Rusty Metal and Weathered Wood;
Scratch-building a Carson and Colorado Flat Car in On3

By Chris Butler
Photographs and Illustrations by the author

Part 1 – Why Were Narrow Gauge Freight Cars Built That Way?

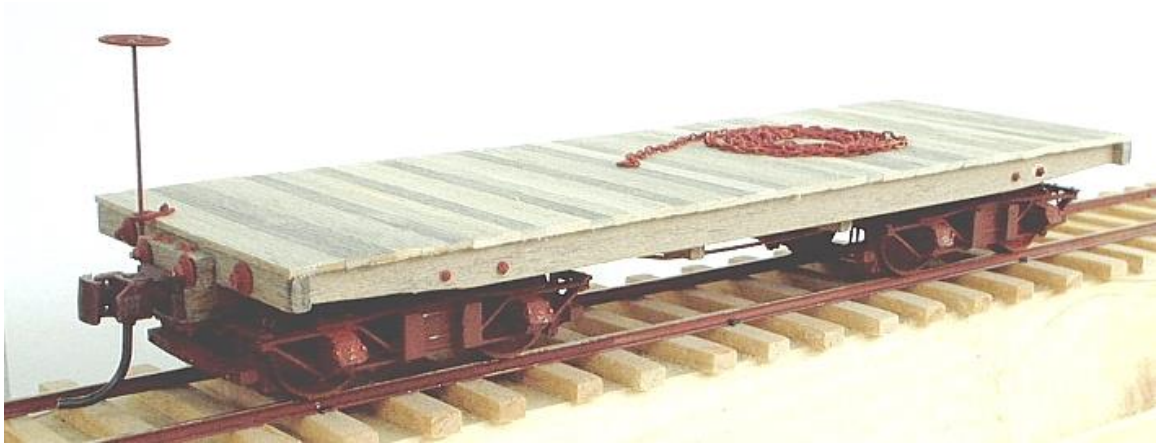

Fig. 1. The author's completed 22' On3 flat car.

Some while ago, I decided that it would not be too difficult to scratch-build a simple narrow gauge flat car in O-Scale and be a really interesting project to boot. A few pieces of strip basswood, commercial trucks and I might even install the brake rigging - hey, what could be easier and simpler? Well, this is a story about a little project that grew and grew. Sound familiar?

Scale Plans

I model small prototypes and so I based my design on the 1/32nd scale plans of the circa 1875 Carson & Colorado 22' long, 3' gauge flat car (which ran originally between Carson City, Nevada and Keeler, California) that appeared in the Dec 1999 / Jan 2000 issue of Finescale Railroader. This is published free of charge and available openly for download on the Internet at http://www.finescalerr.com/. The problem was that I wanted to model it in O-Scale.

A few days later (Well OK, weeks later) and I had finished redrawing the plans for the car but this time in O-Scale using CorelDraw 9. It's not until one goes through an exercise such as this, that the all important (and often missing) details become all too apparent. In retrospect, the original 1/32nd plans were quite scant in terms of details. Fortunately, some plans and renovation photos in two issues of the NGSL Gazette - the Nov/Dec 2001 (North Shore Railroad 3' gauge flat car) and the May/June 2002 (Diamond and Caldor 3' gauge flat car) helped fill in most of the missing information. Where would we be without back issues of the NGSL Gazette, eh?

Although re-drawing the plans was a lot of work, it was well worth it in terms of a "learning" experience and, I was really happy with the end result. It was around this time, I realized that I had to make a decision – either stick with my original vision and

build a quick and simple piece of On3 rolling stock or build something better. I picked the latter option.

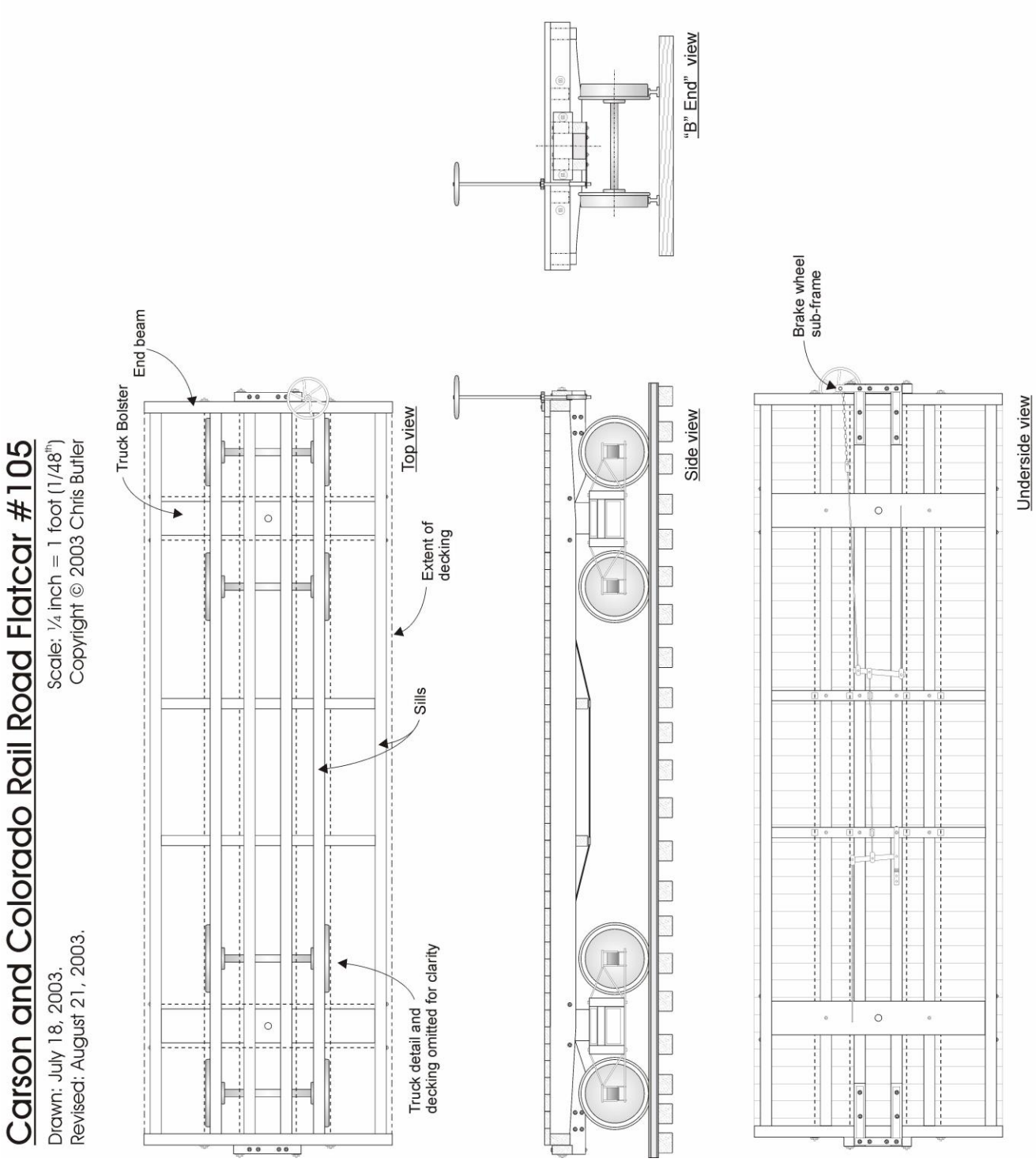

Fig. 2. The completed drawings – I will make these freely available upon request. Just send an e-mail to me at cabutler@primus.ca

Truss Rods

As I studied the drawings of a few flat cars, it became clear to me that the truss rods that run from end-to-end (lengthwise) perform multiple roles. The prototype connected the sill sections into the end beams with simple mortise joints. No yellow glue here because once tensioned, the truss rods hold the car together and prevent the end beams from becoming detached. The clever parts are the needle beams. These lateral beams create an open triangulated girder and force any weight that's placed in between the trucks out toward the end beams. The un-sung hero's here are those massive washers and nuts that are threaded on to the ends of the rods. Don't believe me? All of this can be proved by applying simple trigonometry. In mechanical structures, triangles really rule… Right, Stan?

The other important role that the lateral truss rods perform is to effectively transfer any pulling or pushing forces from one coupler to its counterpart at the other end of the car.

The side-to-side or Transverse rods form a similar triangulated girder but they strengthen the side sills by deflecting any side load toward the two truck pivot points.

Brake rigging

After installing the truss rods, I decided to go back to my reference books and settle on a simple approach to the problem of the brake rigging. Since my car is supposed to be an early prototype, I decided that I'd not include air brakes and just go with a typical early mechanical linkage. I'm fairly certain the prototype didn't use them either.

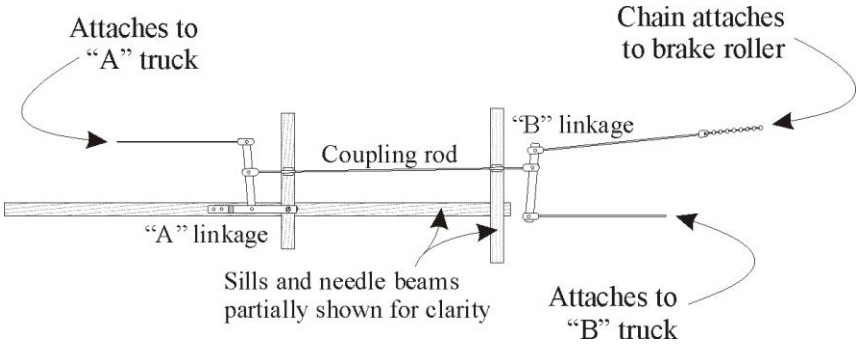

Fig. 3. The brake rigging arrangement the author used on his 22' C&C flat car. Note that the "B" truck is located at the "B" or brake wheel end of the car.

The brake rigging arrangement that these old cars used was truly ingenious; incredibly simple and easy to maintain. When the brake wheel is turned, the chain tightens which applies the brakes to the "B" truck via the "B" linkage. Since the coupling rod cannot be stretched, the "A" linkage starts to move in a clockwise direction (because it's fixed to the chassis at one end) which applies the brakes to the "A" truck. Notice that this rigging arrangement even takes into account the clockwise / anti-clockwise movement of the trucks when the car goes around a curve… The other thing that's apparent here is that it's quite feasible to repair this arrangement with minimal tools, even if you were stuck miles from a repair facility.

Adding an airbrake to this system would simply require a third linkage system, air hoses and a brake cylinder.

As an aside, I noticed that at least the one of the standard gauge wooden Cabooses at the Smiths Falls Railway museum had a similar (but alas, not identical) brake roller arrangement.

Shiplap decking

I've built a few wooden decks in my time (you know, the usual 2x12" joists on 16" centers with 2x6" decking either nailed or screwed to it) and it's always puzzled me how the under frames on freight cars could ever provide adequate support. For example, on the C&C narrow gauge prototype car, there's a gap of approximately 22" between the outer sill and the closest center sill. How can this work? We'd never build a deck with joists on 22" centers because the decking would sag.

The answer to this is in the way the decking sections are shaped. Unlike our residential decks, the freight car builders used shiplap decking. Due to its shape, each freight car decking section overlaps its neighbour on its edges.

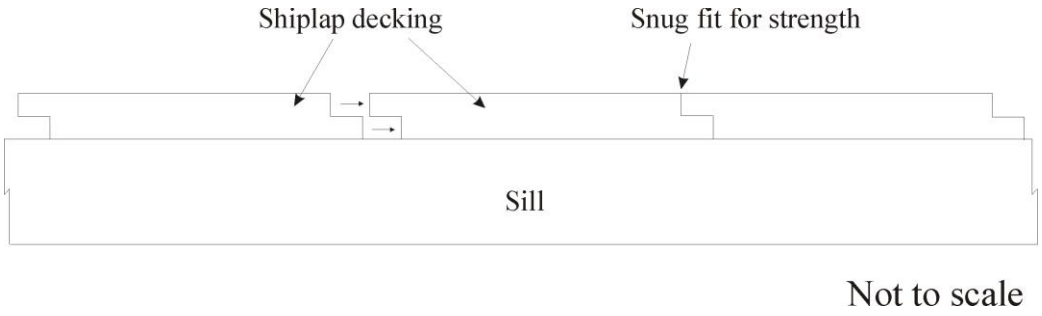

Fig. 4. The Shiplap decking

The Shiplap design provides greater strength because once the decking sections are installed it effectively makes them one big continuous sheet – in our case, 22'x7'.

If you think about it, older houses employ a similar arrangement with tongue and groove flooring.

If you'd like to construct this flat car (or something similar), please send me an email at cabutler@primus.ca and I'll respond with scale drawings in CorelDraw 9 format and also un-scaled drawings in hi-resolution, 600 DPI JPEG format.

In the next instalment, I'll describe how I scratch-built my 22' Carson and Colorado Flat Car. Until next time…