

ELECTRICITY FROM TOWN REFUSE :
THE ST.PANCRAS FLASCO, 1893-1900

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Introduction

The burning of town refuse in special furnaces was introduced in the 1870s and became a widespread practice because of its hygienic and economic attractions. By 1912 there were at least 338 refuse destructors (as the incineration plants were called) in about 240 towns in the United Kingdom. It was early found that the burning of the refuse at a temperature high enough to make its fumes and residue innocuous generated enough heat to produce steam in useful quantities from boilers associated with the furnaces, and in the 1890s this steam began to be used for the generation of electricity. Thus began a long association between refuse destructors and public electricity supply stations, many being designed and built as combined stations.^{1,2}

The first three electricity generating stations to use heat from refuse destructors were at Ealing (October 1894), Cheltenham (May 1895), and Oldham (March 1896); but these all used existing refuse destructors to which electricity stations were appended. The first successful station designed ab initio as a combined station was that at Shoreditch (opened June 1897). However, the first plan for a combined station was made in mid-1893 for a site at Kings Road, St.Pancras, London, and the station was opened in the autumn of 1895. As a combined station it was a total failure. The fact was hushed up in the technical press; there is a remarkable silence on the matter. In his book on early power stations, Parsons³ describes the St.Pancras installations and implies that the combined working was successful. My suspicions were aroused by a comment in a paper by Adams⁴ of 1905, and this led me to investigate the matter in some detail using mainly the minute books of the St.Pancras Vestry (later Borough Council) and the local newspapers. The story does credit to nobody.

It is necessary to explain that St.Pancras had municipal electricity supply from mid-1892, when a generating station was opened in Stanhope St., between Regents Park and Euston Station. This supplied the area in its vicinity, and had initially a capacity of about 1000 kW to supply about 10,000 lamps and 90 arc-lights, using 11 Willans-Robinson triple-expansion engines coupled to 11 Kapp dynamos made by Johnson and Phillips. The design and supervision was by Professor Henry Robinson, born 1837, died 1915, Professor of Civil Engineering at Kings College, London, from 1880 to 1902, and a well-known consulting engineer with a practice in Westminster from 1863. In the three obituaries I have looked at⁵, only two mention any example of his work, and both mention only the St.Pancras electricity works !

Plans for the Kings Road site

It was soon decided that electricity should be supplied also in the eastern part of St. Pancras, and Prof. Robinson was asked to prepare plans. A site in Kings Road (now St. Pancras Way), at grid reference TQ 294 840, between Pratt St. and Georgiana St., had already been earmarked for a refuse (or 'dust') destructor, and Robinson was asked to consider it as a site for the electricity works also. His report (which was published⁶) was prepared jointly with W.N. Blair, engineer to St. Pancras Vestry, and presented in mid-1893. It went much further than merely recommending that an electricity works be built on the site; it recommended a combined refuse destructor and electricity generating station according to the plan produced here as Fig. 1 and interpreted by simplification (by me) in Fig. 2. There were to be 18 destructor 'cells' (i.e. independent furnaces) in three sets of six, the refuse to be tipped in from a raised roadway. Twelve of them were to be used for providing a hot platform for preparing tarmacadam and for driving mortar mills (grinding the clinker from the cells) by a steam engine. The remaining six cells were to be used with five Lancashire boilers to produce steam for electricity generation. I now quote :-

'The cells are designed to give the most perfect combustion to as large a quantity of refuse as possible with the least amount of labour, and with these objects in view a continuous supply of refuse to the fires will be effected by mechanical action applied to the firebars, and by the application of forced draft from a fan when necessary to increase the temperature.'

'If the capacity of the 18 cells thus provided be taken at 10 tons per cell per day

The boilers were to have ordinary grates to burn coal when needed. It was thought that during the winter the refuse might be of such quality as to burn directly in these grates as well as in the refuse-destructor cells, 'resorting to coal when the heavy load comes on in connection with electric lighting', i.e. in the dark evenings.

Robinson and Blair went on to say that

'utilising the waste heat produced by the destruction of town refuse for raising steam is now well recognised

There is therefore no doubt whatever as to the practicability of raising steam and applying it to engines driving dynamos for generating electricity.'

Space was provided for five engine-dynamo sets each of 130 kW, but only three were to be installed initially. The engineers continued :-

'The power available from the destructors will be not less than 300 h.p. with the first instalment of three boilers, and 500 h.p. with the complete set of five boilers.'

'The northern part of the parish can be served either by high tension from Kings Road, or, preferably, by a third generating station combined with refuse destructors.'

Confidence in the use of refuse destructors for generating electricity was clearly very great -- at this stage !

What actually happened ?

The refuse destructor was started up on 15 August 1895, but the electricity works were delayed by various troubles, particularly with the boilers. The destructor cells were not satisfactory either, and the design had to be modified by the substitution of firebrick for iron at the back of the furnace cells. In April 1896 the Vestry learned that :

' ... the main idea was to pass the hot gases through the boilers and economiser of the Electric Light Station. The opportunity has never been offered of working continuously on these lines .. '

A councillor demanded that advice be sought from 'some well-known expert on dust destructors', but he was out-voted. The Chairman of the appropriate committee stated 'that there was no doubt that the destructor would eventually prove a success'. He had to defend a charge of being secretive about the failure of the destructor. 'There is nothing in connection with the works which need give any anxiety. There has been no cause for the discredit thrown by some people on the works .. ' The boilers, however, could not produce enough steam even to drive the fan for forced draught in the furnaces !

Nearly a year later, in March 1897, the Vestry learned that

'the present working of the Refuse Destructor is not satisfactory, and certainly does not come near to the expectations expressed in the Report of the Special (King Road Station) Committee of the 14th April last, and that the alteration of the cells then advised does not appear to have provided the expected remedy of the defects then stated to exist'.

In fact, a serious decline in performance was reported. The managing foreman, Mr. Morley, suggested some alterations to the furnaces which would increase their burning capacity from 4 to 6 tons per day, but said that he could not hope to make them approach the 10 to 20 tons per day achieved at the destructor at Leyton which was built by Messrs. Beaman and Deas.⁸

The appropriate committee visited the Leyton destructor to see for themselves, and were enormously impressed by its performance. They recommended that Beaman and Deas should be asked to estimate for converting the six cells associated with electricity generation at Kings Road to their system. Their estimate was £2000, later raised to £2247 plus boilers, and they guaranteed 240 h.p. of steam power from the 72 tons per day of refuse they would burn in four of their cells replacing the six original ones. The matter was argued at great length in Vestry and committee meetings during April and May 1897 and experiments were made in burning St. Pancras refuse at Leyton. The figure achieved was 14.2 tons per day using St. Pancras workmen to operate the furnaces; using men skilled in Beaman and Deas plant, a still higher figure should be achieved. However, the Vestry tried hard to argue that what mattered was the tonnage burnt per man-day, and that this was not better at Leyton than it would be at St. Pancras if Mr. Morley's alterations, costing only £10 per cell, were made. One councillor pointed out that there were other considerations, namely that 75% of the refuse carted into Kings Road by contractors had to be carted out again because the furnaces could not cope with it, but he was hardly listened to.

Six cells (not associated with the electricity station) were improved according to Morley's proposals, and gave an improved burning rate of over $6\frac{1}{2}$ tons per day. Argument continued during the summer, but by September 1897 the Vestry was able to persuade itself that

'A destructor like Horsfall's or Beaman and Deas' might be the best destructor possible at Lewisham [did he mean Leyton ?] or in any district where residuals found a good market '

but not at St. Pancras. So they voted £250 to Morley to convert the remaining 12 cells to his improved system, and they abandoned the idea of using an expert firm.

Electricity from refuse once more a possibility

By February 1898 all 18 cells in the refuse destructor had been converted, but the cost had been £405. In March the Vestry was informed that the cause of

the excess cost was that the crowns of the furnaces had fallen in and had had to be rebuilt. The Chairman of the committee concerned asked for another £60 for a fan to provide forced draught for the cells on the south side, i.e. those connected with the electricity station. In April he reported to the Vestry that all 18 cells were working well, and had burnt 500 tons of refuse in six days - twice the previous rate of burning. (Note that this was still less than 5 tons per cell per day.) He had been in communication with the Electricity Committee 'with regard to the utilisation of the waste heat for driving the machinery of the adjoining electricity station.' The Chief Electrical Engineer was satisfied that the destructor could supply heat for this purpose and he would make a test. It was, however, necessary to report to the Vestry in June 1898 that

'A series of tests were conducted, but in consequence of the irregularity in the supply of steam, it was found impossible to rely upon it for generating purposes, and therefore had to be abandoned.'

The Vestry's committees did not give up, however. In October 1898, the Vestry was told how efforts were being made to fix three boilers removed from the Regents Park central station at the refuse destructor, three cells to each boiler. Again, in February 1899, Vestry approved the expenditure of £300 for two boilers 'in order to obtain steam for the generation of electricity from the gases of the dust destructor'. I have, however, been unable to find any record of success in this matter.

Discussion

I am evidently quite justified in using the term 'fiasco' in the title of this paper. Combined working failed utterly. The contrast between the promises in the 1893 report of Robinson and Blair and the actual performance is stark.

Robinson may have been remembered for his work at St.Pancras in his obituaries, but I doubt if the Vestry were pleased with him, for he does not appear to have been consulted again by them after the opening of the station at Kings Road. The Vestry appear to have relied on their own judgement and on that of their own employees in the whole matter, and they rejected all advice given by outsiders. In other words they relied on amateur and general-practice opinion rather than specialist knowledge; perhaps they had become disillusioned by Robinson. But they paid dearly for both this and for their unwillingness to pay for furnaces to be built by an expert and experienced firm. Firstly they lost say 240 h.p. of free power for the generating station. Secondly they paid out £765 directly, and a vast amount in labour costs, to improve their furnaces to a consumption still only one-third of what it could have been. Thirdly, they had to pay for years for the carting away of refuse from the destructor because it could not be burnt there (presumably there were long-term contracts to cart refuse to the destructor). And the unrecorded cost of Vestry-men's time in the prolonged and futile discussions (although entertaining to read now!) over so many years must have been astronomical.

Finale

The Vestry was replaced by a Borough Council in November 1900. I believe the refuse destructor closed around 1920. The electricity generating station expanded to occupy not only the whole of the original site, but the whole block enclosed by Kings Road, Pratt Street, College Street and Georgiana Street. It was demolished only a few years ago.

References

1. D.G.Tucker, 'Electricity from town refuse - three quarters of a century ago', Electronics & Power, 22, 1976, pp.16 - 20
2. D.G.Tucker, 'Refuse destructors and their use for generating electricity: a century of development', Industrial Archaeol.Rev., 2, 1977-8, pp.5 - 27.

3. R.H.Parsons, The Early Days of the Power Station Industry, Babcock and Wilcox Ltd./Cambridge Univ.Press, 1939, pp 124 - 7
4. W.P.Adams, 'The combination of dust destructors and electricity works economically considered', J.I.E.E., 34, 1905, pp.256 - 325
5. Obituaries of Prof.H.Robinson, Proc.Inst.Civil Engrs., 200, 1914 - 15, p.471; J.I.E.E., 53, 1914 - 15, p.871; and The Electrician, 74, 2 April 1915, p.879.
6. Electrical Engr., 11, 1893, pp.585 - 8
7. This section is based entirely on
 - (a) The minute books of the St.Pancras Vestry and its various committees, available at the Local History Department of the Borough of Camden Public Library at Swiss Cottage, London, and
 - (b) The regular and full reports of Vestry and Committee meetings (much more detailed than the minutes, as a rule) published in the St.Pancras Guardian, a weekly newspaper.
8. 'Refuse destructor at Leyton', Engineering, 62, 1896, pp.670 - 1

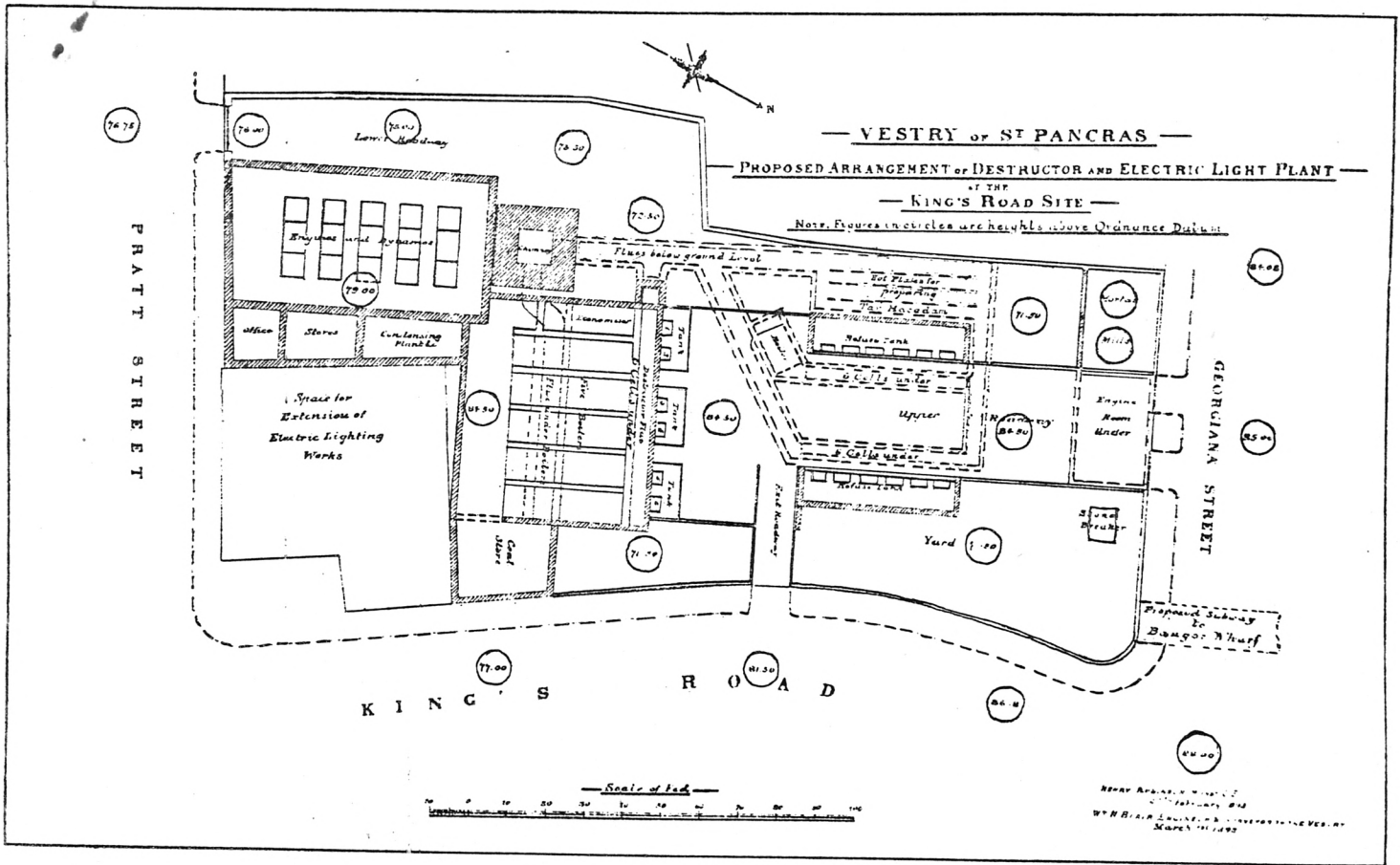


Fig. 1

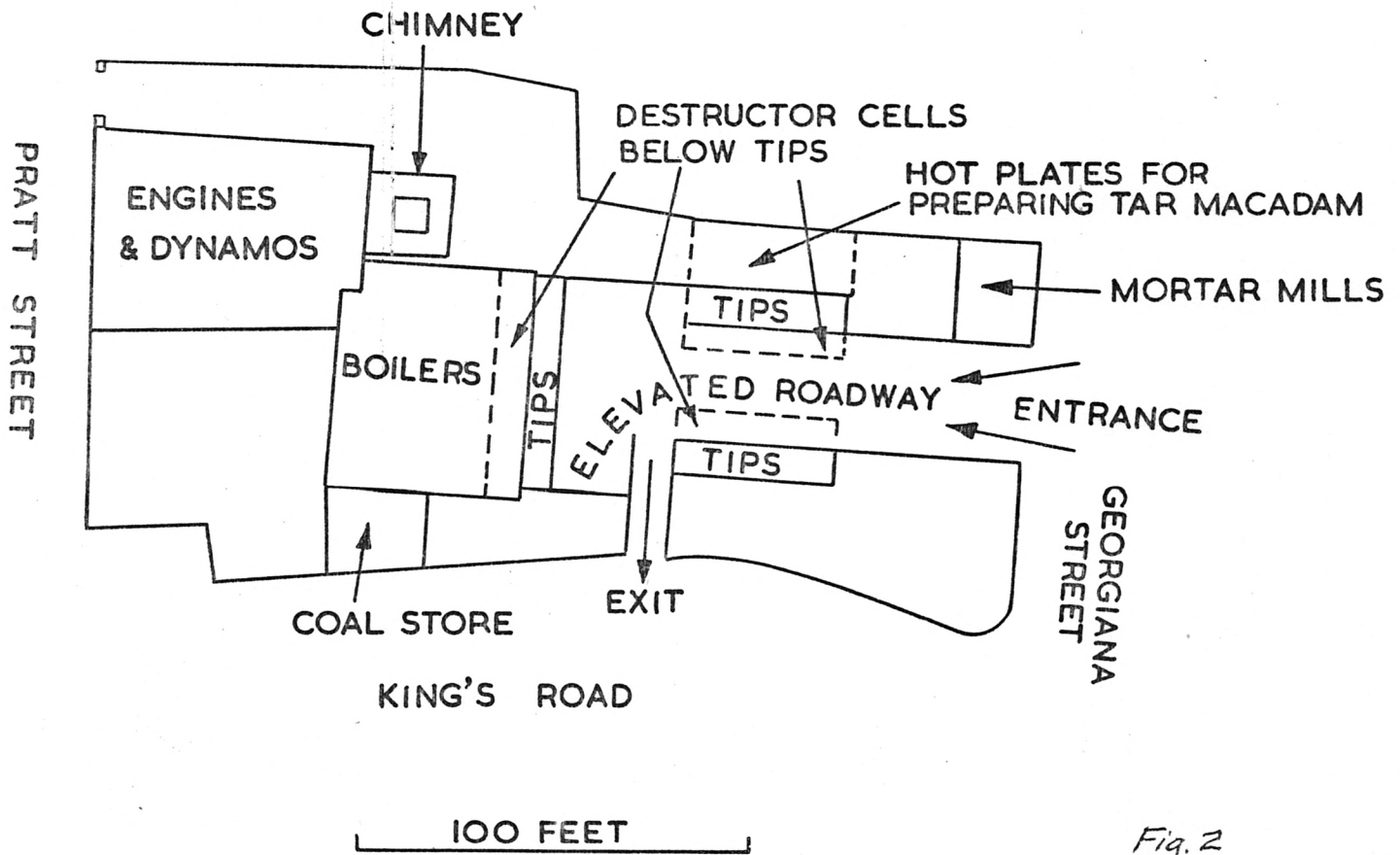


Fig. 2