

Tillers’ TechGuide

A Simple Forecart Design for Draft Animals

By Richard Roosenberg

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Introduction

As to the forecart, we take it for granted and never thought of writing a TechGuide for it. Thanks for making us think about it.

The simple forecart used by Tillers to pull a hay baler and manure spreader is the basis for this design. It doesn’t drive a PTO shaft or many of the features advertised for some carts on the market. That’s another level of complexity. The baler we use has an auxiliary engine to power its own mechanisms and the manure spreader is a ground-driven trailer model.

The forecart can carry heavy loads without lifting the tongue by virtue of the drawbar’s hitch-point being kept very close to the axle. On our cart it extends only 7 inches (175mm) behind the axle. Since we walk beside our cattle when working, we do not have a seat on the forecart, as do most forecarts that are designed for horses.

Acknowledgement of Reviewers

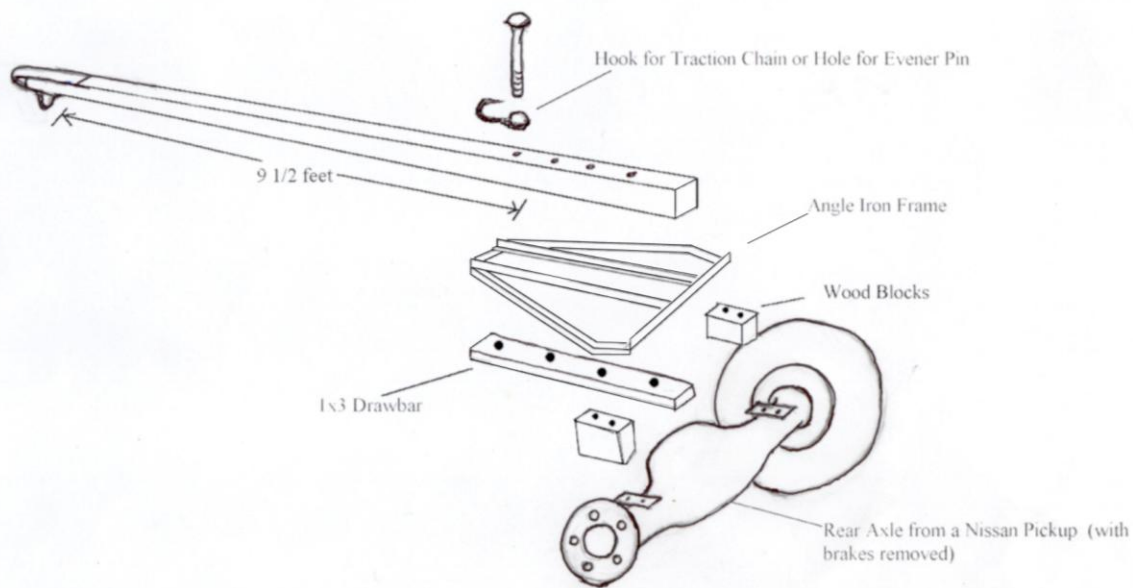
This is the first draft of this TechGuide. It was inspired by an information request by Ken Perry who uses draft animals in Wisconsin. Comments are appreciated. Future drafts will integrate suggestions, corrections, and improvements to illustrations. Please send comments to: Tillers International, 5239 South 24th Street, Kalamazoo, MI 49002 USA

Safety Cautions

For safety, please realize that hitch carts can be dangerous when leading a heavy load down hills. As compared to a rigid tongue going directly to the load, a hitch cart introduces flex between the load and the draft animals. The lighter the cart the more likely the load can push it to the side on a downhill, jackknifing the load into the backside of the animals. While this has not happened to us, our forecart is relatively light and the risk is there. Most of our work, however, is on very flat ground.

Materials and Design

We built our forecart on the rear axle of a Nissan pickup. We were looking for an axle that would be available in many developing countries. We took off the brakes (they are of little benefit without the weight and would be better placed on the load). We made a triangular frame that anchors to the axle at the mounts for the spring and braces the tongue. The angle iron we used was 3/16 by 2x2 inch (5 by 50x50mm). We used a 1x3 inch (25x75mm) flat bar for the draw bar. It is about 32 inches (800mm) long and extends forward under the angle iron frame and tongue. Several bolts anchor it directly to the tongue. We attach our traction chain to a hook on the front bolt so the force of draft is transferred directly as possible to the drawbar. With horses, you would want the hammer over your evener to attach to such a



Sketch of Tillers Forecart

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bolt and perhaps drop the evener pin through another.

Hitch Load Capacities

The tongue load supportable by the hitch of the forecart is a matter of balance between the front and the back. Relatively heavy weights can be supported by the back hitch because the weight of the front is stretched so far forward. The axle serves, of course, as a fulcrum. The load the rear hitch can support is inversely proportionate to the weight of the tongue at its front times the ratio of the lengths of each from the fulcrum (the axle). For example, the front of the tongue on Tillers' forecart is 11 feet 10 inches (142 inches, or 3.55 meters) forward of the axle. A small scale hooked to the front of the tongue measures 22 pounds (10kg.) when supporting the tongue without a load. As mentioned earlier, the hitch extends 7 inches (175mm) behind the axle. The load capacity can be quickly calculated in inches and in pounds. It is like balancing a teeter-

totter with a light person having the advantage of a long distance from the support.

$$\text{Load capacity} = \frac{142 \text{ in} \times 22\text{lb}}{7 \text{ in}} = 446.38 \text{ lb}$$

While our New Holland baler with its motor mounted forward takes two people to lift it, it does not approach the 446.38 pounds (202.9 kg) required to overbalance the cart. On the other hand, we have to watch how we load the manure spreader to be sure it does not lift the tongue up against the yoke.

Extra weight can be added forward on the tongue to increase the hitch load capacity substantially. The Amish sometimes add a solid steel bar to the bottom of the tongue to accomplish this. With a forecart a fair amount of weight on the hitch is an advantage. First, it reduces the resistance of the wheels of the trailer being pulled. Secondly, the greater the tongue weight of the trailer being pulled

relative to its overall weight , the less likely the forecart will be jackknifed on a downhill. The forecart tires will have more traction to resist sliding to the side.

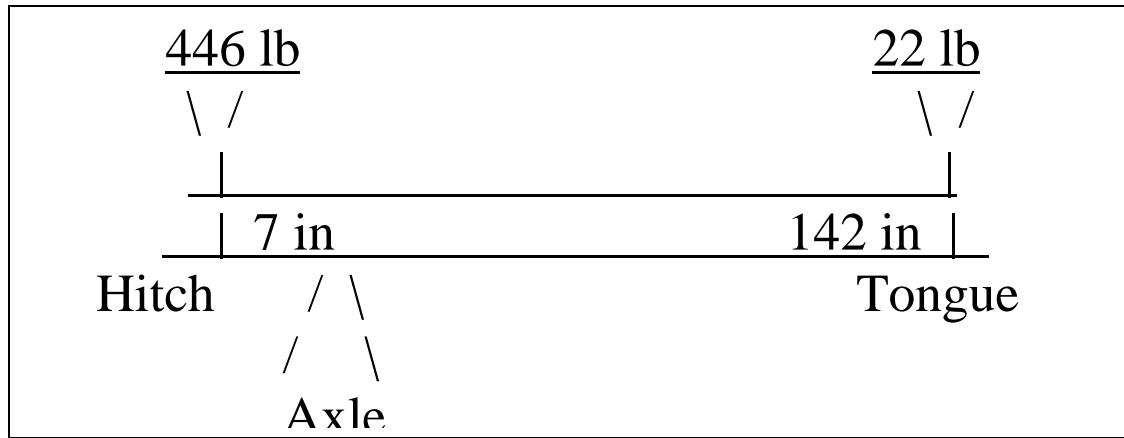


Figure 2: Diagram of hitch Load Capacity

Conclusion

A forecart can be a versatile tool, especially on a farm with some implements designed for tractors. This versatility makes it useful in anticipating transitions to tractors from draft animals in developing countries as well as the reverse in developed countries.

Suggested reading and Reference

Teamster 2000

Reed, Elmo

Three- point-Hitchcart

Nolle, Jean

1986 *Machines Modernes a Traction Animale.*
Editions L'Harmattan, 5-7 rue de l'Ecole
Polytechnique, 75005 Paris