Mining in the Ingleton Coalfield

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A glance at the geological map of England shows a small area of coal measures in the north-west of Yorkshire, covering some 20 square miles around the villages of Ingleton and Burton-in-Lonsdale. The latter was once known as "Black Burton" owing to the collieries and potteries in the valley of the River Greta. The last mine closed over 20 years ago, but before that there was a long history of coal-mining on a small scale, very largely limited to some four square miles in the south-east of the coalfield. It is the purpose of this article to outline the growth and decline of the mining industry here, to examine the reasons for the limited area of mining and exploratory activity and, lastly, to look into the possibility of future mining.

In brief the geological succession is as follows:

- Boulder clay, gravels, etc., over almost the whole area.
- Permian Brecias.
- Red measures (Upper Coal Measures).
- Productive grey measures with two main workable coals.
- Unproductive grey measures.
- Millstone grit.

The beds are more or less synclinally disposed with the worked area on the south flank only (see general map, Fig. 1). The two chief coals are the Four Feet or Main Coal, and some 90 ft. lower the Six Feet or Deep Coal. A Yard Coal, only intermittently worked, underlies the Four Feet, and an 18 in. Crow Coal lies midway between the two main seams. Fireclays and ganister have been worked extensively in the past but none is worked now.

During the course of a geological study of the area the writer was able to collect together a variety of documents, from which it was possible to piece together a mining history. Papers seen included working and abandonment plans, sections of strata seen in shaft sinking, the records of a dozen exploratory boreholes, reports on output and opinions on prospects, and miscellaneous legal and administrative documents. Particularly interesting was a transcript of a personal memoir of an early nineteenth century coal mine owner.

G. J. Sergeantson, lessee of all the collieries in the coalfield, wrote a personal memoir about 1844, in which he recounted how he and his family had gained control of the collieries. From 1648 to 1736 a very complicated series of negotiations took place by which the collieries of the Ingleton and Bentham Moor Manors came by marriage into the Sergeantson family. Somewhat later in the eighteenth century another branch of the same family acquired a part interest in the collieries of Burton-in-Lonsdale Manor, although Thos. Hodgson was effectively in control. Much of the remainder of the memoir is concerned with the intermittent strife between the Sergeantsons holding the collieries on the Ingleton (south) side of the River Greta and Hodgson (and his apparently ineffective partner) holding the Burton collieries on the north. The River Greta was the manorial boundary, but owing to its crossing the outcrops of the two main coals no less than three times in a mile of its winding course, and its strong tendency to erode its banks, drainage problems were acute. Both in the eighteenth and in the early nineteenth centuries joint attempts were made to drive a drainage level from the mouth of Clifford Gill, half a mile to the west, to serve both groups of mines, but its failure, partly owing to mismanagement, only led to further strife. The agent was at one time sacked after workings had been driven up into the bed of the River Greta! A new agent "soon found it possible to reduce the wages of the workmen"!

Eventually, after Hodgson had become mentally deranged, Sergeantson managed to buy him and his partners out and thereafter all the collieries were under one management, from 1843 onwards.

Throughout the memoir the terms Ingleton and Burton collieries refer to all the mines in those manors, but a number of individual pits are mentioned by name and it is possible to gain some idea of the locations of coal workings during this period. The position of coal outcrops and pits near the river is shown in Fig. 2. Actual areas of workings here were not recorded but the indications are that little was left untouched. Farther east (see Fig. 3) Moorgarth pits were working in 1823 but had trouble with faults. A few years later
Moorgarth was considered exhausted but it was reopened much later. The Four Feet and Yard Coal were worked and also the Six Feet but to a lesser extent. Sinkings near Yorkieber about 1830, reached a coal up to 9 ft. thick at 43 yd. depth but this cannot definitely be identified. Near the river, coal was being worked on both banks near Faccon Farm, both Six Feet Coal and Crow Coal. In 1829 the Four Feet Coal was being worked on Enter Farm and a 40 h.p. pump engine was in use. There were also workings in Bleaberry Hill. A few years later a shaft was sunk at Winning Pit and an extensive area of Four Feet Coal was worked. The Burton Collieries at Barnoldswick and near Stephens Wood were in intermittent operation about 1837 and in the same year the short-lived Lancaster Mining Co. made trial sinkings in vain near Westhouse and on Newby Moor. Several other attempts were made around Westhouse but all to no avail and little information has survived. In 1842 the Wilson Wood Pit was sunk and reached the Six Feet Coal dry. Farther south-west a shallow pit, probably the Gin Mine, was sunk to the Four Feet Coal.

Thus, by about 1844, small mines extended along almost the whole outcrop from Burton to Moorgarth, most of them working coals at not more than 100 ft. to 200 ft. depth. To the south of these a line of old bell-pits marks the outcrops clearly, and it is possible some of these date back to monastic times. Most of the eighteenth and early nineteenth century mines were worked pillar

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Fig. 1.—"Solid" geological map of the Ingleton Coalfield, North-West Yorkshire.
and stall and there are frequent references to pillars being robbed back to the shafts. Actual production figures are available only for four years, for which Sergeantson's memoir quotes 16,000 tons per annum for 1835-8 from the Ingleton Collieries at an average price of 6s. 3d. per ton.

From the last notes in Sergeantson's memoir up to the 1880s the records are scanty but it appears that the Wilson Wood and Winning Pits were at least in intermittent operation, and that some mining was done near the river at Facocon and Bleaberry Hill, presumably to supply the potteries at Burton. The coming of the railways in the 1850s at first seems to have affected the collieries adversely by the bringing in of more easily won coal from the Yorkshire and Lancashire coalfields, but later, the rise of the shipyards and iron-works at Barrow-in-Furness caused a revival of interest in developing mining at Ingleton. Sometime during the 1870s J. Barker took over the lease of all the

WORKED AREAS
FOUR FEET COAL
INGLETON
WORKED AREAS
INGLETON SIX FEET COAL

Fig. 4.—Map of worked-out areas of the Six Feet coal, compiled from abandonment and old working plans

collieries and began a search for new areas of coal, particularly as the Winning Pit closed in 1876 and the Wilson Wood Pit in 1887. A number of consultant mining engineers were approached and some of their reports have been preserved.

Harper in 1873, Lishman in 1875, Atherton in 1885, and Ramsay in 1886, all suggested the development of pits to the north of the river at Barnoldswick—in spite of the failure of previous trials (of which they may have been ignorant) and the published note by J. Phillips, author of *The Geology of Yorkshire*, in 1836, regarding "Red Rock Cutting off the Coal." Atherton went so far as to draw up plans for branch railway lines (never constructed) from Bentham and Wennington to the river at Faccan, and for adit mines to be opened north of Faccan Farm. Two collapsed adit mouths can still be seen there but they could not have enjoyed more than a very limited success for geological reasons discussed below.

During the 1870s the Newfield and Grove Pits came into operation and Moorgarth Pit was reopened for a time. Grove Pit was worked until 1914 (sometimes known as Old Ingleton Colliery) but the others closed in the 1890s and things were at a low ebb towards the turn of the century—again partly owing to general mismanagement. Barker again called in consultants and Davis in 1889 reported that complete reorganisation was needed. Both he and Rhodes recommended the sinking of boreholes to prove new areas and from 1903 a number were sunk by Barker’s successors, Messrs. Pease & Partners. The first was sunk from the bottom of the Grove Pit shaft, apparently on a "hunch" by the foreman that the Six Feet Coal was the equivalent of the Barnsley Coal and thus the Parkgate and Silkstone Coals should be found lower down. Needless to say, they were not found! Two other unsuccessful boreholes were sunk in 1904-6 into the Millstone Grit series near High and Low Bentham. Both were 600 ft. deep but there does not seem to have been any good geological reason for their sites. It is just possible they were intended to prove the thin Chintsfield Coals in the Millstone Grit but, if so, both failed.

A borehole near Ingleton Station in 1905 was more successful and proved the Six Feet Coal in a new area although rather deeper than anticipated—at 1,170 ft. Some evidence of the presence of the Four Feet Coal was also obtained. Before proceeding with a new sinking, it was decided, apparently without geological advice, to prove the northwestern extension of the coals once and for all, by a deep boring near Holden House, roughly in the centre of the coalfield. By January 1908 this had reached 1,666 ft. with no coals! At this stage, with possible reserves encountered in only one boring out of five, a geologist was consulted. Prof. Lebour, of Newcastle, soon deduced that the Holden House boring had penetrated into the Millstone Grit Series and suggested the possibility of an unconformity below the Red Measures. A further boring was sunk between Holden House and Burton but it added little information and its exact location has since been lost.

Finally, in 1912, with the scanty evidence of a single borehole, a new shaft sinking was commenced close to the main road fork at the south end of Ingleton village. By early in 1914 this reached the Four Feet and Six Feet Coals at 700 ft. and 800 ft., respectively. Also, to everyone’s surprise, two coals 10 ft. and 9 ft. thick were found at about 400 ft. depth. The New Ingleton Colliery started production in 1914 and the old Grove Pit was
closed. A "model colliery village" was built close to the pithead and the future was rosy indeed with war-time demands on hand.

But by 1918, the two thick coals, Ten Feet and Nine Feet, had been worked out as they only occurred over a very limited area cut off by "washouts" and "faulty ground" on all sides, later shown to be an unconformity below the Red Measures. The Six Feet Coal was worked up to 1928 when it was temporarily abandoned, never to be re-opened. The workings in the latter then covered an area roughly one-quarter of a mile by one-third of a mile, bounded by faults on the north-east and old workings on the south but with a large area of unworked coal to the north-west. The Four Feet Coal was worked to some three-quarters of a mile from the shafts in this direction before being "cut off by Red Rock in wash-outs." The Yard Coal was worked intermittently by dinting from the Four Feet roads but was generally of somewhat inferior quality and roof control was difficult. Working ceased in 1935 when the red rock was encountered and a 60 yd. drift failed to penetrate it. The pillars were robbed back to the shaft and the pit was officially abandoned in 1940.

The reasons for the final closing of this, the last pit in the Ingleton Coalfield, are obscure as a large area of Six Feet Coal was left untouched below Four Feet Coal workings and a probable larger area still was never proved. Several reasons for the closing have been given to the writer by old miners, each denying the others' reasons. One claimed "the coal ran out," which is hardly true. Another said, in effect, that there was gross mismanagement. A further comment was extreme difficulty of roof and floor control. A lack of market and inability to compete with the larger coalfields may have had their effects. Probably there is an element of truth in all these claims.

All that remains now of the New Ingleton Colliery is an overgrown tip and the colliery village. The pithead buildings have gone and the yard is now a disused car dump. All the potteries have closed and mining in the Ingleton coalfield is dead, at least for the present.

Geological Structure

Until the writer's researches in 1950-54, no serious attempt had been made to elucidate the geological succession or structure of the coalfield. The exact age and thickness of the Coal Measures was unknown and the presence of an unconformity had been suggested only in an unpublished report. From a study of the exposures in the banks of the River Greta it became possible to piece together a reasonably complete succession through the whole of the Coal Measures. This was the key to the interpretation of the mining and borehole records, and they in turn could then fill in some of the gaps in the story determined from surface exposures. This succession is detailed in Fig. 5.

Briefly, the upper parts of the Millstone Grit and the lower unproductive Grey Measures are similar to but considerably thinner than the equivalent beds of the Yorkshire-Lancashire borders around Burnley and Halifax. Mussel bands of the Lensisulcata and Communis zones have been found. Workable coals are absent though ganisters and fireclays have been mined in the past. The productive Grey Measures with their workable coals are in the lower part of the Modiolaris zone of the Middle Coal Measures. The Similis-pulchra zone is absent, and the Red Measures have yielded mussels and plants indicative of the Phillipisi and Tenus zones of the Upper Coal Measures. In the south-eastern part of the coalfield the latter rest unconformably on the productive Grey Measures and cut down to rest on lower horizons westwards—on unproductive Grey Measures below the Six Feet Coal near Burton and on beds just above the Ganister Marine Band equivalent (Gastrioceras listeri) in the Holden House borehole.

Thus the known workable coals are confined by the unconformity to the south-eastern part of the coalfield, an area of about four square miles, and any attempts to find them in the centre was doomed to failure. The areas of known workings in the Four Feet and Six Feet Coals are shown in Figs. 3 and 4.

However, in the extreme north, in Leck Beck,
Red Measures are seen with southerly dips of 30 deg. or more, resting with apparent unconformity on Grey Measures stained red to varying degree but yielding mussels indicative of the upper part of the Modiolaris zone. Thus the unconformity appears to rise again north of the Holden House borehole, and a concealed area of workable coals may exist beneath Leck Beck.

The overall structural picture which emerges is that the Grey Measures were folded into an anticline with an east-west axis and eroded before the Red Measures were laid down, or that there was considerable pre-Red Measure faulting producing similar effects. Post coal measure folding and faulting, particularly the shearing movements of the Craven faults, have produced, in effect, a synclinal basin cut off by the latter faults on the north-east.

The Red Measures are divided into an upper and a lower division as shown in Fig. 5, but their relationship to each other is obscured by the Hollintree fault, which runs parallel to and is probably a part of the Craven fault system. The lower Red Measures are the important cover of the workable coals in the greater part of the worked area and their thickness is not usually more than 300 ft. to 400 ft. Their unconformable base is clearly irregular in the vicinity of Barnoldswick, and a similar irregularity nearer Ingleton could easily explain the failure of the Ten Feet and Nine Feet Coals to outcrop.

To the south-east of Ingleton village upper Red Measures appear to be faulted against productive measures around Yarlside, but the available evidence is inconclusive as to detail.

The Permian Breccias rest unconformably on both upper and lower Red Measures entirely outside the area of known workable coals.

A more detailed account of the stratigraphy and structure may be found in the Quarterly Journal of the Geological Society, Volume CX, pp. 231-266, 1954. (from which we reproduce our Figs. 1, 2 and 3).

Future Prospects

Some small areas of coal remain reasonably well proven but untouched. An area of Six Feet Coal, roughly one mile long and averaging one-quarter of a mile wide, lying in a strip running from north-east to south-west under the River Greta between Ingleton and Barnoldswick, occurs north-west of known workings and astride the old manorial boundary. It is limited on the north-east by the unconformable Red Measures. A more limited area of Four Feet and Yard Coals may be expected above the Six Feet Coal but again bounded on the north-west by the unconformity. Depths to these coals would be of the order of 300 ft. to 800 ft., and a drift mine could have a useful working life, particularly if it were sited so as to take in some part of the unnamed coals up to 3 ft. in thickness encountered in the sinking of the New Ingleton shaft above the Four Feet Coal. None of these outcrops and none has been worked.

South-east of Ingleton village an area of about square mile between the railway at Moorgarth and the South Craven fault had a few scattered early nineteenth century mines, but it is not known which coals were worked or to what extent. Reading between the lines in Sergeantson's memoir it is possible that the Four Feet and Six Feet coals and possibly also the Ten Feet and Nine Feet coals outcrop in heavily faulted ground with fairly steep dips. A few shallow boreholes might easily prove small areas of untouched coal. Opencast mining might be possible here and also along the known outcrop between Moorgarth and the River Greta, although old bell-pits may be common.

A further possible area for investigation is in Leck Beck at the northern end of the coalfield, where Grey Measures high in the Modiolaris zone are exposed between the Craven fault and the unconformity below the Red Measures, generally with steep southerly dips. Although there is no direct evidence in this drift-covered country it is probable that the lower part of the Modiolaris zone with its workable coals underlies the exposed beds. A reasonable guess is the depth to the coals would be 1,000 ft. but taking an optimistic view of available evidence they could not be expected to cover more than about one square mile, and they would have steep dips and frequent faults. A single deep borehole, suitably sited, could test this area.

Although outside the Ingleton coalfield, it is felt that another small and related area could be considered if any development should take place at Ingleton. Some six miles south-east of Ingleton is a heavily drift-covered area around Austwick. While the northern part of this is almost certainly underlain by limestone, the southern part, some two square miles, may well be Coal Measures completely concealed by boulder clay. Recent studies of the Millstone Grit Series have shown that the upper beds of the Millstone Grit dip under this hollow and taking a very optimistic view there is room for up to 1,000 ft. of Coal Measures. One or two shallow borings could test this area.

To sum up, mining prospects in the Ingleton coalfield are not good, but, on the basis of the above discussion, some areas can be pin-pointed for a future boring programme, and the mining history of Ingleton may yet have further chapters added to it.

Incorporated Plant Engineers.—Mr. G. D. Jordan, M.Eng., A.M.I.Mech.E., A.M.I.Plant.E., senior engineer, operational research and cybernetics department, the United Steel Co. Ltd., and a member of the Institution's Council, will present a paper on "Operational Research and the Plant Engineer," to a general meeting of Incorporated Plant Engineers at the Royal Society of Arts, John Adam Street, Adelphi, Strand, on Tuesday, November 4, at 7 p.m. This is the first of a programme of three special lectures, open to non-members, which have been arranged for the current session.