

Mr. R. H. Mitchell, who is also an accomplished draughtsman, kindly consented to carry on the class. The thanks of myself and all concerned are due to Messrs. Hardinge and Mitchell for their honorary services as drawing-masters.

At the annual Government examinations for schools of mines held during December eighteen of our students presented themselves, taking between them forty-two papers, with the result that two first-class, twenty-two second-class, and fifteen third-class certificates were obtained, whilst three papers fell below the minimum. Many of the second-class papers, especially those in the mining subjects, were not far off first class. Considering that all our students are employed in mines or batteries, most of them working the three shifts, and have therefore little time for study, these results are very creditable. The President's medal, given for proficiency in the mining subjects, was won by Mr. Boyd Bennie, with an average of 69 per cent., Mr. N. Whyte, with an average of 66·5 per cent., closely following.

Last year the school sent nine candidates up for mine-managers' and battery-superintendents' certificates, with the result that six obtained first-class mine-managers' certificates, and two battery-superintendents' certificates. For this year's examinations some ten or twelve of our students are candidates.

During the year nineteen assays and analyses were made for the public, besides a number of determinations of minerals which were not charged for. A good deal of experimental work was done in the school laboratory by the staff and one or two of the more advanced students. In this way several minerals previously unknown in the district were identified. The following results may be quoted as showing the character of the work done in the school laboratory:—

(1.) Analysis of stilbite from the Waihi Extended Mine: Water lost at 100° C., 1·41 per cent.; loss on ignition (water), 16·91 per cent.; silica, 56·68 per cent.; alumina, 16·41 per cent.; calcium-oxide, 8·45 per cent.; sodium-oxide, 0·97 per cent.: total, 100·83 per cent. Specific gravity, 2·103.

(2.) Analyses of borings from a borehole in the Waihi Consols Claim at a depth of about 400 ft.: No. 1 sample—Silica, 60·70 per cent.; alumina, 18 per cent.; ferrous oxide, 6·86 per cent.; calcium-oxide, 4·03 per cent.; magnesium-oxide and manganese-oxide, strong traces; alkalis and water, not determined. No. 2 sample—Silica, 65·72 per cent.; alumina, 16·37 per cent.; ferrous oxide, 6·81 per cent.; calcium-oxide, 4·60 per cent.; magnesium-oxide and manganese-oxide, strong traces; alkalis and water, not determined. The analyses and microscopic examination of the particles showed that the borehole was passing through a solid andesite. No. 1 sample was mixed with a certain amount of material from the upper part of the borehole.

(3.) Analysis of a soft black substance from a crosscut in the Waihi Mine: Water lost at 100° C., 13·70 per cent.; loss on ignition, 13·55 per cent.; silica, 36·88 per cent.; lead-oxide, 0·38 per cent.; copper-oxide, traces; alumina, 26·60 per cent.; ferric oxide, traces; oxides of nickel and cobalt, 1·63 per cent.; manganese calculated as  $Mn_2O_4$ , 5·07 per cent.: total, 97·81 per cent.

(4.) Analysis of oxidized ore from Waihi Mine: Water lost at 100° C., 0·26 per cent.; loss on ignition, 1·60 per cent.; silica, 89·98 per cent.; ferric oxide, 5·62 per cent.; alumina, 1·82 per cent.; oxides of manganese and nickel, 0·39 per cent.: total, 99·67 per cent. The oxide of nickel was not exactly determined, but was at least 0·20 per cent. All metallic iron was removed by a magnet, but the percentage of iron was nevertheless unexpectedly high. The sample assayed 2 oz. 5 dwt. 17 gr. of gold and 10 oz. 2 dwt. 12 gr. of silver per ton. The specific gravity was 2·314.

(5.) Specific gravities of various samples of Waihi quartz (oxidized ore): No. 1, 2·314; No. 2, 2·517; No. 3, 2·505.

(6.) Analysis of lustrous, friable, bituminous coal from Wharekeraupunga: Water lost at 100° C., 0·55 per cent.; volatile matter, 36·50 per cent.; fixed carbon, 51·15 per cent.; ash, 11·80 per cent.: total, 100 per cent. The sample contained no less than 15 per cent. of sulphur, the greater part of which must have been combined with the carbon compounds, for the ash consisted mainly of silica and alumina. As the coal occurs in very thin, broken seams of no great extent, it is commercially valueless. A qualitative examination of the ash revealed the interesting fact that it contains the rare element vanadium in easily detected quantity. The vanadium probably occurs in the coal as a sulphide.

(7.) Experiments in testing potassium-cyanide solutions: The bulk of these experiments was made in order to ascertain the influence of the double cyanide of zinc and potassium on the titration of cyanide-solutions with silver-nitrate. A full description of the experiments would occupy too much space for the present report, but the following conclusions, amongst others which were arrived at, may be given: (a.) The more diluted the solution the greater is the total amount of apparently free potassium-cyanide, and therefore the greater is the amount of double cyanide which appears to be simple cyanide. (b.) The greater the percentage of double cyanide present the greater is the percentage of apparently free potassium-cyanide. (c.) The more slowly the titration is performed the less is the percentage of apparently free potassium-cyanide. A moderate speed gives the most consistent results.

A second set of experiments was made in order to ascertain the influence of exposure to the atmosphere on potassium-cyanide solutions of 0·1 to 0·5 per cent. strength. It was found that forty-eight hours' exposure in deep beakers not more than half filled caused losses of from 22 to 36 per cent. with fairly pure KCN solutions. The ratio of the exposed surface to the bulk of the liquid had evidently an important influence on the results. It appeared also that the percentage loss of KCN was less in the stronger solutions (0·5 per cent.) than in the weaker solutions (0·1 per cent.), though, of course, the absolute loss was much greater. In order to test the influence of alkalis with respect to atmospheric loss, caustic potash and quicklime were added to the extent of 0·4 per cent., with the result that in the solutions containing caustic potash the average loss was reduced to 10·7 per cent., and in those containing lime to 5·1 per cent.