

A MODELER'S GUIDE TO PASSENGER CAR TRUCKS OF THE 20TH CENTURY



RICHARD BALE PROVIDES A
COMPREHENSIVE REVIEW OF TRUCK
EVOLUTION ...



EXCEPT FOR THE BODY, the largest, heaviest, and most expensive components of a railroad car are the trucks. Since they incorporate the braking system, the trucks also represent the most important safety feature on a car.

Prior to Reconstruction following the Civil War, freight and passenger cars rode on trucks that were similar and often identical.

With the introduction of heavier passenger cars and increased train speed, car builders began to address the need for specialized passenger trucks to provide a safer, more stable ride. Six-wheel trucks seemed to be the answer.

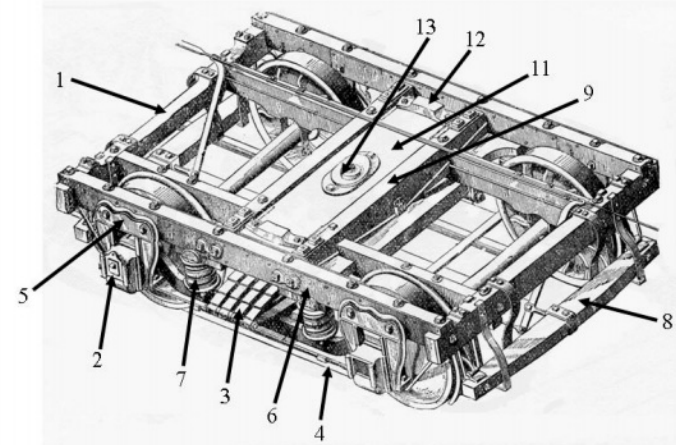
Spreading the weight over 12, rather than eight, wheel bearings on a longer wheelbase was thought to impart less motion to the car and theoretically provide a smoother ride. Improved safety was also expected since brake shoes could be mounted on 12 wheels.

In addition to longer wheelbases and more wheels, among the early innovations for passenger trucks was the introduction of swing hangers and equalization. More about that later.

WOOD FRAMES

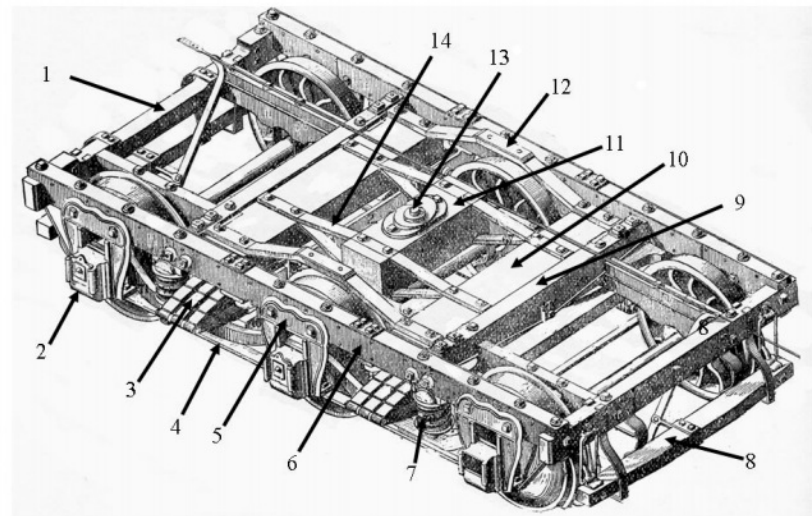
Late in the 19th century, most passenger car trucks were built with hardwood frames [1]. By the 1890s, composite construction was standard. Rods and iron flitch plates sandwiched the timber frame to strengthen it. Cast metal pedestals were bolted to the timber frame to support the axle and journal box [2].

Four-wheel wood framed passenger truck—Circa 1880



- | | | |
|-----------------------------|--------------------|------------------------|
| 1 Wood frame end sill | 6 Wood frame | 11 Center bearing beam |
| 2 Journal box | 7 Equalizer spring | 12 Side bearing |
| 3 Elliptical bolster spring | 8 Brake beam | 13 King pin |
| 4 Equalizer | 9 Transom | 14 Side bearing bridge |
| 5 Cast pedestal | 10 Spring beam | |

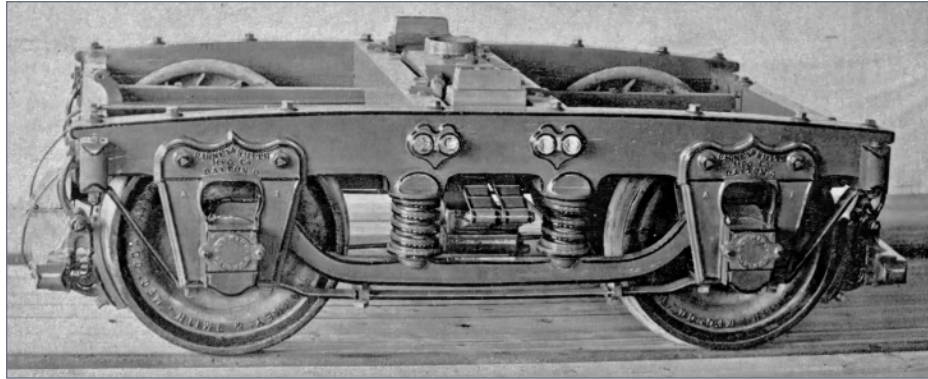
Six-wheel wood framed passenger truck—Circa 1880



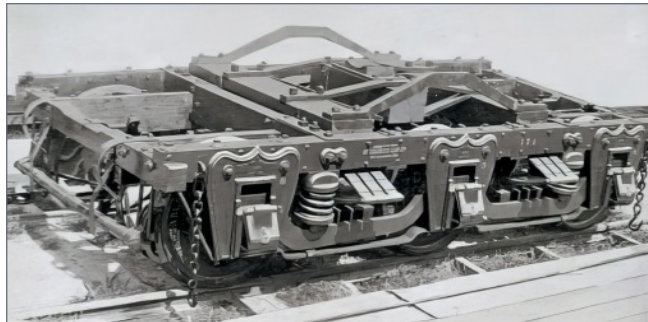
1. Schematics for early two- and three-axle wood frames.

FABRICATED STEEL FRAMES

By the late 1890s, passenger cars had grown to such proportions that wooden-beam trucks were inadequate and unsafe. Around the turn of the century, builders began using rolled channels and plate steel to fabricate passenger truck frames. Most of the other components, including the bolt-on pedestals, remained the same [4, 5].

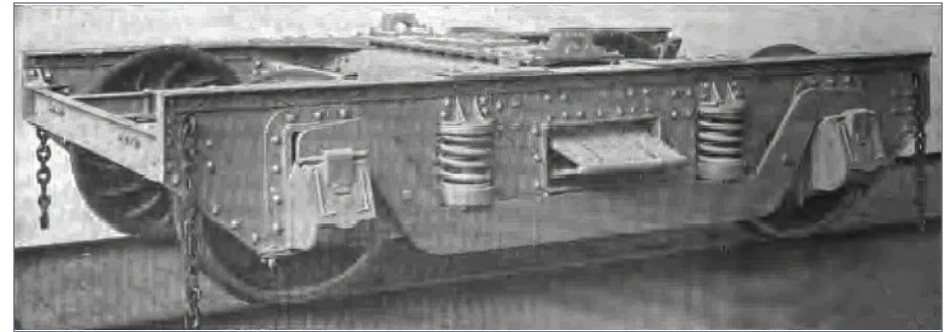


2. This wood-framed truck from the early 1890s has a two-section elliptical bolster spring, drop equalizer with coil springs, and cast pedestals bolted to the side frame. Below the equalizer is a stabilizing pedestal tie-bar.

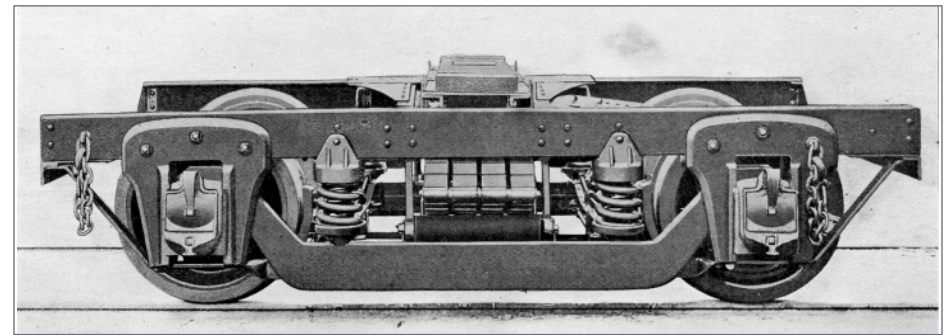


3. This six-wheel wood-framed truck from the 1880s has separate cast pedestals that held the vertically sliding journal boxes. The tie bar,

visible below the drop equalizers, links and helps stabilize the pedestals.



4. Barney & Smith produced this steel-fabricated truck in 1903. Note the outside drop equalizer.



5. The frame of this four-wheel truck from the transitional wood-to-steel car era was fabricated using a rolled-steel channel. The inside swing bolster hangers supporting a four-section elliptical spring package are visible along with bolt-on pedestals and an inside drop equalizer. ACF built this truck circa 1912.

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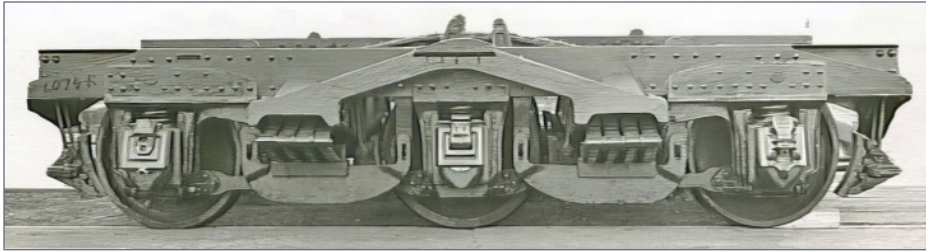
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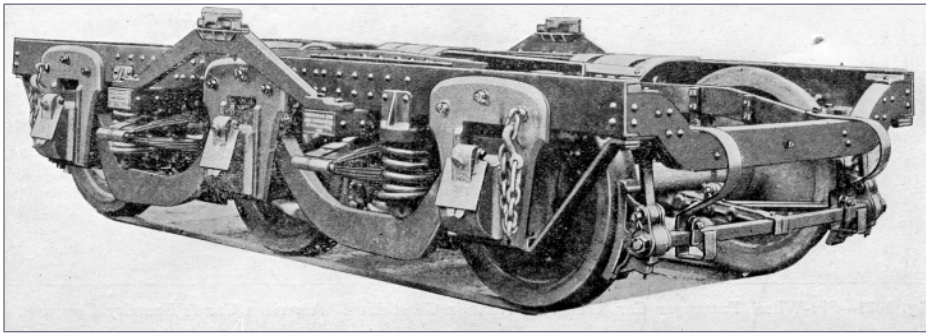
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6. The frame of this Pennsylvania Railroad class 3D-SP2 six-wheel truck from the early 1900s was built-up from steel shapes.

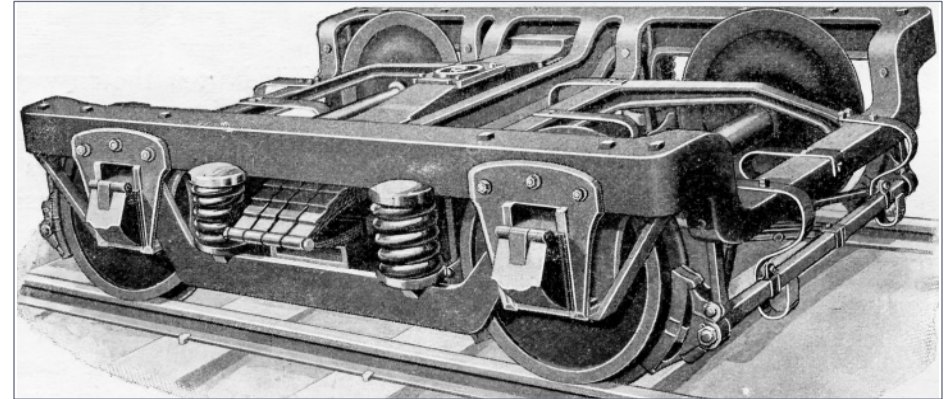


7. ACF constructed the frame of this six-wheel truck using rolled steel stock. Note the pedestals bolted to the channel frame, plain bearing journal boxes, drop equalizers, and car side-bearing brackets.

CAST STEEL FRAMES

In 1904, the Big Four Railway, a subsidiary of the New York Central, ordered four-wheel trucks with a one-piece cast steel frame for a group of baggage cars. A one-piece cast frame provided absolute rigidity; a guarantee that the frame would remain square and that the wheelsets would always run true. Cast frames were developed both with and without integrally cast pedestals; the latter allowing frugal railroads to recycle individual pedestals from older trucks.

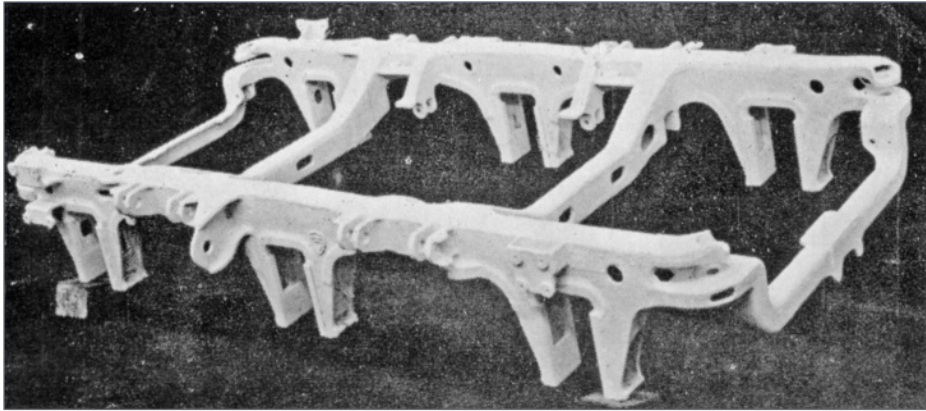
The 1907 introduction of the first production-model steel car signaled the end of wood-framed trucks on new passenger equipment. The steel-age introduced the use of new materials but did not alter the basic design of trucks.



8. A pre-WWI example of a one-piece cast frame with separately cast bolted-on pedestals. This four-wheel truck has four-section elliptical bolster springs and drop equalizers.



9. This Pullman six-wheel truck from the early heavyweight period utilized a one-piece cast frame with separate bolted-on pedestals. The looped strap-springs mounted on the dropped end sill support the floating brake beam.



10. A one-piece frame for a six-wheel truck with integrally cast pedestals produced by Commonwealth.

With cast steel frames, cast pedestals, equalizing bars, springs, spring planks, generators, wheelsets, and brake rigging; trucks became excessively heavy. The Big Four trucks weighed 6-1/2 tons each.

In the era of the heavyweight passenger car, the weight of four-wheel trucks had grown to 7-1/2 tons each, with six-wheel trucks weighing as much as 10-1/2 tons. Even in the lightweight era that began in the mid-1930s, trucks weighed nearly 10 tons each – amounting to one-third of the car's total weight.

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GENERAL STEEL CASTING CORPORATION

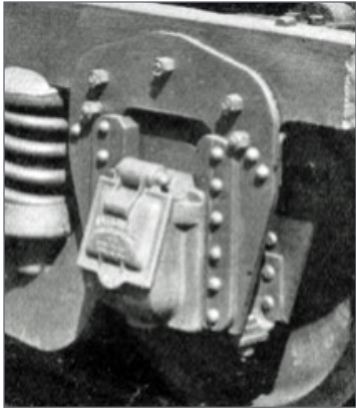
The Commonwealth Steel Company was established in Granite City, Illinois in 1901. Over the next several years it became the major supplier to the railroad industry of both simple and complex steel castings. In 1928 the Baldwin Locomotive Company and the American Locomotive Company, formed General Steel Casting Corporation (GSCC). The following year, GSCC acquired Commonwealth. GSCC continued to identify and market castings under the Commonwealth brand name. By the end of the 20th century, most of the nation's passenger equipment was riding on trucks produced by GSCC, or on truck frames cast by GSCC to customer specifications. Car builders added brake equipment, bearings, and various ride-control devices of their choice to the GSCC casting. This resulted in a vast array of hybrid trucks beyond classification.



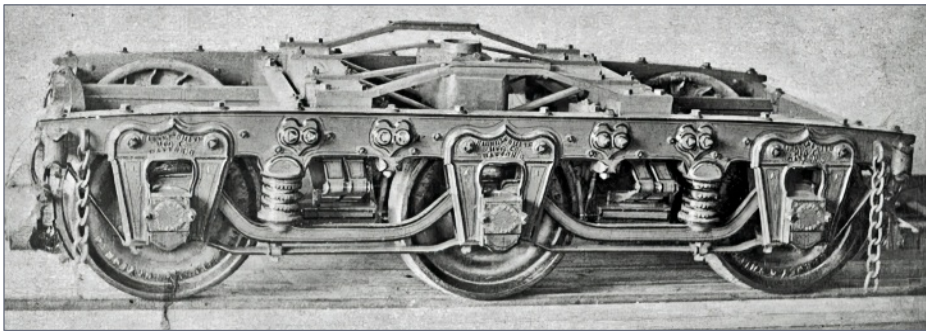
PEDESTALS

The pedestal holds the journal box in place horizontally but allows vertical movement. Individual pedestals, cast in the shape of an inverted letter "U", were bolted to the side member of the truck frame. The two downward projections of a pedestal are called legs, and the space between them a jaw, which is closed at the bottom by a pedestal tie bar [13].

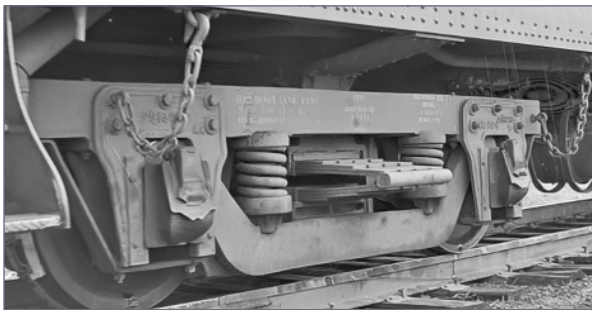
With the development of the one-piece cast truck frame, the pedestal was integrally cast with the frame, which ensured truck alignment. To minimize wear by the constant vertical movement of the journal box, hardened steel liners are fitted to the inside of the pedestal jaw.



11. Closeup of a pedestal.



12. This six-wheel truck features individual cast pedestals bolted to the steel-clasped wood frame. Details include slender drop equalizers with coil springs, pedestal stabilizing bars below the equalizers, and car side-bearings. This truck was produced by Barney & Smith in the 1880s.



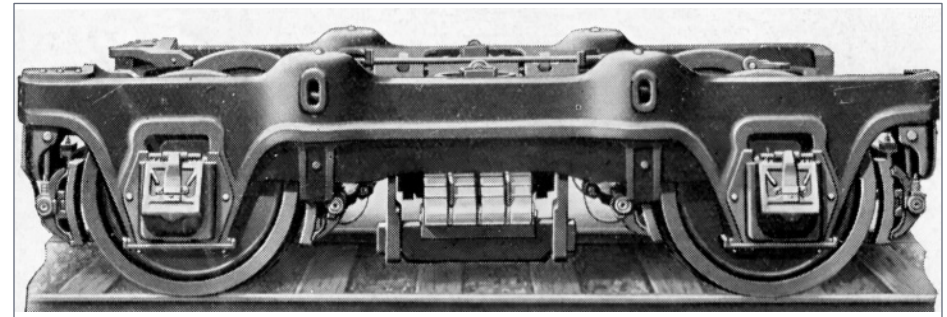
13. A heavy tie bar from the corner of the truck frame to the bottom of the pedestal helped stabilize bolt-on pedestals.

EQUALIZERS

A major advance in truck design introduced in the 19th century was equalization. A steel lever, or equalizer, connected the axles, so a bump received by one wheelset was transferred to and partially absorbed by the others. Although demonstrated in the 1840s, the equalizer was rarely applied before the 1870s, when it subsequently became a standard in truck design.

Three forms of equalizers became popular. Straight equalizers are mounted internally, and for modeling purposes are generally not visible [14]. An advantage to straight equalizers is easy access to brake shoes and other components for maintenance.

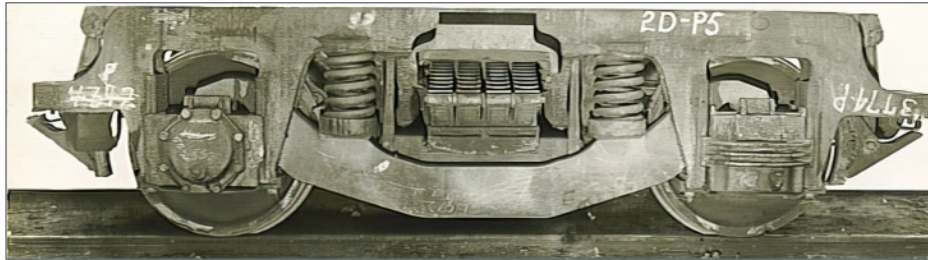
The most common type of equalizer is an inside drop equalizer [15]. Less common is a double outside equalizer, in which the outer member can be seen resting on the top of the journal box [18]. Drop or bottom equalizers on six-wheel trucks consist of a pair of dogleg members looped between the journals on each axle [24].



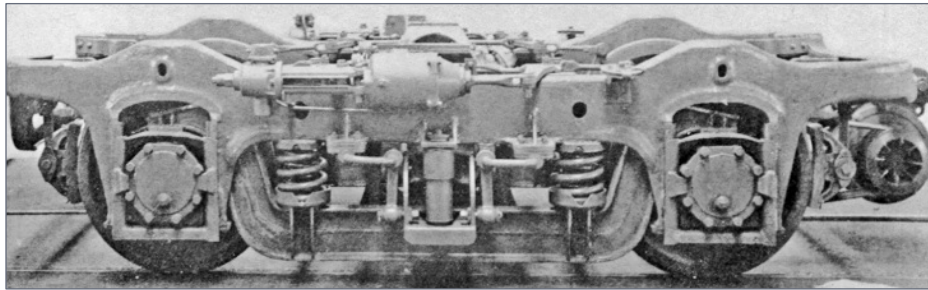
14. Built by GSCC in the late 1920s for heavyweight coaches, this four-wheel truck has straight equalizers hidden behind the frame. The two equalizer springs are housed inside the blisters on the side of the frame. Note the plain bearing journals, pedestal liners and the swing hangers supporting the four-section elliptical bolster spring.



Wheels, axles, bearings, and equalizers represent unsprung weight. To lighten them while still maintaining strength, some drop equalizers were forged with an I-beam cross section [16].



15. This Pennsylvania Railroad class 2D-P5 truck from the early 1930s has an inside drop equalizer. The brake beam is supported by the slightly extended end sill. Free-standing trucks show considerable open space above the journal box since they are not supporting the weight of a car.



16. To reduce unsprung weight, the equalizers on this all-coil truck were forged with an I-beam cross section. A Monroe automotive-style hydraulic shock absorber is in the middle of the truck. Pullman built the truck in the late 1930s for the Chicago, Milwaukee, St. Paul & Pacific Railroad.

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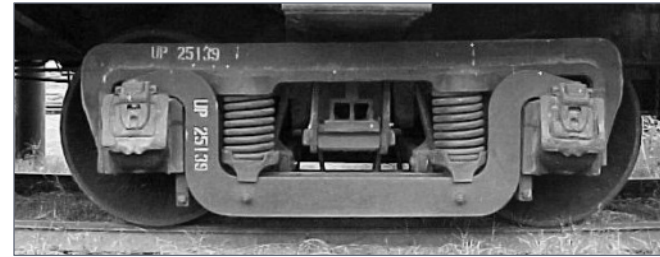
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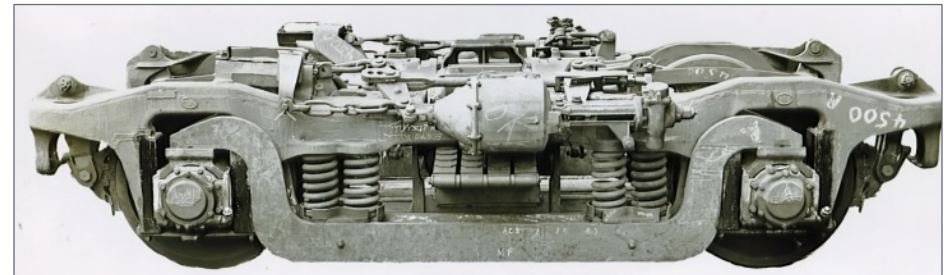
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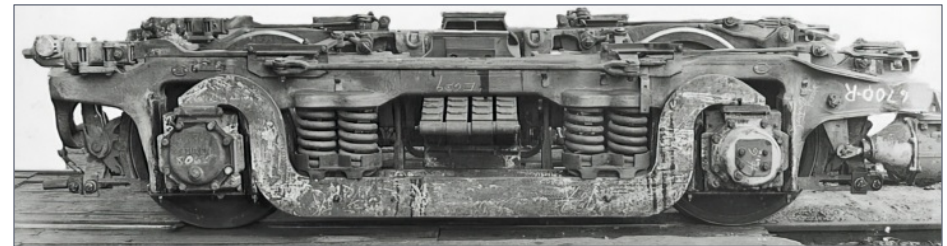
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17. Outside drop equalizer on a heavyweight Union Pacific truck with plain journal bearings.



18. This Pennsylvania Railroad class 2D-P6 truck has double drop equalizers with the outside member resting on the journal boxes. The air brake cylinder is mounted on the side of the truck frame. This truck was used on PRR's Keystone Tubular Train built by Budd in 1950.



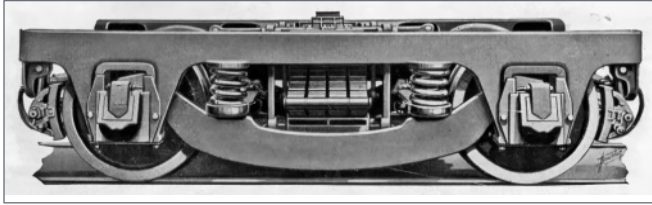
19. Pennsylvania Railroad class 2D-P7 four-wheel truck with outside drop equalizers was used on the Fleet of Modernism cars built in 1938. Due to clearance issues, some air brake cylinders were mounted on the end sill rather than on the side of the truck.

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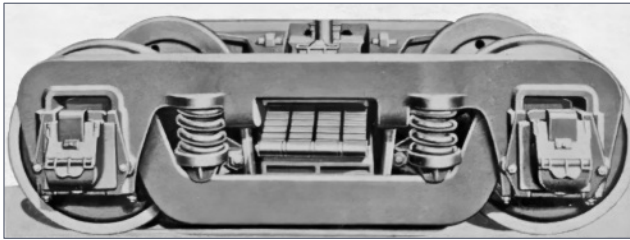
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FOUR-WHEEL HEAVYWEIGHT TRUCKS



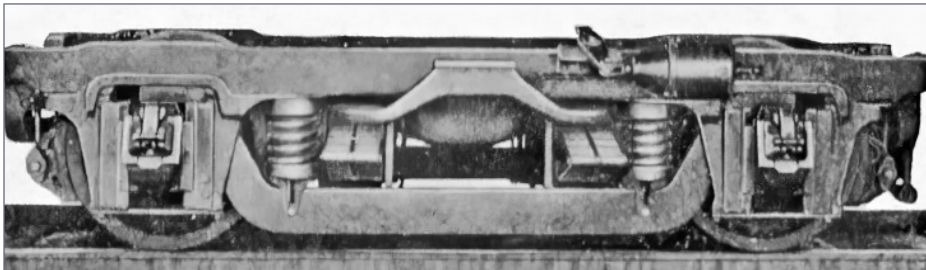
20. GSCC cataloged this Commonwealth four-wheel passenger truck in the late 1920s.

The clean design featured a graceful inside drop equalizer, integrally-cast pedestals, and plain bearing journals.

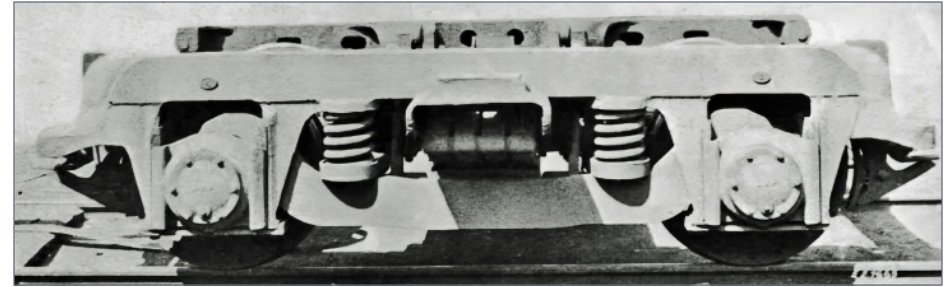


21. This basic four-wheel passenger truck from GSCC circa-1940 advertising material has plain-bearing journals, a

sizable inside drop equalizer, and four-section elliptical bolster springs suspended by inside swing hangers. This clean promotional image lacks any hint of brake components.



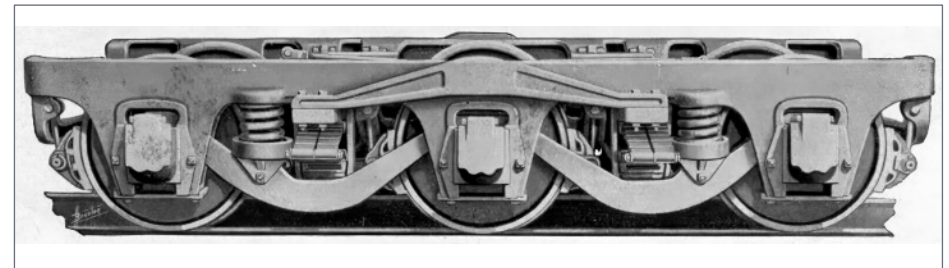
22. Heavyweight passenger trucks with plain journal bearings continued to be available into the era of lightweight cars. This image is from GSCC promotional literature dated 1940.



23. This Pennsylvania Railroad class 2D-P5 four-wheel passenger car truck is equipped with SKF roller-bearings.

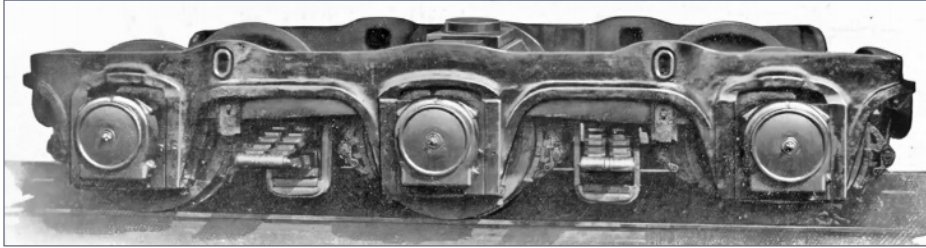
SIX-WHEEL HEAVYWEIGHT TRUCKS

The use of six-wheel trucks peaked during the era of heavyweight passenger cars. Though the trucks continued to be built in limited numbers, primarily for maintaining older equipment, they were rarely used on new equipment after 1935. There were some exceptions such as heavy diners and dome cars, including the Milwaukee Road's superdomes built in 1952.

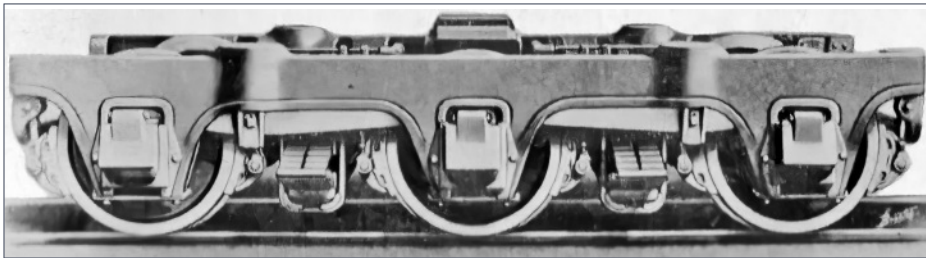


24. This classic Commonwealth six-wheel passenger car truck continued to be produced throughout the heavyweight era. Spotting features include a one-piece frame with integrally cast pedestals, fitted with plain bearing journal boxes, dogleg drop equalizers, coil equalizer springs, clasp brakes, and a car body side-bearing mounted outside the truck frame. GSCC continued to catalog this truck after it acquired Commonwealth in 1928.

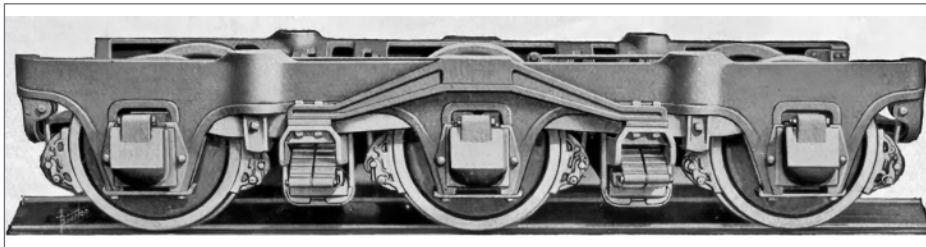




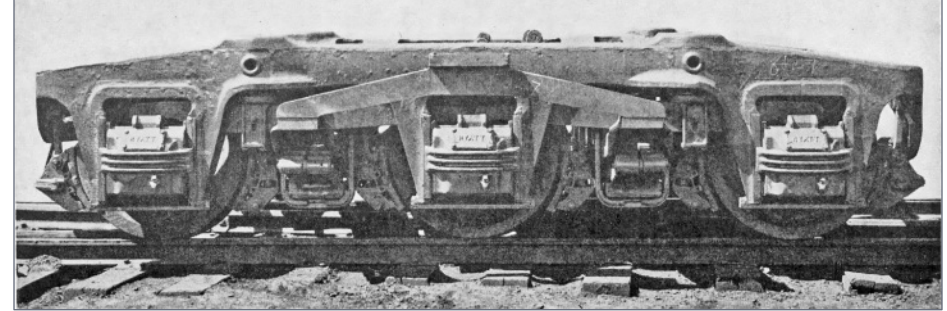
25. This six-wheel truck from the late 1920s has been fitted with a novel automatic journal lubricating system manufactured in Britain by the Isothermos Co.



26. The straight inside equalizers on this six-wheel heavyweight truck can be seen below the frame and above the elliptical springs. The equalizer springs are positioned behind the bulges in the side of the truck frame. Commonwealth offered this truck in the mid-1920s.



27. This is the same Commonwealth truck shown in [26] with a car-body side-bearing added.



28. This WWII-era Pennsylvania Railroad class 3D-P2 six-wheel heavyweight truck had heat-dissipating fins on the caps of the Hyatt roller bearings.

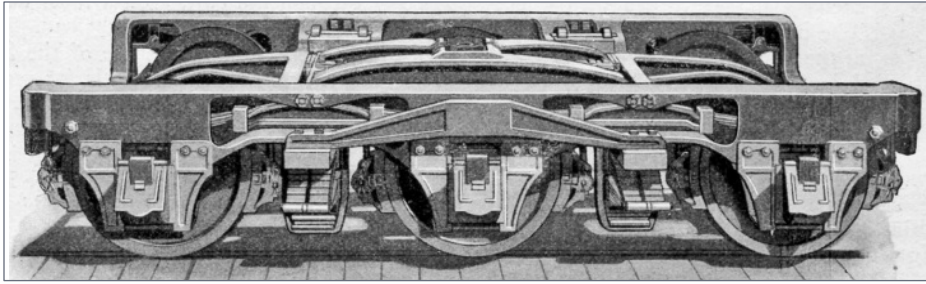
JOURNAL BEARINGS

Railroads were slow to apply expensive roller bearings to freight trucks since the cars would spend much of their time offline. That was not the case with passenger equipment, most of which operated on home rails. The actual conversion of passenger trucks to roller-bearings took an extended period, with cars regularly assigned to first-class name trains receiving priority.

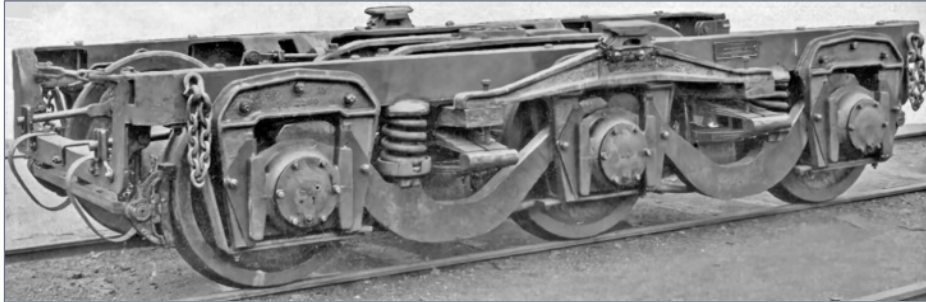
Among the first railroads to institute the change was the Pennsylvania, which began installing roller bearings in its heavyweight passenger equipment in the early 1920s.

Although most new passenger cars were built of steel, as of 1920 sixty percent of the existing American passenger car fleet was of wood construction. Until those cars were stricken from the books through attrition, most of them continued to ride on trucks with plain bearings.





29. This circa 1916 six-wheel passenger truck has plain journal bearings riding in independent pedestals bolted to the one-piece cast frame. Additional details include top equalizers, two-section elliptical bolster springs suspended from swing hangers, and a car side-bearing frame mounted on the bolsters.



30. An early example of SKF roller bearings is this Southern Pacific six-wheel truck from the 1920s. Note the individual cast pedestals bolted to the one-piece cast frame, drop equalizers, and outside car side bearings. The steel strap springs mounted on the end sill support a floating brake beam.

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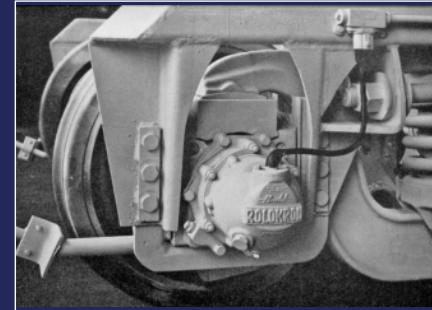


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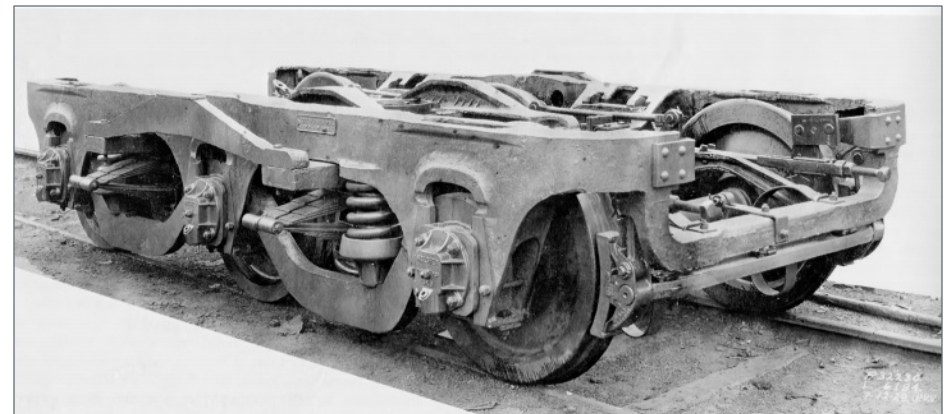
Rolokron unit.

JOURNAL CAP HARDWARE ADD ONS

Various devices were attached to journal caps including heat dissipators [28], automatic lubricating systems [25], and anti-wheel-slide sensors like this Budd Rolokron unit.



31. Rolokron anti-wheel-slide sensor.



32. The one-piece frame of this 1929 Pullman truck has integrally cast pedestals with roller-bearing journals. The strap springs supporting the brake beam are inside the dropped end sill.



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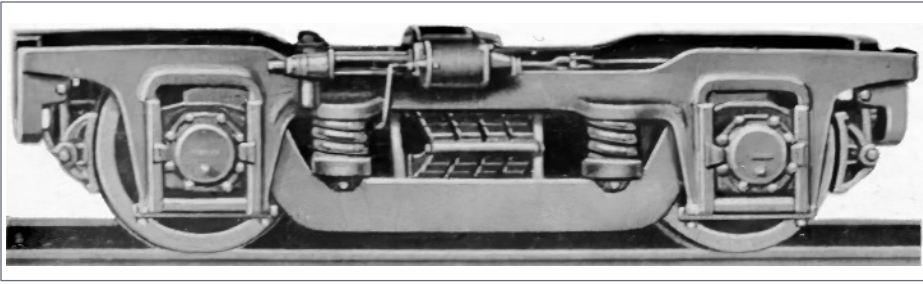
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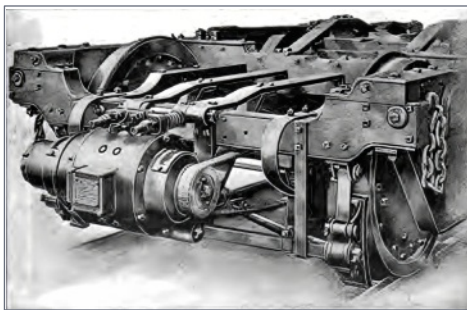


33. GSCC promotional material from the late 1930s included this Commonwealth four-wheel truck with roller bearings. The extended end sill of the cast steel frame provides convenient support for brake rigging. An air brake cylinder is mounted outside the one-piece cast frame.

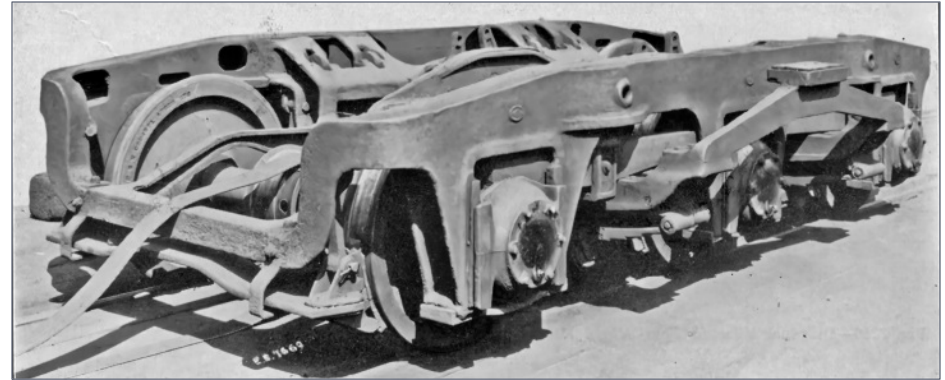
GENERATORS

Passenger cars require power for lighting and other appliances. Batteries supplied the power, and the cars' rotating wheels drove generators that recharged the batteries continuously.

Generators were mounted on the end sill of truck frames or to the underframe of the car. On heavyweight equipment, large, flat belts linked to an axle-mounted pulley usually drove generators [34, 35]. To meet the increased need for power in cars of the lightweight era, geared shafts connected directly to an axle in addition to the belts drove generators.



34. A Gould generator is mounted on the end sill of a fabricated steel truck frame from the early 1900s.



35. The deeply dropped end sill on this 1920s-era PRR six-wheel truck provided sufficient room for the flat axle belt to drive a body-mounted generator.

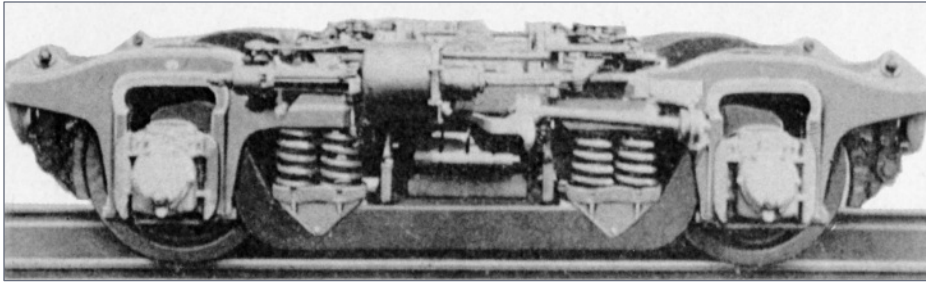


SPRINGS AND SHOCK ABSORBERS

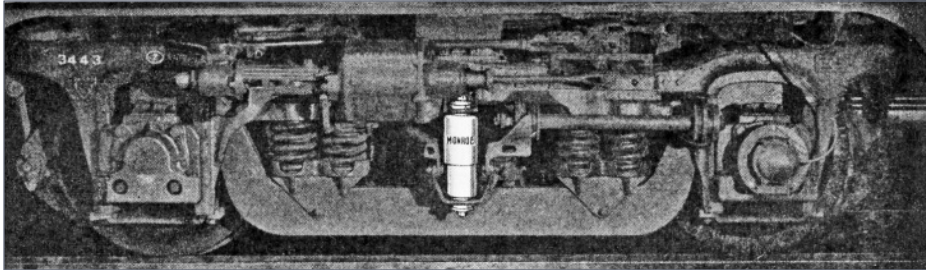
Since the 1870s, passenger truck designers have tinkered with an endless combination of elliptical and helical or coil springs. Elliptical spring packs are made up of a variety of lengths and leaves. As the leaves flex against one another they tend to be self-dampening.

Coil or helical springs provide a softer ride, but they can be bouncy and develop harmonic vibrations. To help mitigate the bounce, coil springs are generally fitted with a damping device, or a second inner coil wound in the opposite direction.

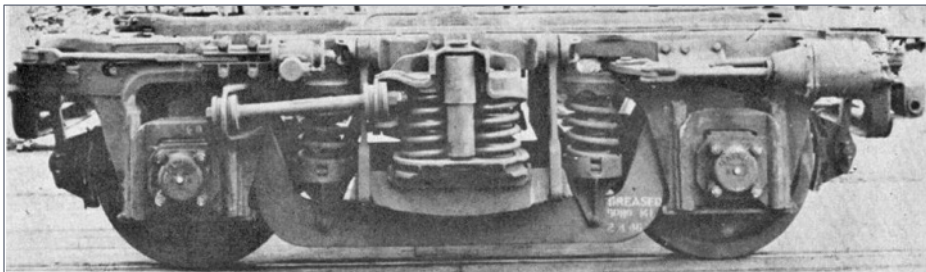
All-coil trucks required shock absorbers to dampen runaway bouncing. The two most common types were adapted from the automotive industry. Monroe tubular hydraulic shock absorbers modified for use on railroads were introduced in 1938 [37].



36. This Commonwealth four-wheel truck has four-section elliptic bolster springs and dual coil equalizer springs. This popular truck was original equipment on cars Pullman built in the late 1930s for the Baltimore & Ohio, Rock Island, New York Central, and Illinois Central railroads.



37. Promotional literature from the 1940s highlights a Monroe hydraulic shock absorber.

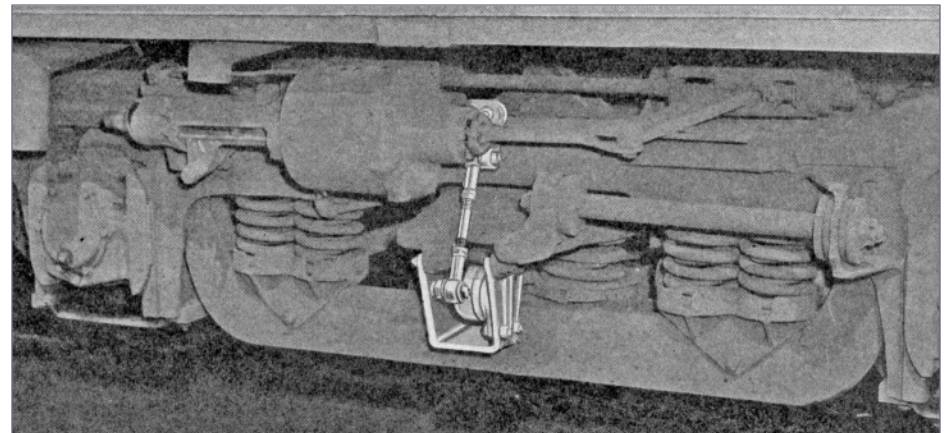


38. The New York, New Haven & Hartford Railroad ordered this all-coil spring truck from GSCC in the 1940s. Note the outside swing hanger for the bolster springs, the bolster anchor, and the Monroe automotive-style shock absorber.

Within a few years Houdaille rotary friction snubbers were also installed on railroad trucks [39]. Manufactured by the Houdaille-Hershey Corp. of Buffalo, NY, they had the advantage of being adjustable without removing them from the truck. (Houdaille is pronounced who-DIE-uh).

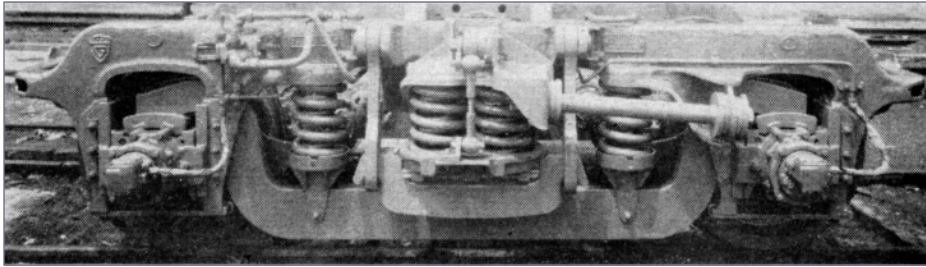


39. Close-up of a Houdaille rotary friction snubber.

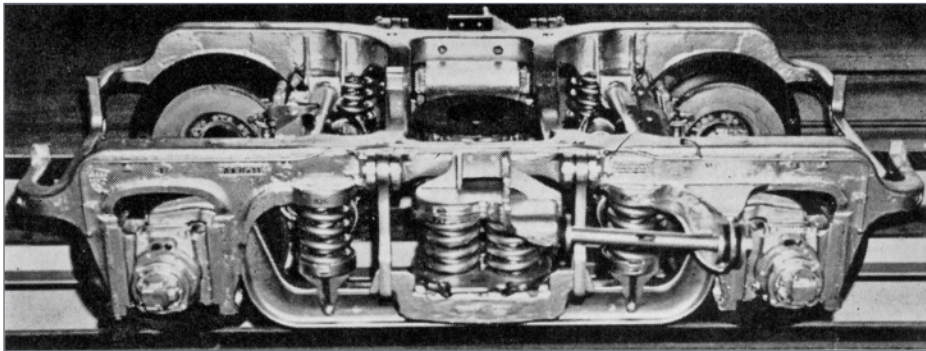


40. Sales literature from the mid-1940s highlights a Houdaille rotary friction snubber on an all-coil truck.





41. The Union Pacific specified this class 41-CUDO-11 all-coil spring truck for 118 sleepers it ordered from Pullman, Budd, and AC&F between 1949 and 1956, and 221 more it rebuilt in the early 1960s. Spotting features on the truck include an outside bolster swing hanger, a bolster anchor, Decelostat anti-wheel-slide system on the axle caps, and a Houdaille friction snubber visible between the bolster springs.

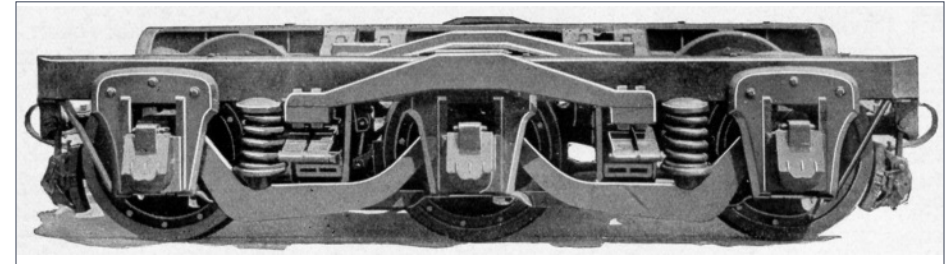


42. Identifiable components on this all-coil spring truck, cataloged by GSCC in the late 1960s, include a bolster anchor, outside swing bolster and an I-beam inside drop equalizer.

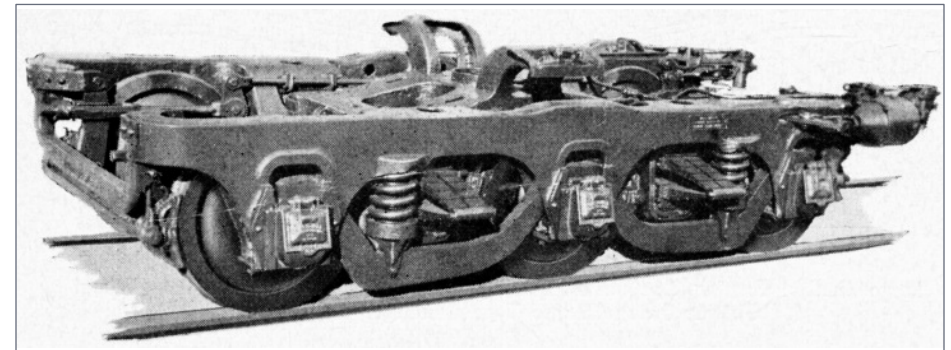
CAR SIDE-BEARINGS

Heavy car bodies supported on a small bolster plate at the center pin of a truck, can lean excessively, especially around curves. Side-bearings were developed to reduce rolling and provide a more stable footing for the car body.

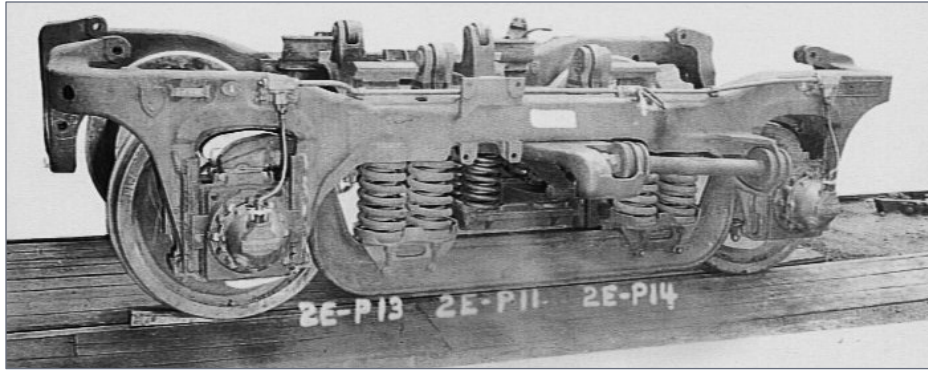
A greased pad on the underside of the car body rested on a static support at the edge of the truck [43]. The two surfaces slid against one another as the car rounded curves. In some applications a fixture with heavy rollers was mounted on the truck frame [45].



43. This GSCC six-wheel truck from the late 1920s has car side-bearings mounted on the outside of the truck frame above the elliptical springs. This common truck of the heavyweight period has bolted-on pedestals, plain-bearing journals, dogleg drop equalizers and coil equalizer springs.



44. This Commonwealth six-wheel truck from the heavyweight period has gooseneck car side bearings. Due to clearance issues, some air brake cylinders were mounted on the end sill rather than on the side of the truck.



45. The car side-bearings on this all-coil Pennsylvania class 2E-P11, P13, P14 truck are lateral rolling wheels. The anti-wheel-slip controllers are in place on the journal cap, but the brakes and linkage are yet to be installed.

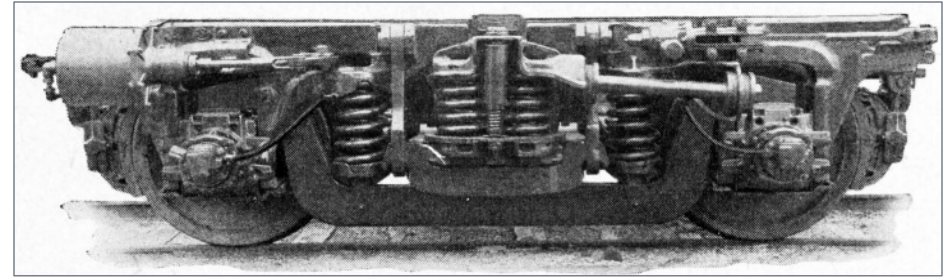


SWING BOLSTER

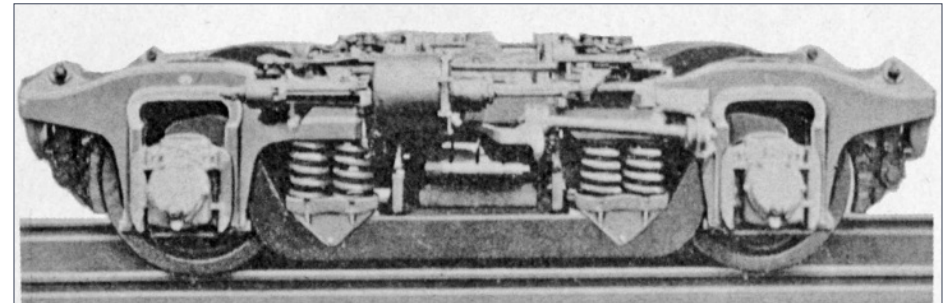
Trucks have vertical flexibility, but no lateral flexibility to absorb shock from the wheels. The development of the swing bolster, patented by Charles Davenport in 1841, was a significant advance in truck design.

In a conventional design, the bolster is connected directly to the truck frame. In Davenport's design, the bolster is connected to the wheel pieces with swing links connected to a secondary bolster, called the spring plank. This allowed the bolster to move laterally as much as one inch, which greatly reduced the transfer of any shock from the wheels to the car.

The swing links are readily visible in [46] and [48]. Davenport's swing bolster was not immediately accepted. In fact, some mechanical engineers argued that the laterally moving bolster made the ride worse.



46. This Commonwealth truck from GSCC is like those used on the *Train of Tomorrow* Pullman built for General Motors in 1946. Details visible on this side of the all-coil truck include bolster springs resting on a spring plank suspended by an outside swing hanger, a bolster anchor, Decelostat anti-wheel-slip controllers, a hydraulic shock absorber, and an air brake cylinder mounted at the end of the truck frame.



47. The inside swing hanger on this four-wheel truck is less visible than the outside type of swing hanger in [48].

SWING HANGER

Swing hangers are links that suspend the spring plank and bolster spring from the truck frame, allowing them to move laterally, thus minimizing the transfer of shock to the car body from abrupt sideways movement of the wheels.

There are two types of swing hanger: inside [47] and outside [48], with the former being difficult to see, especially on a

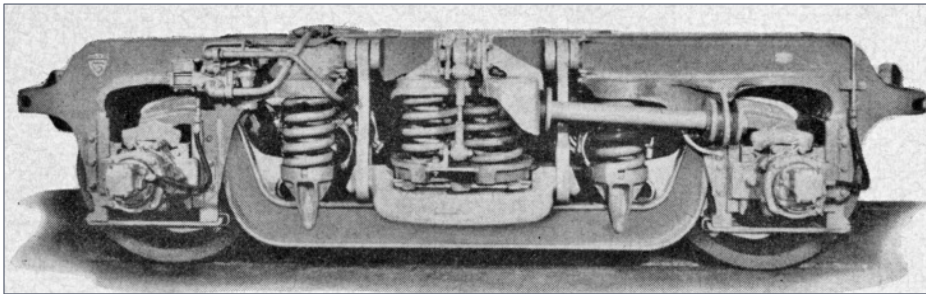
model. Inside swing hangers had been in use for decades, but outside swing hangers first appeared in 1946 on the General Motors *Train of Tomorrow* [46]. For unknown reason, the design was not commonly applied until the early 1950s.

Outside swing hangers allow for a longer truck bolster that extends beyond the side frame, which improves stability and reduces body roll. Outside swing hangers also allow the use of softer bolster springs, which further improves ride quality.

Beginning in the 1950s, most new passenger cars were given trucks with outside swing hangers. They essentially solved the problem of excessive side roll on heavy dome cars and diners.

THE LIGHTWEIGHT ERA

Despite the financial limitations of the Great Depression, the American railroad industry managed to reinvent itself during the 1930s. With the promise of modernization by the fledgling diesel locomotive, passenger car builders utilized the perfection of spot welding and modern materials, including aluminum and stainless steel, in the development of lightweight passenger cars.



48. The outside swing hangers are readily identified on this class 41-CDO-11 four-wheel truck. The Santa Fe ordered this truck on more than 50 lightweight sleepers Pullman built in the late 1930s and early 1940s. The ATSF also ordered this truck on 55 cars from Budd and ACF during the post-war years.

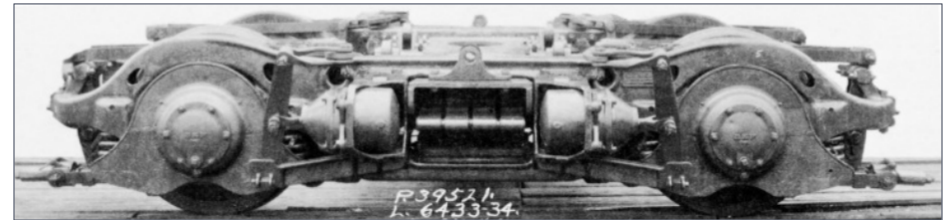
Lightweight cars required a new type of truck, the focus was on four-wheel trucks for faster, lighter passenger trains. Except for articulated cars and some heavy diners and dome cars, six-wheel trucks were seldom used on new lightweight passenger cars.

Other than the introduction of bolster anchors and the extensive use of outside swing hangers, the design of four-wheel passenger trucks during the lightweight period was active but hardly revolutionary. There was an abundance of new designs, but the fundamental difference from one lightweight truck to the next was a matter of size, shape, and arrangement of the basic components.

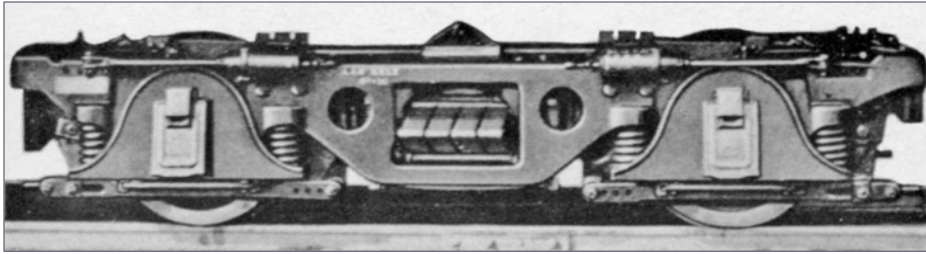
The triple-bolster truck was an exception. It was an expensive and complicated attempt to eliminate the need for heavy equalizers. The Pullman Company's version of a triple-bolster truck had wing-like pedestals that looked like Napoleon's hat [50].

Coil springs were located at each end of the pedestal. The heavy equalizer and its sizable chunk of unsprung weight were eliminated.

The design offered a soft ride, but the trucks tended to get out of tram and weave or hunt. The addition of bolsters in 1941 corrected the problem. Triple-bolster trucks did not gain wide acceptance.



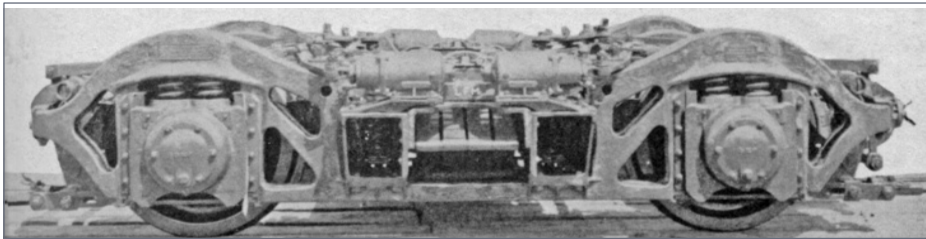
49. The Locomotive Finished Material Co. produced this triple-bolster truck in 1936 for the Illinois Central's Pullman-built *Green Diamond*. Coil springs were positioned at each end of the wing-like pedestals. Also unusual are the individual brake cylinders for each wheel.



50. This triple bolster truck with wing-type pedestals was used on 24 *Daylight* cars Pullman built for the Southern Pacific Railway in 1937. The trucks were modified in the early 1940s with the addition of bolster anchors and roller-bearings.



51. GSCC built this distinctive lightweight six-wheel coach truck in the late 1940s for the Canadian National Railway.



52. The Locomotive Finished Material Co. developed this distinctive triple-bolster truck for the Union Pacific's lightweight *Challenger* cars. Note the pair of coil springs above the journal box, and the hardened steel liners riveted to the pedestal.



R. Bale

BOLSTER ANCHOR

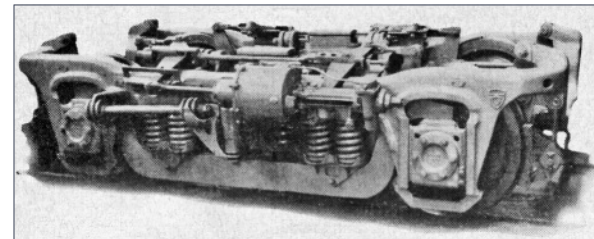
GSCC introduced the bolster anchor in the very late 1930s. Also known as a floating bolster, horizontal stabilizer, or drag link; the bolster anchor consists of a heavy rod that ties the truck frame to the bolster.

The anchor permits the bolster to move vertically, while keeping it square with the side frame of the truck. Substantial rubber mounts on each end of the rod minimize shock and vibration.

The device all but eliminated the problem of hammering and excessive wear between the bolster and the transom. Following its introduction, the bolster anchor became a virtual standard on four-wheel trucks of the lightweight period.

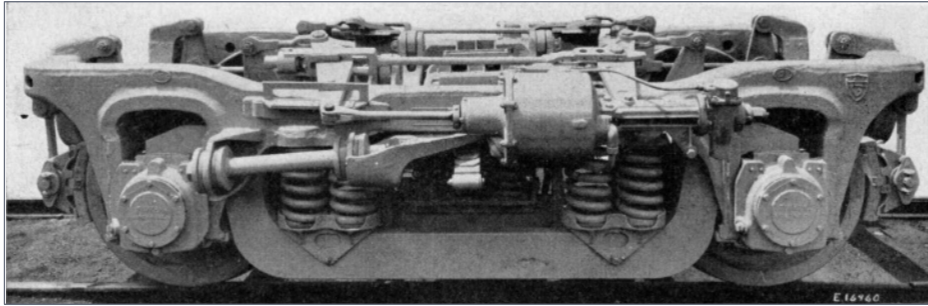


53. GSCC bolster anchor.

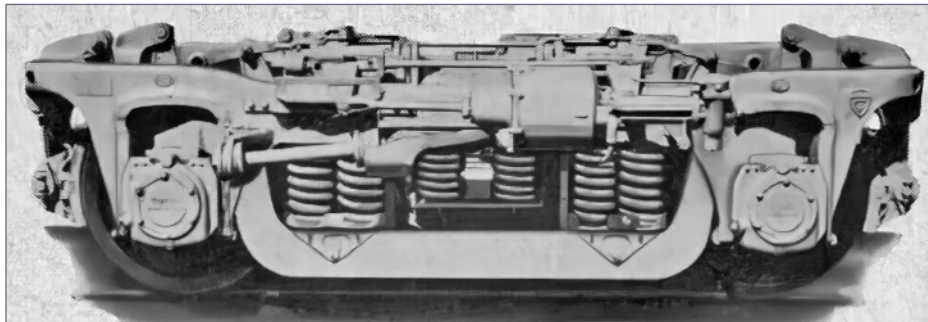


54. GSCC cataloged the Commonwealth four-wheel all-coil spring passenger truck from 1946 thru the early 1950s. It featured drop equalizers, paired equalizer springs, bolster anchors, and Monroe shock absorbers.

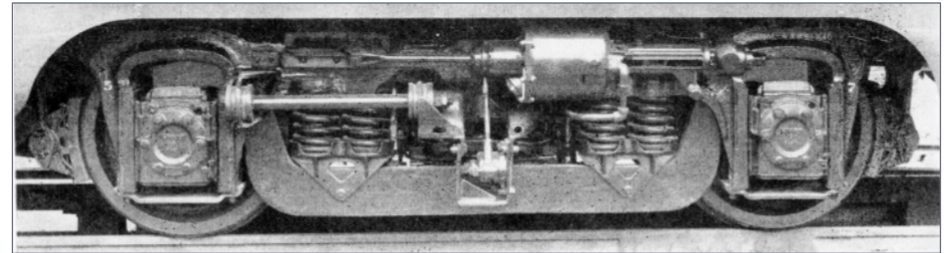




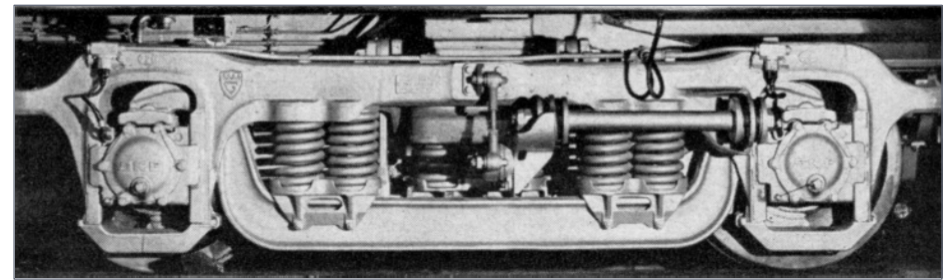
55. Pennsylvania Railroad class 2E-P6 four-wheel passenger truck in use in the late 1940s had inside swing hangers, a bolster anchor, and coil equalizer springs. A sizable air brake cylinder is mounted outside the truck frame.



56. This popular Commonwealth lightweight, four-wheel passenger truck has bolster anchors and paired coil equalizer springs. The bolster spring package is a combination of coil and a single section of elliptic springs. Pullman used slight variations of this GSCC truck from 1948-1951.

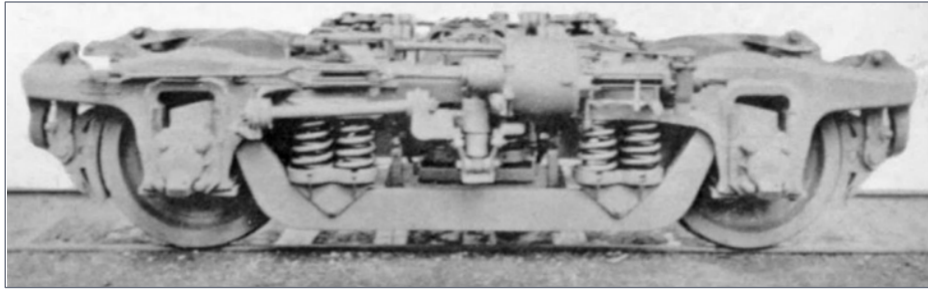


57. GSCC introduced this Commonwealth four-wheel passenger truck after WWII and cataloged it through the 1950s. Spotting features include a bolster anchor, Houdaille rotary friction snubber, drop-equalizer with paired coil springs, Timken roller-bearings, and outside-mounted air brake cylinder. This popular truck was used on cars built by Pullman, AC&F and Budd. Railroads specifying this truck included the Wabash, Texas & Pacific and Missouri Pacific.

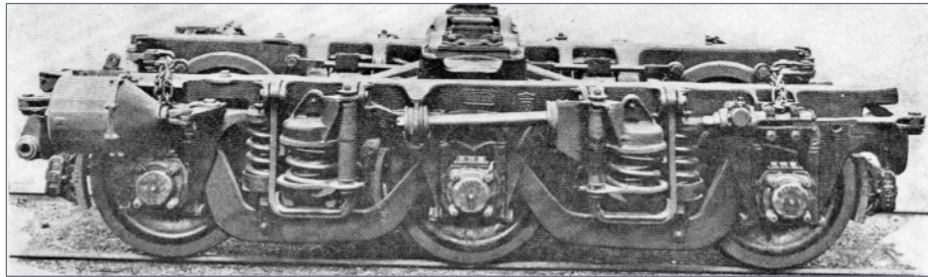


58. During the early 1950s, GSCC supplied this four-wheel single-bolster truck to Pullman for lightweight sleepers built for the Baltimore & Ohio in 1948 and Great Northern and Northern Pacific in 1950. It features an anchor bolster, Houdaille rotary friction snubber, and an equalizer forged with a weight-saving I-beam cross section.





59. This lightweight Commonwealth four-wheel truck is from the early 1940s. Note the slender bolster anchor, Monroe shock absorber and air brake cylinder mounted outside the one-piece cast frame.



60. This all-coil six-wheel Commonwealth truck from the post-war period has bolster anchors, outside swing hangers and a total of four Monroe shock absorbers.

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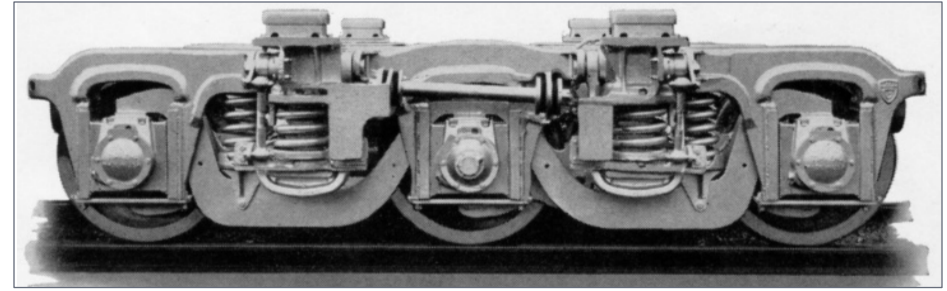


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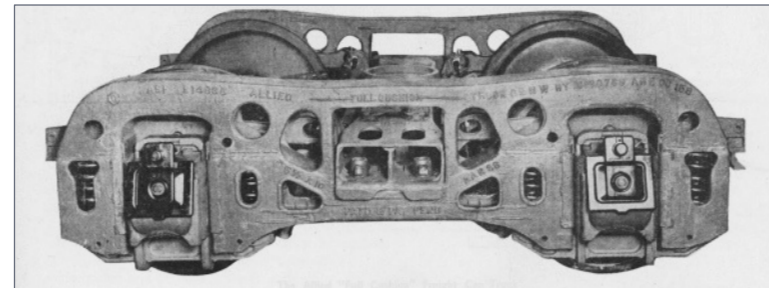
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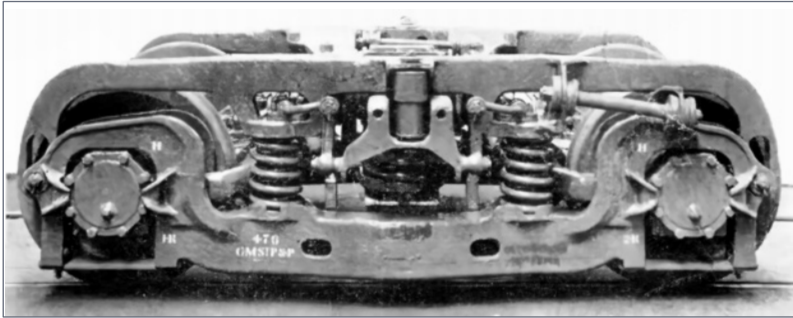


61. Among the few six-wheel trucks developed during the lightweight era was this all-coil truck GSCC introduced in the mid-1950s. Note the bolster anchor, outside swing hangers, dual Houdaille rotary shock absorbers, and four car side-bearings. Budd used this truck on 14 full-length dome cars the Santa Fe ordered in 1954, and on six Missouri Pacific 10-6 sleepers built in 1956.

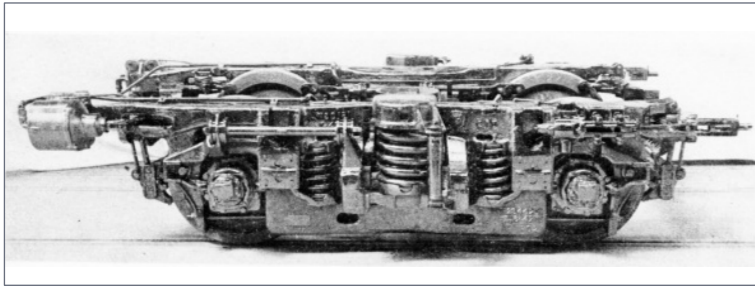
UNIQUE TRUCKS



62. The unique Allied Full Cushion truck was used in high-speed service, including express cars and troop sleepers, from WWII to the mid-1950s. The Allied truck provided a soft ride; The Southern Pacific even used them briefly on ammunition boxcars. Unfortunately, the Allied truck was prone to derail at high speed. As with other trucks where the journal boxes moved vertically inside frame pedestals, the boxes tended to bind, causing the truck frame to get out of tram. A second negative was that Allied trucks were difficult to service. The controversial truck was banned from interchange service in 1955.



63. The Milwaukee Road used this unusual Commonwealth all-coil truck in the 1960s for some of its lightweight coaches. The distinctive truck frame is matched to an equally unusual outside cast drop equalizer.



64. Another distinctive Milwaukee Road truck is this 1950s-era four-wheel passenger truck with an in-line row of coil bolster springs, shock absorbers, leveling bars, and slender bolster anchors.

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