

taken down and examined as to fracture and structure. This has never been done, so far as I know.

II.—To make the result of I conclusive, let a comparison be made between such a stem and one made at the same time from the same metal but not used. This has never been done, so far as I know.

III.—Let a stem which has broken in service be examined as to its structure at other points than that of fracture.

IV.—Let such a stem be tested to ascertain whether, at any point in it, it is not possible to produce at will either granular or fibrous fracture by simply varying the means and method of fracture. This has never been done, so far as I know. Nor has Mr. Argall's claim, that such a granular fracture is very different from the "crystallized" fracture, ever been supported by the actual production and comparison of the two.

V.—Let any stem, new or old, used or unused, be tested as in IV. This has been done often with bars of iron or steel, and it has been proved that a granular or a fibrous fracture can be thus produced at will. But if there is anything peculiar about stamp-stems the experiment would show it. It has never been performed upon a stamp-stem, so far as I know.

It is such evidence as this that would convince doubters, and prove the crystallization-theory. That theory is now a fable, because such evidence in its support is wholly lacking. And it will never cease to have been a fable, because it was framed and held without evidence. It may, indeed, cease to be one, and become an acknowledged fact—when the necessary evidence is forthcoming, but not before.

## SILVER LEAD MINING IN BRITISH COLUMBIA.

Contracts are being let to various packers and teamsters to bring ore to the Fork. The rates of hauling are low in many cases, some of the contractors not being familiar with the packing of ore down steep mountain trails filled with many feet of snow.

The concentrator which is being built on Carpenter creek will be completed and put in operation in the early spring.

A 1,600 pound sample of "Nonpareil" ore delivered at Three Forks this month went 640 ounces to the ton. The "Nonpareil" claim is in the Jackson basin, 25 miles from Kaslo.

Three car loads of machinery for the Pilot Bay smelter are at Nelson.

Shipments from the Alpha have averaged \$105 to the ton, and high grade ore has been struck on two levels lately run.

A 50-ton concentrating plant has been shipped from Fraser & Chalmers, Chicago, to the Pilot Bay smelting works.

The development work on the Noble Five group of claims to date is as follows: There are two short tunnels in on the 'World's Fair,' but the main work is done on the ground of the 'Bonanza King.' The No. 1 tunnel has been run 204 feet on ore all the way. The depth beneath the surface at the breaks of the tunnel is about 200 feet. Eighty feet from the mouth of this tunnel a winze has been sunk 50 feet to the middle drift. The middle drift itself, was run 100 feet in ore towards the face of the hill, and from that point an upraise made to the mouth of No. 1 tunnel. No. 2 tunnel is in 340 feet and for 300 feet they have been drifting on ore. At 145 feet in depth a raise has been made connecting with the middle tunnel. No. 3 tunnel is in 150 feet, with a raise to the surface of 110 feet for air. Only the smallest fraction of the immense quantity of ore in sight has been shipped as yet. The first shipments were made during the winter of 1893-4, and aggregated about 500 tons of an average value of \$125, making during last winter an output of \$72,500 gross. The highest grade shipment ever made from the Slocan country came from this mine. One car-load was shipped of which the average return was 549 ounces to the ton in silver. Far below the Bonanza King a tunnel is being run on a fine chute of ore on the Noble Five. It is now in 60 feet and there is a considerable quantity of clean ore on the dump; not less than 50 tons. The amount of ore shipped this winter will depend very largely on what the railway facilities are. There is in the mine a large quantity of oxidized ore which cannot be concentrated, and is not sufficiently high grade to stand a long haul. It is possible that it may be shipped to the Golden Smelter. At present, the ore has to be rawhided from the mine to Cody creek, and then transferred by sleigh to Three Forks, from which it will be shipped by rail if the railroad runs, and it will.

A most remarkable sight on the Reucan is the outcrop of solid ore on the surface. The galena is 8 feet 8 inches wide, and for that distance is solid and clean. The ledge has been traced for a few hundred feet and prospect holes dug on it. It shows up clean ore all the way, at the widest place about twelve inches. Part of it is clean galena mixed with seams of oxidized ore, which assays 900 ounces to the ton. The clean galena is said to average \$50 a sack. There is some of the prettiest looking ruby silver ore on the ground that was ever seen. It is not by any means beyond the capacity of the Reucan to ship at least 600 tons of ore this winter, and the owners are preparing to ship all they can. The Reucan has the makings of a great mine in it. The upper tunnel is in 353½ feet. There has been continuous ore in this tunnel for 330 feet of its entire length. There is a raise from this tunnel of 65 feet, and 100 feet of the vein in length by 24 feet in height was stoped out last winter, and resulted in the shipment of about 80 tons of clean ore. In sinking, a very fine showing of ore was struck in the winze.

Byron N. White of the Slocan Star mine has contracted for the delivery of 1,000 tons of ore at Three Forks before the 1st day of January. The teams will begin to haul the ore on or about first of December and will haul 30 tons a day at least. The mine will ship not less than 3,000 tons if transportation facilities are available. But Byron White does not venture to figure ahead of the first of the year. The output of the Slocan district has been conservatively estimated at 10,000 tons; 1,800 from the Slocan Star and 1,000 from the Alpha, makes 25 per cent of that amount from two mines, with the Idaho, the Fisher Maiden, the Cumberland, the Mountain Chief, the Alamo, the Wonderland, the Noble Five, the Reucan, the Payne, and a number more to hear from.

## ASBESTOS CLUB.

### Mine Explosions Generated by Grahamite-Dust.

At the ordinary quarterly meeting of the Asbestos Club, held in their rooms, Black Lake, Que., on Thursday evening, 8th inst., a paper on this subject was contributed by Mr. William Glenn,\* Baltimore as follows:

"The Ritchie grahamite-mines of Ritchie county, West Virginia, were situated near the central part of the upper barren coal-measures of the Appalachian coal-field. The rocks of the region are shales and sandstones, which lie almost horizontal. They show no evidence whatever of containing carbonaceous ingredients, except that they enclose, at long intervals, thin veins of exceedingly impure coal.

The vein of grahamite is a straight and vertical fissure, which cuts downward across the horizontal strata of the rocks mentioned. It will be sufficient here to state that the fissure is about 4 feet wide, and that it was compactly and completely filled with the asphalt-like mineral first described by Prof. Leslie in 1863.† He regarded it as a mineral pitch or insipidated petroleum, which he called asphaltum. The name grahamite was proposed in 1865 by H. Wurtz,‡ who more fully considered and de-scribed the mineral. Both these writers together with Prof. Blake,§ who studied the body in 1890, maintain that it is a form of asphalt.

An accurate and comparatively full study of the mine was made in 1873 by Prof. W. M. Fountain, of the University of Virginia, who published his observations under the title "Notes on the West Virginia Asphaltum Deposit,"|| thus further maintaining that grahamite is an asphalt.

Fig. 1. represents that part of the mine first to be considered. As no maps can now be had, the writer has been compelled to construct the sketch in part from material found in his leather copy-book and in part from memory; yet, so far as concerns the present purpose, it may be regarded as accurate. The figure represents a vertical section of the mine, and is in effect a view of the vertical vein with one side-wall removed, showing all the workings therein existing at the date presently to be mentioned.

The levels numbered 2, 4 and 6 represent workings made for removal of vein-matter when it was supposed that the proper way to mine the material was by means of a succession of such levels. The rooms lettered A B were the initial rooms, constructed when it was determined to mine by a method called by miners "standing breasts." In this method the miner stands upon the material he already has broken down, and attacks in turn that above his head. As all rocks occupy increased space when broken into smaller masses, it will be seen that the miner at work must soon nearly fill the space between the vein-matter over his head and that which he has mined already. To prevent this, the latter is removed at proper times and in necessary quantities. When a room is mined upward to its extreme height, then all its contents may be withdrawn. The details of the process do not pertain to this paper.

In the west mine (Fig. 1), on February 9, 1871, room A had been completed and the material had been removed from it. Also, the communication between its bottom and level 4 had been closed, so that air could not be passed from the level through the room. Room B was being mined, and had attained about the condition indicated in the figure. Mining consisted simply in digging down the soft vein-matter by means of the exceedingly light pick used by bituminous coal-miners in Pennsylvania and West Virginia.

The contractors for room B, believing they could blast out the grahamite cheaper than they could dig it, received permission to try the effects of powder. But the attempt failed, either because the charge was insignificant or because the powder failed to explode. The Dupont mine-powder used in this hole was contained in a paper cylinder 1½ inches in diameter, in which it occupied 3 inches height. Two days after a second hole was prepared and charged with a similar cylinder containing 6 inches depth of powder. The position of this blast is shown at a, Fig. 1. The shot was fired at 3 p.m. of the date given, and immediately there occurred what was apparently a mine-explosion; such a disaster as is known among miners as a fire-damp explosion. For the size of the workings, it would have been judged unusually severe.

The first effect observed was, that so much of the pit-head structure (not shown in Fig. 1) as lay near the prolongation of level 4 had been demolished. A man who had been standing at that moment on the bridge leading from level 4 to the storage-bins, had disappeared, together with his mine-car. The latter had been driven almost horizontally for 90 feet, and there had been wrecked against the east hillside of the ravine of Mine Run. Even the cast-iron car-wheels had been broken by impact against soft earth, while the wooden car-body was little more than splinters. The man was driven 60 feet, when, by impact against a heavy tool-chest, he received injuries almost immediately fatal. "He was burned and blackened past recognition." (1)

The effect was as if level 4 had been a great gun, out of which the man and car had been projected. So much of timber structures as lay near the line of fire had been swept away.

Before those near the pit-head had recovered from consternation, one of the men belonging to room B appeared at the portal of level 4. He was seriously burned and could tell no connected story. Upon his clothing and on his bare arms adhered more or less of what seemed half-burned coke, and some of this material was still aflame. His burns were fatal. His brother and partner was found under room D, or nearly so in level 4. This man survived, and was subsequently able to give a clear account of the incident up to the moment of his injuries.

The third and only remaining man in this level was 140 feet inside of room B, and was engaged in constructing the initial work of a room, such as is indicated at C, D, E, Fig. 1. When the explosion occurred, he came down into the level and walked along it to the open air. He had seen the reflection of a flame in the level, was aware of what had occurred, but was in nowise injured.

Two other men were driving the end of level 2, then 640 feet long. They had heard the sound of the explosion; their lamp-flames had nearly been extinguished by an air-wave; but otherwise they had nothing to relate.

The ravine of Mine Run, less than 100 feet wide, contained all the pit-head structures. Upon so much of them as lay near the prolongation of level 4, and upon the east hillside, there adhered a coating of coke. This was not only peculiar but striking and prominent. On all parts of the old storehouse left standing, and upon the hillside near the portal of level 3, there remains adhering, about a ¼-inch thick of cinder such as our mineral makes. The fire seems to have melted the mineral, thrown it from level 4 towards level 3, and left it a cinder sticking to every opposing

\*The observations herein set forth were studied and discussed by the late P. G. Sauerwein, of Baltimore, who was the president of the Ritchie Company, together with the author, who was the manager of that company's mines and railway. As the more learned and able one of us cannot take part in this paper, the author alone must be held responsible.

†Proc. Am. Phil. Soc. ix., 185.

‡Am. J. Sci., 1866, ii., xlii., 420; Proc. A. A. A. Sci. xviii., 124.

§Trans. xviii., 563.

||Am. J. Sci., iii., vi., 409, 1873.

Report of the manager upon this explosion. It was written February 10th and contained about four thousand words.