Model Railway Journal - 13 1987

SCRATCHBUILDING MODEL WAGONS

The second part of CHRIS CROFTS' important article examines prototype running gear of traditional opens.

BRAKES

In this section I am going to describe the more usual types of hand brakes used on British wagons over the last hundred years. I hope to draw attention to some of the more interesting variations and help modellers avoid the most common pitfalls. As I have never built a model of a fitted wagon, I feel hardly competent to discuss vacuum brakes, never mind Westinghouse, and I shall keep more or less clear of these. Similarly, the intricacies of the Dean-Churchward brake will be avoided, as will the three-position brake widely used in Scotland (as well as on the Hull and Barnsley Railway).

Up to 1st June 1912 new wagons only had to have a brake on one side. Most owners, railway companies included, were unwilling to spend money on safety measures that were not compulsory, so brakes on one side only were normal up to this date. Shunters had to risk life and limb if the brake happened to be on the far side of a wagon, and accidents were frequent. The Midland Railway made a start to fitting brakes on both sides from about 1906, and from 1st January 1939 all wagons, old and new, had to have a brake lever on both sides. Moreover, it had to be applied at the right-hand end of the wagon as a shunter faced it.

The first type of brake to be considered is the double brake, so named because it had two brake blocks. A certain amount of confusion seems to exist in connection with the wording applied to this brake; 'double brake' means one set of brakes, two brake blocks, on one side of the wagon. 'Double brake both sides' means two unconnected, independently-operated sets of double brakes, one set (with two brake blocks) on each side of the wagon. During the period represented by most of our models this was the commonest brake of all, but it is now virtually extinct. BR 16-ton mineral wagons have, I believe, Morton brakes, while vans and the few surviving open goods wagons are fitted.

The brake consists of two V-irons (*Fig. 8*) bolted to the middle of the solebar on its outer and inner faces. Between them runs a brake shaft bearing a tumbler at its inner end and the brake lever at its outer. Pushing the brake lever down rotates the tumbler in a clockwise direction (seen from the outside of the wagon) and this, acting through the push-rods (*Fig. 9*), applies the blocks to the wheels. The blocks are suspended from a bracket on the outer face of the middle bearer by two brake block hangers per block (*Fig. 10*). Each push-rod consists of two iron or steel plates, 3 ft 0 7/8 in long in the 1923 RCH specification, 2½ in deep and ½ in thick, 2 7/8 in apart. Up to 1923 the two push-rod plates were quite unconnected, except at the ends where they were fixed to the brake block and the tumbler, but after that, wood packing was bolted between the plates to stop them buckling. As our models are viewed mainly from above, I feel that a wagon cannot look right unless both inner and outer plates are fitted. Similarly, I like to see two separate hangers to each brake block.

At the outer end, each push-rod plate has a single hole for the brake block pin. At the inner end, it has six 13/16 in holes, in two rows, to permit adjustment at the tumbler. The push-rods used by the LMS and LNER had an extra hole at the inner end, on the centre line of the plate, to take the inner safety loop (*Fig. 11*). Some of the push-rods used on the Midland Railway were narrower than the type described above, but enlarged at the tumbler end to take the adjusting holes. A few of these can still be seen on preserved wagons, and are rather flimsy-looking.

Safety loops, as their name implies, were fitted to stop pieces dropping on to the track if anything worked loose. Those at the ends of the push-rods were bent and twisted up from 3/8 in x 1½ in steel strip, and bolted to the inner faces of the middle bearers. In the 1923 specification both safety loops at one side were the same length, but in earlier specifications, the loop protecting the upper push-rod was shorter. Again, the Midland did things differently – theirs were just bent and fixed to the bottom of the middle bearers. All my Midland wagons except the last one to be built are wrong in this

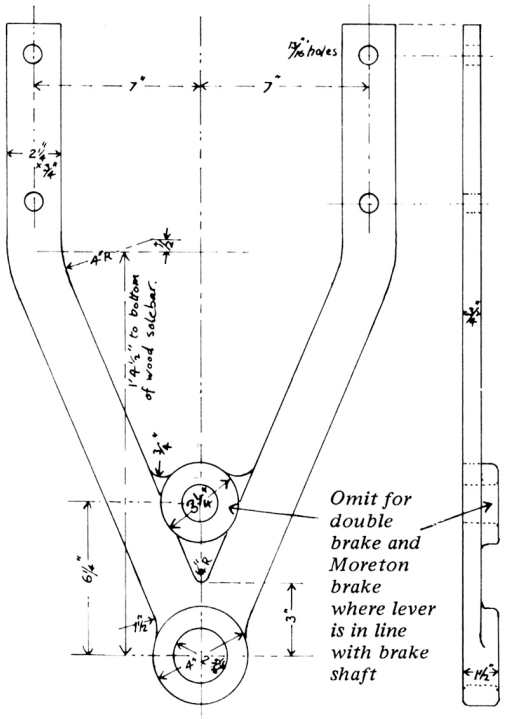

FIG. 8 V-IRON

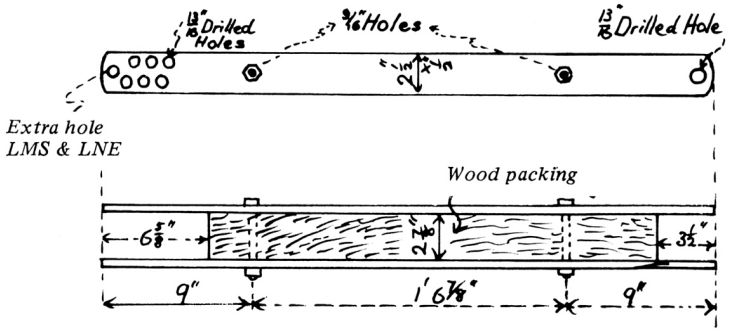

FIG. 9 PUSH ROD (1923)

For earlier wagons omit wood packing and ½ in. bolts

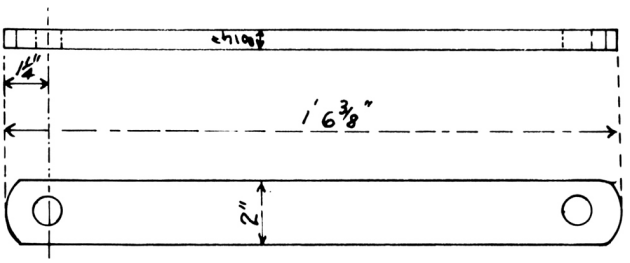

FIG. 10. BLOCK HANGER

respect, but until you read this, I am the only one to know! The inner safety loop was bent up from 5/8 in diameter round bar. It was usually fixed to the inner end of the upper push-rod (with washers and split pins, N-gaugers please note!), but sometimes it was just looped over the brake shaft, which, incidentally, ran in a ferrule 2 7/8 in diameter between the V-irons.

Brake blocks came in three basic types. The first to be considered (*Fig. 12*) was introduced in 1923, and was not handed. In 4mm scale a beautiful representation could, at one time, be obtained from Studiolith, but I believe it is no longer available. The second type, in use up to 1923 on new wagons, is basically similar to the previous type but has only one lug, and is therefore handed (*Fig. 13*). The third is also pre-1923 but has two extended lugs and is not handed. The ABS LNWR block is a reasonable representation. I am including drawings of the first two types in the hope that someone with the necessary skill to make the masters will produce them as there is a real need. Anyone taking up this suggestion should note that the rubbing faces are coned 1 in 20 to match the wheel treads; the old Studiolith blocks had this feature, and it meant that the modeller had to take care to get the right face to the outside.

The 1923 specification brake hand lever is shown in *Fig. 14*. Note that where it fits on to the brake shaft there is a thicker boss. This type of lever was used long before 1923, but some earlier wagons had a lever with a double joggle to clear the right-hand axlebox (see photo of Bolsover wagon). This type of lever was not unknown on wagons built after 1923! Not all levers had the loop for the shunter's hand. Later levers tend to have the end bent outwards,

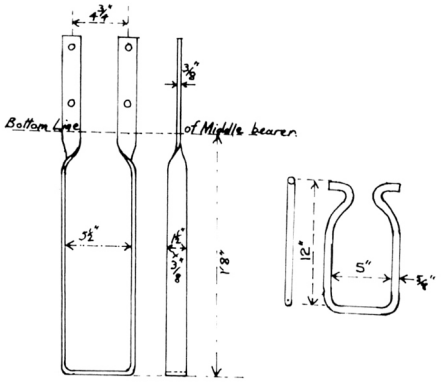

FIG. 11 SAFETY LOOPS (1923)

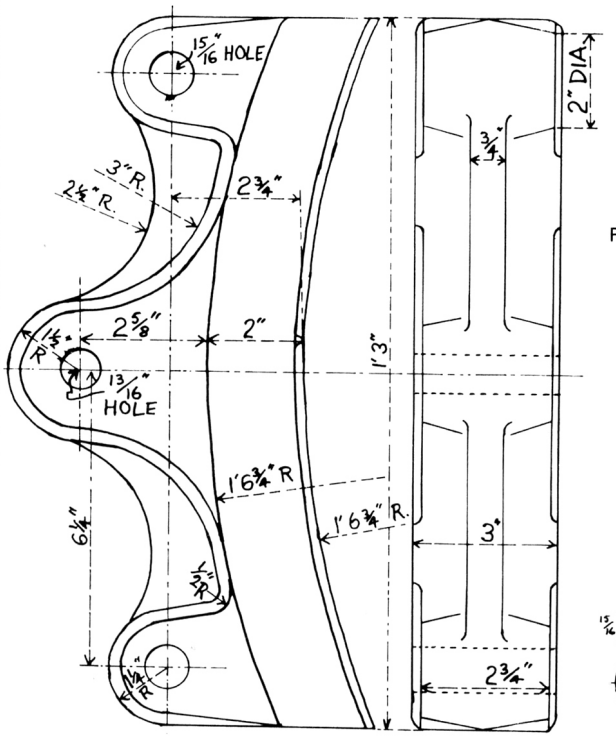

FIG. 12 BRAKE BLOCK (1923)

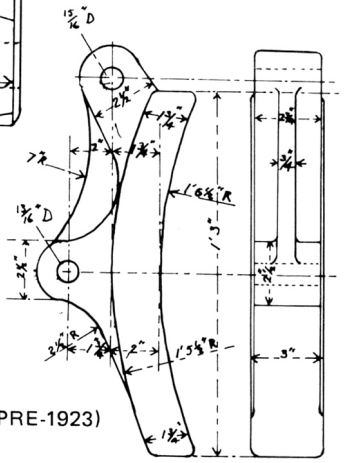

FIG. 13 BRAKE BLOCK (PRE-1923)

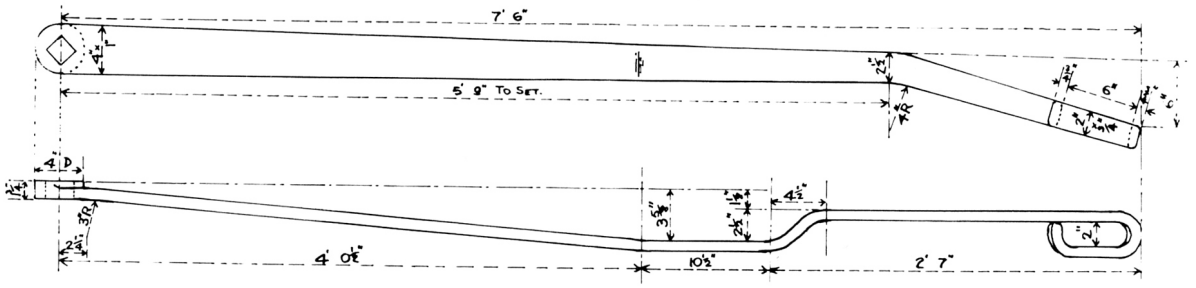

FIG. 14 HAND LEVER

Note: Some levers were slightly different at the handle end.

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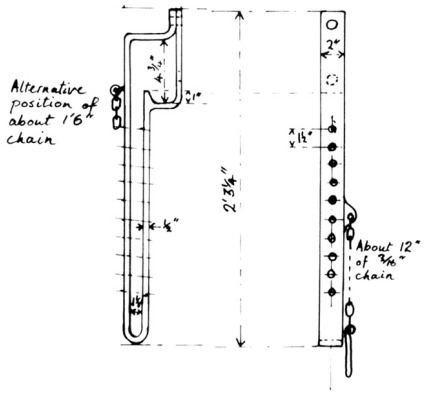

FIG. 15 BRAKE GUARD (PRE-1923)

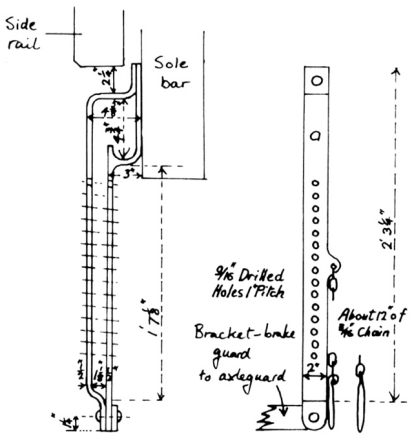

FIG. 16 BRAKE GUARD (1923)

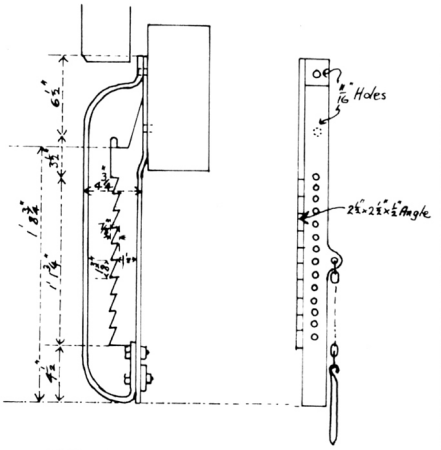

FIG. 17 BRAKE GUARD (S. WALES WAGONS)
GWR wagons had similar but without pin & chain.

then parallel to the solebar, and finally in at right angles. Details such as this, together with variations favoured by different railway companies (e.g. very short levers on the Midland, very long ones on the LNWR), must be established by frequent reference to photographs.

Brake lever guards came in four basic types. The pre-1923 type is shown in *Fig. 15* and is made in two pieces. The 1923 type (*Fig. 16*) is made in three pieces. This type is usually stayed to the adjacent axleguard by a simple bracket. In this type, there are fifteen 9/16 in diameter holes at 1 in centres; these should be in both the front and the back plate. The GWR used a toothed brake rack instead of a pin and chain (as did the GER, but of a quite different type). Private owners' wagons working to Barry, Cardiff, and Penarth Docks had brake guards with pin and chain *and* tooth racks – belt and braces! (*Fig. 17*).

There are a few small points worth mentioning to complete this section. Firstly, the push-rods as seen in plan are *not parallel* to the long axis of the wagon. The inner ends are further from the centre than the outer ends, so that the push-rods form a very shallow V with the point at the V-irons. This angle is quite apparent because we view our models from above. Kits never seem to have this feature. Secondly, from April 1923 onwards, wagon solebars were 2 in further apart. To compensate for this, V-irons were joggled inwards 1 inch immediately below the solebar. Finally, when you assemble brakes, make sure that pushing the brake lever down will apply the blocks to the wheels and not move them further away! It is very easy to make this mistake, especially with the wagon upside-down. I have done this several times and had to dismantle the brakes again, and I should be very surprised to find that I was alone.

The other type of brake to be described is the Morton brake, probably developed in the 1900-1910 period when the need for brake levers on both sides of the wagon was becoming apparent. The Morton brake has only two V-irons bolted to the inside of each solebar. In them, a brake shaft 2¾ in diameter runs across

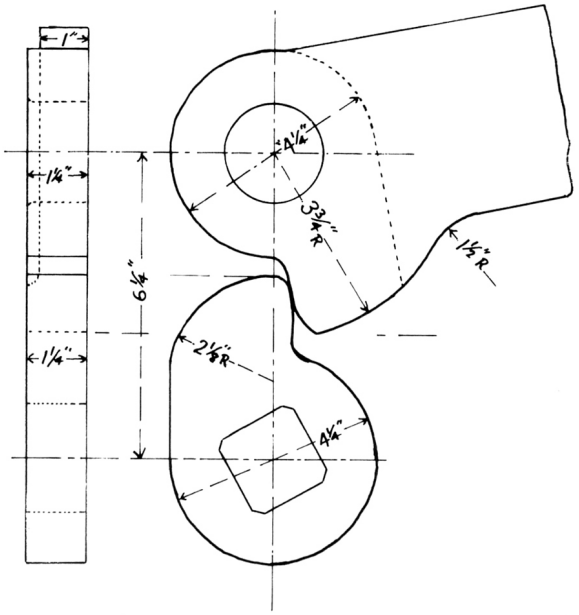

FIG. 18 LEVER END & CLUTCH (MORETON – OTHER SIDE)

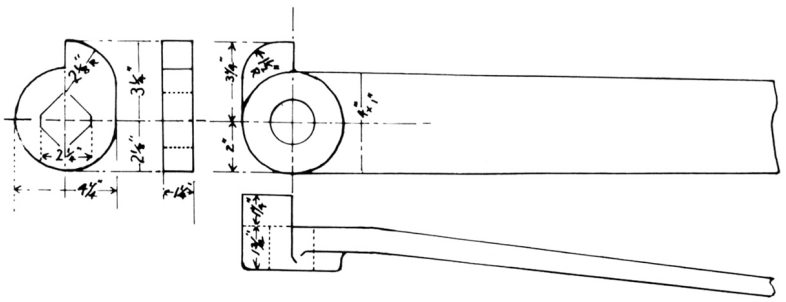

FIG. 19 LEVER END & CLUTCH (MORETON)

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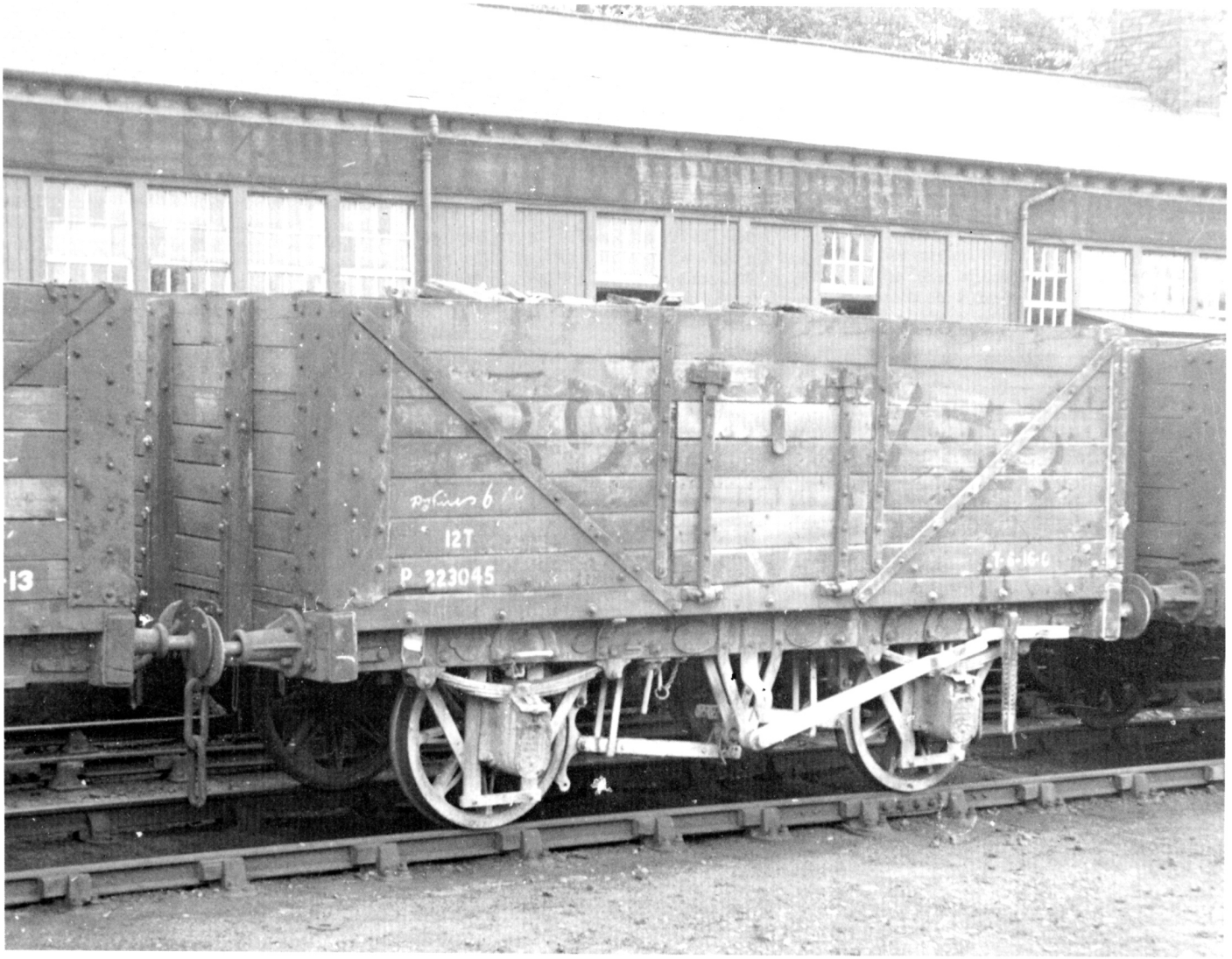
the width of the wagon. The shaft is reduced to 2¼ in diameter where it runs through the V-irons (I am adding this statement because otherwise the previous sentence would appear to contradict the dimensions on the drawing of the V-iron). A tumbler fixed to the brake shaft operates the push-rods (at one side only) and thus applies the blocks to the wheels. Because the shaft runs right across, the tumbler can be in line with the blocks, so the push-rods are parallel to the longitudinal centre-line of the wagon and are not angled. Neither brake lever is fixed to the brake shaft. Each lever operates the shaft by means of a clutch – in effect a one-toothed gear wheel. Because the shaft must always rotate the same way to apply the brakes, the arrangements are different on the two sides. On one side the end of the lever is in line with the cross shaft, on the other it is 6¼ in above it (*Fig. 18*). In the most widely-used arrangement, the push-rods and blocks are on the side where the brake lever is pivoted above the brake shaft. The clutch reverses the rotation of the brake lever, so that, as you face the wagon at the side with the blocks, *the push-rods are the opposite way round* from the arrangement with the double brake – i.e. the left-hand push-rod is at the top. This brake was used by the LNER on open and covered goods wagons, by the LMS on covered goods wagons from 1923 and open goods from 1934, and by the GWR once they had got the Dean-Churchward brake out of their system. I think the Southern used it too, but I am not certain about this.

It has often been stated that the Morton brake could not be used with mineral wagons because the cross shaft would foul the bottom doors. As I have two photographs of bottom-door wagons with Morton brakes, and RCH drawing No. 1002 shows this brake on a bottom-door wagon, I thought I had better check. It turns out there is just enough clearance – another myth exploded! Even so, Morton brakes on mineral wagons were uncommon. The North-Eastern Railway used the Morton, but put the blocks at the side where the brake lever was in line with the cross-shaft, so on these wagons the push rods are the same way round as on a double-brake wagon. They used an odd type of safety loop, too. The Great Northern and the Great Eastern used a variation where the two brake blocks were on opposite sides of the wagon, and at opposite ends. The Midland used a Morton-type brake on some wagons but both the handles faced the same end, so that one was left-handed – an arrangement which became illegal in 1939. Some wagons with Morton brakes were modified to vacuum brakes by British Railways, which involved fitting a second pair of blocks and push-rods, and connecting a vacuum cylinder to the cross-shaft. A tie was fitted between the bottom of the axleguards to resist the effect



This wagon, which at first sight may appear to be a 1923 RCH Standard wagon, was in fact built to the 1907 specification probably early in 1923. It was built and owned by W. H. Davis and probably numbered in the series 4390-4689. The records relating original fleet numbers to British Railways P-series numbers were destroyed. This wagon remained in W. H. Davis' ownership and would have been on simple hire to the Bolsover Colliery Company. Features that distinguish this wagon from a 1923 Standard include: round-based ribbed buffers, cast iron spring shoes, Attock's grease axle-boxes, diagonal braces ending by door hinges, brake V-irons not joggled, brake safety loops of different lengths, second plank down 8 in instead of 9 in. The nearer brake pushrod has been given a wood packing to the 1923 specification. The brake blocks are dissimilar, but neither is to the 1923 pattern. These small differences were often overlooked by earlier observers, which is why sketches may be unreliable for modelling purposes unless backed by other information.

HARRY TOWNLEY

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FIG. 21 GREASE AXLEBOX – UNITED BOTTOM

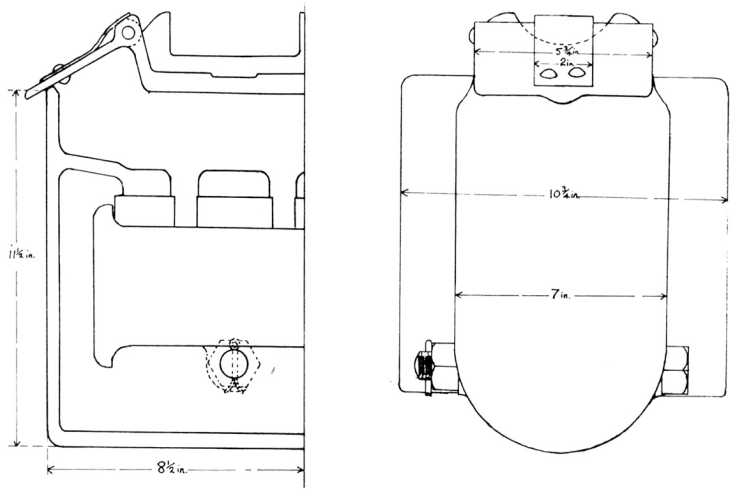


FIG. 22 ELLIS PATENT AXLEBOX

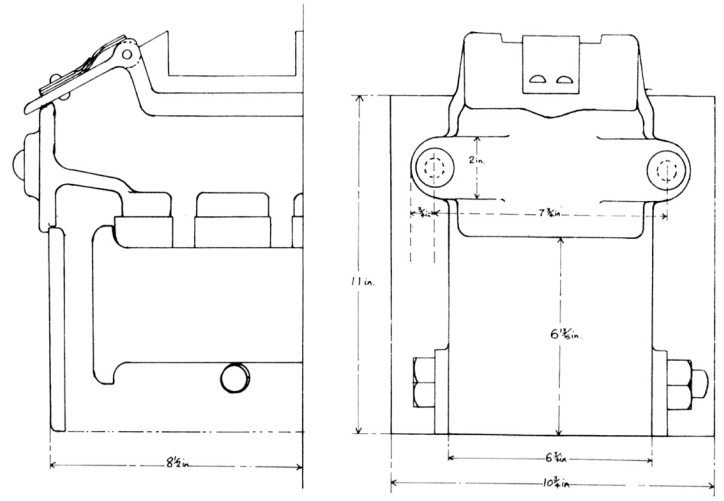
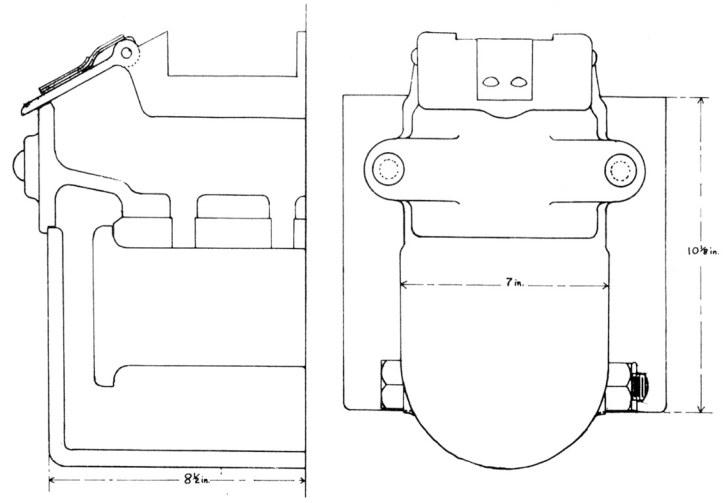


FIG. 23 UNITED ELLIS AXLEBOX FOR 8 AND 10 TON WAGONS



of the power brakes in spreading the wheelbase. Most wagons which had vacuum brakes from new did not need this modification as they had coach-type brakes with two brake blocks per wheel. This modification was common on ex-LMS vans.

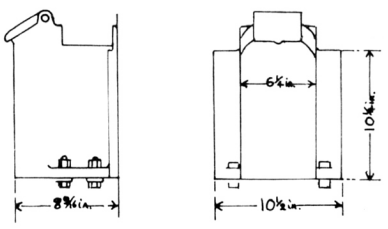
AXLEBOXES AND SPRINGS

The function of an axlebox was (and still is) to provide a housing for the brass bearing in which the axle journals ran, and also to contain lubricant for the bearing. The axlebox was made to slide vertically in the axleguard so as to accommodate irregularities in the track. This vertical movement was under the control of a spring, which was, in wagons, nearly always a multi-plate spring. Wagon builders always referred to 'spring plates', not 'leaves'. Earlier axleboxes used grease as a lubricant.

The first grease boxes to be considered are the Midland Railway 8A shown in *Fig. 20* (almost identical boxes were also used by private builders) and the united bottom grease box shown in *Fig. 21*. It will be seen that the top part of these boxes is a grease chamber, grease being applied by lifting the sprung lid. The difficulty with these axleboxes was that the whole box had to be removed to get at the brass bearing. This led to patent axleboxes being developed by Ellis, Attock and Rigley. Although I have not yet had the opportunity of looking at the records in the Patent Office Library, it appears that the subject of the patents was the method of getting at the bearings without removing the axlebox from the axleguard.

The Ellis box came in two varieties. The first was a square-looking box and was open at the bottom. There are still quite a few of these around on preserved railways, and if you get a chance to inspect one you will find that it is possible to look up into the box and see the axle journal. This box was often referred to as an Ellis patent box. The drawing (*Fig. 22*) shows one suitable for a 10-ton wagon, while the photograph is of one on a 12-ton wagon. The other type of Ellis box was known as the United Ellis, which differed from the previous type in having the bottom of the box completely enclosed, giving a distinctive round-bottomed appearance. These boxes were extremely common right up to early British Railways days, yet I do not know of any castings or mouldings on the market, at least in 4mm scale. In the hope that someone may produce castings,

FIG. 20 8A GREASE AXLEBOX FOR 8-TON WAGONS



or to help those who wish to scratchbuild them, I give drawings of both 10-ton and 12-ton types (*Figs. 23 & 24*). Incidentally, wagon builders tended to refer to the load that each axlebox bearing would take. Thus a 5-ton box would be suitable for a 12-ton wagon – 7 tons of wagon plus 12 tons of coal plus a little bit of safety margin divided between four axleboxes. In both open and United Ellis boxes the method of access to the bearing was the same: the end of the wagon was raised, and the nuts on the top lugs released; the top drawer could then be pulled out, and the brass bearing removed through the hole for inspection.

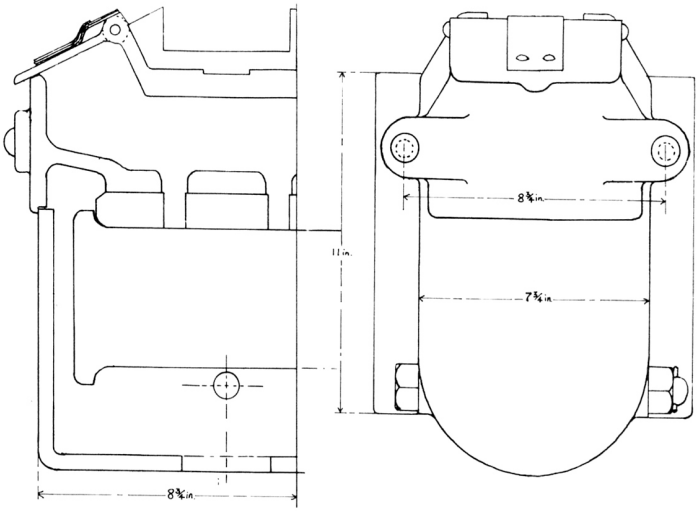
In an Attock's axlebox, access to the bearing was by lifting the grease chamber lid and sliding the axlebox front out vertically. I do not have a drawing of one of these boxes, but a photograph is included. This box is on a 10-ton wagon. Slater's produce a very nice plastic moulding of this box.

In the Rigley's box, access to the bearing seems to have been by hitting the top left-hand part of the front upwards with a suitable instrument, when the whole top part of the box would pivot around the pin on the right. Again, I have no drawing, but I can give a photograph and some major dimensions. The Rigley's box seems to be the least known of the grease boxes commonly fitted to private owners' wagons, yet some owners insisted on it. I have only ever seen one wagon with Rigley's boxes modelled – and I built that!

All these axleboxes were superseded in 1923 by the RCH standard split oil box, which is too well known to need detailed description. Oil boxes had been used before this, especially on wagons that did not need to be tipped, such as cattle and tank wagons, but the new RCH box could be inverted without the oil running out, hence its adoption for the new standard mineral wagons. This new axlebox was frequently used as a replacement for older grease boxes, on both 10-ton and 12-ton wagons. For any coal train up to the early 1950s, though, a majority of wagons with grease boxes should be the modeller's aim.

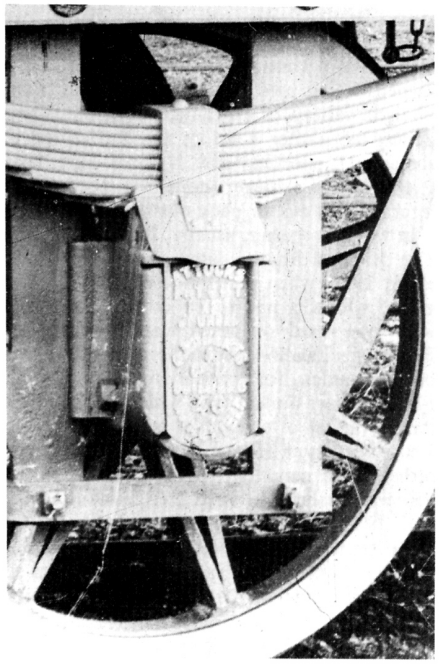
I have confined myself mainly to axleboxes commonly used on privately-owned wagons. Each pre-grouping railway company favoured its own type of box, details of which can frequently be found in books on the relevant company. Additionally, a good selection of commercial castings is available, at least in 4mm scale.

FIG. 24 UNITED ELLIS AXLEBOX FOR 12 TON WAGONS



SPRINGS

The springs used under mineral wagons tended to have either 5 or 9 plates. After 1923, only the 5-plate spring was used. The modelling position with regard to spring castings is improving, at least in 4mm scale, but anyone wishing to make masters might like to note two points: (1) The front of each spring plate is half-round in section, but the tapered part at each end is square at the front. If you get both parts right



An Attock's patent axle-box under a 10 ton wagon. CHARLES ROBERTS COURTESY BILL HUDSON

Left: *An Ellis patent axlebox with 9 in x 4¼ in journals fitted to a 12 ton wagon by Wagon Repairs Ltd. Main dimensions are: Across front face 8 in. Axleguard front to face of box 9 in. Bottom of box to bottom of lid 11 in. Bottom of box to spring bed 11 7/8 in.* Right: *A Rigley's patent axlebox under a preserved 10 ton wagon. Main dimensions are: Across front face (bottom part of box) 6 7/8 in. Axleguard front to face of box (bottom part) 9 in. Depth of bottom of box 3 5/8 in. Depth of top of box (to bottom edge of lid) 6 1/8 in. Depth of lug on right 2 5/8 in. Projection of lug from side of box 1 1/8 in.* AUTHOR

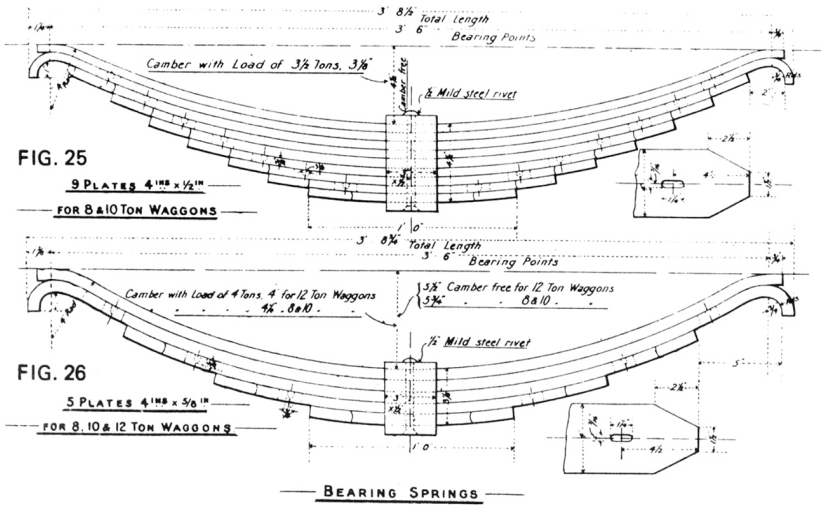


FIG. 27 SPRING SHOE

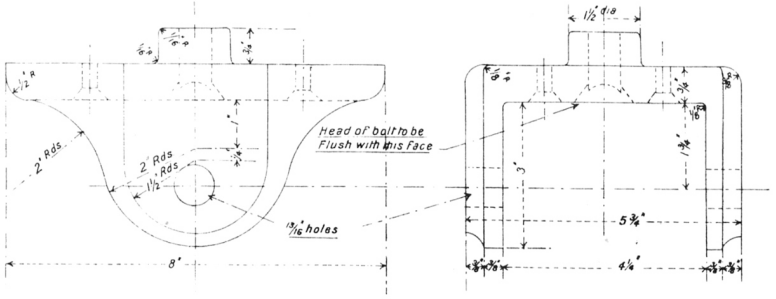
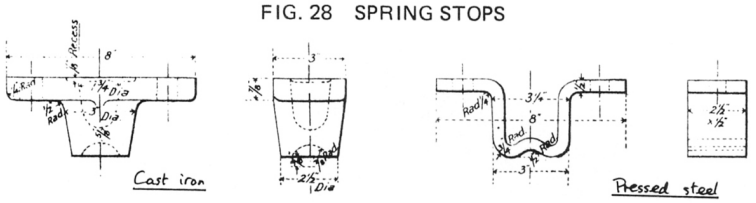


FIG. 28 SPRING STOPS



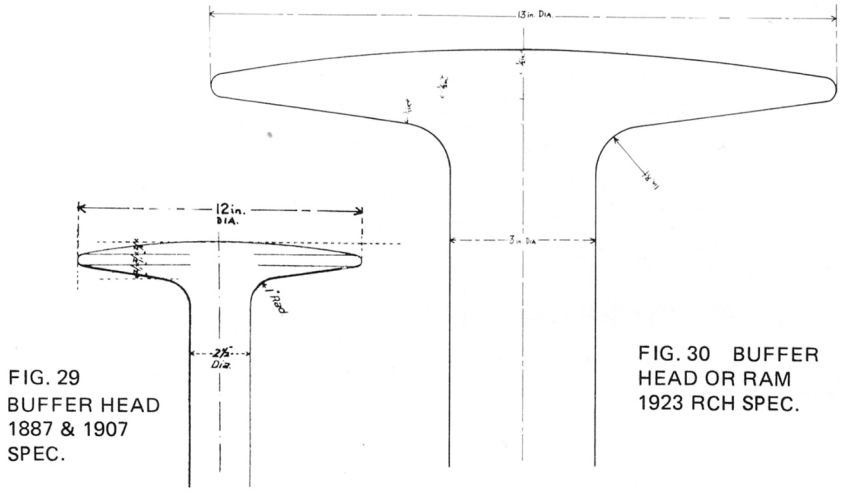


FIG. 29
BUFFER HEAD
1887 & 1907
SPEC.

FIG. 30 BUFFER
HEAD OR RAM
1923 RCH SPEC.

the spring looks most impressive, but if you ignore the half-round part the individual plates disappear into a blob. (2) The second plate, not the top one, sits on the bolt in the shoe.

Spring shoes up to 1923 were usually cast iron (see *Fig. 27*). After 1923, a pressed steel type was used, but I do not have a detailed drawing. Wagons with 5-plate springs needed a spring stop on the solebar above each spring – two kinds are shown in *Fig. 28*. Some railways preferred their own type of spring – the Great Eastern, for example, used a 4-plate spring. Although I do not have drawings of every type, it is usually possible to work out something convincing from a photograph.

BUFFERS

From late 1887, all new wagons were required to have sprung buffers, and many, perhaps most, railway companies had been fitting them for many years previously.

Each buffer consists of two parts. That which made contact with the next wagon was called a buffer by the RCH, a buffer ram by some wagon builders, and a buffer head mainly by modellers. The part bolted to the headstock (by, usually, four ¾ in bolts with the nuts outside) was called the buffer guide, or, sometimes, the buffer base. Buffer rams were remarkably consistent and the type used until 1923 is shown in *Fig. 29*. In the 1923 specification the dimensions were increased to those shown in *Fig. 30*. These dimensions had actually been specified since 1914 for tank wagons 18 ft or more over headstocks. Although good representations of the 12 in buffer in 4mm scale are available from several sources, it is not possible, as far as I am aware, to obtain the 13 in variety. Using the 12 in buffer in its place is roughly equivalent to the adoption of a track gauge of 4 ft 4 in – not much better than 00 gauge and distinctly worse than EM! I am therefore including the drawing of the 1923 buffer in the hope that some manufacturer will take the hint.

As with axleboxes, so it was with buffer guides, and each pre-group railway had its own fancies, many of which are readily available in model form. Until about 1907 most privately-owned wagons used a guide rather similar to the Midland variety, or a 4-ribbed equivalent. These guides left rather a lot of the buffer rod or shank unsupported, and it must have been realised that a longer guide was needed. An interim step was to pack out the guide with a 1 in wooden washer, usually, I believe, of elm. The Midland Railway used this method until about 1916, when it introduced a longer buffer guide, which is not to be confused with the long type used on fitted wagons. The 1907 RCH specification introduced several new buffer guides for private owners' wagons. *Fig. 31* shows a plain type which was simply a longer variant of the guides in use since 1887. The ribbed type (*Fig. 32*) seems to have been rather more common, particularly on the 12-ton wagons built in large numbers during the period 1919-1923. *Fig. 33* shows one type of buffer with a foot-tread, required on wagons working to the South Wales ports. I feel that all these buffer guides are worthy of manufacturers' consideration.

The 1923 standard buffer guide, of which I do not have a detailed drawing, appears to

have been derived from the ribbed type (*Fig. 32*) by putting flats at the top and bottom of the base flange, thus reducing the height to 9 in so that the same guide could be used on wood- or steel-framed wagons. This guide can be obtained in model form from several sources, but it should be noted that some castings have the ribs with straight edges instead of curved. This makes the guides look much too heavy, but a few minutes work with a half-round file rectifies matters. The top rib of the guide was shorter than the other three, to allow a shunter's pole to be rested on the buffer. Sometimes this top rib was straight-edged, as in the photographs, but other guides had curved top ribs. Again, a little work with a file may be needed, after checking the type from a photograph.

In part 3, next issue, Chris begins to apply all this expertise to modelling.

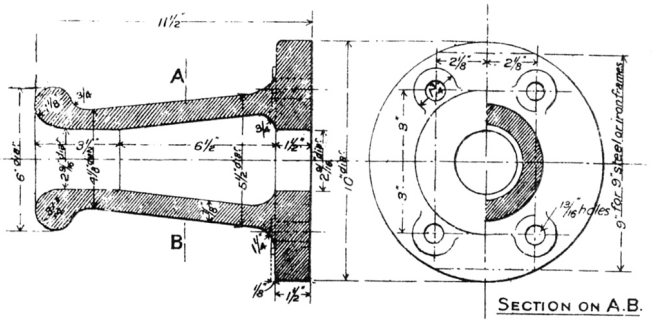


FIG. 31

— CAST IRON —

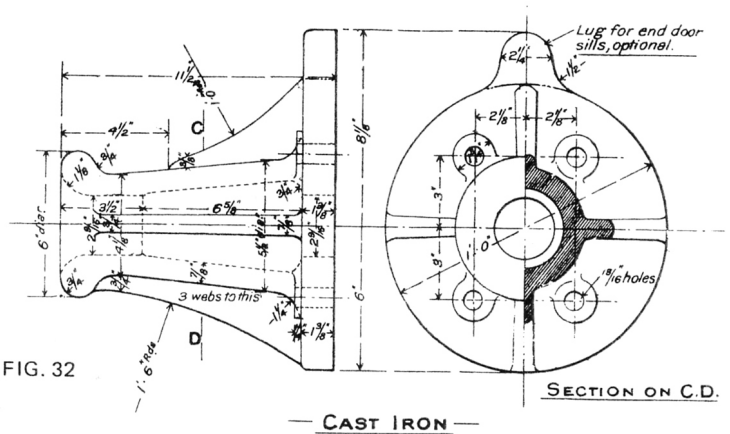
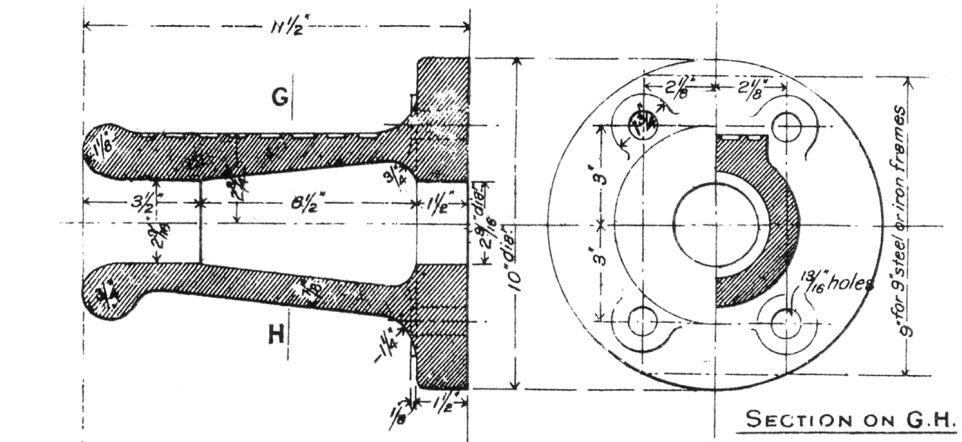
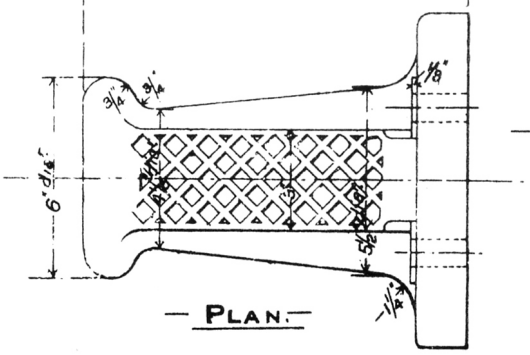


FIG. 32

— CAST IRON —





— CAST IRON. —

FIG. 33