms and artillery. We ought to be more and more careful in our selection of powder, adhere to the good old standard makes, and patronize those who have had many years' experience, who have pride in maintaining their reputation as manufacturers, and are not in the business simply for present gain.

The better class of manufacturers in this line have been greatly discouraged in the past few years by the cheap, inferior goods placed upon the market, and the readiness with which they have been seized upon by consumers simply because they were cheap. Blasting powder has been sold, and is to-day selling in many localities, far below what it costs to produce a good article. This is not as it should be. Powder makers run great risks to life and property in the manufacture of this dangerous article. They do not know at what moment their own lives may be blown out or the accumulations of years disappear in the air. They should

be properly remunerated, and encouraged to exert themselves to the utmost in keeping up with the times and furnishing the miner always with a first-class quality of powder.

For this reason I say a standard grade of powder for miners is as necessary as a standard grade of oil, and even more so from the fact that there is more danger in its use, and the effects of smoke from bad powder is equally as injurious as the smoke from mineral oil.

An inferior powder makes more smoke than standard goods, and the result of the blast is unsatisfactory to the miner, unless he puts in a larger charge than is necessary of a better quality which makes the expense greater.

From an inferior quality of powder, the miner often has what is termed a standing shot, from which at least 50 per cent. of the accidents both fatal and minor occur; and well does the workman know why, from such the coal has to be worked off with picks, and often unexpectedly gives way.

As miners we desire powder to be hard and thoroughly glazed, the latter protects the grain from moisture while the former adds strength. And standard mills such as The King are very particular in this respect. The density of the grain is very important, as the strength is in the expansion of the grain. To compound the ingredients just right is very necessary as much so as a perfect process. And the art is not obtained in a week or a month, but from years of experience, as Mr. King has had. He has made it a study for many years.

The mills are situated on the Miami river at King Station. The magnificient plant and its beautiful scenery attracts the attention of the traveler to or from Cincinnati. At these mills a standard grade of sporting and blasting powder is manufactured, which never fails to give satisfaction to the sportsman and miner when the exact grain desired is known.

Dynamite is not made or sold at these mills. The ingredients of this material are not so numerous as the ingredients of black powder. It consists of 75 per cent. of nitro-glycerine—which is too dangerous to be used by itself—absorbed by 20 per cent. of porous infusional earth called rotten stone. Other substances besides rotten stone have been utilized as an absorbent, such as cornmeal and brown sugar. It has been estimated that 95 per cent. of all fatal explosions in mines are caused by dynamite. It freezes at the surprisingly high temperature of 40 degrees "Fahrenheit." And frozen cartridges cannot be set off by ditonation. Accordingly the practice of thawing the cartridge in stoves or by means of fire is very common.

THE CHAIR: Gentlemen, you have heard the paper, which is very fine and we are now ready for discussion. Brother Haughee will be very glad to answer you any questions concerning these explosives.

A MEMBER: I would like to ask Mr. Haughee if King's Powder Company only manufacture one grade of powder, that is, triple F and double F and single F powder, and the different grades are used in different seams of coal, different quality of coal in blasting. Now in the Mahoning Valley the triple F powder is a course powder and to blast that coal a slow powder is the best. That is my experience. In other fields it requires a finer grade of powder to act quick so as to mash it right up, and it does better work. It suits the seams much better and gives better satisfaction. Now I would like to say further that I know that this company manufactures a cartridge, a powder that is put in cartridges and the cartridges are water-proof and the most convenient thing I ever saw in mining in the Hocking Valley. This summer I had a box on hand and I just decided to try this cartridge powder. Well, we went to work and I had not been in the habit of carrying any blasting powder with me for many years, as I had not been mining any, and I started in and took that box of cartridge powder in the mine and used that and it gave entire satisfaction. I thought it was the most convenient thing I ever handled. All I had to do was, when I had my hole ready was to get a cartridge and tamp it in and away it would go. It was the nicest thing I ever saw. Of course it depends upon the amount of powder necessary to blast the coal out and probably they will have little difficulty in arranging the size of the cartridges to suit the different seams throughout the country, but I am convinced that it is a success.

MR. HAUGHEE: In reply to the question, I would say that King's mill manufactures seventeen different grades of powder, CCC, CC, C, and FFF, FF, etc., and all these powders are different grades. Anyone desiring a list of them can have them in that form so they can see what they are.

So far as the blasting powder is concerned called the Peters (?)

blasting cartridge, it was put on the market about eighteen months ago and introduced in Tuscarawas county, and southern Ohio. It has not taken as well as the company thought it ought to and the difficulties could only be satisfactorily explained to them by a practical miner that knew of the difficulties there were in drilling a round hole and having the cartridge to fit. These cartridges are made in different sizes, running from an inch and a half to two and a quarter inches in diameter and they are made fairly waterproof. It is a splendid thing in wet holes. But the miner finds when he purchases a case of these, that he cannot have a great variety of different sized cartridges in the case. For instance, he will have a cartridge or two of six inch and one or two of eight inch and one foot and eighteen inches and up as high as 36 in a locality where it is necessary for a hard shot. So in 25 lbs. he cannot have very many cartridges of the same size and probably the cartridges he uses to-day will be just the same thing he will need tomorrow, and if he uses up to-day all the same size, then tomorrow he has not got the same cartridges. For that reason the cartridge has not taken in the market as it was thought it would. I want to say now that a company in Illinois recently ordered a thousand kegs of powder in cartridge form and they are using it now. I introduced it to the mines and asked the miners what they thought of it. They liked the form of it, yet there was objection to the size of the cartridge, yet the blasting cartridge is a good thing and may some day come into use.

SECRETARY HASELTINE: I would like to ask Mr. Haughee to explain to the members of the Institute the different grades of powder required in different kinds of coal and why it is necessary to make different powder for different mines even in the same locality.

MR. HAUGHEE: I will try to answer the gentlemen's question the best I can. In the Hocking Valley the coal is all mined down there. There is none of it solid shooting. The coal in the Hocking Valley is of a soft nature. It is full of seams and won't stand a very hard shot. It is porous and requires a quick powder. In that it is necessary for the quickest blasting powder.

That is, FFF. Almost fine enough for a shot gun. In the Akron and Massillon district their coal is close and of a hard nature and is shot upon the solid. It will take a slower powder, and it takes and F FF, and the miners would only use those two grades. But in Illinois there are fifteen workable seams there and nearly every seam takes a different grade of powder and in different places the same seam will take different grades of powder. The mine at Springfield takes a different grade from the mine at Athens, which is only about six miles away. It is the same seam of coal but it varies very much in its nature. The Athens coal is softer coal and requires a slow, strong powder, while the Springfield coal is hard, a little bit more open and it takes a little quicker powder than the Athens coal. Then, when you come up to Aurora, where the seam which is worked in Springfield is 200 feet underground—it crops out on the Illinois River at Kingston—the coal is very hard and in that coal, it takes a quicker powder, C and C M and F, and at Shaw's mines, F F is used. So, to work the coal successfully, it is very important that the powder agent, when he goes into a district of Illinois, knows something about the different seams of coal. I am glad to say I have had very good success down there in finding this out by going into the mines and seeing the different qualities of coal and for that reason I have a knowledge of the different seams I think.

A MEMBER: I would like to ask Mr. Haughee one question, and that is, which is the stronger powder for the same weight, the fine powder or the course, or is it of equal strength?

MR. HAUGHEE: It is all just the same, just the same as nut coal, lump coal or slack and pea coal. Its being fine does not add anything to the strength, but just to the quickness—the velocity of the powder. The CCC powder is the same as FFF in blasting powder, but not in sporting.

A MEMBER: I move, Mr. Chairman, that we tender Mr. Haughee a vote of thanks for his very able paper.

PROF. SPERR: I think this motion deserves some remarks. I believe remarks are always in order, I wish to make some re-

marks on this paper. I am a good deal like the President was after my paper was read and discussed, I have gained a good many valuable points by discussion. I think such papers as these and their discussion show us all the value that there is in men who are working along a certain line laying up their experience. Now every member of the Instittte is working upon something which interests him and if he will put it in writing it will interest all of us and then there would be no trouble on the part of the Secretary to get papers to fill out the programme. That I am sure. I adopted this plan with reference to my paper, something I have worked on that I thought would be of interest. Otherwise I am at work upon the technical questions in the instruction of students, and while such things may be of general interest, yet I don't think that they are as interesting as the practical questions of our everyday life. Of course every man is capable of writing, if he writes at all, on the line on which he has been at work and every member of the Institute can do that. I should myself like to see a greater number than have heretofore been availing themselves of the opportunity of writing up their experiences during the year for our winter meetings.

SECRETARY HASELTINE: Mr. President, I wish to support Prof. Sperr in his remarks. Mr. Haughee's paper was prepared on a personal request of mine and a suggestion of the subject, knowing that he was an expert in that line and was interested in it and feeling that men interested as Prof. Sperr says, in a particular line can instruct us on that line. But as I said in my annual report, by some means the impression has become general that it is only very scientific papers, such as were written by Prof. Sperr, Prof. Lord and Prof. Orton that are acceptable. Now that is a stab at the very foundation of our Institute and I am glad to hear those members express themselves as against that view of the situation. Mr. Haughee is certainly none the worse for the effort he exerted in preparing that paper. It has been a source of great information to us all and will be to those who read the papers in the Ohio Mining Journal and I hope that other members, in the future, will take hold and help us along that line. What we want is papers written by practical men.

Theory is all right, but it is practice that we want. I wish specially to emphasize our gratitude to Mr. Haughee for his paper.

MR. WM. DALRYMPLE: Mr. Chairman, I don't know whether I will be in order in making this suggestion or not, but I would be in favor of always selecting a Secretary that knows all about our occupation, a man that is personally acquainted with our work, and, when he makes a call for a meeting, to just state to us that he wants us to write a paper and to name the subject and to say positively "we want a paper from you." Probably it might do better than the way we have been doing. We sometimes get a little careless and indifferent and these practical men have got so many things to do and so many different subjects that they could write about that they have got lost and don't know which one to select.

MR. HAUGHEE: If we will go back only a few years ago, I think probably three years ago this winter, it was stated in the meeting that the Institute was dead and buried. I think the Secretary that was selected at that time has had the interest of the Institute at heart and I don't think he has failed in any respect. With reference to the suggestion of Mr. Dalrymple, I would say that the Secretary has had the interest of the Institute at heart and I don't think he has failed to work up this interest and I don't think we can make a better selection for the future.

MR. DALRYMPLE: Mr. Chairman, I don't want it to be understood that I am casting reflections upon the present Secretary. Not at all, but I want to leave the impression that the Secretary and Board ought to be familiar with the members' occupations and that they ought to be able to name the subject that they want to be written on. I am not casting reflections on our present Secretary. I know he has been faithful in his duty. I am in favor of his staying right where he is.

SECRETARY HASELTINE: The gentleman need not be alarmed about my skin being thin. I am not hurt at all. I was pleased with Mr. Dalrymple's suggestion. It is much easier for a man to write on a subject if someone gives him that subject.

It is difficult for the Secretary or Executive Committee or anyone else to know exactly what is running through this member or that member's mind or what, if he was called upon, he would select as his subject. Still, I want to endorse Brother Dalrymple's suggestion of selecting a certain number of men able to write a paper on any subject, and selecting them in any way thought best by the members of the Institute and impressing it upon the member that it is obligatory that he be present at the meeting with that paper. We cannot have a mining journal that will be interesting unless we have papers that will be interesting to read.

MR. DALRYMPLE: I received a paper from Mr. Haseltine containing a very urgent appeal to write a paper and I knew it was my duty to write one; but I had so many irons in the fire that I thought I would just let that go; the Institute will have enough without it. I think it will be easy for the Secretary to do that. I know that our Secretary has the breadth of mind to comprehend and take in the parties that are able to write on any subject he may be pleased to name. I am confident of that.

The question then being on the motion to tender a vote of thanks to Mr. Haughee was unanimously adopted.

SECRETARY HASELTINE: Mr. President, when we were arranging this meeting the prospects for papers was not so flattering as it was when the programme was printed and many of you who were present at last winter's meeting, at which we spent an afternoon at the Ohio State University and were handsomely entertained, will remember that the general expression by those at that time was that we make our future meeting at the University and this prompted us to laying out this afternoon for an afternoon at the University in which Prof. Lord will give us an illustrated lecture accompanied by experiments with the gases to be met with in the mines. We thought too, in that connection, that it would be interesting for the members to view the buildings, and especially Orton Hall, which, while not completed, will be a matter of interest. I asked the Professor if he was able to exhibit the buildings to us, as he had designed it, and he told me

last night that he thought he would go to Fremont. I rather urged him not to go, rather more an account of his health than on acconnt of his business. He expressed a doubt then as to whether he would go or not, but I presume from his not being here that he has gone. I urge all the members to go, for I know from past experience that the entertainment this afternoon will be something that no one can afford to miss.

THE CHAIR: How shall we go? Shall we meet here and go all together?

A MEMBER: I suggest that we meet here at 1:30 o'clock to start.

At this point a recess was taken until 1.30 P. M., when the members met at the convention hall from which they proceeded in a body to the Ohio State University, where the afternoon was spent in listening to the lecture of Prof. Lord.

"Professor Lord then received the Institute in the lecture room of the Mining Department of the Ohio State University, and gave some experiments illustrative of the properties of the various gases which were of interest to the miner. 'Black Damp' or CO^2, was prepared from limestone and mutriatic acid, it's weight illustrated by pouring the gas from one vessel to another; by floating soap bubbles upon it, which rested upon the surface like corks upon water. Even a more practical demonstration was given by pouring the gas into a cup standing on the scale of a balance. As the heavy air fell into this, the balance turned over on the weighted side. 'Fire Damp' and 'Marsh Gas' were prepared and mixed with air in various proportions, and those most explosive determined. Among the other features, the production and combustion of Carbon Monoxide the 'White Damp' of the mines was shown. This gas, the most poisonous encountered in the mines, was shown by an experiment to be an explosive one, if mixed with the right proportion of air. The effect of small mixtures of 'Fire Damp' on a lamp flame, both in the open flame and in the Davy lamp, was shown in apparatus especially constructed for the Mining Department, and used to instruct students

in the methods of testing for this gas. At the conclusion of the address, the following resolution was passed."

Resolved, That the thanks of the Institute be tendered to Prof. N. W. Lord, of the Ohio State University, for his very excellent demonstration of the properties and combination of the gases encountered in the mines.

EVENING SESSION, 7:30 P. M.

The convention was called to order with Captain Morris in the chair.

THE CHAIR: The first thing on the programme this evening will be the report of the committee on the revision of the constitution. We will take that report now, if you please.

MR. E. D. HASELTINE: Your committee appointed to revise the constitution beg leave to submit the following report:

REVISION OF ARTICLE III, OF THE CONSTITUTION.

The Institute shall consist of members engaged as mining engineers, geologists, chemists, students of mining schools, metallurgists, metallurgical engineers, all persons either directly or indirectly interested in any of the above named occupations, and those practically engaged in operating and working mines. Membership shall not be limited to residents of the State of Ohio.

WM. B. HANLON,
THOS. H. LOVE,
E. D. HASELTINE.

THE CHAIR: Well, you have heard the report; what shall be done with it?

A MEMBER: I move its adoption.

The motion being seconded, unanimously prevailed.

SECRETARY HASELTINE: While we are waiting for Prof. Lord and the others to gather, I move you that a committee of three be appoinied to examine the roll of membership and to strike off such members as appear upon that roll who do not care to longer remain with us and also a committee to draft suitable resolutions upon the life of John R. Buchtel, who died sometime during the summer. The date I have not exactly.

The motion being seconded prevailed.

THE CHAIR: I will appoint on the first committee, to revise the roll of membership, John Hanlon, Prof. Sperr and William Dalrymple. On the committee to draft resolutions on the death of John R. Buchtel, I will appoint Dr. Edward Orton, Hon. Andrew Roy and Hon. Anthony Howells.

SECRETARY HASELTINE: Now, Mr. Chairman, I want to make another motion, and that is that the Chair appoint a committee of three, which has been our custom in years past, to select officers to serve for the ensuing year. We have dispensed in years past with the formality of taking a ballot, and if it meets with your approval, I move you that we proceed in that way this year.

The motion being seconded, prevailed.

THE CHAIR: I will appoint on that committee, Thomas H. Love, James Haughee and Ebenezer Lewis. Now if there is any other miscellaneous business that any of the members wish to bring up, we will receive it now, so that we can finish the miscellaneous business before we go on with the papers.

MR. E. D. HASELTINE: Mr. President, it seems to me to be an apt time now to have some discussion relative to the summer excursion, as to when the most of us can most likely get away. I have some doubts as to whether or not the summer excursion will be very well attended this year on account of the World's Fair. I would like to find out as nearly as we can, whether or not it will detract from the attendance and when will be a suitable time for the most of us to get away.

SECRETARY HASELTINE: Mr. President, one of the reasons of the delay in last summer's excursion I omitted in my annual report. I had in mind a trip that had been talked of for two years and that was up the Twelvepole and Guyandotte Rivers on the line of the Norfolk & Western Railroad. I had a talk perhaps two years ago with the officers of the Norfolk & Western Road in which they expressed a great desire to take the Institute over the line of their road and exhibit to them their coal fields, but they said that the line from here through to their main line, which would ultimately take us to the Pocahontas coke fields, would not be completed during the last summer in time for us to go. The talk I had was with the superintendent of the road and the tone of it was that it would be a gratuitous excursion so far as the railroad company was concerned. That fact, as I said, deterred us from going there last year, and another reason I had in view was the fact that the present year would be the centennial year and that a great many would feel like spending their money in Chicago, and that if a trip was made over a line on which there would be no railroad expenses, that many would feel like taking in both who otherwise would not. I have not said anything to them lately about it. I don't know what the sense of the members would be on the subject. My plan was that we would take in perhaps that portion of the state of Ohio about Ironton and Hanging Rock that ought to be interesting and go on to some suitable point and stay over night and make the trip in daylight through that portion of it that has recently been opened and visit such points of interest as we would desire and finally go on to their coking regions about Pocahontas. I am not very familiar with the country only in a general way. I think there will be no trouble about securing a train that will take us through, providing we have a good turnout. It is quite embarrassing to the committee to make arrangements for an excursion train and then only have 30 or 40 or 50 people all told. Now I don't wish to be put in an embarrasisng position again, as I was last summer, which perhaps was not the fault so much of the members of the Institute as misfortunes that surrounded us which we could not foresee. I would like to have a pretty full expres-

sion of the members as to their desire to go on this excursion, regardless of The World's Columbian Exposition. If the members have any place they would like to visit in preference to it, we would like to hear it now. The President, Vice-President and Executive Committee are the ones that make the arrangement, but they give their consent and the Secretary does the work. That is the rule, and while that may not be good practice, it has kind of dropped into that rut.

MR. LOVE: The committee appointed on the election of officers report the following: For President, Prof. Lord; for Vice-President, Captain Morris; for Secretary R. M. Haseltine; for Executive Committee, Prof. Sperr, Mr. Wm. Dalrymple and Mr. Willard.

THE CHAIR: You have heard the report of the committee. What shall be done with it?

MR. E. D. HASELTINE: Mr. Chairman, I move you the report of the committee be received.

The motion being seconded, prevailed.

THE CHAIR: Our President has not arrived yet, but we will try to get along until he comes. Now the first thing on the programme this evening will be a paper by Thos. H. Love, the mine inspector, on "A Practical System of Mining Coal in Ohio."

The following interesting paper was read by District Mine Inspector, Thos. H. Love, of Leesville, Ohio, before the Ohio Institute of Mining Engineers, at its recent meeting in Columbus: