



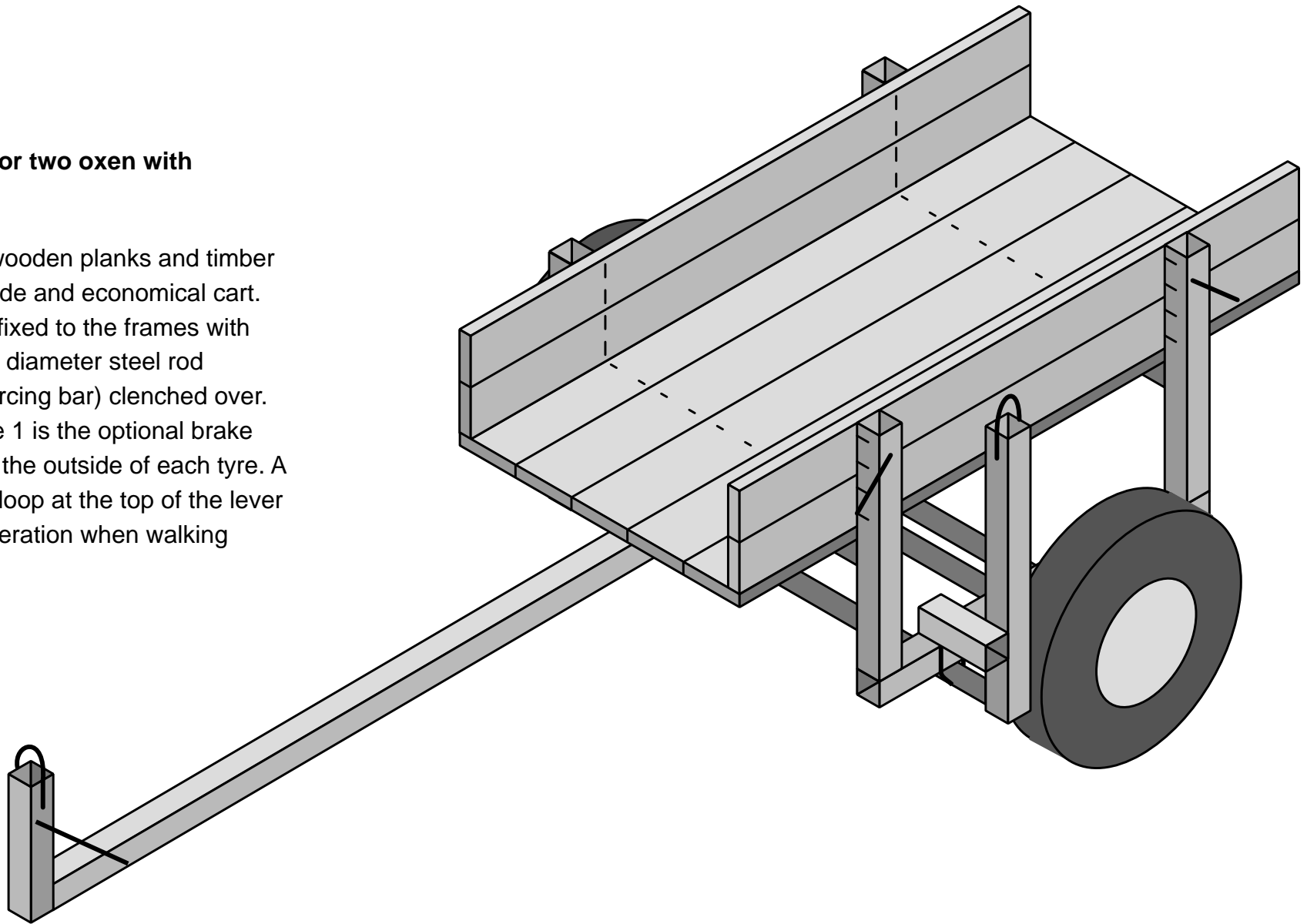
Low-Cost Animal Cart Programme

Low Cost Vestigial Steel Framed Cart for Two Oxen

TECHNICAL
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RELEASE

Figure 1: cart for two oxen with brake.

This cart uses wooden planks and timber for a quickly made and economical cart. The planks are fixed to the frames with 8 mm or 10 mm diameter steel rod (concrete reinforcing bar) clenched over. Shown in Figure 1 is the optional brake which works on the outside of each tyre. A rope tied to the loop at the top of the lever allows brake operation when walking behind the cart.



Steel Box Tubing and Timber Cart for two Oxen.

Introduction

In this booklet we tell you how to make a simple cart from square steel tube and timber. This Technical Release does not tell you here how to make the axle - you will have to read another Technical Release to for this. We have designs for stub axles with PVC bearings and with needle roller bearings that you can make yourself and we have designs for twin offset axles using PVC, wood and scrap ball bearings. All axles can be made without machine tools - in fact you do not even need a drill!

This Technical Release describes an ox cart made from

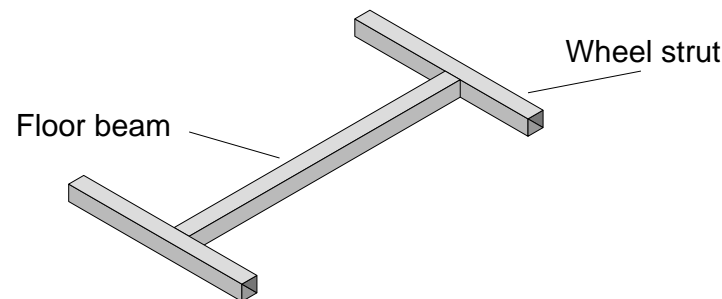


Figure 2: finished H frame.

TR33: 5th April 1999

60x60x3 square steel tubing and is suitable for oxen weighing 350 kg to 500 kg. If you have really strong animals then use 75x75x3 tube - its only a little bit more expensive.

You should find that you can make the 60x60x3 cart body for about £ 50 depending on the cost of the materials and labour. An axle plus wheels, tyres and tubes will cost another £ 60 - £ 70. Once you get organised, two men can probably make one cart in a day. We've designed these carts to be easy and quick to make.

Idea Behind Design

These carts are designed to be constructed without lots of special tools and jigs, and without any hard-to-get materials. The only tools which you must have are a welder, a wood saw,

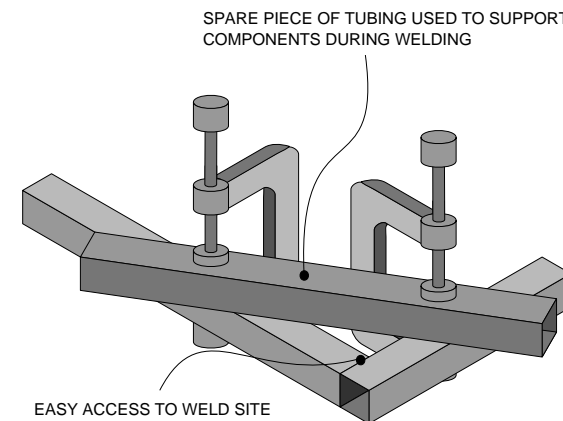


Figure 3: holding frame components during welding.

a hacksaw, and a hammer. You might find that a couple of 5" or a 6" G clamps (or something like it) are useful too.

The cart frames are fixed together by welding and the wooden planks are fixed to the frames with clenched steel bar. You weld 8 mm diameter re-bar (concrete reinforcing bar) to the steel box tubing so it sticks out about 20 mm beyond the surface of the planks, and then knock the ends over with a hammer so they lie on the surface of the wood.

You will see that there are no mitres or complicated angles or

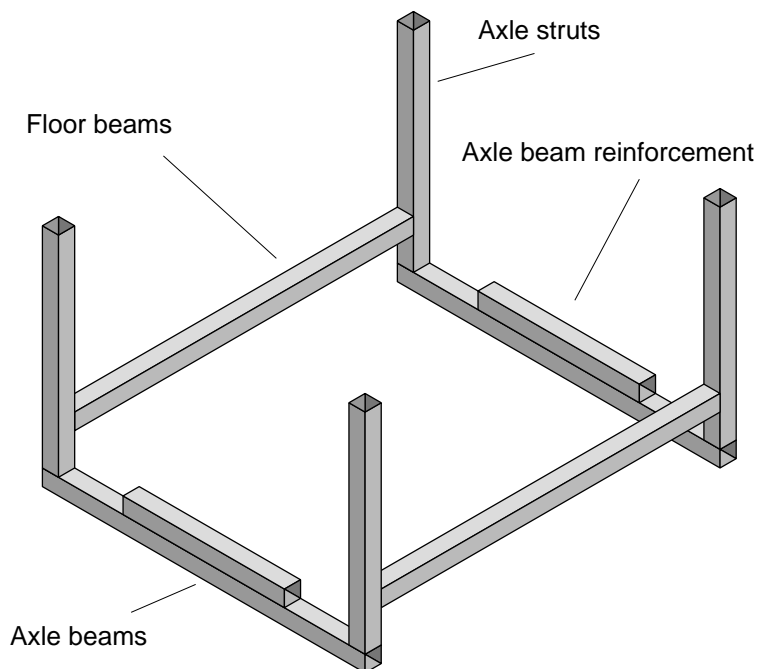


Figure 4: main frame assembly.

TR33: 5th April 1999

joints to cut when making the cart, so you save time. Also the exact lengths of the components are not very critical - again it saves a little time, but you will find that the carts look better if you take a little trouble to get things square and even etc and welding is easier with good square ends. It is much better to use a try square to mark the position of a cut than guess.

These carts have been tested in Kenya and Uganda and we have had only a few serious failures caused by poor welding or incorrect material. We think that they are strong enough, but we cannot be sure - somebody will always break anything.

TABLE 1: 60x60 RHS vestigial frame ox cart.

| description | length mm | # | total mm | cost £UK |
|--|-----------|----|----------|--------------|
| 60x60 RHS: | | | 11520.00 | 36.67 |
| floor beams 7 x 160 mm (floor planks 160 mm) | 1120.00 | 2 | 2240.00 | |
| wheel struts 3 x 160 + 25 + 60 + 180 | 745.00 | 4 | 2980.00 | |
| axle beams 1100 mm long | 1100.00 | 2 | 2200.00 | |
| draw pole | 2700.00 | 1 | 2700.00 | |
| draw pole upright extn | 400.00 | 1 | 400.00 | |
| draw pole reinforcement | 1000.00 | 1 | 1000.00 | |
| R8 | | | 5850.00 | 0.90 |
| plank fixings each plank (13 off) takes 6 | 75.00 | 78 | 5850.00 | |
| R12 | | | 1200.00 | 0.33 |
| yoke loop | 400.00 | 1 | 400.00 | |
| tie cleats | 200.00 | 4 | 800.00 | |
| 6"x1" timber | | | 23.40 | 4.99 |
| tray planks 13 off | 1.80 | 13 | 23.40 | |
| TOTAL = | | | | 42.89 |

Cutting list and costs

Table 1 shows a cutting list for a complete cart - Recent prices of materials in Kenya are shown converted into £_{UK}.

Construction step by step

- 1) First get all the material together and clear a space to work. Ideally you will be able to work on a flat area of concrete. Start by cutting the 60 × 60 box section steel into the right lengths, as in the cutting list, then cut the bottom and side

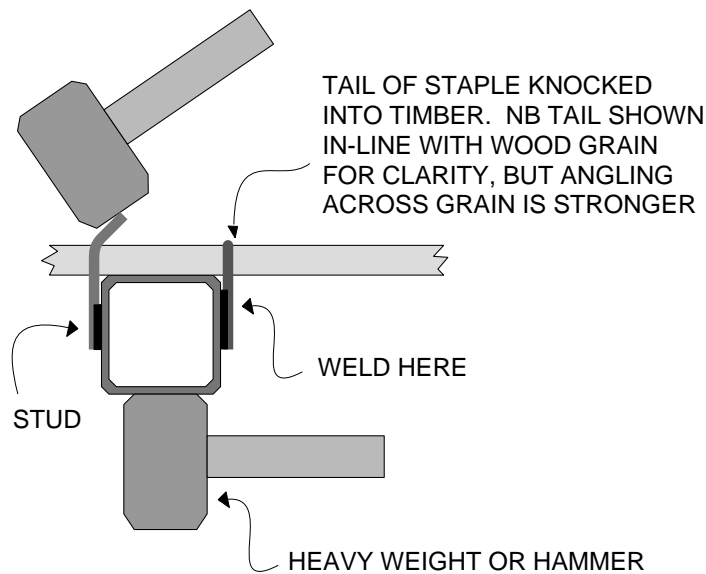


Figure 5: tightening welded stud.

planks. Lastly cut the 8 mm dia or whatever re-bar for the fixings ie the studs.

- 2) Next make up the two H-shaped frames shown in Figure 2. If you have a couple of G clamps you can use them to hold two pieces of the frame together during welding as shown in Figure 3. It's quick and you can tap the parts with a hammer until everything is square and straight and then weld.
- 3) Then stand the two H frames on the axle beams as shown in Figure 4 and weld up the main frame.

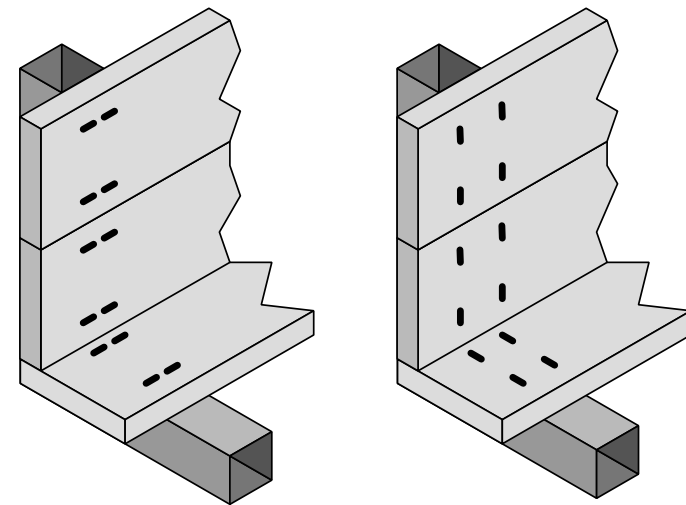


Figure 6: studs or staples bent in line with grain (left) or across it (right).

- 4) Next you can fit the side and the bottom planks to the frames with studs. Studs are just short lengths of round bar welded to the sides of the box section as shown in Figure 5 (which also shows how these studs can be tightened with a hammer and a weight or another hammer).

Studs can either be put through holes in the planks or they can just be welded at the edge of each plank and then simply bent over the edge.

When you bend the end of the stud over you can either bend it in line with the grain of the wood or across the grain, as shown in Figure 6. Bending it in line as shown on the left lets it go into the wood nicely and looks neat, but bending it over across the grain gives a stronger joint.

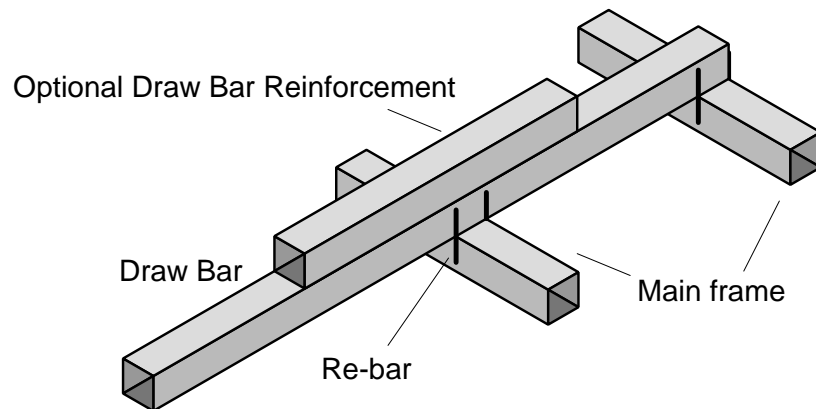


Figure 7: method of fixing draw bar to body. (View of cart upside down.)

- 5) Nearly there! Now you need to fix the draw pole. It is best to fix the draw pole to the body so it can be taken off and replaced if it gets damaged. A good way to do this is with short lengths of round bar welded on as shown in Figure 7. It is easy to cut through the re-bar hoops if you need to change the draw bar. You will need to use new re-bar of course when you put the new draw bar on. Also shown in Figure 7 is an easy way to reinforce the boom with an extra piece of steel tube welded to the main tube.
- 6) If you want to make it so that the ends of the load tray can be removed easily you can do so in the way we have shown in Figure 8. This is a good way because it is cheap

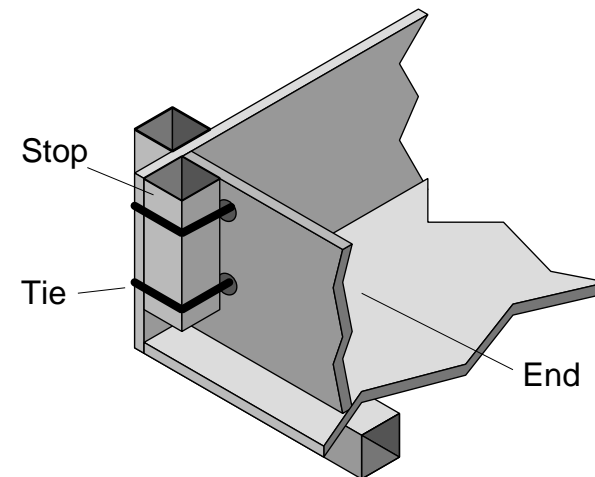


Figure 8: method of fixing tray ends with rubber or rope

and very easily repairable.

7) Paint or creosote the cart. You've finished it!

Modifications

There are many different versions of this cart. You can try longer or shorter carts and you can make them wider or narrower. When you do this, check the length and width of the planks of wood that you will use - you do not want to find that you are two inches short of being able to get two runs of plank out of one piece of timber, or that its just too narrow and you have to fiddle about and fit in a narrow strip.

Other DTU cart developments

The DTU has been working on a range of carts for use with both donkeys and oxen. It has designs for wooden and steel framed bodies and for a range of wheels and axles. All steel framed carts can be fitted with a simple brake. The DTU also has designs for single and double donkey harness.

Cart Drawings

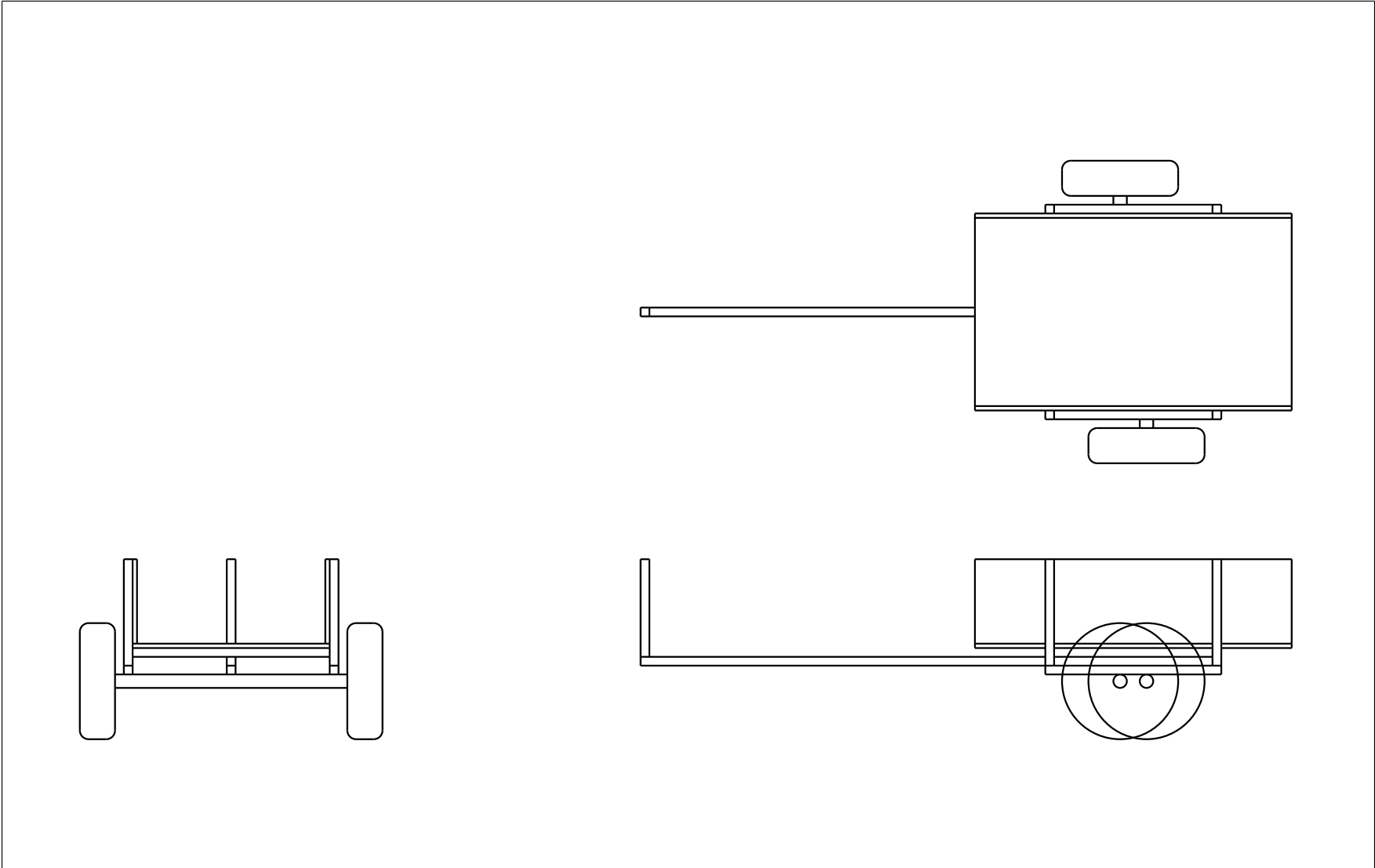
You will find two drawings on the next pages, the first one gives a general view of the cart, and the second gives a view of the main components. As we have said you can vary the size of the cart quite a bit and even make it much longer if you add extra frames. You could even make a four wheeled cart like

this!

Acknowledgements

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| | | | | | Scale | 80 mm | <input type="checkbox"/> | Title STEEL & WOOD TWO DONKEY-CART | Drawn by | CEO |
| | | | | | Date | 9/7/95 | | | Dwg No. | 1/2 |

