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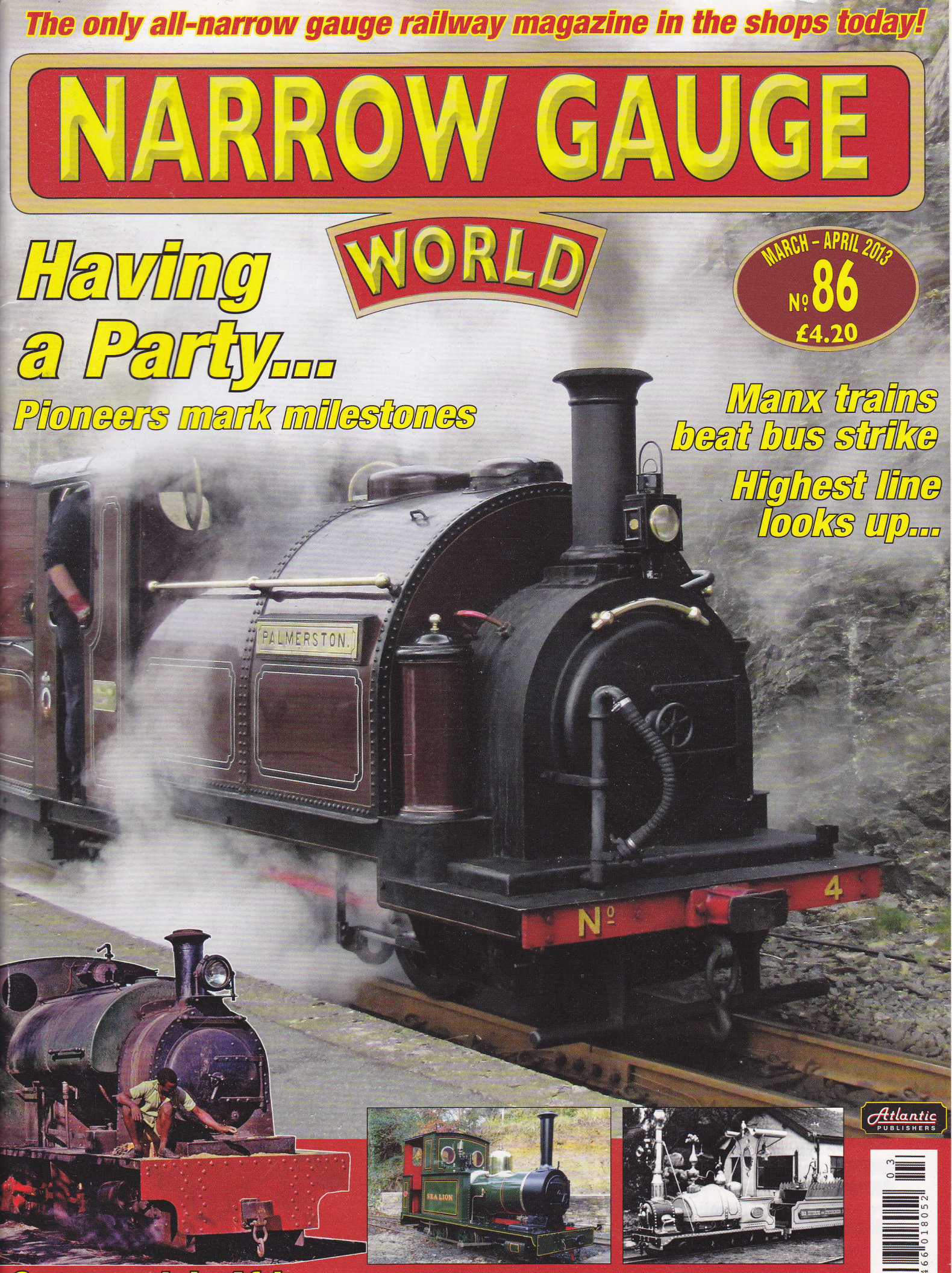

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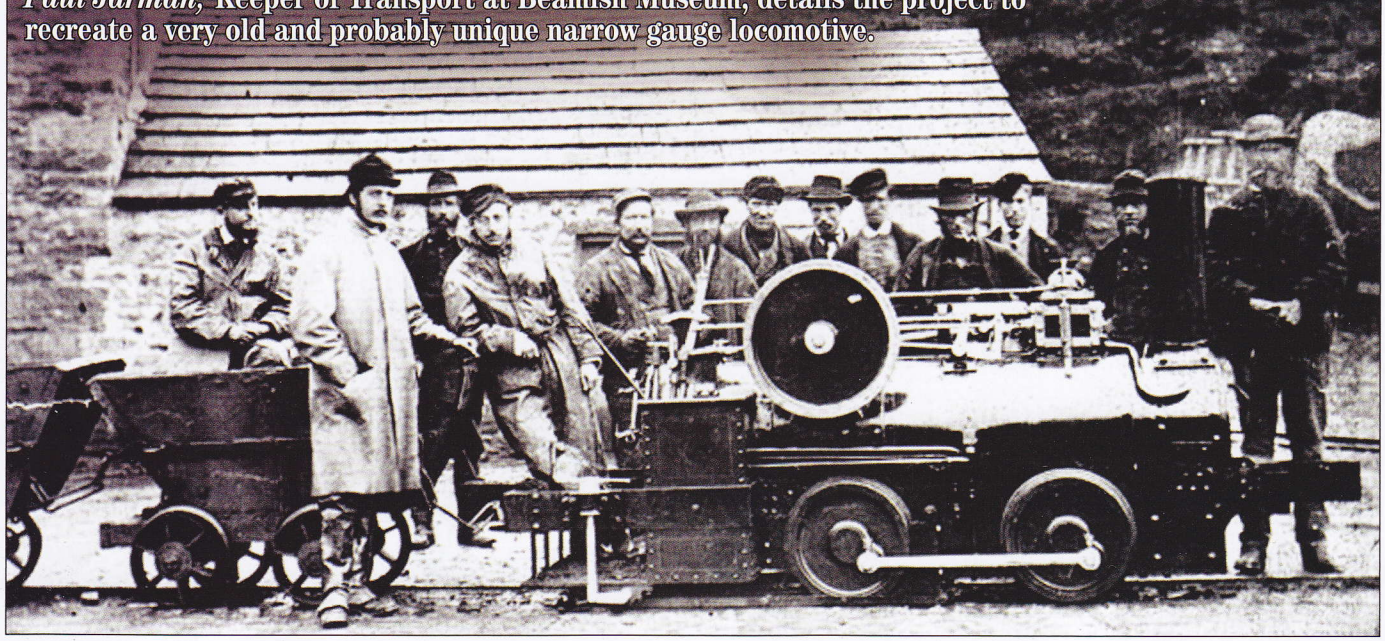
Samson – A long lost Lewin...

Paul Jarman, **Keeper of Transport at Beamish Museum, details the project to recreate a very old and probably unique narrow gauge locomotive.**



In the autumn of 1874 a diminutive 0-4-0 geared locomotive, looking more in common with a traction or portable engine of the period, was delivered to the London Lead Company's 1ft 10in gauge Cornish Hush Mine tramway in County Durham. So the engine, known as 'Samson', entered the annals of north east railway history, albeit its tenure in a valley to the south of Stanhope and Frosterley was brief.

For almost as long as I have worked at Beamish, I have been fascinated by Samson, leading to our new project to construct a replica of the locomotive. Although it ran for only a relatively brief period and was probably scrapped by 1904, it is of that era when almost any engineering company could turn its hand to manufacturing a range of steam engines, often quite improbable and inevitably lost to most photographic or documentary records. And I was not alone – years before this project gathered momentum the well-known model engineer Ken Swan had considered a 7¼ inch gauge version and my regular partner in crime, volunteer engineer David Young quickly seized upon my tentative suggestions with the assurance that he could help the museum realise a working full-size replica. So it is that early 2013 has seen a tangible start on the project. But first, some history...

The *Poole Herald* of 17th December 1874 reports "Mr Lewin has just sent away to be worked in a lead mine a small locomotive..." Further media coverage was to be found in *The Engineer*, *Engineering* and the *Mining Journal*. The latter report, dating from January 1875, included an engraving and is worth mentioning in full...

"The above illustration represents a small geared tramway engine for the working of narrow gauge tramways, in the place of horse labour, designed by Mr S Lewin, of the Poole Iron Works, Dorset. The design is very simple, and it certainly possesses very many advantages over the double cylinder direct-acting loco for small powers. It is not so complicated, and the whole of the working parts are kept well up out of the way of dirt or any obstructions, while the gearing is very strong and of cast steel, rendering it very durable and not liable to injury. The engine can be easily handled, and no difficulty is experienced from the engine getting on its centres. One of these engines was supplied last autumn to the London Lead Mining Co, of Middleton in Teesdale, and they report that 'as a substitute for horse labour the engine is answering its object most satisfactorily,' and they also say 'we consider the design and workmanship very good and can confidently recommend them for tramway work.' The engine which they here refer to is of the 2½ nhp type and weighs in working order 2 tons 12cwt."

The reference to the 'engine getting on its centres' is interesting – it refers to the tendency of a single-cylinder loco to require careful positioning of the piston (in order to place the engine on its 'starting stroke'). The claim therefore of no difficulty must refer to the experience of the operator rather than some particular feature of the design itself.

The reference to nhp is notional horse power, again a term familiar from traction engine and agricultural engineering practice and at odds with the now accepted railway norm for TE (Tractive Effort) or IDHP (Indicated Drawbar Horse Power).

"Mr Lewin has just sent away to be worked in a lead mine a small locomotive..."

Above: the only known photograph of 'Samson', showing it (looking very new) at the north eastern end of its short railway serving Cornish Hush lead mine to the south of Frosterley in Weardale.

Right: General arrangement drawing for the new Lewin engine, prepared by David Young.

All photos/ drawings courtesy of Paul Jarman/Beamish museum

Not the first?

It is possible that Stephen Lewin did build a loco before Samson. Works number 551 was listed in the general number series (as were all of the locos so allocated) and described as a single cylinder 6¼in 4hp portable engine. Tantalisingly, two later locomotives supplied from Poole were also described as '4hp portable engines' so maybe Samson had a predecessor, and quite possibly this loco bore some resemblance to him.

Lewin's sales literature described the 'Tramway Locomotive Engines' in the following terms:

"I make these of two kinds, one suitable for drawing weights up to about 35 tons at a speed of about 5 miles per hour on very narrow gauge lines to replace horse power. The other kind I make is a simple form of direct-acting Contractor's Locomotive to draw weights from 40 to 150 tons on gauges varying from 2ft 6in to 5 ft 1in."

The latter direct-acting loco was built to the same format as was the famous Seaham Harbour standard gauge Lewin (No 683) when supplied to the Londonderry Railway in 1877.

There is only one known photo of Samson showing the engine at Cornish Hush, probably at a location above the 'flats' where the lead was tipped and prepared for processing. As photos go, it is extremely useful, being an almost dead side-on view.

There are also two engravings, showing the rear three-quarter view of the loco and a side view of that opposite the photo. However, these should be treated with care as they demonstrate a certain amount of artistic licence. What they do raise, however, is a question regarding the boiler design – a subject of much discussion between Ken, David and I. The options are a conventional locomotive type boiler or for a marine (or non-depending) type. The latter seems more probable, given the restricted dimensions and later practice on Lewin's more diminutive loco output. However, one engraving seems to suggest the backhead of the boiler is of greater depth than the barrel itself and is not circular, as would usually be the case for a marine box.

One explanation for the depth of the backhead is that part of it forms the rear end of the pressure vessel whilst the lower part is structural, enabling the boiler to be mounted against the frame ends, which do not run the whole length of the loco, as described later. This practice can be seen on the Ramsbottom engines used on the 18in gauge internal railway system at the LNWR's works at Crewe.

The smokebox and its door set the standard for the Lewin style of 'face', the box carried on wing brackets mounted directly onto the frames.

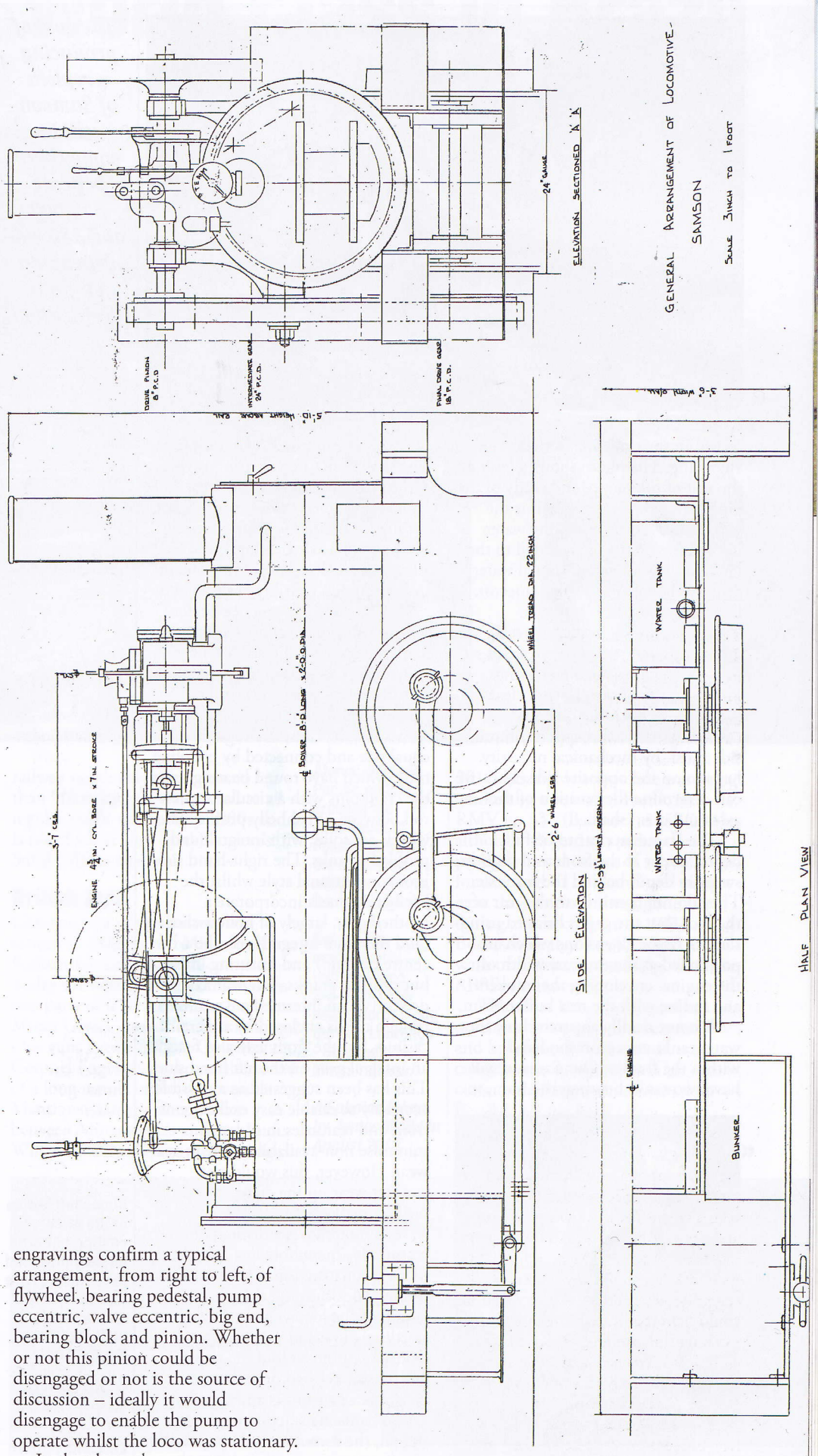
Overtype motion

Critical accessories to the boiler, in the case of Samson, are the crankshaft, motion and cylinder block. These are carried atop the boiler on brackets, and though our best evidence is again the potentially suspect engravings, the photograph does give quite a clear indication of the arrangement.

A pair of slide bars/guides carry the piston rod/little-end and appear to sit on a boiler-mounted bracket at their outer end. Stephenson Link motion is fitted, and the reversing lever can be seen in the forward position in the photo, with the forward eccentric rod to the fore and lifting links lowered accordingly. The engravings suggest that a marine type big-end bearing was employed – Lewin a seasoned marine engine manufacturer.

Above and slightly behind the rear axle is the crankshaft, with the flywheel prominent in the photo. The engravings confirm a typical arrangement, from right to left, of flywheel, bearing pedestal, pump eccentric, valve eccentric, big end, bearing block and pinion. Whether or not this pinion could be disengaged or not is the source of discussion – ideally it would disengage to enable the pump to operate whilst the loco was stationary.

In the photo the water pump can just be discerned. This is driven from the crankshaft, the linkage being



General arrangement drawing reproduced to approx 16mm/ft scale

shown in the three-quarter rear view engraving. The photo shows a lever at the rear of the pump, and study of the pipework would suggest this is the bypass mechanism, enabling water not required to be recirculated to the tank. We will fit an additional water feed, in the form of a small injector, located in one of the bunkers.

Moving to the frames, wheels, gears, rods and footplate we again see inconsistency between engravings. However, the photo shows a clear layout along with the obvious inference that what happens on one side must, by mechanical necessity, happen on the opposite side. Thus we can determine the position of the axles and crankshaft.

The frames appear to be full depth, swept at the front and slightly swept in depth behind the rear axle. They do not continue to the rear of the loco, but the gap is bridged using slender frame extensions which are positioned at the extreme width of the engine, enveloping the bunkers and in line with the rear buffer beam.

It is not readily apparent how the water tanks are accommodated within the frames. Our Samson will have two tanks between the frames, of equal size and with a balance pipe. The tank structure will also provide additional stiffening in this area.

It is presumed that Samson is not sprung (as per De Winton practice). However, the axle bearings may be allowed a small degree of movement in hornguides, possibly cushioned on rubber 'springs' – a practice evident on the 1860s Crewe locos as well as contemporary rolling stock and something that was incorporated into Beamish's replica of the standard gauge 'Steam Elephant'.

Samson has four driving wheels of equal size and connected by coupling rods, which have round bearings over the crankpins with a circular section rod between of fishbelly profile. The wheels are solid, with integral (and profiled) cranks. The right-hand side is of conventional style whilst the left-hand wheels incorporate a toothed gear, largely of hollow section (and therefore integral with the wheel centre casting?) and featuring integral but profiled cranks. The rear axle is driven (via an intermediate gear, though this is enclosed by a metal casing), but the front axle also features an integral gear on the left hand side. This has been suggested as a possible economy to enable easy exchange of front and rear axles in order to minimise non-availability due to gear wear. However, this would not counter wear on the crankshaft pinion or intermediate gear.

The footplate is a distinctive feature. It's incredibly low and clearly of such construction as to preclude frame plates running the whole length of the loco. The brake rod is startlingly low and would appear from the photo to foul the ground, and must have had only marginal clearance of turnouts and the like. Given Samson's traction engine design, the reverser would be used as an effective means of retarding the loco and so it could be assumed that the brake fitted is for parking purposes only. Many contemporary traction engines were not fitted with brakes at all and drivers habitually used the reversing lever for braking.

Ken and David had both independently concluded that the driving wheels were of 20-inch diameter, based on scaling the photo from probable dimensions of the wagons also depicted. This enabled David to commence preparing drawings for the project, calling upon his skills learnt in a drawing office as an apprentice. Much discussion over details took place, along with an acceptance that we would have to enlarge the driving wheel diameter to make a practical working locomotive. The dimensions also took account of us widening the gauge to two feet, for reasons of interoperability and lack of any meaningful length of 1ft 10in gauge running line!

"The cost of producing a replica of Samson will be somewhere between £50,000 and £80,000 depending on final specification"

Reasonable time

We have deliberately made a quiet start on this project. I was keen that it would be seen as credible once in the public eye, thus the drawings were completed, major component patterns produced (by David, who is integral to the project) and frame profiles cut ready for drilling and initial erection. These stages are now complete and a bay within our new Regional Heritage Engineering Centre has been allocated to the project, which will also give the new facility a demonstrable outcome within a reasonable time, alongside the many and varied projects which are progressing alongside this one.

It is anticipated that the cost of producing a replica of Samson will be somewhere between £50,000 and £80,000 depending on final specification. Use of volunteer labour would reduce the sum markedly and the benefit of the non-depending boiler design is that it is a cheap vessel to produce. The project is being managed under our Safety Management System for railway operations at Beamish, ensuring integrity of the design, traceability of materials and quality control of the construction process. We have not set a deadline for completion, but it is hoped that significant progress will be evident over the next two years, with a possible steaming in the third year if all goes well and I can identify sufficient funding for the project.

Progress will be reported on my website at www.beamishtransportonline.co.uk where 'Samson' can be entered into the search function. In due course a full feature on the project will appear on the site, where I will describe much more of the rationale and detail behind it… NGW

Above left: Some of the many casting patterns already prepared for Samson, here for the flywheel and crankshaft pedestals that will be a distinctive feature of the locomotive.

Left: The pattern for the flywheel is also ready and waiting for use.