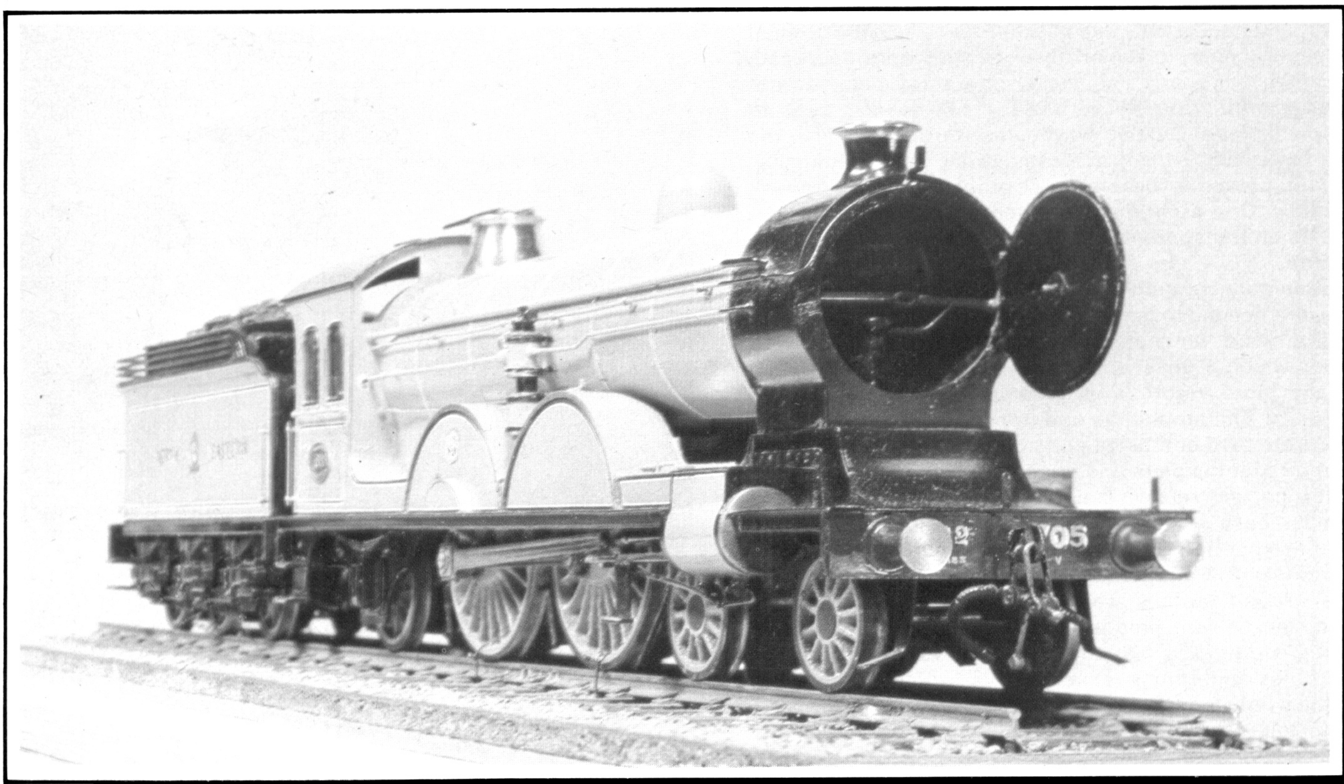


CLASS 'V' ATLANTIC

The Prototype

The 'V' Class was introduced on to the North Eastern Railway in November 1903 with the prototype, No. 532. They were a logical extension, by Wilson Worsdell, of his excellent 4-4-0 tender express engines (in the same sense that Raven's 'Pacific' was a logical extension of his superb 'Atlantic' types.) It was discovered, in service, that the cab roof of No. 532 was pitched too low, resulting in poor visibility for the crew along the 5ft 6in. diameter boiler. The roof was raised, retaining the same arc diameter and the whistles removed from the roof and placed on top of the firebox between the safety valve casing and spectacle plate. Nine further 'V' Class were built in 1903-04 providing a much needed and powerful addition to the hard pressed R, S and other types.

The Model

Astute followers of Geordie locomotive practice will notice an inexcusable howler on reading this article, which basically could have been avoided if a little more research had been carried out. If you can't see it read on and perhaps you won't fall into the same trap.

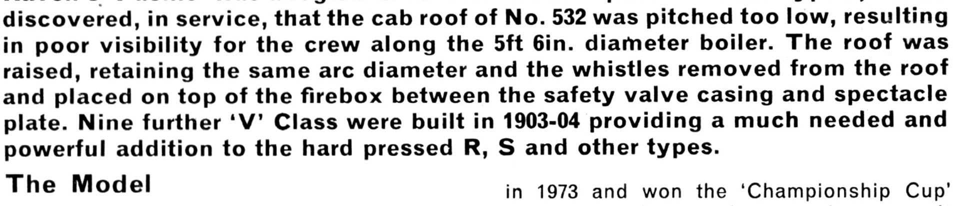
This model was started in 1965 and in spurts of 'stop-go' activity was completed in 1973 and won the 'Championship Cup' at the Manchester show in that year. It should have started life as a 'Z' Class 'Atlantic', since having seen photographs of that handsome class, in a number of books, it was my intention to build one. So, 'taking my first walk into space', so to speak, I purchased the 'O' gauge Skinley blue print and this was my first mistake. The catalogue said 'LNER Atlantic type ex NER'. Now in my ignorance, I did not know that there was more than one 'Atlantic' type on the North Eastern so on studying the drawing, several differences quickly became apparent.

1. It was in Gresley LNER condition.
2. It drove from outside cylinders on to the second driving wheel (identifying it as a 'V' Class).
3. The splashers were very wide (identifying it as a 'V' rather than a 'V/09' which had splashers marginally thicker than the driving wheels).

To build a model in NER condition, with that dominant gem of a safety valve casing, required more detailed information. This came principally from four sources.

1. 'Engineering' for January 1904, which contained sections and sectional elevations of the locomotive. Especially good for details of Westinghouse Pump, cab-layout, safety-valves, casing and smokebox layout.
2. 'Railway Modeller' for April 1954. Especially good for tender and general livery details.
3. Ken Hoole's book 'The North Eastern Atlantics'. To all people interested in North Eastern engines or 'Atlantic' types, this book is a must, containing equally readable matter and reams of statistics, plus useful photographs.
4. At least two dozen photographs of the class at work and at rest, giving three dimensional detail and at the same time clarifying much of the 'Engineering' drawing.

I once read that when commencing work on a tender loco, 'always start with the tender'. This was to ensure a uniform standard of finish between loco and tender since the loco normally takes longer to build and in order to complete the model, the tender is rushed resulting in an inferior product.



Photos: Brian Monaghan

The building of an O gauge fine scale locomotive

by
NEIL ROSE

The Tender

So I started with the tender. Bought out parts were the screw couplings, tender axleguards (trimmed down CCW (LNER) pattern) and wheel castings. The latter, as on the loco, were from the 'GAJO' range: these, up to 12 months ago, were readily available and in my opinion the best and cheapest ever offered to the O gauge fraternity. The tread and flange were machined to BRMSB standards, the centres bushed with nylon rod, and two wheels mounted on to 3/16in. dia. mild steel rod. The backs of the wheels were relieved on the lathe thus assisting the cleaning out between the spokes. Further turnings required were the buffers (mild steel shanks and brass stocks), pickup dome and filler pipe.

Always wishing to build from a flat base, I first cut out the running plate from brass sheet (I think about 0.030in. thick). The superstructure is basically a box soldered up from 0.020in. brass sheet. The flare on the sides and back of the tender were produced by rolling them on a piece of $\frac{1}{4}$in. diameter rod: the corners, where back and sides meet, were mitred by trial and error. Beading and coal rails are electrical conductor wire, similarly so are the handrails. The tender back is fitted with a handrail and a curious cranked lamp iron. The tender front is a mixture of detail gleaned from photographs and sectioned drawings. It is fitted with two toolboxes, fashioned from stripwood, sealed and painted, a brake column and water-pick up column and a coal-hole sandwiched between two vertical angles. The tender top sports a shovel and fire irons fashioned from copper wire and held in 'U' section brackets of brass strip. The load of coal is real and held in place by pouring carefully metered quantities of polyurethane varnish over several layers of coal pieces in an attempt to portray a tender that has had coal removed thro' its coal hole at footplate level.

The tender has a sub-frame that carries the three axles The outer frame to which the axleguards are attached is soldered to the running plate for strength and is electrically insulated from the wheels. It is soldered to the drag beam and buffer beam resulting in a strong outer chassis. The drag beam has a spring loaded tie bar fitted through it enabling the tender to be coupled to the loco. The rear buffer beam has the screw coupling fitted through the centre and the buffer stocks soldered at 39mm centres. Also, either side of the screw coupling are two sections of 5-link chain modelled from fine gauge wire and fixed to the beam by sweating through two 2mm square sections of shim copper. These chains on the prototype were, apparently, a throw back from early railway days when quality control on the forging of chain links was none too good resulting in runaway train sections, especially on inclines. Therefore couplings were multiplied for extra safety and this principle was projected into 20th century practice even when, as in this case, screw coupling drawgear was provided.

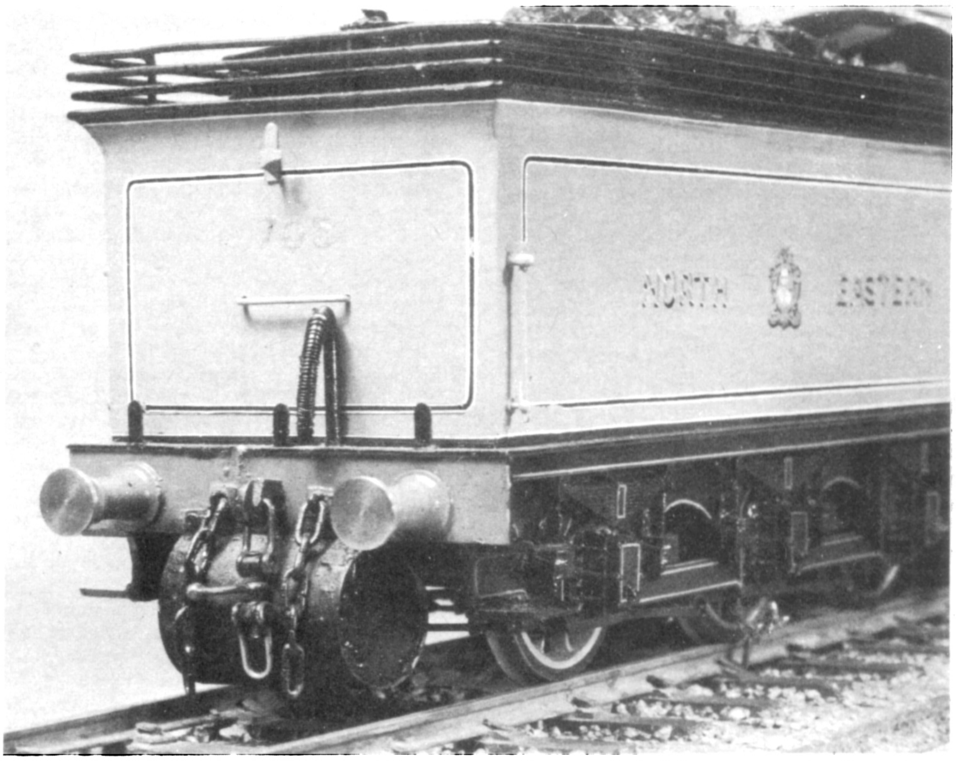
wheel treads, the brake blocks were turned from PVC bar and attached to the brake hangers with copper pins. The leading and middle axle are sprung, which improves the riding qualities of the tender significantly. Because there are always at least five wheels in contact with the track, it was decided to use the tender wheels for pick-up purposes. Phosphor-bronze strips bear on the back of each wheel and are fixed to strips of thin Bakelite on the inside of the 'U' section sub-frame, thus they are insulated from the chassis and body. Two wires are then taken from the tender, via push fit-connectors, to the motor in the loco.

Finally the superstructure is fitted to the running plate by four 6BA screws, one in each corner, through to tapped brass blocks in four corners of the dummy chassis.

The Locomotive

This part of the model was built as three separate units:

1. Chassis (including cylinders, buffer-beam and drag-beam, and motor).
2. Running Plate (including splashers, cab, cab roof and backhead fittings).
3. Boiler and Smokebox (including boiler mountings, smokebox internal detail and opening smokebox door).



Steam pipes and vacuum pipes are different diameters of copper wire with the flexible portion represented by fine fuse wire wrapped around and soldered top and bottom. Just under the buffer beam hangs an air cylinder held by brackets on to the beam. The cylinder was made by lapping copper shim around a piece of 16mm diameter dowel and glueing shim ends to the dowel. Rivet detail was produced with a blunted scriber. Fine 'L' shaped brackets were fabricated from 0.030 brass strip, pinned to the cylinder and soldered to the beam. The chassis sub-frame is an inverted 'U' shape in section and is based on the keeper plate principle using fine bore tube and wire.

The tender is fitted with full brake gear fabricated on a wooden block from thin brass strip and then transferred *en bloc* to the sub-frame. To insulate this spidery framework from possible contact with the

It was noted at the pre-construction stage, that the clearance afforded to the trailing axle was limited, in radial terms, thus again, as on the tender, the trailing axleguards perform a dummy function. I decided to commence work on the chassis rather than the running plate. This was because the latter was punctuated with holes for motor and wheel clearance, etc. and no doubt would have had to be 'fitted' to the chassis eventually to ensure clearance, so I thought it more practical to have a working chassis first, thus allowing me to cut out and fit the running plate afterwards in one go.

The Chassis

The frames are cut from a grade of brass known as 'Half-hard screwing brass' and are 1/16in. thick. Although the purists will say that this gives a full size frame thickness of nearly 3in. I think that there are two great advantages from choosing such a gauge: reasonable bearing thickness in the axle holes and inherent strength (stiffness) over a thinner gauge. Under reasonable circumstances the frame thickness is not discernable in the model. The frames are kept apart by brass spacers at three points: above the leading bogie, over the driving wheels and above the trailing axle. This results in a strong and heavy chassis, especially over the driving wheels, where it is needed most. The driving wheel axles have no compensation and actually rotate in the frame spacer.

Motors

The motor is an ex-Government 24v D.C. job bought from New Cross Radio Supplies in Manchester. This was treated in the manner described by the late Hamilton Bantock in the 'Railway Modeller' for April 1972. This meant, basically, stripping out the armature and endcaps and shaving off approximately 5/16in. on the diameter of the casing (i.e. 5/32in. on the radius) so that its overall width was no more than the overall width of the frames. It was then fitted in a simple gearbox and drives through worm and wormwheel direct on to the second driver. Two screws through either side of the frames keep the gearbox in position while the motor itself is clamped in a ring at the drive-end which, in turn, is fitted into the top of the gearbox.

Buffer and drag beams

The buffer beam and drag beam are sweated across the frame ends but the drag beam is dummy in that it does not take the train load. This is taken by a further spacer fashioned from brass sheet and screwed across the frames about ¼in. behind the drag beam. A further spacer of rigid PVC which is cemented between the frames, holds detail such as the reservoir cylinder and pipework (which I think is connected to ejectors on the prototype).

Leading bogie

The leading bogie is equalized and sprung after a fashion. Equalization comes from having one bogie side frame fixed and the other allowed to pivot in a vertical mode about its centre line. The keeper plate principle outlined on the tender is used here again. The bogie spacer is drilled centrally and fixed to a length of phosphor-bronze strip approximately ¼in. wide and 1¼in. long. The other end of the strip is drilled and fitted to a pin, on which it is allowed to rotate, midway between the leading driving wheel axle and the bogie centres. By forming this strip into a particular shape it presses down on the bogie thus ensuring its continued contact with the rails. It is not, though, a true bogie since it does not take any load off the driving axles.

Trailing axle

The rear axle is fixed and runs, as do the driving wheels, in generous journals of brass equal in length to the distance between the inside faces of the frames. The trailing axle journal is two small blocks of brass, squared up and screwed together. The axle hole is drilled along the interface of the two blocks so that, when separated, each block is half a journal, so to speak. The journal is held in place by thin gauge phosphor bronze strip attached to the frame spacer thus allowing this single axle a limited degree of compensation. The trailing axleguards are carried on a plate sub frame under the cab. This is cut from 1/32in. brass sheet and soldered to the main frame and drag beam. The particular pattern of axlebox casting was not available commercially so it eventually was fabricated as a hybrid using the laminated spring and hanger assembly from a MR6-wheel coach axlebox and an axlebox and hornblock combination from suitable pieces of brass offcuts.

Springs

Spring hangers and springs behind the driving wheels are manufactured by sweating together four pieces of brass and fretting out the combined shapes of hanger and spring, unsweating them and attaching them to the inside faces of the frames with the soldering iron. When painted black they are most effective and fill in behind the wheel spokes, what is on most models, an embarrassing amount of fresh air. Sand pipes are electrical conductor wire soldered to the frame sides. Brake gear is built up in a similar manner to that on the tender.

Wheels

Bogie and driving wheels are castings machined to BRMSB standards, as previously stated, and the bogie wheels are mounted on the axles in exactly the same way as the tender wheels. But the drivers had to be treated differently. Once the tread and flange had been turned, and the axle hole bushed, a little jig was knocked up which ensured constant positioning of the crankpin relating to the axle. Once the pilot crankpin hole had been drilled it was opened up to a force fit for a small brass bush which had been drilled and tapped 8BA. Balance weights, after studying photographs, were only noticeable on the second axle and these were built up by shuttering off the front and back of the wheel and pouring/pasting 'Plastic Padding' into the cavity and afterwards, trimming it with needle files.

Driving wheel axles, trimmed exactly to length, were then inserted in the axle holes. The worm wheel and worm were mated, by meshing them with shims of cigarette paper interposed, and by placing 0.001in. shims of copper under the clamp ring that held the motor drive-end. The leading driving wheels were fitted to the axle by pressing one wheel on the axle end and ensuring it was square to the axle. The other wheel was then offered up to the other axle end (quartering being done by eye) and pressed on using a soft-jawed vice. Back-to-back dimensions and squareness of the wheel to the axle were then checked. All was well and the exercise was repeated on the motor axle. To ensure consistency in quartering this second axle, two surplus lengths of brass were sweated together and two holes 8BA clearance drilled in them, the distance between these hole centres being the coupled wheelbase of the locomotive. The first wheel was pressed on the motor axle and rotated so that the distance between the crankpin hole on that wheel and the leading wheel equalled exactly the centres on the brass strip, which was screwed through to the crankpin holes with 8BA cheese-head screws. Thus one side of the engine had correctly spaced and quartered wheels. The other side was treated similarly but rotating the wheel for quartering was obviously done against resistance from the wheel on the other end of the axle. But this was overcome and when both sides were satisfactory a tiny amount of Araldite was dropped on each axle end and wheel bush and allowed to set for 24 hours, ensuring (to this day at least) constant quartering and negligible wheel wobble.

Cylinders

Compared to the chassis the cylinder assembly was complex. The front faces of the cylinders on the prototype were polished steel. I think the sketch should explain the overall cylinder assembly. Suffice it to say that the cylinder body is held distant from the frames by a lateral stretcher holding it immediately behind the polished steel face and immediately in front of the piston gland/stuffing box. The slidebars, again mild steel, were fitted in the back of the cylinders by pushing them in pre-drilled holes and securing them with Araldite. The bottom slidebars carry a single step which is soldered to them. Cylinder drain-cocks are turnings pushed in holes and fixed with adhesive. Operating levers are bent to shape and fixed with solder to the drain cocks. The cross-head and piston are a fabrication of brass, welding-rod and dressmaker's pin.

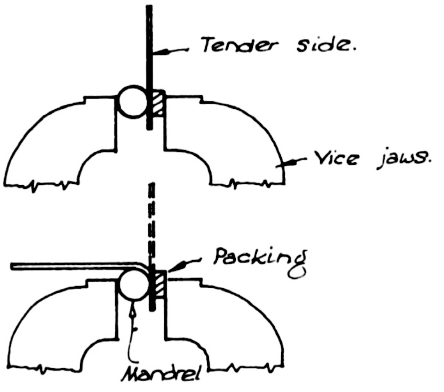
Rods

The connecting and coupling rods are fashioned in mild steel to give the same texture as the full-size article. They posed two problems: producing the fluting and making the brass big-end on the con-rod. (This rod must have featured in the 1901 equivalent of the 'Guiness Book of Records' for length since between the big end and little end centres the distance is no less than 10ft. 6in.). The fluting on the coupling rod is parallel and was relatively easy to produce using a 2mm diameter end-mill. The tapered con-rod had, naturally, tapered fluting and this was achieved eventually by the simple expedient of moving the rod through a few degrees after each cut and cleaning the whole up with square section needle files. I say files (plural) because I used no less than three files per rod. The crankpin holes in the coupling-rods are drilled to take specially turned 8BA screws which fit neatly in the tapped holes in the driving wheels. The con-rod big end proved a most absorbing exercise. Not only did it have to contain the brass journal but the oil cork and tapered wedge also. The sketch will explain how this was done. The only difficult part really was fitting the brass into its seat in the rod. However, once this was accomplished it was a simple matter to fit the oil cork and wedge. Again the crankpin that fitted the big end to the driving wheel was specially turned, this time with two journal diameters, one for the con-rod and one for the coupling rod.

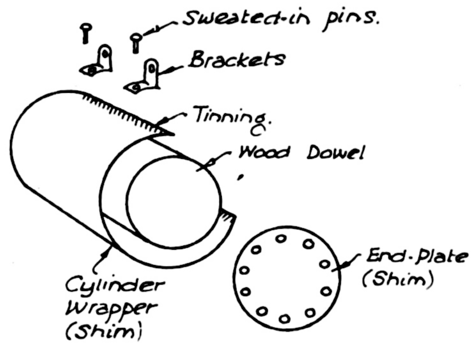
At this point, the chassis was 'chocked' up fore and aft and the motor energised. Except for some minor tight spots, which a dab of jeweller's rouge cured, everything was fine. It was left running for approximately 12 hours and seemed to run itself in satisfactorily.

The chassis section was finally completed by adding the running plate section forward of the cylinder covers and the platform on top of the cylinders. The curved inspection cover over the valve chest (between the cylinders) was formed from a Duckham's oil can and soldered into position. Likewise the lamp irons and running plate valance. The buffers and screw coupling, together with steam and vacuum pipes, were fitted in the same manner as those on the tender.

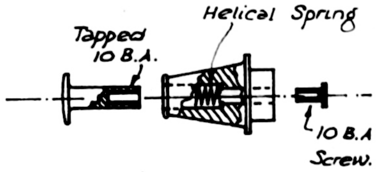
Neil Rose will conclude this description in the October MR



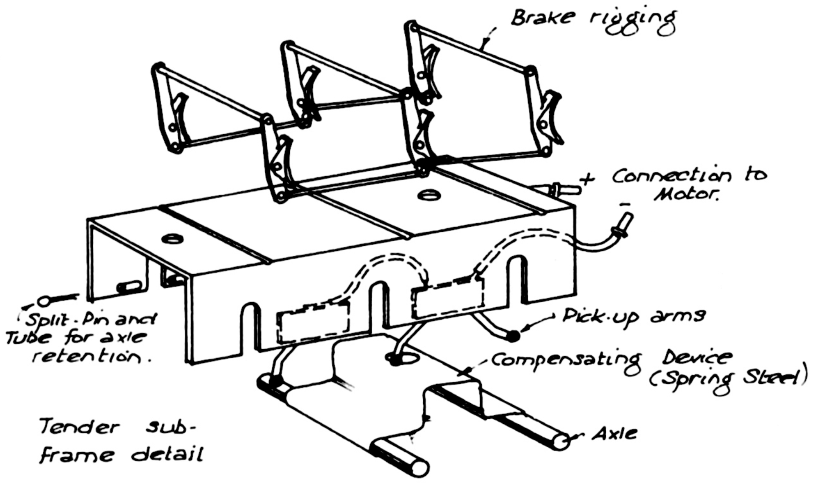
Method of producing the flare on the Tender sides.



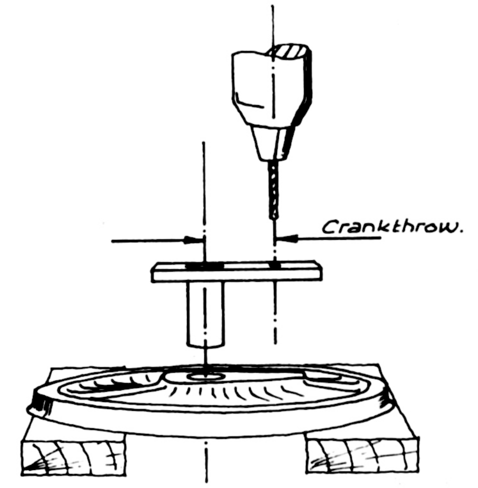
Fabrication of Air cylinder under Tender buffer beam.



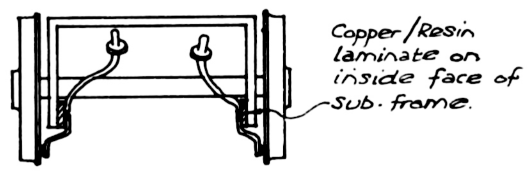
Method of Buffer Construction



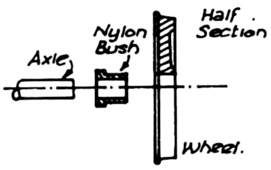
Tender sub-frame detail



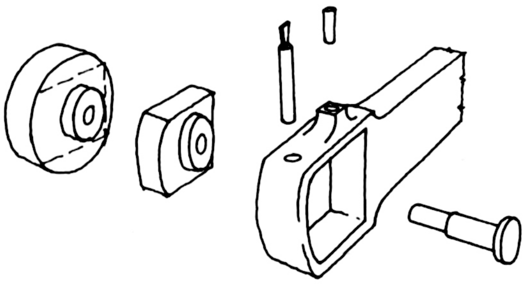
Drilling the Crankpin holes.



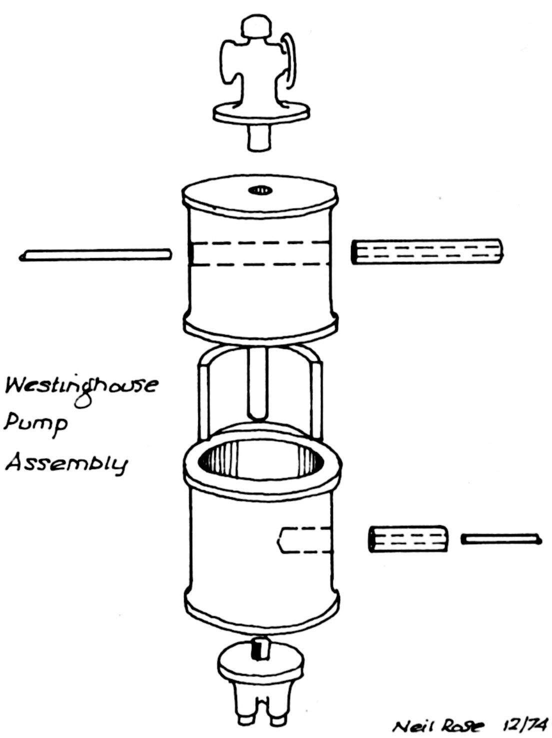
Tender Pick-up detail



Wheel Insulation.



Big End Assembly.



Westinghouse Pump Assembly

Neil Rose 12/74