



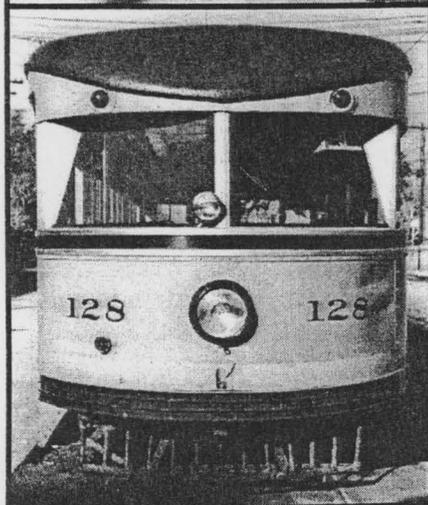
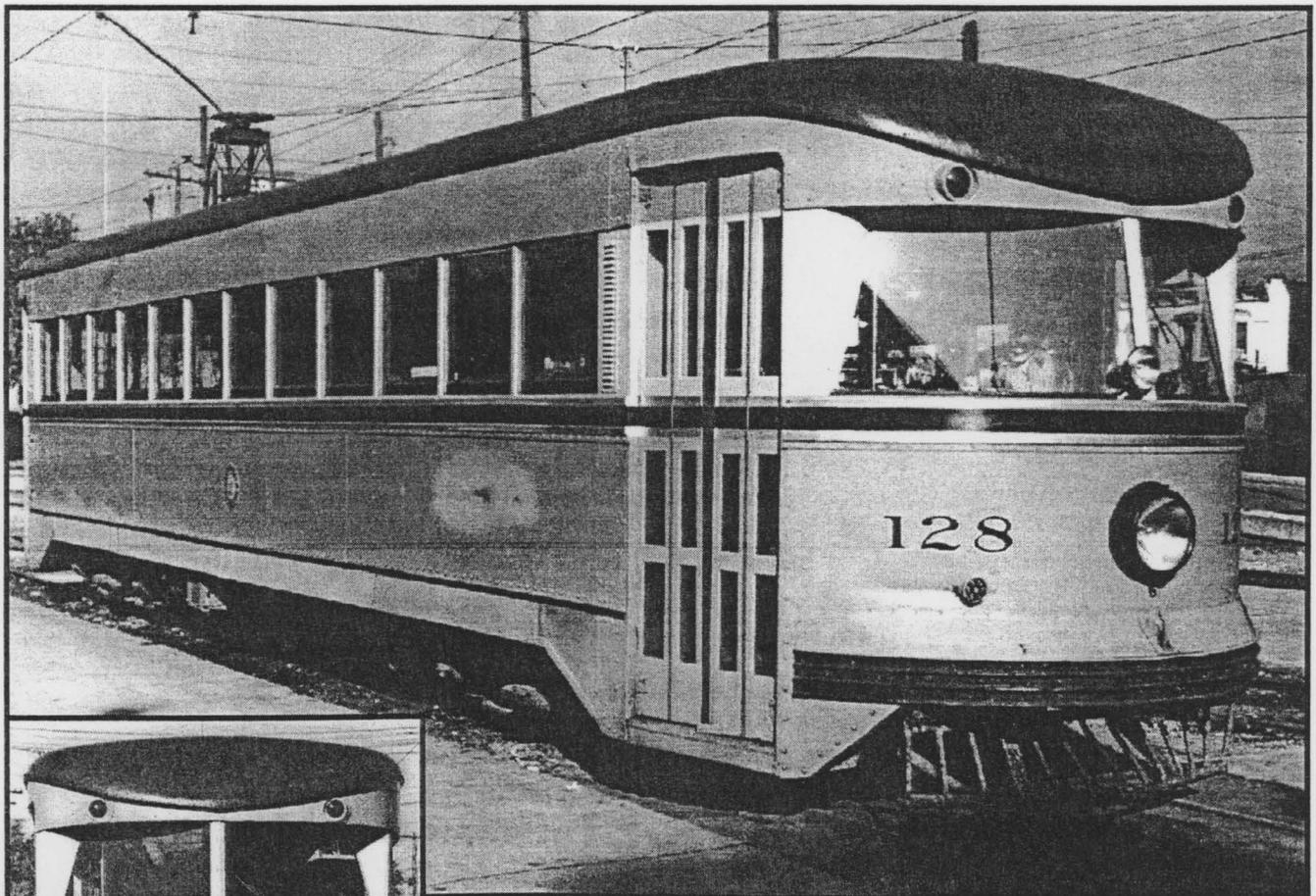
GAZETTE

Volume 84, Number 5

Whole Number 462

November 1995

Rebuilt Truck Installed on Bamberger Railroad No. 127



Bamberger Railroad No. 128, sister to Orange Empire's 127, is shown here in Ogden, Utah on September 29, 1939, not long after being purchased as one of a group of five cars from the Fonda, Johnstown and Gloversville Railroad in up-state New York. John Smatlak's story of the on-going restoration of BRR 127 and the installation of its newly rebuilt truck begins on page 6. (George Krambles photo)

is done because a rivet cannot be loosed once in place). After the car is assembled with nuts and bolts, they are removed one or two at a time as red-hot rivets are installed in each hole. During the riveting process, the structural members are pulled together in a tight fit as the rivets cool.

Each individual steel-framed railroad car really has its own custom specifications. Unlike a modern automobile where one part is readily interchangeable with another, the fitting, bolting, and riveting process results in each car being slightly different from its "identical" twins. For example, each of the dozens of wooden-framed window sashes in the Blimp had to be individually fitted back when the car was first restored, since one window sash would not automatically fit into another window's space! Little wonder that carbuilding was termed an "art."

The structural members of the 418 have now been repaired and riveted, and the mechanical brake and coupler components await installation. Joel Marsh's "Blimp body crew" has been augmented by Dave Stuart, Paul and Greg Peters, Roger Ringle, and Gary Starre. Dave Garcia's "coupler crew" has used the volunteer efforts of Bob Cook, Rex Atwell, Dave Riddell, Bob "Fuzzy" Irvin, Paul Harr, Jeff Williams, Brian Norden, Tim Olcott, Robbie Olcott, Bill Barbour,

and Jack Corrick. Bob Cook took care of sandblasting and later repainting many components; Rex Atwell and Dave Riddell lent invaluable assistance heating, straightening, and otherwise repairing the many bent and damaged components. Helping out with riveting and other odds and ends have been Jack Corrick, Bill Lamb, Ray Ward, and several others whose names were not recorded.

More Work Ahead

Of course, the work is still far from complete. Although it's anticipated the coupler will be going back under car 418 before the end of the year, there is plenty of electrical wiring and air plumbing to be completed as well. With all of this work done, crews can then finish up body work preparatory to repainting the car's end. This brings us to the last point: your support, in the form of dollars and/or labor, would be welcomed. Crews will be working in Carhouse Four this fall and winter to complete the job and return this proud "Big Red Car" to demonstration railway service.

Thanks are extended to Dave Garcia, Joel Marsh, and Gary Starre for their assistance in the preparation of this article.

Bullet Car Progress

By John Smatlak

The events of August 12, 1995, were a major milestone in our Bullet car restoration program. On this hot Perris afternoon, we installed the first rebuilt Brill 89E truck under car 127. One thousand volunteer hours spread over the past four years had turned a pile of worn parts into a refurbished truck, ready to give a lifetime of demonstration railway service.

Our truck assembly program began in the fall of 1991, when we shipped a container-load of parts from Philadelphia to Perris. Our goal from the beginning was to replicate, as closely as practical, the car's original running gear. We accomplished this by "kit-bashing" a truck utilizing parts from two similar trucks. In retrospect, this was certainly not the "easy way out," but the results made it all worthwhile. The newly created hybrid truck closely resembles the original.

The Story of the Brill "89E3"

Our pair of Brill 89E trucks will actually be a

hybrid of a Brill 89E1 and an 89E2, hence my designation "89E3". The story began in the early 1980s when the Museum acquired a pair of broad-gauge 89E1 frames from the Southeastern Pennsylvania Transportation Authority (SEPTA) in Philadelphia. These frames had come from the final order of 89E trucks, built for the Philadelphia Suburban Transportation Company's "Brilliner" cars Nos. 1-10. (An interesting trivia note, the PST Brilliners were Brill's last order for electric rail cars. This particular pair of truck frames was rumored to have come from underneath car 10, which had been an early wreck victim. If true, this may be the last set of truck frames ever produced by carbuilder Brill, once an industry giant.)

Upon arrival at the Museum, the Brilliner truck frames were put into storage; they would lay dormant until September 1989, when the issue of re-equipping the 127 was examined anew. The 127 was originally equipped with 6 foot wheelbase trucks, and the Brilliner frames were 6 feet 4 inches. Could we squeeze these

frames in? We started by making some rough measurements. It became immediately obvious that the existing end frames would not clear the stairwell under the car. Could we modify the side frames to make them work?

The next step was to create detailed drawings of the 127's underbody. Extensive field measurements were made, and CAD (Computer Aided Design) drawings created, to test clearances on the computer screen. This process revealed that if we cut the *end frame ears* off the side frames, the truck would just clear the stairwell on curves. The car's original side frames had been equipped with an end frame which was located lower to the rails, so it was decided that we could solve the clearance problem as well as create a more historically accurate truck by making this modification.

The other major problem was that the truck frames we were using were built for a broad-gauge system—that is, they were designed to hold wheelsets which were 5 feet 2-1/4 inch gauge instead of the standard railway gauge of 4 feet 8-1/2 inches. Fortunately, the component pieces of this type truck are held together with bolts (ranging in diameter from 1-1/8 inch on the side frames down to 1/2 inch for attaching some of the smaller parts). This allowed us to solve the gauge problem by disassembling the truck frame, and shortening the cross-members, known as *transoms*. The truck frame was then reassembled with new fasteners and mated with the wheels, axles, bolsters and other parts from the standard gauge 89E2 trucks. If you're interested in more details, the actual step-by-step process of creating the truck was described in the March 1993 issue of the *Gazette*. Suffice to say it was a lengthy, but educational, experience.

Traction Motors

As mentioned earlier, our "new" truck has a wheelbase of 6 feet 4 inches compared with the 127's original 6 foot wheelbase truck. One advantage of using the slightly longer wheelbase truck is that the 100 hp GE model 706 motors we acquired from the Philadelphia Bullet cars will actually fit into the truck. (I'm not so sure they would fit into a 6'0" wheelbase truck).

The 127 came to the museum as a carbody only, with little electrical equipment intact. Fortunately, the car did retain its K-75 controller, which we intend to reuse. The K-75 controller was designed for a maximum of four 50 horsepower motors, which presents a problem insofar as using the 100 hp motors we have on hand. (K-type control was the most basic and widely-used design for street railway operation. The motor current is essentially run right through the controller

itself, presenting limits on the amount of current which can be safely handled.)

We have ruled out trying to use all four 100 hp motors in a standard series/parallel wiring scheme. Instead, we have decided to install all four motors but only use two (one in each truck). Operation of the car would theoretically be similar to a P&W Bullet with a pair of motors cut out. A wiring layout will be created to permit access to all four motors, but only two would be connected in the circuit at any given time. The primary purpose of installing all four motors is to permit the "standard" brake rigging to be used on the truck, as per the original. Having a one-motor truck is assumed to be impractical because during braking the motorless wheelset would "lock up" or skid before the powered wheelset (with the flywheel action of the motor) could be brought to a stop.

The primary advantage of utilizing the GE model 706 motors is that no modifications will be necessary to the wheelsets we have on hand, i.e. we will not need to mount new bull gears. Also, these motors will fit into the truck without modification. The disadvantages of utilizing the GE 706 motors include not being able to wire the motors in a standard configuration owing to their high horsepower rating. This means a non-standard wiring layout and various other complications. Additionally, the car might be prone to over-acceleration, and minor slipping of the wheels as a result. But unless a better alternative presents itself, this is what we'll go with. Due to the lack of a complete set of bearings (we're still working on obtaining some additional motor parts from our museum friends back east), the motors were not installed at this time.

Documentation

Since my last *Gazette* report, we've uncovered still more documentation on the 127. Earlier this year, retired Santa Fe engineer and railroad historian E.R. Mohr sent us two critical Brill blueprints; the first was an underbody drawing, the second was a print of the car's original trucks! Finally, an important piece of General Electric documentation for the car resurfaced in the museum archives.

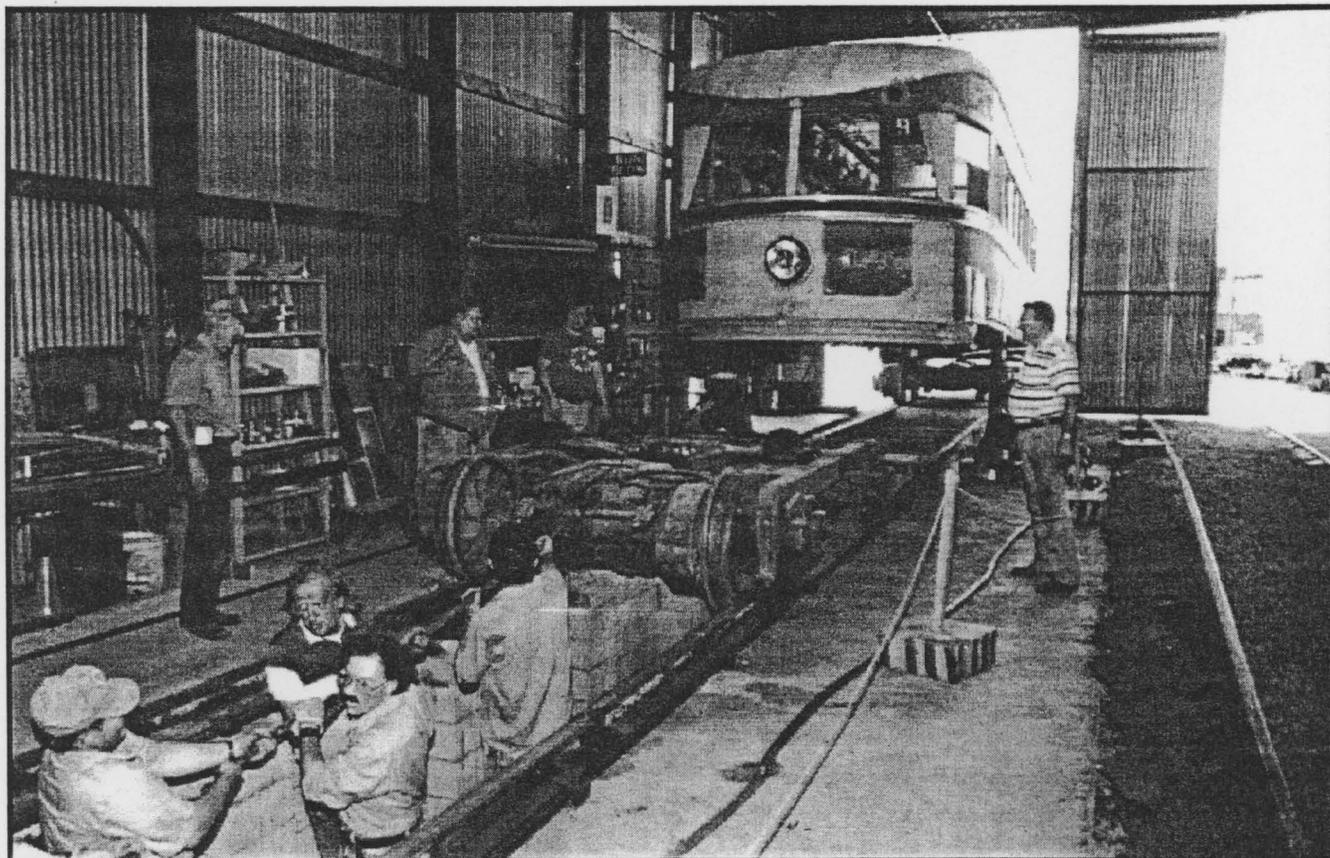
The Brill underbody blueprint provided by Mr. Mohr is a scale drawing which shows the car's under-floor framing as well as all of the electrical and airbrake equipment. It contains top and side views, and five cross-sections. It answers virtually every question we had about how the various components were mounted underneath the car. The top view even provides reference numbers for each of the structural components on

the print (the numbers likely refer to smaller fabrication drawings for each of the component pieces). Rather than come up with our own system of identifying the pieces we'll need to fabricate, we can now use the same numbering system which the factory used to assemble the car in 1931. The Brill truck drawing provides top and side views with a cross-section at the bolster.

The General Electric documentation had been obtained by Dave Garcia some 20 years ago. It dates from October 1931, and includes a schematic for the propulsion equipment, a detail schematic of the resistors, a resistor calculation worksheet, and requisition paperwork for the electrical equipment. The requisition documents were used by GE employees at the company's Erie, Pennsylvania, plant to assemble and ship all of the electrical equipment to Brill for application to the five FJ&G Bullets then under construction. The resistor calculation worksheet is an interesting piece of traction technology. It takes into account motor characteristics, wheel size and gear ratio, the nature of the intended service, the weight of the car, and records the value of the resistors needed within the motor circuit to achieve the desired rate of acceleration.

Installing the truck

For the past two years, the 127 has been "borrowing" a pair of trucks from a PE "Hollywood" car (St. Louis Car Company model M-72s). Our job now was to remove the "temporary" front truck and install our newly completed Brill 89E3 in its place. Standard practice for such a job would be to lift the carbody high enough to allow the truck in question to be rolled out from underneath the car, so for starters the 127 was switched onto the pit track in Carhouse Two. (This particular track not only has a pit, but more importantly a concrete apron which serves as a stable base for the air-powered lifting jacks). In order to permit the trucks to clear the framing for the stairwell, the 127 would need to be raised about four feet in the air. This was too high to achieve by elevating only one end, so the first step was to jack up the rear of the car and place blocking between the carbody and the rear truck. (This permitted a more "even" lift when we raised the front of the car.) The jacks were then applied to the front end of the car, and the carbody slowly raised until the necessary clearance was achieved. A chain was then fastened to

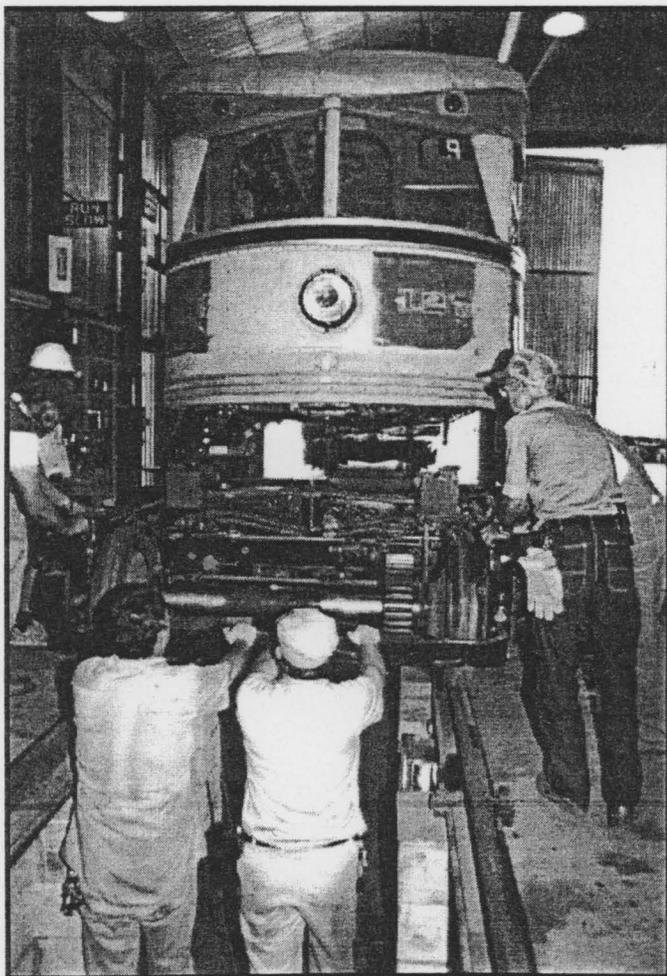


A few years ago a pair of PE "Hollywood" car trucks was installed under the 127 to provide mobility for the car and to get it onto the "live" railroad. Those trucks were only meant to be temporary, until the re-created Brill 89E trucks could be completed and installed. In this view, OERM's shop forces pull the front "shop truck" out from under the 127 in preparation for installation of the first re-created 89E truck. The scene is the standard gauge maintenance pit in Carhouse 2. (John Smatlak photo)

the front truck, which was slowly pulled out from underneath the car by a group of volunteers standing in the pit. A forklift then moved in and removed the truck from the rails.

With the truck missing and the front of the car raised up over four feet on jacks, the 127 vaguely resembled a missile ready for launching from a silo. Next, the new truck was carefully rolled underneath and the carbody lowered back down. Happily, everything fit together perfectly, and the 127 was soon on its way around the loop to perform clearance tests.

With Hutchinson & Northern electric locomotive No. 1 doing the honors, the 127 was pushed slowly around the loop. Remember, we put a 6'4" wheelbase truck underneath a car which was built with 6'0" wheelbase trucks. As expected, the relatively sharp curves did not present any problems, but it was nice to



The "new" 89E truck is pushed under the front end of the Bamberger Bullet Car. Following this the car was carefully lowered down onto the truck as the crew checked critical clearances. Afterward, a trip around the Loop confirmed all of the planning and design work, as the modified truck performed perfectly under the car. (John Smatlak photo)

see the new truck's performance nevertheless. A couple of trips were made along with a photo stop in front of the bookstore. It was a nice reward for a hard day's work. The honor roll of helpers for the project included Dave Stuart, Terry Dawson, Dave Garcia, Bob Cook, Paul Peters, Jack Rummy, Ken Davis, Wally Richards, Phil Bonde, Mel Miller, and John Smatlak.

What's Next?

The assembly of truck number two will benefit from our experience with the first, although some of the components will require more extensive repairs. (We used the "good" parts on the first truck). For starters, one of the side frames has a bent set of pedestal jaws (the pedestal is the area where the journal box rides, the term "jaw" probably came about because of the way the two halves of the pedestal grip the journal box). This defect was probably the result of an in-service accident; it should not be too difficult to correct with the side frame detached from the rest of the assembly. More complicated will be the repairs to the bolster. You may recall from our March 1993 *Gazette* article that we already "straightened" this casting, but now we have to weld a series of cracks. We'll also need to bore out and add bushings to the holes for the bolster spring-seat pins. These holes run through the casting and have developed serious cracks.

We've also been doing paint research on the car to determine its "color history." Although the main carbody was always painted orange, the color varied quite a bit over the years as the car was repainted. We've selected a 1939 target era for restoration. In this period, the car was new to the Bamberger yet it still wore its last FJ&G paint. The only difference was that the lettering on the belt rail had been painted over. Based on color chips we developed, we have purchased the paint for the exterior of the car. As soon as some indoor work space opens up, we'll be able to get started on this part of the job.

Summary

As always, we're looking for documentation on the Brill Bullet cars to aid us in our efforts. The wealth of material out there never fails to amaze us! If you've got any information at all on the Bullets, please let us know. Photos, slides, movies, drawings, blueprints, personal reminiscences, whatever—please let us know! Missing pieces from the puzzle still include interior photos showing details of the restroom area in the rear of the car (any interior views are useful), an underbody photo, and a photo of one of the trucks with the motors

installed. Please contact me in care of the museum if you have any information.

We've learned a lot from our work so far, and the ongoing financial backing of our many friends and

supporters continues to inspire our efforts. It's a lot of work to take a carbody and turn it back into a working high-speed interurban car, but if anybody can do it, Orange Empire can!

The Brill 89E truck

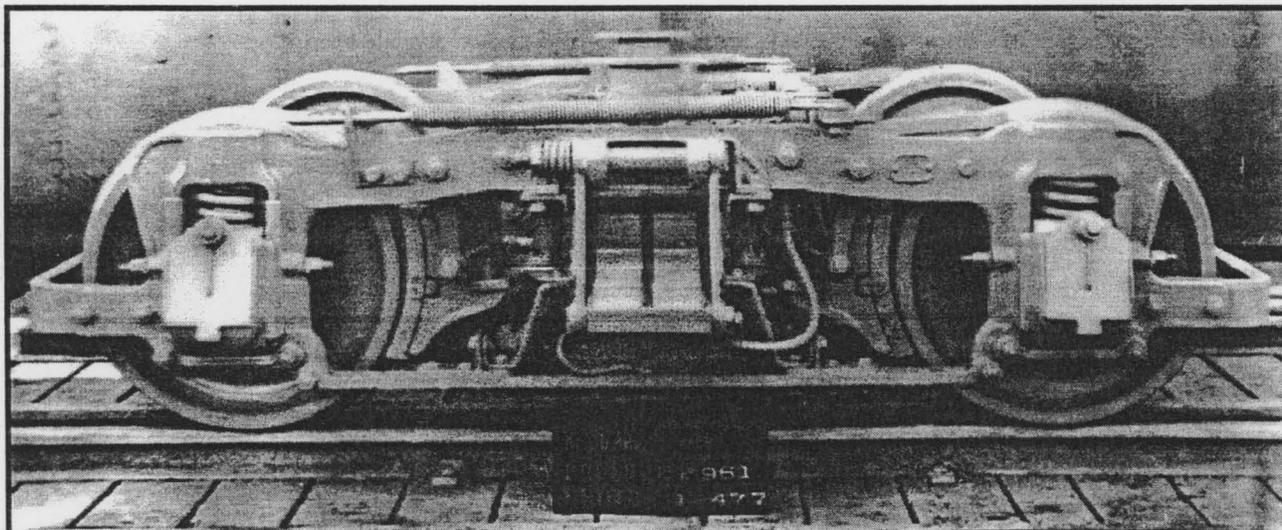
In 1929, an extensive equipment test program was carried out jointly by Brill, Westinghouse, General Electric, and the Cincinnati Car Company. This consortium of car builders and equipment suppliers tested a variety of new trucks, motors, and control equipment. The results of these tests helped produce the 20 famous "Red Devil" high-speed interurban cars—constructed later that year by the Cincinnati Car Company—for the Cincinnati & Lake Erie Railroad. The Cincinnati ABC-74-D (Arch Bar Cantilever) trucks created for these cars had a 6'2" wheelbase and utilized 28" wheels. Despite the small wheel size, each axle carried a 100 hp motor, made possible by new compact motor designs from Westinghouse and General Electric. Ten of the cars were equipped with GE's 706-A motors, and the other ten with Westinghouse's 539-A1s.

The J.G. Brill company also had plans for building high-speed, light weight interurban cars, and began work on their own compact truck design. The Brill design would also use 28" wheels, as well as the new compact 100 hp motors. The first known tests associated with Brill's new truck design were conducted in September 1930, when C&LE *Red Devil* number 127 (ironically) was brought to the Philadelphia & Western for testing. The car exchanged its trucks for a modified pair of Brill type 177s, which were recorded in the company's order books as "177 E 2." These trucks appear to have been only a higher capacity version of the standard model 177 design. Subsequent prototype versions of the 89E

truck differed because they utilized a cantilever-style bolster suspension, such as that used in the Cincinnati high-speed trucks. In this design, the bolster is supported by two sets of transverse semi-elliptic springs. One end of each spring set is attached to swing hangers suspended from the side frames, and the other end to hangers attached to the bolsters. Thus the bolster is quite free to move laterally as well as vertically, helping the trucks to "iron out" the ride on rough or irregular trackage.

The Brill order books record the construction of three sets of experimental 89E trucks, although based on the consecutively running start and finish dates, I would surmise that these were actually just different revisions of the same set of trucks. Builder's photographs exist for all of the aforementioned orders, and only minor changes are visible between them.

Brill went on to produce a total of just 35 pairs of 89E trucks for four different car designs. In 1931, ten pairs of 89E2 trucks were produced for the famous Philadelphia & Western Bullets. Later that same year, five pairs of 89E2 trucks were made for our FJ&G Bullets. Next were ten pairs of broad gauge 89E1 trucks to equip the ten "80 series" cars for the Philadelphia & West Chester Traction Company. These were produced over two separate orders in 1931 and 1932. Finally, ten broad gauge 89E1 trucks were made for the Philadelphia Suburban Transportation Company's "Brilliners."



This builder's view shows the 127's original running gear. Notice the arch in the side frames, necessary to make room for the magnetic track brake apparatus. This is the only feature of the car's original trucks omitted in our re-created version. (Historical Society of Pennsylvania Photo)