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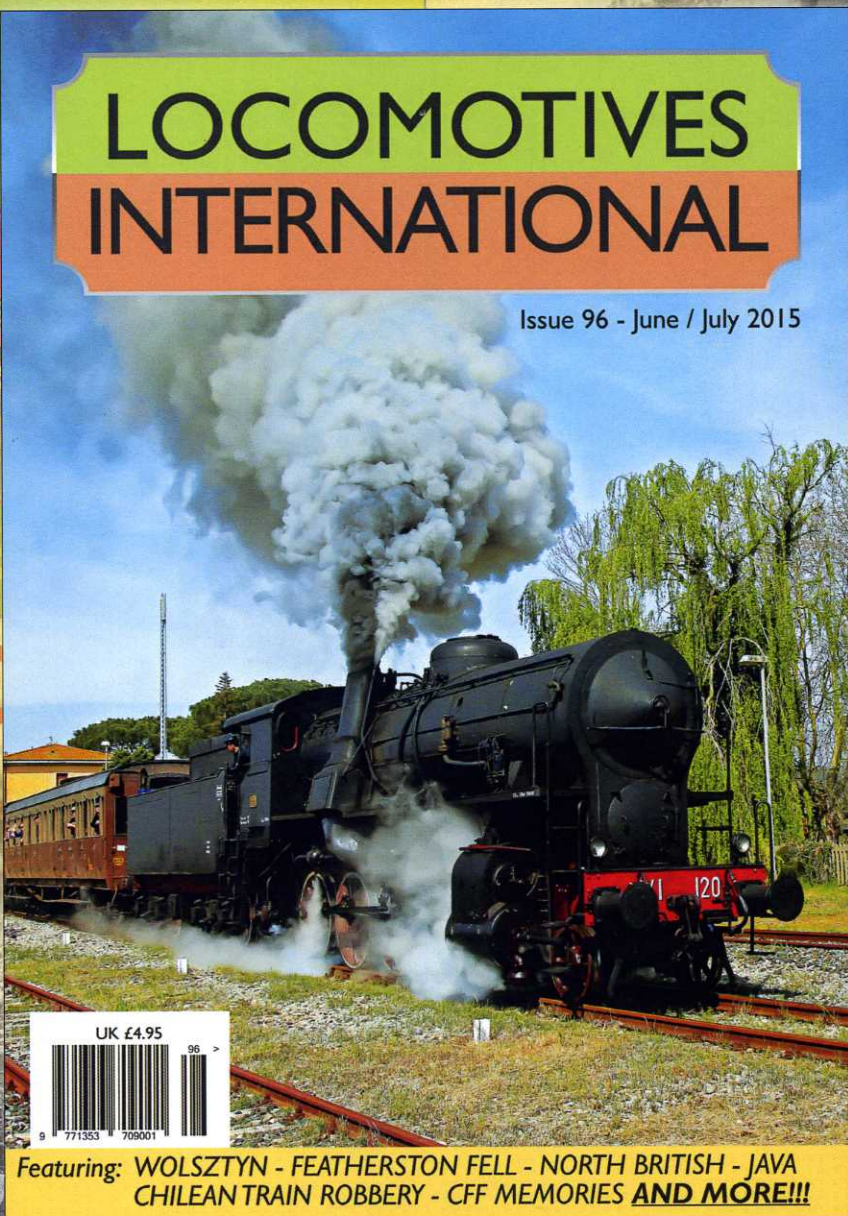
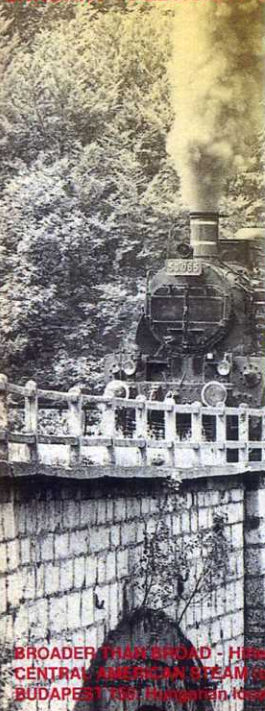
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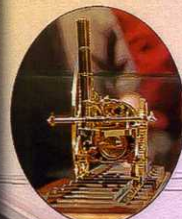
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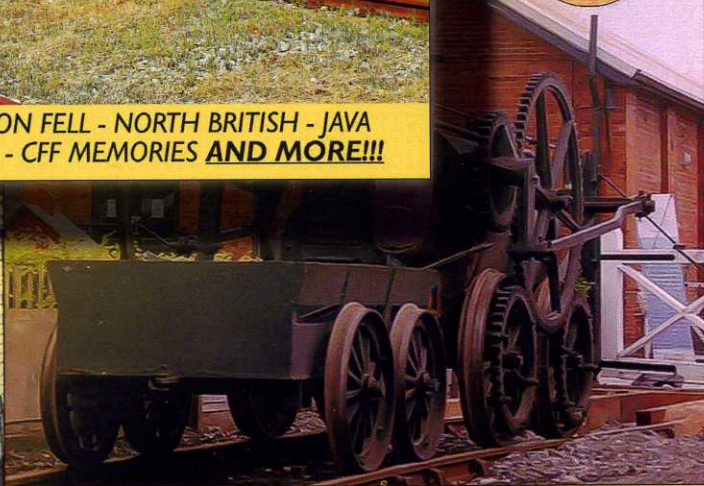
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BROADER THAN BROAD - Hesse's 9 metre gauge
CENTRAL AMERICAN STEAM on the 3 foot gauge
BUDAPEST 1850 - Hungarian King's Palace feature



ELECTRIFYING THE SOVIET FORESTS

by David Scotney



In 2009 on the surviving Semigorodnaya timber railway, in Vologda Oblast, a Workshop Wagon was still in use. At that time 28km of the railway was still being operated, out of an original maximum length of some 165km.

A Korsakov

Over the 26 years of its existence, Locomotives International has extended its scope to include far more than just the "Locomotives" of its title. In the first "Locomotives International Annual", David Scotney provided a detailed history of the German "Fakultativwagens" - a combination boxcar / passenger vehicle - and in particular a lone survivor deep in the Soviet Forests. To represent the "non locomotive" coverage in the magazine, we present here the second in David's series on rare vehicles which have survived in the USSR well beyond their design life.

The mass development of electric power across the USSR was the first major project started after the revolution. The GOELRO Plan (план ГОЭЛРО - Plan of the State Commission for Electrification of Russia) was developed and adopted in 1920, and provided a 10-15 year programme for the development of electric power stations across the country, powered by peat, coal and water, and an associated electricity distribution system. Lenin was closely involved with the Plan and endorsed it with the following statement:

*'Communism is Soviet power plus the electrification of the whole country, since industry cannot be developed without electrification.'*ⁱⁱ

By 1947 the USSR could claim to have the 'first place in Europe and second place in the world for the production of electric power'ⁱⁱⁱ.

Inevitably electrification and its advantages could not be brought to all dispersed workplaces in the forests and industrial areas across the USSR using normal fixed generation and distribution methods; but the mantra of electrification still required to be pursued. Other more flexible options were therefore needed.

Around one third of the land area of the USSR was made up of forest - an enormous area. The principal means of accessing the forest was by 0.750m gauge railways, which at their peak in the 1950s had about 50,000km of track. The exploitation of the forest and the operation of some 700 railway networks was undertaken predominantly by the Ministries of the Timber Industry and Internal Affairs.

Starting in the 1930s the benefits of electrification were gradually being brought to the forest areas and dispersed industrial areas with semi-portable internal combustion power stations of 12, 50 and 60kW which were able to power electric chainsaws, crawler winches, workshops etc. Unfortunately the availability of petrol in the forests of the USSR in the 1930s was quite limited (despite the Union being the second largest oil producer in 1939^{iv}) due to other industrial demands in the country, its export to western countries (to obtain hard currency for acquisition of western technology etc.), and, when available, its transport to dispersed locations did not prove easy. In these locations therefore the steam engine and wood gas-generator engines provided the most dependable power sources for the timber industry.

The development of a more dependable power source for mobile electric power stations, the provision of fully equipped mobile electrically-powered workshops and the use of the extensive 0.750m railway networks to transport them would therefore have seemed to offer a pragmatic combination to spread the benefits of electrification more widely.

What was required?

In the wake of the Second World War there was a need to increase timber extraction and develop industry across the USSR, and the Soviet planners therefore identified a requirement for self-contained workshop and electricity generating units which could be moved around the 0.750m networks as work demands fluctuated.

At that time, as part of the development of the 0.750m industrial networks, a basic *Fakultativwagen* had been adopted for carrying people and goods. This was being constructed in East Germany by Soviet-managed 'Sowjetische Aktiengesellschaften' (SAG - Soviet Corporations) at Ammendorf and Weimar^v. Existing Soviet railway plants were operating at full capacity to deliver mainline railway requirements and therefore the SAG units were also required to

provide capacity to construct the mobile workshop and electricity generating units.

So the starting point for the new vehicles seems to have been the existing *Fakultativwagen*. Given the constraints of the gauge and the characteristics of these wagons it was identified that two separate 'paired' units were required to meet the brief:

- A mobile workshop; and
- A mobile electrical generating station.

The Design Concept

The *Fakultativwagen* provided the template for the new units. The same length of vehicle was adopted, with the same bogies and the same roof profile. Initially the asymmetric layout of the bogies on the *Fakultativwagen* was also considered. However all the doors were to be hinged, rather than using the sliding side door of the *Fakultativwagen*, which allowed the use of a wider chassis frame and internal framing of the bodywork.

The next consideration for these new units was what should they contain and potentially how they would be used, and the following seem to have been adopted:

- The mobile workshop had to have some flexibility of layout to enable different requirements of electrically-powered tools etc. to be accommodated. Power cabling was required to all the power tools and lights, linked to external power input cabling. There should be an adequate supply of storage for parts, tools etc.. There should be limited overnight / messing accommodation for a couple of staff separate from the workshop area. An external crane should be provided to enable medium-sized objects to be lifted which were beyond human efforts.
- The mobile electricity stations required a form of power unit, a small steam boiler and cylinder unit, and an electrical generator (to provide industrial AC supplies of 230V (or later 400V)). In addition water should be conserved as much as possible since 'good' water may not always be easily obtainable in certain locations. The fuel used should

be readily available, and wood would seem to be the potentially predominant fuel. A main switch/control board must be included to manage the electrical power supplied to external cables. The electricity was to be used for the Workshop Wagon, hand chainsaws, crawler winches, etc.. The operation of the station should be relatively simple for a limited level of staffing.

- The basic construction frame and body of the *Fakultativwagen* would however require to be strengthened to allow the possibility of the units being detached from their bogies and placed on tractor sledges to access even more remote locations than those on the 0.750m networks. However no evidence has come to light that this was indeed ever attempted!

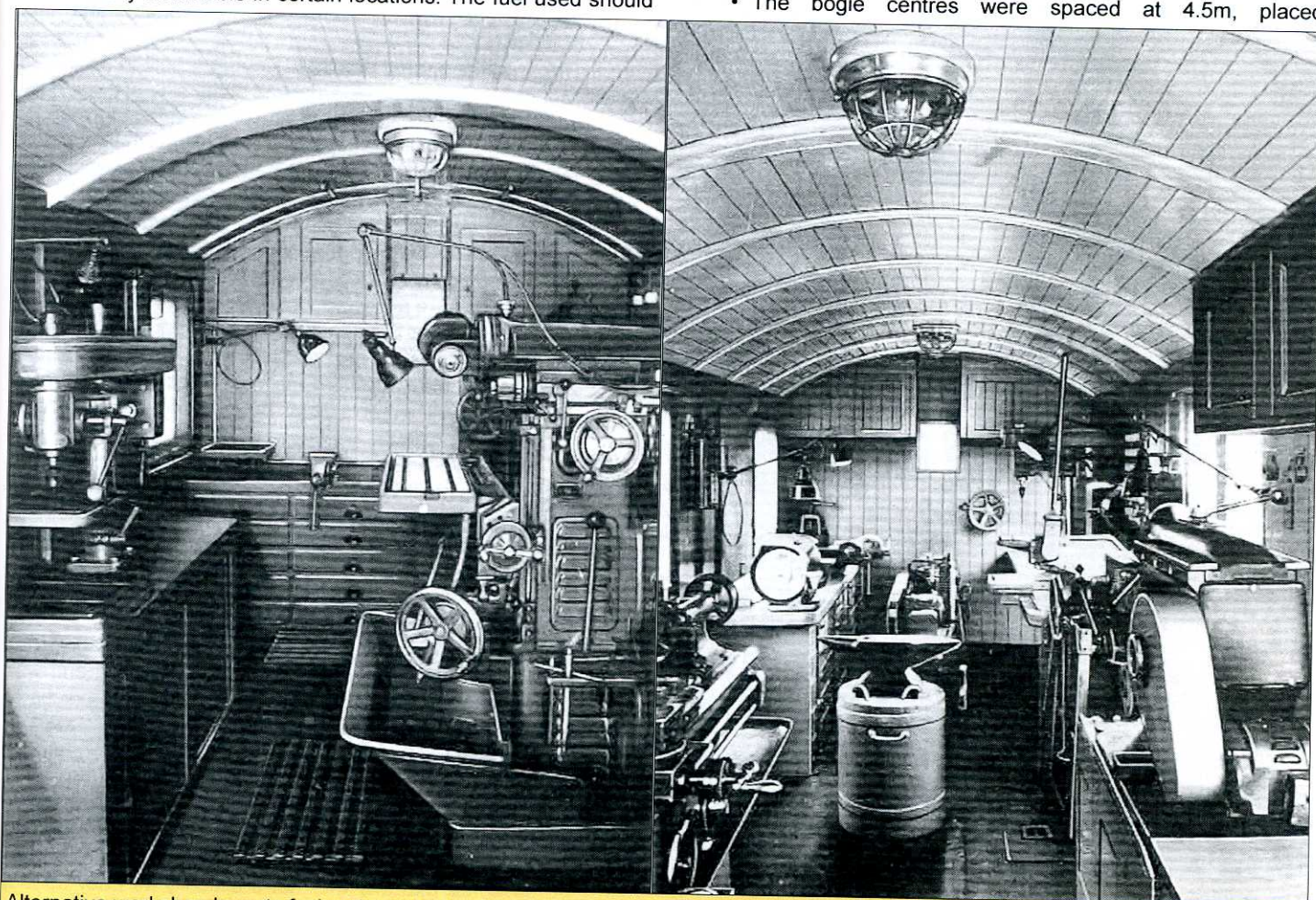
In most cases the two units would operate together; the only, somewhat unusual, times that they would be separate would be when the electricity station was supplying power to users other than the workshop or when the workshop had access to an external electrical supply. Theoretically it may be assumed that two technically competent staff could operate the whole double unit, and live in the accommodation in the Workshop Unit, with additional manual support only to collect wood fuel wherever the units were temporarily based.

Вагон Мастерская (Workshop Wagon)

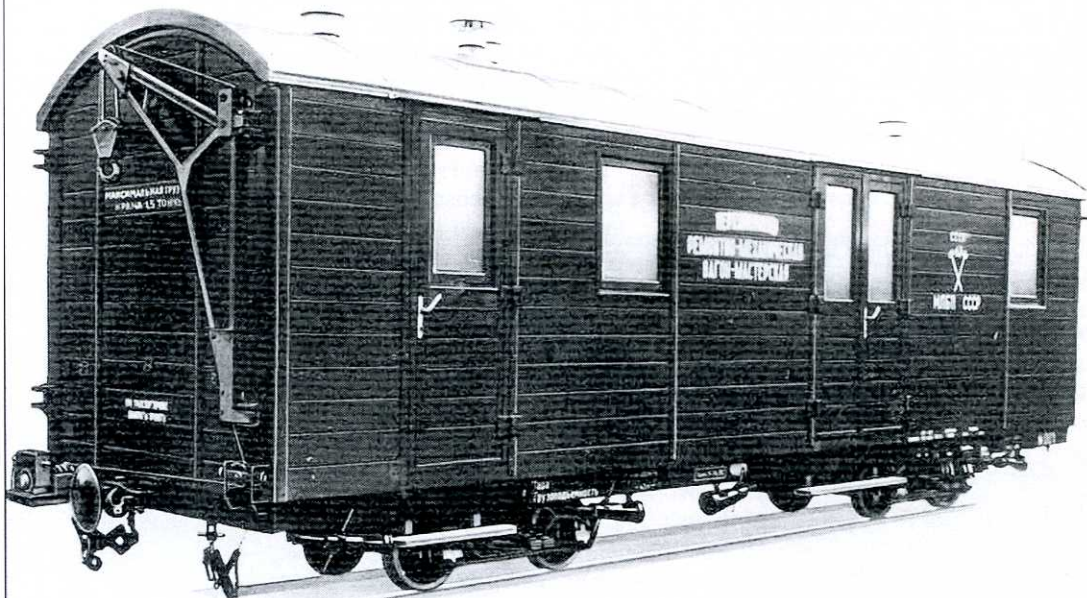
The Workshop Wagon seems to have been developed straight from the *Fakultativwagen*, with many aspects in common.

Most aspects of the design can be seen from the drawing and illustrations, with the main elements being:

- The main chassis frame was 7.74m long but, unlike the *Fakultativwagen*, it was 2.25m wide (0.2m wider) to cater for a wider inside-framed body;
- The use of the standard USSR diamond-frame bogies of 1.02m wheelbase – with virtually all the examples using leaf-springs;
- The bogie centres were spaced at 4.5m, placed



Alternative workshop layouts facing the outside wall (with the handbrake wheel visible).

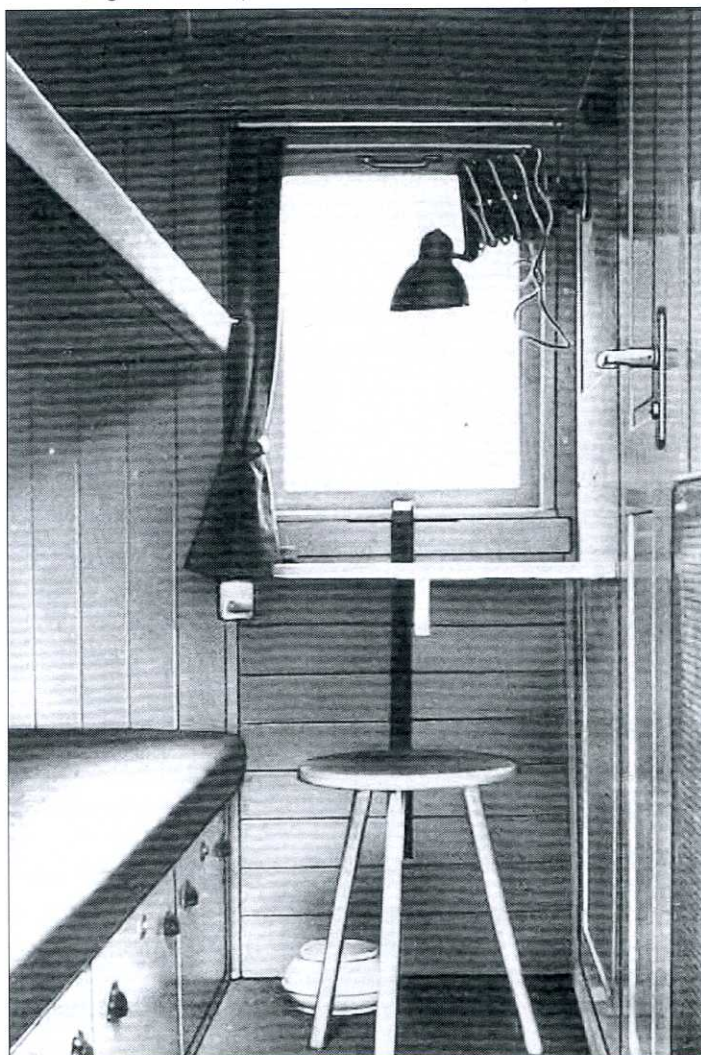


Works picture of the exterior of a Workshop Wagon.

Ammendorf Works

asymmetrically 1.99m and 1.25m in from the ends of the main chassis frame;

- The body sides and ends had steel frames with flush horizontal wooden plank panels between (unlike the externally framed *Fakultativwagen*);
- Also, unlike the *Fakultativwagen*, there was a thick insulation of glass wool squeezed between the outer panelling and the



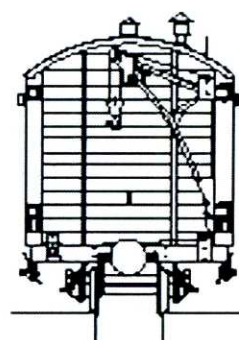
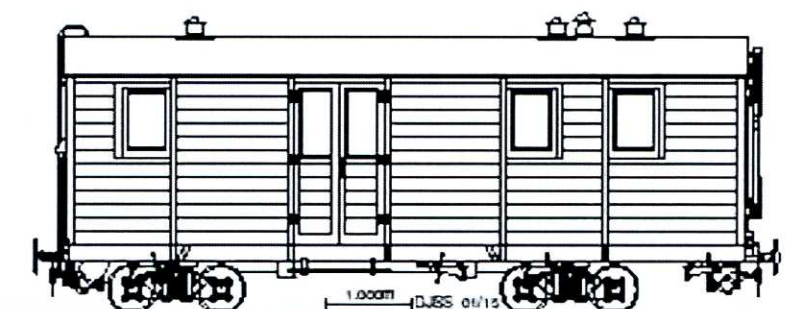
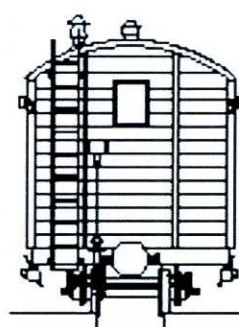
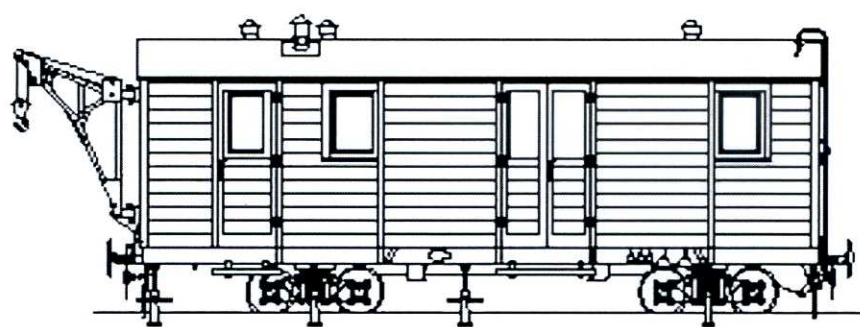
The interior of the crew vestibule, showing the two bunks to the left.

Ammendorf Works

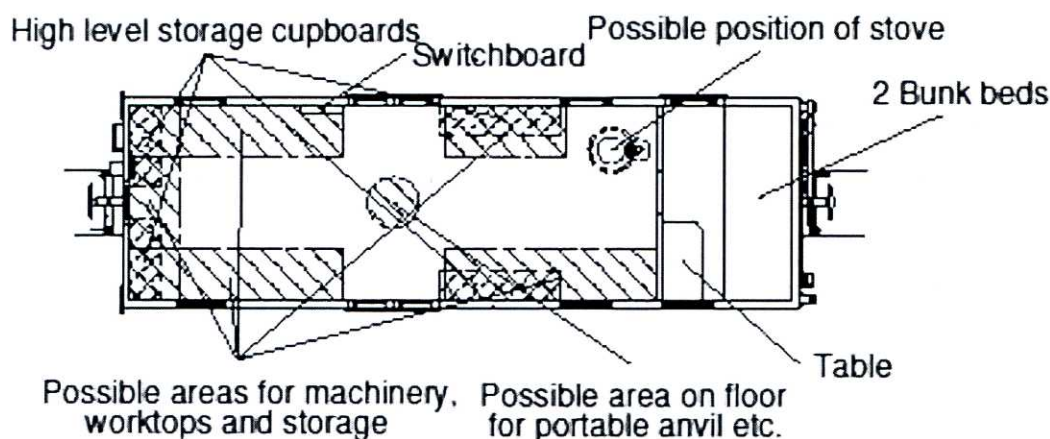
inner walls;

- The body cross-section followed that of the *Fakultativwagen*, but with the arc roof extended a little further outward to match the greater body width;
- The interior of the body was split into two sections - a cross-vehicle vestibule-like area (which was roughly twice as wide as the vestibule in the *Fakultativwagen*) for crew accommodation, including a double bunk and a table, with one external door (with window) on one side and a matching window in the other side and an off-centre linking door into the main workshop area, which had two windows and a double door on each side and a small window and hand brake wheel at the end;
- The workshop area had as standard built-in high-level cupboards across the external end either side of the window (above the hand brake wheel) and on the sides between the double doors and the window nearest the vestibule together with a standard stove (like that in the *Fakultativwagen*) near the vestibule partition alongside the interior door;
- There seem to have been different layouts available for equipment / worktops / storage and indeed types of equipment (whether these could be specified for individual locations or were allocated arbitrarily cannot be identified) –
 - There were 6 potential areas of work use, not all of which could be used together, which comprised one across the end under the hand brake wheel, two on each side either side of the double doors and also freestanding elements on the floor;
 - Possible equipment seems to have included lathes, drilling machines, milling machines, vices, anvils, work surfaces, drawers for tools and equipment, additional storage cupboards etc. (it is assumed that all the equipment was supplied from within *Sowjetische Besatzungszone* (SBZ – Soviet occupation zone) / *Deutsches Demokratische Republik* (DDR));
- Unlike the *Fakultativwagen*, but logically, the Wagon was lit by electric lights placed both along the ceiling and with spotlights along the worktops and for individual pieces of equipment;
- At the crew vestibule end there was an external crane of 1.5t capacity which rotated in two large fulcrum brackets attached to enlarged steel frame corner pillars (the crane could be detached with removable pins and moved to the opposite corner pillar if required – although it must be assumed that this was not practically as easy as it is described), the size of the crane jib was designed to enable it when out of use to clip flush against the end of the Wagon

USSR 0.750m Gauge - Workshop Van



1.000m (USS 01/15)
 From: Data on - <http://scaletrainsclub.com/board/viewtopic.php?b=2&id=3745>
 Photographs on - <http://maurice.pavlov.com/indexa.php>

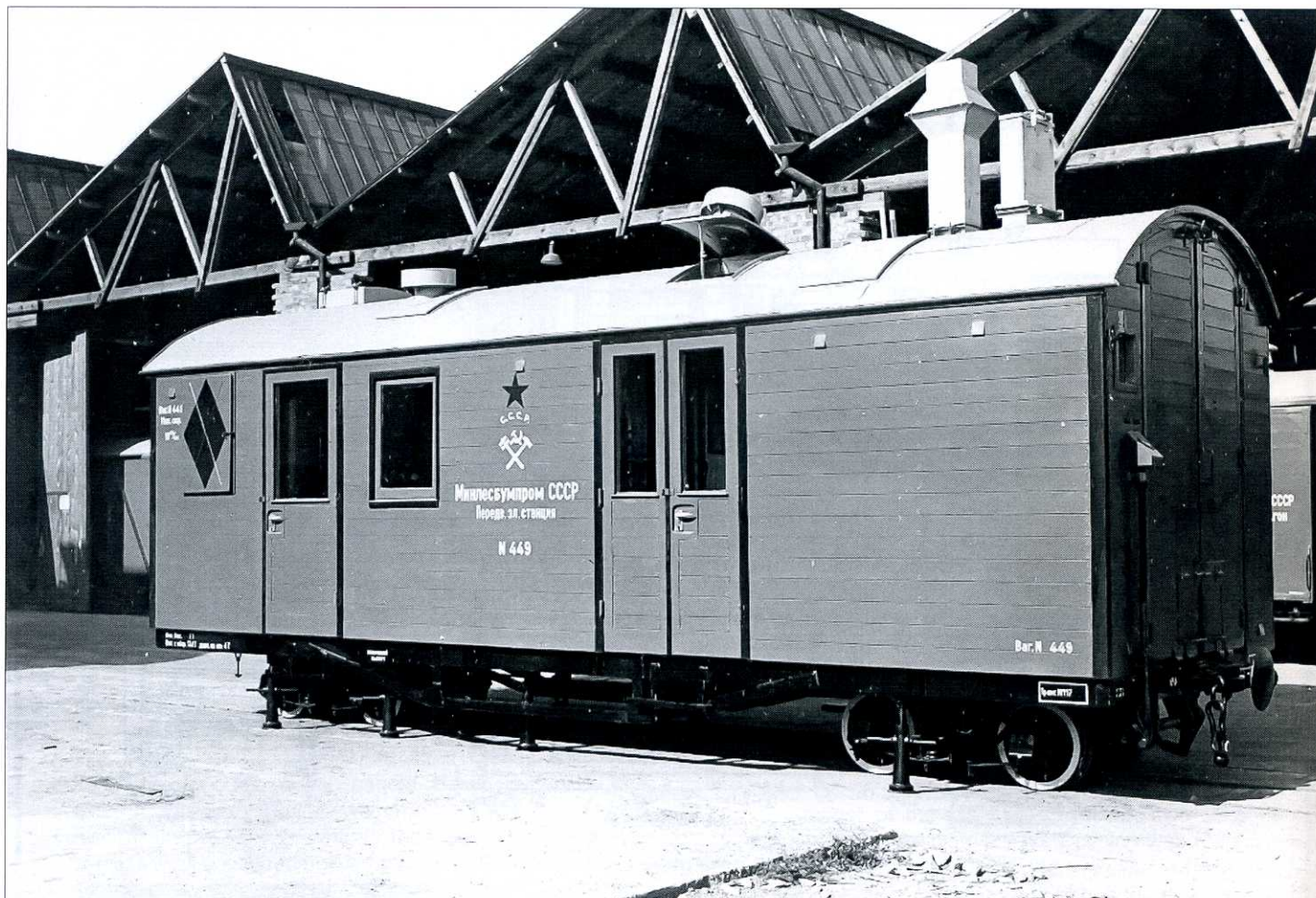


below the roof level;

- To provide stabilisation to the Wagon when used as a crane, or when equipment was being used in the workshop, permanently attached jacks were provided under the main frames with two on each side alongside the bogie centres, and two more on each side to provide additional support for the crane roughly equally spaced either side of the bogie jack at the crane end of the Wagon (including one at the

end of the Wagon virtually under the jib brackets), the jacks were suspended under the frames when not in use;

- Additional stabilisation when the crane was in use also came from rail head clips, of the scissor type, suspended from the frame at each end of the Wagon to both rails, once again these were hooked up when not in use; and
- Finally the *Fakultativwagen* type of ladder was once again provided at the workshop end of the Wagon.



Передвижная Паровая Электрическая Станция, 40 кВт (kW) (ППЭС-40 - Mobile Steam Electricity Station, 40 kW (kW))

The design of the Electricity Station seems to have followed after that of the *Fakultativwagen* and indeed the Workshop Wagon; while there were elements in common with both, some major changes had to be made to meet the operational requirements of the Station.

Once again the overall design can be seen in the accompanying drawing and illustrations, the main aspects of which are:

- The main chassis frame was again 7.74m long with a width of 2.25m as on the Workshop Wagon, but unlike the other vehicles the edge of the frames was reinforced with a light external girder arrangement (to cater for the higher loadings on this vehicle);
- The same 1.02m diamond frame bogies seem to have been used – but they were symmetrically placed with a spacing between centres of 5.24m (a preliminary drawing has been found indicating an asymmetrical spacing as on the *Fakultativwagen* and the Workshop Wagon but it must be assumed that more detailed calculations relating to the weight distribution of the various equipment required the use of symmetrical bogies);
- The body broadly followed the Workshop Wagon pattern of steel frames with flush horizontal wooden plank panels between, insulation between the outer and inner walls and an arc roof (however the door furniture was somewhat more sophisticated than the 'standard' found on both the *Fakultativwagen* and the Workshop);
- At one end of the vehicle there was a large circular hole in the upper part of the external panelling matched by a rectangular hole on both sides which were covered by grilles of wire and sheet metal to provide an air flow for the fan condenser;
- The interior of the vehicle was split into two unequal rooms with a door between – one smaller room held a boiler unit and provided a floor storage area for wood fuel with double doors both sides (for loading wood fuel and to allow

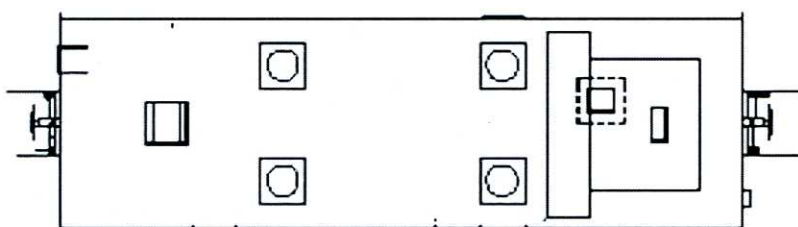
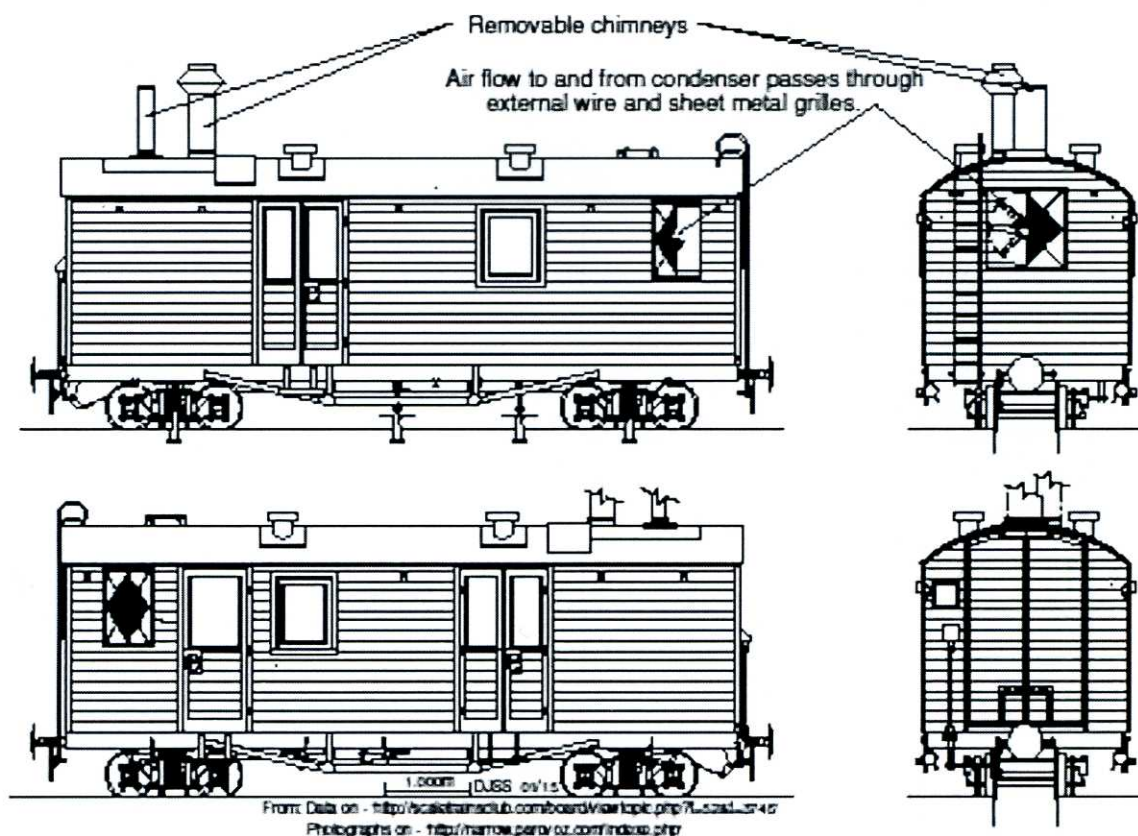
A newly constructed Mobile Steam Electricity Station.

Ammendorf Works

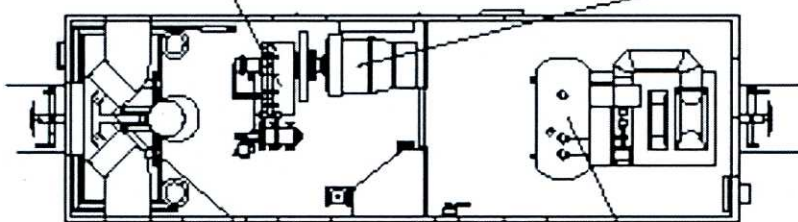
a cooling airflow) and at the end of the Station very large double doors (to allow the removal of the complete boiler unit for servicing / replacement and to allow a cooling airflow) together with a hand brake wheel and an associated small window alongside the doors, while the other room held a steam engine, generator, switch panel, fan condenser and water tank and had windows on both sides and a single door on one side;

- The Station equipment is believed to have been sourced totally from manufacturers within the *SBZ/DDR* although only one specific supplier has been identified, the main items being –
 - A composite boiler unit, fired primarily by wood, supplied by specialist boilermaker F.L. Oschatz of Meerane (Sachsen) [company founded 1849, taken over in 1945 as a *Sowjetische Aktiengesellschaft* (SAG), in 1948 became *VEB Dampfkesselbau Meerane*, in 1990 became *Meeraner Dampfkesselbau GmbH*, and in 2007 was taken over by Hitachi^{vii} – a former employee of F.L. Oschatz established a separate company *Oschatz GmbH* in Mannheim/ Essen in 1948 and this also still exists^{viii}];
 - Which supplied steam to a small 60hp 2-cylinder steam engine mounted across the Station;
 - Which was coupled to an electric generator placed along the side of the Station (with switchboard / control panel on the side wall of the Station above/behind the generator) supplying either 230V AC (some supplied up to 1950) or 400V AC (with transformers to convert to 230V AC);
 - With a large fan condenser at the end of the car taking the exhaust steam from the engine and condensing it back into water stored in a tank below the condenser for re-use in the boiler;
 - Logically the Station was lit with electric lights in the Ceiling;
- A removable chimney and steam escape vent were attached

USSR 0.750m Gauge - Mobile Electricity Station



60hp 2-cylinder steam engine Generator (with switchboard on wall behind)



Fan condenser (with water tank below) Boiler

on the roof above the boiler unit when the Station was in operation (the chimney was of a simplified 'balloon' type to try to catch the sparks from the burning wood and reduce potential fire risk in the forest^(k)), in addition an area of the car roof on each side of each room provided ventilation (these all had fixed ventilators but they could also be propped open to allow a cooling airflow), and roof access was provided at the condenser end of the Station by the same ladder found

- on the *Fakultativwagen* and the Workshop; and
- Like the Workshop, permanently attached jacks were provided under the main frames to stabilise the Station when in use with two each side alongside the bogie centres and two more on each side in the area of the steam-engine and electricity generator where there would be considerable sideways vibration (these were suspended under the frames when not in use).

Main Dimensions etc.

	Workshop Wagon	Mobile Steam Electricity Station
Length over buffers	8.527m	8.527m
Overall width	2.520m	2.520m
Maximum height above rail level	3.110m (not allowing for ventilators, ladder or chimney)	3.110m (not allowing for ventilators, ladder or removable chimneys)
Centre buffer above rail level	0.620m	0.620m
Bogie centre	4.500m	5.240m
Bogie wheelbase	1.020m	1.020m
Wheel diameter	0.500m	0.500m
Unladen weight	7.5t	13.663t
Load capacity	5.5t	
Working requirements		Water in boiler 0.25t Water in condenser (full) 1.3t Water in tank 0.43t Wood reserve 0.15t Oil etc. 0.07t 2 crew 0.15t
Total Maximum / Working Order Weight	13.000t	16.013t
Electricity Output		230V/400V AC - 40kW
Brakes	Hand (from wheel in Workshop)	Hand (from wheel in Boiler Room)

Delivery & Use

The construction of both vehicles seems to have started around 1948 and continued till 1954. The actual number is likely to have been less than the 500 *Fakultativwagen* which are believed to have been built; but once again the total number, how many came from Ammendorf or Weimar, and when, cannot at present be identified.

The Workshop Wagons and the Mobile Electricity Stations were delivered to industrial railways across the USSR. Various examples can be found in the images on Dmitry Zinoviev's website: <http://narrow.parovoz.com/indexe.php>.

While in use the Electricity Stations did not seem to have suffered any major level of modification, although the condenser grilles do seem to have often been opened / removed to assist in air flow. However some of the Workshop Wagons did have a number of modifications whilst in use, which included:

- Removal of the stove and chimney;
- Roof recovering with roofing felt of various widths;
- Replacing the bogies with various other available types;
- Covering / replacement / removal of windows and doors;
- Re-use of crew vestibule as a storage area;
- Removal of all or part of inside wall between crew vestibule and workshop area;
- Reconstruction of the crane with a larger jib;
- Crane taken out of use (with rope removed);
- Removal of crane;
- Removal of jacks and rail-head clips; and
- Provision of additional, or removal of some original, tools, lights and work areas.

One photographed example rebuilt with a combination of a larger crane jib and with the jacks removed does show inevitably excessive body lean due to overloaded bogie springs on the side supporting the jib.

After-life

The Mobile Steam Electricity Stations had a limited period of functionality. They inherently suffered from the basic problem of the use of electricity with cables linking from the stations to the equipment being used: both limiting distances to the working environment and having problems of safety in the messy and wet working conditions of the forest. Most forestry enterprises and dispersed industrial plants gradually achieved their own permanent electrical supply facilities for workshop and general uses. In addition, from early in the 1950s alternative equipment came into use for forest work^{x, xi}:

- From the late 1940s mass produced wood gas-generator crawler tractors of type KT-12^{xii}, built initially at Kirovskiy works in Leningrad and from 1951 in Minsk, came into use to replace the electric crawler winches for timber haulage;
- From 1955 mass produced petrol chainsaws (called 'Druzhba' (Дружба) – 'Friendship' – to commemorate the 300th anniversary of the unification of Ukraine and Russia in 1954!) were introduced and rapidly replaced the electric chainsaws; and
- Where mobile generating stations were required new self-propelled diesel-electricity generating stations were developed by Demikhovo Works (SEP and later ESU) for the peat industry and Kambarka Works (SRP-2 based on the DM54 diesel locomotive) for the timber industry – but these were aimed primarily to provide power for mechanical track-laying machines and quantity production did not start until a little later.^{xiii}

It should be noted that as well as the KT-12 tractors, many vehicles both road and rail, in the USSR at this time were fuelled by gas-generators (as were some buses in the UK during the 1939-45 War) and the production of the small wooden chocks to fire the generators employed quite a large proportion of the USSR logging industry at the time.



A workshop still exists in a dilapidated condition at Soblago, in Tver Oblast, on the route of the abandoned 63km former forestry line from Andreapol to Zhukopa with some equipment still available for use!

S. Gabbasov



The forestry railway starting at Lipakovo, in Archangel Oblast, still has some 113km of route and provides limited passenger train access for 33km to the isolated settlements of Luzhma and Cézanne. At Lipakovo itself the remains of an Electricity Station, immediately recognisable from the end circular aperture, is still to be seen emerging from the snow.

S. Shorokov

Unlike the Electricity Stations, the Workshop Wagons had a somewhat longer working life since they were found to be very well equipped and retained their primary role for considerable periods as static installations in many locations using permanent power supplies (although their cranes and sleeping accommodation were generally not retained in use), some remaining on their bogies while others were grounded in their later lives.

The bodies of both the Workshops and Electricity Stations, stripped of machinery, were also reused as storage sheds in many locations. The former Workshops proved the most practical and robust in this new role since it was far harder to make the Electricity Stations weather-tight given the large circular hole at the end of the timber body to accommodate the grille and fan for the condenser. Scattered carcasses of both types of vehicle could be found until relatively recently across the area of the former USSR – indeed in some cases matched pairs of each type remained close to each other.

Context

Instead of electric power lines running into the forest areas after the Second World War the 0.750m lines, with their Workshop Wagons and Mobile Steam Electricity Stations, were able to provide a means of distributing electrically-powered equipment and the required power supply – albeit only as required on a temporary peripatetic basis. It was a useful palliative until the main electric supply reached most outlying settlements and other more flexible forms of power appeared for basic forestry roles.

These vehicles used facilities and resources from Germany as a temporary expedient to help develop industry in the USSR which had been largely decimated during the Second World War, until Soviet industry was able to meet further requirements. Their design followed on as a logical development from the *Fakultativwagen*.

Remnants of the Workshop Wagons and Mobile Electricity Stations lingered on as abandoned hulks, or indeed the former in working order, until relatively recently. Some of the remains were mistakenly noted as *Faultativwagen*, or vice versa, but the large

round aperture in the end of the Electricity Station quickly showed its true identity.

References:

- i. http://en.wikipedia.org/wiki/GOELRO_plan
- ii. Lenin, V., *Our Foreign and Domestic Position and Party Tasks*, Speech delivered to The Moscow Gubernia Conference Of The R.C.P.(B.), 21.11.1920. <https://www.marxists.org/archive/lenin/works/1920/nov/21.htm>
- iii. *Goelro Plan*, in *The Great Soviet Encyclopedia*, 3rd Edition (1970-1979). <http://encyclopedia2.thefreedictionary.com/Goelro+Plan>
- iv. <http://www.americanforeignrelations.com/O-W/Oil-Oil-and-world-power.html>
- v. Kühle M., Machel W-D., *Schmalspurwagen der Waggonfabriken Ammendorf und Weimar ab 1946/47*, in 'Die Museums-Eisenbahn 1/1997'.
- vi. Scotney D., *A German Fakultativwagen in the Soviet Forests*, in *Locomotives International Annual No. 1*, Mainline & Maritime Ltd, 2014.
- vii. http://www.mdkb.de/en_20_history.html?oncekeys=id%7Ccode%7Ctemplate
- viii. <http://www.oschatz.com/historie.html?&L=1>
- ix. Semmens P.W.B. & Goldfinch A.J., *How Steam Locomotives Really Work*, Oxford University Press, 2003, pp.23-24..
- x. *Logging Equipment*, in *The Great Soviet Encyclopedia*, 3rd Edition (1970-1979). <http://encyclopedia2.thefreedictionary.com/Logging+Equipment>
- xi. <http://www.ilimgroup.com/techprocess/harvesting-technologies/facts/>
- xii. <http://www.belarus-tractor.com/de/company/production-history/>
- xiii. Kashin P., Bochenkov V., Balabin V. & Moskalev L., *Russian Narrow-Gauge Diesel and Electric Locomotives*, Zhelznodorozhnoe Delo, 2003.

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<http://narrow.parovoz.com/indexe.php>; and

<http://scaletrainsclub.com/board/viewforum.php?f=52>.