writer has personally witnessed, is his reason for suggesting that the subject may profitably be treated in the curriculum of our mining schools. During the past few years a number of valuable papers on the subject have appeared, to which he cannot refer in detail, but which are to be found in the transactions of the various mining and metallurgical societies, and the volumes of the technical weekly and monthly papers.

It is advisable for the examiner to make his first trip through the mine workings in company with the superintendent or foreman, when special points will attract his attention, and explanations be suggested. He may have his attention drawn to the size and dip, or character and extent, of the pay shoots, and may note dislocations or interruptions, and will be able to observe that certain facts seem to control the value of the ore. A few samples taken here and there and assayed on his return to the surface will throw light upon much that he has observed, and may determine whether a thorough sampling is necessary or unnecessary.

At any rate, this preliminary examination will enable the engineer to formulate his scheme for sampling, if one is necessary. Since sampling is a laborious task, it is well not to pursue it for a longer time than eight hours in any one day with any one crew. It is usually done by men working in pairs, who are employed solely by the engineer, and whom he has proved and found trustworthy. If the character of the ore and the circumstances of the case render one sure that the miners are not, and will not be, in collusion with the vendor, each pair may consist of a miner and an assistant, which allows the miner to do the muscular work to which he is habituated, and leaves the assistant free to collect the chippings and to keep his eyes open to watch for fairness.

The sampling of veins may be carried out by any one of three systems, which are subject to infinite variations, due to each examiner's experience or idiosyncrasies, and due also to the varied character of mineral deposits.

The first system aims at securing a correct average through the taking of a great number of small samples. Since the underlying principle of sampling is to obtain a correct general average of the value of the piece of ground under test, it is evident that the larger the number of samples cut the closer will be the approximation to the real value, provided the samples are taken at equi-distant points, and provided also that each sample cut represents a *true cross section* of the vein or deposit.

As to the intervals between consecutive samples, these depend upon the regular or irregular distribution of values, and upon the regularity in width of the ore body. If the distribution is irregular, inclined to segregate in spots or bunches, and the width suddenly pinches or expands, closer intervals are required than when the width is practically constant and the distribution of values regular. In some of the gold quartz veins of Ontario and Nova Scotia the interval should not exceed three feet, while at the Dufferin Mine ten feet intervals would not be too great. In some of the silver-copper veins of British Columbia twenty feet intervals would be permissible,* whereas many of the pyrrhotite deposits of that province would not allow greater intervals than five to ten feet.†

Among the veins in Clear Creek County, Colorado, ten feet intervals are quite short enough, and with many of the amygdaloid belts of Michigan twenty to twenty-five feet would be permissible.

* *e.g.* The Silver King Mine, Nelson, B.C.

† *e.g.* Le Roi and Deer Park Mines.

The sample (by this system) is sometimes cut by a small hand pick or geologist's hammer, but is beter taken with a moil and single-hand hammer. The objection to the pick is that the point, unconsciously perhaps to the operator, will get out an undue proportion of the softer portions of the vein, while the poll of the hammer equally tends to find the harder portions. It is better, in almost every case, to use the moil and hammer, and to cut a continuous groove across the section of the vein at right angles to its strike. The width and depth of this groove will vary according to the size of the sample desired, which in its turn depends upon the character and nature of the ore, the hardness of the vein-stone, its richness, and upon the conveniences at hand for treating large samples. In ordinary cases, and for veins not exceeding ten feet in width, a groove from three to four inches wide, and from a half to one inch in depth is quite sufficient.

It will be found in most cases that samples taken at ten to twenty feet intervals, with channels of the size above mentioned, are sufficient. If the results of the assays show wide discrepancies between two successive samples, new samples may be cut half-way between the divergent samples. The mention of this re-sampling brings up a not infrequent case in the sampling of mines carrying precious metals, and one on which I have found quite a divergency of views; the hypothesis may be stated as follows:—

Ten samples have been taken at ten feet intervals along an ore shoot showing in the roof of a level. Beginning at the first cut, the value of the samples have been:—

| | |
|---|---|
| No. 1 | $ 7.60 |
| No. 2 | 8.20 |
| No. 3 | 8.10 |
| No. 4 | 7.80 |
| No. 5 | 120.20 |
| No. 6 | 16.00 |
| No. 7 | 0.40 |
| No. 8 | 7.10 |
| No. 9 | 6.00 |
| No. 10 | 8.20 |

The arithmetical mean of these figures is $19.56, but No. 5 sample is so divergent from the approximate regularity of the values of the other samples that it must be verified or discarded. If a new sample be taken from the No. 5 groove, and again a value of about $120 a ton is obtained, the fact does not tell the engineer whether there is a gradation from $7.80, ten feet to the left up to $120, nor whether there is a similar gradation to the right, towards No. 6, and if the new sample affirms the high assay, there are few engineers who would care to take the average of the ten samples at $19.56, the arithmetical mean of all the assays, or who would use the value of $120.20 in the so-called "foot-ounce" calculation. Some engineers would throw out the high sample altogether and take the mean of the remaining nine samples, or $8.38.

Re-sampling may prove the value given to be accidental or erroneous, in which case there remains the possibility that this one sample has been salted. Good practice now would require that samples should be cut half-way between No. 5 and No 6, and half-way between No. 4 and No. 5; if the new samples (No. 4a and No. 5a) confirm the original high value of No. 5, their mean may be substituted for the original value in calculating foot-ounce values, or, if they do *not* confirm the original high value, their mean also may be substituted. The practice to be followed in each case will be governed by the