Build One **Full Size** Pump Car

Part 1 of 3 To be Emailed separately, **Part 2** Full set of drawings for narrow gauge pump car

**Part 3** Pump Car pages from 1909 Buda Catalogue


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**And other Hand Powered Rail Vehicles**

- Hajtany (HU)
- Railbike (US, GB)
- Dresinskyklign (NO)
- Handcar (US)
- Drezina (RU)
- Resina (FI)
- Drezyny (PL)
- Skinneccykel (DK)
- Cykeldressin (SE)
- Draisines (BE)
- Bicilinha (BR)
- Dresin (NO)
- Biciclette Ferroviaire (IT)
- Spoorvegiaets (BE)
- Dressin (SE, NO)
- Dresina (SP)
- Schienenvelo (CH)
- Dreziny (CZ)
- Spoorfiets (NL)
- Pump Car (US, GB)
- Velorail (FR, GB)
- Cyclo Draisine (FR)

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**For all Gauges**

Mark Egerton is preparing **AutoCAD .dwg** drawings for Laser cut gears 18 inch & 6 inch

There will be four 10 mm steel blanks with holes to bolt or rivet them together. With a **key way** in the centre hole of the small gear. (Quote £140.80 + VAT for all 8)

He has also designed a simple to weld “**built up**” crank (no materials price yet)

And a laser cut **Walking Beam** from two 10 mm layers to weld together, with the closest “**off the shelf paint**” matches we can find.

Our design will use **30mm axles**

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October 2013 No23 For this free email newsletter, contact: jackietomhas002@hotmail.co.uk Or download from: [www.velocipedes.co.uk](http://www.velocipedes.co.uk)

NEXT RALLY – North York Moors Railway, Thursday 7th & Friday 8th November 2013 contact Tamsin on whin74@yahoo.co.uk for more details

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2 foot at [www.statfoldbarnrailway.co.uk](http://www.statfoldbarnrailway.co.uk)
with 2 bolt cast iron pillow /plummer block housing.
http://simplybearings.co.uk/shop/ 8 for the 30mm axles @ £10.31 each plus 4 25mm @ £8.75 + VAT. (2 for the walking beam and 2 for the crankshaft), plus £1.50 shipping (£142.48). 30mm bright drawn bar 3m £35 + VAT. £133.35 + VAT

The prices quoted are estimates we have been given, we are not selling.

We are planning to appear at the Midlands Model Engineering show in 2014 (not this year)
We want to have at least 3 “BUILD ONE” CD’s to help build different machines, available on the stand. (With instructions, laser cutting code, drawings, photos of the build and old machines).

With examples of the built machines either on the Exhibition Stand or on the Test Track outside. You will get regular updates.

Mock ups of the CD cases, we may just have paper wallets to save money.

The “Build One” Team
Everyone puts in ideas and suggests improvements as we progress.

Trevor Catterson and friends who actually try out the drawings and laser cut parts, build meticulous machines and photograph it all
To edit all the ideas & drawings, question the alternatives and key in the AutoCAD – Kevin Thomas
To answer all the complex laser cutting questions and bring the price down by nesting and tagging parts and especially do the specialist gear and chain bits and give advice – Mark Egerton
To do the Historic Research, the paper drawings and wood mock-ups – Jacqui Thomas

Below Photo of the actual type of machine depicted in the patent but without the rocking platform, which seems impractical to me.

There is not an original Patent for pump cars, they developed in service. This is FIRST patent for an “improvement”, a rocking platform also connected to the walking beam in 1859. View it on www.google.com/patents/us26453
SECOND a submission to the Military in 1861 during the American Civil War (1861-1865).

An enormous 40 man machine I can only think this was to meet a very unusual specification or an attempt to dump an archaic design on the military (this still goes on today).

I cannot see this brute getting the approval of General Herman Haupt, commander of the US Military Railroad, he was professional Railwayman.

In 1882 George Sheffield obtained a patent (View it on www.google.com/patents/us265987) which I thought surprising given all the prior usage but the patent is for five improvements not the basic machine.

1. A removable, adjustable, threaded walking beam pivot
2. Split bearings to take up wear
3. Wings between the large gear spokes
4. To snugly grip the crank and replace the key on the shaft
5. A sprung loaded (to off) foot brake to act on both axles.

The improvements can be seen today, it was a generational change and altered the look of pump cars.
Ours is 2 foot gauge but there is no real difference to a standard gauge one except the deck is over the wheels, not between them. (These wheels sets were dragged from a drained reservoir).

“Back to Back” for narrow gauge

The wheels we used were standard gauge, the flanges were thick. At 2 foot gauge the back to back is 20” but needed to be 21½” so I had to cut a ¾” “ring” off the back of each wheel.

I clamped the axle boxes to a trestle and dropped the axles in and slowly worked round the back of the wheel with a 9” angle grinder with a slitting disc, using my knee to brake the wheel and let it slowly rotate.

Took a whole morning, made my arms ache and I was very glad of a leather welding apron.

Kit of parts being assembled after the deck was carried on an estate car roof rack, with the rest of the bits inside (it was very hard work).

Above our crank and gears with keyways (wings” not shown “).

Above this gear drawing is labelled “Buda” for narrow gauge, but I have never seen any like it on a real pump car.

I chose “Problem Free” (so far) second hand cast gears - wider than the original ones.

I made a crank shaft from a solid slab torched out with oxy-propane (with welded on plates “wings” to grip a gear spoke).
The clamps with capscrews held the crank open when turning the two outer bearings between centres 2. (on a Dean Smith and Grace No.18 lathe) There is an easier way see MAKE A CRANKSHAFT

Our connecting rod had an adjusting thread on the bottom to equalise the movement on both sides of the walking beam.
On our 2 foot machine at the non driven end, one wheel on the axle (the non braked one) can freewheel to make getting round narrow gauge curves easier. (A colonial refinement).

The knurled brass fitting in the centre of the freewheel is a “Stauffer” type greaser.

The timber work on a standard gauge machine is simple, gallows, frame and deck.
On a narrow gauge machine the frame has two “ladders” to lower the wheel bearings so the deck clears the wheels.

FIRST FIND YOUR WHEELS!
DO NOTHING ELSE UNTIL YOU HAVE THEM Spend the time visiting vintage machines, measuring up and photographing.

SECOND HAND WHEELS
Dead petrol cars or abandoned Push Cars on Preserved Railways are the easiest source (I have not paid more than £20 per push/petrol car wheel so far).

Wickham 17 ½”
NOS Wickham 16”
Buda 17 ½ “

Fairmont
20” rim cut from JCB front wheel centre if you want to try homemade wood centre wheels.

Mine Car Wheel (probably Hudson)
New Old Stock

FOR SALE (Jan 26) NY - NOS Fairbanks Morse velocipede drive wheel. - New old stock 20 in Fairbanks Morse Sheffield Velocipede drive wheel still tagged. Very rare and in very good shape. Asking $750 obo contact

Add from the www.narcoa.org/ North American Railcar Operators Association website OR try www.railspeeders.com want adds

George Sheffield's big selling point was the lightness of his machines with wood centres.

NEW HOME MADE SHEFFIELD WHEELS

We intend to design early wood centre Sheffield 20” wheels. They will be from 6mm laser cut steel, mig welded to make up the wheels, they will have a “flat” tread (NO 1 in 20 cone angle) and will need to be commercially rolled. Plus a ring of 10mm black bar welded to the back of the “flange”.

With wooden radial spokes, routed using a laser cut jig glued up to produce the shaped spoke holes, the centre hole and the bolt fixing holes.

A separate laser cut jig will be to rout the rim “felloes” and their bolt holes.

Router Guide and cutters

Red indicates welds
**VERY OLD WHEELS**

Earliest, straight spoke (suffered cooling breaks), cast iron usually chills.

Later curved spoke had less cooling breaks.

Chilled wheel cross section showing the chilled/hardened area – broken flanges were the problem with chills.

Composite wheels, (sometimes wrought iron spokes set in the sand moulds and the cast iron poured in around them).

Billmeyer and Small 1879

[Composite image of early railway equipment]

**www.chasewater railway.co.uk**

**Will welcome a Pump Car Rally**

Contact Mark Sealey, 07850 930796
management@chasewaterrailway.co.uk

On Thursdays and Sundays Chasewater serves the best lunch on any Heritage Railway. Those are the days to organise a Rally

Jacqui.
Composite Wheels

1888 steel plate wheels, first replacement for wood centres before one piece pressed steel wheels.

SECOND MAKE YOUR GEARS

Designed by Mark Egerton

Estimated cost of laser cutting

£30 each large  £5.20 each small x 4 layers = £140.80 + VAT

AutoCAD gears Full Size

With clamped crank cheek in red

Lock & Stop

with spigots to weld in or thread the ends and nut.
THIRD MAKE A CRANK SHAFT
Designed by Mark Egerton
FOURTH MAKE A WALKING BEAM

our 2 foot machine had two flame cut pieces. 10mm thick, bent out to shape at the ends then welded. (we will AutoCAD one)

Our 2 foot gauge walking beam

Bent and Riveted Walking Beam 1905

2 foot Walking Beam, the pivot and the drive pin are welded in.

The “Harvey” type above.

2 foot “Harvey” drive pin
“Harvey” beam Pivot, you could turn one

The 1892 Sheffield beam was “similar/identical” to the Harvey one.
**BRAKES VERY IMPORTANT**

**SHEFFIELD** had a spring like No. 1 Harvey

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**No. 1 HARVEY**

The brake pedal has a spike on the back (at the bend) projecting under the frame, that engages the flat spring visible above (see the catalogue parts list)

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**BUDA** Coil brake spring under the pedal

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Brake Step with Post

Brake Spring
MORE BRAKES

Kent and East Sussex machine

Nene Valley Railway machine with adjustable brake blocks.

Chasewater machine
Photo Tony Yong

Mangapps machine with another return spring position.

Pivoted “Rising wedge” brake of 1879.

KALAMAZOO 1888

This is old fashioned, it has a foot pedal brake in the floor above the gears and “outside” brake blocks. Standard Gauge.

Billmeyer and Small 1880 “Denver Hand Car”, has the same brake arrangement as the Kalamazoo above, the return spring is under the pedal. This machine is Narrow Gauge – the deck is over the wheels.
An “Interesting” Idea For a Brake?

The brake pivot looks empty, it is the pin coming out of the frame behind the left wheel at the bottom of the complete picture (The brake block may have fallen off and the empty bracket could be flipped over out of the way).

The piece of wood in the crewman’s hand may be to shove in the gap between the pivot and the wheel, leaning on it to brake the car. But drop the piece of wood and you are in big trouble.

DOWN UNDER

HARVEY has an extra (possibly Wickham replacement “axle steady bearing”) on the driven axle next to the gear.

BUDA No. 1 no extra bearings either side of the gear on the axle.

Not having the extra bearings means the axle and its gear can be forced down and out of mesh under very heavy loading.

Sometimes the small gear on the axle is “wider” than the “big” gear this may be to help with the alignment of the gears and also protect the big (and more expensive gear). If the gears shift relative to one another, partial engagement could throw extra stress on the teeth of the big “narrow” gear and damage some of the them. http://www.youtube.com/watch?v=w2vu55qiEno at 2min 17
Aligning Beam, Crank & Gears

Only rarely is the walking beam down the centre line.

The Crank and Big Gear fit centrally between the frame stretchers.
And the small gear on the driven axle is never central

Helical Gears

For a Really Cracking Story

with loads of photos, on the Rebuilding of a
Sheffield No1 Railroad Handcar by Lary Shaffer of Maine.
http://faculty.plattsburgh.edu/lary.shaffer/

Today with her new section house, with just the brake to be added.

Near the Broadalbin NY section house on the F. J. & G. R. R. The dirt road was macadamised in 1912, so the picture must be earlier than that.

Lary found the handcar many years later decomposing in the grass with the section house when he was 12 years old and had the extraordinary good sense to buy the remains from the railroad for $2. Now 50 years later it is a magnificent piece of working industrial archaeology with a provenance. Most preserved machines have sadly not brought their histories with them.