Correction:
Letter published in May HJ without diagram

Deadbeat Escapement

HERE WE go again! At the end of 2003 I had given up trying to convince people of the advantages of the 'pure' design of dead-beat escapement, and why what I called the Britten approximation was inferior. I had not expected to have my case very well described in Ted Wale's article (*HJ* March 2005 page 109), so much so that I almost thought he agreed with me, and have the reasoning behind my case apparently knocked down by reference to an article in *Clocks* by Laurie Penman. Here an experiment was described which, it was suggested, proved that the oblique impact of a scape wheel tooth on the dead face of a pallet (which is inherent in the Britten approximation) could not cause any sideways jolt on the pendulum.

Now come on, gentlemen (Wale and Penman, that is), that experiment doesn't prove any such thing. The set-up described is in no way analogous to a scape wheel tooth landing obliquely on the dead face of a pallet; let me explain.

Wheel B, which is presumably meant to represent the pallet dead-face, is free to rotate around its centre, and is probably pretty light in weight. The pallet, on the other hand, cannot rotate freely, for it is rigidly attached to an enormous mass called the pendulum, which is slowly swinging back and forth. Compared with the speed of movement of the scape wheel tooth, the pallet is effectively stationary and immoveable.

Wheel A, presumably representing the scape wheel tooth, is also free to rotate about its centre; but the tip of the scape wheel tooth is not like that at all. It is a nasty sharp rigid thing, doing its best to dig a hole in the pallet, and bouncing off again, for all we know, before settling down to have the pallet slide slowly past it. And that sliding is not without friction; the clock community has not discovered the holy grail of mechanical engineering, frictionless sliding contact!

I do not think Mr. Penman's experiment has proved anything of value to us in this matter, and I am still convinced that the pendulum driven by a Britten-design escapement would receive a little knock sideways every half swing. If those little knocks do exist, it is an unfortunate fact that their direction and timing are such that they are cumulative and negative; in other words, it is not as if one knock cancels out the other, they both act to subtract momentum from the pendulum.

My visualization is best expressed in the diagram which shows one pallet only. (Adding the other pallet would confuse nearly everyone, and would not change the argument, I assure you). Arrow A is the position and direction of motion of a scape wheel impact on the entry pallet using the 'pure' design, whereas arrow B is the position and direction of a scape wheel impact using the Britten design. Directions A and B are between $2\frac{1}{2}$ and 3 degrees apart, for a 30-tooth scape wheel.

Since there is bound to be friction between the tooth tip and the pallet, I believe that in the diagram, the pendulum would suffer an anti-clockwise knock from impact B, this occurring when the motion of the pendulum is clockwise. The rest follows.

I don't know how big these knocks are; it may be that they are small enough to be ignored; but I have learned the hard way that for precision you don't accept **any** avoidable interference with the action of a pendulum. This one is easily avoided altogether.

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