THE MAGNETIC NEEDLE, AND MINING PLANS.

Recent events in connection with mining operations show most forcibly the great importance of having the working plans of mines almost mathematically correct, yet we have had plain proofs that many, considered in every way most reliable, have just been the reverse. Many of the mining surveys now in use, says the London *Mining Journal*, cannot be relied on within five or ten yards at a distance from the shafts, and the protracting of one line from the preceding ones, and so on in succession, perpetuates every error, and is a system of "judging," as it is termed, that should not be adopted by the mining engineer. In many instances the taking of the magnetic variations have been entirely disregarded, and this has led to many errors appearing on plans. In taking the meridian there was a great deal of difference in the observation taken on one day and that observed on another. To some extent, no doubt, the atmosphere affected the needle, for oxygen being a component part of it was a substance that attracted the needle, and it was also probable that the heat of the sun also affected it. The difference in the weather and the seasons of the year, it may be taken, had a tendency to a variation of the needle from the true meridian. To determine the deviation of the plane of the meridian, or of the due north, it was usual for the direction of the pole star to be taken while the first star in the tail of the constellation of the Great Bear was passing precisely underneath the polar star. The true pole was a point in the line joining the two stars a little removed from the pole star, just opposite to the next star which is visible to the naked eye. It has been said that greater accuracy has been obtained by taking what is termed the "solar meridian," but how this can be done does not appear to be known to many of our mining managers. One gentleman has informed us that he has taken it frequently by a transit instrument; all that was required being to find the proper time the sun was passing the meridian of a certain place, and then fixing, on some important station on the surface, make the observation at the proper time. The ordnance maps were generally tolerably correct, and they were used to find the longitude of the place wanted or required. As to taking the time, which, of course, was required to be most exact, it was done by ascertaining the Greenwich time at a place and then correcting it by means of calculation, so as to obtain the mean time at Greenwich.

As to old mining plans, as a rule, it is no doubt correct to say that if they were now brought into use, to have the workings correctly carried on such could not be done without going and comparing them or getting the true meridian again. But it has been stated by one of our mining engineers who has paid a great deal of attention to the subject, that by adopting the solar meridian there would be a universal similarity in all plans, as every plan would be drawn on its proper meridian. Every plan throughout the country would be as parallel as possible, and by that means they would be able to compare them at once. However, the taking of the solar meridian as yet has not been adopted by many of our mining engineers, who consider it of more importance to know the variation of the compass from a certain line. Still it has its advocates, whose number will in all probability increase, for it has its attractions, especially among the young members of the profession.

One of the simpler methods by which the meridian can be approximately determined is by drawing a thin rod vertically on a drawing board or some level surface, the shadow cast by the rod being measured a short time before midday, and the vicinity marked. Through the point with the rod as a center the arc of a circle is struck, when the extremity of the shadow again touches the arc after midday, the point where it touches is marked, and midway between the extremities of the two shadows may be found the point, which is in the same meridian as the rod itself. It is, however, most desirable for future reference to mark by strong stakes at several chains distance on either side of the shaft the meridianal line which has been taken as a base for the survey. In the surveying of boundary lines on the surface, or of the mainways in the skeleton of the survey underground, the compass should be entirely discarded. Where very great care has not been taken it may be said the use of the magnetic needle underground, where the greatest accuracy is so necessary, has led to many errors which have led to litigation and loss of time by driving in the wrong direction. Surveying, however, can be done without a needle, especially where there is only one shaft, and this can be effected by two thin copper wires carrying heavy weights at the bottom immersed in buckets of water to diminish the oscillation, a deal straight edge being fixed so as almost to touch each wire at right angles to the lines between them. The extremes of six or ten successive oscillations should be marked with a pencil on each straight edge, and the mean taken with a pair of compasses, and the wires fixed to such mean points. Standing behind the wires the surveyor should next send a candle along the heading as far as it could be seen, and fixed in a line with the wires, and this operation should be repeated in the opposite direction, placing a candle against one of the wires, and to check the whole it should be seen whether the three candles are exactly in line. The latter, being the basis of the whole underground survey, should be permanently marked by a few pegs driven into the roof with nails in them, or by some other marks. On the surface permanent pegs should be placed at some chains distance on each side of the shaft in a line with the wires. By this means there is obtained a line on the surface exactly corresponding with the base line of the operations underground.

This system has been found to be a really good one after the most severe tests that it was possible to have, not only in ordinary mining but in tunnelling as well. Surveys for the purpose of ascertaining the extent and direction of underground workings should be so trustworthy and accurate as to enable the surveyor to show from this map or plan the very points on the surface below which the mineral has been taken away, and to what extent the subterranean excavations have extended. This, under ordinary circumstances he can do by taking the horizontal dimensions of the surface area from which the mineral has been excavated beneath. Another means frequently used in surveying was by having three stones in a line, and testing the compass frequently, when a correct survey could be ensured by a competent surveyor, and this could be done in thin seams of minerals where the theodolite could be brought into use. The magnetic needle, however, was a rather favorite mode of surveying, but in connection with it; but it was affected by magnetic stones and ironstone. Still, in making surveys of mines there can be no question as to the importance of the taking accurate note of the magnetic variations, so as to ensure the accuracy of mining plans, and these have at many places been entirely ignored, and with serious consequences to the owners of mines. In one case we are told of two beds of coal which were worked simultaneously according to the plans, and the result was that there was a difference of several chains, which greatly astonished the engineers. Only recently, too, in an action tried in one of the Superior Courts, heavy damages were awarded to a mine-owner for trespass and getting minerals by the party who had gone beyond his boundary, owing to the inaccuracy of the plans. To have plans accurate and in every way reliable it has been suggested that there should be a long line on the top, showing the variation of the compass at every time, so by that means no errors could well arise. However, the importance of accurate plans in connection with every description of mining operations cannot be too forcibly expressed, nor can the best known systems be too often brought under the notice of mine managers and mining engineers, on whom so much responsibility rests for the safety of those employed under them, as well as for the security of the property placed in their keeping.

MINERALS CONTAINING SILVER.

Only a small proportion of the large amount of silver which is at the present time produced for commercial purposes is found native, and then not pure, as it is generally alloyed with a little copper, gold, platinum, mercury, arsenic, iron, lead, bismuth or antimony.

Native silver occurs in masses or in arborescent and filiform shapes in veins traversing gneiss, schists, porphyry, and other rocks; it also occurs disseminated in native copper and galena, but usually invisible to the naked eye, therefore requiring the aid of a good microscope to determine its presence.

Silver when pure has a metallic luster. Color and streak, silver white. Ductile. Hardness, 2. 5.—3. Specific gravity when pure, 10.5. Minerals containing silver are found in veins of nearly all descriptions, and even in sea water minute traces have been found by a careful analysis.

Silver is a metal extensively used in the arts and manufactures, and many products contain more or less proportions.

Silver will be found in the products as well as in the refuse from nearly all lead and copper smelting works, if carefully looked for, and a very small amount can be determined with accuracy. Any mineral or alloy containing what is called a "trace" of silver about one-half ounce to the ton of 2,000 lbs., can be assayed, and the metal extracted and determined with accuracy.

Mr. George Attwood, in his "Practical Blowpipe Assaying," gives the following list of principal minerals containing silver:

Argentite, silver glance containing 87% silver, with sulphur.

Stephanite, brittle silver ore, containing 68% silver, with sulphur and antimony.

Proustite, light red silver ore, containing 65.4% silver, with sulphur and arsenic.

Pyrargyrite, dark red silver ore, containing 59% silver, with sulphur and antimony.

Argentiferous grey copper ore (fahlerz), containing from 5.7% to 18-31.8% silver, with antimony and sulphur.

Argentiferous sulphide of copper, containing 53% silver, with sulphur and copper.

Polybasite, containing 72-94% silver, with copper, sulphur, arsenic and antimony.

Chilenite, containing 86.2%, with bismuth 13.8%.

Bromyrite, containing 57.4% silver, with bromine 42.6%.

Cerargyrite (horn of chloride), containing 75.3%.

Embolite, containing 60—72% silver, with bromine and chlorine.

Sternbergite, containing 33.2% silver, with iron 36%, and sulphur 30%.

Iodyrite, containing 46% silver, with iodine 54%.

Selenic silver, containing 11.6-42.8-65.5% silver, with selenium, copper and lead.

Hessite, containing 62.8% silver, with tellurium 37.2%.

A new line of railroad is to be constructed from the main line of the Missouri-Pacific at the Pacific junction, to Carthage, Mo. This line will open up a new and very rich section of Missouri and will shorten the through line to Texas by about 30 miles.

Advices from Paris say that *La Liberte* announces that Col. Flatters' Trans-Sahara Mission will be taken up, and the murder of Col. Flatters and his followers avenged. The new expedition will consist of a regiment of 700 men mounted on camels.