DATA SHEET

Return to index

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Title:	**AAR COUPLER CONTOUR**
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Page:	**1 of 6**

HISTORICAL

During its development years, American railroading relied upon primitive, dangerous, link-and-pin couplings to join engines and cars in train. Personal injuries were frequent. A wide variety of drawhead, pin and link designs reduced interchange to a haphazard business, complicated by thefts and losses of links and pins. More railroad coupler designs were patented during the middle years of the nineteenth century than could be discussed in the whole of this Manual. Two notable ones deserve mention -- the Miller Hook of about 1863 and the "Janney" of about 1875. The hook ends of the Miller design would engage each other no matter whether the hooks were open or closed. A gravity lock secured the hooks in closed position. The Janney was a vertical-plane, knuckle-type coupler, and the first reliable and really worthwhile improvement for freight cars. To uncouple either Miller or Janney, the trainman would raise the locks by manipulating an operating rod extending to the side of the car. The rod had to be held in raised position until the cars were separated.

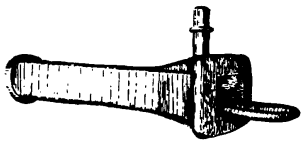


Fig. 1: Link and Pin Coupler of 1831 (NC)

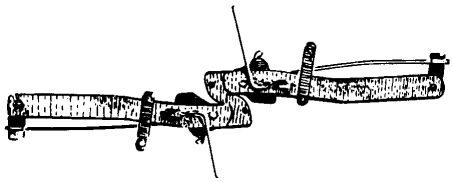


Fig. 2: Mated Miller Draw Hooks of 1863 (NC)

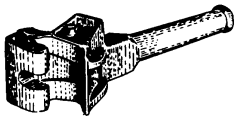


Fig. 3: Early Janney

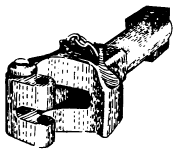


Fig. 4: Tower Coupler of 1893 (NC)

While the Miller Hook found some acceptance, particularly on passenger equipment of the Chicago, Burlington & Quincy RR, it was the Janney, first extensively used by the Pennsylvania Railroad, which became great-ancestor to the modern AAR coupler. Its slotted-face knuckle allowed intercoupling with link-and-pin types -- a mandatory requirement for this and subsequent knuckle-type couplers until the link-and-pin couplings were outlawed. Thus the important principles of inclusiveness and compatibility were established -- principles which ever since have been followed in designing railroad coupler contours. Janneys coupled together on contact, eliminating the grave dual hazard imposed when men had to step between cars to guide links manually. The "Tower" coupler, introduced in 1892, was the first fully-automatic coupler in existence up to its time. It was unique in that it provided an internal lockset feature which eliminated the necessity of holding the lock in raised position to uncouple. Another innovation was that the coupler could be unlocked and the knuckle thrown fully open by manipulation of the rod extending to the side of the car.

By 1885 there were nearly 500,000 cars in use and on them at least forty different designs of couplers, exclusive of link-and-pin couplings. A few could be intercoupled with some of the other designs, but most of them could be coupled only with those of the same design. This serious situation compelled the Master Car Builders Association to take vigorous action toward a solution of the problem. An extensive program of tests was instituted, culminating in the adoption of the Janney-type coupler as MCB Standard. The first contour, that of 1889, Fig. 5, was improved in

HISTORICAL - continued

1904 to increase strength and then remained unchanged for many years. The 1904 design appears as Fig. 6.

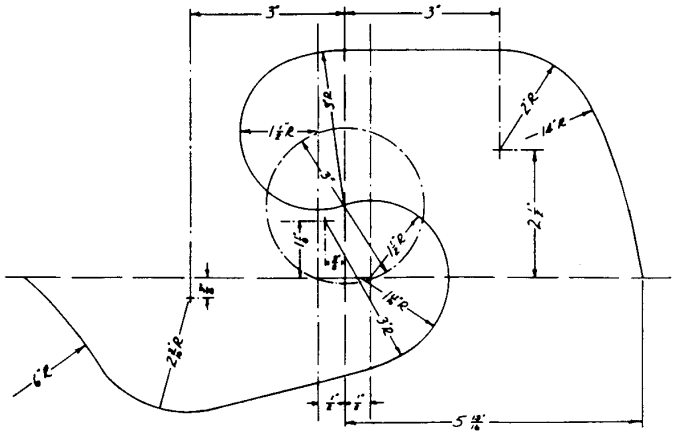


Fig. 5: Janney Coupler Contour of 1889 (MCB, redrawn)

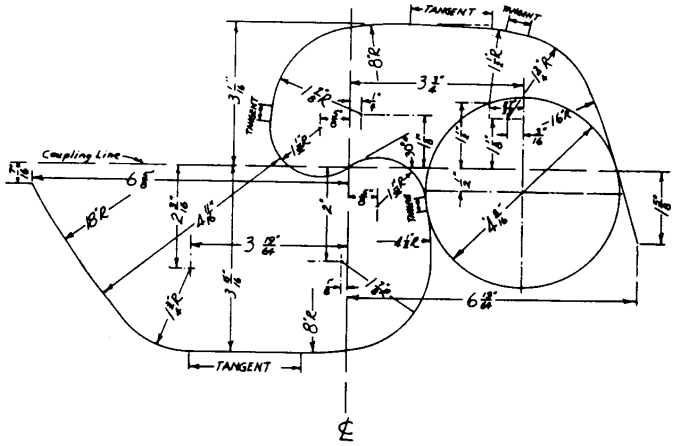


Fig. 6: MCB Coupler Contour of 1904 (MCB, redrawn)

Despite this and subsequent efforts by MCB Committees, coupler problems did not appreciably diminish. However, through the persistent efforts of the MCB, including many investigations and exhaustive road-service and laboratory tests conducted cooperatively with the various coupler manufacturers, a single standard coupler design was finally adopted in 1916. This coupler was identified as the Master Car Builders' Standard Type D shown in Fig. 8. Contour was either the No. 5 (similar to "1904") or the straight-line design designated as No. 10. The latter, shown in Fig. 7, was adopted as standard in 1918. The Master Car Builders Association was succeeded by the American Railroad Association in 1918**,** and its name was changed to Association of American Railroads in 1935.

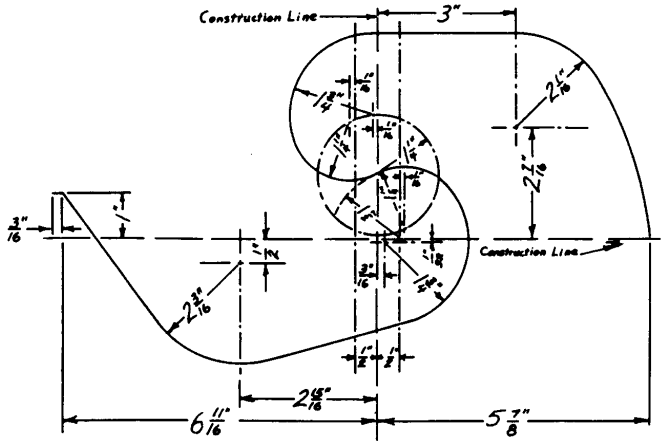


Fig. 7: MCB No. 10 Coupler Contour (MCB, redrawn)

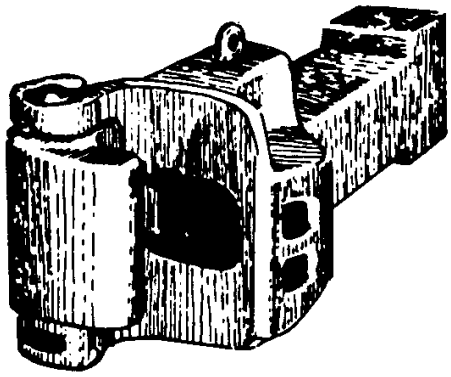


Fig. 8: MCB Standard D Coupler of 1904 (NC)

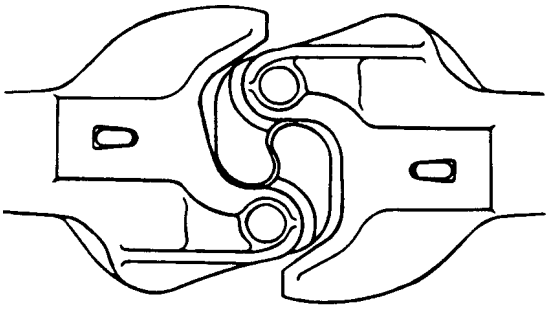


Fig. 9: Mated MCB Couplers of No. 5 Contour (left) and No. 10 Contour (right) illustrating compatibility.

As Fig. 9 further illustrates, the key words continued to be "compatible" and "inclusive" while coupler standards were developed and refined. The interlocking ability of contours MCB 5 and MCB 10 carried over to later development of the ARA and AAR couplers which, for some time, regularly intercoupled with the older MCB designs.

The standard E coupler, the basic, general service appliance, is provided with an improved No. 10 contour identified as No. 10A. The type F and H coupler contours differ in some respects from the 10A and also differ somewhat from each other. All, however, employ the straight-line principle which insures longitudinal alignment of mated couplers in buff and provides maximum column strength, the better to sustain heavy compressive forces in train service. All AAR Standard Couplers will intercouple with each other, a mandatory requirement. However, none of the operating parts of any one design are interchangeable with those of any other. Provision is made in the design of parts to prevent wrong assembly.

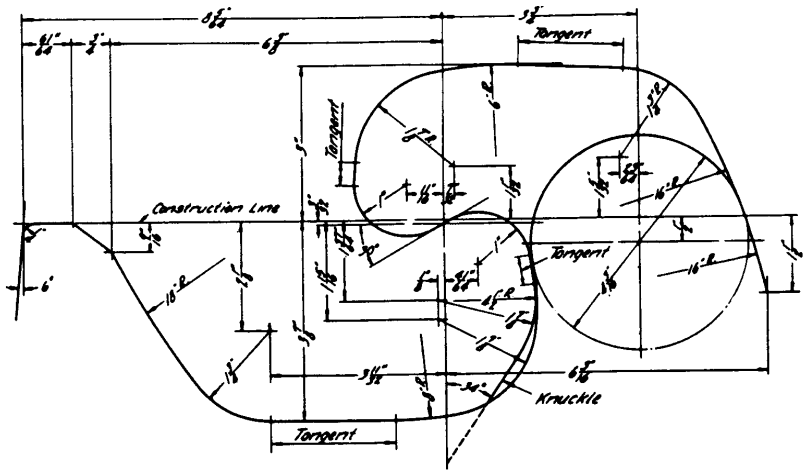


Fig. 10: AAR Standard No. 10 Contour (AAR)

TYPE E COUPLER

The Type E coupler represents a substantial improvement over the original standard Type D coupler. This design was approved as AAR Standard in 1932 to supersede the Type D, for which after 1934 only repair parts were manufactured. It offers many operative and dependability advantages over Type D, plus greater strength in the side wall of the coupler head and reinforcement of the front or buffing face of the drawhead. It may be interchangeably fitted for either top operation or rotary bottom operation as preferred, the latter being more widely used. The contour lines of the Type E were improved in 1934 to the No. 10A which design has been retained since.

PASSENGER TIGHTLOCK COUPLER, TYPE H

The Type H Tightlock coupler was advanced to AAR Standard in 1947 as an outgrowth of developments begun in 1936. This development was prompted by the construction of high-speed, lightweight passenger equipment and the desire to minimize objectionable shocks and noise attributable to free slack in the contour of then-standard couplers. The Type H coupler was designed to eliminate contour slack and, by means of interlocking wings provided on the sides of the head, prevent relative vertical movement between mated couplers. This feature also provides safety in event of derailment. Certain mating surfaces are machined in order to obtain desired tight-fitting conditions.

FREIGHT INTERLOCKING COUPLER, TYPE F

The development of the Type F Interlocking coupler, begun in 1943, was to obtain in a freight coupler the various safety features and other benefits provided by the Type H Tightlock coupler in passenger service. The design was made final and adopted as AAR Alternate Standard in 1954. Interlocking wings similar to those of Type H are provided and in addition a central safety shelf is positioned beneath the head to support a mated coupler in the event of shank or draft-gear failure, a major safety factor since pulled-out drawbars may bring about serious derailments. Type F Couplers are manufactured primarily for bottom-rotary operation, but can be furnished fitted for top operation when required and so ordered. Acceptance to date has been somewhat limited, but more general use is expected. The contour of the Type F coupler provides 3/8" free slack between like mated couplers, about half that of mated E couplers. This is the least amount possible to insure positive locking and negotiating of minimum track curves. No machining is required. Reduced slack restricts vertical contour angling; therefore, a flexible coupler carrier is necessary to permit negotiating of vertical curves and classification humps.

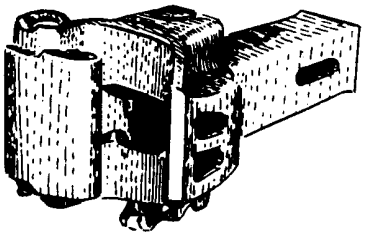


Fig. 11: AAR Standard E Coupler (NC)

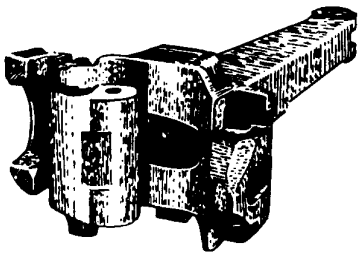


Fig. 12: AAR Standard Type H Tightlock Passenger- Service Coupler

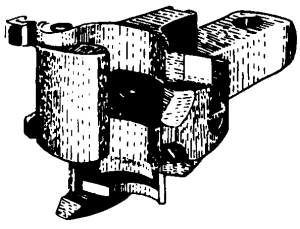


Fig. 13: AAR Alternate Standard Type F Interlocking Coupler (NC)

DEEP-KNUCKLE TRACTION COUPLER

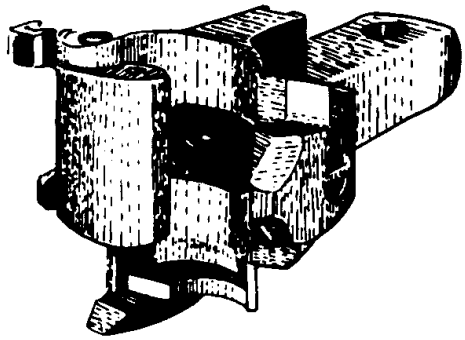


Fig. 14: Traction Coupler with 16" Knuckle

Short-radius curves demand lateral movement of couplers, a requirement carried to the extreme on the interurban electric railroad. Various Illinois, Indiana, Ohio and Wisconsin companies adopted a design based on the MCB coupler. It was shank-pivoted, equipped with draft gear in the shank and secured near the drawhead to a carbody-mounted radial carrier track. A vertically-sprung pocket ran on the carrier. In some cases, the mounting placed the drawhead below interchange height, and the need for occasional handling of an interchange car called for compensating increase in knuckle depth. Possible variation in platform height of cars made a similar demand. Permitted vertical movement combined with rough roadway to introduce the danger of vertical slipover of knuckles. This risk plus the other factors enumerated led the traction lines to choose a knuckle extending to a 16" depth. This variant was usually produced on an MCB contour: of twelve examples inspected, ten were on a modified MCB No. 5 contour and the other two on an modified MCB No. 10 contour.

Modification usually consisted of increasing the breadth of the vertical plane at the end of the thumb of the drawhead, and in most instances adding a broad, vertical buffing surface to the knuckle side of the coupler head. These buffing surfaces would mate when cars were coupled, relieving the knuckles of buffing stress. As suggested by Fig. 9, such couplers would satisfactorily mate with interchange types.

Merchandise dispatch motors of the Chicago, North Shore & Milwaukee RR were equipped with a special coupler having buffing surfaces and a knuckle 14" deep, with the whole extension below the drawhead. Passenger equipment on this line carried couplers mounted below interchange height. If it became necessary for a box motor to operate in train with passenger cars, knuckle depth was available.

KNUCKLE DEPTHS

Firm information as to knuckle depths over the years of MCB, ARA and AAR couplers is not fully available. At the date of preparing this sheet, standard knuckles are 11" deep. In 1904 the 9" depth was standard, and old drawings suggest that this standard had been held since at least 1889. The possibility of lesser depths in earlier years should not be discounted. For special purposes, knuckles as deep as 19" have been cast.

VARIATIONS ON BASIC CONTOURS

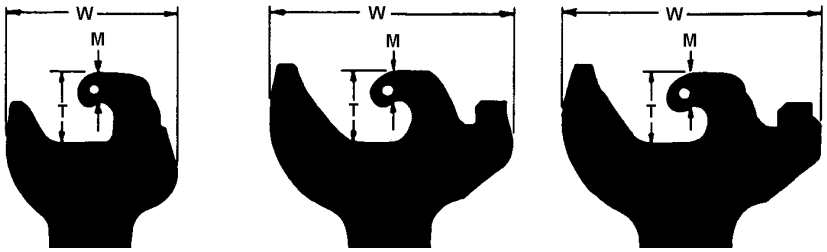
Three-quarter-size MCB-type couplers are available for special applications, such as to rapid-transit cars. In some cases these have pin-and-jack tightlock mechanisms and under-mounted stud contacts for automatic electrical coupling of control-communications wiring. The half-size MCB coupler is available for non-interchange (sometimes called "captive") applications.

NARROW GAUGE APPLICATIONS

Since most narrow-gauge roads are (and were) of the "captive" type, coupler standards were largely road-determined. The two-foot-gauge Monson RR operated with links and pins into the 1940's. On other Maine two-footers, knuckle-type couplers were required by regulating bodies. The Wiscasset, Waterville and Farmington used a three-quarter-size MCB No. 5. The same coupler was used on the three-foot-gauge Southern Pacific Co, line. The Denver & Rio Grande Western and Colorado & Southern narrow-gauge roads used full-size couplers. Diesels lately delivered to the Nacionales de Mexico and Coahuila & Zacatecas three-footers in Mexico were fitted with full-size AAR couplers. The East Broad Top used full-size couplers in order to accept standard-gauge cars in interchange through exchange of trucks. The Newfoundland Railway (CNR, 3'-6" gauge) long used a coupler of MCB profile, three-quarter-size. At mid-1966, however, most revenue cars were equipped with the full-size E coupler, and the road is preparing to accept mainland cars in interchange via car ferry and truck exchange.

COMPARISON

This drawing offers simplified silhouette views of three important coupler heads, all based on the AAR 10-A Contour. These dimensions will be helpful in understanding the relative sizes of the three couplers.



	Type E	Type F	Type H
Extreme Width of Coupler Head (W)	**14 - 17/64"**	**22 - 19/32"**	**23 - 1/16"**
Knuckle Thickness, Pulling Face (coupling line) to Buffing Face (K)	**3 - 3/32"**	**3 - 1/4"**	**3 - 3/8"**
Depth, Buffing Face of Knuckle to Buffing Surface of Throat (T)	**6 - 7/8"**	**6 - 13/16"**	**6 - 3/4"**

ACKNOWLEDGEMENTS

National Castings Division, Midland-Ross Corporation, authorized reproduction of certain drawings marked (NC) from a copyrighted booket "Railroad Couplers", produced by National Malleable and Steel Castings Corporation, now out of print. The Mechanical Committee of the Standard Coupler Manufacturers supplied drawings from the archives of the Master Car Builders Association; these are designated (MCB). The NMRA is particularly grateful to the Mechanical Committee of the Standard Coupler Manufacturers for its work on the text and the assistance provided by Messrs. W. Earl Keef, formerly of the Wiscasset, Waterville & Farmingfon RR, Lee Klaus and John Maxwell of the NMRA Prototype Information Committee, Robert B. Browne. A. V. Johansson, Howard Hicks and J. C. Noble.