MEMOIRS OF THE GEOLOGICAL SURVEY.

ENGLAND AND WALES.

THE GEOLOGY OF THE COUNTRY AROUND DRIFFIELD.

(EXPLANATION OF QUARTER-SHEET 94 N.W.)
(NEW SERIES, SHEET 64.)

BY

J. R. DAKYNS, M.A.,
AND C. FOX-STRANGWAYS, F.G.S.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE.

PUBLISHED BY
EYRE AND SPOTTISWOODE, EAST HARDING STREET, LONDON, E.C.
ADAM AND CHARLES BLACK, NORTH BRIDGE, EDINBURGH.
HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.
1886.

Price Ninepence.

LIST OF GEOLOGICAL MAPS, SECTIONS, AND PUBLICATIONS OF THE GEOLOGICAL SURVEY.

THE Maps are those of the Ordnance Survey, geologically coloured by the Geological Survey of the United Kingdom under the Superintendence of ARCH. GEIKIE, LL.D., F.R.S., Director General.
(For Maps, Sections, and Memoirs illustrating Scotland, Ireland, and the West Indies, and for full particulars of all publications, *see* "Catalogue." Price 1*s.*)

ENGLAND AND WALES.—(Scale one-inch to a mile.)

Maps marked * are also published as Drift Maps. Those marked † are published only as Drift Maps.

Sheets 3*, 5, 6*, 7*, 8, 9, 11 to 22, 25, 26, 30, 31, 33 to 37, 40, 41, 44, 47*, 64*, price 6*s.* 6*d.* each.
Sheet 4, 5*s.* Sheets 2*, 10, 23, 24, 27 to 29, 32, 38, 39, 58, 84†, 85†, 4*s.* each.
Sheets divided into quarters; all at 3*s.* each quarter-sheet, excepting those in brackets, which are 1*s.* 6*d.* each.
1*, 42, 43, 45, 48, NW, SW, NE*, SE, 48, NW†, SW*, NE†, (SE*), (49†), 50†, 51*, 52 to 57, (57 NW), 59 to 63, 65†, 66 SW†, NE†, NW*, SE†, 67 N†, (S†), 68 E†, (NW*), SW†, 69†, 70*, 71 to 75, 76 (N) S, (77 N), 78, 79, NW*, SW NE*, SE*, 80 NW*, SW*, NE, SE, 81 NW*, SW, NE, SE, 82, 83*, 87, 88, NW, SW*, NE, SE, 89 NW*, SW*, NE, SE*, 90 (NE*), (SE*), 91, (NW*), (SW*), NE*, SE*, 92 SW, SE, 93 NW, SW, NE*, SE*, 94 NW†, SW†, (NE†), SE†, 95 NW*, NE*, (SE*), 96*, 97 SE, 98, 99 (NE*), (SE*), 101 SE, 102 NE*, 103*, 104*, 105 NW, SW, (NE*), SE, 106 NE* SE*, 109 SW, SE*, 110 (NW*), (NE*) SW*.

HORIZONTAL SECTIONS,
1 to 139, England, price 5*s.* each.

VERTICAL SECTIONS,
1 to 75, England, price 3*s.* 6*d.* each.

COMPLETED COUNTIES OF ENGLAND AND WALES, on a Scale of one-inch to a Mile.

Sheets marked * have Descriptive Memoirs. Sheets or Counties marked † are illustrated by General Memoirs.

ANGLESEY†,—77 N, 78. Hor. Sect. 40.
BEDFORDSHIRE,—46 NW, NE, SW†, SE†, 52 NW, NE, SW, SE.
BERKSHIRE,—7*, 8†, 12*, 13*, 34*, 45 SW*. Hor. Sect. 59, 71, 72, 60.
BRECKNOCKSHIRE†,—36, 41, 42, 56 NW, SW, 57 NE, SE. Hor. Sect. 4, 5, 6, 11, and Vert. Sect. 4 and 10.
BUCKINGHAMSHIRE,—7* 13* 45* NE, SE, 46 NW, SW†, 52 SW. Hor. Sect. 74, 79.
CAERMARTHENSHIRE†, 37, 38, 40, 41, 42 NW, SW, 56 SW, 57 SW, SE. Hor. Sect. 2–4, 7, 6, ; and Vert. Sect. 3–6, 13, 14.
CAERNARVONSHIRE,†—74 NW, 75, 76, 77 N, 78, 79 NW, SW. Hor. Sect. 28, 31, 40.
CARDIGANSHIRE†,—40, 41, 56 NW, 57, 58, 59 SE, 80 SW. Hor. Sect. 4, 5, 6.
CHESHIRE,—73 NE, NW, 79 NE, SE, 80, 81 NW*, SW*, 88 SW. Hor. Sect. 18, 43, 44, 60, 64, 65, 67, 70.
CORNWALL†,—24†, 25†, 26†, 29†, 30†, 31†, 32†, & 33†.
DENBIGH†,—73 NW, 74, 75 NE, 76 NE, SE, 79 NW, SW, SE, 80 SW. Hor. Sect. 31, 35, 36, 39, 43, 44; and Vert. Sect. 24.
DERBYSHIRE†,—62 NE, 63 NW, 71 NW, SW, SE, 72 NE, SE, 81, 82, 88 SW, SE. Hor. Sect. 18, 46, 60, 61, 69, 70.
DEVONSHIRE†,—20†, 21†, 22†, 23†, 24†, 25†, 26†, & 27†. Hor. Sect. 19.
DORSETSHIRE,—15, 16, 17, 18, 21, 22. Hor. Sect. 19, 20, 21, 22, 56. Vert. Sect. 22.
ESSEX,—1*, 2*, 47*, 48. Hor. Sect. 64, 120.
FLINTSHIRE†,—74 NE, 79. Hor. Sect. 43.
GLAMORGANSHIRE†,—20, 36, 37, 41, & 42 SE, SW. Hor. Sect. 7, 8, 9, 10, 11; Vert. Sect. 2, 4, 5, 6, 7, 9, 10, 47.
GLOUCESTERSHIRE,—19, 34*, 35, 43 NE, SW, SE, 44*. Hor. Sect. 12 to 15, 59; Vert. Sect. 7, 11, 16, 46 to 51.
HAMPSHIRE,—8†, 9†, 10*, 11†, 12*, 14, 15, 16. Hor. Sect. 80.
HEREFORDSHIRE,—42 NE, SE, 43, 55, 56 NE, SE. Hor. Sect. 5, 13, 27, 30, 34; and Vert. Sect. 15.
HERTFORDSHIRE,—1† NW, 7*, 48, 47*. Hor. Sect. 79, 120, 121.
HUNTINGDON,—51 NW, 52 NW, NE, SW, 64*, 65.
KENT†,—1† SW & SE, 2†, 3†, 4*, 6†. Hor. Sect. 77 and 78.
LANCASHIRE,—79 NE, 80 NW*, NE, 81 NW, 88 NW, SW†, 89, 90, 91, 92 SW, 98. Hor. Sect. 62 to 66, 85 to 87. Vert. Sect. 27, 34, 61.
LEICESTERSHIRE,—53 NE, 62 NE, 63*, 64*, 70*, 71 SE, SW. Hor. Sect. 46, 48, 49, 52, 122, 124, 126.
MERIONETHSHIRE†,—59 NE, SE, 60 NW, 74, 75 NE, SE. Hor. Sect. 26, 28, 29, 31, 32, 35, 37, 38, 39.
MIDDLESEX†,—1† NW, SW, 7*, 8†. Hor. Sect. 79.
MONMOUTHSHIRE,—35, 36, 42 SE, NE, 43 SW. Hor. Sect. 5 and 12; and Vert. Sect. 8, 9, 10, 12.
MONTGOMERYSHIRE†,—56 NW, 59 NE, SE, 60, 74 SW, SE. Hor. Sect. 28, 27, 29, 30, 32, 34, 35, 36, 38.
NORTHAMPTONSHIRE,—64, 45 NW, NE, 46 NW, 52 NW, NE, SW, 53 NE, SW, & SE, 63 SE, 64.
NOTTINGHAM,—70*, 71* NE, SE, NW, 82 NE*, SE*, SW, 83, 86, 87* SW. Hor. Sect. 60, 61.
OXFORDSHIRE,—7*, 13*, 34*, 44*, 45*, 53 SE*, SW. Hor. Sect. 71, 72, 81, 82.
PEMBROKESHIRE†,—38, 39, 40, 41, 56. Hor. Sect. 1 and 2; and Vert. Sect. 12 and 13.
RADNORSHIRE,—42 NW, NE, 56, 60 SW, SE. Hor. Sect. 5, 6, 27.
RUTLANDSHIRE†,—this county is wholly included within Sheet 64.*
SHROPSHIRE,—55 NW, NE, 56 NE, 60 NE, SE, 61, 62 NW, 73, 74 NE, SE. Hor. Sect. 24, 25, 30, 33, 34, 36, 41, 44, 45, 53, 54, 58; and Vert. Sect. 23, 24.
SOMERSETSHIRE,—18, 19, 20, 21, 27, 35. Hor. Sect. 16, 16, 17, 20, 21, 22; and Vert. Sect. 12, 46, 47, 48, 49, 50, 51.
STAFFORDSHIRE,—54 NW, 55 NE, 61 NE, SE, 62, 63 NW, 71 SW, 72, 73 NE, SE, 81 SE, SW. Hor. Sect. 18, 23, 24, 25, 41, 42, 45, 49, 54, 57, 51, 60; and Vert. Sect. 18, 17, 18, 19, 20, 21, 23, 26.
SUFFOLK,—47,* 48,* 49, 50, 51, 66 SE*, 67.
SURREY,—1 SW†, 6†, 7*, 8†, 12†. Hor. Sect. 74, 75, 76, and 79.
SUSSEX,—4*, 5†, 6†, 8†, 9†, 11†. Hor. Sect. 73, 75, 76, 77, 78.
WARWICKSHIRE,—44*, 45 NW, 53*, 54, 62 NE, SW, SE, 63 NW, SW, SE. Hor. Sect. 23, 48 to 61 Vert. Sect. 21.
WILTSHIRE,—12*, 13*, 14, 15, 16, 19, 34*, and 35. Hor. Sect. 15 and 59.
WORCESTERSHIRE,—43 NE, 44*, 54, 55, 62 SW, SE, 61 SE. Hor. Sect. 13, 23, 25, 50, 59, and Vert. Sect. 15.

GENERAL MEMOIRS OF THE GEOLOGICAL SURVEY.

REPORT on CORNWALL, DEVON, and WEST SOMERSET. By Sir H. T. DE LA BECHE. 14*s.* (O.P.)
FIGURES and DESCRIPTIONS of the PALÆOZOIC FOSSILS in the above Counties. By PROF. PHILLIPS. (O.P.)
The MEMOIRS of the GEOLOGICAL SURVEY of GREAT BRITAIN. Vol. I., 21*s.*; Vol. II. (in 2 Parts), 42*s.*
NORTH WALES. By SIR A. C. RAMSAY. Appendix, by J. W. SALTER and R. ETHERIDGE. 2nd Ed. 21*s.* (Vol. III. of Memoirs, &c.)
The LONDON BASIN. Part I. Chalk and Eocene Beds of S. and W. Tracts. By W. WHITAKER. 13*s.* (Vol. IV. of Memoirs, &c.)
Guide to the GEOLOGY of LONDON and the NEIGHBOURHOOD. By W. WHITAKER. 4th Ed. 1*s.*

MEMOIRS OF THE GEOLOGICAL SURVEY.

ENGLAND AND WALES.

THE GEOLOGY OF THE COUNTRY AROUND

DRIFFIELD.

(EXPLANATION OF QUARTER-SHEET 94 N.W.)
(NEW SERIES, SHEET 64.)

BY

J. R. DAKYNS, M.A.,
AND C. FOX-STRANGWAYS, F.G.S.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE.

PUBLISHED BY
EYRE AND SPOTTISWOODE, EAST HARDING STREET, LONDON, E.C.
ADAM AND CHARLES BLACK, NORTH BRIDGE, EDINBURGH.
HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.
1886.

Price 9*d.*

PREFACE.

THE Quarter-Sheet of the Geological Survey Map, described in the following pages, includes more than a third of the high chalk country of Yorkshire known as the Wolds, and likewise an inland portion of the lower district called Holderness.

A small area of Jurassic Rocks is represented at the north-west corner of the Map, but with this exception the whole area lies upon Chalk, which, towards the south and east, is covered with Drift deposits. The Oolitic rocks present some interesting irregularities in their mode of occurrence, the Coralline series, for example, being rapidly overlapped by the Kimeridge Clay, which was much and unevenly denuded before the deposition of the Cretaceous system.

The district of Holderness has already been described in the Survey Memoir on "The Geology of Holderness," to which the reader is referred for the general character and history of the lower ground to the south-east.

ARCH. GEIKIE,
Director-General.

Geological Survey Office,
28, Jermyn Street,
25th October 1886.

A 19138. Wt. 17275.

NOTICE.

THE larger portion of the country comprised within this Sheet was surveyed by MR. DAKYNS. MR. FOX-STRANGWAYS mapped a strip of country along the northern edge of the Sheet, and a few small areas elsewhere.

MR. HOWELL superintended the mapping of the whole, as District Surveyor.

Only one edition of the Map is published, viz., that showing the Superficial Deposits, with such parts only of the underlying rocks forming the solid geology, as are not concealed by overlying Superficial Deposits.

The Six-inch Geological Survey Maps of Yorkshire included within this Quarter-Street are 143, 144, 145, 160, 161, 162, 177, 178, 179, and the southern parts of, 125, 126, 127. These are not published; but M.S. Coloured Copies are deposited in the Geological Survey Office.

H. W. BRISTOW,
Senior Director.

Geological Survey Office,
28, Jermyn Street, S.W.,
20th October 1886.

CONTENTS.

LIST OF ILLUSTRATIONS.

THE GEOLOGY OF

THE COUNTRY AROUND

DRIFFIELD.

CHAPTER I.

INTRODUCTION.

THE district comprised within this Map includes a large portion of the Chalk Wolds, in fact more than a third, with the neighbouring low grounds to the east of Driffield and of North Grimston.

The area contained is 216 square miles. Driffield is the only town; but there are several important villages, the principal being Nafferton, Lowthorpe, Burton Agnes, Kilham, Rudston, Langtoft, the Luttons, Sledmere, Kirby Grindalythe, Duggleby, Wharram-le-Street, Fridaythorpe, Huggate, Wetwang, Garton, North Dalton, Hutton Cranswick, Foston, North Frodingham and Beeford.

There are no rivers of importance. The largest is the river Hull, which, with its numerous tributary becks, drains the south-east corner of the area; and, by the aid of a canal for a portion of the distance, allows of the navigation being continued from the Humber to Driffield.

In the north-west corner the small streams flowing from the base of the Chalk run in the first instance north and east to join the Derwent above and below Malton, and thence south to the Humber; while the valleys in the south-west, although they are now dry, fall in the same direction.

Throughout the greater part of the district in which the Chalk forms the surface, there are, from its porous nature, no perennial surface streams. The larger valleys which are usually dry during the summer have intermittent brooks or "gipsey" races; but powerful springs burst out along the east foot of the Wolds, showing that there is a copious underground drainage, although but little water is seen at the surface.

Crossing the northern edge of the district is the Gipsey Race, which rises not far from the western escarpment near Wharram, and flows east along the great Wold valley to the sea at Bridlington Quay, having entered this area again near Rudstone.

The watershed of the country apparently follows the line of high ground crossing the western edge of the Map from Settrington Wold by Wharram to Burdale Tunnel, thence running west to the escarpment above Acklam, and again southerly to Huggate Wold, and east of Warter. Whether the underground water parting exactly coincides with this line there is no means of judging, as the contour of the impervious beds below is unknown.

The highest ground is near Huggate, where the Wolds attain an altitude of over 700 feet; but the Chalk maintains nearly this level along the western edge of the Map, being about 650 feet at Settrington, and over 600 feet on Warter Wold. From this elevation the ground declines gradually to the south-east till it reaches the flat land beyond Driffield, which averages from 15 to 50 feet above the sea. The lowest ground in the north-west corner is only about 200 feet above sea-level, consequently the Chalk escarpments about here are very steep.

Table of Formations.

The geological formations found within the area of this Map are:—

Post Tertiary	Post-Glacial and Glacial Beds	Recent Alluvium.
		Warp? or older Alluvium.
		Valley Gravels and Gravel Terraces.
		Boulder Clay.
		Interglacial Sand and Gravel (Marine).
		Boulder Clay.
Secondary	Upper Cretaceous	Upper Chalk (Chalk without Flints).
		Middle Chalk (Chalk with Flints).
		Lower Chalk (Grey Chalk without Flints).
		Red Chalk.
	Lower Cretaceous	Ferruginous Sands (Neocomian Beds?)
	Upper Oolite	Kimeridge Clay.
	Middle Oolite	The Cement Stone (Argillaceous Limestone and Shale).
		Coralline Oolite (Oolitic Limestone and Coral Rag).
		Passage Beds.
		Calcareous Grit.

CHAPTER II.

THE OOLITES.

Middle Oolite.

Only a small portion of the Middle Oolite crops out in this district, but the beds are well exposed in the quarries and other sections on Grimston Hill, which in one place or another show the entire thickness of the beds we have to describe, and form the key to the structure of the Oolites in this neighbourhood.

Calcareous Grit.—The Calcareous Grit just enters this Map at the foot of Grimston Hill, but is soon cut off by the large east and west fault coming down from Nine Spring Dale. The beds are exposed in the road south of the village of North Grimston close to the edge of the One-inch Map. They consist of alternating bands of hard and soft sandstone, with blue siliceous beds, similar to those seen in the well-known quarries at Castle Howard and Birdsall. The thickness of the Calcareous Grit is probably between 60 and 70 feet, but as the lower beds are cut off by the fault there is no means of estimating it exactly.*

Passage Beds.—The Calcareous Grit in its upper part becomes more calcareous as it approaches the overlying limestone, and there are a few feet of passage beds; which, in some cases, form a distinct feature separable from either the grits below or the limestone above.

These beds which crop out on the flanks of Grimston Hill are composed of bands of hard calcareous sandstone, with large oolitic grains, alternating with softer and more earthy beds. In this Map they are exposed just where the bridle road turns off from the main road, and in the stream south of the quarries; but the best sections are further to the west in the neighbourhood of Langton, where the beds cover a somewhat large extent of surface, and are quarried for road-metal.†

Coralline Oolite (*Oolitic Limestone and Coral Rag.*)—The whole of the upper part of Grimston Hill is composed of this limestone, fine sections of which are exposed in the quarries on the south side. Judging from the height of the bank at Grimston Hill House these beds must have a thickness of nearly 100 feet, but not nearly so much as this is seen in the quarries.

The lower part of the limestone is very soft and marly, and abounds with specimens of *Echinobrissus scutatus*; above this come more massive beds, some of which are very rich in fossils, especially

* Messrs. Blake and Hudleston estimate the thickness at 60 feet.—*Quart. Journ. Geol. Soc.* vol. xxxiii., p. 376.

† Memoirs of the Geological Survey. Explanation of Quarter-Sheet 93, N.E., p. 21.

Echinodermata and Corals, while others are remarkable for the great quantity of flint they contain.

The lower beds with *Echinobrissus scutatus* crop out on the west side of the large quarry at the side of the railway, but are not very well seen, being hidden by the limekilns which have been built over them; a better section is exposed on the north side of the hill below Grimston Hill House, close to the large fault. The main mass of the limestone is, however, best seen in the quarries at the side of the railway and in the road above; here the beds, which have a high dip to the south-east (about 20°), are extensively worked, and have yielded a large list of fossils.

The following list of fossils from the Coral Rag of this district is taken from Messrs. Blake and Hudleston's paper (p. 379). The relative abundance of forms is thus noted,—*r.* rare, *c.* common, *v.c* very common:—

Belemnites abbreviatus, Mill.
r. *Nautilus aganiticus*, Schlot.
Ammonites varicostatus, Buckl. (var. of *A. plicatilis.*)
—— *alternans*, Von Buch (*A. cordatus*, var. ?)
—— *vertebralis*, Sow. (same var. as at Sike Gate).
Purpuroidea nodulata, Y. & B.
Natica grandis, Münst (*? cincta* Phil.).
—— *clio*, D'Orb. (*? arguta*, Phil.).
c. *Chemnitzia*, var. of *heddingtonensis*, Sow.
r. —— *pollux*, D'Orb.
r. —— *langtonensis*, Bl. & H.
r. *Nerinæa tornatella*, Buvig.
v.c. —— *fasciata*, Voltz.
Littorina pulcherrima, Dollf.
c. —— *muricata*, Sow.
Nerita, sp.
Neritopsis Guerrei, Héb. & Desl.
——, sp.
Trochus, sp.
Turbo corallensis, Buv.
Pleurotomaria reticulata, Sow.
—— *Moreana*? Buvig.
Trochotoma tornata, Phil. (*T. discoidea*, Buvig.)
Alaria, sp. (cf. *tridactyla*, Buv.).
v.c. *Ostrea duriuscula*, Phil.
v.c. *Exogyra nana*, Sow.
—— sp.
Ostrea gregaria, Sow.
c. *Anomia radiata*, Phil.
r. *Plicatula*, sp. (cf. *fistulosa*, M. & L.).
v.c. *Pecten vimineus*, Sow.
—— *inæquicostatus*, Phil.
—— *intertextus*, Röm.
—— *lens*, Sow.
c. *Hinnites* (very large).
v. c. *Lima læviuscula*, Sow. (North Grimston variety).
c. —— *rigida*, Sow.
v.c. —— *pectiniformis*, Schlot. / *rudis*, Sow.
—— sp. (cf. *elliptica*, Whit.).
—— *subantiquata*, Röm. (small).
r. *Avicula ædilignensis*, Bl.
c. *Trichites Plotii*, Lhwyd.
Mytilus ungulatus, Y. & B.
Modiola inclusa, Phil.
c. *Arca quadrisulcata*, Sow.
—— *pectinata*, Phil.
Cucullæa elongata, Phil.
r. *Trigonia* (costate sp.).
**Protocardium isocardioides*, Bl. & H.
v.c. *Astarte ovata*, Smith (attaining a great size).
c. —— *rhomboidalis*, Phil.

* This is probably the *Cardium lobatum* of Phillips. (Compare also *Cypricardia isocardina*, Buvig.)

Opis virduncnsis, Buvig.
—— *lunulata*, Röm.
—— *Phillipsi*, Morr., or *coralina*, Damon.
Panopæa gigantea, Buvig.
Homomya crassiuscula, M. & L.
Goniomya v-scripta, Sow.
Terebratula insignis, Schüb.
c. *Cidaris florigemma*, Phil.
c. *Cidaris Smithii*, Wright.
c. *Hemicidaris intermedia*, Flem.
v.c. *Pseudodiadema hemisphæricum*, Ag.
Collyrites bicordatus, Leske.
c. *Pygaster umbrella*, Ag.
Echinobrissus scutatus, Lamk.
Pentacrinites, sp.
Apiocrinus, sp.

The Cement Stone.—About 300 yards east of the great limestone quarry there is a quarry in these beds, which, being about the only place where they are worked to any extent, may be said to be the typical section of the district. They consist of fine-grained argillaceous and somewhat sandy limestone, alternating with softer and more shaly beds: the harder bands are largely worked and burnt for lime, being said to make a good cement, which is sold under the name of "Blue Lias Lime."

There appears to be over 50 feet of these beds in the hill to the south of North Grimston; but, from the very irregular way in which these strata has been deposited, the thickness varies considerably in short distances, and no very exact estimate can be made.

The outcrop of the Cement Stone is limited almost entirely to this district; and the sudden ending off of the beds, both on the north and south, is very striking. On the north side these beds cannot be traced more than 200 yards from the quarry; and the Kimeridge Clay, which comes on above, overlaps them and reposes directly on the limestone below. The same thing occurs to the south, but in a more striking manner; here the limestones themselves thin out in about a mile; and east of Birdsall the Cement Stone, which makes the sharp tabular feature at Picksharp Wood, rests directly on the Lower Calcareous Grit, while the Cement Stone itself ends off suddenly to the south, the Kimeridge Clay again overlapping these beds, and coming down on to the Lower Calcareous Grit.*

The very partial development of the Cement Stone is probably due to the fact that its origin is entirely local, and that it is composed of a calcareous mud derived from the Oolitic Limestones, which could only be formed in the immediate neighbourhood of that limestone.

This sudden ending of the beds in so short a space considerably complicates the stratigraphy of the district, for in faulted ground like this it is not easy to decide whether these abrupt terminations of the beds are due to faulting or to the unconformable overlap.

* This is well shown on Horizontal Section, Sheet 138, line D.

Upper Oolite.

Kimeridge Clay.—The Kimeridge Clay chiefly occupies the steep slopes at the foot of the Chalk Wolds, and runs up several of the deep valleys intersecting that formation.

It consists of dark shaly clays with septaria and thin bands of impure limestone full of fossils. The maximum thickness exposed in this map is about 200 feet, but this is probably only the lower part of the formation, the upper beds having been removed before the deposition of the Chalk.

The best locality for obtaining fossils are the steep slopes about Settrington Wood, where the commonest species are—

Discina latissima, Sow.
Exogyra subsinuata, Leym.
Ostrea flabelloides, Lam.
Lucina portlandica, Sow.
Thracia depressa, Sow.
Ammonites biplex, Sow.
" *cordatus*, Sow.
" *Lamberti*, Sow.
Belemnites abbreviatus, Mill.

The Kimeridge Clay crops out in the low ground in the north-west corner of the Map, and along the steep bank beneath the Chalk to the east of Settrington. In Nine Spring Dale the underlying Oolites are thrown up by a fault, leaving only a narrow strip of Kimeridge Clay east of Grimston Hill House. The beds here dip rapidly to the south, so that between the brick-yard, where there are 12 feet or more of this clay,* and the Chalk hills to the south a considerable thickness intervenes.

The outcrop also extends some distance up the valleys at Wharram Percy and about Duggleby. At the latter place it is a good deal covered by superficial gravel, the clay itself being only seen in a few places.

The Burdale Tunnel runs in shale for more than half its length, and as the northern end of the tunnel is only just below the surface for some distance, it is probable that the outcrop of the Kimeridge Clay extends some distance up this branch of valley, although hidden by surface accumulations.

There is also, probably, an inlier of this Clay running from Burdale to Thixendale; for, although the bed itself is entirely hidden by the gravel of the valley, it was proved by Mr. Mortimer, in the excavations in Fairy Dale and in other places (*see* p. 8); and it cannot be a great way below the surface, for the lower beds of Chalk extend along the main valley, and springs burst out at either end, while the red bands in the lower part of the Chalk are seen at Burdale.

The Kimeridge Clay also just comes to the edge of this Map in Millington Dale, and to the north of Warter, but there are no sections.

* Blake and Hudleston.—*Quart. Journ. Geol. Soc.*, vol. xxxiii., p. 380.

CHAPTER III.

CRETACEOUS ROCKS.

Lower Cretaceous Rocks (*Neocomian Beds*).—Professor Blake* mentions a small outlier of ferruginous grit of Lower Cretaceous age opposite to Wharram Station; unfortunately, we could not find a trace of this bed, but it is very probable that fragments of such rocks would be found in the hollows of the Kimeridge Clay, and lower formations, as at Kirkby Underdale,† if there were better exposures.

The Red Chalk.—In this Map we are approaching the original limit of deposition of this formation; and the Red Chalk, which is soft and marly in the east, gradually changes its character, becoming much thinner and harder towards the west, where it passes into a conglomerate containing large fragments of oolitic ironstone and other rocks. The so-called "Red Chalk" is not always red, but is sometimes of a yellowish tint.

The outcrop of the bed, which in a general way is not difficult to trace above the clays below, is, however, in some places very irregular, and appears to rest on a very uneven surface of the Kimeridge Clay, running up over hills in that formation in a curious manner. This is particularly observable at The Whams above Settrington Wood, where the base of the Chalk which crops out in the brow above the wood suddenly runs up over the summit of the hill just east of the Keeper's Lodge; and we have a narrow neck of clay connecting the main mass of Settrington Wood with that of Nine Spring Dale. The same thing occurs just west of the Keeper's Lodge, a narrow neck of clay apparently running across the hills from The Whams to Settrington Wood House. Thus the Chalk about here, which, from the general contour of the ground, would appear to be continuous, is in reality in the form of two outliers separated from the main mass by ridges marking old pre-cretaceous hills of Kimeridge Clay.‡ Further south the same peculiarity is repeated on both sides of the hill north of Wharram, and on either side of Wharram Grange, forming three outliers, although the Chalk at first sight appears to be continuous with the main mass to the east and south. Whether the outcrop of the Red Chalk itself is continuous round these outliers in all cases is not very clear. At Settrington

---

* *Proc. Geol. Assoc.*, vol. v., p. 245.

† Memoirs of the Geological Survey. Explanation of Quarter-Sheet 93, N.E., p. 25.

‡ Memoirs of the Geological Survey. Explanation of Quarter-Sheet 93, N.E., p. 27, and note. Also Blake, *Proc. Geol. Assoc.*, vol. v., p. 245.

Wood there is no evidence that it runs up over these necks; and from the close proximity of the flinty chalk in some places it would appear as if both the Red Chalk and the Grey Chalk above were deposited unconformably in these hollows between the banks of clay. This is, however, not the case at Wharram Grange, for we can trace the Red Chalk continuously across the fields from the escarpment on the west to the valley on the east, so that here at least the outcrop of this bed must bend up over the neck between these two valleys.

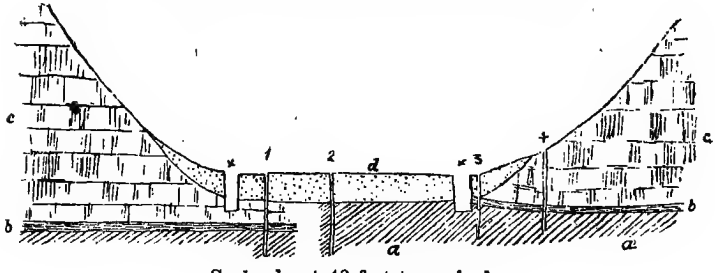
The irregularity of the base of the Chalk is also well shown in the valley along which the railway runs to Burdale Tunnel. On the west side of this valley, opposite Wharram Station, the Red Chalk crops out above the 450-ft. contour line, whereas on the other side it is at the bottom of the valley or at a level of about 400 feet, thus giving a fall of over 50 feet in about 200 yards. The same thing may be observed at the mouth of the tunnel, where the base of the Chalk falls 50 feet in about 100 yards. Mr. Mortimer, who has made some excavations in Fairy Dale, a little north of the southern end of the tunnel, has found the Red Chalk to be at a depth of 9 feet on one side of this valley and 17 feet on the other, the horizontal distance being about 67 feet, thus showing the irregularity of the surface of the clay upon which the Chalk rests.* When we get these sharp rolls in the base of the Chalk in crossing valleys, we need not be surprised at the ridges of clay separating the outliers mentioned above.

Fig. 1.

Section across Fairy Dale.

$\frac{2}{3}$ its length from the mouth.

(Copied from a drawing by Mr. J. R. Mortimer.)



Scale about 40 feet to an inch.

a. Kimeridge or Neocomian Clay.
b. Red Sandy Chalk, 2 feet thick.
c. Chalk.
d. Soil and Chalk Grit, 8 feet thick.
× Excavations 10 to 12 feet deep.
1, 2, 3, 4. Borings.

* Mr. J. R. Mortimer, of Driffield, to whom we are indebted for much valuable information, has made a great number of excavations across the Wold Dales with a view to discovering the shape and formation of these valleys. Figures 1, 3, 4, and 6 are from his drawings, which he has very kindly allowed us to reproduce. Mr. Mortimer has published these drawings in his paper "On the origin of the Chalk Dales of Yorkshire." *Proc. Yorksh. Geol. Soc.*, vol. ix., pl. 3.

The outcrop of the Red Chalk runs up the valleys east and south of Duggleby for some little distance. It was also found in the Burdale Tunnel, and was exposed by the excavations in Fairy Dale mentioned above, where it probably forms an inlier which may be continuous with that at Water Dale* although the bed itself is hidden by superficial gravel between these points.

Lower Chalk (*Grey Chalk, or Chalk-without-Flints*).—At the base of the Chalk, and immediately above the Red Chalk, which is stratigraphically nothing more than the basement bed of the Chalk,† there is a narrow band of grey marly Chalk with irregular pinkish bands in it; such coloured bands being never seen except below the Chalk-with-Flints.

These beds may be seen along the sides of Nine Spring Dale, near Wharram-le-Street, and in the old ballast pit at the side of the railway near Wharram Station, but they are seldom well exposed, owing to the amount of slipped ground which obscures the base of the Chalk.

At or near the top of the Lower Chalk there is often a black carbonaceous band, which is well seen in the Speeton Cliffs near high-water mark, and also at numerous places along the western escarpment of the Wolds.‡ Mr. Mortimer informs us that this band was formerly seen in the section near Wharram Station.

The Lower Chalk in this Map appears to be not nearly so thick as it is in the country to the north. On the northern edge of the Wolds there are over 100 feet of Chalk-without-Flints,§ but in this district the flints come down much nearer to the base of the formation, and in some cases there cannot be more than a quarter of this thickness, if so much. This is particularly noticeable about Settrington Wood and on the hill west of Wharram Grange, where quarries in the Flinty Chalk have been opened quite close to the base of the Chalk formation. At Settrington Wood this may be due to unconformity, but this can scarcely be the case in other places.

Middle Chalk, or White Chalk-with-Flints.—There is no good section showing the junction of the Lower and Middle Chalk within the area of this Map; but, as we have mentioned, at the foot of the Speeton Cliffs an excellent section is seen. In this section, of which we give a sketch below, the upper beds of the Lower Chalk are very irregular, and present the appearance of false and lenticular bedding, or even of having been crushed.

---

* Memoirs of the Geological Survey. Explanation of Quarter-Sheet, 93 N.E., p. 26.

† *See* W. Whitaker, On the Red Chalk of Norfolk.—*Proc. Norwich Geol. Soc.*, vol. i., p. 207, 1883, and *Geol. Mag.*, dec. ii., vol. x., p. 22.

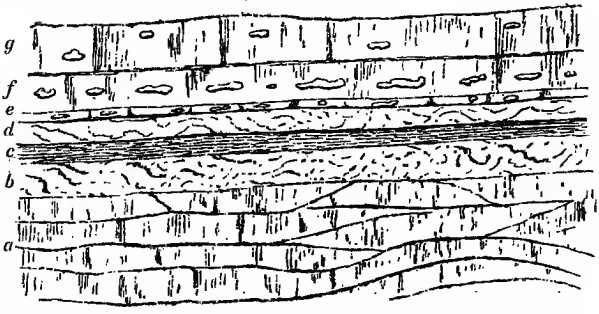
‡ These latter will be mentioned in the Explanation of 94 S.W. and 86.

§ *See* Memoirs of the Geological Survey. Explanation of Quarter-Sheet, 95 S.W., p. 25.

Over these irregular beds lie the perfectly even and regular beds of the Chalk-with-Flints with a sharp line of demarcation; and the contrast between the two is so great as to look like an unconformity. The under surface of the Middle Chalk is scored with slickensides.

Fig. 2.

Section showing junction of Lower and Middle Chalk, Buckton Cliffs, Speeton, near High-water Mark.



a. Chalk-without-Flints, apparently false-bedded.
b. Chalk much crushed and false-bedded with veins of chalcedony.
c. Band of dark coaly shale with plant remains in some places. This bed has been a good deal washed away by the sea, which has formed a long cavity.
d. Very hard Chalk; full of chalcedony; much crushed and striated on the under surface.
e. Thin bed with Flints. Very constant.
f. Chalk with very regular bed of Flints.
g. Regularly bedded Chalk-with-Flints.

It is noteworthy that both Dr. Barrois* and Mr. Jukes-Browne† consider that there is a distinct stratigraphical and palæontological break at the base of the Middle Chalk. The latter also says that in the zone of *Holaster subglobosus* which comes at the top of the Lower Chalk, "the planes of bedding are very indistinct, and the mass splits along curved lines, which produce an appearance of irregular and lenticular bedding."

In a quarry near Londesbrough in the Map to the south (94 S.W.), the base of the Middle Chalk is well defined by a peculiar thin band of closely jointed chalk similar to the band which Mr. Jukes-Browne has observed as constantly forming the base of the Middle Chalk in Lincolnshire, and about which he writes us as follows:—

"The basement bed of the White Chalk with Flints in Lincolnshire is a thin bed, about six inches thick, of hard chalk, closely and regularly jointed, so that a weathered face looks like a bed of columnar trap in miniature. The bed beneath it is always shaly, so that the contrast between horizontal and vertical lines is striking." Thus the base of the Middle Chalk is well defined.

---

* *See* Barrois, "Recherches sur le Terrain Crétacé Supérieur." Lille, 1876, p. 25.
† A. J. Jukes-Browne, "The Subdivisions of the Chalk."—*Geol. Mag.*, dec. ii. vol. vii., p. 248. 1880.

The Middle Chalk forms the highest part of the Yorkshire Wolds. The rock is hard and white, and contains flints, which are nearly always of a pale grey colour. They sometimes occur as nodules, either in lines or sporadic, and sometimes as tabular layers. They end abruptly downwards, but die out gradually upwards, so that the top of the Middle Chalk is not a well defined line, and the division shown on the Map is, consequently, merely approximate.

Upper Chalk.—This is a hard White Chalk without Flints. It forms the greater part of the Chalk area in the Map, and, of course, the whole of the eastern part of the Wolds.

The line drawn on the Map separating the Upper from the Middle Chalk is merely approximate, and is intended to show only in a general manner the division between these two.

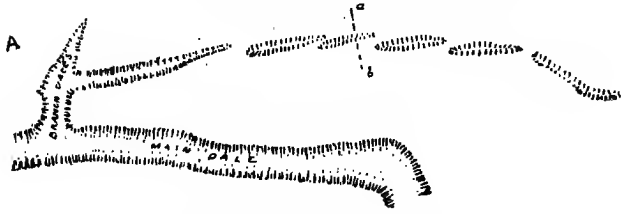
On the Wolds between Burdale and Wold Barn there is a long line of curious hollows, something like potholes; these are probably due to slipping of the ground or to subsidences caused by the removal of matter from below by water. The resulting hollows may have been enlarged by the dissolution of the surface by rain.

Mr. Mortimer writes:—"These hollows were filled (excepting some 4 feet of soily matter at the top) with small *un*waterworn Chalk gravel, mixed with various sized pieces of angular-formed Chalk, fallen probably from the sides of the rent. The removal of the débris from its south side to a depth of 14 feet, exposed the jagged and uneven appearance of the rocky side of the chasm or hollow."

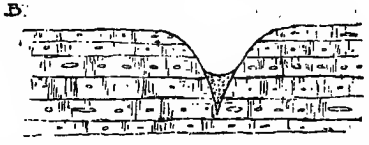
Fig. 3.

Chain of curious hollows on Raisthorpe Wold.
(Copied from a drawing by Mr. J. R. Mortimer.)

A.—Plan. Scale about 3 inches to a mile.



B.—Section along the line *a*, *b*.



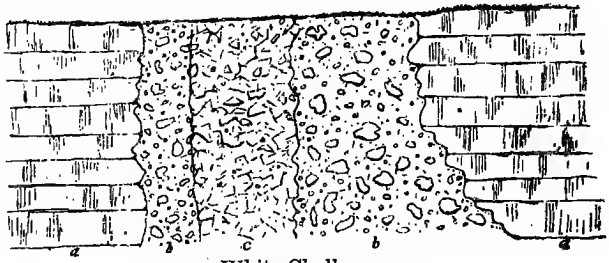
There is a remarkable stack of rocks, known as the Fairy Stones, on the Wold near the south end of Burdale Tunnel. It

consists of a mass of broken chalk and flints cemented together into a breccia. This mass of breccia is precisely similar to the breccias which may be seen on the Speeton Cliffs lining the sides of open joints or filling others. These breccias are obviously due to the reconsolidation by carbonate of lime of materials derived from the atmospheric waste of the cliff. Probably the Fairy Stones were formed in a similar way, and no doubt owe their great hardness to the large proportion of silica remaining after much of the chalk had been carried away in solution. Similar brecciated masses may be seen on other parts of the Wolds. Mr. Mortimer has made an excavation across one of these masses near High Towthorpe, and has kindly furnished us with the accompanying diagram.

Fig. 4.

Section of fissure near High Towthorpe.

(Copied from a drawing by Mr. J. R. Mortimer.)



a. White Chalk.
b. Loose Chalk Gravel.
c. Chalk Breccia.

Mr. Mortimer has made an excellent collection of fossils and antiquities from the Chalk Wolds, which are placed in his museum at Driffield. From this collection the following list was named by Mr. Jukes-Browne :—

* *Cardiaster excentricus*, from Burdale.
† *Galerites conicus*, from Beverley.
* „ *subglobosus*, from Hessle.
* *Holaster lævis* (var. *tricurvis*), from High Towthorpe.
† „ *pillula*, from Driffield.
* „ *planus*, from Acklam Wold and Uncleby Stoop.
† *Micraster cor-bovis*, from Wold House, Driffield.
* „ *cor-testudinarium*, from Etton cutting and elsewhere.
† *Inoceramus labiatus*, from Stonepit Wood, near Sledmere.
Ostrea vesicularis (var.) Plentiful at Speeton in a grey bed.

---

* From the Chalk with Flints.

† From the Upper Chalk without Flint. *Inoceramus labiatus* from near the base of this division.

Mr. Mortimer says that he has found *Terebratulina gracilis* in the railway cutting at Fimber. This will be also near the base of the Middle Chalk.

CHAPTER IV.

SUPERFICIAL DEPOSITS

Glacial and Post-Glacial Beds.—We put these two divisions together, because it is very difficult to say where one begins and the other ends. There appears to be no hard-and-fast line between them—one passing gradually into the other.

The lowest division is Boulder Clay, which occupies the greater part of the low ground, and the coast-section shows it to be generally the Purple Boulder Clay of Mr. S. V. Wood.* But though on the coast it is seen to consist of several divisions with bands of sand and gravel frequently intercalated, yet, for want of sections, it is quite impossible to recognize these sub-divisions in the interior.† A thin coating of Boulder Clay also covers the eastern slopes of the Wolds; nowhere reaching as high as 270 feet above the sea, and being more often limited to less than 200. This clay is of an earthy character, reddish in colour, and seldom containing many stones. It probably owes its colour mainly to its small thickness, and to having thus become weathered throughout; but the colour and the earthy character may be partly due to its having been mainly derived from the denudation of the Chalk. A good instance of the effect of weathering in changing a bluish into a reddish clay was seen at the Nafferton Brickyard. The Boulder Clay was here partly covered by sand, and a distinct line of demarcation between the blue and red colours ran down nearly vertically from the feather-edge of the sand across a homogeneous mass of clay.

There are no sections to show the relation of the Wold clay to that of the plains.

A puzzling mass of clay occurs in a wood on the Wold near Sledmere. It does not look like Boulder Clay; and, save a solitary drift-pebble here and there (we saw only one), it contains no other extraneous matter than small pieces of chalk scattered plentifully through it. It is dark in colour, and was once dug for brickmaking; but there is little to be seen now.

To the north of Thirkleby there is a considerable spread of a

---

* *Quart. Journ. Geol. Soc.*, vol. xxiv., p. 146.

† For a general description of this clay, as seen in the coast-section, *see* Memoirs of the Geological Survey. Explanation of Quarter-Sheet 94 N.E. The Glacial and Post-Glacial Beds east of the Chalk are much more fully described in the Geology of Holderness (Mem. Geol. Survey).

red sandy clay with angular fragments of chalk, which we at first thought to be Boulder Clay, but which is very likely merely the insoluble residue resulting from the decomposition of the Chalk.

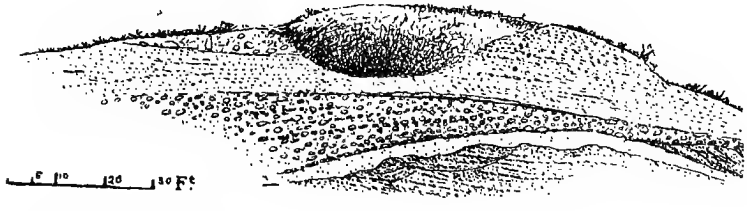
The Boulder Clay contains various beds of sand and gravel intercalated in it. Of these the most important are the undoubted marine sands, which occur in several places.

A line of singular steep, detached, sandhills, containing marine shells, ranges along the course of a small stream between Little Kelk and Lisset Bridge. A similar set of sandhills extends from Foston Mills by Brigham to Brandesburton (in the next Map), where also marine shells have been found.

Sand occurs also about Gransmoor; but it is uncertain whether this is of the same age, or not, as the Kelk sand. There is a seam of Boulder Clay, 5 feet thick, over the Kelk sand at Barf Hill, so that they are truly interglacial. We add a figure showing the section at Barf Hill.

Fig 5.

Gravel Pit at Barf Hill.



On the left-hand side we have at the top a bed of red Boulder Clay 5 feet thick. The Boulder Clay probably lies in a hollow denuded out of the underlying beds; but the section is obscure where this might have been seen. The Boulder Clay rests upon sand 10 feet thick, which thickens to 15 feet on the right, where it seems to limit the Boulder Clay. At the base of the Sand we have in one part a seam of clayey sand 1 foot thick. Below the Sand we have gravel, thinning from left to right from over 10 feet thick to 2 feet. At the right-hand end of the section the gravel consists of coarsish gravel, on fine false-bedded gravel, on coarser false-bedded gravel, on coarsish gravel; in all about 10 feet thick. The gravel rests on a stratum of sand with clay ranging from 2 feet 6 inches to 4 feet. This stratum lies in the form of an arch on an irregular surface of false-bedded sand containing marine shells. Of this sand a thickness of 15 feet was seen.

At Kilham a large mound of marine sand occurs in the dale. The sand contains seams of drifted coal, and marine shells were found in it by Mr. Clement Reid. It is, probably, of the same age as the Kelk, Brigham, and Brandesburton sands.

Craik Hill, near Kirkburn Grange, four miles from Driffield, is a mound of sand at the side of the valley. It is overlain by Boulder Clay, and probably belongs to the same set of interglacial beds as the Kelk sands.

The sand at Nafferton contains marine shells, and is probably of the same age.

In the sands mentioned above, the following shells have been found :—

At Kelk—

Balanus, Crania, Astarte borealis, Cardium edule, Cyprina islandica, Mactra ovata, Mya, sp., *Ostrea edulis, Pholas crispata, Tellina balthica, Venus, Purpura lapillus, Buccinum undatum, Dentalium,* sp.

At Kilham—

Cyprina islandica, Mytilus, sp., *Tellina balthica.*

At Nafferton—

Tellina balthica, Mytilus, sp., *Mya,* sp.

A curious curvilinear ridge of flinty gravel occurs at Skerne. It looks something like a beach-gravel. There is a small patch of chalky gravel on the Wold, at the watershed between Kilham and Rudstone. There is also a patch of sand on the Wold near Fimber, at a height of more than 400 feet above the sea. This is not quite so high as the gravel at Speeton Beacon, which is 454 feet above the sea.

A bed of chalky gravel lines the Wold edge from Harpham to Nafferton, interrupted however, by the valley between Harpham and Lowthorpe. It is continuous with, though probably older than, a similar gravel occupying the flat country between the railway and Cattle Holms.

Beds of similar chalky gravel, both intercalated in and overlying Boulder Clay, occupy the site of Driffield.* Chalky gravel fills the bottoms of the larger Wold-dales for a considerable, but uncertain, distance up the dales. Such is the gravel about Rudstone. The gravel at Kirkburn, and that between Bainton and Southburn, forms one spread with the gravel which extends from Driffield up the valley of the Gipsey. These valley-gravels are all derived from the Chalk area, and they occur like ordinary river-gravels, though they often exist where no stream now flows. Those in the Gipsey valley are to a large extent composed of flints, left behind while much of the soluble chalk was carried away.

Freshwater shells were found in similar chalky gravel by Mr. G. W. Lamplugh at Bridlington Quay, and by ourselves at Pocklington.†

The higher reaches of the larger Wold dales, and all the smaller dales, though often flat-bottomed, seem to be occupied merely by chalk detritus and rain-wash. Mr. Mortimer has made an excavation across the upper part of Fairy Dale, which shows very well how the sharp-pointed bottom of the dale is hidden by this kind of gravel so as to form at the surface the present flat-bottomed valley.

---

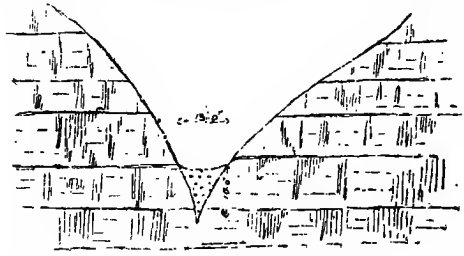
* Mr. Mortimer gives some sections in these beds.—*Proc. Yorkshire Geol. Soc.*, New Series, vol. vii., p. 373. Also *Quart. Journ. Geol. Soc.*, vol. xxxi., p. 111.

† See *Proc. Yorkshire Geol. Soc.*, New Series, vol. vii., p. 389. Also Memiors of the Geological Survey. Explanation of Quarter-Sheet, 93, N.E., p. 31.

Fig. 6.

Section across the top end of Fairy Dale, showing the sharp-pointed form of the Dale bottom.

(Copied from a drawing by Mr. J. R. Mortimer.)



The sides of many of the principal Wold dales are lined by a curious deposit, locally known as "gruts,"* to which the Rev. E. M. Cole, of Wetwang, particularly called our attention. These gruts are more like chalk detritus due to the action of the weather than anything else; but they are decidedly dirty. They have in places been dug to make mortar, as at Huggate. Here, however, they occupy a portion of the Chalk plateau, so that they are by no means confined to the dales, though more common there than elsewhere.

Freshwater shells were found in the Burton Agnes brickfield; we have, therefore, coloured that part as Alluvium. There may very well be other patches of freshwater clay that have escaped notice for want of sections. Possibly, too, some portions of the area coloured as Boulder Clay may consist of clay other than Boulder Clay, either intercalated in, or more recent than, that formation. Thus the clay at Cattle Holms is of a clean character. But the country does not afford sufficient evidence to allow of our working out all these minute details.

The very low ground along the larger streams is formed of ordinary silt and peaty soil known as Carr Land.

The following well-sections, kindly communicated to us by Mr. J. Villiers, of Beverley, will give some idea of the thickness of the superficial deposits:—

Well at Nafferton Station.

	Ft.
Very soft warp clay, about	13
White gravel, full of water	10
Chalk, very small, rotten stuff	25
Solid chalk	162

Well at Kelk.

	Ft.
Strong blue clay	60
White gravel	3
Chalk	—

* This word was originally written "grout," and applied to a mixture of infertile clay, sand, and gravel. *See* Marshall. *Review and Abstract of the County Reports of the Board of Agriculture*, vol. 1., p. 418. 1818.

Well at Gembling.

	Ft.
Strong red clay	10
Sand and gravel	6
Blue clay	56
Chalk	—

These well-sinkings show that at Kelk and Gembling the surface of the Chalk is below the level of the sea.

Holderness has, by artificial draining, been converted from Chaucer's "mershe countree" into a corn-growing district, though now and again in bad seasons farmers are found who think it had better have been left as a place in which to shoot wild ducks.

At the beginning of the century the Wolds were mere wastes of furze bushes. They are now enclosed, and grow corn and turnips; and, save along the dale-side, which is too steep to be ploughed, being at an inclination of 30°, little remains of the old aspect of the country.

CHAPTER V.

PHYSICAL STRUCTURE.

With the exception of the north-west corner, which really belongs to the district to the west, the area comprised within this Map consists of two portions, physically and geologically distinct, which are roughly parted from one another by the railway between Bridlington and Hull. The larger portion, lying to the north-west of the railway, consists almost entirely of Chalk, with a covering of glacial beds along its eastern margin; while in the extreme north-west corner of the Map, beds below the Chalk crop out. The smaller or eastern portion consists entirely of a low-lying flat, occupied throughout its whole extent by glacial and post-glacial beds; the solid rock nowhere occurring at the surface. This portion is practically a part, or rather an extension, of Holderness; for, strictly speaking, Holderness is the region watered by the River Hull. For this reason the village of Foston is called Foston-on-the-Wolds, though it stands on the low country, and at some distance from the Wolds. Therefore, as the whole country, from Bridlington to the Humber, comprised between the Chalk Wolds and the sea is physically and geologically one and the same, we may speak of it all as Holderness. It has already been described in the explanation of 94 N.E., and in the Memoir on Holderness by Mr. Clement Reid. Suffice it here to say that it is a low-lying country, nowhere within the limits of this map rising more than 70 feet above the sea. The drainage is naturally southward by the River Hull to the Humber (for the land rises towards the sea), but has been greatly altered and improved by dykes or artificial ditches running directly to the sea.

Along the western margin the Chalk Wolds rise rather sharply, thus forming a clear boundary to the flat. The railway runs along the edge of this flat just below the rise of the Chalk, while the road from Bridlington to Beverley runs for the most part just along the edge of the Chalk. Thus the villages and towns, Carnaby, Burton Agnes, Nafferton, Great Driffield, Hutton, and Cranswick, stand just on the Chalk. The eastern slope of the Wold is, however, covered with drift, though seldom to any great thickness, up to about the 200-ft. contour line. The rest of the Chalk area is entirely free from Boulder Clay, but there are some outlying patches of sand and gravel; and sporadic drift pebbles (which may be the relics of vanished gravel beds) are met with at a much higher elevation than that attained by the general covering of Boulder Clay. The Chalk Wolds form a range of

hills rising to about seven hundred feet above sea-level, intersected by many deep and narrow dales, nearly all of which are perfectly dry. In fact, the only dale which contains a stream throughout its entire length is the Great Wold Dale, in which flows the Gipsey Race. This stream rises at Wharram-le-Street, in the extreme west of the Chalk area, and, flowing through the whole extent of the Wolds, enters the sea at Bridlington Quay. It is subject to sudden "spates," like the bournes of the south of England. Such streams are here called "gipsey-races." These spates are not uncommon on the Wolds, and they even occur in dales which are generally dry, one having been known in the dale which runs from Langtoft to Kilham. At the latter place, however, water is found constantly; as also for about a mile above the village in the dale leading up to Broach Dale, so that below here the dale is always watered by a stream, although the greatest quantity of water bursts out of a powerful spring in the Chalk at Bracebridge, near the eastern edge of the Wold.

Springs also exist at Nafferton* at the Wold edge. A small stream flows through Great Driffield, and strong springs break out near the Wold edge at Emswell and Little Driffield, which are the chief sources of the river Hull.†

The lower part of the great valley up which the Malton and Driffield Railway runs is occupied by a gipsey, and a strong spring also issues from the Chalk at Kirkburn, near the Wold edge. Between Kirkburn and Southburn there is a beck, as well as below Bainton; but both this and the Southburn are probably mere surface streams, due to the covering of Boulder Clay, which there overlies the Chalk.

Lie of the Rocks, Faults, &c.—The dip of the Chalk is generally south-east at low angles; but, owing to numerous rolls and disturbances, the individual dips are often in other directions, so that they are not of much value in estimating the general inclination of the strata.

In the country to the north, we have noticed‡ that the Chalk is traversed by numerous lines of disturbance; and in this Map, judging both from the observed dips and from the run of the dividing line between the Middle and Upper Chalk, there seems to be a series of considerable folds between Fimber and North Dalton, the axes of which run approximately east and west. Owing to the want of distinctive beds, it is difficult to trace faults in the Chalk. A fault with a considerable disturbance of the beds, amounting to 40° of dip, was seen in a quarry south of Langtoft. There is also a sharp roll, with dips of 10° and 20°, near Driffield Wold House. A fault was also seen in a quarry

* The Rev. E. M. Cole, of Wetwang, thinks that Nafferton derives its name from its springs. *See* his "Scandinavian Place Names in Yorkshire."

† Mr. Mortimer has written on this subject, "The Chalk Water Supply of Yorkshire."—*Proc. Inst. Civ. Eng.*, vol. lv., p. 285; 1879.

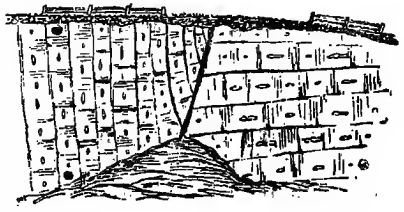
‡ Memoirs of the Geological Survey. Explanation of Quarter-Sheets 95 S.W. and 95 S.E., p. 38. For further account of the contortions in the Chalk, see *Proc. Yorksh. Geol. Soc.*, vol. ix., p. 43. 1886.

at the road-corner west of Wetwang. At Wharram-le-Street there is a very sharp dip of 80° in the Chalk, the beds striking north of north-west; but, curiously enough, this does not appear to affect the base of the formation, which is only a short distance lower down.

At Weaverthorpe, just beyond the limit of the Map, there is a very marked line of disturbance, and as the section here is particularly good, we give the following sketch :—

Fig. 7.

Fault in Chalk Pit, Weaverthorpe.



a. Chalk with Flints. Dip 85°.
b. Undulating Chalk with Flints.

The only fault of any importance, and which really affects the mapping, is the one in the north-west corner. This fault, which has a downthrow to the north, brings up the grits and limestone of the Middle Oolite against the Kimeridge Clay. The amount of throw must be considerable; but as the base of the Kimeridge Clay on the north side has not been proved, there is no means of estimating it exactly, although, judging from the general run of the beds, it will be between 200 and 300 feet. The general direction of the fault is east and west along Nine Spring Dale and the northern foot of Grimston Hill, which stands out boldly above the low ground of the Kimeridge Clay, making a very striking feature in the landscape. South of this line of fault the beds dip rapidly to the south, as much as 20° at Grimston Quarries, so that the Kimeridge Clay soon comes on again in its natural manner, although at a much lower level. The age of this dislocation is probably pre-cretaceous, as it does not appear to affect the Chalk in the least; although, from the latter part of its course being entirely in clay, it cannot be traced quite up to the foot of that formation.

There is also a small fault in the valley south of the quarries, but it does not call for particular notice; it has a downthrow to the south, and appears to shift the Cement Stone beds slightly. This fault is more important in the next map to the west, where it has a larger throw.* Faults traversing these beds are always

* Memoirs of the Geological Survey. Explanation of Quarter-Sheet 93 N.E., p. 36.

very uncertain on account of the unconformity of the formation and its very partial deposition.

The unconformity of the Kimeridge Clay to the beds below is very marked east of Grimston Hill, where it overlaps the Cement Stone and comes down directly on to the limestone.

The unconformity of the Chalk to the Kimeridge Clay has been noticed in the description of those strata.

INDEX.

LONDON: Printed by EYRE and SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.
[17275.—500.—12/86.]

GENERAL MEMOIRS OF THE GEOLOGICAL SURVEY—*continued.*

The WEALD (PARTS of the COUNTIES of KENT, SURREY, SUSSEX, and HANTS). By W. TOPLEY. 17*s.* 6*d.*
The TRIASSIC and PERMIAN ROCKS of the MIDLAND COUNTIES of ENGLAND. By E. HULL. 5*s.*
The FENLAND. By S. B. J. SKERTCHLY. 36*s.* 6*d.*
The MANUFACTURE of GUN FLINTS. By S. B. J. SKERTCHLY. 16*s.*
The SUPERFICIAL DEPOSITS of SOUTH-WEST LANCASHIRE. By C. E. DE RANCE. 10*s.* 6*d.*
The CARBONIFEROUS LIMESTONE, YOREDALE ROCKS and MILLSTONE GRIT of N. DERBYSHIRE. By A. H. GREEN, DR. C. LE NEVE FOSTER, and J. E. DAKYNS. (2nd Ed. in preparation.)
The BURNLEY COAL FIELD. By E. HULL, J. R. DAKYNS, R. H. TIDDEMAN, J. C. WARD, W. GUNN, and C. E. DE RANCE. 12*s.*
The YORKSHIRE COALFIELD. By A. H. GREEN, J. R. DAKYNS, J. C. WARD, C. FOX-STRANGWAYS, W. H. DALTON, R. RUSSELL, and T. V. HOLMES. 42*s.*
The EAST SOMERSET and BRISTOL COALFIELDS. By H. B. WOODWARD. 18*s.*
The SOUTH STAFFORDSHIRE COAL-FIELD. By J. B. JUKES. (3rd Edit.) (*Out of print.*) 3*s.* 6*d.*
The WARWICKSHIRE COAL-FIELD. By H. H. HOWELL. 1*s.* 6*d.*
The LEICESTERSHIRE COAL-FIELD. By EDWARD HULL. 3*s.*
ERUPTIVE ROCKS of BRENT TOR. By F. RUTLEY. 15*s.* 6*d.*
FELSITIC LAVAS of ENGLAND and WALES. By F. RUTLEY. 9*d.*
HOLDERNESS. By C. REID. 4*s.*
BRITISH ORGANIC REMAINS. DECADES I. to XIII., with 10 Plates each. Price 4*s.* 6*d.* each 4to; 2*s.* 6*d.* each 8vo.
MONOGRAPH I. On the Genus PTERYGOTUS. By T. H. HUXLEY, and J. W. SALTER. 7*s.*
MONOGRAPH II. On the Structure of the BELEMNITIDÆ. By T. H. HUXLEY. 2*s.* 6*d.*
MONOGRAPH III. On the CROCODILIAN REMAINS found in the ELGIN SANDSTONES. By T. H. HUXLEY. 14*s.* 6*d.*
MONOGRAPH IV. On the CHIMÆROID FISHES of the British Cretaceous Rocks. By E. T. NEWTON. 5*s.*
The VERTEBRATA of the FOREST BED SERIES of NORFOLK and SUFFOLK. By E. T. NEWTON. 7*s.* 6*d.*
CATALOGUE of SPECIMENS in the Museum of Practical Geology, illustrative of British Pottery and Porcelain. By Sir H. DE LA BECHE and TRENHAM REEKS. 155 Woodcuts. 2nd Ed. by T. REEKS and F. W. RUDLER. 1*s.* 6*d.*; 2*s.* in boards.
A DESCRIPTIVE GUIDE to the MUSEUM of PRACTICAL GEOLOGY, with Notices of the Geological Survey the School of Mines, and the Mining Record Office. By ROBERT HUNT and F. W. RUDLER. 8*d.* (3rd Ed.)
A DESCRIPTIVE CATALOGUE of the ROCK SPECIMENS in the MUSEUM of PRACTICAL GEOLOGY. By A. C. RAMSAY, H. W. BRISTOW, H. BAUERMAN, and A. GEIKIE. 1*s.* (3rd Edit.) (*Out of print.*) 4th Ed. in progress.
CATALOGUE of the FOSSILS in the MUSEUM of PRACTICAL GEOLOGY:
CAMBRIAN and SILURIAN, 2*s.* 6*d.*; CRETACEOUS, 2*s.* 9*d.*; TERTIARY and POST-TERTIARY, 1*s.* 8*d.*

SHEET MEMOIRS OF THE GEOLOGICAL SURVEY.

Those marked (O.P.) are Out of Print.

4 - FOLKESTONE and RYE. By F. DREW. 1*s.*
7 - PARTS of MIDDLESEX, &c. By W. WHITAKER. 2*s.* (O.P.)
10 - TERTIARY FLUVIO-MARINE FORMATION of the ISLE of WIGHT. By EDWARD FORBES. 5*s.*
10 - The ISLE OF WIGHT. By H. W. BRISTOW. 6*s.* (O.P.)
12 - S. BERKSHIRE and N. HAMPSHIRE. By H. W. BRISTOW and W. WHITAKER. 3*s.* (O.P.)
13 - PARTS of OXFORDSHIRE and BERKSHIRE. By E. HULL and W. WHITAKER. 3*s.* (O.P.)
34 - PARTS of WILTS. and GLOUCESTERSHIRE. By A. C. RAMSAY, W. T. AVELINE, and E. HULL. 8*d.*
44 - CHELTENHAM. By E. HULL. 2*s.* 6*d.*
45 - BANBURY, WOODSTOCK, and BUCKINGHAM. By A. H. GREEN. 2*s.*
45 SW - WOODSTOCK. By E. HULL. 1*s.*
47 - N.W. ESSEX & N.E. HERTS. By W. WHITAKER, W. H. PENNING, W. H. DALTON, & F. J. BENNETT. 3*s.* 6*d.*
48 SW - COLCHESTER. By W. H. DALTON. 1*s.* 6*d.*
48 SE - EASTERN END of ESSEX (WALTON NAZE and HARWICH). By W. WHITAKER. 9*d.*
48 NW, NE. IPSWICH, HADLEIGH, and FELIXSTOW. By W. WHITAKER, W. H. DALTON, and F. J. BENNETT. 2*s.*
49 S, 50 SE - ALDBOROUGH, &c. By W. H. DALTON. Edited, with additions, by W. WHITAKER. 1*s.*
50 SW - STOWMARKET. By W. WHITAKER, F. J. BENNETT, and J. H. BLAKE. 1*s.*
50 NW - DISS, EYE, &c. By F. J. BENNETT. 2*s.*
51 SW - CAMBRIDGE. By W. H. PENNING and A. J. JUKES-BROWNE. 4*s.* 6*d.*
51 SE - BURY ST. EDMUNDS and NEWMARKET. By F. J. BENNETT, J. H. BLAKE, and W. WHITAKER. 1*s.* 6*d.*
53 SE - PART of NORTHAMPTONSHIRE. By W. T. AVELINE and RICHARD TRENCH. 8*d.*
53 NE - PARTS of NORTHAMPTONSHIRE and WARWICKSHIRE. By W. T. AVELINE. 8*d.* (O.P.)
63 SE - PART of LEICESTERSHIRE. By W. TALBOT AVELINE, and H. H. HOWELL. 8*d.* (O.P.)
64 - RUTLAND, &c. By J. W. JUDD. 12*s.* 6*d.*
66 NE, SE - NORWICH. By H. B. WOODWARD. 7*s.*
66 SW - ATTLEBOROUGH. By F. J. BENNETT. 1*s.* 6*d.*
66 E - CROMER. By C. REID. 6*s.*
68 NW, SW. FAKENHAM, WELLS, &c. By H. B. WOODWARD. 2*s.*
70 - SW LINCOLNSHIRE, &c. By A. J. JUKES-BROWNE and W. H. DALTON. 4*s.*
71 NE - NOTTINGHAM. By W. T. AVELINE. (2nd Ed.) 1*s.*
79 NW - RHYL, ABERGELE, and COLWYN. By A. STRAHAN. (Notes by R. H. TIDDEMAN.) 1*s.* 6*d.*
80 NW - PRESCOT, LANCASHIRE. By E. HULL. (3rd Ed. With additions by A. STRAHAN.) 3*s.*
80 NE - ALTRINCHAM, CHESHIRE. By E. HULL. 8*d.* (O.P.)
80 SW - CHESTER. By A. STRAHAN. 2*s.*
81 NW, SW. STOCKPORT, MACCLESFIELD, CONGLETON, & LEEK. By E. HULL and A. H. GREEN. 4*s.*
82 SE - PARTS of NOTTINGHAMSHIRE and DERBYSHIRE. By W. T. AVELINE. (2nd Ed.) 6*d.*
82 NE - PARTS of NOTTINGHAMSHIRE, YORKSHIRE, and DERBYSHIRE. By W. T. AVELINE. 8*d.*
84 - EAST LINCOLNSHIRE. By A. J. JUKES-BROWNE.
87 NW - PARTS of NOTTS, YORKSHIRE, and DERBYSHIRE. (2nd Ed.) By W. T. AVELINE. 6*d.*
87 SW - BARNSLEY. By A. H. GREEN. 9*d.*
88 SW - OLDHAM. By E. HULL. 2*s.*
88 SE - PART of the YORKSHIRE COAL-FIELD. By A. H. GREEN, J. R. DAKYNS, and J. C. WARD. 1*s.*
88 NE - DEWSBURY, HUDDERSFIELD, and HALIFAX. By A. H. GREEN, J. R. DAKYNS, J. C. WARD, and R. RUSSELL. 6*d.*
89 SE - BOLTON, LANCASHIRE. By E. HULL. 2*s.*
89 SW - WIGAN. By EDWARD HULL (2nd Ed.) 1*s.* (O.P.)
90 SE - The COUNTRY between LIVERPOOL and SOUTHPORT. By C. E. DE RANCE. 3*d.* (O.P.)
90 NE - SOUTHPORT, LYTHAM, and SOUTH SHORE. By C. E. DE RANCE. 6*d.*
91 SW - The COUNTRY between BLACKPOOL and FLEETWOOD. By C. E. DE RANCE. 6*d.*
91 NW - SOUTHERN PART of the FURNESS DISTRICT in N. LANCASHIRE. By W. T. AVELINE. 6*d.*
92 SE - BRADFORD and SKIPTON. By J. R. DAKYNS, C. FOX-STRANGWAYS, R. RUSSELL, and W. H. DALTON. 6*d.*
98 NW - NORTH and EAST of HARROGATE. By C. FOX-STRANGWAYS. 6*d.*
98 NE - The COUNTRY between YORK and MALTON. By C. FOX-STRANGWAYS. 1*s.* 6*d.*
93 SW - CARBONIFEROUS ROCKS N. and E. of LEEDS, and the PERMIAN and TRIASSIC ROCKS about TADCASTER. By W. T. AVELINE, A. H. GREEN, J. R. DAKYNS, J. C. WARD, and R. RUSSELL. 6*d.* (O.P.)

SHEET MEMOIRS OF THE GEOLOGICAL SURVEY—*continued.*

93 SE, 94 SW The COUNTRY between YORK and HULL. By J. R. DAKYNS, C. FOX-STRANGWAYS, and A. G. CAMERON.
94 NW - - DRIFFIELD. By J. R. DAKYNS and C. FOX-STRANGWAYS.
94 NE - - BRIDLINGTON BAY. By J. R. DAKYNS and C. FOX-STRANGWAYS. 1*s.*
95 SW, SE - SCARBOROUGH and FLAMBOROUGH HEAD. By C. FOX-STRANGWAYS. 1*s.*
95 NW - WHITBY and SCARBOROUGH. By C. FOX-STRANGWAYS and G. BARROW. 1*s.* 6*d.*
96 SE - NEW MALTON, PICKERING, and HELMSLEY. By C. FOX-STRANGWAYS. 1*s.*
96 NE - - ESKDALE, ROSEDALE, &c. By C. FOX-STRANGWAYS, C. REID and G. BARROW. 1*s.* 6*d.*
96 NW, SW NORTHALLERTON and THIRSK. By C. FOX-STRANGWAYS, A. G. CAMERON, and G. BARROW. 1*s.* 6*d.*
98 SE - - KIRKBY LONSDALE and KENDAL. By W. T. AVELINE, T. MC K. HUGHES, and R. H. TIDDEMAN. 2*s.*
98 NE - - KENDAL, WINDERMERE, SEDBERGH, & TEBAY. By W. T. AVELINE & T. MC K. HUGHES. 6*d.* (O.P.)
101 SE - NORTHERN PART of the ENGLISH LAKE DISTRICT. By J. C. WARD. 9*s.*
104 SW, SE NORTH CLEVELAND. By G. BARROW.
108 SE - OTTERBURN and ELSDON. HUGH MILLER. (Notes by C. T. CLOUGH.)

THE MINERAL DISTRICTS OF ENGLAND AND WALES ARE ILLUSTRATED BY THE FOLLOWING PUBLISHED MAPS OF THE GEOLOGICAL SURVEY.

COAL-FIELDS OF ENGLAND AND WALES.

Scale, one inch to a mile.

Anglesey, 78 (SW).
Bristol and Somerset, 19, 35.
Coalbrook Dale, 61 (NE & SE).
Clee Hill, 53 (NE, NW).
Flintshire and Denbighshire, 74 (NE & SE), 79 (NE, SE).
Derby and Yorkshire, 71 (NW, NE & SE), 82 (NW & SW), 81 (NE), 87 (NE, SE), 88 (SE).
Forest of Dean, 43 (SE & SW).
Forest of Wyre, 61 (SE), 55 (NE).
Lancashire, 80 (NW), 81 (NW), 89, 88 (SW, NW).
Leicestershire, 71 (SW), 83 (NW).
Northumberland & Durham, 103, 105, 106 (SE), 109 (SW, SE).
N. Staffordshire, 72 (NW), 72 (SW), 73 (NE), 80 (SE), 81 (SW).
S. Staffordshire, 54 (NW), 82 (SW).
Shrewsbury, 60 (NE), 81 (NW & SW).
South Wales, 38, 37, 38, 40, 41, 42 (SE, SW).
Warwickshire, 62 (NE SE), 63 (NW SW), 54 (NE), 53 (NW).
Yorkshire, 88 (NE, SE), 87 (SW), 92 (SE), 93 (SW).

GEOLOGICAL MAPS.

Scale, six inches to a mile.

The Coal-fields and other mineral districts of the N. of England are published on a scale of six inches to a mile, at 4*s.* to 6*s.* each. MS. Coloured Copies of other six-inch maps, not intended for publication, are deposited for reference in the Geological Survey Office, 28, Jermyn Street, London.

Lancashire.

Sheet.	Sheet.	Sheet.
15. Ireleth.	73. Todmorden.	97. Oldham.
16. Ulverstone.	77. Chorley.	100. Knowsley.
17. Cartmel.	78. Bolton-le-Moors.	101. Billinge.
22. Aldingham.	79. Entwistle.	102. Leigh, Lowton.
47. Clitheroe.	80. Tottington.	103. Ashley, Eccles.
48. Colne.	81. Wardle.	104. Manchester, Salford.
49. Laneshaw Br.	84. Ormskirk.	
55. Whalley.	85. Standish.	105. Ashton-under-Lyne.
56. Haggate.	86. Adlington.	
57. Winewall.	87. Bolton-le-Moors.	108. Liverpool.
61. Preston.	88. Bury, Heywood.	107. Prescott.
62. Balderstone.	89. Rochdale, &c.	108. St. Helen's.
63. Accrington.	92. Bickerstaffe.	109. Winwick.
64. Burnley.	93. Wigan.	111. Cheedale.
65. Stiperden Moor.	94. West Houghton.	112. Stockport.
39. Layland.	95. Radcliffe.	113. Part of Liverpool.
70. Blackburn.	98. Middleton, Prestwich.	
71. Haslingden.		
72. Cliviger, Bacup.		

Durham.

1. Ryton.	6. Winlaton.	11. Ebchester.
2. Gateshead.	7. Washington.	12. Tantoby.
3. Jarrow.	8. Sunderland.	13. Chester-le-St.
4. S. Shields.	9. ———	16. Hunstanworth.
5. Greenside.	10. Edmondbyers.	17. Waskerley.

Durham—*continued.*

Sheet.	Sheet.	Sheet.
18. Muggleswick.	25. Wolsingham.	38. Maize Beck.
19. Lanchester.	28. Brancepeth.	41. Cockfield.
20. Hetton-le-Hole.	30. Benny Seat.	42. Bp. Auckland.
22. Wear Head.	32. White Kirkley.	46. Hawksley Hill Ho.
23. Eastgate.	33. Hamsterley.	52. Barnard Castle.
24. Stanhope.	34. Whitworth.	53. Winston.

Northumberland.

44. Rothbury.	80. Cramlington.	98. Walker.
45 Longframlington.	81. Earsdon.	101. Whitfield.
	82. NE. of Gilsland.	102. Allendale Town.
46. Broomhill.	83. Coadley Gate.	
47. Coquet Island.	87. Heddon.	103. Slaley.
54. Longhorsley.	88. Long Benton.	105. Newlands.
55. Ulgham.	89. Tynemouth.	108. Blackpool Br.
56. Druridge Bay.	91. Greenhead.	107. Allendale.
63. Netherwitton.	92. Haltwhistle.	108. Blanchland.
64. Morpeth.	93. Haydon Bridge.	109. Shotleyfield.
85. Newbiggin.	94. Hexham.	110. Wellhope.
72. Bedlington.	95. Corbridge.	111. Allenheads.
73. Blyth.	96. Horsley.	112.
	97. Newcastle.	

Cumberland.

55. Searness.	65. Dockraye.	74. Wastwater.
58. Skiddaw.	69. Buttermere.	75. Stonethwaite Fell.
63. Thackthwaite.	70. Grange.	
64. Keswick.	71. Helvellyn.	

Westmorland.

2. Tees Head.	12. Patterdale.	25. Grasmere.
6. Dufton Fell.	18. Near Grasmere.	33. Kendal.

Yorkshire.

7. Redcar.	116. Conistone Moor.	260. Honley.
9. ———	133. Kirkby Malham.	261. Kirkburton.
12. Bowes.		262. Darton.
13. Wycliffe.	184. Dale End.	263. Hemsworth.
20. Lythe.	185. Kildwick.	264. Campsall.
24. Kirkby Ravensworth.	200. Keighley.	272. Holmfirth.
	201. Bingley.	273. Penistone.
25. Aldborough.	202. Calverley.	274. Barnsley.
32. Whitby.	203. Seacroft.	275. Darfield.
33. ———	204. Aberford.	276. Brodsworth.
38. Marske.	215. Peeke Well.	281. Langsell.
39. Richmond.	216. Bradford.	282. Wortley.
46. ———	217. Calverley.	283. Wath upon Dearne.
47. Robin Hood's Bay.	218. Leeds.	284. Conisborough.
	219. Kippax.	287. Low Bradford.
53. Downholme.	231. Halifax.	288. Ecclesfield.
88. Leybourne.	232. Birstal.	289. Rotherham.
82. Kidstones.	233. East Ardsley.	290. Braithwell.
84. E. Witton.	234. Castleford.	293. Hallam Moors.
97. Foxup.	246. Huddersfield.	295. Handsworth.
98. Kirk Gill.	247. Dewsbury.	298. Laughton-en le-Morthen.
99. Haden Carr.	248. Wakefield.	
100. Lofthouse.	249. Pontefract.	299. ———
115. Arncliffe.	250. Darrington.	300. Harthill

MINERAL STATISTICS.

Embracing the produce of Coals, Metallic Ores, and other Minerals. By R. HUNT. From 1853 to 1857, inclusive, 1*s.* 6*d.* each. 1858, *Part I.*, 1*s.* 6*d.*; *Part II.*, 5*s.* 1859, 1*s.* 6*d.* 1860, 3*s.* 6*d.* 1861, 2*s.*; and Appendix, 1*s.* 1862, 2*s.* 6*d.* 1863, 2*s.* 6*d.* 1864, 2*s.* 1865, 2*s.* 6*d.* 1866 to 1881, 2*s.* each.
(These Statistics are now published by the *Home Office*, as parts of the *Reports of the Inspectors of Mines.*)

THE IRON ORES OF GREAT BRITAIN.

Part I. The North and North Midland Counties of England (*Out of print*). Part II. South Staffordshire. Price 1*s.* Part III. South Wales. Price 1*s.* 3*d.* Part IV. The Shropshire Coal-field and North Staffordshire. 1*s.* 3*d.*