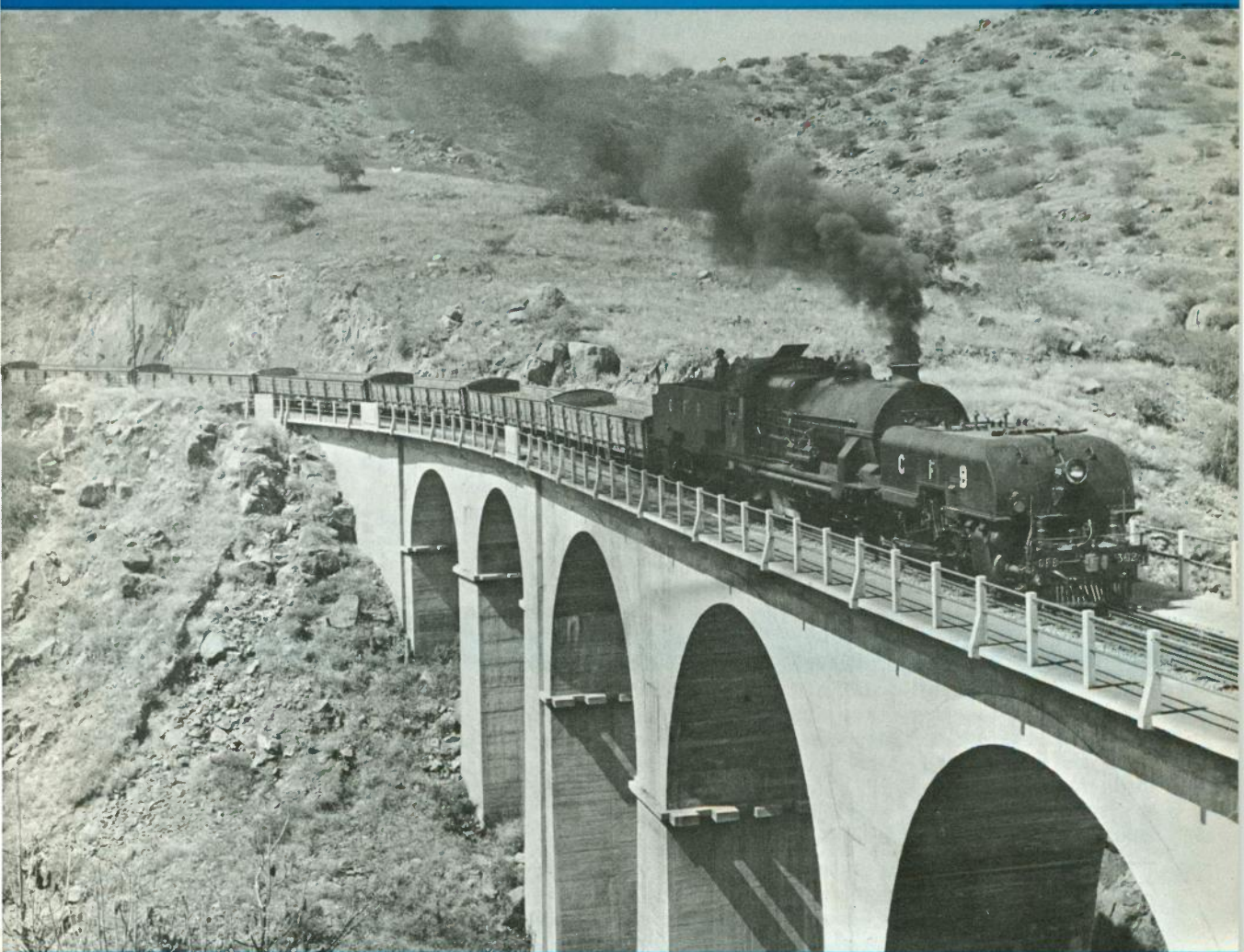
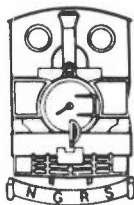


THE NARROW GAUGE

No. 78



NARROW GAUGE RAILWAY SOCIETY



NARROW GAUGE RAILWAY SOCIETY

Serving the narrow gauge world since 1951

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The Society was founded in 1951 to encourage interest in all forms of narrow gauge rail transport. Members interests cover every aspect of the construction, operation, history and modelling of narrow gauge railways throughout the world. Society members receive this magazine and *Narrow Gauge News*, a bi-monthly review of current events on the narrow gauge scene. An extensive library, locomotive records, and modelling information service are available to members. Meetings and visits are arranged by local areas based in Leeds, Leicester, London, Preston and Stoke-on-Trent. Annual subscription £4.00 due 1st April

THE NARROW GAUGE

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Published quarterly by the Narrow Gauge Railway Society to record the history and development of narrow gauge rail transport. Our intention is to present a balanced, well illustrated publication, and the Editor welcomes original articles, photographs and drawings for consideration. Articles should preferably be written or typed with double spacing on one side of the paper only. The Editor appreciates a stamped addressed envelope if a reply is required.

A range of back numbers, and binders for eight issues are available from the address above.

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Printed by Hadfield Print Services Ltd., Mount Pleasant Street, Ashton-under-Lyne. Lancs.

EDITORIAL

No. 78 WINTER 1978

About now, members will be planning their summer trips so as a change from lamenting all that has gone let us consider what is left. For those with sufficient time and money there is still plenty of scope. India and Indonesia are the prime attractions, followed by Taiwan, the Philippines and Brazil. Nearer home, East Germany offers plenty to see, Portugal and Austria can be recommended (try riding the daily mixed up the Tua valley, or Austria's little Klaus-Garsten line), while if Spain is a shadow of 20 years ago, Ponferrada-Villablino remains 100% steam, some very vintage stuff survives on the northern industrial lines and the other surviving narrow gauge lines have their own appeal. Increasing dieselisation, standardisation on modern steam power and a hardening of attitudes by the authorities, particularly in the sugar industry, make Poland less attractive than formerly, but Roumania's common carrier and forestry lines would seem worthy of investigation. Again, many Western European countries have interesting preserved railways, and Switzerland offers plenty to electric railway enthusiasts.

Back in Britain, we have our own preserved lines, (and why not put something back into the hobby by lending a hand on one of them ?), there are still some interesting industrial lines for those who care to look, while for those who like exploring abandoned lines, there is plenty of scope. Many are in beautiful countryside such as those that served Snowdonia's slate, Cornwall's mines, or the South Wales tramroads. For a day out, the lines that served the Midlands ironstone fields, Pennine reservoirs, Kent cement works or Purbeck ball clay are amongst the many possibilities.

Cover photo: Caminho de Ferro de Benguela oil-burning Beyer Garratt 362 drifts down to the coast with an ore train. It is shown crossing the Commander Alvaro Machado Bridge over the Lengue Gorge, on the section of line built in 1948.
(collection G.S. Moore)

AFTER STEAM ON THE SIERRA

K. Taylorson

For most enthusiasts, reading Peter Allen and Robert Wheeler's classic work *Steam on the Sierra* (Cleaver-Hume Press, 1960), about the minor railways of Spain & Portugal, is guaranteed to bring on a severe attack of the "Fifteen Years Earlier" syndrome endemic among those who began exploring Continental railways too late. A more positive reaction, however, is to remind oneself that, unlike many countries where minor railways have been swept completely into oblivion, Spain does still retain a number of nominally independent lines, mostly narrow gauge, and nearly all now operated by Ferrocarriles de Via Estrecha (FEVE). These lines, while no longer steam operated, do nevertheless have the atmosphere of individually run systems operated to meet local requirements, an increasingly rare phenomenon in the rationalised Western Europe of the late 1970's. This article is a brief survey of some of the surviving, and recently defunct, narrow gauge common carrier railways in eastern Spain, as seen in 1977.

A visit to the FC Escatron—Andorra in February allowed brief inspection of the two railways in the Barcelona area, the first being the metre gauge Catalan Railways, which run passenger trains from their own station in Barcelona over the 32km to Martorell. Services are operated by multiple units and are well patronised by Barcelona-bound commuters, though the terminus at Martorell Central has been reduced to a mere siding and platform, graced by only a flagman's hut. However in the jumble of decaying workshop buildings behind the station we found a shed containing two former Catalan steam locos; a 2-6-0 + 0-6-2 Garratt and 209, a 2-6-2 side tank built by Soc. Anonyme Energie, Charleroi as late as 1948. These are preserved by Barcelona Railway Society. At the rear of the complex were six identical 0-6-0 side tanks by La Maquinista Terrestre y Marítima, Barcelona, in a sad state of decay, probably not having turned a wheel for over fifteen years.

Moving on westwards we called in at the site of the FC Reus—Salou, officially closed only ten months before our visit although having suffered 'suspension of service' since April 1975. This line was dieselised about 1958 but kept the remaining steam locomotives to handle summer excursion traffic beyond the capacity of the railcars. We found the surviving 0-6-2 side tank built by Brush Electrical Engineering Co. Ltd. (number 281) Loughborough in 1899, dumped in the goods shed, now inhabited by gypsies. It was amusing to see that the new residents were also using a section of track for the transport of 'general merchandise' in a horse drawn wagon! Two thoroughly vandalised Billard railcars were found in the carriage shed along with a small petrol driven inspection trolley and an antique third class four wheel coach with transverse seating. The station sites at Reus and Salou have now been cleared but anyone passing through the area will find it interesting to follow the course of the line, which was more in the class of roadside tramway than railway. As a bonus, two of the Falcon Engine & Car Works 0-4-0 side tanks dating from 1886 and 1888 are 'stuffed and mounted' in the vicinity.

In July I turned my attention to a more thriving group of minor railways, with a short visit to Mallorca and the Costa Blanca. Of all the Mediterranean islands Mallorca has most of railway interest, with three separate systems dissimilar in all but gauge. This surprisingly enough, is 3ft, reflecting the strong British influence in railway construction on the island. The most important is the one-time Mallorca Railways system, now a part of the state-owned FEVE combine. The surviving system comprises a Y-shaped network with Palma at the base, with a branch to La Puebla splitting off to the north east and the main line to Manacor and Arta forming the south east arm. It was with great disappointment however that I found that services on the main line beyond the junction (Empalme) had been 'suspended' a matter of weeks before my visit, following fire damage to a number of railcars. This was a flimsy apology as evidenced by the large number of railcars standing idle at Palma in addition to the two or three required for the residual service to Inca and La Puebla. However, transparent excuses of this type are not unique to Britain and FEVE have used 'suspension of service' as a successful precursor to closure on other occasions, so the future of the scenic line to Arta therefore looks very bleak.

Making the best of the situation, I joined the 09.00 train, one of four services a day to La Puebla, at the imposing FEVE station on the Plaza de Espana, Palma. This consisted of a standard blue-liveried FEVE railcar, built by Eskalduna of Bilbao in 1958, with a matching trailer. Both were filled to capacity as we pulled away dead on time to the sound of three rings on the station bell, a starting signal peculiar to stations on this line. We passed two semi-derelict steam locomotive sheds on the left, and a large dump of rotting coaches on the right, though all the steam locomotives were cut up during the early 1960's. The line soon leaves the suburbs of Palma behind and snakes through a largely depopulated agricultural landscape with the mountains of the island's central range looming ever larger on the left. Business was brisk at the six stations before Inca, where however



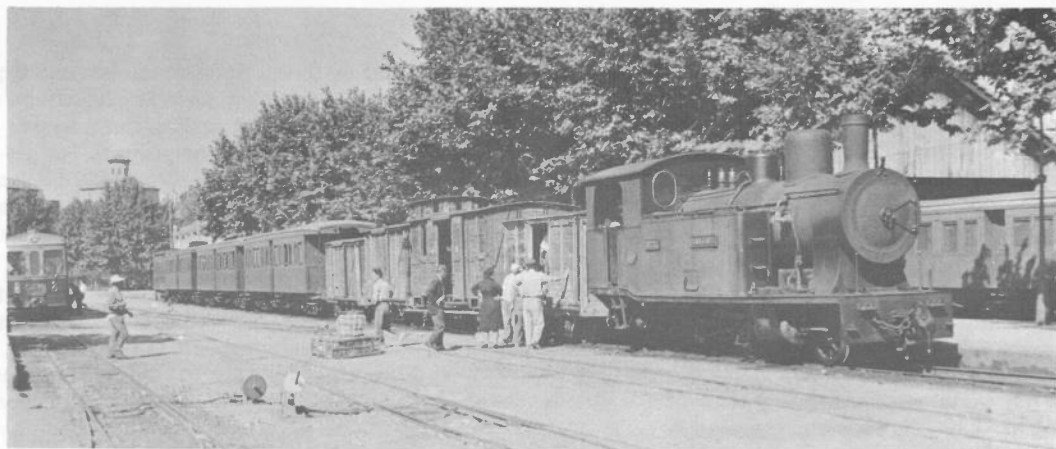
Ferrocarriles Catalanes: Three of the derelict 0-6-0 tanks at Martorell. The leading engine is lettered OG, being originally allocated to the Olván—Guardiola section. All were built by La Maquinista Terrestre y Marítima, Barcelona to a Krauss design between 1904 and 1911.

(K. Taylorson)

most passengers left and we dropped our trailer. Only a handful of passengers travelled through to La Puebla, a modest terminus, devoid of goods facilities in common with other stations seen—the railway is now effectively passenger only. The railcar was turned round in just over a minute and I rejoined without a ticket, but the conductor guard issued one without demur and politely refrained from commenting on my brief sojourn at La Puebla. I stayed on as far as Inca, enjoying a non-stop run as far as Empalme as no intermediate passengers presented themselves, and the driver whipped the car up to a good 70kph, in truth rather more than the track is good for.

Inca is now the most important town on the railway and boasts a shuttle service of fourteen daily trains to and from Palma, all of which seem well patronised. Nevertheless if the main line is permanently closed, the La Puebla line is certain to follow and it will seem difficult to justify retention of the railway infrastructure just to serve Inca, because the railcars do not carry more people than a modern bus and Inca is served by good roads. After a one hour stopover at Inca I returned to Palma and spent some time photographing movements around the station and exploring the old roundhouses, one of which contained two 1930-vintage Cia. Auxiliar de Ferrocarriles/De Dion railcars and some road-rail conversions of grotesque antiquity.

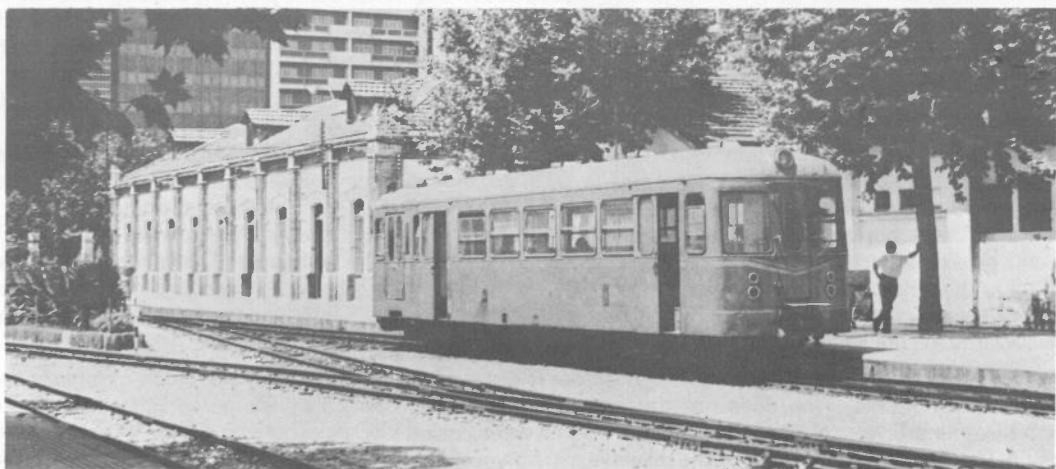
Having found a good hotel right outside the FEVE station I was well placed next day to explore the second of the island's railways, the overhead electric Ferrocarril de Sóller S.A. This line runs from its own unobtrusive station opposite the FEVE establishment for 25km to the resort of Sóller in the north west of the island. The railway exists more on excursion traffic than on pure transport although some parcel traffic is carried and, surprisingly, goods facilities are still in evidence. Six return services a day in peak months are worked by wooden bodied twin pantograph motor cars, built by Carde y Escoriaza in Zaragoza during 1928, with up to five trailers according to demand. This was high in July and a 10.15 relief was being run before the 10.30 'Tren Turístico' service. This latter is a device for exploiting summer customers, as the train is no different from other services except that it is stopped for ten minutes at a photo position 2 km short of Soller, and a fare of 150 pts, as opposed to the normal fare of 55 pts, is charged!



*Ferrocarriles de Mallorca: The station pilot at Palma, 21 SANTANY, removes a van from the rear of morning arrival from Arta in June 1960.
(M. Swift)*



*Ferrocarriles de Mallorca: Railcar 2001 and trailer form the 12.30 train to Palma at La Puebla in June 1960.
(M. Swift)*



*FEVE, Mallorca: Railcar 2002 forming the morning train to Inca awaits departure time at Palma in July 1977.
(K. Taylorson)*

Scorning such commercialism, I joined the 08.00 service well patronised by thrifty Spanish tourists and locals. For the first kilometre or so, the train runs tramway fashion down a central reservation, sounding its whistle and obeying traffic police on point duty! The line then leaves the town behind and strikes out towards the mountains, eventually threading through them by means of five short tunnels and one long tunnel. For the last few kilometres there are memorable views of a deep wooded valley to the right before the train begins its descent to near sea level at Sóller, reached about 55 minutes after leaving Palma. Sóller shed contained a green-liveried Ferrottrade bogie diesel, presumably for the freight service although it would seem difficult to keep such a large machine fully occupied.

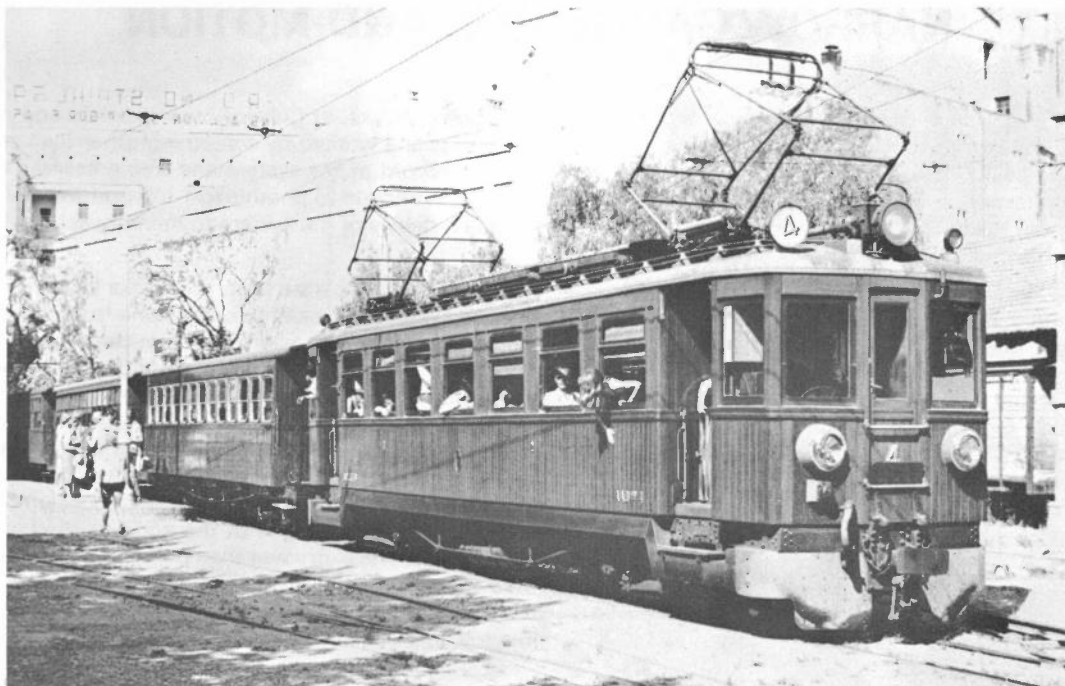
At Sóller there is a physical connection with the third island railway, the Tranvia a Puerto Sóller, connecting the town with the beaches two kilometres away at Puerto Sóller. The tramway operates a frequent service using single-pantograph motor cars hauling two gaudily painted trailers, and charges a modest ten pesetas for the twenty minute ride, which starts with a tortuous passage through the narrow streets of the old town and ends with a run along the length of the beach. Two trains are needed to maintain the peak half hourly service, crossing at a loop one kilometre from Puerto Sóller.

Saying goodbye with some reluctance to the island of Mallorca—which is, in truth, far different from its misrepresented ‘fish and chip’ image—I took the night boat to Alicante, a thirteen hour crossing costing less than Sealink’s Dover—Calais service, and with a cabin berth thrown in. Alicante is the starting point of the last railway in this survey, the former Strategic Railways of Alicante (ESA), which was one of a network of five autonomous railways serving this coast and its hinterland. Four of the railways, including the celebrated Alcoy—Gandia with its panting Beyer Peacock 2-6-2 tanks, have passed into history but the ESA lives on as a FEVE branch fighting hard to retain traffic. The railway has the advantage, not shared by its compatriots, of serving important coastal tourist developments, including the Costa Blanca package tour capital of Benidorm, and the railway runs a frequent service between there and Alicante as well as ten daily trains to Garganes or the terminus at Denia. Fares are kept low to combat road competition, the maximum fare for the 125km run being a mere 85 pts (then about 60p), remarkable value even by Spanish standards.

The railway runs from the Estación Marítimo, on the coast a kilometre east of the ferry terminal. The four track terminus has altered little since steam days, even the small roundhouse is still in use to house the ubiquitous FEVE railcars. There was, however, no trace of the three 2-6-0 tanks reported dumped here in 1974. I joined the 09.45 railcar to Denia, obtaining a front seat next to the driver with a fine forward view and even a small ‘camera window’. That FEVE ownership has not totally destroyed the happy-go-lucky light railway operating methods was shown when, five minutes past due departure time, a decision was taken to remove our railcar—although full of passengers—and replace it with an identical unit which had just worked in from Denia. This manoeuvre was accomplished with lingering devotion to detail and we set off fifteen minutes late.

The line traverses the coast as far as Cala Piteras, then begins simultaneously to climb and head inland to settle down about 200 metres from the sea and 60 metres above it for most of the journey, although the line does go higher in places. After La Merced the scenery becomes more desolate and the halts further apart, and often deserted. At Villajoyosa, a pleasant two road quarter-roundhouse still stands, complete with turntable, and here also, as at most of the stations, well used goods facilities are in evidence. At Benidorm were two of the Batignolles 0-6-0 diesels, painted a garish yellow to match the stock of the ‘Limon Express’, a tourist train which runs once a week at supplementary fares. This stock is stabled at Benidorm. The line continues to Altea, and there follows the most scenic section with the line clinging to a high ledge giving breathtaking views of waves lapping at the rocky coves far below. At Teulada we passed FEVE diesel 1203 on a short freight, and duly threaded our way into Dénia, past the abandoned ESA station, and after a reversal terminated in the old Carcagente—Dénia station 100 metres further on. The line to Carcagente, closed in 1974, carries straight on and is officially closed for reconstruction although no-one seriously expects this to happen. Dénia has little hint of its former glory as a meeting point of independent railways, and now broods on its changed fortunes while the FEVE railcars keep up their tenuous connection with the outside world. A half buried track meanders on from the station towards the dockside recalling an even more mysterious past.

These reflections aside, it will be seen that the minor railways of eastern Spain do have much of interest to the narrow gauge enthusiast who does not demand active steam. No two lines are alike, and all the systems described in this article can easily be covered in one week, using the many cheap flights now available to Barcelona, Palma or Alicante. None of the railways can however be guaranteed secure and to delay a visit would be to invite further casualties such as those which have occurred even in the last two years.



Ferrocarril de Sóller: The 10.30 "Tren Tourístico" at Palma in July 1977.

(K. Taylorson)



FEVE, Dénia: Railcar 2129 drowns in the mid-day heat in the former FC de Carcagente a Dénia station before returning to Alicante in July 1977.

(K. Taylorson)

NARROW GAUGE TIME-AND-MOTION

Rodney Weaver

In the early months of 1961 I was working at APCM's Mason's Works, at Claydon near Ipswich, and it was here that I first took serious notice of an industrial narrow gauge line worked by something other than steam. Looking back I realise that I could have made a very complete record of the system and also preserved a rare diesel locomotive, but in those days there was still main line steam traction to photograph and one was only just beginning to look further afield. But at least I did commit certain details of the system to memory as I was once detailed to make a time-and-motion study on part of it.

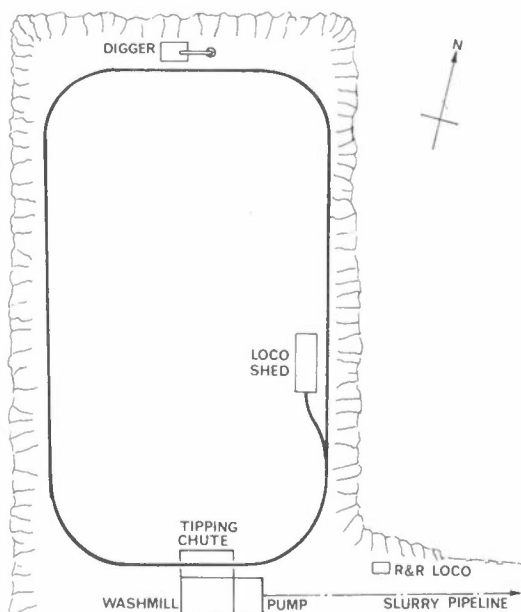
The narrow gauge system at Mason's works was in two parts quite separate from the works itself. The first part one came to was the limestone quarry, where a 2ft gauge system was used to carry stone from the quarry face to the crusher. Further on was the clay pit which boasted a completely circular 2ft system carrying clay from the quarry face (about 300 yards away if my memory is correct) to the washmill. I should perhaps digress here to explain that cement is made by firing a mixture of clay and limestone or chalk in a rotary kiln. The mixture is generally fed to the kiln in the form of a slurry which consists primarily of clay and water with the addition of a controlled amount of limestone or chalk to achieve the correct percentage of carbonates in the slurry. Mason's Works was fortunate in having both clay and chalk within half a mile of the works, and the method of supplying the main works was somewhat different from that at other establishments. The clay was milled to a slurry in the clay pit and then pumped to the chalk pit where it underwent further milling with the addition of chalk, the millers here being advised by the laboratory how much chalk to add. The slurry was then pumped up to the main works and stored in large slurry mixers. At the time I was there a new kiln had been commissioned and the increased demands for slurry had created a bottleneck at the clay pit, which was considered to be working excessive hours to keep pace with demand. I was therefore told to go down to the clay pit and find out what was wrong.

It was quite obvious that the fault lay in the slurry pumps, which were of insufficient capacity, but before one could recommend additional capacity it was necessary to prove that the rest of the system could keep pace with increased pumping. To do this I spent a whole day recording the working of the 2ft line to see how much time was wasted and if possible to establish its maximum capacity. The layout in the clay pit was extremely logical and would be ideal for a working model. The washmill was situated at one end of the pit and served by a line which ran right round the working face. Three trains were in use, running in an anticlockwise direction round this circuit, and the digger was at the opposite end of the oval. Five locomotives were based at the clay pit; two 30hp Rustons, two 20hp Orenstein & Koppels and a 40hp Ruston. I do not have a note of the numbers but they would almost certainly be those reported in NGN 45/4, viz:

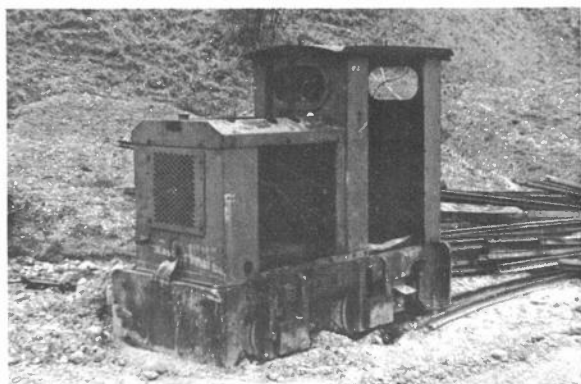
No 2	OK 7601	No 5	RH 183774/37	30hp	
No 3	OK 7592	No 11	RH 195850/39	40hp	ANN
No 4	RH 183773/37			30hp	

One locomotive of each type was in use at the time of my survey, so it was possible to note the maximum loads that could be handled by each class, though of course the main interest was how much the 40hp machine could take. My method was quite simple. Sitting outside the washmill, just beyond the tipping bay, I could see the whole system and could therefore note down the time, to the nearest five seconds, at which trains arrived at or left any point on the system. For the first hour or so there were no delays, trains running straight on to the tippler and straight up alongside the digger; this period therefore gave me a useful indication of the minimum running times. As the day wore on, however, things slowed down. As the washmill filled up it became necessary to reduce the input of clay and water to the rate at which the pumps were removing slurry and this meant that trains were being kept longer over the tippler and even waiting while the previous train was emptied. Eventually there were two loaded trains waiting for the third to clear the tippler! At the other end of the quarry trains were being loaded as soon as they arrived and at no time was there a holdup here.

Lunchtime provided an opportunity to explore the locality and I had a look inside the locomotive shed, where the second Orenstein & Koppel was stripped down. This had just been the subject of one of those happenings that could only occur on a light railway. A few days previously it had been in service and the driver had reported that it was rather rougher than usual and didn't seem to be as powerful as it ought to be. Nevertheless, it was still running, so he finished his shift without changing locomotives. The next morning a fitter arrived, started the engine and diagnosed a sticking exhaust valve. He took the cylinder head off to attend to the offending valve and then noticed that both pistons were on top dead centre! Further examination showed that a connecting rod



A.P.C.M. MASON'S WORKS, IPSWICH
2ft gauge claypit railway system



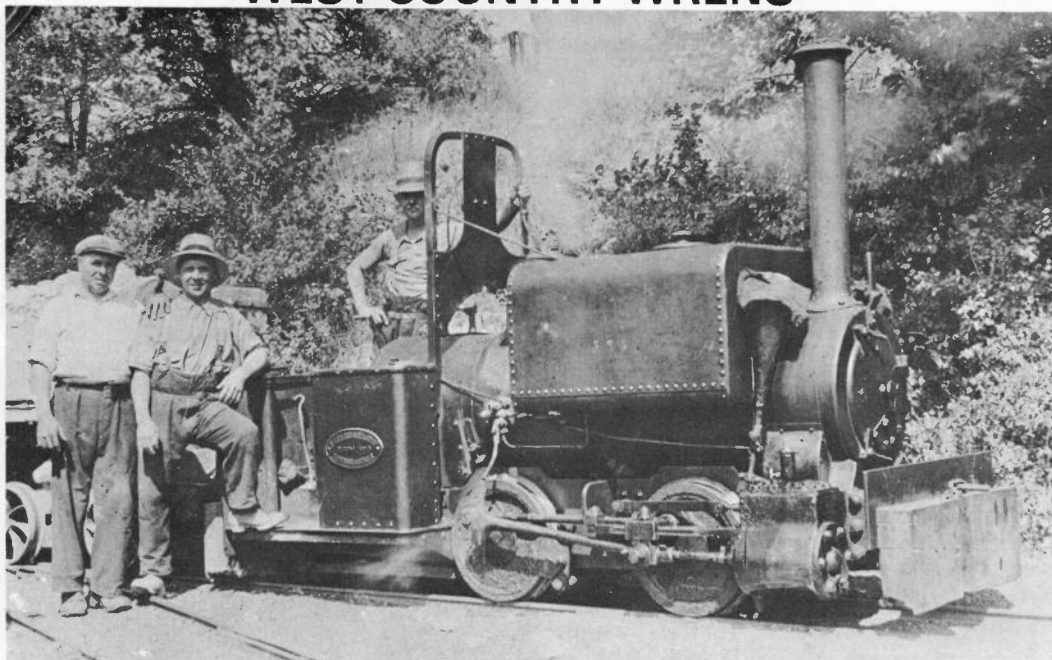
By March 1967 the clay pit and chalk pit railway systems had closed and the locomotives were awaiting disposal. Ruston No. 11 ANN is shown dumped in the upper photograph, while in the lower, No. 2, one of the rare two cylinder class MD2 Orenstein & Koppel diesels lies off the track near the tipping chute. (both Andrew Neale)

had broken just above the big end and the rest of the rod, together with the piston, had stuck at the top of the cylinder. How long the engine had run in this condition was a matter of conjecture but the driver had complained about it before lunch It said much for the construction of the engine that it had survived such treatment without apparent harm.

I then discovered a sixth locomotive, sitting forlornly off the track beside the access road to the quarry. This was quite obviously of local interest as it carried the name "Ransomes & Rapier" on the radiator and I noted that it was fitted with a 20hp Ailsa Craig engine, which struck me as odd for I had always thought of Ailsa Craig as manufacturers of marine patrol engines. At the time I thought it was a pity to see a perfectly good locomotive going to waste and now regret that I did not yield to the temptation of asking how much they wanted for it. I have never established the identity of this rare locomotive.

At the end of the day I had several sheets of paper covered with figures, which occupied my time for most of the next day as I totalled up the lost time due to insufficient pumping capacity. It had taken about 9½ hours to mill the clay dug out on that particular day, whereas the railway had been idle for about 2¼ hours during this period. Replacing the smaller locomotives by 40hp Rustons would reduce the running time still further and enable sufficient clay to be carried in the space of about 6¾ hours. Extra pumping capacity could therefore be justified as it would reduce the working day in the clay pit by around 25%. It was very satisfying to be able to report that the railway system was perfectly adequate. My report was well received but as far as I know nothing was ever done to improve matters. The clay pit system was eventually replaced by conveyor belts on 19th October 1966 (NGN 45/4) and apart from the two 30hp Rustons (purchased by Alan Bloom and moved to Bressingham) all has been scrapped. My own connection with Mason's Works was severed a week or so later when I was posted to Lower Penarth — another narrow gauge stronghold in those days — and I had the satisfaction of leaving Ipswich for the last time on one of the last steam-hauled Norwich expresses, with which "JOHN OF GAUNT" reached 93mph at Brentwood, there being a superabundance of bowler hats on the footplate.

WEST COUNTRY WRENS



A number of Kerr Stuart's diminutive "Wren" class were employed on industrial and contractor's railways in South Western England. The best known were the fleets at Devon County Council's Beacon Down and Wilminstone quarries and KS 4255 at Quartzite Quarries, Gloucestershire which lay derelict for so many years. Our pictures show two less well known ones—a delightful view of "old-type" Wren KS 3290 at John Board's Dunball Cement Works, Bridgewater in the early 1930's (Upper: collection F. Jones), and "new-type" Wren KS 4161 at Stoneycombe Quarries near Newton Abbot. (Lower: F. Jones)

THE BENGUELA RAILWAY

G.S. Moore



*The gateway to Central Africa—Lobito terminus one very wet afternoon. In the foreground stands the preserved Hunslet contractors locomotive GENERAL MACHADO, and a class 11 arrives on a lengthy train from the Zaire border.
(collection G.S. Moore)*

The discovery of diamonds at Kimberley and gold in the Transvaal drew railways from the coast of the Cape Province towards these areas. But later coal, copper and other base metals were discovered in the Katanga (now Zaire) and Northern Rhodesia (Zambia) which plotted the course of railways even further northwards. A remarkable Scottish mining engineer, Sir Robert Williams, a close friend of Cecil Rhodes, was deeply involved in these discoveries and instrumental in founding the Union Minière du Haut Katanga to develop these finds.

The lines of communication from Central Africa to the ports already established on the south and east coasts meant a long sea voyage for minerals destined for Europe and America. Hence the project came into being for a shorter route from these central areas to the west coast, which Williams considered vital for the successful development of their vast mineral wealth. This may be said to be the origin of the Benguela Railway.

Lobito Bay, a few miles north of Benguela on the coast of Angola, was a superb natural harbour, but almost devoid of inhabitants at the turn of the century. In 1902 the Portuguese Government granted a 99 year concession to Sir Robert Williams to construct and operate a railway from Lobito to the border between Angola and Katanga, a distance of 838 miles through almost undeveloped country. A Portuguese company, Companhia do Caminho de Ferro de Benguela was formed, but most of the capital was subscribed by Tanganyika Concessions Ltd. The railway therefore became a joint Anglo-Portuguese operation, administered from a head office in Lisbon, but also having a London office.

By the terms of the concession construction was to begin on 1st March 1903. A private contract was made with George Pauling & Co., the famous railway contractor, and a small quantity of permanent way and materials was shipped to Benguela, because Lobito was not in use as a port. Work started on the first section to Catumbela (7 ½ miles), but owing to financial difficulties the contractor ceased work in August 1903.

In 1904 Griffiths & Co. (Contractors) Ltd. took over the contract, and continued building the line as far as Cubal, 123 miles from Lobito, reached in 1908. This section was one of the most difficult on the entire route, and included four kilometres of rack rail to overcome a 6% gradient. The contractor used a number of locomotives during the work, DOM CARLOS, a tiny Hunslet four coupled saddle tank, NORTON GRIFFITHS, a slightly larger four coupled saddle tank from Hudswell Clarke, and three six coupled side tanks also by Hunslet, named DOM CARLOS I, MACHADO and ROBERT WILLIAMS. DOM CARLOS I achieved fame even before it left England when the Hunslet Engine Co. delivered it to Liverpool for shipment only 21 days after the order was received! These locomotives passed to the railway, receiving running numbers 01, 2A, 1, 2 and 3 respectively. 01 is now preserved on a pedestal at Lobito station, and carries the name GENERAL MACHADO.

Construction of the line eastwards from Cubal was undertaken by Pauling & Co., who started work in January 1910. At the outbreak of war in 1914 the track had reached Chinguar, 340 miles from Lobito, which was destined to be the eastern terminus for the next ten years.

Apart from the contractors locomotives, the line was first worked by five former Cape Government Railway 6 class 4-6-0 tender locomotives dating from 1897/98, and four 7 class 4-8-0 tender locomotives built by the Avonside Engine Co. in 1907. The rack section was the preserve of four 0-6-2 side tanks fitted for rack and adhesion working, and built by Maschinenfabrik Esslingen in 1906/07. Five additional class 6 locomotives were delivered by North British, and two 8 class 4-8-0's by Kitson, both in 1910. Sixteen class 9 4-8-0's followed from North British and Baldwin during 1915-23.

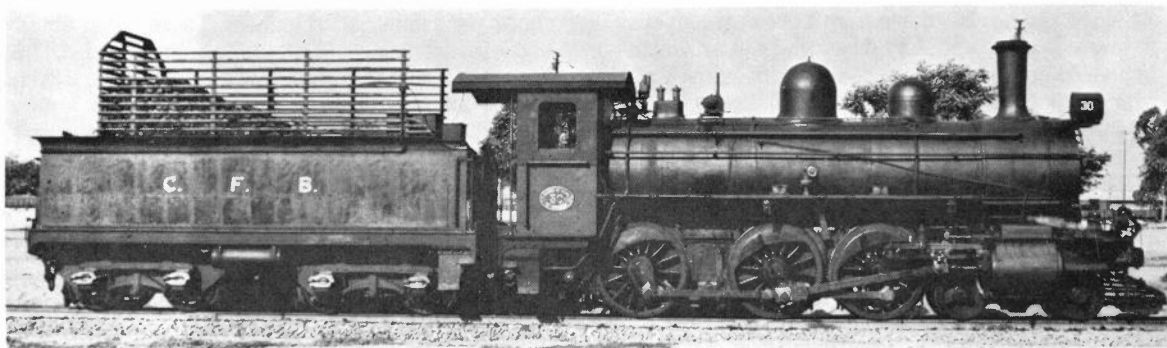
Sir Robert Williams was determined to finish the line to link up with the Chemin de Fer du Bas-Congo au Katanga (B.C.K.), and work went forward again in 1924. Owing to frontier changes effected by the Luso-Belgian Convention of 1927, a further section had to be constructed and the frontier, on the river Luau near Dilolo, was reached on the 28th August 1928. The formal opening ceremony was held on 10th June 1929, but Williams' dream of a through route from Katanga to the coast was not fully realised until the B.C.K. reached the frontier in 1931.

Completion of the Benguela Railway thus opened up a direct route to Central Africa, reducing the distance from the mines to Europe and America by over 2500 miles. It cost more than £12m. during the long years of construction, but has been the major lifeline of the copper belt ever since, at least until the recent political upheaval in Africa.

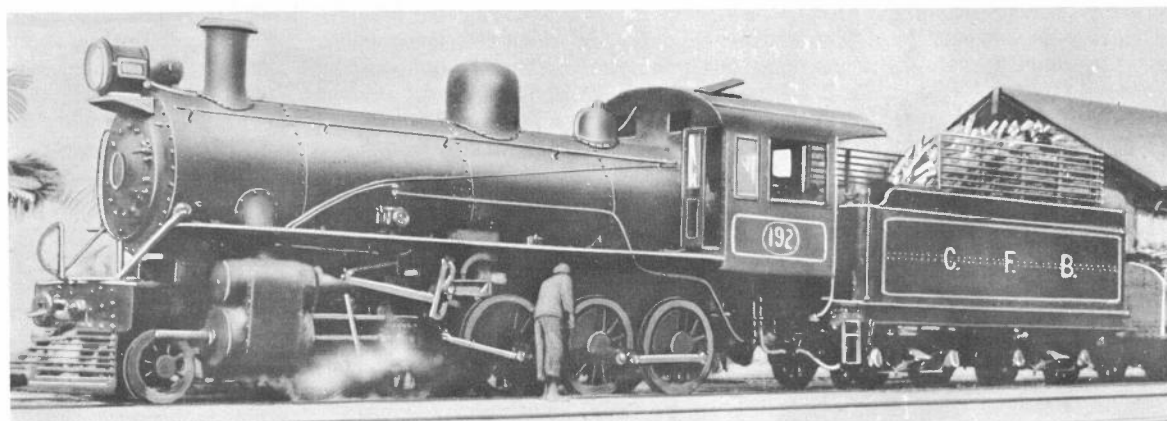
To handle the increased traffic and greater mileage, further locomotives were ordered as the line was extended. In 1926 Beyer Peacock supplied six 10A class 4-8-2 + 2-8-4 Garratt locomotives to work the difficult section from Benguela to Nova Lisboa. These were the first of the wheel arrangement which in later years became most popular—the "Mountain Garratt"—weighing nearly 170 tons, the largest built at that time to run on 60lb rail. They proved capable of hauling 450 ton trains on the steepest section, double the load taken by the 4-8-0 type used previously. The 10A class had Lentz poppet valves, actuated by Walschearts valve gear, a novel feature not repeated on the fourteen examples of class 10B delivered in 1930. For the more easily graded sections eighteen 9C class 4-8-0's were supplied by North British in 1929.

There is no coal in Angola, and to provide fuel for the locomotives timber proved to be the most economic alternative. The railway planted enormous areas with eucalyptus trees, which stretch for many miles along the length of the line. Their forest service cut wood fuel and stack it at the trackside, and plant new trees to replenish stocks. All the wood-burning locomotives are hand fired, and carry a rich aroma along the line. The sight of a wood-burning Garratt at night is a spectacle to be remembered.

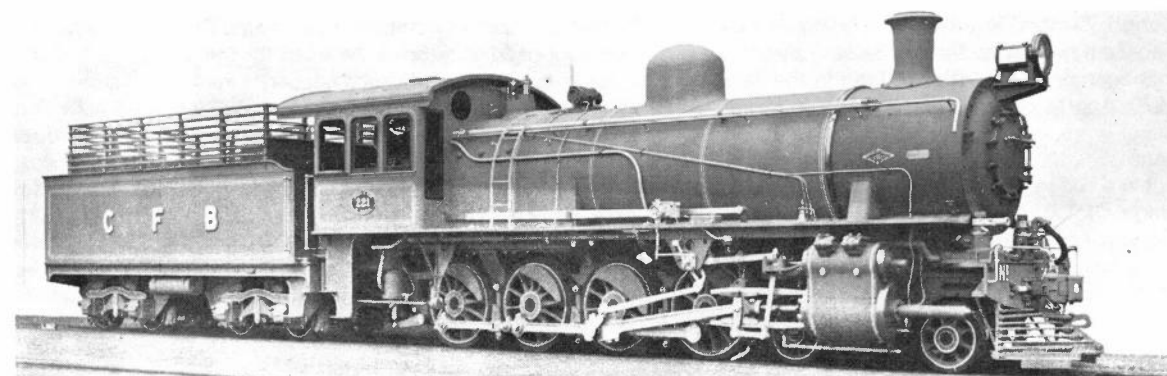
The Port of Lobito developed rapidly as a large and efficient interchange point between shipping and the railway. The harbour itself is protected by a sand spit three miles long, now developed as the residential area. Towards the landward end stand the railway offices and terminal station, and beyond are marshalling yards to serve traffic to and from the quays. The main line follows a fairly level route along the coast to Benguela, 21 miles to the south. Turning inland the line rises abruptly through barren, mountainous country to reach 3000 ft at Portela, only 37 miles from Benguela, then drops sharply to 1770 ft at Catengue, a further 16 miles. The rack section was on this stretch until 1948 when a new, longer route with only 2 ½ % grades was constructed. After Catengue there is a further climb to Cubal and the inland plateau beyond, the line reaching a summit of 6082 ft at Vila Verde, 240 miles from Lobito.



C.F.B. 30 is the last of five class 6 locomotives delivered new in 1910, but very similar to the much earlier examples obtained secondhand from the Cape Government Railways. The class was the most common passenger engine on railways in southern Africa in the years before the Great War.
(N.G.R.S. Library)



A very heavily retouched photograph of C.F.B. 192, one of a pair of 9B class locomotives delivered by Baldwin in 1920. The artist unfortunately omitted the centre coupling rods, but added lots of rivets to the chimney, dome and boiler bands.
(B.L.W. photograph. Collection H.L. Broadbelt)



C.F.B. 221 illustrates the final development of the 9C class 4-8-0, one of 18 built by North British in 1930. Note particularly the similarity to the Baldwin class 9B above.
(N.G.R.S. Library)

At Nova Lisboa, 265 miles from Lobito, the railway workshops were established in 1929. These cover about forty acres and are capable of carrying out all maintenance and repairs to locomotives, rolling stock and all the other equipment required to operate a busy railway. The railway has a hydro-electric power plant and a steam power plant to provide electricity for the works and town. Routine maintenance is also carried out at the locomotive depots at Lobito, Cubal and Luso. There are sub-depots at Benguela, Silva Porto, Munhango and Teixeira de Sousa.

From Nova Lisboa to the border the line undulates, falling gradually through Silva Porto and Luso to Teixeira de Sousa, eight miles from the junction with the B.C.K. (now Societe Nationale des Chemins de Fer Zairois). This line runs east through Kolwezi to Teke, then divides. The main route to the copper belt turns south through Likasi (Jadotville) and Lubumbashi (Elizabethville) to connect with the former Rhodesia Railways ten miles north of Ndola on the Zambian border. The other line runs north west through Bukama to Ilebo (Port Francqui) on the Kasai river. At Kamina, 226 miles from Tenke, is the junction with the former Chemins de Fer du Congo Superieur aux Grands Lacs Africains (now S.N.C.Z.) extending to Kalemie (Albertville) on the western shore of Lake Tanganyika.

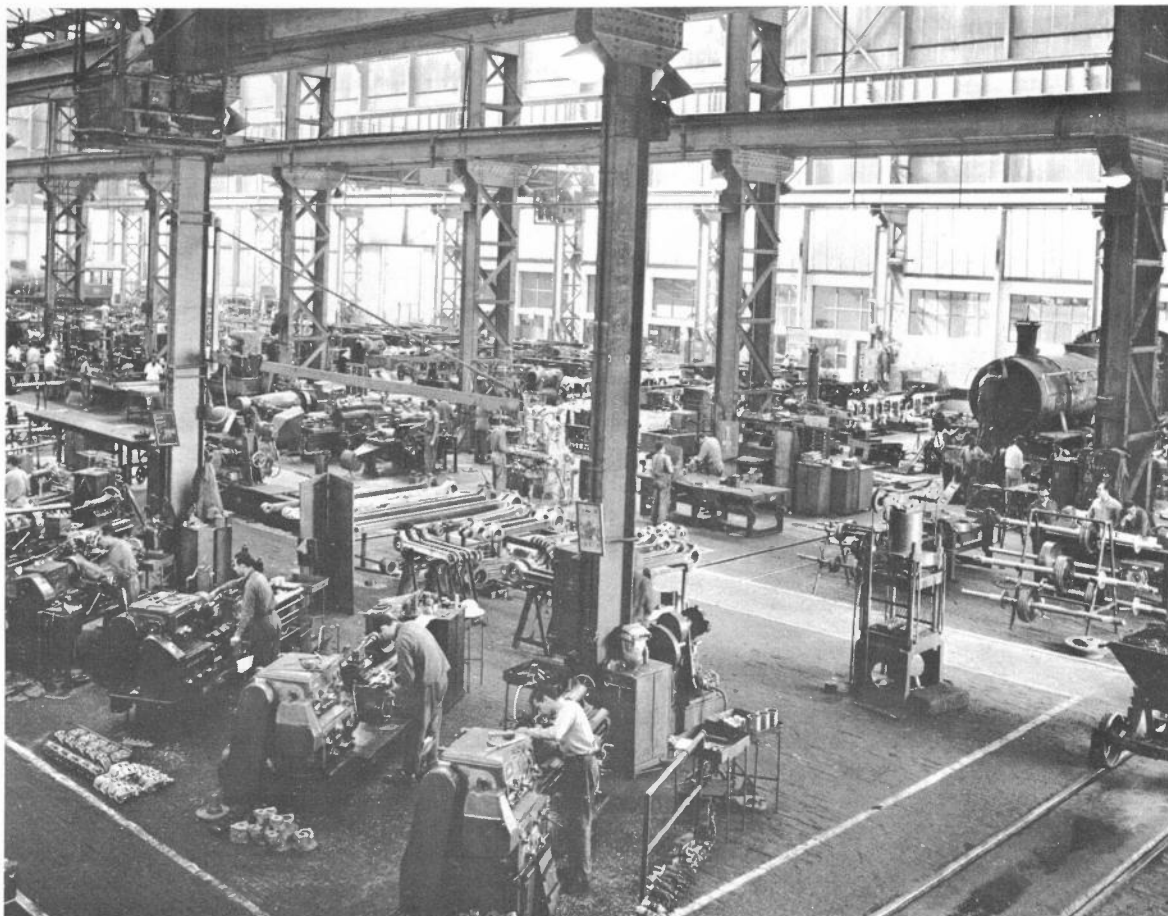
Like most African railways, the Benguela was constructed through totally undeveloped country to reach a destination hundreds of miles away, but its very existence encouraged growth along its route. The towns of Lobito and particularly Nova Lisboa would have been impossible without the railway. Agriculture, forestry and mining all grew up around the tracks, many of the basic necessities being provided directly by the railway. Even so it was twenty years before improvements were required to increase line capacity, the first being the deviation to replace the rack section. The Esslingen tank locos were modified by removal of the rack gear and motion, and transferred to shunting duties. In 1951 six 11 class 4-8-2's were delivered from North British, and were designed to haul passenger trains weighing 500 tons up 1 ½ % grades. Fifteen additional Garratts of class 10C followed in 1952-54, and a further ten of class 10D in 1956. The arrival of these new locomotives enabled some of the earlier machines to be retired, and the class 7 and 8 4-8-0's were sold to the Government owned Mossamedes Railway which was converted from 60cm gauge to 3ft 6in gauge during the early 1950's.

Four diesel shunters arrived from North British in 1961 for heavy shunting duties at Lobito, and although two similar locomotives were later delivered by Andrew Barclay there was no main line dieselisation. Nine 16th class 2-8-2 + 2-8-2 Garratts were purchased from Rhodesia Railways in 1964, and entered service as C.F.B. class 10E between 1964 and 1968.

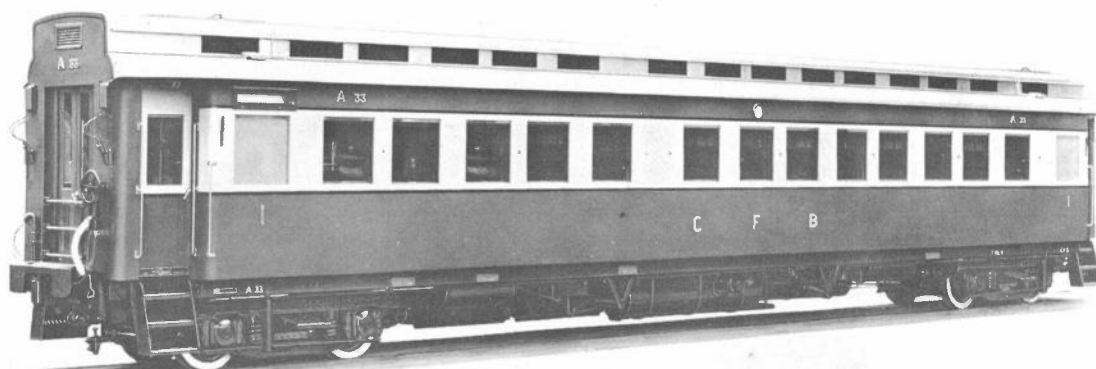
So, at the end of the 1960's the Benguela remained entirely steam worked, and one of the smartest, most efficient and most profitable railways in Africa. The level coastal section from Lobito to Benguela was the preserve of the older class 6 and class 9, aided by the larger class 11. Most of these burned imported coal. Oil burning Garratts worked the heavy grades eastwards from Benguela, but beyond Cubal all locomotives burned wood. Freight trains were made up almost entirely of 40 ton capacity bogie stock, fully fitted with vacuum brakes, and the twice weekly through passenger train provided opulent sleeping and dining accommodation in Birmingham-built carriages warm with varnished wood and polished brass.

The railway has not been entirely immune from the political upheavals in Central Africa, and problems in the Congo, Zambia, Rhodesia and finally Angola itself affected the normally smooth operations. Construction of the Tan-Zam railway to Dar-es-Salaam by the Chinese was supposed to remove the need for the Benguela but the management had sufficient faith in the value of their line to plan an ambitious deviation—the Cubal Variant—in 1970. Apart from a short branch from Robert Williams to the iron mines at Cuima built in 1962, this was the first major work since 1948. Construction started in late 1972 to lay a line 100 miles long leaving the existing route south of Lobito, and follow the Cavaco and Caimbambo rivers to Cubal. It reduced the distance by over 20 miles, cut the ruling gradient by half, and tripled the line capacity. Because of the arid nature of the country diesel electric locomotives were purchased to work this new section. The first ten 2000 h.p. Co-Co's arrived from General Electric, U.S.A. in 1973, followed by a further twelve in 1975. The variant, costing £17.5m. was completed and opened to traffic on 20th October 1974, enabling the former route from Benguela to Cubal to be abandoned. Steam traction was retained on the Lobito—Benguela branch, but the diesels were expected to take over main line traffic as far as Silva Porto, about 385 miles. Steam locomotives displaced were moved to the western end of the line to cope with increased traffic.

The activities of armed nationalist groups cut the railway on a few occasions during the 1960's, but by ceasing operations during the night, and protecting trains during the day serious disruption was prevented. Then, in January, 1975 the Portuguese Government signed an agreement with the three nationalist groups, MPLA, FLNA and Unita, to grant full independence on 11th November, 1975. The provisional coalition lasted only a few months before civil war broke out, and traffic on the railway ceased abruptly in August 1975. The bridge over the Kasai river at Dilolo was destroyed, cutting the route to Zaire.



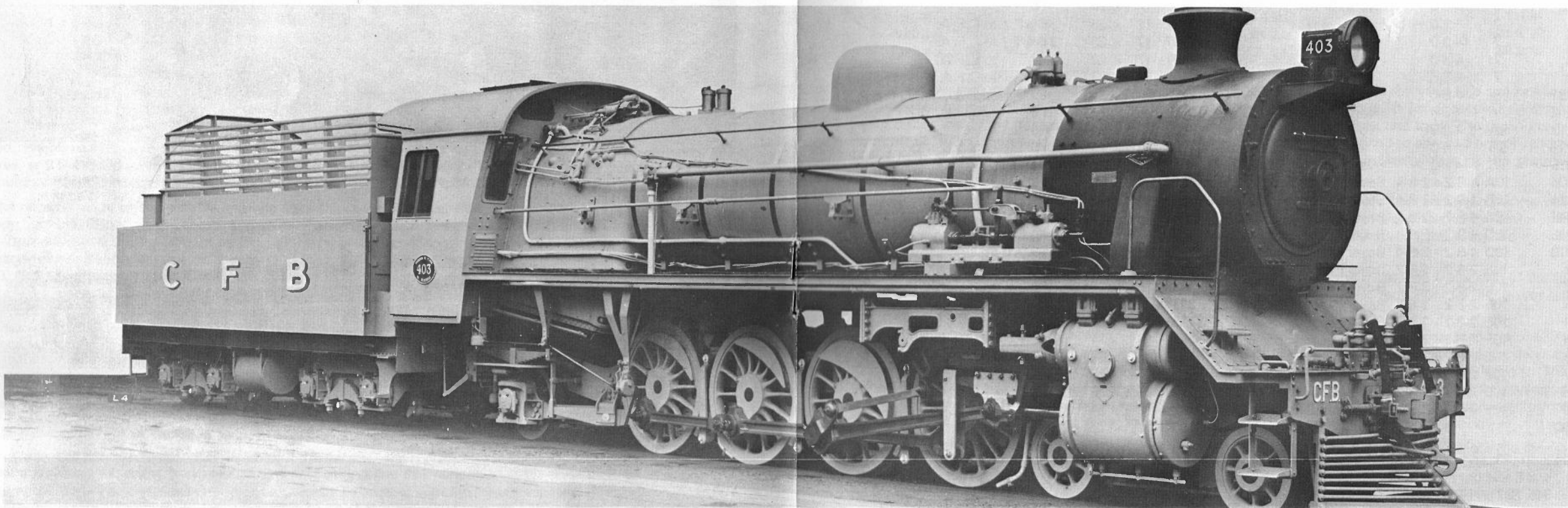
A busy scene in the locomotive repair shops at Nova Lisboa in December, 1962. The erecting bay contains a number of frames, and at the extreme right and left, two class 9 locomotives under repair.
(P. Waugh)



A magnificent first class carriage built for the Benguela Railway by Metropolitan-Cammell Carriage & Wagon Co. Ltd., Birmingham in 1953.
(Galitzine & Parts. Ltd.)



C.F.B. 320 is one of the second batch of wood-burning Beyer-Garratts supplied to the railway. These fourteen locomotives, designated class 10B, differed slightly from the first examples in having bar frames, piston valve cylinders and a small increase in heating surface. Their total weight exceeded 171 tons, but the maximum axle load was limited to 13.2 tons allowing operation on 60 lb rail. (collection R. Bridge)



C.F.B. 403 is an example of class II, comprising six 4-8-2 locomotives supplied by North British in 1951. This type is very similar to the well known class 19D of South African Railways, being a powerful mixed traffic design with a limited axle load. A large tender fitted with extended racks for wood fuel is used with this class, which were usually employed on passenger trains over the less steeply graded section. (collection G.S. Moore)

Since then reports from Angola have concentrated on the complicated political situation, and followers of the steam locomotive have sought inspiration elsewhere. The railway certainly suffered substantially from looting, war damage, and the exodus of most of the Portuguese. However, some services were restored in early 1976, and by August 1976 the Kasai river bridge was repaired. For some reason reopening was postponed at the last minute, and although encouraging reports of cooperation between Angola, Zaire and Zambia appear in the press from time to time, these have not been followed by a resumption of services. Recovery from the civil war will clearly take some time, and the Benguela Railway is one of the keys to that recovery.

The author wishes to acknowledge the assistance of H.L. Goldsmith, R.A. Wheeler, Beyer Peacock & Co. Ltd. and Galitzine & Partners Ltd. Since 1975 many Angolan towns have been renamed; for example Nova Lisboa is now termed Huambo. Because no comprehensive details are available, and most maps still show the former names these are used throughout this article.

Steam locomotives of the Benguela Railway

<i>C.F.B. No.</i>	<i>Class</i>	<i>Type</i>	<i>Builder</i>	<i>Works No.</i>	<i>Date</i>	<i>Cylinders</i>	<i>Dr. wheels</i>	<i>Remarks.</i>
01		0-4-0ST	Hunslet	847	1904	7" x 10"	1'8"	Preserved
2A		0-4-0ST	Hudswell Clarke	760	1906	9" x 15"	2'6"	
1, 2	4	0-6-0T	Hunslet	874-5	1905	14" x 18"	3'1"	
3	4	0-6-0T	Hunslet	900	1906	14" x 18"	3'1"	
11, 12	5	0-6-2T	Esslingen	3441-2	1907	17" x 19"	3'4"	
14, 15	5	0-6-2T	Esslingen	3351-2	1906	17" x 19"	3'4"	orig. 5, 6
21	6	4-6-0	Dubs	3446	1897	17" x 26"	4'6"	ex C.G.R. 185
22	6	4-6-0	Neilson	5144	1898	17" x 26"	4'6"	ex C.G.R. 223
23	6	4-6-0	Neilson	5274	1898	17" x 26"	4'6"	ex C.G.R. 588
24	6	4-6-0	Neilson	5139	1897	17" x 26"	4'6"	ex C.G.R. 218
25	6	4-6-0	Neilson	5324	1898	17" x 26"	4'6"	ex C.G.R. 600
26-30	6	4-6-0	North British	19348-52	1910	17" x 26"	4'6"	
121	7	4-8-0	Avonside	1534	1907	17" x 23"	3'6¾"	to C.F.A.
122	7	4-8-0	Avonside	1537	1907	17" x 23"	3'6¾"	to C.F.A.
123	7	4-8-0	Avonside	1524	1907	17" x 23"	3'6¾"	to C.F.A.
124	7	4-8-0	Avonside	1536	1908	17" x 23"	3'6¾"	to C.F.A.
131, 132	8	4-8-0	Kitson	4727-8	1910	20" x 24"	4'0"	orig. 30, 31. to C.F.A.
201, 202	9A	4-8-0	North British	20865-6	1915	20" x 24"	4'0"	orig. 190, 191
203-212	9A	4-8-0	North British	23057-66	1923	20" x 24"	4'0"	
215, 216	9B	4-8-0	Baldwin	54017-8	1920	20" x 24"	4'0"	orig. 192, 193
221-238	9C	4-8-0	North British	23978-95	1929	20" x 24"	4'0"	
301-306	10A	4-8-2 + 2-8-4	Beyer Peacock	6333-8	1926	18½" x 24"	4'0"	
311-324	10B	4-8-2 + 2-8-4	Beyer Peacock	6602-15	1930	18½" x 24"	4'0"	
331-342	10C	4-8-2 + 2-8-4	Beyer Peacock	7366-77	1952	18½" x 24"	4'0"	
343-348	10C	4-8-2 + 2-8-4	Beyer Peacock	7593-8	1954	18½" x 24"	4'0"	
361-370	10D	4-8-2 + 2-8-4	Beyer Peacock	7667-76	1956	18½" x 24"	4'0"	
381	10E	2-8-2 + 2-8-2	Beyer Peacock	6564	1929	18½" x 24"	4'0"	ex R.R. 602
382	10E	2-8-2 + 2-8-2	Beyer Peacock	6879	1938	18½" x 24"	4'0"	ex R.R. 610
383	10E	2-8-2 + 2-8-2	Beyer Peacock	6900	1938	18½" x 24"	4'0"	ex R.R. 615
384	10E	2-8-2 + 2-8-2	Beyer Peacock	6902	1938	18½" x 24"	4'0"	ex R.R. 617
385	10E	2-8-2 + 2-8-2	Beyer Peacock	6880	1938	18½" x 24"	4'0"	ex R.R. 611
386	10E	2-8-2 + 2-8-2	Beyer Peacock	6901	1938	18½" x 24"	4'0"	ex R.R. 616
387	10E	2-8-2 + 2-8-2	Beyer Peacock	6904	1938	18½" x 24"	4'0"	ex R.R. 619
388	10E	2-8-2 + 2-8-2	Beyer Peacock	6563	1929	18½" x 24"	4'0"	ex R.R. 601
389	10E	2-8-2 + 2-8-2	Beyer Peacock	6569	1929	18½" x 24"	4'0"	ex R.R. 607
401-406	11	4-8-2	North British	26959-64	1951	21" x 26"	4'6"	

Notes:

Numbers 2, 21, 23, and 29 were withdrawn from service and presumed to be dismantled.

Classes 7 and 8 sold out of service.

Numbers 345, 387 and 404 withdrawn following accident damage.

C.G.R. — Cape Government Railways

C.F.A. — Caminho de Ferro do Angola

R.R. — Rhodesia Railways

HUNSLET'S SMALLEST LOCOMOTIVE

T.F. Rushworth

In the late Victoria era, many of the British locomotive builders appear to have competed unofficially to construct the smallest possible locomotives for industrial use. The Hunslet Engine Company's contribution was only 5ft 10in long, weighed 2 tons 4 cwt empty and comprised engine No. 551/1891 FREYRE built for 2ft 2¼ in gauge, to the order of M. Cardenosa for Seville in southern Spain.

The drawings show the details of FREYRE and are based upon the general arrangement drawing dated 26th November 1891, kindly supplied by the Hunslet Engine Co. Ltd. Copies of the official works photo are no longer available and the photograph is an enlarged version of a very small one in the 1893 Hunslet catalogue.

A comparison of the general dimensions of Hunslet's 'baby' with those of its contemporaries WASP and FLY for the 1ft 6in gauge Horwich Works tramway of the Lancashire and Yorkshire Railway, show that FREYRE was the smaller in almost every respect.

	<i>HORWICH 1ft 6in</i>	<i>FREYRE</i>
Cylinders :	5in x 6in	4in x 6in
Boiler :	2ft 3in x 5ft 2in	1ft 10in x 4ft 7½ in
Heating Surface :	47.86 sq ft	30 sq ft
Grate Area :	1.78 sq ft	1.5 sq ft
Wheel diameter :	1ft 4¼ in	1ft 6in
Wheelbase :	2ft 9in	2ft 8in
Weight empty :	2tons 19cwt 2qr	2tons 4cwt
Weight in working order :	3tons 11cwt 2qr	2tons 16cwt
Length over buffer beams :	7ft 4¼ in	5ft 10in
Height :	7ft 4½ in	7ft 0in
Width :	3ft 0in	4ft 6½ in
Tank capacity :	76½ galls	80 galls

The engine was unsprung and the drive from the cylinders was direct on to the front axle in a similar manner to that used on most of the De Winton vertical boiler locomotives. The four 1ft 6in diameter cast steel wheels were placed inside the frames, and the axles were coupled by outside cranks and rods. The driving axle cranks comprised 1ft 3in diameter discs with slightly convex faces 3½ in wide, designed to accept a belt drive to a saw or other item of machinery, achieved by packing the loco up on blocks completely clear of the ground, or by removing the coupling rods and raising the front end off the rails.

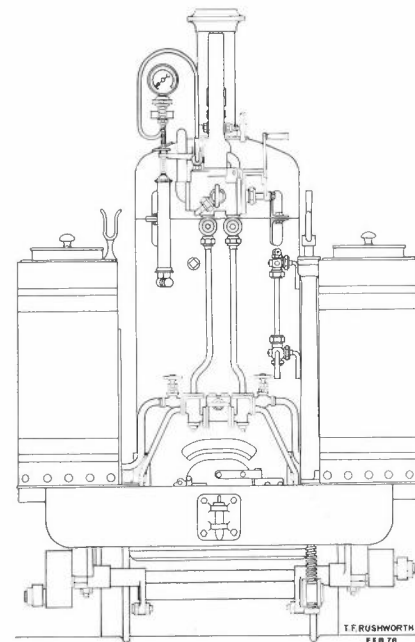
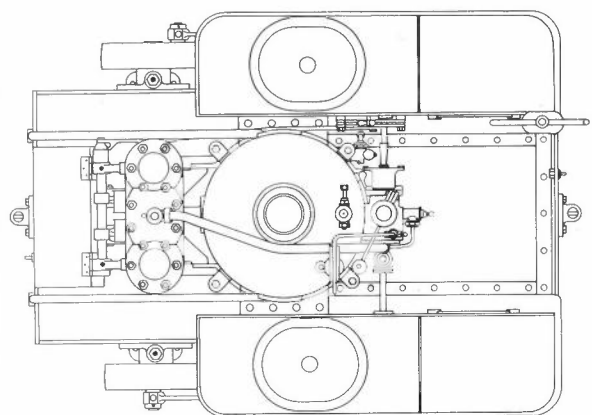
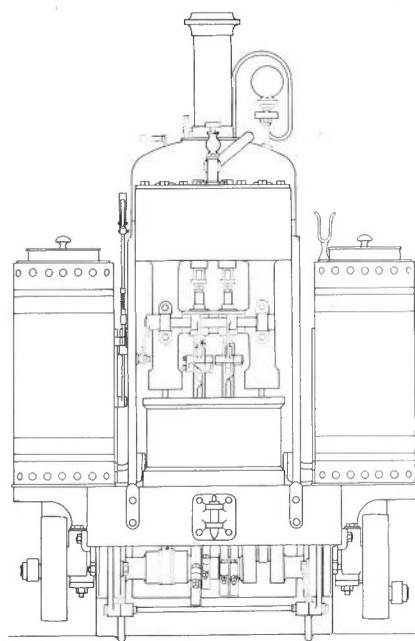
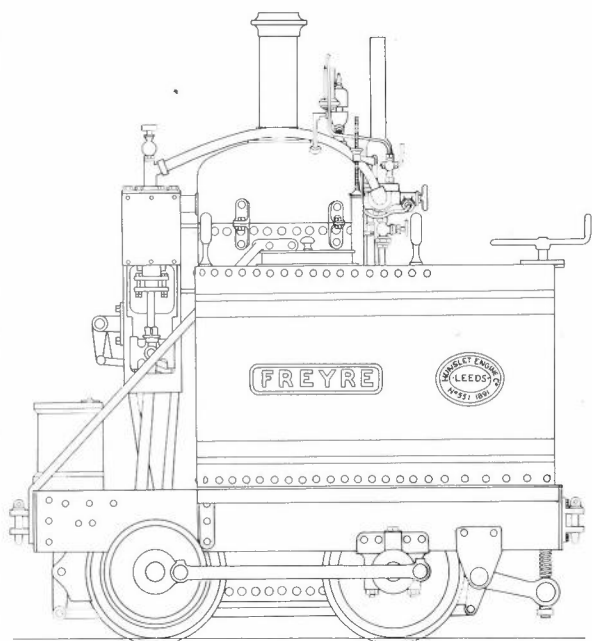
The drivers footplate was a well between the frames some 1ft 10in x 1ft 11in and because the boiler was apparently not fitted with either lagging or cladding, the close proximity of the driver to the boiler must have provided a pretty hot ride in the sunshine of Seville. The screw brake handle on the footplate applied brake blocks acting only on the leading wheels.

The combined water tanks and fuel bunkers were cantilevered from the frames on either side of the footplate providing a total water capacity of 80 gallons and a fuel space of 8 cubic feet. Fuel for firing was extracted through a vertical sliding door on each bunker, opening directly on to the footplate.

The boiler shell was constructed of ¾ in thick steel plates and designed for a working pressure of 130lb/sq in fitted with a Yorkshire iron firebox 1ft 4½ in diameter by 1ft 11½ in long. Thirty-seven 1½ in diameter tubes 2ft 3¼ in long provided 21½ sq ft of heating surface to which the firebox added a further 8½ sq ft. The steam turret on the boiler top incorporated the regulator, whistle, blower valve, Salter type safety valve, pressure gauge and pipes to the twin No. 3 injectors mounted on the boiler shell above the firebox door; each injector drew feed water from its adjacent tank. The water level gauge was fitted on the right hand side of the boiler.

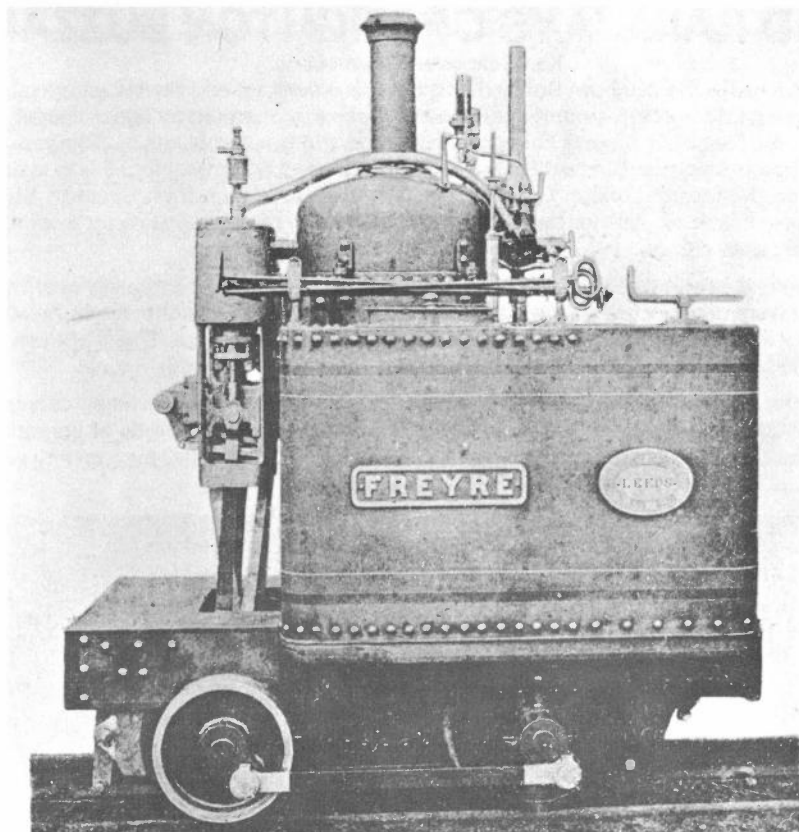
Access to the smokebox for day to day ash clearance must have posed a problem unless the chimney was removable, because the smokebox shell was a one piece pressing some 11in deep retained by bolts passed through four angle brackets on the boiler and smokebox shells.

The two 4in bore by 6in stroke cylinders were cast separately and bolted together with the steamchest between, and fixed by two cranked plates bolted to the front of the boiler shell. The crossheads worked in trunk guides cast integrally with the cylinders and flanking the Stephenson link motion.



HUNSLET ENGINE CO. LTD.
LEEDS
ENGINE N° 551/1891 'FREYRE'





The locomotive exhibited certain features similar to the De Winton locomotives but the position of the tanks at the sides of the boiler, produced a shorter, wider machine than the De Winton.

The nominal tractive effort was 480lb and the haulage capacity excluding the locomotive was 24 tons on level track, 11 tons on 1 in 100 and 6 tons on 1 in 50. The lightest track for which the locomotive was designed and the smallest radius curve traversable were 10lb to the yard and 14ft respectively.

The photograph shows minor variations from the arrangement drawing, including substitution of a tubular cylinder lubricator for the Ashcroft type; twin fire iron supports on the top of the left hand tank; omission of the wooden tool box and the diagonal supports between leading buffer beam and the boiler. Hunslet's records indicate that these supports were found to be unnecessary and were not in fact fitted.

The locomotive, built to Order No. 13700, was steam tested in the works yard on the 29th October 1891 and left the works on the 6th November 1891. FREYRE was painted Victoria green, lined out with a broad black line edged in French grey, with a 'distant' yellow line. The frames were painted purple brown.

The Hunslet catalogue of 1893 indicates that they were prepared to build this type of engine for any gauge from 1ft 8in to 3ft 3 $\frac{3}{4}$ in gauge but no further orders materialised and No. 551 remained the sole example of the 'FREY' class. There is no record that any spares were ever supplied and the makers patterns were destroyed in 1926.

A similar vertical boiler machine, engine No. 600/1893 was built for a 3ft 0in gauge line in Russia, this engine was fitted with inside frames and an overall closed cab like a steam tram engine.

I have been unable to ascertain for whom the loco actually worked because M. Cardenosa & Co. appear to have been London agents. No railway of 680mm gauge is listed in the relevant Industrial Railway Society handbook, but possibly one of our readers may be able to cast some further light on this point.

Finally, I wish to record my thanks to Geoffrey Horsman and the Hunslet Engine Co. Ltd. for assistance with information incorporated in this article.

SAND RAILWAYS OF LEIGHTON BUZZARD

Ken Scanes and Kevin Lane

Sand has been quarried in the Leighton Buzzard area for over a century, and narrow gauge railways have been used in various workings. From 1919 a number of quarries; primarily operated by either Joseph Arnold & Sons Ltd., or George Garside (Sand) Ltd., were linked with washing and grading plants in Billington Road, Leighton Buzzard, by the 2ft gauge Leighton Buzzard Light Railway. Here sand was transhipped into main line wagons at Grovebury sidings on the former London & North Western Railway branch from Luton to Dunstable. Several brick and tile works were later established beside the light railway, to receive sand direct from the quarries in 2ft gauge skips over their own sidings.

From about 1950 sand began to be diverted to road transport, this trend continuing over the years. In 1964 new washing plants were constructed adjacent to the quarries at the north end of the light railway, replacing the obsolete installations at Billington Road, and much reducing traffic over the line. Finally, British Railways closed Grovebury Sidings in late 1969, and through sand trains over the L.B.L.R. ceased.

Rail transport in the quarries has also declined, but survives in four quarries formerly connected to the light railway. The installations and operations are described below, though the methods of operation do vary from day to day. All the locomotives listed are four wheel Motor Rail "Simplex" type, the majority with 20 h.p. diesel engines.

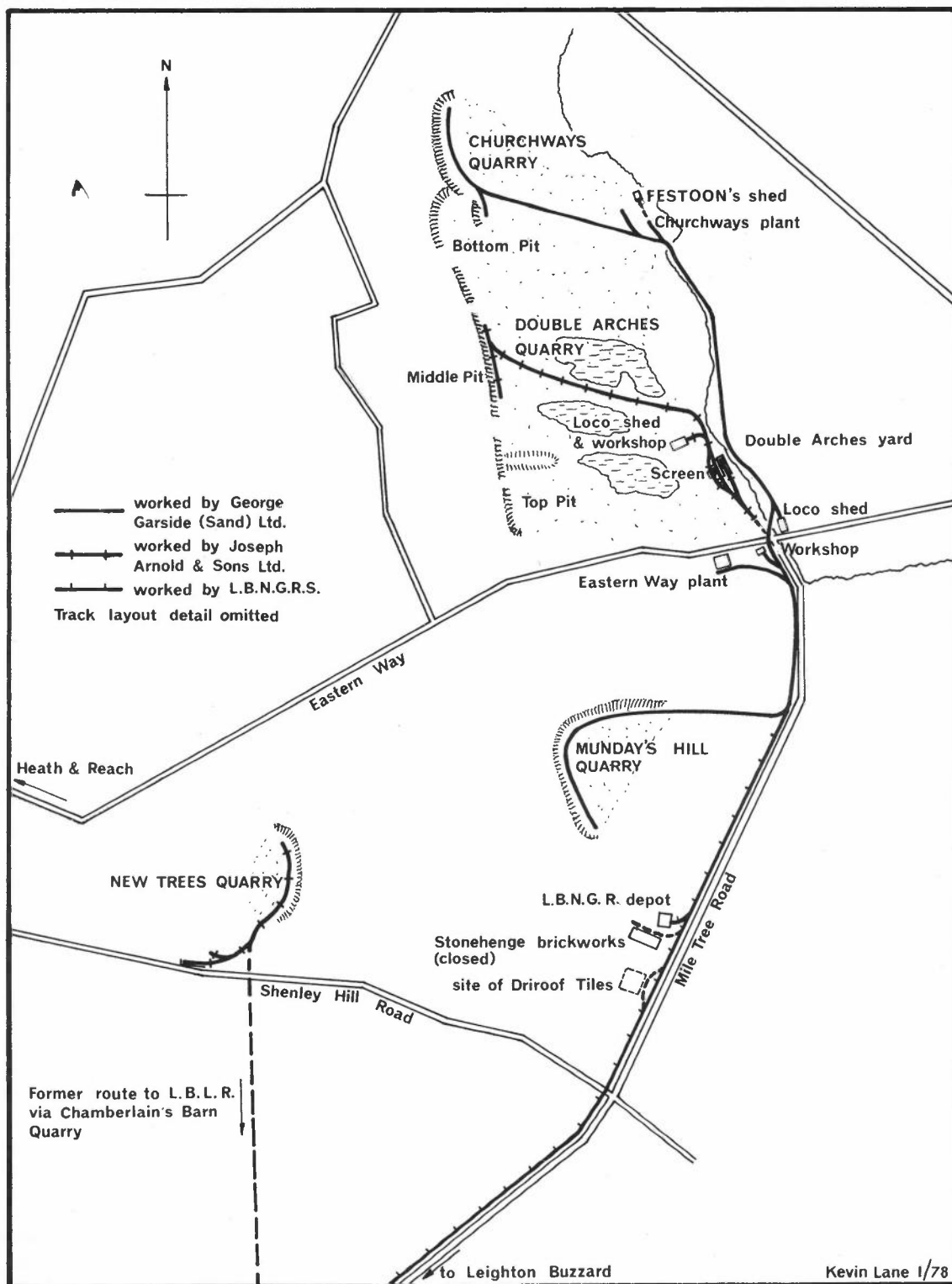


Motor Rail diesels 4803 and 9547 climb away with a loaded train up the steep bank from quarry to tipping dock at Joseph Arnold & Son's New Trees Quarry on 18th July, 1977.
(Kevin Lane)

Although industrial rail traffic over these railways is but a shadow of its former self, the three mile section of the L.B.L.R. south of Munday's Hill Quarry does see regular use by the Leighton Buzzard Narrow Gauge Railway. Formed in 1967 as the "Iron Horse Preservation Society", it ran the first public train on 3rd March, 1968. The following year the Society changed its name to Leighton Buzzard Narrow Gauge Railway Society, and started regular steam hauled services. The Society now has six steam and ten internal combustion locomotives, and runs trains on weekends and holidays from April to September. Further details are outside the scope of this article, but may be obtained from the L.B.N.G.R. Guide Book*, which briefly describes the history of the Leighton Buzzard sand industry and the L.B.L.R. The complete history is covered in "The Leighton Buzzard Light Railway", by S.A. Leleux, (The Oakwood Press, 1969), now out of print but obtainable on loan from the N.G.R.S. or your local library.

Our thanks to Mr. F.C. Arnold of Joseph Arnold & Sons Ltd. for his help in preparing this article.

*Published by Leighton Buzzard Narrow Gauge Railway Society Ltd., The Railway Workshops, Mile Tree Road, Leighton Buzzard, LU7 91A. Card cover, 8" x 6", 40 pp., 22 photographs, map. Price 10p. at the railway, 25p. by post.



Kevin Lane 1/78

NEW TREES QUARRY (Joseph Arnold & Sons Ltd.)

This quarry opened for production in 1963, and was originally connected to the L.B.L.R. by a branch via Chamberlain's Barn Quarry, but is now completely isolated.

One train of eight skips shuttles over the ¼ mile of track between the roadside tipping dock and quarry face, where it is loaded by a JCB hydraulic excavator, usually operated by one of the locomotive drivers. The steep climb out of the quarry necessitates the use of two locomotives on the train, one at each end, although that at the lower end is not coupled, but has a simple push block over the buffer. Sand from the tipping dock is transferred to a primary screen by a wheeled front-end loader, which also fills lorries from the stock pile.

There is no shed, and the two locomotives in use are left overnight with the train on top of the tipping dock, padlocked against children from the adjacent housing estate. Leaving a locomotive at either end of the train has the added advantage of preventing children from taking skips for rides down into the quarry. Locomotives at present in regular service at the quarry are MR 4803 of 1934, and MR 9547 of 1950, both recently reconditioned at Billington Road workshops. The spare locomotives, MR5859 of 1934 and MR8994 of 1946 are kept on the solitary siding next to the tipping dock.

DOUBLE ARCHES QUARRY and PLANT (Joseph Arnold & Sons Ltd.)

Double Arches takes its name from the bridge carrying a stream under the adjacent road, and is made up of three working faces; Bottom Pit, Middle Pit and Top Pit. During the 1930's Bottom Pit boasted one of the largest faces in the industry, nearly 600 yards long. Until fairly recently as many as ten locomotives could be found at work each day, Top Pit alone requiring four or five trains shuttling between the face and primary screen.

Operation is now confined to Middle Pit, and whilst eleven locomotives are stabled here, no more than three have worked at the same time in recent months. A train of six skips is usually loaded in the quarry by a JCB excavator, the operator generally riding on the locomotive to change points. The line from the quarry face to the plant is about 1000 yards long, running first across old workings, past a couple of flooded pits, and eventually dividing into double track to climb through a tree-lined cutting into the yard. Depending upon the quality of the sand, it is taken either by a tortuous route across the yard to a tipping dock beside the washing plant, or tipped into the primary screen. Oversize material falls into skips beneath the screen, the remainder into skips on an adjacent track. These are then shunted to the tipping dock by a second locomotive.

With the cessation of traffic to Stonehenge Brickworks, the connection from the yard to Eastern Way level crossing and the L.B.L.R. has fallen out of use, and is now submerged under several inches of sand.

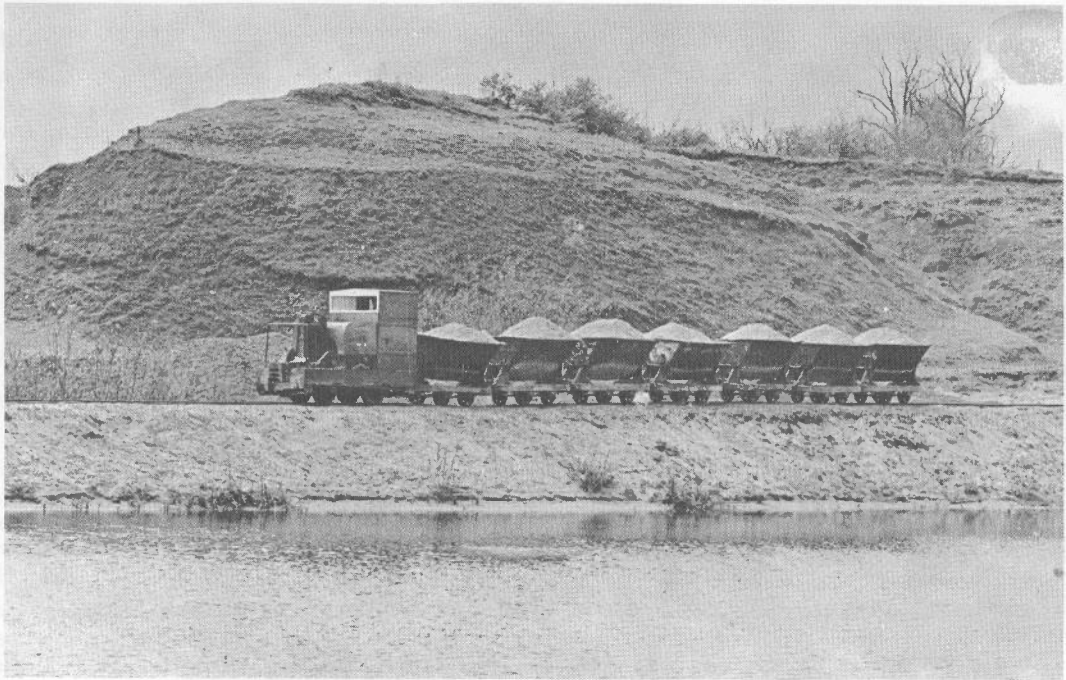
Locomotives in regular use are normally stabled in the single track workshop, the rest in the double track shed next door. Those out of use reside outside in the open. The following are currently at Double Arches, together with a "bow frame" Simplex converted to an air compressor, which lies at the back of the shed.

8	MR 9409 of 1948	36	MR 7214 of 1938
16	MR 4709 of 1936	—	MR 7153 of 1937
20	MR 8748 of 1942	1	MR 8683 of 1941 out of use
26	MR 8720 of 1941	18	MR 7188 of 1937 out of use
33	MR 7037 of 1936	24	MR 4805 of 1936 out of use
35	MR 7126 of 1936		

BILLINGTON ROAD WORKS (Joseph Arnold & Sons Ltd.)

Joseph Arnold & Sons Ltd. have their main workshops in the former L.B.L.R. locomotive shed, next to Pratt's Pit in Billington Road, Leighton Buzzard. The works, although only a few yards from Page's Park station on the L.B.N.G.R., is no longer connected to the rest of the rail system, and locomotives and other equipment must be transported by road vehicle to and from Double Arches or New Trees quarries.

There is an assortment of cabs and bonnets from old Simplex locomotives in front of the works, and to one side, half hidden behind an "elephant's graveyard" of Ruston Bucyrus excavators are several dismantled locomotives. Inside, covered in dust in one corner, "42" MR 7710 of 1939 is a permanent fixture. This is the last survivor of the former L.B.L.R. 40 h.p. locomotives which passed to the quarry companies when they took over traffic operation in 1958. Other locomotives come and go, MR 8540 of 1940 and MR 8756 of 1942 were reconditioned here last summer.



Garside's No.31 MILL REEF trundles past a flooded pit with a train of sand for Churchways washing plant. 12th March 1977.
(Kevin Lane)



Garside's AYALA pauses at Eastern Way with a short train en route for Eastern Way. The lorry in Arnold's Double Arches yard is standing on the disused connection to Double Arches quarry, now buried under several inches of sand.
(Kevin Lane)



A view of Garside's Churchways Quarry looking south, 12th May 1977. No. 31 MILL REEF is on the train with No. 34 RED RUM behind the excavator, the latter being the excavator operator's personal transport. Note the half buried wagon fitted with a hand pump to the left of the train. Possibly this was used for carrying fuel to the excavator.
(Kevin Lane)



Garside's No. 29 AYALA enters Churchways washing plant, 5th May 1977. (Kevin Lane)

MUNDAY'S HILL QUARRY and EASTERN WAY PLANT (George Garside (Sand) Ltd.)

Munday's Hill Quarry is usually served by two trains of seven skips, shuttling the 1000 yards or so between the working face and Eastern Way drying and grading plant. Trains are loaded by a Ruston Bucyrus face shovel, usually having its own operator, but occasionally worked by one of the locomotive drivers. A solitary locomotive is sometimes parked near the excavator, its purpose unclear until you realise that it is the operators personal transport.

There is a long climb out of the quarry, first across the quarry floor, then up a shallow valley surrounded by an area which has been reclaimed and is now being returned to agriculture. The line levels off and turns north to run alongside Miletree Road for 200 yards over the metals of the L.B.L.R., the only section still carrying sand traffic. A branch turns west away from the light railway to climb up to the tipping dock serving Eastern Way plant. One train is normally loaded while the other is tipped. Full trains are hauled by the locomotive and empty trains propelled back to the quarry.

CHURCHWAYS QUARRY and PLANT (George Garside (Sand) Ltd.)

Operation of Churchways Quarry is best described in two sections, north end and south end. The north end yields a very fine grade of sand which seems to be rarely required. The method of operation is apparently to take sand from the hoppers at Churchway washing plant as required, and occasionally run a few loads down from the quarry to top up the hoppers. However, this has not been confirmed by observation. The south end, adjacent to Joseph Arnold's Bottom Pit is also rarely used. On the few occasions I have seen it worked, operations were similar to those at Munday's Hill, with two trains in service here instead of at Munday's Hill.

A spur from the line to the north end of Churchways quarry serves the south end, and the train is loaded here by a Ruston Bucyrus dragline excavator, then propelled onto the "main line". The route to Eastern Way plant is about one mile, and climbs steadily out of the quarry beside a flooded pit and through scrubland to the junction of the line serving Churchways washing plant. Behind the plant hoppers, on a branch which served Longstretch Quarry, disused for many years, stands a shed containing the preserved, bow-frame 20 h.p. Simplex petrol locomotive, No. 21 FESTOON, MR 4570 of 1929. This has not seen the light of day since 1969 when it was on display at a local school to commemorate fifty years of the L.B.L.R. The main line leaves the plant and crosses a stream to run along the most picturesque part still in use, with farm land on one side and dense woodland on the other. It reaches the edge of Double Arches yard, where Joseph Arnold's installation is visible through the boundary hedge, passes the locomotive shed and crosses the stream to reach Eastern Way level crossing. Loaded trains usually halt on the siding leading to the locomotive shed, and the driver walks forward to the level crossing to protect the returning empty train across. This is being propelled and is therefore "blind". When the empties are clear the loaded train can pull back onto the main line and continue across the road to Eastern Way plant.

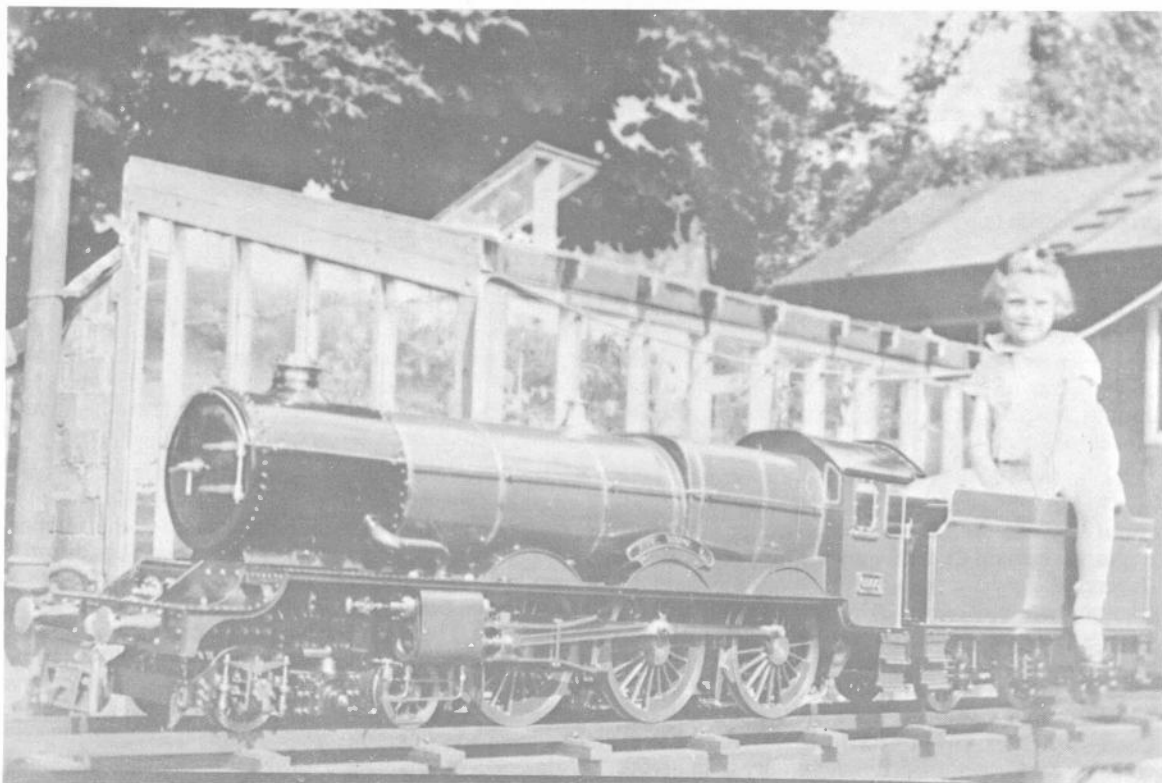
All locomotives used for sand trains are kept in a single track shed with an up-and-over door.

No. 15 BROWN JACK	MR 7148 of 1936 out of use and not positively identified
No. 16 ANGLO	MR 7149 of 1936
No. 17 DAMREDUB	MR 7036 of 1936
No. 27 —	MR 5852 of 1933 out of use
No. 29 AYALA	MR 7374 of 1939
No. 31 MILL REEF	MR 7371 of 1939
No. 33 UTRILLO	MR 7140 of 1936 out of use
No. 34 RED RUM	MR 7105 of 1936

On the other side of Eastern Way is a workshop where locomotives are reconditioned. No. 13 ARKLE MR 7108 of 1937 is stabled here, and used by the fitter as required.

STANLEY BATTISON'S LOCOMOTIVES

Sydney A. Leleux



*Stanley Battison's first locomotive, KING GEORGE V probably very soon after its completion.
(collection W.A. Hickinbottom)*

W.A. Hickinbottom, one of my colleagues at work, was at one time very friendly with the late Stanley Battison. Knowing of my interest in narrow gauge and miniature railways, one day he brought along an envelope containing a collection of old photographs of Stanley Battison's locomotives. As we examined these photographs, he told me the story behind them, at least so far as it was known to him.

Stanley Battison was the manager of Tatham's lace factory on Nottingham Road, Ilkeston in Derbyshire, and a very keen model engineer. Like many expert modellers, he much preferred building locomotives to operating them.

The first of six locomotives he constructed was a 1 ½ in scale model of the Great Western Railway 4-6-0 KING GEORGE V, designed to run on 7 ¼ in gauge track. This was built during the 1930's, and was an accurate scale model of the prototype, even having four cylinders with piston valves actuated by inside Walschearts valve gear. Stanley hardly ran this locomotive at all — being a scale model it was not sufficiently robust to stand up to heavy work. It was sold to the owner of a timber yard at Callington in Cornwall, probably named Dingle.

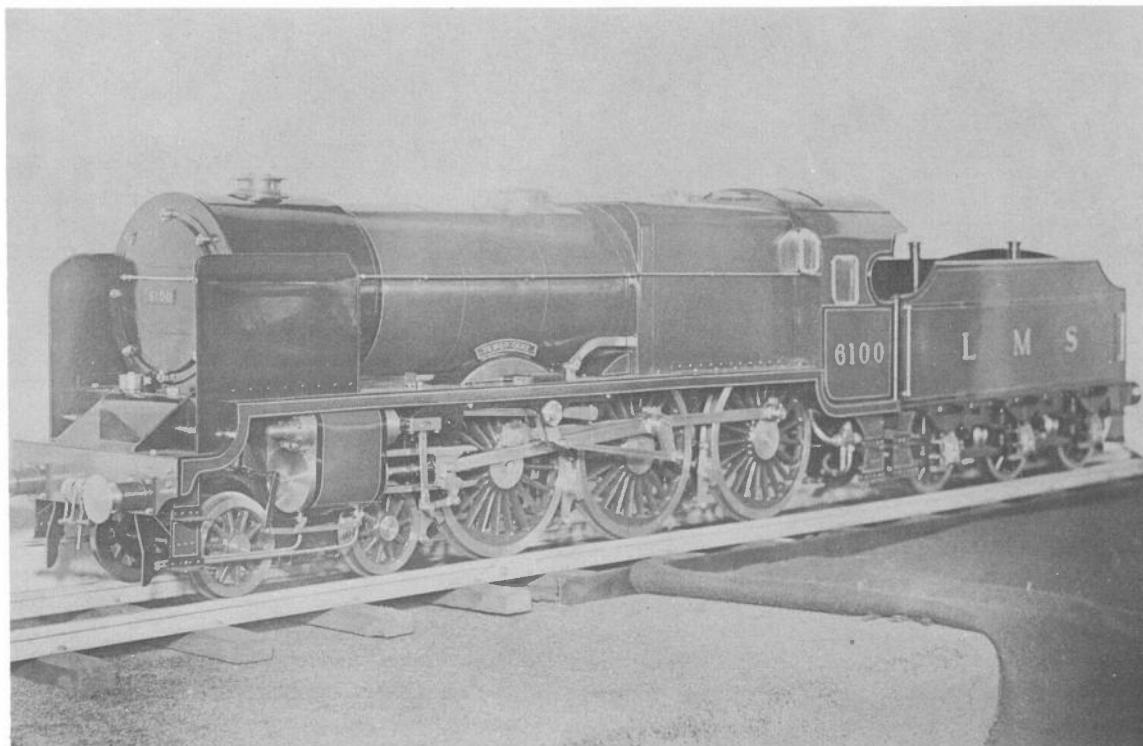
The second locomotive seems to have been a freelance 2-6-2 tender locomotive, again for 7 ¼ in gauge. It had the general appearance of a Swindon design, but outside cylinders and valve gear. This locomotive was tested on a length of 7 ¼ in gauge track behind Tatham's works, where the local model engineering club had 2 ½ in, 3 ½ in and 5 in gauge track, but really came into its own during the war. One wartime idea to avoid travelling and bring a little entertainment to the people was the "Holidays at Home" programme staged during traditional local summer holidays. To make Ilkeston that much more exciting Mr. Battison laid down 100 yards of 7 ¼ in gauge track on the Rutland Ground, a park between Derby Road and Oakwell Drive, and hauled trainload after trainload of happy children. The locomotive was later sold to Mr. Dove of Nottingham.



*Many people were obviously having a "holiday at home" in Ilkeston when this free-lance 2-6-2 was in service
(collection W.A. Hickinbottom)*



*DUCHES OF ILKESTON is seen in service at Gyllingvease Beach, Falmouth.
(collection W.A. Hickinbottom)*



Stanley Battison's final masterpiece, the superb 10¼in ROYAL SCOT 4-6-0, immediately following completion.
(collection W.A. Hickinbottom)

Such was the popularity of "Holidays at Home" that a 7¼in gauge line was again laid on the Rutland Ground the following year. This time Mr. Battison's latest locomotive, DUCHESS OF ILKESTON, provided the motive power. It was a 4-6-2 which had been modified from a "Royal Scot" type 4-6-0 during construction. After the war it was sold to Mr. Lucas of Mansfield, the main Austin and Rover dealer whose showroom was full of locomotive models in those austere post-war days when there were very few cars available. Mr. Lucas took this locomotive to Gyllingvease Beach, Falmouth in Cornwall for the 1948 summer season, where it operated on a single point-to-point track.

The early post-war years saw the construction of two identical "Pacific" type locomotives for 9½in gauge track. The design was a standard Great Northern Railway "Atlantic" type, but lengthened by Mr. Battison to accommodate the additional pair of driving wheels. After test runs on a track inside the lace factory, they were delivered to parks at Matlock and Matlock Bath. Both were at the Hall Leys Miniature Railway, Matlock in recent years, and may still be there.

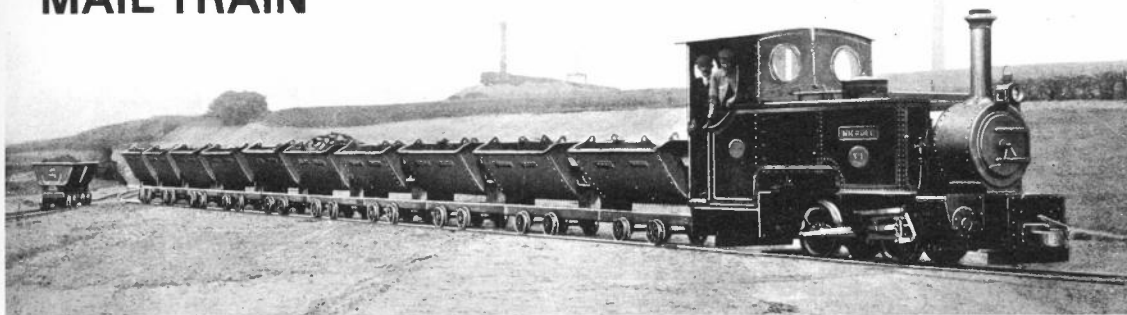
Stanley Battison's largest locomotive, and what is thought to have been his last, was a 10¼in gauge 4-6-0 ROYAL SCOT. Surprisingly relatively little is known of this locomotive, but it may be the ROYAL SCOT latterly operated by the Newby Hall Railway at Skelton, near Ripon, North Yorks.

Most, if not all, of these locomotives were constructed using Henry Greenley's drawings, although Stanley Battison sometimes adapted them to produce different types. There is relatively little documented history of these, and indeed many other miniature locomotives, but perhaps members can confirm their continued existence or fate.

And finally, while writing about wartime miniature railways I recall riding on a line, probably 10¼in gauge, in a park at Hornchurch, Essex in about 1945. This railway, a single straight track with a corrugated iron tunnel near the far end, ran close to a stream which bordered the park. In 1965 I wrote to Hornchurch Council who replied:

"The Council agreed to hire a miniature railway for use in Harrow Lodge Park in July, 1943. The railway, including the engine, carriages, and track was supplied and operated by Mr. J. Minks, who then resided at Wingletye Lane, Hornchurch, and continued in use for about two years". No further details were available.

MAIL TRAIN



STEEPEST ADHESION WORKED GRADIENTS FOR NARROW GAUGE PASSENGER TRAINS

Mr. Wade's comments on steep gradients of the Plynlimon & Hafan (NG 76) were of interest to me in connection with some notes I am preparing on the railways of Ecuador.

The ruling grade on what was originally the Guayaquil and Quito Railway (3'6" gauge) is 5.5% or 1 in 18 on the Mountain Section from Bucay to Palmira, over which the line climbs the western slopes of the Andes. The AVERAGE grade over the 48.7 miles of the Mountain section is 3.8% or 1 in 27, and over the 7.4 miles between Sibambe and Alausi stations—a section which includes the Devil's Nose switchback and some formidable hairpin bends to gain height—the average grade is 4.3% or 1 in 23.

The precise distance laid at 1 in 18 is difficult to define. The original contract for this section of line refers to a maximum of 2 miles at this grade, but with the many local realignments following frequent floods and landslips it could well be much more than this distance now. Certainly the ruling grade of 5.5% is listed on an official gradient profile for five separate sections of line between adjacent pairs of stations.

Now Mr. Wade has started things off, what about a league table of steepest n.g. passenger lines worked by adhesion power only? Data for both ruling gradients and longer lengths with steep average gradients would be of considerable interest.

DIDCOT, OXON

HENRY GUNSTON

DREWRY ADVERTISEMENT

The Drewry advertisement on the back cover would have landed them in serious trouble had there been a Trades Description Act in 1931. The left-hand picture is in fact a massively doctored picture of one of the 60cm gauge rod drive 0-6-0s supplied to the Buenos Aires Great Southern Railway in 1927, while the locomotive on the right was of standard gauge, not broad gauge as the latter term would be understood in English-speaking countries. Even more misleading is the claim that everything was designed and built in their own works. The Drewry Car Company did not possess any manufacturing facilities between 1907 and 1963!

KENILWORTH, WARWICKS.

RODNEY WEAVER

(It is particularly ironic that Drewry should have chosen the BA GSR locos for their advert as it was the disastrous failure of these locos that caused the rift between Baguley and Drewry, and led to the severance of their original association in April 1930!—AN).

ERRATA

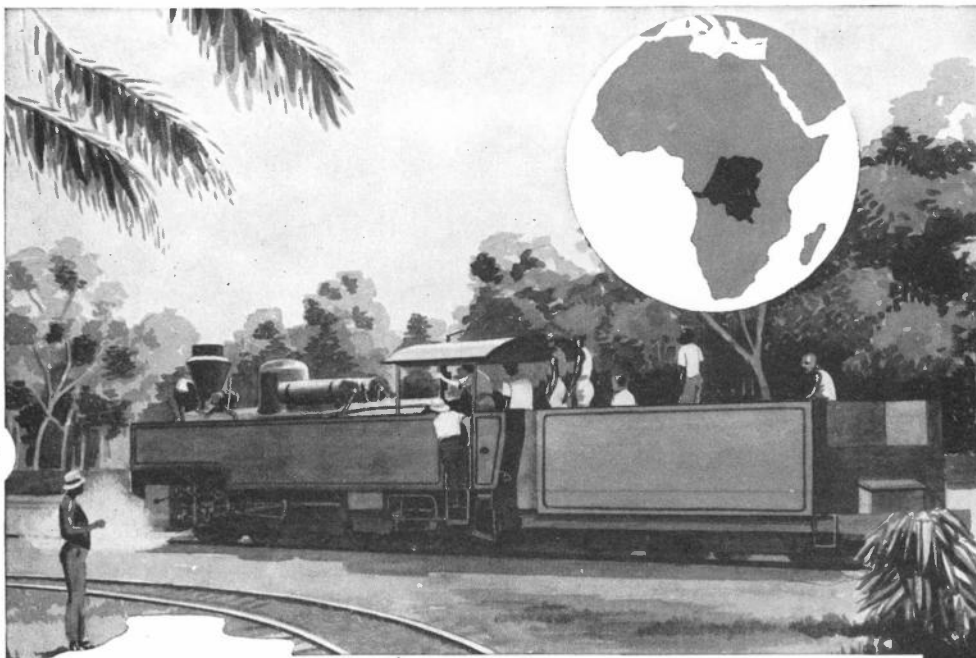
Apologies to all our readers and contributors for a few errors that slipped into the last issue:-

P. 14 FLORISDORF should be FLORIDSDORF

P. 16 Allan C. Barker should, of course, be Allan C. Baker.

P. 19 The third Bagnall "Haig" is WB 2827 as correctly given in the appendices, not WGB No's 2807 or 2872 as given in the photo caption and text respectively.

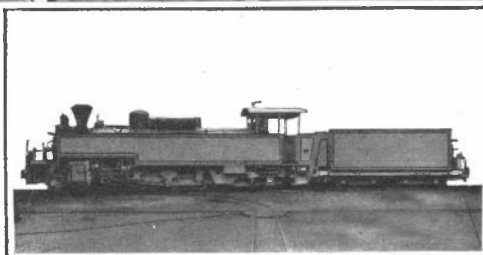
Also, on P. 19 of NG 76, HC 1317 was noted derelict at Surrey Docks Station in January 1933, not 1923. Incidentally, your Editors were rather disappointed not to receive any additional information on this article, in comparison to the many interesting letters received about the Bagnall Stirling Singles. Surely someone can fill in a few of the many blanks in our details of the disposal of these locomotives? For instance, has anyone any details of any that were definitely destroyed during the Great War, or indeed of *any* of the vast quantities of 600mm gauge locomotives used by both sides in this conflict?



For SERVICE in the CONGO

The jungles of West Africa form an unexpected background for a locomotive, but Bagnall locos are employed on unusual jobs in faraway places throughout the world.

Built for the Ministry of Supply and delivered to the Vicicongo Railway in the Belgian Congo, this 2-8-2 type locomotive is giving continuous service in one of the world's most rugged countries.



The locomotive, for use on 1ft. 11½in. gauge, has cylinders of 15½in. dia. by 17½in. stroke, with a tractive effort at 75 per cent. boiler pressure of 14,991 lbs. and a total weight of engine and tender in working order of 55·63 tons.



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dm BL 83

This Bagnall advertisement from the "Railway Gazette", May 8th 1953, illustrates the 600mm gauge 2-8-2 tender tanks built for the Vicicongo Railway in 1943 of which only five (WB 2683-7) were built of the seventeen originally ordered.

(N.G.R.S. Library)