

ART. XVIII. – *Tindale Fell Spelter Works, East Cumbria, and its Closure in 1895*. By J. K. ALMOND.

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**I**N contrast with lead, metallic zinc has had only a short history, at least in Europe. Demand for zinc, or spelter, began to increase markedly in the years before 1850 as new uses appeared for the metal: sheet zinc was introduced for building purposes, and zinc coatings were applied to iron sheets to prevent rusting (so-called “galvanising”). At much the same time emerged the use of zinc for electric cells, and by 1850 nearly all brasses were prepared directly from zinc and copper. Between 1840 and 1890, British consumption of zinc increased twenty-fold. It was at the beginning of this period that the spelter works at Tindale Fell was established. In this paper some of the features of the works are outlined, and the circumstances surrounding the ending of operations in 1895 described in more detail.

### **Establishment of the Spelter Works**

In 1845, a lease of land on the Naworth estate in East Cumberland was negotiated with George, Earl of Carlisle and George, Lord Morpeth,<sup>1</sup> for the purpose of setting up a zinc-smelting works. The lessee was James Henry Attwood (1785-1865), a member of a Midland family prominent not only in banking and politics but also in various branches of industry, notably iron, steel and glass. The site leased was at Rigg Foot, Tindale, some 10 km east of Brampton (NY 618592).

Reasons for selecting such an apparently remote site presumably included proximity to coal deposits being actively worked and for which customers were wanted and to mines producing zinc minerals, and convenient railway facilities for despatch of the metal product. The lease stipulated that coal, coke and lime requirements were to be purchased from the local workings. The Earl of Carlisle’s colliery railway, linking the coal pits at Midgeholme in the east with staithes at Brampton, had been opened to horse-drawn wagons at the end of 1828, and locomotive working was introduced in 1837.<sup>2</sup> This line passed along one edge of the site of the spelter works, and a branch from it ran through the site itself to nearby limekilns, quarries, and coal workings (Fig. 1). Sixty years later, John Cameron Swan – who came to have a close association with the operations of the Tindale smelter – observed:<sup>3</sup>

The perception of the fact that there was a future for zinc, and the selection of the site for the works, was evidence of the acumen and remarkable judgment of Mr Attwood. He had all Britain to choose from, and he certainly managed to make choice of the one spot in which the greatest number of favourable conditions were present.

### **History of the Works after 1860**

J. H. Attwood died in 1865 and it appears that from 31 July 1868, three years after his death, control of the zinc-smelting operations at Tindale Fell passed to the Tindale

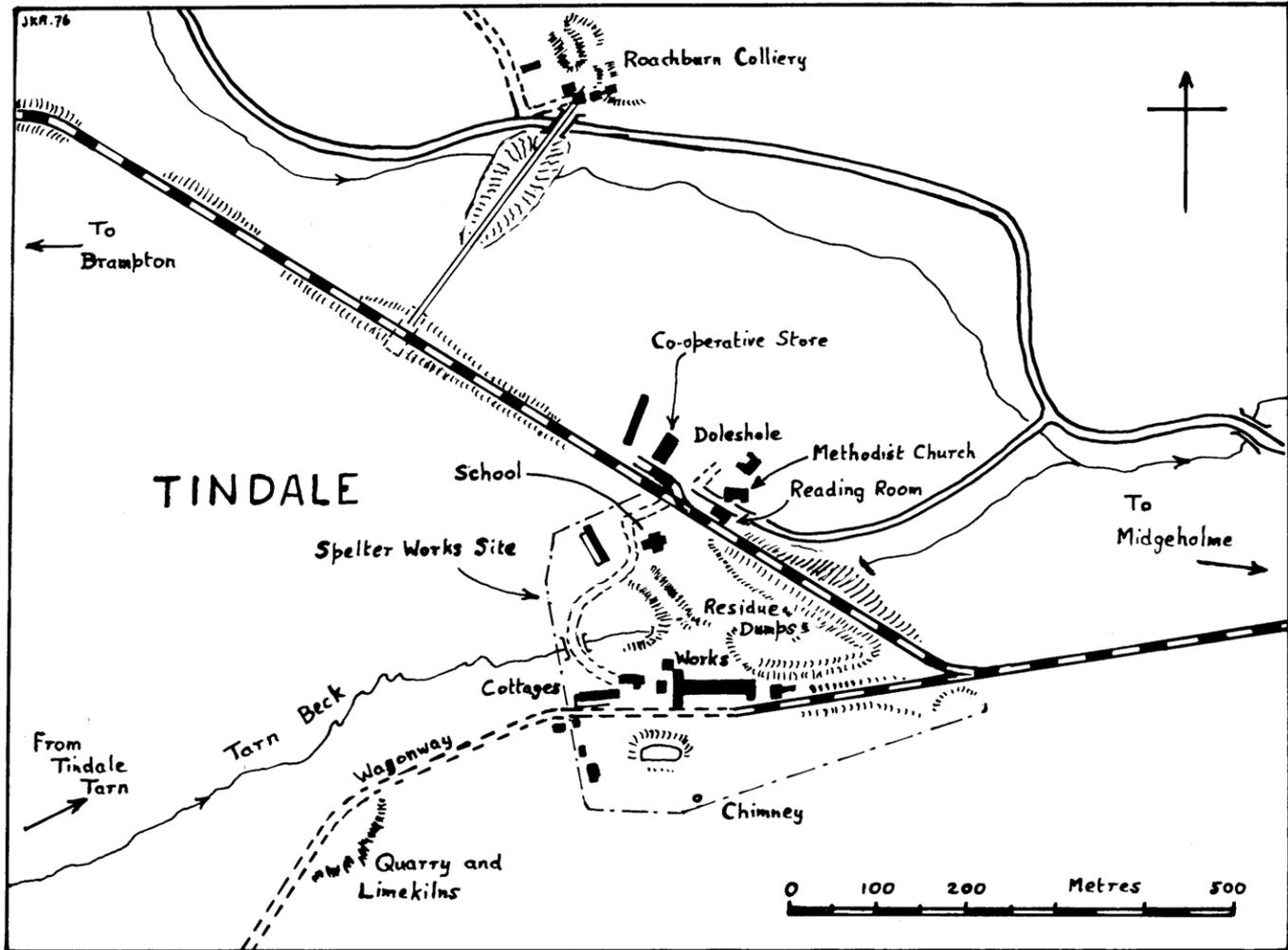


FIG. 1. — Site of the Tindale spelter works in the late 19th century. Based on Ordnance Survey Sheets surveyed between 1863 and c. 1895.

Spelter Company. The leading member of this company was a notable mineral merchant of Newcastle upon Tyne, John Cameron Swan (1827-1916), with his relatives as other proprietors (Plate I). Output of zinc increased from 636 tonnes in the year ended 31 July 1869 to 1,430 tonnes in the year ended 31 July 1882.<sup>4</sup> In 1863, spelter production was given as 750-800 tonnes,<sup>5</sup> and it is unlikely to have exceeded this level in earlier years. In the nine years from 1883 to 1891, 13,000 tonnes was made: total output during the life of the works is estimated at 40,000 tonnes.

In 1882 the works was involved in a reorganisation aimed at rationalising some of the local metal-mining operations. J. C. Swan and his associates at that time formed the Nenthead & Tynedale Lead & Zinc Company Ltd. to acquire from the London Lead Company mining leases and lead-smelting works at Nenthead. It was thought the new arrangement would make it advantageous to extract ores of both lead and zinc at the same time from the various mine workings, the lead ore to be smelted at Nenthead and the zinc ore to be smelted at Tindale. In this way it was hoped each commodity would support the other – an important consideration in a time of falling and uncertain world prices.

The zinc ores coming forward to the works were mainly of sulphide (blende), although there was also some carbonate (calamine), especially in the earlier years. To extract metallic zinc from the zinc-bearing materials involved two stages. Firstly the finely-ground ores were heated in reverberatory furnaces in order to convert the minerals to zinc oxide. Secondly the zinc oxide was mixed with small-sized coal and the mixture charged into fireclay cylinders, or retorts, which were strongly heated in coal-fired furnaces. At high temperature, zinc in gaseous form would be produced by chemical reaction within the charge, and this zinc, distilling from the hot retort, would be cooled in fireclay tubes, or condensers, of conical sections, to be collected as liquid.

A single retort and condenser could yield a few kg of metal during 24 hours of working with a charge, so a practical spelter works required a large number of retorts in order to achieve significant output. In its heyday the Tindale Fell works claimed a capacity of 912 retorts, arranged in 14 subliming furnaces.<sup>6</sup> The fireclay retorts and condensers had only short lives, and this explains why so many broken fragments are to be found at the site of the works today. Part of the labour force at the works would be involved in moulding and preparing fresh clay retorts and condensers, and it is possible some – most likely women or children – would be engaged in recovering zinc-bearing crusts from the old claywares before discard.

In 1859, the manager of the Tindale Fell works was George Ingram, and Abraham Little the clerk.<sup>7</sup> Twenty years later, Joseph Thompson appears to have occupied the position of resident manager, at the same time that J. C. Swan was paid an annual sum of rather more than £200 for management.<sup>8</sup> In 1884, John Harrison was listed as manager.<sup>9</sup> While the manager's house appears to have been on the works' site, the proprietors maintained for their personal use a house near Hallbankgate known as Moss Hill. About 1860 this had been J. H. Attwood's residence.

The Nenthead & Tynedale Company was soon affected by adverse economic conditions. The price of lead continued to fall – from £16 a ton in 1880 to £13 in 1890, and to less than £10 in 1893. Zinc prices were more variable. After falling from more than £20 a ton in 1875 to £14 in 1885, the price rose to just over £23 (1890), only to fall back again to £14.60 by 1895. The company paid a dividend of 7½ per cent in the year to 30



PLATE I. — John Cameron Swan, 1827-1916, the leading proprietor of the Tindale Fell spelter works from 1868 to 1895.

(From *John Cameron Swan his family and friends, 1827-1916*, by his daughters Emily and Mary, n.d. c. 1919-20).

September 1889, and another dividend – its last – of 2½ per cent in 1890-91.<sup>10</sup> Ten years earlier, the cost of producing zinc metal from Alston ore minerals had been reckoned at about £15 a ton, and it is unlikely that expenses had decreased appreciably during the decade 1881-90.

### Closure of the Tindale Spelter Works

Coincident with these financial difficulties, the fifty-year lease of the 6.9 hectare (17-acre) spelter-works site expired on 1 May 1895. By 1893 negotiations were proceeding for renewal, but no agreement could be reached on terms. Negotiations continued into the early part of 1896, but after mid 1895 the works was closed, so bringing to an end an interesting period of metallurgical endeavour. It was another thirty years before the site saw any serious revival of activity, and then it was a failure.

An extract from the 1845 lease included details of items to be revoked at its expiry, J. H. Attwood as lessee being free to remove for sale elsewhere those things which Lord Carlisle chose not to purchase:<sup>11</sup>

... all furnaces reservoirs aqueducts spelter works workmens houses offices erections and build-ings ... all ... steam and other engines machinery and the moveable retort works articles and things ...

One year after the lease had expired, in June 1896, the representatives of the Naworth estate received the following telegram:<sup>12</sup>

Important been informed today Spelter works being dismantled by company. See lease as to their powers of removal also as to cottages.

Whether this move was made simply to obtain salvageable materials or to precipitate a favourable settlement of the lease is obscure. There is, however, abundant evidence that the Carlisle family was reluctant to renew the lease. Amongst objections were that sulphurous fumes had caused great damage to the vegetation in the neighbourhood of the works, that the type of workman attracted into the area was undesirable, and that the living accommodation provided for the spelter-works' employees was inadequate.

An eloquent but gloomy picture of the damage caused by sulphurous fumes from the works is contained in a report prepared for the Earl of Carlisle in November 1893.<sup>13</sup> It was claimed the effluent had destroyed 95 hectares (234 acres) of grazing land by killing much of the vegetation and making the remainder unfit for animal food:

26 acres of this land used to be laid out as Cowkeepers' Allotments and also a further portion laid out as Garden Allotments. All these have been totally destroyed.

... There still remains a remnant of a wood where fine healthy trees have once grown ...

Moreover, adverse effects were experienced over a further 61 hectares (150 acres):

This portion ... has not any healthy growing vegetation. During the early Spring the farmers complain ... of the loss they sustain among their sheep by the sulphurous deposit on the grass which causes abortion among the ewes, and generally checks the vegetable growth.

William Dobson, the occupant of Tarn House Farm, situated 1.6 km south west of the works, complained that "about 1200 tons of sulphur is poured out of their chimneys yearly at great cost to the Company, and at equal loss and detriment, in many ways, to everybody else".<sup>14</sup> The problem of sulphurous fume given off during the treatment of sulphidic ore minerals was world wide. In the decades around the turn of the century

much development work was done to improve roasting furnaces and to contain the sulphurous product. During the final years of the Tindale works enquiries were made into ways of curtailing the quantities of fume emitted to the atmosphere.

The report of November 1893<sup>15</sup> went on to describe other unfavourable circumstances attributable to the smelting company's operations, and notably housing for the workmen:

... wretchedly poor, what originally was a single cottage having now been made into two ... a kitchen 14 ft × 12 ft and one room above as a bedroom ... with a small detached pantry ... and in many cases there are large families. The sanitary arrangements are extremely bad, what with the impossibility of having a garden ... the workmen connected with the Spelter-works are poorly provided for.

When surveyed in 1886-7, 14 of the spelter-works' cottages housed 93 people, or an average of 6.64 each.<sup>16</sup> George James Howard, 9th Earl of Carlisle, and his wife Rosalind Frances Stanley, were active in the improvement of the Naworth estate and could be counted upon, where the standard of housing was so poor, to want better conditions. Indeed, from the 1880s, Lady Carlisle assumed control of the management of the estate and became increasingly concerned with the welfare of all who dwelt in the neighbourhood. Estate tenants included more than a hundred colliers and a considerable number of lime workers, as well as the much smaller number of spelter-works' employees. Lord and Lady Carlisle personally scrutinised details for the renewal of the works' lease. Thus, a draft lease prepared *c.* 1895 included a clause regulating the minimum size of bedrooms:<sup>17</sup>

For each child of 12 years of age and under 250 cubic feet. For each child over 12 years and under 18 years 400 cubic feet. For each person 18 years and upwards 500 cubic feet.

A further clause stipulated:

The cottages occupied by married men with a family of children of both sexes to have at least three bedrooms, and the kitchen not to be considered as a bedroom.

Such accommodation would indeed have been Utopian luxury to thousands of families in all parts of Britain. It is small wonder Cameron Swan found the terms for renewal unrealistic although he expressed himself agreeable to building a further 20 cottages and altering the existing set to house 20 workmen in place of 40. Arguing that considerable expense would be involved, Swan wanted five years in which to erect the houses and a new lease for a period of 42 years, whereas the estate offered only 25. By 1896, however, he had come to see the desirability of the lease including an escape clause providing for a break at each period of 3 or 5 years.

Apart from the deplorable terrace dwellings ("kennels" as Lord Carlisle described them), some of which lay immediately next to the works itself,<sup>18</sup> there were significant social amenities in the neighbourhood. Thus, in 1870 a Wesleyan church had been established at Doleshole (or McDole's Hall as one map had it) on the north side of the steep little valley of the Tarn Beck,<sup>19</sup> although fortnightly Anglican Sunday services had been held in the hamlet ten years before this.<sup>20</sup> An estate survey of 1873 gives Farlam as the situation of the Anglican church for the works' community, and Midgeholme as the site of the (presumably Anglican) school.<sup>21</sup> A new church for the parish of Farlam, designed by Salvin, was built *c.* 1860 on a site given by the Earl of Carlisle, and with a substantial part of the cost met by another member of the family; the colliery lessees, Mrs Thompson & Sons, contributed £300, and J. H. Attwood £70.<sup>22</sup>

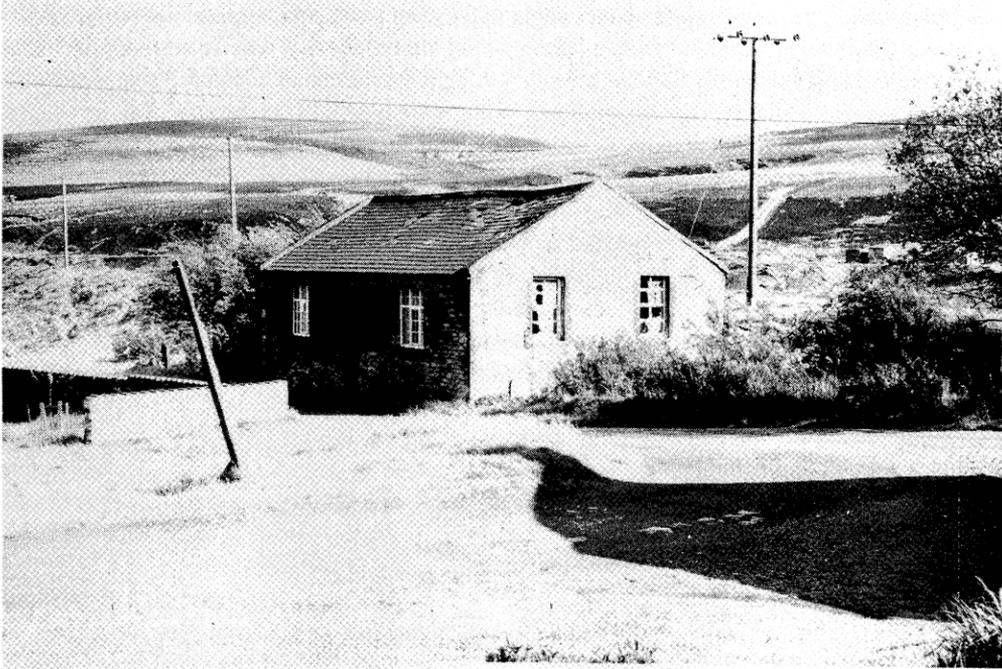


PLATE II. – The Reading Room at Tindale in 1974. A stone slab over the doorway records the date of erection, 1888.

A post office operated from the spelter works. A “school-house for children, and a teacher’s residence” had been established in connexion with the Spelter Works by 1859.<sup>23</sup> The O.S. map surveyed in 1863 shows a “school” on the north bank of the Tarn Beck only a hundred metres from the works. In 1884 John R. Purdy was schoolmaster at the Spelter Works.<sup>24</sup> The following year, 1885, a school board was being set up with the active approval of both J. C. Swan and the Carlisle family.<sup>25</sup> By the same date the Tindale Co-operative Society was functioning, with both a manager and a secretary.<sup>26</sup> In 1888 a stone-built Reading Room was put up (Plate II). Two other substantial buildings that survive in the hamlet carry stone tablets of the same year: these are the Wesleyan Methodist Church, and the Co-operative Store (converted to a private dwelling *c.* 1970). The store had its own railway siding.

Cameron Swan wrote to the Earl of Carlisle to support the application of a works’ employee for an allotment and cow pasture. Allotments were being let to workmen in the neighbouring collieries at the same period. Harris states that in 1886 “Almost 160 cottagers – well over half of all the householders on the colliery lands – were keeping cows”.<sup>27</sup> But by contrast, in 1888 only six cows were kept amongst the 40 spelter-works cottagers.<sup>28</sup> Although the allotments and cow pastures may not have been situated in the immediate vicinity of the spelter works, if fresh allocations of land were being contemplated in the late 1880s, the ground can hardly have been as badly ravaged by sulphurous fume and deposit as made out by the report of 1893. Indeed, one workman reportedly claimed “they could greatly improve it [i.e. the poor land] by a little attention in the way of liming, draining, and manuring”.<sup>29</sup>

Besides meeting complaints concerning pollution and inadequate housing, John Cameron Swan was faced with the charge that the company was occupying an area substantially larger than the 6.9 hectares to which it was entitled. Dumped materials had evidently spread outside the boundaries. The spelter-works company was given to understand that any possibility of renewing the lease would depend upon proper recompense being made for injury to land and farm animals, and for encroaching on land outside the leased area. Swan was evidently prepared in principle to meet these terms, but it was over the size of the sum to be paid in compensation, and the period of time during which the building alterations were to be effected, that negotiations finally broke down. Besides the various items of expenditure on "amenities", a substantial sum would apparently have been necessary to improve the works themselves. On his part, as a practising teetotaler, the Earl of Carlisle was anxious that any new lease should contain a clause compelling the company "to use every effort to prevent shebeening and also undertake to prevent the erection of a public house on the land leased".<sup>30</sup>

Thus, for a combination of reasons, the smelting-works' site at Tindale was abandoned, leaving behind extensive dumps of retort residues together with fragments of broken fireclay retorts and condensing tubes, and at least a score of men without jobs. Perhaps a few were able to turn to the nearby coal industry for work.

Soon after the works' closure, Joseph Potts was appointed to arbitrate on outstanding issues. As a result, in 1898 Lord Carlisle was awarded £580 from the Nenthead & Tynedale Lead & Zinc Company, by that time in receivership. In the same year Carlisle paid to the company £105 for "realisation of spelter works' plant".<sup>31</sup>

Thirty years later, attempts were made to extract zinc from the residues at the site by "fuming", and a novel rotary-kiln plant was installed for this purpose but proved unsuccessful. By 1939 it had been dismantled for scrap, leaving the industrial site of Tindale once more abandoned.<sup>32</sup>

### Acknowledgements

Mr E. J. Deas of Gosforth has made available information concerning the Nenthead & Tynedale Lead & Zinc Company Ltd which it is a pleasure to acknowledge. Mr B. C. Jones has readily supplied information in response to enquiry and has drawn attention to several useful sources. The suggestions and critical comments of Dr Alan Harris are appreciated, as is the help of the staff of the Department of Palaeography and Diplomatic in the University of Durham in connexion with the Howard of Naworth estate papers.

### Notes and References

<sup>1</sup> George Howard, 6th Earl of Carlisle, died in 1848. His eldest son, George William Frederick Howard, Lord Morpeth, lived from 1802 to 1864.

<sup>2</sup> Alan Harris, "The Tindale Fell waggonway". CW2, lxxii, 242-3. For a short time between 1837 and 1840 *Rocket* worked on this railway before being removed with the intention of renovation and showing at the Great Exhibition of 1851. E. S. Tonks (ed.), *Industrial locomotives of northern England* (South Yardley, Birmingham. Birm. Loco. Club, 1966), M87-8.

<sup>3</sup> J. C. Swan, in discussion of "The Alston mines" by the Revd. W. Nall, *Trans. Instn. Min. Engrs.*, vol. 24, (1902-3), 409.

In 1837, James Attwood was raising iron ore at Frizington Parks in western Cumbria; a few years later he located and began working iron ore at Birks, and in 1846 his company started mining at Woodend

- (producing 15,000 tonnes in 1849). (J. D. Kendall: "Notes on the history of mining in Cumberland and North Lancashire", *Trans. N. Engl. Inst. Min. Mech. Engrs.*, vol. 34 (1884-5), 93-5.
- <sup>4</sup> *Nenthead & Tynedale Lead & Zinc Company Ltd. prospectus* (Newcastle upon Tyne, 1882); Public Record Office, BT31/14717.
- <sup>5</sup> *Report of 23rd meeting of the British Association*, Newcastle upon Tyne, 1863 (London, 1864), 725.
- <sup>6</sup> *Nenthead & Tynedale . . . prospectus*.
- <sup>7</sup> Will of James Henry Attwood of Moss Hill in the parish of Farlam, proved at Carlisle, 21 August 1865.
- <sup>8</sup> Joseph Thompson is listed as proprietor of the "Carlisle" spelter works in *Mems. Geol. Survey . . . Mineral Statistics . . .* (ed.) Robert Hunt, (London, 1876, 1879, 1880, 1881 and 1882). In 1859 Joseph Thompson was manager of J. H. Attwood's other zinc works at Ripley, Derbyshire.
- <sup>9</sup> *Bulmer's Directory of East Cumberland* (1884), Midgeholme parish, 470-1. I am grateful to Mr B. C. Jones for supplying me with this reference.
- <sup>10</sup> Walter R. Skinner, *The Mining Manual for 1893* (London), 246.
- <sup>11</sup> HN C 607/3. "Extract of lease . . . of Spelter Works at Farlam . . ." (Howard of Naworth estate papers, University of Durham, hereafter cited as HN).
- <sup>12</sup> HN C 607/3. File: "Correspondence relating to Tindale Spelter Works, 1893-1933". Text of telegram quoted in letter dated 17 June 1896.
- <sup>13</sup> HN C 607/3, 8 November 1893.
- <sup>14</sup> HN C607/3, 14 January 1895.
- <sup>15</sup> HN C607/3, 8 November 1893.
- <sup>16</sup> Alan Harris, "Colliery settlements in East Cumberland", CW2, lxxiv, 140.
- <sup>17</sup> HN C 607/3.
- <sup>18</sup> This was Spelter Works Terrace, said to have been called colloquially "Gateshead Terrace" and demolished c. 1962. The position of the manager's house in relation to the works' effluent seems to have been no more favourable.
- <sup>19</sup> *Bulmer's Directory, 1884*.
- <sup>20</sup> William Whellan, *The history and topography of the counties of Cumberland and Westmorland* (Pontefract, 1860), 675-6.
- <sup>21</sup> HN C 607/1. "Report on the Naworth Estate, 1873, No. 9, Forests Manor". The separate parish of Midgeholme was formed in March 1883.
- <sup>22</sup> William Whellan, *loc. cit.*
- <sup>23</sup> William Whellan, *loc. cit.*
- <sup>24</sup> *Bulmer's Directory, 1884*.
- <sup>25</sup> HN C 589/7. Letter from J. C. Swan to George Howard M.P., 7 February 1885:  
". . . tell Mrs Howard that the Spelter Works school has done surprisingly well in the late examination. The Master is really a very efficient teacher, and a fine young fellow . . . strongly in favour of Board Schools".
- <sup>26</sup> According to *Bulmer's Directory . . . 1884*, 471, the manager was George Hindson and the secretary William Shipley. The accounts of the Tindale Spelter Company in 1880 showed an entry of £20 as "co-operative share".
- <sup>27</sup> CW2, lxxiv, 143.
- <sup>28</sup> HN C566/3, 12 March 1888.
- <sup>29</sup> HN C566/3. Letter, J. C. Swan to R. Du Cane, 31 March 1888.
- <sup>30</sup> HN C 607/3. "Lord Carlisle's notes on Spelter Works New Lease, 23 January 1895".
- <sup>31</sup> P.R.O., BT34/2501, company no. 17,356.
- <sup>32</sup> J. K. Almond, "Zinc production at Tindale Fell, Cumbria", *Jnl. Historical Metall. Soc.*, vol. 11, no. 1 (1977), 30-8.

