

and composed of analagous elements an equal duration of formation is supposed; but, in order that the calculation of a denudation of 320 yards might be regarded in any other way than as an entirely theoretical result, we ought to have good reason for supposing for each of these two periods equality in the amount of vegetable deposits.

Despite these drawbacks, the relation indicated, even were it much less apparent than it is, merits attention, because it appears to fit in very well with the hypothesis of the progressive reduction of the areas of deposit, and of a final moderated denudation of the coalfield.

Two other consequences result from the theoretical ideas which have been expressed. One is the gradual extension of the surfaces suitable to the aërial vegetation, due to the contraction of the deposit basins, which must also have helped to increase the wealth of the upper part of the coalfield. The other results from the relative straightening of the oldest peripheric portions of this formation. They have thus been ravined and furnished material for its later portions. In Belgium there are hardly any indisputable facts to support this theory, facts of this kind having up till now received but little attention from us, though they are not uncommon abroad. MM. C. Grand-Eury and H. Fayol have cited numerous instances in France, and we owe to Professor A. Habets an interesting specimen taken from the seam of the San Victor Mine, belonging to the Colliery Society of Turon in the Asturias, formed almost entirely of coal-pebbles having the corners and angles rounded off. It appears impossible for these pebbles, which are $\frac{3}{4}$ in. or more in length, to have been produced in any but a very ancient coal-seam, and one which had been subjected to actions both of removal and erosion, and which had already been consolidated before the coal-formation terminated. Having brought to your notice and discussed the principal theories on the origin and mode of formation of coal, which have led to a few ideas on this subject being given, which might also have been extended to other than the Franco-Belgian coalfield; it is not denied that these ideas are of such a nature that objections may be raised against them—objections as well founded, perhaps, as those which have been made to other theories in the course of this paper; if such be the case, the old proverb, "Criticism is easy, but art is difficult," will be once more confirmed.

EXTRACTION OF GOLD AND SILVER FROM ORES BY POTASSIUM-CYANIDE SOLUTIONS.

The comparatively recent introduction of cyanide of potassium as a solvent for gold and silver has been the means of a large quantity of gold being obtained that would otherwise have been wasted; and it has also made it possible to work ores that, by the ordinary battery process, would have been unprofitable. The attention of men in all the mining countries in the world has been given to this solvent, and especially South Africa, where the gold found there in the auriferous conglomerate is in a very finely divided state, and particularly well suited for extraction by this means. The gold obtained from the auriferous lodes in South Africa is not taken from the quartz, but is found in a free state, cemented to the small pebbles of quartz, which now form as hard a substance as if they were all in one solid body.

The cyanide-potassium solvent has been very successful in treating ores found at Kuaotunu and in the Ohinemuri district, by reason of gold being found there in such a minute form. If the gold were in coarse particles in the stone it would have to be pounded into a fine dust before the cyanide treatment would be successful; and even in the ores found at Ohinemuri, where the gold is in a specially fine divided state, some of the particles are so coarse that the cyanide does not dissolve them in the time allowed for treatment.

This has been proved conclusively by running the gangue from the leaching-vats over a system of tables covered with copper-plate and silvered over with mercury. At the Golden Cross Mine, Waitekauri, this system has been in use for some time, and, although the gold is in a fine state in the ore, there is still a certain proportion of it obtained by amalgamation on these plates. The cyanide solution has a cleansing effect on the surface of any particles of gold, and renders the latter fit for adhesion to quicksilver when brought in contact with it; but, even although the cyanide solutions have been a great success in comparison with the treatment formerly adopted for our ores, considerable improvements will yet have to be made in the method of its application.

Hitherto experiments for improving the cyanide process have been practically stopped, owing to the fact that the Cassel Company possessed patent rights for the use of cyanide in all its compounds for the treatment of auriferous and argentiferous ores found in any part of the colony. There was no benefit accruing to any one making experiments with a view of ascertaining the possibility of making improvements in connection with this process, as such improvements were of no direct benefit to the person making them, the Cassel Company still claiming the royalty. Some time ago Dr. Gaze, of Westport, applied for a patent to use chlorine in conjunction with potassium-cyanide, but the application was objected to by the Cassel Company, and a decision given in their favour, although an experiment conducted by Dr. Gaze in my presence showed conclusively that chlorine in conjunction with potassium-cyanide had a much more rapid effect than with potassium-cyanide alone.

The ground of objection maintained by the Cassel Company is that, having obtained a patent for the use of cyanogen in all or any of its compounds, no other person has a right to use any chemicals in which cyanogen forms a part. A considerable number of experiments have been made with this solvent by J. S. Maclaurin, B.Sc., University College, Auckland, and he has published two pamphlets containing the results of his experiments, which are to be commended to those using this process.

Mr. W. Skey, Analytical Chemist, Colonial Laboratory, has also made a number of experiments with this solvent, and he shows that pyritic ores have an accelerating effect in cyanide solutions for dissolving gold. The following is his report on the experiments made:—