

NEW PALLETS FOR OLD

In which replacement pallets are made

by Guy Gibbons

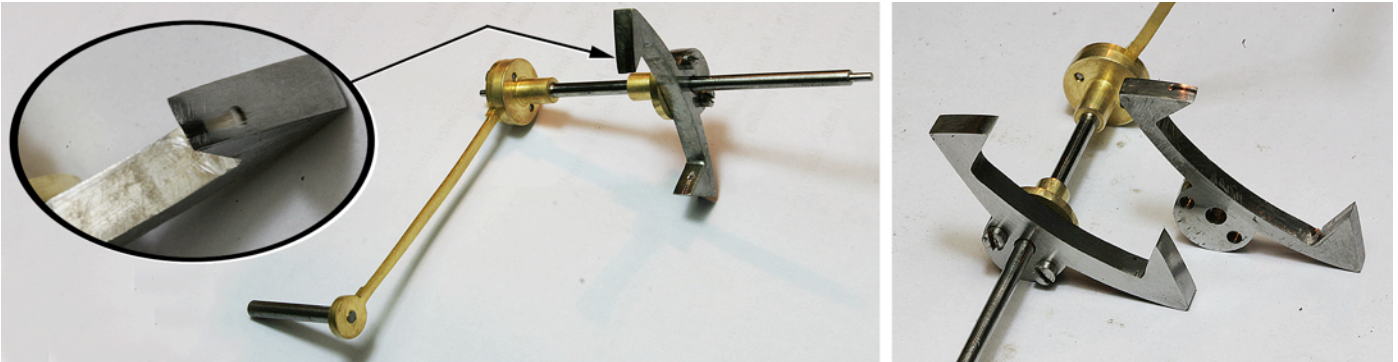


Figure 1: (left) the wear on the refaced pallets, and (right) a comparison of the new and old pallets

Returning to 'Miss Havisham's clock' mentioned in the January edition, another significant defect was the worn pallets. The pallets fitted had been previously refaced with slips of mainspring material and were badly worn. I decided to make new pallets from gauge plate as I have never liked using soft-soldered facing slips. The hardness can never be as good as pallets quenched from red, and even the action of soft soldering using the now obsolete 183°C 63/37 tin/lead electrical solder will at least draw the hardness to a pale straw temper (say 220°C).

Using modern lead-free electrical solder will make matters worse as this tends to melt at a temperature 20°C or so higher, which will draw (temper) the hardness even more. Worse still, using slips of mainspring at their relatively soft blue temper (i.e. without rehardening) will always be a short life solution, and it has always been a mystery to me as to why this 'repair' technique is so often suggested. With the advent of diamond files, there is no longer the excuse that final shaping of the applied facing slips is not relatively easy at pale straw temper – providing, of course, one avoids at all costs clogging up the file with soft solder.

For those who would like a little more quantification, we can assign approximate Rockwell C (Rc) hardness values to the tempering colours of a typical carbon steel as follows:

- Quenched from red: 60Rc
- Pale straw: 54Rc (\approx 220°C)
- Blue (mainspring): 45Rc (\approx 280°C)
- Annealed: 27Rc.

What we can observe from these figures is that merely by tempering to pale straw (soft solder temperature) one loses about 20% of the total available hardness between fully hard and annealed, while using a blued mainspring will lose nearly 50%. And with such small slips of steel, overheating is terribly easy to achieve accidentally, and will destroy pretty much all of the hardness in the steel. Using a soldering iron to melt the pre-tinned pallet face before applying the slip of facing material will make things a little safer compared to using an open flame.

One day I will perhaps experiment with using a lower temperature bismuth or indium based solder to affix dead-hard facing slips – or maybe there is a reader out there who has already tried this technique?

Figure 1 shows the old and new pallets. I will not detail the process of making the pallets as this is described in the many standard texts, the only difference perhaps being that I tend to make mine using the old pallets as a pattern rather than trying to construct them from the geometry of the existing 'scape wheel and pallet arbor centres. Some would say this is wrong, but I do not find it easy to measure the 'scape wheel to pallet arbor centre on a back cock, which is a necessary step if the pallets are to be 'constructed' by technical drawing. One cannot rely on just measuring the front plate centre distance or, if one does, must be prepared to reposition the back cock to provide the exact same centre distance.

One also must be aware that the pallet arbor may in the past have been bent to get a better action.

Using the old pallets as a pattern does require a careful inspection of the existing pallets in-position in order to get a 'feel' for whether the geometry looks about right, and if not make appropriate adjustments as one approaches the finished shape of the new pallets. It is not unknown for me to fail at my first attempt, but success usually results on the second attempt⁽¹⁾.

One final observation may be relevant. Firstly I use gauge plate (also called Ground Flat Stock (GFS)) for pallets, which is an alloy steel whose composition is designed primarily to ensure low distortion on heat treatment (to make gauges). It also achieves a little greater hardness than plain carbon steel at the same tempering colours. For example tempering gauge plate to pale straw (220°C) will result in a hardness of around 60Rc compared to 54Rc for carbon steel.

1. Had I heard an excellent talk by Sid Lines entitled 'Bracket clock overhaul' when I remade these pallets, I would have known of his technique which is to make a first replacement set of pallets out of brass which can easily be filed and bent to get a perfect action. These pallets are then used as a template to make the gauge plate pallets 'for real'.