ON HER MAJESTY'S SERVICE

John -

I thought you might like a copy of this if you haven't already seen it?

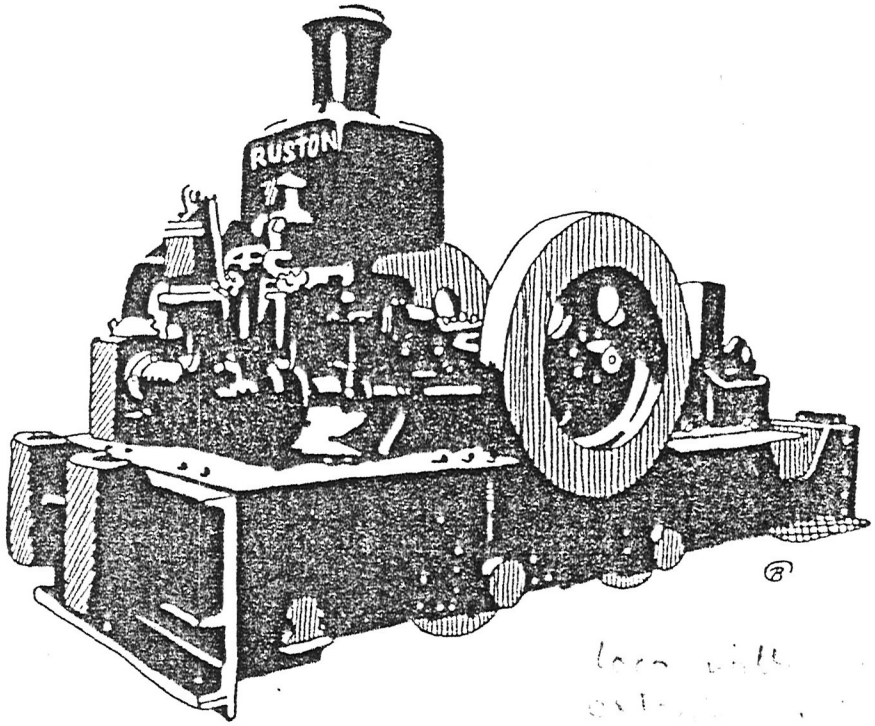
Gordon.

22.6.87.

The Eighteen Inch Gauge

Gunpowder Factory Railway

At Waltham Abbey



by Brian Clarke

Gunpowder Factory Railway, Waltham Abbey

A number of manufacturing and storage establishments run by the Military in the London area operated 18" gauge internal railways. These were never on view to the public and often only became known because equipment turned up later, after sale. The very narrow track gauge allowed easy access to buildings and passage through restricted clearances, with tighter track curves than possible with wider gauges. All the various lines used the same pattern of side buffers and central coupling link. Locomotives and stock were on occasion transferred from one line to another, as required by the Military.

A gunpowder factory was first set up at Waltham Abbey in the 1600's, to the north of the town. First evidence for use of rail transport dates from the 1890's when a hand-propelled line of about 3' gauge was in use. By World War I, the site had become the Royal Gunpowder Factory and a Royal Small Arms Factory had been established to the south at Enfield Lock. Both of these employed hand-worked 18" gauge lines. Details of the stock used then are scarce, since the builders no longer have records from that time. There were several types, a comparatively recent example of which is preserved by PERME, the successors of the Gunpowder Factory. There was also a kind of tipping truck in use.

Basic wagons at the Small Arms Factory were 4 wheel flats. These had modifications as necessary, including the fitting of racks for rifles. This establishment was served by a standard gauge branch line or siding from the Great Eastern Railway at Brimsdown. Movements on this used a locomotive owned by the Small Arms Factory, into which the standard gauge track extended.

During 1917, a consolidation of the 18" gauge railways into one, locomotive-worked system took place. This involved construction of a new section connecting the formerly isolated hand-worked parts. Total length became 1 5/8 miles, with two river bridges (swinging), a third, smaller river bridge and an interesting tunnel. This involved a track gradient of 1 in 60 each end,

easing to 1 in 100 to compensate for an S curve of 60' radius on the swing bridge approach. The tunnel occured at a particularly awkward location and was necessary to pass beneath a main road, being positioned between the two swing bridges. It was parallel with and adjacent to the river. To gain clearance beneath the road, a watertight, concrete lined cutting was made. At its lowest point, this was 3' below the river water level.

The town sewer had to be re-routed in connection with the new railway. It represented a serious obstacle as it syphoned under the river, across the new route. A coffer dam was required for access to pipe joints in the river, with only just enough clearance for barges to pass. Both swing bridges had a central pier of concrete, supported by three piles into the bed. One span was fixed, the other extending half its length onto land and pivoted centrally. A locking lever placed at the land end also actuated a signal arm mounted on the fixed span. This seems to have been the only train control, although a telephone line followed the course and could have been for safe planning of train movements.

The old, hand-worked lines used rails of 20lb per yard on pressed steel sleepers and this was also used in the early stages of extension work. By the end of 1917, 30 lb rail had been adopted on wooden sleepers. Some old curves were 25' radius but nothing sharper than 30' was allowed on the new line and all old curves were progressively eased. They were too sharp for the locomotives. All track appears to have been neatly buried with gravel to just above the rail foot.

New rolling stock was built for use on the main line, though probably not rendering the earlier trucks redundant. These were roofed bogie wagons with open sides and sheets which could be unrolled in wet weather. Overall length was 12' but other dimensions can only be estimated from photographs. They each weighed 2 tons fully laden, a normal train consisting of 6 wagons. an interesting feature was their massive dumb side buffers; in fact nothing on the line appears to have had sprung buffers - surprising in view of the

gunpowder carried. Loads consisted of wooden trays stacked in the wagons. There may perhaps have been other types of traffic on the main line. One cannot help speculating about a possible passenger service for workers, between the two factories. However, no evidence has yet been found for this.

Five BEV battery locomotives were operated at the Gunpowder Factory. They would have been ideal for use in the works but it seems most unlikely that they ventured onto the main line regularly. Main line traffic was handled by several locomotives of the Ruston, Proctor & Co "ZLH" Class, built at Lincoln. They had one cylinder and developed 10 b.h.p. Although designed to allow for operation on many different fuels including benzol and alcohol, they were in practise started on petrol and then run on paraffin. The writer has heard it said of early farm tractors using this fuel combination that the petrol guzzled up on starting would have cost (at that time) the same as the paraffin used to run the engine all day. In consequence, they were left running but unused for hours on end and if they stalled it was regarded as a financial disaster. This could also be true for the "ZLH" engines.

These locomotives had engines of the slow speed, horizontal type with two heavy, 2'9" diameter flywheels. A downward bulge in the footplate was required to house these. Advantages were claimed over contemporary designs for "automotive" type, high speed engines which wore rapidly, suffered from vulnerable cooling systems and broke down frequently. The "ZLH" engines had a large, cast iron water hopper mounted above the cylinder for cooling. This required topping up several times daily but dispensed with fragile radiators and circulating pumps.

Trials showed that the Rustons could haul up to 9 loaded bogie trucks along the main line without difficulty. Specified load for level track was 36 tons maximum. Gear transmission gave speeds of 3 or 6 m.p.h. forward or reverse, final drive involving chain gears running in an oil bath. Each axle had an 11" diameter drum with a band brake of "Ferodo Patent" type, hand

operated. Foot controlled fittings included sand boxes and a 9" diameter, polished warning gong fitted outside the frame. Because of the explosion risk, exhaust gasses passed through baffles and boxes filled with pebbles. A water spray was also available but it is not clear if these particular machines were so fitted. The pipe exiting just below the "chimney" and leading down to the track could have been for dumping water used in this system. A bristling bank of sight feed lubricators was prominently mounted in the cab.

Photographs of a train on the Waltham line show a woman driver and second person travelling in the cab, who could have been a shunter. The locomotive livery was a dark body colour, with fine lining out and the ornate Ruston, Proctor crest applied. No running numbers, names or declaration of ownership were carried. Evidence from makers records show engines supplied to Waltham as 51707 (16-3-1917), 51901 (28-9-17), and 51927 (29-10-17). Ruston publicity claims four were operated there (though not specifically naming the establishment) but as it quotes the wrong track gauge this may also be in error.

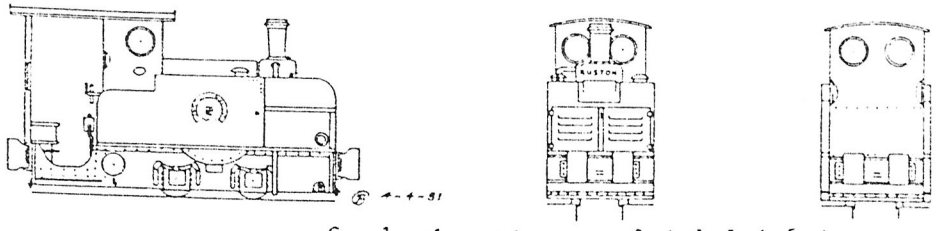
Perhaps the biggest mystery arising from the publicity photographs for "ZLH" locomotives is a view of one running between standard gauge rails, on it's own rails stated to be 16" gauge. A running shed is visible in the background with large tender engines, which does not fit the descriptions of the interchange of gauges at Waltham. Was it really 18" gauge and did it operate at another, "unknown" location ? Careful comparison with the Waltham machines shows only one variation, in the drawgear which in any case may be just a modification for pulling standard gauge trucks on the interlaced track. Detailed specifications for a 16" gauge "ZLH" are among surviving drawings, though this is not proof of one actually being built. An indication of how versatile the basic design was can be seen in No 113041 (1920) for Portland Cement, Swanscombe. It had outside flanged wheels made with "worn profile", spaced for 3' 5 3/4" gauge track. The 3' 3" gauge Davington Light Railway (another

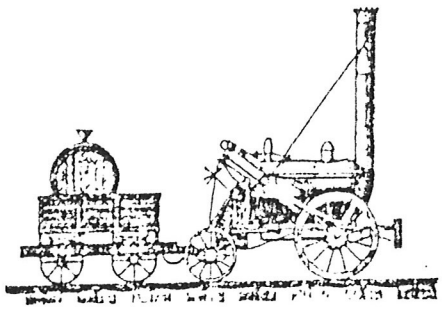
Government explosives carrier) used one, looking rather odd and too small for the track in a photograph with the wheels right outside the frame.

It seems that the rail system at Waltham Abbey closed entirely after a short working life, in the 1920's. However, manufacture of explosives continued there until operations were dispersed during World War II. Although the area has not been redeveloped beyond all recognition in the years since closure, detailed examination of the former route is difficult because public access is limited. A section of track is still in position in the Small Arms Factory and it is quite possible that other relics may survive in out of the way corners of the old line.

The area was heavily wooded with a view to reducing the effect of blast from accidental explosion, which, with the bridges and waterways, made for a most attractive setting. Although none of the Waltham engines escaped scrapping, two similar "ZLH" machines of wider gauge have survived. One is at Gloddfa Ganol in North Wales, the other preserved at Lincoln. The Works Drawings were photographed in June, 1941 (by which time the design was considered obsolete) but by then were incomplete, deteriorated with age. Now even the reel of microfilm negatives has reached the end of its life. Study of prints taken to piece together a correct drawing for the Waltham engines proved quite a jigsaw puzzle.

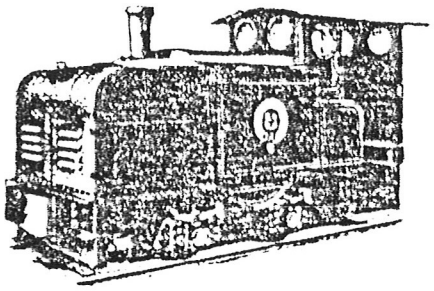
Thanks are due to Kenneth Miller and Ray Hooley for the research and information used in this booklet. If anyone can add further detail - particularly for the factory track layouts and early rolling stock - the writer would be pleased to hear from them.





A Hundred Years Ago.

1815 1920



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