

Perfect slickensided faces are common, the prevailing strike of which is north-east south-west. These siliceous bodies also show marked signs of jointing and recementing with silica, though at times the joints have remained open. In the 1370 stope at the 24 level this is very noticeable—stoping having been made quite difficult owing to the fractured “quartzite” back.

The foregoing suggests several points of interest when considering the formation of these so-called “quartzites.” The absence of gold even when in close proximity to the richer portions of the lodes certainly suggests that they were formed either before or after the latter. Persistent slickensided surfaces with a uniform strike of north-east south-west are positive evidence that earth movement along this line took place after their formation. It has been suggested that this earth movement was responsible for the opening out of the schists prior to mineralisation and formation of the ore bodies.

If such be the case then the “quartzites” were formed before the gold-bearing lodes, possibly during the period when the schists were being formed and when circulation of underground solutions was restricted. As they occur now, they may be best regarded as minor areas of silicified barren rock, apparently having no effect on the lodes and troublesome only when crossed in the workings, on account of their hardness.

Commenting in general terms on the bottom levels of the Gwalia Mine, the development of the past three years has been most encouraging both as regards ore reserves, values and geological conditions.

There is not the slightest doubt that the shearing of the Gwalia dyke is quite as intense, if not more so, in the bottom as in the levels higher up. The eastern ore bodies and the Gwalia South Shoot No. 2 have been almost ridiculously regular in their habit, and I can see no possible reason to suggest that they will not continue in the same way to greater depths. There is also quite a reasonable possibility that the shoot of ore of the western series, found at the second level in the northern end and proved to the 6 level, will continue to a much greater depth and provide a considerable amount of milling ore.

## 2.—INSPECTION OF GINGIN DISTRICT FOR THE DEPARTMENT OF AGRICULTURE.

(F. G. Forman, B.Sc.)

Following a request from the Director of Agriculture I accompanied Dr. L. J. H. Teakle, Research Officer and Adviser in Plant Nutrition, and Mr. H. W. Bennetts, Veterinary Pathologist, to Gingin on the 14th June.

These two officers were engaged in the investigation of a disease affecting lambs, foals, and calves, and known as “Gingin Rickets.” As it was suspected that the disease was limited to country occupied by outcrops of Cretaceous chalk and greensand,

I was requested to make an inspection of the affected country with the object of verifying or otherwise this point.

Gingin is a small farming town about fifty miles north of Perth, on the Midland Railway Company's line to Geraldton. It is situated on the banks of the Gingin Brook at the point where it emerges from the Darling Plateau on to the coastal plain.

The western edge of the granite and gneiss of the plateau lies some eight miles to the east of Gingin, and west of this no igneous rocks are exposed.

At Gingin the outcropping rocks are Cretaceous sediments consisting of an upper and lower greensand with an intervening chalk horizon, and basal shales. The Cretaceous sediments are exposed over an area from Poison Hill in the north to a little south of Moorgup Hill. They occupy the valley of Gingin Brook for about four miles above the railway station and to the east they disappear about three miles from the town. On the west there is a fairly sharp division between the Cretaceous rocks and the more recent sediments of the coastal plain on a line of a prominent scarp which probably marks a line of faulting.

To the north and east of Gingin the country is composed of a sandy plateau, its junction with the granite on the east being supposedly along the Darling Fault plane. Parts of this sandy plateau may be of Jurassic age, but there is no evidence of this in the immediate locality.

The junction of the sandy plateau and the coastal plain sediments is marked by the Poison Hill-Quinn's Pole scarp, which as already mentioned, probably marks a fault. Apart from the physiographic evidence of faulting supplied by the scarp, which is in a line with the main Darling Fault scarp further south, the presence of a line of mound springs lying roughly north and south a few miles out on the coastal plain would also suggest a dislocation of the strata somewhere in this locality.

The coastal plain is at the surface composed of recent sands with limestone patches, and is in places swampy.

The coastal hills of limestones and calcareous wind-blown sands occupy a strip of country from the coast to about eight to ten miles inland.

From information supplied by Mr. Bennetts it appears that the whole of the area occupied by outcropping Cretaceous rocks is liable to carry the disease. The disease is also apparent in those parts of the coastal plain adjacent to Gingin Brook, whose source is a few miles north of Gingin and which flows over Cretaceous sediments continuously until it emerges on to the coastal plain. Water shed from the granite country to the east, which would normally flow into Gingin Brook, is diverted to the south by the Brockman River.

Country adjacent to the Moore River, whose head waters are in the granite and gneiss of the Darling Plateau, is apparently unaffected.

At the junction of the Moore River and Gingin Brook there are two adjacent farms, the one watered by the Moore River being unaffected and the one watered by Gingin Brook being affected by the disease.

The coastal plain country north of Gingin Brook and known as the Beermullah plains is apparently sound. This country is watered by numerous swamps and lakes and by the Mungala Brook.

The only section of the area examined which is affected under all circumstances is that country close to Gingin occupied by Cretaceous outcrops.

On the coastal plain the disease appears to be governed by whether the country is watered by Gingin Brook or by the Moore River. The only apparent distinction between these two waters is their source. The Gingin Brook has its source in sediments and is entirely cut off from the granite, while the Moore River has its source in granite country and must receive a very large proportion of its water from granite areas.

*Conclusion.*—The disease is not confined to any particular geological type of country, but there is evidence that waters derived from country of different geological type may have some effect in the distribution of the disease. Analyses of water from various sources to test this conclusion is indicated.

### 3.—ARTESIAN WATER POSSIBILITIES ON KIMBERLEY DOWNS AND NAPIER DOWNS STATIONS, WEST KIMBERLEY.

(F. G. Forman, B.Sc.)

Following your instructions I proceeded to Kimberley Downs Station on the 28th August and was engaged until the 2nd September, investigating the artesian water possibilities on Napier Downs and Kimberley Downs. During this visit I was able, through the courtesy of Mr. A. Thompson, manager of Kimberley Downs Station, to visit many of the outlying bores and wells on the two properties and to view the salient geological features of the district.

The area examined is shown on the Lands Department Litho. 134/300 and is bounded on the north-east by the Napier Range, on the south by the Derby-Hall's Creek Telegraph Line and on the west by the holdings of the Meda Pastoral Company.

The Lennard River, which forms the boundary between the Kimberley Downs and Napier Downs Stations, is flanked by red alluvial flats and black soil plains, carrying Rosewood, Boxwood and Bauhinia, with Bundle-Bundle, Flinders and Ribbon grasses. The remainder of the area is made up mostly of well grassed Pindan country carrying Beefwood, Bauhinia, Peach bush, small patches of dense wattle and small Boxwood flats. The grasses are mostly Ribbon grass and soft spinifex.

The rocks in this area consist of sandstones, grits and shales of Carboniferous age with regional dip of about 2deg.-3deg. S.S.W.

The sandstones with underlying shale beds are well exposed at Kimberley Downs homestead, where they outcrop forming a typical dip slope of which Mt. Marmion is an outlying remnant.

Scattered over the country are a number of small buttes of which Hawkstone Peak, Mt. North and Mt. Perry are typical examples. These hills are all composed of the same current bedded sandstones and

grits that are seen at Mt. Marmion, and are apparently remnants of an old tableland whose surface has since been denuded to the present configuration.

In the Napier Range, the lower Carboniferous limestones, which underlie the sandstone and shale series, outcrop and the strata here steepen and dip from 20deg.-25deg., but still in the same regional direction.

About two miles west of Napier Downs homestead a fossiliferous limestone outcrop was observed, with a dip of about 40deg. to the north-east. This unusual dip is probably caused by drag along a fault plane with a north-west-south-east strike, but may be evidence of normal reversal of dip due to local folding. Fossils, contained in specimens from this limestone, have been identified by Miss L. Hosking of the University of Western Australia, as possibly of Lower Carboniferous age.

The igneous and metamorphic rocks, which outcrop to the north and east of the Napier Range, require no mention here as they are not a potential source of artesian water.

The rocks of Carboniferous age, which occupy all the area under consideration, are lithologically and structurally well adapted for the storage of artesian or sub-artesian water. The sandstones and grits have the requisite porosity for the storage of water and the shale members of the series furnish efficient cover beds. The structure, which is that of a very gently dipping monocline, is an ideal one for an artesian basin, the low dips involved leading one to expect that supplies of water would be available by quite shallow boring.

During the wet season there is no lack of water, the chief difficulty being one of transportation owing to the wide spread flooding caused by the Lennard River and its tributaries. During the dry season, however, the rivers all cease running and there are very few reliable pools left at widely separated intervals in the river bed.

The water supply has been augmented to a certain extent by shallow sub-artesian bores and wells, while at the 67-mile peg of the Derby-Hall's Creek telegraph line there is a Government artesian bore, which is said to yield 142,000 gallons of water per day from a depth of 1,003 feet.

On Napier Downs station there are three sub-artesian bores; one, the Hawkstone bore, just west of Hawkstone Peak; a second, the Halfway bore, about halfway between Hawkstone Peak and Napier Downs homestead; and a third, the Travellers' Creek bore, on the road from Kimberley Downs to Napier Downs and about one and a half miles north of the Lennard River.

The three bores all yield good supplies of fresh water, the Hawkstone bore and the Travellers' Creek bore being fitted with pumps. A fourth bore has recently been put down at Napier Downs homestead. This bore was in shale and dense limestone and yielded no water, being sunk in an unfavourable location too close to the sedimentary outcrop.

Kimberley Downs station uses the water from the 67-mile artesian bore, but apart from this has no other bore waters developed. A number of shallow hand bores have, at different times, been sunk on this property in various places.