MODEL ENGINEER

Bill Perrett of Southampton DMES wrote this history of 25 years of model railway passenger car development. It previously appeared in Model Engineer between December 1987 and July 1988.

PASSENGER COMFORT

Bill Perrett describes a quarter century of driver/passenger vehicle development at Southampton D.M.E.S.

Part I

With the ever increasing public passenger carrying, and more powerful engines to haul these larger loads, the need to consider safety becomes even more apparent. As well as safety, comfort should also be a consideration, both for the driver and passengers. I have been on some club trollies where just one circuit is enough to last the afternoon!!

At my home club, **Southampton and District Society of Model Engineers**, we feel we have gone a long way to satisfy both of these factors; an undertaking in which I played a considerable part, in design, development and construction. During a visit to one of our open days, our worthy Editor showed interest in these trollies, and suggested that someone should do a write-up on them, so this is the result of that suggestion. He has also given extra impetus (I was part way through with the project) due to his comments in Smoke Rings, 18 September.

Operational Safety

What constitutes safety? Probably one of the most important factors is the ability to be able to stop a heavily laden train in a short distance, should an emergency arise. Ideally, continuous braking by means of vacuum or compressed air would be the answer, but this would limit the motive power to engines so equipped to supply the necessary motivation for these systems.

However, there is another way to have an effective continuous braking system. Almost 25 years ago, when constructing two trailing trollies for use on our Southampton track, the idea occurred to me to try the system that has been in common use on trailers and caravans for many years. In one word "over-ride" braking. After almost 25 years of use, with slight modifications, I can say that this seems to be the ideal answer. During that period of time another member followed the same idea, and a couple of winters ago myself and other members spent the whole out of season period on rationalising existing trollies and building new ones. The society can now boast of 13 trollies of which only 2 are unbraked. The total count is 4 with hand operated brakes (one of these is also foot operated), 4 dual purpose with over-ride brakes and with provision to fit auxiliary handles for hand operation on visitors' days, 3 normal over-ride trollies, and the two unbraked. There have been occasions when we have had all seven over-ride trollies working behind the leading trolley, and there has been no problem at all to stop this train.

Top of page: A demonstration train hauled by the Author's 5 in. gauge G.W.R. 15XX. Even though heavily loaded, the train can be stopped very quickly should the need arise. (Photo: Alan Bealing). Right: The young lad is awaiting the chance to sit behind the driver. Note the provision of both foot and handbrakes. This is Bill's own trolley and carries an auxiliary water tank for the locomotive. (Photo: Alan Bealing).

Opposite page, left: A view of a rake of the trollies, showing the back rests, a recent innovation and their smart appearance. Opposite page, right: A bird's-eye view of the coupling between two trollies, the extension to the valances can be seen here, although for this photograph the skirt guard has been removed.

One other factor in the design of these brakes, which adds greatly to their efficiency is their being of a disc type. There is no tendency to grab and lock, certianly not on a steel track such as ours. Another obvious point which favours the over-ride system is, the heavier the load, the greater the braking power.

As far as I am aware no other society has used this system, but having said this I will probably be proved wrong. I do know that the Witney and West Oxon Society are constructing a similar system, having seen ours, so possibly it could provide some

wers to the braking requirements for others. Several other societies have shown interest.

I have used the term "leading" trolley and not "driving" trolley for a very good reason. Our leading trollies are constructed basically the same as the remainder of our trollies, except for the coupling to the engine, and brakes operated by hand. These trollies also carry passengers, a desirable feature as it means extra weight to increase the adhesion on the initial braking unit. The so-called driving trolley can sometimes mean nothing more sophisticated than a plank of wood, with a wheel on each corner. For braking, nothing more than another wooden pad bearing down on the rails. This may be okay for a lightweight driver, with a 3½ in. gauge *Tich*, but they so often would try to when we had a rush on during a busy Sunday afternoon.

It goes without saying that a check rail, or anti-tip, adds considerably to safety should a derailment occur. It does prevent the front of the trolley valance dipping in and making contact with the piers. Years ago we tried rollers on the inside of the valances, but discarded them as unsuccessful. Recently we have fitted wooden blocks to the inside of the valances, with approximately ½ in. clearance from the check rail. For the short time they have been in use they appear to be a success, in fact it is possible to stand on the footboard on one side, roll the trolley along and not derail. Obviously the block is rubbing hard on the check rail and too much misuse would require a renewal job.

AND SAFETY

to add even one passenger trolley behind could be courting trouble.

As the requirement of an over-ride brake is a rigid coupling between trollies, this rules out what in my opinion is a dangerous practice sometimes used, that of a chain with buffers on trollies. I always have visions of little fingers between closed buffers!! These rigid coupling of ours also incorporate what we refer to as a skirt guard, this being a plate to prevent skirts (not the mini type) from getting under the following trolley. It did happen before these were fitted, in the early days.

Another safety point that raised its ugly head many years ago, was a child getting its foot between the gap between the valances of two trollies, fortunately with little injury. This prompted the fitting of a spring loaded extension on the rear of all valances to close this gap. The end of these extensions fit behind the front of the valance of the following trolley, and in doing so plays some small part also in stabilising the whole train from the leading trolley. The valance has to be sprung to enable it to negotiate the curves.

One of the more recent additions in the interest of safety was the fitting of short back rests to all trollies. This prevents the possibility of passengers slipping off the rear. These back rests also serve another useful purpose, insofar as they prevent passengers trying to sit between trollies, as

My last, but by no means least word on the subject of safety falls on the driver. This is observation!! So often one sees drivers spending 95% of their time with their eyes glued to their cabs instead of using this time to observe the track ahead. Some may argue that if a track is fully signalled, it is only necessary to obey the signals for a safe journey. My personal feelings are that on a raised track, signals are really only cosmetic. So many of our tracks are in public parks and the like, which means that at some point in time "a person or persons unknown" is going to attempt to derail a train with an obstruction. To avoid this the driver should be in a situation where he can stop the train within the distance of his vision (much like driving a motor vehicle). This also means that he should be driving at a safe distance from the train in front.

At our Southampton track we have only very basic signals, that is just one at the station. The red only operates when the steaming bay traverser is in operation, this bein situated ahead of the station in full view. The amber and green are manually operated by station staff responsible for collecting tickets, which are issued from a small ticket office. Once tickets are collected, and drivers have confirmed they are ready to move, the leading train is given the green and other trains move off at suitable and safe distances. This gives a continuous two lap trip to the satisfaction of the passengers. I should mention that the red will over-ride the amber or green, but normally our traverser is only operated when trains are stationary in the station.

Passenger — and Driver Comfort

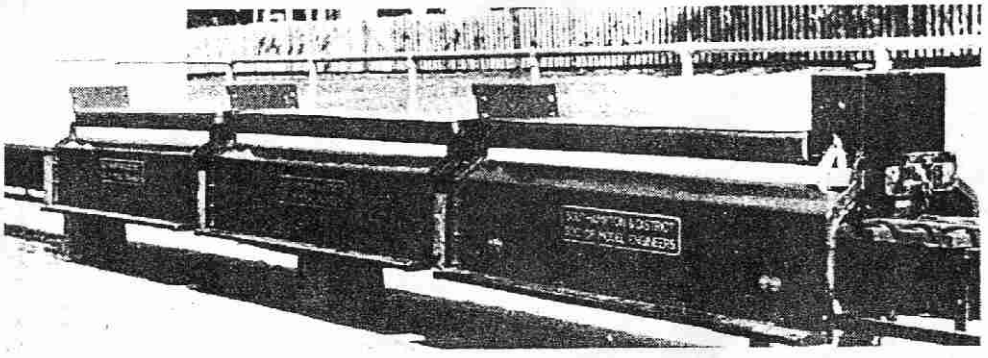
This moves me on now to the other word included in the title of this article, "comfort". The reason for this is that we carry the public, yet in some instances subject them to riding in similar conditions that existed when there were 1st, 2nd and 3rd class on the 4 ft. 8½ in. line, only they are 3rd class. One of my main objections is to plain wooden seats, or at best foam rubber purchased from some market stall, which when subjected to the weight of a body just flattens out. Our seats are upholstered with a form of dense reconstituted foam chips which are quite firm, the poor old driver also having the benefit of this as well.

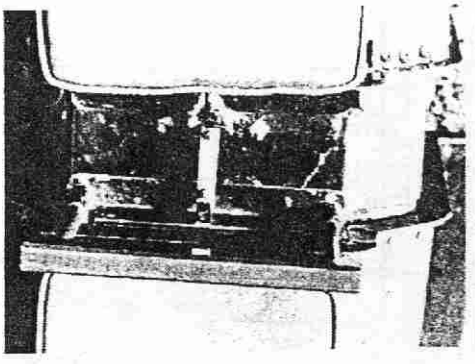
Springing of trollies, to my way of thinking, is a must, yet I know of one society running with no springing at all. Of choice I prefer the springing to be on the axles, not in the bogie frames centre; what is sometimes referred to as the drunk bogie. Although there is more work in our type, I consider it gives a more stable ride.

Another feature which adds to the driver's comfort, is the means to be able to lock the brakes on, when the train is being loaded and unloaded in the station, and he is attending to the engine requirements. One last thought on comfort is nothing to do with the trollies, but the track. The correct superelevation and transition play a great part. When we built our track I had a contact in the P.W. offices of B.R. who kindly worked out the superelevation for approximately 10 mph. Another friend assisted, by the loan of a book, which enabled the required transition to be set out.

Anyone who has visited our track will, I think, agree that some thought and care in this field will help considerably. For anyone interested in figures and as applied to our track, the superelevation, in round figures, for our 50 ft. radius over 5 in. gauge is ⅜ in. and for the 80 ft. radius it is ¼ in., with an offset of 1 ft. 6 in. for the 50 ft. transition and 10 in. for the 80 feet. The 50 ft. transition covers a distance of 42 ft. and the 80 ft. a distance of 35 ft., so the lead-in is very gentle, giving no discomfort to passengers at speeds of about 8 mph. Anyone who has used our track will, I think, agree that these figures give a reasonable ride.

To be continued



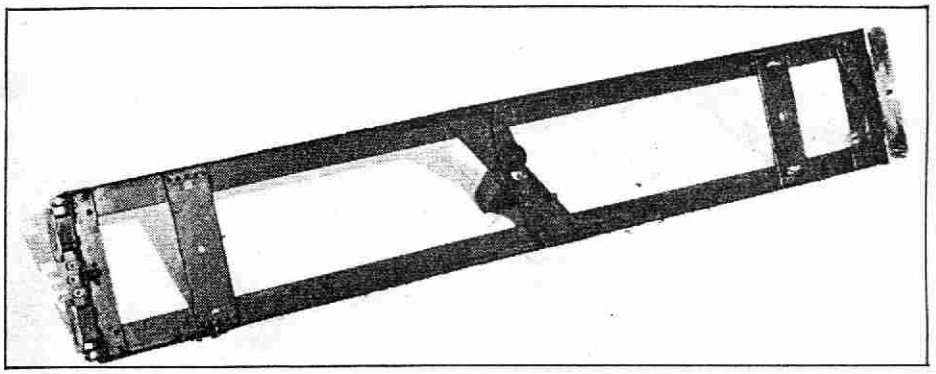


PASSENGER COMFORT AND SAFETY

Part II
from page 745

Bill Perrett describes a quarter century of driver/passenger vehicle development at Southampton D.M.E.S.

Having, in Part I, dealt with safety and comfort in general I now turn to a description of the trollies as used by ourselves at Southampton D.M.E.S. The drawings and photographs may not always be quite compatible with each other, as the drawings have been done in the light of on-going experience, and have been amended accordingly. The basic design of the trollies was to an original made by E. Salt, a member of the society some thirty years ago. We have modified the design over the years as the needs for passenger safety became apparent, so we have ended up with what I am about to describe.

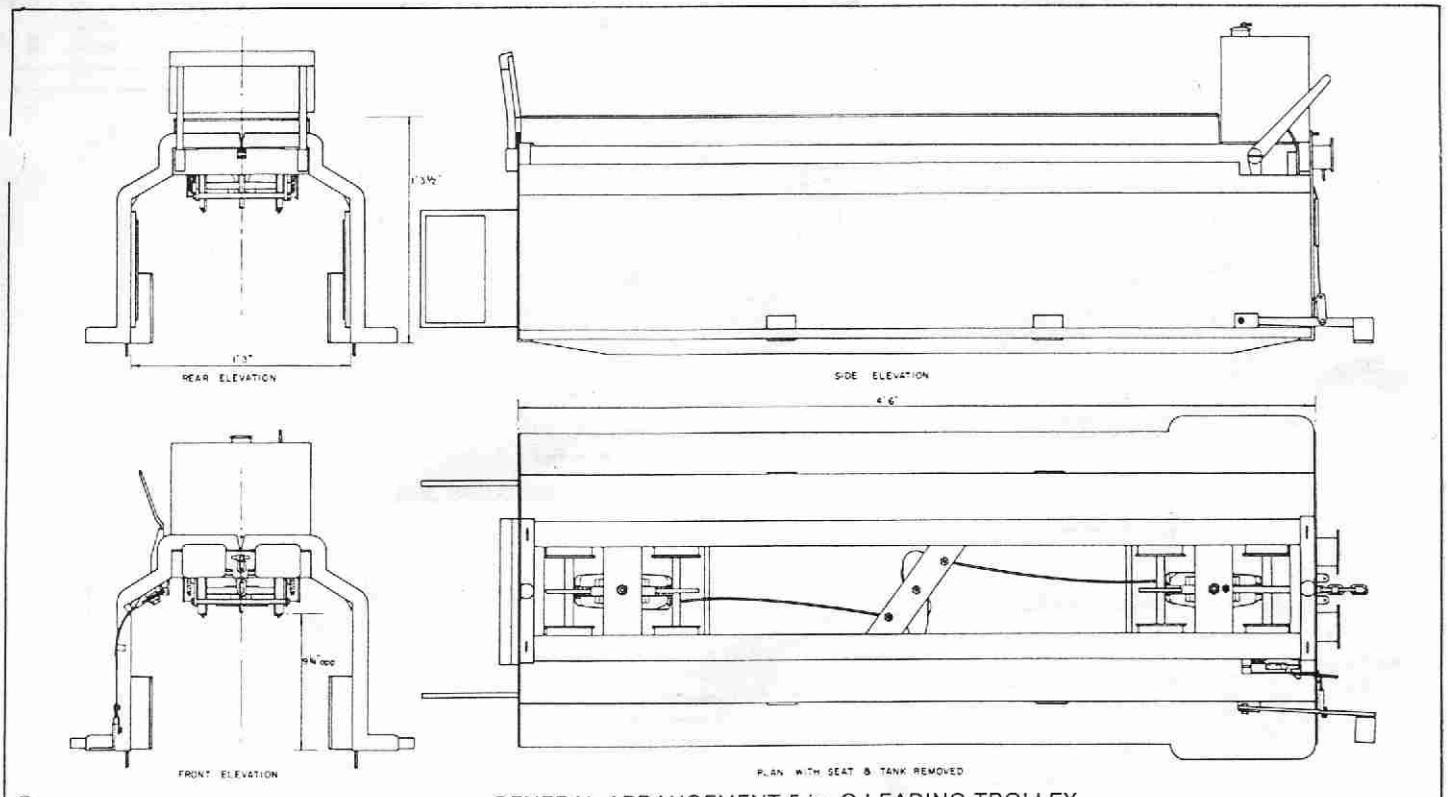


The frames of Bill's own trolley, incorporating all the improvements made to the Club's vehicles.

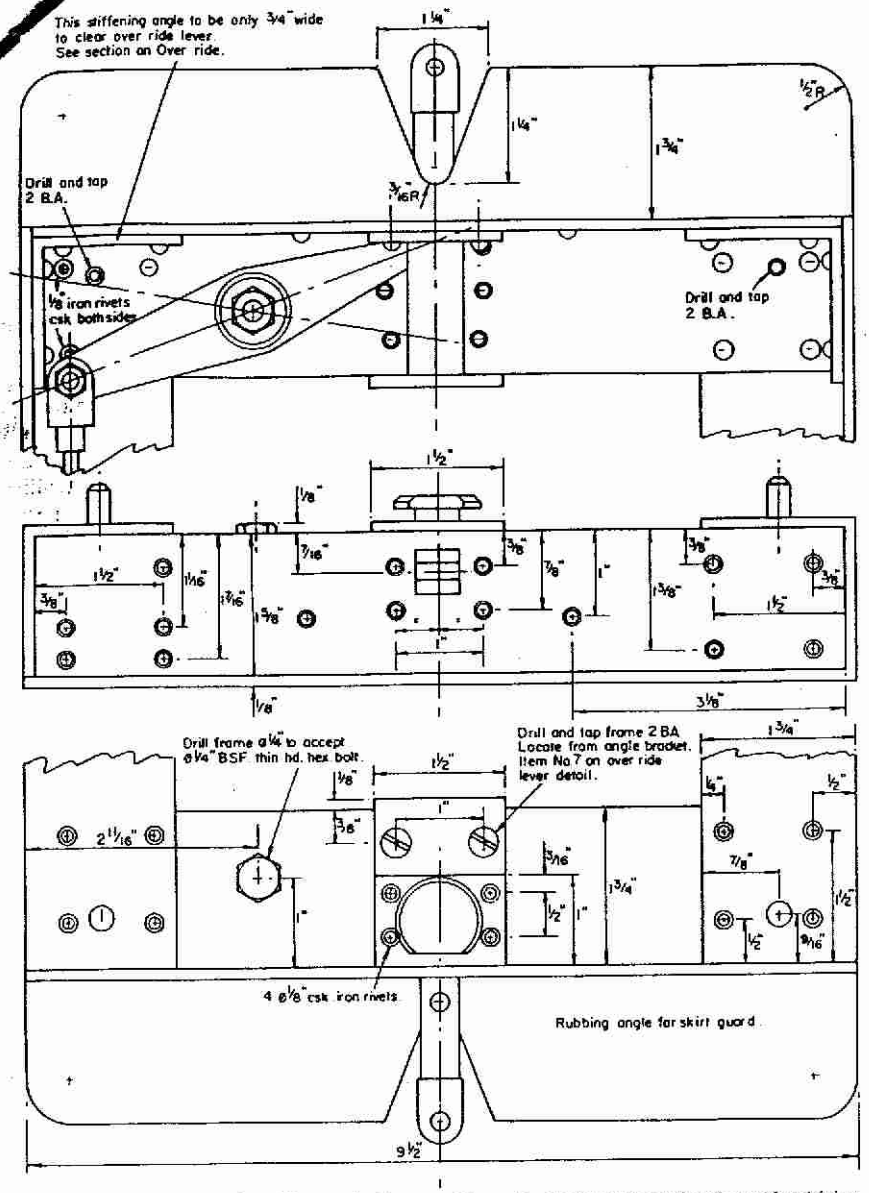
Construction — Main Frames

Construction of the main frame is of nothing more sophisticated than 1¾in. × 1¾in. × ⅛in. bed angle. This can usually be obtained from scrap iron merchants and similar sources. As our trollies are 4ft. 6in. long I have drawn the plans accordingly but they could be stretched to 5ft. 10in., provided allowances are made to all other applicable measurements. Assembly of the frames is a simple riveting job using ⅛in. r.h. soft iron rivets countersunk as shown. The inner rows on the bogie bolster are countersunk both sides, this is because the rollers on the bogie bear and travel in this area. Be sure to fit a smaller stiffening angle, as indicated on the drawing, in the corner next to the over-ride lever, to give clearance to the end of this level. More detail of this can be seen on the over-ride lever detail drawing. The rubbing angle shown ensures that the skirt-guard stays in position under the frame, when the trolley is under tow and coupling extended. I have shown sockets to take the back rests at one end of the frames only.

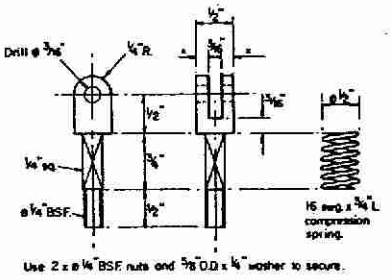
If desired these could also be fitted on the other end as well to accept the back rests on the universal trolley when used for auxiliary driving use. Also a possible use could be to accept a suitably bent piece of



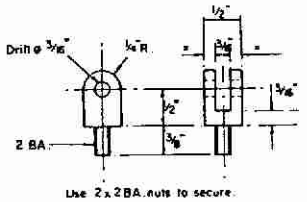
GENERAL ARRANGEMENT 5 in. G LEADING TROLLEY



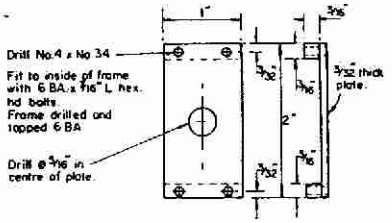
Leading end when used in trailing mode. Rear end if constructed as universal and used for driving. Main construction is of 1¾ in. × 1¾ in. × ⅛ in. bed angle and assembled with Ø ⅛ in. R.H. iron rivets, countersunk on outside, unless otherwise stated. See over ride lever drawing for extra detail. I.E. Side elevation. Frame length, excluding rubbing angle 4 ft. 6 in.



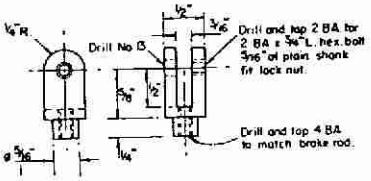
5 in. G. & TROLLEY TO TROLLEY COUPLING



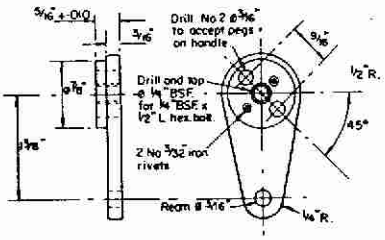
3½ in. G. COUPLING UNIVERSAL TROLLEY ONLY
2 off. M.S.



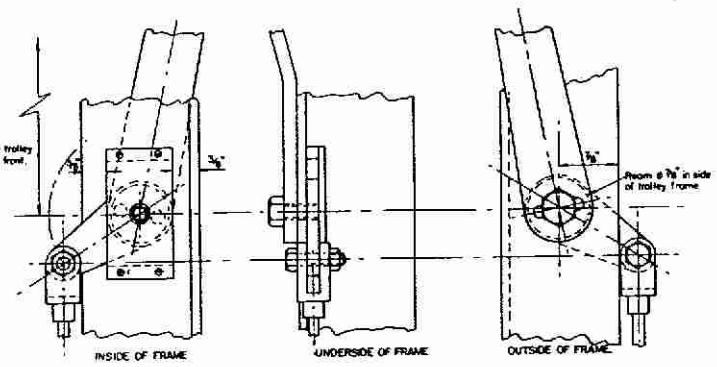
BRAKE LEVER RETAINING PLATE
1 off M.S.



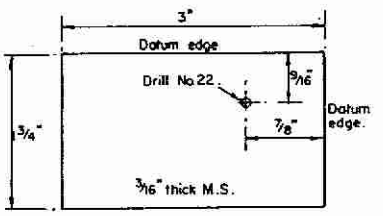
BRAKE ROD FORK 1 off M.S.



BRAKE LEVER 1 off M.S.

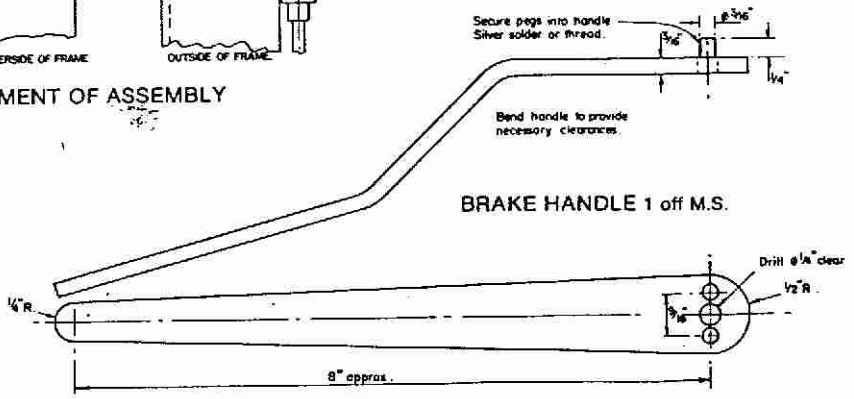


GENERAL ARRANGEMENT OF ASSEMBLY



Drilling jig for valance locating and securing pin in frame and matching hole in valance.

JIG No. 1



BRAKE HANDLE 1 off M.S.

in. dia. gas pipe, machined at the ends as with the back rests, to form a U shaped hand hold or stop, for the front of the trolley. I have not drawn this out, as at the present time we have not found the necessity for this, so have no experience of it. It is strongly advisable, if making more than one trolley, to make up a form of jig to position the sockets, so that back rests can be interchangeable.

It should be noted that the intention of the universal trolley in the drivers' mode, is that it be used as a supplementary driving trolley for the use of visiting drivers, on open days too as a single unit. The normal leading trolley is designed specifically for this purpose, and there are some variations in brake controls and couplings, which I will deal with later, on a separate drawing.

It will be seen that the over-ride coupling has a hole drilled through midway. This is to insert a pin, should it be required to reverse the train. Without this pin all brakes would just lock on, when reversing.

The centre stay is constructed of $\frac{1}{8} \times 2$in. m.s. and acts as a carrier for the brake equalising gear. Drill the stay before fitting with $\frac{1}{8}$in. r.h. iron rivets. Hole positions are shown on the G.A. of this item. I should point out that these trollies are designed with the hand brake on the right hand side, and it is important that the centre stay is orientated in the direction shown from the underside. Should it be desired to reverse the hand brake then the stay has to be reversed in direction. Likewise the over-ride lever pivot pin drilling has to be reversed. The drilling for the brake rod pull-off spring anchor is best delayed at this stage, as the available spring may be different to those on the drawing and so affect the position.

With the exception of the 2 BA tappings, required to fit the angle bracked holding the tube guide for the over-ride coupling, all holes can be drilled, at the frame ends. A $\frac{1}{8}$in. thick plate is riveted at the position shown in centre of end angles. This is then drilled and tapped through to accept the valance anchor bolt shown on the Trolley Frame Components drawing. It is best not to finally fit this until the valance is made, when the size of the flat can be determined.

It is desirable to make up a simple drilling jig, (No. 1) to locate the position of the valance locating and securing pin tapping, and to use the same jig to drill the matching hole in the valance angle. The reason being that when the universal trolley is used as a drivers' unit, the valances can be interchanged side for side. The pins can be finally fitted now, with the use of Perma Bond A118 Retainer. Should it ever be required to remove them, this is no problem, as heat will break down the bond.

Perhaps I should add the usual disclaimer about Perma Bond, but I have used their products quite a lot and find they are very successful. The range they produce is very far reaching, and I feel we of the modelling fraternity could make more use of them. I am constructing a 5in. gauge B.R. tender for a Stardard Class 5 locomotive, from stainless steel. With the exception of some 8 BA screws, Perma Bond F241 Toughened Acrylic Adhesive is being used throughout.

Frame Variations

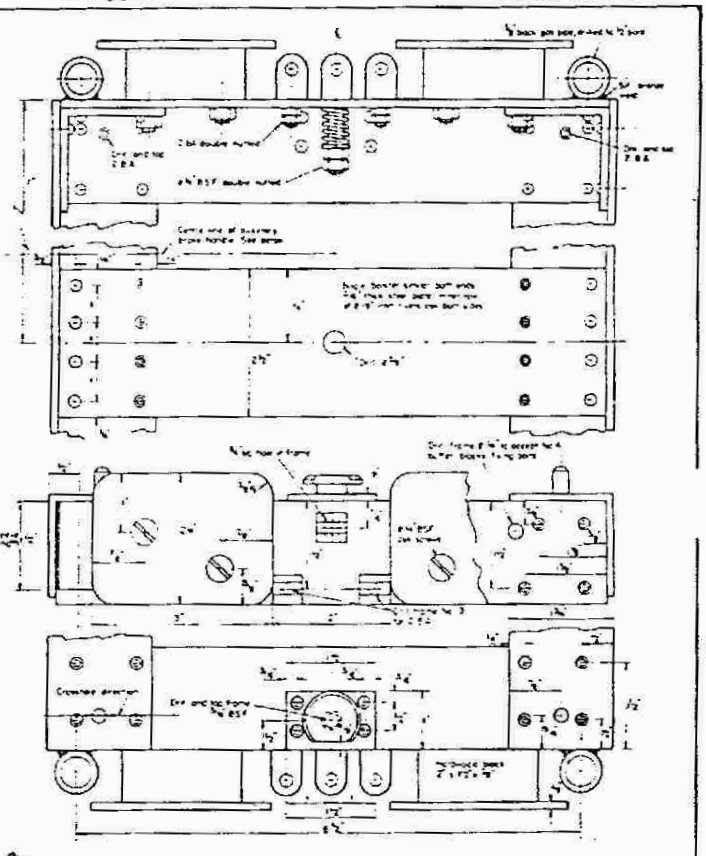
If the frame being constructed is for a universal type trolley then now is probably the time to fit the brake handle assembly. This differs from the brake handle on the permanent leading trolley as it is removable and so presents no hazard to passengers when the trolley is used in the trailing mode.The handle locates into position with two $\frac{3}{16}$ in. dia. pegs, and is fixed by a $\frac{1}{4}$in. x $\frac{1}{2}$in. BSF set screw. There are no parking brake facilities on this trolley as the intention is "auxiliary" only. On the brake rod fork it will be seen I have used 2 BA bolts and not made pins, this is a method I prefer as not only does it mean one less item to make but also one can often obtain suitable bolts on the surplus market, and often these are of H.T. steel which is to be preferred. It is obviously deirable that there be a plain portion on which the mating part pivots. This idea will be seen to be carried out throughout the whole construction. If it is preferred to make pins then sizes are obvious, and the fork has to be drilled accordingly and not tapped on one side. The fork is shown tapped 4 BA to accept the brake rod, the brake rod itself being 4 BA (.142in.) as this was readily available. Should any deviation be made from this size then it must obviously be followed through the rest of the construction.

If it is intended that the frame under construction is only for trailing purposes, then life is made a little easier, by not having to make the 3 $\frac{1}{2}$in. gauge couplings or the buffer blocks and plates.

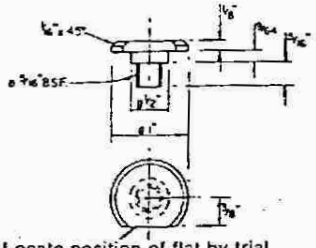
The trolley to trolley coupling is provided with a spring to soften the snatch on starting and operates through a $\frac{1}{4}$in. square hole in the frame. All spring sizes shown are as used on our trollies at Southampton and, although in general just produced from a collection accumulated over the years, seem to do the job required satisfactorily. I should add all lengths are free lenghts.

Now to the variables on the permanent leading trolley, ie "driver's trolley". As there is no over-ride requirement then the drilling for the over-ride level is not required. Neither is it required that th stiffening angle be made smaller to ammommodate this lever. No rubbing angle for the skirt guard is fitted either.

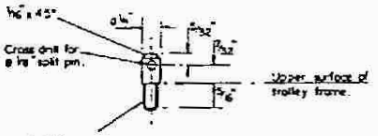
To be continued



Rear end of trolley frame when used in trailing mode. Front end when used as auxiliary drivers trolley. If constructed for trailing mode only omit buffer tracks on two offset — 3½ in. G couplings. Assembled with Ø ⅛ in. R.H. iron rivets, countersunk on outside, unless otherwise stated.



Locate position of flat by trial assembly. Use Perma Bond No. 118 retainer adhesive or similar for final assembly.
VALANCE ANCHOR BOLT 2 off M.S.



2 BA
Use Perma Bond No. 118 retainer adhesive or similar for final assembly.

VALANCE LOCATING & SECURING PIN
4 off M.S.

PASSENGER COMFORT AND SAFETY

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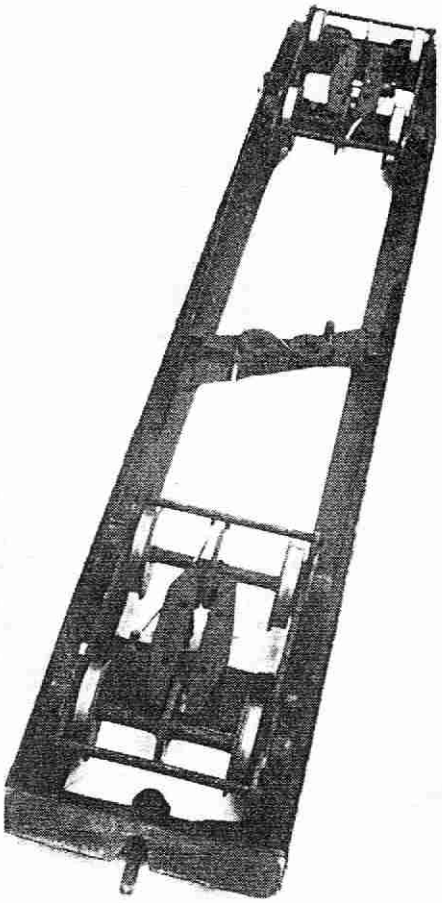
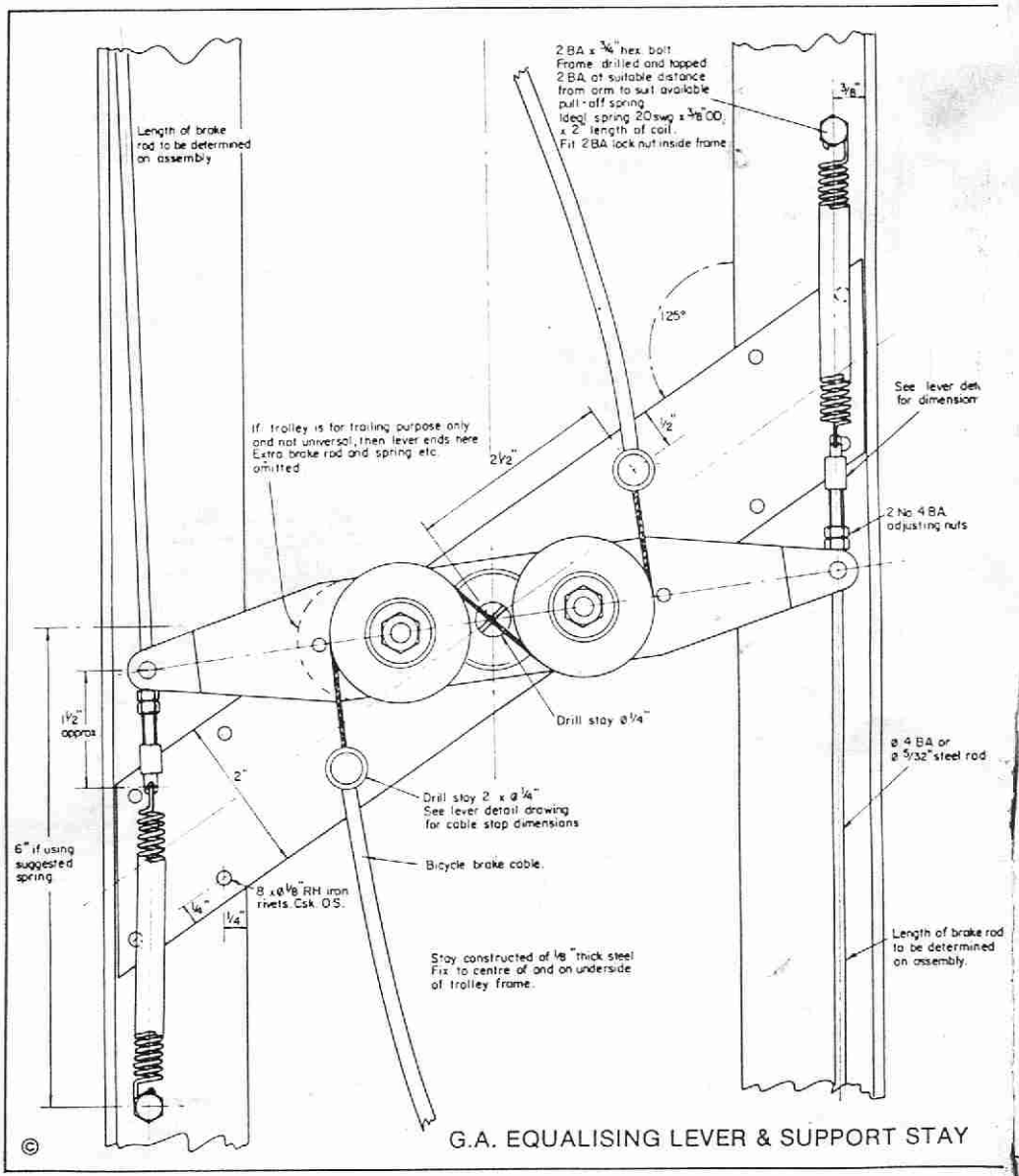
Part III from page 90

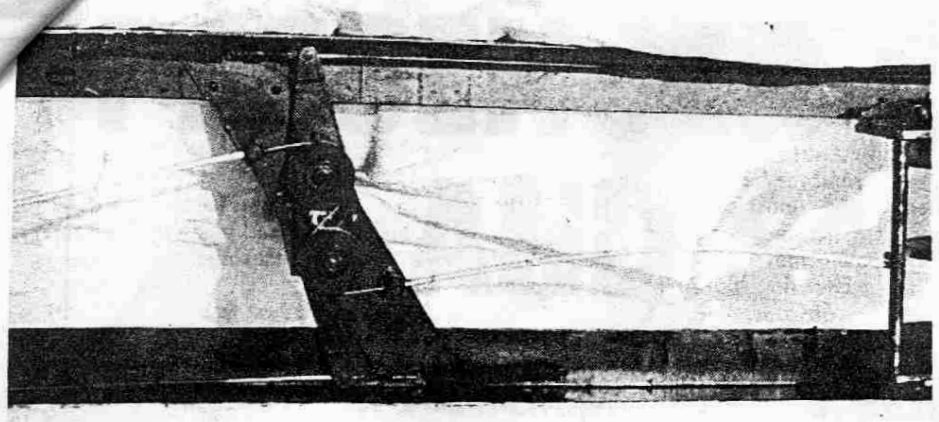
All that is required at the rear end is the standard trolley to trolley coupling plus the sockets for back rests. The front end carries the normal 3½ in. gauge couplings, and a modified 5 in. gauge coupling, designed to give a more direct pull to the front bogie, no matter what the radius of the curve. The buffer plates and blocks are set out a little more, to eliminate too much slack between engine and trolley. This may have to be varied to a degree, depending on the length of the coupling chain links. I am not suggesting that buffers and buffer plate should be in close contact when coupled, but there should be only a minimum amount of slack, so that there is little snatch when moving off with a fully laden train, causing the least amount of strain on the engine coupling. The drawing gives details.

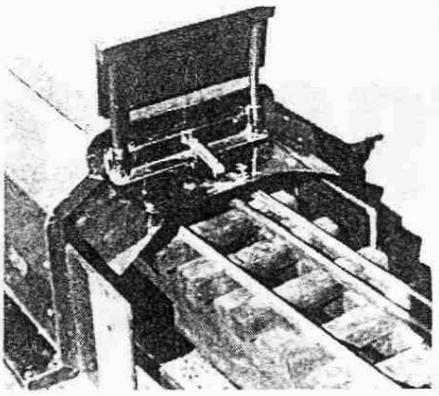
The other main item that differs from other trollies is the brake control, which incorporates both parking facilities and the means to connect to a foot pedal, which will be dealt with when making the valances. The parking brake drop (Brake Handle Detail drawing) is cut and bent from ⅛ in. m.s. angle and fitted in position indicated, allowing clearance to permit valance angles (1 in. × 1 in. × ⅛ in.) to fit. Whenever I quote ⅛ in. thick angle in short lengths, use can be made of off-cuts of bed angle from the main structure of the frame.





Above: An underside view of the trolley frame.
Opposite page, left: A close up of the equalising lever.
Right: The rear end of a trolley showing a coupling and backrest.





The handle is a prefabrication job, it can at first be assembled with Perma Bond F241 adhesive, this can be a trial run to ensure free movement of the roller. When satisfied with this, use ⅛ in. csk. iron. rivets for final assembly. The brake rod must have free travel through the hole in the roller, as this is the action when the foot pedal is operated. Ease the ½ in. pivot hole to a slightly oval shape to permit handle to moved to one side to disengage from the stop bracket when it is in the parked position. The double coiled spring washer keeps the handle in the parked position, and at 90 deg. to the pivot pin. From this information and by trial and error it is a simple matter to see in which direction the hole has to be made oval. When fitting, the double coiled spring washer is fitted between the handle assembly and the frame.

The foot brake connection also acts as a stop on the brake rod. It can be made from ½ in. round rod and knurled, or ½ in. AF hexagon, as it has to be screwed up finger tight when assembling the trolley at the track side. The filed nut of the brake rod which fits inside can be secured with Perma Bond A118 for safety.

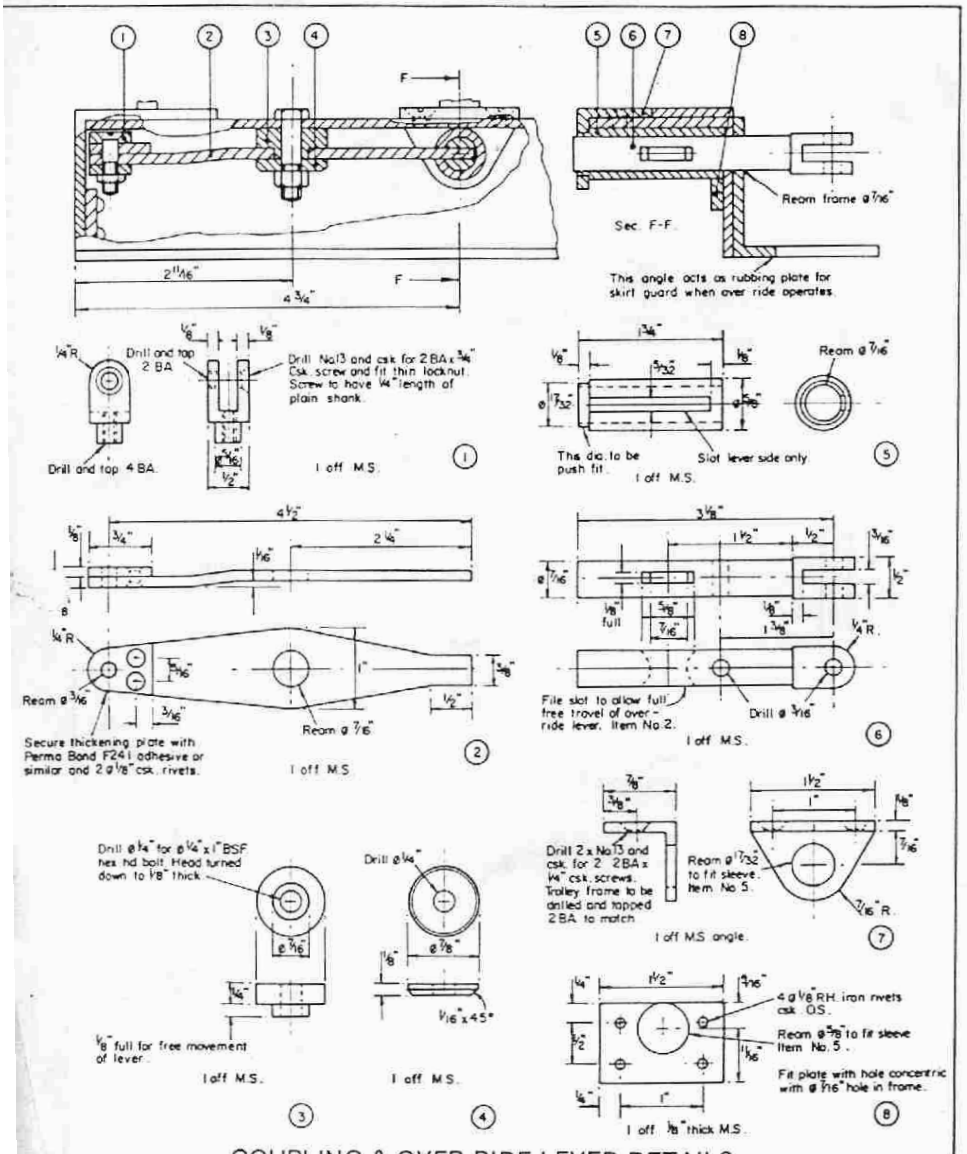
Before the frames are put to one side one final item can be made, this being the Coupling and Over-ride Lever. The general section on this drawing shows a further view of the reduced size of the stiffening angle and also the skirt guard rubbing angle.

The operating lever, is a simple prefabrication job again, making use of Perma Bond F241 adhesive and a couple of ⅛ in. csk. iron rivets. It will be wise to make and fit the fork Item No. 1 at this stage, as it is not possible to fit the fork pivot bolt once the complete unit is assembled. The actual brake rod can be screwed into the fork later.

The trolley frame has to be reamed 7/16 in. dia. at 7/16 in. from the top and in the centre, to give free movement of Item No. 6. This item must also have free travel in the guide sleeve, Item No. 5. Now is a good time to fit the guide support angle, Item No. 7, by using a length of 7/16 in. dia. rod with the guide fitted, and passed through the reamed hole in the frame, thus making it possible to ensure that the guide is square. The trolley frame drilling is located from holes in the angle and tapped 2BA to receive the fixing screws. Having done this it is now possible to fit the front guide locating plate, Item No. 8, by a temporary assembly of the guide, complete with plate, and 7/16 in. dia. rod to be sure of concentricity. Once again use can be made of Perma Bond F241 adhesive to fix the plate into position, prior to fixing for good with ⅛ r.h. iron rivets. Some readers may wonder, after my praise of Perma Bond, why I still recommend rivets. The plain fact is, I am a "belt and braces" man, and surface contact could be impaired by paint, etc, as found on bed angle.

When we are dealing with passengers it is much wiser to be over the safety limit. Other items for the over-ride assembly are plain turning jobs which need no comment. The only thing to be checked before final assembly is the clearance, permitting full travel to the lever, of the curved slot in Item 6, into which the end of the lever arm engages. The final shape of this is more a case of trial and error. The full travel at the fork end is approximately 1⅛ inches.

To be continued



COUPLING & OVER RIDE LEVER DETAILS

PASSENGER COMFORT AND SAFETY

Bill Perrett continues his description of Southampton D.M.E.S. passenger vehicles

Part IV from page 227

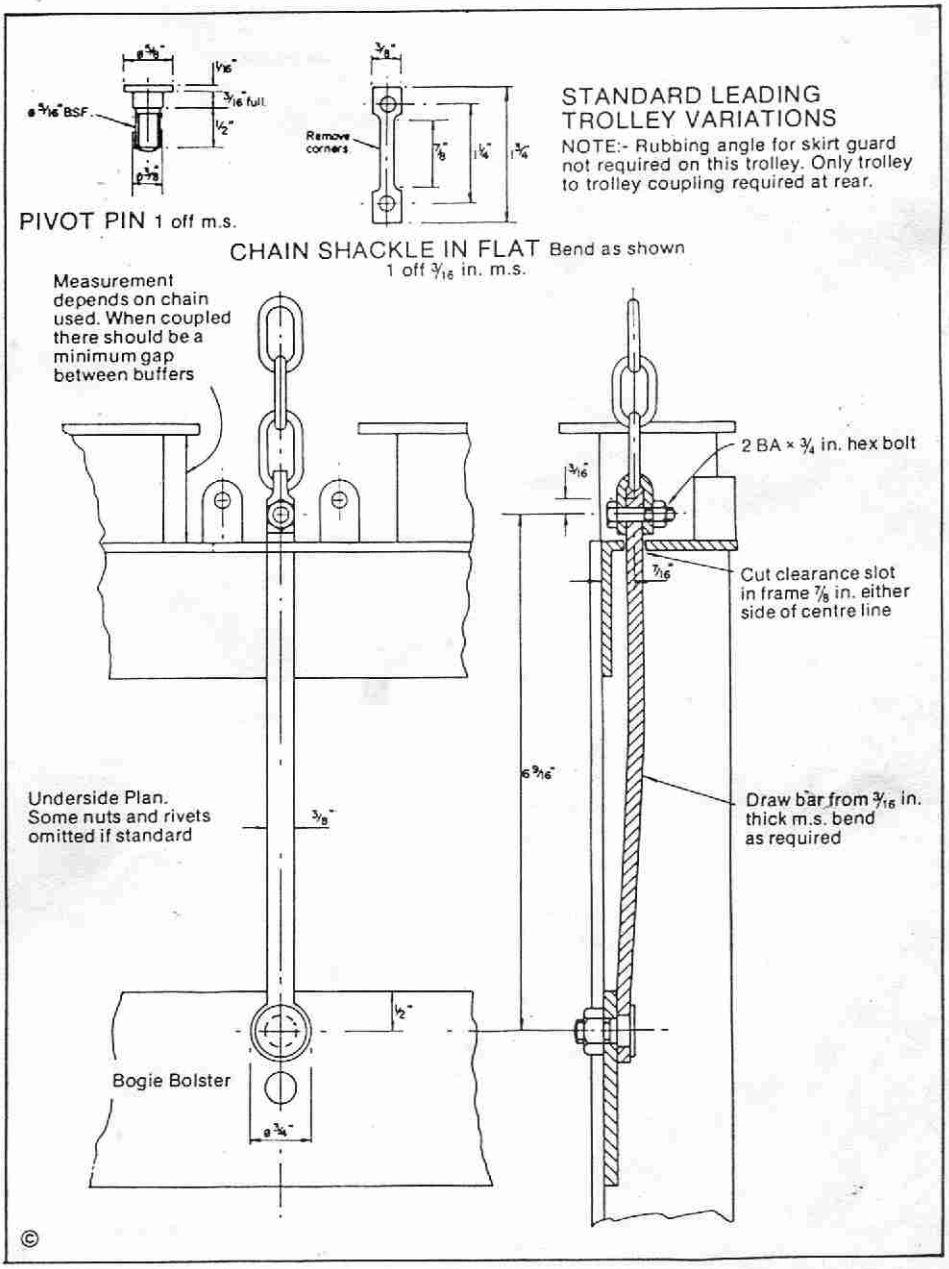
Last time the description dealt with the making of the frames for the passenger vehicles. This time we include a couple of drawings which had to be omitted in Part III for reasons of space. We now move on to the all-important bogies, it is in their design that stability lies.

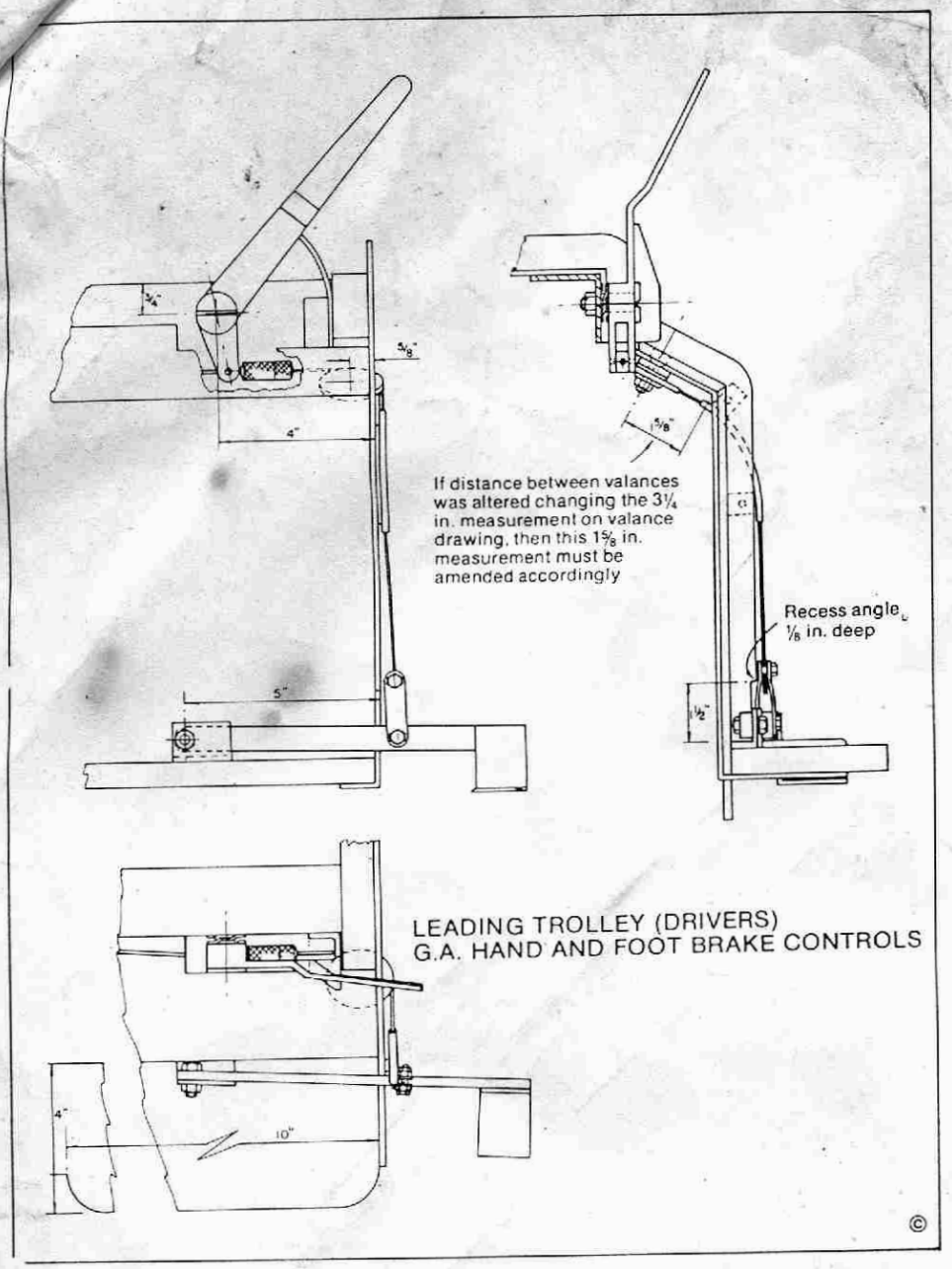
The Bogies

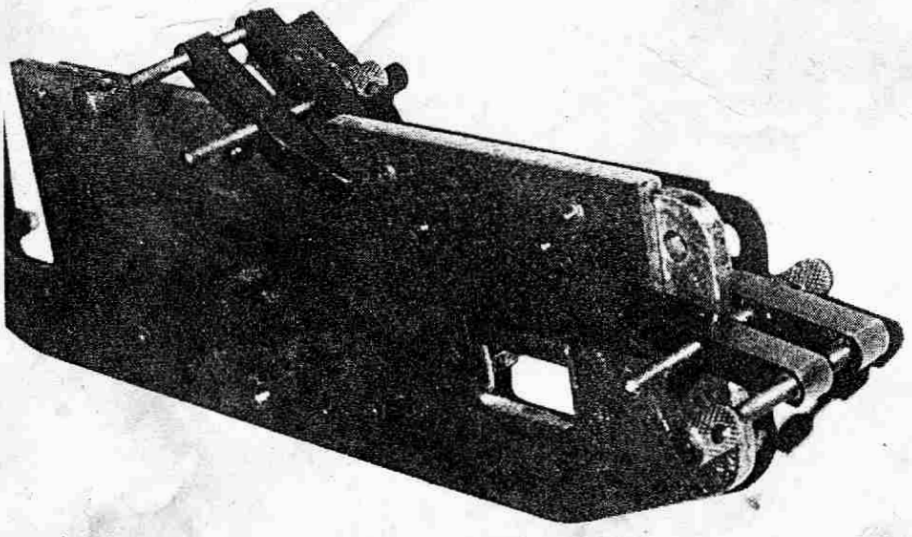
The frames are now ready to hang the bits and pieces on, so we will turn our attention to the bogies. These have been designed, in so far as possible, to make use of stock material, the only pattern making required is for the wheels, which are specified in cast iron. Possibly a search through one of our suppliers' catalogues could turn up a suitable wheel casting, 3 in. dia. over the tread does not seem too extreme. The original bogies as designed by E. Salt, called for individual castings for the axle-boxes, but they are now made from $1\frac{5}{16}$ in. lengths off a $1\frac{1}{4} \times 1\frac{1}{4}$ in. C.I. bar. When I made my original trollies some 25 years ago we still had a motor cycle industry, and it came as a shock to the supplier when I asked for 32 Velocette clutch springs, these being ideal for the job. However, one of my fellow members .pproached a local spring winding firm when we built our new trollies, and it seems that if you take a reasonable number they will accommodate you. There is also an auxiliary spring shown on the drawing. This in effect acts as a soft spring giving a very limited movement to the axle-boxes on an unladen trolley, but as soon as a load is applied the short spring pins make contact and the load is transferred to the main springs.

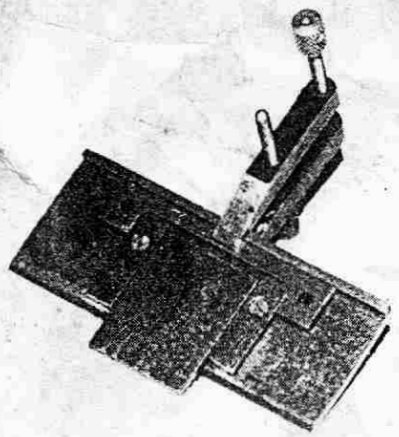
Construction of the bogies begins with the frames, which are from $\frac{3}{16}$ in. b.m.s. If at all possible these should be treated as engine frames and machined in sets of four. Use of drilling jigs can be a great help in speeding up operations on the bogies. The first to be used is No. 2, required to drill frames for the horn keeps, the same jig being used to drill the keep themselves. I have shown some of the jigs used with the assemblies, they are not elaborate but have been found to do the job satisfactorily. Freehand drilling will do for the remaining holes but once again can be done as pairs, marking the inside for identification when assembling and reassembling. Do not, at this stage, drill the holes for the spring anchor brackets, these are drilled through from the bracket themselves. The tapping hole in the frames to take the roller pin can be drilled now, but do not tap until the angle which supports the main bogie stretcher has been fitted and drilled through. Make the end stretchers now, as all stretchers have to be fitted together on final assembly.

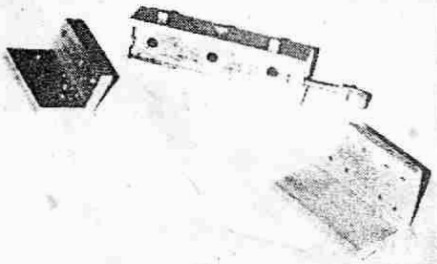
Before final assembly, make up pivot blocks and fit to the main bogie stretcher at $1\frac{1}{8}$ in. centres and square with the stretcher. Be sure to machine away clearance for the head of the bogie pivot pin











Above: Drilling jig No. 2 in position to drill the tapping holes in the horn keeps.
Top right: Another view of drilling jig No. 2 with removable sections fitted, and the horn keep in position after drilling.
Right, centre: Left to right, drilling jigs Nos. 3, 9 and 10. It should be noted that Jig. No. 3 has been amended on the drawing.

before final fixing, which can be done at this stage.

The spring anchor brackets are drilled using drilling Jig No. 3. Be sure to make them left and right hand. By using the Jig No. 4 to locate their position when drilling for the ⅛ in. rivets you can be sure of free movement of the springing, and also that the auxiliary spring pins line up. Final assembly of the bogie frame can now be done. Having next tapped the frames ¼ in. B.S.F. for the roller pins, these can be made and fitted. The rollers themselves can also be made, all these items being pretty straightforward jobs. Make the rollers a reasonably easy running fit, and on final assembly grease the bearing.

Axle-boxes can now be made, and as already stated, they are machined from a 1¼ in. square cast iron bar. Castings could be made if desired, in which case the actual ball race housing would be a full 1¼ in. dia. all round, the choice is yours. The ball races used are standard double shield type, 1⁵⁄₁₆ in. o.d. × ½ in. bore = ⅜ in. wide. Double shield bearings have given no trouble over the years, and obviate the need for a grease nipple in the centre of the axle-box covers. However, if open races are used, then provision should be made for the odd squirt of grease.

A Limited Production Run

As a production line was opened up when it was decided to build four new trollies, my fellow members produced the axle-boxes with the help of fixtures, as it does speed the job up when more than one trolley is required. I will endeavour to give some idea of the methods used.

Firstly square the C.I. bar to approximately 1⅝ in., either in a shaper or by milling. It is of no consequence if it is 1/32 in. oversize, as the use of the fixtures will ensure that all parts fit.

Having now got the bar cleaned up the hardest part arrives if you have no power hacksaw, that of cutting off individual slices. It is best to allow a tolerance to permit the facing of both ends, to give a final thickness of 15/16 in. This thicknessing can probably best be done in the four jaw chuck. Centre pop the required number of blanks, in the centre, on one end only. It is quite accurate enough to scribe two lines corner to corner and centre pop at the intersection. Now mount a blank in the four jaw chuck, and set the centre pop to run true with use of the wobbler. If you are fortunate to have a four jaw self centring chuck which is accurate then the centre popping etc. can be dispensed with.

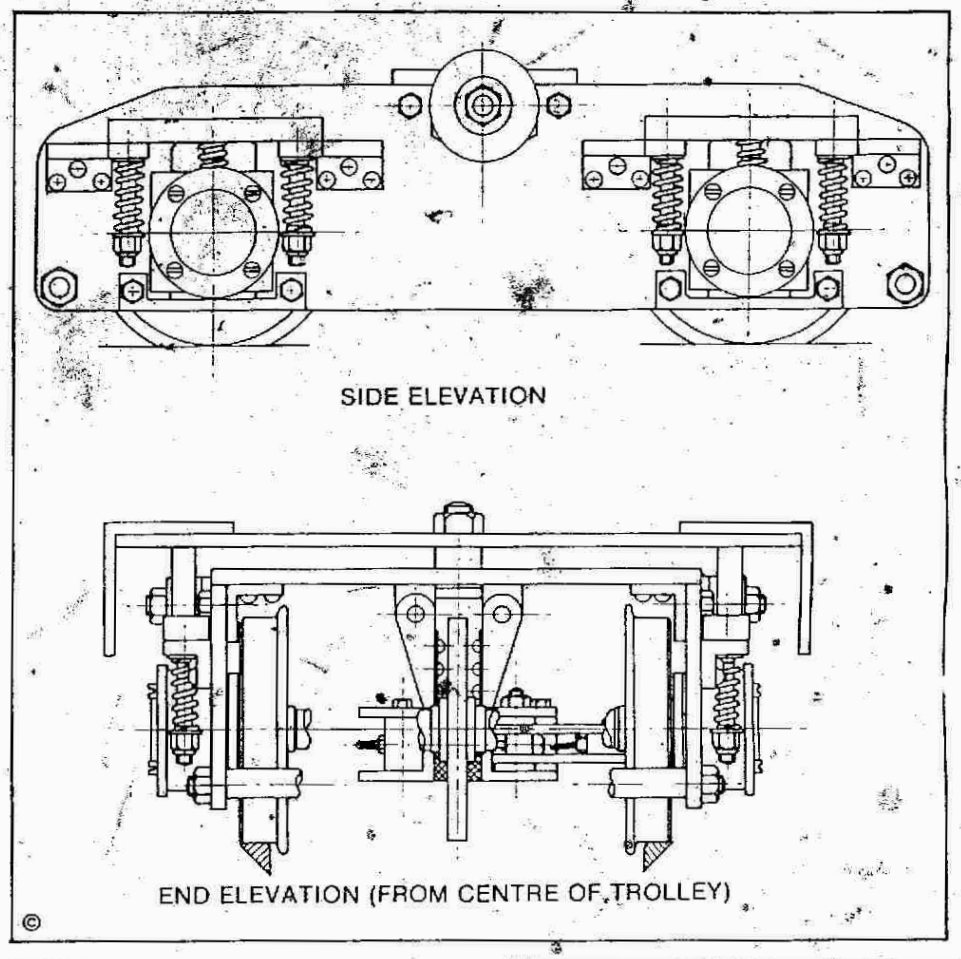
Now drill through to ⅝ in. dia., finally using a boring tool to open out to 21/32 in. diameter. This must be accurate as it will be the register for the fixtures. Still continuing with the boring tool, complete the housing for the ball race, which requires to be a light tap fit. When assembled the outer ring of the race is under a pinch fit from the end cover.

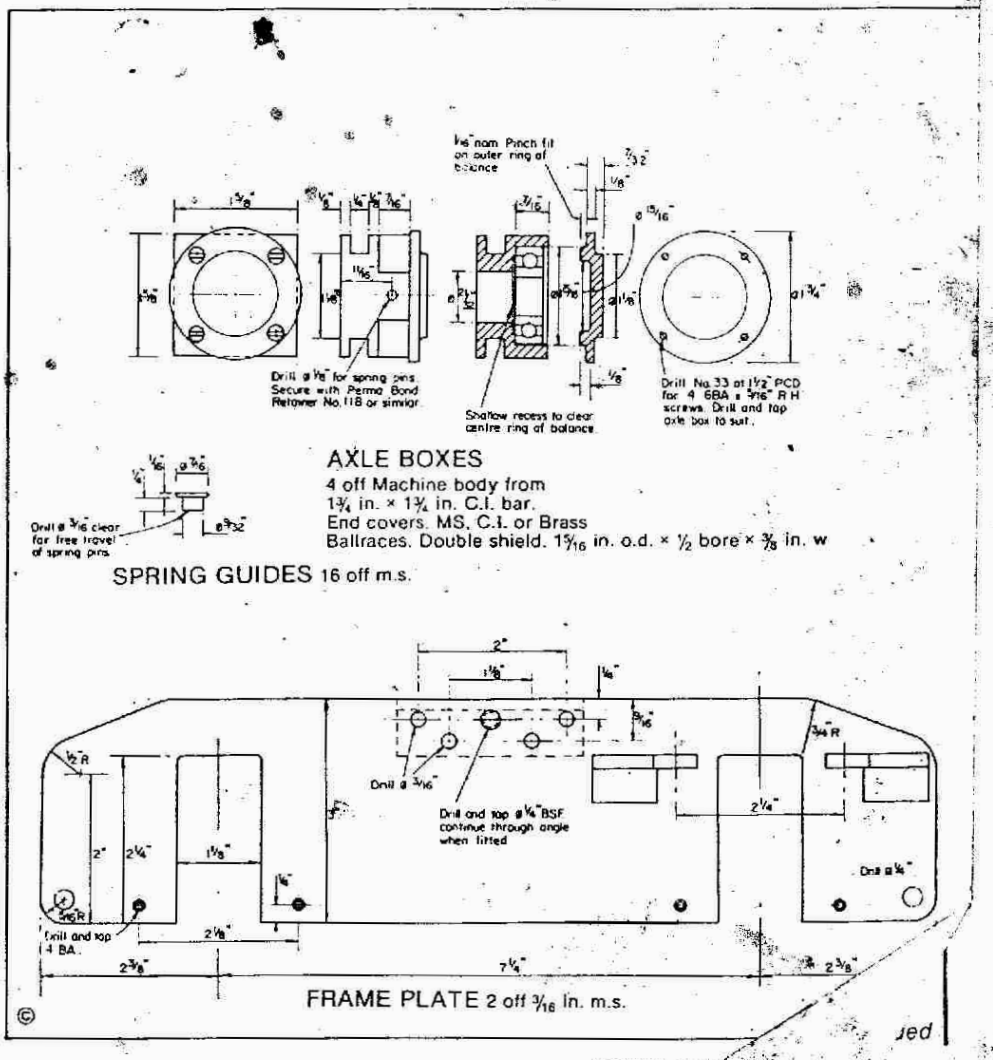
Having machined the housings in all axle-boxes required, fixture No. 5 is set up in either the three or four jaw chuck and the 21/32 in. spigot set to run true. Each box is mounted in turn, housing side out, and secured by packing piece and a nut. The corners can now be turned off to a diameter of 1¾ in. for a distance of 7/16 inch.

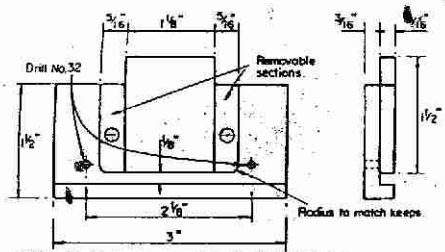
The horn slots are next end-milled out, making use of Fixture No. 6. The axle-boxes are attached to the fixture with the housing outwards, the housing accommodating the securing washer and Allen cap screw. Before final tightening, make sure that the square of the axle-box and the fixture square are consistent with each other. A machine vice is fitted to the table of the milling machine, with the fixed jaw parallel with the line of cut. The fixture with axle-box is gripped end on in the vice, the square of the fixture sitting firmly on the bed of the vice. By use of the cross feed the whole is correctly positioned under a ¼ in. dia. drill, the cross slide then being locked into position.

It is possible to calculate the depth of cut required, to permit the axle-box to fit between the horns, but it would be wise not to take the full cut on the first axle-box to begin with. Having done the first cut take a depth reading on the mill. Now remove from the vice and rotate through 180 deg. to mill out the other slot to the same reading. Without removing the job from the fixture check the axle-box for fit and if necessary remove an equal amount from each slot until a satisfactory fit is obtained, noting the final reading on the mill depth indicator. It is now a simple matter, provided the width between all the "horns" is the same, to machine all axle-boxes to a similar size, using the final depth reading.

Some may think that there is not a lot of

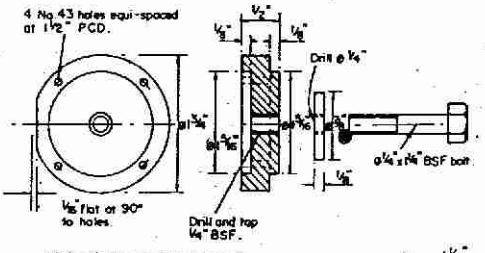






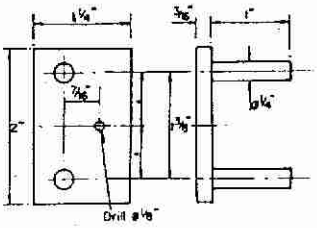
Drilling jig for horn keeps and tapping holes in bogie frame. Removable sections in place to drill keeps. Sections removed to drill tapping holes in frames.

JIG No. 2



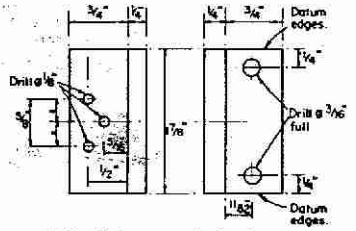
Drilling jig for axle box end cover. Tapping holes and end cover holes.

JIG No. 7



Drilling jig for auxiliary spring pin.

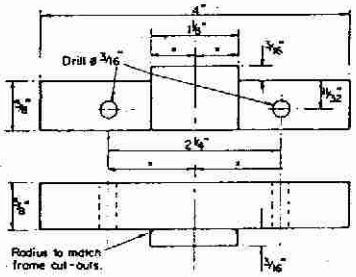
JIG No. 8



Drilling jig for spring anchor brackets from 1" x 1" x ¼" M.S. angle.

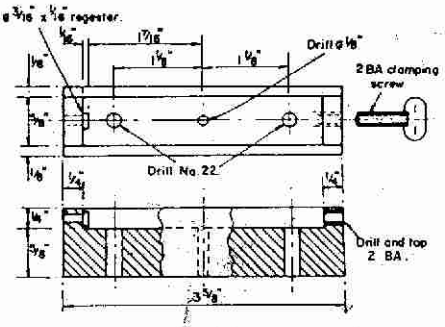
JIG No. 3

(Ammended from original in photo.)



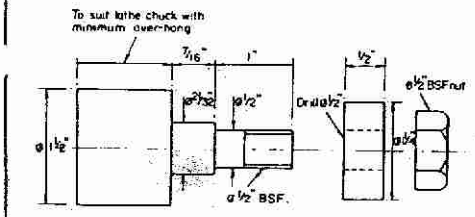
Fixture to locate position of spring anchor brackets.

JIG No. 4



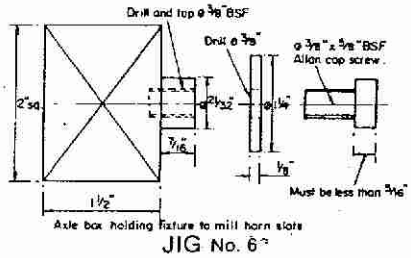
Drilling jig for spring beams.

JIG No. 9



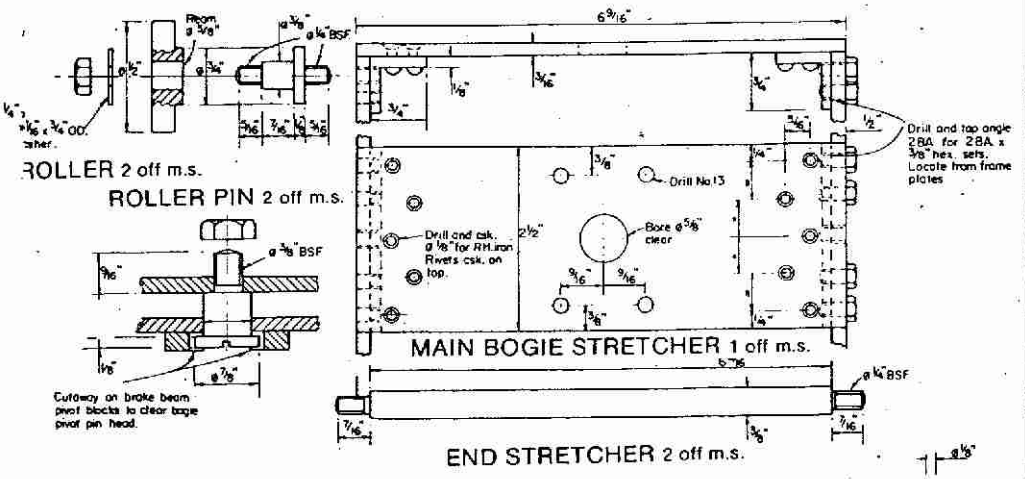
Axle box holding fixture to machine outside of ballrace housing.

JIG No. 5



Axle box holding fixture to mill horn slots

JIG No. 6

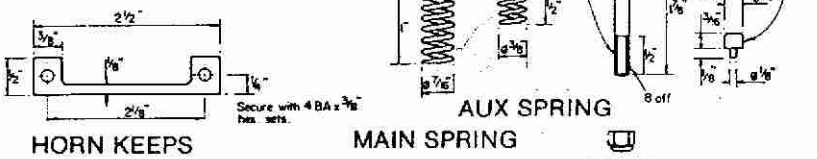


ROLLER 2 off m.s.

ROLLER PIN 2 off m.s.

MAIN BOGIE STRETCHER 1 off m.s.

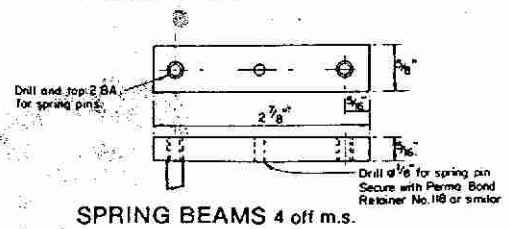
END STRETCHER 2 off m.s.



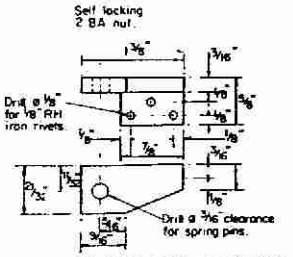
HORN KEEPS

AUX SPRING

MAIN SPRING



SPRING BEAMS 4 off m.s.



SPRING ANCHOR BRACKETS

4 off each hand m.s. angle

bearing surface in the 3/16 in. thickness that the frames offer without the use of horns, but 25 years use, almost every Sunday afternoon during the summer months have shown very little wear on the prototypes. I might add that this converts to over 6,000 miles as this is the mileage recorded on my 1500 class Western Pannier tank engine, behind which the trollies have travelled, plus being used by other engines.

Jig No. 7 is used to locate the 6BA tapping holes for the end cover securing screws. The jig is secured into position, using the set bolt and large washer, with the flat on the jig in line with one of the flats on the axle-box. The final job on the boxes is the drilling and fitting of the auxiliary spring peg on the upper side. For this use is made of Jig No. 8, the position needs to be correct so that it matches the other spring peg on the main spring beam. The object of the position is that all weight is carried directly over the centre of the ball race. The pin can be a light press fit, or Perma Bond A118 retainer can be used. If the frame cut-outs for the axle boxes were left with round corners, make the axle-box horn slots to match, to give full travel should it be required.

End covers are made next, the type of metal is your choice. The job is a straight forward lathe job, all I would say is have the ball races fitted so that it is possible to take a measurement ensuring that the covers can be correctly machined to pinch the outer ring of the ball race. Use drilling Jig No. 7 to complete.

To be continued

PASSENGER COMFORT AND SAFETY

Bill Perrett continues his description of Southampton D.M.E.S. passenger vehicles

Part V, from page 457

Previous instalments have covered the reasons behind the design for the braked trains used at the Southampton D.M.E.S. track. Following on from this came a description of the construction of the frames of the trollies. Last time a start was made on the all-important bogies. This time we move on to deal with axles, wheels and brake gear.

Turning the axles is straightforward, the only points to bear in mind is that the ball race has to be a light press fit on the outer ½ in. diameter. The wheels and brake disc have also to be a press fit. The centres in the end need to be larger than normal so that there is still a register after drilling and tapping ¼ in. B.S.F. for the ball race retaining screw and washer. Turn the axle between centres.

The brake disc was made from ⅝ in. thick slices off a 3 in. M.S. bar. I think that if you have not got a power hacksaw it may pay to have some friendly words with your metal supplier, or else take a census of available machinery in your society, it could save an awful lot of perspiration.

These ⅝ in. lengths are set up in the lathe chuck to run reasonably true and bored out ⅝ in. dia to be a press fit on the axle. Before any more machining is done press on to the axle, and for good measure fit a ⅛ in. dowel as shown on the drawing. Mount the axle between centres when the complete disc can be machined to finished size, the 3 in. overal dia. may be a little smaller but will not matter. What is important is that the ¼ in. thickness is constant throughout the disc.

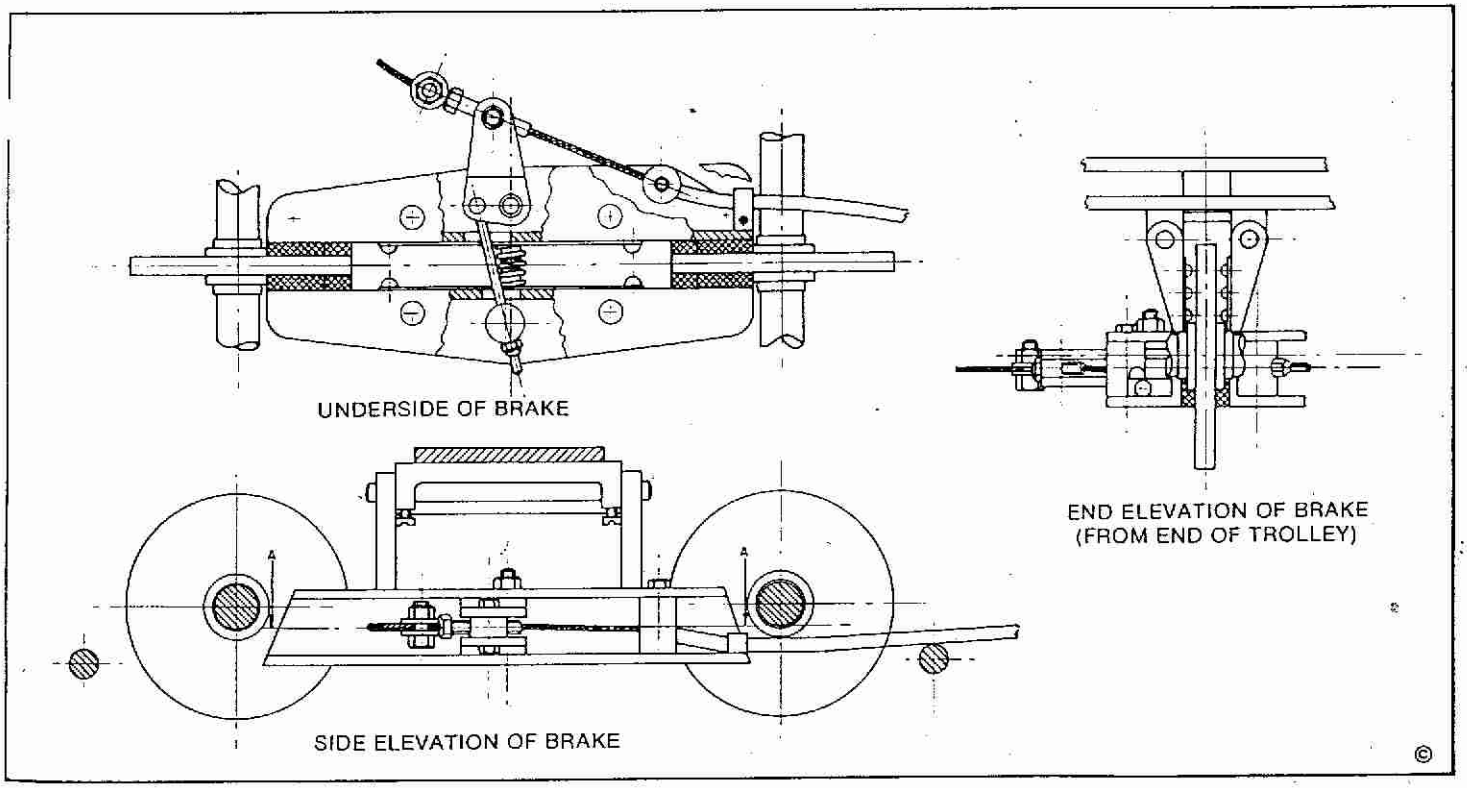
An Alternative Disc

Should it be desired to fit discs to existing axles without removing the wheels the method outlined on the "Alternative Brake Disc Assembly Drawing" can be used. This has been done on some of our trollies with complete success. The rough disc is sawn in half (do not clean up) then cross drillings are done from the cut side on one half. The two halves are clamped together and using the previous drilled half as a jig cross drillings are completed. With rods through to locate, the two halves are mounted in the chuck and bored out to ⅝ in. diameter. The two halves can now be clamped in position on the axle, using F241 adhesive on flat surfaces and A118 retainer for the outer four rods. When the adhesives have cured, drill centre hole through axle and fit final rod. Continue machining as before.

Turning and fitting wheels need no special comment, other than to say that the addition of a dowel in the same manner as on the disc is a wise precaution, something which we have done with ours. All that is needed now, before the axle-boxes can be fitted, is the ⅝ in. o.d. × ⅝ in. long spacers, and special washers for the ¼ in. csk. socket cap screws.

Suspension

The spring beams are from 2 ⅞ in. lengths of 5/16 in. × ⅝ in. b.m.s. bar, and are drilled using Jig No. 10, the end holes being tapped 2 BA for the long spiral pins and the centre hole to accept the short spring pin, either as a press fit or secured with retainer. These beams can be fitted to frames now, using the recommended springs, with spring guides either end and a self locking 2



ut fitted. The auxiliary spring is fitted final assembly when the brake gear is in position.

Brake Assembly

The brake assembly on the bogies is very simple in its operation, yet proves to be very effective and foolproof when in use. The calipers are operated by a bicycle rear brake cable, through a bell crank, which closes the Ferodo pads on to the discs. I know there are critics of the use of ordinary brake cables, but in all the 25 years of operation we have not had a single one let us down. All I would suggest is that approximately every five years they are checked and re-greased, that is a measure of my confidence in them. The Ferodo pads were cut from a very large diameter type of brake pad, scrap material, and knowing model engineers I am sure they will be able to discover a source of the same. By having the braking points where they are, they counter the pitching forward effect that braking would have on the bogie.

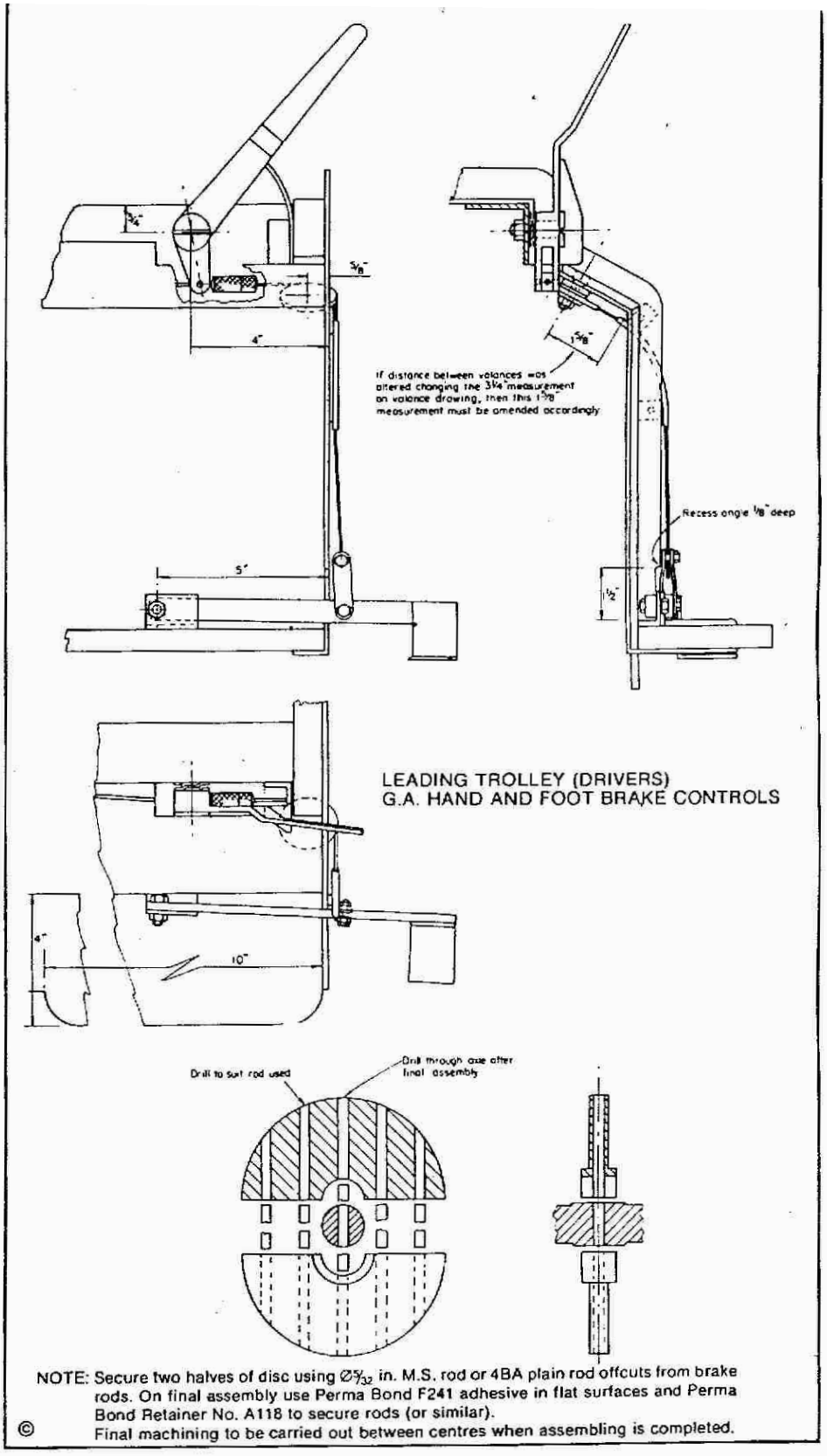
Reference to the G.A. of the bogie will show that on braking the leading axle will attempt to move down, thereby lifting the front of the bogie, with the reverse happening on the trailing axle. One other point is the positioning of the pads below the centre line of the disc, this means in a small way that the heavier the load so the disc will rise and pad contact is lower and on a slightly larger diameter. Reference to the diameter reminds me to mention that these brakes are designed on the principle that the disc size relates to wheel size. Should larger wheels be in use, then larger discs are required, which in turn may mean a variation in the caliper beam length.

Construction of the caliper beam assembly should present no great problem if reference is made to the drawing, it is mostly a stick and rivet job. The beam itself is specified in aluminium, this is because it is what came to hand when I built the prototype, and is preferred to steel if only for the weight factor. Numerous holes have to be drilled, all freehand, with the exception of the brake pad fixing holes (tapped 6 BA). This is carried out with Jig No. 11, which in turn is used to drill the pads themselves. The reason for all fixing screws being countersunk under the beam is so that there is nothing to catch on in the event of a derailment. Normally, should a derailment occur, the two end stretchers of the bogie make contact with the rail, and the caliper is well clear, it is just an extra precaution. Do not use steel plate of any greater thickness than 18 s.w.g. in the construction, as the object of this is that there shall be a slight deflection should it be required to align with the discs. Fixture of the brake pads is once again by our old favourite Permabond F241 and brass 6 BA csk. screws with their heads well below. These pads seem to last forever, my original ones are still in service.

Reference to the G.A. of the bogie, and section G.A. on the Operating Mechanism drawing should give a clear understanding of the method of operation and clarify the function of each part. When assembled the outer brake cable passes under the axle and over the end stay, hence the reason for the angled hole in Item 7 to receive the outer cable and direct it on its way. Be sure to check outer cable size before manufacture of parts, as there could be slight variation. It was not thought necessary to fit end sleeves to the cable as is normal practice, as it can be made a neat fit in the drilled hole. These outer cables can be obtained from cycle dealers in a continuous length, and the inner one made up with one nipple on a length intended for a cycle rear brake, which is more than long enough for one trolley. Method of assembly of the paired plates of the bell crank can best be seen by reference to the bogie G.A.

When finally assembling the brake mechanism to the bogie remember to first put the bogie pivot pin in position. Also the release spring has to be fitted between the plates of the calipers. Finally the retaining screws are tightened to hold the caliper pivot pins in position, this being done through access holes in the brake beams.

The wheels and axle-boxes can now be



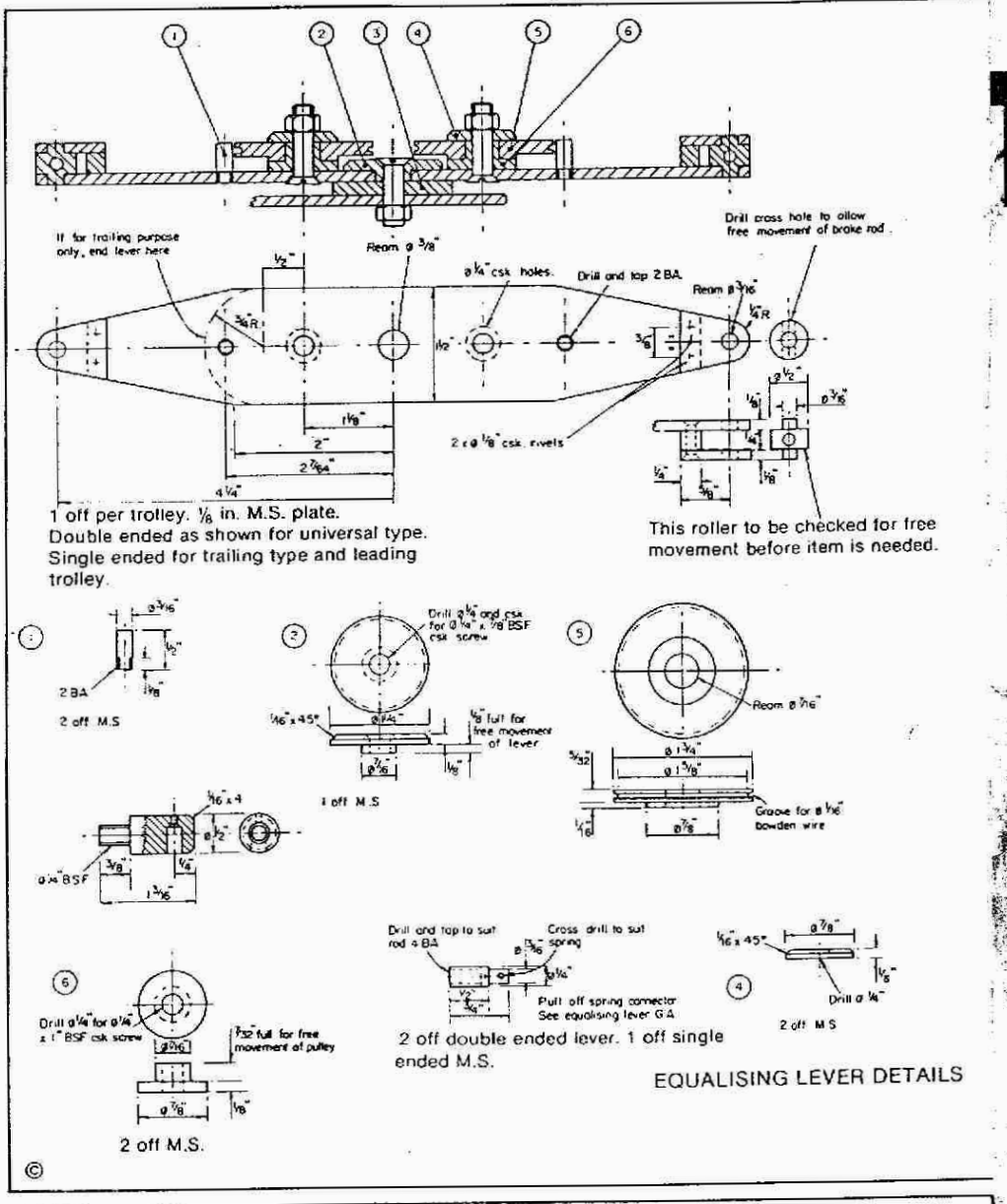
dropped into position, not forgetting to fit the auxiliary springs. To retain them the horn keeps must be fitted using 4 BA × ⅜ in. Hex. set screws. Using the self locking nut on Item No. 4 the first adjustment can be made. With the brakes fully closed, adjust until Items 5 and 8 are approximately square with the beam. Be sure to adjust both bogies similarly. Item 8 is used for adjustment of the cable which will be fitted after the next assembly has been installed, this being the equalising lever.

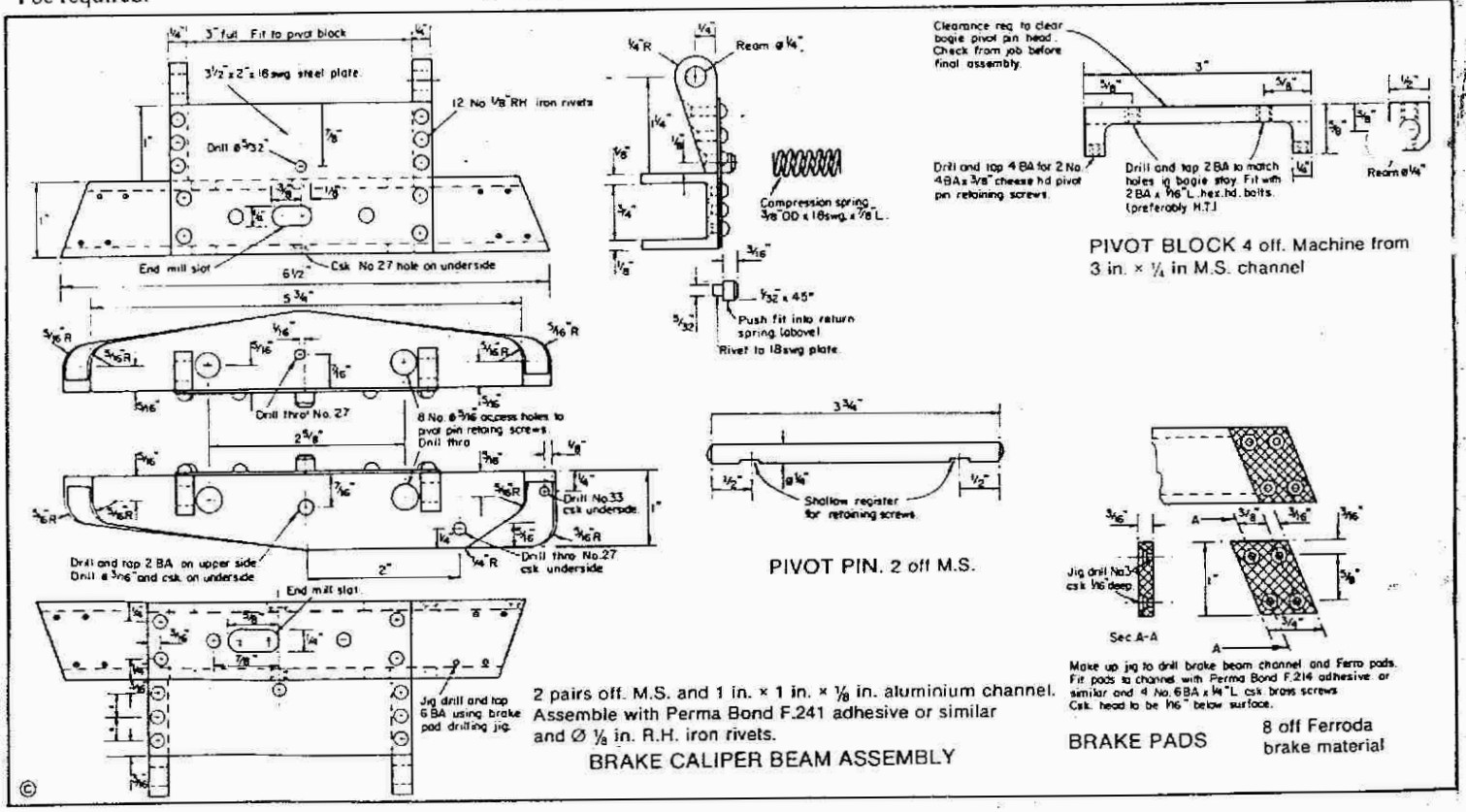
By referring to the "G.A. Equalising Lever and Support Stay" drawing it can be seen that the cable is free to travel around the pulleys, thereby applying the same pull to both bogies.

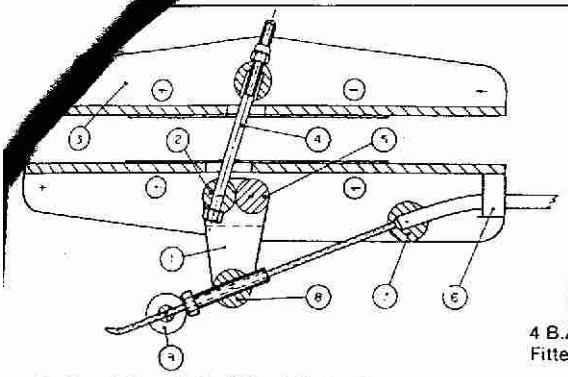
If the trolley to which this lever is to be fitted is intended only to function as a permanent leading trolley or, in a trailing mode only, then the lever can be single sided and end where shown. If as a universal type then make the full double sided lever.

The lever itself is once again a stick and rivet job using Permabond F241 as a locating means, and also as a check assembly to ensure that the end rollers, which take the brake rod, are free to rotate. The brake rod must be free to travel through the roller as this is the action when the opposite brake rod is pulled, on the double lever. Once satisfied with these criteria, then rivet up with 2 × ⅛ in. csk. iron rivets each end.

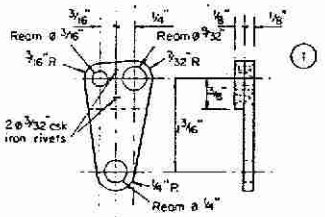
The remaining items to be made for the lever are sraightforward turning jobs. Should your intention be that this assembly is for a leading trolley, and you wish to fit a foot operation to the brake, then it would be wise to make up an extra one each of Items 1, 4, 5 and 6, as these will be required.



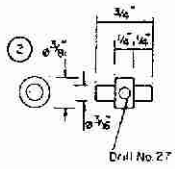




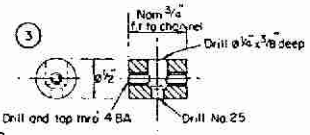
Section A-A on G.A. of Bogie Brake Gear



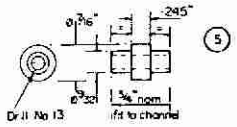
2 pairs of (handed) Prefab from ⅛ in. M.S. plate
Use Ø 3/32 in. csk. Iron rivets or Silver solder.
4 B.A. × 2½ in. L. hex. hd. bolt as adjustable tie bolt.
Fitted with self locking nut. 2 off M.S.



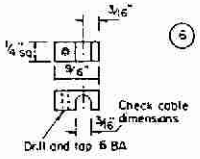
2 off M.S.



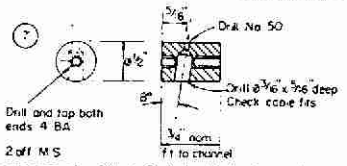
2 off M.S.
Use 4 B.A. × 5/16 in. L. csk. screws to fit to lower side of channel. Use 4 B.A. × 5/16 in. L. hex. hd. bolts for upper side.



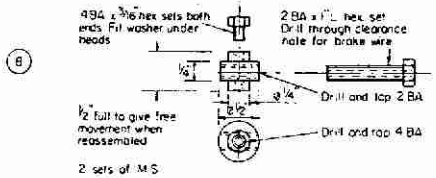
2 off M.S.
Fit to channel with 2B.A. × 1¼ in. csk screw
Csk. on lower side
Screwed into tapped hole on upper side and fit lock nut



2 off M.S.
Fit to channel with 6 B.A. × ⅜ in. csk. screw.

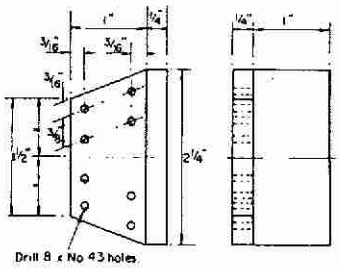


Fit to channel with 4 B.A. × ¼ in. L. csk. screw on underside. Use 4 B.A. × ⅜ in. hex. hd. bolt on upper side.



2 B.A. × ⅜ in. L. hex. bolt. (H.T. preferred)
Cross drilled sliding fit on brake wire.
1 only reqd. per trolley as rear bicycle brake cables are normally supplied with nipple fitted to one end.

BRAKE CALIPER OPERATING MECHANISM DETAILS



Drilling jig for brake beams tapping holes and brake pad holes.
From 1¼ in. × 1¼ in. ¼ in. M.S. angle
JIG No. 10

I would strongly recommend that you consider a foot operated brake, as it leaves both hands free to deal with the engine, and no trouble is experienced in stopping on the mark. It should also instil more confidence in the public that you know your job if you can stop at will without a lot of grabbing for brake handles.

Item No. 1 on the drawing is intended to prevent any possible chance of the inner cable being unshipped from the pulleys. When fitting the cable it is a simple matter to thread it through in the direction required.

Make the pulleys a reasonably easy running fit on their pivots, and on assembly a small amount of grease would not come amiss. I am afraid that most of us are always oiling our engines, but the poor old trollies are so often neglected, yet the requirements are the same. The same comment regarding lubrication must apply to all moving parts which cannot be seen once the trolley is assembled on the track.

The final assembly required 3 × ¼ in. × ⅞ in. of 1 in. BSF csk. screws, bearing in mind to obtain an extra one should a foot brake be anticipated. When making the cable stops, I would once again warn you to check the cable size as when making the bogie cable stops.

Having fitted the equalising lever, this can now be connected to either or both the over-ride lever and brake handle depending which variation is being constructed. Common sense will dictate the length of the brake rods, bearing in mind the equalising lever travelling equidistant either side of centre-line, and the overall travel of the rods being only ¼ in. to ⅜ in. in operation, from full on to full off of the brakes. Full off in fact is very little, just enough to permit the wheels to run free, as the brake mechanism can float from side to side. About 1½ in. of thread on the brake rod end will be sufficient to give any later adjustment required, this adjustment is done to merely locate the equalising lever position.

The pull off springs do not have to be too powerful. Their only function is to return the brake handle, and footbrake if fitted, to the off position on release. They also assist the return of the brake rod on the over-ride lever side, although the action of being under tow will also do this, but could bend the rod. With the dual function trolley they also retain the rod opposite the one being operated, in a neutral position.

The operating cables are now fitted, trial and error being the order of the day to determine the length of the outer cables. They need to be long enough to permit the bogie free movement in all directions, yet not long enough to be sagging down on to the bed of the track.

Now do a trial run with the inner cable, finally passing it through the cable clamp, Item No. 9 on the "Brake Caliper Mechanism" drawing. Make sure that the cable adjusters, Item No. 2 on the aforementioned drawing, are screwed right in. Pull the cable through, and with the calipers in a closed position on both bogies and the brake lever or over-ride lever in the off position measure how much cable requires to be cut off to allow about 1½ in. spare end.

Having withdrawn the cable tin well, with Tinmans soft solder, a length of about 3 in. in the vicinity of where the cut is required. Use Fluxite as flux and clean well afterwards. The cable can now be cut by gentle application to the edge of a fine grinding wheel, and provided care is taken it will not fray.

Before final fitting of the cable, grease it well. Having now replaced the cable, once again pass it through the cable clamp. This can be tightened just enouh to permit the cable to be drawn through, with the aid of a small Mole grip, and yet not slip back. By this means it is possible to arrive at a position at which to tighten the cable clamp.

Now put pressure on either the over-ride lever or brake handle as would normally be done on braking. This action will probably be found to force the outer cable further into the cable stops. If this is so, it is no great problem to use the cable adjusters to set the pads as mentioned earlier, just clear of the discs, in the full off position.

The only other adjustment required is to check the parking brake on the leading trolley type to ensure it is possible to engage the "park" position with the handle, and that it is effective. Adjustment is on the two locknuts of the appropriate brake rod. Check also that the over-ride level still has plenty of spare travel when brakes are fully applied.

That about concludes the basis of the trolley and brakes, and we will move onm to try some of your skills with wood, saw and plane. Much of the next section means the use of these tools. *To be continued*

PASSENGER COMFORT AND SAFETY

Bill Perrett continues his description of Southampton D.M.E.S. passenger vehicles

Part VI, from page 585

The general construction of the valances is of 6 mm W.B.P. Plywood on 1 in. × 1 in. × ⅛ in. angle and frames. A fellow member, who is in the business of wood, has reliably informed me it is throwing money away in the sea to buy marine ply for our purpose, and that W.B.P. Ply (Water and Boil Proof) is every bit as good. In any case I am sure that some weather protection will be given, either paint or varnish.

With two exceptions all valances are identical to each other, these exceptions are on the leading trolley. No small rubbing angle (sec. B-B) is required for obvious reasons. In the interest of added comfort for the driver, the footboard is made a bit wider for 10 in. at the front end.

May I emphasise how very important it is that two clearances are checked before any construction work is carried out on the valances. First, that when negotiating curves they will be wide enough to clear any superstructure, including any existing check rail. Probably the best place on the trolley to check this would be mid-way between the bogies. Should they require more clearance then the 3¼ in. long angled section as shown on "Trolley Valance" drawing, this would need to be increased as required. The other checking which needs to be done is the clearance above ground level.

Having satisfied yourself that these clearances are in order a start can be made on the angle supports. The shape and size of the supports can be seen from the drawing. It is an all welded construction, and when we built ours we used the portions cut out to fill the gaps created when bending in the opposite direction. Don't forget they are left and right-handed!

Using Jig No. 1 which was used to locate the "Locating and Securing Pin" hole in the frame, the matching holes can be drilled in the support angles. Provided that the trolley frame sides are exactly equal in length, then the finished valances will be interchangeable as required on the universal trollies.

The end semi-circular cutout is also done at this stage and a trial assembly carried out. It may be found that, due to the angle of entry, a slight relief may require filing on the underside at the end.

Drillings for the various fixing screws, etc., should now be done, and where required, tapped. The decision has now to be taken on what fixing screws to use. I have shown 2 BA round head screws with large washers, as I used these on my prototype trollies of twenty five years ago, but use can be, and has been, made of ¼ in. Roofing Bolts, or the modern metric equivalent, (I used to know them as Gutter Bolts) which have a large diameter shallow round head. This obviates the need for washers. With metrication the ¼ in. could be 6 mm. However, you pay your money and take your choice, but tap the angle accordingly.

Remember the clearance holes for the leg guard fixings are only required in one pair of angles. It might be a good idea to use these drillings to spot through the position of the 2 BA tappings required in the 7 in. long b.m.s. backing strip of the actual leg guards and drill and tap them ready for later.

To get the correct size of ply required it is best to fit the angles into position on the trolley frame, checking that everywhere it is square and parallel. Allow enough to form a mitre edge at the join to the other ply part of the valance at the top. Sec C-C and D-D will show what I refer to. The ply is carried 1 in. below the footboard as shown to prevent the possibility of the footboard fixing screws tearing down and out.

Once satisfied all is well and the mitre joint (minus fillet) is a matching fit between the two plys, clamp the whole unit together with "G" Clamps. The fixing screw holes can now be drilled. Secure the ply into

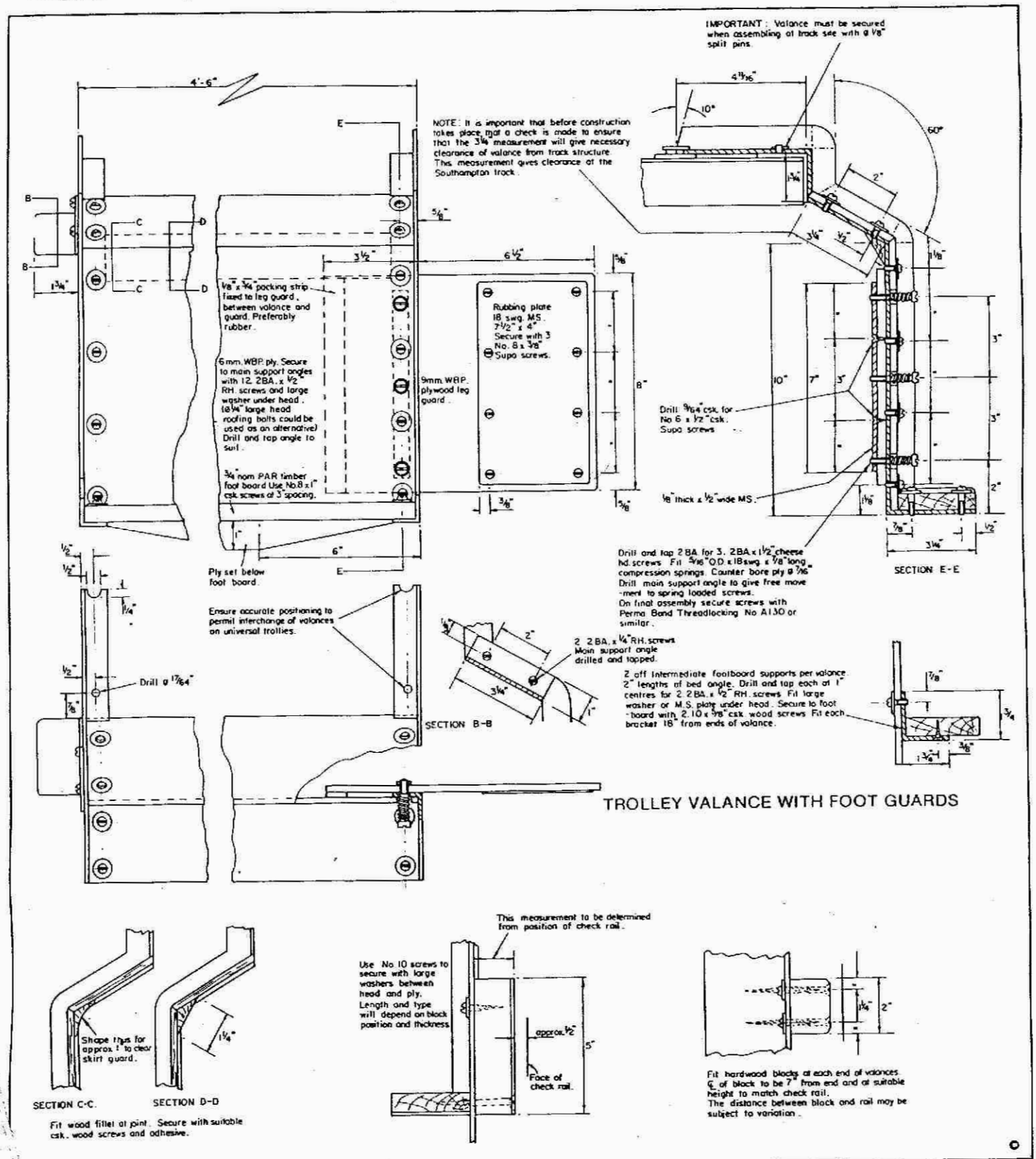
position with your choice of screw.

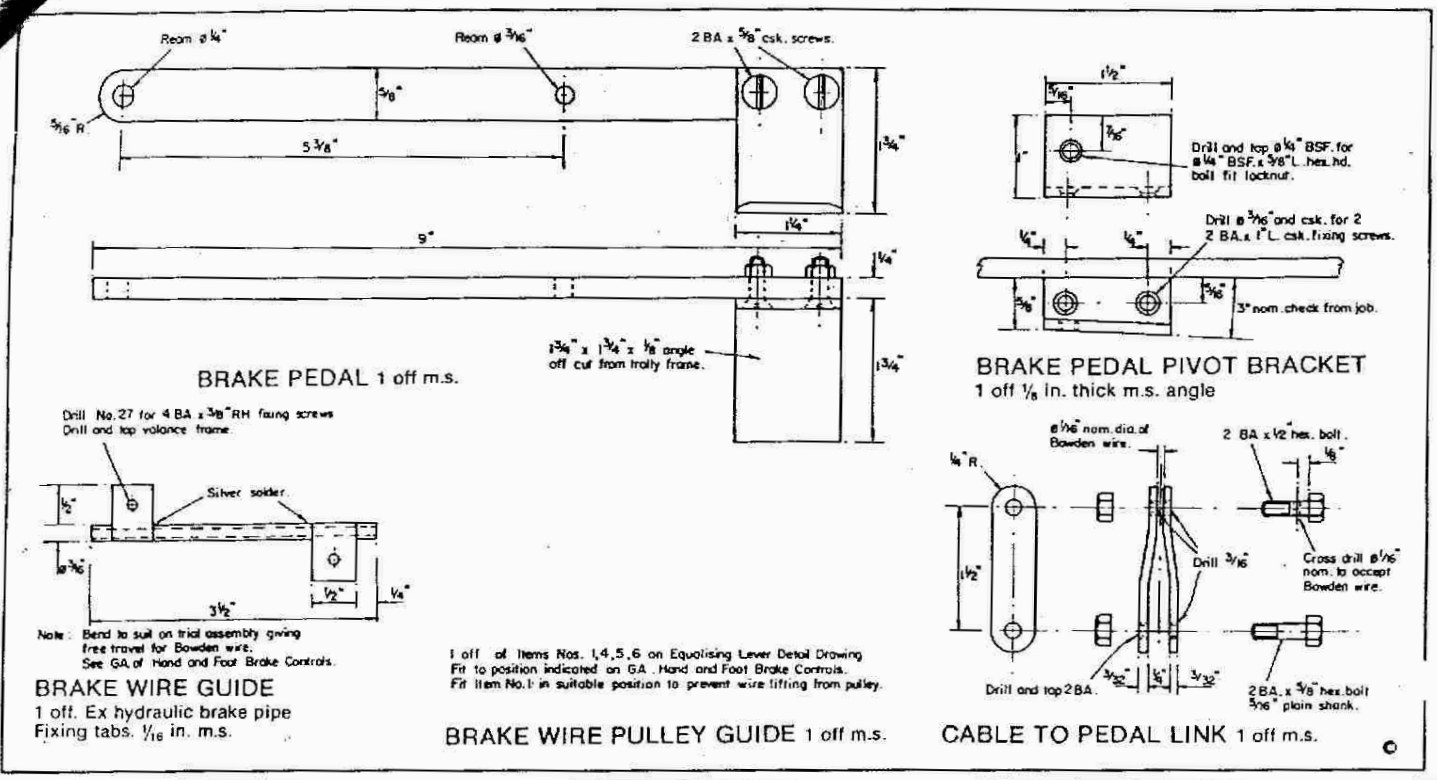
The mitre joint is now strengthened by fixing a wood fillet inside, this being held in place with wood adhesive, preferably exterior grade, and csk. wood screws. These can be put at about ⅜ in. from the outer corner of the mitre at approximately 3 in. apart. No. 6 × ½ in. should be about right for the job. Cut away the small clearances as shown in Sec. C-C to prevent the skirt guard from fouling.

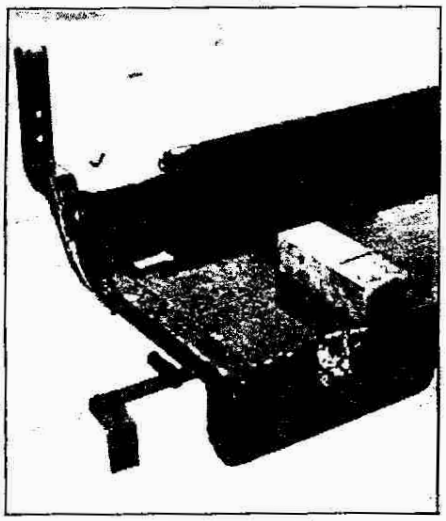
The Footboards and Leg Guards

The footboard is yet another adhesive and wood screw fixing job. If for a leading type of trolley remember the front wider section. Added support is given to the board by the fixing of two offcuts of bed angle as indicated on the drawing. Two reliefs will have to be made across the inner edge of the footboard to accommodate these angles.

Leg guards are made from 9 mm W.B.P. ply. These are held in position with the three 2 BA × 1½ in. spring loaded screws, which also maintain contact of the guard with the following trolley. The valance ply is counterbored to permit the springs to bear on the angle. The 2 BA screws are screwed into the previously tapped 7 in. length of ⅛ in. × ½ in. bar, and as a safeguard, on final assembly, a spot of PermaBond A118 is used. The bar is secured into position with a couple of No. 6





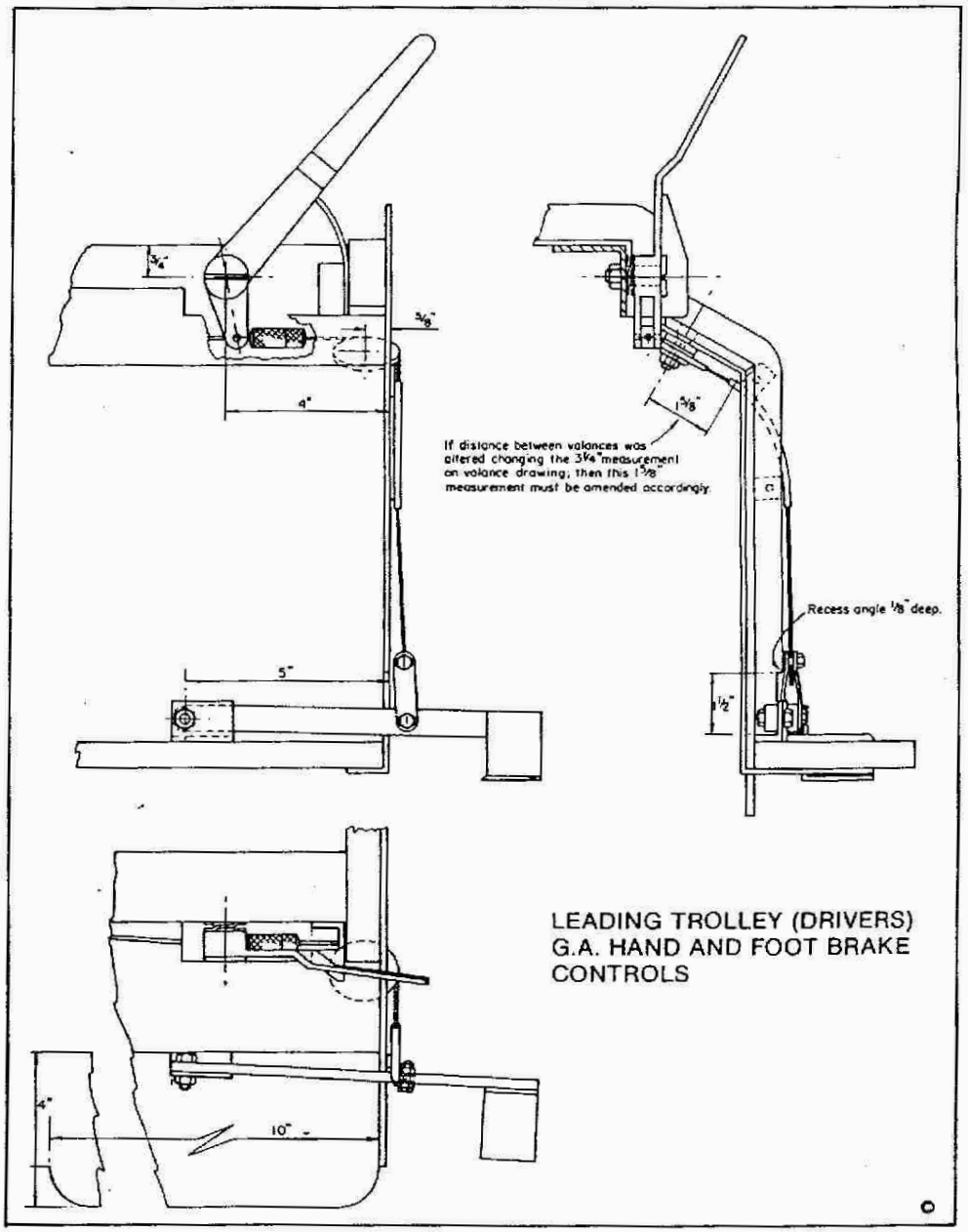


A valance, "inside out", showing the construction, a rubbing block and a foorbrake pedal.

× ½ in. csk. Supa Screws. I find these Supa Screws are best for fixing into ply. ⅛ in. × ¾ in. packing strips are required on the inner end, to compensate for the thickness of the angle, thus maintaining the guards in line with the valance. I have shown rubber, as this was to hand, and does not wear the ply. However, if you have no suitable rubber then a strip of wood should do.

To complete the leg guards, rubbing plates are fitted, as a considerable amount of movement takes place between the two trollies. If the trolley is not a leading type then fit rubbing angles to the front as shown, this is required because of the over-ride action. Sec. B-B gives details of this, once again it being an offcut of bed angle.

The final job which applies to all valances is the fitting of rubbing blocks to the inside. Obviously, if your track does not have a check or anti-tip rail this fixture is pointless. However, as this article is aimed to a great extent at the safety aspect of our hobby, and if you carry the public, I cannot



see how you can avoid considering the installation of one. Ideally, in my opinion, it should be just above the line of the trolley footboards.

If this is the position of your check rail then the position shown for fixing the blocks should be about right. It is important that they are fitted, four per trolley, in line with the bogie pivot point, thus the distance between block and check rail remains constant. Half an inch seems a reasonable distance between the two, no contact normally being made, unless some clownish passenger attempts as it were to "rock the boat". Should this happen the driver is made aware of it by the drag created, and can act as he sees fit.

The Foot Brake

Now for that little added bonus of a foot brake which, once fitted, you will wonder why you never did it before. The "G.A. Hand and Footbrake Controls" drawing shows the general layout. If, as suggested, when making the parts for the equalising lever, you made the extra items suggested, these can now be fitted in position shown. Should you have had to amend the 3¼ in. measurement on the valance drawing to make them wider, then the 1⅝ in. measurement must be amended accordingly. If you have not already done so cut away the ply to clear the brake handle and also to give access to the foot brake connector.

Make up the pedal itself, once again

A close-up of the drivers' end of a braked trolley.

using a bed angle offcut. Foot contact is kept low, as so often we have to lean forward to drive some engines and this was found to be a preferred position, but it can be changed if desired. The pedal pivot bracket has to be made and before fixing the pedal itself requires fitting with a ¼ in. × ⅝ in. dia. BSF pivot bolt and locknutted on outside. The edge of the valance support angle is relieved approximately ⅛ in. for a distance of 1½ in. as shown. With the brake pedal arm resting within this the two fixing holes are marked and drilled through the footboard. The bracket is now fixed with 2 × 2 BA × 1 in. csk. screws.

The cable to pedal linkage is next made and fitted, the lower end being free to move, the upper end to sandwich the cable between the two links.

The brake wire guide tube is made in the straight, and is a scrap piece of car brake pipe, with a couple of fixing tabs silver-soldered on. It can now be bent to guide the cable between the pulley and the pedal linkage. When in the ideal position, mark angle and drill and tap for 4 BA × ⅜ in. r.h. screws.

If you did not do so when making the parking brake handle, make up the mating portion of the foot brake connecter now.

All that remains now is to feed the cycle inner cable through, with the soldered nipple resting in the coupling. Having decided where the cable requires cutting, withdraw and carry out the same operation as was done on the main brake cable. Finally grease and fix. There is no fine adjustment on the foot section but the cable can be clamped in a suitable position to give full travel, and comfortable operation.

To be continued

PASSENGER COMFORT

Concluding Bill Perrett's description of Southampton D.M.E.S. passenger vehicles

Part VII (conclusion), from page 713

Previously in this series attention has concentrated on the structure of the vehicles. This time we turn our attention to the all important matter of passenger comfort, finishing with the final touches and a few ideas on variations to make the use of the trollies more attractive for driver and passenger alike.

Seating the Passengers

The seating calls to task not only woodcraft but someone hopefully, handy with a needle. I am sure that societies, if they have no lady member with the necessary skills, can find a wife or girlfriend to oblige. If not it may well be worth it to have the job done professionally. I refer of course to the seat covering.

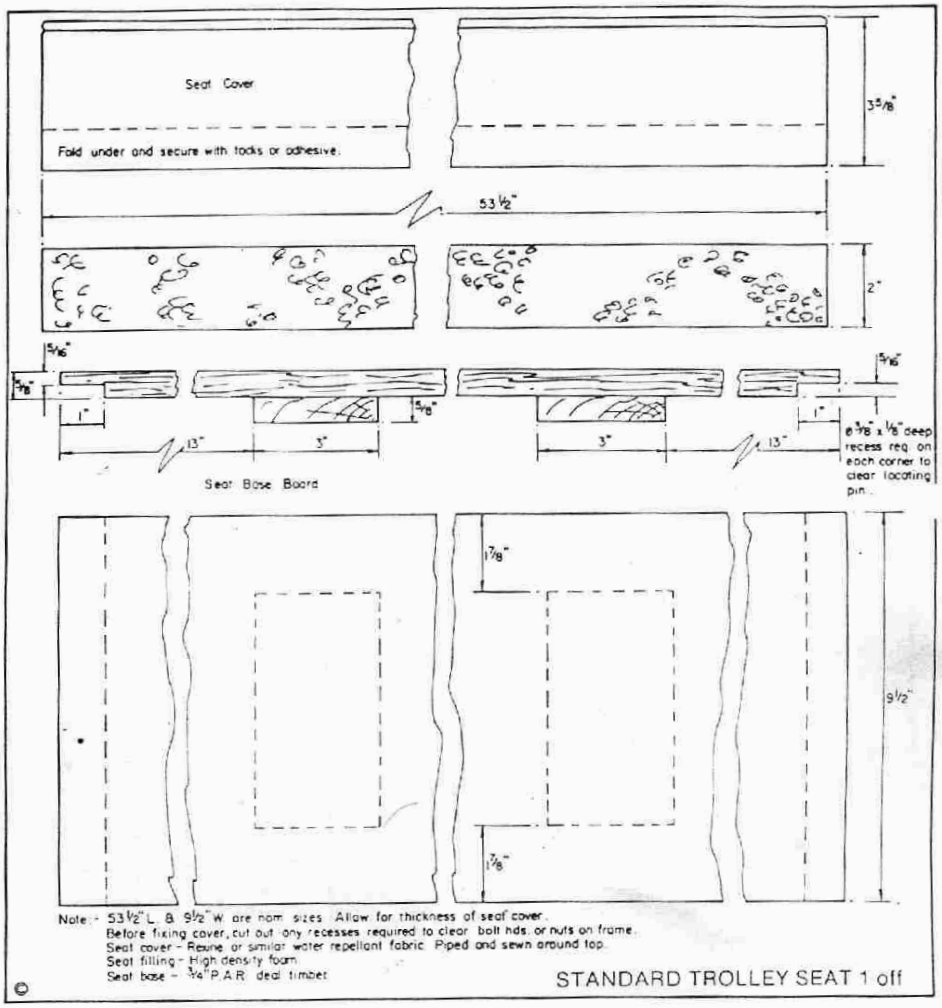
The cover and filling is attached to a wooden base with suitable cutouts to clear bolts etc. Across this base are fixed two ledges which act to strengthen it and also, what is important, to locate the seat in position by fitting between the frame members.

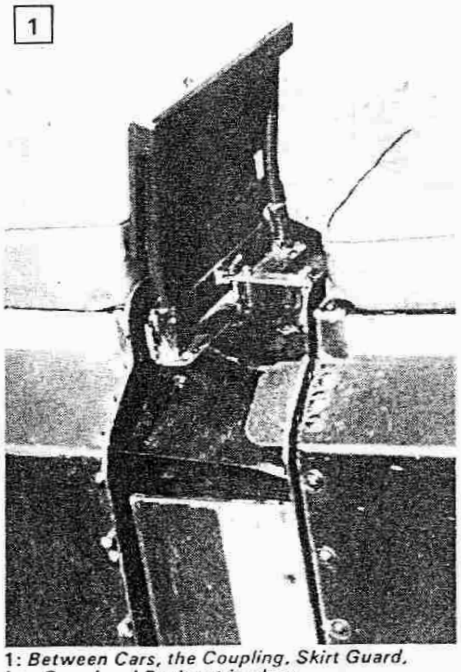
For filling I strongly recommend that nothing but a firm foam be used. I cannot put a name to that used by ourselves, all I know is that it is in the form of multi coloured fragments made into a solid block. The cover should be a neat fit, and secured under the baseboard with tacks or adhesive. I should add that it is wise to round off all corners on the baseboard to avoid chafing of the fabric. The choice of cover is really very open, with different types of coverings on the market. I would suggest it be on a fabric base, waterproof and simple so that dirty marks can be wiped off easily.

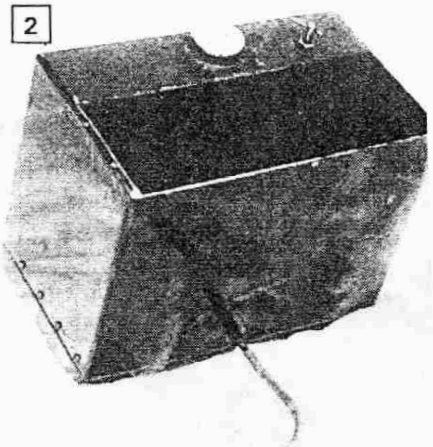
Variations

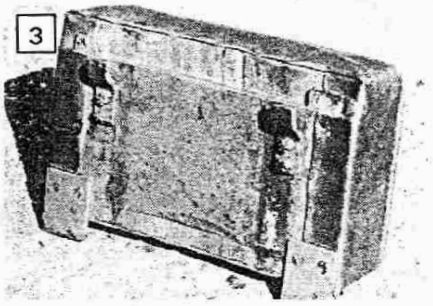
If you are making the leading trolley and use a tank engine, it is possible you would care to make the tank and coal bunker to fit to the trolley. If this is so,then the main seat is shorter, this being detailed on the "Non Standard Base" drawing. Using these measurements, fit filling and cover to base as before.

Should it be thought that at some point in time it may be desirable to use this trolley behind a tender engine, then a small section of replacement seat can be made as on the drawing, to fit in the place of the tank. The two cranked brackets on the underside locate and secure this small section into place. Once again treat as standard seat, regarding filling and cover.









1: ***Between Cars, the Coupling, Skirt Guard, Leg Guard and Backrest in place.***

2: ***The removable driving Tank and Coal Bunker.***

3: ***Replacement Seat for the Driver of Tender Engines.***

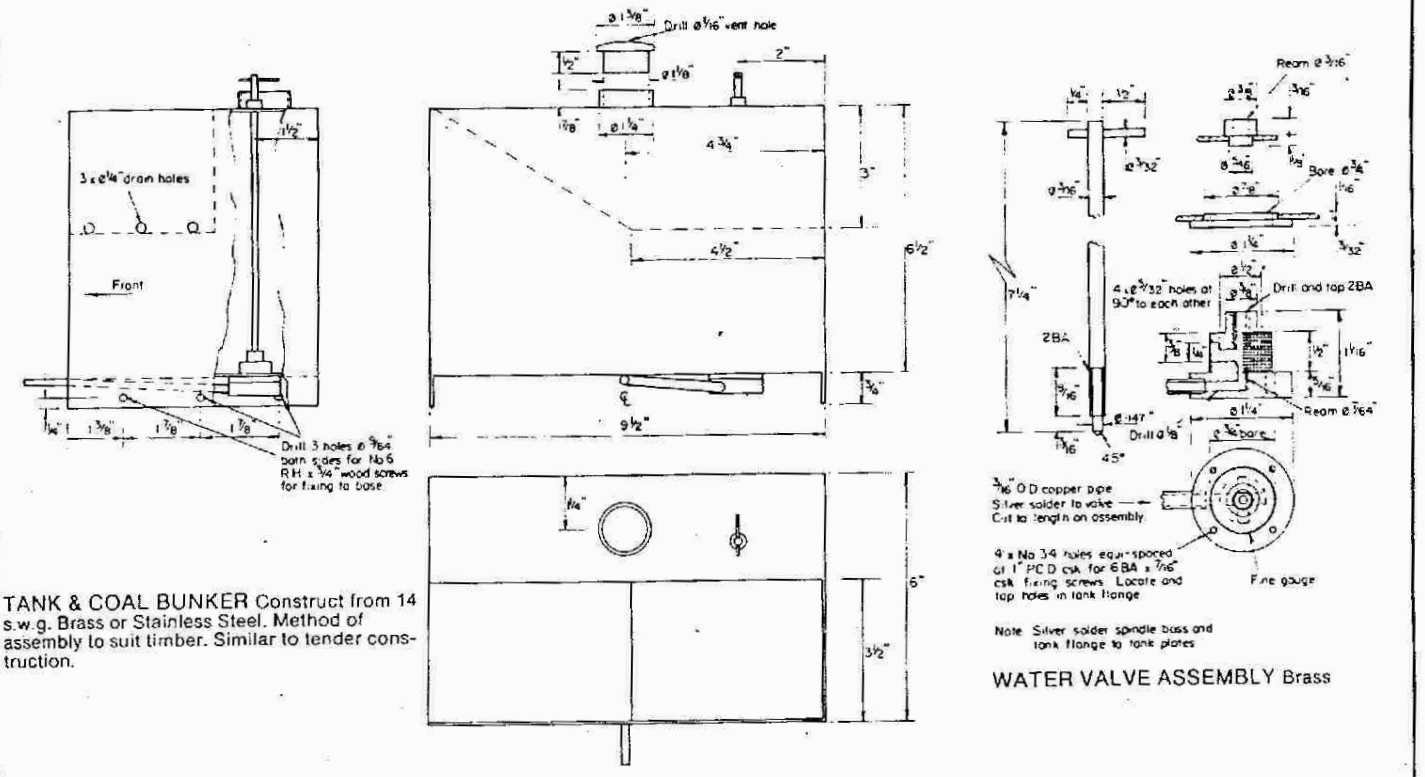
AND SAFETY

Whilst doing all the base boards, it is as well to make up the base for the tank if the intent is to make it. All dimensions are on the "Trolley Tank and Coal Bunker" drawing. The only difference between this base and the previous small one is the small rebate at the sides and the clearance for the valve and pipe, both of which should be done when the tank is tried on the base. It is also a ¼ in. thicker.

Now that the base is made it will be as well to make the tank, etc. Very little comment should be required on the conventional tank construction, as model engineers can usually produce a tender. Stainless steel or brass can be used, stainless being the stronger. Our old friend Perma Bond F241 can come to our asssistance if stainless is used, with the assistance of brass angle, ⅜ in. × ⅜ in. × 1/16 in. and 8BA csk. brass screws, at about 1 in. intervals. The water filler hole and upper valve spindle guide can be made with flanges to assist with fixing if stainless is used.

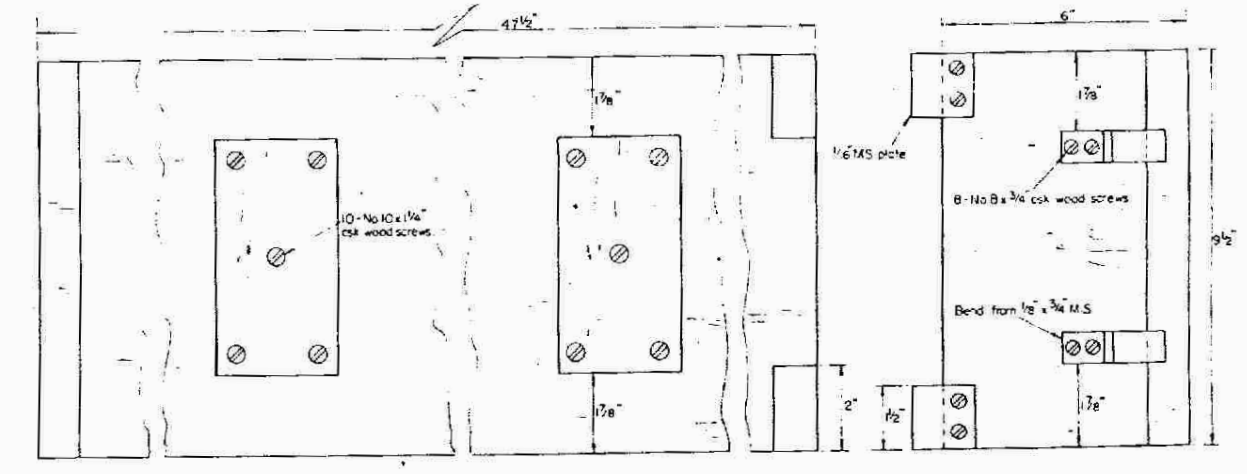
Directly below and concentric with the valve spindle guide, another flanged plate is fitted, with a ¾ in. dia. hole. This is to act as a thicknessing flange for the water valve body.

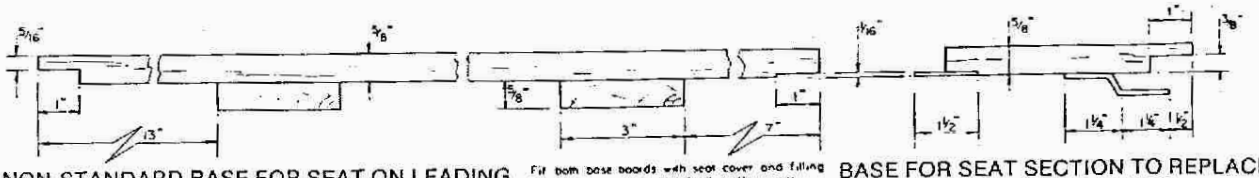
The valve is the usual turning exercise following the dimensions given. A water way is machined around the outside and connected to the centre by four 5/32 in. dia. holes. The 1/16 in. o.d. copper outlet pipe is now silver soldered in position. A stainless steel fine gauze filter is joined with silver



TANK & COAL BUNKER Construct from 14 s.w.g. Brass or Stainless Steel. Method of assembly to suit timber. Similar to tender construction.

WATER VALVE ASSEMBLY Brass

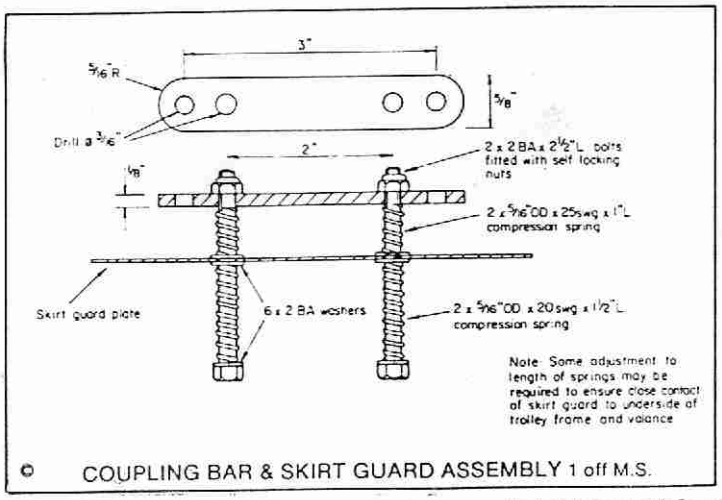




NON-STANDARD BASE FOR SEAT ON LEADING TROLLEY WITH TANK/COAL BUNKER

Fit both base boards with seat cover and fitting in similar manner to standard trolley seats. Base boards of ¾" P.A.R. deal timber.

BASE FOR SEAT SECTION TO REPLACE TANK/COAL BUNKER



© COUPLING BAR & SKIRT GUARD ASSEMBLY 1 off M.S.

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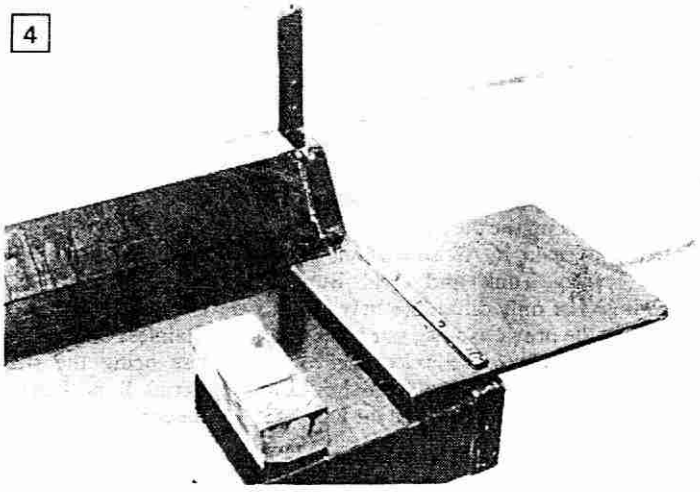

4: *A Valance with Sprung Leg Guard attached.*
5: *A Rigid Coupling with spring loaded Skirt Guard assembled.*
6: *Two axle mounted Discs and Brake Caliper.*
7: *An eight car train carrying thirty nine comfortably seated passengers, driven by the late Bill Perrett.*

solder (stainless steel flux required) to form a sleeve which will slip over the valve body. This is retained in place by the smallest amount possible of Perma Bond F241, too much would block the strainer. The valve spindle is made from stainless steel and needs no comment.

The valve is now fitted to the tank flange, and having orientated the outlet pipe in the right direction, the position of the four fixing holes is spotted through. The flange is now drilled and tapped 6BA. A thin gasket is fitted between the valve and flange and the final fitting made. The outlet pipe is finally bent to shape and cut to the required length. It is now possible to remove the clearances required in the wooden base to house the valve and pipe, the pipe outlet being in the centre. Having made the small rebate either side of the base, it should now be possible, by means of the extended sides, to fit the tank with No. 6 × ¾ in. R.H. woodscrews. All that remains is to fit the valve spindle and make and fit a filler cap.

Remaining Jobs

The only thing left to make for the trolley is the backrest. This is partly another wood job, the actual rest being of 6mm W.B.P. ply topped by a length of 1⅛ in. × ⅞ in. (finished size) P.A.R. timber, suitably rebated to accept the ply. This gives a safe edge to the upper side of the rest. Reference to the "Trolley Accessories" drawing will show this in detail. Waterproof adhesive and one or two panel pins should secure the two parts together.

Scrap ¼ in. dia. black gas pipe is quite suitable for the rest legs. Turn the ends, for a distance of 1¾ in., to an easy fit into the sockets provided at the rear of the trolley. Bend to approximately the angle shown, how exact is not important, but all legs require to have a common angle, bent in a similar position.

A small flat on the contact surface of the legs with the ply is to some advantage. This is an end milling operation. The part on which the flat is required is gripped in the machine vice and level with the upper surface of the jaws. The bent part now angles down through the jaws, this ensures that the subsequent flat is square with the bend. Obviously the cutter used needs to be smaller than the diameter of the workpiece.

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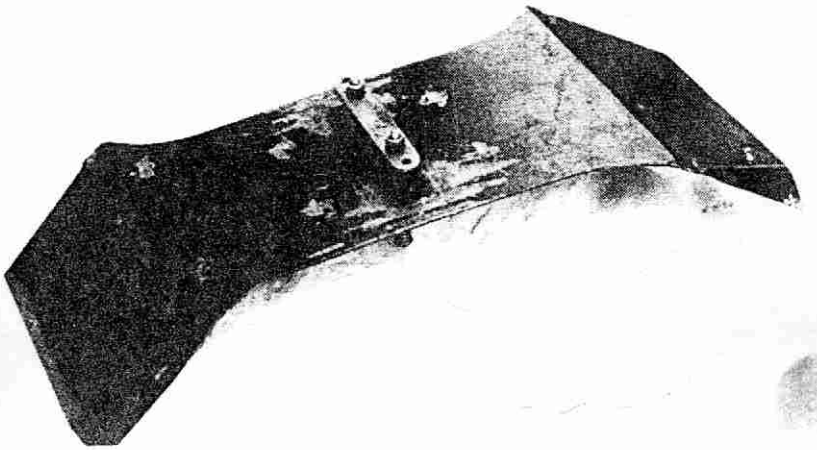
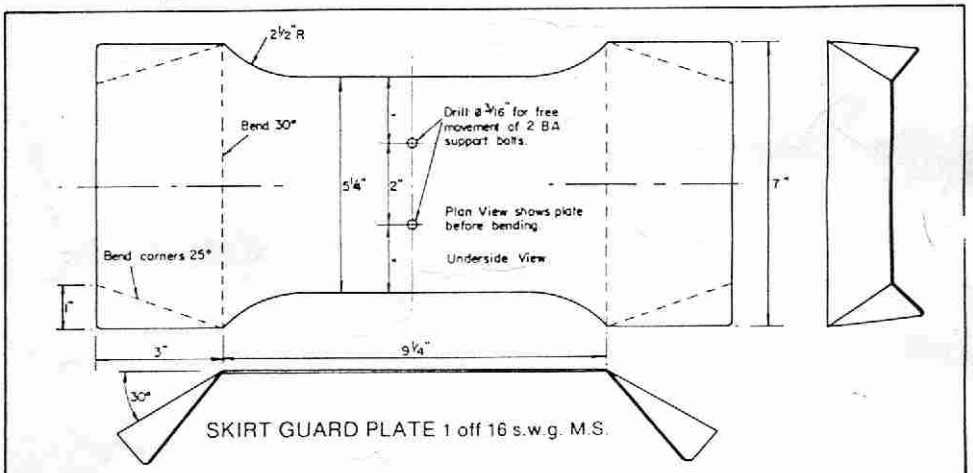
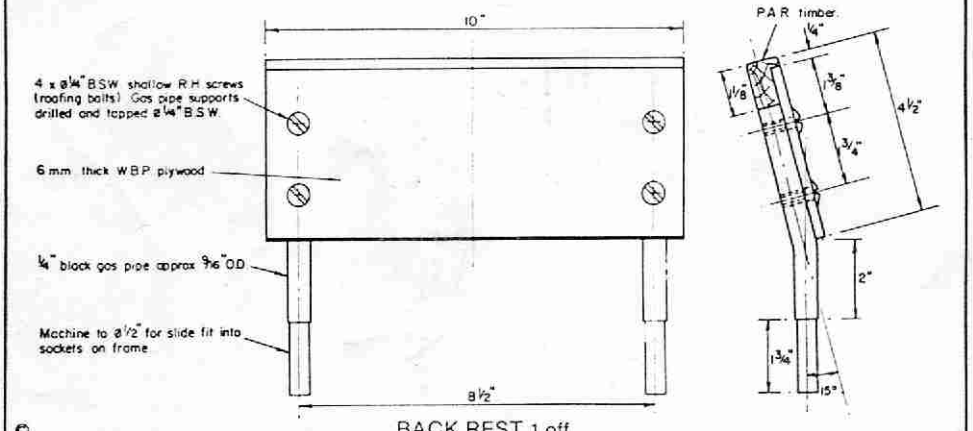




SKIRT GUARD PLATE 1 off 16 s.w.g. M.S.



© BACK REST 1 off