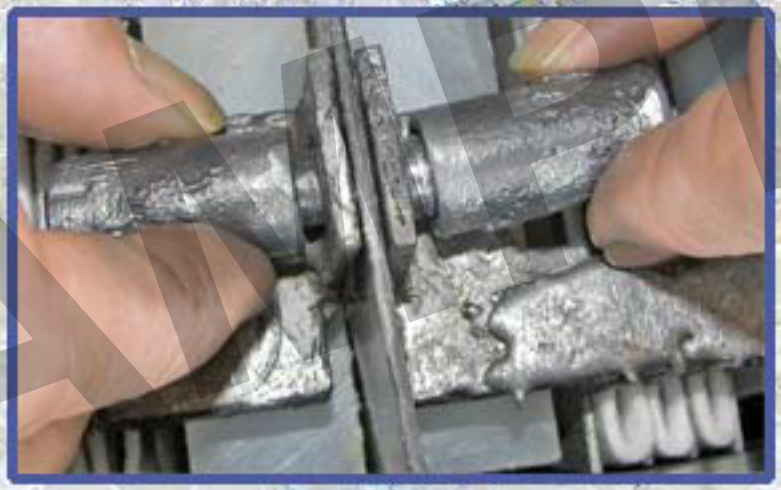
The Battery Builders Guide



by Phillip Hurley

The Battery Builder's Guide

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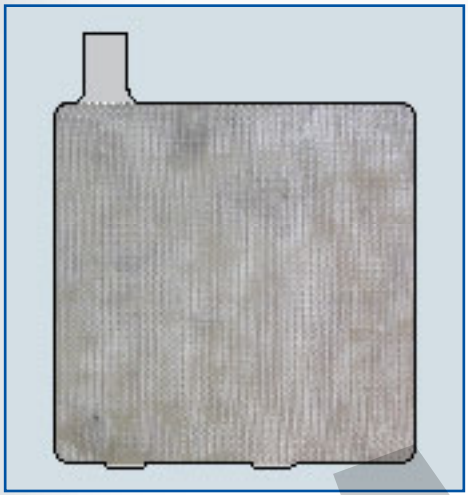
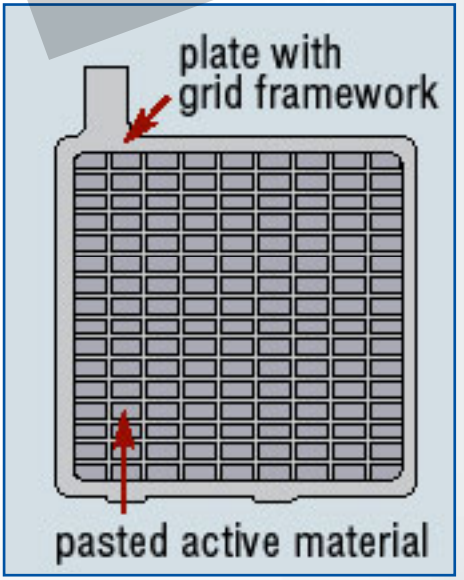


A solid plate, with scoring to increase surface area.

spongifying the lead on each plate, which enhances the performance of the cell. The porous sponge plates of Plante's experimental cell produced about 7.25 amp-hours per pound of lead and had an efficiency of about 72%. Plante continued experimenting and improving on his lead acid cell for the next twenty years. Although the Plante batteries worked very well, they were not viable as a commercial offering because the process for forming the plates took a long time.

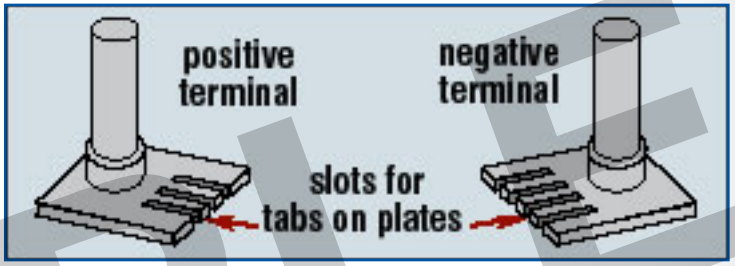
In 1881 Émile Alphonse Fauré developed a different process for plate preparation and drastically reduced the time it took to make plates. Rather than forming the solid plates by the tedious process of charging and discharging through many cycles over many days, Fauré filled grids with the appropriate chemical compounds so that the batteries could be put into service after one initial charge. This made the manufacture of lead acid batteries an economical enterprise, as they could be mass produced at a fast rate.



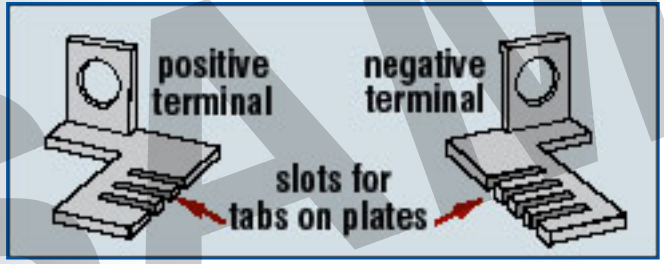
A pasted Fauré plate

Terminal posts and intercell connectors

Terminal posts are the visible lead posts that you see on batteries. The number of terminal posts on a battery can vary. Most consumer batteries have two: one positive and the other negative. Most individual battery cells within a case are



Terminal posts for external connections



Internal intercell connections

connected in series (positive to negative) to add voltage. The cells are connected via intercell connectors which can either be external or internal.

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Case covers need to fit well and be sealed, and have ports with caps for filling and venting. If you make your own covers, recycled caps can be used, which can save you some fabrication work. Or, you can purchase new caps like the flip-top vented caps shown in the photo.

New vented flip-top caps for a recycled case lid

Case covers can be sealed with Viton® caulk and then epoxied to retain the cover to the case. If heat is used for sealing or unsealing, here are the melting points for some commonly used materials:

- Polypropylene — 320°F
- High density polyethylene — 248°F to 266°F
- Low density polyethylene — 221°F to 239°F
- Polyvinyl chloride — 413°F

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▲ When everything is ready and in place, unscrew the caps from the battery cover and place the caps in a plastic container for cleaning.

▲ Next, twist off the terminals with a pair pliers. Terminals are easily removed in this manner. Place the terminals in a receptacle for cleaning and melting.

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Removing the battery elements

Once the lid is off the case, remove the elements from the battery. If they have intercell connections, the elements will be attached to each other through the cell wells. To get the elements out of the cells you need to cut the intercell connecting rods. I usually use a thin chisel to bend the strap attachments away from the cell walls so that I can get at the connecting rods with the chisel. Then, hammer the chisel gently to sever the connecting rod between the intercell connectors. However you can do it, each element needs to be disconnected from the others so that you can remove it from the cell well.

Once the intercell connectors are cut, pull each element from the case. In some batteries the plates will have expanded so much that they become tightly retained in the case.

To test for removal, grab both of the group straps and pull straight upward. If they do not budge you may need pliers to grab the group straps. If the case tends to move upward as you pull the plates, you can use your feet to hold it in place while you lift the element.

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The scribe lines are deepened with the linoleum knife, being careful not to stray from the scribe line. The linoleum knife deepens the cuts quite well if you work slowly.

The fanout knife is used to finish the cuts.

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The burn

Burning the lugs to the strap is pretty straightforward. Start by melting the protruding lug tops down to the surface of the strap and then melt the lugs and strap together in one continuous melt. If you need to add lead to voids or to even out the surface you can do so with the welding wire while burning.

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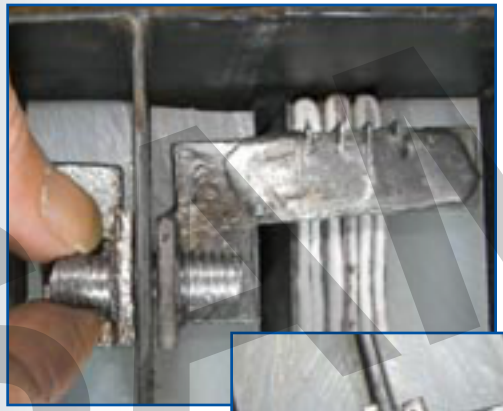
Battery Assembly

Adjust and align the holes in the intercell connectors with the holes in the cell walls and slip the threaded lead rods through the connectors and cell wall.

Test the pocket nuts on the threaded rods to see if the connection is tight. If they are a bit loose, add a thin lead connecting seal over the threads (see page 137). Press the seals onto the threads. Be careful not to drop the seals into the cell well, otherwise you will have to remove the element and retrieve the lost seal.



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