REPORT OF THE SWANSEA MINE - ZEEHAN

Introduction

This is an addendum of the reports prepared two years ago for the Swansea Syndicate. In this report is given the latest investigations, and the information deduced from the evidence obtained is fully discussed. Earlier reports deal only with the work performed at the upper levels; this deals almost wholly with the result of operations at the lowest level (110 feet) where the lode channel and the contained ore shoots are little disturbed and are well exposed for examination. A modification and an amplification of the views expressed in earlier reports is necessary in order that a true interpretation of the structure of the ore-bodies , based on the latest evidence, may be given. An account is given also of the nature and character of the lode channel and the ore shoots, and of their relationship, which is clearly illustrated on the accompanying plan. Much work remains to be performed to complete the investigation, but sufficient information has been obtained for the purpose in view.

The ores

Ores of lead, zinc, silver, copper, antimony, and iron are found in these lodes, but the three first mentioned only are of economic importance. All are in the sulphide form except iron, which is found also as carbonate and in that form with quartz is the chief gangue of the other minerals. In quantitative importance the chief mineral components of the lode are:-

Galena (argentiferous),
Sphalerite or zinc blende,
Tetrahedrite or fahl ore,
Chalcopyrite or copper pyrites.

In some parts galena predominates, in others sphalerite constitutes the greater portion of the ore-body. Tetrahedrite is prominent and a constant associate of galena. Chalcopyrite is quite subordinate. The silver constituent, as might be expected, is contained almost wholly in the galena component. Although the several minerals that make up the lode material are contemporaneous they are not, as a rule, intimately mixed. Galena, sphalerite and tetrahedrite are everywhere associated but each occurs in the blebs and bunches and a large amount of each may be separated by Knapping with a small hammer. Other means of separation and concentration may be employed after reduction to the size of the smallest particle of the mineral.

One striking feature of this ore is the comparatively low content of silver. In other parts of the field the presence of tetrahedrite and chalcopyrite is indicative of a high silver content. Here the proportion is much lower than in the average grade of ore.

The ore-bodies and their structure

The ore-bodies are contained within a lode channel 32 feet wide and over 1200 feet in length. The lode channel courses 335°, and the ore-shoots course 319°

or obliquely across the channel. The shoots are thus limited in length (about 110 feet) by the walls of the lode channel. Where they meet the walls the metallic minerals end abruptly, but irregular veinlets of quartz enter the wall-rock in the direction of strike of the shoots giving rise to the idea that faults are responsible for their termination.

On the footwall side of the lode channel the containing rocks are hard quartz grits and slates; within and on the hanging wall side are soft dark grey shales, very soft white volcanic ash, and grey arenaceous slate. Some beds of the volcanic ash contain water-worn pebbles and boulders - weathered conglomerate - of quartzite indicating its deposition in shallow waters. Developed in the ash are secondary minerals, one of which a soft, greasy, pale green mineral, is particularly conspicuous. Its composition has not been determined.

The effect of the country rock on ore deposition is not apparent. However, the largest bodies of ore appear to accompany the white ground (volcanic ash) and there is some evidence of selective replacement. Siderite (carbonate of iron) and sphalerite (zinc blende) are more prominent where the shoots are contained in dark grey shale; while galena and tetrahedrite (fahl ore), are more abundant in ash country. This is not an invariable rule, however, for in No. 3 ore shoot the nature of the ore is seen to vary little as the shoot is exposed in shale and ash. No. 2 shoot alters from galena to sphalerite in a very short distance. In all shoots quartz is abundant.

Main shoots are connected by flat and highly inclined veinlets of galena, blende, siderite, and quartz, and veins and bunches of ore traverse all rocks within the lode channel.

The ore shoots dip in a north-easterly direction at rather low angles. They are at the No. 3 level more highly inclined than in the higher levels. The reason for the pitch of the ore shoots in a northerly direction is quite apparent (see plan). Three shoots of ore have been intersected and opened in the main workings. Many others of similar nature are known but undeveloped in the lode channel between main shaft and the farthermost prospect shaft 1050 feet northwestward. Although the main shaft is only 110 foot deep all the prospect shafts (about 30 feet deep) on the line of lode are drained by the pump in operation there, in other words, the lode channel is drained to a point 1050 feet from main shaft.

Production

The complete records of the production of lead and zinc ores from this mine are not available. It is estimated that the output is not less then:-

2000 tons of galena, consisting largely of lead, 60 per cent and silver in the proportion of 16 oz. per ton, and 1000 tons of sphalerite consisting largely of zinc 47 per cent and cadmium 2 per cent. The ore on hand consists of:-

50 tons lead ore (60 per cent lead, 16 oz. silver per ton)
200 tons zinc-lead ore (zinc 30%, lead 20%, silver 9 oz. per ton)
200 tons zinc ore (46% zinc)

Between Nos. 2 and 3 levels, 30 feet apart, 500 tons of first grade ore, 200 tons of mixed ore, and 200 tons of zinc ore have been mined. In the following table the weight and nett value of ore produced and sold lately is given.

Nature of ore	Dry Weight Tons	Dry Weight Cwt.	Lead %	Zinc %	Silver oz.	Nett Price per ton £	s.	d.	Nett Value £
Lead	30	1	61.1	8.9	17	16	19	10	511
"	29	16	61.95	7.0	15.7	17	1	11	510
"	24	13	63.05	7.8	15.55	17	19	2	431
Zinc	52	7	5.75	50.85	3.05	5	11	1	291
"	62	3	4.9	49.8	2.7	5	7	10	335
"	70	4	6.45	52.35	2.4	5	19	1	418
"	41	4	5.25	50.5	2.6	5	11	2	229
"	43	10	1.90	42.35	1.2	3	12	2	157
"	46	18	4.7	45.75	2.3	4	2	4	193
"	32	8	5.65	47.20	2.25	4	8	4	143
"	53	18	3.8	46.65	1.3	4	12	4	249
"	64	12	6.65	51.95	3.35	5	12	7	364

Development

No. 3 level (110 feet)- From the shaft a north-east crosscut intersected No. 1 ore-shoot at 10 feet. It is here thin and poor. A south-east drive exposed a little clean galena. A drive was cut north to intersect No. 2 ore-shoot at 30 feet. A solid body of ore 2 to 3 feet wide and consisting largely of galena is exposed in a north-westerly drive a distance of 50 feet. The cresscut from main shaft intersects the south extension of this shoot at 43 feet where it consists almost wholly of amber-coloured zinc blende, 2 feet in width. Thirty feet farther south the ore is again exposed at the end of a short crosscut from No. 1 ore-shoot drive. Here the vein is 5 feet wide but it consists largely of quartz and siderite; here also the eastern wall of the ore channel intercepts it and only a few irregular veinlets of quartz mark its position. At the north end of the drive on this shoot the ore there is cut off abruptly also. The drive was advanced a few feet into the wall-rock without important result. No. 3 ore-shoot is cut in two crosscuts. In the southern one it is poor and thin but shows an increase in the proportion of galena as it is exposed in the north drive. In the other crosscut the vein is 18 to 20 inches wide of which about half is galena. Siderite and quartz are the gangue minerals.

Between main shaft and No. 4 shaft 1050 feet away to the north ore shoots of galena and sphalerite have been exposed in two shafts (Nos. 2 and 3) 30 feet deep, and in several trenches. None of these shoots has been explored along its course.

Future operations.

If the Syndicate intends to continue operations on Nos. 1, 2 and 3 ore-shoots only then a larger shaft will be a necessity and more powerful winding and pumping plants will be required. If, however, exploration at 110 feet level is to be extended then the present equipment will serve the purpose. On the plan it will be seen that it would be futile to drive outside the ore channel on the course of the known shoots. Other parallel shoots may be found south as well as north, but the exploratory crosscuts and drives should be directed across or along the course of the lode channel as shown on plan.

A new main shaft should be sunk in the soft hanging-wall rocks at a point 400 feet due north of present main shaft. This would not only serve as a point of attack at depth on the south shoots but also those to the north of the proposed shaft.

General Remarks

This lode channel is the most extensive and the widest of any known in the western district. All the exploratory works thus far undertaken have been productive of good results and the prospects of finding other shoots as development is extended are certainly bright. The ore produced is classified by hand as galena, mixed ore, and zinc blende, and all grades find a ready market. The mixed ore is sold to the Electrolytic Zinc Co. and is treated at their Zeehan works.

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