



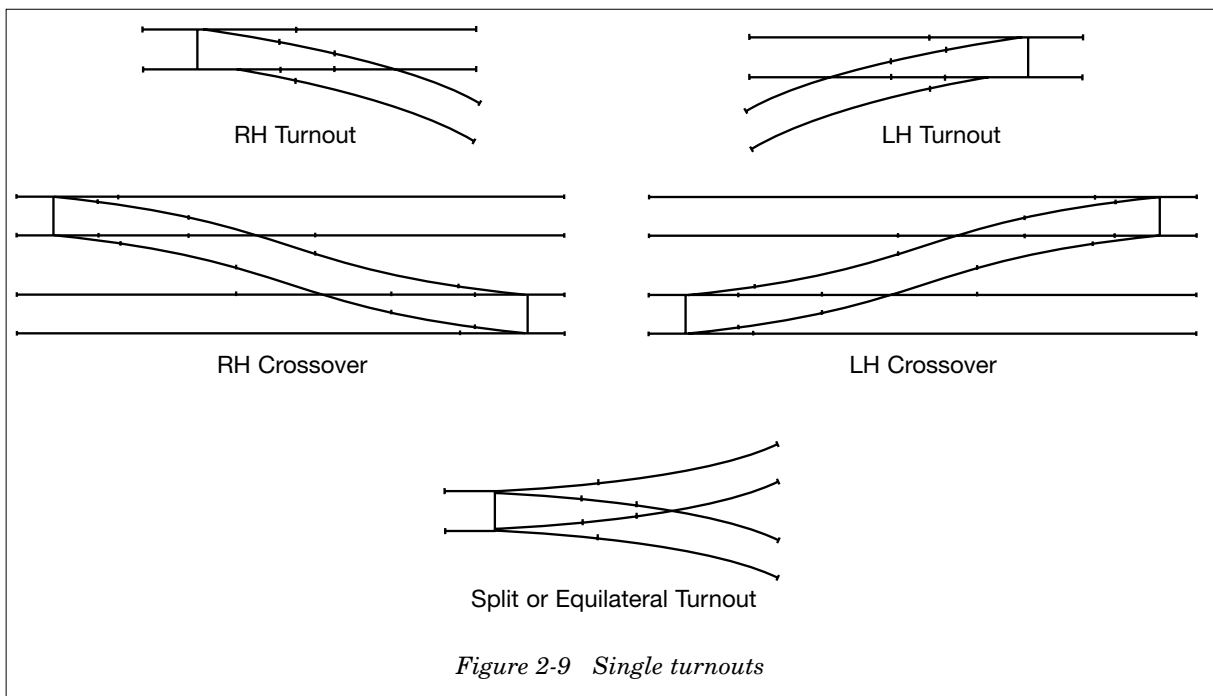
2.2 Pointwork configurations

In the following paragraphs some of the more common pointwork configurations are shown together with the accepted terminology used to describe them. When planning track layouts the preference is to use a combination of single turnouts as these require the minimum of special chairs and timbers to construct them and

maintenance is straightforward. However, in a restricted space it may be necessary to superimpose one turnout upon another, which introduces additional crossings and timbering and may, in bullhead track, involve the use of special chairs.

2.2.1 Single turnouts

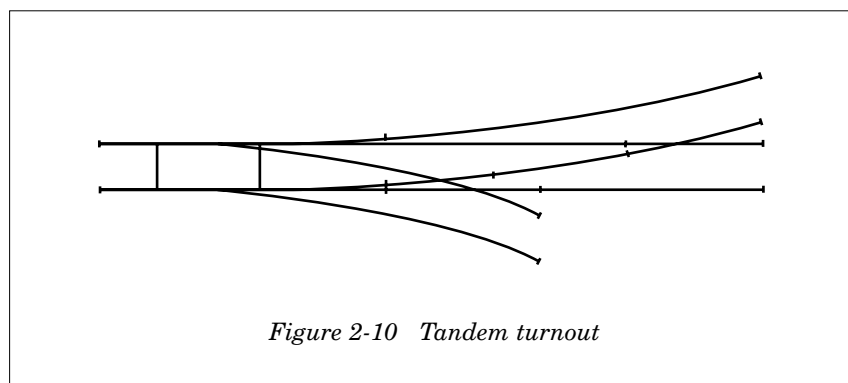
These follow the pattern described in 2.1 and are illustrated in Figure 2-9.



2.2.2 Tandem or double turnout

This uses one set of switches immediately after another and before the crossing, which introduces a third crossing and crowded timbering. Where space is particularly crowded the crossing may

form part of a continuous curve but this would require movements to be carried out at low speed. (Figure 2-10 and Photo 2.2)





2.2.3 Three-throw turnout

There is a nomenclature problem here as the 3-throw yields the same outcome as the double turnout. It uses a left hand and a right hand set of switches that are superimposed to divide three ways together in symmetrical form. The left hand stock rail has a left set and the right hand has a right set. The blades are not usually all together on the same timber because that is expecting perfection in all dimensions and tolerances. Normally, one pair of blades is located one timber along from the other which allows for some slop and for the drive rods to be fitted. When the centre route is set, Figure 2-11, there is the risk of wide gauge for a few feet. Another possible arrangement, which is even more awkward, is when both roads turn out the same side. This means that one stock rail has to have double the set in it. Note also that one blade supports another against the stock rail, easy in bullhead but not in flat bottom. (Photo 2.3)

*Photo 2.2 A double tandem turnout leading off from a double slip at Stowmarket Goods Yard.
(NRM Windwood Collection GE1005)*

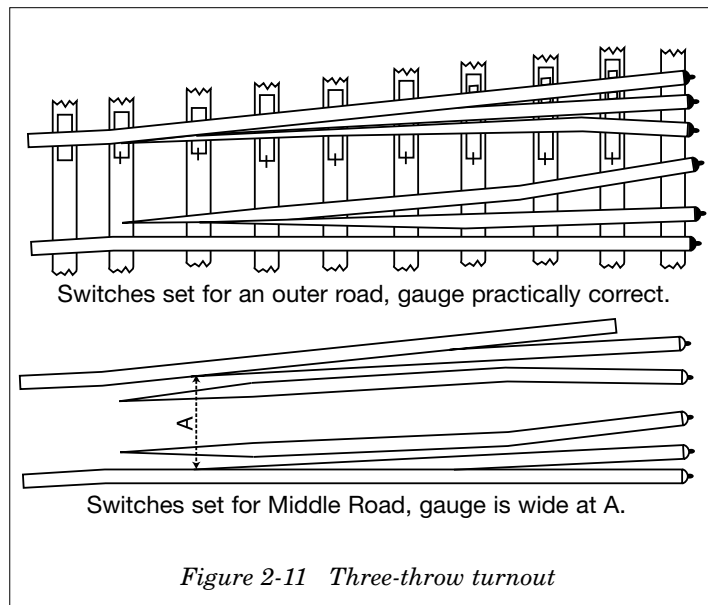


Figure 2-11 Three-throw turnout



Photo 2.3 Symmetrical three throw turnout in Hadleigh goods yard. A second asymmetrical three throw is just visible in the top centre of the photo. (NRM Windwood Collection GE1043)

2.2.4 Four throw turnout

This has three sets of switches in close succession giving four exits and six crossings. Kemp Town LB&SCR had a four throw at the station throat in a tunnel mouth. This had a single set of switches in Y form, on each heel of which another set of

switches opened out to both left and right giving four routes. As shown in Figure 2-12, this looked odd - like a tropical palm - and must have had lots of odd chair castings.

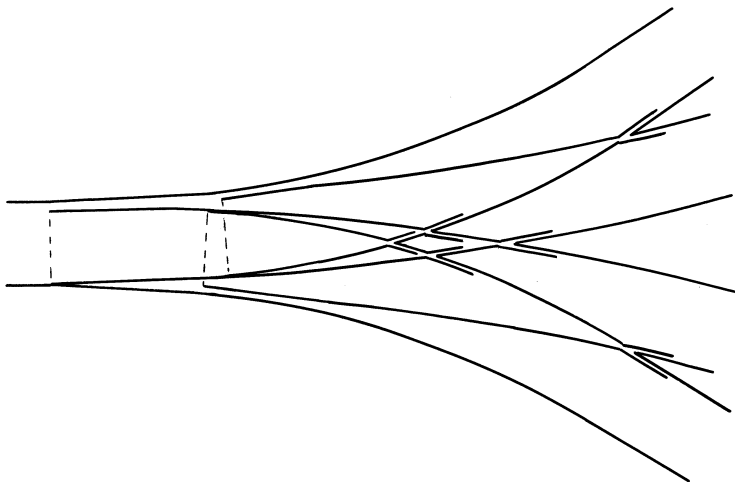


Figure 2-12 Symmetrical four throw turnout.

2.2.5 Five throw turnout

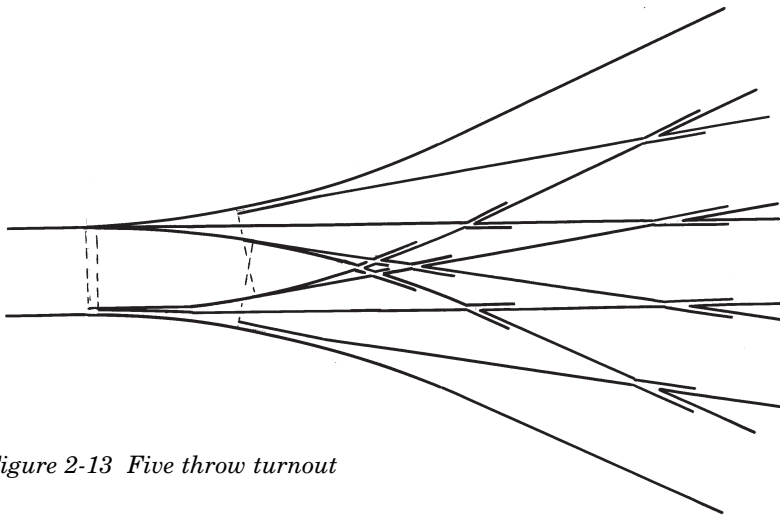


Figure 2-13 Five throw turnout

At the SNCF Museum at Mulhouse there is a five throw turnout. This has a short three throw whose outer limbs then split again with switches toe to heel giving five routes. Being symmetrical, see Figure 2-13, it is very crowded with ten crossings in total – four at the centre so close they need to be seen to be believed. It's worth the trip just to see it.

2.2.6 Obtuse Crossings

Where one track cuts right across another a different type of crossing is needed, the obtuse crossing. Two of these combined with two common crossings make a track diamond. Figure 2-14 shows an obtuse crossing and Photo 2.4 shows a track diamond.

The obtuse crossing is made up of four rails: a running knuckle or elbow bent to shape, two point rails, one each left hand and right hand, and a bent check knuckle. Figure 2-14. The obtuse is a trickier crossing to make and use. Too fine an angle and the point rail ends are too thin and take a battering as they are not as well supported as in the common crossing. Too wide an angle and the wheel tread will fall into the gap rather than be carried over it. Either way, because there are gaps in both rails, when one wheel is crossing its gap the other does not have a check to guide it so the risk of wandering wheels is greater. Thus the range is restricted to between 1 in 4 and 1 in 8, with the latter limit dictated by the MoT Requirements. (See also under square crossing, Section 2.2.7).

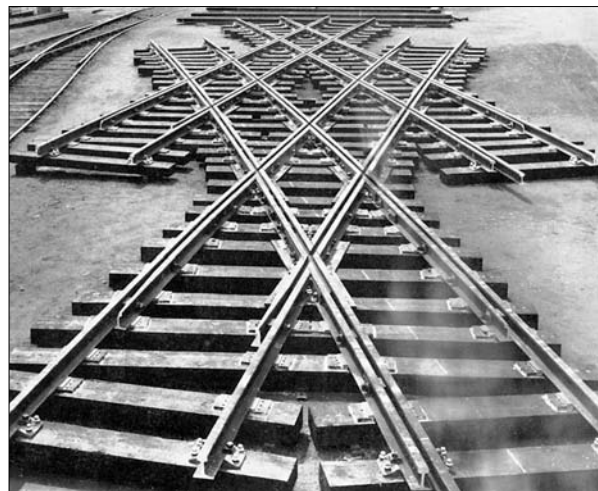


Photo 2.4 Track diamond pre-assembled before being transferred to site. (Balfour Beattie Rail).

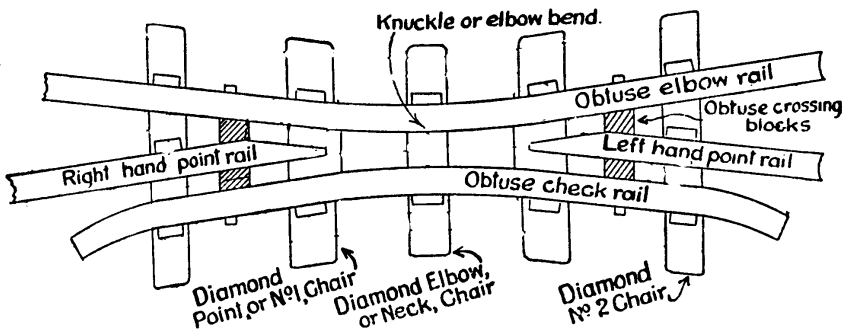


Figure 2-14 An obtuse crossing, sometimes called a K crossing.



2.2.7 Square crossings

The principle of these is the same as diamond crossings except that the angle between the tracks is either a right angle or close to it, i.e. steeper than 1 in 4. This means that both wheels on an axle will have to cross a gap in the rails without continuous support. There is little difference between the crossings, or none if it is truly square, and the guidance is worse than in a diamond. In some

cases, the support problem is overcome by some form of support systems for the wheel flange. Because of this such crossings were subject to speed restrictions to reduce the risks, particularly because the components are subject to heavy wear. Figure 2-15 shows an unguarded crossing and Photo 2.5 shows a fully guarded version.

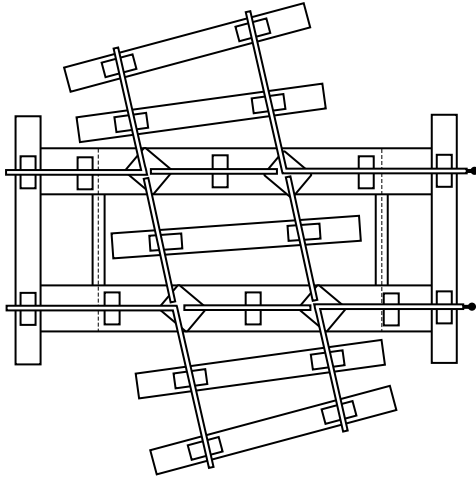


Figure 2-15 Unguarded square crossing.

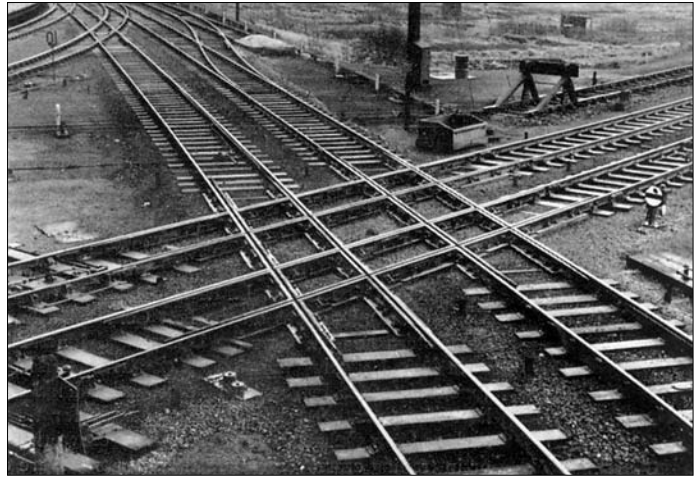


Photo 2.5 Fully guarded square crossing on East Coast main line at Retford. (Balfour Beattie Rail).

2.2.8 Switch Diamonds

In use since the 1920's these are a possible alternative to obtuse crossings, allowing diamonds flatter than 1 in 8. Instead of the point rails being fixed they are moveable on slide chairs, and no check rails are needed. The running knuckle rails are exactly the same as in the normal obtuse crossing and the point rails are made the same way except that they are longer to close against the knuckles. Photos 2.6 and 2.7.

In modern BR practice the widest angle at which switch diamonds are used is 1 in 4 3/4 and the flattest might be 1 in 28. When angles are wider than 1 in 4 3/4 there is little length left in which to swivel. The problem is that there are two more sets of switches to work and interlock. The prototype interlocking requires the diamond blades to work independently to provide protection according to the route set.

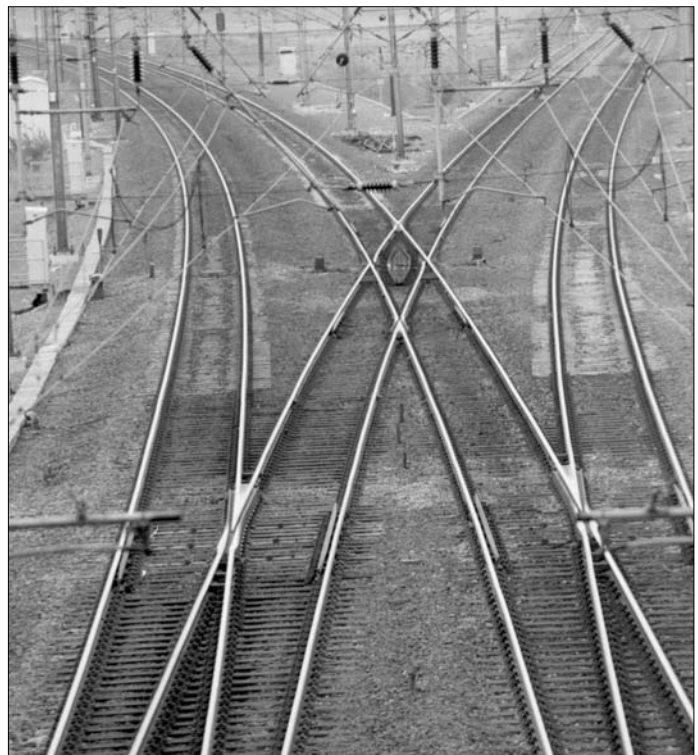


Photo 2.6 Modern switch diamond at Colton Junction (W. Goodwin).

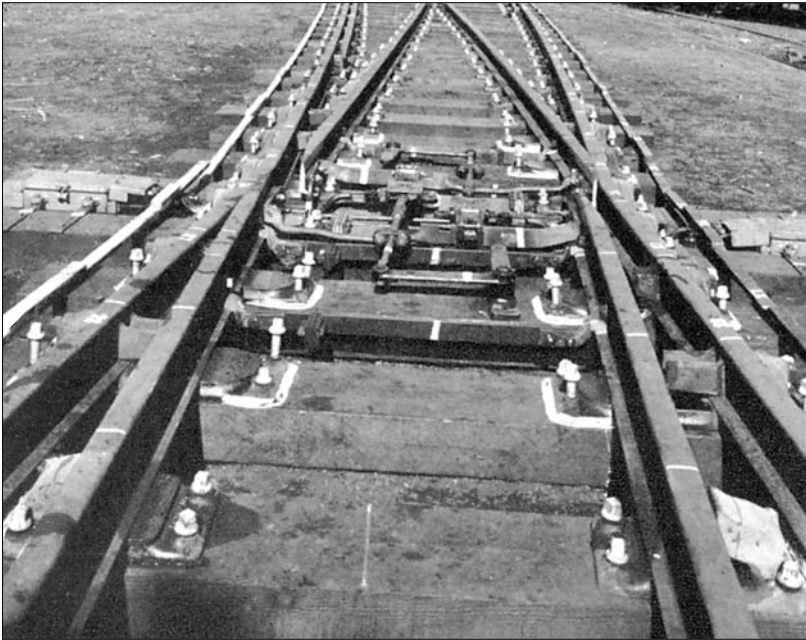


Photo 2.7 Close up of a moveable switch diamond crossing under construction. Note the detection and blade locking mechanism attached. (Balfour Beattie Rail).

2.2.9 Swing nose crossing

To provide a smoother ride on high speed routes some acute crossings have moveable noses which close the gap to give a full rail surface. The nose is

driven from the point end and is fitted with detection and locks, see Photo 2.8.



Photo 2.8 Swing nose crossing. Note the absence of check rails. A suitable prototype for multi-standard pointwork for model railway test tracks. (Pandrol Rail Fastenings Ltd).



2.2.10 Spring crossings

Formerly used in main lines at loop trailing exits, to give a full rail surface to the main line, while

trains exiting the loop pushed their way out, see Photo 2.9.

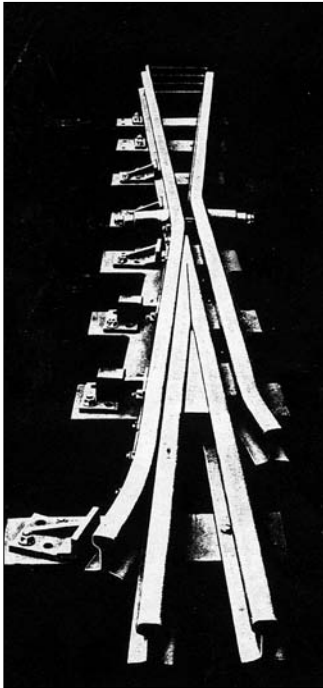


Photo 2.9 Spring nose crossing.



Photo 2.10 High speed double junction at Grendon Underwood, G.C.R., with diamond set at 1 in 8. (Loco Publishing Co).

2.2.11 Double junctions

The limit of 1 in 8 for obtuse crossings meant that these could not be laid for high speed, and even the early switch diamonds did not help much. A way to overcome this was to widen the six foot way as in Photo 2.10 of Grendon Underwood Junction on the GCR. By deviating the straight main the points

took the Y form with maximum radius on each road and the diamond crossing was skewed such that an acceptable fixed 1 in 8 could be used. Such junctions were unusual, as into the 1930's the norm was still to restrict speed to 15 to 20mph at double junctions.

2.2.12 Inside slip points

In this formation, known as compounds on the GWR, switches have to be fitted inside a diamond. To allow sufficient length for the switches the

diamond has to be close to the 1 in 8 limit. Both single and double slips are shown in Figure 2-16 and Photos 2.11 and 2.12.

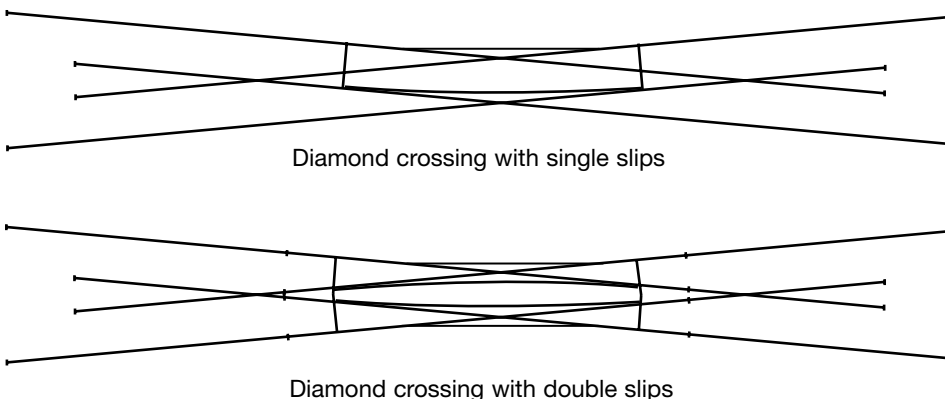


Figure 2-16 Single and double slips.



*Photo 2.11
Double slip
switch under
construction.
Note fittings for
detection and
locking have been
pre-attached.
(Balfour Beattie
Rail Eng.).*



Photo 2.12 Trackwork at Liverpool Street showing two single slips in the foreground leading to a double slip in the middle distance. The presence of continuous check rails in the left hand roads suggests that the curves are less than 10 chains radius. (NRM Windwood Collection GE868).



2.2.13 Outside slip points

These allow slips to be used in much tighter diamonds but introduce two more common crossings for each slip. Outside slips normally have both curved rails outside the diamond but the term

is often used for semi-outside slips where one rail cuts the diamond. Figures 2-17 and 2-18 and Photos 2.13 and 2.14 show the variations.

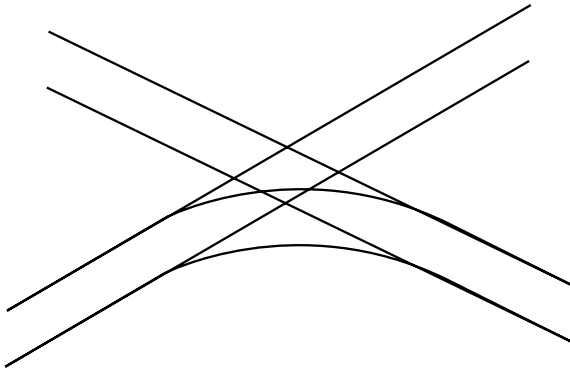


Figure 2-17 Semi-outside single slip.

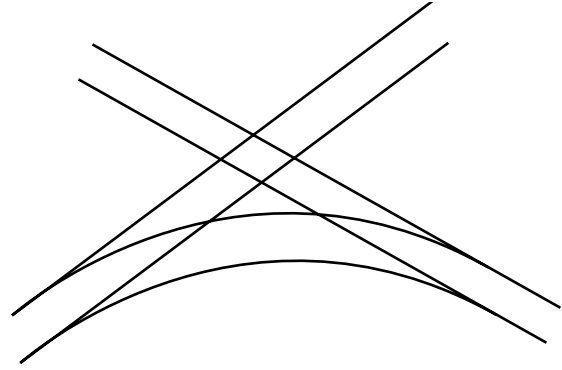


Figure 2-18 Outside single slip.

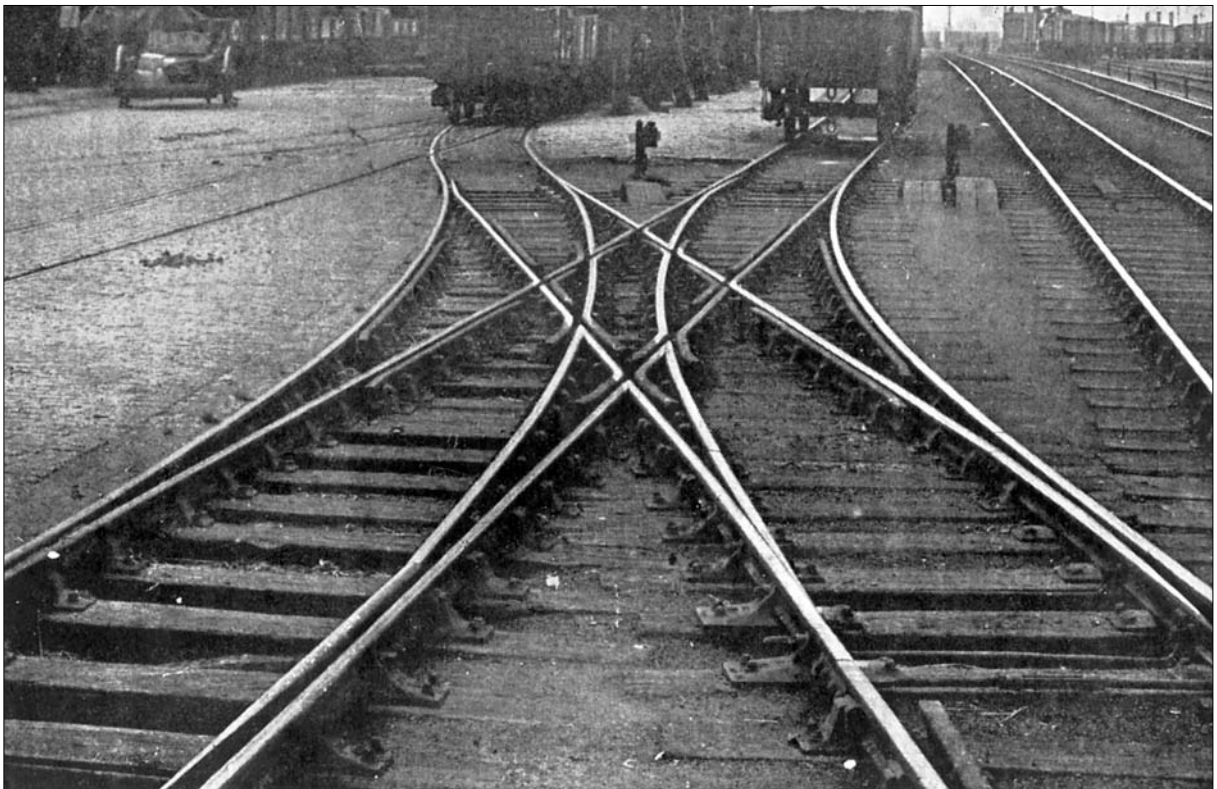


Photo 2.13 Symmetrical semi-outside double slip in a goods yard. (R. Chown Collection).



Photo 2.14 Bishops Stortford station. Outside slip on the right which forms part of an asymmetrical cross-over. (NRM Windwood Collection GE176).

2.2.14 Scissors crossovers

These are so useful that some remain today, e.g. London Cannon Street. They require common and obtuse crossings so close together that today they

are cast as one in manganese steel, but in bullhead days were built up. (Figure 2-19 and Photos 2.14 and 2.15)

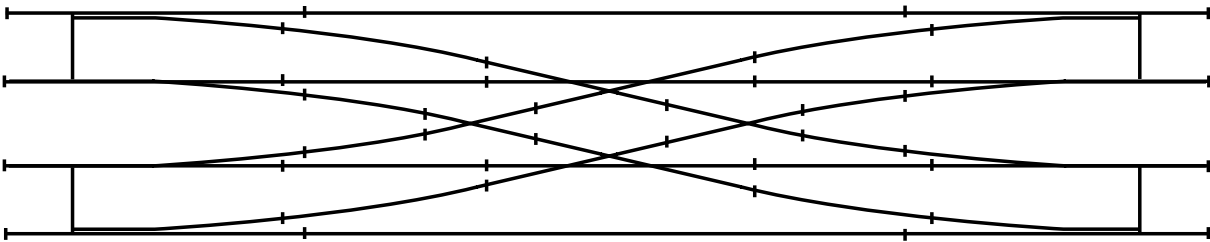


Figure 2-19 Scissors cross-over.



Photo 2.15 Scissors cross-over, Southern Region.

(Pandrol Rail Fastenings Ltd).

2.2.15 Trap points

Company practices varied as to whether one blade or two be used. Post grouping units were usually a standard set of switches. They are a DoT requirement to protect passenger running lines from the odd things that take place on goods lines

and sidings. In complex station layouts they may be straddle traps, that open by opposing movement to derail an errant vehicle in a straight line clear of the passenger lines on either side. Figure 2-20.

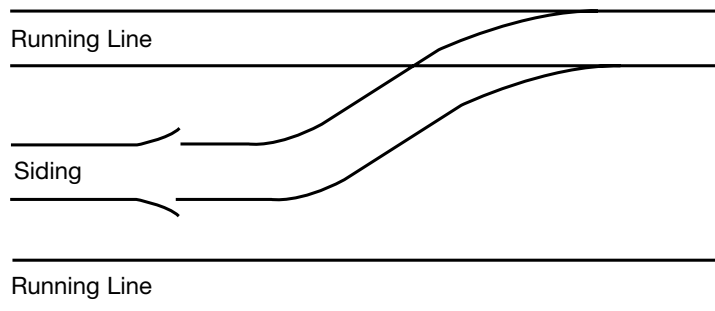


Figure 2-20 Layout of straddle trap.

2.2.16 Catch points

In running lines these were trailing points to catch vehicles lacking continuous brakes that might have broken loose on gradients. They were also used in places and still survive on modern BR to allow two otherwise conflicting moves to take place in rapid succession. As such they are worked from the box and are part of the interlocking. Another such location in the past was on a running line downhill from a place where a siding was shunted off a gradient steeper than 1 in 260.

Runaway points such as these were usually a

full turnout so that the escapee would be put right off the track, even on a high embankment. On lines considered a high risk it might even be extended as a siding buried in sand, called a sand drag, to bring a vehicle to a halt without destruction. There was one in South Wales, with several points of entry, which was tested successfully by the GWR, a whole train being brought under control.

On modern BR, catch points in continuous welded rail have a different form, see Photo 2.16, to allow rail temperature stresses to be carried through.

2.2.17 Interlaced or gauntlet track

Examples of interlaced trackwork are extremely rare in Britain on main lines although they were not uncommon on tramways. In the latter case it was resorted to where a street narrowed and tramcars were required to maintain a set distance from the surrounding buildings. (Figure 2-21) Using gauntlet track avoided the need for point blades with their attendant maintenance. An example can be seen at Crich Tramway Museum in Derbyshire.

The Boyne Viaduct at Drogheda was strengthened in 1932 requiring a reduced formation width. As a result the original double track was interlaced (Photos 2.17 and 2.18) but in 1996 was replaced by a single track with turnouts at each end as part of a major resignalling scheme.

Interlaced track was also used to allow trains to move across a weighbridge without all vehicles being weighed. Two sets of point blades would be used with four rails between, one pair being attached to the measuring equipment and the second pair being permanently supported.



Photo 2.16 Modern catch point. (Pandrol Rail Fastenings Ltd).

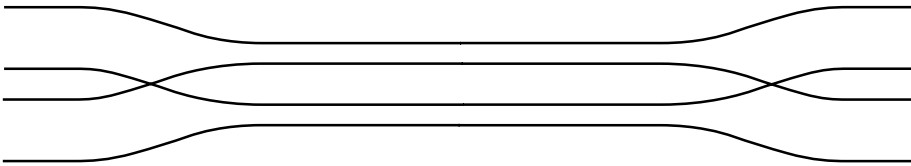
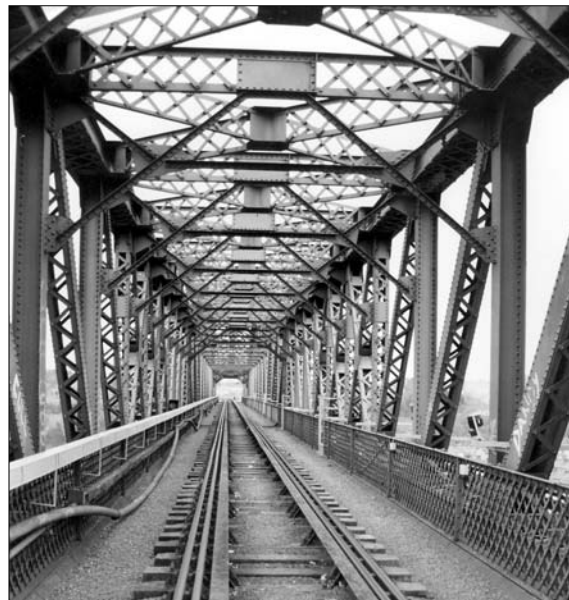


Figure 2-21 Interlaced or Gauntletted trackwork.



Photo 2.17 Interlace crossing.



*Photo 2.18 View across the Boyne viaduct.
(Both photos Oliver Doyle).*



2.2.18 Gauntlet or interlaced turnouts

Before the advent of powered driven point blades the maximum distance for mechanical operation was limited to 350 feet from the signal box. In very rare cases, where a new line was built, the physical location of the junction might need to be situated beyond the maximum distance. To overcome this

problem, rather than move the signal box, the track could be gauntletted and the point blades located at a convenient distance from the box. (Photo 2.19)

Gauntletted turnouts have also been used to avoid the blades being in awkward positions such as level crossings or moving bridges.



Photo 2.19 Interlaced turnouts at Wymondham Junction with the Focsett Branch. (HMRS Collection).

2.2.19 Multi-gauge track

With the demise of the broad gauge in Britain, multi-gauge track ceased to exist with the possible exception of some feeder junctions where narrow gauge lines met the standard gauge. The more complex multi-gauge turnouts are outside the scope of these notes and those interested should

contact the specialist societies mentioned in Part 1, Section 4, Researching Information.

The following photographs (Photos 2.20 to 2.22) of multi-gauge trackwork have been included for the reader's interest.



Photo 2.20 A mixed gauge crossover. Because the common rail is required to be on the outside adjacent to the platform face, the narrow gauge line has to side step to attain the correct alignment. Careful use of guide rails allow this to be achieved without using additional moving blades. (HMRS Collection).



Photo 2.21 Mixed gauge track believed to be at Swindon. (HMRS Collection).

Multi-gauge track still occurs overseas, most notably in India and Australia where three separate gauges remain in regular use. Gladstone in South Australia is particularly notable as all three Australian gauges meet there. Photo 2.22 shows a triple gauge turnout. Numbering the rails from left to right: rails 1 and 3 are 1435mm (4ft 8 1/2in) gauge: rails 2 and 4 are 1600mm (5ft 3in) gauge and rails 2 and 3 are 1067mm (3ft 6in) gauge.

Where routes part and gauge separation is required a number of special formations are required. These range from a simple split with no moving parts involved to quite complex arrangements.



Photo 2.22 Triple gauge turnout at Gladstone, South Australia. (Pandrol Rail Fastenings Ltd).