HIGH LEVEL

D100

ARMSTRONG WHITWORTH 0-4-0 DIESEL ELECTRIC

Armstrong Whitworth and Co, of Scotswood, Newcastle-upon-Tyne were early pioneers in the field of diesel traction in the British Isles, By the late 1920s they were assemblng the mechanical parts for large main-line locomotives for the Argentine. In 1931 they set up their Diesel Traction Department and obtained licences to manufacture Sulzer and Saurer engines.Although Armstrong Whitworth's main interests were in the export market - especially South America and the Commonwealth countries - their first diesel for the UK, a 250hp jackshaft-driven 0-6-0, was in effect the prototype of the class 08 shunter. Between 1934 and 1936 similar but more powerful locomotives were built for the LMS and the War Department.

In 1933, in an effort to encourage home sales of shunting locomotives, Armstrong Whitworth built a batch of six standard-gauge,15-ton 0-4-Os as demonstrators. Numbered D21-6, each had an 85hp, six-cylinder Armstrong-saurer 6BLD engine with a frame-mounted traction motor. Transmission was by gear drive to a jackshaft and side-rods. The engines ran trials at locations as various as Dorman Long's steelworks in Middlesborough, the War Department at Shoeburyness, Beckton Gas Works (famous for its cutwdown steam engines) and the Bass brewery at Burton-on-Trent, Armstrong Whitworth put considerable effort into securing firm orders but none was forthcoming and the six demonstrators - though successful in their work - remained the only examples of their type. Some time elapsed before they found permamanent homes. D21 went to Dunston Power Station . D22 worked at Reyrolle Ltd of Hebburn-on-,Tyne ; D23 was with the Admiralty at Chatham Dockyard; D24 went to the Dunlop Rubber Co.; and D26 worked for the Magnesium Elektron Co. Ltd.

The most famous member of the sextet was D25 , better known as *The Lady Armstrong*, delivered in 1934 to the independent North Sunderland Railway. While the regular Manning Wardle 0-6-0ST was out of action earlier in the year, the line had hired a one-off Armstrong Whitworth diesel - D10 of 1932, ex-Appleby Frodingham steelworks and later the works shunter at Scotswood until its withdrawal in 1957, Subsequently Armstrong Whitworth offered one of the demonstrators on favourable terms. Fitted with air brakes and with a modified generator and traction motor yielding a top speed of 30mph, The Lady Armstrong handled the regular service on the 4 ¼ mile line between Seahouses and Chathill, although breakdowns were frequent. This diminutive engine was the first passenger diesel locomotive in the UK and the North Sunderland was, by extension, the country's first fully-dieselised public railway.

Painted plain black with red bufler beams, The Lady Armstrong worked until 1946 when the engine sustained major damage, She was taken to Darlington works for repair but parts were unobtainable - Armstrong Whitworth had closed down their Diesel Department in 1937 and ceased locomotive work altogether in 1939. The engine never went back to Seahouses. In October 1949 W H Arnott Young bought this historic locomotive for scrap - for £42 10s, against an original hire purchase price of £1850. The remaining five locomotives in industrial service lasted much longer and fortunately both D21 and D22 - still active in 1970 - survived into preservation. The former is at the National Railway Museum and the latter on the Tanfield Railway where, vacuum-braked and with a Gardner engine replacing the original Saurer, it is often used on passenger trains. The High Level model is based on this locomotive.

GENRAL NOTES ON CONSTRUCTION

Read the instructions carefully - preferably more than once - before starting work. Study the diagrams until you become familiar with all the parts and the way they go together. We have tried to make these instructions as comprehensive as possible, which may make some assembly sequences appear more complex than they actually are.

Leave the parts in the fret until they are required for use. This will protect them and makes identification simpler. Small holes can be drilled more easily while the parts are still attached. Where an accurate hole size is specified, holes are etched undersized so they can be drilled or reamed out to the correct diameter. Except where you have a visible outside edge, such as along the footplate, it is advisable not to file off the cusp around the edges of components, especially with dimensionally-critical parts such as formers and spacers. The slight alteration to their dimensions could be enough to affect the way they integrate with other parts.

This is a small locomotive with equally small wheels. Its power will surprise you but current pick-up may be a problem unless you make the engine as heavy as possible (at least 4oz). Fill every available space with lead, during assembly or after - we have indicated suitable nooks and crannies in the instructions. It is easy to make this model nose-heavy so pay attention to ballasting the rear end - even a couple of whitemetal crew figures might help!

Other than the routine clean ing-up and filing-off of parts as they are detached from the frets or sprues, you should not need to modify any of the components in any way. If something isn't right, think twice before reaching for a file or drill. Any problem with fit or alignment is likely to have been caused by errors earlier in the assembly sequence. Distortions and misalignments can build up and it becomes more and more difficult to get parts to fit until, eventually, the kit becomes almost unbuildable. Backtrack through your work and look for things like excess solder, tabs not fully filed off, inaccurately formed parts or alignments that are not quite true. If you modfy any of the components, you might well be storing up trouble for yourself.

All fold lines are etched on the inside of the bends. When soldering parts in place, tack-solder first in one spot only and then check that everything is as it should be re final soldering along the joint. Moving a part that isn't aligned correctly can be difficult if it has been tack-soldered at more than one point. As always, plan ahead and think through every move before soldering or gluing parts together. If you are patient and carefull, you will find that building this scale model locomotive becomes an immensely rewarding experience.

ADDITIONAL PARTS REQUIRED

This kit is designed to take the Mashima 12/20 motor.
Wheels are a 12mm pug wheels on a 2mm axle available from Sharman Wheels , 13 Orwell Court, Wickford Business Park, Essex, SS11 8JY. You can also use Alan Gibson's 12mm diameter disc driving wheels (ref G4836P) but they will need to be bushed to take a 2mm axle. If using other makes of wheel, check that the crank throw is 3mm to match the moulded pinion wheel and flycrank included in the kit.

ASSEMBLING THE BODY

The footplate needs to be kept flat throughout this assembly sequence. The best way to build up the body is on a small, flat piece of wood, a little larger in size than the footplate. If you are modeling an air braked locomotive, drill location holes for the castings as shown in Figure 9, using the drill starts under the footplate. Remove the small parts attached to the center of footplate and store them safely.

While the cab front (2), sides (3,4) and rear (5) are in the fret, tin the inside corners, where they butt against one another. Solder the handrail knobs into the cab sides and grind flush the excess at the back. Remove the cab front, sides and rear from the fret. Study Figure 7 and decide whether you are going to add the cab fittings now or later – it is probably easier to solder them in place now, but the position of the cab floor and console must be determined before doing so. Using the drill starts provided, fit the two triangular lost wax valves (6?2) to the cab front. The indicator panel with six gauges (7) fits between the front windows, level with their top edges – use the packing piece (8) to pack it out to a scale thickness, and run fuse wire up behind the gauges, as shown. Solder the panel onto the cab front and check that there is clearance for the windows. Make the control handles out of wire to the dimensions shown and then solder in place. Add the cylindrical valve (9) with the piping made from 0.5mm wire and then solder the cab front onto the footplate, checking that it is vertical, square and central in relation to the footplate edges. Fit the cab rear into its slots, checking with a straight edge that it is in line with the cab front, and solder in position.

Open up the holes in the console (10) to the diameters shown in Figure 7 and then bend it up into a box. First fold down the top until it is slightly past 90 degrees and then bend in the sides - they will push the top back up so it is square. Solder the console joints from the inside and file the top edges flush with the sides. You can use the heads of brass pins, bent at 90 degrees, to represent the control handles (the two upper ones on each side). The other handles are catches for the access panels and can be represented by 0.4mm wire. Add lead to the inside to about half the depth of the console, to allow clearance for the wormgear.

Tack-solder the cab sides to the cab front and rear, at the top of the corners. The sides sit on the outside - their leading edges being flush with the front faces of the cab front and rear. Check all is square and tack the sides to the footplate. After a final check, flux the inside of the corners and then run in seamed joints. Try not to get any solder on the rivet detail as it is very difficult to clean off without damaging the rivets. Be sparing with the heat – the cab etchings are very thin and can easily buckle if heat is applied unevenly. Bend the floor support lugs up through about 45 degrees and joggle the cab floor (11) into place. If necessary, make minor adjustments to the angle of the floor support tabs, so the floor sits level, and then solder the floor in place. Now add the console, using the locating slot in the cab front. Fit the handbrake (12) inside the cab and then fit the handbrake cover (13) to the outside. Cut a 30mm length of 1mm wire, to represent the exhaust, and solder this inside the cab, as shown in Figure 7.

Tin along the top inside edges of the traction motor cover sides (14,15), where they will meet the cover lid (16). Butt the sides of the traction motor cover up to the cab, check they are vertical and solder them in position. Add the detail (17) to the left-hand side and the gear cover casting (18), butted against the cab, to the right. Temporarily slot the traction motor cover lid into its location in the cab rear, so it sits on top of the cover sides and rule a pencil line crosswise along the approximate centre line of the latter's curved section. Remove the cover from the loco. Firmly clamp a length of 1/8in or 3mm rod or drill bit in your vice so it protrudes horizontally by about two inches. Looking down on the rod or drill bit, line up the marks on the traction motor cover lid with the centre line of the rod and form the curve by gently bending the part around it, using pressure from your thumbs and fingers. Don't form the whole curve in one go – just get the

bend started, and then check it against the side plates before forming the rest of the shape. If things don't go quite right, Figure 5 shows how to "drift" the curve back to where it ought to be. When you are happy with the shape of the cover lid, tin the inside edges. Add lead to the space between the cover sides and then solder the lid on, keeping your iron at about 45 degrees to the riveted faces.

With reference to Figures 2 to 6, remove the bonnet formers (19,20) from the fret. Trim off the tabs but do not remove any cusp from the edges. Do not remove the crosspieces from the rear former just yet. Draw a line lengthways along the centre line of the bonnet (21), on the outer (detailed) face, using the filler-cap holes as a guide (Fig. 2). Draw another two lines along the bonnet, parallel to the centre line and 8mm away from it. Remove the bonnet, trim off the tabs and position it squarely between two short lengths of hardwood, with the centre line parallel to and just visible above these packing pieces (Fig. 3). Clamp this in your vice, with the half-etched detail towards you. Lay a steel straight edge along the center line of the bonnet and push against it, away from you, to make the first bend (angle A). Check the angle using a former and adjust if necessary. The bend should be gently rounded.

Now you can form the bends at the shoulder of the bonnet. Remove the bonnet from the vice and clamp up the same rod or drill bit that you used for the traction motor cover lid. Position the bonnet so that one of the outer lines – which indicate the approximate centre lines of the bends (angle B) – runs along the center line of the rod or drill bit, when viewed from above. Now, using firm pressure from the fingers and thumbs of both hands, begin to form the shoulder. As with the traction motor cover lid, just get the bend started - and then check it by pushing one of the formers home into it's slot. The position of your pencil line, in relation to radius on the former, will indicate the direction in which to continue the bend. Return to the drill bit or rod and continue to form the bend, applying pressure to the appropriate side of the line. Continue this process of bending and checking, little and often, until the bonnet is a snug fit on the former. Figure 5 shows how to reposition the bend if necessary – minor tweaking can be done with flat nosed pliers. Repeat for the other side.

Solder the radiator grille overlay (22) to the front bonnet former (Fig. 6). When you have done this, offer them into their slot at the front of the bonnet. Adjust the depth of the slot with a file, so the front face of the overlay is flush with the leading edge of the bonnet. Lay the side of the bonnet on a hard, flat surface. Keeping the rear former square in its slot, tack-solder it at the shoulder with one of its sloping faces butting tight up against the bonnet. Check for squareness and then repeat with the front former on the same side. Turn the bonnet over and do the other side, again tack-soldering at one point only. Allow each joint to cool before doing the next – this will prevent buckling through unequal expansion. Check that the formers are square and if not, unsolder and adjust. When satisfied with the result, place the bonnet on a flat surface apply gentle pressure and tack-solder the bottom edge of each former to the inside vertical face of the bonnet, checking each time for squareness. The bottom edge of the bonnet should be flush with the bottom of the formers and there should be no gaps – a little pressure will relieve accidental bowing. When you are satisfied, run a seam of solder around the formers where they meet the bonnet. Avoid getting solder on the grille detail. Trim off the tab on the top of the rear former, but leave the tab on the radiator grille and front former (this represents the headlamp bracket). Cut four lengths of 0.4mm wire and pass them through their holes in the bonnet to the other side. Solder solidly in place from the inside. Trim the wires until they protrude by 1.5mm and bend them downwards, to represent the bonnet catches – when closed they should be vertical but on the prototype they were usually at a jaunty angle.

Shape a length of 0.4mm wire to represent the conduit running up to the headlamp and solder this to the right-hand side, as shown in Figure 9. Solder the filler-caps (23 x2) into their locations on top of the bonnet. Carefully remove the excess wire from inside the bonnet and then solder

the assembly to the footplate, using the tabs and slots provided. Make sure it is butted up against the cab front. Grind away the crosspieces on the rear former and then fill the top of the bonnet cavity with lead, down to the level of the bonnet catches.

Add the detail overlay (24) to the battery box (25) and then bend the latter to shape as shown in Figure 1. Solder it in place against the bodywork, parallel to the footplate, and then add the lid (26). The inside of the box can be filled with lead. If required, add the air tank (27), actuator valve (28) and compressor (29) (North Sunderland Railway loco only). Turn the body over and remove locator tabs, mounting pegs or any other obstructions that may be protruding beneath the footplate. Use the buffers (30 x4) to locate the inner (31,32) and outer (33, 34) layers of the bufferbeams together. Solder them along the outside edges and file flush, and then trim off the buffer locator pegs on the inner faces of the beams. Bend down the locator tabs on the front and rear of the footplate and locate one of the beams onto its tab. The top edge of the rectangular cutaway, at the back of the beam, should sit on the top edge of the locator tab on the footplate. Check the beam is central on the footplate and lightly tack-solder it to the tab. You can now adjust the vertical and horizontal position of the beam by gently tweaking it with pliers. When you are happy with position of the beam, solder it in place, taking care not to de-solder the buffers. Having attached both bufferbeams in this way, fit the web (35) between the right hand traction motor cover side and the rear bufferbeam.

Offer up the valance (36 x2) to the footplate and solder in place between the bufferbeams, tight up against the recess etched into the underside of the footplate. Tack-solder at one end first, check for distortion and then solder the other end. Repeat with the second valance. Check that the footplate is still level, that the valances are straight and there are no gaps between the valances and the footplate. When satisfied, run a fillet of solder along the inside.

Noting that they are handed, fold up the cab steps (37,38) and solder them into their slots in the footplate. Add the center steps (39 x2). Fit the front and rear lamps (40 x2) and horn (41) and then run a length of 0.4mm wire up to the rear light (Fig. 10). Using solder or glue, fix the rivet strip (42) along the joint between the traction motor cover lid and the cab rear. *The Lady Armstrong* had screw couplings; others in industrial service had the three-link pattern. Drill the bufferbeams for couplings (not supplied) and add the detail parts (43 x2). Fit the bonnet vents (44 x2) and traction motor cover vents (45 x2) in position on their raised rectangular locators. Add the brake pipes (46 x2) if required and run 0.4mm wire along the buffer beams as shown in Figure 10.

Place the cab roof (47) upside down on an open phone book. Take a length of dowel or, better still, steel rod approximately 1.5mm in diameter and gently roll the cab roof to shape. Mark where the exhaust comes through the roof and drill a 1mm hole. The cab roof overhangs equally on all sides. It should not be fitted until painting is complete.

ASSEMBLING THE CHASSIS

There are various options concerning the jackshaft. The arrangement we suggest cheats a little but works – and is virtually invisible! In our “Illusodrive” system, the jackshaft revolves in synchronisation with the wheels but is entirely cosmetic, being driven by gears off the rear axle rather than the connecting rod – it is not physically connected to the latter. This set-up, used in conjunction with the 108:1 gearbox, gives ultra-smooth performance.

The fastidious could, should they wish, make a functioning jackshaft by omitting the geardrive, fitting the flycrank and pinion with crankpins and locating the rods in the usual way. This is an

easy modification to make, but we found on our pilot models with compensated chassis that there was a slight possibility of binding under extreme conditions – the loco is effectively running as a species of 0-6-0 but with movement on one axle only. A more practical alternative, therefore, is to use the gear drive and also fit the flycrank and pinion with crankpins and bushes, so that the jackshaft is driven by gears and connecting rods – this seems to solve the binding problems. Another possibility, but perhaps only for the truly obsessive, is to make the gear on the rear axle a loose fit so the loco is driven is by the jackshaft alone, as per prototype.

Cut the axles to length from the silver steel stock provided: OO – 20.2mm, EM – 22mm, P4 – 22.4mm
These will give a better fit in the bearings than the axles supplied by wheel manufacturers, which are usually slightly undersized. Most 2mm bearings, we find, are oversized in any case, leading to excessive slop in the wheelsets.

While the sideframes (48,49) are still in the fret, carefully drill or ream out the bearing holes as follows:
Rigid chassis – open out the front, rear and jackshaft holes until the bearings are a tight fit, then solder the bearings in place with the flanges to the outside. Open up the idler shaft holes to 1.5mm.
Compensated chassis – open out the rear axle and jackshaft holes until the bearings are a tight fit, then solder them in place with the flanges to the outside. Open the idler shaft holes to 1.5mm. Open up the holes in the compensation beams (50 x2) and solder the bearings in place. Now open up the front axle holes in the sideframes so the bearings are a push fit – do not actually solder the bearings in place. If you are building a compensated chassis in OO gauge, there is limited clearance between the beams, the gearbox and the chassis sides, so you need to file the gearbox and compensation beam bearings on the rear axle flush on both sides. On a rigid chassis this is not necessary.

Punch out the rivet detail on the sideframes – a small practice piece is included in the fret – and then assemble the chassis (making sure it is square and straight), using appropriate spacers (51,52) for the gauge you model in. Bend up the brake stretchers from the bottom edge of the chassis and strengthen the bends with solder. Cut two 22mm lengths of bullhead rail and solder them to the bottom of the chassis as shown in Figure10.

Compensated chassis only – with front bearings (borrowed from the gearbox) temporarily fitted in the frame, put an axle in place and then push an M2 bolt (not supplied) or a bar of suitable diameter through the hole in the front chassis spacer so that it is resting on the axle. Secure this in position to form the pivot for the front axle. Remove the bearings – their holes will allow for vertical displacement of the axle.

Bend a piece of 0.5mm wire to shape as shown in Figure 8 and solder it to the front spacer, underneath the pivot bolt. Adjust the ends of the wire so they prevent the compensation beams from wandering inwards along the axle. Whilst still attached to the sprue, drill 0.5mm holes (to locate the sandpipes) in the centre of the bottom faces of the sandboxes (53 x2). The sandboxes can be fitted now, unless you intend to use a wheel press, in which case fit them after the wheels. At this stage you may like to give some thought to the pick-up arrangement (see overleaf) and, if you prefer, solder a double-sided paxolin strip in place before painting. Give the chassis a good scrub with household cleaner and then, when dry, paint it.

Now you can assemble the gearbox, which is designed so that, contrary to the usual practice, the motor is fitted last. This allows you to check at every stage, right through to fitting the wheels and rods, with a free-rolling chassis. Before starting work, make sure your work area is spotlessly clean and study Figures 12 and 13.

While the gearbox etch (54) is still in the fret, ream or drill the holes so the shafts and axle bushes, shown in Figure 12, are a tight fit. Solder in the axle bushes, with their shoulders on the opposite side to the bend lines and file the bushes so they are flush on the inside of the gearbox. Check that the motor mounting screws can slide up and down in their slots. Remove the gearbox from the fret and bend up as shown in the diagram.

Fit the first stage gear (27/10 tooth) the 2mm collar (identical to an axle bush) and the shaft into the gearbox. A small drop of “Loctite” on one end of the gearshaft is enough to secure it. Leave the collar free to slide on the shaft. Fit the second stage gear (20/10 tooth) and gearshaft into the gearbox. Now position the collar on the stage one shaft, so that when the gear is pushed up against it, the 27-tooth portion is central in the gearbox. For the time being the collar should be fixed temporarily - a piece of tape or some insulation sleeve from electrical cable will do the job. Check both gears revolve freely.

In EM and P4, you will need washers between the compensation beams (if fitted) and the gearbox. You will also need them between the gearbox and the sideframes on a rigid chassis. Push the rear axle through the bearings in the chassis, locating the compensation beams (if fitted) and the 20-tooth final drive gear as you do so - this is a push-fit on the axle. Cut the 1.5mm idler shaft to length - equal to the width across the outside of the frames – and push it through, locating the collars and 14-tooth gear as you do so. Glue the shaft into the frames – the gear is free to rotate on the shaft and the 1.5mm collars should not be fixed yet.

Using a drill bit of about 2mm diameter, countersink the back of the crankpin holes and fit crankpins into the wheels. It is advisable to secure the crankpins in the wheels with a small amount of “Araldite”. Assemble the wheels and the 20-tooth gear (with the boss to the left) and washers onto the axles. There must be virtually no sideplay on the rear axle as this can affect the mesh of the gears. Gauge and quarter the wheels (the right hand pair leads the left by 90 degrees and fit the brass balance weights (55 x4). When you are happy with the position of the wheels re-check the position of the 20-tooth gear on the axle. It should run right up against the left-hand side of the gearbox.

Position the 14-tooth idler gear so it is directly in line with the 20-tooth rear axle gear. Push the 1.5mm collars up to the gear and glue them in position. Fit the flycrank (56) to the jackshaft axle, push the axle through the bearings, locating the 20-tooth gear as you do so (the gear sits in a cutaway in the rear spacer). You may find it beneficial to file a flat on an unused area of the axle, so that it can be gripped with flat-nosed pliers to prevent it from turning when positioning the components. The jackshaft should be washered the same amount as the rear axle. Mesh the 20-tooth jackshaft gear with the 14-tooth idler gear, and then fit the pinion wheel (57). Turn the pinion wheel and flycrank on the jackshaft, until their position matches the quartering of the driving wheels.

Before fitting the rods, fold up the brass pinion cover (58). Bend up the sides first and then the top and bottom. When you have done this, remove the strengthening disk from the centre. To accommodate the extra depth of OO/EM flanges, the half-etched area needs to be cut away. Locate the pinion cover by hooking the bottom under the chassis and soldering or gluing the top tabs into their slots. The curved top part (which is hidden behind the valance) can be cut off if it does not clear the footplate. If you have not already done so, fit the sandboxes. Fit pieces of 0.5mm wire into your pre-drilled holes, to represent sandpipes. Glue on the brake hangers (59?4), ensuring they are vertical and that their mounting pegs do not foul the compensation beams.

While still in the fret, drill out holes in the dummy extension pieces on the front layer of the side rods (60,61), so that a 14BA bolt is a tight fit in them (about 0.9mm dai). Open out the rest of holes in the side rods (60 – 63) and the connecting rods (64– 67) to 1.5mm diameter, as shown. Noting that the small oil filler corks are at the rear, solder the two layers of each rod together so the holes are in exact alignment - use a couple of “long” crankpin bushes, well oiled, for this (the oil keeps solder off the bushes). Now, open out the crankpin holes to 1.6mm - this will give a running fit between the rods – but leave the holes in the dummy extension pieces as they are.

Because of the limited clearances between the rear wheel crankpin fixer and the connecting rod, we suggest using a “long” crankpin bush at the front axle and a short one at the rear. These bushes should be reversed, with a 0.4mm washer spacer washer at the front crankpins to separate the rods. If you wish to use this method, file two “short” crankpin bushes until their length gives a running clearance when fitted into the rods. This can be easily achieved by pushing the bush through a piece of paper and then through the hole in the rod - the protruding end of the bush is then filed flush with the front face of the rod. Use the same procedure for the front crankpins, but this time use a long bush with two rods and a 0.4mm spacer washer to obtain the correct length. The jackshaft bushes must equal the thickness of the connecting rod plus one 0.4mm washer, plus clearance – i.e. about 1.5mm.

It you decide to fit the rear crankpin bushes the conventional way round, using nuts to secure them, then make sure you file the rear crankpin nut as thin as possible. In addition to this, you may also need to space the rods further apart, so the connecting rod clears the nut on the rear crankpin. On a P4 chassis, watch the connecting rods do not foul the steps and valances, when the body is fitted.

Slot a 14 BA countersunk bolt through the hole in the dummy extension pieces, with the head to the back face of the rod, and secure with a small amount of solder. Fit the side rods onto the crankpins and fit crankpin bushes. Temporarily fix the rods in place using crankpin nuts and test by pushing the chassis along a piece of track. When all is well, remove the crankpin nuts and secure the rear driver crankpin bushes with a small amount of “Superglue” and cut their crankpins flush. Remove the front “long” crankpin bushes, push them through the front hole in the connecting rods and then back through the front hole in the side rods (on the crankpins). Push a jackshaft bush into the hole at the rear of the connecting rods, slip a washer over the bush and push the rear end of the connecting rods over the bolt which protrudes from the dummy extension piece on the side rods. Check the bush is through the washer and hard up against the extension piece and secure the connecting rods with 14BA nuts. The nuts can be fastened and then reduced in thickness, or alternatively, removed altogether and the bushes glued in place. Test the loco for free running - if your quartering is accurate, it will be almost impossible to tell it is not physically connected to the connecting rods when the loco is in motion and the body is in place.

If you have chosen to fit crankpins to the jackshaft, we suggest that the coupling rods are trial-fitted with the dummy extension pieces reversed so they face the front of the loco. Test that everything works before cutting them off.

When you are satisfied that the chassis is moving freely, you can fit the motor. Using a carborundum slitting disc, cut off the rear motor shaft (brushgear end) so about 1mm is left. Shorten the front shaft to 8mm and deburr. The worm, a force fit on the shaft, should now be pressed on in a vice until it is flush with the end of the shaft. Fit the motor to its slots in the gearbox using the screws supplied with it. Remove the piece of tape, or whatever was keeping the first stage collar in place on its shaft and glue the collar in place so that the gear runs centrally under the worm. When the glue has set, slacken off the motor mounting screws slightly and adjust the mesh between the worm and the 27-tooth gear. Test the mechanism under power

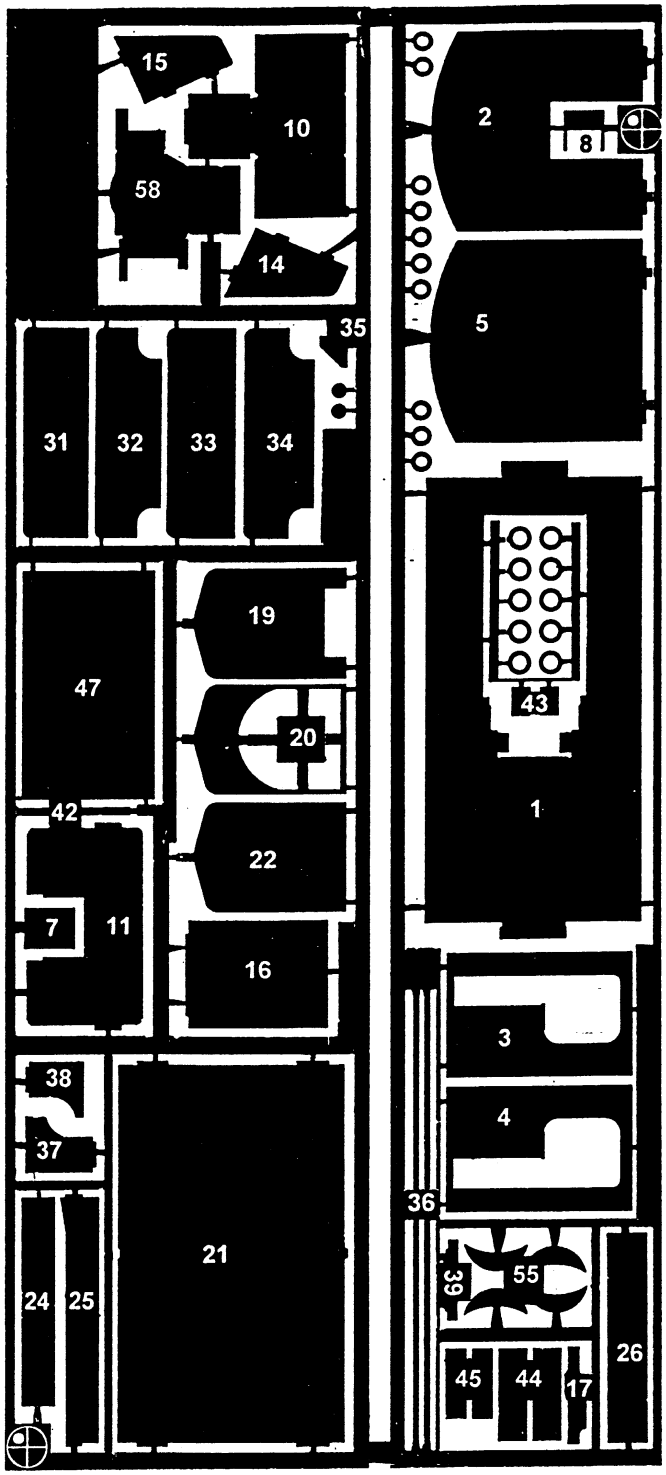
and then run it for an hour or so – gently at first, then gradually increasing the speed. Allow time for the motor to cool if it runs hot.

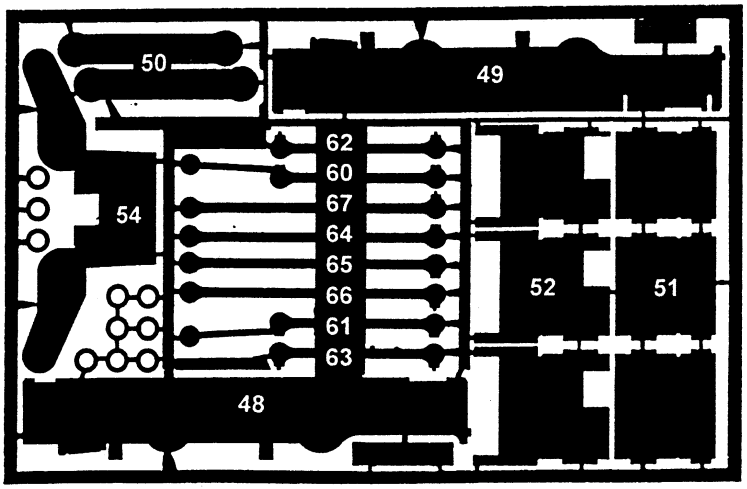
Most modellers have their own ideas about pick-ups. Our suggestion, illustrated in Figure 8, is to glue a length of thin copperclad strip – suitably gapped – between the sideframes, ahead of the front wheels. Solder flexible wire pick-ups to these strips (0.3mm for the front wheels, 0.4mm for the rear) and tweak them gently so they make good contact with the backs or rims of the wheels, without shorting on any metal parts. Run fine insulated wire from the strips, around the motor and solder to the brush tags.

ARMSTRONG WHITWORTH 0-4-0 DIESEL ELECTRIC LOCOMOTIVE

PARTS LIST

1. FOOTPLATE
2. CAB FRONT
3. CAB SIDE (LEFT)
4. CAB SIDE (RIGHT)
5) CAB REAR
6. VALVES ×2
7. INDICATOR PANEL
8. PACKING PIECE
9. CYLINDRICAL VALVE
10. CONSOLE
11. CAB FLOOR
12. HANDBRAKE
13. HANDBRAKE COVER
14. TRACTION MOTOR COVER SIDE (LEFT)
15. TRACTION MOTOR COVER SIDE (RIGHT)
16. TRACTION MOTOR COVER LID
17. TRACTION MOTOR COVER DETAIL
18. GEAR COVER
19. BONNET FORMER (FRONT)
20. BONNET FORMER (REAR)
21. BONNET
22. RADIATOR GRILLE OVERLAY
23. FILLER CAPS ×2
24. BATTERY BOX OVERLAY
25. BATTERY BOX
26. BATTERY BOX LID
27. AIR TANK
28. ACTUATOR VALVE
29. COMPRESSOR
30. BUFFERS ×4
31. FRONT INNER BUFFERBEAM
32. REAR INNER BUFFERBEAM
33. FRONT OUTER BUFFERBEAM
34. REAR OUTER BUFFERBEAM
35. WEB
36. VALANCES ×2
37. CAB STEP (LEFT)
38. CAB STEP (RIGHT)
39. CENTRE STEPS ×2
40. LAMPS ×2
41. HORN
42. RIVET STRIP
43. BUFFERBEAM DETAILS
44. BONNET VENTS ×2
45. TRACTION MOTOR COVER VENTS ×2
46. BRAKE PIPES ×2
47. CAB ROOF
48. CHASSIS SIDEFRAME (LEFT)
49. CHASSIS SIDEFRAME (RIGHT)
50. COMPENSATION BEAMS ×2
51. CHASSIS SPACER (FRONT)
52. CHASSIS SPACER (REAR)
53. SANBOXES ×2
54. GEARBOX ETCH
55. BALANCE WIEGHTS ×4
56. FLYCRANK
57. PINION WHEEL
58. PINION COVER
59. BRAKE HANGERS ×4
60. SIDE ROD – FRONT LAYER (LEFT)
61. SIDE ROD – FRONT LAYER (RIGHT)
62. SIDE ROD – BACK LAYER (LEFT)
63. SIDE ROD – BACK LAYER (RIGHT)
64. CONNECTING ROD – FRONT LAYER (LEFT)
65. CONNECTING ROD – FRONT LAYER (RIGHT)
66. CONNECTING ROD – BACK LAYER (LEFT)
67. CONNECTING ROD – BACK LAYER (RIGHT)





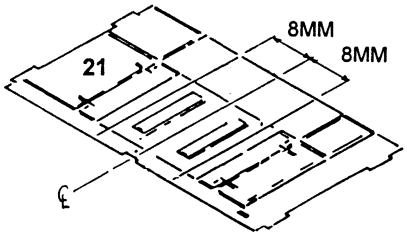


FIG. 2

BONNET ASSEMBLY

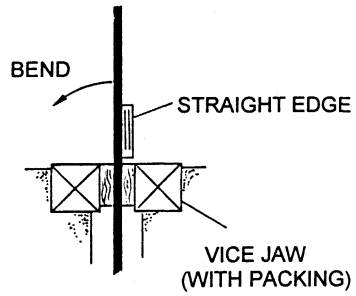


FIG. 3

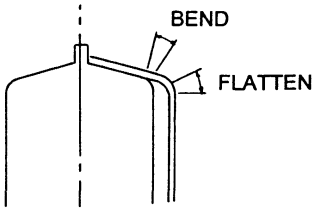


FIG. 5

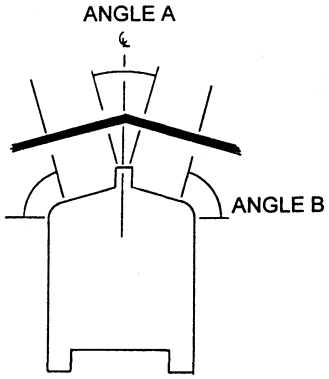


FIG. 4

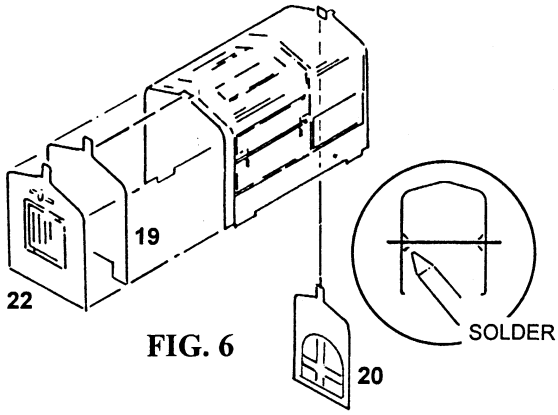
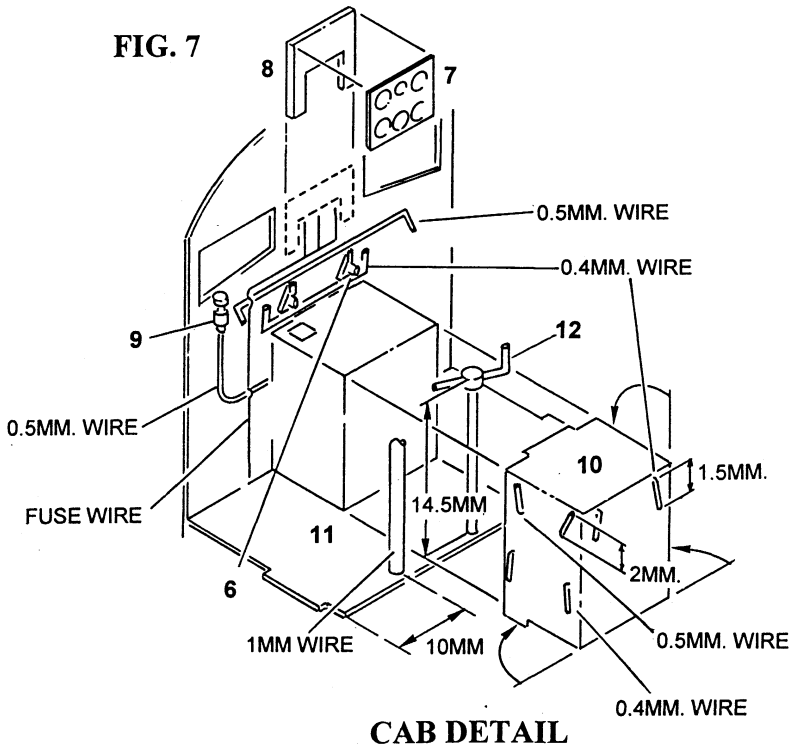


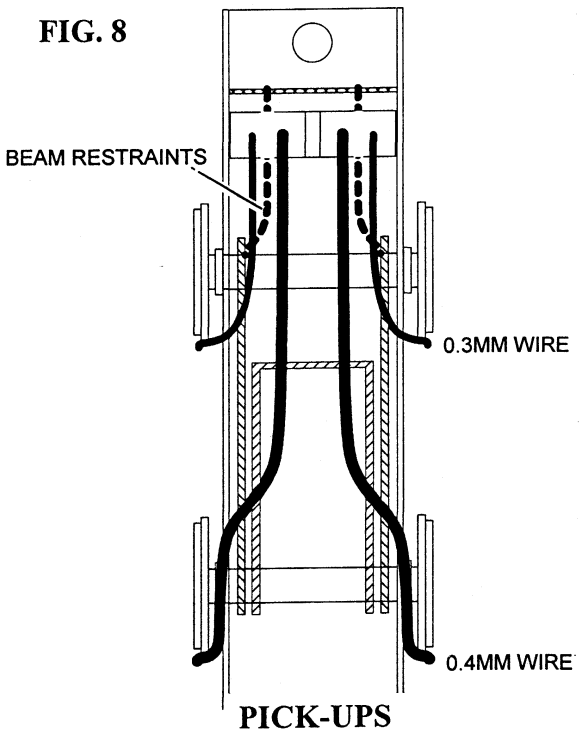
FIG. 6

FIG. 7



CAB DETAIL

FIG. 8



PICK-UPS

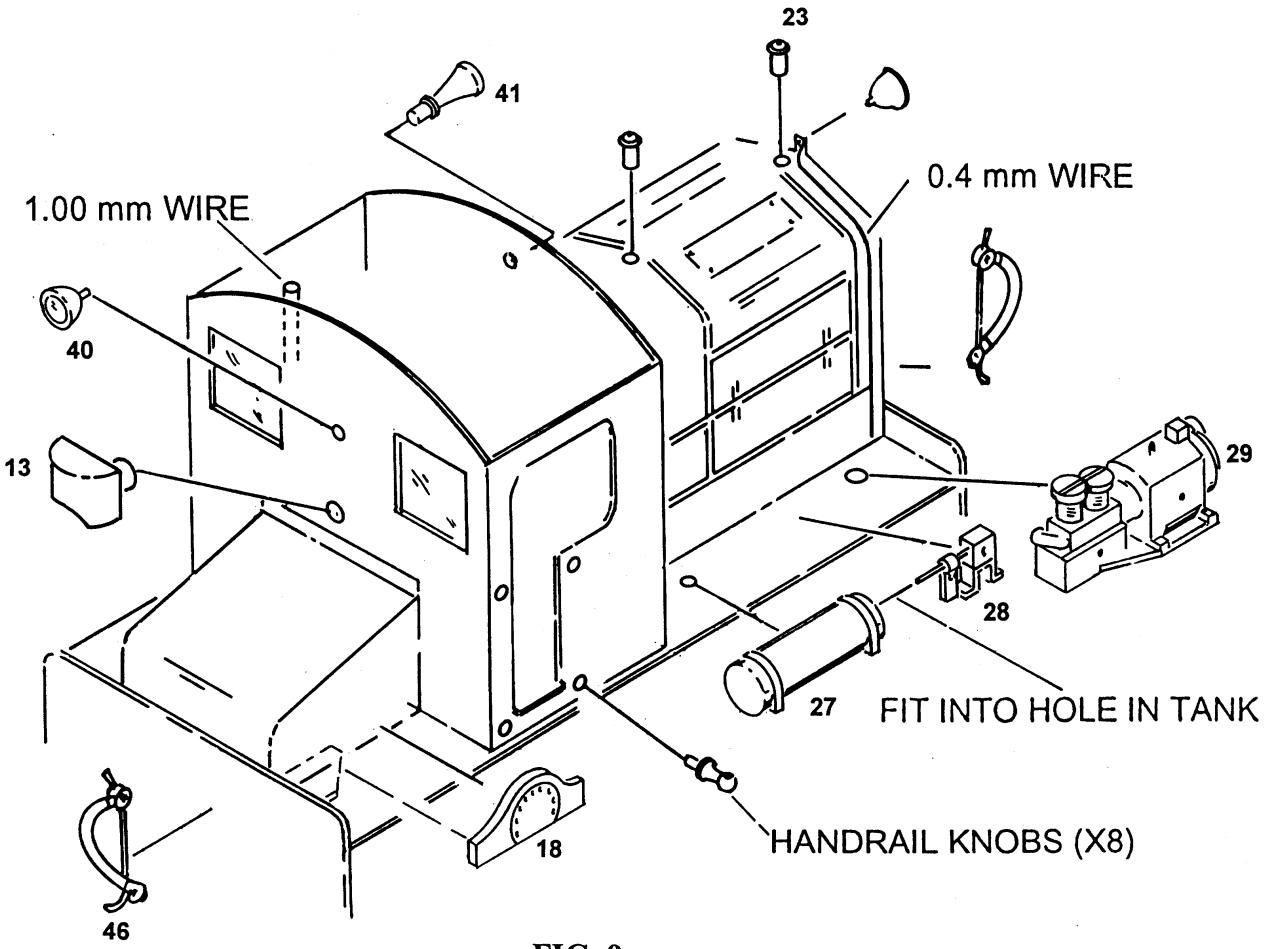


FIG. 9

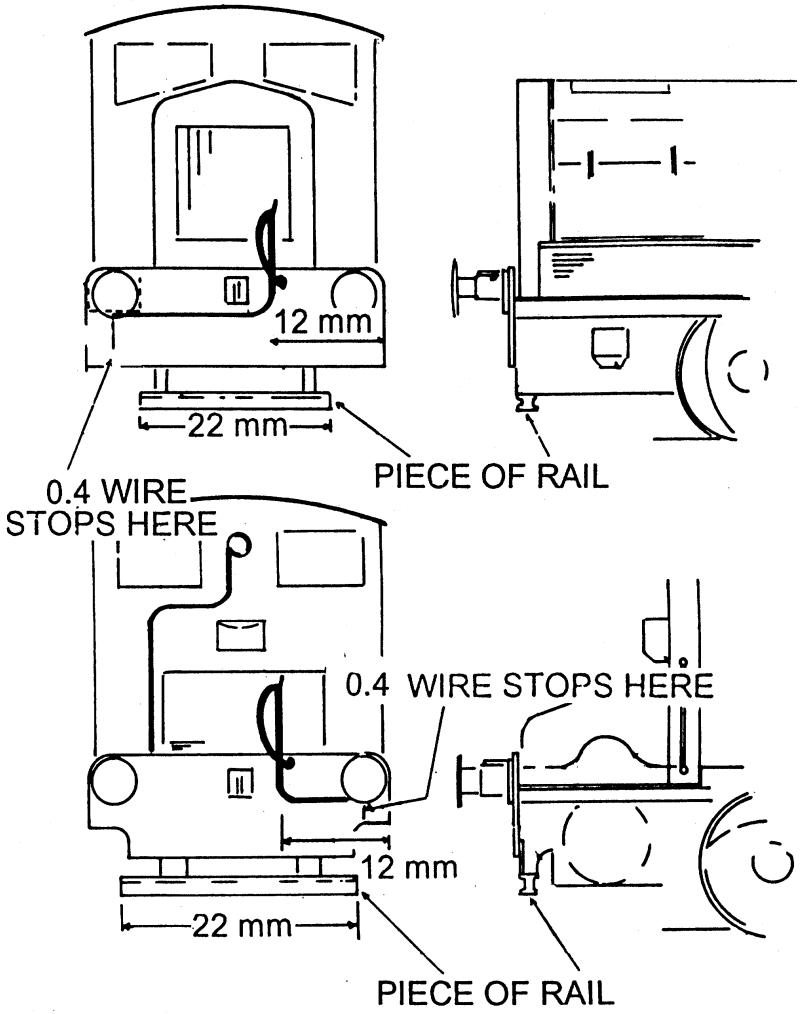


FIG. 10

LOCATION OF CASTINGS

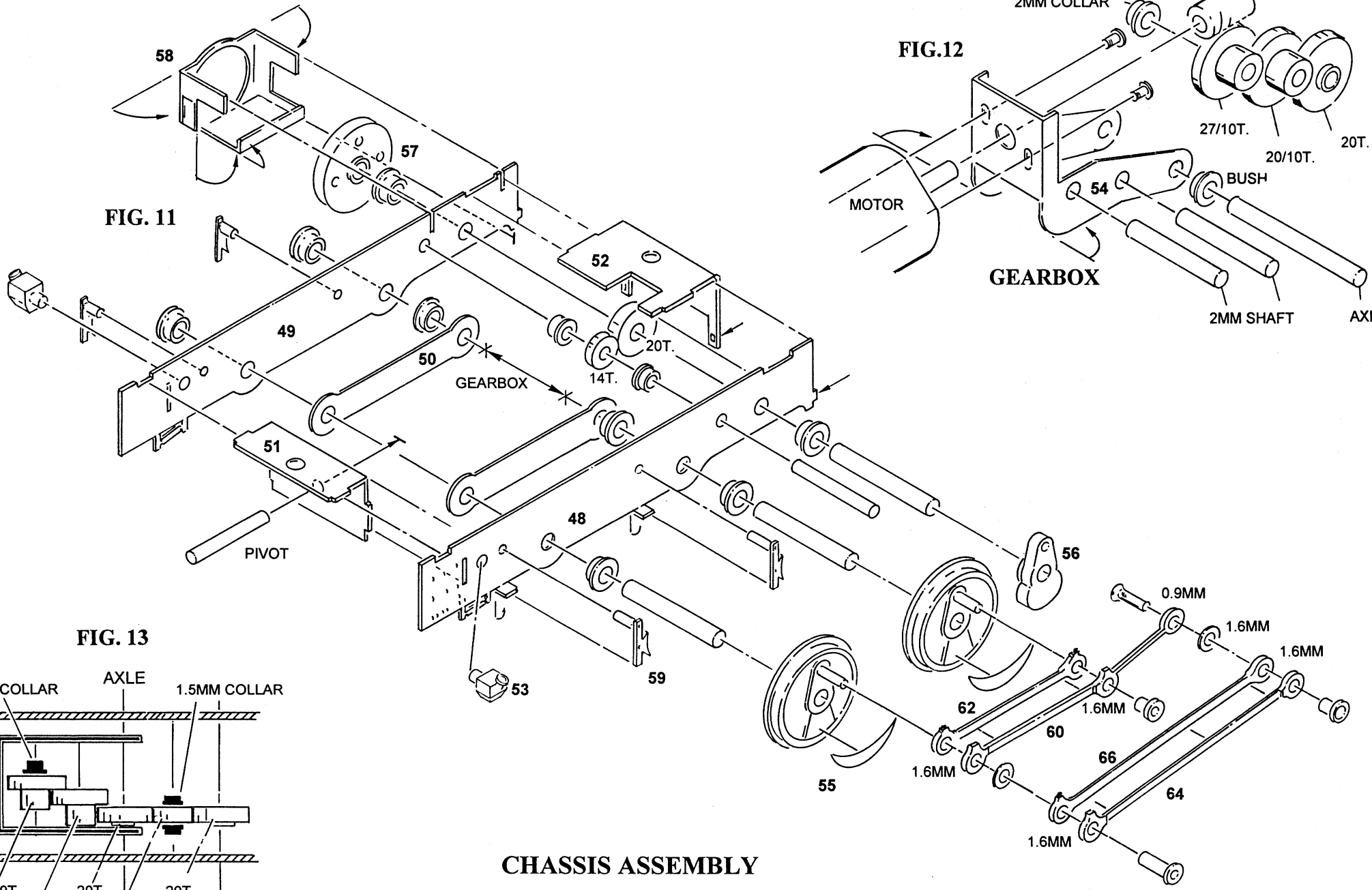


FIG. 11

CHASSIS ASSEMBLY

FIG.12

GEARBOX

FIG. 13

with Illuso-Drive