R.S.H. "HUSKY"
0-4-0 DIESEL-MECHANICAL LOCOMOTIVE

'The new HUSKY 107bhp diesel-mechanical shunting locomotive is a great little worker,' read Robert Stephenson & Hawthorns' trade advertisement for this tiny 14-ton engine. It is particularly suitable for factory yard shunting and is available for all rail gauges between one metre and 5ft 6ins. Of thoroughly robust design, all details of the HUSKY have been simplified to ensure complete ease of operation and maintenance.'

Introduced in 1956, the 'Husky' was designed as a cheap, up-to-date and reliable shunter with a light axle loading, combining the simplicity of steam with the convenience of a diesel or petrol-engined locomotive. RSH anticipated considerable demand from small, rail-served industries such as gas works, foundries, chemical plants and civil engineering contractors. The specification called for a haulage capacity of around 150 tons (six or seven loaded wagons) on a gradient of 1:100. On level track, the makers claimed, a 'Husky' could handle 420 tons. On such duties, speed was not critical and the 'Husky' could manage 5mph in low gear and 8mph in high gear. The engine was the familiar Gardner 6LW diesel, driving via a jackshaft. Good all-round visibility was important in the confined spaces where these engines were expected to work, and the 'greenhouse' centre cab was a key design feature.

Although well liked by drivers and maintenance staff, the 'Husky' was not a great commercial success and only fifteen were built over a ten-year period. Sets of parts were produced at RSH's Forth Bank Works on Tyneside but most of the 'Huskies' were actually assembled to order at the English Electric company's Stephenson Works in Darlington. Four were adapted for the 5ft 6in gauge railways in Pakistan while a meat-packing plant in New Zealand ordered a solitary 3ft 6in gauge example.

All the British-based 'Huskies' lasted into the 1970s apart from the very last one to be built, which had a working life of less than two years - on dock work in Middlesbrough - before being scrapped in 1968. Most appear to have been outshopped in RSH's distinctive light green, which was similar to the shade used by the old North Eastern Railway. Differences between individual locomotives were slight, although the prototype had dumb buffers and footplate-mounted sandboxes. Engines built for export had the appropriate buffer/coupling arrangements and the broad-gauge locomotives for Pakistan had a different cab roof profile. All details and measurements for the model were taken from RSH 7901/56, late of British Imperial Sand Ltd and now preserved in working order on the Tanfield Railway.

GENERAL NOTES ON CONSTRUCTION

This kit is designed to take the Mashima 12/20 motor and 1Omm diameter disc driving wheels (ref. M014) from Sharman Wheels. As far as we know, no other commercially available wheel on a 2mm axle matches the throw of the pinion wheel and flycrank included in the kit.

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.

This is a highly detailed kit containing many small parts. Our pilot models were assembled using solder throughout - we recommend a 25w iron with the smallest available bit. If you prefer to glue the small details, do so only when soldering of the main superstructure is complete. Heat from the iron will destroy glued bonds and some adhesives - notably cyano “superglues” - may give off toxic fumes. Read the manufacturer's safety notes before using.

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.

The 'Husky' is a tiny locomotive with exceptionally small wheels. Its power will surprise you but good current pick-up may be a problem unless you make the engine as heavy as possible (at least 4oz). Fill every available space inside the body with lead. It is easy to make this model tail-heavy so pay attention to ballasting the front end - even a bit of lead in the sandboxes might helpl To keep the engine running well, you will almost certainly need to clean the wheels more often than usual .

Other than the routine filing-off of tabs as parts 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 modify any of the components, other than purely cosmetic alterations to represent variations on a specific prototype, 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 before 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 parts together. If you are patient and careful, you will find that building this scale model locomotive becomes an immensely rewarding experience.

We want you to enjoy building your kit, but remember that even railway modelling has its risks. Frets contain sharp edges, soldering irons get very hot, adhesives may give off toxic fumes, knives and files are designed for cutting. Please be careful . . .

BODY ASSEMBLY

Study Figure 2 before commencing work. Pay particular attention to the sequence of the bending operations and do not solder anything in place until the specified time.

Using flat-nosed pliers, bend the valances (X) on the cab floor (1) down through 90 degrees. Bend the sides of the cab frame (2) down through 90 degrees and, after double-checking that the parts are correctly oriented, push the tabs on the frame sides into their locations in the cab floor - do not solder them in at this stage. Bend the cab ends down, locating them on the small ledges (A) which protrude from the front and rear edges of the cab floor. Turn the cab assembly upside down and, using your fingers and thumb, gently squeeze the front and back, so they butt right up against the floor. Now, using wood packing to prevent your fingers from burning, tack-solder the floor to the inside faces of the frame ends, maintaining pressure as you do so. When this is done, solder the tabs on the frame sides into their slots in the cab floor.

The frame may have a tendency to bow out slightly, at the top corner bends. This can be easily rectified by gently squeezing the frame in a vice, across the top corners, until the width at the top equals the width at the bottom. When you are happy that all is well, run in seamed joints at the corners of the frame.

If you wish to use transparent styrene sheet to glaze the cab, we suggest cutting the glazing to size at this stage and fitting it after painting. It should be a snug fit in the rectangular window openings of the cab frame.

Fold up the cab seats (3,4) and solder them into their locations inside the cab (Figure 7), making sure their tabs in the side of the cab are filed flush on the outside. Cut the handbrake lever (5) with about 4mm of its locator peg from the sprue. Open out the locating hole (at the rear of the cab frame) to suit the locator peg and slot in the lever from the inside. Secure it with solder and trim the peg flush at the back. Whilst in the fret, tin the inside edges of the cab front (6), rear (7) and side overlays (8,9). Locate the cab front on the front of the frame as shown in Figure 2. It should sit on the small ledges (A), which protrude from the cab floor. Check that it is central and that its side edges are flush with the outer faces of the cab frame sides. Solder the front overlay in place, using small quantities of solder along the edges. Repeat this process for the cab rear overlay and then solder the cab side overlays in place – their leading edges should be flush with the outer faces of the front and rear overlays. The small ledges (A), used to locate the front and rear overlays, must now be filed flush with the outer faces of the cab.

The Husky's unique split-level footplate features two integral spines, which prevent the footplate from flexing, as well as supporting the raised cab. The spines will eventually be hidden and must not be cut off.

Remove the small parts attached to the centre of footplate (10) and store them safely. Position the footplate in your vice, so one of the bend lines at the spines is just visible above the jaws (Figure 5). Carefully bend the spine (B) down through 90 degrees, using a straight edge to finish off. Repeat this process for the second spine. Sight along the footplate and tweak it straight if necessary.

Bend the valances (Y) down through 90 degrees, working on one section at a time. The best tool to use for this is a pair of flat-nosed pliers, with smooth jaws, which are long enough to grip the whole front sections of valance. When you have done all four valance sections, check the footplate is straight. Leave the front sandboxes (Z) flat for the time being.

Solder two M2 nuts over the holes on the upper side of the footplate, using a bolt with a well oiled thread to position them. 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 longer than the footplate, but narrow enough for the valances to sit over the sides. Make a couple of hacksaw cuts in the wood for the front and rear of the cab to sit in.

Manoeuvre the cab assembly into position on the footplate as shown in Figure 1 - the spines on the footplate will spring inwards slightly to facilitate this. Locate the notches in the height adjustment tabs (C) on to their locators (D) on the spines. The cab should clip into position with the spines sitting in the slots in the cab floor. Do not solder anything at this stage. With the footplate sitting on its piece of wood, check that the cab sits level and square. Minor adjustments can be made by bending the height adjustment tabs upwards or downwards, using a pair of small pliers. When you are happy with the position of the cab, solder the floor to the spines and solder the four vertical sections of the cab (E) to the footplate.

Punch out the rivet detail on the bonnet (11) as shown in Figure 4. Trim two lengths of 0.4mm wire to length and solder them into the etched grooves, to represent the rainstrip above the bonnet doors.

Bend up the bonnet so its shape exactly matches the bonnet front (12) and then solder the latter in place, flush with the leading edges. Check the height and width of the bonnet is constant along its length. Open up the filler cap holes until the top of the filler caps (13 x2) will pass through. Push the filler caps into their locations and secure them, making sure that they are central in their holes. Solder the bonnet vent (14) into its location on the left-hand side of the bonnet and trim the peg flush at the back. Anneal four 30mm lengths of 0.4mm wire and pass them through their location holes, just below the rainstrip, and out the other side of the bonnet. Solder the wires solidly in place from the inside and trim the ends so they protrude by 1mm. Drill out the holes in the bonnet doors (15 x4) to 0.5mm and solder the doors in place. The smaller of the two rectangles, at the bottom corners of the doors, should be butted up against each other, with the four cross-wires sitting in the semi-circular cutest on the upper edges. When the doors are fixed, bend the ends of the cross-wires downwards through about 45 degrees, to represent the bonnet catches (see Figures 3 and 4).

Using a 0.5mm bit, drill through the holes in the doors and through the bonnet itself to form the locations for the door handles (16 x8). Push the latter into place and then, using a length of lightly oiled 0.4mm wire to space them away from the door face, solder the handles from the inside of the bonnet. Use the minimum amount of solder and avoid letting it run through onto the louvres. After making sure they are facing the correct way, fix the bonnet handrails (17 x2) in position. Use a piece of 0.7mm wire (lightly oiled) to position the handrails the correct distance from the bonnet face. If the handrails do not fit into their locations, carefully open out the holes – do not force anything. When they are fitted, remove the square edges from the top corners of the handrails with a sharp blade.

Now fit the bonnet assembly to the footplate, making sure it is butted up against the cab front (Fig. 1). Fit the bonnet rivet strips (18 x2) along the joint between the bonnet and the footplate, ensuring that the pairs of double rivets are at the front.

Punch out the lines of rivets on the rear cover (19) as shown. Bend the cover to shape and solder along the inside of the joints, applying pressure with wood packing where required. Fix the rear cover doors (20 x2) in place, checking that they are correctly oriented. Attach the door handles (16 x2), one per side, in the same manner as the handles on the bonnet doors. Fit the rear cover assembly to the footplate, making sure it is butted right up against the rear of the cab. Fix the rear cover rivet strips (21 x2) along the joint between the cover and the footplate – the plain section goes up against the cab. Turn the body over and remove any locator tabs or other obstructions that may be protruding beneath the footplate. Do not remove the spines.

Use the buffers (22 x4) to locate the inner (23 x2) and outer (24,25) layers of the bufferbeams together. Solder them along the outside edges, file flush and then trim off the buffer locator pegs flush with the back 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 register with the two small locators on the footplate. Lightly tack-solder the beam to the tab. You can now adjust the angle of the beam by gently tweaking it with pliers. When you are happy with its position, solder it in place, taking care not to de-solder the buffers. Position the radiator grille (26) and the louvre panel (27) on the bonnet front and solder them in position as shown in Figure 3.

Carefully score along the bend line where the sandbox joins the valance. This prevents the valance from distorting and ensures a nice sharp bend. Fold the front sandboxes to the shape shown in the diagram. Start by bending the front inwards through about 30 degrees. Now make the 90 degree bends at the sides – this should push the front back up to the correct angle. Finally, bend up the bottom until it meets the sides, solder it in place and then solder the tips of the corners to the underside of the footplate. Locate the front sand box necks (28 x2) into their rectangular cut-aways and then add the etched lids (29 x2).

Noting that their locators are slightly offset to make a handed pair, fold up the cab steps (30,31) and solder them in place, under the cab and behind the valance. Add the footsteps (32 x4). Solder the air tank casting (33) into its hole under the cab floor, at the left-hand side, with the small drain-cock outermost. Bend the exhaust cover (34) to shape and fit it into the slots on the cab front. Solder the air horn (35) in place. Drill the bufferbeams for the couplings hooks (36 x2), which can be soldered in place once you have added the coupling detail parts (37 x2)

Solders the rear sandbox top castings (38 x2) on the footplate. They should sit right up against the cab and 0.5mm away from the rear cover side. Use a piece of wire to obtain the correct spacing. Bend the rear sandbox bottoms (39 x2) to shape and solder them in place, so their faces line up with the sandbox tops. Use the drill-starts on the underside of the footplate to drill 0.5mm holes up into the sandbox castings, taking care not to drill all the way through. Anneal four 20mm lengths of 0.5mm wire and solder them into the holes under the sandboxes to represent the sandpipes – they can be shaped and trimmed to length when the chassis is fitted. Fit the etched rear sandbox lids (40 x2).

The cab detail can be added now or, if you wish, after painting. Having studied Figure 7, bend the top of the control console (41) down through just over 90 degrees and then bend the sides in until they meet the console top, pushing it up and into square. Solder along the inside of the joints. Fold in the sides of the electrical switch box (42) and then bend the switch detail (at the back of the console) up through 90 degrees. Solder the switch box into its locations and to the switch detail. Push the control handles (43 x2) up through their slots in the console top and secure with solder. The handles can be arranged at various angles, but because they represent dual controls, each lever must correspond with its counterpart on the opposite side of the console. Push a piece of 0.5mm wire up through the slot in the center of the console and solder it in place. Bend it to the left or to the right and then trim it so it protrudes by about 2mm. Locate the tabs on the console into their slots in the cab floor, with the sides sitting on the two small ledges (F) and solder in place.

Using the holes in the overlays as a guide, drill 0.4mm locations into the cab frame and fit the cab handrails (44 x2), making sure they are the correct way up (Figure 2). When drilling the rear handrail holes, angle the drill inwards, towards the front of the cab – the handrail can be tweaked into line when fitted. Use a piece of 0.4mm wire (lightly oiled) to space the handrails an equal distance from the cab side. When the handrails are fixed, remove their square edges with a sharp blade. Using the drill-starts, drill 0.4mm holes through the rectangular locks on the cab doors and through the cab frame. Bend two small pieces of wire into “L” shapes and fix them in place, as shown in the diagram. Place the cab roof (45) upside down on an open phone book. Take a length of dowel or, better still, steel rod approximately 15mm in diameter and gently roll the cab roof to shape. Try the roof in place – it should sit centrally on the cab. It should not be fitted until painting is complete. Trim the square-section body of the exhaust pipe casting (46), until the curved pipe sits snugly on top of the cab roof.

CHASSIS ASSEMBLY

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.

Cut the axles to length from the silver steel stock provided:
Driver axles, OO – 19.75mm, EM – 21.25m, P4 – 22.7mm.
The jackshaft axle should be 1mm shorter than the above sizes.

We suggest that you temporarily fit wheels to the axles and use back-to-back gauge for verification. The axle ends should be flush with the front faces of the wheels

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 (47,48) 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 in each of them, 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 (49 ?2) and solder the bearings in place, checking that they are fully home and not skewed. Now open up the front axle holes in the sideframes so the bearings are a push fit – do not actually solder them in place.

Punch out the rivet detail on the sideframes – a small practice piece is included in the fret. Open out the small holes at the bottom of the chassis sides to 0.5mm diameter.

Select the appropriate chassis spacers (50,51) for the gauge to which you model. Bend the sides of the transmission cover (52) through 90 degrees, slot the rear spacer through the opening and manoeuvre it into position, so the cover sides fit through the slots in the rear spacer (Figures 8 and 9). Push the spacer tight up against the back of the transmission cover and solder it in place. Now bend down the top – a slot on the top locate on the small tab on top of the spacer. Bend the small extensions (on the ends of the cover sides) outwards through about 45 degrees. For a OO chassis, the extension pieces should be snapped off completely. Strengthen all the bends with solder. Noting that they are left and right-handed, fit the transmission details (53,54) to the transmission cover. To locate them, use pieces of 0.5mm wire, trimmed slightly proud at the front. Attach the bolted flanges (55 x2) to the transmission details using longer pieces of 0.5mm wire and then trim all the wires flush at the back. For an EM and P4 chassis, the longer wires should be curved upwards at the front to represent hydraulic feed pipes. On OO models these wires should be filed flush at the front. Now take this assembly, along with the front spacer and the sideframes, and solder up the chassis, making sure it is square and straight as you do so. When the rear spacer is in place, solder the small extensions on the transmission cover sides to the sideframes

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 through the hole in the front chassis spacer so that it is resting on the axle. Tighten up the nut so bolt can now form the pivot for the front axle. Remove the bearings – their holes will allow for vertical displacement of the axle – and solder the nut and bolt in place.

Bend the brake gear mounts, at the top of the chassis, through 90 degrees. Carefully fold the small angle brackets (at the bottom corners of the chassis) through 90 degrees. Cut two 22mm lengths of 1mm wire and solder them to the brackets to represent the stone guards, as shown in Figure 8.

Solder two 14BA nuts on the underside of the holes in the brake gear mounts - the nuts should sit in the small cutaways. Use a lightly oiled bolt to position the nut and be sparing with the solder.

When building up the hanger assemblies, pay particular attention to the fact that you are making a handed pair. Use pieces of 0.4mm wire to locate the brake blocks (56 x4) on the hangers (57,58). When the blocks are in place, trim the wire almost flush at the front of the blocks. Solder pieces of 0.5mm wire into the holes at the bottom of the hangers and trim them so they protrude by 2.5mm at the rear and are slightly proud at the front. Layer the pull rods (59 x2) onto the front of the hanger assemblies, so the end hole in the rods lines up with the bottom of the lever. They should run along

the lower edge of the location slots, but must not obscure them. Push pieces of 1mm wire into the holes in the top levers, file almost flush at the front and leave 2mm protruding at the back. Fold the locator on the top of the brake hangers through 90 degrees. Using a drill of about 2mm diameter, countersink the location hole in the chassis so the top of a 14BA-countersunk bolt sits flush.

The brake gear is fully removable. Although it is fitted after the wheels, it is advisable to try it in place and make adjustments before painting. With a wheel and axle temporarily fitted, locate the slot at the top of the brake assembly onto its locator on the chassis. Push the hanger forward until the top hole lines up with the hole in the brake gear mount. Push a 14BA-countersunk bolt through both holes, secure it with a nut and trim the bolt flush with the nut. Check the position of the brake blocks in relation to the wheels. The pins at the bottom of the hangers locate in the small holes at the bottom of the frames. If the hangers are not parallel with the frames, try bending the locators at the top slightly past 90 degrees. When you are happy that everything fits, remove the brake gear.

Open out the holes in the front chassis overlays (60,61) to 0.5mm and fix them in place by soldering sparingly around the edges. Make sure the holes in the overlays line up with those in the chassis. Fix the rear chassis overlays (62,63) in place taking particular care not to fill up the idler shaft locations (in the frames) with solder. To prevent this from happening, push the end of a crankpin bush (lightly oiled) into the holes when fixing the details. If the worst happens, and the solder does take to the bush, it can be collapsed with pliers and then removed.

Bend a piece of 0.4mm wire to shape, solder it across the top of the pivot bolt and then adjust the ends of the wire, so they bear lightly against the compensation beams, preventing them from wandering inwards along the axle (Figure 6). At this stage you may like to give some thought to the pick-up arrangement and, if you prefer, solder a double-sided paxolin strip in place before painting. Give the chassis and brake gear a good scrub with household cleaner. When dry, paint them the colour of your choice.

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 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 10 and 11.

While the gearbox etch (64) is still in the fret, ream or drill the holes so the shafts and axle bushes, shown in Figure 10, 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. Check there is a small amount of sideways movement on the stage 2 gear, and that the side faces of the gears are not jammed tight up against each other. 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.

The 20-tooth drive gears are an extremely tight fit on a 2mm axle and almost impossible to push on when building the chassis. To avoid problems during assembly, it is recommended that you ease the fit of these gears slightly by carefully opening them out with a reamer or a tapered file. Having done this, assemble the wheels, the beams, the 20-tooth gear (with the boss to the left) and the washers onto the axles. There must be virtually no sideplay on the rear driven 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 wheel overlays (65 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.

Check the idler shaft location holes are free from solder or glue. Cut the 1.5mm diameter idler shaft to length - equal to the width between the frames, plus about 0.75mm. Make sure you cut the shaft ends square. Locate the collars and 12-tooth gear on the shaft and spring this assembly into place, pushing the frames outward slightly as you do so.

Position the 12-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. Carefully open out the holes in the flycranks (66 x2) until they are a tight fit on their axle. For the “Illusodrive” system, the crankpins on the flycranks should be cut off, leaving only the large diameter

boss, as shown. Fit one of the flycranks to the jackshaft axle and 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). The axle should protrude by about 0.3mm from the face of the flycranks with one 0.4mm (full-etched) brass spacer washer on either side. 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. Mesh the 20-tooth jackshaft gear with the 12-tooth idler gear, and then fit the second flycrank. Adjust the flycranks on the jackshaft until their position matches the quartering of the driving wheels. Secure them in place with a small amount of "Loctite".

While still in the fret, open out the holes in the coupling rods (67 x2)(68 x2) to 1.5mm diameter, as shown. Solder the two layers of each rod together to make a handed pair. To ensure the holes are in exact alignment, use a couple of crankpin bushes, well oiled (the oil keeps solder off the bushes). Now open out the driver crankpin holes to 1.6mm - this will give a running fit between the rods. The jackshaft holes should be left at 1.5mm diameter. Paint the flycranks and, if you wish, the rods.

To fix the rods in place, we suggest using the Sharman crankpin bushes, which are supplied with the wheels. The bushes are reversed and glued in place, without nuts. If you wish to use this method, file the "long" 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 thin 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. The jackshaft bushes are purely cosmetic and can be filed flush with the rear face of the rod.

Fit the coupling rods onto the crankpins and fit the 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, secure crankpin bushes with a small amount of "Superglue" and cut their crankpins flush. Push the jackshaft bushes into their holes at the rear of the coupling rods and secure them. A small piece of 1mm wire can be used to fill the hole in the centre of the bush. (If the crankpin is used, glue the bush to the crankpin and file off the excess.) Test the loco for free running - if your quartering is accurate, it will be almost impossible to tell the flycranks are not physically connected to the coupling rods when the loco is in motion and the body is in place.

Fit the brake gear, as described above. 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 less than 1mm is left. Shorten the front shaft to 7.5mm 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. 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 (make sure the side-face of the stage 1 gear does not jam the stage 2 up against the gearbox side). 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 6, 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.

Offer up the up chassis to the body and bend the sandpipes to shape. The front sandpipes run vertically for 5mm and then turn inwards to finish below the brake blocks. At the rear, they are routed between the wheels and the flycranks, behind the connecting rods (see the illustration on the box lid). Trim the sandpipes to length and secure the body with two M2 bolts. Make sure the front bolt does not touch the motor when screwed fully home.

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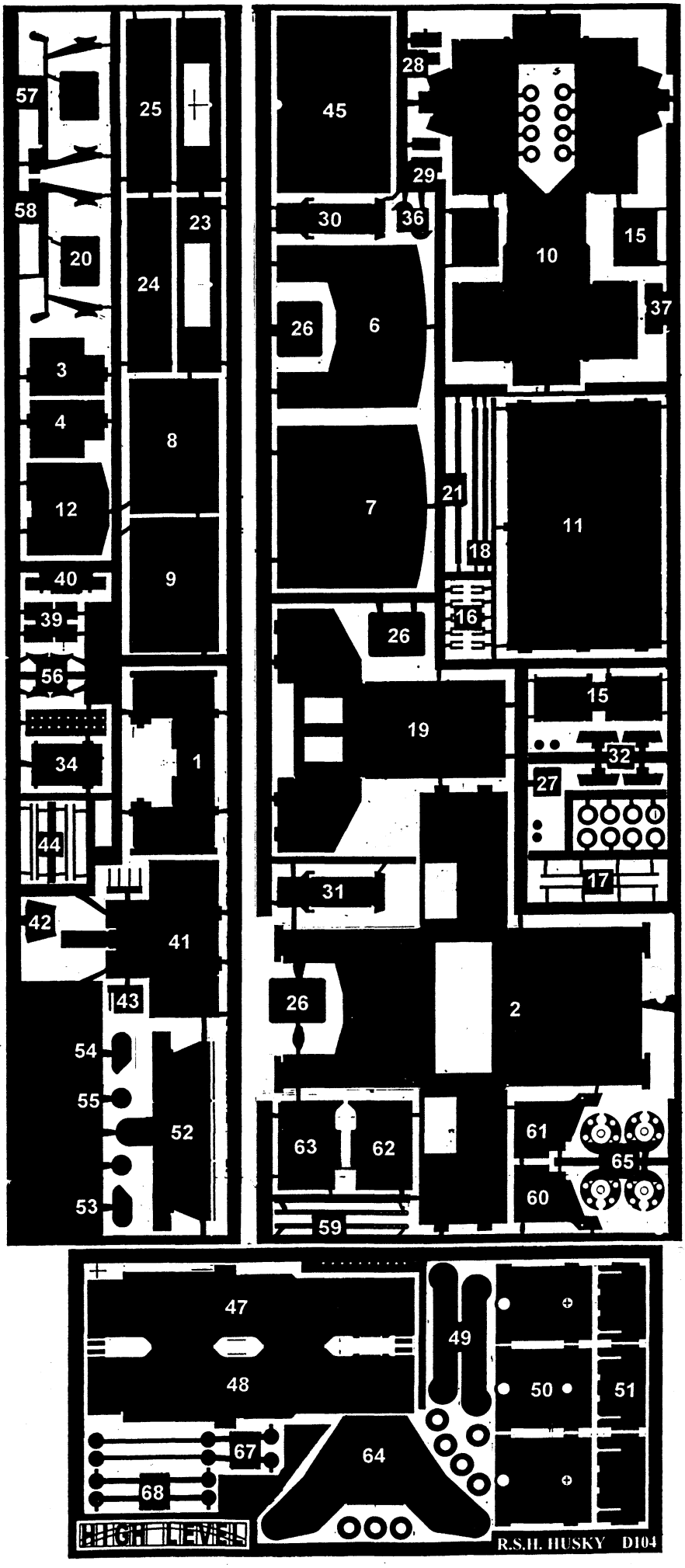
PARTS LIST

1. CAB FLOOR
2. CAB FRAME
3. CAB SEAT (LEFT)
4. CAB SEAT (RIGHT)
5. HANDBRAKE LEVER
6. CAB FRONT OVERLAY
7. CAB REAR OVERLAY
8. CAB SIDE OVERLAY (LEFT)
9. CAB SIDE OVERLAY (RIGHT)
10. FOOTPLATE
11. BONNET
12. BONNET FRONT
13. FILLER CAPS (×2)
14. BONNET VENT
15. BONNET DOORS (×4)
16. DOOR HANDLES (×10)
17. BONNET HANDRAILS (×2)
18. BONNET RIVET STRIPS (×2)
19. REAR COVER
20. REAR COVER DOORS (×2)
21. REAR COVER RIVET STRIPS (× 2)
22. BUFFERS (×4)
23. INNER BUFFERBEAMS (×2)
24. OUTER BUFFERBEAM (FRONT
25. OUTER BUFFERBEAM (REAR)
26. RADIATOR GRILLE
27. LOUVRE PANNEL
28. FRONT SANDBOX NECKS (×2)
29. FRONT SANDBOX LIDS (×2)
30. CAB STEP (LEFT)
31. CAB STEP (RIGHT)
32. FOOTSTEPS (×4)
33. AIR TANK
34. EXHAUST COVER
35. AIR HORN
36. COUPLING HOOKS (×2)
37. COUPLING DETAILS (×2)
38. REAR SANDBOX TOPS (×2)
39. REAR SANDBOX BOTTOMS (×2)
40. REAR SANDBOX LIDS (×2)
41. CONTROL CONSOLE
42. ELECTRICAL SWITCH BOX
43. CONTROL HANDLES (×2)
44. CAB HANDRAILS (×2)
45. CAB ROOF
46. EXHAUST PIPE
47. SIDEFRAME (LEFT)
48. SIDEFRAME (RIGHT)
49. COMPENSATION BEAMS (×2)
50. CHASSIS SPACER (FRONT)
51. CHASSIS SPACER (REAR)
52. TRANSMISSION COVER
53. TRANSMISSION DETAIL (LEFT)
54. TRANSMISSION DETAIL (RIGHT)
55. BOLTED FLANGES (×2)
56. BRAKE BLOCKS (×4)
57. BRAKE HANGER (LEFT)
58. BRAKE HANGER (RIGHT)
59. PULL RODS (×2)
60. FRONT CHASSIS OVERLAY (LEFT)
61. FRONT CHASSIS OVERLAY (RIGHT)
62. REAR CHASSIS OVERLAY (LEFT)
63. REAR CHASSIS OVERLAY (RIGHT)
64. GEARBOX ETCH
65. WHEEL OVERLAYS (×4)
66. FLYCRANKS (×2)
67. COUPLING RODS– BACK LAYER (×2)
68. COUPLINGS RODS – FRONT LAYER (×2)



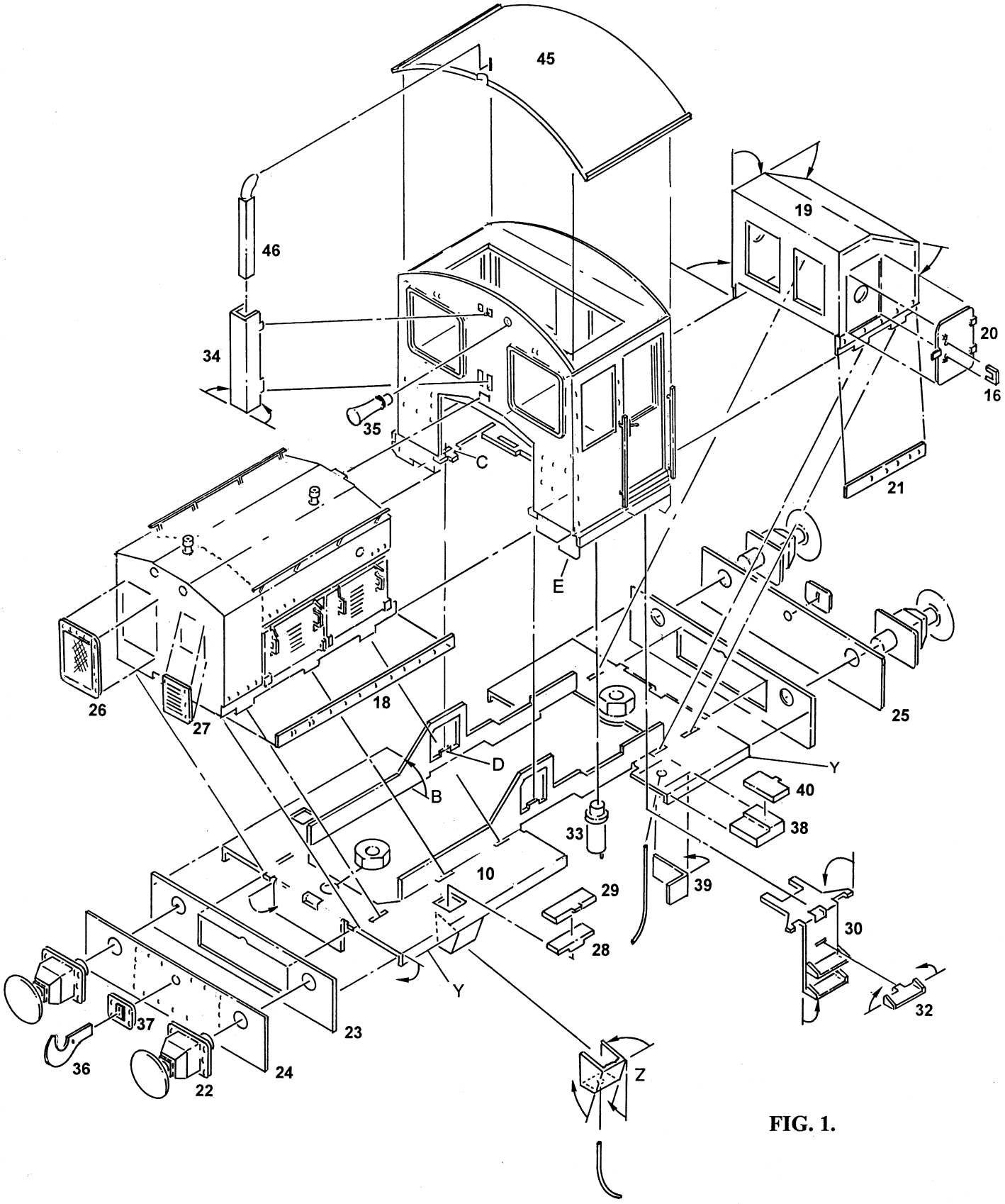


FIG. 1.

MAIN BODY ASSEMBLY

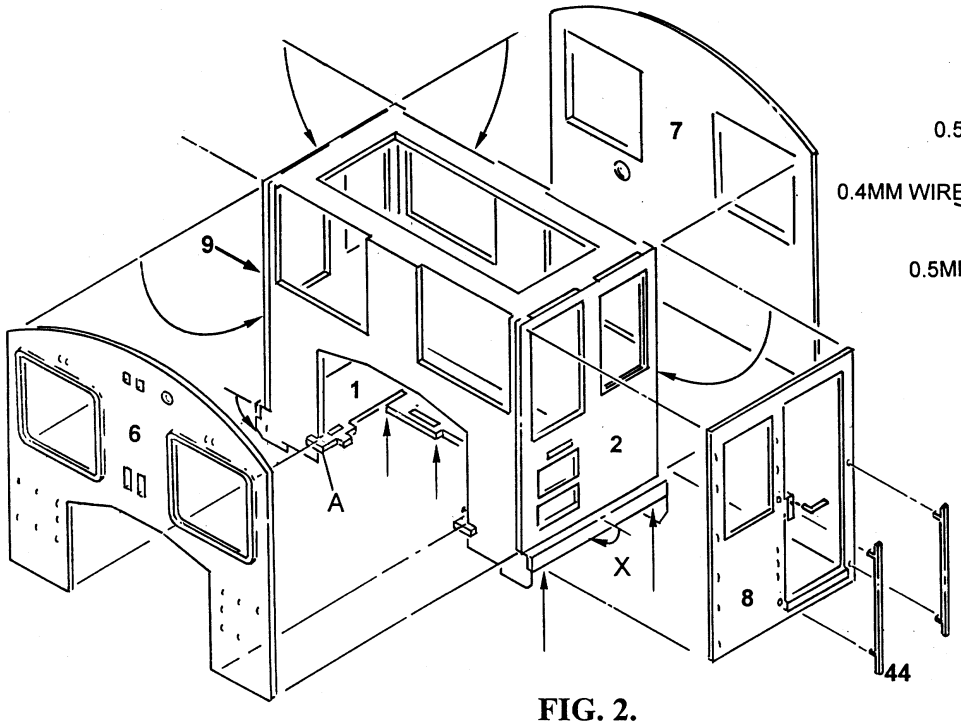


FIG. 2.

FIG. 3.

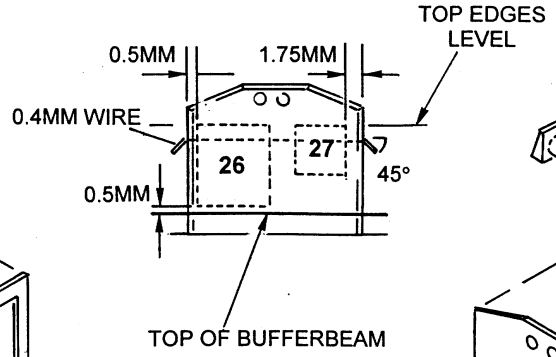
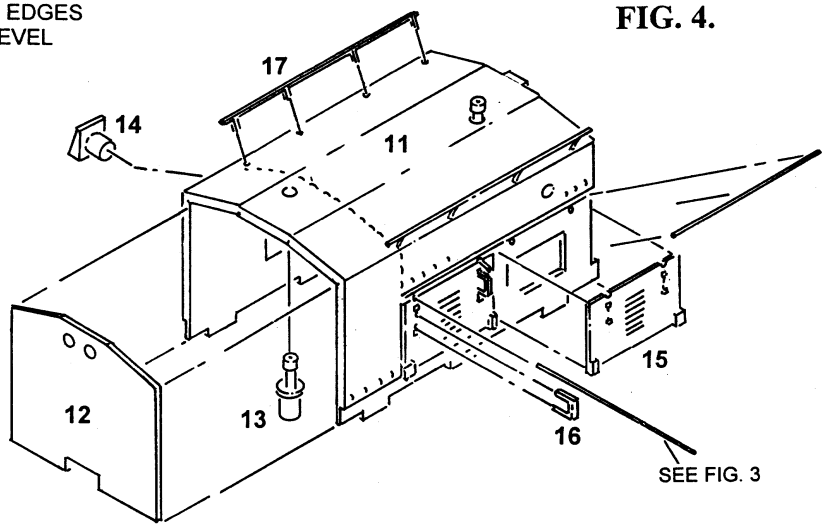


FIG. 4.



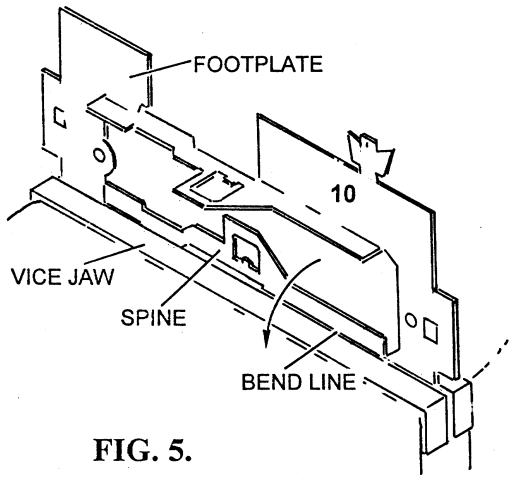


FIG. 5.

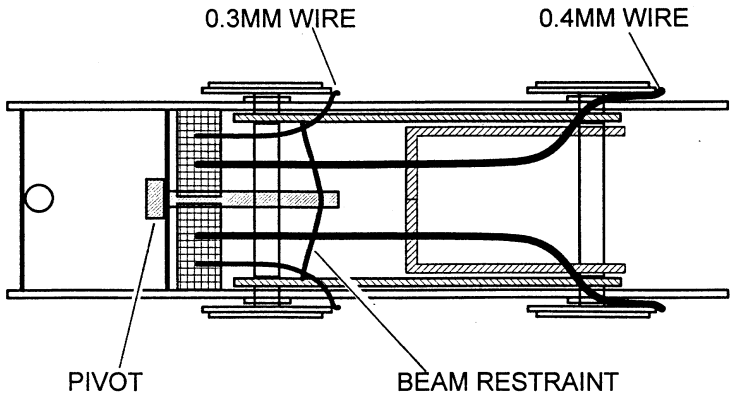


FIG. 6.

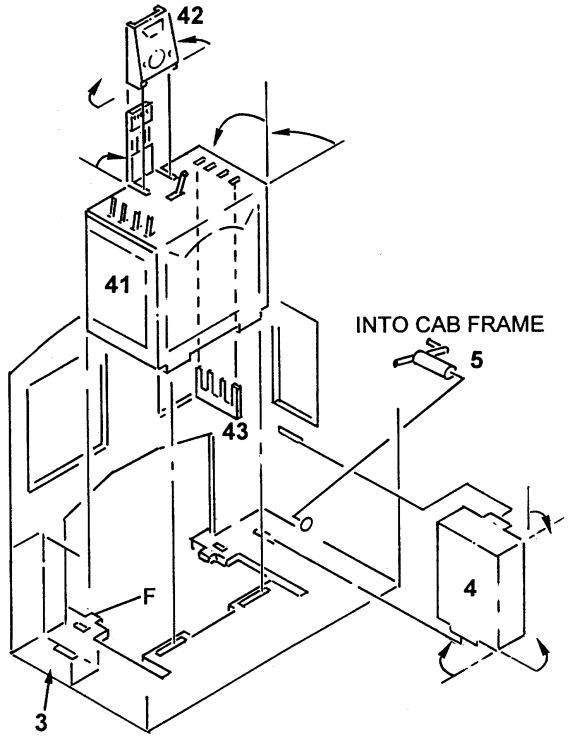


FIG. 7.

with Illuso-Drive

FIG. 8.

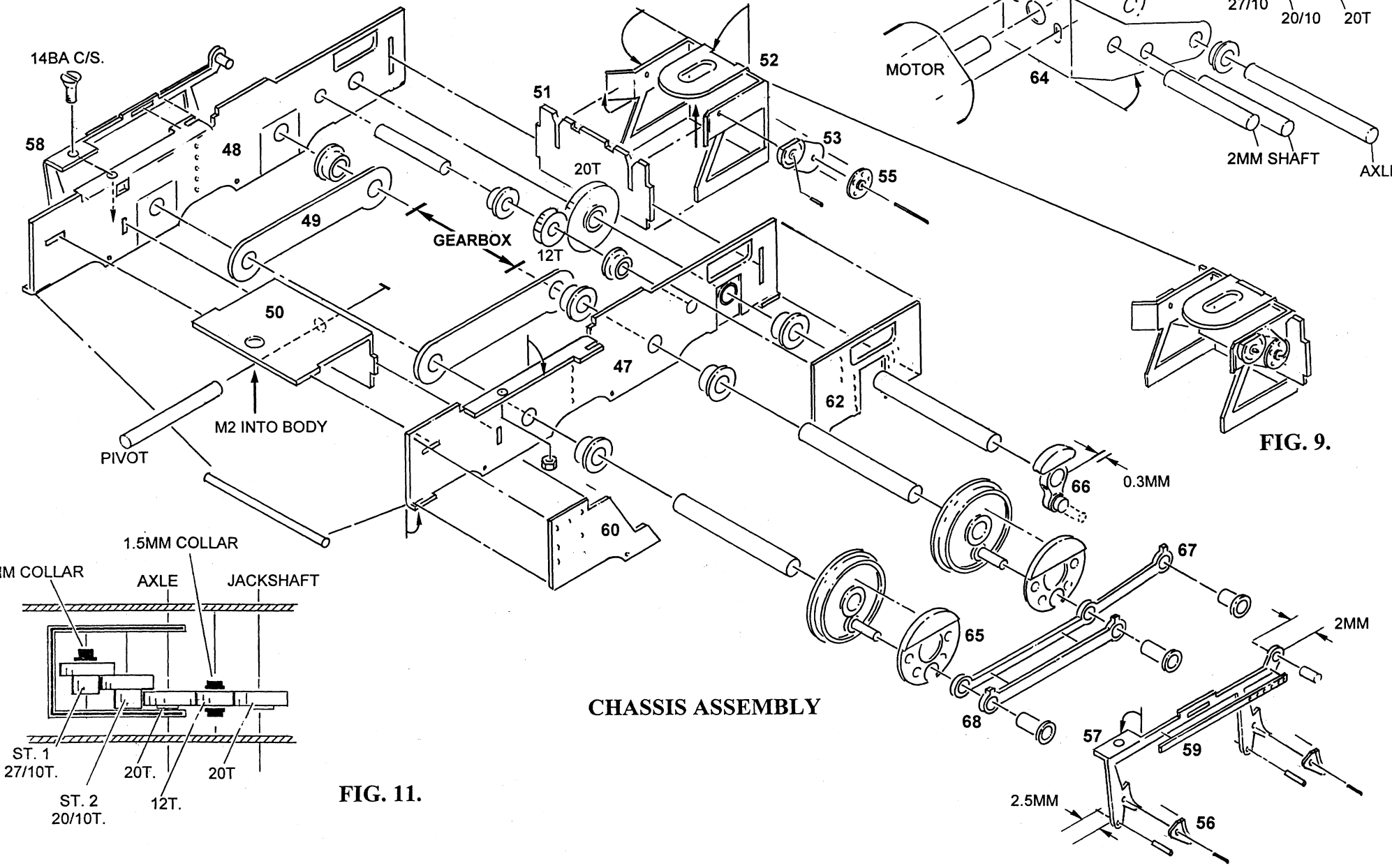


FIG. 10.

FIG. 9.

FIG. 11.

CHASSIS ASSEMBLY