Warré Hive Lifter – Wood and Bits of String

Introduction

What do you do on a sunny day while you're waiting for your apiarist to populate your Warré hive? You build a hive lifter of course!

There are lots of great ideas at http://warre.biobees.com/lift.htm and I was particularly impressed with Kai Serschmarn's lift. Unfortunately, anything involving joining bits of metal together is way beyond me – so I focussed on the timber constructions.

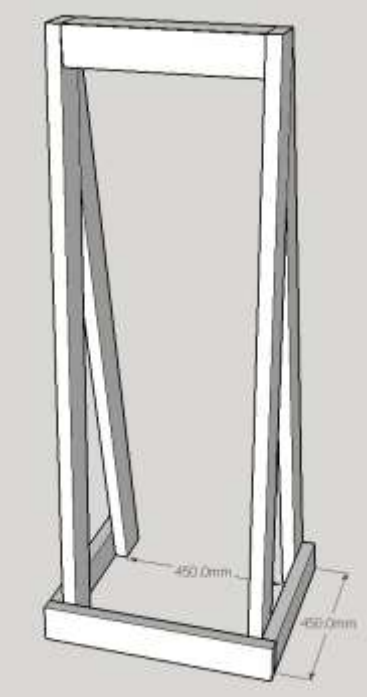
The thing that most have in common is that they resemble guillotines (I suppose that's the French influence :-)

The other thing that they have in common is that they are all forklifts – a pair of tines designed to fit neatly under the handles of the Warré box with a winding mechanism to raise it, and a slide to keep it vertical.

My first thought was "how do I stop the forks from drooping?" and my second thought was "how do I stop the slides from jamming?" It's obviously possible to deal with these problems (because people have!) but they weren't problems I felt like dealing with just then.

So, "play to your strengths" I thought – I'm moderately handy with chunks of timber and I know a bit about ropes. Ropes make things go up and down. Beehives are things. Therefore ropes make beehives go up and down. QED!

Frame Design



Fundamental Principle: When you're lifting with a rope, it has to be pulling directly above the centre of gravity of the thing that you're lifting.

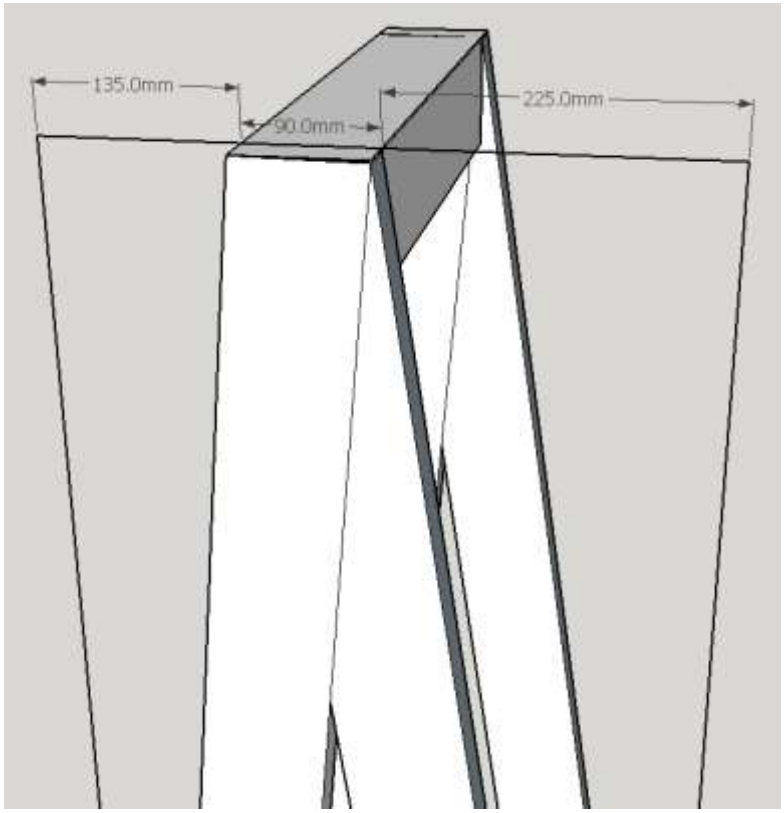
With that in mind, everything else just fell into place:

- the headboard has to be centred over the hive
- the headboard has to be high enough to lift from a stack of hive boxes
- the support has to be strong / rigid enough to support a full hive being lifted
- the base has to be wide enough to surround the hive so that the centre of gravity of the hive falls well within its footprint.

The base has a clear area of 450mm square – plenty of room for a Warré hive with room to work.

The height of the frame is not critical. I chose 1500mm because that would allow for a 4 box hive and is a nice, manageable size.

The supports are actually asymmetric – they lean backwards slightly from the centre.



This results in the face of the headboard being exactly over the centre of the clear (450 x 450) base area.

All support timber is 90mm x 35mm treated pine.

The headboard is 90mm x 90mm treated pine.

Fasteners are a combination of 65, 75 and 100mm galvanised bugle head timber screws.

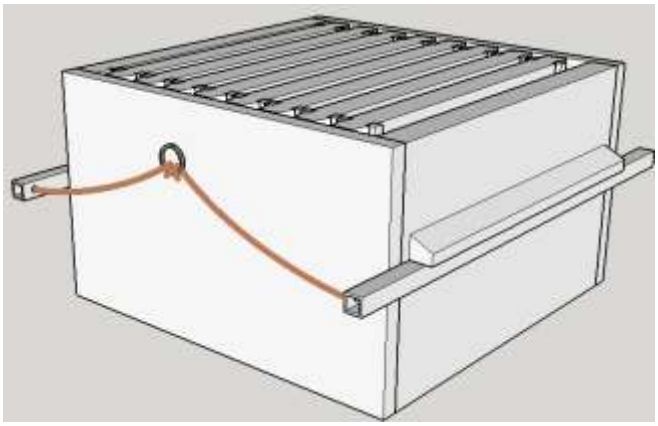
Lifting Gear

Hive Clamp

This is the component that takes the place of the forks in forklift designs. It fits snugly under the handles of the box being lifted and applies the upward force to lift it.

The big difference here is that:

- the lifting force is actually applied to the ropes at each end, not directly to the bars
- the lifting force applied to the rope also holds the bars against the box



I chose hollow, square aluminium bars 450mm x 19mm.

I attached the rope by drilling a 6mm hole 12mm from the end of each bar, pushing the rope through the hole and tying a stopper knot in the end of the rope to stop it pulling back.

I chose 6mm double braid polyester rope because it's strong (700kg breaking strain), easy to work with and relatively cheap. The fitted length of the rope should be about 450mm from bar to bar when laid out flat.

I also chose to tie a stainless steel ring in the middle of each rope. You could achieve a similar effect by simply tying a loop in the rope – but I find that the ring is easier to manipulate to get it exactly in the middle.

Winch

I chose a small trailer winch to provide the actual lifting power and locking mechanism (it has a ratchet that can be engaged to prevent the load from dropping when unattended).

The block (pulley) on the headboard is positioned just left of centre so that the rope hangs down exactly in the middle.

I initially had the winch mounted directly on the support frame but, in early trials, found that the rising hive interfered with the winch handle so I put it on a 45° angle.

The critical thing is to align the winch so that its rotation is perpendicular to the rope – otherwise the rope tends to bunch up on one side and jam.

Hanger

This is the bit that connects the winch to the hive clamp.

It's simply a 500mm bar (piece of timber) that:

- is attached to the winch rope at its centre
    - in this case by drilling a 6mm hole through the timber, pushing the rope through and tying a stopper knot
- has ropes 25mm from each end (450mm between them) that connect to the rings on the hive clamp
    - in this case, I drilled 6mm holes to pass the hanger ropes through so that I can control the length of the hanger ropes.

It's possible for the hanger ropes to be of fixed length but that dramatically reduces the flexibility of the arrangement. By allowing the hanger ropes to be of variable length:

- using a short length allows you to lift the top box off a high stack
- using a long length allows you to lift a bottom box without having to take the higher boxes off first.

I chose to attach stainless steel clips to my hanger ropes because they go well with the stainless steel rings that I'd tied into my hive clamps for this purpose.

I also chose to mount small cam cleats to control the length of the hanger ropes. I find them more efficient than other types of cleats, tying knots, etc.

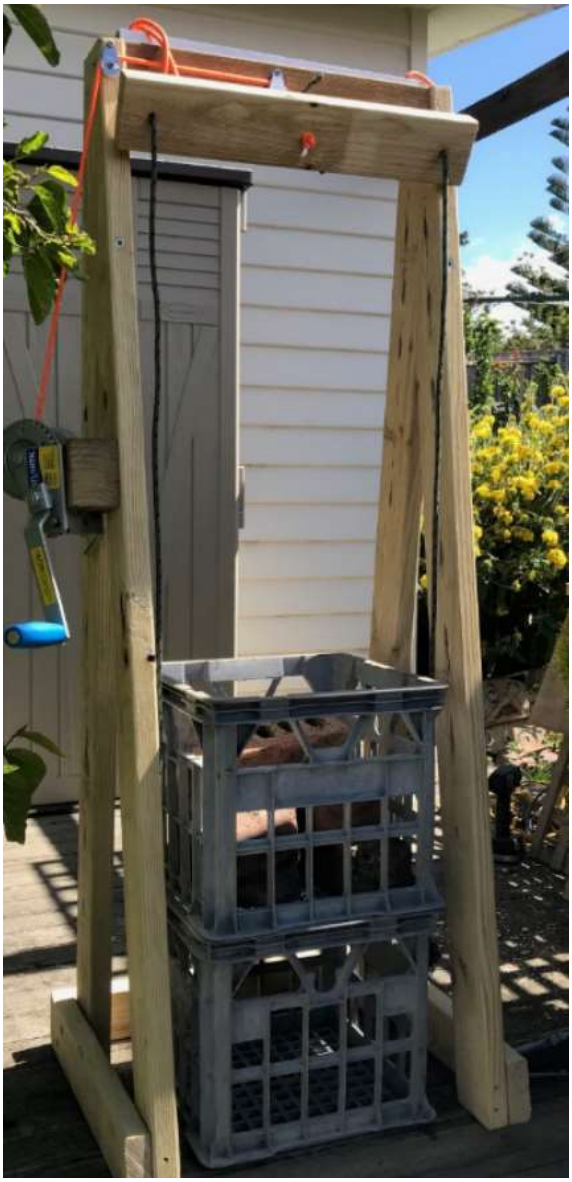
I chose not to put turning blocks on the hanger ropes because, while they will often be adjusted, they will never be adjusted while under pressure so friction shouldn't be a problem.

Trials

I mentioned that my hive is away being populated… Well, thankfully I had some crates in the garden that are about the same size as a Warré hive:

They have a nice lip around the top which, while it isn't as pronounced as Warré handles, looked as though it would do.

In position:



Hive clamp in place:

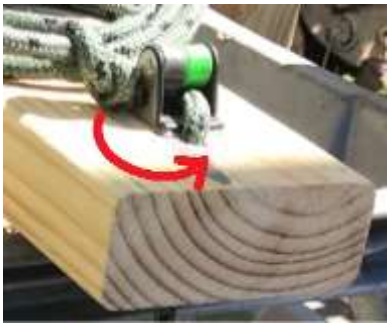
Mission accomplished!

Performance

Putting the hive clamp on was straightforward. There is a tendency for it to slide down until you've attached it to the hanger so it's probably best to lower the hanger and adjust (approximately) the hanger ropes before you fit the hive clamp.

The stability of the hive during the lift is critical. In my trial, I had the weighted box on the top and I found that there was some tendency for the load to tilt. Given the fact that the hanger ropes are at the front and the back and the support frame is on both sides, it is impossible for the lifted boxes to

fall right over – but nobody wants seasick bees! I resolved that problem by lowering the hanger bar right down to the top of the load so that it effectively stopped the hive from moving away from the centre.



Adjusting the length of the hanger ropes wasn't as easy as I'd thought. For neatness, I'd put the cleats inboard of the feeder hole. In fact, anywhere else would have been better:

- putting it on either side would have allowed for a it to be adjusted from that side
- putting it on the end (180° from where it currently is) would probably be the most accessible – so that's what I'll try next.

The length of the ropes on the hive clamp is fairly important for several reasons:

- if they're too long, the whole thing becomes a bit floppy to put on and, in the extreme:
    - prevents the hanger board from stopping the top of the lifted box from tilting
    - fails to keep the clamp bars firmly under the hive box handles
- if they're too short:
    - it's hard to put the clamp over the hive
    - the strain on the rope is magnified dramatically during the lift.

I think the ideal length for the ropes is such that they form an angle of about 45° to the horizontal (unlike mine in the trial which were about 30°).

Actually raising the load was very easy. Admittedly, it was quite a light load but, with a 3 to 1 gearing and at least 8 to 1 (handle / spindle) that gives an overall purchase of 24 to 1. In other words, 4kgs of effort can lift nearly 100kgs of hive!

The ultimate test – raising and supporting 90kgs:

Parts List

Component	Main Structure	Hanger	Hive Clamp
Treated Pine (90mm x 35mm)	4 x 1500mm 2 x 450mm 1 x 590mm	1 x 500mm	
Treated Pine (90mm x 90mm)	1 x 450mm 1 x 90mm (winch base)		
Winch (300kg capacity) eg Altantic Cadet	1 + galv fasteners to suit		
Galvanised bugle head wood screws	14 x 75mm 2 x 100mm 12 x 65mm		
Turning Blocks (5-8mm) eg Ronstan RF661	2 + galv fasteners to suit		
Polyester double braid rope (6mm)	4m	4m	1.5m
Stainless Steel hooks eg Ronstan RF533		2	
Cam cleats eg RWO R3591		2 + galv fasteners to suit	
Stainless steel rings (5mm x 31mm)			2
Aluminium square tube (19mm x 19mm x 1.2mm)			2 x 500mm