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(Imitation) Radiator Repair Project

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Introduction

The mounting flanges on the imitation radiator on the Vancouver Electric Vehicle Association's (VEVA's) 1913 Model 38 Detroit Electric by the Anderson Car Company were failing. This document describes the project to repair the radiator.

Around the time of VEVA's car, the Anderson Car Company made a few models with a hood and grille that looked like the radiator and hood of the gasoline cars of the day – In 1912, Models 28, 29, and 30 had a steering wheel and the Model 31 had the Anderson classic tiller – all with an imitation radiator. Later models 82 to 85 from the early '20s also sported a radiator looking front. In addition, vehicles from the later years of Anderson (by that time renamed the Detroit Electric Car Company) used bodies from other manufacturers and therefore looked like they had a radiator.

Figure 1: 1913 Model 38, 1920 Model 82, 1937 Dodge Body Model 99 - All with Imitation Radiators

The imitation radiator on VEVA's car is mounted with two flanges, cast on each side of the radiator. Two bolts through each flange affix the radiator to the chassis. After 100 years the flanges had cracked and started to separate from the main casting. There is evidence that the flanges had been somewhat unsuccessfully repaired in the past as well.

Figure 2: Cracking Flanges

How to Repair the Grille

Anderson drawing 4178 of the radiator (again our thanks to electricvehiclemuseum.org and Galen Handy) specifies it is made from aluminum. However, prior to WW1, there was no standard for exactly what aluminum might be. Apparently, the mix could change from morning to night as the shifts changed and each craftsman used their own special concoction. Your author suspects that casting such a large part from aluminum was difficult – judging from the number of cracks in the part. Alloying the aluminum would have helped to reduce the number of part failures at the time of manufacture.

At some point a repair had been attempted with some kind of welding process, but the weld was of poor quality and likely never really worked.

Trawling the Internet for clues indicates that a TIG process is generally the preferred method to repair aluminum. Therefore, TIG was tried on the cracked flange with particularly poor results. The metal immediately started to bubble and separate into what looked like powder and bubbles of metal. TIG was not going to work.

The next process tried was oxy-acetylene – with equally poor results.

Aluminum brazing was chosen as the successful repair method. Blue Demon BDTP-125-01T low temperature aluminum-zinc brazing rod worked well on the radiator material. The tensile strength of the rod is 47,000 lb/sq in and the Brinell hardness is 100 – which is very similar to 6061 aluminum – and likely stronger that the original material the grille is made from. Bernzomatic AL3 Aluminum Brazing/Welding Rods also worked well, but its tensile strength was not quite as high and it was slightly more expensive.

Flange Repair

The flange with the worst damage was cut off and a replacement flange was made to replace it. The flange was created via CNC, and then shaped by hand to match the grille. On the replacement flange, an extra wall was created on the grille side to allow plenty area for the brazing material to bond.

Figure 3: Replacement Flange Before

To attach the replacement flange, the mating surfaces are covered with the brazing rod material, and then the replacement flange placed on top. To affect the bond the two parts are then heated to re-melt the brazing material in between the parts. Once the parts are attached, the brazing material can be used as a filler to affect the required fillets around the flange.

Figure 4: Replacement Flange After

The flange on the other side needed only the corrosion and material from the previous repair removed, and then the brazing rod material could be used as a filler material. The brazing rod material has a high surface tension and therefore can be made quite thick before it runs off. Because the orientation of the grille was never perfect, large blobs would accumulate in some areas during the brazing process, which resulting in a great deal of grinding. Good welders weld, poor welders grind, apparently.

Crack Repair

In the interior of the grille there were two large cracks and a number of holes that required repair. The cracks were ground out and filled with the brazing rod material with reasonable success. The size of the part made it difficult to apply enough heat – so two high-heat propane torches were used. The cracks went through many of these holes, and therefore, the holes were filled at the same time. The front side is ground flush, and the back side is ground nearly flat. Because it was difficult to fill every crack and hole perfectly with the brazing rod, JB Weld, a metal filled epoxy was used as a filler to finish off the surfaces.

Figure 5: Cracks Are Cleaned, Ground, Repaired and Ground Again

Finally, with a coat of paint the grille is as good a new!

Figure 6: The Finished Grille