Building an 8 wheeled timber frame Wagon.

by Arthur Hayes

Every now and then, a few things fall into place and you have a chance to build something from your “to do” list.

In the middle of last year, a guy turned up at a model railway meeting with a bundle of small sticks in his hand. He threw them on the table indicating that everyone could help themselves, and they would make a good load for their wagons. The “S” scale modellers made a grab for the larger ones, I was able to latch onto the smaller ones. Yes, I thought what a good load for an “S” wagon. I have wanted to build a few “S” wagons for some time. I had been looking for suitable branch I could use for some time, these will do.

I had also looked around to see what was available in kits that I could use. I had defendant ideals in my mind what I was looking for in an “S” wagon. Sorry, what I could find didn’t cut it for me.

A few months later another guy turned up at the meeting with some QGR Plans under his arm. One of the plans was a drawing for a standard 32’ timber underframe. At long last, the penny dropped, yes I say, this could be so helpful when building wagons.

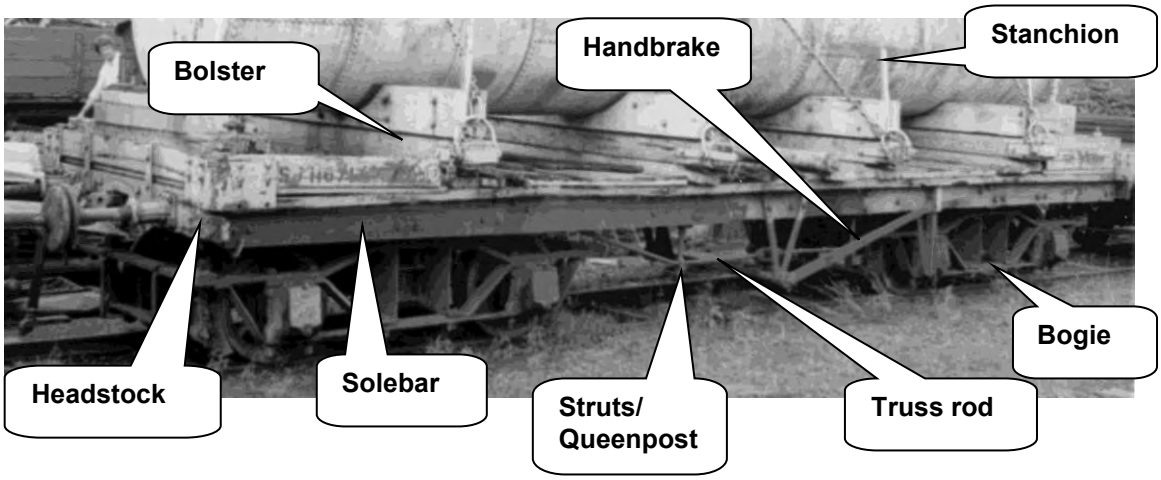
As we build our rollingstock collection, or we add more industry onto the layout there comes a time when you want that special item of rollingstock that is not available.

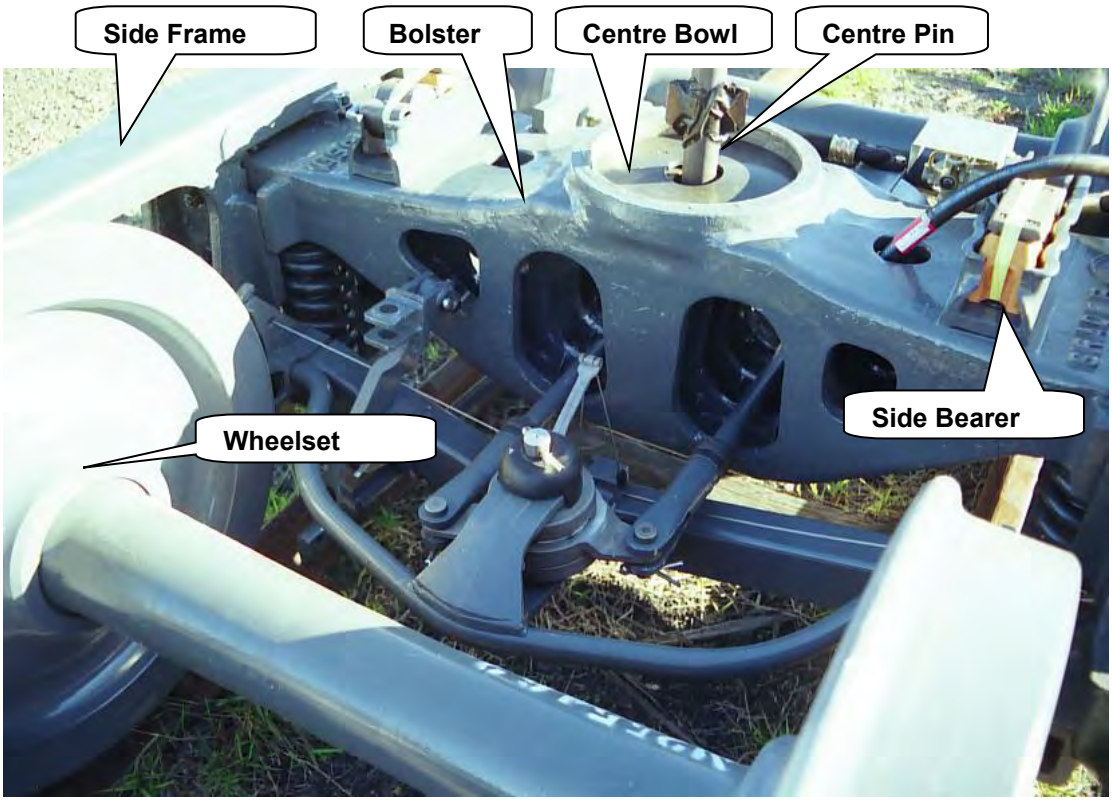
Or, may be you would like something simple to start your scratch building skills. Why not build a timber framed 8 wheeled wagon. Most wagons start off with a frame to which you can add a box, cylinder or a frame to make that special wagon. The end product will be something that you created, and will take a special spot in your collection, or on a train running on the layout. Who knows, it may be worthy as a special display in a glass case.

For the session, I want to go through the process I used to build a timber framed wagon, which could be used for any scale and discuss options available to modellers.

What is a wagon :-

Before I go too far and start talking in another language, I’ll go through the name of the various components that are found on the wagon. This will help you understand what I’m talking about during the session.





Research :-

It's important to have a look around before starting on your model. The last thing you want is someone saying there is something wrong with your model.

"S" wagons could be observed on most lines around the state. Yes, they mainly carried logs and timber and not every line had a saw mill. I recall seeing "S" wagons carrying department loading, bridge girders/timbers, small rails for crossing etc, stop blocks, bond wood huts etc.

The wagons could also be used as "runner" for other wagons with long loads of logs/poles etc.

Hear I was for years thinking, there must be an easy way to build wagons. Seeing the plan I was on the way, working off a small scaled plan can be hard to get an accurate measurement. I just wanted the basic measurements. After all, no one was going to be crawling under the thing to have a look.

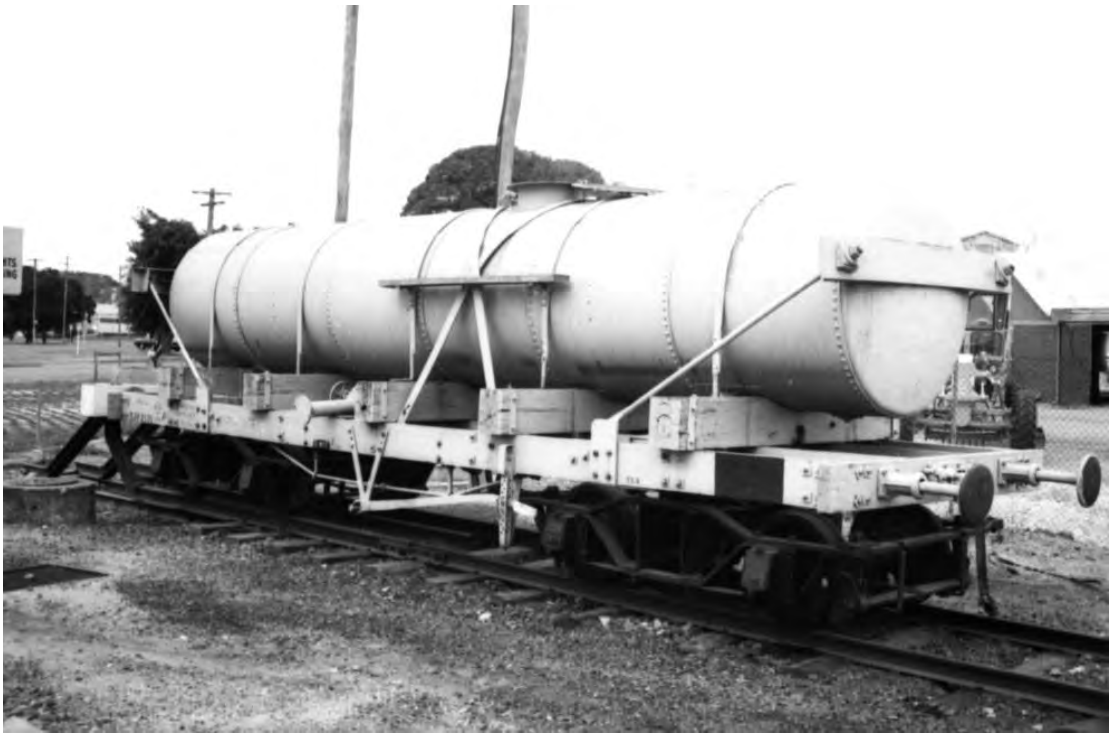
I started checking out various plans and discovered the wagons were not all the same size.

The eight wheeled “S” wagon came in three (3) sizes. Yes, small, medium and large, the “S” wagon has two bigger brothers in the “SJ” and “SR”.

	S	**SJ**	**SR**
Tare	7 t 15 cwt	10 t 10 cwt	10 t 10 cwt
Capacity	12 t 5 cwt	21 t 10 cwt	20t 9 cwt
Length	19 f, 26 f, 30 f, 32 f	26/27 f, 32 f	42 f

The majority of “S” wagons had four (4) stanchions, however there were a number with three (3).

So, you can see, there is quite a variety to choose from. Also, some wagons were fitted with tanks carrying water and molasses, other carried bulk cement in containers.



SJW 2121 Maryborough.

The other thing I noticed in checking the plans was the difference in detail, some components which changed over the years.

I then started looking at some photos and checking out the detail that I felt was required to make the thing look the part. Yes, there were other gear on the wagon frame that gave the wagon its purpose. Stanchions, bolsters, screws and chains. The bigger the scale, the more detail you may want to add.

The QGR drawing showed detail that was not on my photos or other photos I viewed. This suggests a few things could have occurred over time. The components on the plan were on the wagon when built in 1913 and in later years the components were deemed unnecessary and were not replaced after overhaul. Or, the wagons were never built as per the plan. If, you are modelling a period/era, this information could be important.

It is always helpful to locate photos taken in the period you are modelling to verify these thing. As sure as eggs break when dropped, someone will pick up on an error. I have found out the hard way a few times. I've asked the question, wait for an answer, nothing comes forward until after the model is finished.

Sometimes the detail in the photo is taken from different angles and gives a different perspective to detail on the actual wagon.

If you can, try to locate the wagon you are going to build. There are still a number of wooden wagons in museums. I go armed with a camera, measuring tape, pen and paper. A drawing or a second set of photos can also help to record measurements.

When taking photographs, try and take few at different angles. Models are generally viewed from a different angle than the prototype.

Photograph can be helpful in calculating size of components if you are unable to obtain measurements. Most times you will know or will be able to find out a common measurement on the wagon. Other measurement can be scaled from this common known measurement.

Once you have collected all of your data, you may like a scale drawing to assist you along the way.

Materials :-
Most modellers have a preferred material that they like to use. Being a timber wagon, wood could be a good choice. However, I think scale would play a part into which material that would give the necessary strength required.

I model in HO and made my most of models from styrene.

Not being a draftsman and unable to make a good scale drawing, I chose to record the various measurements in a table. This will assist me in having a set of standard measurements for all wagons.

In the table I record both the actual measurement and the nearest strip size with the part number of the material I was going to use.

I have included the table on the next page for a "S" Wagon.

"S" Wagon in HO scale.

Actual	mm	Inches
¼	0.0725	0.00285
½"	0.145	0.0057
1"	.291	0.0114
2"	.583	0.0229
3"	.875	0.0344
4"	1.166	0.0458
5"	1.457	0.0574
6"	1.75	0.0689
7"	2.041	0.0803
8"	2.332	0.0916
9"	2.625	0.1033
10"	2.914	0.1148
11"	3.207	0.1263
12" / 1'	3.5	0.1378
2'	7.0	
3'	10.5	
4'	14.0	
5'	17.5	
6'	21.0	
7'	24.5	
8'	28.0	
9'	31.5	
10'	35.0	

Stanchions .

Width	Deep	Length
1½"	1½" at the top'	2'
	2" at the bottom	
	3" base	
0.0229	0.0344 (3")	7.00 mm

Trust Rod Struts.
7' apart, (32' wagon)
or 3 ½' (12.25mm) from centre line

End Sides

Width	Height	Length
1½"	6"	
.0171	0.0689	
Evergreen 8206 HO 2 x 6.		

Steel corner Brackets 12" & 12", 10" w

Headstock .

Height	Width	Length
9'	3½"	7' 6"
.1033	.040	28mm
Evergreen 135 .100 x .030		

Solebar

Height	Width	Length
9½'	3½"	
.109	.040	
Evergreen 135 .100 x .030		

Solebar 9" in front floor edge.

Floor Boards

Width	Height	Length
5¾"	1½"	
.06595	.0171	
Evergreen 2067 Car Siding "O" Scale 3¼" x .020.		

Pivot Beam

Width	Height	Length
11½"	10½"	
0.132		
Evergreen 167 .080 x .156 Pivot Beam Evergreen 127 .020 x .156 Centre Casting Floor height = 3'2" (11.08) using Canetode Bogies. Using 10 BA screws. Wider beam if using 8 BA screws.		

Coupling Height
Add pad .040 under floor to give coupling centre 9.33mm (2'8") above rail.

Cross Bracing in Frame

Width	Height	Length
2½	8" H/S. 9" F	
.0289	.09 - .103	
Evergreen 134. .030 x .080		

Bolster (On floor to support load)

Width	Height	Length
8"	6"	
0.0916	0.0689	

Bolster 2½" above floor.

I also add notes to the sheet that may be helpful next time around.

Getting Started:-

During my research I discovered that there are two types of frames. The “S” wagon has a floor, but the “SJW” Water Wagon has an open frame. Thus, two different methods of construction would be required.

For the “S” Wagon with a floor, I cut out the floor and added the Solebars, Headstocks, Pivot beams. Before adding the pivot beams, you may need to drill and or tap a hole to mount the bogies. More details on that can be found below.

For the open framed wagon, I build a jig to assist in keeping everything square and straight to show the various timbers in the frame as seen on the wagon above.

Pivot Beam:-

When adding the pivot beam, there are a few things that will need your consideration. How are you going to mount the bogies, please refer to the section on bogies on the next page which could assist you on this matter. How high is the floor above the rail? Check the height of the bolster on your bogie, pack/build up the pivot beam to give the floor the correct height. Check the size of the hole in the bogie bolster on the bogies you are using, each manufacture will have a different size. A wider pivot beam may be necessary due to the size of the screw required to fix the bogie.

Bogies with large wheels can scrub on the floor. Model bogies have a larger flange than the prototype. You have one of two choices, use smaller wheels, or take a little out of the floor.

Bogies:-
On the prototype a centre casting is added to the pivot beam. The bogie has a centre bowl that allows the centre casting to drop into. A centre pin helps to keeps everything together.

Mounted on the bogie bolster and on the floor of the wagon are side bearers, which stop the wagon body from rocking to far to one side.

Most manufacture's just use a plug/screw or similar arrangement to hold the bogie onto the floor of the wagon.

There are various ways to fix bogies and provide a form of suspension to allow your vehicle to run trouble free. Most of the time, I just screw the bogie to the pivot beam and leave a small amount of free slack to allow the bogie to turn and ride out the ups and downs in my track.

If using a threaded screw, I use a small amount of glue to stop the screw from working loose. If using a self tapping screw, be mindful the styrene could bubble up as the screw working into the material. This could result in your vehicle leaning to one side.

Other use a compensating suspension arrangement, this can be done in two ways. Compensation is based on the principle that any object supported on three points will always maintain in contact with the surface on which it is placed. If the weight is carried on more than 3 points, the object will rock if it is placed on an uneven surface. For this reason, a fixed wheelbase bogie or underframe in practice only has 3 of its 4 wheels in contact with the rails at any one time. This allows sideways movement of the tyre in relation to the rail, the flanges being necessary to hold the wheels on the track. Compensation therefore, is particularly important for wheels with very fine flange, though it is also useful with uneven trackwork. It allows all wheels to maintain constant contact with the track thereby providing smoother and more reliable running. One way is to allow the bogies to rock in different directions. One bogie rocks across the wagon, the other bogie rock along the wagon. If you are narrowing bogies and adding a new bolster, one side of the new bolster can be made to rock.

Others use a small spring on the bolster screw to apply tension to the bogie which allows the bogie to move with the track.

Before fitting bogies to the frame, I run them a flat surface (a sheet of glass) to make sure all the wheels are square. Some small adjustment in the side frames may be necessary to get the bogie square and all wheels level.

Coupling:-
Now is not a bad time to think about how you are going to mount the couplings. You may need to add a pad to secure the coupling of choice and make a space in the headstock to accommodate the coupling draft pack. Most scales have standards for the correct height. A few small calculations from rail level and the bottom of the wagon floor will give you the correct height. A dry fitting can help to check everything is in order. To achieve a uniform height on all my rollingstock, I build a coupling gauge on one end of a test track.

Modelling in HO, and using KD couplings can be a problem. The coupling draft box needs to fit between the wheels. Some modifications may be required to allow the bogie turn.

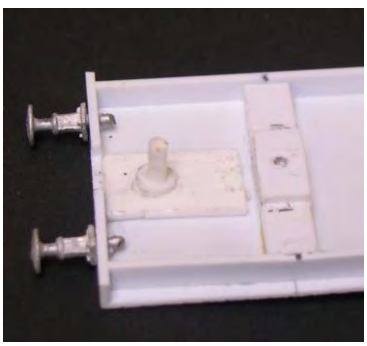
Another consideration is the gap between wagons. QGR wagons came fitted with buffers and we don't like a big gap between our wagons. The radius of your curves, track plan and the location of the bogie on the wagon will play a part in how close you can couple your wagons. Some couplings also have a stop on the coupling shank restricting the swing to one side.

Fit buffers before the coupling to ensure the coupling knuckle will clear the buffer heads.

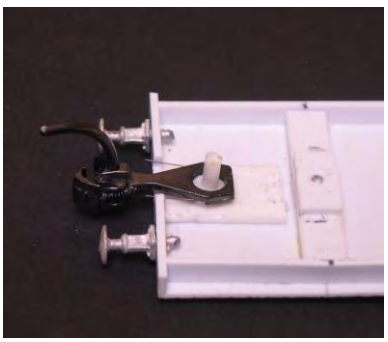
On the prototype, the drawbar is continuous and sprung. In other words, the draw hooks on each end are coupled through the centre of the wagon. I fit my couplings to the floor of the wagon. Where I can, I like to screw the coupling into place. On my "S" wagon, I didn't want a screw sticking up through the floor, so I had to rethink the whole thing.

One choice was to glue the coupling into place, and most likely it would have worked OK. The issue I have with using a standard KD coupling is the size of draft box. To get the coupling head to clear the buffers, the draft box is outside the headstock. On a wagon fitted with autos, that acceptable to a point. On wooden wagons there is no yoke on the headstock. What I was looking for was to get the shaft out further without the draft box sticking out.

With my brain working overtime, I came across the new # 158 HO scale coupling. The coupling was centred by whisker spring wire wrapped around the rear of the shaft. Using styrene rod a new pivot for the coupling shaft was built under the wagon. A bush was made using tube to remove the slack between the shaft swivel centre and the rod. The sides were left open and slide plate (lid) was made from sheet. The sides of the lid were angled to added clearance between the wheels. A hole was drilled in the pivot beam end to allow the rod to poke through. The box was secured together with a small piece of Styrene tube slid down the rod and fixed with solvent. Move the coupling back and forward a few times as the solvent sets to keep the shaft from setting in the soft styrene. Seeing you don't use the draft box, the coupling is available in a bulk pack (# 150), 25 pair for about $ 55.00.



New pivot, rod and tube



Coupling on new pivot

Bottom plate added

Adding weight :-

If the wagon is to run empty, weight could be added under the floor.

Other Detail :-
Various components make the wagon look the part. I feel a wagon is undressed if the underframe gear is missing. Items I added included the struts. I used “am models” CV-12 NSW GR queen posts cut down available from Horizon Hobbies. I have also used small fish hooks cut down to size.

Truss rods were made by bending brass wire to the required angles. A small drawing on the piece of paper helps to get the right angles.

Brake cylinder is a combined piston, cylinder and triple style. I used Kerroby HD 0038 Brake Cylinder 4 wheel wagon, again available from Horizon Hobbies. For other brake equipment refer to Rod Farlow’s article in the 1998 Convention hand book.

Hand brake lever (one side only), a few nut & washers on the sole bar etc could be added to finish the model.

The “S” wagon will have bolsters, stanchions, screws and chains added to the floor to carry its load of logs/timber. Other wagons could have timber chocks left on the floor from a previous load.

Painting :-
Most of us have a choice of paint we like to use for one reason or another.

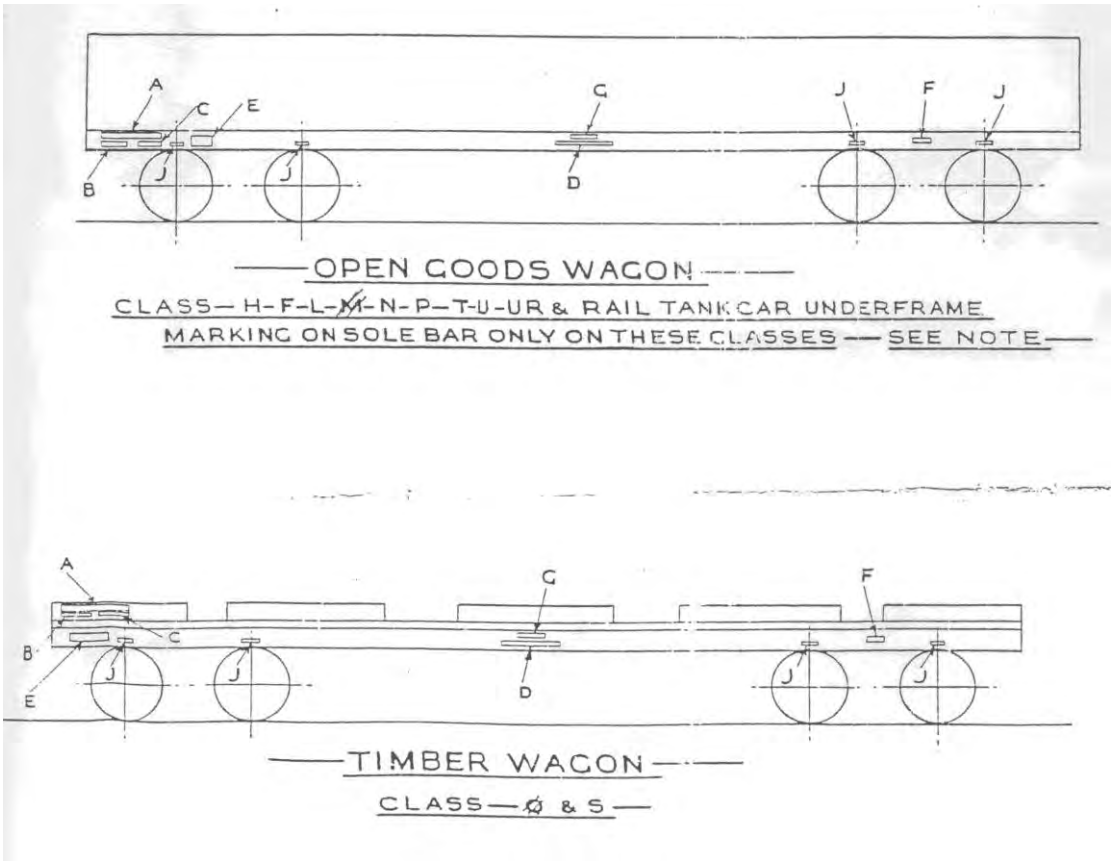
One again, do your research on this one. Looking at wagons in museums can send you up the wrong road. I recall a modeller building an open wagon, he did a great job and then painted it. He used photos taken of a wagon in a museum. I didn’t have the heart to tell him he had got it wrong by painting the inside as the same as the outside. But, a couple of others were not backward in coming forward on his error.

Yes, in the open area of the museum they may have painted the inside to protect the timber. Some platform wagons did have their floor painted which soon wore off in traffic, also floor boards were replaced without being painted. Generally, the insides of a timber wagon didn’t get painted.

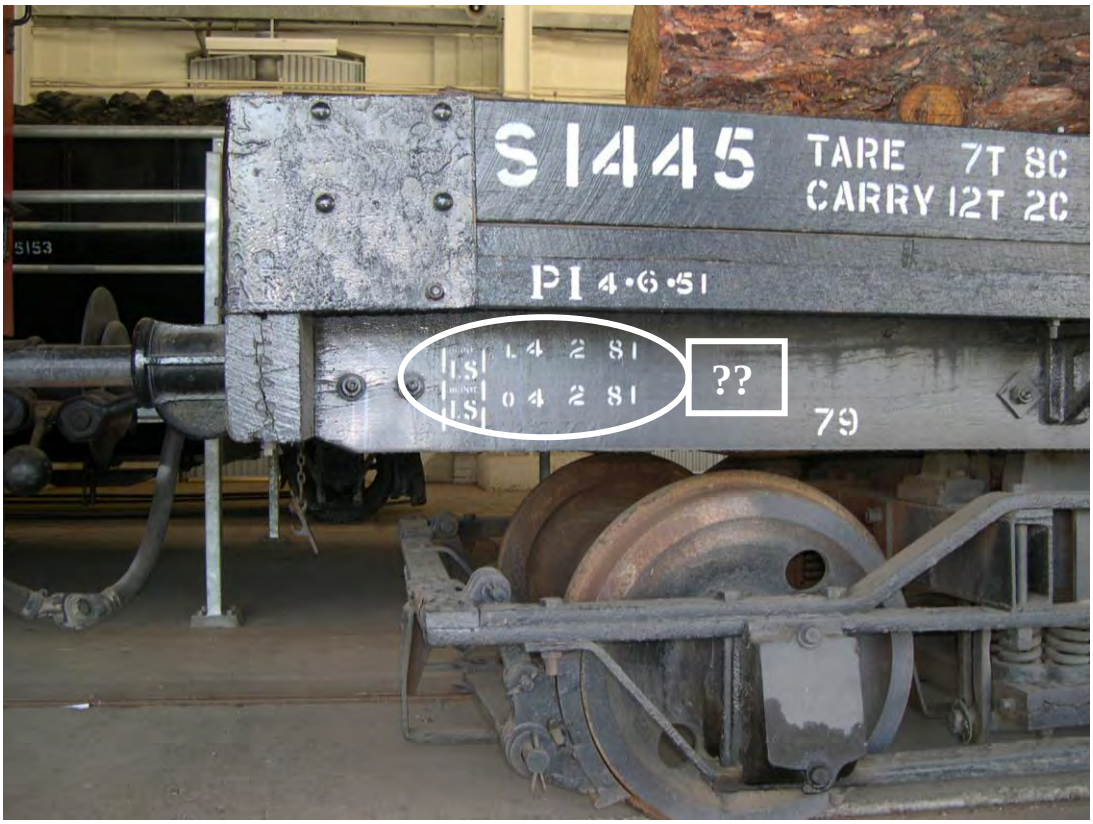
The floor of this wagon showed signs of being painted, however through use most of the paint has gone.

When modelling an era, check the colour of the era from photos taken in the era where possible. Colours did change with time.

Decals :-
The diagrams below shows standard lettering used on QR Wagons.



Position	Lettering	Example	Stencil
A	Number (Both sides diagonally opposite)	P 5957	3”
B	Painting Date & Depot (Both sides diagonally opposite)	PI 17-9-56	1”
C	Tare Carry (Both sides diagonally opposite)	10T 12C 21T 8C	1½”
D	Westinghouse Brake Overhaul date & Depot (Both sides in line with cylinder)	12-5-59	1½”
E	Lifted & Oiled (Both sides diagonally opposite)		1”
F	Size of Journal (Both sides diagonally opposite)	8” X 4”	1½”
G	Dust Collector (Both sides in line with dust collector)	D.C.	1½”
J	Year of withdrawal of axle (Over each journal)	57	1½”
In later years:- Unit length, Drawgear Classification, Line carrying Capacity was added.			



Once again, check to make sure the information is correct. The above wagon was painted in 1951, the axle is good to 79. But the wagon was oiled and lifted in 81, two years after the axle should have been replaced. Not to mention the 30 year paint job in such a good condition.

Loads :-
I feel a load on wagon completes the model. Yes, in various types of traffic, the wagon did return to the major locations empty.

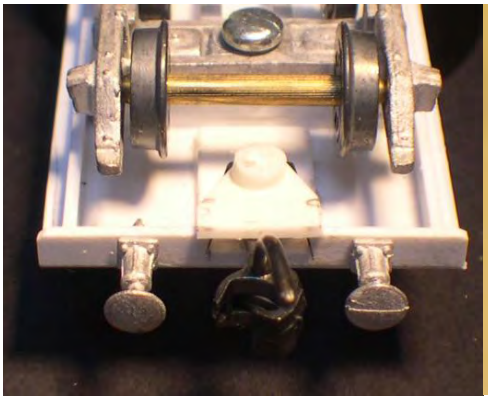
When adding a load to a wagon there is a few things to take into consideration. The carrying capacity of the wagon, what is the weight of the load you are adding to the wagon. With timber wagons on the QGR network a small overload was allowed, 2 ton in case of the “S” wagon was allowed. No overload is permitted with steel wagons.

Where is the load placed on the wagon, is the weight shared by both bodies.

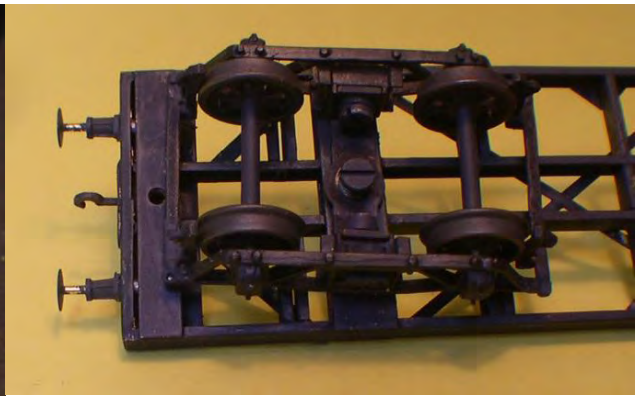
Is the load secured to the wagon, we don’t want it falling off before reaching the destination.

Will the load pass under bridges and pass through stations or other trains without being remodelled, in other words, is the load out of gauge for the network.

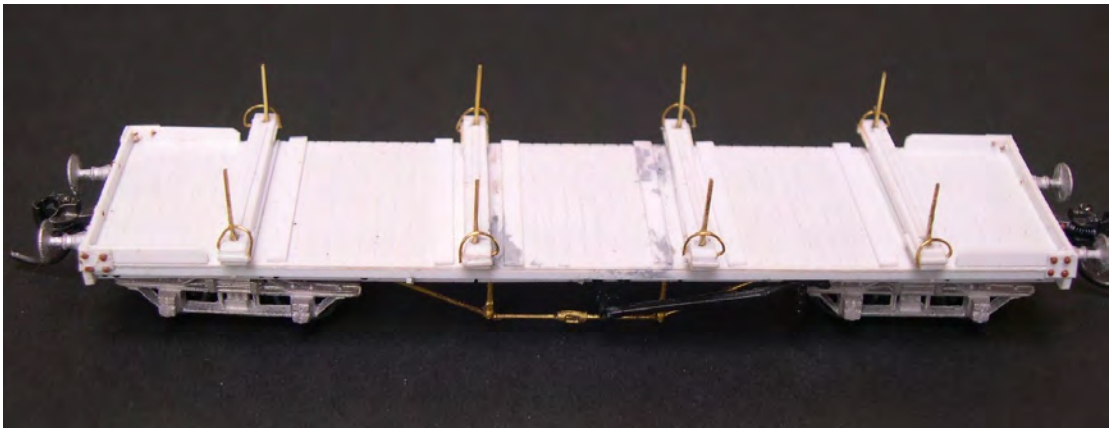
Conclusion:- Trust you enjoyed the session and that you have a lot of fun with the hobby. Please find on the following pages a few photos of the model and a scale drawing of the 32’ standard underframe kindy drawn by Jim Hutchinson.



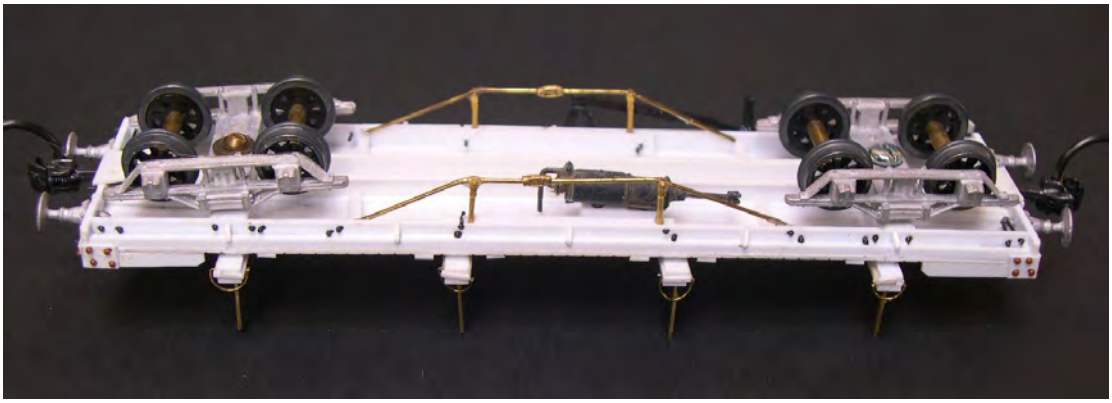
Illustrating whisker coupling



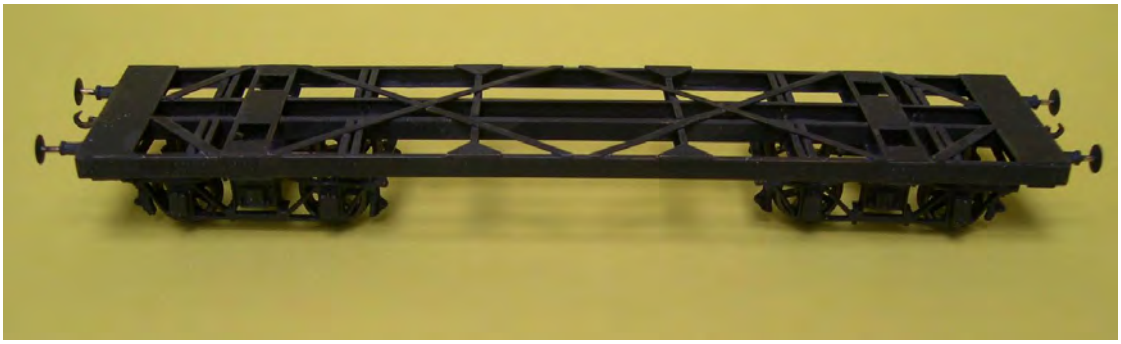
Bogie mounted with spring tension



HO Scale above floor detail.



Underfloor detail



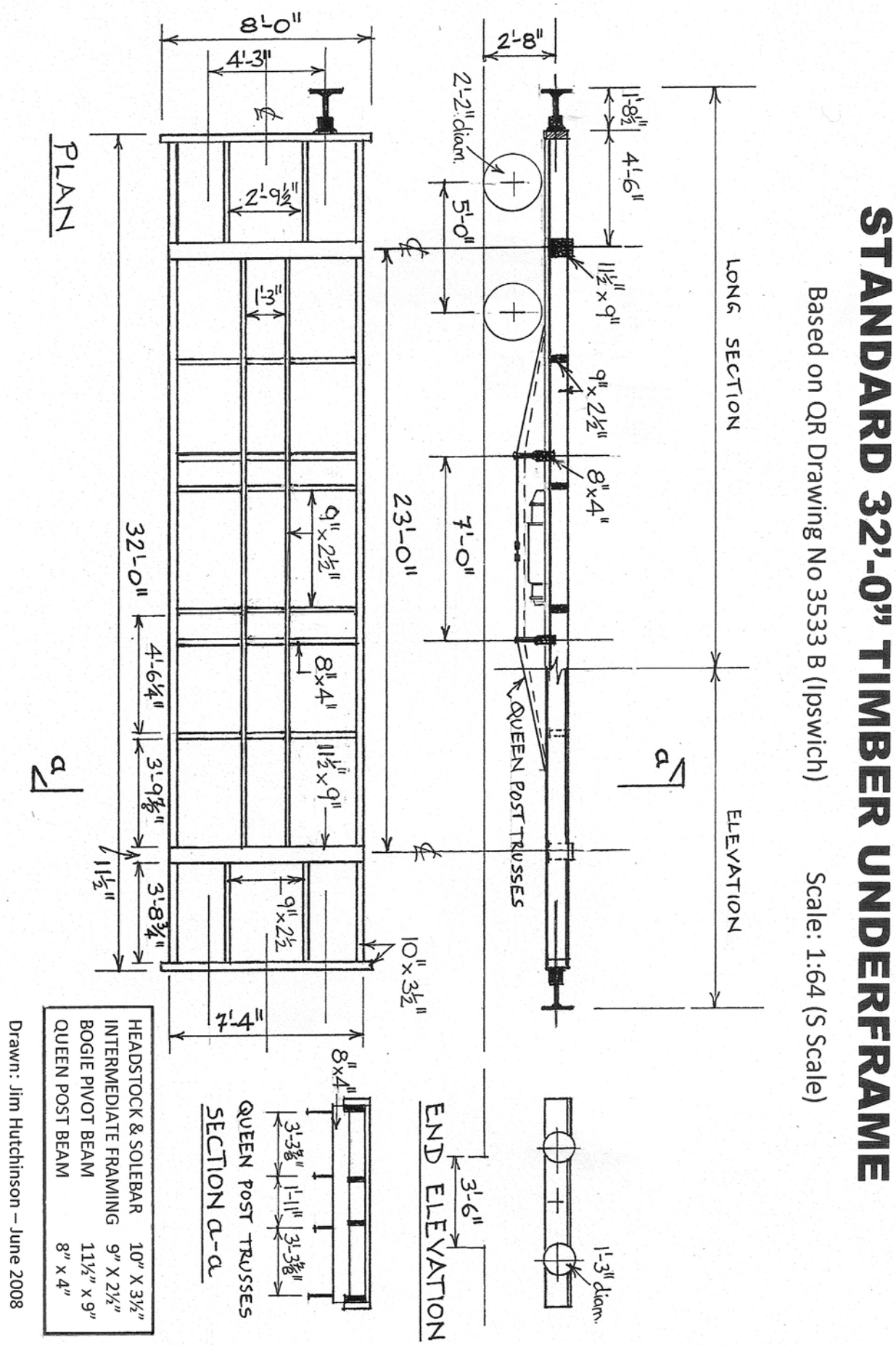
Underframe constructed from Brass (Les Downey)

S Wagon with log load.

SP Wagon with a load of pineapple bins

SML with a couple of Holden Station Wagons.

MS with 5’ Bar frame bogies.


STANDARD 32'-0" TIMBER UNDERFRAME
Based on QR Drawing No 3533 B (Ipswich)
Scale: 1:64 (S Scale)
LONG SECTION
ELEVATION
PLAN
END ELEVATION
QUEEN POST TRUSSES
SECTION a-a
8'-0"
4'-3"
2'-8"
2'-2" diam.
1'-8½"
4'-6"
5'-0"
11½" x 9"
9" x 2½"
8" x 4"
7'-0"
23'-0"
32'-0"
2'-9½"
1'-3"
9" x 2½"
8" x 4"
4'-6¼"
3'-9⅞"
11½" x 9"
11½"
3'-8¾"
9" x 2½"
10" x 3½"
7'-4"
3'-6"
1'-3" diam.
3'-3⅜"
1'-11"
3'-3⅜"
HEADSTOCK & SOLEBAR 10" X 3½"
INTERMEDIATE FRAMING 9" X 2½"
BOGIE PIVOT BEAM 11½" x 9"
QUEEN POST BEAM 8" x 4"
Drawn: Jim Hutchinson – June 2008