

*Australian Railway Kits*

ABN: 27 416 246 418

Incorporating Main West Models

Manufacturers, Wholesalers and Retailers of Quality Australian Model Railways

PO Box 252 Warwick, Queensland, 4370 Australia

Phone/Fax: 617 4667 1351 Website: [www.arkits.com](http://www.arkits.com) Email: [info@arkits.com](mailto:info@arkits.com)

# NSWGR D55 2-8-0 LOCOMOTIVE AND TENDER KIT

**E199 Manufactured Exclusively for AR Kits by DJH Engineering from Patterns owned by AR Kits**

**PLEASE READ INSTRUCTIONS THOROUGHLY BEFORE COMMENCING ASSEMBLY**

## **CONSTRUCTION**

This kit contains sufficient parts to make either the oil or coal version of the D55. Both oil and coal parts are shown on the drawings, therefore during assembly refer to parts listing where alternative OIL VERSION parts are marked thus (\*). There are some components of this kit which were derived from the D50/D53 and therefore require minor modifications, and small number of holes to be drilled.

### **Construction**

It is important to ensure that all parts are clean, free of "flash" (excess metal on castings) and fit properly. The "flash line" is easily removed from most areas by scraping gently with a sharp hobby knife - a round blade is more effective than a straight pointed type. Pull the blade along the "flash line" - several light strokes are better than a single one. Some areas are better cleaned up with 6" jewellers' files. Take care not to flatten round parts by filing too heavily. All locating holes for detail fittings should be pre-drilled to the size specified in the instructions. Sometimes it is necessary to clean out these holes with a "rat tail" file; take care not to snap off the tip of the file. Gently wash the castings in warm soapy water to remove mould release residue.

Etched brass items are best removed from the fret by placing the fret on a scrap piece of hard timber (eg Pyneboard) and cutting the tabs with a large Stanley knife - cut the tab at the point furthest away from the part, then trim the tab off close to the part with a small pair of quality side cutters. Hold small parts with a pair of flat nosed (not serrated jaws) pliers while cleaning up with jewellers' files. Be careful not to distort the etchings; they are difficult to straighten if bent or twisted. Drill all required holes before assembly, noting the spigot sizes of the fittings, because some holes will be difficult to drill after parts are assembled.

As with all classes of NSWGR locomotives, individual D55s varied in minor details from time to time in their life. Modellers are therefore advised to check photographs of the particular locomotive they have chosen to model.

These kits are designed to give many years of operating pleasure. A little extra time taken during construction will ensure that your kit will do this. It cannot be emphasised too strongly that the basis of a smoothly operating model is care when constructing the chassis and valve gear, ie you must double check every step. Check that the axles turn freely in their bearings, check again with the coupling rods on, then again with the connecting rods on,-etc, etc.

### **Assembly methods**

The two main construction methods are:

(a) Low melt solder - Low melt solder is an excellent medium for use with white metal kits. It is quick and easy providing a stronger joint than can be achieved with glue. It has the added advantage of easily repairing minor casting flaws, and because of the relatively low temperature, many parts can be held in the fingers while soldering. Brass to white metal joints can also be made by "tinning" the brass first with normal solder. Low melt soldering requires the correct type of soldering iron (e.g. Dick Smith T2200). These irons have temperature control, as low melt solder only requires between 70 to 138 degrees centigrade depending on what you are soldering. You must use special low melting point solder, such as that available from AR Kits

### **IT IS ADVISABLE NOT TO ATTEMPT TO SOLDER ANY CASTINGS WITH A STANDARD SOLDERING IRON**

(b) Glue - Superglue and Plastibond are two types of glues suitable for use with this kit. Some modellers prefer to superglue major joints first then "fillet" the joint with Plastibond. Small detail parts are best glued with Superglue. . Glue is not recommended for those parts needing good electrical contact, such as the tender bogies.

It does not matter which method you choose but dry fitting parts will ensure a good fit.

### Electrical pickup

The electrical system used on these kits is called "half live". Looking from the top facing forward the locomotive chassis collects current from the live wheels on the right-hand side, shown as LS (live side) on the drawings. The tender is insulated from the locomotive and current is collected from the wheels on the left-hand side of the tender.

### Cleaning up/Painting

On completion, any areas which were soldered should be washed using a soft brush and methylated spirits. An excellent pressure pack flux remover is also available from Dick Smith stores. Then wash thoroughly in warm soapy water. Rinse with clean water and allow to dry thoroughly before applying a suitable self-etch primer.

### Spare Parts

Spare parts are available on a replacement basis. Should any part be missing or damaged contact AR Kits for a replacement. Should you have any problems with the Mashima motor please do not attempt to repair it yourself - return the motor to us. Mashima will not replace motors which have been tampered with.

Should you have any queries or problems with construction please drop us a note and we will do our best to advise you . Likewise we would be pleased to hear any suggestions you may have for improving the kits or instructions.

### General

The following drill sizes are required: 0.4mm, 0.5mm, 0.6mm, 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.1mm, 1.2mm, 1.5mm, 1.6mm, 1.9mm, 2.0mm, 2.1mm, 3.7mm.

During construction refer to the drawings at all times. A number of parts are quite similar, so double check if in doubt. Note that attached to the instructions is a photocopy of the lost wax brass castings sprues with each part numbered for easy identification. In the general instructions the part numbers are shown in brackets.

The instructions sometimes refer to the right hand (R/H) and left hand (L/H) side. This is taken as viewing the model from above and looking forward.

To minimise the risk of losing parts, do not remove them from the etched fret or the plastic packing until you are ready to use them. We recommend that you start construction with the tender.

### Safety First

**These models are not toys and are not suitable for young children. White metal castings contain lead and modellers are advised to wash their hands after working with unpainted white metal castings. When using superglue, solder or when spray painting, ensure your work area is well ventilated**

### Tender Drawing T1 (Parts T1 - T22)

Take tender back and sides (T2) and fold to form rounded corners, note that the corners have a series of lines etched on the inside of the corners to facilitate rounded corners; fold the corners carefully to form a rounded corner, not a sharp one. At this point solder the bogie centre pivots (T9x2) to the underside of the tender floor. Now fix the back and sides onto the tender floor (T1). Note that the arrow etched on top of the tender floor points to the front. Use solders sparingly to avoid excess creeping through the joint and onto the rivet detail. Fold the door shapes on the tender front (T3) as shown in the small insert drawing 1, then fix to the floor and sides. Note, for the oil version, remove the doors. For the coal version, bend the coal trough (T4) and fix to the front (T3) noting that the fold on the rear coal trough helps to locate this part.

Fit the side valances (T6x2) followed by front valance (T5). Check that the assembly is "square". Before adding the front steps (T7x2), fold the bottom step as shown. Add front step treads (T8x2). Fit the front bulkhead steps (T10x2) and the brake cylinder (T22) to the tender floor. Test fit the tender top (T1 1) into the tender body - do NOT fix in place at this stage.

Fix the turned brass side frame mounts (T14x4) to the bogie side frames (T12x4). For good electrical pickup low melt solder is recommended here. The bogie stretchers (T15x2) are on the etched nickel silver valve gear fret - remove them and check that the holes either side fit over the brass side frame mounts (T14), you may need to enlarge the hole slightly. Fold the stretchers as per Drawing 1, using a pair of flat nosed (non-serrated) pliers.

Push the brass wheel bearings (T13x8) in the bogie side frames using low melt solder if necessary, and attach the side frames to the stretcher with 4.0mm long brass screws (T16x4) and washers (also from the nickel silver fret) (T17x4).

Tighten the screws, then gently ease the side frames apart to fit the wheel sets (T18x4) in place, making sure the insulated wheels are on the same side for each bogie - see drawing 1. Place the bogie on a piece of flat track and test run, some "fine tuning" may be necessary.

Take the bogie mounting screws (T21x2) and attach the assembled bogies to the tender using the springs (T20x2) and washers (T19x2). Note the two springs (T20x2) are cut to a length of 4.0mm from the single spring provided.

### **Tender Drawing T2 (Parts T23 - T45)**

Fit the water filler (T23), the coal partition (T38), and for the oil version add tank vent (T44 oil) and tool box (T45 oil) to the tender top. Fit tool box (T24) to the coal partition (T38), . Fit lamp bracket (T37). Using 0.4mm wire, fold and fit rear grab iron. Fit the drawbar pin (T,2S) using M2 nut (T26). Fold and fit the tender floor (T29). Fit the short handrail knob (T30) noting that the hole is aligned vertically. Using 0.4mm wire make up handbrake stand using handbrake wheel (T31). Fit buffer beam (T34) to the underneath of the floor, noting that the two vertical spigots form the lamp irons. For the oil version drill buffer beam (T34) as shown to accept the additional brake pipe (T36 oil) - see inset drawing.

Now fix the tender top (T1 1) in place, and for the coal version, add coal (T39), fire iron bracket (T28) and fire irons (T27x3). For the oil version drill the tender top (T11) to accept the oil tank (T40 oil). Before fitting the oil tank (T40 oil) add small vent (T42 oil) and large vents (T43x3 oil), then fit oil tank front insert plate (T41 oil). Fold and fit the ladder (T32) as shown - hook the top of the ladder over the top of the tender into the two dimples provided, note - for easy fitting drill these out 0.7mm, then locate the horizontal lugs into the holes on the back of the tender. Secure in place by spot soldering the bottom lugs to the buffer beam (T34). Fit the brake pipes (T36) followed by buffers (T35x2). Fix the lamps (T33x2) to the rear of the tender on the outside edge (and level with the top) of the conduit.

### **Locomotive Drawing 1/5 (Parts 1 - 30)**

As mentioned previously all holes shown on the drawing should be drilled prior to assembly.

Fit the smoke box (13) to the boiler/firebox (16) making sure that the base of the firebox and firebox are level (check the assembly on a flat surface). Check that there is no flash inside the smoke box which may prevent the motor from fitting properly. Secure the M2 screw (14) in place inside the smoke box. Clean up the footplate (16) and remove the feed sprues from the centre cutout under the boiler using a razor saw. Do not use side cutters as they will distort the casting. Fix the smoke box/boiler/firebox assembly to the footplate (16) securing it in place with M2 nut (15) making sure that the footplate is kept straight.

Remove the cab (1) from the fret and fold up as shown. Solder the inside corners of the sides/front. Fix the screw (2) into the cab as shown at this stage as it is not possible to do this once the cab assembly is completed. Take the fall plate (3) and fold the tabs down 90 degrees, then glue the plasticard (6) to the underside trimming so that it overlaps the three outside faces by 0.8mm to prevent it shorting out against the tender. Before fitting the fall plate (3) to the cab floor (4) enlarge the cutout in the front of the cab floor to 11.0mm wide and 2.5mm deep, for easier access of the motor. Attach the footplate (3) to the cab floor (4) using 0.4mm wire as shown. Fold the cab floor support (5) as shown and fix inside the cab. Fix the cab floor (4) on top of the cab floor support (5). Fit R/H cab sandbox (7) and L/H sandbox (8) in place.

Fit the completed cab to the footplate using M2 nut (17), and, working inside the firebox, use low melt solder to fix the cab to the fire box. Detail the boiler by adding the safety valves (19), steam generator (20), dome (21), chimney (22) - note: for oil version assemble and fit chimney cap (29 oil) and chimney cap bracket (30 oil) using 0.4mm wire - and add chimney cap stop block (28 oil). Fit smoke box door (23) -note: drill the smoke box door as shown before fitting. Fix sandbox step treads (27x2) before fitting footplate sandboxes (24xpair)

The fitting of the gearbox (25), motor (12), back head detail (10) and regulator handle (9) is covered under Chassis Drawing 7.

### **Locomotive Drawing 2/5 (Parts 31 - 67)**

Drawing 4 covers the fitting of handrails, pipe work and other minor fittings.

Note that steps (51) should be folded before fitting, likewise rear step treads (52x4) and front buffer beam step (43). When fitting the guard irons (39x2) note that they need bending out to the track centres (see the photograph on the label for clarity). Note that centre line of the steam pipes (58x2) is 15mm back from the front/leading edge of the smoke box. Note also that the boiler handrails go right around the boiler and that they have been shown broken on the drawing for clarity. For the oil version fit cab lamp (56 oil), chimney lamp (57 oil) and oil firing valve (59 oil).

### **Chassis Drawing 3/5 (Parts 68 - 96)**

Take the R/H frame (68) and L/H frame (69). Trim the front section to a length of 4.0mm as shown in Drawing 5, then drill a 0.7mm hole in each frame as shown in the inset drawing on the top of Drawing 6. Carefully clean out the axle holes with a 3.7mm drill bit and push fit the axle bushes (70x8). Ensure that the bushes are fully seated before securing with solder on the inside of the frames. Note there are a number of holes in the chassis that may require cleaning out to a specific size, check the drawing for details, Fit the turned brass chassis spacers (71a & 71b) noting that the rear spacer (71b) has a M2 thread for fixing the motor (see drawing). The holes in both spacers must be aligned vertically. Fit front mounting plate (72) and rear mounting plate (73) with the arrows pointing forward and tighten the spacer screws (74x4). Temporarily fit axles and wheels to the front and rear axle bushes and place the chassis on a section of level track to check that the chassis sits properly on the track. If necessary, loosen the spacer screws and adjust. Remove the wheels and axles and solder the chassis together.

Before fitting the driving wheels (85x2, 86x2, 90x2 and 91x2) note that the insulated wheels are on the L/H side as viewed

from the top facing forward and that the two centre driving wheels are flangeless. Fit the driving wheels, axles (84x4) and axle spacing washers (88x8) - due to manufacturing tolerances these spacing washers (88x8) are not always required on all axles. In some cases they may cause the chassis to bind, particularly on sharp curves. Test to suit your application. Secure the wheels with the axle nuts (87x8), placing the axle gear (89) on the second axle as shown on the drawing. If necessary clean out the hole in the axle gear with a 1/8" reamer or 1/8" drill bit. Move the gear to one side of the axle, place a small spot of super glue or Loctite 601 on the centre of the axle and push the gear to the centre of the axle. Make sure the gear is "square" with the axle. Be careful not to get any glue or Loctite in the axle bushes. Make sure that all axles rotate freely in the axle bushes. The wheels are quartered so that the crankpin on the right hand wheel leads that of the left hand wheel by 90 degrees when the axle rotates forward. Use a Romford axle nut driver to tighten the axle nuts. Remove the etched counterweights (94x4), (95x4) from the fret and glue to the wheels as shown. Using a Romford axle nut driver fit the crankpins (92x8). Axle covers (93x8) should be fitted after final assembly and painting.

Now fit drawbar/tender pickup placing insulator washer (77) on M2 screw (75) cut to 10mm, and pass this through the rear mounting plate (73). Add insulator (78) and secure with M2 nut (79). Now add spring plate (80), loco tender coupler (81) and spring (82) (cut to a length of 7.0mm), followed by M2 nut (83).

#### **Chassis Drawing 4/5 (Parts 97 - 118)**

Fit crankpin spacing washers (97x8) then add rear coupling rods (998xpair), leading coupling rods (99xpair) and centre coupling rods (100xpair). For easy removal of the coupling rods during testing, painting etc, strip a short length of insulation from some fine electrical wire and push this "tubing" onto the crankpins as a temporary retainer. The crankpin washers (101x8) should not be fitted until the chassis has been completed and painted. Check that the rods revolve freely; should binding occur, locate where this happening and gently ease out the offending hole in the coupling rod with a rat-tail file, remove the minimum amount to achieve free movement. Sometimes swapping the side rods around (i.e. left to right) can overcome binding.

Remove the wheels from the chassis and fold the rear brakes (104) as shown before fitting. Note that the arrow on top of the etch points to the front. Using 0.7mm wire, fit the leading brakes (102x2) and support bracket brakes - (103x2). Using 0.7mm wire through the holes at the rear of the frames locate the R/H pull rod (106) and L/H pull rod (107) between the frames. Note that the 0.7mm wire extends 3.0mm on the L/H side for later fitting of the brake cylinder (131). Fit the brake stretchers (105x3) and leading brake stretchers (108x2).

Test fit slide bar support bracket (109) into the cutouts on top of the frame making sure it can be pushed down to the bottom of the cutout. Then remove, fold as shown in the drawing before fitting motion detail plates (110x2) and put aside for later fitting. Make up cylinder assemblies using cylinders (111x2), rear cylinder covers (112x2), front cylinder covers (1 13x2), valve crosshead guides (1 14x2) and valve covers (1 15x2) - note that rear cylinder covers are drilled 1.2mm, and the valve crosshead guides 0.7mm.

Trim and file the slide bars (116xpair) as per the inset drawing, note these are left and right handed, the etched fold line goes to the inside of the fold. Test fit the crosshead into slide bar, you may need to clear out the keyways of the crossheads using a knife-edge file, or you may need to lightly file the inside edges of the slide bars to achieve a good sliding fit. It is essential that the crossheads slide smoothly in the slide bars.

Fix the slide bar assemblies to the rear of the cylinders and also attach underneath the cylinders - see drawing. Fix the completed cylinder assemblies to the frames.

Trim M2 screw (117) to a length of 9.0mm and fix to front spacer (72a) using M2 nut (118)

#### **Chassis Drawing 5/5 (Parts 119 - 142)**

Fit brake cylinder (131) and pass 0.7mm wire through as shown. Assemble the front bogie using bogie body (137), bogie wheel (138) and bogie arm (139) -note trim the riser back 2.5mm as shown on the drawing. Attach bogie wheel inserts (140x2) and fix bogie to chassis with M2 nut (142). Note that the optional outside sprung bogie frame (141) can be fitted now if desired.

Fit wheels, axles and side rods. Fit the connecting rods (122xpair) to crossheads (123xpair) using 14BA screw (121x2) and nut (124x2). Fit the crossheads into the slide bars and then fit the slide bar support bracket (109), then fit a 35mm length of 0.7mm wire between second and third drivers as shown - note finished length of 29.5mm is easier to cut after fitting motion bracket (119).

Clean out hole in motion brackets (120xpair) using a 1.0mm drill before fitting to motion bracket backing plates (119xpair). Locate spigot on the front of the motion bracket (120) into the slide bar support bracket (109) at the same time locating the valve spindle into the top of the cylinders. Note that the rear of the motion bracket backing plate (119) locates on .7mm wire. After final positioning trim off excess .7mm wire.

Attach return crank assemblies (128xpair) to motion bracket backing plates (119xpair) using 14BA x 1/4" C/H screws (126x2) and (127x2), securing with 14 BA nuts (129x2) and (130x2). Fit the big end of the connecting rods to the crankpins of the third axle drivers followed by crankpin fixers (125x2) and small arm of the return crank assemblies (128xpair). Note that the small arm of the crankpin assembly is fixed to the crankpins at the angle shown in the inset drawing.

Assemble the gearbox as per the accompanying instructions and trim the shaft to 3.5mm as shown in Drawing 3. Do not force

the worm onto the shaft. If necessary, carefully ream the worm bore using a 2.0mm drill or hand reamer so that the worm fits the shaft without undue force. Use a spot of superglue or Loctite 601 to permanently fix in place. Clean the shaft of excess glue or Loctite. As the gearbox screws are self tapping, screw the screws for the bottom cover plate screws in and out a couple of times before fitting the gearbox to the chassis. Before fitting the gearbox remove the centre section of the slide bar support bracket (109) as shown in Drawing 7. Remove 0.75mm from the bottom of the gearbox as shown in Drawing 7 and fit gearbox to the chassis.

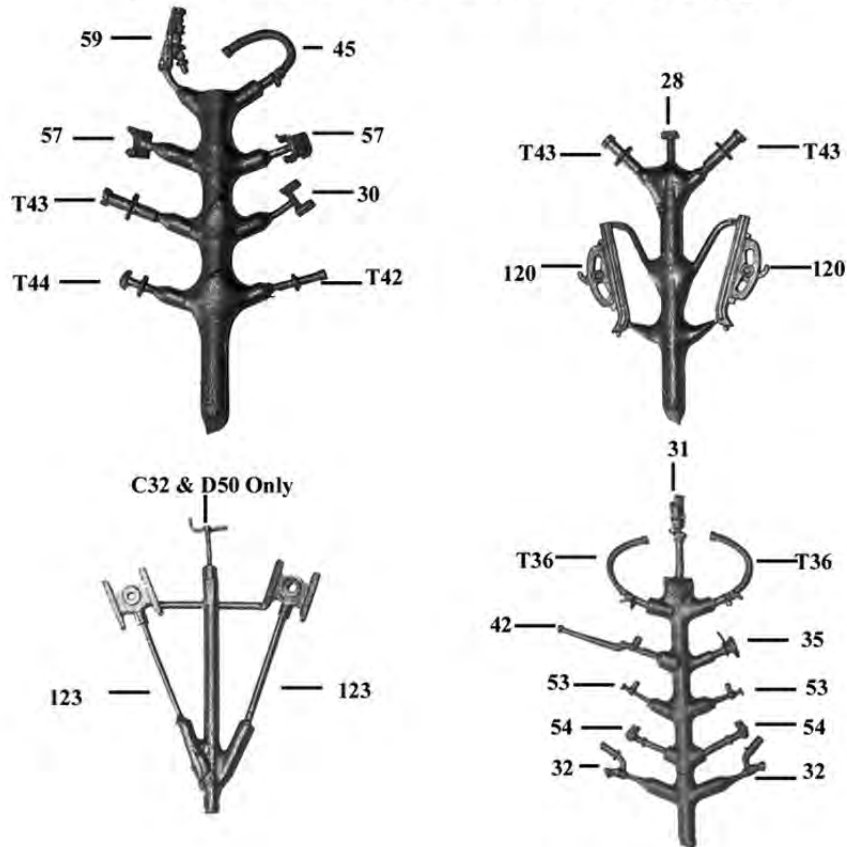
Fit the locomotive body to the chassis securing with M2 nuts (134 and 135).

Take two 60mm lengths of pickup wire, solder to the motor terminals and mark the positive (+) lead for later identification. Trim the motor coupling sleeve to 12mm and fit half way onto the motor shaft. Pass the motor through the hole in the front of the cab ensuring the motor coupling sleeve (26) couples to the shaft on the gearbox (check from underneath). Note, for easier fitting/removal of the motor, temporarily screw an M2 x 16mm bolt into one of the threaded holes in the rear of the motor, **finger-tight only**. Pass the wires down through the footplate, see Drawing 3. Fit M2 screw (96) to the rear chassis spacer (71b) and **gently tighten the M2 screw just enough to retain the - motor**. Take the negative lead and solder it to the power clip (136) which locates under M2 body mounting nut (135) (see Drawing 7). The other wire spot solders to loco tender coupling (76) (see Drawing 5).

Lightly oil the mechanism and test run, checking for electrical "shorts" on sharp curves etc. Also check that the motor does not overheat due to chassis binding.

15 April 2009

### (E199) - D55 - Lost Wax Brass castings



### Drill Sizes - Key

<b>0.5mm dia. - A</b>	<b>0.7mm dia. - B</b>	<b>0.8mm dia. - C</b>	<b>0.9mm dia. - D</b>	<b>1.0mm dia. - E</b>
<b>1.2mm dia. - F</b>	<b>1.6mm dia. - G</b>	<b>2.0mm dia. - H</b>	<b>2.2mm dia. - I</b>	<b>3.7mm dia. - J</b>
<b>0.4mm dia. - K</b>	<b>1.1mm dia. - L</b>	<b>1.8mm dia. - M</b>	<b>2.1 mm dia. - N</b>	

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## Tender Drawing 1.

T1.	Floor	E	3.	Fallplate	E
T2.	Sides and Back	E	4.	Cab Floor	E
T3.	Front	E	5.	Cab Floor Support	E
T4.	Coal Trough	E	6.	Plasticard	P
T5.	Drawbar	E	7.	R/H Cab Sandbox	E
T6.	Valances x 2	E	8.	L/H Cab Sandbox	W/M
T7.	Front Steps x 2	E	9.	Regulator Handle	W/M
T8.	Front Steps Treads x 2	E	10.	Cab Backhead Detail	W/M
T9.	Bogie Pivots x 2	T	11.	Boiler/Firebox	W/M
T10.	Front Bulkhead Steps x 2	E	12.	Motor	-
T11.	Tender Top	W/M	13.	Extended Smokebox	W/M
T12.	Bogie Sideframes x 4	W/M	14.	M2 x 12mm C/S Screw	T
T13.	Wheel Bearings x 8	T	15.	M2 Nut	T
T14.	Bogie Sideframe Mounts x 4	T	16.	Footplate	W/M
T15.	Bogie Stretchers x 2	E	17.	M2 Nuts x 2	T
T16.	Brass Screw x 4	T	18.	Cab Roof	W/M
T17.	Bogie Sideframe Washers x 4	E	19.	Safety Valves	W/M
T18.	10.5mm Bogie Wheels x 4	T	20.	Steam Generator	W/M
T19.	Bogie Bearing Washers x 2	E	21.	Dome	W/M
T20.	Spring x 1	-	22.	Chimney	W/M
T21.	M2 x 8mm C/H Screw x 2	T	23.	Smokebox Door	W/M
T22.	Brake Cylinder	W/M	24.	Footplate Sandboxes x 1 pr	W/M

## Tender Drawing 2.

T23.	Water Filler	W/M	25.	Gear Box	-
T24.	Tool Box	W/M	26.	Motor Coupling Shaft	P
T25.	Drawbar Pin	T	27.	Sandbox Step Treads x 2	E
T26.	M2 Nut	T	28.*	Chimney Cap Stopblock	L/W
T27.	Fire Irons x 3	E	29.*	Chimney Cap	E
T28.	Fire Iron Bracket	E	30.	Chimney Cap Bracket	L/W
T29.	Tender Floor	E			
T30.	Short Handrail Knob	T		0.4mm dia. Wire	
T31.	Handbrake Wheel	E		Insulated Wire	
T32.	Ladder	E			
T33.	Lamps x 2	W/M			
T34.	Buffer Beam	E			
T35.	Buffers x 2	W/M			
T36.*	Brake Pipe x 2	L/W			
T37.	Lamp Iron	E			
T38.	Coal Partition	E			
T39.*	Coal	W/M			
T40.*	Oil Tank	W/M			
T41.*	Oil Tank Front Insert Plate	W/M			
T42.*	Small Vent	L/W			
T43*	Large Vents x 3	L/W			
T44*	Tank Vent	L/W			
T45.*	Tool Box	W/M			

0.4mm dia. Wire

## Drawing 3.

1.	Cab	E
2.	M2 x 8mm C/H Screw	T

## Drawing 4.

31.	Whistle	L/W
32.	Clack Valves x 2	L/W
33.	Headlamp	W/M
34.	Marker Lights x 2	W/M
35.	Smokebox Door Handle	L/W
36.	Single Lamp Irons x 2	E
37.	Buffer Beam	E
38.	Double Lamp Iron	E
39.	Guardirons x 1 pr	E
40.	Pump	W/M
41.	Pump Valve	W/M
42.	Handrail Post	L/W
43.	Front Beam Step	E
44.	Dummy Coupler	W/M
45.	Brake Pipe	L/W
46.	Buffers x 2	W/M
47.	Single Smokebox Door Lamp Iron	E
48.	Reversing Rod Cover	W/M
49.	Reversing Rod Detail Plate	E
50.	Reversing Rod Backing Plate	E
51.	Rear Steps	E

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52.	Rear Step Treads x 1 Pair	E	98.	Rear Coupling Rods x 1 pr	E
53.	Firebox Valves x 2	L/W	99.	Leading Coupling Rods x 1 pr	E
54.	Globe Valves x 2	L/W	100.	Centre Coupling Rods x 1 pr	E
55.	Large Air Tanks x 2	W/M	101.	Crankpin Washers x 8	T
56.*	Cab Lamp	L/W	102.	Leading Brakes x 1 pr	E
57.*	Chimney Lamp	L/W	103.	Support Bracket Brakes x 1 pr	E
58.	Steam Pipes x 2	W/M	104.	Rear Brakes x 1 pr	E
59.*	Oil Firing Valve	L/W	105.	Brake Stretchers x 3	E
60.	Handrail Bracket (A)	E	106.	R/H Pull Rod	E
61.	Handrail Bracket (B)	E	107.	L/H Pull Rod	E
62.	Handrail Bracket (C)	E	108.	Leading Brake Stretchers x 2	E
63.	Medium Handrail Knobs x 2	T	109.	Slidebar Support Bracket	E
64.	Medium Handrail Knob	T	110.	Motion Detail Plates x 1 pr	E
65.	Medium Handrail Knobs x 2	T	111.	Cylinder Bodies x 2	W/M
66.	Handrail Brackets (D) x 2	E	112.	Rear Cylinder Covers x 2	W/M
67.	Handrail Bracket	E	113.	Front Cylinder Covers x 2	W/M
	0.4mm dia. Wire		114.	Valve Crosshead Guides x 2	W/M
	0.5mm dia. Wire		115.	Valve Covers x 2	W/M
	0.7mm dia. Wire		116.	Slide Bars x 1 pr	E
			117.	M2 x 16mm C/H Screw	T
			118.	M2 Nut	T

## Drawing 5.

68.	R/H Frame	E
69.	L/H Frame	E
70.	Bushes x 8	T
71a.	Spacer	*T
71b.	Spacer Threaded	T
72.	Front Mounting Plate	E
73.	Rear Mounting Plate	E
74.	Spacer Screws x 4	T
75.	M2 x 16mm C/H Screws	T
76.	Power Clip	E
77.	Insulated Washer	P
78.	Insulator	P
79.	M2 Nut	T
80.	Spring Plate	E
81.	Loco Tender Coupler	E
82.	Spring	-
83.	M2 Nut	T
84.	Axles x 4	T
85.	Insulated Driving Wheels x 2	T
86.	Insulated Flangeless Driving Wheels x 2	T
87.	Axle Nuts x 8	T
88.	Axle Spacing Washers x 8	E
89.	Axle Gear	T
90.	Flangeless Driving Wheels x 2	T
91.	Driving Wheels x 2	T
92.	Crankpins x 8	T
93.	Axle Covers x 8	E
94.	Small Balance Weights x 4	E
95.	Large Balance Weights x 4	E
96.	M2 x 16mm C/H Screw	T

## Drawing 6.

97.	Crankpin Spacing Washers x 8	E
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0.7mm dia. Wire

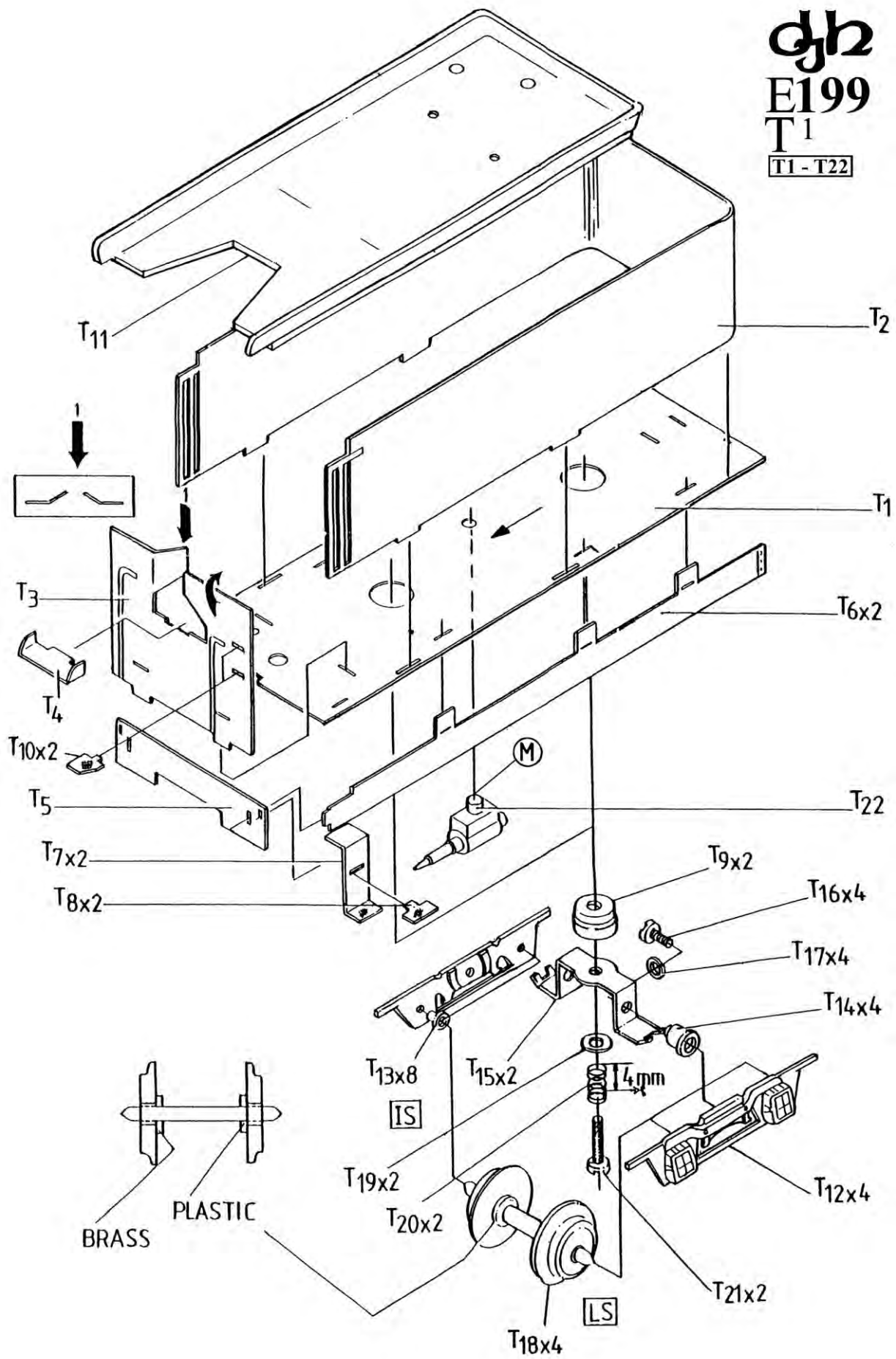
## Drawing 7.

119.	Motion Bracket Backing Plates/Valve Spindles x 1 pr	E-T
120.	Motion Brackets x 1 Pr	L/W
121.	14 B.A. x 1/8" C/H Screws x 2	T
122.	Connecting Rods x 1 pr	E
123.	Crossheads x 1 pr	L/W
124.	14 B.A. Nuts x 2	T
125.	Crankpin Fixers x 2	T
126.	14 B.A. x 1/4" C/H Screws x 2	T
127.	14 B.A. x 1/4" C/H Screws x 2	T
128.	Return Crank Assemblies x 1 Pr	E-T
129.	14 B.A. Nuts x 2	T
130.	14 B.A. Nuts x 2	T
131.	Brake Cylinder	W/M
132.	Gearbox Base Plate	P
133.	Gearbox Base Plate Mounting Screws x 2	T
134.	M2 Nut	T
135.	M2 Nut	T
136.	Power Clip	E
137.	Bogie Body	W/M
138.	Bogie Wheel	T
139.	Bogie Arm	W/M
140.	Bogie Wheel Inserts x 2	E
141.*	Bogie Frames	W/M
142.	M2 Nut	T

0.7mm dia. Wire

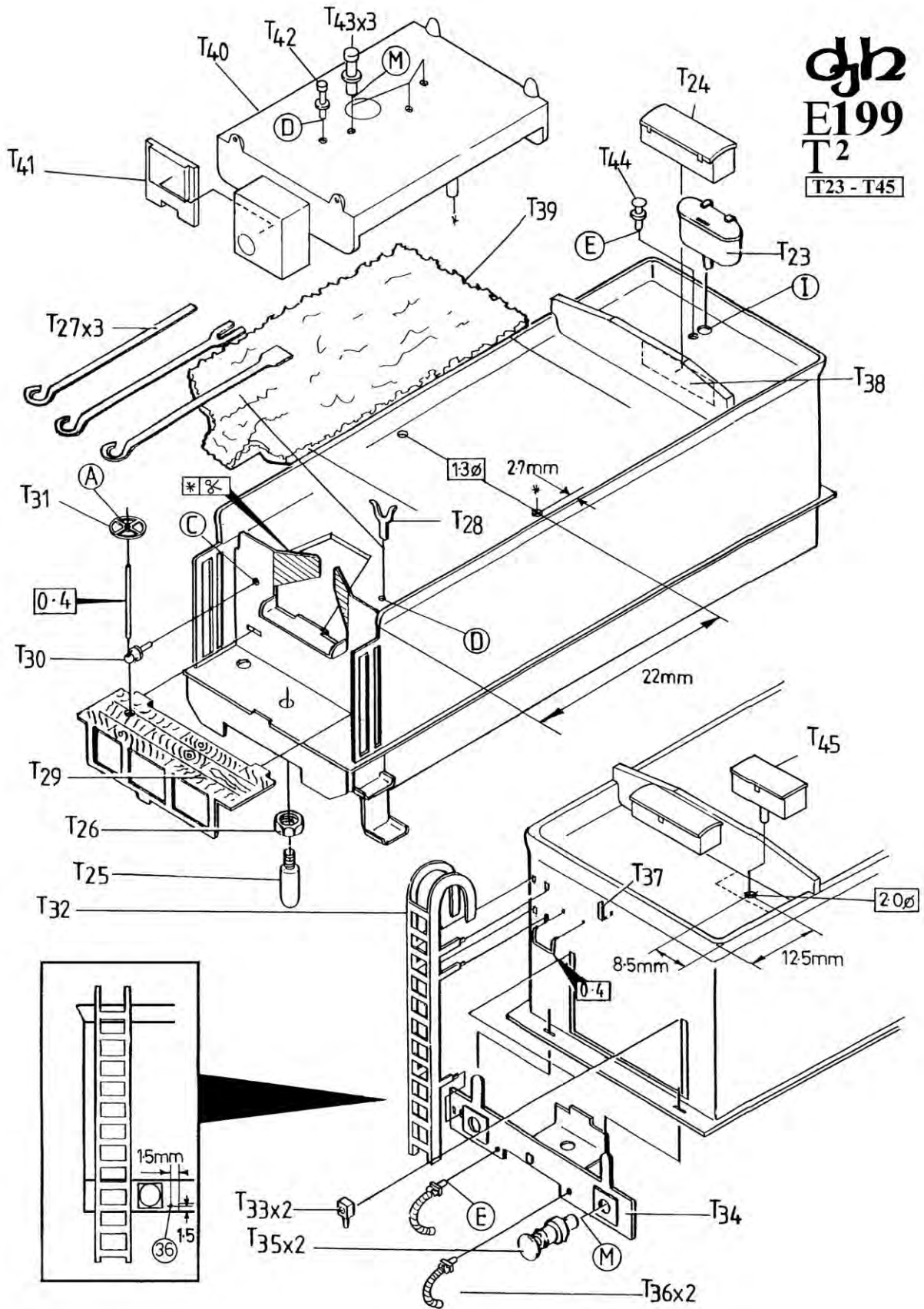
1.0mm dia. Wire

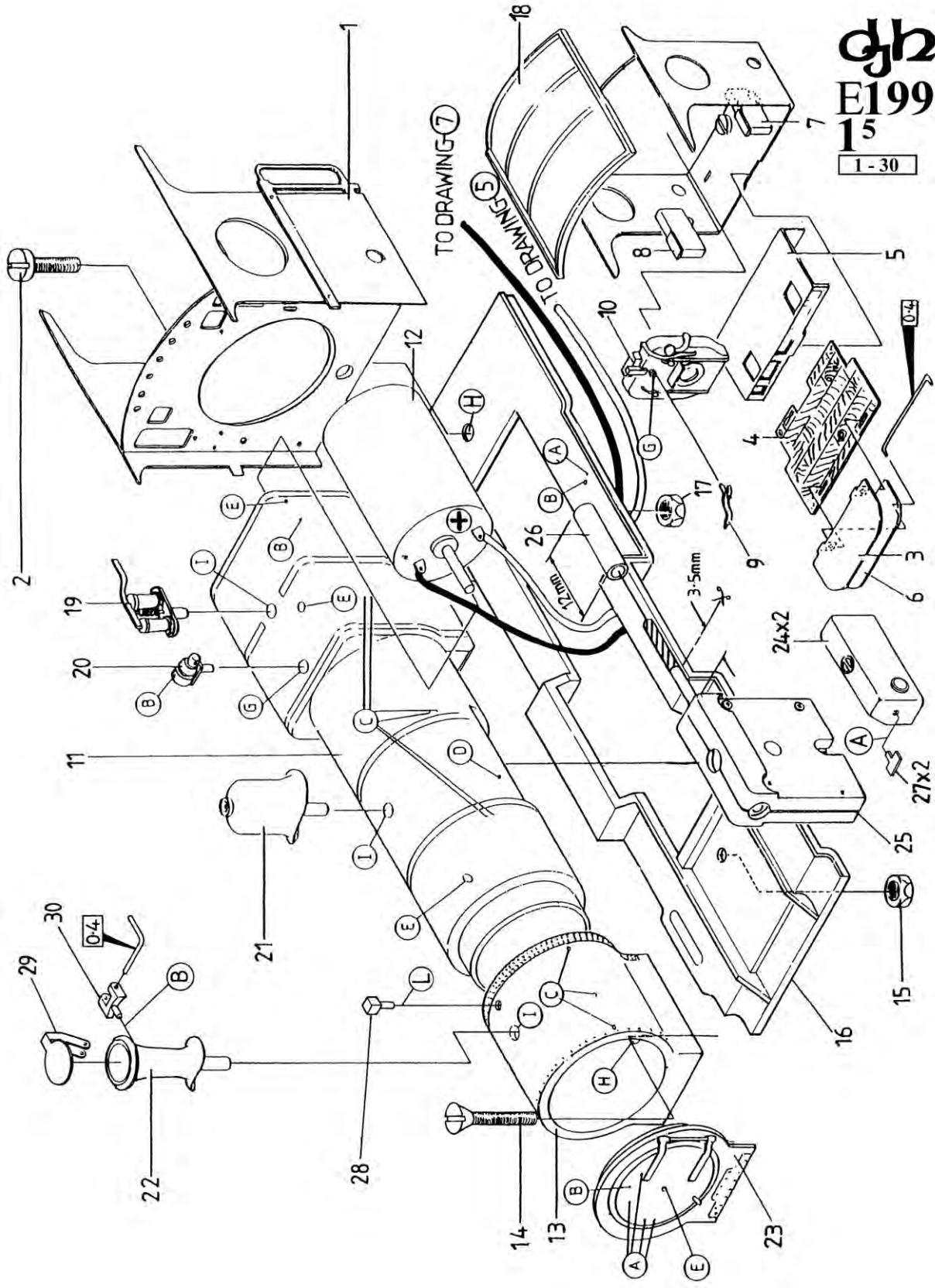
**gh**  
**E199**  
**T<sup>1</sup>**  
**T1 - T22**



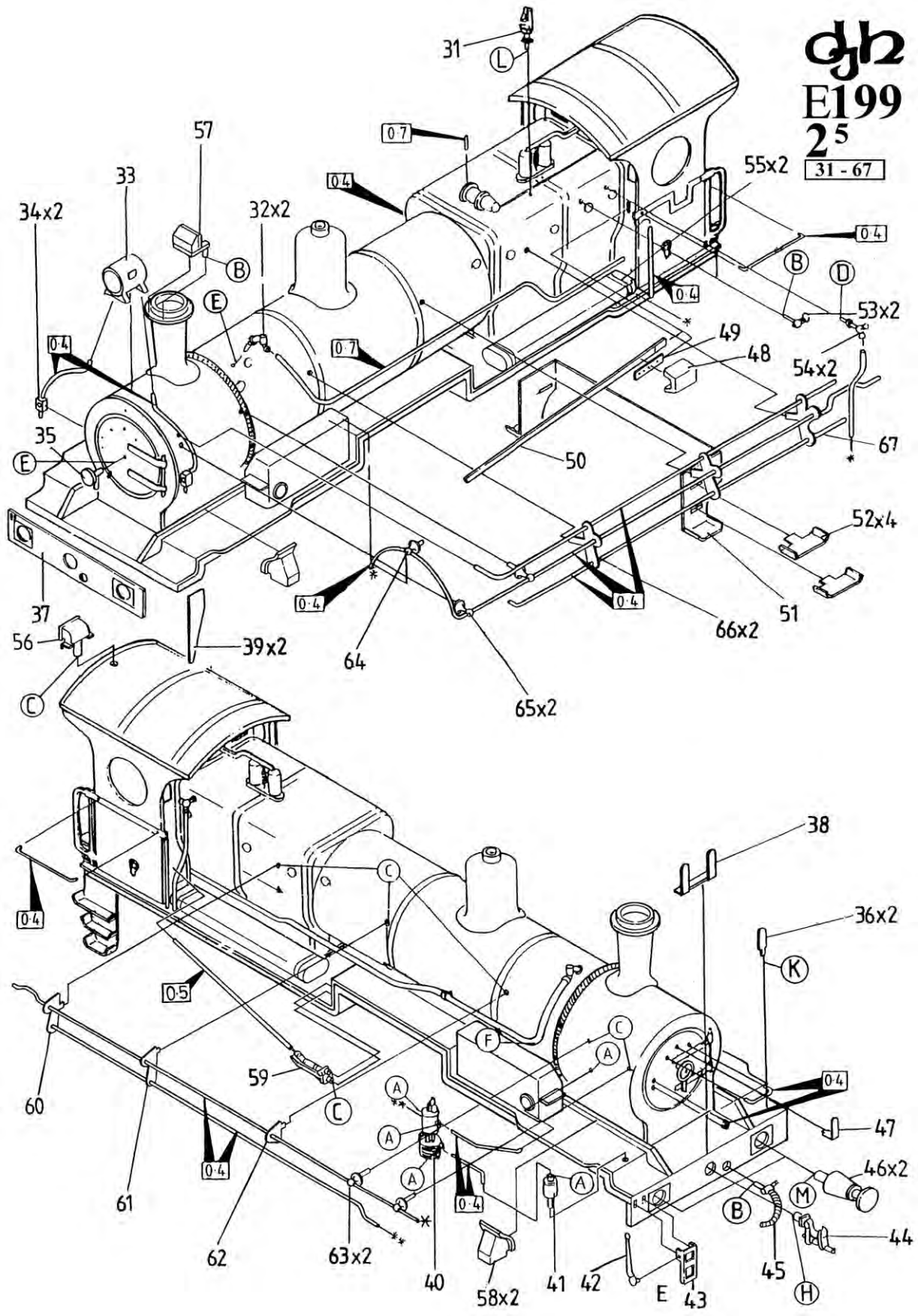


**gh**  
**E199**  
**T<sup>2</sup>**  
**T23 - T45**

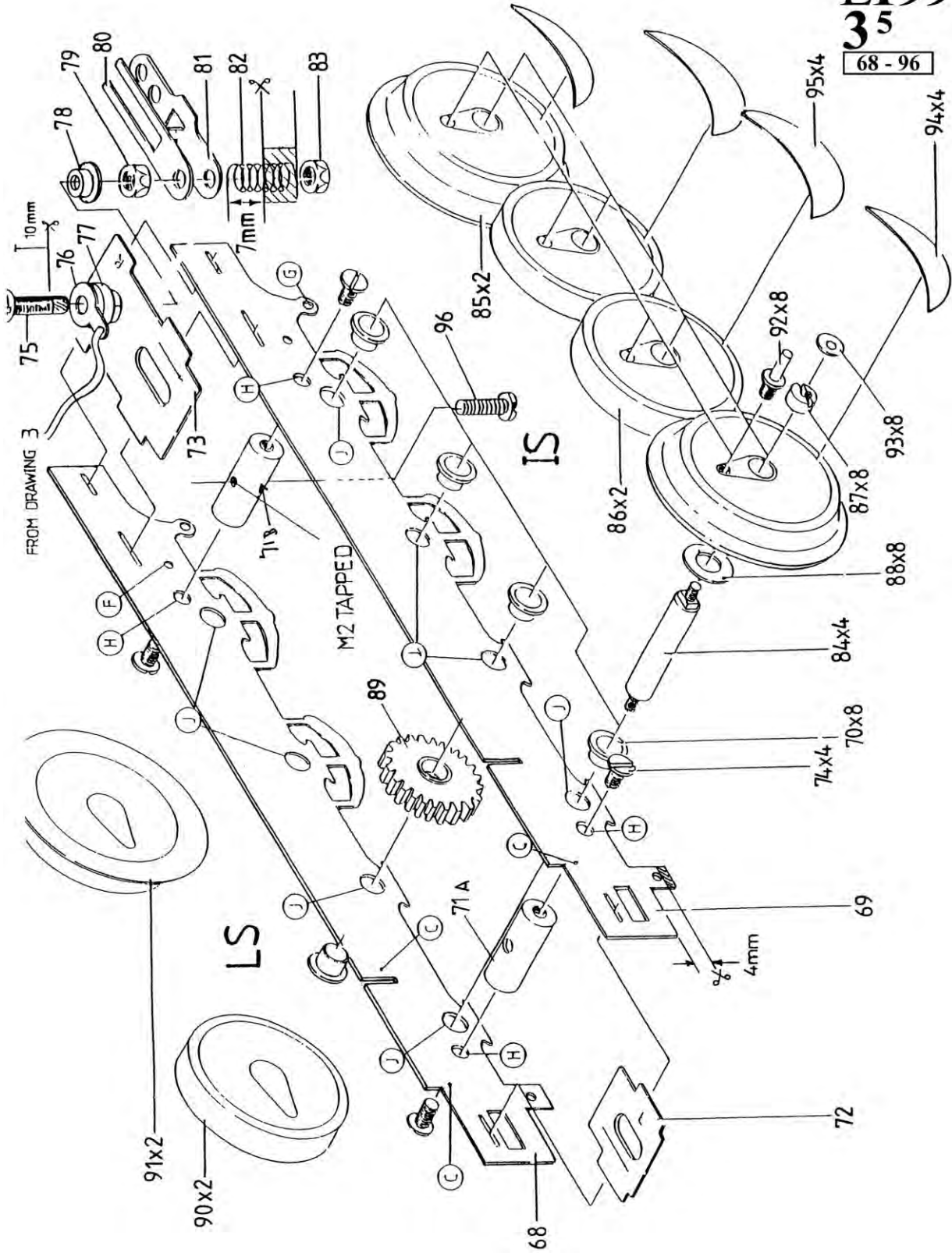




**dh**  
**E199**  
**2<sup>5</sup>**  
**31-67**



gh  
E199  
35  
68-96



**dh**  
**E199**  
**4<sup>5</sup>**  
97 - 118

