unable to obtain any data proving that the fossils have been found in any other location than near the surface or in the upper part of fissures.

Another local controversy has greater justification, and this difference of opinion is in regard to the nature of the faulting which has so much disturbed and contorted the district. Compression or the shear-zone theory, and elevation and depression have each their But any engineer who strictly adheres to supporters. either theory will soon find himself at fault in more senses than one, for each has been controverted by practical experience. In the writer's opinion, the complex faulting is owing to the following historic sequence of geology :- This district, in conjunction with the rest of the Pacific coast has been subjected to a great upheaval with consequent faults and general weakening of the surface crust. A great thrust from the west probably started the volcanic activity, and the enormous mass of igneous material, removed from below and precipitated on the surface, reduced the support and greatly increased the weight-hence a general subsidence took place, with its accompanying normal faults. The cooling of this great mass caused shrinkage and compression, and has caused some of the shear-zone phenomena, but the consequent parallel fissures and reversed faults have been intersected and cut off by previous faulting.

The veins are true fissure veins, the metal in them being the result of metalliferous liquids flowing through them, attacking the country-rock on each side, dissolving the rock and naturally replacing it with metallic sulphides. Such being the case, the shoots of ore often fade away into the surrounding country-rock and there being no well-defined walls the ore is frequently lost. This, with the very irregular width of the veins and their complex faulting, renders Rossland geology an exceedingly difficult problem to mining engineers. Yet, the writer has proved by actual practice that these difficulties may be overcome by careful study ; but the conservative mining engineer with fixed ideas, formed from experience in other districts, would soon convert a mine into a worthless hole in the ground.

Thh principal ores are chalcopyrite and pyrrhotite carrying various percentages of gold, silver, copper and bismuth, but although some ore will run to a total value of \mathcal{L} to per ton, the majority is of so low a grade that only the abundant facilities of transportation and the comparatively low cost of smelting would justify mining in such a country.

The diorite formation is intensely hard and expensive to work, but fortunately the water is easily handled.

At the present time Rossland is under a cloud, and the constant friction between the Miners' union and the companies has ended in several large mines being closed. In each case, the companies attribute this cessation of work to defective machinery; although the writer has no authority for questioning this statement, judging from his own experience, the hoisting and drilling plants in the district are unusually good. Electricity is the motive power, the West Kootenay Company supplying by cable transmission, power to run the dy-namos at the mines at a cost of about 50 per cent. less than the same work could be done by steam ; this, with the various works lighted by electricity, gives the dis-trict a very business-like appearance, and the surrounding mountains with their railroads and self-acting trams tipping into the railroad trucks all bear evidence of practical and economical work.

As it is possible that members of the Institute might be in a somewhat similar district to this, the writer will point out a few matters that might be of use. First, where chalcopyrite changes into pyrrhotite the continuation of the ore is pretty well assured; on the other hand, where pyrrhotite changes into chalcopyrite it is likely soon to scatter out among the enclosing rocks. When a lode gives out and leaves no visible trace, small and sometimes almost invisible streaks of calcite frequently follow the strike of the lode or run parallel with it. Once, by following one of these streaks a few feet and then crosscutting, the writer found ore where it would otherwise have been certainly missed. The inflow of water in underground workings is no sign of vicinity to a lode, but rather the reverse. Where water proves troublesome, a crosscut intersecting the water flow and conducting it to the nearest fault line will sometimes act as a drain and save much hoisting. Where the gangue of a lode becomes silicious, the quartz, though apparently worthless, frequently monopolizes all the gold values. The more valuable quartz is clouded with a dark-grey substance : these stains are probably caused by some form of petzite, this, however, is merely a surmise, for the quartz on assay yields no trace of tellurium.

NOTES ON SUMP SOLUTIONS, EXTRACTOR-BOX WORK, AND CLEANING-UP, IN THE CYANIDE PROCESS.*

BY ALFRED JAMES, M. INST. M. M.

O^{NE} of the problems at present agitating the minds of cyanide operators is the effect on the extraction of gold by the continued re-use of the cyanide solutions. Such solutions contain, amongst other matters salts of zinc, iron, occasionally copper, alkalies and alkaline carbonates, ammonia, and sulpho-cyanides ; and it is obvious that, unless these constituents are prevented from accumulating in the solutions, the solvent power on the precious metals of any added cyanide must sooner or later be impaired.

Solutions which had been in use for some months were therefore examined, and the results noted: it was found that the extractions returned were in every case less than those obtained on the same material—ores or tailings — by making up cyanide solutions of the same strength with fresh water. Thus :—

	Extraction with fresh solutions.			Extraction with used solutions.			
	oz.	dwt.	gr.	OZ.	dwt.	gr.	
(a)	15	13	14	15	0	12	per ton.
(b)	20	18	3	18	13	16	
(b')	21	0	17	19	0	5	**
(c)	3	17	2	3	13	5	**
(c')	3	18	9	3	13	5	**

It may be suggested that the presence of double cyanide of zinc and potassium ($K_2 ZnCy_4$) may have misled the operator as to the strength in cyanide of the solutions, but it will be shown that this matter has received special attention, and that the results were similar, even when equal quantities of solid cyanide of potassium were added to fresh water and to a solution of double cyanide of potassium with caustic potash present.

Experiments were carried out with the object of overcoming this loss of power in the used or "sump" solutions, and it was found that the addition of lime improved the extractions from ores and tailings containing practically only quartz and gold, but that such treat-

* From a paper read before the Institution of Mining and Metallurgy.