

AUTOCAR

1903 North Eastern Railway Electric Autocar Trust

Newsletter No.20 — Summer 2013



The North Eastern Railway 1903 Electric Autocar Trust

Registered Charity No: 1105829
Company Registration No: 05171008
www.electrcautocar.co.uk

- Chairman** Stephen Middleton,
Rose Lea House, 23 Brunswick Drive, Harrogate,
North Yorkshire, HG1 2QW.
Tel - 01423 561 965
E-mail - middletonmarketing@btconnect.com
- Secretary** Dave Cullingworth,
29 Beckett Close, Nawton, York, YO62 7SB.
Tel: 01439 771 758
E-mail: david.cullingworth@btinternet.com
- Treasurer** Peter Lund,
41 Penfold Way, Dodleston, Chester, CH4 9NL.
Tel: 01244 661070
E-mail - plund97005@aol.com
- Press,
Publicity
& Editor** Simon Gott,
Embsay Station, East Lane, Embsay, Skipton,
BD23 6QX.
Tel: 07564 249 029 (daytime only please)
E-mail: autocar.newsletter@gmail.com
- Membership** Stuart Hiscock,
2 Lairs Crescent, Snainton, N Yorkshire, YO13 9BQ.
- Project Engineer** Steve Hoather
- Front Cover:** Glazing in the autocoach (Stephen Middleton)

July 2013

Welcome to the 20th issue of our newsletter. Progress continues on various fronts with both the autocar and autococh. In this issue we have Alan Chandler's piece on restoring the end of the autocar and look at some of the work that has been done on the autococh.

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New Members

A warm welcome to our latest new members, Mr V Shahbazian of Harrow, Mr B Morris of Leyburn and Mr D Reeve of Bury.

Underframe appeal

Nearly there! Since the last newsletter we have received donations from R Chapman, D Sunderland and S Clarke and have now reached a grand total of £5860.70. There's only £139.70 to go to reach our goal of £6000 to fund the purchase and transport costs of our underframe, which will soon be in use. Just a few more cheques are needed to achieve our target - will it be yours that reaches the 6K mark? (Please send cheques to Stuart, our membership secretary — his address is opposite).

Chairman's notes

Stephen Middleton

It is gratifying to see momentum building. Over the past month we have gratefully received some exceptionally generous donations for the underframe. In addition, our 'founder donor' the Ken Hoole Trust approved £6000 to pay for new doors for the autococh. This will save us time and give a better, safer coach than trying to repair the very poor original examples. *Heritage Railway* magazine ran a page about our project, describing it as one of the most important in railway preservation. That is very heartening.

Progress on the autococh is rapid, with windows glazed, ends repanelled and roof canvassed within four weeks. The engineering side is progressing to schedule in Loughborough too and next year we should see something not seen for over 80 years, 3170 able to run under its' own steam, well diesel actually!

Thank you for all your support. You are making this project happen.



Above: The autococh being shunted, giving us a good view. (Mike Edwards)

Opposite: The two ends, showing recent work. (Both Stephen Middleton).



Engineering Progress Report

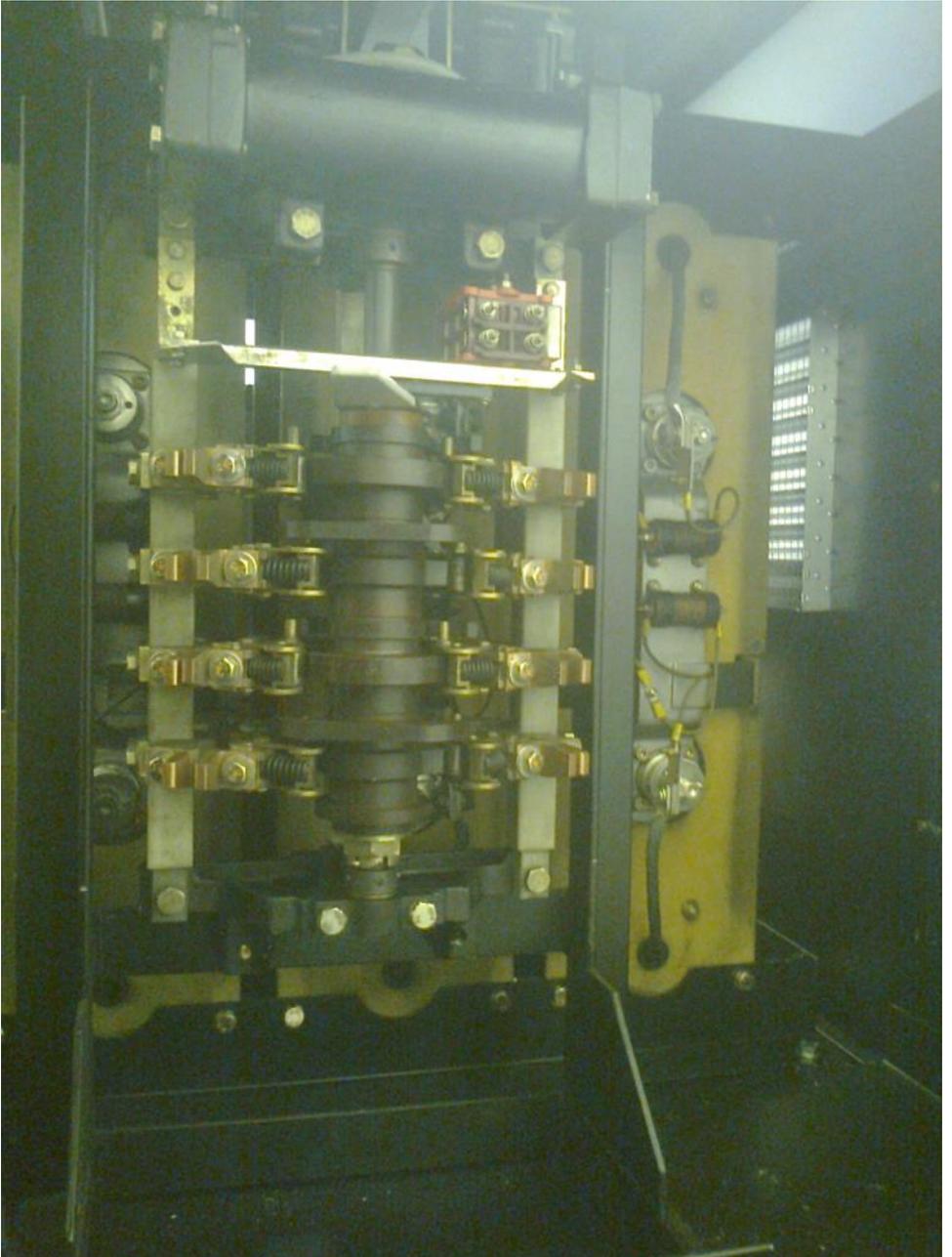
Stephen Hoather

Since the engine housing was delivered to our workshop in March, Dave Moore and Peter Van Houten have been working on fitting the ancillary equipment in the empty spaces in the housing. There are spaces at both ends of the housing, so we are splitting the equipment, with the high voltage gear at one end (rectifiers, contactors, reverser etc.), and the low voltage electronic control racks at the other. Having agreed the layout for each section, Peter then draws the various mounting brackets and arranges for Adey's to make them. When painted, Peter fits the components to check everything is OK, all the time trying to keep ahead of Adey's needs for the next set of drawings. The HV end is nearly ready for wiring up, and we have started on the LV end. The photo opposite shows the reverser, which is a large electrical switch which changes the connections to the motors depending on the direction selected by the driver.

In his quieter periods, Peter has also been preparing drawings of the fuel tank (which is in three sections to fit in the underframe) and battery box. The drawing for the centre section of the fuel tank is ready to start manufacture, and the battery box is almost finished at Adey's. Interestingly, this box uses the original mounting points on the underframe dating back to when it was built as a GNR Milk van. The battery box has been designed to look like a typical one of the period, but is made of steel instead of wood and is deeper to allow the charging transformer to fit inside.

Noel Craigen and Dave have been working on the electrical schematic drawing for the vehicle, and this threw up a number of questions on the details of the fire detection and suppression system for the engine. We had always intended to have this aspect assessed by an independent expert (like the braking system), and I am delighted that we have obtained the services of Evan Green-Hughes for this role. Evan has a background in fire technology in the film industry, and is associated with several preserved railways.

I said last time that we were still hoping to obtain the remaining brake gear from some scrap vehicles in Northern Ireland. This turned out to be a bit of a roller coaster ride, but our brakes contractor (Railway Brake Services) is also working for the Brighton Belle project and they were also interested in some



parts from these vehicles. At very short notice, Phil Coomer of RBS went over to Northern Ireland with Simon Hartshorne from the Brighton Belle project and removed some of the gear. He was also able to arrange for the scrap merchant

to remove other items later. I have not yet got a complete list, but hopefully we now have everything we need to recover for the brake system, apart from one valve for the trailer (which was not fitted to the NIR vehicles).

As part of our Safety Verification process, we arranged to hold a “Risk Review” meeting in early June with representatives of two of the railways which are likely to operate the unit – E&BASR and NYMR. The aim was to identify any issues which might need design changes, so that they can be included at an early stage. It was a very useful meeting which helped clarify our thinking in a number of areas such as the marker/tail lights, operation of the fire system and driver/guard communication. It emerged at the meeting that neither railway could guarantee to be able to provide an air braked loco to rescue the autocar should it fail in service, so we are now looking at the possibility of fitting a vacuum through pipe along the outside of the power car’s solebar to permit the vacuum brake on the trailer car to be used in some rescue situations.

The unpowered bogie for the power car is now at Boston Lodge where they are making good progress with its overhaul.





The underframe is still stored in the yard at Adey's in the condition it was delivered from Emsay. We are not being charged for this storage, but when it goes into their workshop, we will (understandably) be charged for storage if we are not ready to proceed with all the work. The drawings for the underframe reinforcing plates are at present being reviewed by our independent engineer before they are released for manufacture, and when it goes in the shop we also intend to fit the larger assemblies such as the engine housing, fuel tanks, battery box and brake cylinders. At the same time the motor bogie needs the speed probes and extra footstep brackets fitted, and (hopefully) we will be able to swap the unpowered bogie for the overhauled one from Boston Lodge. It's a bit like a game of skittles, get them all lined up before you fire.....!



Opposite and this page:

Work on the bogie, with new sections of frame, a spring and a frame to test it, a bolster, looking smart and shiny.

(Jon Whalley - CME, F&WHR)

Raising an eyebrow

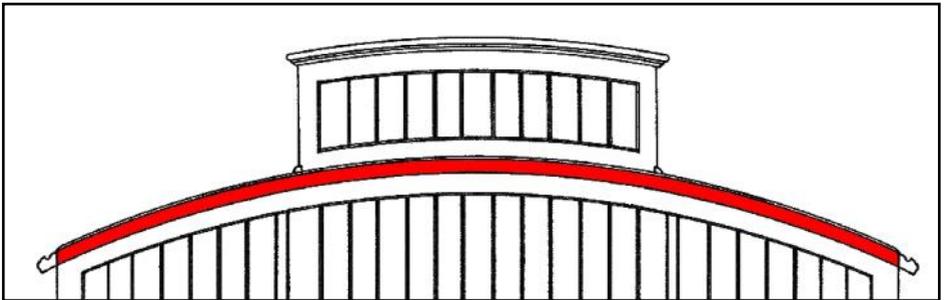
Alan Chandler

As work continues on the saloon end of the autocar, we needed a replacement beading to secure the roof canvas at the front edge of the roof. This beading is complex in shape. It is approx. 25mm thick and 45mm wide and curves in two planes, to match both the curved profile of the roof and the bow at the end of the autocar. This is illustrated below, with the beading highlighted in red.

The end of the autocar viewed from above:

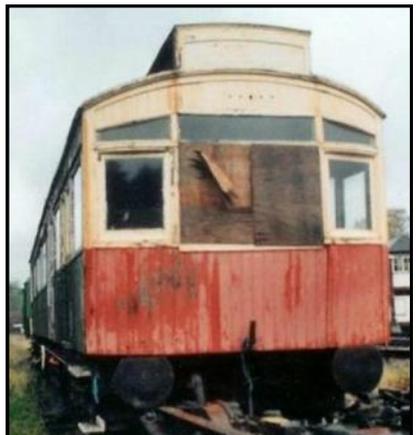


and viewed from the front:



The archive view opposite, taken before the start of restoration, shows the original beading at the engine end, perhaps looking like eyebrows on the face of the autocar.

Photo: Alan Lancaster





Our options for making this beading were a) to cut it from a large piece of hardwood, b) attempt to accurately steam-bend hardwood of the correct cross-section to match the two profiles or c) laminate it from curved strips of hardwood, cut to match one radius and bent to the other. This last method was chosen as being the simplest and therefore most likely to succeed.

The beading was made in three sections. The centre section, under the clerestory, only curves in the vertical plan and so was cut from a single piece of hardwood.

Above: A more recent view. (Stephen Middleton)

Below: Since the above photograph was taken, Alan attached the rest of the tongue and groove boarding, including that above the cab windows, seen below partially overlapped by the centre section of the beading. (Simon Gott)



The two side sections were made with thin strips of hardwood, cut to match the curve of the roof. These were glued together while firmly screwed around the curved front of the autocar. Polyurethane glue was used to ensure the final beading will be waterproof. The beading was built up to the required thickness using six laminations and the assembly then trimmed to the final shape.

The following pictures show one of the side sections during manufacture and the finished section lap-jointed to the centre section.



These final views show the finished beading, complete with half round trim that was steam-bent to the required shape. The Autocar has it's eyebrows back!



Autocoach Droplights

Over the last few months, Colin Clift has been working on the autocoach's droplights. These are made from four sections of timber, which when locked together, hold the glass in place. The glazing fits in a groove cut on the inner edge of all four sections.



Top:

Holding the droplight rigid while the glue dries.

Opposite:

Showing the tongue and slot assembly of the droplights.

(Both SG)

An Engineer's Perspective — Traction design (continued)

Dave Moore — Volunteer Engineering Advisor to the Trust

The Electrical Power Equipment

As we are now at the stage when the large electrical apparatus is being fitted into the engine housing, it is a good time to describe and explain what these items do. When fully assembled, much of this equipment is buried out of sight and remains a mystery to the casual onlooker. This part of the project is effectively a large part of the transmission which makes the electric drive so special, in much the same way as when it was first used in 1903.

Our power equipment is of a later vintage, but it is representative of what became the classic diesel-electric locomotive transmission employed on all the Direct Current traction motored locomotives used in this country, from LMS 10000 to the modern General Motors Class 66s. The basic principle is the same, indeed most of the heavy electrical gear even looks similar, and the method of operation is much the same. Most road vehicles use gearboxes with friction clutches, and on the railways most multiple units have engines driving gearboxes with torque converters – effectively hydraulic automatic transmissions. Electric transmissions such as ours are very much in the minority. As such, knowledge on how they work tends to be limited to those few electrical specialists who design or maintain them. Their special features and efficiency has given them this level of importance to the project.

The cornerstone of the electric railway vehicle transmission is always the traction motor itself; everything to do with our autocar's required performance defines what the required motor characteristics are. We worked out what the required Tractive Effort and Traction Power characteristics would be for the autocar plus its autocoach at the beginning of the project. We wanted to be able to work on any heritage line, and this meant designing the system so that the Tractive Effort is sufficient to start the two coach train on a 1 in 49 gradient. This is at Goathland on the NYMR and the steepest we are likely to encounter. The SR Mark 4 motor bogie we sourced has two English Electric EE507 motors – these were standard on virtually all SR stock from 1951 to 1984, and a single bogie could lift two coaches up the 1 in 30 of the Folkestone Harbour branch.

Moving back up the transmission to the power source, the main (i.e. traction)

alternator coupled to the engine outputs a 3 phase supply of varying frequency and voltage. This all seems rather complicated, but this regulated power source to the motors is simplified by passing it through a rectifier unit to make it into direct current for the DC traction motor. Reproduced opposite is a section of the electrical schematic diagram for the new autocar system, produced by Noel Craigen, working in conjunction with myself. This shows how the transmission elements link up to create a power drive. I've coloured the diagram in the most interesting places to make it easy to follow.

The important point to understand is that we may be rebuilding the power drive 110 years on, but many of the major components are descendants of the original apparatus, and do indeed even look similar. At the left of the electrical diagram, is the traction power source, shaded in orange. The field of this machine is controlled by the ECU, described previously, and its 3 phase alternating current output is shown in red. This is split between the traction motors at this point, and two independent rectifiers convert this into direct current, shown in blue. The original machinery is clearly shown in the photos to be a big (they always were at this time) DC Generator with exciter machine, which actually has less parts than our latterday system. The direct current to the traction motors is switched by large power switches known as contactors, shaded in blue. This puts the DC onto the motor, but its direction of rotation has to be set by determining the direction of current flow through the traction motor field with respect to the direction of current flow through its armature.

This has been the method of reversing traction motors since tramcar days, and works well but requires a dedicated multiple contact switch in order to do it. Both motors are reversed simultaneously as they must always go together, and the twin reverser, in shaded green, does exactly this. This swaps over the direction of current through the fields shown in orange, and allows electrical direction change without the need for a gearbox. Even the most modern mechanical transmissions can have difficulties when being converted for rail, because equipment developed for automotive applications never gets driven at full speed in reverse for half its working day!

AGM

We have set the date of the AGM for Saturday 12th October at Embsay, probably starting around 13.30. Afterwards, there will be an opportunity to look at the autopair and inspect progress. The station bookshop will be open — members of the Trust are entitled to a 10% discount.

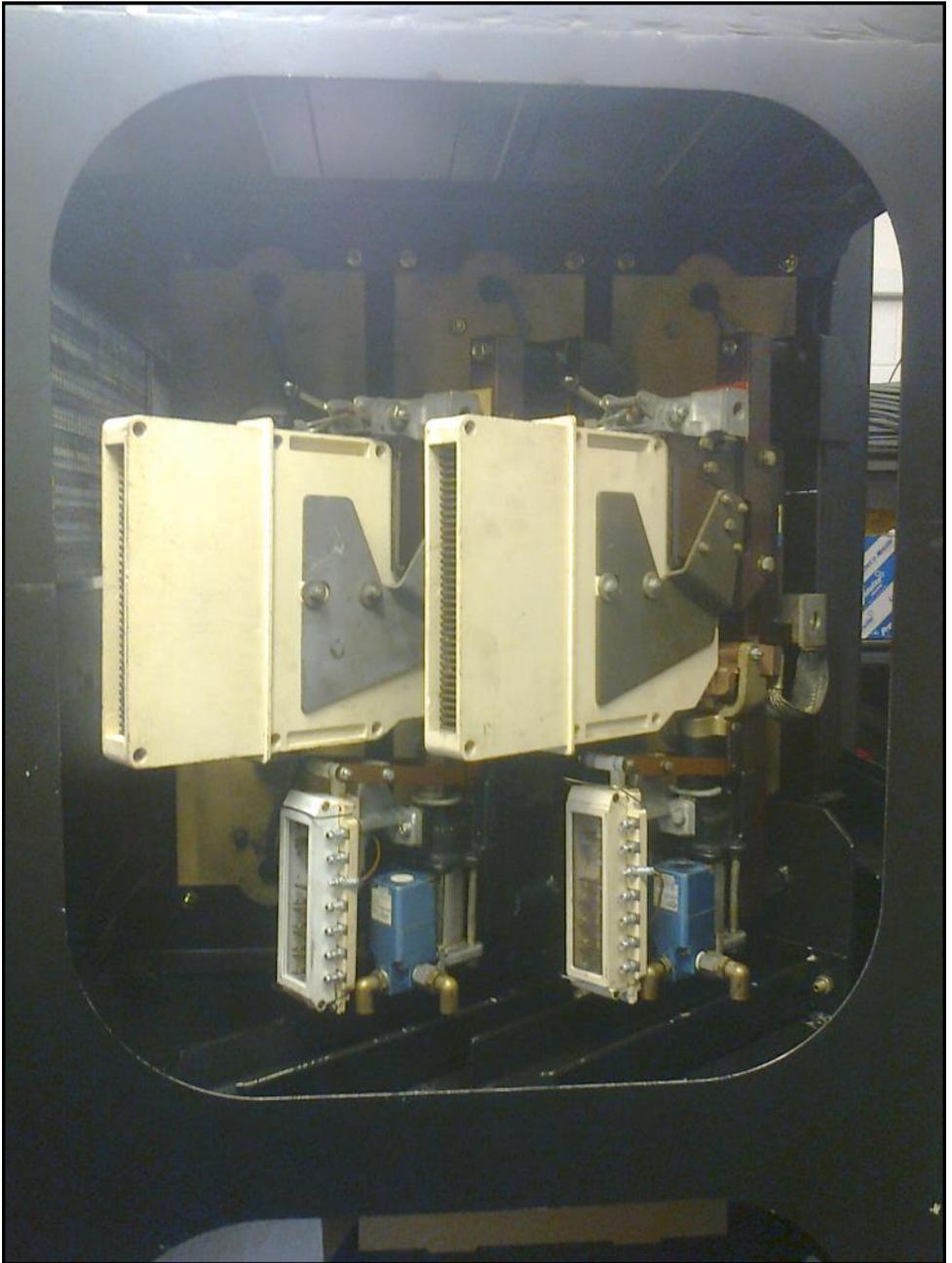
On Sunday the Keighley Model Railway Club are holding their 7mm Festival and the Worth Valley Railway have a steam gala running on both days, so members living further afield may wish to make a weekend of it. One of the members of the Keighley Club scratchbuilt a 7mm model of the autococh and this sometimes runs with an autococh, as seen below, giving people a miniature preview of what we hope to achieve in 2014-15.



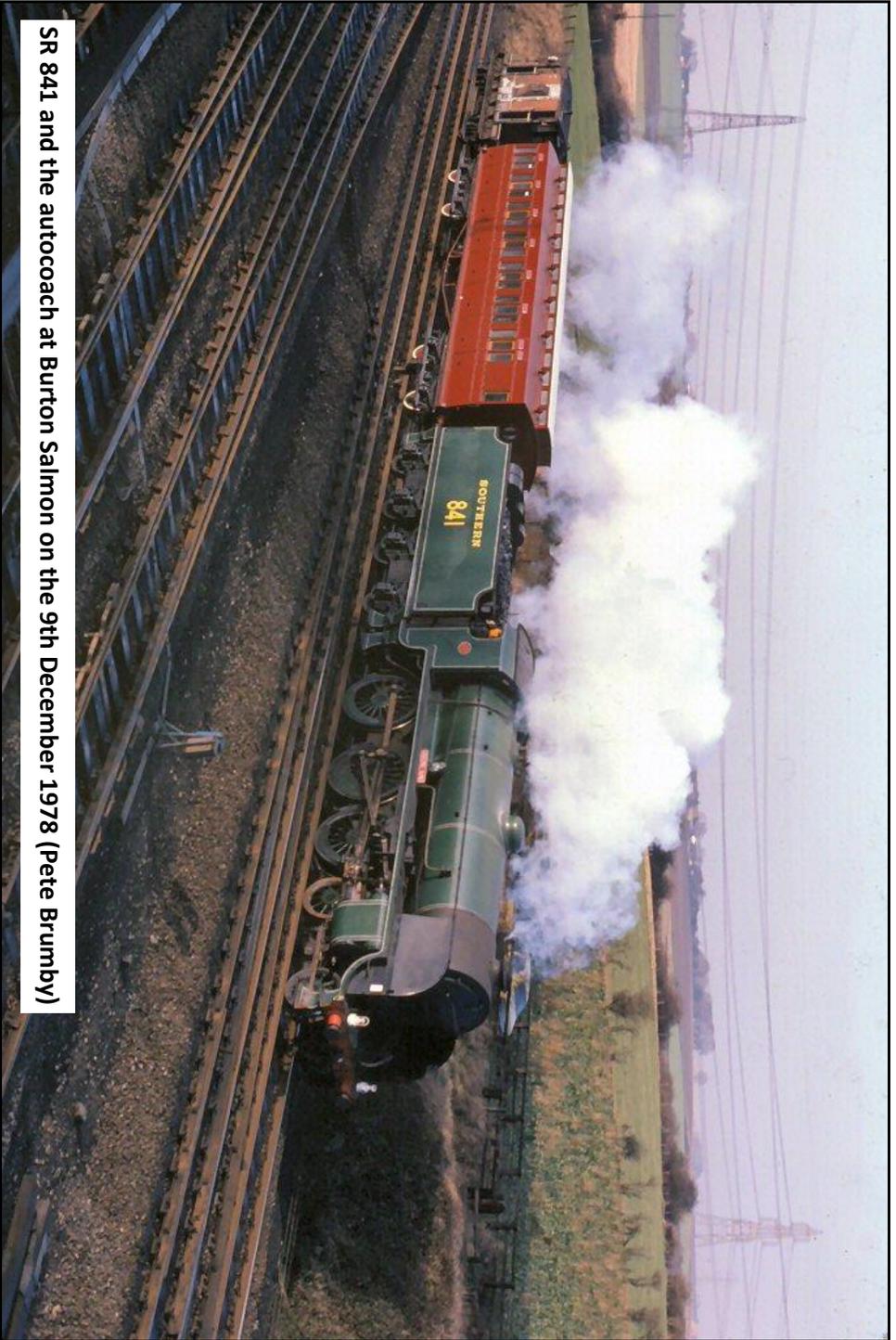
Publicity

Our publicity stand attended Scalefour North and Bradford model railway exhibitions — thankyou to Geoff Wilson and Michael Savage for manning the stand and to the Scalefour Society and Bradford Club for the invites and their hospitality.

We are due to attend Pickering model railway exhibition on the 17th and 18th August — if you can attend, I'd recommend it. It is held in the Memorial Hall which is around 200 yards from the NYMR station. Although held at Pickering, it is actually organised by the Scarborough club: <http://sdrmweb.co.uk/>



Trial fitting the motor contactors in the engine housing. (Dave Moore)



SR 841 and the autococh on Burton Salmon on the 9th December 1978 (Pete Brumby)