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SCRATCHBUILDING MODEL WAGONS

In the first part of this important article CHRIS CROFTS puts the case for scratchbuilding and examines prototype construction of frames and bodywork of traditional opens.

When I built my first wagons I made many mistakes, simply because I did not have the answers to many of the problems that arose in the building. After several years of study and research I like to think I now have most of the answers, and I am happy to pass on the results of my work in the hope that other modellers will not repeat my mistakes.

Here are a few sample questions to ask yourself: What size bolts were used to fix the axle guards to the solebars? (for you will need to simulate the nuts); how do you tell if a wagon has bottom doors? (especially important if you are modelling an empty wagon). what is the position of the two nuts near the end of each headstock? (they are attached to strapbolts and will need to line up with them on your model); where are the middle bearers? (whose position determines the placing of a whole range of parts, on body, frame, and brakes. Come to that, *what* are the middle bearers?). If you can answer all these questions, and can look at a large photograph of a wagon and name and state the size and function of all the visible parts, you don't need this article, and, if you've finished your evening's modelling, you can go for a pint (or better still, come round to my local and get me one!). If you don't know the answers, please read on.

Another question: why scratchbuild? There are two basic answers to this – (a) there isn't a kit of the wagon you want; (b) you can do a better job than the kit manufacturers. To these we could add: 'I scratchbuild because I like it and it gives me greater satisfaction' and 'It takes so long to modify kits to my requirements that I might as well scratchbuild in the first place.' Although it is true that you will find plenty of variety in the available kits, suppose you decide on a location, find the wagons which ran on your line, and then decide to model them? This is where your problems could start. Let me illustrate the point by reference to my own chosen line, the Dore-Chinley line of the LMS (ex MR).

Many of the trains working over this line would be coal trains, with corresponding empty workings. About 80% of the wagons would be private owners, some from South Yorkshire and others from North Derbyshire. Let us consider the wagons of the major Derbyshire owners:

- Staveley – many 10-ton 6-plank wagons, with a wider bottom and top plank.
- Bolsover – mostly 1923 RCH 12-ton wagons (but see later).
- Hardwick – this company had numerous 10-ton wagons with 7 planks but with the second plank down narrower than the rest (a typical Eastwood's wagon).
- Grassmoor – not enough known to build many models, but kits, not suitable.
- Clay Cross – the Clay Cross Co. had quite a lot of 6-plank wagons, with the top plank wider than the rest, and only 15 ft 0 in long. No kit available.
- Stanton – many early Eastwood's wagons, rather similar to Hardwick, including some that had started out with end doors but had had these stopped up. Also some S. J. Claye wagons with odd wagons inherited from Holwell Iron Co.

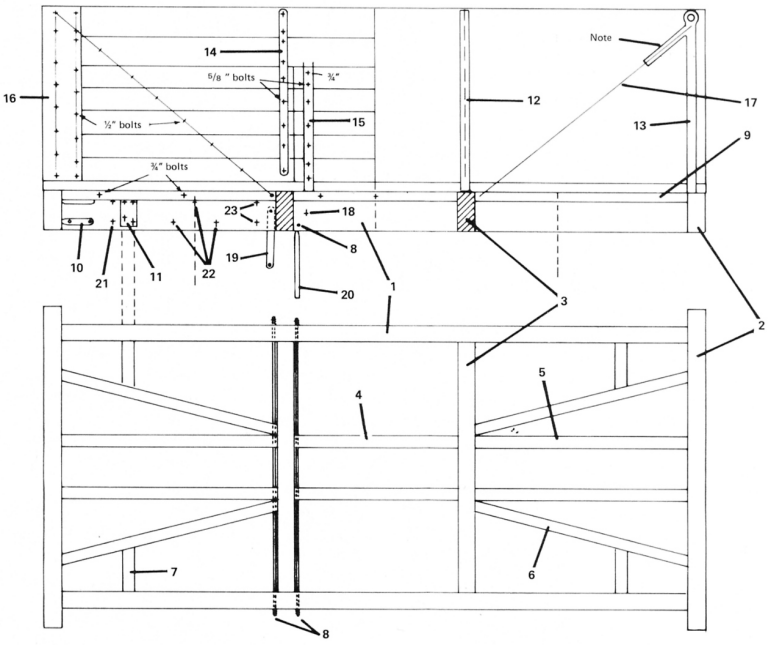
It is impossible to build most of these wagons from kits. But what, you ask, of the 1923 standard Railway Clearing House wagons? Surely you can build these from kits? Well, you can, of course, and, if you are not too fussy, they will give you a reasonable representation of the wagons you want. But a kit may not represent *exactly* the wagon you want, and, by the time you have effected alterations, it might have been quicker to build from scratch. A few of the variations are shown in the panel on the next page.

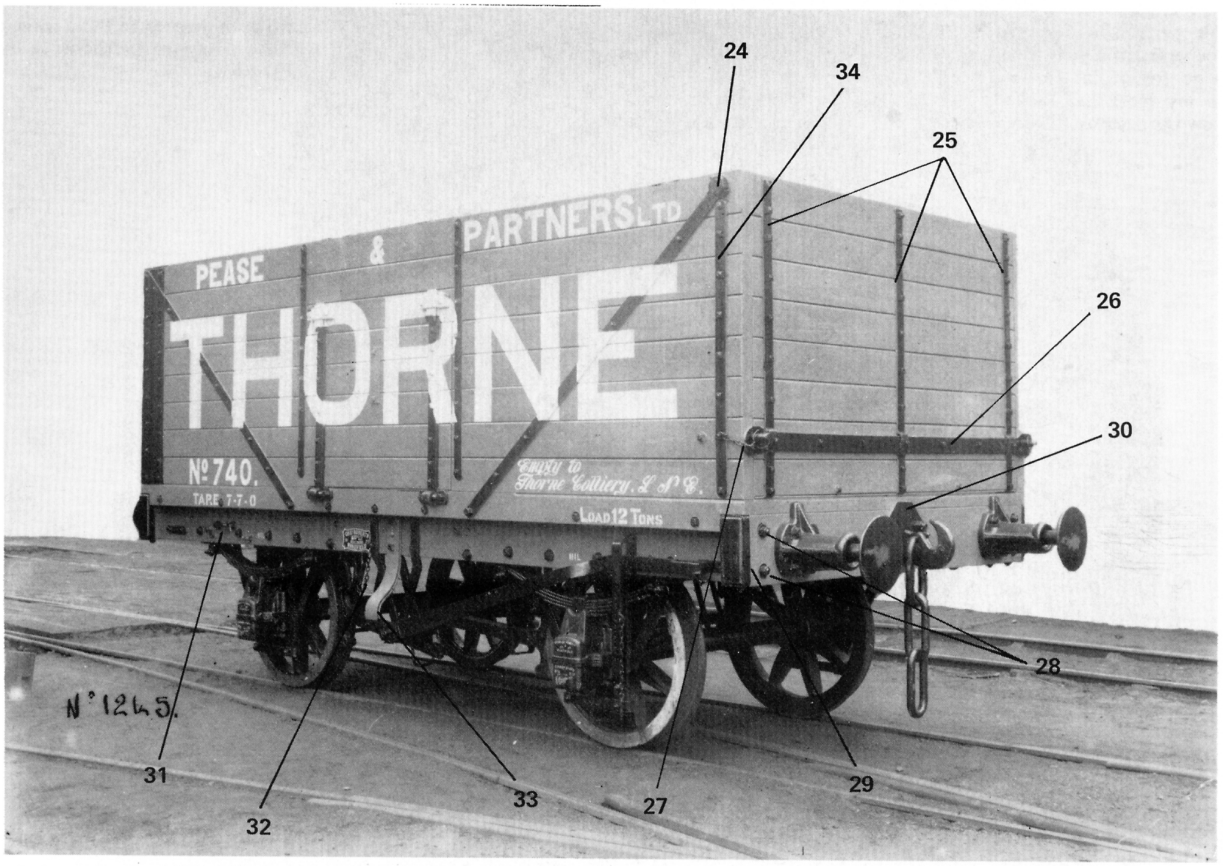
PHOTO: RICHARD WILLE

KEY TO FIGURE 1

1. Solebar
2. Headstock
3. Middle bearer
4. Middle longitude/short middle
5. End longitude/long middle
6. Diagonal
7. Buffer trimmer
8. Cross rods
9. Side rail
10. Strapbolt
11. Washer plate to trimmer knee and axle-guard
12. Side knee
13. End knee
14. Side knee washer plate
15. Side door band
16. Corner plate
17. Centre line of diagonal brace
18. Monkey-tail eyebolt
19. Brake block hanger ┐ suspended from
20. Brake safety loop ┘ middle bearer
21. Washers and nuts on knee bolts (sole-bar and buffer trimmer knee)
22. Washers & nuts, axleguard crown bolts
23. Washers and nuts, axleguard wing bolts

Note
Although the RCH drawing showed this extension to the end knee, there is little evidence of it on photographs or preserved wagons. Possibly not all wagons had it.





This photograph of a 1923 RCH standard wagon shows some additional features not given in the drawing. Built in 1927 by Charles Roberts of Horbury Junction, it is an eight-plank wagon – the extra height necessary to allow the wagons to hold a full 12 tons of Yorkshire coal. Obviously a model of this wagon could not be used on pre-group layouts; the colliery did not open until 1926. By the late 1930s the number would not have had the 'No.' prefix. 24. Nut on end door bar. Note that the eye through which the end door bar passes is part of the diagonal brace; the end knee washer plate stops short. 25. End door band washer plates. 26. End door fastener bar. 27. Cotter and chain to secure end door fastener bar. 28. Strapbolt washers and nuts. 29. Headstock hoop. 30. Drawbar front plate. 31. Horse hook. 32. Bottom door fastener bar (monkey tail) pin and chain. 33. Side door spring. 34. End knee washer plate.

EXAMPLES OF RCH WAGON VARIATIONS

End door bar passes through top plank.	Top plank (and top of end plank) cut away.
Side knee washer plates bent round.	Side knee washer plates *not* bent round.
Hexagonal nuts.	Square nuts.
Wooden end pillars.	Steel T-section end pillars.
Door protector on 3rd-4th plank up.	Door protector straddles 2nd-4th plank up.
Separate washers on headstock for strapbolts.	Single strapbolt washer plate.
Crown and wing washer plates.	Separate washers for axleguard crown and wings.

The list is endless. But what about improving on the efforts of the kit manufacturers? Is this really possible? I can assure readers that it is, for several very good reasons. Firstly, the materials impose limitations. Most manufacturers tend to stick to one material, such as one of the plastics, white metal, or etched metal. As a scratchbuilder, you can choose the most appropriate material for each part of the job. For instance, plastic is very good for some wagon bodies, but is poor for brakes. Etched metal is ideal for brakes, but poor for bodies, because it is impossible to etch plank grooves the correct shape. White metal is best for things like axleboxes and buffer guides, but, like plastic, is poor for brakes. Also, perhaps to save on the use of costly white metal, kit manufacturers tend to make cast wagon sides too thin. This, of course, shows on an open wagon. A further difficulty with white metal is that it shrinks in the mould, and this can cause dimensions to be quite a long way out, so that the character of the wagon is lost. Secondly, one should always remember that manufacturers are modellers, albeit pretty good ones. But like the rest of us they may not know of some of the details required for a first-class model. Where, for instance, can you buy a kit which has washers behind the nuts on the frame? Most manufacturers, in common with most modellers, are probably still calling these nuts 'rivets'. And because the manufacturer thinks of them as rivets he probably shapes them as rivets on his product. A final point is that kit manufacturers must take commercial considerations into account. Because of this, they may have to omit details or compromise even if, as modellers, they know how things should be done. For all those reasons it is often possible for a careful modeller who is in possession of the right information to improve on the efforts of a manufacturer.

THE FULL-SIZE WAGON

We have now reached the stage where we can consider the structure of the prototype. Throughout this section, and indeed through the rest of the article, I am going to use the names that were current among wagon builders and repairers. Sometimes these are different from those used by the modelling fraternity, and where this is the case I shall draw attention to the fact.

I shall start by describing the frame ('chassis' is a car builder's and model-maker's term!). In a real wagon, the frame with the appropriate running gear could run without a body, whilst in our models, most of the frame is merely cosmetic or non-existent, and the body is a stressed member. The frame consists of two solebars, two headstocks (not buffer beams) and two middle bearers. On most wagons these would be of best oak, 12 inches deep and five inches thick. These main frame members were held together by mortice and tenon joints, by rods running across and also along the length of the wagon, and by pieces of angle iron called 'knees' bolted to the main frame members. The through rods (longitudinal) and the cross rods were of 1 1/8 in and 7/8 in iron respectively and were threaded at the ends to take hefty nuts. All nuts were on the outside and usually had washers or washer plates (taking the place of several individual washers) under them. The exceptions were those wagons which had an iron or steel flitch plate running the full length of the solebars on the outside; on these wagons, no washers were necessary. The LNWR and, I believe, the NER used this system. There were no rivets on wooden wagons. Rivets are for holding pieces of metal together and they form a more or less permanent joint. They are quite unsuitable for joining wood to wood or wood to metal, particularly where, as in a wagon, items have to be dismantled fairly frequently. I am emphasising this point because if modellers think of rivets they will model rivets, and rivets *cannot* look right. While I am labouring this point, I may as well add that the 'pimples' on wagons were not bolt heads, either; most wagons had the bolt heads on the inside, so that the nuts would be easier to get at. Wagon repairers got a higher piece-rate if they had to undo nuts on the inside of a wagon. The 1923 RCH specification, incidentally, required all nuts to be outside.

Back to the frame. In addition to the six main members, there were also end longitudes (long middles), middle longitudes (short middles) and diagonals, all 3½ in x 12 in. Unless you wish to emulate Geoff Pember's meticulous work and model the lot, you need not add them, especially as the diagonals and end longitudes get in the way of P4-type running gear (and besides, I like to put a chunk of lead between the middle bearers where the short middles should be). The other frame items are the buffer trimmers. These were not wood but 9 in x 3 1/8 in steel channel with the open end facing the centre of the wagon. The coil springs of the buffers bore against the trimmers. They don't need to be modelled but if you know about them it will help in understanding the items on the outside of the solebar – and these *do* need to be modelled. Trimmers apply to 1923 RCH standard wagons; before 1923, wagon buffers had plate springs which passed through the end longitudes and diagonals – and, of course, no buffer trimmers. Two important parts of the frame that I have not so far mentioned are the side rails. These were bolted to the outside of the solebars and were spaced out from them with packing pieces on wider wagons. Their function was to keep the floorboards in, although some wagons built by the LMS and, I believe, other railways, had no such 'curb rails' (the LMS term). Modellers usually build side rails as part of the body, but wagon builders always regarded them as part of the frame.

THE SOLEBARS

Now is a good time to take a look at the solebars and the various items visible on them.

The two pieces of metal at the end of each solebar are called **strapbolts.** These are exactly what the name implies; the inner end is a strap and the outer end is a bolt going right through the headstock. Sometimes the strapbolt nuts on the headstock had separate washers and sometimes they had a single washer plate. The strapbolts were at 6½ in centres. The bottom one was 2¾ in (centre) from the bottom of the solebar, while the top one was tucked in behind the side rail. Obviously, if the side rail was in contact with the solebar, as on many older wagons, other arrangements would be necessary. Thus, on many Midland wagons of the older type (and on the Slater's kits of them) there is only one central strapbolt. The flat part of a strapbolt was 9 in long and the bolt holes were at 5 in centres.

The next items along the solebar were two ¾ **in bolts** on the same centre lines as the strapbolts. These bolts, 1 ft 4½ in from the end of the solebar, attached the buffer trimmer knee to the solebar. The outer end of the knee took the bolts that held the inner ends of the strapbolts to the solebar.

Then comes a **rectangular washer plate.** The holes nearest the end of the solebar took bolts holding the knee on the inside of the buffer trimmer. The other two holes took bolts holding the axleguard wing. The dimensions of the plate are shown in *Fig. 2.* It was ¼ in thick. Since pre-1923 wagons had no buffer trimmers,

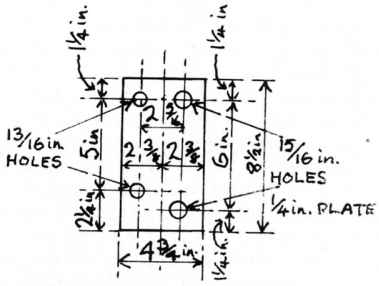
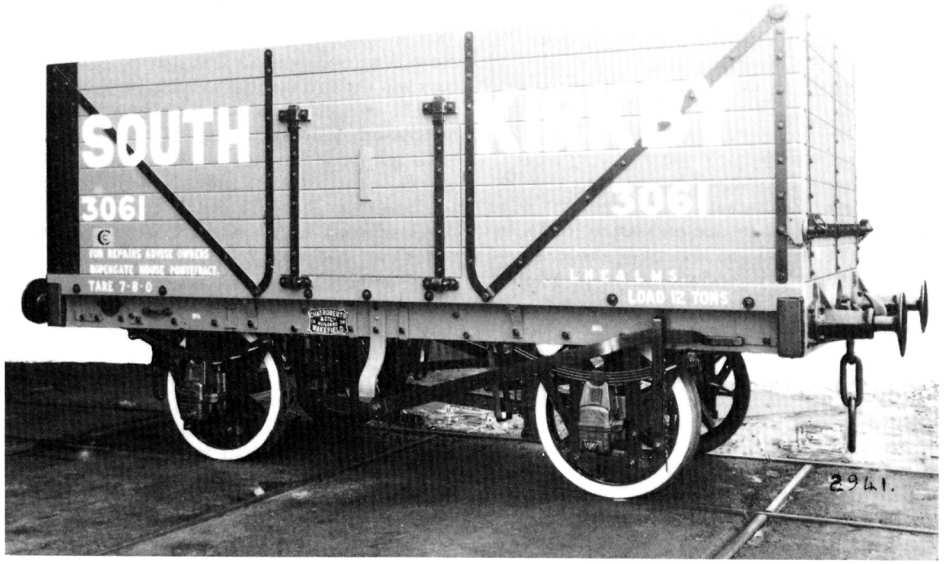


FIG. 2 WASHER PLATE TO TRIMMER KNEE & AXLEGUARD

they obviously did not need this washer plate. Some wagons with frames longer than 16 ft 6 in would also have different arrangements.

The next three bolts along the bottom of the solebar are **axleguard bolts.** In passing, I might mention that axleguard has been used by modellers to mean axlebox plus spring plus axleguard. The part that wagon builders called an axleguard is now generally referred to by modellers as a W-iron – a term not usually used by wagon builders, though I understand it had some limited currency. Corresponding to these three bolts are two near the top of the solebar,



This wagon, from the same builder, looks identical in construction to the Thorne wagon. However, in this case the side knee washer plates are bent round at the bottom, and there are small brackets between the side rail and the solebar, taking the inner, lower washer plate bolts. On the original prints it is possible to see that the brake levers are different, that on the South Kirkley wagon having simply a bent end instead of a loop. It is small differences like these that make the study and modelling of wagons so fascinating. CHAS. ROBERTS

SIDE DOOR SPRINGS

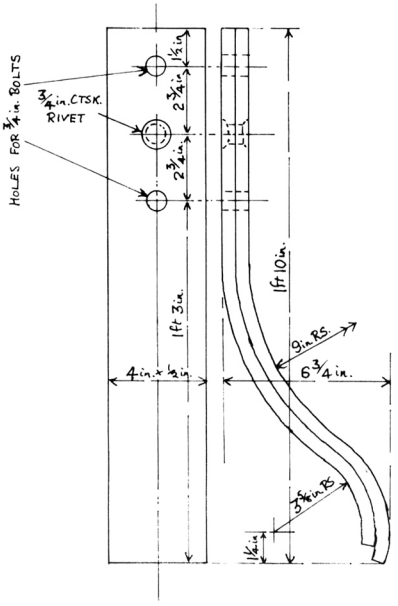


FIG. 3 FOR WOOD UNDERFRAMES (MINERAL)

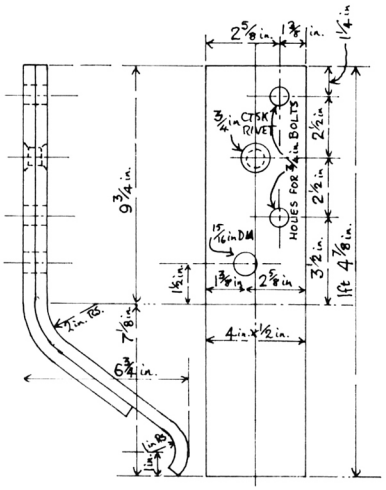


FIG. 4 RIGHTS & LEFTS FOR WOOD UNDERFRAMES (GOODS)

one in the axleguard crown and one in the wing. The **top crown bolt** is obviously 4 ft 6 in from the centre of the solebar, on a 9 ft wheelbase wagon. The bottom crown bolts are 6 7/16 in from the centreline of the top crown bolt, and the **wing bolt** a further 11 9/16 in out. Reference to *Fig. 1* should clarify the point. The axleguard bolts usually had individual washers under their nuts in 1923 wagons. Before 1923, and occasionally after, it was usual to have a semicircular axleguard **crown washer plate** (often just called a crown plate) and two **wing plates.** Dimensions are in *Fig. 1.* (An interesting crown plate variation was found on wagons built by Eastwoods. Their wagons had distinctive angled crown plates instead of the more usual semicircular type).

Proceeding towards the centre of the solebar we come to a large nut with a washer under it – **the cross rod nut.** This is on the end of a cross rod or tie rod, the centre line of which is 1 in inside the middle bearer, and thus 11½ in from the centre line of the solebar. The centre of the cross rod is 2 in from the bottom of the solebar. On many wagons, there is another nut diagonally above the cross rod nut towards the centre of the solebar. This nut holds the **monkey tail eyebolt** and is a sure indication that the wagon has bottom doors. The monkey tail, or bottom door fastener bar, was a bent piece of iron bar that held the bottom door shut. It pivoted in two eyebolts which were just what the name implied – an eye on the inside of the solebar extended to bolts passing through to the outside and held by nuts. The end of the monkey tail formed a handle situated usually, but not invariably, below the left-hand edge of the side door. Pushing the handle caused the fastener bar to lock in the eyebolts, thus releasing the bottom door. The handle was normally held captive by a pin (pushed through a bracket) with a chain – items not often modelled, especially in 2mm scale!

The remaining parts along the solebar are fairly straightforward, being the **V-irons,** which will be dealt with under the section on brakes, and the **door stops.** The latter came in several kinds. The 1923 RCH specification includes one type for mineral wagons and another for merchandise wagons. However, LMS Diagram 1666 wagons (which were merchandise wagons) had the mineral wagon door stop, and some LNER mineral wagons had the merchandise wagon door stop. So, in deciding which type to fit, the modeller should consult photographs wherever possible. The two types of door stops (which the RCH drawing calls door springs) were repeated in longer varieties for use with steel frames. All four types had two plates. Some door springs used on earlier wagons consisted of only one plate, while the NER favoured a three plate door stop.

As it is very difficult to make a convincing door spring without having the proper dimensions, I am including drawings of the types used with wooden solebars (*Figs. 3 and 4*). It will be noted that the merchandise wagon doorstops are handed, and that the boltholes are not central. This is because two stops were used, one at each edge of the door. The two holes vertically in line with each other took bolts which also went through a knee fixing the solebar to the middle bearer. These knees were on goods wagons only. On mineral wagons, the

side knees took vertical bolts through both the solebars and the middle bearers, thus holding the frame together. Some older wagons had wooden door stops, and others had none at all – the doors just dropped on to the brakework, doing it a power of good, no doubt!

This completes the description of the bolts and ironwork along the solebar. The components were repeated in reverse order along the right hand half. I have not yet described the label clip or ticket clip, one type of which is illustrated in *Fig. 5*. I once heard an interesting, though possibly apocryphal, story about ticket

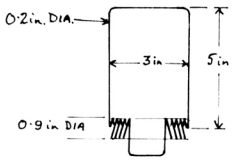


FIG. 5 LABEL CLIP (SKETCH)

clips. An employee at a wagon works invented a new type and made up a sample, which he sent over to a neighbouring factory to be galvanized. The people at the latter factory promptly patented his design! True or not, the fact that they were galvanized indicates that you should paint them thus on models.

THE HEADSTOCKS

Compared with the solebars, the headstocks are very simple. The **strapbolt washers** or washer plates have already been considered. The ends of the solebar were often chamfered at about 45°, and frequently had a **hoop or clip** to prevent the wood splitting – not always successfully. The buffers can be considered separately. The only other feature was the **drawbar end plate**, two varieties of which are given in *Figs. 6 & 7*. It should be noted that the 1923 type was handed, as the through rods ran the length of the wagon. At the door end, the plates were extended upwards to form a lip to keep the door sill in. Before the adoption of this type of plate, many headstocks carried two pieces of plate or angle for the same purpose. Kenline, who manufacture a range of wagon fittings, refer to drawbar front plates as coupling pockets, although I have never heard this term used by wagon builders.

THE MIDDLE BEARERS

The middle bearers were two transverse frame timbers, 12 in deep and 5 in wide. They were usually spaced at 4 ft 6 in centres and their position affects a whole range of other components, both on the body and on the frame. Firstly, the body is attached to the middle bearers by very substantial pieces of iron angle called **side knees**, also at 4 ft 6 in centres. The bolts went through the side knees, then through the side sheeting (planks) and then through the side knee washer plates on the outside of the wagon. So, because the middle bearers are at 4 ft 6 in centres, the side knee washer plates, which are invariably modelled, must also be at 4 ft 6 in centres. Because of the side knees, it was not usually possible to have a door more than 4 ft wide. So if a wider door was needed, side knees of a different type had to be used. These were bolted to the outside of the solebars. They could not then, of course, be in line with the middle bearers, as their bolts would foul the latter.

The diagonal brace took, at its lower end, a **cross rod**. This had to be below the floorboards, and also had to be clear of the middle bearer, either outside it (1923 wagons) or inside (some pre-1923 wagons). The diagonal brace *cannot* terminate vertically below a side knee washer plate – but how often do you see models where it does? The **brake block hangers** are attached to the outside faces of the middle bearers. It is for this reason that it was not possible to move the middle bearers out much (to get a wider door) while retaining a 9 ft wheelbase. I suspect it was for this reason that the Midland Railway went to a 9 ft 6 in wheelbase for Diagram 663A, because for their next open wagon, which became LMS D1666, they put the side knees outside *and* went back to a 9 ft wheelbase. The **brake safety loops** were usually bolted to the inner faces of the middle bearers. If you don't know this, your model can look wrong – as one of my early ones did! You will see, then, that the middle bearers affect many visible (and modelled) parts of a wagon, so it is worth knowing exactly what they are! I find it useful to model the middle bearers, mainly so that the brakework will be right. At the end where the suspension rocks, the middle bearer has to be cut to accommodate it.

THE SIDE RAILS

There is little to say about these. There are nuts along the length of the side rail and their sizes and positions are shown in *Fig. 1*. Some of these nuts are on bolts which just go through the side rail and solebar (with a packing piece between them on wider wagons) while others are on cross rods. In all cases, though, the centre of the nut must be below the bottom of the floor. At their ends, the side rails had a piece cut out to accommodate the headstock. It may sound rather elementary to mention this, but not everyone spots it. On some wagons, there was a half-round piece of wood fixed to the side rail between the door hinges. I have seen this referred to as a 'roller hinge', but this is misleading. Charles Roberts called these pieces of wood **door thresholds**. Their function was to eliminate the gap between the door and the side rail when the door was down. This stopped pieces of coal (and feet!) getting caught in the gap. As you will have to model them, it is worth noting that the part of the door hinge which was bolted to the side rail was rarely on the centre line of the latter. In 1923 wagons it was at the top (where its bolts would foul the floorboards!) while in some earlier wagons it was at the bottom.

THE BODY

In describing the body I refer the reader once more to *Fig. 1*. The left-hand end of the drawing shows the outside, while the right-hand end shows the inside, but with plank and bolt details omitted for clarity. The **body sheeting** was of deal or larch. The planks could be either 2 3/8 in thick (2½ in nominal) or 2 7/8 in (3 in nominal). The railway companies tended to go in for 2½ in sheeting, while many builders of private owner wagons (e.g. Charles Roberts) always used 3 in sheeting unless the customer specified otherwise. This is in direct contradiction to the widely-held view that private owner wagons were a cheap, rough job. The sheeting was, in a wagon with one end door, held to the frame at eight places, two at the fast end and three along each side. At the end, the sheeting was bolted to the two **end pillars** or stanchions, which in turn were bolted to the headstocks. The end stanchions could either be 5 in square section timber, tapered on the outside towards the top, or 5 in x 4 in x ½ in steel T-section. The railway companies, after the grouping, preferred T-section. The pre-group companies and the private wagon builders tended to use wood. Although the RCH drawing specified steel end stanchions (but with wood as an acceptable alternative) I cannot recall seeing a photograph of a wood-framed private owner wagon with steel stanchions. The sheeting was fixed to the end pillars with **5/8 in bolts**, with the nuts on the outside, of course. The bottom two bolts shared a single **washer plate**, through which went also the 1 in bolts holding the end stanchion to the headstock. The remaining bolts in the end pillar had individual washers.

Each side was held to the frame by knees. The two **side knees** were bolted to the middle bearers, while the **end knees** were bolted to the headstocks. Side and end knees also had a bolt going deepwise through the solebar. The side

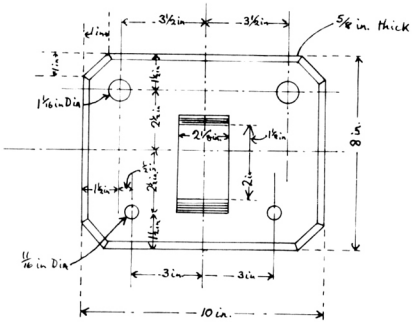


FIG. 6 DRAWBAR PLATE (1907 SPECIFICATION)

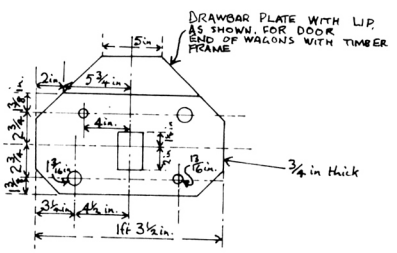
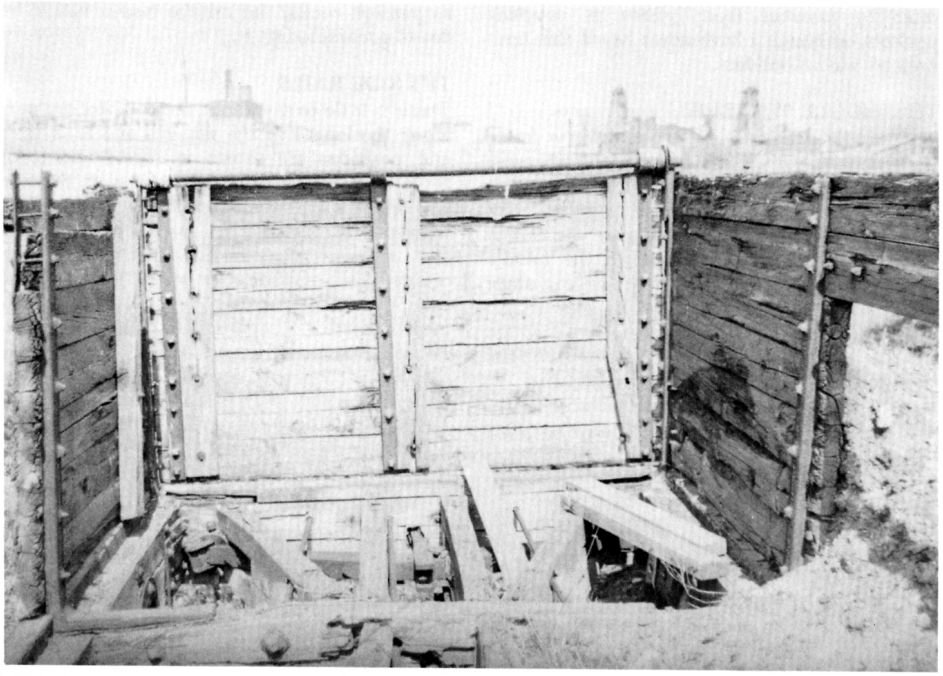


FIG. 7 DRAWBAR FRONT PLATE RIGHT AND LEFT HAND 1923 STD. WAGONS



Side knee, washer plate, bolts, and middle bearer conveniently exposed in a derelict wagon. Note how thick the side knee is, especially at the bottom, compared to the washer plate on the outside. The nuts on this wagon are on the inside. BILL HUDSON

and end knees were massive pieces of iron, as they had to be, since they held the body together and to the frame. Despite the fact that we view our models mostly from the top, in which view the knees are clearly visible, these components seem almost unknown to modellers! In the region where a side knee bends round to be bolted to a middle bearer, it is 3 in wide and no less than 2 in thick. The side knees tapered in both planes so that at the top they were 2¾ in wide and 1¾ in thick. The end knees, at the top, were shaped to form an eye for the end door bar. On 1923 wagons, according to the RCH drawing, the end knees also had a diagonal piece to which the top two planks were bolted. The bolts holding the sheeting to the knees had nuts on the outside and, underneath the nuts, **washer plates** taking the place of individual washers. These washer plates are of 2½ in x ¼ in iron (or, more likely, mild steel). These washer plates are the items which most modellers call 'strapping' and which are thought to hold the planks together. The real job of holding the planks is, of course, done by the knees. A comparison of the dimensions of knees and their washer plates should make this clear. Wagon builders rarely, if ever, used the term 'strapping'. It was always 'ironwork'.

At the corners, the end sheeting was fixed to the side sheeting by **corner plates.** These were of ¼ in steel, 12 in wide on the side and end, and with a 1 in radius on the corner. Each plank was (usually) held to the corner plate by two ½ **in bolts.** These bolts were in two vertical rows. The row nearer the edge was 1½ in from the edge of the plate, while the other row was 6 in further in. The bottom plank had an extra bolt, and the top plank two extras. Inside the corner, there was a single **corner knee** – although many wagons, especially older ones, had two separate knees in each corner – which took the eight bolts in the top side and end planks. The rest of the bolts shared **vertical washer plates** inside the wagon. These were only 1½ in wide. The ones in the extreme corners were shorter than those nearer the centre, because of the arrangement of the nuts in the corner plate. Running from the top of the corner plate to the side rail (and also at the door end) was a **diagonal brace.** I have already stated that this took a cross rod at its lower end, so it cannot end directly below a side knee washer plate. Sometimes the side knee washer plate was extended and bent round to meet the diagonal brace. After 1923, such bending had to be away from the door, but prior to that the side knee washer plates could be bent either way, depending on whether the cross rod was inside or outside the middle bearer. The diagonal braces did not have washer plates, and were made of 2½ in x ⅜ in iron or steel. On some older wagons the diagonal braces were inside. In such cases, the diagonals often came through the top end plank, and were here shaped to take a very **large nut,** usually with an angled packing piece below it. At the bottom, inside diagonal braces were sometimes extended down on to the solebars. In such wagons, the inside width of the wagon must be 6 ft 1½ in or something very close to it. This dimension is obtained as follows:-

Width between solebars	6 ft 1 in
Plus two solebars	10 in
Thickness of two diagonals	0½ in
Total	6 ft 11½ in

It is sometimes useful to know this if you are trying to build a model with only a photograph to guide you.

SIDE DOORS: These are fairly straightforward. The parts of the hinges on the door itself were known as **door bands.** They were 2 ⅝ in wide and had ⅝ in bolts. Needless to say, there were corresponding **washer plates** on the inside. The difficulty for the modeller is that the door bands were *tapered*, from 1 in thick at the bottom to ⅝ in at the top. In the middle of the door was a **door protector** – a piece of iron which stopped the door sheeting being bashed to pieces when the door was dropped. On the 1923 RCH drawing the door protector covers the second and third planks down on the door. Much more commonly it is moved half a plank down, so that it covers all the middle plank, and half of the plank above and below. A few, but by no means all, of the LMS mineral wagons, and also the ABS kit, were made to the drawing. Nearly all private owner wagons had the alternative arrangement, so if you want to build one from the kit you will have to modify it. The side **door catches** call for little comment. Each one has a washer plate behind it.

END DOORS: The main problems with end doors arise from the arrangement of the hinge and the catches. End doors were hung from an **end door bar,** 2 in diameter, which was carried in eyes forged at the top of the end knees – obviously they could not just run in holes in the side sheeting. There were three **end door bands** or hinges, each band being 2½ in x ¾ in. The hinge bands were bent round at the top to form a loop that would hang on the end door bar.

End door variants: On 1923 wagons, the end door bands were inside the door. They were fixed to the sheeting with ⅝ **in bolts,** with 2½ in x ⅜ **outside washer plates.** There were two ways of fixing the end door bar. In the first method, the bar passed through the end knee, then there was a large washer, and the bar was secured by a cotter. The door bar had a spacing sleeve or ferrule between the knee and the outermost door band. With this type of door bar fastening, the top of the end plank was cut away to make room for the fastening arrangements, and the top plank on the end door was also shallower. An end door bar protector was bolted to the top of the end knee washer plate at each side. It was a short piece of metal, and its function was to prevent the door bar coming out if the cotter at the opposite end was lost.

In the alternative arrangement, the side and end sheeting was not cut away. The door bar passed through the side sheeting and was secured by a large nut. Charles Roberts favoured this arrangement, while the LMS and LNER used the other type.

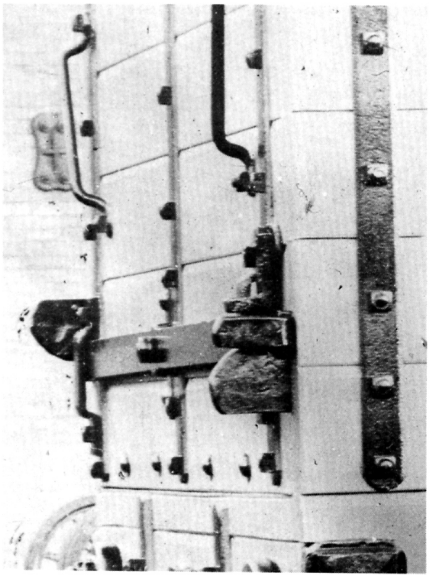
Two further variations were found in some pre-1923 wagons. In one, the end knees were extended upwards and the door bar was above the top of the sheeting. In the other, the door bands were on the outside of the door, so that the door bar was above the sheeting. In this type of wagon, the end knees, as well as being extended above the sheeting, were bent towards the end of the wagon to accommodate the door bar. Any door bar protectors would need to be correspondingly bent.

There were three main variations of end door fastener bars. In 1923 wagons, and some earlier ones, the end door fastener bar was enlarged at each end to form an eye, which fitted over a pin fixed to the side sheeting. The door was secured by a cotter passing through the pin. The cotter was chained to the side of the wagon. A second type of fastener, very popular before 1923, was the swing bar

type. The bar was pivotted at or near its centre, and, when horizontal, engaged catches let into the side sheeting. When the bar was rotated, one end moved upwards out of one catch and the other end moved downwards out of the other. The outer ends of the catches were tapered, rather like those found on some gates, so that when the door closed the fastener bar would slide along the catches and then drop into place. At the end where the fastener bar dropped into its catch, there was another catch to make sure it stayed in. The third type of door fastener is the D-drop catch. In this type, the door fastener bar was fixed. When the door was closed, the D-drop catches had to be slid downwards to engage the fastener bar. The catches were welded and were of steel, 2¾ in x ⅝ in for 3 in sheeting and 2¼ in x ⅝ in for 2½ in sheeting. They are particularly fiddly to model, but fortunately were not too common. In all types of end door fastening, the fastener bar was 3 in x ¾ in. Many end doors had grab handles or commode handles. Their positions and dimensions varied, so again, you must be guided by photographs. Commode handles were required on wagons working to South Wales ports.

The top of all the sheeting – door, sides, and fast end – was protected by a capping iron, given as ⅜ in x 2¼ in on the 1923 RCH drawing, but presumably ½ in wider for 3 in sheeting. The capping iron frequently worked loose, and it is a nice touch to model it as such on a few wagons.

To be continued



End door fastener, swing bar type. The bar pivots anti-clockwise to release the door. A catch at the right-hand end (just visible) prevents accidental release. Note also commode handles and pieces of flat iron bolted to headstock to keep the door sill in.

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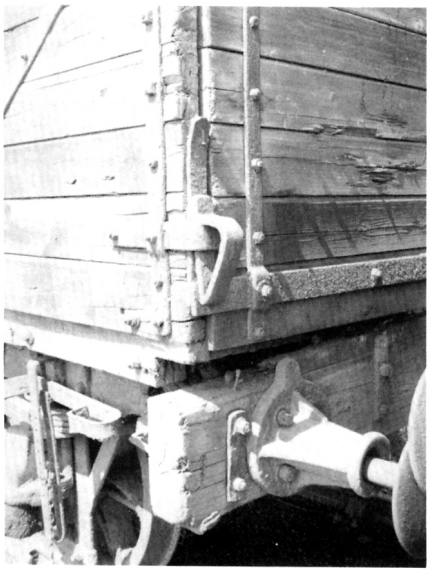

D-dropper end door fastener – very fiddly to model! Note also round-based ribbed buffer, with lip to keep door sill in, single strapbolt washer plate and flat piece of iron bolted to headstock, also to keep door sill in.

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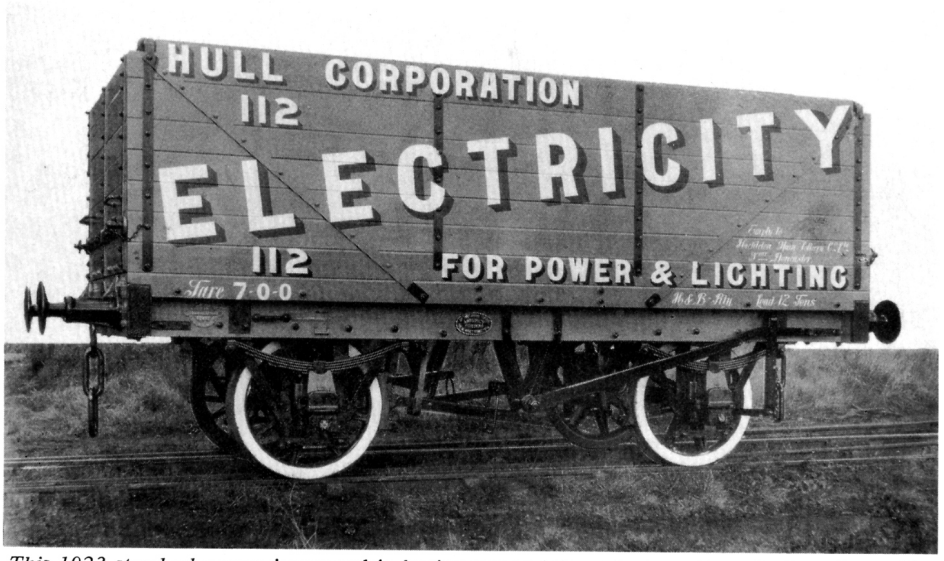

This 1923 standard wagon is unusual in having two end doors, but no side or bottom doors. The door bar is secured by a cotter at both ends, hence the need for a door bar protector (the short piece of iron bolted to the top of the end knee washer plate) at both sides. This arrangement was used on LMS mineral wagons. It is interesting to speculate as to the fate of this wagon under the 1939 pooling arrangement; lacking side doors, it would have been quite useless for deliveries to coal merchants.

AUTHOR'S COLLECTION

There are so many interesting features on this wagon that it is difficult to know where to begin. However, the following features are worthy of note: End door bands outside. End door bar protector. This is the curved piece of metal at the top of the end knee washer plate. Its function is to stop the bar working out if the nut should come off the opposite end. D-dropper and door catches. Commode handles on end door, and foot-treads on round-based ribbed buffers. Nuts to side knees inside. Diagonal braces inside, some nuts inside and others outside! Side door bands tapered and much thicker than side knee washer plates. Wooden side door stop, protector on door has been lost. Double-cranked brake lever. Brake lever guard has pin and chain and toothed rack.

CHAS. ROBERTS