

A European business trip made in October 1891

Jane Ellis on transcribing the diary of WG Kirkaldy in the archive of Kirkaldy's Testing Works in Southwark

The diary of WG Kirkaldy (*pictured right*) – son of Kirkaldy's Testing Works founder, David Kirkaldy – offers a rare and fascinating insight into business travel, as well as the family lives of European engineering dynasties in the late nineteenth century. From the author's own experience of travelling to meet customers and suppliers as an engineer in the electronics industry, William's comments and observations are surprisingly familiar.

This is the first extract to be published of ongoing research into the archives at Kirkaldy's Testing Works.

David Kirkaldy established his Testing & Experimenting Works at the Grove in Southwark in 1865 which housed his patented Universal Testing Machine. The business later moved to purpose-built premises at 99 Southwark Street. The new Testing Works opened on 1 January 1874 and was run by David Kirkaldy, his son William and grandson David until 1965, when the works were taken over by Treharne & Davies. Testing continued until 1974 when it finally closed.

Several years passed before Dr Denis Smith, then chairman of GLIAS, rediscovered the mothballed site and helped to get it listed, to ensure that the importance of Kirkaldy's Testing Works was recognised. A museum trust was set up in 1983 and since then enthusiastic volunteers have worked to restore and maintain the machines and the Testing Works, and open it to visitors and school groups several times a month.

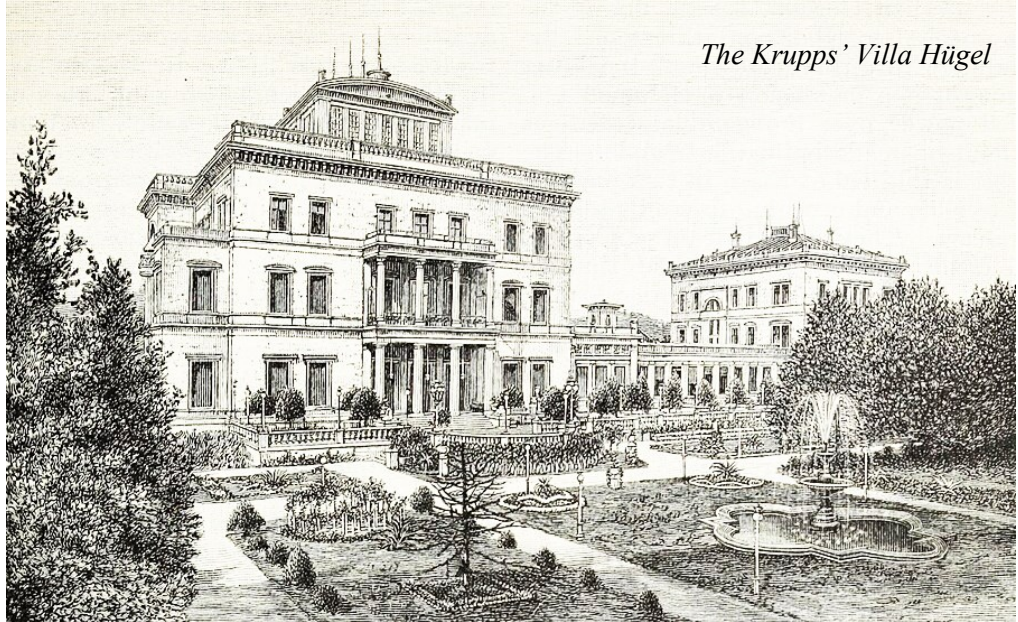
In June 2014 English Heritage (now Historic England) upgraded the listing of both Kirkaldy's Testing Works and the Universal Testing Machine to Grade II* (see <https://historicengland.org.uk/listing/the-list/list-entry/1385928>). Kirkaldy's Testing Works now has a new lease of life, as a charity run by volunteers: it is registered charity number 297557.

In addition to the Universal Testing Machine – still operational – and a collection of historic testing machines, there is also archive material going back to the early days of the Testing Works, in particular notebooks and diaries written by David's son, William George.

WG Kirkaldy was educated at University College School, leaving in 1880 to join his



father to train as a testing engineer in the workshops at Southwark Street. In 1884 he became a partner in the business, the firm being then known as David Kirkaldy &



Son, since when he practised as a public testing engineer. Between 23–31 October 1891 William George travelled to Europe to visit two clients on behalf of the Testing Works. He kept a detailed diary, of which a transcript is presented here.

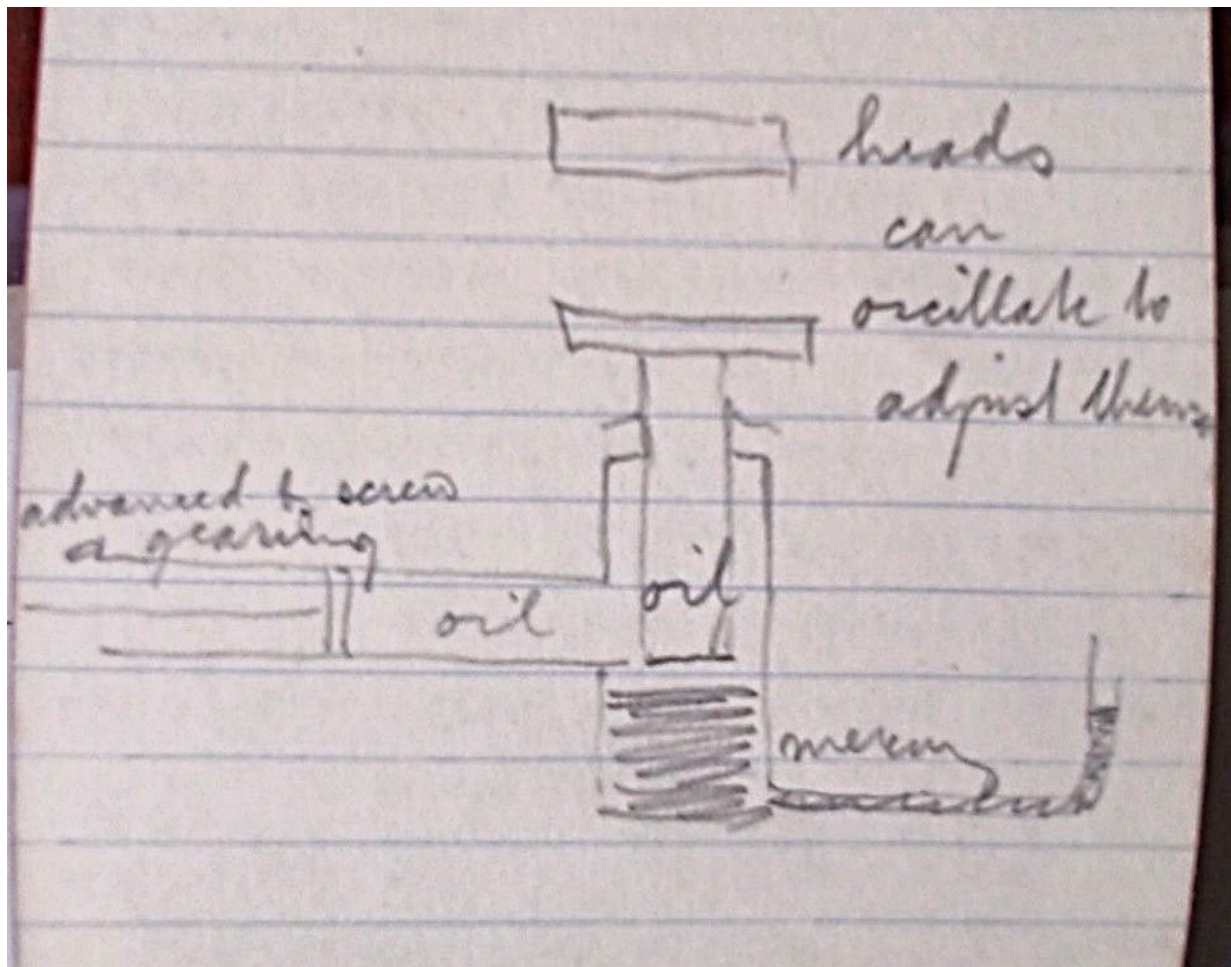
WG's first visit was to the Arsenal at Mechelen (Malines in French), the central workshop for Belgian Railways, which had purchased a Universal Testing Machine made to Kirkaldy's patented design some 10 years earlier. William was there to review its performance and maintenance. He was very satisfied with the visit and his reception, commenting: "They are as proud of the machine I believe as we are and appear to have spent no pains in adding special tools & other conveniences."

Before moving on to Germany he treated himself to a day at leisure in Antwerp, going back to places he had visited 11 years earlier as an 18-year-old being taken around Europe by his uncle. A transcription of his diary for this trip is in progress.

His second visit was to the Krupps factory at Essen to discuss "the matter of the special tests to be made for the Agent General for South Australia". It's not clear from the diary exactly what Krupps was manufacturing for this customer, but we can infer that metal railway tyres were involved. Kirkaldy's company had obviously been engaged by the Agent General as independent assessors of the work to be carried out by Krupps. The agreement reached was for three sample tyres to be made in the presence of William George and stamped by him, each tyre to be cut into two pieces, with one half going to Southwark Street for testing and the other half presumably being retained by Krupps for testing on site.

Over the three days he spent in Essen, in addition to formalising this testing procedure, William George was given an extremely comprehensive tour of the Krupps factory. In the evening of 28 October, he attended a lavish dinner party at the Villa Hügel, the home of Friedrich Krupp and his wife Margarethe; his comments show that he was obviously impressed by the style and opulence of the villa.

Transcription of the diary was not particularly easy; William's handwriting is difficult to read in places, especially names of those he met in the course of his business. I may not have rendered all the names correctly, but I have attempted to be consistent throughout. My thanks to Colin Jenkins and other Kirkaldy volunteers for their helpful suggestions. **Jane Ellis**



THE DIARY

Antwerp: visit to Arsenal at Malines 23 & 24 Oct* 1891

Left Liverpool Street 8.00pm. Harwich 9.40pm arrived, steamer "Cambridge" left about 20 minutes later. Very smooth passage, quiet night, stateroom to myself. Rose about seven, breakfast and then on deck. Interesting passage up to Antwerp, great variety of craft on the river.

Tram to the Place Verte, engaged room at the Hotel de L'Europe. Left soon after for the station, booked to Malines¹ by the 10.43 train.

On reaching the Arsenal had a very cordial reception from Monsieur Roussel & afterwards from his assistant at the testing machine.

Kirkaldy's Patent Testing Machine was found kept in the most perfect order, quite a treat to examine. Both M. Roussel and his assistant expressed themselves as highly pleased with the behaviour of the machine. They said it was as good as when new, the knife-edges being in splendid order.

Found a very fine collection of tools added all around the place. Being just on the dinner time I was asked to return in the afternoon. M. Roussel showed me through the laboratory (a very extensive & complete place of three rooms; one being very large). Saw the chain

proving machine in another building. Also, the falling-weight apparatus in the open air.

In the "Kirkaldy" machine-house there were in addition one machine for cement testing by pulling, another small one for crushing cement cubes, about three small thread or twine testing machines.

A handsome apparatus consisting of a ram (bronze) vertically working a cylinder in the floor, it being forced down by a screw and worm with flywheel. In fact, a large plunger worked by a screw; they said that it brought the pressure on beautifully and very steadily. Was shown the Bauschinger² apparatus for reading extensions to be mounted up after dinner. Twisting yoke same as our own.

The bushes for pulling like our own, but in addition another set was made with the hardened collars (straw colour) set into a block with spherical seal to adjust themselves to irregularity of heads etc.

Left the Arsenal for lunch (Hotel Couronne etc), returned about one o'clock. Had to wait at the bureau till 1.30 for the contremaître to unlock the gates.

Joseph Stallaert, the assistant & actual tester at the machine, on arrival took me along with him. At the test house he kindly showed me almost every tool and appliance in succession.

Monsieur Roussel returned in the afternoon and we three had a most pleasant time (M. Roussel knew no English but I managed very well with him); he took me upstairs and showed me the museum, very interesting but nothing for a moment to compare with our own³. Saw the original specimens tested by David Kirkaldy when the machine was first erected. Presented me with an album of litho-drawings of the machine, two brochures and afterwards with many loose sheets showing specimens (the latter from M. Stallaert) from the small cement crushing machine.

Very clever slipping clutch for slow & fast gear. Vertical cylinder has same above in particular kind of oil; while beneath the oil again there is a cylinder centred down and containing a substrata of mercury. An orifice at the bottom leads to an upright glass tube (like a barometer tube); when the pressure is increased the mercury rises in this tube. One side is a scale showing kilos. Total on specimen 72 sq. centimetres (?). The other side reads kilos per square centimetre for that size specimen.

Examined also the spring tester, the cloth/paper testers etc.

Very much interested in a beautiful micrometer measuring instrument, the contact being shown by a very sensitive galvanometer, a weak battery or pile being on the floor. One wire led up to the micrometer stationary end of the machine where the galvanometer stood, whereas the other wire led to the moving measuring head. The specimen to be measured lay upon a vulcanite bed at each end. When the head was advanced sufficient just to make the contact, the galvanometer showed at once.

It was tried before me in going up and slacking back repeatedly – its sensitiveness was most beautiful. Read to 1/1000 of 1 mm.

All the tools and apparatus were maintained in perfect order. The main knife edges require trimming up now but they have been in constant work 10 hours a day for the past 10 years, and do not appear very much in need after all. The machine is taken to pieces systematically every year to make sure of its condition.

They are as proud of the machine I believe as we are and appear to have spent no pains in adding special tools & other conveniences.

An explanation was given as to how they broke the cast iron wing beams; it had been quite owing to their handling but the back washer appears to have rust at the part that caused the breakage. They have now made all good with a riveted girder of great strength. They ascertain and deduct the amount of deflection or spring from this tackle when reading off deflections of their specimens if they are of larger span and the strain over 50 tons. All their big wire ropes are tested in conical bushes, the wires held by white metal run in hot. The alloy being lead, antimony and bismuth, very fusible being I understood below that of boiling water. They offered to give the proportions but I forgot to avail myself of the offer. Saw a large rope just got ready, length between caps however only about 4 ft. They have much difficulty in testing the longer manila ropes.

Told them about adding spiral or volute spring above or beneath the back balance weights (they had complained of the great shock occasionally felt on the machine having carried away 3 bolts securing the worm brackets on the main carriage). I therefore felt it to be right to inform them how to overcome or mitigate same. Made a sketch for them with which they were much pleased and wondered that they had never thought of it themselves.

They certainly showed me the very greatest attention and kindness, and laid great stress on my remembering them most kindly to David Kirkaldy.

The number of test-off runs up to 75 a day; 17,000 a year is about the average but that includes all classes of tests. I enjoyed my visit exceedingly and returned laden with papers.

Missed a train at Malines so had something to eat there (was in the works until 4.30) Left Malines 5.43. Quick journey to Antwerp. Back to the hotel, with book and papers, then had a good long walk around the town until 8.30. Wrote up log and letters 9.40.

25 October: Day at leisure in Antwerp

Visited the Tower of Antiquities, the esplanade overlooking the river, the Cathedral. The Musee of paintings and etchings, very fine buildings and collections. The Plantin Museum of Printing was a very extensive and interesting place of great extent. Fine

library and great collection of wood blocks engraved, copper plates, letter printers & copper matrix blocks like the modern form.

Walked practically through all boulevards and main streets and saw all the principal buildings, out from 10.00 till 5.20, dined 5.30 to 6.30. Walk again from 7 till 8 o'clock. Turned in early on account of early start the following morning.

Essen: visit to the Krupps works, 26-30 October 1891

26 October

Wakened at 5 o'clock sharp, packed and dressed. Left hotel at 5.36, drove to station, booked to Roosendaal, arrived there 7.20. Breakfast. Booked to Venlo return. Stopped for customs at Kaldenkirchen, lunched, then proceeded to Duisburg, changed, then on to Dortmund and changed again. Reached Essen at 1.30. Drove to Krupps Works⁴. Saw Herr Schnabel first, he telephoned up to Herr Hoecker who was at the Hotel "Essener Hof"; he had been at the station three times expecting to meet me.

Walked up to the "Essener Hof", rooms waiting for me, very comfortable, consisting of sitting room and bedroom opening off it⁵.

Dined and then returned to the works with Herr Hoecker, reached there about half past three. Herr Berger of the gun factory came and showed me all around the gun shops, everything on a very large and magnificent scale. Machinery the best adapted and beautifully kept. Most interesting and instructive visit, saw the museum in detail, models of guns, shells etc. etc., working model of the hydraulic action of very large guns, one of the men put the apparatus through all its phases.

Afterwards saw the outside of the Krupps cottage (where the grandfather of the present Krupp lived). Chatted with Herr Hoecker some time in his office. On leaving with him we visited the electric lighting station, a very fine display of vertical duplicate engines about five pairs, action very smooth. Returned to the Hotel, dined with Herr Hoecker and he remained till nine o'clock. After he left wrote a letter home (to DK) then this log completed by 10.10. Turned in.

27 October

Rose at 7.30, breakfast over by 9 o'clock. Waited then for Herr Hoecker who arrived at the half hour. Walked down to his office, where Herr Venes soon joined us, the matter of the special tests to be made for the Agent General for South Australia was discussed. Both Herr Venes and Herr Hoecker were very pleased to know that we were to make the experiments and they offered their assistance for me to get just what I wanted. Three tyres⁶ of about 1 foot diameter they recommended, to be taken each from a different charge but which could be rolled at the same time and in my presence; that I could put my stamp upon them and that they would divide them into two parts sending us one half of the circumference in each case. Then Herr Venes

conducted me to the Siemens-Martin furnaces and showed me them very carefully, the ingots were all octagonal and about 5 feet long. Pig -iron, scrap steel of good quality and also ordinary scrap steel melted down till the metal boiled like water. Then we crossed into the hammer and forging shops where I saw the ingots first marked off into lengths sufficient for one tyre each (and the end division on top equivalent to another tyre was rejected). The ingots when heated and put under the hammer were first incised with the knife tool at the proper distances, then they were forced into round billets and cut off into lumps. These lumps (all carefully weighed) were taken under another hammer and flattened up endwise like cheeses, the middle punched out; (again weighed) and put finally under another hammer with an aperture down the centre of the anvil, the tyre ring was then hung up (after being re-heated) a bar or saddle was entered through it and then it was allowed to drop into its seat across the top of the anvil. Thus, the ring was beautifully forged round and drawn out, the men spinning it steadily round the saddle bar. This made a plain ring without any flange, the tyre mill (Germany pattern) doing all the rest⁷.

Other tyre forgings (for rolling in the English style of mill) were forged and beaked under a steam hammer after the English style but clever tools were used for tilting it up again on the anvil face (for setting back to the proper width) there was a claw hook operated by lifting the hammer head.

Then saw some tyres finished on the English mill, very interesting, the final reheating of the tyres being especially fine, the furnaces were all below the floor and heated by gas, the tyres stand upright. The heat was magnificent in its uniformity and in the exact way it could be regulated by screw valves. The top of the furnaces were closed by traversing lids run off or on upon tramrails.

Looked into the crucible melting place to enquire when they were going to cast, arranged to come back at 4 o'clock. This was a very fine building of great height (to keep it as cool as possible), the roof being entirely of timber and an interesting specimen of architecture.

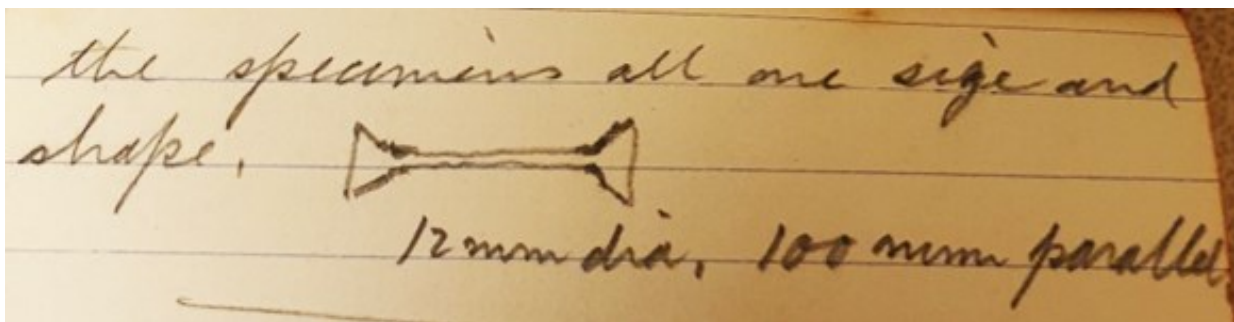
Then returned for M. Hoecker 12.45 o'clock and we three walked back to the Hotel where we were served with an excellent and *recherché* dinner, everything in the best style. More attention than I required could not possibly have been given to anyone. We started for the works again about 3 o'clock.

Mr Venes took me again to the tyre forging where I saw the flanging on the beak as above. Then he showed me the German tyre mill but it was not working as they were busy shifting for a new section. I saw the room containing all the various sections which they roll. The rolls were also well arranged.

Returned to Mr Hoecker's office and soon Mr Hoecker arrived to take me to the crucible house, saw the oven casting several small ingots and afterwards one large one which took 400 crucibles (their largest however are 1700 crucibles). The precision and regularity of the men was admirable and fascinating in every way. The big ingot took 14 minutes to fill and the stream of steel did not vary or slacken the whole time. All done quite silently. Afterwards I went with Mr Hoecker to see the axle forge, the

great "Fritz" hammer, the nail cropping and the rolling mill, light plate rolling mill and lastly the immense shop containing the hydraulic forging presses. Only the small one of 2000 tons is finished. The building is over 500 feet long and 200 feet broad, built of iron & steel and glass. Splendid travellers the whole length, large planing, slotting, drilling and multiple sawing machines for armour plates. Large furnaces and rolls also for armour. Here I saw them rolling one of the end plates for backing the compound armour.

Returned to Hotel and awaited M. Hoecker's arrival. Had supper together and chatted, a note arrived from Herr Krupp asking me to dine with him tomorrow night. To which reply was sent by telephone with thanks. When M. Hoecker was leaving M. Haacke came in and afterward took me into their club attached to the hotel, built and presented by Krupp to his officers. Spent the evening there till 10.30, then returned to write up log. Turned in sharpish.



28 October

This day was spent in seeing the testing machines, falling weight apparatus for testing tyres & axles and another for armour plate bolts. Introduced to Herr Uhlenhaut who gave me a great deal of time in the wheel and axle shop and other places. Saw also the spring shop and many other things of interest.

The testing machine first shown was the one Greenwood & Batley exhibited in 1862 (very similar to the American pattern at our Arsenal at Woolwich), the steelyards were lifted up away from the specimen. The torsion apparatus they confessed was quite a sham as they could not make any use of it. This machine they used entirely for testing the small pieces cut off ends of gun forging, the specimens all one size and shape (12mm diameter, 100mm parallel).

In another room was a German machine, a tremendously complicated system of levers, the leverage was enormous as the weight on the steelyard was small and the length of same also very short. The weight was screwed out by a handwheel at the far end of the lever. Later in the day I saw a small machine for 'bending' plate specimens at a very rapid rate, it was operated (the centre bearing) by a screw rotated by power. Very rapid but smooth action. I saw also another upright testing machine (made by Krupps) for dealing with plate specimens. It appeared a nice machine, well made & kept and fairly sensitive. One man adjusted samples in the machine and

marked down the readings called out to him by the man at the steelyard (the dropping of steelyard was noted & marked down). The two tests I saw were done very rapidly.

Returned to the Essener Hof by six sharp, dressed for evening and carriage came for me at 6.45. Drove to Herr Hoecker's house, picked him up and then drove over to the Villa Hügel, a long drive through what would have been lovely country in the summer & daylight. The grounds were very extensive as it was quite a drive to the house after passing the lodges.

The house was magnificent, on entering the hall the master of ceremonies ushered us to the cloakrooms and then along the length of the Hall to the reception rooms where Herr Krupp greeted us with every kindness, introducing me to Madame and the other guests. Two of them young ladies, one being English. The dinner was most *recherché* throughout and the table a wealth of flowers. The dinner was a very agreeable one and afterwards on entering the library we shook hands all around (according to their custom) and then talked to one another while coffee was served.

Madame Krupp was charming in her manner to all and very kind to me, as also her husband who now had quite a long talk with me. And mentioned our long connection with his father, adding that he hoped it would long continue.

Afterwards we left the house to go to the small and elegant house fitted up for bowling & ninepins. Herr Hoecker took me previously upstairs to see the large ballroom (it was as big as the Westminster Town Hall) and most sumptuous, the floor being in *parqueterie* and by far the finest surface that I have ever known. The portraits of three Emperors of Germany adorned the walls, lovely music gallery with grand organ and full orchestra attached. Certainly, the grandest room for size, finish & proportion (it was immensely high with ornamented roof) that I have entered.

We the gentlemen of the party who had come over to try the bowls (we were ten) had a very sociable evening, the game was amusing and fascinating, so the time passed all too quickly.

We left a little after twelve o'clock. Reached the Essener Hof again by quarter to one.

As the other carriages drew up, I remained with the guests for a little while chatting (they all spoke French). At the Hügel I met Herr Teuker one of the directors, a very handsome and tall man and equally agreeable. All together I enjoyed the evening immensely.

29 October

Rose at 8 o'clock; breakfasted by 9 o'clock or soon after. As Herr Hoecker did not come, I walked to the Works and left a copy of my book for him⁸ along with the copy of "The Engineer" containing the review thereof. He was not at the works so I returned to the Hotel, (wrote home), afterwards he arrived (but his cold was rather

bad) we together went down to the works, where again I saw the hammer “Fritz”. Had a long chat in his office & then came back together for Table D’Hôte dinner, many present there.

After dinner had a long walk round the town of Essen with Herr Hoecker, saw statue to the late Krupp. Monument in bronze representing the German wars, the two last about 1864 and again 1870–71. Walked up to one of the Colonies for the men, then to some of the houses for the officials which were really handsome in design and finish⁹. Returned to the park and also visited the cemetery where I saw the tombs of the late Krupp and his wife. Handsome black marble monuments. The larger one having bronze statuary in front. Returned to hotel in time to change rapidly and start for station. Mr Lefroy (Mr Shewinton’s inspector, being also his nephew) was in the carriage. We travelled together as far as Crefeld, where he had to alight receiving a telegram from Mr Shewinton.

Reached Roosendaal too late to catch train for Antwerp, so put up at the Hotel du Cygne, very comfortable and beautifully clean.

30 October

Breakfast early and had a walk around the town, not much to be seen except fish sale by Dutch auction. Went on to Antwerp and spent a long day there seeing a good deal more of the city. Crossed at night by the steamer “Ipswich”, comfortable passage, very smooth.

Reached London breakfast time, all well. 31 Oct*.

** For consistency, all dates have been edited to conform to LIA’s house style*

Notes

1 “Belgium was the first country on the European continent to be equipped with a railway network. The law of 1 May 1834 resolved on the creation of a railway network at which Mechelen would be the centre ... on the 5 May 1835 the first stretch was opened linking Brussels and Mechelen”. (Belgian Railways)

2 The Bauschinger effect, described and named after a German engineer Julius von Bauschinger in the late 19th century, is observed in materials like steel where the yield strength in one direction is reduced after plastic deformation in another direction.

3 David Kirkaldy devoted two floors of the premises at 99 Southwark Street to what he called his “Museum of Fractures” which contained samples of material that had been tested to destruction. Evidently, they had copied this practice at Malines.

4 “Already by 1850 Krupps cast steel works was the largest firm in Essen. In 1900, 47,000 worked there.” (Neumann)

5 The hotel known as the “Essener Hof”, which is run by the firm, but is intended for guests of Mr Krupp, and especially for persons doing business with the firm. Only when not filled in this way is it at the service of the public. Its capacity is limited to twenty-five rooms, beside dining and reception rooms, billiard halls, etc. By special arrangement, however, the principal officers and directors of the works dine regularly here at reduced rates. The boarding establishment is known as the Menage. (Lindsay)

6 WG uses the spelling “tyre” throughout the diary, although at the time the more usual spelling was “tire”. I have retained his spelling throughout. “The first successful steel locomotive tires were manufactured by Krupp, of Essen, in 1851 (according to W P Marshall), and before 1860 Krupp’s tires had made considerable progress in Germany and France.” (Ahrns)

7 “There were several methods of making steel tires. Krupp made a square bloom of crucible cast steel, which was drilled through in two places, and the holes opened out into a single aperture. The bloom was then reheated, reduced to a circular shape under the hammer, and finally shaped in the rolls.” (Ahrns)

8 “Illustrations of David Kirkaldy’s system of mechanical testing as originated and carried on by him during a quarter of a century”, written by W G Kirkaldy and published in 1891.

9 The Colonies were built by Krupps over a number of years to house their employees. “The largest colony of all is known as Cronenberg, and is deserving of closer attention. It was built in the years 1872–74, but since then has been enlarged several times. It is situated not more than one hundred steps from the west boundary of the works. According to the census of March, 1892, 8001 persons lived within the limits of this colony, which covers over fifty acres of land.” (Lindsay)

Additional sources: publications

Ahrons, E L: “The British Steam Locomotive 1825–1925”, published 1927

Belgian Railways: “150 jaar Belgische Spoorwegen”, guide to the railway museum at Brussel Noord, published 1985

Kirkaldy, W G: “Illustrations of David Kirkaldy’s system of mechanical testing as originated and carried on by him during a quarter of a century”, published 1891

Lindsay, Samuel M: “Social Work at the Krupp Foundries, Essen, A R, Germany”, published in the Annals of the American Academy of Political and Social Science, Nov 1892, Vol. 3 (Nov 1892), pp. 74-106 <https://www.jstor.org/stable/1008598>

Neumann, Harald. “Zeitreise Durch Das Ruhrgebiet”, published 1996

Web resources

The “Fritz” hammer, Schmiedhammer Fritz. History Today

Villa Hügel, information and photographs; Villa Hügel in Essen

Villa Hügel, The Palatial Home of Prussia’s Eccentric Cannon King – Atlas Obscura

Krupp’s works, Alfred Krupp’s Steel Works in Essen (1890). German History in Documents and Images

Mechelen/Malines and the railway workshops, Living apart together? The City of Mechelen and the Arsenal – Central Workshop of the State Railways (1836-1914)

The author

Jane Ellis is the volunteer and events coordinator at Kirkaldy’s Testing Works. She graduated from Manchester University with a degree in physics and worked in the electronics industry for about 20 years, beginning as a development engineer and later working in process engineering, production management and continuous improvement roles. In 2004 Jane returned to university, obtaining a PGCE from UEL, following which she taught mathematics in a sixth form college until her retirement. She has been a volunteer at the Testing Works since 2017.