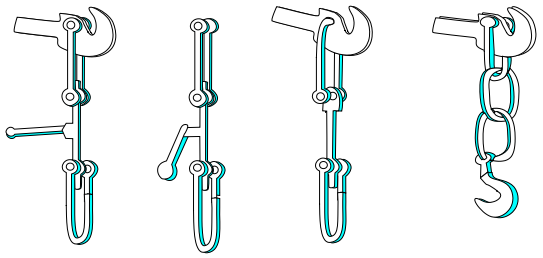
Couplings

Introduction



There is no such thing as a standard coupling. Any vehicle manufacturer is likely to have changed its design more than once and there were tens of different manufacturers.

There are some accepted design criteria, such as those adopted by the Railway Clearing House in 1907 or 1923. Later British Railways effectively standardised on design features in the 1950's and then later the UIC coupling was adopted across Europe to allow the interchangability of stock.

- AMBIS Engineering supplies the following coupling etches
- Pre-Grouping hooks on CH3
- RCH pattern hooks on CH1
- BR era (1950's) hooks on CH2
- UIC/ BR Screw coupling hooks on etch CH4
- Steam era screw link hooks on etch CH5
- LMS hooks 6 with relieved sides CH6
- Early coach screw coupling hooks CH7

There are a number of basic dimensions that generally apply, but then these have exceptions depending upon local circumstances.

As a safety issue any coupling should not drop closer than 6 inches to the rail level. Given the height of draw-bars/buffer centre height this means a loose coupling should be little more than 3 feet long. From this length it means buffers would normally be 18 inches long, otherwise coupling/uncoupling cannot be achieved, but this allows stock to be buffetted about. The "instanter" coupling link was introduced to reduce this buffetting by shortening the centre coupling link, but allow speedy coupling/uncoupling by a shunter to be maintained. First introduced by the GWR about 1907 the "instanter" link was made from maleable iron and would stretch and the benefit of it was lost.

A discarded BR period "instanter" in 2017 at the Mid-Suffolk Light Railway site.

After the grouping in 1923 a cast version of the "instanter" became available and was used (at least) by the LMS and LNER. Following nationalisation in 1948 the "instanter" casting was changed and the heavy sides were relieved presumably to make coupling and uncoupling easier.

It appears that to reduce buffetting of passengers a screw-up link coupling replaced the loose link coupling during the later part of the 19th century. This also provided a continuous draw-bar weight and provided for automatic braking to be adopted. This became universal for all passenger carrying stock other than where autocouplers were used. A screwed rod

replaces the centre loose link allowing a "rigid" coupling between stock. However to enable uncoupling it has to be lengthened so that it can be removed from the hook and therefore needs to be "stowed" for safety when not in use.

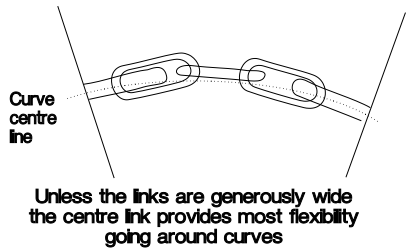
It is noticeble multiple unit trains seem to have kept the use of coupling links until at least the demise of the experimental APT when these coupling links broke prematuely ending that programme.

You should examine evidence about a type of vehicle, if the exact vehicle cannot be traced, as there were more noticable styles introduced for screw couplings than loose link couplings. For example the GWR used a hook beneath the buffer beam which was possible because the top link to the coupling was made as an inverted U shape. Other manufacturers shackled a link either side of the draw-hook, limiting the link's sideways movement resulting in the coupling having to be "tied up" or being hooked over the draw-hook.

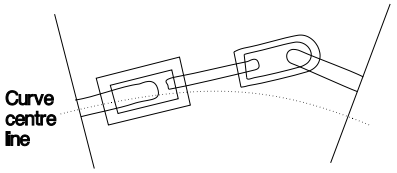
In general stock with screw couplings would be fitted with buffers at least 20.5" long., so should a wagon be maintained and then outshopped with "instanter" or three link couplings the draw-hook would need to be extended away from the headstocks to compensate - see photographs of BR era wagons. Alternatively the buffers may have been replaced by the first available items, resulting in the same necessity to increase the effective length of the coupling..

To enable some stock - such as bogie bolster wagons to enter factory yards where there were very tight curves - some working appendices were annotated such that a loose long coupling would be required to enable long wagons to be shunted. Some anecdotes record the use of a wagon's standard coupling and a resulting derailment.

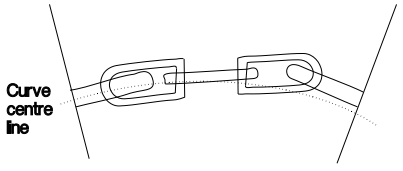
In a model context the length of the coupling needs to be considered where long vehicles, long buffers and tight curves exist. One of the first steps to mitigate problems would be to spring or compensate buffers, the next to ban the use of long vehicles where the curves are tightest or more drastically re-design the layout to remove the tight curves.

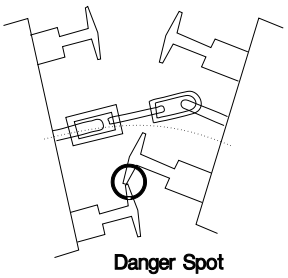


Unless the links are generously wide the centre link provides most flexibility going around curves

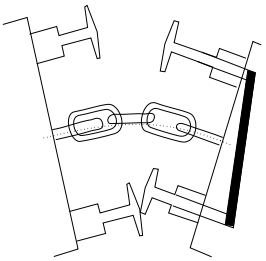


A screw link with two piece top link does not provide any flexibility, but the coach type also used by GWR, LNER does





Danger Spot



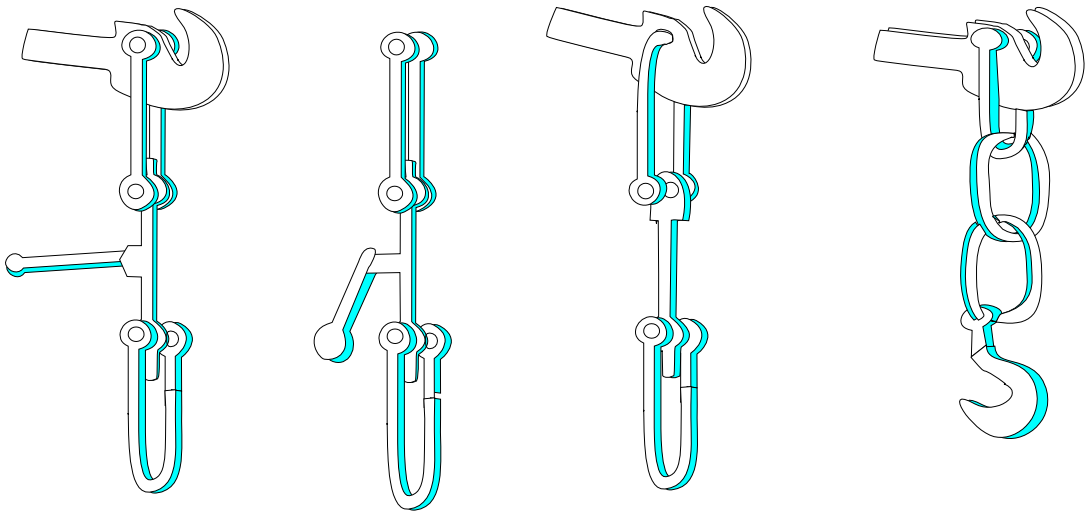
Compensate or Spring Buffers

There are several different approaches to providing a shortenable coupling link. One uses a twin screw helix, another a single screw and bushed connection. There are different pattern tommy bars for providing leverage to tighten/loose the screw as well. Wagon stock generally is fitted with a lighter-weight coupling than a locomotive.

A few classes of locomotives have been observed with different couplings. The BR standard 9F and the Bullied Pacifics are two, where a short "U" link through the draw hook followed by a short "U" link connected to the screw link was used - in effect a four part coupling. This may be to overcome the long overhang of the front buffer beam and give

AMBIS Screw coupling etch - CC4

Some of the variety that can be found with couplings and made from CC4.



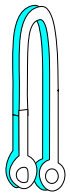
some flexibility when negotiation of tighter curves than available with a shacked coupling.

Assembling screw couplings

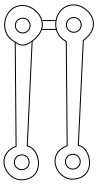
The AMBIS Engineering coupling etch CC4 has a number of components to provide a variety of coupling link styles.

- Make sure the holes needed doexist and will allow your lin/wire to pass through. These etches are on the edges of production capabilties. Where a hole is not clear probably a .001" layer of metal has been left, use a pin to pierce this. Use a cutting broach to open/smooth the holes.
- Use of dressmakers pins, or commonly available wire (not supplied) will be necessary to assemble these couplings.
- Select the style of coupling required.
- The centre screw section needs to be folded up and the top and bottom bosses fitted with a rod or pin. If using a top "U" link then an oval hole is needed in the draw hook such as in CH5 or a "Gedge slot" in CH7 etchings.
- Remove any square edges from the coupling parts with gentle filing.
- Do not make the centre links too inflexible as this can result in unwanted uncoupling if there is any jerking in the movement of a moving train or during reversing movements.
- Although parts can be glued together we would normally recommend solding component layers together.

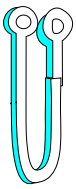
The bottom etch link may be substituted by a soft iron wire loop if the user desires to enable "magnetic uncoupling". AMBIS has also manufactured laser cut steel links that can be shaped into a bottom link.



Top U link needs to be fed through draw hook. If using The "Gedge" slot in the hook (Ch7) it may ne necessary to thin this link for about 2mm - following prototype practice - to allow the link to be dropped and then turned in the hook.

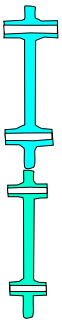


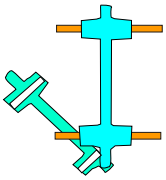
Cut out Shackle links - double their thickness if necessary.
Pin these links to the coupling hook with wire of a pin (see PIN40 product)

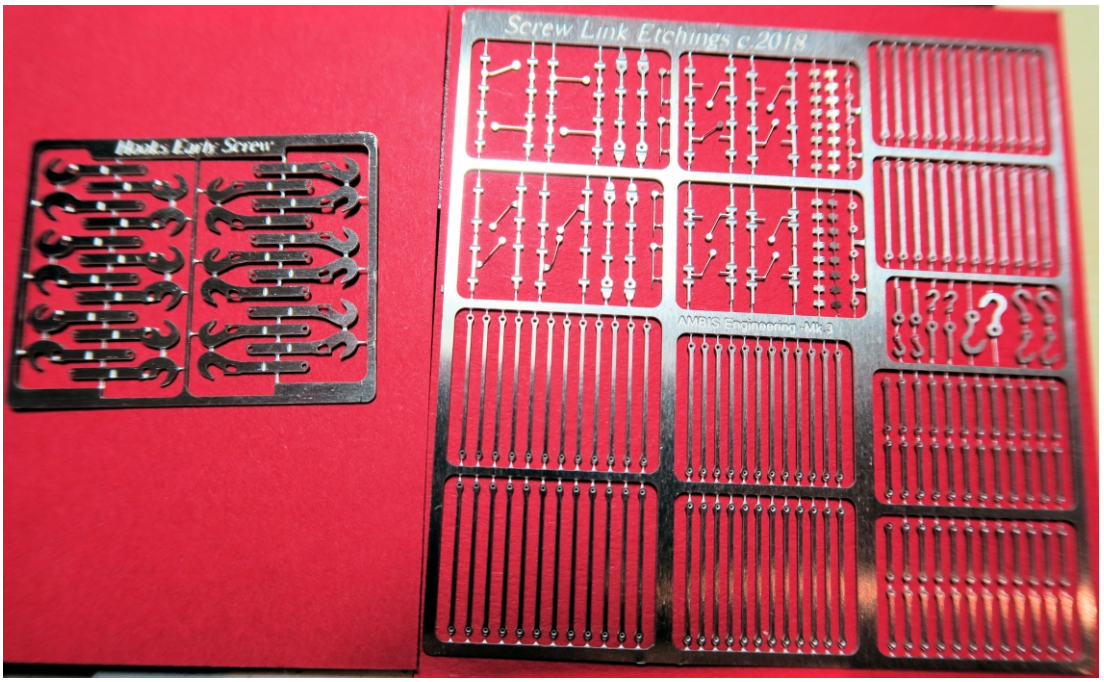


Cut out and fold up the lower U links - or make new versions from soft iron wire.

Cut out centre link, check a pin will sit in the groves at top and bottom.
One version of this link is a pin with lower attached cross pieces where the lower link can be fitted. This allows the link to be made retracted.







The latest screw coupling etches , left the early screw coupling etch with oval slot or "gedge slot", right the links etching making 20 coupling links without addtional works.

Some Additional Notes on Screw Couplings

There is not one type of screw coupling. They appear to be introduced following accidents in the 1870's or thereabouts with automatic brakes, usually vacuum, the increasing speed of trains and the concept of removing the bufferting between vehicles to provide a continuos drawbar. So it is very unusual to find any vacuum (or air-braked) rolling stock or engine expected to operate passenger trains to be fitted with loose couplings. The practice of fitting small industrial tank locomotives with vacuum brakes and screw couplings is a feature of changes made on the preservation railways to enable those engines to haul passenger trains.

Many freight only engines or shunting duty tanks usually had loose couplings though some used for empty coaching stock duties may have vacuum brakes and a few steam heating pipes for carriage warming. Very often a loose coupling on an engine is shackled to the drawbar hook, not looped through it.

Before the introduction of screw couplings some locomotives had more than three chain links and may have a large hook at the end of the chain. This was also during the era of the fitting of "safety chains" when the quality of the iron links was such they were found to break at times.

There is a complex relation between length of coupling and the length of buffers and overall vehicle length. The common arrangement for loose couplings is an 18 inch long buffer and a loose coupling 3 feet long. There was a common rule that couplings not in use should hang above the rail height by around 6 inches (the weight of a loaded vehicle may depress its springs and reduce this clearance distance). This was to avoid obstacles in the track such as point operating mechanisms, on the GWR lines the ramp of the mechanical warning apparatus and in areas with a 4th rail (such as on London Transport electrified lines) electrocution. Screw couplings have to be extended to pass over the drawbar hook and thus when not in use need to be stowed away providing the required clearance. The GWR provided a hook beneath the buffer beam for this purpose and thus could not use shackled couplings because they are not flexible sideways. Other railways would fold the coupling away often using the tommy bar used to tighten the coupling as a hook, or may hang the lower link over the drawbar hook.

Screw couplings are heavy and more difficult to manipulate than loose couplings which partly explains the preference for loose couplings on freight stock that was regularly re-marshalled in yards, frequently several times during one journey.

In many cases vehicles with screw couplings may also have long buffers (more than 18 inches). During the BR era there was a practice of using instanter or loose couplings (sometimes replacements) on wagons fitted with long buffers in which case the coupling hook was fixed beyond the buffer beam by a sleeve or sleeve and bracket (e.g. for 24 inch buffers - a 6 inch extension)

So there are two distinct patterns of screw coupling - the shackled and the other a looped through the hook type. There are a number of detailed variations on how the screw coupling was built. One particularly noticable variation was used on some Bullied Pacifics and some BR 9F's. This coupling was a loop through type with a second short link shackled to the screw adjuster. Other screw couplings use a loop through link or two straight shackled links from the hook before also being shackled to the screw adjuster.

Some screw adjusters had one thread which raised or lowered the bottom link, others used two threads from a central point into upper and lower shackles. There would be a tommy bar to provide leverage on the screw and this was attached to it in one of several ways.

So for some fidelity to the prototype it would be appropriate to fit the correct pattern of coupling to vehicles and especially locomotives.

A shackled three link loose coupling, where the coupling has been looped over the drawbar hook.

Photograph of an industrial engine in preservation c.2003 at Chatham Dockyard.

A modern coupling with two screw threads fitted to container wagons, there is no unused coupling link - these wagons are kept in sets. Note the projection of the hook beyond the buffer beam in conjuction with UIC type long buffers. The hooks are able to slide along slots in the buffer beams which give lateral flexibility.

A shackled single screw link coupling on MR 2-4-0 158A at Butterley c.2018.

Note the long tommy bar and long lower link. The coupling on the adjacent coach has a long looped upper link and an early pattern drawbar hook.

Some notes on the development of couplings

There is an article in the Midland Record No.23 journal which shows the variety of couplings found in use in 1907 on engines. Many of the illustrations refer to eye bolt (or hookless couplings). Curiously the eye bolt screw coupling has an uncanny resemblance to the later Bullied and BR 9F coupling except a hook replaces the eye bolt.

Our main concern is the compromises that are inevitable with models. The larger scales used from "O" gauge may be able to replicate the ways of stowing screw couplings otherwise only the side buffer beam hook seems practical for working screw couplings - and even then only where the coupling is little used.

Most modellers seem to rely on the use loose links with a top through link. This is generally inappropriate for engines - the top link is more likely to be shackled to the coupling hook. For rolling stock the through top link is much more appropriate - we have found no use of a shackled coupling for coaches, though on more modern stock the shackled link would be more appropriate - see the container flat wagons.

We have drawn attention to the "Gedge" hook - an innovation from a Mr. Gedge. The early through links would require a slot in the coupling hook through which the top link could be fed. The Gedge slot has considerable advantage for modellers as the use of a slot through which the coupling link can be dropped, but can result in lost coupling links - you can guess how we were alterted to this.

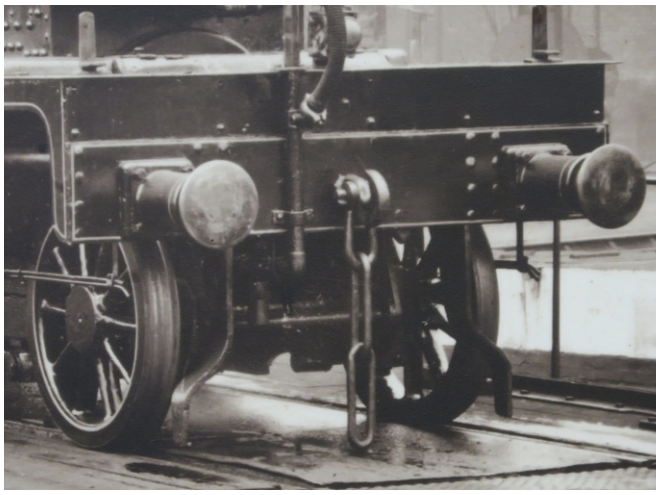
The Gedge hook uses a narrow slot. The top link of a coupling will have a flattened section on one side which just passes through the narrow slot in the hook before reaching its normal resting place whereupon it is fed through and twisted to hang downwards. At 12 inches to 1 foot scale this was practical as the coupling would need lifting and twisting again before it parts company with the hook. However in smaller modelling scales this disentanglement is emminantly possible by accident when coupling or uncoupling vehicles so is probably best avoided.

In smaller scales reproduction of a working Gedge hook and thinned link is rarely practiced, model couplings are best constructed to remain intact at all times.

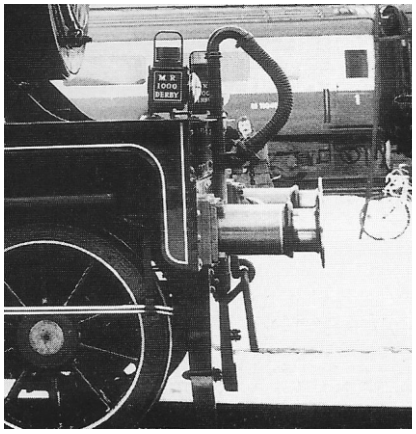
It is quite noticable the first screw adjusters had a central, pivotted tommy bar and twin screws. Later versions seem to simplify this by using a single screw thread and a tommy bar arrangement at the top end of the screw bar of the coupling - this arrangement appears almost universally applied to diesel engines. However twin screw versions still persist such as in the modern container flat wagon run in sets.

In Operation

It is common practice for the coupling on rolling stock to be used in preference to that on an engine, which in model form is ideal especally when the adjacent rolling stock has corridor connections as the hook is hidden from view. The downside is that vacuum pipes on an engine can obsure its hook making coupling and uncoupling more difficult. Additional pipes such as carriage heating or auto-fitted stock add further complications which is where an auto-coupler becomes extremely useful.



An unusal event - a Midland Compound 1028 in LMS livery with a shackled loose front coupling hanging dangerously low. The preserved LMS 1000 also has a loose link front coupling.
Photographic evidence suggests loose link couplings on the front of the MR compounds generally ceased after 1907.

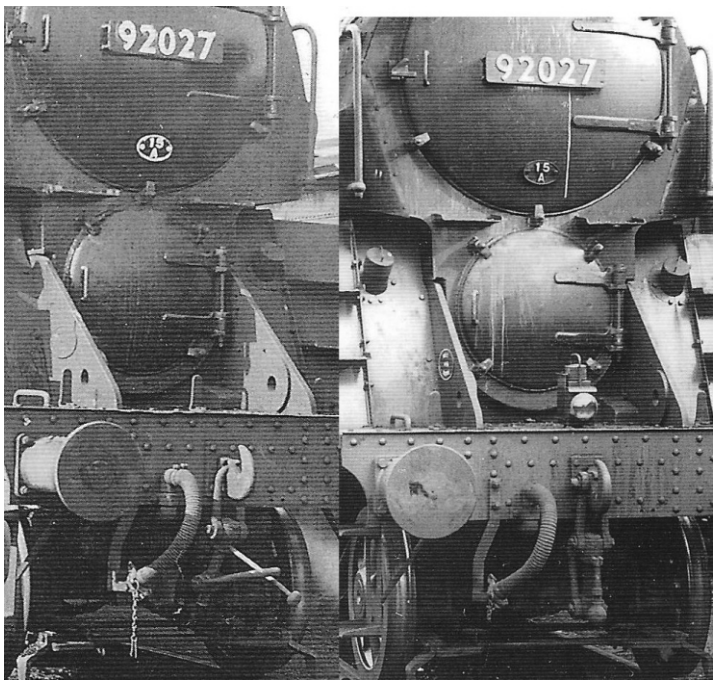


One way of stowing a long loose coupling can be seen in the shadows. The middle link is rotated and holds the bottom link up at the top end of the middle link trapped there by the top link.

Other ways of stowing a screw coupling:
1- where the coupling loop is retracted
2- where the coupling loop is folded backwards and upwards
3- where the bottom loop has been hooked over the coupling hook.

Two Bulleid Pacifics with three link screw couplings - even on the Merchant Navy tender. The shackled top link is inflexible but the third loop provides lateral movement.

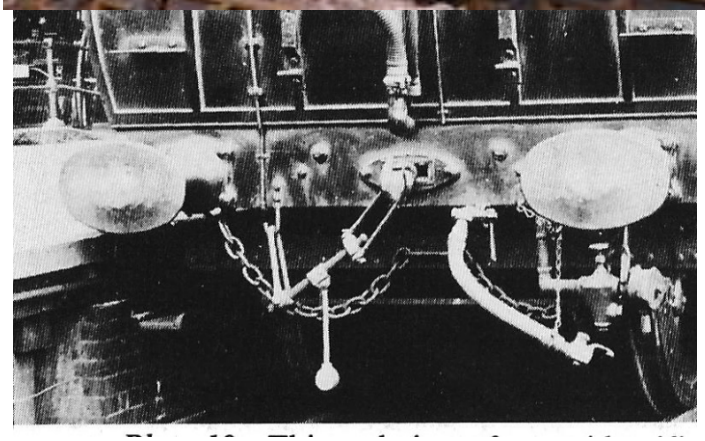
On the BR Riddles 9F some of this class had a similar coupling. But not as far as we are aware on the tender. Locomotives first allocated to the western region (or those built at Swindon?) possibly had loose top link couplings and a hook on the buffer beam - keeping a GWR tradition. Others have the common two link shackled screw couplings.



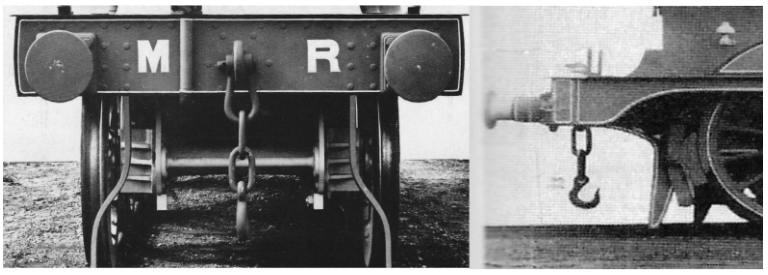
Clearly coupling arrangements could change over time. In two years this Crosti boilered 8F 2-10-0 changed from a shackled to a looped through coupling (1955 to 1957)

A GWR King showing the common way that screw couplings were stowed. Note the vacuum pipe and steam heating pipe (?) to the left of the coupling hook.

However on this "2251" class engine a steam heating pipe lies to the right of the coupling hook and the screw coupling has been stowed to the left.

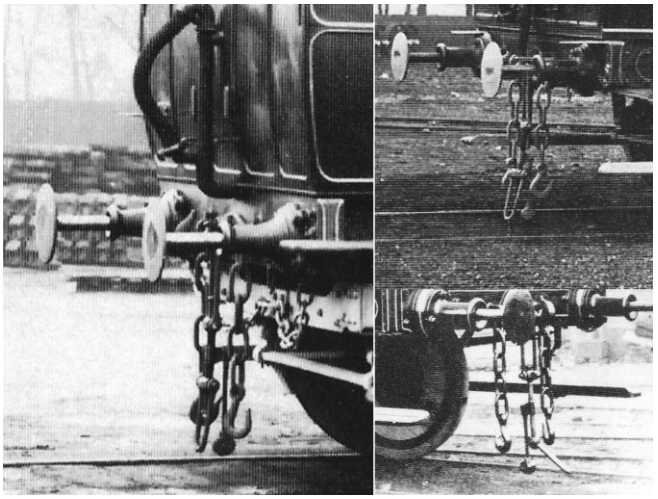


Other railways stowed the screw coupling on a hook to one side as well as the GWR. This is a Midland Railway coach. The visible small chains are attached to the bogie. Note the use of twin screws, the single screw arrangement appears to come later.



An early form of locomotive coupling, three shackled loose links plus a hook. At this time not all locomotives may have had a hook on the buffer beam, some just had links shackled to an eye bolt.

Presumably the hook was used to attach to the top link of the adjacent stock.



Early photographs usually were taken with a three-quarter view hence it can be difficult to see how safety chains were applied. These are all MR coaches where a two small 5 link chains terminating in a hook were found on coaches until around 1890-1900 when they ceased to exist on new coaches. There is no evidence that shows safety chains fitted to goods stock or engines.
Note the use of two screw adjusters.

Two coaches at Butterley c.2018. On the right an old coach with "leather faced buffers as been fitted with a loop top twin screw coupling. The "Gedge" slot hook suggests this was a relatively modern fitting.
Note the adjacent coach has an early style hook with a loop top coupling which has been stowed on a side buffer beam hook under the buffer beam.

At the other end of the coach there is a loop topped coupling as there is on the other vehicle. Note the coupling is screwed tight and the tommy bar that is pivotted on the screw link has friction overcoming gravity as it is not hanging downwards.
A slot through which the coupling link is fed is distinctly oval, whereas the other coupling has a "gedge" slot.

AJA - 2018, reviewed 2022
Some of the illustrations used have been reproduced from publications or information web sites while we have concentrated the view on different coupling arrangements.