

the associated rocks usually contain pyrites these springs are often chalybeate.

#### RELATIONS OF TOPOGRAPHY TO GEOLOGICAL STRUCTURE.

Finally, the topography of the surface, if carefully studied, will often throw much light on the underground structure.\* The ravines and valleys are formed by the gradual erosion of the surface. The shape of the resulting hills and ridges is necessarily influenced by the inclination of the strata, by the relative hardness of different rock-beds, and by the presence of folds and fissures and other lines of weakness. A quartz-vein or bed of hard rock may show itself as a sharp ridge or as a well defined bench; and a stratum of soft rock, or the line of a great fissure, or the weakening of the strata by an anticlinal fold may produce a ravine or a deep valley. A break in the line of a ridge of hard rock may prove to be due to faulting, and in such case is often accompanied by the lateral displacement of the ridge beyond the fault. In regions where the strata are horizontal the small streams often will be found in deep ravines with precipitous banks. When the rock-beds are inclined the ridges will usually follow the strike of the rocks, and one hill-slope will be gentle and the other precipitous.

The importance of care and accuracy in the topographical work is evident. If the contours be carelessly drawn important truths may be concealed or false inferences deduced.

#### MAP AND SECTIONS.

The field work completed, the data will next be plotted, and the lines of probable outcrop of the deposit traced upon the map as a guide to prospecting operations. If the deposit be a bed or fissure-vein, and the plane of the deposit can be approximately determined, the tracing of the outcrop line is comparatively simple, involving merely the application of the principles of descriptive geometry. If the plane of the deposit be a warped surface, or combination of such surfaces, as in the anthracite coal-basins of Pennsylvania, the tracing of the outcrop is more difficult. The best method of procedure in such case is to construct from the data obtained in the field, and platted on the map, a series of cross-sections. In projecting the measurements of dip into these sections, due allowance must be made for the inclination of the strata from or toward the section where the lines of strike are not normal to the section. Allowance must also be made for the curvature of the lines of strike in some portions of the basin. From the cross-sections so constructed the approximate shape of the basin can be determined and the underground contours of the deposit sketched. Each intersection of an underground contour line, with a surface contour line of equal elevation, marks a point of outcrop. Joining these points by a continuous line we have the required outcrop.

#### PROSPECTING.

In order to answer definitely the questions asked at the beginning of this paper it is evident that we must know at least approximately the amount of available mineral, as well as its richness, purity, and other circumstances affecting its value. To form a reliable estimate of quantity it is necessary to know the extent of the deposit and its thickness. The area within the definite boundaries and above any assumed level can be determined from the map and sections. Thickness must be measured. It is not enough to know its thickness at one or two places only, but we must know the average thickness. The greater the number of measurements that can be made the more accurate will be the average result. In like manner a large number of samples from different parts of the deposit will be necessary to determine the average quality and richness of the mineral.

The work of prospecting, then, should be conducted so as to expose as much of the deposit as possible, to enable the measurements to be made and the necessary samples secured.

The exploratory workings are of two kinds, surface and underground; the first directed toward uncovering the outcrop of the deposit, and the latter to prove the deposit in depth. Both are necessary. Too much importance, however, should not be attached to workings in depth, and the surface exploration should in no case be neglected. The outcrop of a mineral vein or bed may be altered by weathering, and may be richer or poorer, better or worse, than the unaltered deposit below. Apart from this the outcrop represents an average section of the deposit, and measurements made on the outcrop will probably represent the true average thickness of the vein. The outcrop represents a section produced by erosion, possibly thousands of feet below the original outcrop. It is not probable that an artificial section, obtained by underground workings a hundred feet or so lower, will be any more reliable in this respect. In most cases there is no reason why a vertical section made by a shaft should have any greater weight in the determination of average thickness than a horizontal one.

Surface explorations are far cheaper, are more rapidly executed, and permit a more satisfactory examination of the deposit than underground excavations.

Underground workings are, however, necessary to determine how far the deposit has been altered, and the richness or quality of the mineral changed by weathering. The results will enable the proper correction to be applied to the data obtained in the examination of the outcrop.

#### Meeting of the Excelsior Copper Company, (Limited).

An extraordinary general meeting of the shareholders of this Company was held on Friday, 24th ult., at the Cannon Street Hotel, London, for the purpose of considering and passing certain resolutions for winding up and reconstructing the Company. Col. Malleon presided.

The SECRETARY (MR. G. R. FENWICK) read the notice convening the meeting, after which

The CHAIRMAN said: In the month of April last we held an ordinary meeting of the shareholders of this Company. On that occasion Captain Davey (the mining captain of the Company), who had just then returned from Canada, gave his report as to the value of the mine. He then pointed out that it required a certain sum of money—about £20,000, I think it was—to bring the mine into a dividend-paying condition. It was after that ordinary meeting that the meeting resolved itself into an extraordinary meeting for the purpose of considering the ways and means of the company, and how best to raise the £20,000 required for the development of the mine. It was finally decided by, I think, an absolutely unanimous vote, that the money should be raised by the issue of debenture bonds. We sent out circulars in conformity with that resolution, asking the shareholders to subscribe to the debenture bonds, the directors pledging themselves to subscribe in equal proportion if anything like the sum required should be subscribed by the shareholders. I regret very much to tell you that the reply of the shareholders was not satisfactory. The amount subscribed was so small that it was returned to those who had subscribed, and the directors set themselves to work to try and find out whether there were any other means by which, by subscriptions, among themselves and their friends, they could carry on the development of the property. The value of the property has been proved right up to the hilt, and if any of the shareholders would like to hear anything on that subject, I am happy to tell them that Captain Davey is in the room, and if they wish it he will address them on that subject. Under these circumstances, and having failed to obtain the money required for the development of the mine by debentures, your directors came to the conclusion that the only way in which it might be obtained was by reconstruction, on the basis of imposing on the shareholders a payment in proportion to their several holdings. This will be carried out by the issue to the present shareholders of shares 18s. 6d. paid. That is to say, that each shareholder in the new Company will be liable for a subscription of 1s. 6d. on every share he may hold in the old Company. But, although he becomes liable for 1s. 6d. per share, it does not at all follow that he will be required to pay up that sum. I myself am of opinion that 1s. per share will be the total amount that may be necessary to call up, and I see gentlemen before me who are sanguine enough to think that even 6d. will be sufficient. At all events, whether it be 6d., whether it be 1s., or whether it be 1s. 6d., the amount is small in proportion to the great value of the mine which is your property. The value of the mine, as I said before, is placed absolutely beyond the realm of doubt. I shall content myself now by moving the first resolution: "That it is desirable to reconstruct the Company, and that with a view thereto, the Company be wound up voluntarily."

MR. J. R. ARMITAGE seconded the resolution, which was then put and adopted, with two dissentients.

The CHAIRMAN moved that the liquidator be authorized to transfer to a new Company, to be incorporated with limited liability under the Companies Acts, 1862 to 1890, all and singular the lands, hereditaments, mines, mining water, and other rights, leases, buildings, plant, machinery, stores, and all other the property and effects of this Company, of every description whatsoever, upon the terms and conditions named.

MR. BATTINSON seconded the resolutions, which were then put and carried unanimously.

CAPTAIN DAVEY then said: Since I last met you at this place I have been out to Canada, where I went with the intention of working a diamond drill in connection with the property; but, as the Chairman just now stated, the money which was proposed to be raised by the Canadian Board was not forthcoming, so we had to work with the limited means at our disposal from this side. We commenced on the dump ores with the most primitive method possible to adopt—three wash tables, one hand jigger, and one buddle. All the stuff was put through a screen, the rough being picked by boys, and the fine treated in the jig and buddles. As a result of that we sent to Swansea eighty-seven tons at a cost of about £340. When we can work our concentrating plant we shall have some good ore to commence with. I calculate to have on the dumps about 10,000 tons ready for treatment. We have sent over, as I have told you, 87 tons of ore averaging from 11 to 24 per cent. This, I am sure the shareholders will say, is a good average for dump ore. But, taking the ore at an average of only four per cent., this will give you a grand total of 400 tons of copper or metal, equal in value to £20,000 sterling at the present price of copper. The whole quantity can be brought to market at half that amount, or £10,000, which will include the cost of plant for treating it. Thus you will be left with a profit of £10,000. What is already broken at the surface is one of the best assets on the Company's property. To treat the dumps you require, in my opinion, a mill and concentrating plant to treat 100 tons of stuff per day. This will cost you £3,000 when erected. In treating four per cent. ore as above you will get (counting one per cent. for

loss) three tons of metal per day, or equal to £180 per day, taking the value at £60 per ton. From this deduct £8 per ton for smelting, and you have to the good £156 per day, or £4,368 per month of twenty-eight days. This estimate is taking the stuff at 3 per cent., but it ought to run to 6 per cent., and, if so, be all the more valuable. If £2,000 be taken for mining, milling, and smelting, there will still be left to you a monthly profit of £2,368, or £28,416 for the year. This I consider a good profit on an outlay of £3,000. During the past two years your mine has been worked with an idea to get out all the available ore, without the least thought of where the ore is coming from after the then reserves were worked out. They have worked up to this point, but there is not an and in advance of a stope, and the stopes are shallow and poor generally. The work has been on both vein and bed-rock, and stoped wherever there has been a sign of ore. I am satisfied that you have a valuable property if only it is fully developed. I don't hesitate for one moment to say that if the money is raised, before this time next year you will have a dividend. I may be told that that is a rash promise on my part, but it shows the confidence I have in the mine. There is also asbestos on the property, and I think, with a little looking after and a little prospecting, we shall not only have copper ore, but also asbestos, and that, as you know, is a very valuable commodity.

In answer to questions, the CHAIRMAN said that in future the Company would only have directors in England. The directors had given fullest consideration to various schemes for the raising of capital, but it was felt that in the present state of the money market it was absolutely inadvisable to appeal to the public for assistance.

The proceedings shortly afterwards closed.

#### A Summary of the Quebec Mining Bill.

This Bill, which has been passed at the late session of the Legislature of the Province of Quebec, may be summarized as to its principal features as follows:—

In all future sales of lands for agricultural purposes, the Crown reserves the mining rights.

Any person discovering a mine may purchase it; but upon private lands the occupant of the surface has the first right to purchase.

From May 1, 1891, a royalty shall be levied of 3 per cent. of the merchantable value of the products of all mines and minerals (unless the amount is already determined otherwise). The royalty on gold is to be 2½ per cent. of the gross weight estimated at \$18 an ounce, and on silver at 2½ per cent. of the gross weight.

For a fee of twenty cents one may see the registers and plans in the mines office.

Inspectors may be appointed by the Lieutenant-Governor, under the control of the Commissioner of Crown Lands.

The inspector has the powers of a justice of the peace, and decides in a summary manner, without appeal, all contestations and suits relating to mining, except in suits relating to rights or titles to immovable property. He may summon persons, convict upon view and settle any difficulty arising from the provisions of the Act.

Any one may explore and prospect on public lands.

An exploration permit, valid for three months, giving the right to make all necessary works, may be obtained by paying, if upon private lands, \$5 for every 50 acres, or if upon Crown lands, \$10 for every 50 acres.

The mine may afterwards be purchased at a minimum price of \$2 per acre for iron and ochre, or \$5 per acre for all other minerals.

The Commissioner may offer mining concessions at public auction, the upset price, or first bid, to be as above.

A mining concession is to be not less than 50 nor more than 100 acres.

The deed of sale may be annulled if work ceases for two years, unless work is resumed within twelve months after notice.

Arbitrators shall decide, if necessary, the compensation to be given to private owners by the intending purchaser of mining rights.

If the purchaser of a mine from private persons does not go to work within two months, or if he discontinues work for eight months his title is forfeited.

Reports must be sent to the Commissioner on the tenth day of January, April, July, and October, containing statements of ores worked, number of men employed, and description of all mining work and erection of plant during the quarter.

Quartz mills may be licensed for \$5.

Mill owners must make monthly returns.

Numerous provisions relate to the duties of inspectors and land surveyors, the duty of owners to erect posts and and mark boundaries, keep passage walls clear, etc., etc., and the powers of the Lieutenant-Governor to aid and regulate mining or control riots.

Maximum penalties are to be imposed as follows:

For mining without permit—\$10 for every day or imprisonment for one month.

For mining without furnishing name, etc. to inspector—\$20 or one month.

For obstructing passage—\$5 or one month.

For damaging another's mine by earth or water—\$5 or one month.

For not complying with inspector's decisions about use of water courses, drains, etc.—\$50 or one month.

For removing a stake—\$10 or one month.

\* See *Coal and its Topography*. J. P. Lesley. Philadelphia, 1856. Also *Topography with Especial Reference to the Lake Superior Copper District*. J. G. Blandy. *Trans. Am. Inst. of Mining Engineers*, vol. i., p. 75. Also, *On the Importance of Surveying in Geology*. Benj. S. Lyman. *Trans. Am. Inst. of Mining Engineers*, vol. i., p. 183.