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A Deposit of Ochre near Mowbray

BY

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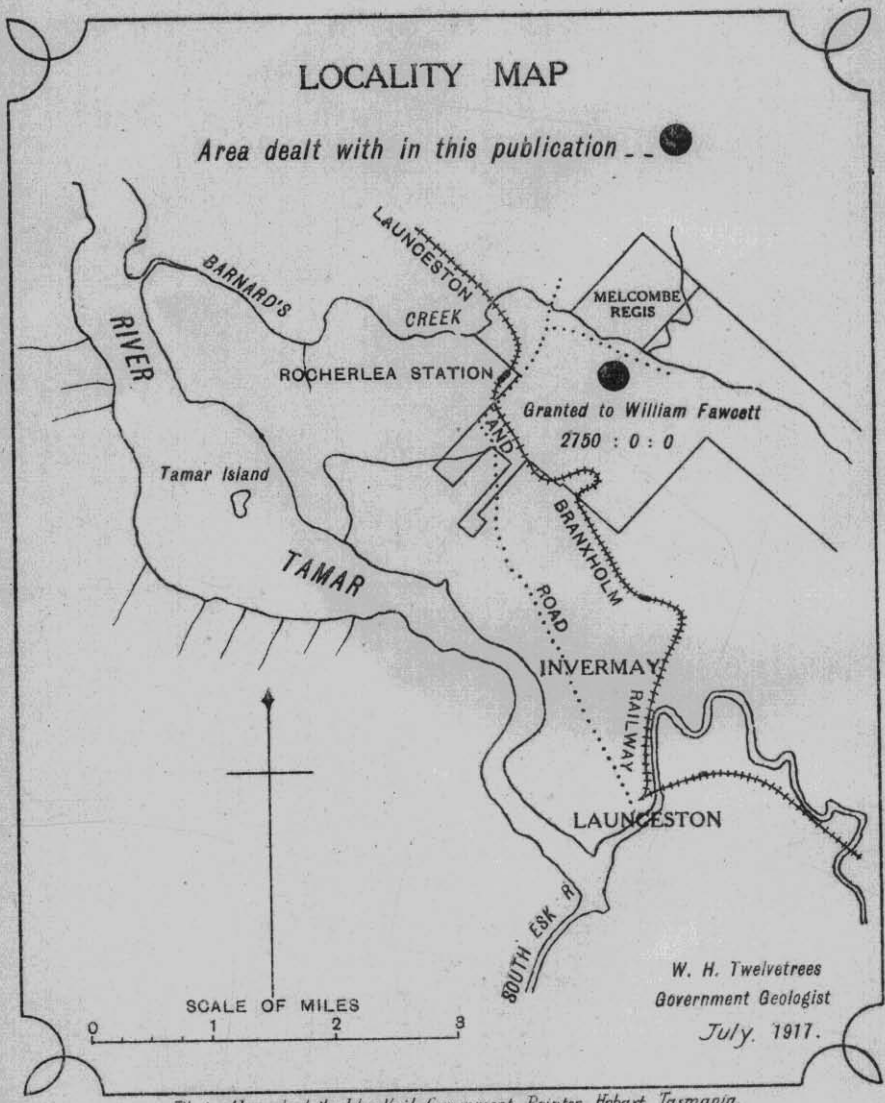
LOCALITY MAP
Area dealt with in this publication
LAUNCESTON
BARNARD'S
CREEK
RIVER
ROCHERLEA STATION
MELCOMBE REGIS
Granted to William Fawcett
2750 : 0 : 0
LAND
Tamar Island
TAMAR
BRANXHOLM
ROAD
INVERMAY
RAILWAY
LAUNCESTON
SOUTH ESK R.
SCALE OF MILES
0 1 2 3
W. H. Twelvetrees
Government Geologist
July, 1917.
Photo-Algraphed by John Vail Government Printer Hobart Tasmania.

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TABLE OF CONTENTS.

PAINT MINE HILL.

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I.—Introduction.

On the old Paint Mine Hill on Russell's Plains, north of Mowbray, some preliminary operations are being carried on, with a view to the extraction of ochres and the manufacture of paint.

As this will be a new industry for Tasmania, it was considered desirable that the deposit should be made the subject of examination, in order to ascertain whether its economic nature justifies the contemplated expenditure, and if so, to draw public attention to a new development of our mineral resources.

Some 20 years or more ago an attempt was made to start working this mineral, and some of it was shipped to Melbourne; but for some reason the company was never floated. The proposition has now been taken up again, and with good chances of success.

The site is between 3 and 4 miles due north from Launceston, and about a mile east from Rocherlea railway-station, on the 2730 acres charted as granted to Wm. Fawcett. Easy access is gained to it by the Lefroy-road, thence along the Lilydale-road as far as ½-mile past the railway-station; from this, a turn-off parallel with Barnard's Creek leads to the hill. The summit is reached by a gentle ascent between 100 and 200 feet above the base. As will be seen from the above, the railway-station in the vicinity is most conveniently situated for freights; or if it is desired to transport by vehicle, there is an excellent road all the way to Launceston.

II.—Occurrence of the Ochre.

Immediately one begins to ascend the hill from its northern side, stones or lumps of earthy ferruginous material are seen lying about on the surface of the soil, suggestive of the occurrence of the ochreous deposit at this

level. In going up the hill from the northern end, floating pieces of ochre and oxide of iron are met with, becoming more numerous as the summit plateau is approached. The hill is a flat-topped one, and the surface seems ochreous for a width of from 300 to 400 yards from east to west. If we assume that the ore-body is continuous from the summit to the northern end of the hill, its horizontal dimensions would be about ½-mile long by, say, 300 yards wide. Enough work, however, has not yet been done to enable the superficial area of the deposit to be estimated properly, nor is its thickness known. It is highly probable that it does not extend vertically to the horizon of the base of the hill, but follows a contour of hard rock at a certain depth below the surface.

A few hundred feet of trenches and other excavations have been cut at the top of the hill, exposing red and yellow ochres of workable quality, but no cuttings are deeper than 5 or 6 feet. An old filled-in shaft, however, is supposed to be 30 feet down, but what it went through is unknown at the present time. The excavation in the floor of which it has been sunk yields first-quality red ochre. At one end of it, however, near the shaft, it is a little inclined to be clayey. At the other end the body of ochre is massive and compact. A small trench close to the north end of this main excavation shows good bright-red oxide, and on the west is also rich ochre. About 100 yards west of this is a low open-cut, where the first discovery was made. This also shows good red material, very suitable for treatment. Eighty yards east of the main excavation is a shallow trench, which exposes yellow ochre; with this, in places, is associated some white kaolin.

Taking the evidence of all these trenches together, one may say that they indicate the existence of a more or less continuous body of ochre within the limits above mentioned. Its nature may not be altogether uniform over the whole area. There may be exceptionally clayey patches here and there, but the extent of these can be ascertained only by prospecting or in the course of working. Considering the comparatively small tonnage required for a moderate paint enterprise, there should be little difficulty in absolutely establishing the existence of the requisite quantities. From all appearances there is sufficient to supply the requirements of works for many years.

III.—Geology and Mineralogy.

The geology of the country in which the deposit occurs is uniformly simple. The hill is part of the Mesozoic diabase country, which flanks each side of the valley of the Tamar. The ochreous deposit seems to occupy a basin or elliptical channel in the hard fresh rock which surrounds it, but its real relations to the bedrock cannot be determined until more of it is exposed. It has some kind of resemblance to laterite, which in tropical and subtropical countries is a common residual ferruginous clay, often occupying the summits of hills. Similar ochre is reported to exist further south along the continuation of the same hill system.

G. P. Merrill, in his work on " Rocks, Rock Weathering and Soils " (page 299), gives an analysis of a very ferruginous Indian laterite, which may be broadly compared with the composition of the Mowbray ochres. His figures are as follows:—

	Per cent.
SiO_2	37·576
Al_2O_3	55·532
Fe_2O_3	
CaO	
MgO, alkalies, water, and loss ...	6·892
	100·000

The chemical composition of laterites, however, is extremely variable, and does not enable any very precise definition of the rock to be made, beyond that it is a residual clay, in most instances due to rock-weathering processes. The typical conditions of its development are found in tropical and arid climates.

The Mowbray ochres have no doubt been formed by the softening and decomposition of the diabase rock, and if the shaft at the summit of the hill were sunk to a sufficient depth the hard floor of the bed-rock diabase would be struck.

Samples treated by Mr. W. D. Reid, Government Assayer, in the Geological Survey Laboratory, gave the following results:—

	Red Ochre.	Yellow Ochre.
Iron sesquioxide...	45·28	42·62
Alumina	13·72	8·78
Silica...	32·40	39·52
Magnesia	1·84	1·50
Lime	0·91	1·28
Water.	5·60	5·80

The specific gravity was 2·76 in a sample which was examined; this will vary slightly with the varying composition of the pigment.

Samples taken from the same trenches have also been assayed in Adelaide by Mr. A. Flounders, as follows:—

	Red Ochre.	Yellow Ochre.
Iron oxide	55·555	43·678
Silica	37·5	40·613
Alumina	4·166	9·195
Magnesium & calcium salts	1·388	2·683
Combined water	1·389	3·831
	99·998	100·000

The quality of the material naturally varies from point to point, but the general composition is considered by paint experts to be such as will absolutely satisfy manufacturers' requirements.

The specific gravity of the red ochre, as determined by the Government Assayer, is 2·76. The specific gravity bottle method is the most accurate one, but a modification of it is more usual in works practice, and with care can be made to give approximately correct results. It is more suited than laboratory methods for use in factory work, the manipulations being quicker and more simple. A narrow, graduated tube or cylinder is filled to a measured height with white spirit. This then receives a weighed quantity of pigment well stirred. Divide the weight of the pigment by the increase in volume of cylinder contents, and the result will be the specific gravity of the pigment. If this is multiplied by 10 the weight of a gallon of the pigment is obtained. By this means the way is opened for interesting and important calculations of the specific gravity and volume of mixed paints. The specific volume is obtained by dividing the weight by the

specific gravity. Thus, take 50 lb. of pigment with a specific gravity of 3, mixed with 4 lb. oil, specific gravity 9. The total weight will be 54 lb., and the specific volume of the mixed paint 17·10. The specific gravity of the paint can then be calculated by dividing the weight by the specific volume—

$$\frac{54}{17{\cdot}10} = 3{\cdot}15.$$

A gallon of it will therefore weigh 31 lb. This example is merely an indication of ways in which these useful formulæ may be, and are, employed in paint works.

It may be mentioned here that ochres are earthy, pulverulent forms of hæmatite and limonite. The Mowbray material varies in hardness and compactness, some of it being very soft and friable, or again harder and dense. It hardens somewhat after extraction from the trenches. Its softness generally will greatly assist its pulverisation, and in many respects it forms an ideal material for reduction.

With a specific gravity of 2·76, the weight of a cubic yard of the ochre will be, approximately, 2 tons, dry.

IV.—Quarrying.

The hill being flat-topped, the position is not too convenient for open-cut working, but sites for benches can be obtained by opening-up a little lower down the hill in one direction. Although the best body of ochre is at present exposed at the summit of the hill, it is quite possible that stone of equal value may be uncovered at the base by prospecting, for ochreous material exists there, and it seems probable that it is *in situ*.

From indications given by the few trenches which have been opened on the hill, it is likely that the quality of the deposit will not be found to be continuously uniform over any considerable area, perhaps not sufficiently so to enable a long face to be worked without selecting. It may be necessary to take out ochre from several points in order to avoid clayey portions of the deposit. These points will be located in prospecting. Prospecting for the best spots will have to go on concurrently with the quarrying, so that there may always be a face or two to fall back on. The tonnage of ochre required, however, will be so

moderate that this prospecting need not be extensive, and certainly will not be costly.

V.—Treatment of the Ochre.

It may be premised at once that treatment methods differ at different works, in accordance with the nature of the ore and the purposes to which the paints are to be applied. Various classes of raw materials require variations in the sequence and kind of treatment; and the methods to be adopted in each particular case have to be decided by whoever has technical control of the undertaking.

Judging from the appearance of the Mowbray ochres, they can be easily prepared for paint manufacture by grinding in one of the mills of the edge-runner type. These mills, universally used in paint factories, are heavy iron or granite discs revolving vertically in a circular pan; sometimes the pan itself is made to rotate. Several ingeniously devised varieties of these mills are in use, and developments of the different types are still in progress.

VI. Physical Characters of the Paint.

The paints directly obtained by simply grinding and mixing the raw oxides with linseed oil are pleasing shades of Indian red and stone colour or warm buff. The red oxide has not that brilliance which is associated with chemical instability, and yields an excellent protective paint, suitable for houses, fences, wagons, and all exterior work, and with the yellow crudes will form the base of decorative paints of various kinds.

The expert opinion given by Mr. Flounders, of Adelaide, who is a practical adviser of repute, is to the effect that the pigment is of the finest staining capacity (especially the red oxide), opacity, and texture; and the colour and toning are exceptionally pure and rich (pale buff and terra cotta). He states that they are the finest oxides handled by him, and the easiest to convert into paint, being very free from flinty grit and clay; with a little judicious blending they will be equal to the best French ochres, which are the standard.

The crude ochres have also been tested by the well-known Launceston firm of J. & T. Gunn Ltd., who report that

the test was most satisfactory, and that, in their opinion, they are equal to any that they have ever used. There was not sufficient time to test their lasting properties.

With respect to the latter point, longer tests have been made elsewhere, which, so far, show the durability which might be expected from oxide pigments, which are notoriously very permanent. The durability of a paint depends partly upon the absence of chemically active constituents in the pigment, and partly on the quality of the oil with which it is mixed. The analyses show that these ochres are practically composed of inert ingredients.

Mr. Les. Cooper, painter, of Longford, has submitted the pigment to a practical test of some considerable duration, and finds its durability satisfactory. He writes as follows, under date of the 17th May:—

> "I have tried the samples of paint from Messrs. C. J. Weedon & Co. about five months ago, and find that it has stood as well as any paint that I have used. I have tested it on an iron roof; it has a very good flow and covering body, and has kept its gloss and body since putting it on. This refers to the two samples of paint—red and yellow."

The paint has also been tried in the Launceston Corporation yards and grounds. The tests have been under observation for six months, and have demonstrated its lasting properties. Mr. E. R. Mason, painter for the Corporation, says, under date of the 21st May:—

> "I am much pleased with both paints. They are of excellent quality, very free, and very good in covering power. I consider them superior to any imported paint that I have ever used, and I have had 40 years' experience in paint-mixing and painting. If I could get this paint, I would not use the imported article."

The comparative ease with which the crude material can be ground to an appropriate fineness is a marked advantage. The ultimate degree of fineness which will be necessary depends entirely upon what uses the mixed paints will be put to. Victorian practice for ordinary oxide grinding seems to be to reduce the pigment to a size that will pass through a 146-mesh screen. This will be sufficient for the usual protective paints. For enamel paints and such like, much finer grinding would be requisite. The finer the raw material is ground, the less wear and tear falls on the machinery in the subsequent stages of manufacture;

this, however, ought to be unusually light with these soft friable ochres. With fine grinding, also, the danger of "settling out" when mixed is greatly reduced.

VII.—Conclusion.

All the opinion which can be gathered up to the present goes to indicate that the deposit now being taken in hand is composed of ochreous oxides, which are both chemically and physically suitable for making paste and mixed paints of the highest degree of excellence.

W. H. TWELVETREES,
Government Geologist.

Launceston, 10th July, 1917.