THE "DE RE METALLICA" OF GEORGIUS AGRICOLA*

A REVIEW

(Continued from April 1st Issue.)

The methods of staking mining lands in Germany during the sixteenth century, and the officials that were to be approached, are dealt with in Book IV. The Bergmeister, having satisfied himself as to the discoverer's identity, awarded the "head meer" to him, and the remaining "meers" in order to each successive applicant. The head meer, staked on a fissure vein, measured 42 fathoms by 7 wide, while the ordinary meer was 28 by 7. For other classes of deposits other units obtained. Many restrictions were imposed upon individual operators, and there was quite as much red tape as one finds to-day. These, the duties of the mine manager, the collection of tithes, Agricola explains with care and precision. It appears that in those days the day was divided into three seven-hour shifts—morning, noon, and night. "The Bergmeister" it is noted. "does not allow this third shift to be imposed upon the workmen unless necessity demands it." Truly the height of consideration! When, however, the men were forced to work the third shift Agricola remarks that "they keep their vigil by the night lamps, and..... .....they lighten their long and arduous labours by singing, which is neither wholly untrained nor unpleasing." In some places miners were not allowed to work through two successive shifts, in other places the only limiting factor was his own power of endurance. Saturdays and Sundays were regular holidays—Saturdays devoted to shopping and Sundays to "holy things."

The practical work of mining and the art of surveying from the subject-matter of Book V. The advice given as to sinking shafts is that, first, a separate shaft house be built wherein is placed the windlass. Here, also, are kept the iron tools and other mining implements. It is further recommended that adjoining this structure a dwelling be constructed for the mine foreman and workmen. In a quite casual manner Agricola mentions that "the ore and other things which are dug out" are also to be stored in this edifice. Here is a charming sidelight: "Although some persons build only one house, yet because sometimes boys and other living things fall into the shafts, most miners deliberately place one house apart from the other, or at least separate them by a wall."

General instructions follow and illuminating definitions shine like gems throughout. "A tunnel," says Agricola "is a subterranean ditch driven lengthwise and is nearly twice as high as it is broad, and wide enough that workmen and others may be able to pass and carry their loads. It is usually one and a quarter fathoms high, while its width is about three and three-quarters feet.....Each miner sits upon small boards fixed securely from the footwall to the hanging wall." We wonder if it would conduce to efficiency and peace of mind were modern workmen required to work in a "subterranean ditch," three and three-quarters feet wide.

Our mediaeval friend had evidently paid much attention to the character and modes of occurrence of ore in advising the miner where and how to sink on his vein. He lays special emphasis upon the functions of stringers and main veins, and upon vein intersections generally. He then discusses with some elaboration the actual relationship of characteristic minerals and metals—a strangely interesting bit of empirical paragenesis. Here are typical statements: "A vein which contains a larger proportion of silver than gold is rarely found to be a rich one.....The solidified juices, azure, chrysocolla, orpiment and realgar, also frequently contain gold." As to indications of valuable metals Agricola explains among other things that if the miner comes across "dry earths which contain native or *rudis* metal, that is a good indication; if he comes across yellow, red, black, or some other extraordinary earth, though it is devoid of mineral, it is not a bad indication." Schist of a bluish or blackish colour, and limestone of any colour whatsoever, are good indications of silver. Bismuth and antimony are described as special indications of silver; orpiment as special indication of gold; verdigris, *melanteria,* and vitriol, are taken as indicating copper. It is mentioned that bismuth was called by miners "the roof of silver."

Evently extralateral rights did not obtain in those days, as witness the following: "If it [the vein] descends vertically into the earth, the benefit belongs to that mine in which it is seen first of all; if inclined it benefits the other neighbouring mines. As a result the miner who is not ignorant of geometry can calculate from the other mines the depth at which..... the vein bearing rich metal will wind its way through the rocks into his mine."

The modes of extracting the vein matter are now elucidated. As Agricola wrote before the introduction of explosives into the mine, the principal method of extracting hard ore was by means of fire. A heap of dried logs was placed against the rock and ignited. In many cases this process was not only exceedingly tedious, but it caused distress in neighbouring mines which happened to be connected with that in which fire was being used. Hence permission had to be asked of the owners of neighbouring mines and in the case of arsenical, anitimonial, or sulphurous ores the permission of the "Bergmeister" was necessary. After long calcination the ore was dislodged by means of crowbars and hammers. It was always to be hand sorted in the mine, where fire was not necessary or not permitted the miners had perforce to rely upon purely mechanical means.

The practice of timbering was not, in Agricola's time, as crude as one might expect. Pumping was usually accomplished by hand or by horse power, although mechanical appliances were sometimes used. Surveying, to which the latter part of Book V. is devoted, was practised only in its simplest form. A knowledge of the rudiments of geometry with a touch of trigonometry was the basis of the art.

The sixth book contains descriptions of the tools, vessels and mechanical devices used in the mines. Winding, ventilating and pumping machinery, drills, hammers, picks, are clearly described by text and wood cuts. The barrows and trucks in vogue were exceedingly substantial in design. For baling water small and large wooden buckets fed by means of cumbrous wooden dippers were filled and hoisted by hand to the

* Georgius Agricola De Re Metallica.—Translated from the first Latin edition of 1556 with Biographical Introduction, Annotations, etc., by Herbert Clark Hoover and Lou Henry Hoover.—Published for the Translators by the Mining Magazine, London.—For sale by the Canadian Mining Journal, Toronto, Canada.