

THE COAL INDUSTRY IN PEMBROKESHIRE

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INTRODUCTION

THE coal bearing rocks ("Coal Measures") of Pembrokeshire occupy the surface of the ground over a narrow strip of country extending from Carmarthen Bay in the east to St. Bride's Bay in the west (Fig. 1). Near Carmarthen Bay this strip of country is about four miles wide. It narrows westward, and at St. Bride's Bay assumes a northerly trend along the coast, to end at the flank of the St. David's peninsula. The Coal Measures continue westward to form the sea floor in part of St. Bride's Bay and eastward across Carmarthen Bay. Farther still to the east they widen out to about 15 miles and continue across Glamorgan into Monmouthshire, the area of the main South Wales Coalfield (Fig. 2). The Coal Measures occupy the heart of a large syncline. The syncline is complicated in its detailed structure but it preserves the Coal Measures between roughly parallel outcrops of older strata. The Measures have no rocks of younger age above them, and owing to their position in the syncline they do not extend laterally underground beyond the area of their surface outcrop. The boundaries of this outcrop, as shown on any geological map, are therefore the boundaries of the workable coalfield.

All parts of the Coal Measures in Pembrokeshire have at various times been worked for coal, but west of Johnston there has been only surface mining on a small scale and no exploitation of the lower seams by deep shafts. In contrast, to the east of Johnston for a distance of fifteen miles to the shores of Carmarthen Bay, the outcrop has been heavily worked and was at one time the seat of a considerable coal industry. This mining district to the east of Johnston has been named the Daucleddau Coalfield (Fig. 3). The rise and decline of its coal mining and allied industries is the main subject of this paper.

In the South Wales Coalfield several varieties of coal are present. In West Glamorgan, Carmarthen and Pembrokeshire to the west the product is anthracite. It is of high quality, having a carbon content of 93 to nearly 96 per cent., with as little as 1 per cent. of ash. It has been exploited at least since the beginning of the fourteenth century. The quality of the coal and the facility of transport by sea led to expansion of the trade, so that by 1800, despite the small extent of the coal deposits, Pembrokeshire coal mining had attained prominence. The coal was at that time shipped to many parts of England and Wales and to several European countries. Later Pembrokeshire mining was overshadowed by that of the main South Wales Coalfield, where new methods of pumping, hauling and ventilation were more easily introduced. However, deeper mining was undertaken in Pembrokeshire, but even then the largest of its collieries were only of medium size as compared with those which developed in Glamorgan. Great industrial centres like those in the Merthyr area and the Swansea valley were never established in Pembrokeshire, so that coal mining remained rural in character. Its decline in relative importance

PEMBROKESHIRE

GENERALISED GEOLOGY

LEGEND

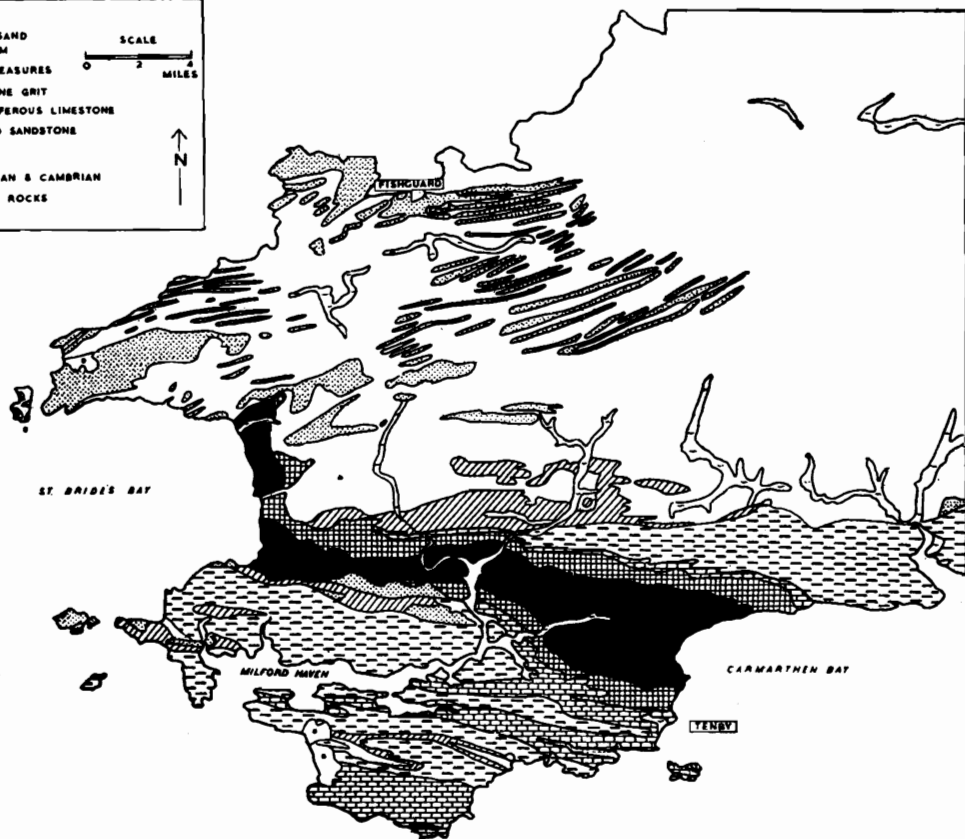
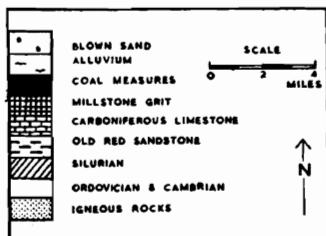


FIG. 1

Pembrokeshire, generalized geology

THE DAUCLEDDAU COALFIELD IN RELATION
TO THE SOUTH WALES COALFIELD

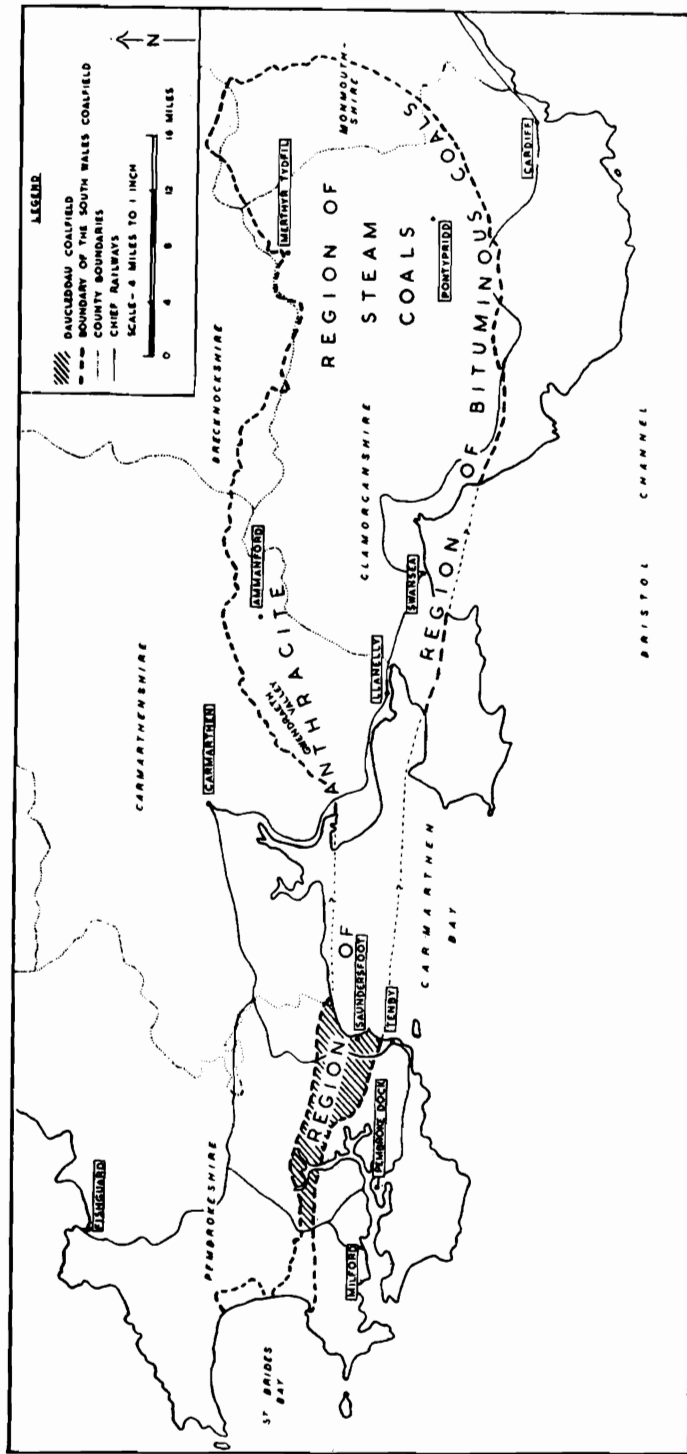


FIG. 2
The Dauceddau Coalfield in relation to the South Wales Coalfield

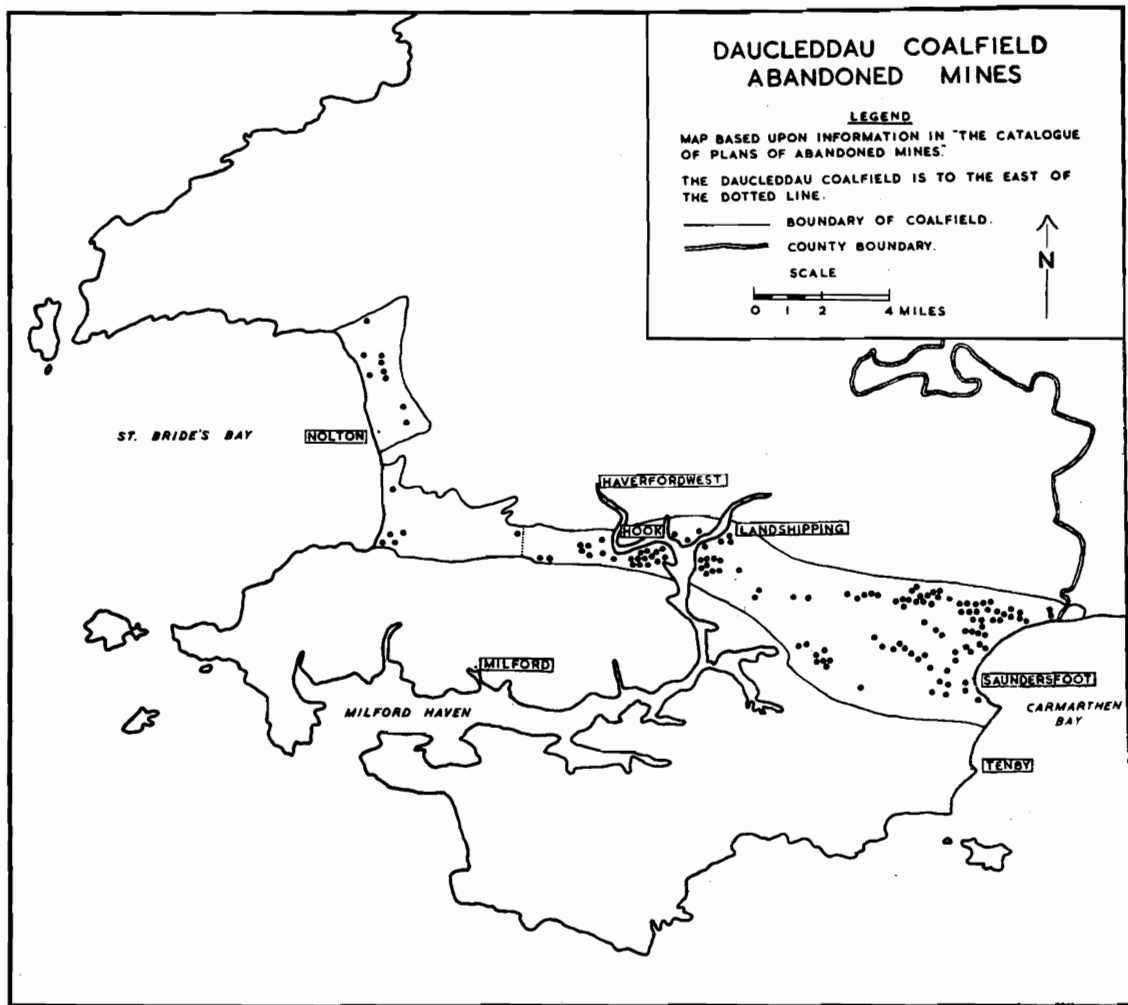


FIG. 3

Dauceddau Coalfield: abandoned mines

began in the nineteenth century and was more rapid after 1900, when one colliery after another was abandoned. The output of coal continued to drop until the nationalisation of the industry in 1947, after which the last remaining colliery closed down.

GEOLOGICAL CONSIDERATIONS

Wherever the rocks of Pembrokeshire are seen in section along the coastal cliffs and elsewhere it is evident that the strata, originally horizontal, have been greatly folded and disrupted, so much so that the original sequence of the layers has been difficult to establish. The folding and close compression of these rocks appears to have taken place at one or other of two periods. The first was that of the Caledonian earth movements before the Carboniferous rocks were laid down. During this period the older Palaeozoic rocks were thrown into folds, compressed and lifted to form a high mountainous tract across what is now Central Wales and the southern part of the Irish Sea. The axes of the principal folds trend north-east to south-west, but as they come down into Carmarthenshire and Pembrokeshire they assume a more westerly alignment.

The second period of intense folding and uplift was that of the Hercynian or Armorican earth movements after the end of Carboniferous times. At this period the Carboniferous rocks of Pembrokeshire and the rest of South Wales, as well as the older rocks on which they rested, were thrown into folds whose trend was approximately east-west. The structures are very complex and include folds, overthrusts and innumerable faults.

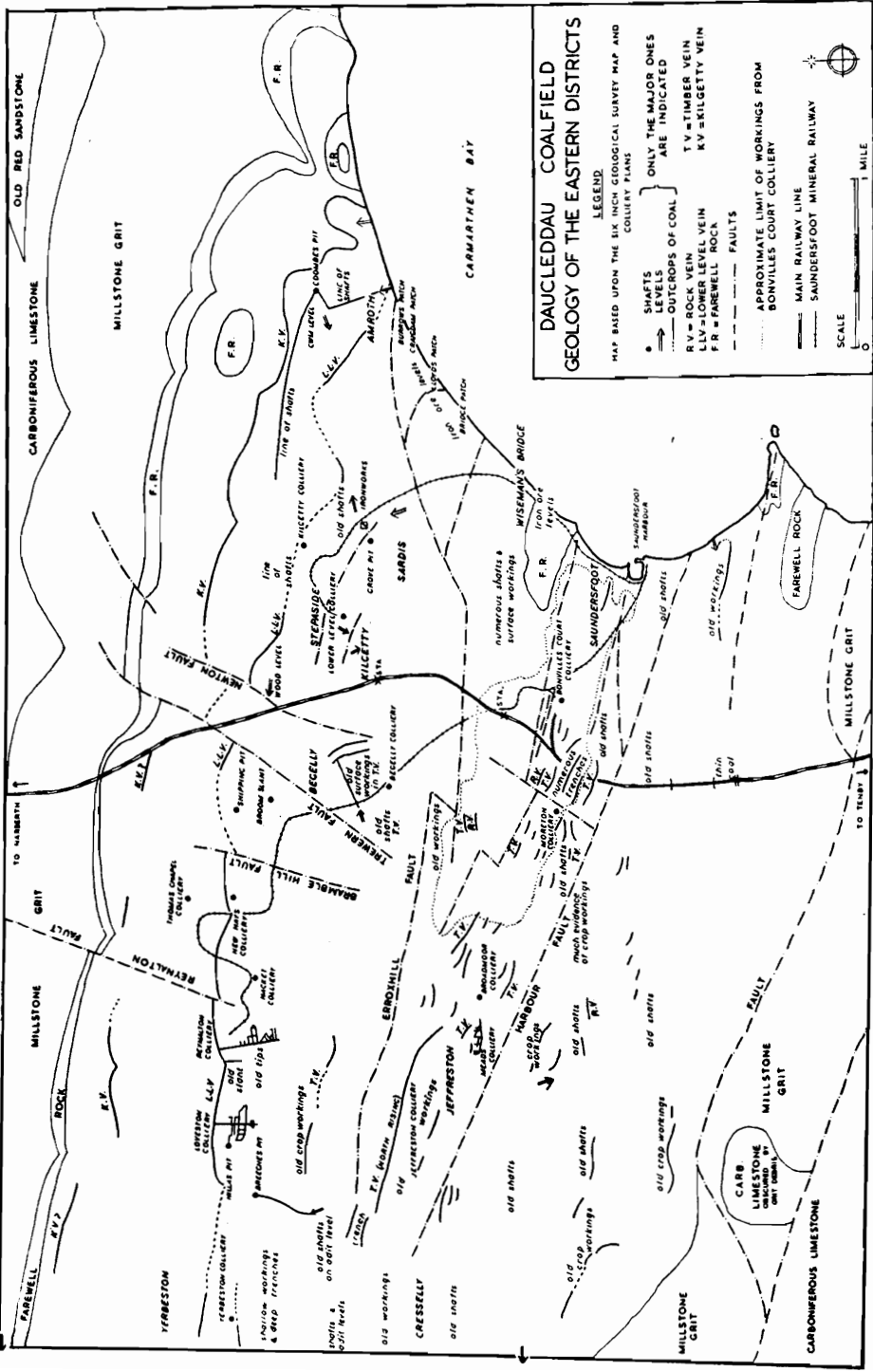
The overthrusts from the south associated with the Armorican earth movements greatly affected the Coal Measures of the Dauceddau Coalfield. The coal seams are irregular, heavily faulted and often at high angles of dip. This is well seen in the central part of the coalfield between Saundersfoot and Jeffreston, the section which is the nearest approach to an axis in the much deformed Carboniferous syncline.

Under part of this ground the lower seams were worked at a depth of about 150 yards. Few of the great number of folds and thrusts observable on the surface exist at that depth, where only the main faults which define the principal belts of the coalfield are recognized. The intense pressure of the overthrusts frequently shattered the higher seams in the series, reducing the coal to small fragments ("culm").

The main faults in the eastern district, which divide it into distinct belts, are the Erroxbill and Harbour faults (Fig. 4). There are others of local importance. In the Landshipping district the Old Mill fault divides the section into two contrasting parts. North of it the coal is little disturbed and the higher seams especially have been worked. South of the fault there has been much disturbance and there has been far less exploitation. The Hook-Freystrop district, west of the Dauceddau, is also divided into narrow belts by faults ranging generally in an east-west direction. The faults known as Slide, Coffin and Amen are the most important.

Of the subdivisions of the Coal Measures it is probable that only the lower half of the Lower Coal Series has been preserved in Eastern Pembrokeshire.

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DAUCLEDDAU COALFIELD GEOLOGY OF THE EASTERN DISTRICTS

MAP BASED UPON THE SIX INCH GEOLOGICAL SURVEY MAP AND COLLIERY PLANS

LEGEND

- SHAFTS
- LEVELS
- OUTCROPS OF COAL
- RV = ROCK VEIN
- LLV = LOWER LEVEL VEIN
- FR = FAREWELL ROCK
- FAULTS
- APPROXIMATE LIMIT OF WORKINGS FROM BONVILLE'S COURT COLLIERY
- MAIN RAILWAY LINE
- SAUNDERSFOOT MINERAL RAILWAY

ONLY THE MAJOR ONES ARE INDICATED

TV = TIMBER VEIN
KV = KILGETTY VEIN

SCALE 0 1 MILE

FIG. 4
Dauceddau Coalfield: geology of the eastern districts

In the Saundersfoot area a total thickness of 453 yards of the Coal Measures is present. Most of the coal it has yielded came from veins designated Rock, Timber, Lower Level and Kilgetty (Fig. 4). Of these the first two have been worked extensively along the central part of the coalfield and in the Begelly area. The Lower Level and Kilgetty veins, each less than 2 feet thick, range from Stepaside to Loveston in the northern part of the area.

In the Landshipping district (Fig. 5) the Rock and Slate veins were worked on the north side of the Old Mill fault. At Hook, the Timber seam with an average thickness of 8 feet was the main source of coal. Its outcrop can be traced almost continuously along the steep slope which overlooks the Western Cleddau.

GEOGRAPHICAL SETTING OF THE PEMBROKESHIRE COALFIELD

The intricate pattern of rock outcrops over the surface of Pembrokeshire stands in remarkable contrast to the relatively simple relief of the land. There are two main regions of relief, the hilly tract to the north dominated by Mynydd Preseli (Preseli Hills) and a broad lower-lying plateau which forms the greater part of the country to the south. The Preseli upland, with summits well over 1000 feet altitude, is essentially part of mountain Wales. Most of the plateau lies between 150 feet and 450 feet altitude and has almost imperceptible slopes. It is, however, considerably dissected by streams occupying steep-sided valleys, and along the coasts it ends abruptly in high cliffs. The plateau surface truncates the rocks of the lowland region with little regard to their structural arrangement and relative resistance to erosion. Only to the south of a line through Tenby and along the shore of Milford Haven is there any marked development of valleys and ridges following the trend of the structural folds.

The Eastern and Western Cleddau rivers, which with their tributaries dissect a large area of the plateau in central Pembrokeshire, unite at a point between Hook and Landshipping, whence their waters flow southward as the Daucleddau river to the head of Milford Haven. Most of the coalfield is drained by the tributaries of the Daucleddau. One of these, the Cresswell river, rises within two miles of the coast at Saundersfoot.

The Pembrokeshire coastline is long, irregular and deeply indented. Its formidable cliffs are relieved at close intervals by sandy havens or deeply cut estuaries which give ready access from the sea to all parts of the rural hinterland. Few parts of the British coast have so many harbours suitable for maritime trade. Most important of all is the long inlet of Milford Haven which, with its tributary valleys, brings tidal and navigable water far into the heart of southern Pembrokeshire. Sea transport was vital to the coal trade, particularly at the time when most cargo vessels were small and capable of navigating small channels and occupying restricted berths. The influence of maritime transport is shown by the concentration of collieries close to the Daucleddau river and near the shores of Carmarthen Bay (Fig. 3).

Fig. 6 shows the chief loading points for coal in relation to the colliery centres. With the advent of large vessels the importance of the Haven declined, though adjustments were made in the method of loading. At Hook Quay,

for example, the berths, dry at low tide, had 16 feet of water at neap tides and 26 feet at springs. This condition was unsuitable for large vessels so when these came into service they had to be loaded at Llangwm Pool, two miles downstream, from barges of 60 to 100 tons which brought the coal from Hook Quay. The whole operation often took as long as three weeks. Similarly, coal from the Cresswell area had to be reloaded into larger vessels at Lawrenny. These difficulties hastened the decline of the coal trade. Coal was rarely taken from Cresswell Quay after 1850, but surprisingly enough Hook Quay continued in use to some extent as late as 1936. At the eastern end of the coalfield before the construction of Saundersfoot Harbour in 1829 ships were loaded at low tide from the sandy shores.

Apart from the incidence of outcrops and access to shipping points the siting of collieries was not greatly influenced by geographical factors. Workings were started on hills and in valleys wherever coal in large or small quantity could be won. The greatest concentration of old shafts, surface workings and tips is along the central portion of the Coal Measures belt (Figs. 4 and 5). It would appear that some workings were started without capital in places where the immediate yield of coal would pay the day-to-day expenses. Many such enterprises were abandoned as soon as difficulty of extraction was encountered. Some sites were doubtless re-opened more than once as mining technique advanced, or when capital became available for initiating non-productive preparatory works. Generally lack of capital held back the exploitation of coal in Pembrokeshire, especially when faced with competition in the South Wales coalfield where, amongst other things, rail transport had come to the aid of all the enterprises.

EARLY REFERENCES

The accounts of the Earldom of Pembroke (Owen, 1918) make reference to coal in the neighbourhood of Coytrath (modern Saundersfoot) between 1324 and 1331:

"also a mine of sea-coal paying a yearly rent of 16/4."

"150 bushels of coal, bought for making lime, 6/3d., i.e. $\frac{1}{2}$ d. per bushel".

Another entry refers to the type of lease in Pembrokeshire. In 1529 a lease was granted to:

"William ap David Williams, of all the coal mines whatsoever lying within our view of Cordrathe Co. Pembroke, which are now in decay and which used to be arrented at 53/4 yearly, with leave to dig, erect and reconstruct at the said mine at his pleasure, paying a yearly rent of 46/8 to the King's Exchequer at Pembroke".

These and other records suggest that before 1550 the coal industry was on a small scale. In this respect Pembrokeshire was not exceptional, for in all areas coal was seldom used more than a mile or two away from its source. and then only by the poor who could not afford to buy wood. In 1600 George Owen placed "sea-coales" eighth among the exports of the county, below corn, cattle, wool, butter and cheese, sheep and swine, herrings, oysters. He commented however (Owen, 1603) upon the increasing use of coal, giving as one reason the shortage of timber. Pembrokeshire anthracite was used by smiths, and, because of its smokeless quality, had been found suitable

for use in malt kilns. It was used, too, in the lime industry. Owen declared that the practice of liming had greatly increased in his day and had improved "the hue and face of the ground" by destroying the "ffurse, fearne, heath and other like shrobbes". He stresses the peculiar qualities of the fuel and gives evidence that a cargo was sent to London for Lord Burghley's inspection. There might have been a great demand for it in the Thames valley if the "passinge were not so tedious". The advantages of culm for use in hot-houses may explain why the product of Pembrokeshire mines was taken to all parts of the western world, and why it was required only in small quantities.

Anthracite had some advantages as a domestic fuel but early in the seventeenth century it was used only locally where no soft coal was found. Along the coast of Devon and Cornwall bituminous coal from Swansea and Neath was used. Anthracite was often so small as to be almost like powder and unsuitable for use in the open fireplaces of English houses. Even the largest pieces were not easily kindled and kept burning.

Throughout the seventeenth and eighteenth centuries the coal trade in England and Wales increased until it became a national asset. Production on a large scale began in coalfields near the coasts, for sea transport could give them access to wider markets than those available to inland fields before the coming of the railways. Pembrokeshire was favourably placed in this respect. Chiefly as a result of the coal trade Defoe (1769) was able to say (*c.* 1726) that Milford Haven became the "largest, richest and . . . most flourishing town in South Wales except Carmarthen", and of Tenby, only slightly less important, that "Its inhabitants are principally traders in sea-coal". By 1700 coal had become the chief item of shipment from Pembrokeshire; there was not always enough coal to meet the demand. John Allen, owner of collieries in the Cresselly district, wrote in April, 1748 "I can't think there will be near eno (coal) in all Milford to supply the trade . . . several of my most constant customers likewise are enquiring for a little coal, as they are most apprehensive of the scarceness of it" (Allen, 1905). To meet this growing demand the Pembrokeshire Coalfield was exploited on an increasing scale during the eighteenth century and became foremost in the anthracite trade, the greatest export in South Wales coming from Milford.

OLDER METHODS OF WORKING

Owen (1603) stated that "the digginge of this coale is of ancient tyme used in Pembrokeshire but not in such skillful sorte as now it is, for in former tyme they used no engines for liftinge up of the coales out of the pitt but made their entrance slope, so as the people carried the coales upon their backes alonge stayres which they called lande wayes". He remarked that in "ould tyme" pits of four fathoms were considered "a great labour". The engines referred to were probably windlasses. Even in Owen's day pits were seldom sunk to a depth of as much as 20 fathoms.

Water frequently impeded working. It was raised in barrels by windlass. Sometimes levels were driven but this was "very chargeable and . . . cost sometymes £20 and oftentimes more". Once the seam was found "they

worke sondrie holes one for every digger, some two some three or foure as the number of diggers are". The coal was conveyed in baskets to the pit bottom by boys working in relays. From here it was raised to the surface by windlass. Owen enumerates the workers in one pit: three digging with pickaxes, seven bearers, one filler, four winders and two riddlers. The men worked by candle light and used, as well as pickaxes, wedges and sledges.

Even two hundred years later the Pembrokeshire mines were still inefficient. Hassall (1794) remarked on the limitations of water wheels as a means of power and advocated the introduction of canals, railways and steam engines. Collins (1806) also remarked on the inferior state of working the mines and the lack of mechanical aids. Curr (1806) reporting on the Moreton Collieries, described them as mere scratchings of old workings which should have been abandoned a century before. He too emphasized the need for a steam engine. A little later an article (*Cambrian Register*, 1817) stated that "no coal country has less advantage from mechanical improvements than Pembrokeshire, and none requires it more in its present state". The first steam engine in the Pembrokeshire coalfield appears to be one at Landshipping, erected by Sir Hugh Owen in 1800 at a cost of £1,900 (Jeffreys, 1807). The new source of power was not used elsewhere in the county until much later in the century, though steam engines were being sold in the South Wales Coalfield from 1770 onwards.

Drainage was one of the greatest problems of Pembrokeshire mining. It was sometimes effected by adit levels. The horse gin was sometimes employed to raise water as well as coal. Jeffreys (1807) recommended this method, although he thought that a steam engine would be more efficient. At a few collieries the waterwheel was used, but most of the small undertakings relied on the windlass. Water restricted the depth of the workings. Many old pits, still rich in coal, were abandoned in a waterlogged condition. A writer (*Cambrian Register*, 1817) deplored that "collieries of this county are not worked to advantage and they are supposed more exhausted than they really are. The adoption of steam engines would not only recover many of the old works now under water, but would enable the proprietors to reach the deeper veins which have hitherto been untouched".

Considering such limitations it is not surprising that shafts did not penetrate to great depths. The much-criticized Moreton Collieries consisted of three pits, each about sixteen yards deep in 1807 and yielding small parcels of coal left by former miners. At Hook, a mine reached 80 yards below the surface. This depth was attained in some other areas. It was well below the level of natural drainage, so that water had to be collected into artificial ponds below the ground and raised to the surface in large tanks. The deepest pits were sunk on adit levels. Thomas Hill Pit, sunk in 1810, attained a depth of 94 yards. Against this, collieries in the Swansea area, where steam engines were used, were sunk to twice this depth.

Having sunk a pit the miners' objective was to work the seam in all directions for as great a distance as possible. This was limited by the difficulty of circulating air and the labour of hauling the coal to the "eye" if the headways had been driven far. At the end of the eighteenth century mines were being abandoned with a recklessness that would have been unthinkable but for the abundance of accessible coal.

EARLY NINETEENTH CENTURY CONDITIONS AND CHANGES

Lack of capital was partly responsible for inefficiency in the Pembrokeshire Coalfield. There were many small concerns operated by workmen adventurers, singly or in groups, which were desperately short of capital. In rather better circumstances were those operated by local landowners. For example, a productive colliery at Landshipping was worked by Sir Hugh Owen. Another large works near Cresswell Quay was owned by Sir Hugh in conjunction with Hugh Barlow of Lawrenny and John Harcourt Powell (Spence-Colby Deeds). Lord Milford possessed numerous collieries near Saundersfoot (Barber, 1803), whilst Edward Leveden and John Allen had interests at Moreton and Cresselly respectively (Fenton, 1803). But the interest of Pembrokeshire landowners was not enough; in England at this period capital was being poured into the coal industry by progressive merchants. Pembrokeshire was perhaps too remote to engage the attention of such speculators. Nevertheless, there were a few enterprising local men who entered the industry and made a success of it. Abel Hicks, for example, who managed a 200-acre farm and a successful coasting business, took up coal mining in 1769, forming a partnership with two other men for the purpose (Green, 1919).

As the nineteenth century advanced, the increasing demand for coal and the efficacy of mechanical aids in other mining areas focused more attention on the neglected resources of Pembrokeshire. This brought about some technical investigation of the coalfield and a limited investment in new projects. It was realized that steam power would be needed to obtain better drainage and ventilation if the deeper coal seams were to be exploited. When it was proposed to sink two new pits to supply coal for Stepside Ironworks the estimated cost of the shafts and equipment was £21,685. To provide for working, raising and hauling the coal would have required a further £13,800 (Foster, 1845). These collieries never reached the size or efficiency indicated by these estimates.

On the whole Pembrokeshire coal mining still failed to attract the capital it needed. A number of new companies were formed, often with non-local support. Bonvilles Court Colliery, Stepside Ironworks and the Saundersfoot Railway were among the enterprises owned by London business men. The landed families failed to invest heavily in new enterprises and confined their interest more to the leasing of mineral land. Some progress was achieved, however, if only by the establishment of bigger units in the industry and the elimination one after the other of the small operators unable to afford the cost of deeper shafts and powerful machinery.

Locally such progress seemed considerable; to those acquainted with advances in mining economy and techniques in other parts of the country the Pembrokeshire Coalfield at mid-nineteenth century presented a gloomy picture. Such was that formed by Herbert Mackworth, H.M. Inspector of Mines, who reported in 1853 (Symons, 1854). He stated that the methods of working had changed little since Owen's day. He found the shafts shallow, the tackle insecure and the ventilation so imperfect that the quantities of air were less than half that required for the health and vigour of the workers.

THE CHIEF COLLIERIES AND COLLIERY DISTRICTS AFTER 1850

(1) *The Saundersfoot Coastal District*

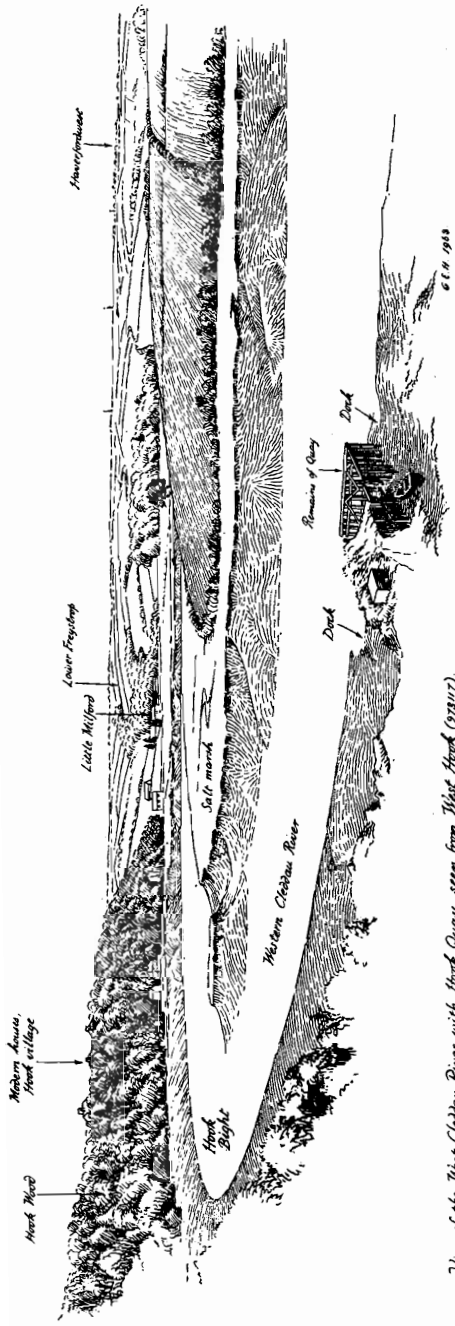
Prior to 1900 several quite prosperous collieries had been at work in this area, but by the turn of the century only Bonvilles Court Colliery remained in production. In the Steapside district the Kilgetty Colliery ceased operations about 1870, Grove Colliery in 1873 and the Lower Level Colliery, which commenced work when Grove was abandoned, in 1900. Moreton closed in 1887 and, apart from a few minor concerns, collieries in the Begelly area were also closed by 1900.

Bonvilles Court, by far the largest undertaking on the coalfield, was opened about 1842. It changed hands several times. Its original promoters intended following up the development of the colliery by iron workings, ironworks, coke ovens and a system of light railways. The latter progressed only as far as the Saundersfoot mineral line. Before 1900 the proprietor of the colliery, railway and harbour was Mr. C. H. Vickerman, who also owned a large part of the mineral property. Situated about half a mile inland from the shore at Saundersfoot, the colliery worked an extensive area of coal between the Harbour Fault and the Erroxhill Fault. The main shaft, known as Tower Pit, reached the Lower Level seam at a depth of 174 yards. At 110 yards to the west of the pit bottom the "K" pit was sunk to the Kilgetty seam, at a further depth of 72 yards.

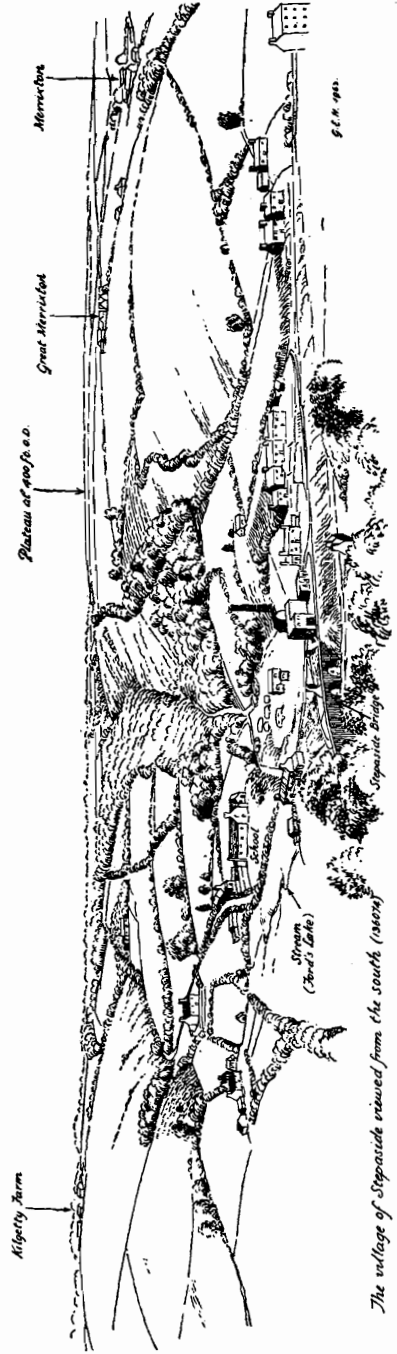
By 1900 it is recorded that the colliery was producing 150 tons of coal per day (Leach, 1900). Unfortunately the colliery records were destroyed by fire in 1913, but after 1912 annual statistics (provided by the Ministry of Fuel and Power) show that until 1926 Bonvilles Court raised over 35,000 tons annually. Thereafter the output declined and four years later the colliery closed down. Among the causes of its failure were excessively long haulage roads, large and untidy surface establishments, a high degree of faulting and much dead ground. Also the seams had a normal thickness of only 20 inches. Other adverse influences were repeated strikes, unreliable deliveries and competition from sources of power other than coal. Prior to 1939 railway rates favoured the South Wales owners as compared with those in Pembrokeshire by 1s. 6d. to 2s. per ton. In 1930, after 88 years in production, the colliery closed. Over 300 men were thrown out of work causing great depression in the locality.

In 1934 Broom Colliery was re-opened. It employed 200 men until it closed again in 1939. Nearly all its output of 30,000 tons per annum was cut and conveyed by machinery and taken by a mineral line to a new screening plant at Bonvilles Court which employed 44 men.

A second colliery, Kilgetty, was opened in the 1930's. Pumping operations commenced in 1935 and the Kilgetty seam was found in a workable state. The quality of the coal raised was excellent and had a ready market, especially in France. However, as the workings continued the seam was more and more interrupted by faults, so that the owners were obliged to close the colliery in February 1939. Output only reached substantial proportions in 1938, when over 15,000 tons of coal were produced.



View of the West Chubbaw River with Herk Quarry, seen from West Herk (1900/1901)



The village of Steppaside viewed from the south (1900)

(2) *The Hook District*

The introduction of deeper mining in the nineteenth century led to the opening of numerous collieries near the village of Hook. In particular the Timber Vein was exploited to the north of the Slide Fault in pits known as the Green, New Aurora, Old Aurora, Beam and Commons (Fig. 7). The West Park Colliery replaced these shortly after 1880 and had a life of about 25 years, when it was followed by the Margaret Pit which commenced operations in 1910. In subsequent years a large sum of money was spent by the Hook Anthracite Colliery Company in developing and extending the area, but in 1934 the company sold out to the Watts Company. The new owners closed down the Margaret Pit in 1936 on account of bad ventilation and collapsing roadways. They opened a new drift driven to reach the Timber Vein to the west of the old workings. More money was spent in the district, including £10,000 on erecting plant for the production of patent fuel. When the National Coal Board took over in 1947 the Hook district was considered to be uneconomical. The flooding of the West Drift at Easter 1948 precipitated the immediate cessation of mining activities.

Geological conditions in the Hook area were far from favourable. Overthrusting from the south had not only crushed the higher seams but caused them to vary in thickness and quality. The field at this point is narrow, allowing little room for expansion. It had also been heavily faulted, mainly in the east-west direction. Only the Timber and Rock seams are well developed; the others, so far as mining is concerned, were neglected because of depth, thinness and the fact that these two yielded coal in quantity.

Despite these geological conditions the Hook area was fairly actively worked. Between 1912 and 1930 its output never rose above 20,000 tons per annum, and was often considerably less (Fig. 9). The increase in production in 1931 was substantial and can be related to the closure of Bonvilles Court, whose markets it captured. The erection of a screening plant in 1932, at a cost of £8,000, increased the demand for Hook coal, as it could be ordered in sizes. Output reached 42,000 tons in 1934 but declined afterwards until the war years, when less than 20,000 tons was obtained annually.

(3) *The Inland Region*

The Inland Region comprised the colliery districts of Landshipping, Yerbeston, Loveston, Reynaldton and Jeffreston (Fig. 6). Landshipping had seen fairly consistent mining activity until 1844. In that year disaster caused by the tide breaking into the workings of the Garden Pit led to the abandonment of work in the area. Mining continued at some distance from the Dauceddau but all collieries in the district ceased work in 1867. Many families migrated to other counties.

The Reynaldton Colliery became important after 1914, when a new drift was made on the Lower Level vein. The mineral railway from Saundersfoot to Thomas Chapel was re-laid and extended to serve this colliery. A locomotive was bought to haul the coal. For seven years the undertaking produced fine quality anthracite, but labour troubles and excessive water led to its closure

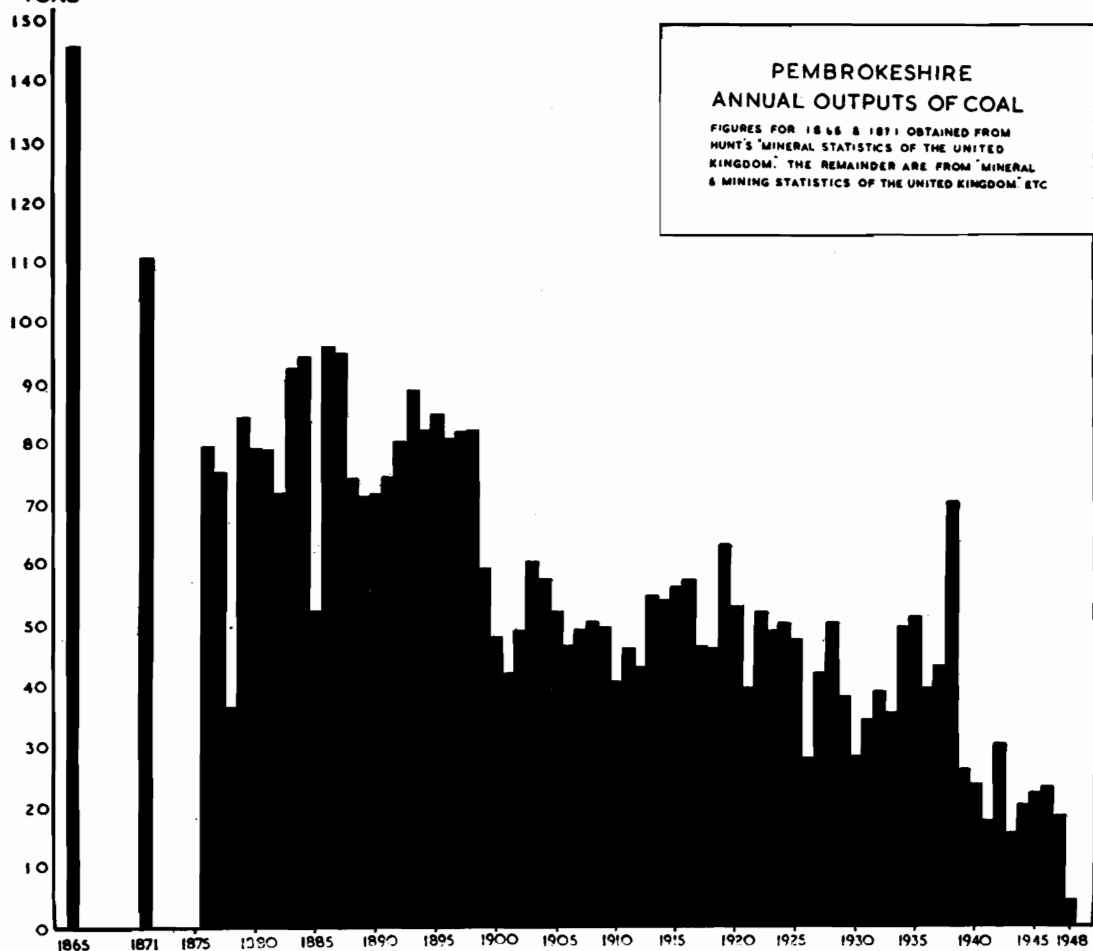
THOUSAND
TONS

FIG. 8

Pembroke: annual output of coal

DAUCLEDDAU COALFIELD.
GRAPHS TO SHOW THE ANNUAL OUTPUTS
OF THE MAJOR COLLIERIES SINCE 1912.

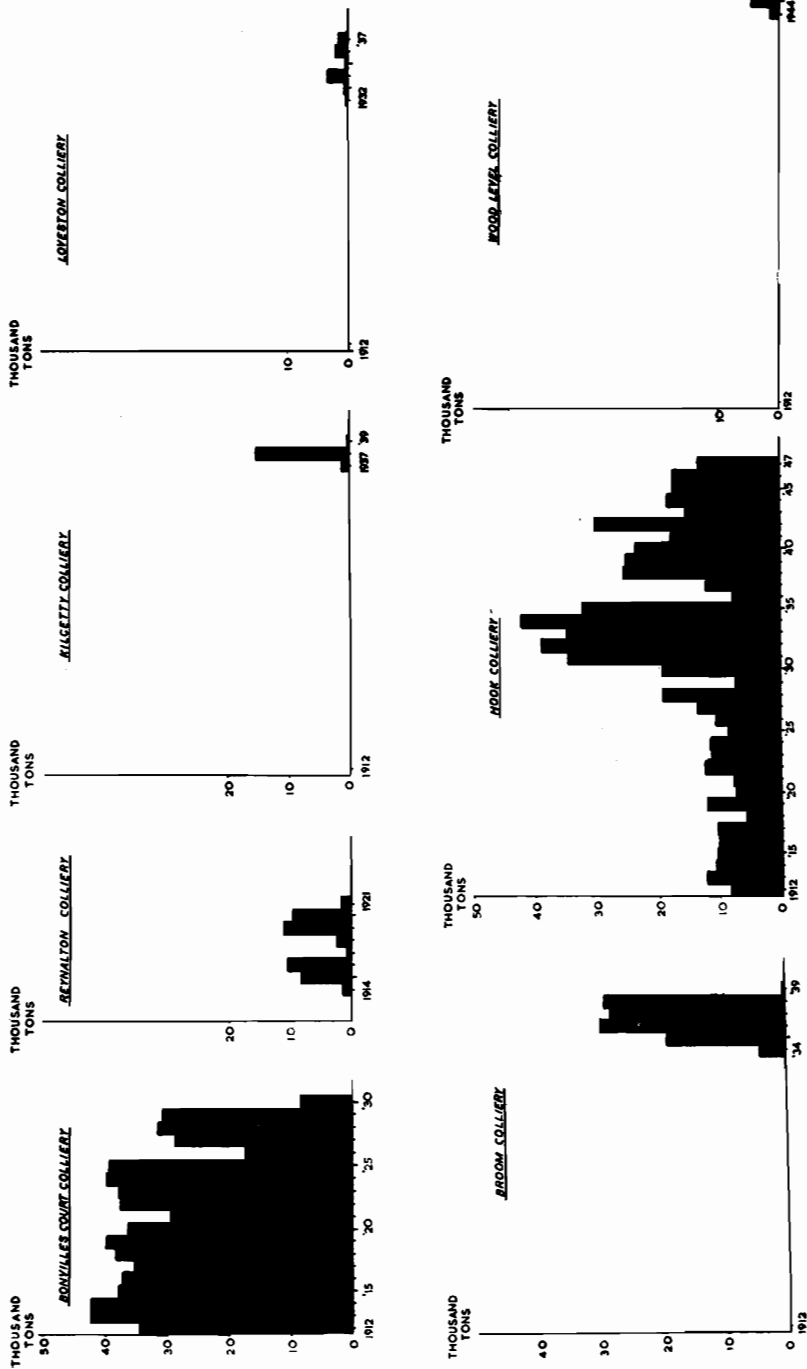


Fig. 9
 Dauceddau Coalfield: annual output of the major collieries since 1912

in 1921. Rail rates also operated against this colliery; 6d was charged on each ton of coal conveyed from Reynaldton to the G.W.R. station at Saundersfoot, and a further shilling from that point over the incline to the harbour. The colliery employed between 50 and 100 men, and its output reached a peak of 11,215 tons in 1919.

In 1932 the Loveston Colliery was developed in an area which had been worked earlier. The new undertaking was small, its highest output being 3,420 tons in 1934. In 1936 it suffered a disaster which gave it a great deal of publicity. The official statement on the disaster (H.M. Inspectors of Mines, 1937) indicated a danger to which much of the coalfield was subject: "Seven persons were drowned by an inrush of water into the Loveston Colliery from old workings. No plans of the old workings have been discovered, but even had they been, it is doubtful if they would have revealed that an isolated area of thick coal to the dip of the old water level had been worked by the 'old men'. It is never safe to assume that in days gone by the workers were unable to work to the dip of water levels. They did so in dry seasons and did not always show such workings on their plans."

TRANSPORT

From early times there had been little inland trade in Pembrokeshire coal. Transport inland, and from the mines to the various points of shipment, was at first by pack-mules but later by wheeled carts. A "day's yoking" by cart and horses was reckoned to be 10 or 12 miles. At the beginning of the nineteenth century the Welsh cart, narrow because of the narrowness of the roads, had a capacity of less than a ton. Carts loaded with coal or lime wore deep ruts in the roads, especially near the loading points where the traffic was most concentrated. The roads were often impassable in winter. Several collieries, in their own interests, contributed to the upkeep of the roads.

Hassall (1794) refers to improvements in the roads as a result of attention to the matter by certain gentlemen of the county. A voluntary society for repairing public roads had proved inadequate for the task. Eventually turnpike acts were passed (there were four in 1792) which ensured communication of a sort between the Pembrokeshire towns, but the roads were not well made, being mostly widenings of existing lanes. Farmers in valleys often found employment for their teams extricating foundered carts laden with coal or lime. The turnpike tolls increased the price of coal. In 1800 the cost at Carmarthen was double that at the pit-head twelve miles away. North of Narberth purchasers of culm from Broadmoor, seven miles away, had to pay tolls at four gates. An interesting feature of road haulage in Hassall's time was the use of horses and oxen together. Teams consisting of two oxen led by two horses were said to have hauled their loads with speed.

Unlike other coal mining districts Pembrokeshire had not developed canals for coal transport. From calculations based on the quantity of coal and culm carried to the coast in 1792, Hassall (1794) showed that carriage by canal would cost only about one-fifth of the cost of cart transport and that canals would soon earn the amount of the capital invested in them. The quantity of coal being conveyed to ships at that time was considerable. Hook Colliery in

1786 exported 5,800 tons by sea against only 40 tons sold at the pithead. Corresponding figures for Landshipping in 1801 were 10,912 and 80 tons respectively (Spence-Colby). The only canal in the Pembrokeshire Coalfield was one built by Lord Milford between Stepside and the shore at Wiseman's Bridge but this appears to have been a failure because it was badly constructed.

Men like Hassall and Collins appreciated also the great saving in time and labour which could be made by the use of rail transport. In 1806 Curr suggested constructing a railway from Moreton to the shore at Saundersfoot one mile away to replace cart haulage employing twenty to thirty men. No railroad to Saundersfoot could be laid without Lord Milford's consent, and this he was reluctant to grant (Jeffreys, 1807). In 1824 a licence was obtained by Mrs. Sarah Child, a coal proprietor in the Begelly area, to lay down a tram road over the lands of the late Lord Milford at Saundersfoot (Picton Papers). However, the line was not completed until 1829, when an Act of Parliament had authorized the construction of Saundersfoot Harbour and mineral lines to serve it.

Saundersfoot Harbour. The growing demand for anthracite and the inconvenience of loading ships on open beaches led to the formation of a company to undertake harbour works. Construction began soon after the passing of the 1829 Act. The first breakwaters and jetties did not afford adequate protection to vessels. Improvements and extensions were therefore made, and eventually the harbour covered three acres. The ballast and landing quays were 425 yards in length and there were five landing tips (Saundersfoot Minutes).

The main mineral line serving the harbour ran from Thomas Chapel and was over four miles long. It was a rough track with short cast iron rails of the unusual gauge of 4 feet. There was a tunnel $\frac{1}{4}$ mile long and a self-acting incline down to the coast at Saundersfoot. For many years it was worked by horse traction, although the Act allowed for the possible use of locomotives. Extensions of the mineral line to serve the Stepside Colliery district were approved. This section presented engineering problems because of its having to be constructed for much of its length along a cliff. Seven collieries were using the harbour in 1846, each having a wharf on the main pier.

Increase in the coal trade as a result of the harbour facilities was not conspicuous at first, but by 1840 business was better than had been expected (Saundersfoot Minutes). After the trade depression of the early '40's rapid headway was made and foreign customers appeared. In 1845 it was said that the harbour was yearly increasing in importance. In 1833, 11,500 tons of coal were shipped; in 1864, 38,000 tons. Several collieries in the area extended their workings, and soon after 1840 Bonvilles Court Colliery was opened. This was destined to become the most important colliery in the county. To illustrate the growth due in part to Saundersfoot Harbour, Moreton Colliery increased its output from 1,000 to 15,000 tons in the few years after 1840.

The harbour had its influence on industrial development other than coal mining. At Wiseman's Bridge in 1850 "a colony of people was engaged in turning out the best fire bricks the county could produce" (Mason, 1854). The bricks were made from a black clay from the coal mines. But the greatest development was that of the Stepside Ironworks, opened in 1849.

Much information about the Ironworks can be obtained from a report made by Messrs. Foster (Foster, 1845), whose survey enumerated the advantages of the locality for the project. The deeper seams yielded coal of the highest quality; there was an abundance of good quality ironstone easily accessible; limestone could be obtained from near at hand and from ships' ballast; the means of transport and shipment were available. The report recommended the establishment of a joint-stock company, for the scheme would involve large capital. Two new collieries were part of the scheme. They were to provide 48,000 tons of coal and culm annually for 36 years. Of this, 34,000 tons was to be used in producing over 11,000 tons of pig iron from four blast furnaces. The remainder was to be shipped to augment the profits, which the report estimated at £11,152 per annum. It was perhaps for lack of capital that the works never reached the lavish scale which the report had envisaged. A company known as the Pembrokeshire Coal and Iron Company was formed in 1846 and began construction in the Stepside valley, not at Saundersfoot a few miles away as the report had suggested. The steep side of the valley was utilized for charging the furnaces from high ground. Within a hundred yards of the site was the branch line of the Saundersfoot railway. Nearby the Grove Colliery was sunk in 1856 to provide coal for the works. In its final state the ironworks consisted of two blast furnaces, enormous blowing engines, coke ovens of the Coppee type, workshops and a line of lime kilns.

Unfortunately the records of the Stepside iron industry have been destroyed. It seems to have had only moderate success. Even within a year of commencement it was reported "on stop". According to Hunt (1865) the works had only two periods of prosperity. Between 1857 and 1861 one furnace was in blast continuously, and in the latter year 4,683½ tons of iron were exported. After the concern had been acquired and extended by Vickerman and Co. in 1863 there was a further period of success which lasted until 1868. In 1864, 2,933 tons of pig iron were shipped from Saundersfoot and a considerable quantity was probably made for the local market. Decline was the result of competition with works more favourably situated, and the depression which occurred after 1872 hastened the process. Then the low price paid for pig iron failed to meet the cost of production and work ceased in 1877. The workshops were retained for service to neighbouring collieries until 1930. When the furnaces were not in blast the local iron ore was shipped from the harbour. In 1861 1,522 tons were exported to Port Talbot, but two years later the amount had doubled (Hunt, 1865). Many people were employed in obtaining the ore, largely from levels driven in the cliffs between Saundersfoot and Amroth.

Prosperity due to the use of Saundersfoot Harbour brought about proposals in the 1840's for other developments, chiefly railways, which were never carried out. Among these were lines to Moreton and Broadmoor collieries and to quarries at Ludchurch, Penally and Prescelly. A proposed extension of the Saundersfoot Railway to link it with the South Wales Railway also never materialized.

The growth of the settlement of Saundersfoot is of interest (Fig. 10). On a plan of the Hean Castle Estate of 1764 only two houses are shown near the site of the village. In 1810 there were six cottages and two small hostels (Leach, 1900). According to a plan of the Tenby and South Wales Railway there were



Remains of the Stepside Ironworks

The blast furnaces stand against the slopes of the valley side behind the building. The Grove Colliery also occupied this slope, which is now heavily wooded.

G. E. H. 1963

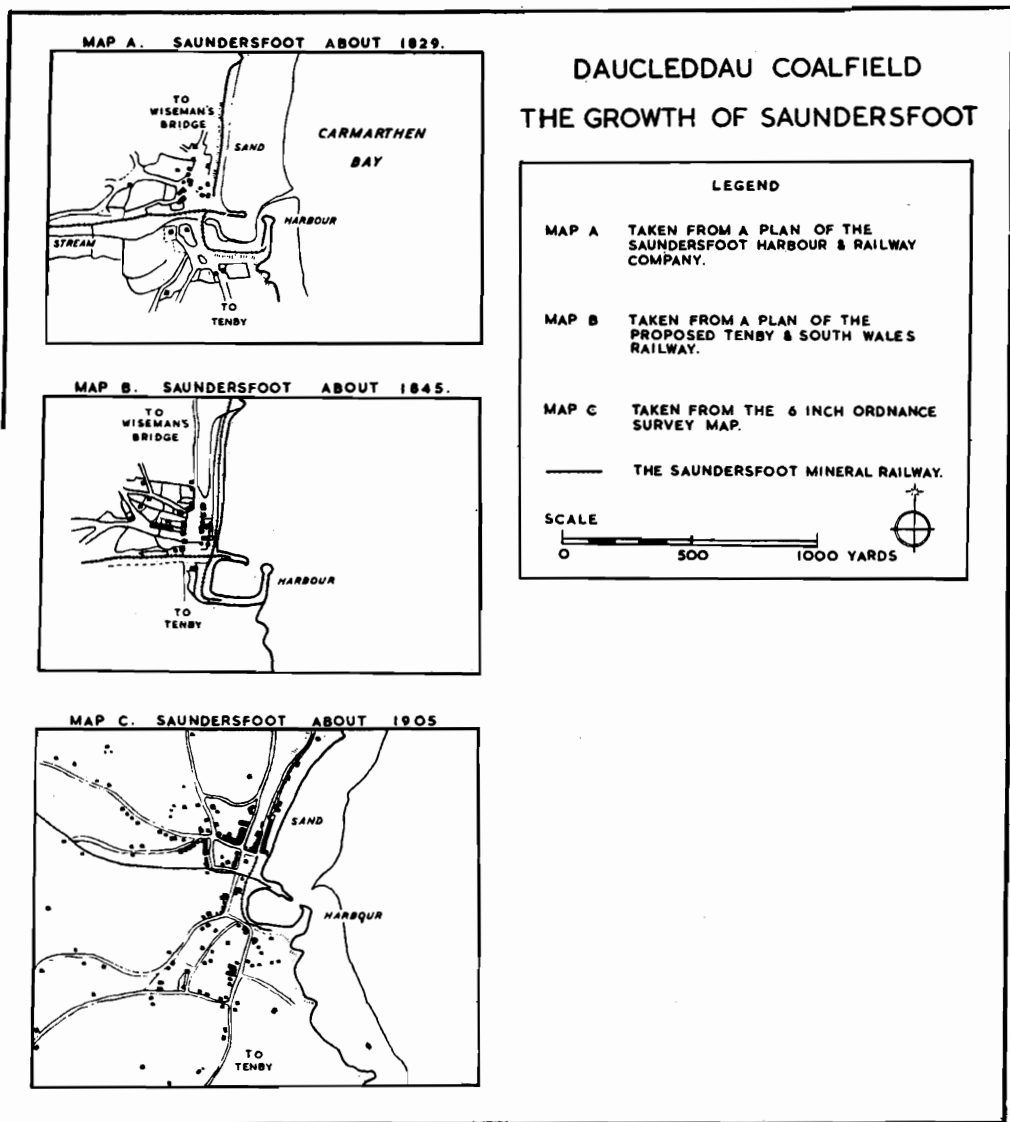


FIG. 10

The growth of Saundersfoot

thirty houses in 1845. Gosse (1856) said that the village presented an "air of bustle and trade" when compared with "idle Tenby". Exports at the time included coal, culm, iron ore, pig iron, bricks, fine silica and patent fuel. Timber, seed-corn, soft coal, manure and general stores were being imported. After 1868, when the village was "nearly important enough to be styled a town" its growth continued, partly due to its favour with holiday makers. It was reported (Haverfordwest, 1875) that visitors to Saundersfoot were attracted from as far afield as London, Birmingham and Oxford.

The Great Western Railway. During the period of the growth of Saundersfoot the Great Western Railway was extended into the coalfield. A branch to Tenby was completed in 1866, the section from Tenby to Pembroke Dock having been laid four years earlier by an independent company. The G.W.R. line passed over the Saundersfoot railway but no attempt was made to acquire the latter or convert its gauge so that a connexion could be made. By 1868 Moreton Colliery was sending coal to the "several towns and villages up and down the line" (Haverfordwest, 1868) but the new railways had no great effect upon distribution before 1880. Anthracite not used locally was still being exported by sea. It was hauled to the shipping points by horse and cart, except in the eastern area where horse-drawn trams were used. In 1874 a locomotive was obtained for the line from Stepaside to Saundersfoot.

Towards the end of its active period the Bonvilles Court Colliery was connected with the G.W.R. and from then about 50 per cent of its output was railed. In the Hook area the difficulty of accommodating large ships led to the construction of the Hook Colliery railway in 1929 at a cost of £40,000. In 1934, of the 42,000 tons of coal produced at Hook only 6,500 tons went by sea. The railway took 21,000 tons, mainly to London. The last shipment of coal was made in 1936, after which date all the coal not sold locally was transported by rail.

OUTPUT AND MARKET

Figures for the production of coal at early dates are few and unreliable. There were no standard units of weight but the following measures were in common use: the hundred (= 8 tons), the chaldron (= 2 tons), the wey (= 16 cwt.), the barrel (= 2/15ths tons), the bushel (about $\frac{3}{4}$ cwt.). The Welsh Port Books reveal that between 1550 and 1603 Ireland took most of the coal from Pembrokeshire and that Milford was the port of despatch.* Quantities were small, however, being less than 1,000 tons, for example, in 1600. Small consignments, usually from Tenby, went to France, Spain and Portugal. In addition small but regular shipments went round the coast to Plymouth, Dartmouth, London and places along the Welsh coast (Lewis, 1927).

The special qualities of Pembrokeshire coal explain why it was transported great distances and in small quantities. Nef (1932) has shown that cargoes left Milford Haven for Flanders, Holland, Norway, France, Spain, Portugal, Scotland, Ireland, eastern England and the West Indies, but that the annual shipments to any one part seldom exceeded 100 tons; 488 tons sent to Rotter-

* For legal purposes the port of Milford extended from Wormshead to Barmouth.

dam in 1681 would appear to be a record. Nef's figures show that between 1565 and 1710 trade from Tenby was still negligible, and that exports, though generally increasing were very irregular. Over 37,000 tons were shipped in 1687-88, but a more usual figure for that period was something less than 10,000 tons.

During the eighteenth century the demand for coal generally, and Pembroke-shire anthracite particularly, increased rapidly. According to Charles Hassall (1794), 120,000 tons were shipped from the county in 1792—108,000 tons of this was coastal trade in Britain. The total was in addition to "vast quantities consumed in the county, in fuel for the inhabitants; and for lime burning, drying malt and smiths' work". The amount of coal raised in that year could not have been less than 150,000 tons. It is well to remember that the coal raised at that time was from higher seams and surface outcrops and much easier to work than that which was mined later.

Figures for individual collieries whose records have been preserved are more reliable than any given for the coalfield as a whole. Late in the eighteenth century coal from Hook Colliery was sold in Milford Haven and around the North Pembroke-shire coast. Distribution along the west coast went as far as Anglesey. There were few markets in Ireland and only small cargoes were taken to South-west England. In 1801 larger quantities of coal and culm were sold from Landshipping Colliery. There were local customers at Haverford-west, Milford and Pembroke and exports went to Pwllheli, Caernarvon and Aberdovey. Among markets in Ireland, Dungarven was important. Only small quantities of coal were sent along the south coast of England, but anthracite was taken from Landshipping as far as Yarmouth, and even Sunderland and Maryport. A shipment of 60 tons went to the Barbados.

In the eastern part of the coalfield detailed records are not available until the period 1833-38. The Cash Book of the Tenby and Begelly Coal Company has been preserved. It throws light on the organization of a typical colliery of that period. About three quarters of the output was shipped from the new Saundersfoot Harbour. There was a lively local trade at the pithead and some coal was delivered in carts to places over 15 miles away. Begelly Colliery had few customers in North Pembroke-shire and along the west coast of Wales but small quantities of coal were taken by sea to a number of places along the south coast of Wales. Most of the Begelly coal went to places along the Bristol Channel and the south coast of England. No coal from Begelly was sent abroad until 1843.

The Begelly Coal Company owned two small sailing vessels, the sloop *Peggy*, carrying about 20 tons, supplying coal to the local market around Carmarthen Bay or as far away as Pembrey and Swansea, and the brig *Mary Anne* of 100 tons which made voyages to the south of England, frequently returning with cargoes of limestone, bricks or timber. The company's accounts record payments for the wages of the crews, victuals, disbursements, gratuities and the costs of repairs.

Later in the nineteenth century the demand for Welsh anthracite increased, as it then came to be used in gas suction plants and to an increased extent as domestic fuel, especially on the continent. Bonvilles Court Colliery, during the last fifty years of its activity, sent most of its large coal to markets all over

DAUCLEDDAU COALFIELD
THE VILLAGE OF STEPASIDE.

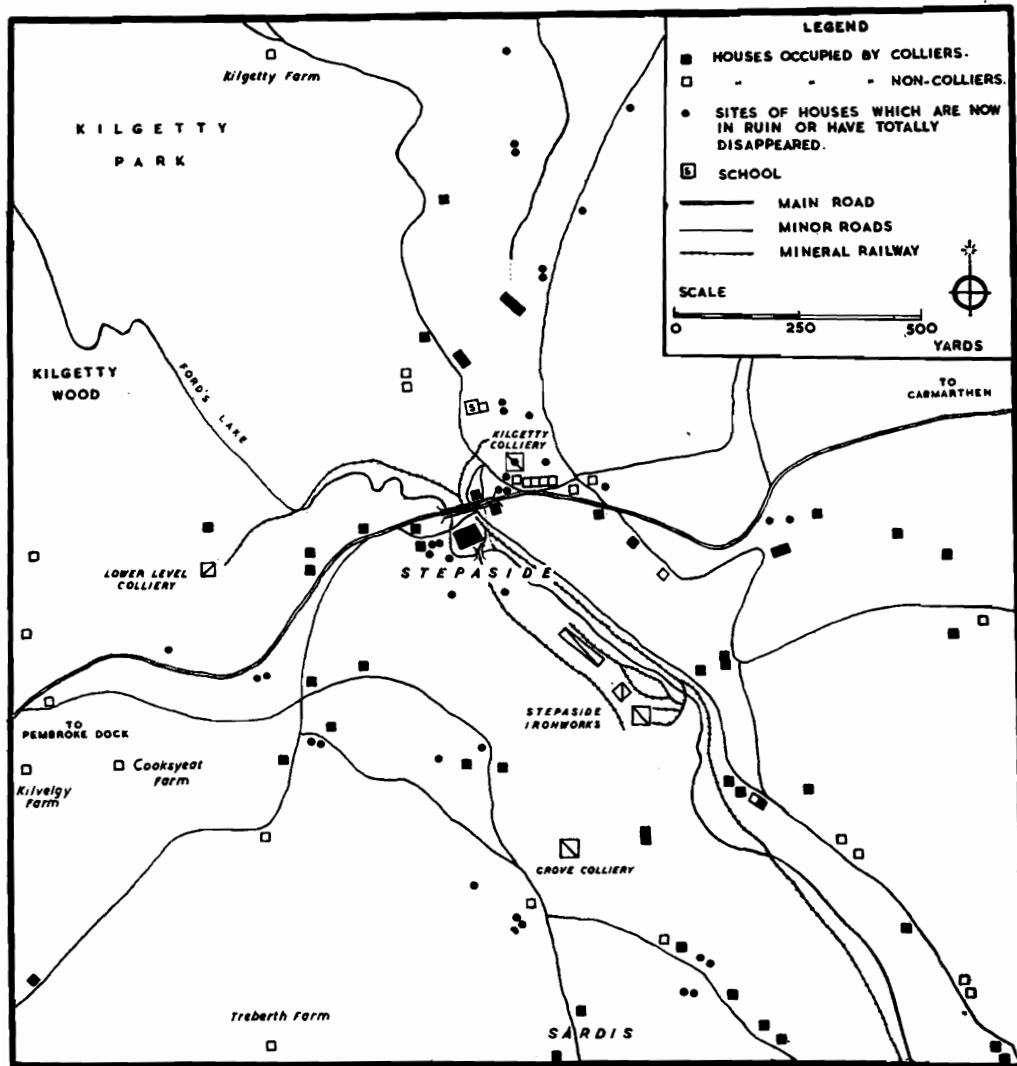


FIG. 11
The village of Stepside

the country—to maltsters in Burton, to the East Coast, to Kent and Ireland. Much of the smaller coal was sold locally and distributed to factors in England and Wales. Some went to France and a little to Canada. Hook Colliery sent malting coal to Ireland and eastern England, and special cargoes were often conveyed to distant markets. About 20 tons went yearly to St. Helena for use in a jute factory. In Singapore, Hook anthracite was used in the tin smelting industry. After 1934 most of the coal from Hook was conveyed on the new colliery railway and then on the main railways to London, the Midlands and the north of England.

Hunt (1865) shows that in 1865 146,000 tons of coal were raised in Pembrokeshire, representing 29 per cent of the anthracite production of South Wales. Of this total 82,000 tons were shipped from Milford Haven and Saundersfoot together, compared with 67,000 tons of anthracite despatched from Swansea in the same year. It may be noted that Pembrokeshire contributed only 6 per cent in 1890 and 1 per cent in 1920 of the whole output of anthracite in South Wales.

Fairly reliable figures for the output of the Pembrokeshire Coalfield are available from 1876, when the Annual Reports of H.M. Inspector of Mines began. Between 1876 and 1898 the total varied between 70,000 and 96,000 tons. After 1900 it fluctuated between 30,000 and 60,000 tons. There was, however, a late but brief prosperity represented by a total of 70,000 tons of coal raised in 1938. This ended with the Second World War and the final closing down of the industry shortly afterwards (Figs. 8 and 9).

COLLIERY LABOUR

The earlier coal mining in Pembrokeshire was characterized by the large number and small size of the concerns. Owen (1603) described a typical colliery employing sixteen people. The working day, from 6 a.m. to 6 p.m., allowed for a brief rest during which the men ate "their allowance as they term it which is $\frac{1}{2}$ d. in bread to every man and 4d. in drink among a dozen".

At Moreton Colliery in 1777 there were 30 men receiving 8d. or 9d. a day and 8 women receiving 4d. (Picton Papers). In the same year Begelly Colliery employed 77 people, including 18 women and a few boys at 3d. or 4d. a day. At Hook in 1785 there were 78 colliers and additional workmen servicing equipment, sinking shafts and driving levels (Spence-Colby).

By 1806 men were paid a shilling a day and women, mainly engaged on winding coal and filling carts, received 6d. to 8d.; Curr (1806) expressed amazement at the low rates of pay in Pembrokeshire, contrasting them with those between 2s. 6d. and 4s. paid in his own area. But despite his small wage the Pembrokeshire collier was better off than the agricultural labourer earning 6d. a day, without victuals. Even in 1880 the collier was paid only 1s. 6d. a day, and there were reductions in times of depression.

The collieries which expanded after 1850 employed larger numbers of men. Bonvilles Court employed 300 (384 at its maximum in 1914). When this colliery closed in 1930 many of its employees went to Hook Colliery, whose numbers increased suddenly from 100 to 250. These two were the biggest employers. Others in Pembrokeshire employed less than 100 men. For the whole coalfield

DAUCLEDDAU COALFIELD EFFECT OF COAL MINING UPON THE LANDSCAPE

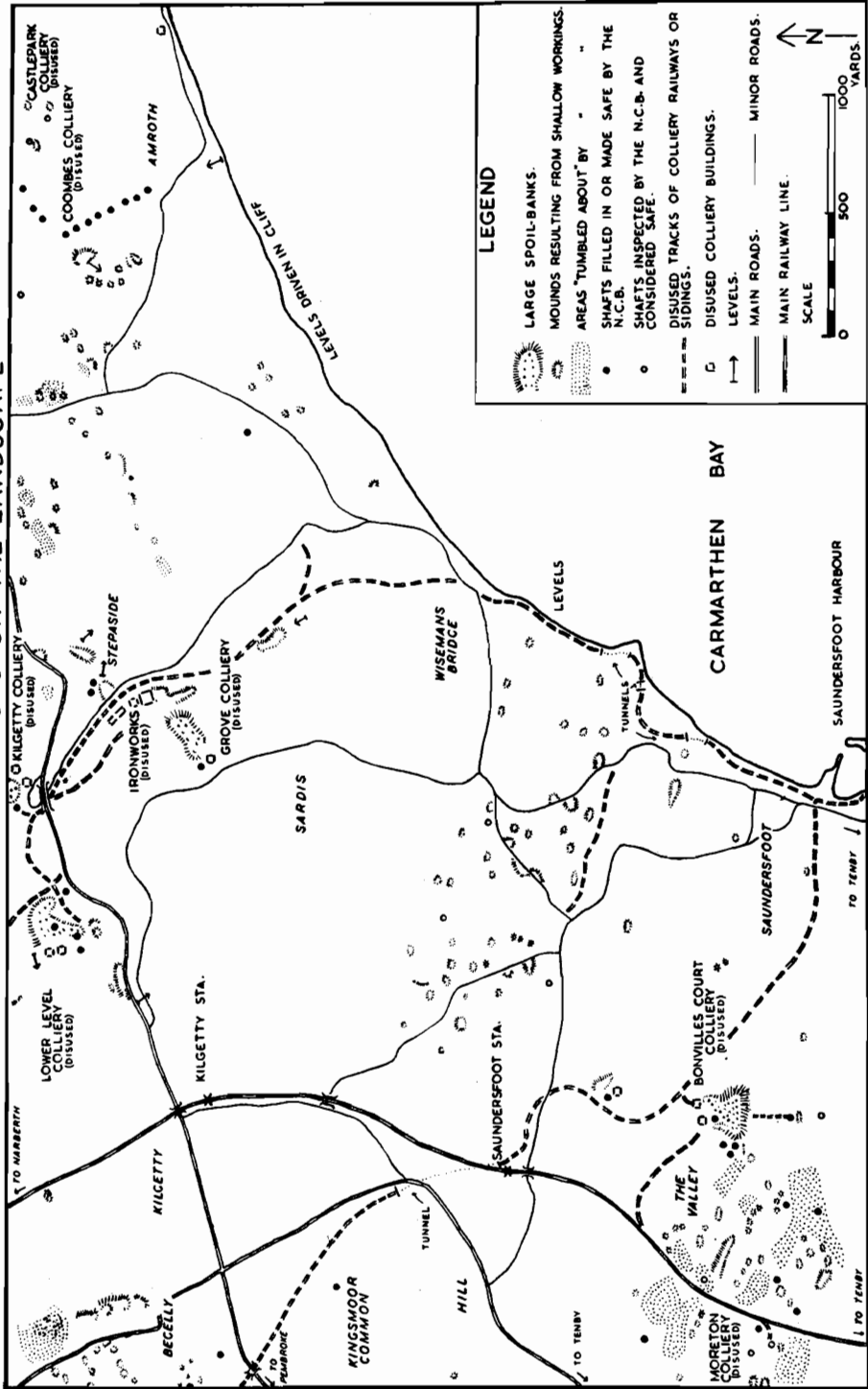


FIG. 12
Effect of coal mining on the landscape

Hunt (1865) records the employment in 1864 of 926 males and some females. For the year 1876 (H.M. Inspector of Mines, 1877) there were 650 persons employed underground (158 under 16 years) and 271 above ground (126 females and 7 boys). In 1902, when there were only five collieries in production, 430 men were employed, and from then until the closing of all collieries except Hook the number varied from 400 to 500.

In the coalfield and its vicinity employment in mining had an effect on agriculture. Hassall (1794) complained that mining claimed the attention of the country people during the spring and summer to the neglect of their agricultural pursuits. He pointed out that canal navigation would release haulers for farm work and hoped that in this way "the whole country about the collieries would soon be cultivated and improved, which now lies in the most disgraceful state of sterility, . . . thousands of acres which now contribute hardly anything towards the support of man would soon become productive". Coal carters were most commonly members of farming or smallholding communities. Many farmers may have worked small mining concerns. A case is known of a farm and a colliery on it being put up for sale together. Apart from the effect on employment, mining in so many small workings must have ruined much farm land. Collins (1806) declared that the whole country was defaced by spoil-banks, seen in almost every field and common.

There is, however, another aspect of the relation between mining and agricultural employment. Mackworth (1854) wrote: "the coal has been usually worked only by very shallow and temporary pits, affording occasional employment to the collier who, therefore, often applies himself to agriculture and other labours. The number of hands at these pits is usually small, sometimes consisting of the members of the family, of whom the women wind up and unload the coal, whilst the men and boys are at work underground. The result of these circumstances is that the Pembrokeshire collier differs but little in any respect from the agricultural labourer, and his gains but little exceed the payment for work on the surface of the ground. He is too poor to move to other localities, such as the valleys of Glamorgan, where wages are much higher; and he has frequently a freehold or other interest in his cottage or hovel".

In later years, with the rapid decline of the coal industry the Pembrokeshire miner was often grateful for his smallholding. In times of unemployment it would help to support him. In Saundersfoot in 1930 55 per cent of the local colliers had smallholdings, evidence of the continuity of the link between the mining and agricultural occupations.

POPULATION AND SETTLEMENT

As the mining industry in Pembrokeshire was small in scale and the mines well scattered over the coalfield, the size and distribution of settlements was not greatly influenced by the presence and movements of colliery workers. Numerous miners' cottages were built but these never formed large or compact villages. A few examples will serve to show how slight was the impact of mining employment on the pattern of settlement. During the First World War a colliery was developed at Reynaldton. It employed 100 men and was regarded locally as important, but at the time only six new houses were built in the

village. The miners came in daily from other mining districts. At Hook in 1938 130 men were engaged at the pit. Of these 82 came from Hook, 25 from Llangwm, 15 from Freystrop, 3 from Haverfordwest and 5 from the Saundersfoot area. The same mobility of labour was in evidence during the 1930's at the Broom and Kilgetty collieries.

The living conditions of Pembrokeshire miners were the subject of contemporary comment. Bourne (1843) remarked on the deplorable ignorance of the countrymen who found employment in the pits around Begelly. He stated that at Saundersfoot the hamlets which housed the colliers were of the most wretched description and the people existed in a state of poverty which would scarcely have been credited in some of the rural districts of England. Mackworth (1854) reported that the cottages were built of a mixture of mud, road scrapings and stones, and were thatched with straw. Low in height, the houses were usually without a ceiling and were partially divided into two rooms by earth or boards. No regard was paid to health when siting the cottages. Frequently they were built on a hillside or in angles of waste ground by the roadside, the high bank hedges shutting out air and settling moisture around the walls. The fires, which were kept burning continuously, often filled both rooms with offensive fumes, yet the heat of such fires tended to keep the mud walls dry. When abandoned, the cottages of this kind soon crumbled away leaving little trace. A few years ago elderly residents of the village of Stepside could recall upwards of forty "clom" cottages which have completely disappeared. Some were replaced by modern houses but the disappearance of most of the cottages represents loss of population after the local ironworks and collieries were closed.

Employment in the coal industry was too small to affect population changes in the district as a whole. The same trends can be discerned in the coalfield parishes as in the county generally—an increase from 1801 to 1861 and a decline in subsequent periods.

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