1893.

WESTERN AUSTRALIA.

REPORTS BY THE GOVERNMENT GEOLOGIST.

GENERAL REPORT FOR THE YEAR 1892,

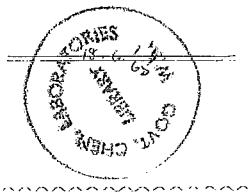
AND THE HALF-YEAR ENDING JUNE, 1893,

BY

HARRY PAGE WOODWARD,

F.G.S., F.R.G.S.,

GOVERNMENT GEOLOGIST.



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1893.

No. 12.

REPORTS BY THE GOVERNMENT GEOLOGIST.

General Report for the Year 1892.

WESTERN AUSTRALIA.

From the Government Geologist to the Honourable the Commissioner of Crown Lands.

SIR,—

I have the honour to report that during the year 1892 I have been, agreeably to your instructions, engaged in the following manner:—

In the month of January I received a letter from Mr. H. E. Parry, agent for Mr. T. W. Powell, forwarding a sample of brown coal which he had obtained whilst boring for water on the Eastwood Estate, near Albany. This I examined and reported upon, as follows:—

> "*Report upon a sample of brown coal from a three-feet seam 64 feet from the surface, which was struck in boring for water on the Eastwood Estate (the property of T. W. Powell, Esq.), on the Great Southern Railway line, 7½ miles from Albany, forwarded by H. E. Parry, Esq.*—The sample is of a dull sooty black colour, showing a good deal of vegetable structure. It is not highly mineralised, but fairly compact, soft, friable, and soils the hands. The fracture is irregular, showing a laminated structure. It does not ignite readily, but when made red hot it burns slowly, giving out a good deal of heat, and when ignited in a tube it gives off a small quantity of gas, tar, and water.
>
> An analysis yielded the following result:—
>
> | | |
> |---|---|
> | Water ... ... | 6·275 |
> | Volatile matter... ... ... | 18·84 |
> | Fixed Carbon ... ... | 14·835 |
> | Ash ... ... | 60·05 |
>
> The percentage of water is low for a coal of this class; the volatile matter, consisting of luminous and non-luminous gases, is also low; so is the fixed carbon, whilst the quantity of ash is enormous. The coke was in the form of a fine sooty powder, whilst the ash was light, and of a creamy colour.
>
> It is of no commercial value, but it is highly probable that seams of a much better quality underlie it. This can only be tested by sinking, which, considering the position of this property, should certainly be done."

This matter I considered so important that, upon my representation, you instructed me to examine and report upon the prospects of discovering true coal in the neighbourhood, when I reported as follows:—

> "*Prospect of obtaining Coal near Albany.*—Albany is a town situated on the North side of Princess Royal Harbour, which latter opens from King George's Sound, on the West side, thus forming an Inner Harbour, where large vessels can be protected in the worst weather. It is the first port in Australia at which the ocean going mail steamers of the P. & O. and the Orient lines call every alternate week respectively on their outward and homeward voyages, and the Messageries' fine steamers once a month each way; and it is now being fortified for the protection of the shipping and coal in case of war. A railway connects this port with the capital, from which it is distant by road about 250 miles.
>
> It is prettily situated on the sides of Mounts Melville and Clarence, and it has the lowest mean temperature and most humid atmosphere of any part of Western Australia.
>
> The coastline here is bold, presenting a series of granite headlands, which protect, in many cases, the entrances to inlets and bays, thus forming harbours. The country inland is mostly flat and sandy, but these plains are broken here and there by bold range masses or isolated hills, which rise abruptly from them.
>
> On the South side of Princess Royal Harbour, and from it to Torbay, a line of limestone hills forms the coastal range for a distance of about nine miles, whilst to the Northward sandy and swampy flats, with low ferruginous sandstone hills, extend nearly as far North as Mount Barker, a distance of about 25 miles, spreading out to 15 or 16 miles in width between the Hay and the Kalgan Rivers.

In this large basin a bore has been put down 68 feet, by Mr. Parry, at Eastwood, 7½ miles on railway from Albany, the property of Mr. Powell, when the following section was obtained:—

8	ft.	6	in.—Sandy peat.
1	„		—Ferruginous sandstone.
5	„	6	„ —Sand and black clay.
5	„		—Quicksand.
		1	„ —Ferruginous sandstone.
30	„		—Quicksand.
4	„		—Stiff black clay.
10	„		—Quicksand.
3	„		—Brown coal, quicksand.
Total—67ft.		1	in.

At this depth the bore most unfortunately fell in, so it still remains undetermined as to whether true coal measures do exist beneath this formation or not.

The hills along the South Coast are of two ages, those forming the main coastal range being the older. They consist of a series of limestones and shaley sandstones dipping at an angle of 40° to 45° to the North-East, or under the flat in which the boring operations have been carried on. In these outcrops no organic remains were visible; but to judge from their high dip, which is persistent for a distance of nine miles, they must be of considerable antiquity, as we know that very little disturbance has occurred in the mesozoic period.

At the South-East end of this range, and to the South of Princess Royal Harbour, the limestones are white, earthy, and contain fragments of hard cream-coloured limestone; but the sandy shales are entirely absent. Although these hills run in the same direction as those further to the Westward, they have no well-defined bedding and are probably the passage or junction beds between the mesozoic sandstone, which outcrops all down the coast to the Eastward, and the older rocks met with here. These mesozoic sandstones make their last appearance on the side of Mt. Clarence, which is on the North side of the harbour, where a sample obtained in sinking a well contained the characteristic fossils, but no fossils have yet been found in these rubbly limestones. In the bed of the Marbellup brook, where the road crosses, 10 miles from Albany, clay and sandstone beds outcrop of an entirely different character to the usual surface deposits of this region, though as yet no outcrops of coal have been met with; but this is not at all strange, as all the older rocks must be covered by a considerable depth of surface deposits.

It is evident that a large basin, surrounded by granite, does exist, and that rocks, probably of palæozoic age, outcrop on its Southern side; but whether coal seams occur or not remains to be proved, and this can only be done by boring. There is no reason why there should not be coal seams beneath the swamps and sandplains in this basin, and should they be found near such an excellent port, they will, of course, be of very great value.

Boring can be done very cheaply here, and should be carried on until granite is struck, which may, in places, be at no great depth, whilst in others it may be over 1,000 feet. Any one undertaking it must, however, be prepared to spend a few hundred pounds; but should he be so fortunate as to strike coal, he will be well rewarded.

This question should certainly be settled, as it is of immense importance to the country, as well as to the persons directly concerned."

On my way to Perth I stopped at Wagin Lake to investigate a supposed gold discovery in that neighbourhood, but as the persons interested did not meet me, and the locality was not known, I was unable to report upon it. I therefore spent a day driving round to note the character of the country, and found it to be similar to all the Range country:—crystalline rocks, with numerous dykes and quartz reefs, some of which will probably prove to be auriferous; the gold will most probably be associated with large quantities of pyrites.

There are many patches of country here, as at Broome Hill, which should be prospected for tin ore.

At Beverley I received instructions from you to examine the supposed gold, silver, and tin discoveries at Mt. Hardey, near York, upon which I handed you the following report:—

"The reported goldfind is on a private block (Avon Location C) of 9,466 acres in extent, taken up in the name of J. W. Hardey, which block runs in a N.E. direction from the Avon River, about three miles to the South of York.

The first workings are situated close to the Beverley road, and between it and the river, near the homestead. The reef, which is a ferruginous quartz, is about 3 feet in width, striking in an E.S.E. and W.N.W. direction, and dips at an angle of from 60° to 70° to the S.S.E., the foot-wall being a much decomposed diorite dyke.

Two or three small pits and trenches from four to five feet in depth have been sunk, but no rich stone has been struck, the best prospects having been obtained at the surface, where some small

specks of alluvial gold were discovered. You have already forwarded specimens from this locality to be assayed, which yielded 2 dwts. of gold to the ton. I did not, therefore, have any samples tested, but crushed and washed a few, in which I could detect no gold.

This reef, although very promising in appearance, does not carry enough gold, where opened, to pay. If further prospecting is decided on, I would advise the prospectors to open the cap further East and West, instead of sinking; but they must bear in mind that this will not be a cheap reef to work, as it will be largely composed of mundic below the water level. Of course, any discovery so near the town would be of great value; but it would require, in spite of its position, to be very rich, for stone of this class is difficult to treat.

The second discovery is about five miles from York, and about two miles along a road which follows the N.W. side of the block.

About half a mile into the block from the fence there is a white hill, which runs in a N.N.E. and S.S.W. direction, and is capped with ironstone at the South end. This hill, when opened, proved to be composed of a white decomposed slate, dipping to the West at an angle of 45°, and containing small strings and veins of white quartz, and some small ferruginous quartz reefs. As some small prospects of gold and tin were said to have been found at the surface, a cutting was put into the hill about six feet in depth, and two or three other small holes sunk, from which samples were forwarded for assay, but these contained neither of those metals. I crushed the samples I had collected, but after washing the only residue was a black iron sand. Small quantities of gold are often carried in small strings of quartz in this class of country; but here the mass, which was supposed to be a lode, is only rock. I do not consider that it will pay to work, even if some of the small veins of quartz are found to be rich in gold.

This country is similar to most of the settled districts, where nearly all the pyrites contains traces of gold, and it is also highly probable that the diorite dykes also carry gold, but up to the present they have never been found rich enough to work. Taken as a whole, it is not a typical gold-bearing district, but has many more of the indications that point to the presence of tin, for which ore it should be prospected."

My next trip was to the Collie River, to report for the information of the Hon. the Director of Public Works upon the boring operations for coal being carried on there under his direction, and at my suggestion it was decided that I should map in the Western portion of the Coalfield.

I there found that all the bores had been sunk near the No. 1 coal shaft, close to the Eastern side of the range. Here the seams were found to be small, and there proved to be no extent of the coal measures, as the metamorphic rocks outcrop in the river only a short distance on either side of the shaft. Upon tracing this formation, I found that these shafts and bores were situated upon a small branch or arm of the formation which runs Westwards up towards the range, and as I did not consider there was any prospect of finding seams of sufficient size and extent to pay here, I advised shifting the base of operations five miles eastward to the shaft where Mr. Hay found the 16ft. seam. This being done, I continued to examine the country to the South and East, and found that the formation was fairly well defined, as the junction beds between the coal measures and the crystalline rocks consist of boulder beds and conglomerates, which can be traced at the surface by the scattered waterworn boulders.

The junction at the North side of this basin is clearly seen in the river, a little to the North of T 27, from which point it sweeps round in a South-East and North-East direction, towards the East branch of the Collie, in the direction of A 116. The West boundary of this basin crosses the Collie between T 20 and T 21, and strikes down to the South-East on the South-West side of the South branch of the Collie, along which I traced it for a distance of 12 miles; but how much further it extends in this direction it is impossible to say at present. At this point I was obliged to abandon the work, as I had only pack-horses, and so had to make the boring camp my headquarters, as there was no feed for horses in the bush at that time of year, and heavy rains having set in the country became boggy and impassable. In reporting upon this country, I advised that the basin should be tested in the probable deep ground along the South branch, and from that across to the East branch, to determine the extent, number, and quality of the coal seams.

On May 21st I received instructions from you to proceed to the Murchison Goldfield, overland, *viâ* the Victoria Plains, Ringhan, Mt. Kenneth, and to return *viâ* the Murchison River.

This programme I carried out, and I had also, when nearly down to the Irwin, to return towards Mt. Magnet to examine a supposed silver field.

As this trip has been fully reported upon, and the report has been published in the form of a pamphlet, I will not now go over the ground again, but only wish to point out that although apparently wrong in the opinion I expressed upon the Nannine, I still believe that if the rich shoots, which are well defined, are carefully worked it will pay. I would also point out that through the delay in the issue of the said report it has been roughly criticised in the cases where first crushings seem to prove me wrong; but, on the other hand, I receive no credit for predictions in which I have proved to be right, as, for

instance, the Mt. Hall, on which property I advised the Manager to sink at the point where he successfully cut the reef after so many fruitless attempts in other places. (*See* Murchison Goldfield Report.)

In the month of October I again visited the Collie Coalfield, accompanying the Hon. the Director of Works, to inspect the work done during the previous six months. This we found had been confined to boring on a small area round the shaft where Mr. Hay obtained the 16ft. seam. Ten bores had been sunk to various depths, with varying success, the large seams being met with in bores 4, 11, and 12; No. 4 being in the bottom of the 30ft. shaft sunk by the Coal Syndicate, whilst the others were only a short distance from it, on a line running E.S.E., towards the bend of the river. This is apparently the Northern outcrop of the large seam which dips into the basin in a S.S.W. direction.

In many of these bores small seams were struck, but, with the exception of those mentioned above, they were not sunk deep enough to cut the main seam.

As Mr. Pendleton did not consider the machine suitable for deep-boring, the formation could not be tested. I therefore advised that the outcrop of the large seam should be followed in an E.S.E. direction, and that the boring in the basin should be postponed until a more suitable drilling machine could be obtained.

The periods between these trips were occupied in writing reports, and a great deal of time was also taken up in correspondence and by visits from persons desiring information. I have also written an account of the mineral of the Colony for the Year Book, and have also furnished sketches on the same subject to persons writing on the Colony, as I considered it better to do it myself than to leave them to compile it from my reports.

The mineral resources of this Colony are being opened up at such a great pace that I find it quite impossible to keep pace with it single-handed, and I hope that the Government will see their way to increase the fixed staff of this department.

I have, &c.,

HARRY P. WOODWARD,
Government Geologist.

14–6–93.

General Report for the first Six Months of 1893.

During the first six months of this year (1893) I have visited and reported upon the Collie coalfield the Vasse coalfield, and the Yilgarn goldfield, the latter embracing Southern Cross, Parker's Range Blackborne's, Hope's Hill, Golden Valley, and Coolgardie (Bayley's find).

The intermediate periods have been spent in preparing a geological map of the whole Colony, a general geological and geographical description of the Colony and prospectors' hand-book, the Annual Report for 1892, Report on the Collie and Vasse, Report on Yilgarn and Coolgardie, in general correspondence, and in being interviewed by visitors, &c.

The Collie Coalfield.

On the Collie Coalfield I found that the bores along the North-Eastern outcrop had been continued for a distance of about two-and-a-half miles from the deep bore in the coal shaft, proving the main seam for this distance, which varies in thickness from 10ft. to 18ft., and is mostly of good quality.

This outcrop is now proved to strike in an East-South-East direction; the main basin must, therefore, lie to the Southward. The basin is probably of great extent; this, however, can only be proved by boring, as there are no outcrops of carboniferous rocks, but it is my intention shortly to map in approximately the area over which it may extend, so that no time may be lost when a suitable drill is obtained for deep boring.

It is very remarkable that the formation here consists almost entirely of soft sandstones, and apparently destitute of organic remains.

As the coal seam is of such good quality and great size at its outcrop, it should certainly be tested in the basin, where also many other seams will probably be discovered.

The Vasse.

At the Vasse three bores have been sunk, but up to the present no coal seams of any commercial value have been struck; good seams may exist, but there is no indication that they will. It is worth testing, however, as should coal be found so near a port it would be of great value.

Yilgarn Goldfield.

I have the honour to report that, as instructed by you, I accompanied the Superintendent of Water Supply to Yilgarn, and that whilst on the field I visited all the mines then at work, and am glad to be able to express my satisfaction at the appearance of the lodes in depth, the great drawback to the successful working being still the scarcity of water. At Coolgardie very little was being done, as all the alluvial workings within an easy radius had been worked out, and water had to be purchased at 1s. per gallon. I was unable at the time to extend my examination of the country further to the Eastward, as there was no water in that direction; but since I left the field rain has fallen over the back country, and the prospectors are now scattered over it. There are a very large number of men on the field, and should there be a wet season, there will in all probability be a famine, as the new roads will be almost impassable during the winter. With this I beg to hand you a short report, reserving the essentially geological portion for my annual report. Your decision to send Mr. S. Göczel with the survey party, to the Eastward, will be a great assistance in the development of the mineral resources of the interior, and his report will be of great interest. As the survey party must proceed very slowly it would be as well if he were to send in a report on the country in the vicinity of Coolgardie, and on a place called the 25-Mile, where there is another patch of rich reefs. I was unable to visit this locality myself, as there was no water there at the time.

Southern Cross.

At Southern Cross four mines are now at work. These are all situated on one line of reef, and it is due to this fact that the shallower mines are short of water, as the deeper ones drain them. The general description of the lode mass is a large interbedded lode, well formed in the deeper ground, between two good walls, striking a little to the West of North, and dipping at an angle of about 80° to the Westward.

This mass varies in width from 5ft. to 30ft.; it rarely consists entirely of stone, especially in the larger portions, where a series of lenticular masses of quartz are met with, the rest of the lode being composed of broken country intermixed with smaller veins and leaders of quartz. These quartz masses often extend along the line of reef for 100ft., and are generally the richest portions of the lode; they are sometimes met with on one wall and sometimes on the other.

The stone is of a highly mineralized character, containing a small quantity of galena, pyrites, and chlorite, the latter often giving the stone a greenish appearance.

The four mines now at work are the No. 1 Central Extended, the Central, Fraser's, and Fraser's South. They are all either engaged in sinking or have lately sunk deep shafts, from which the first true rock has been obtained, and it proves to be a hard hornblend schist, possessing a slatey cleavage, with partings of chlorite.

On the No. 1 Central Extended a deep shaft is now being sunk, which has been connected with the 120ft. level by a winze, down which a good stream of water is flowing.

At the 120ft. level the lode is from 20 to 25 feet in width, but only three or four feet of this is solid stone. The lode is well formed in the settled country, and there should be plenty of water for working purposes if the country were driven across.

The Central has a shaft down 265 feet, with a crosscut at 230 feet, where the reef mass proved to be 30 feet in width between well-defined walls, the stone being of a highly mineralized character, showing gold freely. This is most satisfactory, as there seemed to be a general impression that these reefs would pinch out in depth. There is a large supply of water in this mine, which will be increased when the level is extended through the granite to Hassell's shaft. The workings are extensive, and there is several years stone in sight.

On Fraser's mine, a shaft is being sunk to work the Northern portion of the lode, but in this portion of the mine no new ground has been recently developed. At the Southern end of the lease a crosscut was driven to the Eastward a distance of 40ft., where further progress was stopped by a large influx of water. The lower level is therefore under water, but the lode formation shows well at the 60ft. level, and the class of stone is very good. This mine should now have plenty of water; if not, the drive should be carried farther Eastward.

In Fraser's South the reef has been opened to a depth of 126ft., where it shows a good well-defined lode of mineralized stone showing gold, which is about 8ft. wide at the Northern end, but splits and has not been yet followed up at the Southern end. The masses of stone in the lode dip South, no stone being visible at the surface, except at the North end of the lease, whilst it has been followed for 500ft. at the

60ft. level. There has always been abundance of water in this mine. This whole lode, from the No. 1 Central to Fraser's South, has improved in depth, and there is no prospect of its pinching out, as a whole, although the small, rich patches of stone are found to pinch, but they either make again or other ones are found to replace them in another part of the lode mass.

Parker's Range.

At Parker's Range, with the exception of the New MacIntosh, no development in depth has been done during the last two years, but a good deal of stone has been crushed from near the surface. In the New MacIntosh the workings extend to a depth of 90ft. vertical, or 120ft. on the underlie. The lode is a solid, well-defined body of quartz, from 3ft. to 4ft. in width, and has been opened up by extensive levels, along which it remains settled until it is cut off by a granite bar. At the north end, through this bar, on the upper levels, little stone was met with, but at the bottom a large lode mass from 23ft. to 24ft. in width was encountered. This lode mass appears to be well-defined as far as it has been opened up, lying between two good walls, and consisting of a series of large masses of quartz with mullocky partings. It shows gold freely in places, and is of a very promising character. It is highly probable that this is quite a different lode to that met with in the old workings, the country having been thrown to one side by the dyke. No water has yet been struck in this mine, but there will, in all probability, be plenty in depth.

Blackborne's.

The mine bearing this name has been opened up by an underlie shaft to a depth of 275ft., the reef being solid and well defined from 4ft. to 5ft. in width all the way down it, consisting of solid quartz, which presents a nice mineralized appearance below the water level.

The vertical shaft is down 265ft., which is considerably below the lowest level in the underlie shaft. A very large influx of comparatively fresh water was struck in sinking the underlie shaft, but this, although supposed to be inexhaustible, has now gone down considerably and has become salt, although not nearly so salt as that in the deep shaft. If the water in this mine should prove to be insufficient for working, a large supply could probably be obtained by driving along the lode through the large cross-course to the Northward.

Hope's Hill.

Most of the recent work on this lease has been done on the old Caledonian claim, and it is proposed to drive a tunnel quite through this area into Hope's Hill, so as to be able to convey the stone direct in trucks from the levels of the mine to the battery. There is an enormous lode formation, with shoots of stone first on one side of the lode then on the other; these, had they been picked, would have yielded good returns, but as it was considered more economical to crush the whole of the lode stuff taken out, the crushings have been low, but this system will cease when the great work of development is complete. As the water level is some 100ft. below the level now being driven into the hill, none has yet been struck in the mine.

Golden Valley.

There are only two mines at Golden Valley, viz., The Kathleen and Water Hall, and on these no development has taken place in the last two years, working being confined to getting out the stone already in sight. No water has yet been struck in the shafts, the battery being run with water pumped up from a well at the bottom of the valley, which, however, does not yield enough water to keep the battery constantly going. It is a pity that a shaft was not sunk in the mine itself, as a good supply of water is sure to be struck, and there is no reason why it should not be as fresh, if not fresher than that in the well. Between Southern Cross and Gnarlbine, with the exception of a small belt of metamorphic country 25 miles to the Eastward, all rock outcrops are granite. Immediately to the Eastward of Gnarlbine there is another small belt of auriferous country; on the Eastward side of this the granite again outcrops and extends as far as Coolgardie.

Coolgardie.

At Coolgardie a rich patch of alluvial ground was discovered about a year ago, which since then has been turned over several times. Up to the present no deep ground has been discovered, a good deal of the gold being found on the surface, as on the Murchison. Very few auriferous reefs have yet been found, the gold in the alluvium being apparently mostly derived from rich leaders. On this field the most sensational discovery is a reef found by a man named Bayley, and from his reward claim over 4,500 ounces of gold have been taken. This reef consists of a small blow running in a North-Westerly direction and underlying to the North-Eastward, striking across the line of the country, which here runs nearly north and south. This reef is about 9ft. in width at its largest part, but it pinches towards both ends of the claim, and is entirely lost. At the north end there is another blow of quartz, which strikes North and South, following the line of the strike of the country. This blow then dips under the alluvial flat, but a reef on exactly the same line is met with in a shaft in the gully, after which it appears to be

lost; but to the North-Westward is another large blow, which follows exactly the same bearing as Bayley's reef, and has been taken up by the same company as a lease. From this reef a very nice lot of stone is said to have been taken, but the hole has now been filled in. At the north end of this blow it pinches out, but on the western side of the gully is another large quartz blow, which is exactly on the same line as Bayley's, but there is apparently no direct connection between them. At the south end of Bayley's the reef is lost, as at the North; but to the Westward, on a hill, another lenticular mass of quartz, carrying gold, is met with. From the general character of the reef, it appears to be a true fissure vein, making in size when it follows its true course across the strike of the country, and pinching often to a mere thread when it follows the bedding plane of the rocks. This, of course, is not at present proved, as so little work has yet been done on any of these leases, but should this surmise be correct this vein would follow something of the following course:—Starting with the lease south of Bayley's reward claim it would strike N.W., then N.; on the reward claim, N.W. and N.; on Bayley's lease, N.W. and S.; on the lease north of Bayley's claim, N.W. These breaks in the lode may of course be entirely due to faults or throws, but the blow at the north end of Bayley's claim and the reef in the gully seem to prove the former theory. All the gold from this reef has been taken from a small hole at the north side of the blow, where there appears to be a small vein consisting almost entirely of gold associated with a little oxide of iron. There were also some handsome specimens of gold in quartz, and some portions of the reef carry a good deal of fine gold. It appears to be either the top of a rich shoot or merely a bunch, most probably the latter; in either case it cannot be expected to continue so phenomenally rich much longer, although it may pay well to work. None of the reefs here are yet sufficiently developed for any decided opinion to be expressed, but some of them are well worth prospecting. There are several well-formed reefs, showing gold, about five miles further South, and another patch 25 miles to the Northward. The available land for prospecting in the immediate neighbourhood of Coolgardie is limited, as this belt lies between the granite country and the freehold land of the Hampton Plains Company; but during the winter we shall probably hear of new discoveries to the North-East and South-Eastward, as there are some hundreds of men out prospecting. When we consider the quantity of gold taken from Coolgardie, it is highly probable that some of these reefs will make very good payable mines.

I have, &c.,

HARRY P. WOODWARD,

Government Geologist.

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