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'Model Engineer'
article - 'The
Forgotten Railway'
- Holton Heath
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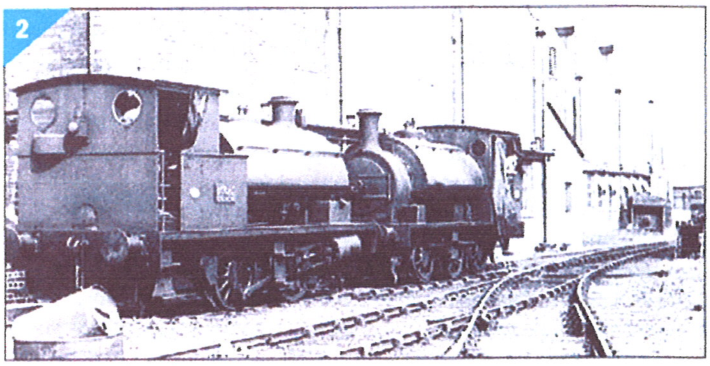
THE FORGOTTEN RAILWAY



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Terence R. Holland looks at the Admiralty narrow gauge railway at Holton Heath in Dorset.

1. Narrow and standard gauge locomotive sheds, July 2001 (photo: the author).

2. Standard gauge locomotives on site in the 1950s (photo: M. R. Bowditch & L. Hayward).

Fig 1. View of the site in 1917.

Fig 2. Plan of the site and surroundings.

Much has been written about narrow gauge railways in the United Kingdom but, despite the large number of publications dealing with this subject, one railway seems to have escaped detailed attention. This is the extensive narrow gauge system (and associated standard gauge sidings etc.) which existed to serve the Royal Navy's explosives factory at Holton Heath in Dorset. The line was laid around about 1915 when the plant was built during the First World War and was situated in the south of the county; close to the shores of Poole Harbour. The narrow gauge line was laid to 2ft. 6in. gauge and served the Royal Naval Cordite Factory (RNCF), which produced cordite and other munitions for the Admiralty. In addition were several miles of standard gauge track connected to the national network. At its peak during the Second World War the factory employed over 4,500 people and produced a weekly output of 150 tons of cordite. Cordite production finally ceased in 1957 when much of the plant was demolished and the majority of the track was lifted. **Figure 1** shows part of the site looking south with one of the nitroglycerine plants in the foreground, the nitric and

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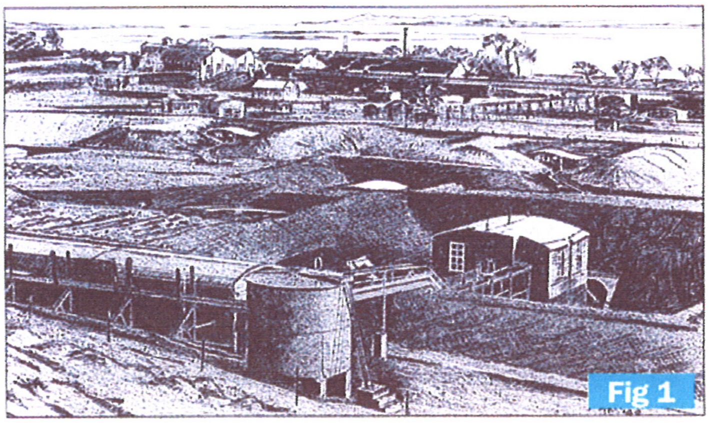


Fig 1

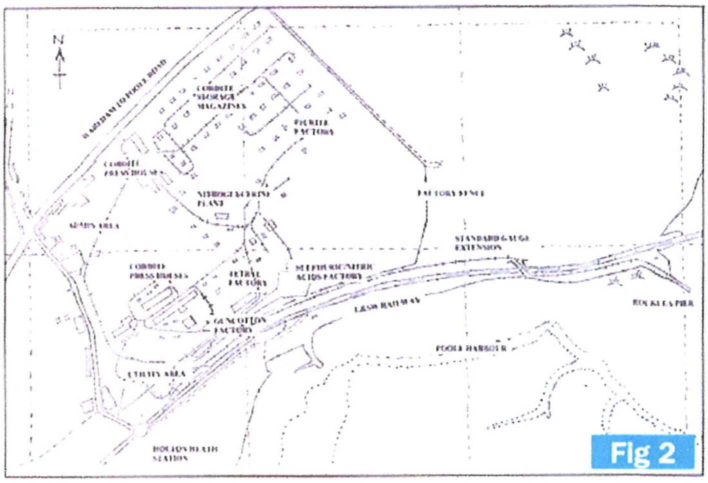
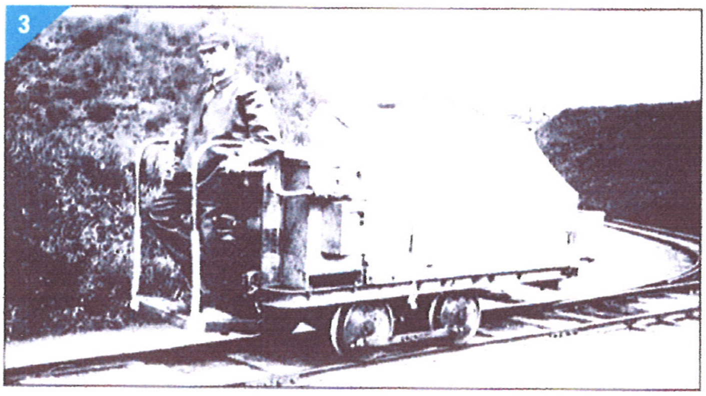
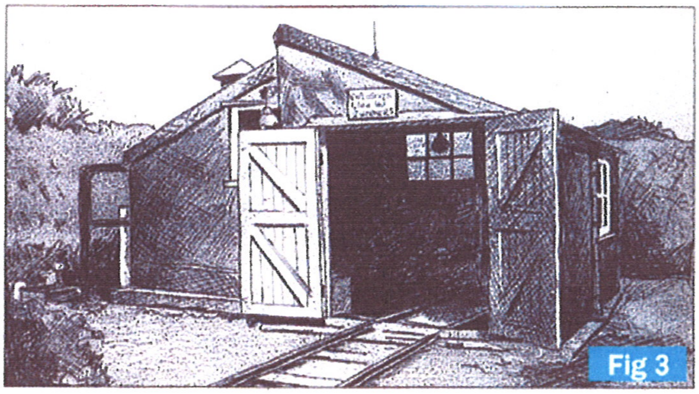


Fig 2





3. Battery-electric powered locomotive (photo: M. R. Bowditch & L. Hayward).
Fig 3. Danger area building served by the narrow gauge railway.

sulphuric acid factories in the middle ground and Poole Harbour in the distance.

Cordite factory

Cordite was used by the Royal Navy as a shell propellant on board their warships. It consisted of a composite, slow burning explosive which was made from nitroglycerine absorbed into nitrocellulose (also known as guncotton). Once produced and extruded into 'cords' (hence the name cordite) it looked very similar to bundles of spaghetti. Cordite was a sophisticated, organic material, invented at the end of the 19th century to replace the more primitive, inorganic gunpowder - prepared from potassium nitrate, sulphur and carbon - which had previously been used. Cordite burned with much greater energy than gunpowder and left virtually no residue in the gun, unlike gunpowder which produced inorganic by-products with much smoke on ignition.

The cordite factory was built just after the outbreak of the war in 1915 at the instigation of Winston Churchill, First Sea Lord at the time, who had appreciated the need for high quality material suitable for the extreme conditions obtaining at sea and for establishing reproducible performance enabling greater accuracy of naval gunnery. A plan of the site is presented in fig 2 which shows the various plants and areas making up the overall factory.

An area of heathland known as Holton Heath was chosen for the construction of the site, which covered approximately two square miles of uncultivated land between Poole and Wareham. Due to the relatively large distances between the process buildings and the complexity of the facility in general, a comprehensive internal transport system was required for moving raw materials and finished products around the site.

Railways on the site

Many of the logistical requirements for the factory in 1915 were met by manufacture on the site, requiring relatively large stocks of raw materials to be held and distributed. For example, raw materials such as iron pyrites, Chile saltpeter, glycerine and cellulose for making sulphuric and nitric acids, nitroglycerine and nitrocellulose. However, in those early years of the 20th century petrol and diesel engines were still in their infancy. The preferred mode of transport, therefore, was a railway and the Admiralty factory was consequently well equipped with both standard and narrow gauge facilities.

At Holton Heath, the established 'standard' military gauge of 2ft. 6in. was chosen for the internal narrow-gauge track. A standard gauge connection to the national network was also essential and this was provided by the L&SWR, with standard gauge sidings etc.; both internal and external to the site. The site also possessed its own standard gauge shunting engines.

Photograph 1 shows the two locomotive sheds which were situated in the south west of the site close to the L&SWR main line. The narrow gauge shed is on the left and latterly, after the original fireless locomotives had been withdrawn, it was used as a charging station for the replacement battery-electric units. Note the engineering works behind the two sheds (see also **photo 2**) and to the extreme right a typical wartime Nissen hut.

The standard gauge

Lines were comprised of an extensive set of external sidings, laid out parallel to the south facing fence and the main Weymouth to Waterloo line of the L&SWR, and internal sidings which serviced the coal storage area, the power station and goods receipts and dispatch buildings etc. The factory fence was equipped with railway gates through which the RNCF standard gauge tank engines operated. The track was laid to typical main line standards in cast iron chairs on wooden sleepers.

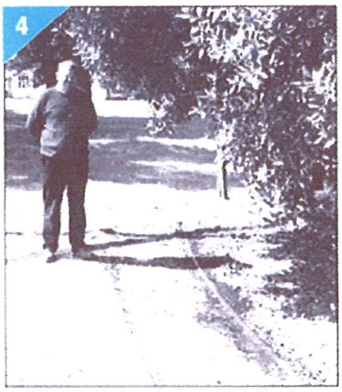
In addition to the local sidings, a standard gauge extension of approximately a mile in length crossed the main railway on a bridge after leaving the site and terminated at a pier head near Rockley on Poole Harbour. The pier was equipped with a travelling crane for loading and unloading the sailing barges, which were used for the import of raw materials and coal and also for the export of finished products to shell filling establishments such as Priddy's Hard near Portsmouth. Latterly, delivery and dispatch operations at Rockley pier were discontinued and the pier became disused. The work was then carried out using the national rail network. Rockley is situated on Wareham Channel in Poole Harbour at the entrance to Lytchett Bay.

Photograph 2 shows two standard gauge works locomotives parked on the sidings within the factory fence, adjacent to the engineering workshops and outside of the standard gauge locomotive shed in the late 1950s. The locomotive in the foreground is Yard No. 1596, built by Bagnall as number 2596 in 1938, when it was supplied new to the RNCF. The far locomotive is most probably Reliance, an 0-6-0 saddle tank built by Hunslet in 1930, Yard No. 1627.

The buildings in photos 1 and 2 still exist in original condition and can be seen through the fence from the public road leading to Holton Heath station. Note the traces of camouflage paint from WW2 on the brickwork of the engineering works above the locomotives. The roof lights are typical of those used in many of the buildings on the site and were designed to make the best use of natural light.

The narrow gauge

This system was extensive, served most buildings on the site and resulted in a considerable network of approximately 14 miles of 2ft. 6in. track; many miles of which ran in raised embankments to protect surrounding areas in the event of an explosion. The construction was typical of narrow gauge lines in general; with light steel rails



fixed to wooden sleepers with steel nails.

The part of the site where explosives were manufactured or processed was known as the 'Danger Area'. Within such areas it was important to eliminate ignition sources and this resulted in a specification for fireless or battery locomotives, as opposed to the then common coal-fired steam locomotive. Buildings within the Danger Area were lightly constructed, mainly of wood, and were surrounded by earthworks known as 'traverses'. The narrow gauge trackwork connecting buildings etc. also ran within earth traverses. The extent and complexity of these earthworks can be seen in **fig 1**. Trackwork within danger area buildings was often laid using oak timbers in order to avoid the generation of sparks. **Figure 3** shows a small building, which was used for drying explosives, served by the narrow gauge with change of track from steel to oak rail at the entrance. Note the earth traverse, the flimsy construction, external lighting, the lightning conductor and explosive/worker limit board: all typical of buildings within the 'danger area'.

Two fireless locomotives operated within the Danger Area in the early days at the RNCF and both were manufactured by Andrew Barclay of Kilmarnock in Scotland, see **fig 4**. These were Barclay works numbers 1474 and 1475 which were supplied new in 1915. These are likely to have been scrapped or sold when the locomotives in the inner 'danger area' were eventually replaced by battery electric units.

The fireless locomotives were known as 'Fowlers Ghosts', after their inventor Sir Henry Fowler and, presumably, partially due to their quiet action. They did not carry a heat source as they operated using superheated water (obtained from a stationary steam plant) which was stored in the large insulated pressure vessel in the place of a conventional locomotive boiler. Consequently smuts or sparks from burning fuels were not present and hence their use in munitions plant or any other industrial application where a serious fire hazard existed.

Note in fig 4 the rear mounted cylinders operated by Walschaert's valve gear, the filling valve on the front of the storage tank, the absence of a smokebox and the manually-operated bell replacing the whistle (presumably to save steam). The lack of a smokebox allows for the rear mounted cylinders with improved vision for the driver. These engines operated very quietly as there was no need for a sharp blast for drawing the fire, as is the case with conventional locomotives.

Photograph 3 shows one of the 'Flame-proof' battery-electric units which replaced the two Barclay engines and it is seen travelling through typical blast-proof earthworks, which were designed to protect individual areas from accidents in adjacent buildings etc. The battery-electric locomotives numbered about 30 units and most were supplied by Greenwood and Batley of Leeds. Note the very basic design of the motive power unit and the light construction of the track.

Some idea of the complexity of the narrow gauge system is evident in **fig 5**, which illustrates the railway system in just one part of the site. This is the services and utilities section of the factory and corresponds to the area which until recently was occupied by the Defence Research Agency (DRA). Many of the buildings illustrated in fig 5 still exist at the current time. The solid dark lines detail the narrow gauge track, whilst the standard gauge is indicated by double lines. Dashed lines in the centre of the drawing, however, detail concrete paths used by the process workers for accessing their respective work areas from the main entrance gate just south of the surgery.

Latterly, when this part of the site was occupied by the DRA, many of the narrow gauge lines were lifted and the track beds were made into access roads surfaced with tarmac.

Of the narrow gauge track little now remains, apart from one short section close to the acetone plant (to the right of the gas holders in fig 5) where inclusion in concrete has ensured survival. This section is illustrated in **photo 4**.

4. A section of the 2ft. 6in. gauge track (photo: the author).

5. Barclay locomotive for the Western Front (photo: Glasgow University Archive).

Fig 4. Andrew Barclay fireless locomotive.

Development of military railways

The first recorded mention of the use of railway locomotives for military purposes occurred in 1855 during the Crimea War, when the Crimea Railway was built to run the 39 miles from Balaclava to the siege batteries at Sebastopol. This railway was of 4ft. 8½in. gauge which was ultimately to become the 'standard' gauge of Britain's railways, along with the USA and much of Europe. The gauge of 4ft. 8½in. was first adopted in the north of England as it happened to be the same as the road wagons which were first run on the early rail tracks, although some historical evidence exists which indicates that this dimension can be traced back some 2,000 years to Roman times. Brunel on the Great Western Railway introduced his superior and much more stable 'broad gauge' of 7ft. ¼in. which was ousted eventually by 4ft. 8½in. as a national standard in 1892.

Presumably, at the time of the Crimea Railway, narrow

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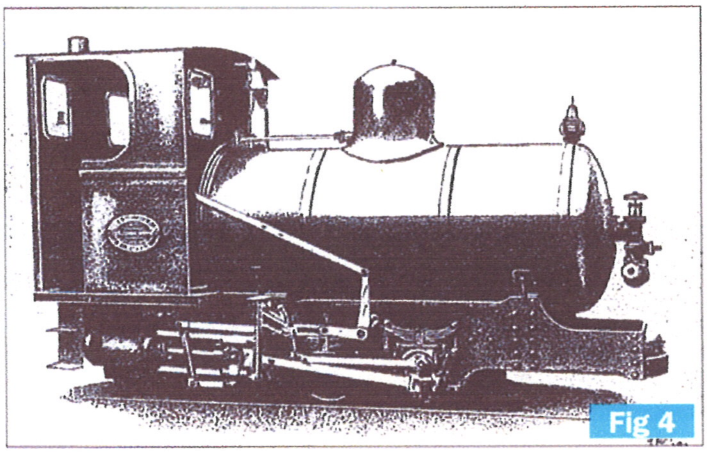
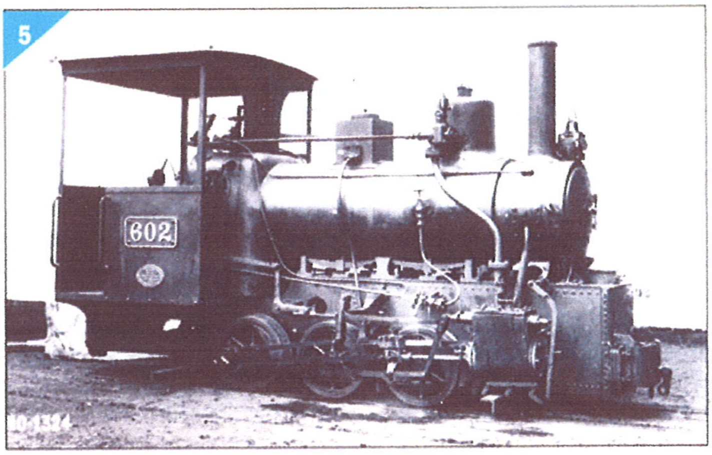


Fig 4



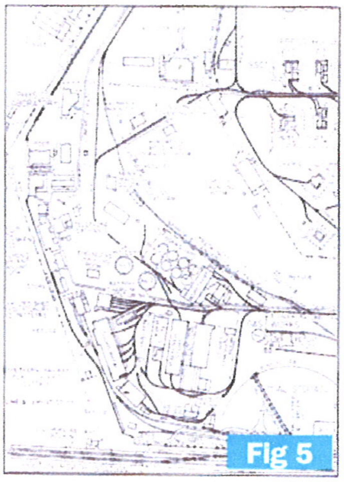


Fig 5

gauge track had not been considered, even though the 1ft. $11\frac{1}{2}$in. gauge Ffestiniog Railway had then been running for some 23 years; albeit without steam locomotives which were not introduced on this Welsh railway until 1863.

Eventually, the usefulness of railways as a means of supplying logistical support to fighting forces was recognised as well as their application within explosive and munitions factories etc. and the military establishment of the period initiated research into this area. Of particular note was the extensive 18in. gauge railway installed at Woolwich Arsenal in the 1870s which, apart from serving the site, was also intended as a military support system. Ultimately the track gauge of 2ft. 6in. was recognised as the preferred narrow gauge for military applications; being a compromise between the standard gauge and other smaller gauges. However, in the early years of the 20th century much of the earlier military research became of little consequence, as a secondary factor was to emerge which ultimately determined the standardisation of narrow gauge railways in the United Kingdom and, indirectly, the rest of the world. This was the unusual, unorthodox developments of narrow gauge railways which took place during the First World War. This war was first perceived as a war of movement, with cavalry taking the offensive to result in a relatively quick end to hostilities. This, however, turned out not to be the case and things rapidly developed into a stalemate with the entrenchment of both sides and few gains over many years of carnage. The military establishment, however, had not envisaged the problems arising from this situation and minimal provisions had been made to service a stagnant battlefield with logistical support. Railways had not been considered and the prevailing north Atlantic weather conditions had rendered the battlefield in France a quagmire.

Ultimately the fighting men took matters into their own hands and improvised all sorts of methods for moving men, munitions and supplies over the battlefield; most of which were based on rudimentary railways. For example, Model 'T' Fords were converted to run on primitive railway track and even monorail systems were improvised.

At that time the railways on the continent consisted of three separate gauges; standard 4ft. $8\frac{1}{2}$in. inherited from England, metre gauge (roughly equivalent to 3ft.) and 60 centimetre gauge which was the most commonly used narrow gauge system on the continent. It was logical, therefore, that the British units adopted the lightest, readily available 60cm gauge feeder system as a standard with which to supply the front. This operational trend was ultimately endorsed by the establishment (after an initial appraisal of using 2ft. 6in. gauge equipment) and actions were emplaced to ensure that significant amounts of 60cm narrow gauge equipment were supplied to the fighting units in France and other areas. Towards the end of the war, over 800 miles of 60cm military railways had been laid which were operated by many steam locomotives, initially supplied from Britain.

Photograph 5 shows a typical 0-6-0 locomotive built by Andrew Barclay of Kilmarnock, Scotland and destined for service in France (ironically this engine and an 0-4-0 version were based on a German design by Orenstein and Koppel). At the completion of hostilities, large quantities of equipment became redundant and were offered for sale on the commercial market and resulted in the setting up of many railways of nominally 2ft. gauge, which were able to utilise this cheap source of 60cm equipment. Typical of such lines was the Ashover Light Railway in the Midlands which employed USA-built Baldwin locomotives, wagons, track and other materials retrieved after 1918 from the Western Front.

Demise of the narrow gauge

The use and application of narrow gauge railways has always been associated with economy and particularly in association with mineral workings. This applied in areas such as Wales, with mineral workings often existing in mountainous regions, where the nature of the terrain made railway (or road) construction difficult. The most important advantage of the narrow gauge was that it could be built cheaply. Many of the Welsh narrow gauge railways were mineral lines taking mined or quarried materials from the mountain quarries to the coast. Materials were loaded on barges and ships for further delivery, thus the transhipment of materials from the narrow gauge to standard gauge was not necessary; that is, the issue of 'break of gauge', with additional expense, time penalty and provision of suitable handling facilities was not a problem. However, elsewhere several factors have consistently acted against the narrow gauge in favour of the established national standard. First and foremost was the issue of 'break of gauge' where the narrow gauge payloads required moving into standard gauge wagons for further transit. This problem was often significant and many innovations were sought, unsuccessfully, to overcome it. Other problems included the reduced payload of narrow gauge systems, compared with the much greater capacity of the standard gauge, and the fact that as many operators were required to man the narrow gauge as with full-size railways. The length of sidings required was also significant, as standard gauge railways could accommodate a given weight of materials on a significantly shorter length of track. These operational problems increased in the early years of the 20th century as wages improved and manpower costs became more significant.

Eventually, the development of petrol and diesel internal combustion engines after the First World War and the use of rubber-tyred, road-using vehicles provided a more economical method of moving materials to the nearest standard gauge railway outlet and many narrow gauge lines were closed. In most cases these quaint relics of the recent past have disappeared forever, but others managed to survive until enthusiasts took over in the 1950s. **ME**

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