is a rack of 1¼ inch slats 4 inches high and 6 inches apart. Three sizes of quartz from ½ inch to ordinary gravel are placed in the rack for the filter. Before emptying the barrel, sufficient clean water is let into the filter to cover the gravel. This acts as a cushion to receive the pulp. Then the barrel is dumped, the contents striking on a wooden float to prevent disarranging the filter bed. The pulp is then washed three times with clean water. Tests being made with ferrous sulphate to determine when the chloride of gold is all out of the pulp.

The resulting solution is conveyed through lead pipes to the stock tanks on the floor below and there retained until it is desired to precipitate the gold. It may be here remarked that all the tanks in this building are lead lined except the 16 precipitating tanks which are made of Florida cypress and coated several times with an acid-proof paint. When it is desired to precipitate, the solution is drawn down to the tanks, which are eight feet in diameter and three feet high. Each tank is provided with three outlets, one 18 inches from the bottom, another one inch and the third in the bottom. About eight or ten buckets of the ferrous sulphate is added to each tank of liquor and thoroughly stirred, then the whole is allowed to settle for three or four days, the gold being precipitated in the form of a brown powder on the bottom of the tank. The solution is drawn off through the two upper outlets opening one after the other to prevent stirring up.

The remainder is swept out through the bottom hole and placed in a small settling tank 2 x 2 x 4 feet and allowed to stand 24 hours. The supernatant liquor is then carefully syphoned off and the precipitate filtered on paper, dried, mixed with one half its weight of bicarbonate of soda and glass borax and then smelted; the resulting brick averaging ·980 fine.

The solution drawn from the precipitating tanks in every case is run through a sawdust filter which every few months is subjected to chlorination to get any gold that may be in it.

So far as the Brookfield ores go chlorination is a success, and there is every reason to believe that many, if not most, Nova Scotia ores could be more profitably worked if concentrators were introduced with subsequent chlorination in view. After the character of an ore is definitely determined and the amount of chemicals necessary to use per ton of ore is settled the process is a very simple one, which is a special advantage to a country like Nova Scotia where there are no men in the line of chlorination who combine theory and practice. Small plants capable of handling say two tons per day can be erected for a comparatively small sum of money. Of course, such additions to the ordinary free milling plant increase the capital necessary to commence operations but until the operators in Nova Scotia gold mines quit putting up half built and equipped mills and expecting dividends from boulders with no underground development they need expect no dividends themselves nor any good report of their gold mines abroad. Some have advocated the idea of inducing the local government to establish a chlorination plant and assay office, but it may well be doubted if a pap-fed concern which would most likely be managed by some laboratory expert with more "pull" than practical mining experience would prove of any benefit to the Government or the gold mining industry.

The plans and specifications for the roasting and chlorination plant were furnished by Dr. Adolph Thies of the Haile Gold Mine, Lancaster County, South Carolina, who is a thoroughly educated chemist and metallurgist with some 40 years of actual experience in gold mining in various parts of the world, and from him also were obtained many of the most useful ideas in fitting up the mill. The furnace house and chlorination plant were erected under the personal supervision of Mr. John. J. Bowers formerly of the Haile Gold Mine.

Mining at Great Depths.

By Bennet H. Brough, A.R.S.M.*

The recent announcement (1) that the Red Jacket shaft of the Calumet and Hecla mine in the Lake Superior copper region has been sunk to a depth of 4,900 feet, the greatest depth hitherto reached by a mine-shaft, opens up a large field of speculation as to future developments of mining at great depths. The subject is one of great importance in view of the rapid exhaustion of the thicker and more accessible seams in the British coalfields, and in view of the attention which at the present time is being devoted to the working of deep-level auriferous deposits in the Transvaal, California, and New Zealand. It appeared, therefore, that a well-considered summary of the existing literature of the subject, supplemented by observations made during visits to the mining districts of the Transvaal, Lake Superior, and the Continent, would not be out of place in the proceedings of the Society.

A.—Depths Hitherto Attained.

The epithet "deep" applied to a mine is a relative term. Early in the last century a shaft 60 fathoms in depth was an object of wonder, and tracing the history of the depths hitherto attained, the rapid progress in this respect is apparent. The first systematic writer on mining, Agricola, (2) describes mine shafts as being for the most part 2 paces long, two-third pace broad, and 30 paces deep. This depth had, however, been greatly exceeded in classic times at Laurium, where silver-lead mines were worked on a large scale by the ancient Athenians. There were 2,000 well-like shafts, many of which still exist and give a good idea of deep mining at that epoch. The workings were carefully laid out with the aid of geodetic instruments, a sighting instrument, and a water level, the use of which was described by Hero of Alexandria in the 3rd century B. C.

The shafts were perpendicular, square in sections, two yards across. The deepest was 360 feet, but most of them did not exceed 80 feet. These shafts are fully described in J. F. Reitemeier's "Geschichte des Bergbaues bey den alten Volkern" (Gottingen, 1785), in B. Caryophilus' "De antiquis fodinis" (Vienna, 1757), and in A. Cordella's "Le Laurium" (Marseilles, 1869).

As a rule in those ancient times, of which we have records in the works of Herodotus, Diodorus Siculus, and Pliny, the mines were of small depth. The rock was generally not difficult to deal with, the minerals extracted were of great intrinsic value, and labour was plentiful and cheap, or, as in the Egyptian and Athenian mines large numbers of slaves were employed.

In this country the mines worked in the early days were evidently very shallow. A variety of details regarding the working of a small colliery, belonging to the monks of Durham and situated in the vicinity of the city, are preserved in the Durham Household Book, (3) which contains the accounts of the bursar of the monastery during the years 1530-1534. At this 16th-century colliery five men were employed, who were paid an aggregate sum of 21d. or about 4d. each per day. The pits worked a very small area, lasting less than a year; but the cost of sinking new ones was a mere nothing, ranging from 2s. 6. to 5s. Among incidental charges are payments for winding ropes at 2s. each, and windlasses at 2d. each.

At the end of the 16th century, shafts were sunk from 70 to 120 feet deep. They were drained by water-levels or adits which were,

* A paper read before the Society of Arts.

1 *Mining Journal*, September 26th, 1896.

2 "De Re Metallica," 1556, Book.

3 Published by the Surtees Society, Vol. xviii., and quoted by Mr. R. L. Galloway in the *Colliery Guardian*, July 24th, 1896.