The Learning Curve

A regular feature sponsored by the Central Council Education Committee
www.cccbr.org.uk/education/

Know your instrument - 2

In November, *The Learning Curve* looked at how a bell works, where understanding can help you to make the bell perform properly. This month, we resume that theme, focusing on the rope and its behaviour. *The Learning Curve* discussed rope handling quite extensively in July 2001 (see *Volume 1 Chapter 25*) so we will look more at aspects not covered then.

Rope weight

Bells are big heavy things and rope is light – like thick string – so you might never have thought that the rope weight would be significant. In fact it is. Rope weighs around an ounce per foot (0.1 kg per metre) which doesn't sound very much, but when you multiply by the rope length the total can be 6-8 lb (2-3 kg). This still doesn't sound a lot compared to the weight of the bell, but force exerted by the rope has has maximum leverage because it is applied to the rim of the wheel, whereas the mass of the bell is closer to the axis of rotation.

Bells are hung the way they are so that they can be controlled by modest forces applied on the rope. In rounds, a good handler with an economical style, will apply forces not a lot more than the rope weight. Looked at from that perspective, it is less surprising to discover that the weight of the rope has an effect.

Every backstroke, the whole rope is lifted many feet higher than it is at handstroke. To see how much, look at Figure 1.

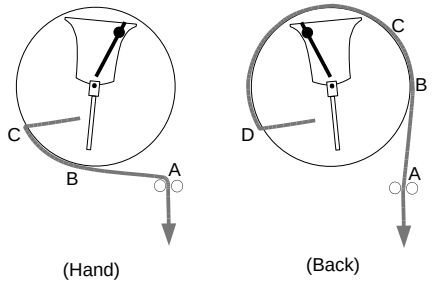

Figure 1: Rope length at hand and backstroke

The length of rope A-B-C is roughly the same at both strokes, but at backstroke an extra length of rope C-D is wound round the wheel – roughly half its circumference. For a 5ft (1.5 m) diameter wheel, that means the rope is pulled about 8ft (2.5 m) higher at backstroke than at hand. It is the same as the distance between the middle of the sally and the tail end.

With no rope attached, a bell will swing evenly at hand and backstroke. Now imagine the retarding force as the weight of the rope is lifted up all the way to backstroke, and the additional pull from its weight as it comes back down before the handstroke. This makes the bell swing less high at backstroke and higher at handstroke than if the rope wasn't there.

So what? When you ring the bell, you need to be aware of two effects, the first of which is often beneficial. The weight of the rope does some of the work needed to achieve an open handstroke rhythm (which needs the backstrokes to be rung more quickly than the handstrokes). Whether this 'free ride' is more or less than you need depends on:

- Rope length – A longer rope is heavier and has more effect.
- Bell weight – A lighter bell is affected more by a given force.
- Number of bells - The more there are, the smaller the difference between hand and back timing needed to leave a 'one beat gap'.

The second effect will catch you out if you are not prepared for it. The bell swings less high at backstroke than at handstroke, so it is quite possible that while you are ringing mostly over the balance, and controlling your bell by how long it pauses at each stroke, occasional backstrokes won't actually rise to the balance, leaving you powerless to control the next stroke. The only way to avoid being caught out and dropping your backstrokes like this is to pull extra hard at handstroke to ensure that the bell will rise enough at backstroke. The longer the draught and the smaller the bell, the more you need to compensate for the weight of the rope.

Springy ropes

Why are some ropes more springy than others? New natural fibre ropes are springy until they bed in, but with repeated use, the fibres knit together making the rope harder and less stretchy. Ringing a heavy bell with a long draught and a new rope can be like ringing with elastic – you can't feel what the bell is doing, which makes it extremely difficult to control it. If you find yourself in such a situation, try to pull smoothly and gently. The harder, and more jerkily you pull, the worse it will get. (See *Volume 1, Chapter 25* for more detail.)

Many towers now use synthetic rope for top ends. Pre-stretched polyester (aka Terylene) has minimal stretch, regardless of age. It also wears much better and does not shorten in damp weather. It is softer and more slippery than natural fibre, so not suitable for tail ends. (There are synthetic materials that look and feel like natural rope, but synthetic tail ends are much less common than synthetic tops.)

Slipping wheel

When you are ringing, you take it for granted that everything upstairs works as intended, including the rope winding properly round the wheel. With some bells, in some situations, that does not always happen. This was mentioned very briefly in August, but it is worth a slightly fuller description of how it happens.

The rope moves very fast, and anything that impedes it can cause the rope to fly out of line. If it does that as the garter hole passes the pulley (ie when the rope changes direction to wind the opposite way round the wheel) and especially if anything is not perfectly in line, then the rope can come over the side of the wheel. Once that happens, instead of being wound neatly round the wheel rim, it takes a short cut as shown in Figure 2. At handstroke, the effect is minor – the distance A-C is not a lot shorter than it was in Figure 1 – but at backstroke the effect is dramatic. A-D in Figure 2 is much less than in Figure 1, so the rope goes up much less than it should. It barely moves at all once the rope meets the gudgeon and wraps round it).

You see the sally hanging temptingly within your reach, not moving a lot, but grasping it is dangerous. In a few seconds, when the bell swings round again, the rope normally flips back onto the wheel, and yanks the sally violently up to its normal backstroke position.

For most of us, this is a rare event, but when it happens, you must have the presence of mind to remember only to hold onto the tail end, not the sally. If you are worried about the rope flying around, you can loosely constrain it by putting your arm around it, providing you don't grip it, and don't risk getting caught in a loop.

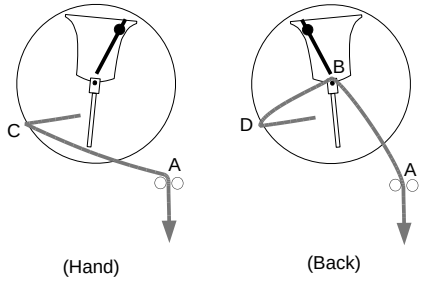

Figure 2: Rope slipped off the wheel

Prevention is better than cure. If you keep a tight rope while ringing, with long vertical strokes, the rope is much less likely to fly out at the critical moment and come off the wheel.

Stiff ropes

Some ropes have naturally stiffer tail ends than others. This can make rope handling harder, because the rope tends to communicate the movement of your tail end (left) hand to the sally, so it does not do what you expect it to.

Stiff ropes are often caused by dampness. Natural fibre rope absorbs moisture from the air. In damp weather the fibres expand, and the ropes go stiff. If it is really bad, you can hold it with the end pointing up in the air, like an Indian rope trick. Some towers avoid the problem by keeping their ropes dry when not in use – hanging the ends in a vertical tube with a heat source, like a light bulb, underneath.

Observed

The scene is a course on raising and lowering. It is an autumn evening in an unheated church.

The band is placed: students on 3, 5, helpers on 2, 4, 6, and tutor on the Treble. The first rise is steady, with tutor and helpers setting a clear framework to support the students. The Treble has risen to the point where the sally is bobbing enough to take it with both hands. The tutor is (of course) ringing with a smooth style and vertical hand movement. As his left hand rises to meet the sally for the first time, the rope between tail end and sally fails to bend. It pushes the sally so far forward that his hands (in the correct place) close around thin air.

More?

Understanding the mechanics will not turn you into a good ringer, but failure to understand how the bell, fittings and rope behave can make it harder to obtain optimum performance from it. If there are any other aspects of the ringing 'instrument' that you would like to understand, please let the Editor know – for example, what happens to the ringing when things move that ought not to move?

Tail End

The Learning Curve, Vol 1 - 1999-2001, is available from CC Publications.

Reprinted from *The Ringing World* 7 January 2005 To subscribe, see www.ringingworld.co.uk/ or call 01264 366620
Collections of monthly *Learning Curve* articles from 1999 are available from CC Publications www.cccbr.org.uk/pubs/ See advertisements in *The Ringing World.*