

270 TRANSACTIONS OF THE GEOLOGICAL SOC. OF GLASGOW.

DESCRIPTION OF STRATA.	Thickness of Strata.		Depth from Surface.	
	FT.	IN.	FT.	IN.
Soft Shale, - - - - -	36	6	1861	0
Shale, - - - - -	10	0	1871	0
Limestone, - - - - -	16	0	1887	0
Hard dark Shale, - - - - -	7	0	1894	0
Dark Shale, - - - - -	9	0	1903	0

XX.—REMARKS upon the BED OF DOLERITE which crosses RENFREWSHIRE to the EAST OF PAISLEY. By ROBERT CRAIG, corresponding member.

[Read 13th January, 1876.]

IN carrying out certain geological investigations in Renfrewshire some years ago, I became acquainted with a dolerite bed, crossing the county nearly from south to north, on the east of Paisley, and which is worked as a surface section at Seedhills. Its thickness there is about 22 feet, varying, so far as has been ascertained, from 22 feet to 25 feet. Where not exposed to atmospheric action it is a hard, pure dolerite, splitting with a straight, smooth surface, which makes it very suitable for paving-stones. It is a bed, and not a dyke; the dip being generally to the south-east, and corresponding with that of the adjacent strata; at Seedhills it is 8 degrees.* Its strike, as already mentioned, is usually nearly north and south, with a slight bearing to the east; but still is very irregular, running with ragged edges, sometimes jutting out, as at Seedhills, from 100 to 200 yards to the west, and at other times withdrawing within the main line to the east, as it appears to do north of Arkleston farm-house. At present I have not discovered its true horizon in the Carboniferous strata, but I will put it down, provisionally, above the main limestone and below the clayband ironstone of the Possil series. At one time I was inclined to place it below the main limestone, as I thought that the Blackhall limestone, which lies about 60 feet above it, was an upthrow of the main bed, but further search does not bear out that opinion.

A bore put down at Saucel, a little to the west of the outcrop

* Not 33° as stated in a paper on the glacial deposits of Renfrewshire, and which was published in the Society's Transactions, Vol. iv., page 140.

of this bed at Seedhills, has shown the following strata underlying the dolerite. Hard amorphous sandstone, upon which the dolerite rests, about 40 feet thick: no correct journal of this part of the bore was kept, and it is probable that the sandstone is broken by beds of shale. Below the sandstone, 24 fathoms of fire-clay with ironstone balls; then $10\frac{1}{2}$ fathoms of shales, interbedded with hard flaggy sandstones or "faikes." Some of these beds are hard, others soft, with intervening beds of argillaceous shale—the "blaes" of the borer. Next, a series of limestone beds and calcareous shale, 14 fathoms thick, different from any strata gone through in the west of the central valley or in the north of Ayrshire, so far as I know. After passing through 4 fathoms of thin-bedded limestones and calcareous shales, varying from 6 inches to 5 feet thick, the bore went through the following:—

						FT.	IN.
Hard limestone, good,	-	-	-	-	-	9	2
Calcareous shale,	-	-	-	-	-	1	6
Limestone, good,	-	-	-	-	-	7	11
Calcareous shale,	-	-	-	-	-	2	6
Limestone, good,	-	-	-	-	-	4	4
Calcareous shale,	-	-	-	-	-	9	4
Limestone, good,	-	-	-	-	-	7	0
Calcareous shale,	-	-	-	-	-	2	8
Limestone, good,	-	-	-	-	-	12	0
Calcareous shale,	-	-	-	-	-	0	6
Limestone, good,	-	-	-	-	-	1	0
Argillaceous shale,	-	-	-	-	-	4	4
Limestone,	-	-	-	-	-	2	8
						64	11

I was at first inclined to put these down amongst the calciferous strata, thinking that they might be the equivalents of some of the limestones found in this group on the east side of the central valley. But I am now of opinion that this great thickness of limestone belongs to the lower limestone series, and probably lies above the main post and coal, of the Howwood, Duntocher, Campsie, and Hurlet horizon, which has not been bored to at this point. We have, however, nothing corresponding to these limestone strata in the above districts. A similar series exists in the north of Ayrshire, in the neighbourhood of Beith, but, except in this particular, there is no resemblance between the strata of the two districts. Whatever the position, the basin containing this

thickness of limestone is of small extent, as three bores put down along the outcrop of the dolerite to the north of Paisley, on the farm of Gallowhill, did not find it. According to these, the dolerite rests, along this line, upon a series of thick-bedded shales, fire-clays, and sandstones, which have been bored into for a depth of more than 30 fathoms. Accepting these beds as overlying the main limestone, I have thus provisionally placed the dolerite, as stated, somewhere between it and the clayband ironstone strata.

With these explanations, and returning to the quarry at Seedhills as the starting point, I will endeavour to trace the dolerite bed, noticing the openings in it as we go along. It has here been extensively quarried, being cut into from west to east, across the strike, for about 150 yards. It is here, as elsewhere along this tract of country, a surface stratum, although deeply covered by a deposit of boulder clay, and has been long worked for paving-stones and other road-making purposes. A ridge of inferior stone passes through the centre of the quarry, running north and south; but is of no great geological value, further than that it causes a small anticlinal, which has preserved two very interesting sets of glacial striæ. Leaving Seedhills, and following the dolerite bed towards the south, the strike is found for a short distance to have a south by east direction, but here the ground is so built over that its traces are lost. After leaving the houses and gardens, the practised eye soon picks up its course, and, following what in appearance is a wavy ridge, finds the bed again laid bare as it crosses the Cart, near Blackhall printfield. On the south side of the river the water has laid bare about two poles of the dolerite, and it is here seen to be lying at a greater inclination to east by south of 15° , which is the direction and dip of the strata in connection. From its outcrop on the south bank of the Cart the strike is in a direction south by west, the edge of the dolerite rising from 20 to 30 feet above the level of the surrounding country, and dipping to the south-east at an angle of 20° . On the south bank of the river is seen, overlying the dolerite, about 60 feet of shale, with thin bands of clay ironstone, one of them being 6 inches thick. Over the shale lies the Blackhall limestone, 4 feet thick, in three thin beds, which have been worked at this place.

Along the west side of the dolerite strike there is a deep cutting which puzzled me considerably for some time, and which I may explain for the benefit of those members who may visit the locality.

It is a long narrow gully, beginning on the west side of the dolerite outcrop near the Cart, and continuing in the same direction as the outcrop, across a field where the dolerite rises high above the surface. It crosses the Blackhall Road, and is seen following the dolerite across Dikebar Hill, the strike having here turned southward. I saw from the first that it was artificial, having the appearance of a heavy railway cutting, but no one could give me any information about it. At last I was directed to two old men living in the vicinity, and they supplied the missing link. An outlier of the Blackhall limestone had run along the west side of the dolerite in a long narrow stripe, and had been taken out by my aged informants' father above sixty years ago. This information was interesting as testifying to the fact that the dolerite, which is not again seen as a surface stratum, continues along Dikebar Hill, having been found along the east side of the limestone outlier when it was excavated. From the direction of the gully the dolerite strike turns to the south-west; and, although I have not seen the connection, not having examined it very minutely, I have no doubt there is a connection with the north-east end of the Gleniffer range, which is not far distant. Overlying the dolerite at Blackhall there are about 6 feet of strata not found at Seedhills, consisting of thin beds of anamesite, a few inches thick, and intercalated ash, much fired and indurated. At one place above the true dolerite, and resting upon it, is a layer 4 inches thick, resembling a miniature bed of columnar basalt, but very much burnt.

Returning to Seedhills, and continuing northwards, the strike has a north-east direction till near the Arkleston tunnel, where it turns more to the north. At the tunnel the dolerite becomes a surface bed, and rises with an escarpment about 30 feet above the ground level to the west of it. The dip here is to the south-east, at an angle of 5° , and the thickness of the bed, which can easily be obtained at present, is 24 feet. The railway at the west end of the tunnel cuts into the underlying strata about 18 feet, consisting of the hard black indurated shale or nondescript beds formerly mentioned, found on the farm of Gallowhill. The coarse hard sandstone found at Seedhills does not extend here. From the tunnel the dolerite bed is seen extending towards Arkleston House, the strike being north by east, and still rising above the land surface with an escarpment of 30 feet. It passes on in the same direction, cropping

out on the west side of the powder-house, which, as well as Arkleston House, is founded upon it. North of the powder-house it has been extensively quarried for road-making purposes. It then takes a bend nearly north-east, and continues for half-a-mile, easily traceable by the practised eye as a continuance of the Arkleston escarpment, although it makes no surface appearance, and the land is under cultivation. From this point we lose all trace of the bed until we reach Elderslie House, which is founded upon it. It then crosses the park between the house and the Clyde, in the bed of which it appears, as is known to all Glasgow geologists and others interested in the river.

By a letter from Mr Deas, engineer to the Clyde Trust, I learn that the dolerite bed occupies the channel of the stream for about 300 yards in length, thus proving that it is lying at a very small angle of inclination, probably not more than two or three degrees. Had it passed at the same angle as it has when crossing the Cart at Blackhall, it would not have obstructed the course of the Clyde for more than 40 yards, or even less, and would have saved a vast amount of labour and expense in its removal. Mr Deas also remarks that its upper surface in the river is 16 feet below high water mark, showing that from Elderslie House the dip is nearly north, while the inclination is apparently regular at about 5°. Passing to the north bank of the Clyde, I failed to find any surface appearance of the dolerite bed, but was told that it extended northward, passing to the west of Blawarthill farm-house. The tenant here was my informant, and he also told me that the Clyde Trust had put down three bores on his farm, at regular distances, extending northward from the river. The bed was found in all the bores, but each bore proceeding north was deeper than the previous one. As the surface land lies nearly level where these bores were put down, there is clear proof that the dip continues in the same direction. As the farmer saw the bores put down, and was paid damages by the Clyde Trust for the use of his ground, I consider his evidence perfectly trustworthy, especially as it quite agrees with what we know of the regular dip north, on the south side of the river. I could not ascertain the exact depth of the bores, but the most northerly one was said to be about 50 feet. It must not be inferred that the dolerite bed is such a depth below high water mark at this point. From the rise of the land near the Clyde, I think the upper surface of the bed,

about one mile north of the river, is not more than 25 to 30 feet below high water mark. After this all trace of it is lost; but I must admit that the search has not been carried on very vigorously, and I have little doubt that a more exhaustive investigation will be rewarded by its discovery farther to the north. There is one very significant feature in a belt of country where the strike and outcrop of the dolerite bed should occur, which is the absence of pits. The same occurs in the line of country between Paisley and Renfrew. No pits are there to be found on either side of the bed, for the reason that the Lower Carboniferous strata are thrown up and the ironstone is thrown off. Whether this applies to the north side remains to be seen.

In bringing these remarks to a conclusion, I may state that I had intended to notice a few more of the lava flows to be found in Renfrewshire, and which prove that active volcanoes existed, probably in some part of the Gleniffer hills, during the Carboniferous period. At present, however, I will only mention one other dolerite bed, that which crosses from the Gleniffer range, and passes the village of Sclates, three miles west of Paisley, near which place it was quarried a few years ago. Thence it runs in a north-east direction, passing near Paisley race-course. Its horizon, so far as I have learned, is almost the same as that of the subject of my paper. Another extensive overflow is found overlying the Quarrelton and Hallhill coal, and extends from near the village of Elderslie almost to Howwood, with a strike nearly east and west. At one place it was found to be above 300 feet thick, while at Hallhill, near its western extremity, its thickness is 80 feet. This bed does not extend very far northwards. From one to two miles from the Gleniffer hills, with which it appears to have a connection, is its present known extremity. Other beds of small dimensions are found intrusive in the Carboniferous strata in the same locality.
