

Revenue (1897) Department.

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ROUTINE SERIES.

G.O., No. 2160

DATED 29th April

[Despatch Abstract.]

Forwarded to the B. of R. for remarks
letter from Mr. Middlemiss, Supt. Geological
Survey of India forwarding a report on
the trial excavations for coals near
Jilard, Salem Dt.

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Order

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11/28/4/97

From Supt. Geological
Survey of India

No. 7/5

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SUBJECT.

To the Board (R. I.).

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27/4

with report & returned

26-5-97
For forwarding a report
on the trial excavations
for Corundum, near
Palakkod, Salem District

26/4/97

BACK PAPERS.

G.O.	No.	Department.	Date.

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Report on some trial excavations for Corundum near Palakod, Salem District, by C. S. MIDDLEMISS, B.A., Geological Survey of India.

INTRODUCTION.

1. My preliminary reports¹ on the corundum-bearing beds in the Salem and Coimbatore Districts having shown that a practical trial as to the richness and value of the deposits was advisable, it was decided, after consultation with the Government of Madras, that the executive part of the work should be carried out by the Public Works Department under the supervision of the Subdivisional Officer of the Public Works Department for the Tirupatur Circle, whilst the sites to be tested and the general conduct of the operations should be superintended by myself, with the help of a native assistant geologist, Mr. S. Sethurama Rau, B.A., who would personally and continuously watch the operations and carry out instructions furnished by me.

2. I chose first a site in some waste land near the village of Erranahalli, and about $2\frac{1}{2}$ miles south-west-by-south of Palakod, the nearest large town. The position was one among a number of outcrops of the corundum-bearing band, now known as the Paparappatti band. This will in future be referred to as No. 1 working. As soon as the necessary formalities had been complied with and the preparations completed, experiments were started in November 1896 and continued until 15th March 1897.

3. Before going any further it will be well to state what was already known concerning these corundum occurrences. On my first visiting them in 1894 the only information then available was that corundum occurred near Pennagaram in the Iharmapuri taluq, as shown by the presence of specimens in the Madras Museum, thus labelled, sent by the local authorities. Since then details were from time to time gathered by my survey, so that up to the time of the opening of the pits at working No. 1 the information stood as follows:—

- The actual matrix of the corundum in this band was known to be in the form of lenticles in a gneiss, among which biotite was prominent as the dark mineral. Such of these lenticles as had actually been seen *in situ* were, however, small, the largest being 3 feet by 1 foot.
- That larger lenticles occurred in the alluvium covered plain near Paparappatti and on the hillsides to the west, was however inferred from large blocks having been found in the surface debris.
- It was known from the presence of old shallow trenches and pits in the alluvium and surface rock that corundum had been dug at some previous time from this neighbourhood. Local information, and the exposure of corundum for sale in the surrounding market towns, also made it certain that corundum was at that time being occasionally gathered.
- It was also evident that, in a general way, the strike of the rock bands containing the corundum was with the strike of the country, namely, about north by east and it was supposed from the slightly different character of some of the corundum occurrences and also from their position that more than one parallel band of the rock existed.
- The position of all the corundum occurrences was as indicated on the accompanying plan, from which it will be seen that the Paparappatti band extends (but with some notable gaps) from Donnakuttahalli near the Cauvery river to Chintalakuttai village near Rayakottai, a distance of nearly 40 miles.

4. The general object of the practical work which I was now endeavouring to carry out was, as stated in the Annual Report of the Geological Survey for 1896, namely—"The excavations, or quarries as they will be, are intended to show the thickness of the corundum-bearing bands, and whether they are continuous or occur as lenticular patches. A fair average sample of the rock extracted, of

¹ Reports to the Government of Madras, the first of which was reprinted with slight alterations in Records, G. S., I., Vol. XXIX, pt. 2, 1896, pp. 43-46.

sufficient size to give a trustworthy estimate of the richness of the rock, is to be carefully cleaned by hand and the proportion of corundum to matrix determined by weighing."

5. The nature of the work resolved itself into :—

- (a) Preliminary clearing of the ground of jungle.
- (b) Digging of trenches until the corundum-bearing rock was exposed.
- (c) Blasting and quarrying the matrix-rock.
- (d) Breaking up the lumps with wedges and hammers into sizes suitable for demolition by hand.
- (e) Cleaning the corundum by hand and weighing.
- (f) Excavations to show continuity or otherwise of the rock matrix.

GEOLOGICAL DETAILS.

6. A brief outline only will here be given regarding the petrology of the neighbourhood of the workings, inasmuch as many details still require working out. I may mention, however, in particular that in addition to biotite in the fundamental rock in which the lenticles occur there is at this place much hypersthene also present, which together with felspar, quartz and iron-ores makes up a biotite-hypersthene granulitic gneiss, and which is therefore mineralogically a passage between the ordinary charnockite series and the Hosur biotite gneiss. It is finely, and not very distinctly foliated, the strike being generally between north and south and north-north-east and south-south-west. The dip of the foliation planes is generally steep, approaching the vertical in most available sections, but the amount and nature of the folds indicated by such dips are never definite enough to allow of a sectional representation of them.

7. Occurring sparingly as adventitious veins and veinlets in this gneissic rock, and palpably younger in age than it, come a coarse flesh-pink and white, rather coarse pegmatite, and some trap dykes. These veins and dykes, though sometimes following the foliation, also occur completely irregularly. Some of the gneiss also presents the character which has been called "trap-shotten", a feature peculiar in itself and too complicated to be described in this note.

8. The actual matrix of the corundum in the workings was found, as anticipated from my previous observations, to be in the form of lenticles in the gneissic rock. These lenticles are symmetrically shaped and are easily recognised by their external shell of rock very rich in biotite, and by the paler-coloured central parts which are less rich in ferro-magnesian minerals. The exact mineralogical composition of these lenticles is still under investigation, and both it and the origin of the lenticles offer problems whose solution will not be attempted here. In size the lenticles vary from the very small ones referred to in my previous report up to such as the one broken up at No. 1 working, which measured 13 feet long, by 8 feet broad and 9 feet deep; the shape being that of an ellipsoid with three unequal axes. A plan showing the excavations at No. 1 working and in the vicinity (see Plate) will sufficiently make clear the disposition, shape and size of the three lenticles which have so far been exposed in the course of the work, and will indicate the degree of probability attaching to the statement, which I think is a correct one, that these lenticles are really dispersed in a bed, layer, or plane, and that therefore they have the same general continuity as any other rock band. In support of this it may be mentioned that half a mile west-south-west of Gollahalli subsequent trial trenches exposed a large lenticle, along the same line of strike, and identical in composition with the three already referred to. This lenticle on partial exposure measured 15 feet long by 8 feet broad.

As these lenticles were originally only indicated at the surface of the ground by the presence of fragments of corundum and matrix rock and by old shallow excavations, and as prospecting in the neighbourhood has revealed a great number of similar indications (roughly represented by the crosses on the map), it seems to me only reasonable to conclude that a detailed examination of the neighbourhood foot by foot and a judicious series of cross trenches would expose more lenticles of the same kind along the present line or along other parallel lines. At the present moment there must be about 20 tons of matrix left at working No. 1, and about as much in the third lenticle, whilst the Gollahalli lenticle will probably yield 60 tons or more; so that about 100 tons of matrix-rock is now ready to hand.

9. The corundum in the matrix-rock occurs in well shaped crystals which in this particular locality are of a dark purplish-grey colour. As described in my previous paper, they are surrounded by a pale pink shell of orthoclase from which

they break out sharp and clean like a kernel from its shell. Their forms are elongated barrel shaped combinations of the hexagonal prism and pyramid. The size of the crystals varies considerably, but may be said to be definitely limited in the following way. The largest crystal found in the broken up lenticle was 7 inches $\times$ 2 inches, whilst the smallest sizes of which any account need be taken are $\frac{1}{2}$ inch by $\frac{1}{4}$ inch. An average size for the crystals in this lenticle I should estimate at 2 inches $\times$ $\frac{3}{4}$ inch.

The corundum seems to be quite pure throughout the lenticle, but in the course of the excavation Mr. Sethurama Rau found that a layer of the outer disintegrated rock near the upper side of the lenticle yielded a number of dark nearly black lumps or nodules of hercynite mixed with corundum. Sometimes a central core of corundum was surrounded by a shell of hercynite. The latter is in a crystalline granular state, and has probably grown in a concretionary way round pieces of corundum as nuclei. Unfortunately none of these concretions were found actually in solid rock, but inasmuch as none are present in the main mass of the lenticle, it is probable that they came from the outer crust of it where ferro-magnesian minerals are more thickly grouped.

PROPORTION OF CORUNDUM IN THE ROCK.

10. One of the chief objects, or rather the chief object, of the practical investigation of these rocks, was to determine by careful weighings the proportion of corundum in the matrix-rock. To attain this end the broken-up rock was weighed as it was given out to the coolies and the resulting corundum was collected at the end of each day and also weighed. This was done every day and a regular account kept.

The total results as given me by Mr. T. Ramanugam Pillay, Subdivisional Officer, Public Works Department, in charge of the work are :—

722 cwt. of matrix-rock yielded 2,845 lb of corundum,
or 3.5 per cent. nearly.

This total is considerably lower than the percentage obtained from the first weighing of the first ton of matrix, which gave, as quoted in the Annual Report :—

1 ton of matrix-rock yielded 150 lb of corundum,
or 6.7 per cent. nearly.

From enquiry, and a study of the daily returns of the weighings, the difference seems to be accounted for in the following two ways. In the first place, when the original big lenticle was blasted, a great many of the larger crystals of corundum broke away and fell out, and they were straightway included in the first weighings. Secondly, all parts of the lenticle were not equally rich, and the richer parts appear to have been selected first. As a third reason it is possible that a certain amount of pilfering may have taken place from the exposed heaps of matrix-rock as time went on. It seems safest to take the total percentage on the whole work as giving probably the nearest approach to a true average, because so long as hand work alone is used in cleaning the corundum, if loss occurs either by pilfering or carelessness, such would also be likely to occur in actual mining operations.

COST OF THE OPERATIONS.

11. Although a small experiment carried on as this one has been is more likely to be more expensive than one worked on a larger scale as a paying concern, yet I give below the actual costs as offering some evidence under this head.

The figures given first below apply to the work done to the first two lenticles of matrix-rock at working No. 1, which supplied all the rock broken up and weighed. These figures also were furnished me by the Subdivisional Officer :—

	R	a.	p.
Clearing ground of jungle, about	20	0	0
Earthwork at the quarry, digging trenches, etc.	71	5	0
Blasting	11	9	0
Breaking matrix-rock and sorting 722 cwt. @ Rs 2-6 per cwt.	112	6	0
Cleaning the above @ Rs 6-5 per cwt.	112	6	0
Sundries—boxes, bags, cartage	35	0	0
Erection of sheds for workmen	22	8	0
TOTAL	385	2	0

or Rs 8-7 per cwt. of broken rock,
i.e., Rs 8-7 per 3.9 lb of cleaned corundum.

Further, it was found that 1½ men at 3½ annas were able to break 1 cwt. of matrix-rock and clean corundum from it.

12. The cost of making other excavations, exposing other lenticles, trial trenches here and at Gollahalli and near Paparappatti was Rs 354.

13. From the figures given in paragraph 11 it will be seen that the two items of greatest expense are those for breaking out and cleaning the corundum by hand, (namely R112-6-0 x 2). It is clear, therefore, that if the extraction of corundum is attempted on a large scale, the adoption of machinery for crushing and washing the corundum, as a substitute for hand-work, would be a desideratum.

FURTHER EXPERIMENTS CONTEMPLATED.

14. Work for the present had to be closed on 15th March. Meanwhile samples of the corundum and matrix will be sent to firms in India and England for testing and valuation. Should their reports be favourable, and the percentage of mineral to matrix deemed not prohibitive, I shall hope to make further trial excavations at other places along the Paparappatti band of outcrops.

G. I. C. P. O.—No. 2 D. G. Survey.—5-5-97.—40.—S. J. D'S.

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