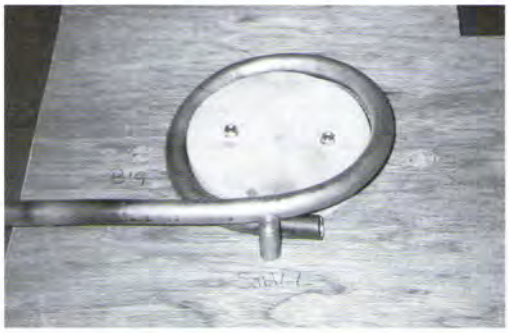
# Smith's Heater Core – DIY version

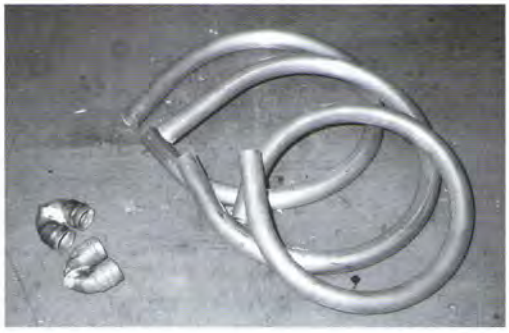
SOME TIME AGO THERE WAS AN ARTICLE in the LRO about how to make a new core for the old round Smith's heaters that involved wrapping a number of loops of 8mm diameter micro bore copper pipe around a paint tin. I made one of these in the hope to replace my leaking core, the results were a little disappointing, time for a re-think. The resulting design used much larger bore copper pipe and with fewer coils.

The new core comprises of four rings of 15mm diameter copper pipe (two different ring diameters) and a handful of modified 90 degree bends. A pile a flat fins with holes in through which the four pipes run through. Two straight 12mm diameter pipes provide the inlet and outlet feeds that go through the bulkhead and connect to the rubber hoses. Hopefully the following will explain how the unit is constructed.

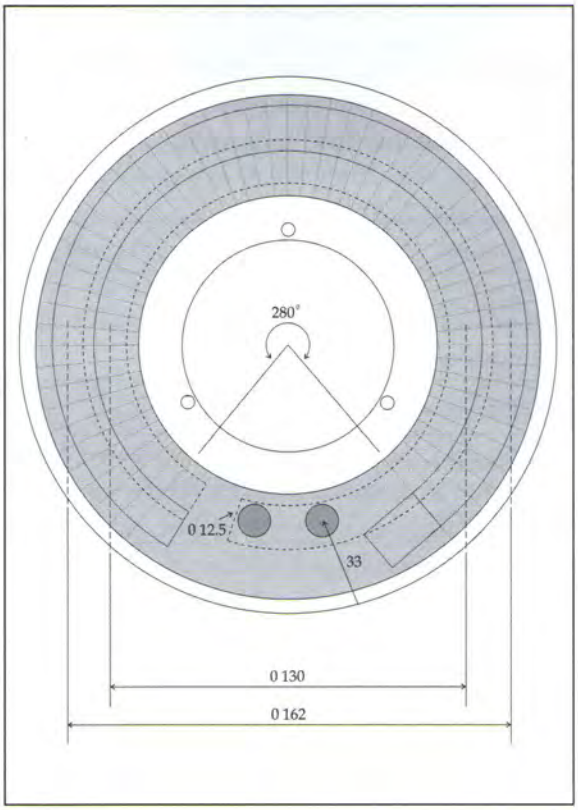
### Method of Construction

The first items to make are the four 15mm rings. To help bend these I made a jig out of three bits of wood. One piece was a circle the same diameter as the smaller ring. The second piece was another circle the same diameter as the larger ring and the third piece was used to bolt the wooden circles to that was clamped down to a workbench. This piece also had a couple of holes drilled in it to accept some steel pegs that help hold the pipe in place while bending. The copper pipe was first annealed to help soften it. It was then bent around the jigs as shown below.





Once you have four rings, you need to cut them to length, see drawing (right) for more info ....

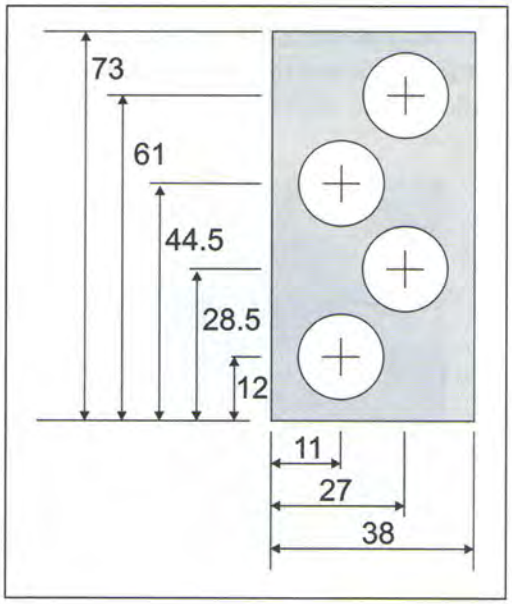


Once the four rings were bent, the next items to make were the 90 degree joining parts. These are used to join the four rings together and provide a tumbling motion to the water that runs through them. This was one of the reasons the micro bore method failed, the water wasn't being disturbed as it flowed though the pipe. The nice hot water would enter the core, the water closest to the pipe wall would start to dissipate its heat, cool and then exit the core. By causing the water to tumble, the cooler water will mix with the still hot water that's in the middle of the pipe providing more hot water to reach the pipe wall therefore providing more warm air to your frozen windscreen. By tumbling the water three times you'll get the most out of the hot water resulting in cold water being sent back into the engine's water system. Another reason the micro bore method failed was because the pipe has a small surface area for the heat to dissipate from. By using 15mm pipe you double the surface area and by adding copper fins to the pipe you further increase the overall area allowing air to move between the pipes to help dissipate the heat away.

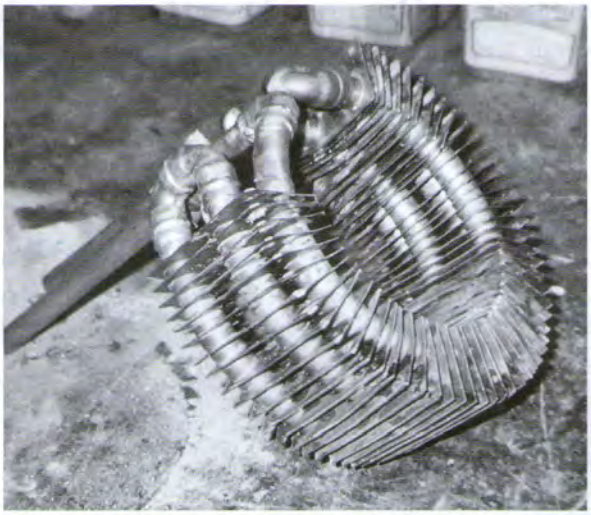
To modify the 90 degree bends, all you need to do is to cut off 5-6mm off one end. Butt the two cut off ends together and solder together using a higher melting point solder than you plan on using for the rest of the job.

You also need two standard 90 degree bends for the inlet and outlet pipes. The only modification you need to do to these is to make a small insert for one end that will reduce the inside diameter to 12mm.

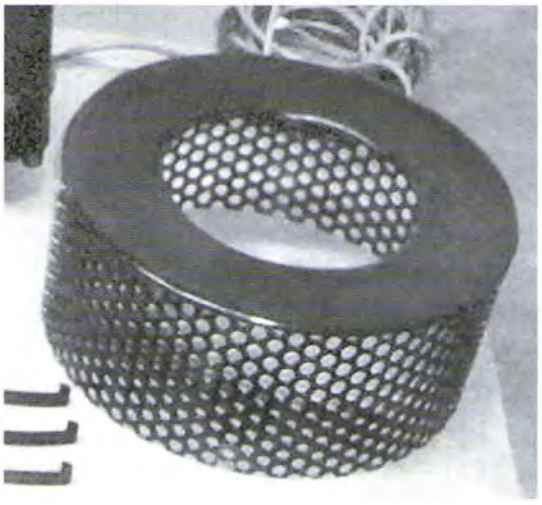
You then make the fins that will help hold everything together and provide a way to dissipate the heat. I made these from 16 SWG cooper sheet and punched out the holes on a fly press. It's a long and boring task, you need some 58 fins in total! Once these have been made, the only remaining parts to be made are the two inlet and outlet pipes. These are simple straight lengths of 12mm diameter pipe, their length can be cut once fitted to the bulkhead.



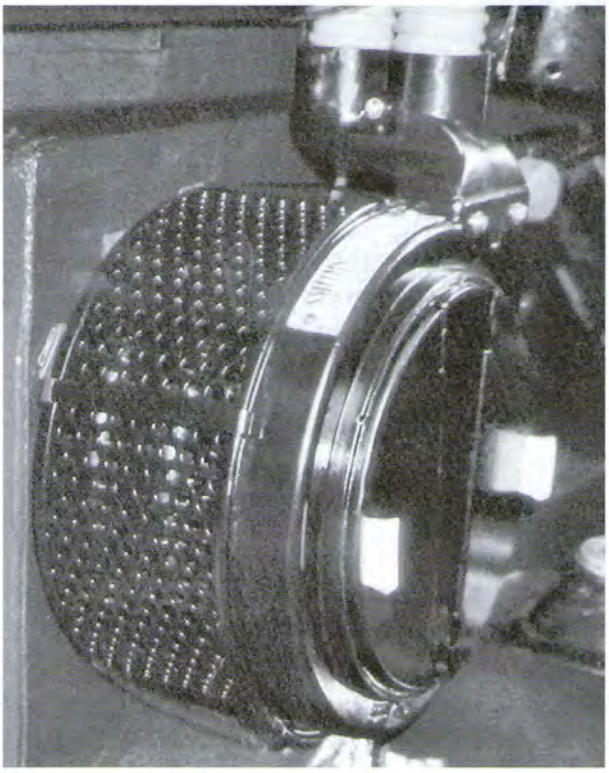
Now you need to start putting all the parts together to make something resembling a heater core. For this you need a good real of solder, some solder flux and a blow lamp. You could use a soldering iron but it would have to be big as there's a lot of copper to heat and copper is the best heat dispersal material there is. Start the construction by sliding on the 58 fins over the four rings. Once they're on, you can then solder in the 90 degree bends and the inlet and outlet pipes. The next job to to solder all the fins to the four rings. This is not an easy job as the fins keep moving around but patience is a virtue and you will get there - eventually. In an ideal world there would be a complete ring of solder around each hole in each fin but you won't get there. As long as the pipe is connected to the fin by some solder, heat will travel from the pipe to the fin and dissipate.



The small 'U' shaped plate fixed to the inlet and outlet pipes is used to secure the core to the back plate of the heater to stop it moving around inside the heater casing. A small brass nut is soldered onto the 'U' plate and a bolt is used to secure the core. If you don't provide a fixing there's nothing to stop the core moving around apart from the two rubber pipes that plumb the unit in.



Hopefully you'll now have a completed core, one that is water tight (test this by blocking one end off and fix a hose pipe the other end and turn the tap on - take cover). The core can be sprayed black to help hide it from view once it's inside the heater casing, a cosmetic touch. The final part of the project is to make a steel separator ring that provides a distance piece between the heater back plate and the front plate, the original spring clips hold it all together. This used to be provided by the old core but we need to make a new part, one that's made from round perforated sheet steel rolled to the diameter of the heater. Tack weld the join and spray black.



*Unit fitted to 'Oskar'*

The complete unit can now be assembled and tested before installing into your vehicle, all being well, you should be surprised with the result, good luck.

**Chris Mortimer**
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