HOOF BALANCE
Theories, rules and laws

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'You can only find the truth with logic if you have already found the truth without it'
G. K. Chesterton 1874-1936

SPEAKING at the 1st UK FARRIERY CONVENTION I presented what I described as a working farrier's interpretation of Hoof Balance. I began by focussing upon three widely used and accepted principles.

'A perpendicular line dropped from the centre of rotation of the pedal joint should bisect equally the weight-bearing portion of the foot'.
'When assessing medial-lateral hoof balance with the use of the T-square, if the foot is not level with the bar then what you see is a hoof which is imbalanced'.
'All horses which display odd sized hooves are suffering from some misdiagnosed, unresolved flexural deformity'.

Through my presentation, I put forward my reasoning for questioning those three statements. As a working farrier the need to understand and justify my own actions is essential because my conduct can, in fact, be questioned at any time. We all need to remember our actions could lead to serious implications, so farriery is not a game and those principles outlined above are not the rules!

Hoof balance to date has been based upon the experience of individuals who, wishing to impart their judgements, go on to provide guidelines. Whilst I believe guidelines are useful and those who set the standards commendable, unfortunately, in the course of time, these guidelines are gradually presented as inflexible truths and used to support dubious theories. We are all aware, however, that there are laws which are universal and beyond question. Who doesn't know 'what goes up must come down? Another such law is Newton's Law of Levers.

Newton's Laws of Motion have often been referred to by farriery authors of the past. More recently, Mark Caldwell FWCF and Chris Pardoe BSc (Hon's) AWCF, both writing in the 1st UK FARRIERY CONVENTION handbook, have also acknowledged the relevance of Newton's Laws.

I believe that a basic appreciation of the Law of Levers will, in fact, change our present interpretation of what farriery is and what farriery does, for many years to come. Some of us have already had an insight of this simple law for some considerable time; we just haven't recognised it yet.

Now Newton's law is a simple one, which serves to explain how compression or load will affect the structure of the hoof.

During the act of progression, whilst the hoof is in the air, nothing much happens to it. It's only when the hoof is on the ground, bearing the animal's bodyweight, that it changes, shape, adapts and conforms. Compression is the key; compression is a closing force, a force that reduces. Horses that are shod too short are prone to long toes, low heels. Shoe them longer and the degree of compression at the heels is reduced and their foot shape changes. So how does that happen? Well, it happens because of the Law of Levers.

As the hoof strikes the ground, it enters that which is known as the stance phase. When the limb pivots around the pedal joint, in effect, the pedal joint becomes a fulcrum, with the long and the short pastern (P1&P2) forming a lever.

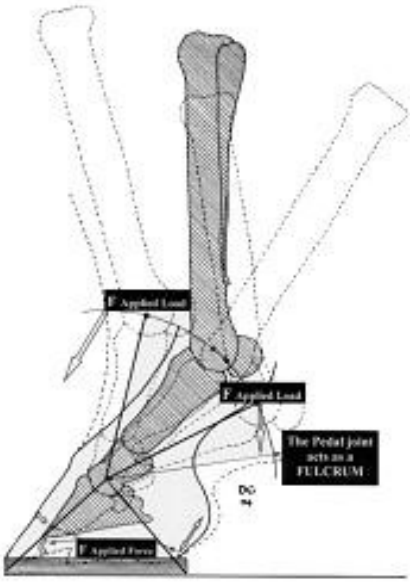
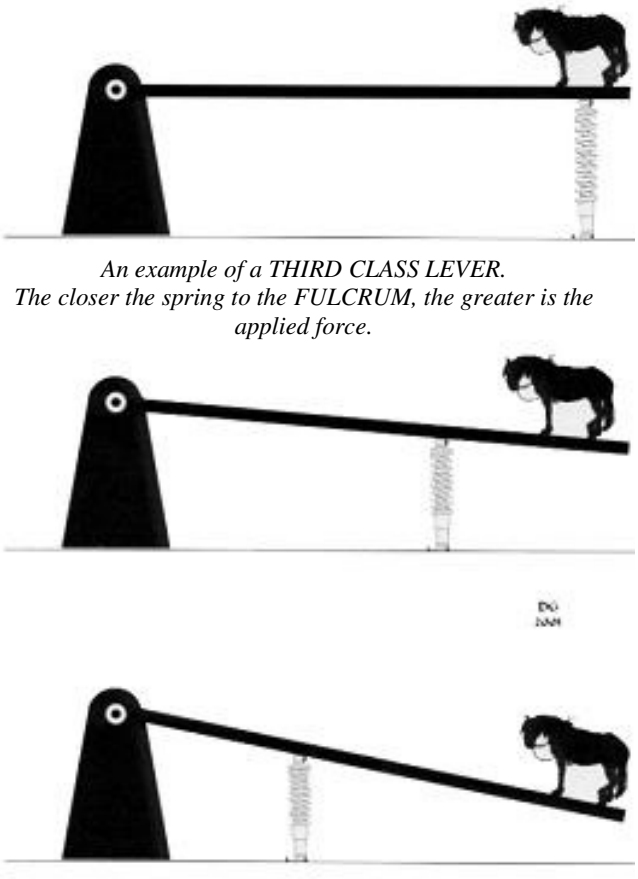


Fig 1: The stance phase with P1 & P2 acting as a lever.

As the limb enters the stance phase, initially the phalanges act as a third class lever, but as it passes through the mid stance, the limb effectively becomes a first class lever.

So how does the length of the shoe reduce the compression at the heels? Well, if we take a closer look at a third class lever all will be revealed.



An example of a THIRD CLASS LEVER.
The closer the spring to the FULCRUM, the greater is the applied force.

Fig 2: An example of a third class lever.

In this demonstration of Newton's law, the weight of the horse is borne by the spring. However, the closer the spring to the fulcrum, the greater is the applied load. As the load increases, the spring is compressed further. With the horse's hoof, the principles are the same. The closer the heels of the shoe in relation to the pedal joint, then the greater is the applied load to the hoof.

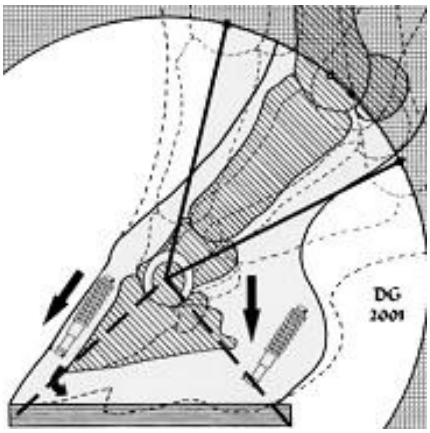
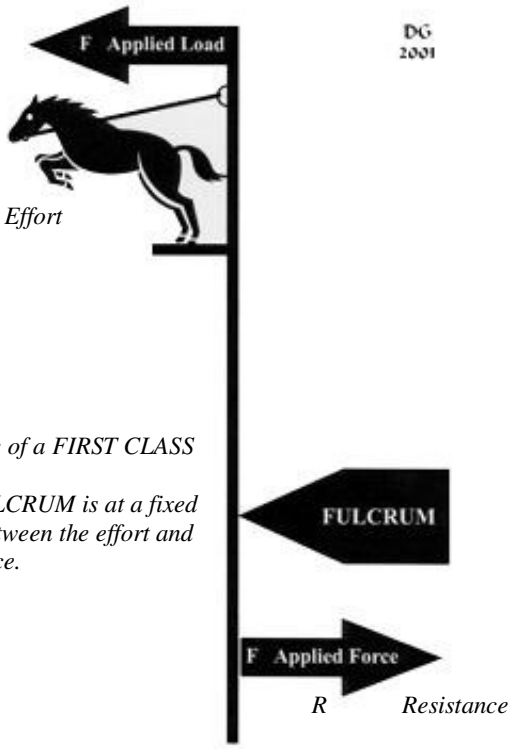


Fig 3: Newton's Law of Levers in action.

Once the limb has entered into the mid phase of stance, it then changes from being a third class lever to a first class lever.



Example of a FIRST CLASS LEVER.
The FULCRUM is at a fixed point between the effort and resistance.

Fig 4: An example of a first class lever.

The initial effect of the lower limb acting, as a first class lever is the compression of the anterior hoof wall and the secondary effect will be a rotation of the pedal bone (P3).

All this may seem obvious, but it is only too easy to overlook the obvious. It is my belief that, once we understand the laws of simple mechanics, we will begin to grasp this law's true worth. Then, with our newfound vision we can review the effects of the so-called 'natural balance' techniques and the T-square theory from a more enlightened and rational perspective.

And what about those three widely used and accepted principles I have questioned throughout my own inquiry? Do those theories and the rules that surround them stand up to the laws of nature? The experienced farrier should have the answer and if we, as farriers, don't have the answers then these questions will continue to challenge our integrity.

'If I have seen farther it is by standing on the shoulders of giants'
Isaac Newton 1642-1727