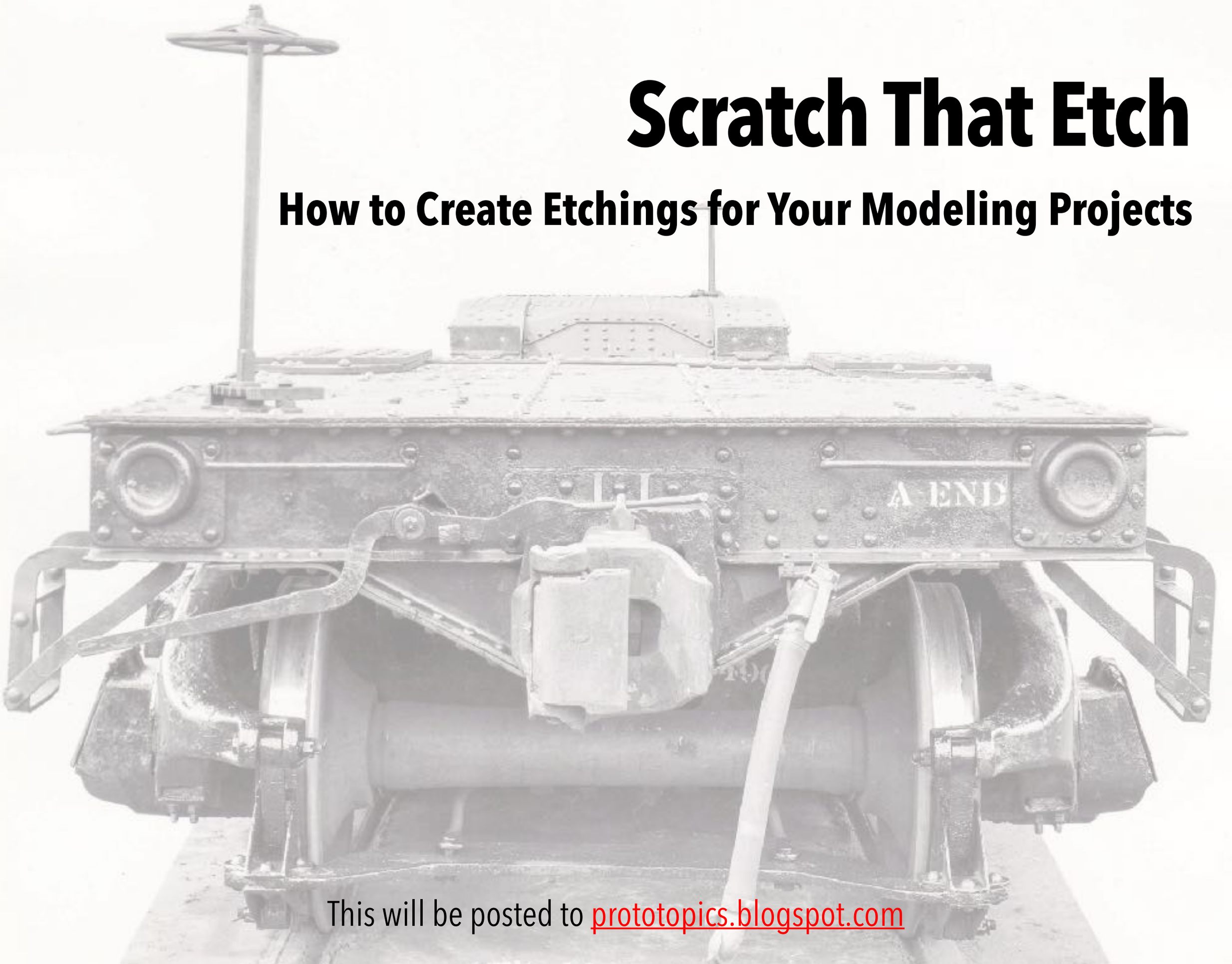
Scratch That Etch

How to Create Etchings for Your Modeling Projects



This will be posted to prototopics.blogspot.com

Apologies!

…and Thanks

George Toman and Tony Sissons

This will be posted to prototopics.blogspot.com

What is Etching?

- Design
- Metal selection
- Coating
- Exposure
- Development
- Etching
- Photoresist stripping

Discussion-worthy providers

- Detail Associates
- Taurus
- Free State
- Alkem
- Plano
- Keyser Valley
- Yarmouth

Providers

- **Insight Designs - high quality with corresponding cost. Don't generally work directly with consumers; will direct you to an intermediary for artwork generation (which also comes with a cost)**
- **PPD - very consumer-friendly and provide guidance. Quite economical**
- **There are others…**

Why?

The three "ities"

- **Availability**
- **Fidelity**
- **Durability**

- **Ladders**
- **Sill steps**
- **Caboose parts**
- **Brake gear**
- **Side sill supports**
- **Etc.**

Tools

To create and use…

- **Software – CAD or Vector; I use Illustrator for this work (I will do a one hour Wed evening Hindsight about drawing for decals and etchings)**
- **Bending tools**
- **Assembly tools**
- **High quality tweezers!**
- **Adhesives – I use ACC for most applications, but will use Goo-MEK mix, too**
- **Patience, patience, patience**

Tools

- Yarmouth etched ladder assembly jig (left)
- Small Shop Hold and Fold (right)

The "Laws"

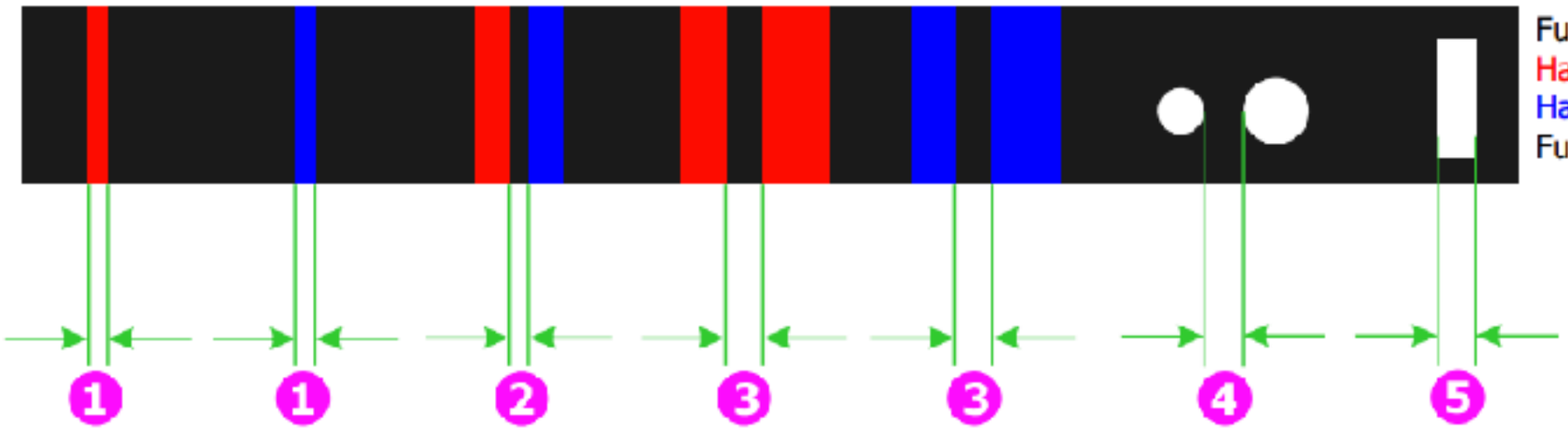
- There are things that cannot be accomplished… the outcome is governed by the physical and chemical properties of the process
- You push at your peril… the tighter the tolerances, the greater the likelihood of failure or parts that are simply too difficult to use

The "Laws"

Recommended Dimensions

When drawing a component for the etching process there are 5 main areas to consider to ensure a successful etch on the metal and thickness selected, they are:-

1. The minimum width of half etch detail
2. The minimum dimension between half etch detail on the front and back
3. The minimum dimension between halfetch detail on the same side
4. The minimum dimension of any full thickness metal
5. The minimum dimension of any full etch (hole) through the metal



Full thickness metal	Black
Half (surface) etch on the front	Red
Half (suface) etch on the back	Blue
Full etch/hole through the metal	White or void

The minimum dimensions for items 1 to 5 are shown below:-

Stainless Steel

1. A minimum width of 0.18mm
2. A minimum width of 0.5 x metal thickness (0.18mm minimum)
3. A minimum width of 1.5 x metal thickness (0.18mm minimum)
4. A minimum width of 1.5 x metal thickness (0.18mm minimum)
5. A minimum width of 1.5 x metal thickness (0.18mm minimum)

All Other Metals

1. A minimum width of 0.18mm
2. A minimum width of 0.2 x metal thickness (0.18mm minimum)
3. A minimum width of 1.2 x metal thickness (0.18mm minimum)
4. A minimum width of 1.2 x metal thickness (0.18mm minimum)
5. A minimum width of 1.2 x metal thickness (0.18mm minimum)

From PPD

The "Laws"

Tag Width & Type

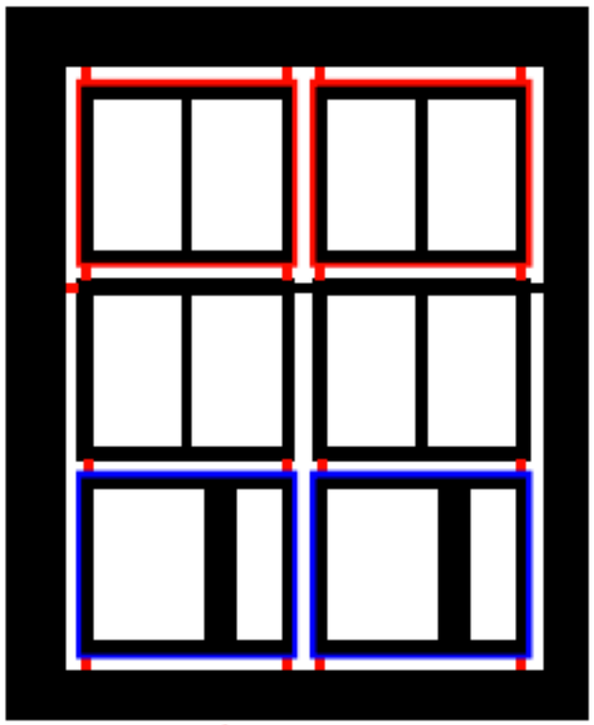
The recommended minimum dimensions for tags for the etch process are related to the thickness of metal used, these are listed below:

Metal Thickness	Full Thickness Tags	Halfetched Tags
0.2mm or less	0.25mm wide	n/a
0.25mm up to 0.7mm	1.2 x metal thickness	1.00mm wide

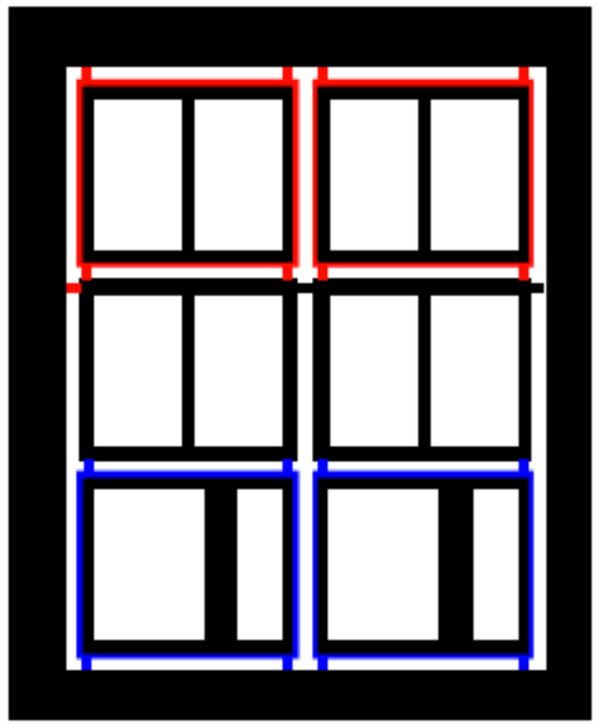
For orders on metal thicknesses greater than 0.7mm please contact us as it may be more cost effective to use an etch and laser combination. Tags are added by PPD using our laser software for the combination or laser only process.

When drawing tags it's important if using halfetched tags to keep them on the same side as any halfetch detail running to the edge of a part. In example 1 below it is likely that the bottom 2 windows will fail and be lost during the etch process, the solution to this is shown on example 2, where a combination of halfetched tags on the front and back are used.

Full thickness Tag/metal	Black
Half (surface) etch tag on front	Red
Half (surface) etch tag on back	Blue



Example 1



Example 2

From PPD

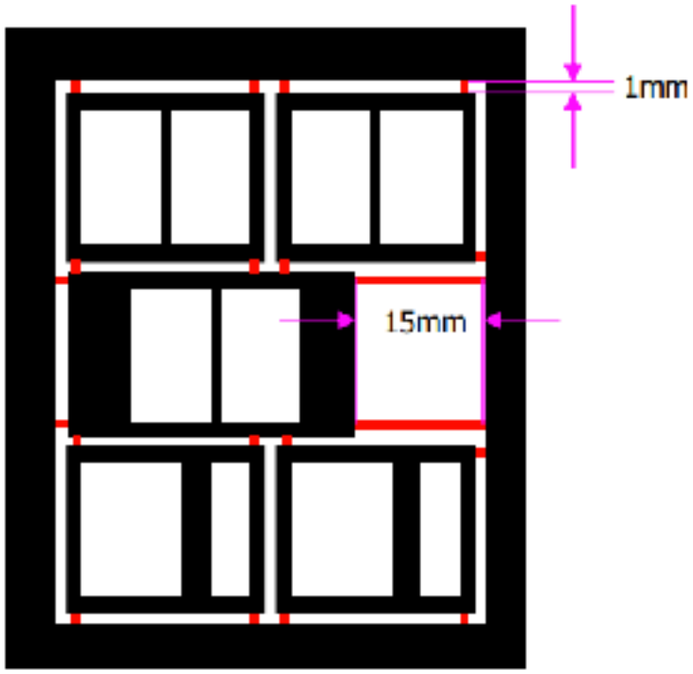
The "Laws"

Tag length & Number

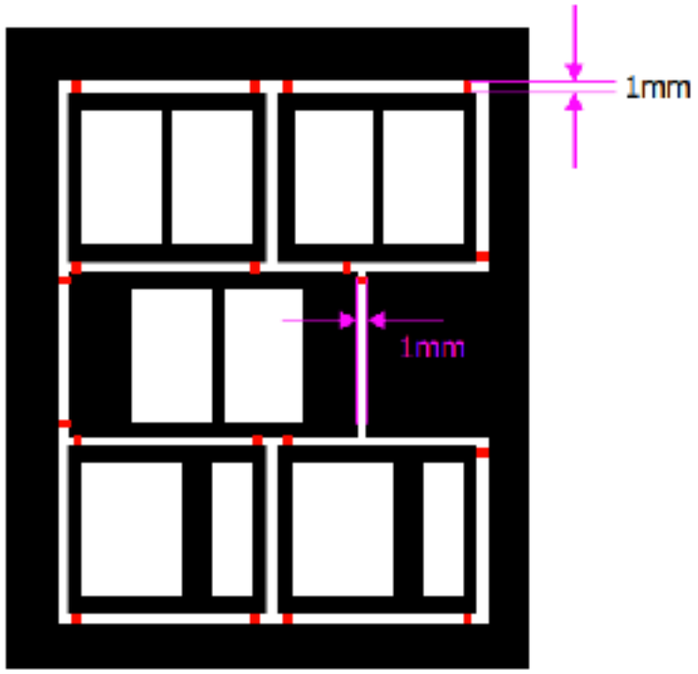
PPD recommend an etchline around each part of approximately 1mm, this enables easy cutting of the parts from the sheet and also reduces the amount of metal dissolved into the etchant which ultimately results in chemical waste.

The tags therefore should be 1mm in length to suit the etchline.

Example 3 shows a sheet of windows where a tag has been drawn at 15mm in length, this results in more metal dissolved and also results in a weak tag which may break during the etching process, example 4 shows the correct layout for this example.

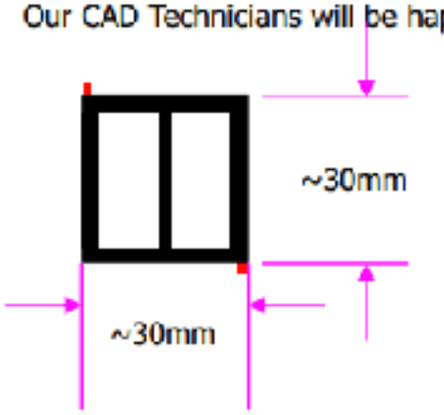


Example 3

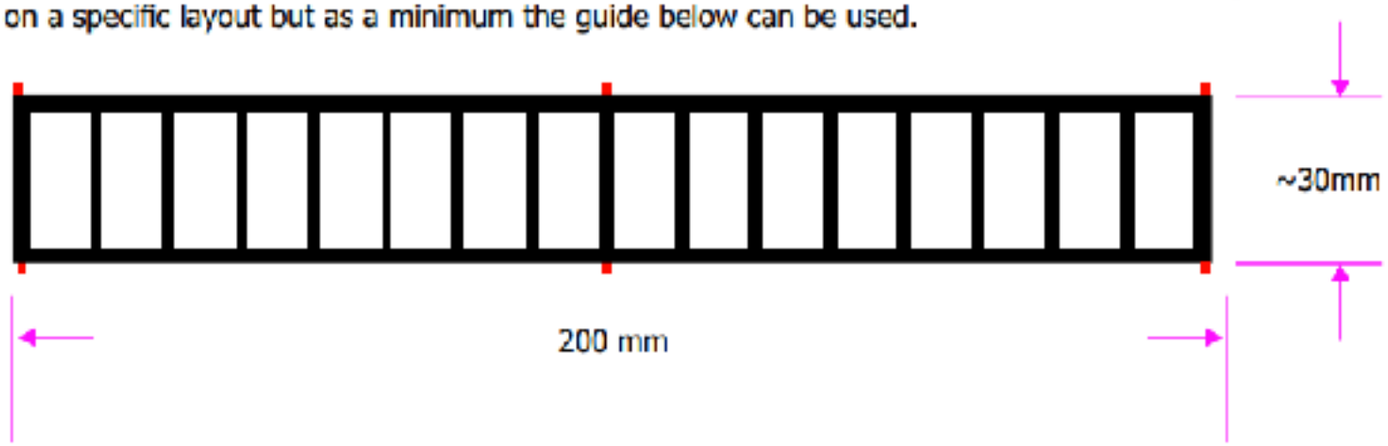


Example 4

The number of tags used depends on a number of factors such as the size and shape of the part, the metal thickness and the type of tag. Our CAD Technicians will be happy to advise on a specific layout but as a minimum the guide below can be used.



2 tags at opposite corners of the part



1 tag in each corner and every ~100mm

From PPD

The "Laws"

Etch Only Process

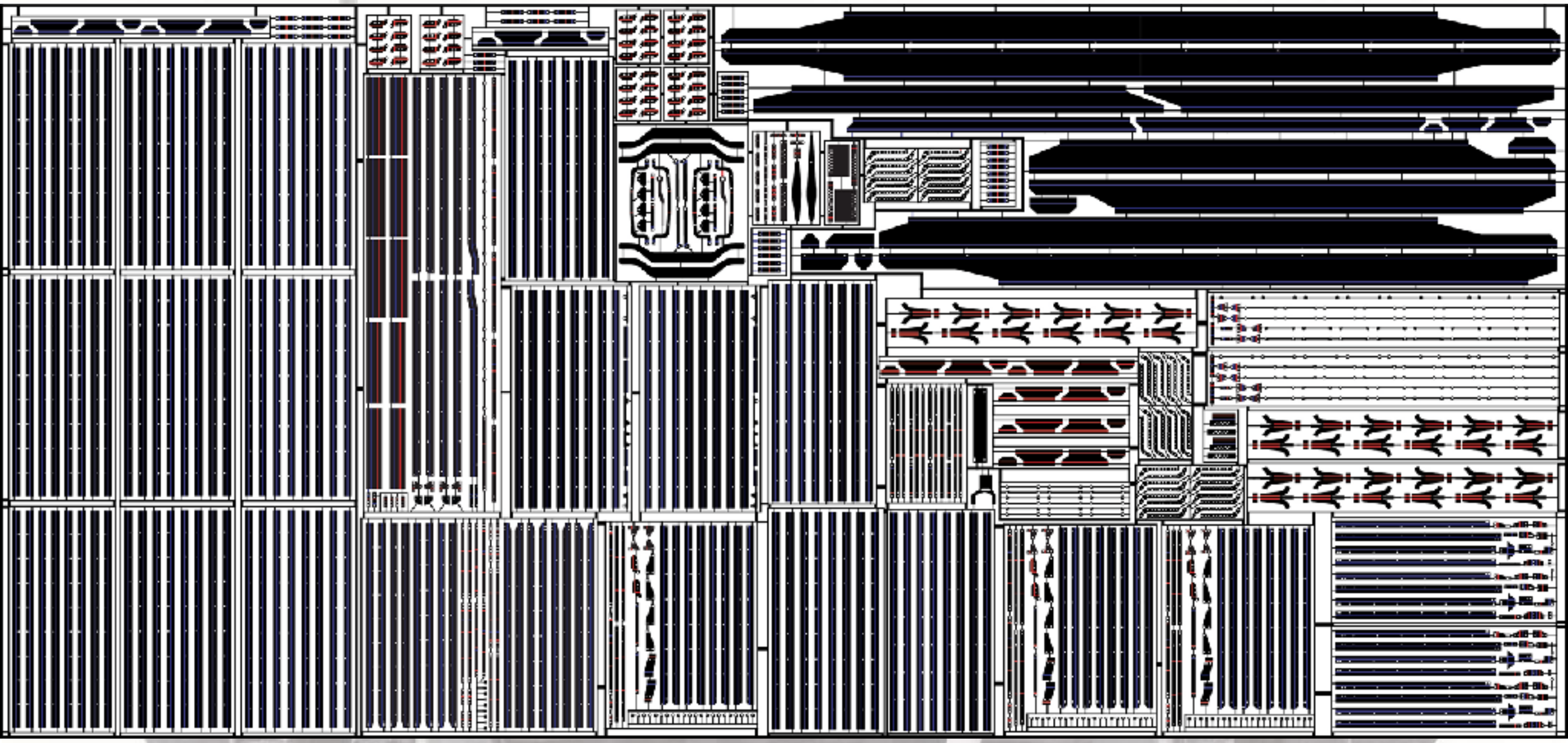
Metal	Thickness	Max. Possible Image size (excluding frame)
Beryllium Copper	0.05 mm	200mm x 890mm
	0.08 mm	180mm x 890mm
Brass	0.10 mm	290mm x 890mm
	0.13 mm	290mm x 890mm
	0.15 mm	290mm x 890mm
	0.20 mm	290mm x 890mm
	0.25 mm	290mm x 890mm
	0.30 mm	290mm x 890mm
	0.40 mm	290mm x 890mm
	0.45 mm	290mm x 890mm
	0.50 mm	580mm x 890mm
	0.55 mm	580mm x 890mm
	0.70 mm *	580mm x 890mm
	0.90 mm *	580mm x 890mm
Copper	0.3 mm	580mm x 890mm
	0.5 mm	580mm x 890mm
	0.7 mm *	580mm x 890mm
	1.0 mm *	580mm x 890mm
Mild Steel	0.15 mm	580mm x 890mm
	0.38 mm	580mm x 890mm
	0.6 mm	580mm x 890mm
Nickel Silver	0.20 mm	290mm x 890mm
	0.25 mm	290mm x 890mm
	0.30 mm	290mm x 890mm
	0.40 mm	290mm x 890mm
	0.45 mm	290mm x 890mm
	0.55 mm	290mm x 890mm
	0.70 mm *	290mm x 890mm
	0.90 mm *	290mm x 890mm
Phosphor Bronze	0.10 mm	175mm x 890mm
	0.15 mm	290mm x 890mm
	0.20 mm	290mm x 890mm
	0.25 mm	290mm x 890mm
	0.40 mm	290mm x 890mm
	0.90 mm *	290mm x 890mm
Stainless Steel **	0.04 mm	290mm x 890mm
	0.05 mm	290mm x 890mm
	0.08 mm	290mm x 890mm
	0.10 mm	290mm x 890mm
	0.13 mm	580mm x 890mm
	0.20 mm	580mm x 890mm
	0.25 mm	580mm x 890mm
	0.30 mm	580mm x 890mm
	0.40 mm	580mm x 890mm
	0.50 mm	580mm x 890mm
	0.50 mm	580mm x 890mm
	0.70 mm *	580mm x 890mm
Spring Steel	0.4 mm	123mm x 890mm
	0.6 mm	213mm x 890mm

For reference:

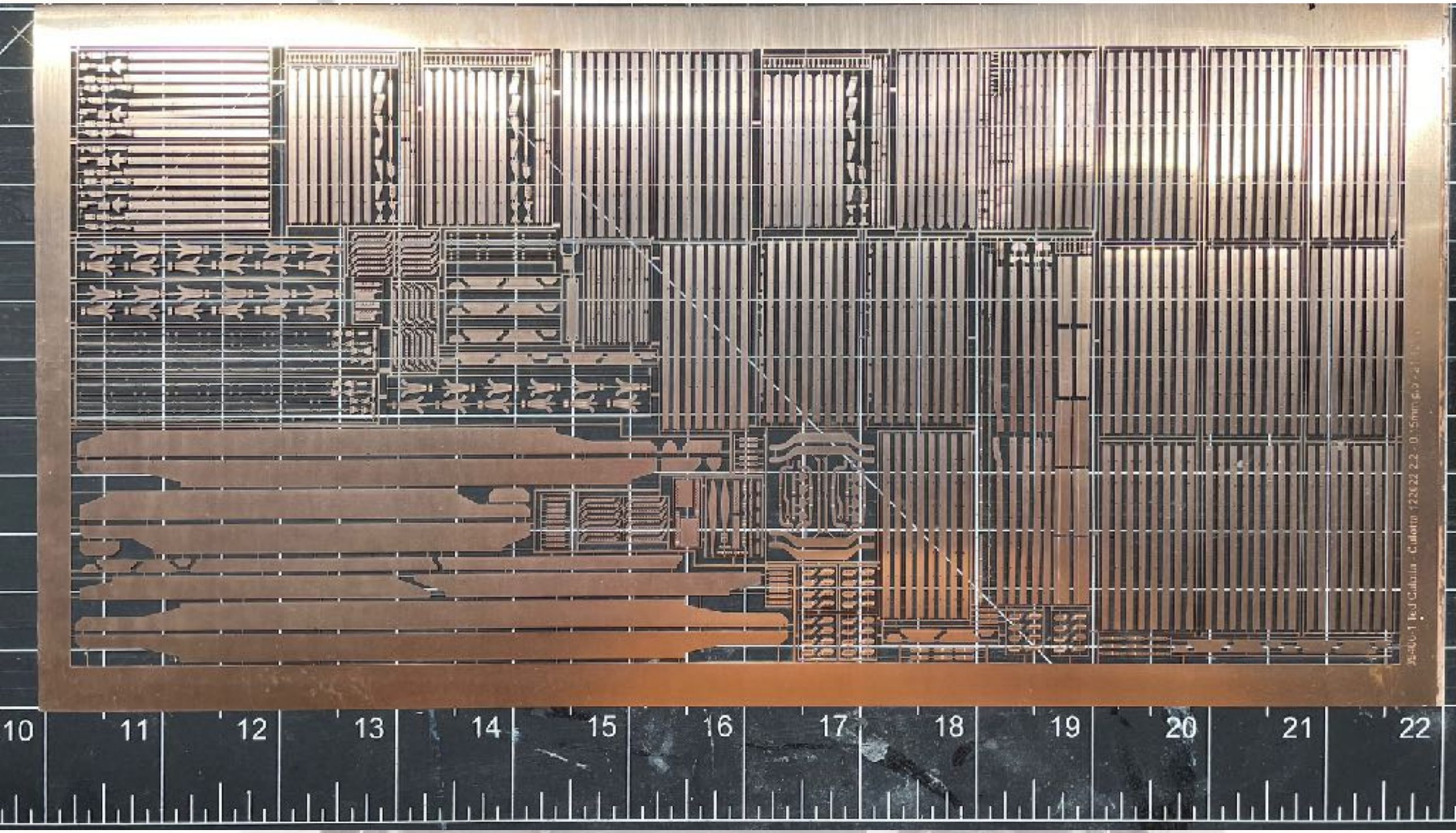
- **0.10mm = 0.0039"**
- **0.15mm = 0.0059"**
- **0.20mm = 0.0078"**

From PPD

Artwork



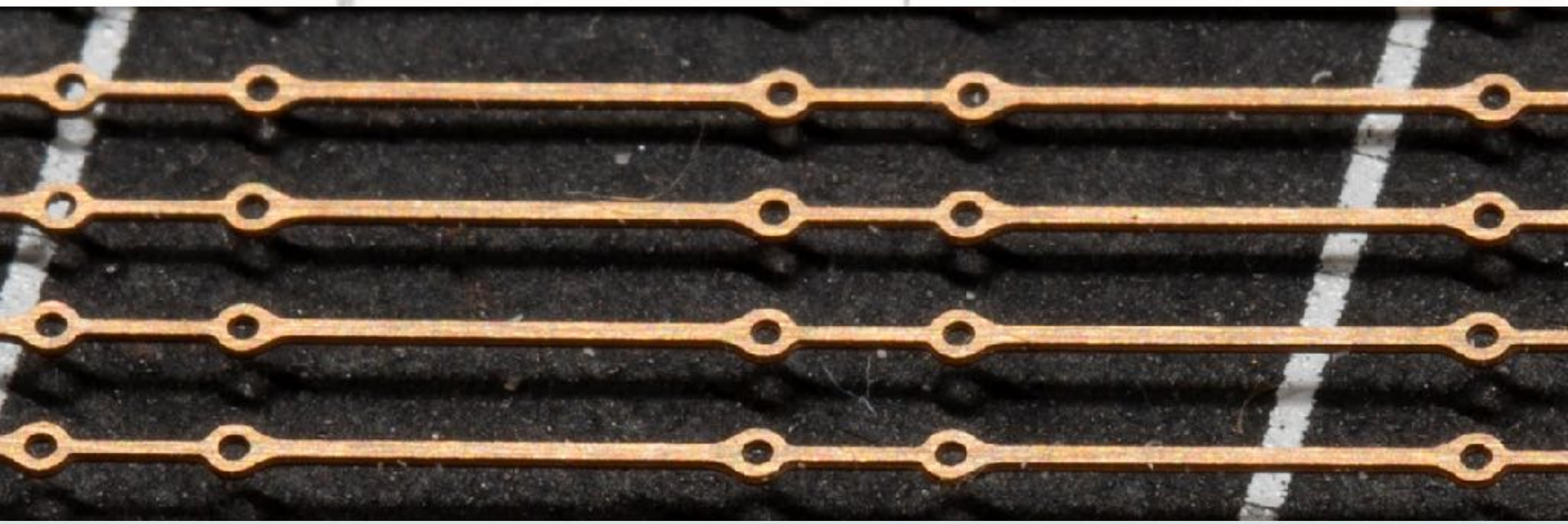
Test sheet

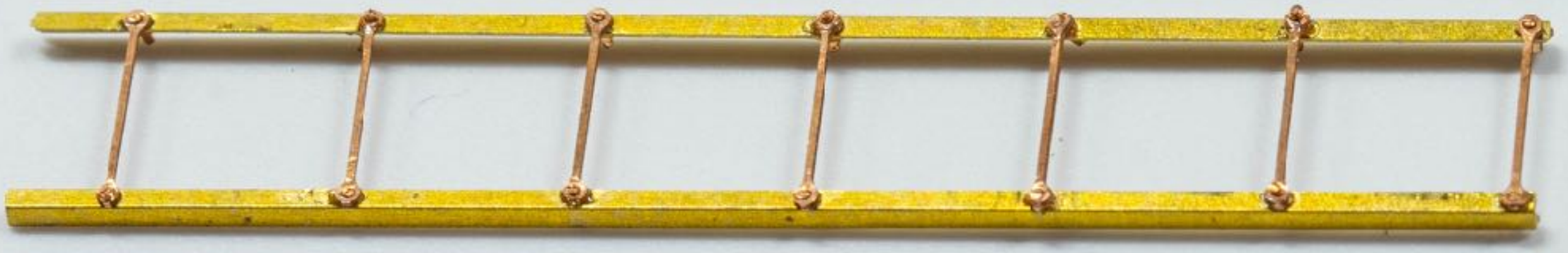


- 0.15mm (0.0059”) phosphor bronze

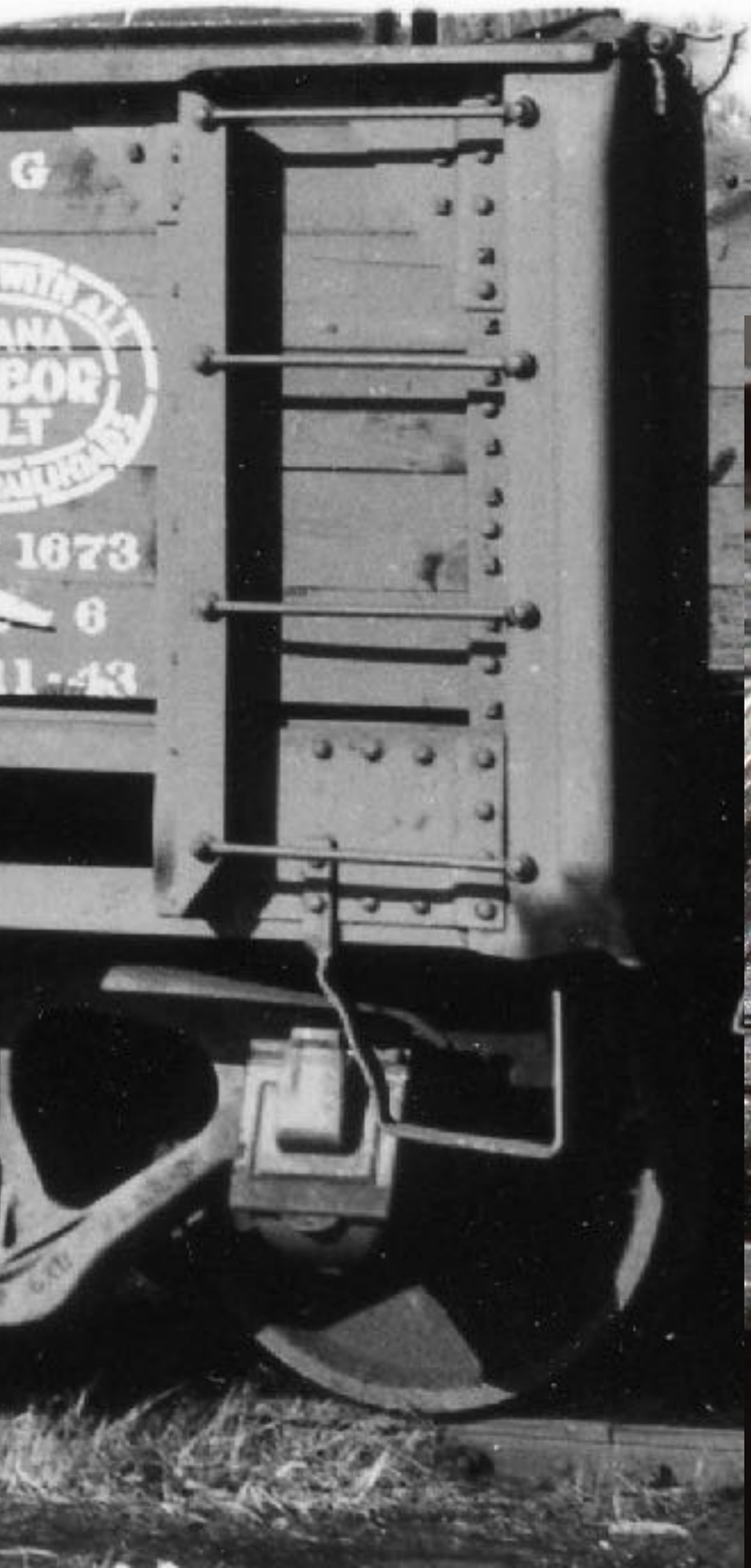
Ladders & Treads ("Rungs")

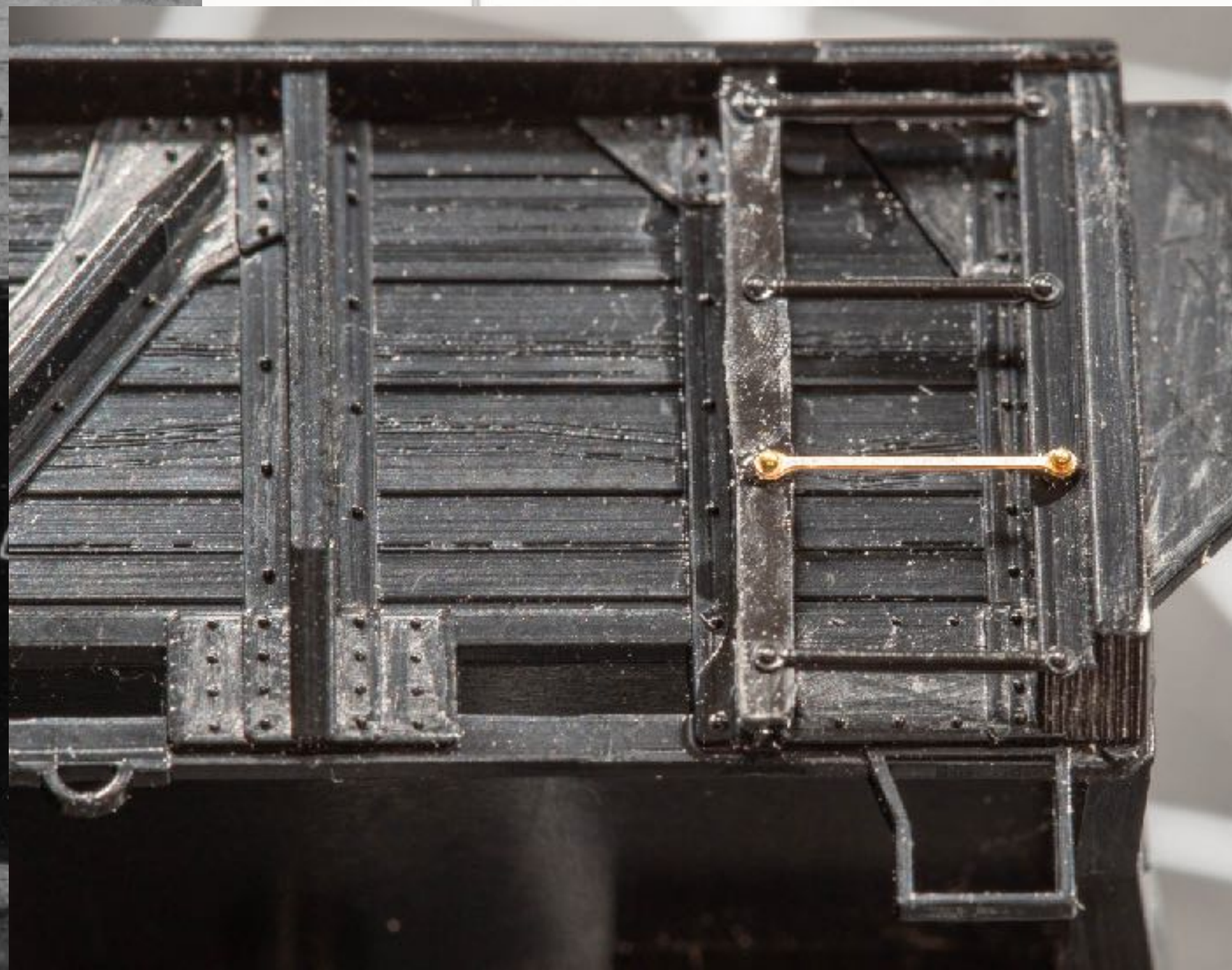
- Ladders are my primary focus with the etching project





Ladders & Treads ("Rungs")





Ice Reefer Drain

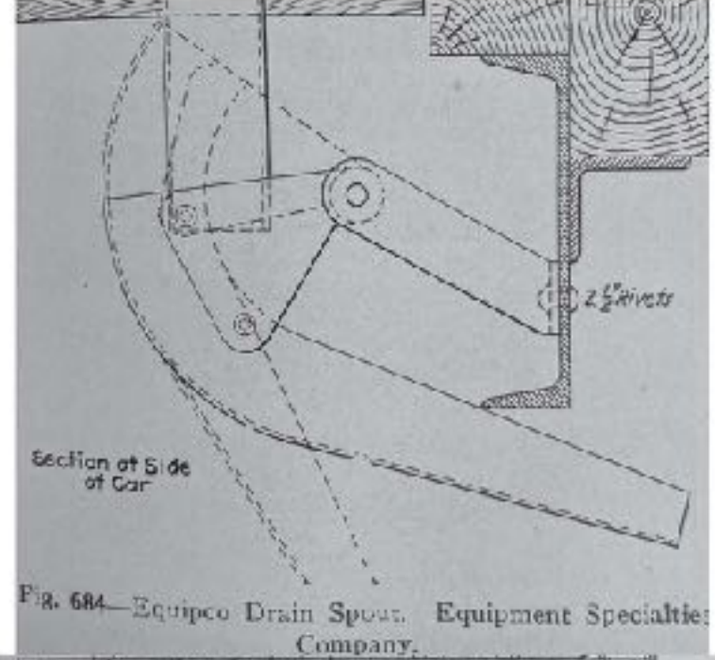


Fig. 684—Equipco Drain Spout. Equipment Specialties Company.

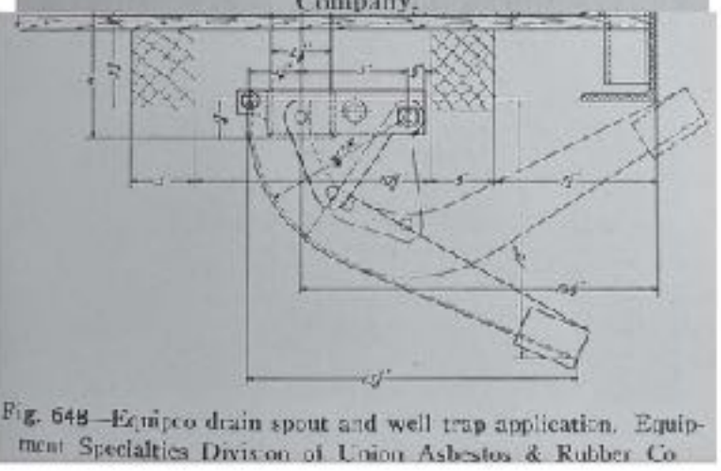
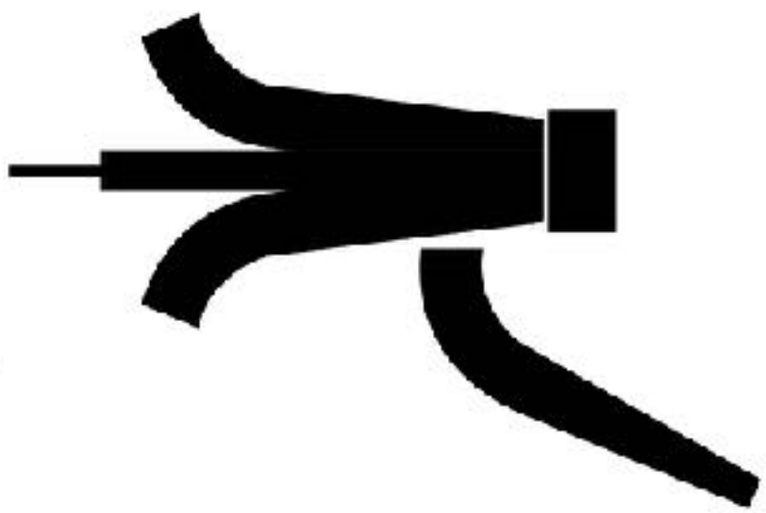
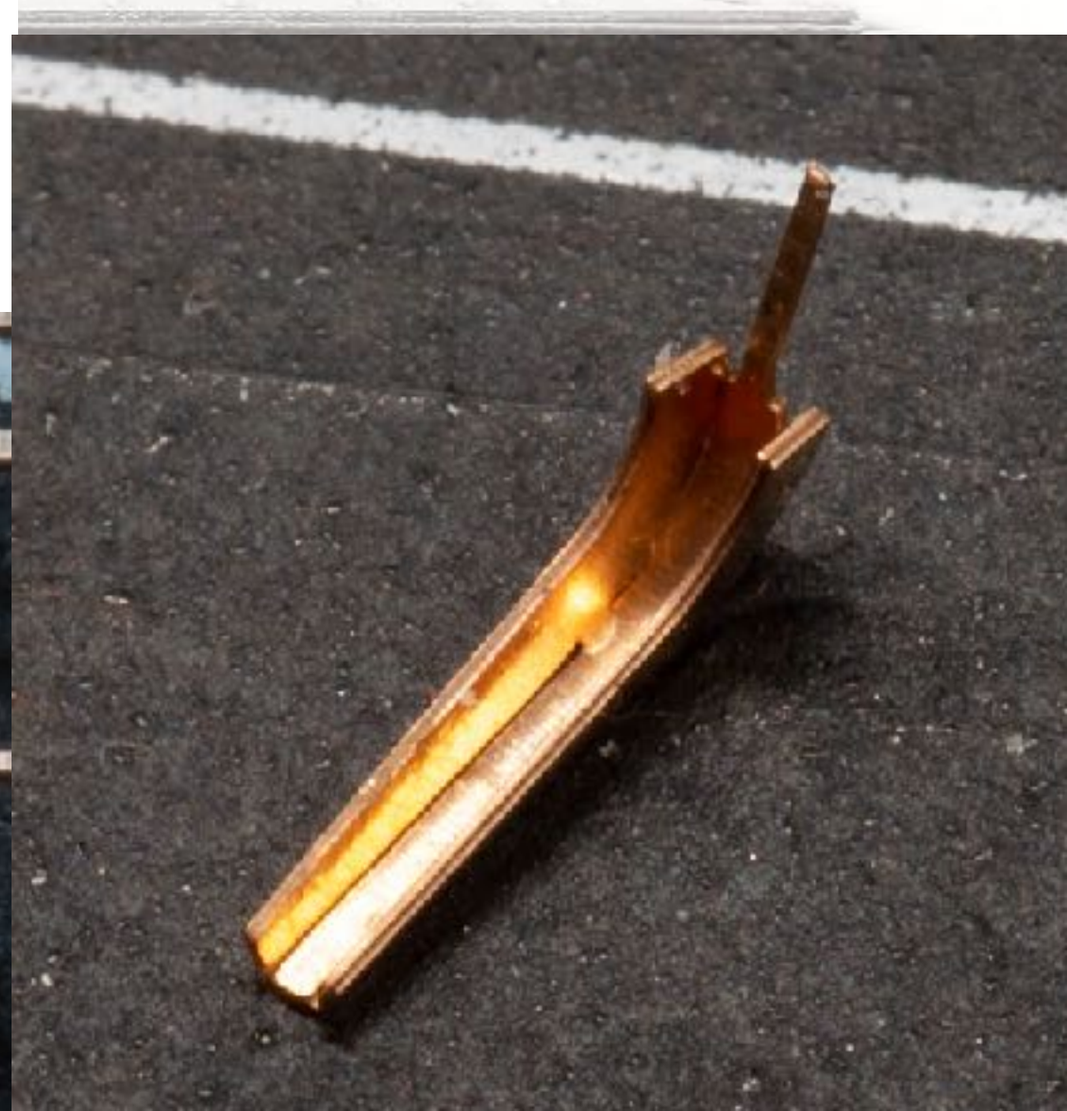
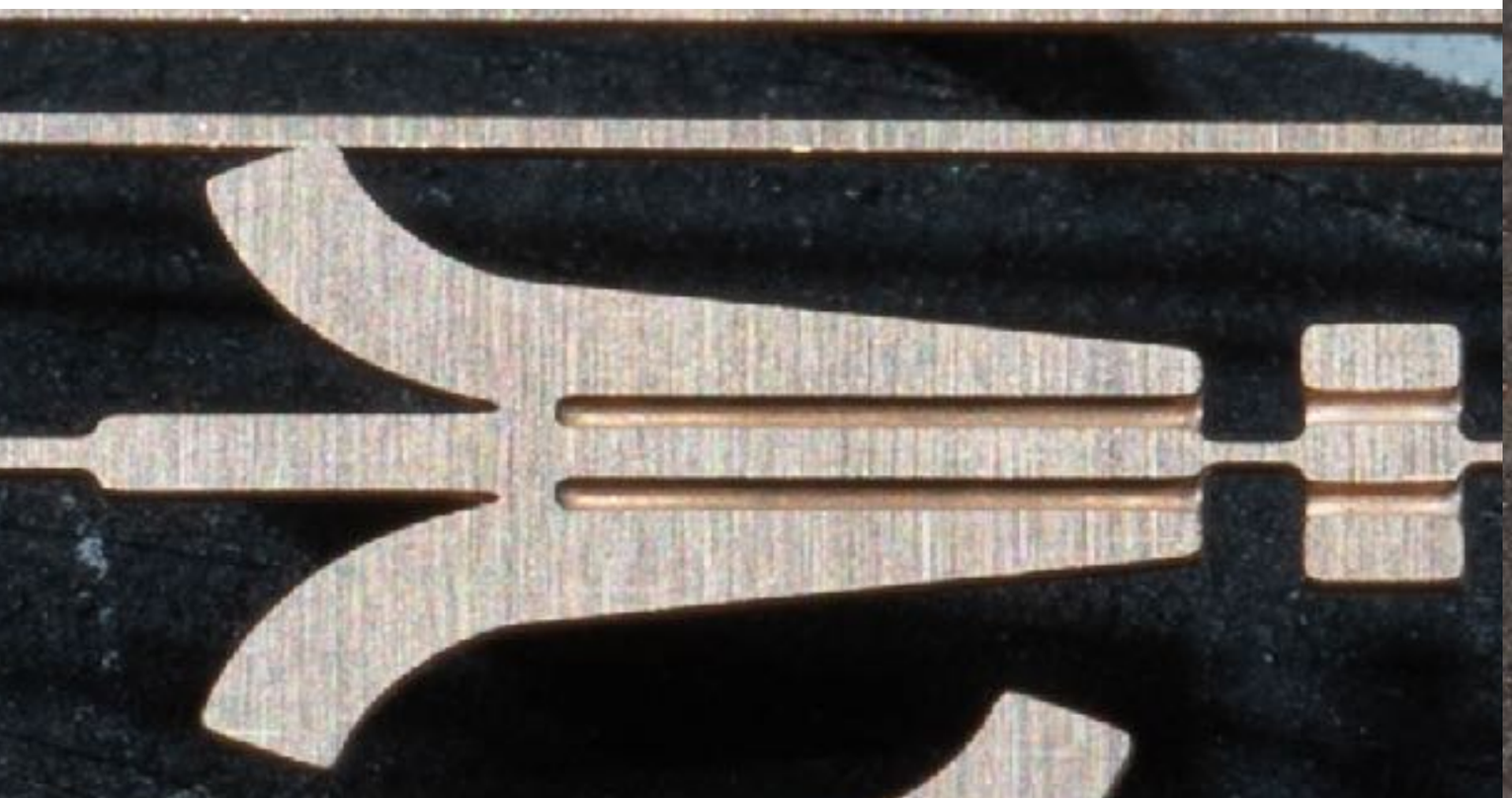


Fig. 648—Equipco drain spout and well trap application. Equipment Specialties Division of Union Asbestos & Rubber Co.

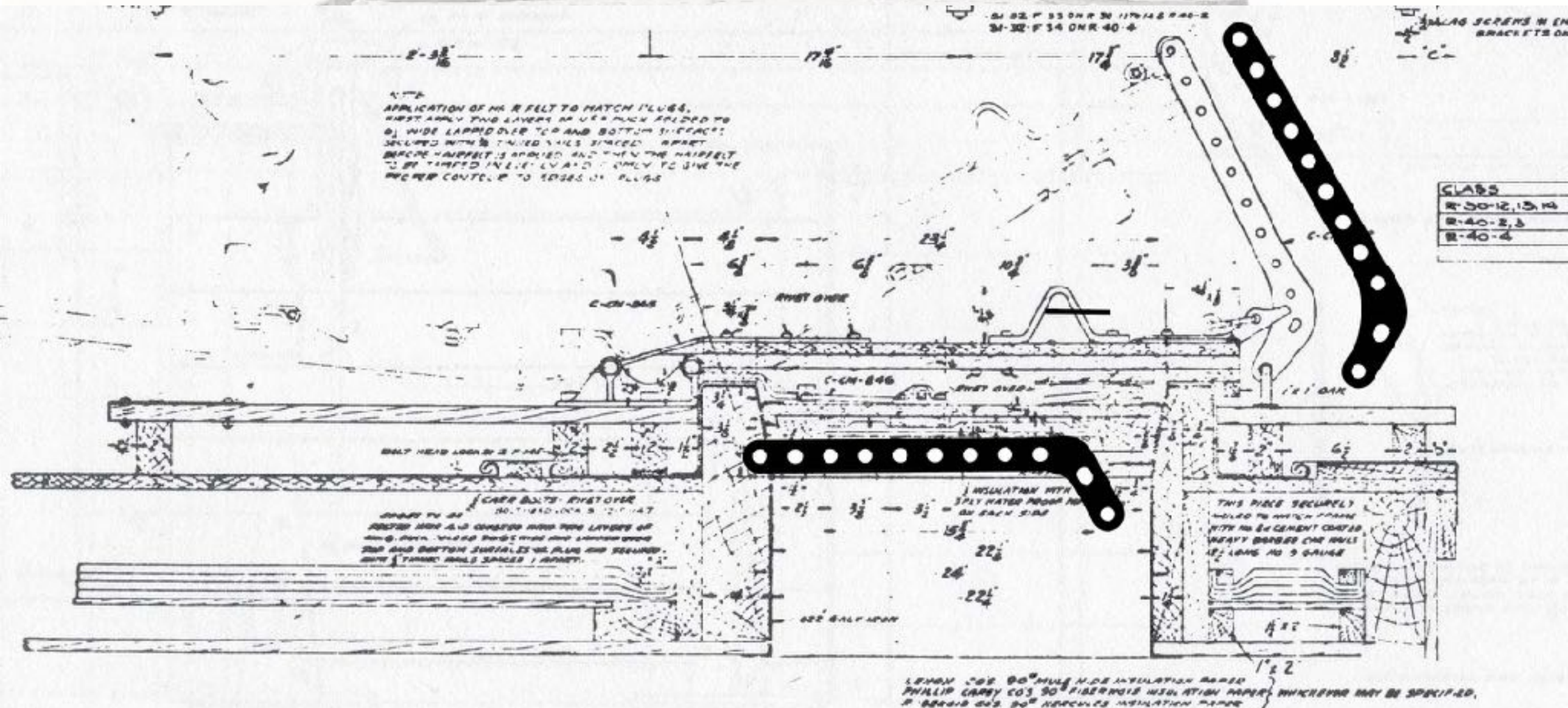






PFE Hatch Cover Levers/Supports

- Applied to vast majority of wood cars plus R-40-10
- Unusual shape not available in HO



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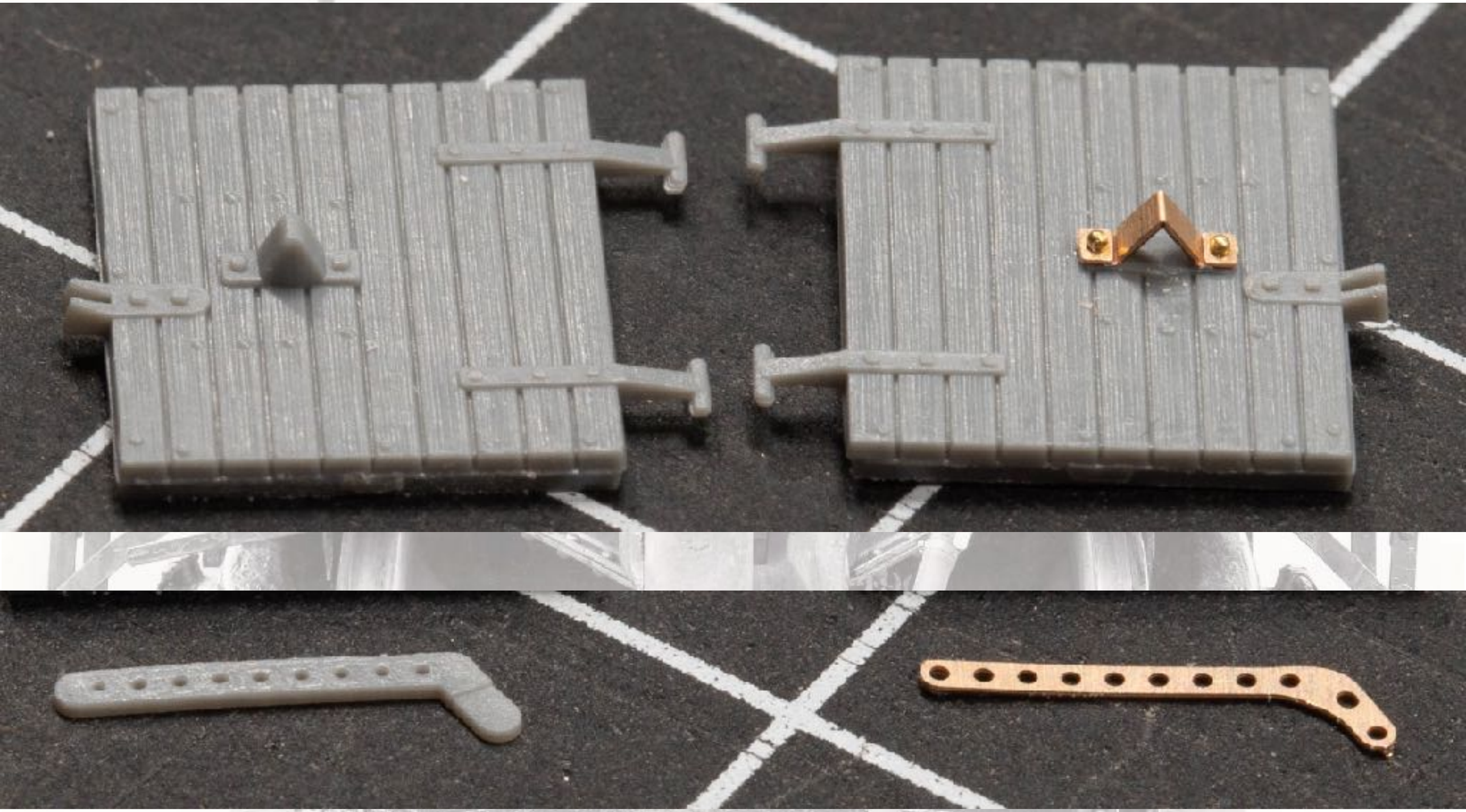
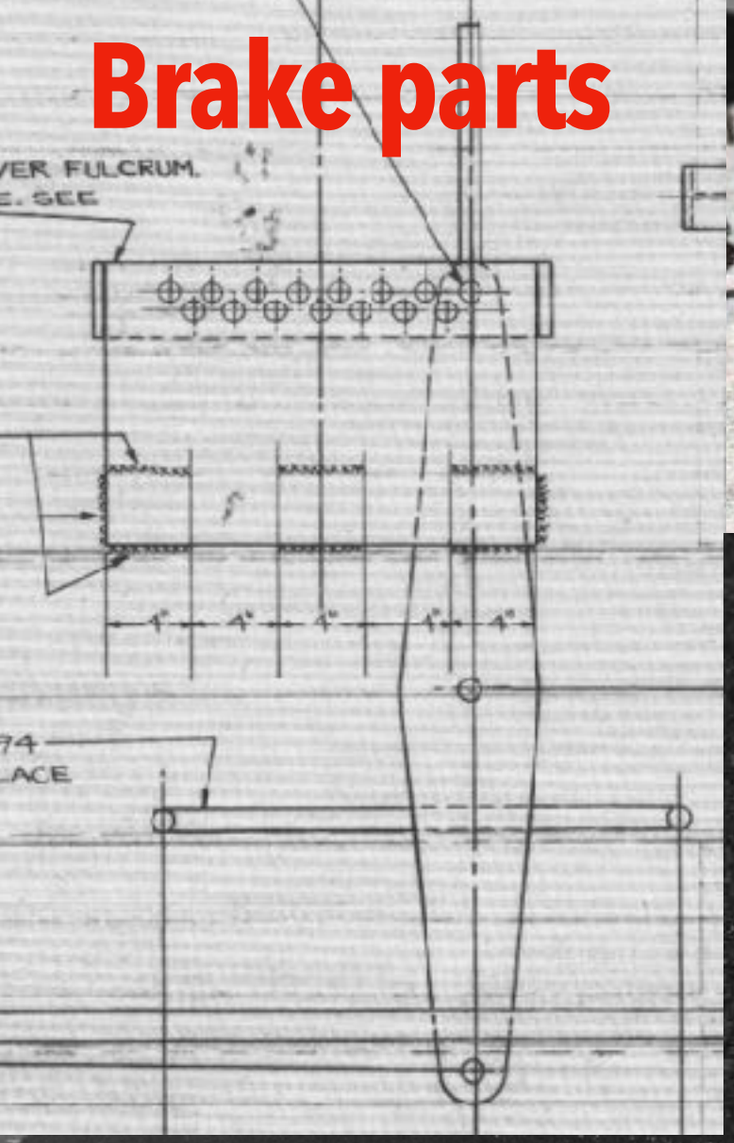
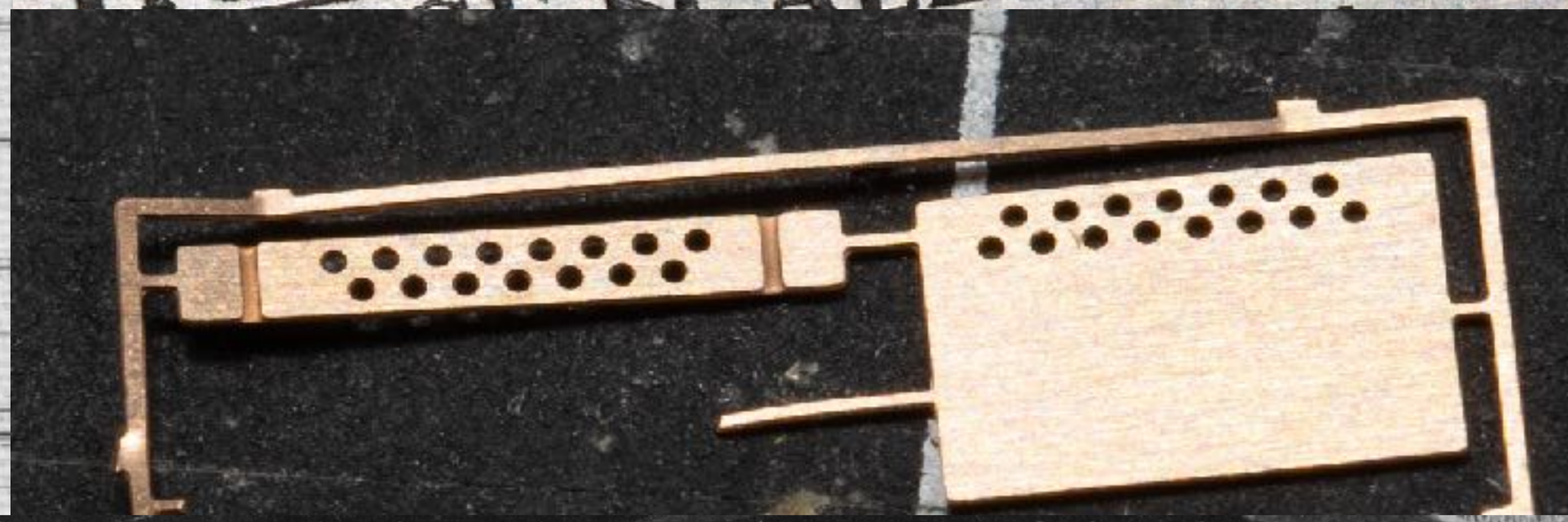


Brake parts

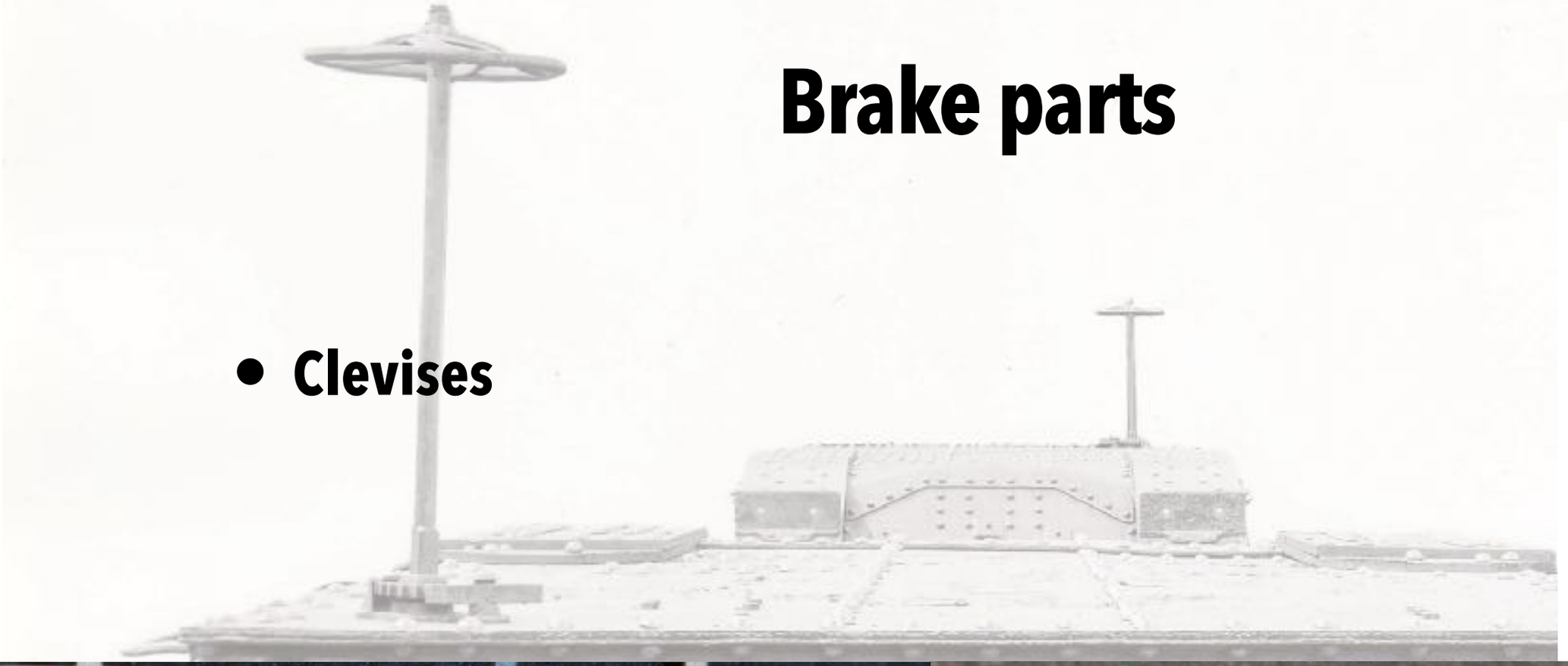


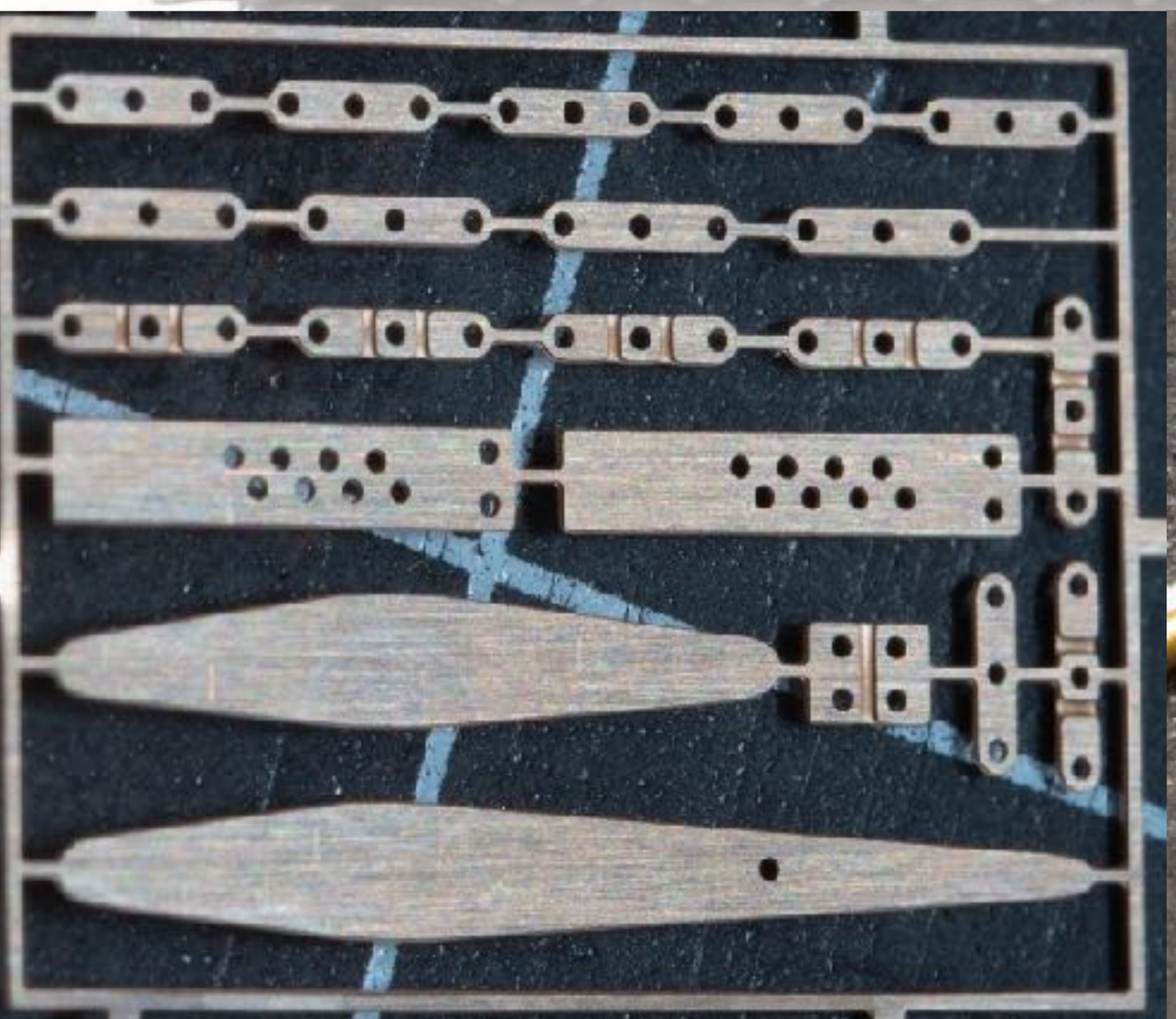


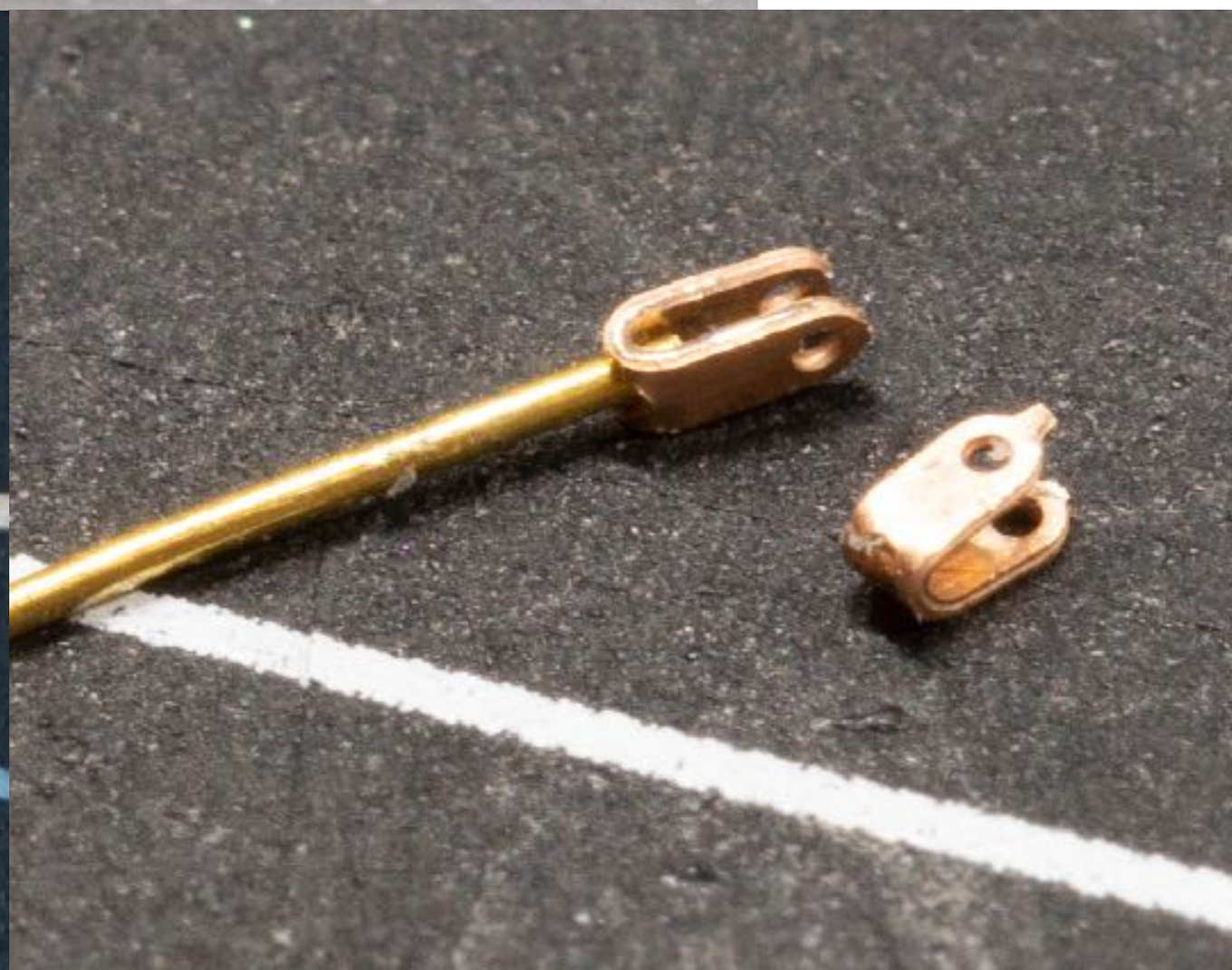
Northern Pacific Floating Lever Fulcrum

Brake parts

- Clevises







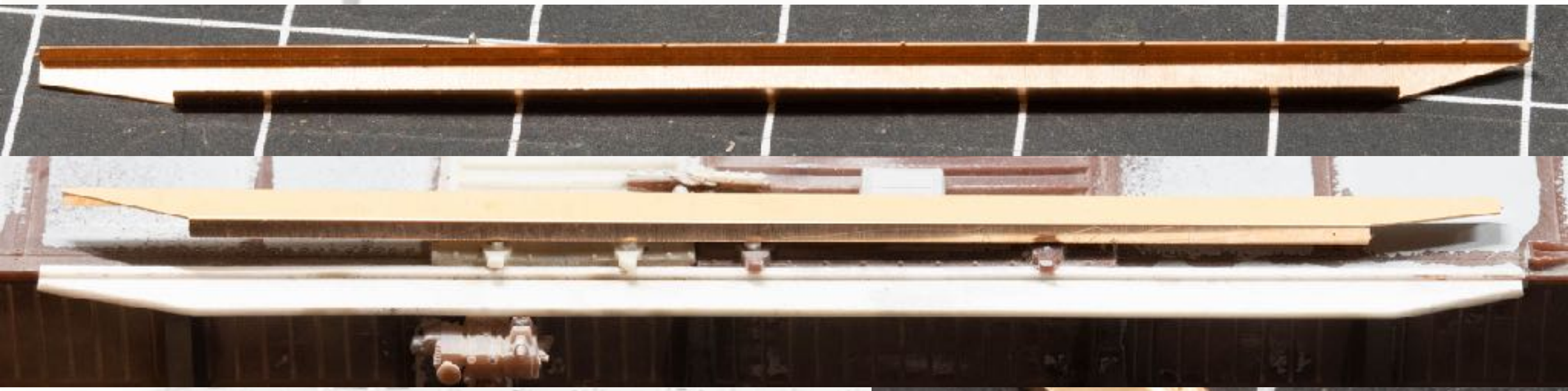
Side Sill Support Sections

Both photos,
Col. Chet McCoid,
Bob's Photo

- Central of Georgia 40' 1-1/2 door car

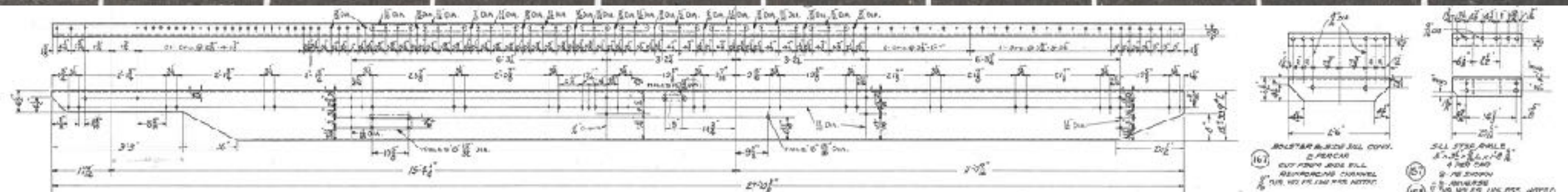
- Erie 40' Auto Car (Shake-n-Take Project)

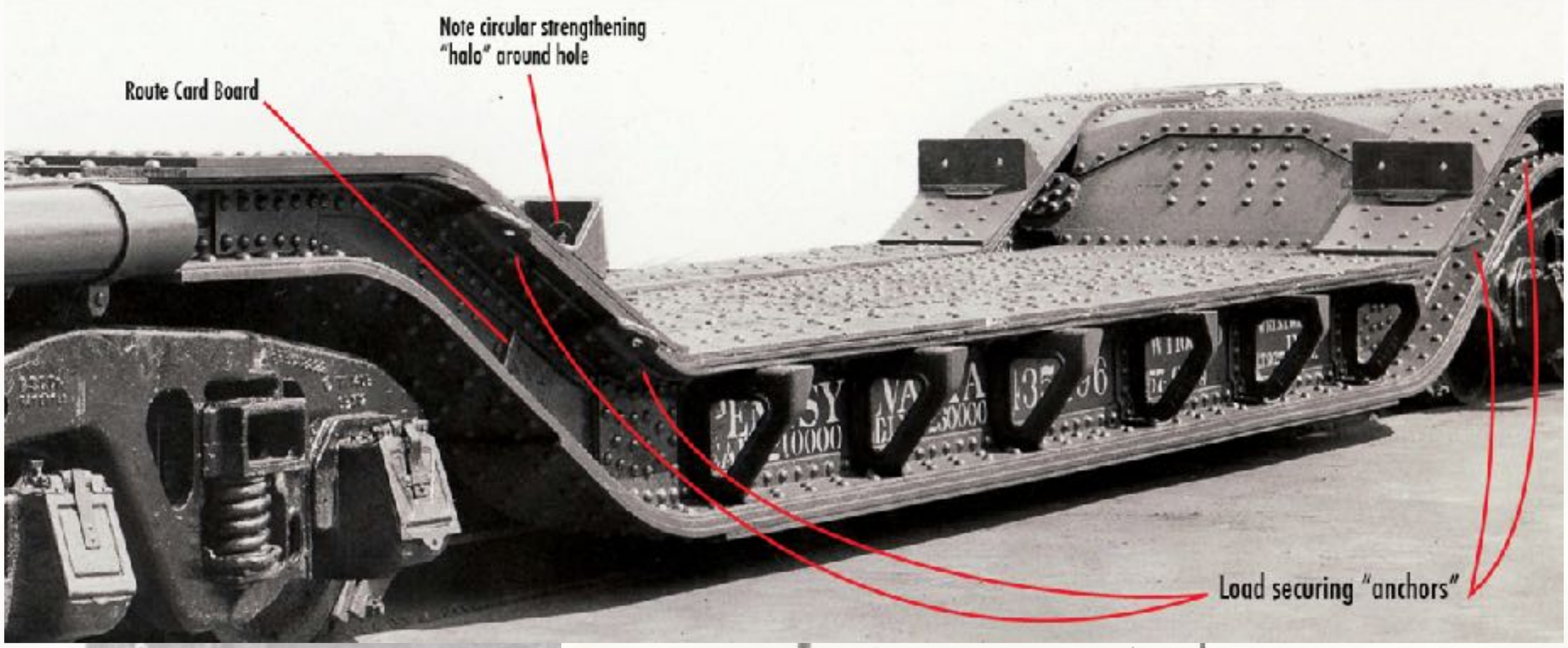
Side Sill Support Sections



- Central of Georgia 40’ 1-1/2 door car

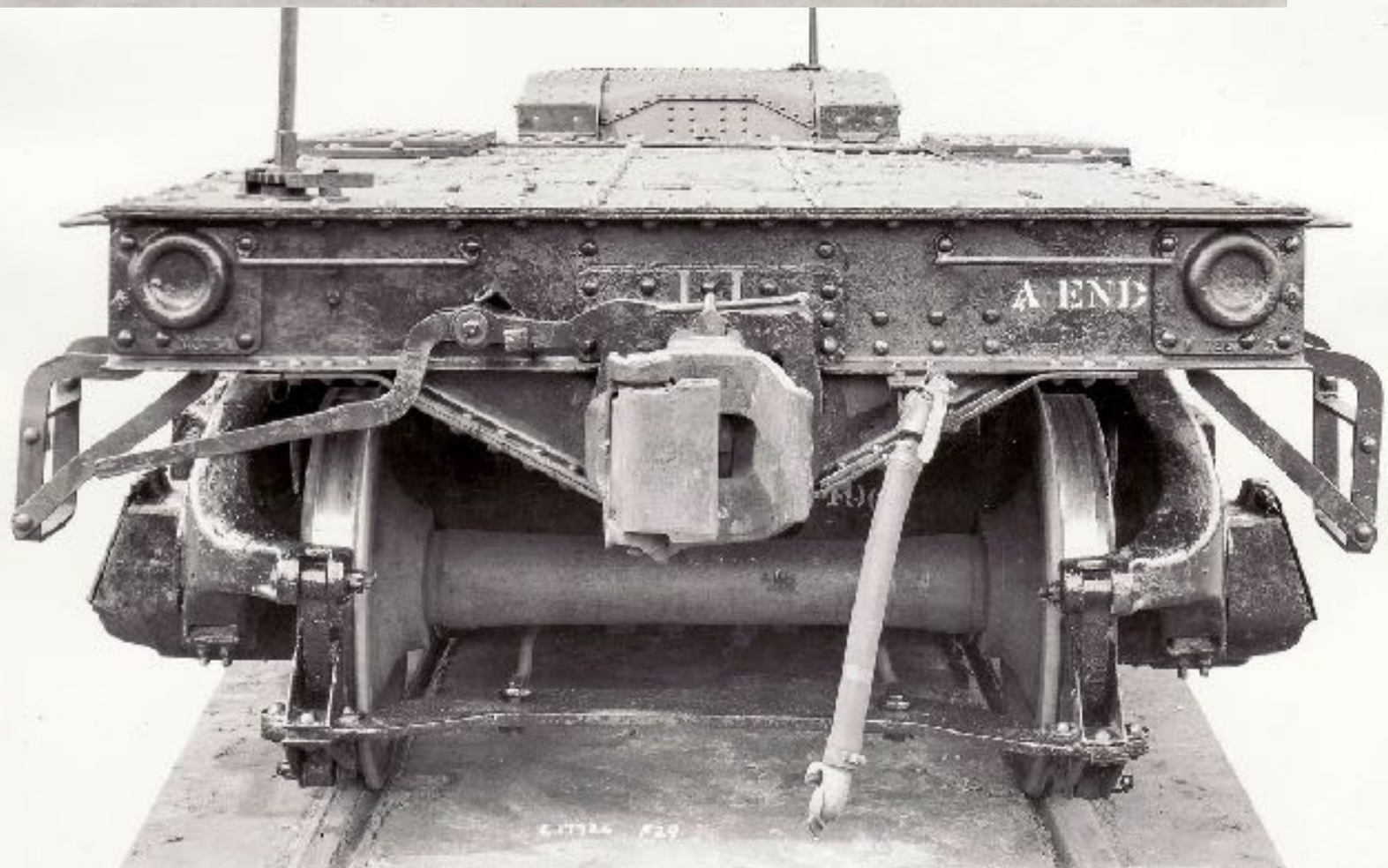
- Erie 40’ Auto Car (Shake-n-Take Project)

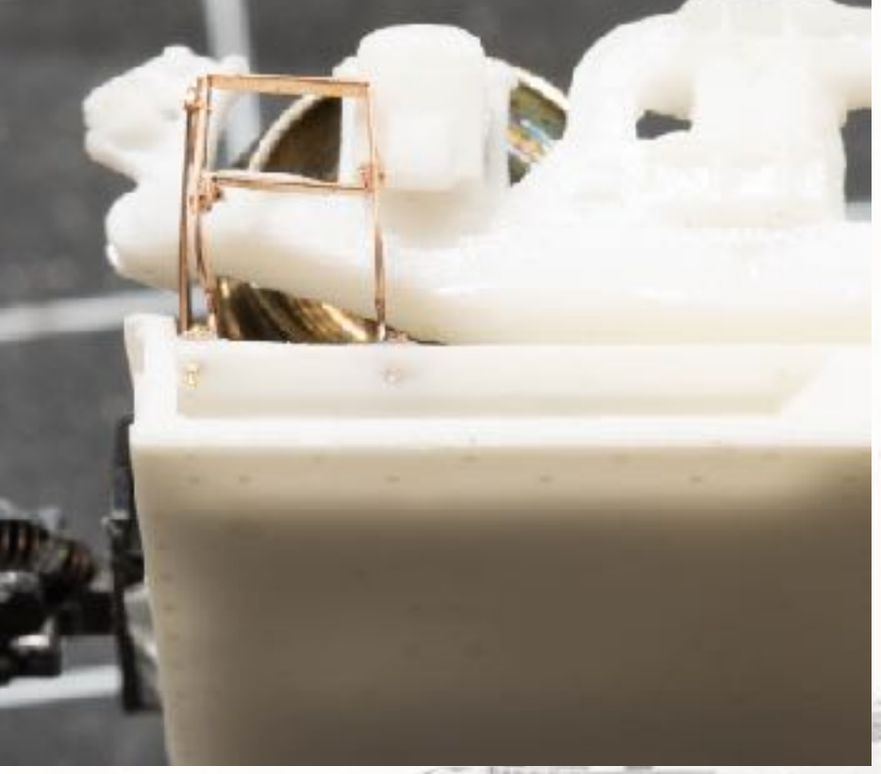


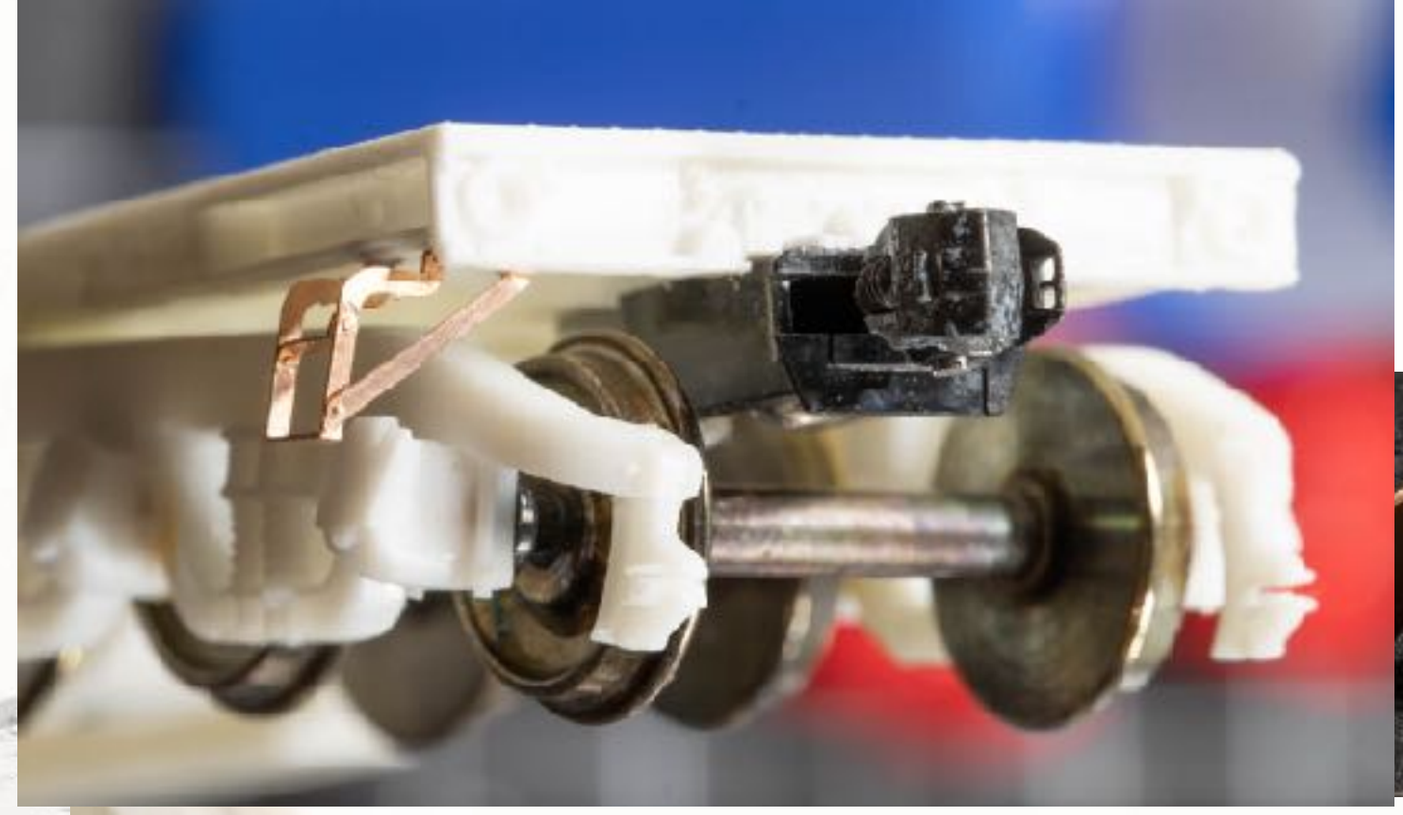


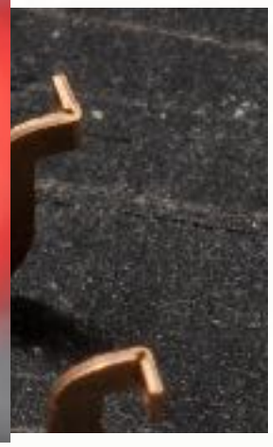
Case study: F&C F29

- Sill steps
- Load anchors
- Carmer top lever
- Brake beams









Case study: F&C F29

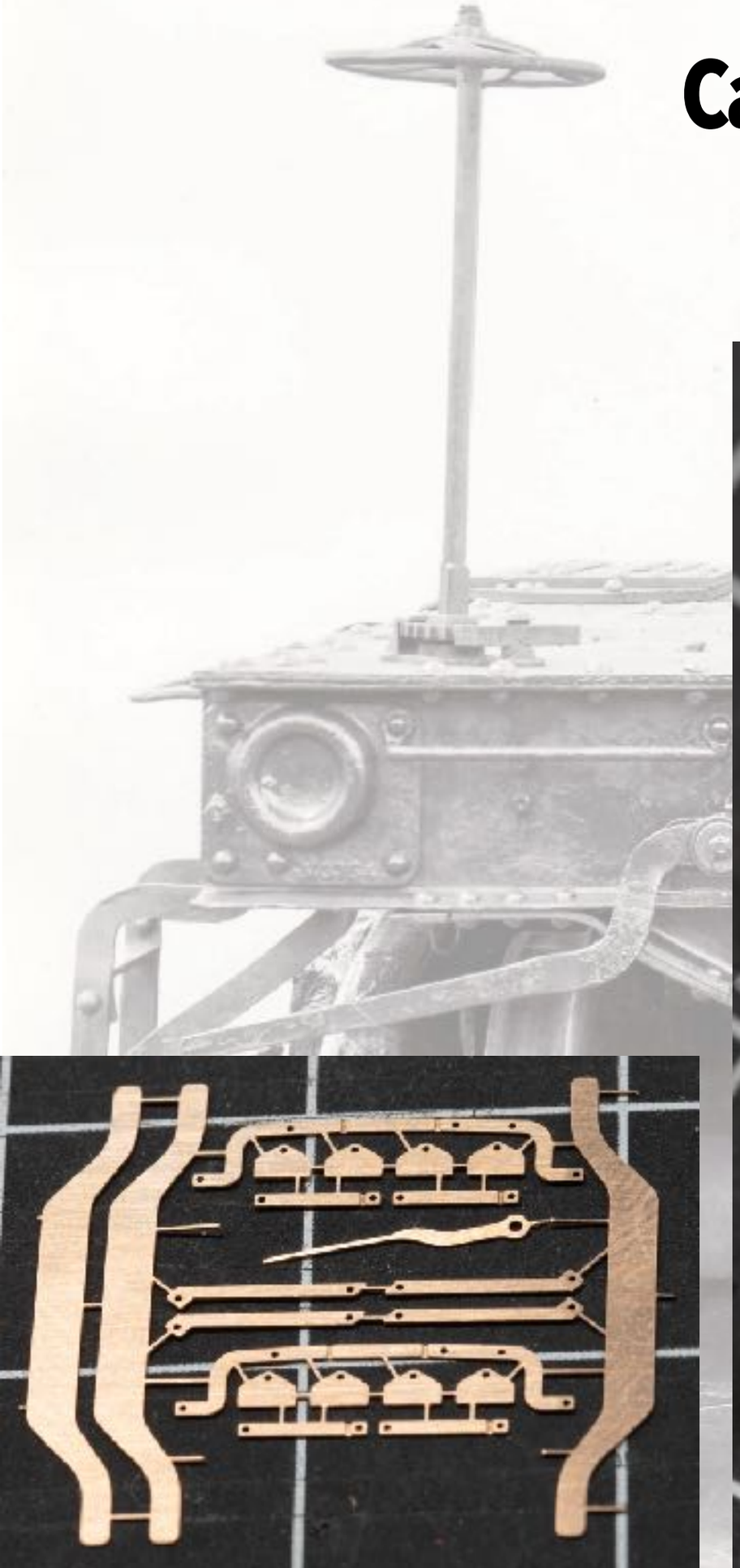
- Sill steps
- Load anchors
- Carmer top lever
- Brake beams

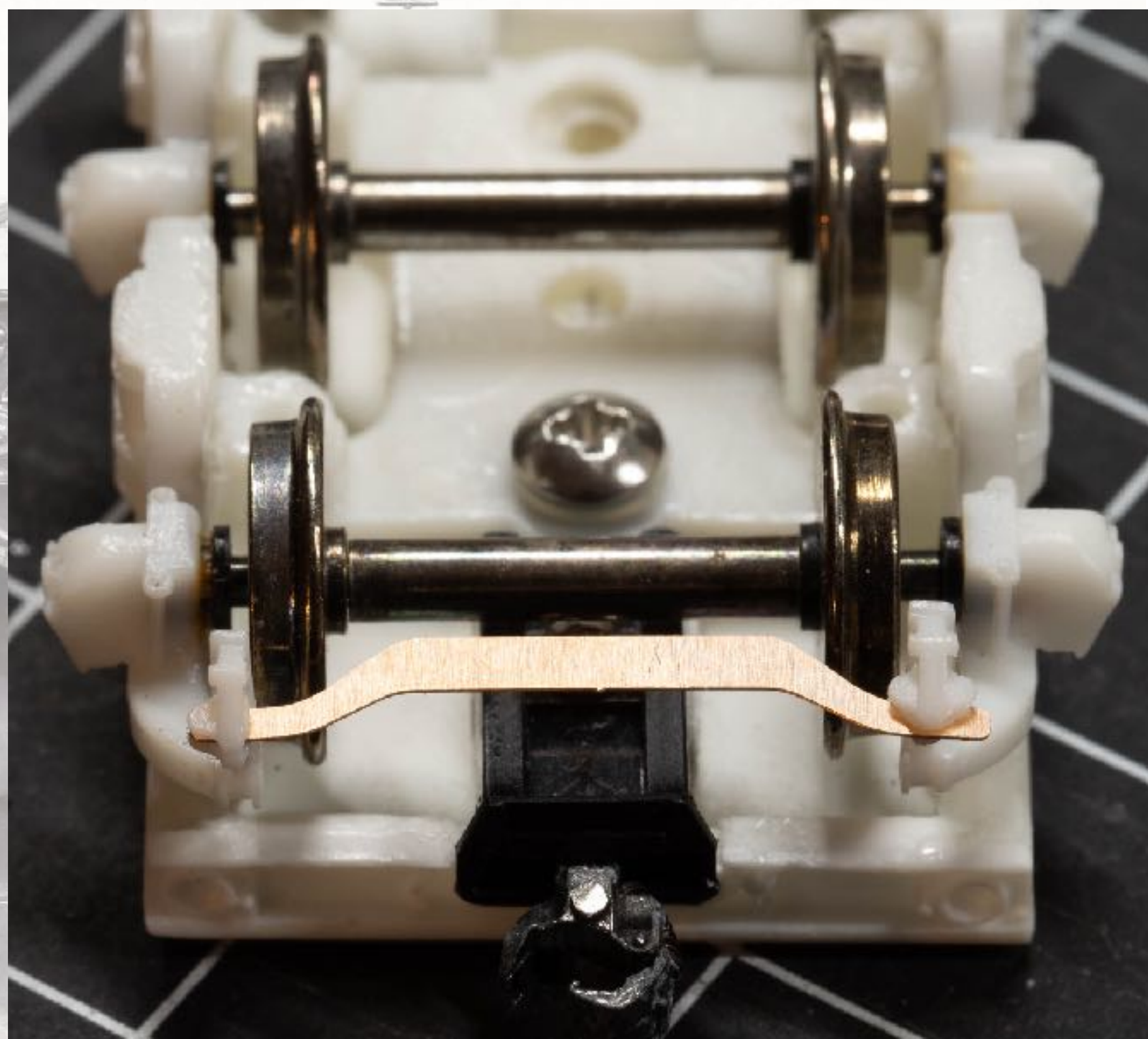
Case study: F&C F29

- Full turning range!
- Sill step does not foul truck swing

Case study: F&C F29

- Brake beams





Other project ideas

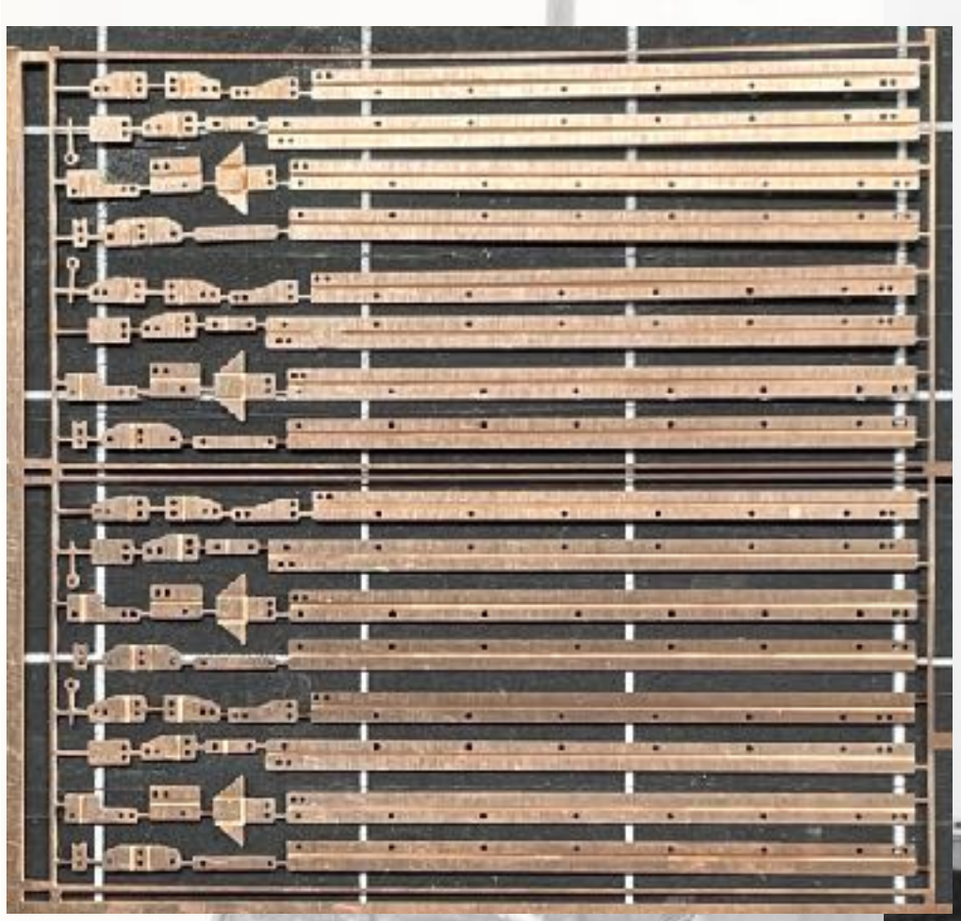
- Signs
- Signals
- Vehicle details
- Details, such as ornate architectural items
- Window frames

Lessons Learned… so far

- Materials
  - Brass can be used for extremely fine etchings, but softer
  - Phosphor bronze can also be used for fine work, but harder
  - Nickel is extremely rigid, but thickness may be an issue
- Tolerances
  - Excellent for fidelity
- Assembly
  - Time-consuming
  - Requires fine motor skills and patience

What's Next?

- **PFE ladder hardware**

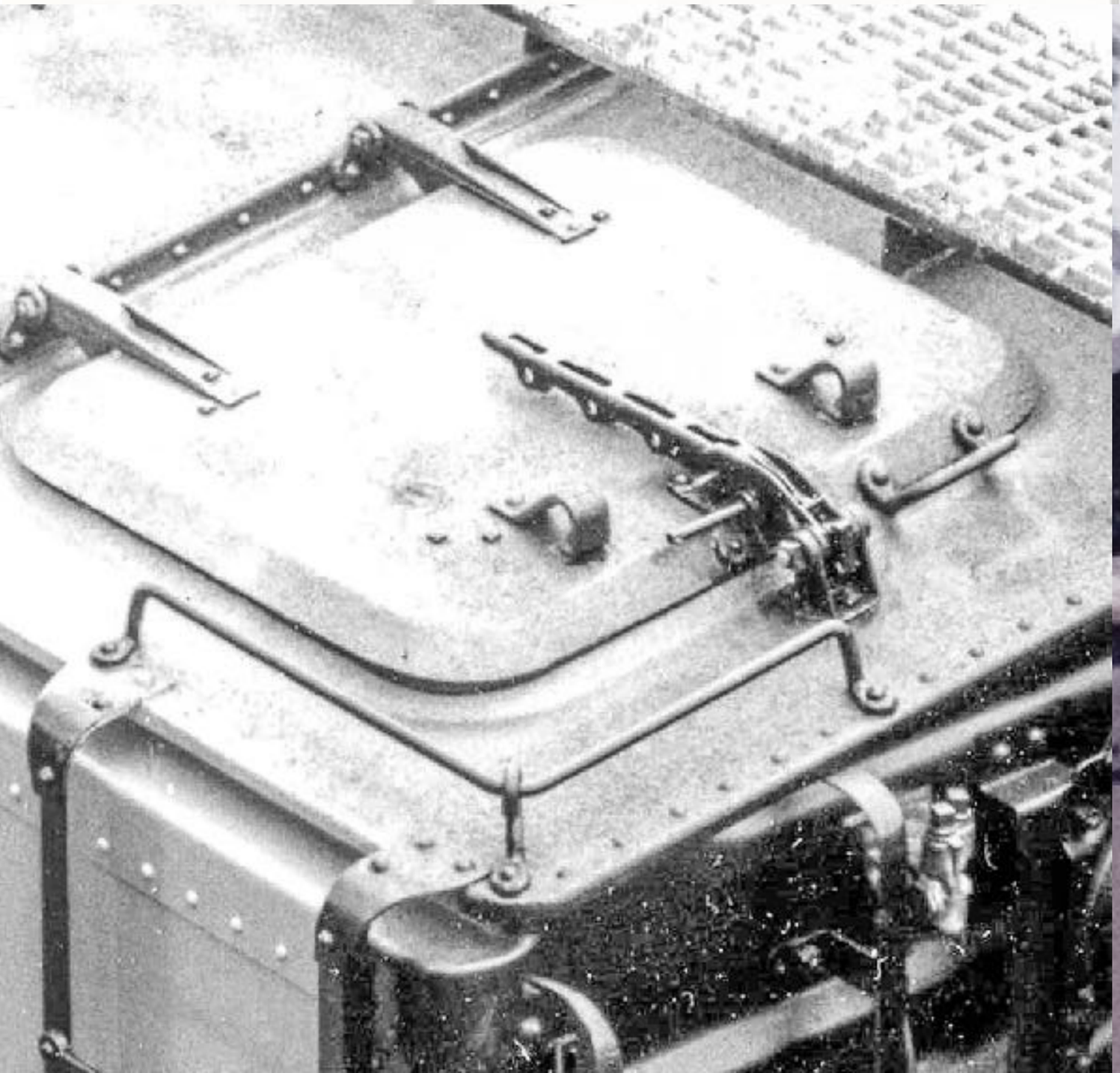


What's Next?

- Types of grabs that take good advantage of etching

What's Next?

- **Testing the boundaries of the process (Equipco hatch cover levers) and assembly**



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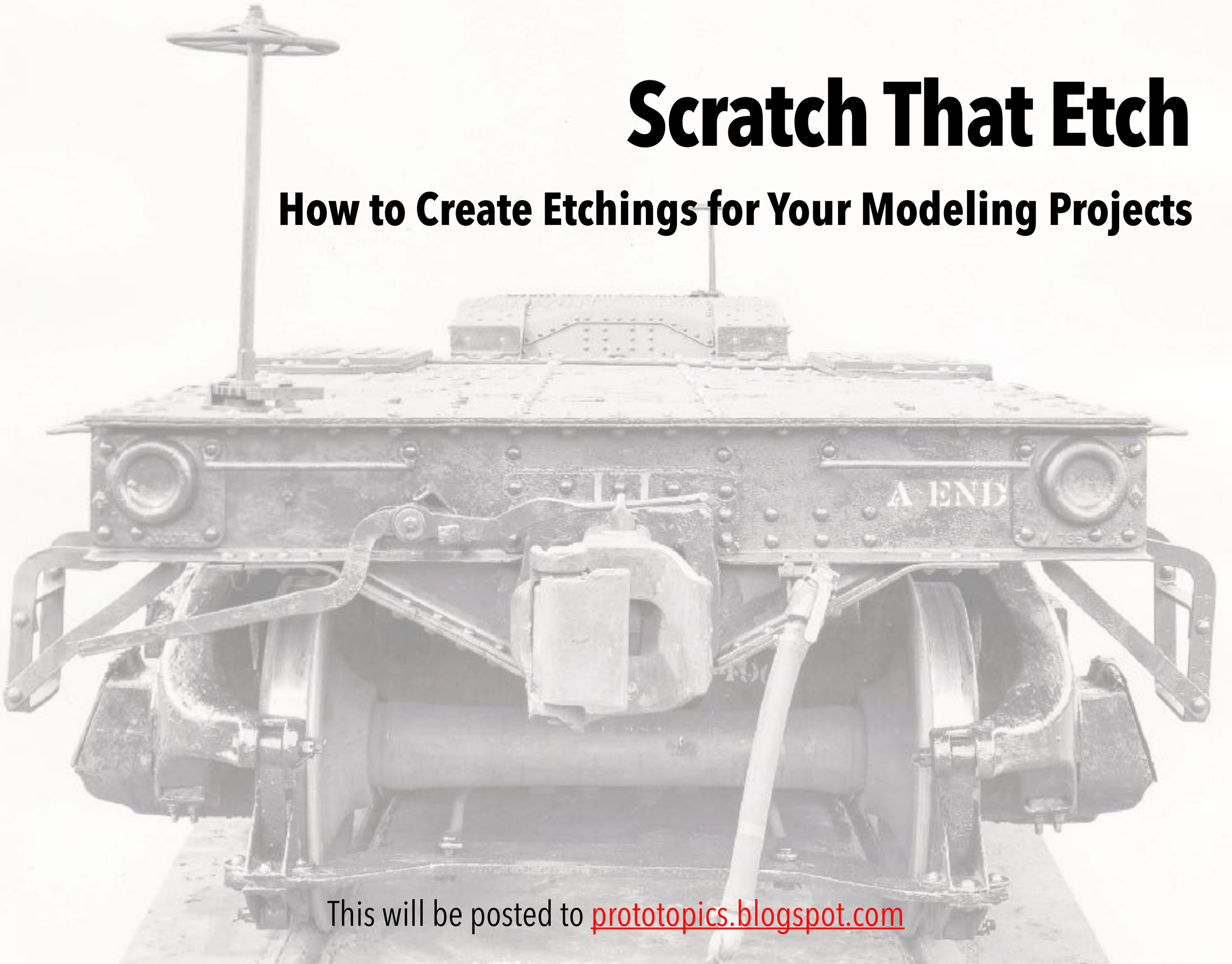

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