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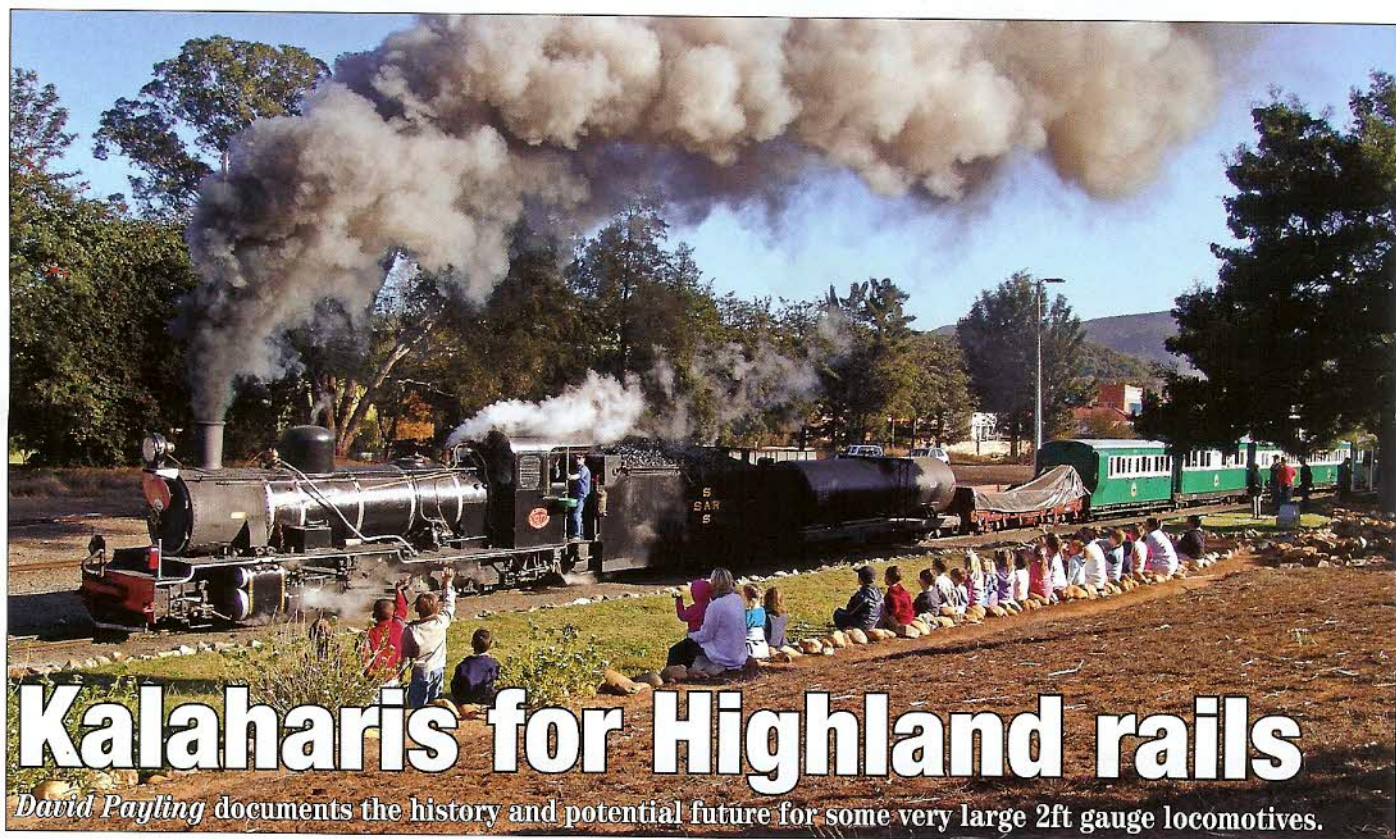
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**Superpower for
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Kalaharis for Highland rails

David Payling documents the history and potential future for some very large 2ft gauge locomotives.

Three ex-South African Railways (SAR) Class NG/G16 locomotives (nos 87, 138 and 143) currently form the front-line motive power of the reborn Welsh Highland Railway. A fourth (no 140) is complete although currently dismantled at Dinas for rebuilding while a fifth (no 109) is under restoration at the Crewe workshops of its owners, the Waterman Railways Trust. Its first ten years in service after overhaul are allocated to the WHR.

However the railway has also a 'strategic reserve' of motive power. The tangible evidence is the large tender engine standing in the bay platform road at Dinas station. It is ex-South African Railways Class NG15 no 133, awaiting its call to workshops for restoration. Sister locomotive no 134 (Anglo-Franco-Belge, 1953) is already at an advanced state of restoration as a major volunteer project of the WHR Society. These two engines belong to

a class of 21, built in batches between 1931 and 1957. Their work lay originally on the Otavi Railway in Namibia (formerly South West Africa, until independence from South Africa in 1990).

The presence of all these ex-SAR locomotives in North Wales is the result of a happy and fortunate coincidence. In the 1990s the directors of the Ffestiniog Railway were searching for suitable motive power as part of their proposal to rebuild the WHR. The motive power would have to be adequate for the tough gradients of the line and it would have to be affordable! And it was at just this time that many ex-SAR narrow gauge locomotives were being offered to buyers at home and abroad.

The reason for this availability was the closure of four of SAR's five narrow gauge lines in the mid-1980s. Since then the many surplus NG/G13 and 16 locomotives (and many

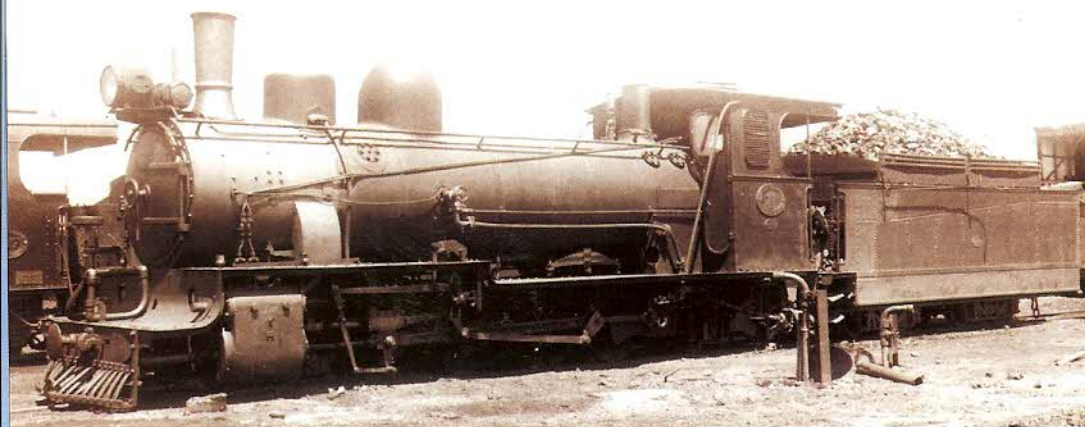
Above: September 2005 saw pioneer NG15 (1931) Sandstone no 17, haul the Avontuur Adventurer. On the second day the train departed from Patensie, bound for Assegaibos, with local schoolchildren out to watch. Photo: Errol Ashwell

Below: The first NG5, no 40, stands at Swakopmund in 1915 with landing boats being moved inland by German authorities trying to deny the use of the harbour to invading forces. Photo: Sam Cohen Library, Swakopmund

of the dieselised Avontuur line's NG15 Kalaharis) had been standing in rough storage, out of use. Thus a window of opportunity had opened. It is probable that ten years earlier, or ten years later, this would not have been possible. By 2000 vociferous protests by some, against the sale of equipment abroad, had led to a situation where few locomotives or rolling stock items have left South Africa for active preservation ever since. Much of what remained in the country has now been scrapped or faces an uncertain future, though two honourable exceptions to this policy are the privately owned Sandstone Railway in the Eastern Free State and the Paton Country Railway in Natal.

In the 1990s the newly-formed Alfred County Railway had re-opened the 76-mile line from Port Shepstone to Harding in Natal. Both it and the Avontuur Railway at Port Elizabeth had steam-hauled tourist passenger services: the Banana Express and the Apple Express, »





respectively. However, this gave work for only a handful of the 21 NG15s and 34 NG/G16s which still existed. The Pfestiniog was able to negotiate the purchase and refurbishment of two NG/G16s from the ACR.

Meanwhile, other Garratts and Kalaharis had found new homes in the USA, Germany, Switzerland and Australia. Among the five Kalaharis that came to Britain, two were bought for a scheme for a narrow gauge railway along the North Yorkshire coast at Robin Hood's Bay. When planning permission was refused, the two NG15 locomotives, nos 133 and 134, were sold to the WHR.

In Namibia

What are the origins of these engines? In fact they very nearly were never built at all! In Namibia's German colonial past, in 1906, the Otavi Railway had been built to link the rich copper deposits at Tsumeb, deep in the country's interior, to the port of Swakopmund on the Atlantic coast.

This 356-mile long railway with its two lengthy branch lines must surely have been one of the world's longest 600mm (approx 1ft 11½in) gauge lines. From the coast at Swakopmund it crossed the waterless Namib desert, rising at a steady 1 in

60 for most of the 100 miles to Usakos. From there the railway stretched a further 256 miles to the mines at Tsumeb.

It was on the Otavi Railway in 1912 that the forerunners of the NG15s appeared. Henschel was contracted to supply three 2-8-2 tender engines (nos 40 to 42 of Class Hd, soon to become SAR Class NG5). They were rigid-framed locos with leading and trailing radial axles, placed as close as possible to the coupled wheels. This gave their long wheelbase the best ability to cope with line curvature. A large, superheated boiler supplied steam to two powerful cylinders, the wide grate of the firebox sitting astride the rear frames.

The engines steamed well, making light of the crossing of the Namib Desert and greatly increasing the load capacity of the railway. Their Achilles' heel, however, was the long rigid wheelbase. They suffered heavy flange wear and were punishing to the track, their permitted speed having to be reduced to 20mph for a time until curves could be eased.

After the First World War, the coast was no longer accessible to narrow gauge trains. The invading South African and British forces had advanced inland in 1915, rebuilding

the sabotaged Otavi Railway, but now to the Cape Gauge of 1067mm. The narrow gauge continued beyond Usakos but now all freight from Tsumeb required transshipment at Usakos. Curiously, in Southern Africa, there is little evidence that transporter wagons for freight, such as those employed on our own Leek & Manifold Railway, have ever been used.

After the war the management of Namibia's railways was assumed by SAR as part of the South African mandate from the League of Nations to govern the territory. As a stopgap measure, SAR allowed a batch of six more Hd (now NG5) engines to be ordered from Henschel in 1922.

However, by the time that further motive power was required for the Otavi in the late 1920s, SAR's preference for narrow gauge motive power had become the Garratt locomotive. These had proved successful with the heavy loads and sharp curvature of the narrow gauge lines in Natal and the Cape. It is said that a NG5 had been sent on trial to the Avontuur line at Port Elizabeth at about this time. Unfortunately, its long wheelbase had jammed in the sharper curves of the line (150ft minimum radius, not dissimilar to the WHR) and the engine was returned home in disgrace.

Garratts in favour

It appears that the authorities in Pretoria now pressed Usakos to accept Garratt power for its next generation of locomotives. The evidence for this comes from the Working Timetables, published annually by SAR for each line. These included a table of permitted train loads to suit the available motive power. For the line from Usakos to Tsumeb, intriguingly, a new entry, the addition of a Garratt to the existing engines, appeared in 1929. Its haulage capacity corresponded to that of the 12 new Hanomag NG/G13s (1927, 1928). The Garratt entry appeared in the table for five years, only disappearing in 1933, two years after the arrival of the NG15s. It has been stated in various references that one, or perhaps two, SAR Garratts went on trial to Usakos at this time but eventually returned to South Africa. Sadly no photographic evidence has so far been discovered of Garratts working from the narrow gauge base at Usakos.

The authorities in Namibia had won the argument and the first of the newly-designed NG15 Class arrived from Henschel in 1931. It seems likely that the Garratt proposal had foundered on the issue of the long

Above: One of the six NG5s purchased by South African Railways in 1922, no 71, stands on shed at Usakos in the early 1930s. Photo: NGRS Library

Below: The Krauss-Helmholz bogie was the secret of the NG15's success. The unit from the Welsh Highland Heritage Railway's no 120, at that time dismantled for repair, is seen at Gelert's Farm, Porthmadog, in October 2000. The main pivot is at the midpoint of the assembly and the attachment point is a ball and socket joint at the centre of the leading coupled axle. Photo: David Payling



distance between servicing stops. Operational range was a key concern of the Otavi management. Whilst the NG/G13s carried four tons of coal and just 1,825 gallons of water, the NG5 carried 2¾ tons of coal plus a massive 2,860 gallons of water.

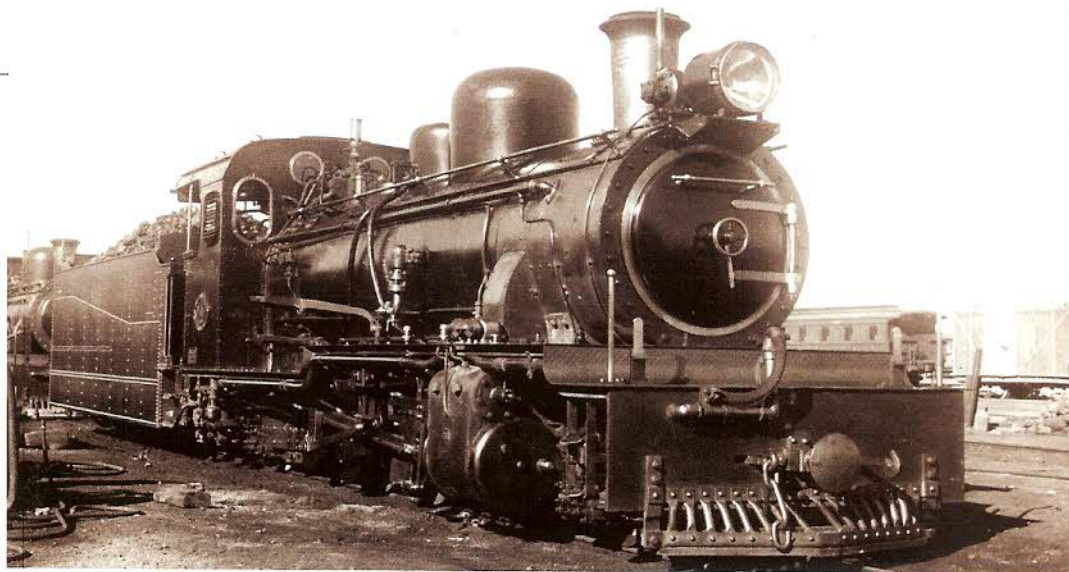
The purpose of articulation, as in the Garratt, was to achieve an acceptable axle load for a powerful and heavy locomotive, whilst having the ability to negotiate sharp curvature. In Namibia, articulation – with its complex pivots and joints – plus four cylinders and sets of valve gear, was seen as an unnecessary additional maintenance cost. The comparative simplicity of a tender engine, plus its ample water and coal carrying ability, was seen as more important.

Meanwhile, other options had also been considered. One of them, a 4-8-2 tender engine, got as far as the preparation of a weights diagram, although such a locomotive would struggle to cope with sharp track curvature.

A superior loco

The NG15 design solved the problem, its origins lying somewhere between the builder, Henschel, and the engineers at Usakos. Perhaps surprisingly, it appears that Henschel built no engines to this design for other customers. The boiler was based on its predecessor, the NG5, although with a superior tube layout and superheater, the latter now having 15 elements in a three-row layout. There was also a rocking grate, whilst a well-proportioned flared lip chimney replaced the stovepipe of the NG5.

The major improvement, however, was to the rigidity of the chassis. The leading and trailing radial axles of the NG5 were discarded in favour of pony trucks, the one beneath the firebox becoming a conventional, compensated Bissell truck. In the new design the leading truck axle was articulated to the front coupled axle in a Krauss-Helmholz bogie, and this was the secret of the new design's success. The leading coupled axle was able to move laterally through the axlebox horns by 3½in, the eyes of the leading coupling rods allowing a corresponding sideways movement by the crank pins. This gave the locomotive a fixed wheelbase which effectively included only the rear three coupled axles. It was now comparable in length to the fixed wheelbase of a NG/G16. The NG15s were able to freely negotiate all of the SAR lines where they were eventually stationed. It could perhaps be said that the Kalaharis represented yet another type of articulated steam locomotive!



To help with long-distance work the NG15 was equipped with more tender space than the NG5s. The water capacity remained 2,860 gallons whilst 5½ tons of coal could now be carried. A canvas sheet was rolled into the rear of the cab roof to provide cover from sun or rain.

Sight feed lubrication was provided and sanding was by gravity from sand boxes set into the running plate, although the first three engines carried a boiler top sand box for a short period after delivery. It may have been felt that the massive slab sided tenders, with water pockets at the sides carried down almost to axlebox level, detracted somewhat from the overall lines of the engines. If so, this would explain why, on some tenders, the outer upper sheeting was cut away by the Usakos workshops to give a swept-up line to the tender top.

In South Africa

With completion of the Otavi's gauge broadening in November 1960, the 21 NG15s began a new life at Port Elizabeth. Here they were put into service during 1961, rapidly becoming favourites on the line. The crews affectionately knew them as Kalaharis, although this was a misnomer. In Namibia the locomotives had worked many hundreds of miles away from the Kalahari desert, which lay to the south and east of the country.

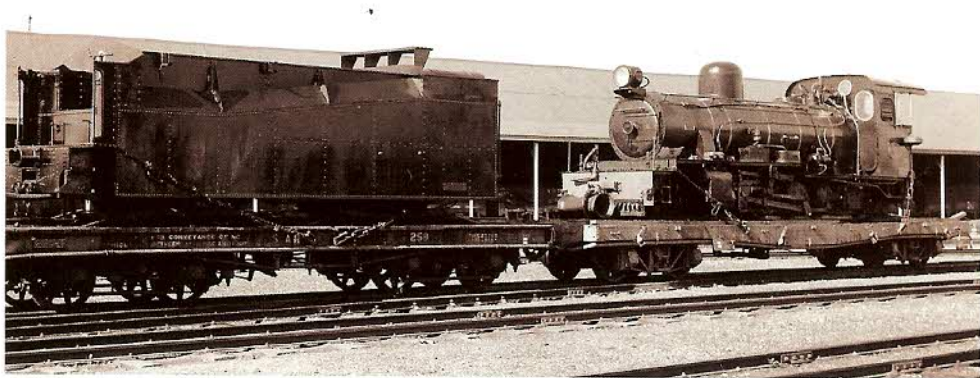
Above: The first NG15, no 17 (1931), stands in immaculate condition at Usakos in the early 1930s. The Pyle International electric headlight is powered by a steam turbo generator mounted in front of the chimney. Note the bell buffer and coupling chains used on the Otavi Railway. Photo: Leith Paxton Collection

Below: At Port Elizabeth the NG15s were transferred to and from workshops on flat cars with narrow gauge rail attached to the deck. Here no 119 is mounted on a pair of ancient Cape gauge flat cars. Only the chimney had to be detached to keep within the SAR structure gauge. Photo: Leith Paxton

Footplate crews liked the spacious cabs of the NG15s, which gave more comfortable working conditions than the cramped accommodation on the Garratts. Management appreciated the simplicity and reliability of their rigid frame construction which gave lower maintenance costs than the articulated engines. For the next 12 years the NG15s dominated services over the 100 miles of the main line from Port Elizabeth to Assegaibos with its deciduous fruit traffic, and also the 17-mile branch to Patensie with its citrus fruit.

The Garratts powered services on the 77 miles from Assegaibos to Avontuur. They also hauled the heavy limestone trains whose journey began with the ascent of the notorious 12-mile long 1 in 40 Loerie bank. Even here, however, the NG15s won a role, working interchangeably with the Garratts and managing a train load only 10-20 per cent less than the latter.

The heyday of the NG15s only came to an end with the delivery of 20 600hp diesel-electric locomotives in 1973 from General Electric of the USA. The diesels took over the haulage of the limestone trains immediately. The Garratts were retired (Class NG/G13) or moved to the Natal lines (Class NG/G16). However, the Class 91 diesels required heavier track to support their 11 tons axle load. This gave an extended lease of life to the NG15s as »





the replacement of 48lb/yard rail with new 60lb rail took many years to complete. Until 1984, therefore, the NG15s continued to haul the relaying trains, the fruit trains and other freight. They also powered the Patensie Branch with its mixed trains and citrus fruit.

The writing on the wall for the NG15s at Port Elizabeth came with the cessation of workshop overhauls at nearby Uitenhage in 1985. Local repairs continued under difficult conditions at the running shed but daily steam ceased in July 1990. A few locomotives were kept serviceable for the Apple Express which continued to run until as recently as 29th December 2010.

In 1990 two NG15s were

transferred to the Alfred County Railway in Natal (nos 119 and 146). No 146 was put into service and soon proved its worth on the timber trains where it proved capable of hauling just one fewer loaded timber cars (25 tons gross) than the NG/G16s. Indeed the line's CME, Phil Girdlestone, was sufficiently impressed with their work to regret that the opportunity had not arisen to update No 146 with producer gas combustion. At Perth, Australia, the manager of the Bennett Brook line, Ross Parker, had the highest regard for the work of nos 118 and 123 on his railway. In fact, wherever they have worked, the NG15s have been known for their eager power and their remarkable turn of speed.

In North Wales

The FR/WHR's locomotive policy has been to favour the NG/G16s as front-line motive power. The Garratts have proved highly reliable in traffic and the engineers now have 14 years of experience of their running and maintenance. They were built to be equally happy running chimney or bunker first and this suits operation of the railway as at present there are no locomotive turning facilities. For the NG15s, half of their work in North Wales will require tender first running. In Southern Africa, where journey distances were far greater, a triangle or turntable was provided at the locations where a journey ended. That being said, in North Wales, the Ffestiniog's England engines ('Prince' and 'Palmerston') and Hunsletts ('Linda' and 'Blanche') have given many years of safe, productive service running equal distances chimney and tender first.

Looking into the immediate future, no 134 has been selected as the first NG15 to be readied for service. This is on the basis of its superior condition and there is now a formally-agreed framework between the Society and the Company for its overhaul. The project team holds regular (weekly) working parties at Dinas. Fund raising has so far achieved 80 per cent of the total required.

Design for the line

Engineering work is addressing both the locomotive chassis and the tender. The original tender design had been appropriate for conditions in Southern Africa, but to suit the North Wales weather it has been redesigned as a tender cab. For operational simplicity the capacity for coal and water has been matched to that of the NG/G16s. The new body has been completed at Caernarfon's Brunswick Ironworks and mounted temporarily on the tender chassis of sister engine no 133. Only the vacuum reservoirs and battery holders are required to complete it.

Meanwhile the chassis of the

Above: In 1965 the Port Elizabeth Historical Society commissioned an excursion train. It proved very popular and the Apple Express, as it became known, was given an elaborate brass headboard. NG15s were the preferred motive power and two were named and decorated with smoke deflectors. Photo: David Payling Collection

Below: During the 1960s NG15s often substituted for Garratts on the heavy limestone trains from Loerie to Chelsea Junction. In December 1962 two NG15s leave Loerie with 12 cars of stone to challenge the 12 miles at 1 in 40 of Loerie bank. Photo: Charlie Lewis



locomotive has been taken in hand. Beneath the firebox the frames and stretchers had been extensively corroded by exposure to hot ash over the 35 years of the locomotive's service life in Southern Africa. The stretcher has been repaired and re-fitted and wastage of the frames made good.

Also at the rear, the severely corroded dragbox is in the early stages of removal and replacement. The wheelsets have been turned to the WHR profile at Boston Lodge and the cylinders re-bored. The refurbished cylinder covers have been re-attached on new studs. This work required the re-alignment of one of the cylinder liners, this having proved to have been fitted out of alignment originally. The brake and suspension components for both engine and tender are being refurbished at Boston Lodge and new locomotive springs are about to be ordered. With the driving wheel axleboxes planned to be machined and fitted shortly, it is expected that no 134 will have a rolling chassis by the end of this year.

The boiler will be the final item to be overhauled. Happily it is one of the newest NG15 boilers, having been built for one of the last batch of Henschel engines (no 144, 1957). Examination has shown it to be basically sound with little platework requiring replacement.

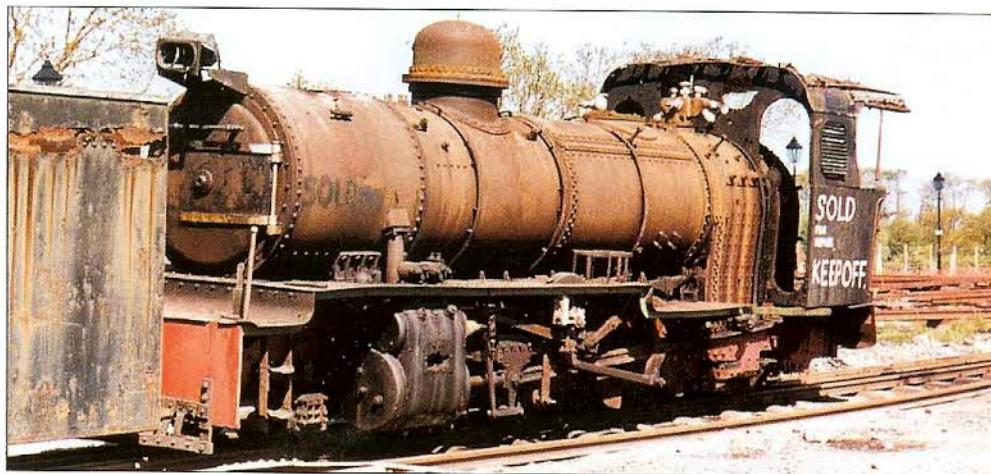
The target for no 134's return to steam is 2015. There is the exciting prospect of testing its abilities on the ferocious gradients above Beddgelert. There will also be the chance for no 134 to show its mettle along the long, straight stretches of railway across the Glaslyn flood plain. **NGW**

More Information

■ The 134 group seeks help, both physical and financial, the priority being to complete the funding to allow the boiler to be restored. Full details of the locomotive and its history can be found on the WHR's 134 Group website at: <http://www.ng15-134.co.uk/>

There is information on how to donate to the restoration and also how to become a Group member and possibly to join the restoration work in progress at Dinas. All will be made warmly welcome.

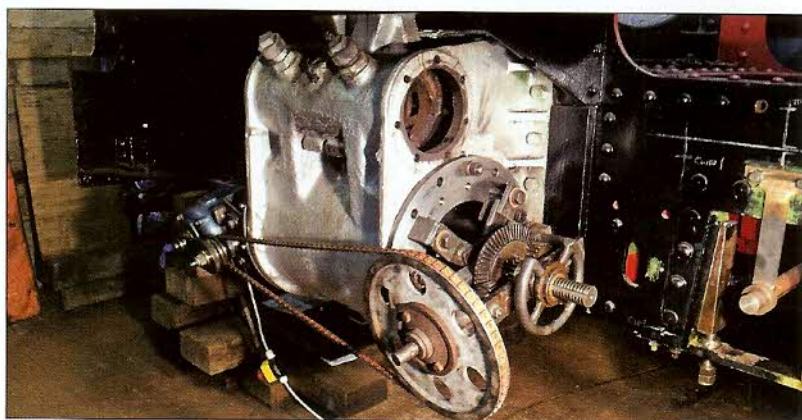
This feature accompanies the publication of David Payling's new book *Garratts & Kalaharis of the Welsh Highland Railway*, reviewed in this issue's On The Shelf pages. For those looking for more on the articulated Garratt locos, **NGW** Features Editor David Joy's book *Engines that Bend* is now available, details on page 2 – Ed.



Above: NG15 no 134 following arrival at Dinas. While looking poor, the loco was basically complete and its boiler was in good condition. Photo: WHR Society Collection



Right upper: By November 2009 the frames had been de-scaled, cleaned and painted. Photo: Laurence Armstrong



Right: In April 2012 the Boston Lodge cylinder boring rig was used to refurbish the cylinder liners.

Below: Mounted temporarily on no 133's underframe, the new tender body was on show at Porthmadog in summer 2012. Both photos: Andie Shaw

