The concealed coalfield of Yorkshire and Nottinghamshire

Gibson Walcot
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Author: Gibson Walcot

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THE CONCEALED COALFIELD OF
YORKSHIRE AND NOTTINGHAMSHIRE.

BY
WALCOT GIBSON, D.Sc.

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THE CONCEALED COALFIELD

OF

YORKSHIRE AND NOTTINGHAMSHIRE.

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WALCOT GIBSON, D.Sc.

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,, III.—Sections of Shafts and Borings to illustrate the Middle Coal Measures above the Top Hard (Barnsley) Coal.
CHAPTER 1.

GENERAL DESCRIPTION.

INTRODUCTION.

The area shown in the sketch-map (Plate 1) of the concealed part of the Yorkshire and Nottinghamshire Coalfield proved by the borings and shafts described in this memoir, amounts to about 1,200 square miles. It can be regarded as consisting of a northern portion—now generally known as the East Yorkshire Coalfield—situated between Doncaster and the river Ouse; and of a southern portion which extends over nearly the whole of the county of Nottingham. The districts in which boring explorations are most active are located chiefly in the trench-like valley of the Trent from Nottingham—where this important waterway becomes navigable—to its confluence with the Humber. Development by shaft-sinking as well as by boring is chiefly taking place in areas bordering the Don between Goole and Doncaster, the Aire east of Knottingley, and the Ouse below Selby. A large area, as yet almost untouched, lies west of the Trent between Newark and Gainsborough; south of the Trent the extension of the coalfield has been proved in several borings.

The chief centres of population are Nottingham, Newark, Mansfield, Retford, Gainsborough, Doncaster and Selby; and as the result of colliery development the population is rapidly increasing, not only by the influx of inhabitants into the older towns but by the creation of towns and villages near each newly opened pit.

The surface of the Nottinghamshire, Derbyshire, and Yorkshire coalfields rises in the east up to a bold escarpment of Permian limestone, which extends in unbroken continuity from the western outskirts of Nottingham city across the coalfields northward into the county of Durham. For many years it was thought that the coal-seams either did not continue east under the Permian limestone or that the general eastward dip of the strata would carry them to a depth too great for profitable mining. So late, indeed, as the middle of last century coal-mining was restricted to the region lying west of the Permian limestone. In 1854, the Duke of Newcastle commenced to sink two pits at Shireoaks, and early in 1859 the valuable Top Hard Coal was cut at a depth of 1,530 feet and proved to be 3 feet 10 inches in thickness. Development southward followed rapidly; and at the present day most of the chief collieries of Nottinghamshire are situated within the outcrop of the Permian limestone. In following the Top Hard Coal to the east, its eastward dip was found gradually to diminish. There seemed therefore every prospect of finding the seam at workable depths still further east beneath the red Triassic rocks which rest upon the Permian formation in this direction. Successful attempts were first made near Nottingham, thence to the north and to the east, thus gradually leading up to the most recent explorations.
GENERAL DESCRIPTION.

SHAPE OF THE GROUND.

In the southern region between Retford and Nottingham the general structure of the country takes the form of a low plateau dissected by the Trent and its tributaries. The ground rises a few feet above the 600-foot contour-line and thence declines gradually down to the alluvial flats bordering the Trent. North of Bawtry the ground slopes to the north and finally merges into an alluvial plain lying between 10-30 feet above sea-level. A few low hills, like those near Heck, and more conspicuously illustrated by the Isle of Axholme, rise here and there above the general level surface.

GEOLOGICAL SKETCH.

The visible part of the coalfield only constitutes the western edge of a basin, the remainder of which, with the exception of small parts of the northern and southern margins, is concealed beneath successive sheets of newer formations. Except for a limited distance in the south-west the margins of this concealed part have not been proved in any of the sinkings or borings; all, with two exceptions (Ruddington and Kelham), having failed to reach the base of the Coal Measures, which belong to the highest division of the Carboniferous System.

The following is a summary of the solid formations and their main divisions which either enter into the composition of the concealed coalfield (A) or form its cover (B):

<table>
<thead>
<tr>
<th>Coal-bearing (A.)</th>
<th>Non-coal-bearing (B.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhætic</td>
<td>Black and grey shales with nodular limestones.</td>
</tr>
<tr>
<td>Keuper Marl and Sandstones.</td>
<td>Red and variegated marls with thin flaggy sandstones and marl.</td>
</tr>
<tr>
<td>Bunter Pebble Beds and Sandstones.</td>
<td>Soft sandstones and sandrock with pebbles.</td>
</tr>
<tr>
<td>Upper Permian Marl</td>
<td>Red marls.</td>
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<tr>
<td>Upper Permian Limestone</td>
<td>Magnesian limestone.</td>
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<tr>
<td>Middle Permian Marl</td>
<td>Red marls.</td>
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<tr>
<td>Lower Permian Limestone and Basement Beds.</td>
<td>Magnesian limestone.</td>
</tr>
<tr>
<td>Upper Coal Measures</td>
<td>Red and grey sandstones and red marls.</td>
</tr>
<tr>
<td>Middle Coal Measures</td>
<td>Grey shales and sandstones with numerous coal-seams.</td>
</tr>
<tr>
<td>Lower Coal Measures</td>
<td>Grey sandstones and shales with a few coal-seams.</td>
</tr>
<tr>
<td>Millstone Grit</td>
<td>Massive sandstones and shales.</td>
</tr>
</tbody>
</table>

CARBONIFEROUS.—A thickness of about 4,000 feet of Coal Measures has been proved in the concealed area but the greatest thickness proved in a single shaft or boring amounts to 2,317 feet (Malthy Colliery). The highest measures have been pierced in two borings (Oxton, Thurgarton), the lowest only in borings at Ruddington and Kelham. All the other borings and shafts end in Middle Coal Measures.
The Lower and Middle Coal Measures consist of alternations of grey shales, sandstones, and coal-seams. In the Lower Coal Measures thick bedded sandstones predominate; in the Middle Coal Measures the sandstones are generally of a flaggy character. Though some workable coals occur in the Lower Coal Measures, the Middle Coal Measures contain the chief seams, one of which named the Top Hard Coal in Nottinghamshire and Barnsley Coal in Yorkshire, is, from its superior quality, the seam invariably sought after. The Upper Coal Measures do not possess workable seams and are composed chiefly of red sandstones and red marls.

The various beds were originally laid down in approximately level sheets and extended not only over the whole district but far beyond it. But whatever may have been their original extension the present outline of the coalfield has been determined by several and distinct operations taking place at different periods. Chief among these are the earth-movements which elevated the strata and at the same time buckled them up into a series of ridges (anticlines) and intervening depressions (synclines).

The rise of the measures towards the southern, western, and northern margins records the effect of this folding; while the fretted edges of the Carboniferous rocks around the margins and the planed down surface of the Coal Measures over the central part of the syncline resulted from denudation. Since the folding, tilting and denudation of the Carboniferous rocks was completed before the commencement of the Permian period the covering Mesozoic formations rest unconformably on their eroded and upturned edges.

As a result of the elevation the Carboniferous rocks were extensively pared down by the denudation, the erosion being most active over the ridges; while in the depressions the Coal Measures, which escaped destruction, form the present coalfield.

Permian.—On the nearly plane surface produced by the erosion of the Carboniferous rocks the Permian and Triassic deposits, which now cover the Coal Measures, were afterwards overspread.

The earliest of these newer deposits was the Magnesian Limestone, a formation of which the prominent member differs wholly in character and was laid down under very different conditions from the underlying Coal Measures. Where it reaches its full development in the district, the Magnesian Limestone consists of two beds of limestone separated and overlain by red marl. The greatest thickness of the formation proved in any one boring amounts to 622 feet (Thorne). The limestone contains much magnesium carbonate and with it were formed contemporaneously masses and beds of gypsum and anhydrite. In addition to these minerals the red marls contain rock salt in beds sometimes as much as 20 feet in thickness. Such minerals indicate that the Permian waters occupied a land-locked basin such as the present Caspian Sea, and unlike the estuaries and lagoons in which the sediments of the Coal Measures accumulated.

Trias.—In persistence and superficial extent the Trias is the predominant rock system of the district, and overspreads more
than two-thirds of the coalfield. The formation reaches a thickness of nearly 2,000 feet and is separable into two major divisions of different composition. The Lower or Bunter division consists mainly of sands, soft sandstones and pebbly beds; and the Upper or Keuper, mainly of red clays or marls with some subordinate sandy beds which are thickest and most persistently developed in the lower part. In Nottinghamshire, the sandstones in the lower part of the Keuper, sometimes called ‘Waterstones,’ are fine-textured even-beded rocks with an impersistent hard conglomerate from a few inches to 2 feet in thickness at the base, overlain by greyish-green shaly clay, 15 to 20 feet thick, passing up into red shaly clays, loams, and sandstones of the usual type. In Yorkshire these characteristic basal beds are absent and the Keuper Waterstones cease to be recognisable in borings, having either merged upwards into the Keuper Marl, or else the sandstones have assumed the Bunter type and so become inseparable from this division.

Towards their summit the red Keuper Marls pass up into pale green or greyish shales (Tea-green Marl) which generally form an outcrop clearly defined by the pale colour of the soil. They are also recognisable in borings at Owthorpe, South Scarle, and Scunthorpe.

Rhætic.—Above the Keuper, a thin series of deposits, termed Rhætic, consisting of black shales in the lower part, overlain by grey shales with nodules and layers of thin-beded limestones, are usually classed with the Trias. The black shales bear some resemblance to the carbonaceous shales of the Coal Measures but contain fossils which are quite distinct from any Carboniferous forms.

The borings at Owthorpe and South Scarle enter the Rhætic beneath a few feet of Liassic shales and limestone; elsewhere the concealed coalfield has so far not been proved further east than the outcrop of the Rhætic.

Superficial Deposits.—The Rhætic formation doubtless at one time overspread much of the area to the west of its present outcrop; but all traces of its former extension or of that of any newer Mesozoic strata have been removed by prolonged erosion. The superficial deposits all belong to comparatively recent periods. They occur in patches, and so far as is known attain importance only over the region north of Bawtry.

Of these superficial deposits the oldest are the Glacial drifts which, locally, as near Doncaster, reach a thickness of nearly 100 feet (Bentley Colliery); but are comparatively thin elsewhere. Their composition varies from a stiff clay filled with far-travelled stones (Balby) to a loose running sand containing much water and presenting considerable engineering difficulties in sinking shafts through it.

The most recent deposits of all are the gravels and alluvia associated with the existing valley-systems, and the warp clays and sands which cover the plains in south Yorkshire.