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Horses Steam and Electric Engines at Prestongrange

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http://www.prestoungrange.org

FOREWORD

This series of books has been specifically developed to provided an authoritative briefing to all who seek to enjoy the Industrial Heritage Museum at the old Prestongrange Colliery site. They are complemented by learning guides for educational leaders. All are available on the Internet at http://www.prestoungrange.org the Baron Court's website.

They have been sponsored by the Baron Court of Prestoungrange which my family and I re-established when I was granted access to the feudal barony in 1998. But the credit for the scholarship involved and their timeous appearance is entirely attributable to the skill with which Annette MacTavish and Jane Bonnar of the Industrial Heritage Museum service found the excellent authors involved and managed the series through from conception to benefit in use with educational groups.

The Baron Court is delighted to be able to work with the Industrial Heritage Museum in this way. We thank the authors one and all for a job well done. It is one more practical contribution to the Museum's role in helping its visitors to lead their lives today and tomorrow with a better understanding of the lives of those who went before us all. For better and for worse, we stand on their shoulders as we view and enjoy our lives today, and as we in turn craft the world of tomorrow for our children. As we are enabled through this series to learn about the first millennium of the barony of Prestoungrange we can clearly see what sacrifices were made by those who worked, and how the fortunes of those who ruled rose and fell. Today's cast of characters may differ, and the specifics of working and ruling have surely changed, but the issues remain the same.

I mentioned above the benefit-in-use of this series. The Baron Court is adamant that it shall not be 'one more resource' that lies little used on the shelves. A comprehensive programme of onsite activities and feedback reports by users has been designed by Annette MacTavish and Jane Bonnar and is available at our website http://www.prestoungrange.org – and be sure to note the archaic use of the 'u' in the baronial name.

But we do also confidently expect that this series will arouse the interest of many who are not directly involved in

educational or indeed museum services. Those who live locally and previously worked at Prestongrange, or had relatives and ancestors (as I did in my maternal grandfather William Park who worked in the colliery), will surely find the information both fascinating and rewarding to read. It is very much for them also to benefit – and we hope they will.

Dr Gordon Prestoungrange
Baron of Prestoungrange
July 1st 2000

Anne Marie Allan

Anne Marie was born in Edinburgh and lives in Prestonpans. Her mother's family were part of the 19th Century immigration that brought Irish miners to the West of Scotland and then to Morrison's Haven. After taking a degree in Literature at Stirling University, she worked as a teacher and then as a librarian with a particular interest in education. Currently she is Information Resources Officer with the Scottish Arts Council.

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THE NEED FOR COAL

LIKE MOST of Scotland's coal, the Lothian coalfield is a basin-shaped series of layers, or seams, interspersed with other material. Over millions of years, movements in the earth caused folds or faults in the seams, while the invasion of molten material from deeper within the earth's crust created solid rock barriers within the coal and burnt areas, where coal was destroyed or reduced to cinders. The basin shape means that in some places coal originally lay on or near the surface, especially near the edge of the coalfield, or where the land surface is worn away by rivers or the sea.[1]

This is, of course, a very simple description of a complex geological process, but it is important to understand a little of the nature of the coalfield and the earliest methods of working the coal in order to understand the how and why of later developments in the use of power at Prestongrange.

It is clear from the charter granted to the Cistercian monks of Newbattle Abbey in the early 12th Century by Seyer de Quincey, Earl of Winchester, that coal was already well established as an alternative source of fuel to replace the rapidly diminishing supplies of timber in the Lowlands. This charter allowed the monks to establish a coal-works and quarry (carbonarium et quarrarium) to work coal seams between the Whytrig Burn and the boundaries of Pinkie and Inveresk. This charter is evidence that coal works on the Prestongrange lands are among the earliest recorded in Scotland.[2] However, it is not known exactly which outcrops of coal were being worked by the monks and it is important to remember that, since the lands known as Prestongrange were extensive, it is not possible to assume that these early records refer to the locality of the later mine.

The earliest types of mine were Bell Pits and Drift Mines. The Bell Pit, as its name suggests, was a pit dug into the earth and hollowed out at the level where the coal was found. The circular chamber created beneath the surface was not a stable structure and mining only continued until the sides threatened to collapse inwards. At this point the hole was abandoned and another started elsewhere. Drift mines, also known as 'ingaun e'es' (ingoing eyes), were opened where natural dips in the surface, such as a river bed, shoreline or glen, meant it was

possible to dig into the side and extract the coal until the threat of collapse in the tunnel prevented further mining.

At this time, coal was not a popular fuel for domestic use, as the smoke and fumes were considered dangerous to health. Although it was used to heat large monastic and noble houses in Scotland, an Act passed in 1306 forbade the use of coal in London.[3] Nonetheless, coal mining has been associated with trade and industry from earliest times. James V gave permission for a harbour, known originally as Acheson's Haven, later Morrison's Haven,[4] and the Abbey was also granted the right to transport coal from workings beside the river Esk for shipment in small boats, along the road still known today as Salter's Road.[5] The packhorses made the return journey with salt from the salt pans and goods taken in trade for the salt and coal they shipped at the harbour.

The monks of Newbattle took up their right to mine coal against a background of political and social instability. In 1261, Haddington was one of the Lothian towns burned in a raid by the English. The later 13th Century was a period of relative calm, but, by the beginning of the 14th, Scotland was embroiled in a series of wars with England which lasted for 150 years.[6] Throughout this period, the Abbey of Newbattle worked the coal until, by the middle of the 15th Century the most accessible supplies were exhausted and it became necessary to dig deeper.

As supplies of timber became even scarcer, the demand for coal increased. But supply was limited by difficulties in transportation and the exhaustion of accessible seams. Roads at this time were not easy to travel: they were muddy, potholed and poorly maintained.[7] By the 16th Century, the supplies of coal available by traditional mining methods were becoming inadequate to meet demand, yet at the same time, there was a growing interest in the use of coal for industry. Hector Boece's 'History', published in 1527 states:

> "In Fyffe ar won black stanis quilk ha sa intollerable heit quhair they are kendillit that they resolve and meltis irne, and are therefore richt proffitable for operation of smithis"
> [*'In Fife are quarried black stones which have such intolerable heat when they are kindled that they resolve and melt iron and are therefore right profitable for operation of smithies'*][8]

At the beginning of the 16th Century, the annual output of Scottish coal was less than 40 thousand tons, still mined from small-scale workings for local supply. Yet up to six tons of coal were needed to produce one ton of salt – and the manufacture of salt was enormously profitable.

A further pressure on the demand for coal was lack of colliers: during the Reformation, church lands passed into the hands of individuals such as Mark Ker, who was granted the estates of Newbattle Abbey in 1587.[9] The labour force represented by the monks and others who lived and worked on the Abbey lands was lost. Attempts were made both to protect coal supplies and to ensure an adequate supply of labour: in 1609, the export of coal was forbidden and in 1606, colliers were reduced by law to a form of slavery which lasted till 1775.[10]

The need to increase supply led to deeper workings and an increasing problem with flooding, a constantly recurring theme at Prestongrange throughout the centuries. The quantity of water which these early mineworkings were faced with is demonstrated by the fact that water flowing from mine-workings provided water supplies for Prestonpans and other villages.[11] Drift mines were free of water only as long as the tunnel cut into the coal seam was angled to allow water to drain naturally. Later workings used a method known as 'Pit and Adit' whereby a drainage tunnel, known as an 'adit' or 'day-level' was dug with an outlet below the mine workings, so that gravity caused the water to flow down and away from the workings.

THE HORSE GIN

DIGGINGS AT this time were to a depth of 70–90 feet, with coal being carried to the foot of the mine shaft by bearers, then carried up a spiral stair or a series of ladders to the surface. Such mines were known as "stair pits". Alternatively, a rope was lowered to the pit bottom and attached to baskets or tubs filled with coal, then hauled to the surface.[12] This early haulage was the origin of the first true mining machine, the 'horse gin'.

The 'Whin' or 'Scotch Gin' did not replace the stair pit, probably because there was little, if any, public concern for the use of human labour in mines and because maintaining a horse-gin was expensive compared to the use of a drainage

tunnel. The gin was operated by means of a windlass (a horizontal axle) on the surface. The windlass was attached to a drum. As the drum turned, it raised or lowered buckets attached to a rope, bringing coal or water to the surface.[13] The motive power for the windlass was supplied either by a horse harnessed to the axle or by water, often the water flowing from old day levels: a nearby flint mill at Cuthill was powered by this method in the 1700s.[14]

Sir John Clerk, a prominent mining figure in the 17th Century, states:

> "One horse will serve for a sink [depth] from 10 to 20 fathoms…and two are necessary for a sink from 20 to 60 fathoms."[15]

There is evidence of the use of gin pits on the Prestongrange estate in a document dating from 1748. This document also refers to a "drowned pit" and, although we cannot be sure of exact locations, (a pit at Dolphingston, for example, was also referred to as Prestongrange) we know that mining ceased at Prestongrange due to flooding in 1746.[16] An estate plan dated 1825, based on an earlier plan of 1741, refers to a "water gin sink"[17] and a report on the Prestongrange coalfield in 1825 also mentions a gin pit.[18] Horse gins remained in operation in East Lothian until the 1840s: a list of machinery and equipment on the Prestongrange estate in 1872, made for inheritance purposes, mentions

> "Gin engines for raising coal; and Gins worked by horse power."[19]

From the personal reminiscences of Walter Pryde, we learn that horse gins were in operation in 1760, although his description is not concerned with raising coal:

> "I was yoked to work coal at Preston Grange when I was nine years old. We were then all slaves to the Preston Grange laird…if we did not do his bidding…the men's hands were tied in face of the horse at the gin, and made run backwards all day."[20]

As pits deepened, another major problem was air. With poorer ventilation, there was the additional danger of 'Black-damp' or 'Chokedamp', a mixture of nitrogen and carbon dioxide which used up oxygen, leaving little or no breathable air. 'Firedamp' or methane – an inflammable gas which accumulated at the work face – brought the danger of

explosion, but this was rarely present at depths of less than 200 feet. The most lethal of the gases present in mine workings is what is known as 'Whitedamp'. This is carbon monoxide, a colourless, odourless gas so poisonous that it can kill very swiftly indeed.[21]

The earliest solutions to such 'bad air' was to build a fire in the workings to create a draught and improve air circulation. As mines deepened, this method was adapted and refined into a two-shaft system, one to draw the air down, another to allow air to pass back to the surface, with doors between to prevent the returning air bringing explosive fire damp in contact with the furnace. A carelessly-tended furnace in a pit at Lower Birsley in the early 1800s resulted in a fire which burned for many years. As for the unfortunate furnace-keeper,

> "Whether [he] escaped or perished in the flames is uncertain, but he was never more heard of in that locality'[22]

By 1700, output of coal was probably around 4 million tons a year.[23] Demand was rising against a background of increasing difficulty in bringing it to the surface. Horses could be used underground only where the size of the workings permitted and the labour of raising coal and transporting it above ground was still largely dependent on human labour.

There were many efforts to improve mining methods, perhaps the most notable being Sir George Bruce's Moat Pit in Fife, with its two shafts, one on land and one below the high water mark in the Forth, protected by means of an artificial island.[24] The Moat Pit demonstrated the improvements in ventilation that could be achieved by the sinking of two shafts instead of one. In general, however, by the beginning of the 18th Century, these efforts had reached their limit.

The Union of the Parliaments of Scotland and England in 1707 brought further difficulties in the form of competition from English goods: the salt industry, for example, though it survived in Prestonpans well into the 20th Century, began a decline from which it never recovered. In 1719, 41 cargoes arrived at Morrison's Haven harbour, 19 of these in ships belonging to Prestonpans. By 1743, due to shipping losses and taxation imposed after union, the harbour trade had ceased.[25] English merchants were determined to protect their own markets and Scotland's efforts to develop trade with the colonies was marked by costly failures.

NEWCOMEN & WATT

IT IS AGAINST this background that Thomas Newcomen's patent for a steam engine in 1705 heralded the dawn of the industrial age. Newcomen's engine worked by a combination of steam and condensation. Fire heated water to form steam inside a cylinder, then the steam was cooled until it returned to the form of water. This created a vacuum inside an enclosed space. A piston inside the cylinder would rise in response to the generation of steam and fall as a result of atmospheric pressure on the vacuum when the steam was cooled and the power generated by this principle could be applied to the raising of coal or water.[26]

But Thomas Newcomen's "fire engine" did not offer an instant solution. These early engines were massive and stationary. Once erected, they could not be readily dismantled and transported elsewhere, although in many cases this did happen. Moreover, the cost of buying an engine included the cost of years of research and experimentation. Newcomen's engine was enormously expensive to install and maintain. For the first such engine erected in Scotland, in Stirlingshire, the costs were as follows: a royalty payment of £80 per annum for eight years, installation cost of £1007 (excluding engine house) and £200 a year to the engineers for maintenance as well as half the colliery profits.[27]

The history of coal working in Scotland has always been tied to economics. Sir John Clerk, writing in 1672, considered the use of equipment to drain coal workings as viable only where a seam was more than 4′ thick, of a depth of less than 500 fathoms and close to a regular market for the coal.[28] The problem with Newcomen's engine was that it was only economically worthwhile for large mining ventures and in the case of the small pits of East Lothian there was not enough guarantee of profit to make such costs worthwhile. It is the need to balance the cost of extracting coal against its saleable value that explains the closure of Prestongrange Pit in 1746.[29]

East Lothian pits therefore made little headway in the use of steam power until about 1780, when James Watt's modifications to Newcomen's original design promised a future for mines such as Prestongrange. Watt's engine separated the action of steam and condensation, resulting in a more practical machine, more mobile and easier to maintain.[30]

Throughout the 18th and 19th Centuries, coal consumption had continued to rise as coal became an increasingly acceptable fuel for household use and steam power encouraged machine development in industry and agriculture. In 1812, William Murdoch, a contemporary of James Watt, created a method by which gas extracted from coal could be used for lighting. The process of extracting gas also produced other elements, including coal-coke and tar, thus marking the start of a developing industry based on the by-products obtainable from coal.[31] As industrial usage began to diversify, differences in the nature of coal seams became more important. Murdoch's gas lighting, for example, initially required the brightly burning coal known as 'cannel coal' and the East Lothian seam known as the "Parrot" was mined for such coal.[32]

The scene would appear to be set for a resurgence in mining in Scotland and this was, indeed, the case. But East Lothian was not at the forefront of this revival, for a number of reasons. Firstly, the coal seams of East Lothian, with their problems of flooding and the depths of the seams, could not compete with other parts of Scotland where coal seams were more easily accessible. It was in West and Central Scotland, where coal seams were both relatively shallow and technically challenging that major industrial development took place. Developments in the iron industry, allowing coal-coke to be used to smelt iron, led to the erection of the first furnace at Carron, in Stirlingshire, close to ore deposits at Bo'ness and coal at Kinnaird and the early 18th Century also saw the beginnings of the shipbuilding industry on the lower Clyde.[33]

Furthermore, the 18th Century was not a stable political period for Scotland. The Jacobite risings of 1715 and 1745 resulted in changes in land ownership in East Lothian[34] and the county itself was a battleground for opposing armies. It was not possible to work the coals under these circumstances, as the old song demonstrates:

> "Hey! Johnnie Cope are ye waukin' [wakened] yet? Or are your drums a beatin' yet? If ye were waukin' I wad wait, To gang to the coals I' the mornin'."[35]

The commonest method of extracting coal at this time was known as "stoop and room": an "oversman" would calculate and mark out pillars of coal to support the roof and the collier would work on the remaining coal. The areas where coal was cut away were the rooms, the pillars were the stoops. Obviously, leaving such large sections of unworked coal

behind was a source of great temptation: it was not unknown for colliers to ignore the danger and remove coal from these stoops:

> "Care must be taken not to suffer Coaliers to impair these pillars, as they commonly do for their own advantage."[36]

In spite of difficulties, East Lothian mine owners made continual efforts to share in industrial expansion and take advantage of new equipment. In 1741, almost 100 years before the sinking of the first modern shaft at Prestongrange, the area was identified as a possible site for the sinking of an engine pit and accompanying working pits to a depth of 50 fathoms.[37] An advertisement in the Caledonian Mercury in 1729 shows that owners were aware of the potential of the new engines for Prestongrange:

> "…the…Coal of Prestongrange…is fit for the Sea as well as Land Sale, there being a good harbour at Morison's Haven not far distant from said Coal which, when formerly wrought, produced a very considerable rent, both by Land and sea Sale…If any persons may have a mind to take a lease of said Coal and Salt Pans jointly or seperately, may set down under the old Level, 12 or 24 Fathoms where there is Coal which will last for many years. And the water may be thrown by a Fire Engine into the Level or otherwise…"[38]

Of course, this advertisement also demonstrates an unwillingness to bear the costs of setting up such a "fire engine". Nevertheless, mine owners were eager to make what headway they could and were closely involved with developments elsewhere in Scotland. The Cadell family, for example, were local mine owners, but also had a founding interest in the Carron Ironworks mentioned earlier.[39]

TURNPIKES & WAGGONWAYS

WHERE EAST LOTHIAN could make improvements was in methods of coal transportation. Money was made available for road improvements by the introduction of the Turnpike System to Scotland in the middle of the 18th Century, when barriers were set up to make sure that road users paid a contribution towards the cost of upkeep. The roads linking Prestonpans, Wallyford and Tranent were such roads.[40] Coal

for local trade was carried by human bearers, with horse or donkey used for longer journeys.[41] However, the turnpike system does not seem to have generated much improvement in the transportation of Lothian coal to the city of Edinburgh. In the early 18th Century:

> "…the state of the roads did not admit of vehicles of any kind being employed in connection with coals or any heavy traffic"[42]

and conditions did not seem to have greatly improved 100 years later:

> "carts are badly constructed, and frequently not five inches deep at the sides…the condition of the horses accords somewhat with the construction of the cart…the general weight brought to the city is 12 cwts. to 15 cwts."[43]

Given these circumstances, it is hardly surprising that Lothian mine owners were at the forefront in the development of an alternative system, the waggonway, where wagons were hauled by horses along wooden or metal rails. The Tranent and Cockenzie waggonway, laid in 1722, was the earliest in Scotland. It was initiated by the London-based York Buildings Company, who acquired land in the aftermath of the rebellion of 1715. It was eventually taken over by the Cadells, who replaced the wooden rails with cast iron in 1815.[44]

Other waggonways included the Edinburgh and Dalkeith Railway, also known as the 'Innocent Railway', initially constructed in 1831, with a branch line laid to Fisherrow in Musselburgh in 1834. Up until its takeover by the North British Railway in 1845, this line, which is now a pedestrian and cycle path, transported up to 300 tons of coal each day. The Innocent Railway is also notable for its use of a stationary steam engine to draw waggons upward where the slope was too steep for horses.[45] Another waggonway was Sir John Hope's Pinkie railway, running between Pinkiehill and Fisherrow in 1814.[46] When we consider that a horse could pull about 48 cwt. up a slope on these waggonways, compared to a human bearer in a stairpit hauling about 3 cwt., it is evident why Cadell's Tranent and Cockenzie waggonway was well used for over 160 years, until the coming of the North British Railway line and its steam locomotives.

Since steam power was used largely for pumping water and raising coal, there was initially little change to methods of

underground working. In about 1840, traditional "stoop and room" was challenged by a new method, known as "long-wall", which used timber to support a wider coal face so that greater quantities of coal could be extracted more easily.[47] However, this change in mining methods still relied on human power to cut and carry coal. Not all seams could be worked by this method and this was particularly true of some East Lothian mines, including Prestongrange. Longwall had replaced stoop and room in many mines by the end of the 19th Century, but at Prestongrange, stoop and room continued in certain seams well into the 20th.[48]

As seam workings extended further underground, bearers were used to transport coal from the face to the tunnels and then to the pit bottom. These were usually women or girls. But this was not simply because women were regarded as a convenient source of unskilled labour: men had the strength to work the coal, but women had the stamina to haul it.

> "…the miner always preferred the girl to the boy, for, strange as it may appear, a woman or girl could always carry about double the weight of coal that a man or boy could."[49]

As long as a ready supply of human labour was available, the only incentive to improve underground haulage was that faster haulage meant more coal was shifted and therefore profits were increased. Baskets carried on the back were eventually replaced by the use of wooden boxes which were harnessed to the 'putter' as the women were called, then dragged to the pit bottom. Later, wheeled wagons known as 'slypes', or 'hutches' were pulled along roadways and eventually, many of these roadways were laid with rails to speed up the movement of coal.[50]

The passing of laws to prevent women working underground meant that by 1844 there were no more female bearers in East Lothian mines. There were two direct results of the change in the labour force brought about by the 1842 Act: an increase in both the number of railed tunnels and the use of ponies for underground haulage.[51] However, horses could only be used in passages wide enough to allow them to move freely. Smaller ponies were particularly valued: in 1858, a total of 400 shetland ponies were bought from the Shetland Islanders by one single dealer alone. By 1860, the cost of a shetland pony had increased fourfold.[52]

Steam-powered machinery did not, therefore, replace the

horse and at least one reason for this is demonstrated in the following story from a local pit. When the miners finished their shift, they discovered that the horse which operated the gin was busy elsewhere:

> "…the men…shouted for hours for the "bucket", but did not get up until the horse came back from delivering an order."[53]

It would not have been possible to dismantle a winding engine, use it to power a wagon for deliveries, then reassemble it to lift the miners out of the pit at the end of their shift – the horse was a great deal more flexible than an engine.

RAILWAYS

ALTHOUGH THE application of steam to pumping and winding engines was recognised from the earliest days of steam power, its application to transportation was an equally important one, resulting in the development of a country-wide railway network between the years 1800 and 1870.

Watt's 'improved' steam engine design was not, initially, appropriate for use with a moving vehicle. The mechanism was too heavy and unwieldy and further modifications were required before it could be used to power transportation.[54] Nevertheless, by 1815, at the close of the Napoleonic Wars, early mobile engines were making an appearance and by 1825, the Stockton and Darlington Railway was hauling goods wagons by steam power. Experiments in steam powered engines for transportation were under way in the West of Scotland by 1817.[55] Both East and West Scotland were equally enthusiastic about this innovative transport method and its potential to revolutionise coal transportation. A large steam engine used about one ton of coal and the labour of two men – driver and fireman – to pull about 550 tons of coal for 60 miles.

The Innocent Railway, with its stationary engine, was authorised by the crown in 1826. In 1836, the Edinburgh, Leith and Granton Railway received royal assent and by 1842, the Edinburgh and Glasgow line had joined the major cities of the East and West coasts with stations at Haymarket in Edinburgh and Queen Street in Glasgow. From 1840 onwards, railway lines proliferated at a great rate. In the 1840s, most of the Lothian lines, had been absorbed by the North British Railway and rails were converted to a standard gauge (ie the

distance between the rails), so that locomotives could travel from one line to another.[56]

By 1846, the Edinburgh to Berwick railway line was taking coal from Cadell's waggonway at Meadowmill for transportation elsewhere.[57] The coastal mines of East Lothian and others inland were linked via a series of marshalling yards and junctions, not only to the shipping ports of Leith and Granton and the city of Edinburgh, but to anywhere else they could compete economically with other pits. It was because of the new rail network, the advances in pumping and lifting equipment and the enormous appetite of the developing iron and gas industries for Scotland's coal, that the owner of Prestongrange, Sir James Grant Suttie, became interested in expanding the mining operations on his estate.

THE GEDDES REPORT

IN 1824, John Geddes prepared a report on the Preston Grange Coalfield.[58] This report is a fascinating look at the industrial landscape around Prestonpans in the early 19th Century, including the area round the Wallyford mine, at that time owned and operated by the Marquess of Lothian.

There were four main elements to Geddes' report: the amount of coal remaining in various parts of the estate, the water courses underground, the cost of establishing a new mine and the accessibility of transport and markets for the coal, given the proposed "Rail-way to Edinburgh and Haddington."[59] Any recommendation, therefore, was closely linked to the twin elements of machinery and transportation.

Geddes was supplied with some estate plans, although these did not cover the whole extent of mineworkings on the estate. Such earlier plans as existed, of both the surface and the workings beneath, showed that old seam workings often linked one pit with another below the surface.[60] The problem of identifying the relationships between this network of old workings made it extremely difficult to identify the most economic location for a new mining operation.

Some of his calculations of available coal were based on the result of borings near Dolphinstone, which involved drilling small holes down from the surface to determine what lay beneath. Elsewhere, Geddes was forced to rely on observations of the land surface, comments from the owner, the memories

of tenants currently living on the estate and what few documents were available.

> "These calculations can not however be depended on as absolutely exhibiting the remaining coal. They are assumed from data which are rather uncertain nothing being known of the extent of the old Wastes, or of the true line [ie the slant] of the old Dip-head levels."[61]

Geddes was extremely careful to avoid any categorical statements. With many 'ifs' and 'buts', he concluded that significant amounts of coal exist on the estate, particularly to the north, ie towards the Firth of Forth. His observation of the presence of ironstone, confirmed in a plan of 1825,[62] offers an insight into the dominance of the west of Scotland in terms of its ironworks:

> "The working of Ironstone in the lands of Preston Grange could not at present be attended with profit, there being no ironwork to consume the same nearer than Carron and these works can be supplied with this material at a cheaper rate in their immediate neighbourhood."[63]

Geddes also observed that the Prestongrange coals were a continuation of seams worked by the Wallyford mine, therefore a new coal working deeper than the existing Wallyford mine would be likely to cause flooding in the new workings. His calculation of the depth required for a new pit was 50 fathoms, while the Wallyford pit as this time extended only to a depth of 39 fathoms. This was important in terms of the pumping equipment which would have to be installed at Prestongrange. Another option, to track the course of the old day levels, or drainage channels, to the sea and renew and extend them, would, he concluded, be "difficult and expensive".[64]

Geddes was extremely wary of offering categorical advice on the best way for Grant Suttie to ensure maximum profit from his mining operations. He presents two options: either to lease the property to Wallyford mine, in which case the expense of the erection of

> "an engine of sufficient power on the Preston Grange Lands"[65]

would be unnecessary. Alternatively, the property could be leased to another tenant, who might be expected to bear the costs of such an engine themselves. By the beginning of the

19th Century, the cost of equipment to work the coal at deep levels was promoting the move from individual to company ownership.

An appendix to this report in April 1825, by Robert Bald, a civil engineer and surveyor, was inclined to be more positive.[66] From old colliery plans, John Geddes' report and a survey of his own, Bald concluded that a combination of clearing out part of the old day level and the erection of an engine would result in enough drainage to allow further mining to take place, though southward rather than under the Forth. However, he does inject a note of caution:

> "…as there is every reason to apprehend that the quantity of water will be very considerable, the power of the Engine would, consequently, require to be great."[67]

Bald also proposed

> "The whole machinery and Fitting of the Colliery to be done at the Tenants expence: the landlord to have it in his power at the end of the Lease to take the whole, or any part of the Machinery he may choose according to the valuation of men mutually chosen."[68]

MATTHIAS DUNN

THE LEASING OF land by George Grant Suttie to Matthias Dunn in 1830 and the sinking of the No. 1 shaft to reopen the mine after more than 65 years, marks the birth of the modern Prestongrange mine.[69] Dunn, from Newcastle, was a prominent mining engineer at the forefront of developments in mining technology. His shaft introduced the first iron 'tubbing' or shaft lining (previously, a combination of stone, timber and clay had been used) to Scotland, and the drainage of water was by a steam pumping engine.[70]

A plan of the mine workings drawn up in 1838 by George Buchanan (which also includes later, undated additions)[71] identifies a waggon road from the pit bottom to the workings and there is evidence that Dunn and his manager, Moore, replaced the use of bearers with wheeled rails.[72] The coal was lifted onto these rails by means of a crane, then transported by waggon along the rails. However, in 1838, Dunn gave up the lease and by 1840 the workings were flooded yet again. It would seem that both owner and leesee learnt a bitter lesson:

View of Prestongrange colliery with horse and gig in the forefront
East Lothian Council, David Spence Collection

Coal trucks entertain the local miners' children
East Lothian Council, David Spence Collection

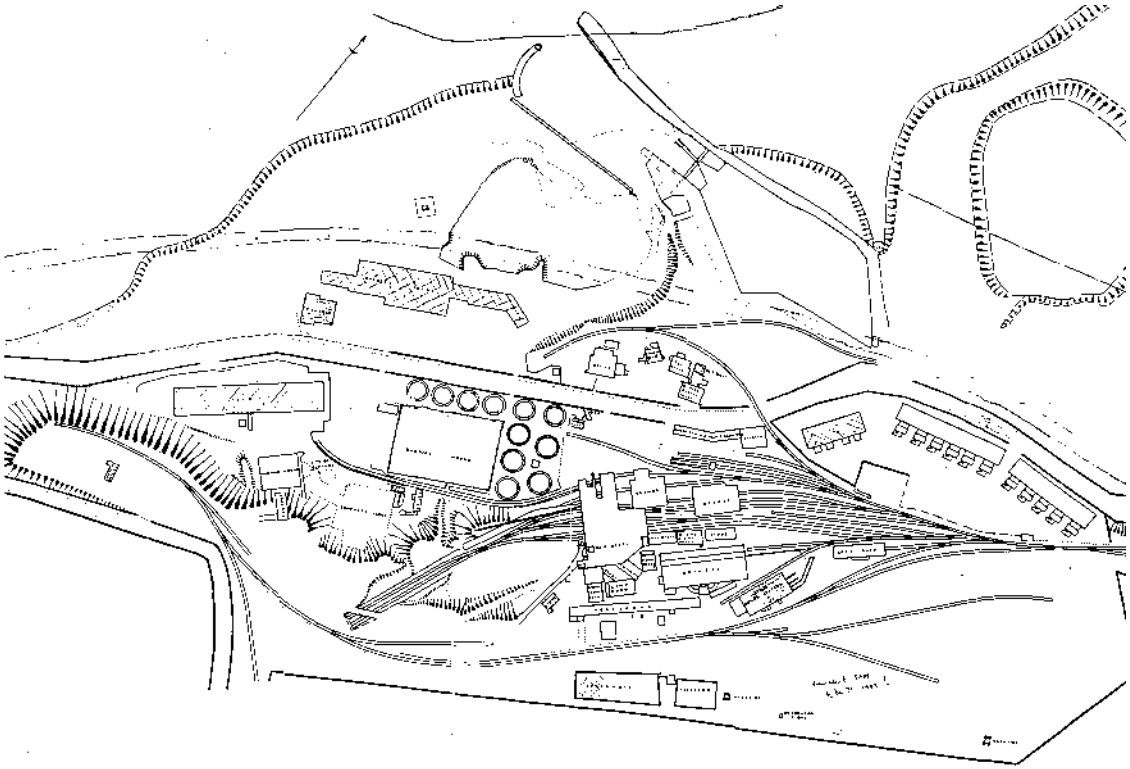
Horse shoeing at Prestongrange
East Lothian Council, David Spence Collection

Lothians Southern Engine No. 17 at work at Prestongrange

East Lothian Council, David Spence Collection

Prestongrange Steam Engine No. 7 entertains visitors at Prestongrange Museum

East Lothian Council, David Spence Collection



Map showing Sidings at Prestongrange colliery c.1943
Courtesy of the National Archives of Scotland

the market for coal, with its rise and fall in prices together with the enormous expense of the machinery involved required restraint on both sides in the pursuit of profit.

> "..the casualties of coal-mining are such as to entitle a tenant of capital and enterprise to good consideration from his landlord and that landlords often get punished for failing to do this."[73]

However we can be grateful for this disagreement between owner and leesee – it was probably responsible for the existence of Buchanan's plan.

CORNISH BEAM ENGINE ARRIVES

IN 1850, the Prestongrange Company took over the lease. They re-sunk Dunn's shaft to the Beggar seam as a pumping pit and sunk No. 2, the Jewel shaft. This company, based in Cornwall, were responsible for the erection of the beam engine, shipped to Prestongrange in parts and assembled on site. Cornish tin mines had long been used to deep workings and this type of engine was commonly known as a Cornish Beam Engine.[74] We gain some insight into the effect of such massive machines on pre-industrial society from a description of a similar engine seen by the poets Wordsworth and Coleridge on a trip to Scotland in 1803:

> "…it was impossible not to invest the machine with some faculty of intellect; it seemed to have made the first step from brute matter to life and purpose, showing its progress by great power."[75]

The original pump installed by Matthias Dunn was presumably on the surface, as was common in the early days, for safety reasons. The Cornish engine had two main pumps below ground, one at the depth of the Great Seam, 420 feet below the surface and another halfway between the Great Seam and the surface, plus another, lower pump at the level of the Beggar Seam, at a depth of 766 feet. Pumps were driven by steam from the surface and could pump water out of the pit at a rate of 650 gallons per minute.[76] Given the quantities of water, it is clear that without steam power, there would have been no possibility of extracting coal at Prestongrange at these depths.

In 1850 the junction for the mineral railway, linking Prestongrange Colliery with the main East coast line was

opened.[77] The inventory of George Grant Suttie's estate in 1872 includes:

> "Rails, sleepers and other articles…used in the formation and working of Railways for conveying Coals from the pit head to any Railway or other place where they are sold or disposed of."[78]

The inventory also mentions sleepers and other equipment for use on underground railed roadways.

After 1876, when Morrison's Haven harbour was rebuilt, railway lines ran from the mine and there were facilities for loading coal onto ships for the overseas trade, as well as a tram line running to the harbour from the Summerlee brickworks.[79] The landscape of the mine was radically different from the grass covered slopes of today. The area was covered in a network of buildings which housed workshops, engine houses, locomotive sheds and stables for horses, a network of railway lines and sidings, and a link to a stone quarry close to where Sam Burns' yard is today. The mineral railway connecting the mine to the main line included further junctions and storage sidings for wagons beside the main line.[80]

The estate inventory lists a wide range of equipment in use shortly before the installation of the beam engine in 1874, although again, it is important to bear in mind that this was equipment in use throughout the Prestongrange estate.[81] Two "water" engines are referred to, one with one and the other with two boilers, the latter described as old. This, perhaps, was the engine installed at the time of the original sinking of the No. 1 shaft by Matthias Dunn.

Mention is also made of "air pumping machines", though these are not fully described and are unlikely to be of recent development since there was little, if any, interest in the use of fans to circulate air until the end of the 19th Century. Ventilation at this time was still by means of a furnace near the pit bottom. Suspicion amongst mine owners regarding innovations in ventilation were to some extent justified: some early mechanical ventilators were up to 40 feet in diameter and their installation was no easy task.[82]

Also included in this inventory is reference to a gig engine with winding apparatus and ropes, so it is likely that horse gins were still in use, although another entry referring to

> "old materials of Gig and water engine with pipes and pump rods and Boiler"[83]

makes it clear that much of what was in operation at this time was a combination of old and new.

In spite – or perhaps because – of the massive investment represented by the beam engine, the Prestongrange Company failed in 1893,[84] but after a gap of only two years, the mine was taken over, by The Summerlee Coal and Iron Company, who leased Prestongrange from 1895 until nationalisation over fifty years later.

SUMMERLEE COAL & IRON

THIS COMPANY, based in Coatbridge, had strong links with the West of Scotland, which was at the forefront of industrial innovation. The parent company produced iron as well as pumping and winding engines for mines throughout the country. Summerlee was responsible for the first iron steamboat built in the early years of the Clydeside shipping industry. The company owned eight blast furnaces in Coatbridge and were owners or leesees of over 10 collieries, mostly around Glasgow and the West, as well as the Prestongrange Colliery in East Lothian and its associated brick and fireclay works.[85]

Summerlee had the breadth of experience and the financial wherewithal to develop Prestongrange and the early 20th Century were years of unparalleled growth and expansion, when Prestongrange coal played its part in fuelling Scotland's industrial development.

The pace of change in these years brought about a proliferation of legislation. In earlier centuries, laws were primarily concerned to make sure that the profits to be made from coal mining were liable to taxation, that the coal seams were protected from damage and that an adequate workforce was available to work the coal.[86]

Although legislation in the later 19th and early 20th Centuries still concerned itself with these issues, many of the new laws dealt with the need to regulate the use of equipment, which was constantly evolving. Regulations were exhaustive, covering use and storage of explosives, boilers, engines, furnaces, haulage, winding, coal sorting, horses, locomotives and associated equipment above and below ground.[87] With the advent of electricity, an even greater weight of legislation was added to what was already in force and coverage was, if anything, even more detailed.

By 1870, the national rail network was largely complete. Scottish lines extended both up and down the country, meeting up with English lines to complete the network of rail transportation. Coal mines were linked to industry by a network of mineral railways, junctions and canals and Scotland's industries were competing ably in national and international markets. Small railway companies had been absorbed, to form such giants as the North British Railway, standardisation of main railway lines was complete and economic conflict with England had shrunk to the level of mere rivalry.[88]

Many of the iron companies of the west expanded their operations to include the building of steam engines for the rail network. Manufacturers such as the firm of Andrew Barclay of Kilmarnock not only built steam locomotives for use at Prestongrange,[89] they also provided materials for other types of steam engine. They were, for example, responsible for manufacturing new pump barrels, rams and valves for improvements to the pumping capacity of the Cornish beam engine in 1905: the Summerlee Iron Company carried out the installation.[90]

The style and capacity of engines and wagons developed for industrial haulage in the early days remained largely unchanged. Wagons were wood, of 10–12 ton capacity; traffic on mineral railways was slow, averaging about 11 kilometers an hour, partly because braking systems for wagons had to be operated manually and engines had to be stopped while this was in progress. Industrial haulage was concerned with heavy loads travelling relatively short distances, but by the early years of the 20th Century, main line train services were increasingly interested in speed and economy in the fuel they used and the design of main line and industrial locomotives began to diverge.[91] A report on the testing of Prestongrange coal on the 9.30 am Edinburgh to Carlisle passenger train in 1909 found it to be:

> "…a very swift coal, not at all durable…the several different wagons contained various qualities…re wagon no. 16968 – all dirt. The coal is … fairly good steam coal but burns away quickly when the engine is working very heavily… not a suitable coal for heavy express work."[92]

At Prestongrange, as with other mineral railways, specific sidings were earmarked for particular destinations. A map dated 1911[93] lists the location of wagons for land sale in the south, others for Leith north and south, for Granton and

closed wagons for "shipment", presumably abroad. The sorting of coal into different types and different destinations was an important one. As mentioned earlier, different coals were suitable for different purposes, some for household use, others for industry.

However, industrial development at this time was not problem free: the 19th Century saw the birth of the labour force as a political power, marked by disputes between owners and workers in the form of strikes and lock-outs.[94] But famine in Ireland brought a steady stream of immigrants to the West coast, eager for employment[95] and the extensive mining operations resulting from the application of steam power to the mining industry required a much increased labour force. In 1900, there were 439 employed at Prestongrange Pit, 61 above ground and 378 below – by 1910, this total had risen to 873, 153 above and 720 below.[96] Many of these were immigrants from Ireland who gradually moved eastward into the Lothians, bringing radical change to the traditional mining communities of East Lothian.

As mineworkings at Prestongrange reached deeper below the surface, pressure increased on existing methods of operation. A second edition of Buchanan's map in 1882,[97] indicates that much of the coal below the land had either been exhausted, in the case of the Great Seam, or were arrested by areas of burnt coal or areas where folds in the seams created rock barriers. At the same time, improvements in boring techniques allowed engineers to test for the presence of coal in previously inaccessible areas, while improvements in shaft construction and haulage machinery meant that coal could be lifted from deep workings.[98]

By the turn of the century, only the Clay and Five-foot Seams were being worked under the land. Other workings extended seawards, from between 300–900 feet below sea level, working the Great (still by stoop and room), the Jewel and the Beggar Seams.[99] The extent of these workings brought rapid change to the machinery in use.

The traditional furnace method of ventilation was inadequate to meet the demands of depths where the temperature itself became an issue: a depth of 900 feet would mean a temperature increase of approximately 18 degrees Fahrenheit, excluding the additional heat generated by human labour and the operation of machinery. Furthermore, the air entering and leaving the shafts caused significant draughts, resulting in wind velocities at times of over 1 kilometre per minute. These

elements, together with the need to circulate breathable air and avoid the gathering of poisonous or explosive gases, created a need for improved methods of ventilation.[100]

Early equipment was large, steam-powered and relied on a revolving fan. Later "axial flow" fans used a series of blades which did not change the direction of air flow and therefore required less energy to run.[101] In 1900, the fan in operation at Prestongrange was a 22 inch Guibal fan, 7 feet wide.[102] In 1906, a new shaft, No. 3, was sunk to provide additional ventilation.[103]

The quantities of water associated with Prestongrange had always been problematic. By the 1890s, the Cornish engine, even with additional support from steam and hydraulic engines below ground, was certainly finding it difficult to cope. On several occasions, the strain proved too great and significant repairs had to be made. By 1900, an hydraulic engine, using water pressure to run the pumps, was in the process of construction as an additional means of pumping water away from the workings.

> "Conditions at Prestongrange…were such that a much higher pressure [than that supplied by a normal hydraulic pump] of drive water was required, consequently a ram pump, driven by a steam engine, was installed on the surface…The steam engine and ram pump were designed and manufactured by the Summerlee Iron Company."[104]

ELECTRIC POWER

BY 1910, an electric turbine pump had been installed at the pit bottom, which pumped water at 3 times the previous rate.[105]

Steam power for underground haulage was initially used only on tracks which were too steep to allow ready haulage by horse or human. Full wagons were attached by rope and pulled up the incline by steam power: empty wagons ran backwards simply by the effect of gravity. By 1841, high-pressure steam winding engines were introduced to Scottish pits and a number of systems came into use.[106]

At Prestongrange, by 1900, the system was Endless Rope Haulage, where a continuous rope travelled along the tunnels which connected the pit bottom to the workings. This system was driven by two engines located on the surface, using steel

ropes. There was also an elevator for raising the dross left after the coal was removed "capable of raising fifty tons per hour". The Endless Rope system was also used to lift coal to the surface.[107] Hemp (vegetable fibre) ropes were used as winding ropes at some East Lothian collieries as late as the 1880s,[108] but presumably, given the weight being lifted, at Prestongrange, these, too, were steel.

Generally speaking, throughout the 19th Century, little effort was put into the sorting and cleaning of coal: in the middle of the century:

> "What is now called 'coal preparation' was virtually unknown. The object was round coal, and to that end the drawer had to fill his hutch with a harp shovel, i.e., one with slots through which the dross passed and was flung back in the waste."[109]

By 1900, at Prestongrange, this situation had changed radically. Although human labour was still used to sort coal from stone, much of the process was mechanised: tumblers were used to shake coal and fireclay free of surrounding matter as well as screens and riddles (metal grilles) which sorted the coal into different sizes. Loading the coal onto wagons was also a mechanised process.[110]

A washer for cleaning coal was installed at Prestongrange as early as 1895, claiming the distinction of being the first in the county. There was also great interest in the use of conveyor mechanisms to move the coal. Although the "jigger" conveyor, which carried coal along in pans, was not marketed until just before World War I, the General Manager at Prestongrange, David Marr Mowat had developed and installed his own version of this machine by about 1907.[111]

The narrowness and steep angle of many coal seams in Scotland encouraged development in coal cutting equipment. Unfortunately, early experimentation was hampered by the lack of a metal strong enough to withstand the abrasion from the coal seam. By the late 1880s, further refinements to these machines and the emergence of suitably strong metals resulted in the production of a number of mechanical coal cutters.[112]

All of these developments in mining equipment and methods must be viewed against the background of motive power: in 1850, steam engines were the only source of mechanical power and by 1900, developments had largely been in the form of refining steam engines to increase power by the addition of compressed air or hydraulic power to steam engines. In the

1850s, almost all machinery in use in East Lothian collieries was steam-driven.[113] As steam power evolved, machinery became less massive and more suitable for use in underground workings. Adaptations which combined steam power with the use of compressed air increased the efficiency of smaller machines, allowing them to use the force exerted by the compression of air to generate greater power and reduce energy loss.[114]

Throughout this time, horses, working alongside men and machines, continued to be valued as an essential part of mining operations. Although these animals rarely saw the light of day, the legislation surrounding the use of horses at pits is clear evidence of care: regulations directed that properly experienced people should care for horses and that properly regulated tests were conducted to be sure animals were healthy. Horses were to be housed in decent-sized stalls in a clean, well-ventilated stable away from haulage or travelling roads. They were not to work unless fit, properly shod, with proper harness and eye-guards and were not to be worked in places too small for them to pass through comfortably. At the end of their shift, they were to be supplied with wholesome food and pure water and should be examined, cleaned and groomed. A record book had to be kept and an annual report made, and any pain, injury, ill-treatment or overworking to be reported.[115]

However, it was not horses, steam, hydraulics or compressed air, but the growth of electrical power which had the potential to generate changes almost as far reaching as those resulting from the harnessing of steam power in the 19th Century. Electricity was in a process of constant development, but its application to mining methods was limited by the danger of explosion from sparks generated by the operation of electrical engines.[116] Nevertheless, although steam power continued as a major source of energy, electrical engines were seriously challenging its use in many areas.

Before 1910, when the electric turbine pump was installed to pump water from the workings at Prestongrange,

> "…all the electrical power for the pit was supplied by a 140 kw DC generator driven by a horizontal steam engine…[and] a little old dynamo for the lights driven by a 'grasshopper' which was accounted the sweetest running engine in the place"[117]

It is interesting to note in passing that the respect people had displayed towards the early engines was by now replaced

in many cases by affection. Perhaps this was due to their smaller size, but clearly people had developed a very personal relationship with mechanical equipment, a situation which remains true even today.

Electrical power was seen to be as far reaching as steam had been a hundred years before, part of an evolutionary process which would continue into the future. Steam, compressed air and hydraulic pumps would be replaced by electrically powered equipment because it was:

> "…more easily transported, with less loss in transmission [ie the amount of power generated relative to the amount of power put to use]. It revolutionised underground transport because it was far easier to install a haulage motor than to make and maintain a road for a horse."[118]

The applications of electric power seemed endless: safer lamps for miners; smaller machinery which could cut coal from seams too narrow or awkward to reach; deeper mineworkings supported by electrical ventilation, pumping and haulage and lifting equipment; faster movement of coal from the face, with automated loading and sorting to speed up the process from coal cutting to railway siding or dock.[119] The technology to transform the railway network existed as early as 1897, when Rudolph Diesel developed a working model of an engine which combined oil as fuel and electrical power.[120]

UNDER INVESTMENT BLIGHTS DEVELOPMENT

HOWEVER, THE optimism of these early years did not last. By 1915, industrial growth in Scotland had begun to die away and developments in the use of mechanical power became piecemeal and erratic. Statistics for coal production between 1800 and 1935 reveal the increases in output resulting from the application of machine mining. But equally, regional and national variations in coal production show how growth in the late 19th and early 20th Centuries had became years of stagnation and decline.[121]

In 1800, the total coal output for the whole of Britain was 10 million tons. By 1870, Scotland alone produced 15 million tons and by 1913, the Scottish coalfields were producing 42 and a half million tons. Two years later, output in Scotland

had dropped to 35 and a quarter million tons a year and this decline in output continued almost uninterrupted until, by the end of World War II, the Scottish output had shrunk to a little over 20 million tons a year.

The second important element in these figures is the comparison they offer between different coal-producing areas: in 1880, Lanarkshire produced 54.81% of Scotland's coal, by 1910, the figure was 43.29% and by 1935, only 28.62%. For East and Mid Lothian, the reverse was true: 5.67% in 1880, 9.87% in 1910 and 15.37% in 1935.[122]

From 1915 onwards, coal production in Scotland was diminishing. At the same time, the coalfields of Lanarkshire, where industrial development was at its height, were shrinking and the smaller coalfields of the Lothians were proportionally increasing their contribution to the shrinking total of Scotland's coal production.

The extraction of coal in the west of Scotland had been the impetus which fuelled industrial development of equipment and machinery – but accessible coal seams were becoming exhausted by intensive mining and new seams were often too technically difficult to exploit.[123] Greater reliance was placed on supplies of East Lothian coal, but the slowing pace of coal mining in the west affected industrial development throughout Scotland.

Furthermore, the fact that electrical power was increasingly put to use in the 1920s and 1930s gives a misleading impression of progress during these years. The technical innovation that promoted the use of electrical machinery was essentially a 19th Century development.[124] A clearer indication of the pace of industry after World War I is seen in the fact that the application of electric power did not advance at the rate typified by the early years of steam. In 1905, coal cutting machines in Scotland were producing two and a quarter million tons of coal, but only about 50% of these were electric.[125] Even though electrically powered machines were produced as far back as 1887, compressed-air machines were in use well into the 20th Century.[126]

Similarly, although coal conveyors were patented as early as 1902, these were far from universal: even in the 1940s, Prestongrange did not have a continuous belt conveyor for shifting coal.[127] There was little investment in equipment such as power loaders which could take full advantage of the speed of the belt conveyor and the pace of production remained tied to the manual loading of the belt at the face. Although some

collieries did invest in electrical equipment – Elphinstone Colliery near Tranent purchased an electrically-driven coal cutter in 1890,[128] the use of electricity in East Lothian was not widespread in the early years of the 20th Century. At the start of the century, most mining machinery, including that in use at Prestongrange, still relied largely on steam power and even as late as 1910 only one East Lothian pit (Woodall) was using electric power for coalcutting.[129]

The reason for such a slow pace of development was both economic and technical. Mine owners were increasingly unwilling to invest in new equipment, claiming that increases in government taxation did not allow them a fair return on their investment.[130] By and large, electrical power replaced steam as a major motive force only where the changeover was a fairly straightforward process without significant alterations to tunnels and seam-workings, or where it was essential to maintain the workings – for example in the case of electrical pumping equipment at Prestongrange. The establishment of the Mining Institute of Scotland in 1878[131] had been intended to support and expand knowledge and experience, but without investment, new techniques could not be developed.

Not until nationalisation, when the government took over the coal mines in 1946–7 was there any large-scale redevelopment capable of taking full advantage of the potential of electric power. And, by that time, the concept of "rationalisation" meant that this was only undertaken at existing collieries if the expense was justified in terms of profit.[132] Mines which required too much investment were earmarked for closure. This was certainly not the future envisaged by mineworkers, engineers and managers in the early years of the 20th Century. To them, no doubt, it seemed that electrical power promised a future where technical development and increased coal production would continue long into the future.

The period between the first and second World Wars was typified by an increasing sense of decay in the mining industry. The building of welfare institutes, pithead bathhouses etc gives an impression of progress and certainly conditions for workers improved.[133] But as far as equipment was concerned, East Lothian mines, including Prestongrange were increasingly operating on outmoded or elderly machinery. A sense of the atmosphere in these years can be found in local press reports:

> "The annual holidays began on Friday, when the pits closed down for ten days. The duration of the holiday is

> exceptionally long, considering the quiet time…at some of the pits lately…"[134]

> "In a military sense the war is over and won, but in an economic sense it is raging as keenly and bitterly as the military war ever did."[135]

The struggle between owners and workers over conditions of employment was another contributing factor to mechanical deterioration: when pits stopped production due to industrial action or lock outs by owners, maintenance procedures could not be carried out and the extent of flooding in some East Lothian pits meant they were permanently closed and machinery lost.[136]

A list of equipment in use 1939, reveals some significant facts about coal mining at Prestongrange at the outbreak of World War II[137]: No. 2 pit, the Jewel, still used a steam hoist, although the air shaft at the harbour had an electric winder. A Norton engine with a 60 horsepower motor had replaced the original steam power for the washer installed in 1895, but electrical power was still supported by machinery installed in 1910 and 1916. A number of pumps and some drilling equipment listed is manufactured by Siemens, a German firm (which is still in existence) whereas most earlier machinery had been manufactured in Scotland.

What this demonstrates is that Scotland had lost its industrial lead. Whereas 19th Century growth allowed engineers to make full use of the applications of steam power, the period of stagnation following World War I meant that electrical power never developed its full potential at Prestongrange. Furthermore, the growing interest in alternative sources of power meant that coal was losing its attraction as a major fuel source. In the 1950s, hydro-electric power was in the process of development,[138] then later oil and gas from the North Sea, nuclear energy and, more recently, wind and wave power have all made a contribution to Scotland's energy resources.

Miners' reminiscences of their days at Prestongrange during World War II give a good idea of how little development had taken place since the early years of the century:

> "…during the war, there were no many what you call belt runs…it was what you called a road…a man had a hutch and a pony..the ponies pulled the hutches…they were pretty strong but they could only pull one because there were nae room…where the coal was lyin'…"[139]

Some innovations in equipment took place at this time, thanks to the lend-lease arrangement with the United States, when equipment was supplied to industry in Britain. Prestongrange benefited with the introduction of a machine known as a "joyloader", which speeded up the process of coal cutting.[140] But loss of manpower during the war, the cost of mechanisation and the fact that owners were not prepared to invest in case of subsequent nationalisation meant that by the end of the war, Prestongrange pit was in the final stages of the decline which led to its closure in 1962. In 1948, East Lothian produced 870,000 tons of coal – 230,000 tons less than in 1939.[141]

A map, loosely dated 1947,[142] shows the deterioration since the early years of the century. The pre-war trade with Europe was never adequately re-established, especially at small harbours such as Morrison's Haven. By this time, the railway line to the harbour and the harbour crane were gone. A large number of railway lines around the mine had been lifted and there was little in the way of industrial addition – most new building was related to the welfare of the workforce, pithead baths, and an ambulance house, for example. The only piece of equipment added was one extra washer.

NATIONALISATION'S INVESTMENT PROGRAMME

NATIONALISATION in 1947 brought large scale redevelopment for Scotland's coalfields, including the sinking of new pits, with wide tunnels of reinforced concrete, haulage engines and mechanised cutting, conveying sorting and washing.[143] For a short time, there was a mood of optimism, reinforced by improvements in working conditions. In 1953, the estimated coal reserves in the East Lothian coalfield were 1230 million tons, extending up to three miles under the Forth.[144] and although some coal seams at Prestongrange were worked out, a great deal of coal remained. East Lothian employment estimates in 1950[145] show 694 people employed at the mine and suggest a projected employment figure of 755 between 1961 and 1965. But although productivity figures at Prestongrange were not low,

> "Prestongrange, with its narrow roadways was not suitable for mechanisation."[146]

Despite innovation on a larger scale in other East Lothian mines, Prestongrange was only one of many pits identified as uneconomic. Between 1959 and 1965, 13 East Lothian mines closed, bringing mining in East Lothian to an end,[147] except for open cast mining such as that conducted at Blindwells, which, strangely enough, represents a large-scale return to the drift mine of the early centuries. At the closure of Prestongrange mine in 1962, the number of workers employed was 696, almost exactly what it had been 12 years earlier.[148]

A visitor to the quiet, grass-covered site of Prestongrange colliery today will find it difficult to imagine the bustle and vigour of the mine in the early years of the 20th Century, just as the mine workers at the time would have found it hard to believe that their way of life, so well established and solidly based, would have disappeared only 70 years later. In the days of full production, the air was filled with the hum of electric generators, the deeper beat of the pumping machines, the constant clamour of men and machinery as haulage engines transported the coal to harbour and railway line. At the brickwork, lorries waited to be loaded with bricks and pipes still warm from the firing, while the women of Morrison's Haven were engaged in their constant battle against the ever-present dust and children were everywhere busy about their lives.

Through the buildings and equipment remaining today, it is possible to chart the whole progress of Prestongrange, from the sinking of Matthias Dunn's original shaft. The beam engine house, surrounded by relics of pumping engines, electrical ventilation and winding machines, remains as a tribute to the art of those early engineers in that so much of it remains intact, nearly 130 years after it was erected. There are wagons which were used for transporting coal both underground and on the surface, and the steam engines which pulled them offer another demonstration of the strength and durability of Scottish engineering. The steam crane is not the original one used at Prestongrange and is an interesting anomaly: although it is of English manufacture, the building of steam cranes was in fact a Scottish specialisation.[149] The pithead baths and the canteen, clearly later additions, show how the working conditions of miners changed over the years. No trace of the horses remains, though they, like the people, were there at the start of mining at Prestongrange and survived well into the 20th Century, through their usefulness in terms of mobility, flexibility and strength.

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