

# Building the B&CC: The Kimber Mill

Ryan Moats, MMR

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AND  
CENTRAL CITY

# Blackhawk and Central City

- Set in 1870
- Small (< 70 sq. ft.)
- Freelance, based on prototypical track construction standards (the CCRR and the Gilpin Tramway)
- Scratch build as much as possible (track, cars, motive power, structures, and throw mechanisms, so far)
- Cover the eight miles of CCRR track built along the north fork of Clear Creek from Forks Creek to Central City
- Operations focusing on early rail issues.

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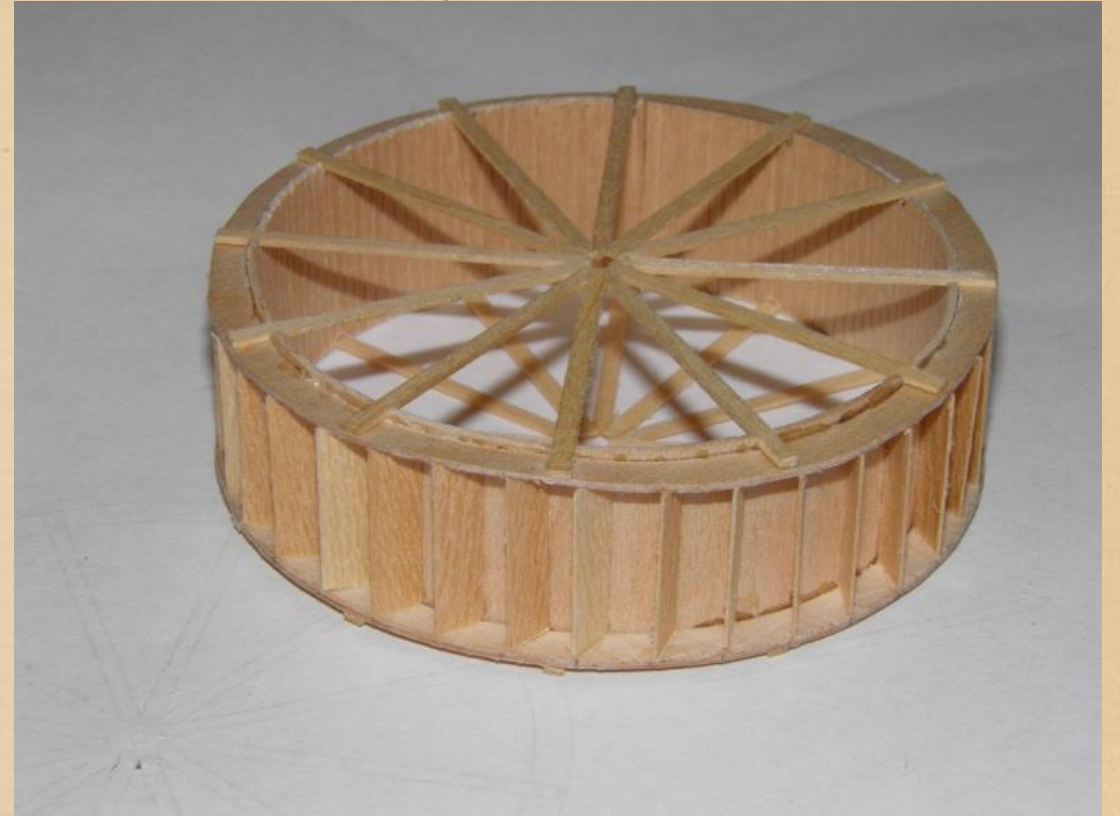
# Prototype Research

- Photos?
  - Oops, there aren't any direct photos.
- Books?
  - pp 101-102 of "The Gold Mines of Gilpin County, Colorado."
  - (Google Books is your friend)
- ... enclosed in a 95'x65' stone building
- ... had 32 stamps, eight Chilean Mills, and sixteen copper amalgamation tales.
- Power was provided by a 40 HP Woodury engine and a 23' diameter by 6' overshot water wheel.

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# Water Wheel

- Prototype: 23' x 6' overshoot
- Sides: 1/32" plywood
- Bottom: Scribe Sheathing
- Spokes: 2" x 6"



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# Amalgamating Tables

- Base: 1/32" plywood
- 3"x3" edging
- 5 mil foil copper
- Beveled 10"x12" pieces
  - 10 degree slope (from "The stamp milling of gold ores")
- Weathering:
  - India ink/Alcohol wash
  - Model Master Silver for mercury dressing



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# Batteries I

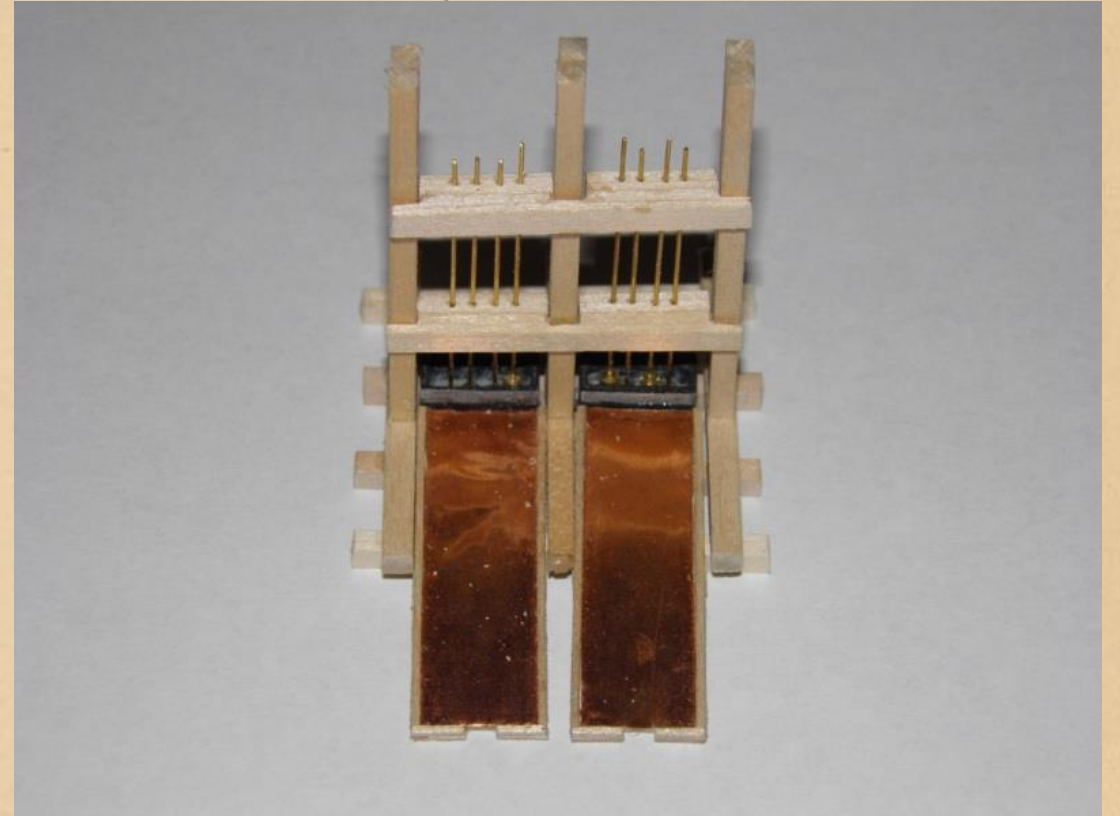
- Amalgamation table
- T-braces from 10" x 12" and 12" x 12"
- Mortar Box Foundation
  - 12" x 12" footer
  - 10" x 12" bracing
- Mortar Box and Stamps based on "The stamp milling of gold ores"



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# Batteries II

- Mortar Box custom printed at Shapeways
- Screen: 500 wire mesh
- Outside footers: 12" x 12"
- Stamp braces
  - 10" x 12" (with #65 holes)
- Stamps
  - .022" brass wire
  - .032" brass wire for 8" d x 6" shoes



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# Batteries III

- Diagonal braces: mitered 10" x 12"
- Grandt line NBWs
- Camshaft: 5/64" brass rod
- Cams custom printed at Shapeways



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# Batteries IV

- Drop order: 2-1-3-4
  - Determined from a photo of restored 19<sup>th</sup> century waterwheel and tin stamps at Geevor Tin Mine, Cornwall, England
- Cam followers from 18g hypodermic needle



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# Center Wheel

- Wood blank from 8"x8" timbers
- Brass banding from .016" flat stock
- Grandt NBWs



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# Counter Wheel

- NWSL 33" wheels
- Banded with 0.005" brass strips



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# Collaboration!?!

- 12 months into the process, an individual with an interest in the history of mining development reached out to me privately and began researching this mill on his own
- Together, we've pieced together a history of the mill from 1868 up through the early 1900s.
- 1870 Gilpin County Stamp Mill
  - 32 stamps
  - 8 Chilean mills
  - 16 amalgamating tables
- Wood frame construction
- Original + two expansions
  - Original 1863
  - Expanded 1868
  - Expanded 1870
- [www.coloradohistoricnewspapers.org](http://www.coloradohistoricnewspapers.org)
- [www.loc.gov](http://www.loc.gov)

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# Best (Only) Prototype Photo

- DPL: 1870
- Internal water wheel
- Two additions



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# Assembly I

- Main supports 12" x 12"
- 4" x 6" bracing
- Flooring from one 1" x 4"
- Stairs from 1/32" plywood, 1" x 12" treads and 1" x 6" risers
- All framing/roofing lumber dimensions from "Carpentry made easy"



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# Water wheel Flume

- Flume
  - Planks: 2" x 6"
  - Bracing: 6" x 6"
- Bent
  - 1" x 8" dowels
  - 2" x 6" planks
  - NBWs
- 8" x 10" stringers
- India ink/alcohol wash



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# Water Wheel II

- Brass hub
- Wood spokes
- India Ink/Alcohol Washes
- Grandt line NBWs
  
- Additional Spokes based on formulae from “Engineers and Mechanics Pocket Book”



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# Water Wheel III

- Brass Axle
- Crow River Products Pillow Blocks
- Sandstone pillars custom printed at Shapeways
- Axle diameter determined from “Engineers and Mechanics Pocket Book”



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# The Roof I

- 2"x6" rafters on 18" centers
- 8"x8" purlin
- 8"x8" purlin post
- 4"x6" brace
- Cut and frame flume opening



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# Water Flow

- “Engineers and Mechanics Pocket Book”
  - ~66 gallons per minute through the water wheel
- “The stamp milling of gold ores”
  - 64 gallons per minute through the mill
- Runoff from the wheel can feed the mills

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# Internal Flume

- Base
  - 2"x12" members
  - 3"x12" edging
- Bents
  - 8"x8", 10"x12" centers
  - 2"x6" bracing
  - 6"x6" stringers
- Washed with India ink/Alcohol



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# Distribution Channels

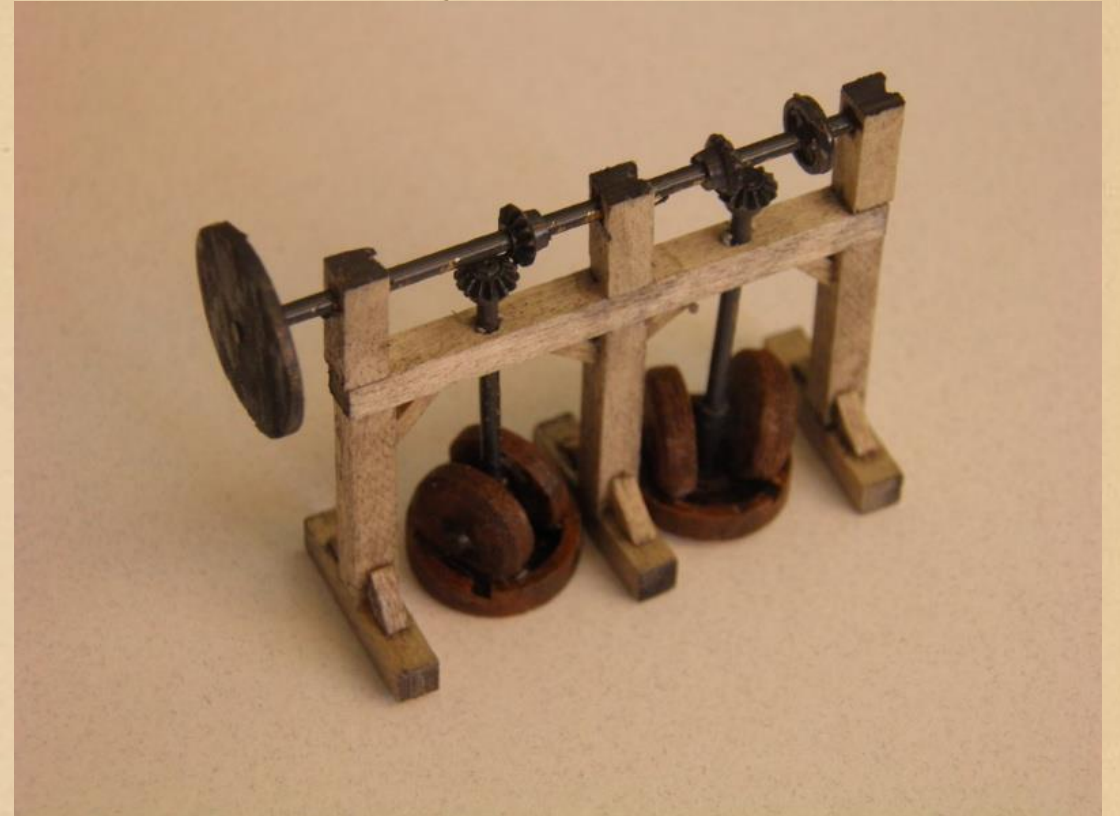
- 3" x 12"
- Notched for even water distribution
- Washed India ink/Alcohol wash



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# Chilean Mill

- Base, stones, spindles and collar all 3-D printed
- Brown India ink for dye
- Support from 12" x 12" and 6" x 6"
- Brass 1/16" driving axle
  - 4.5mm miter gears (gizmozone.com)
  - 5/8" dowel for large pulley
  - Crow River products small pulley



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# Steam Power

- Crow River Kit
- Grimy Black
- 12" x 12" bracing



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# Assembly II

- Interior studs 2"x8" on 2"x12" base
  - 1/64" plywood
  - Applied to roof section as well
- Add
  - Water distribution channels
  - Chilean Mill assemblies
  - Water Wheel assembly

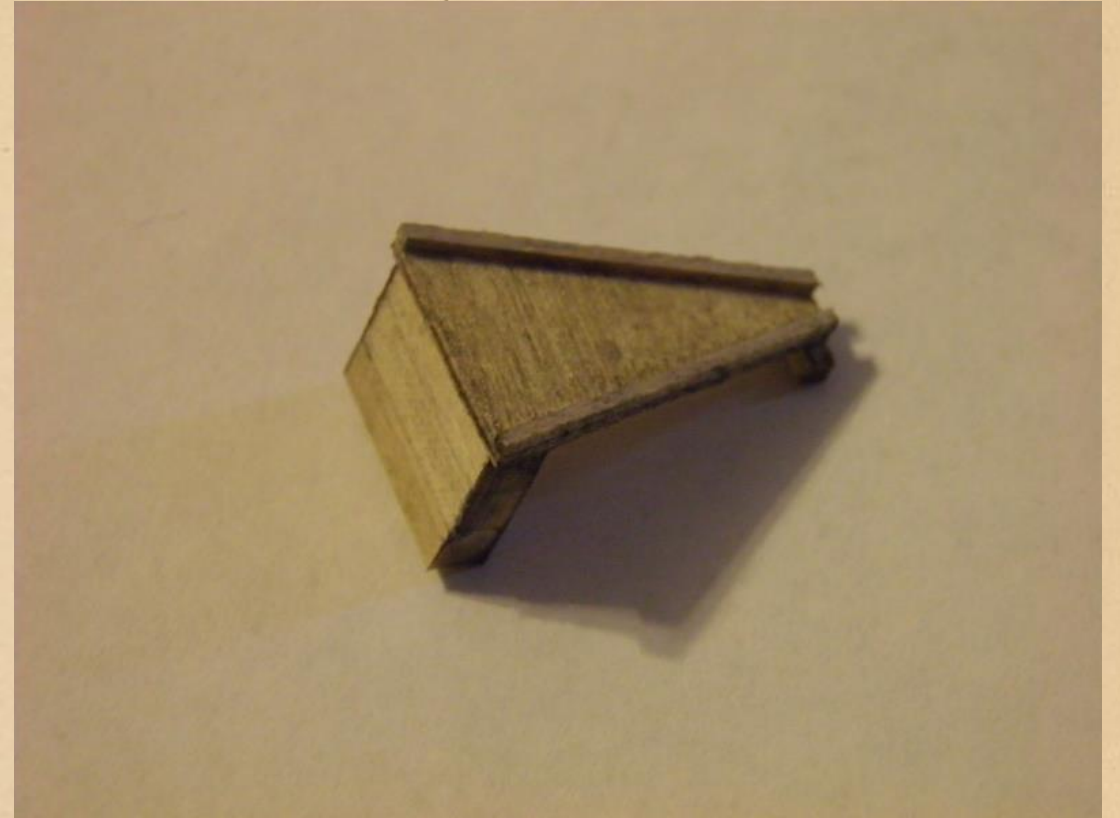


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# “Fan out” table from Chilean Mill

- Base: 1/32” plywood
- Supports: 12”x12” and 6”x6”
- Edging: 3”x3”



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# Pulley Ratios

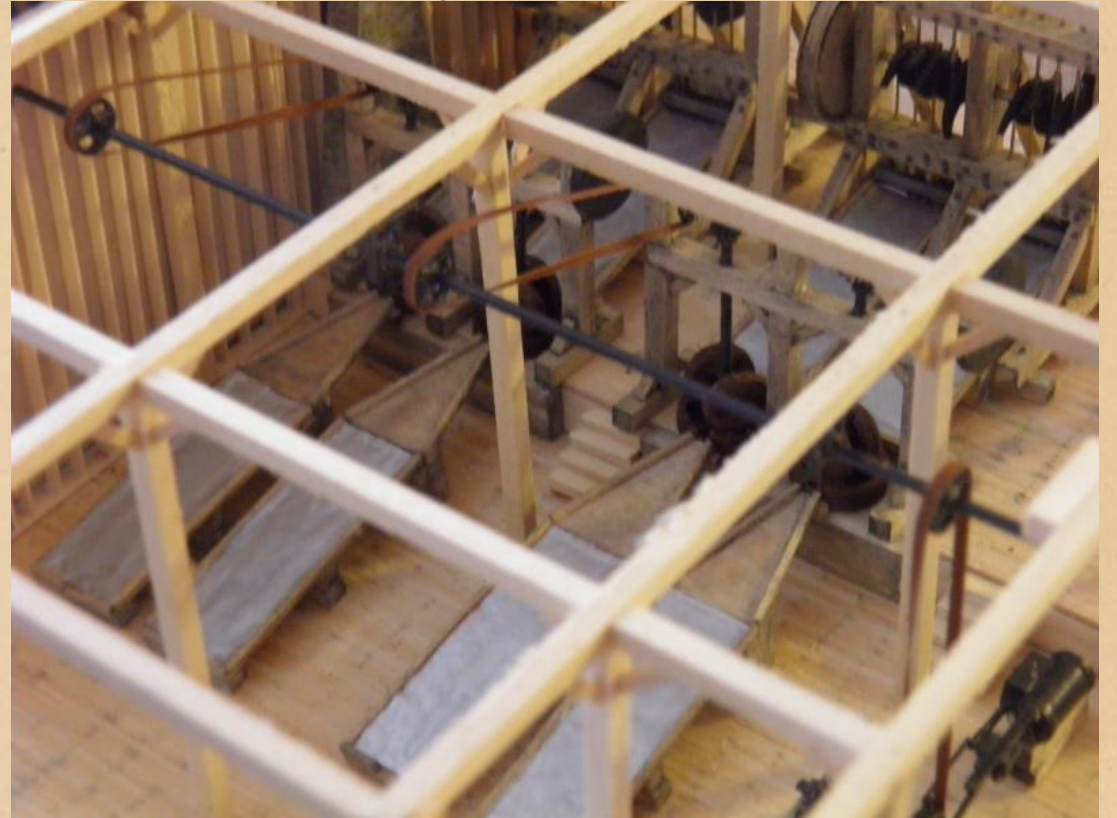
- Revolution Speeds

- Water Wheel: 4 rpm (from “Engineers and Mechanics Pocket Book”)
- Chilean Mill: 6 rpm (from “Stamp Milling and Cyaniding”)
- Stamp Mill Center Wheel: 15 rpm (from “The stamp milling of gold ores”)

- Ratios

- Wheel -> Chilean Mill 3:2
- Chilean Mill -> Stamp Mills 5:2
- Use transfer axle at 30 rpm
  - Chilean Mill -> Transfer Axle 5:1
  - Transfer Axle -> Stamp Mills 1:2
- One belt needs to be strung figure 8!

# Assembly III: Pulleys and Belts



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# Exit Flumes

- 8' sections
  - 2" x 6"
  - 3" x 6"
  
- Washed with India ink/Alcohol



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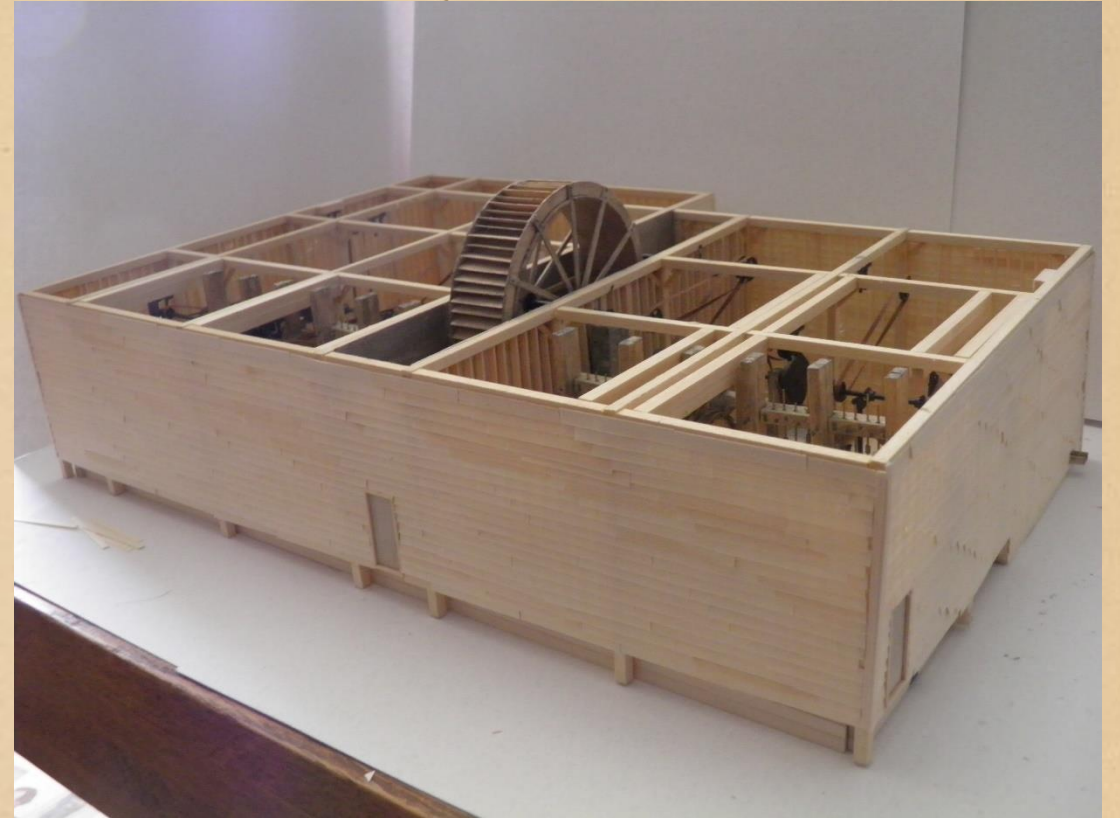
# Steam Boiler

- Kit bashed Keystone Locomotive Works Horizontal Portable Boiler Kit
- Extend stack with  $5/32$ " brass tube



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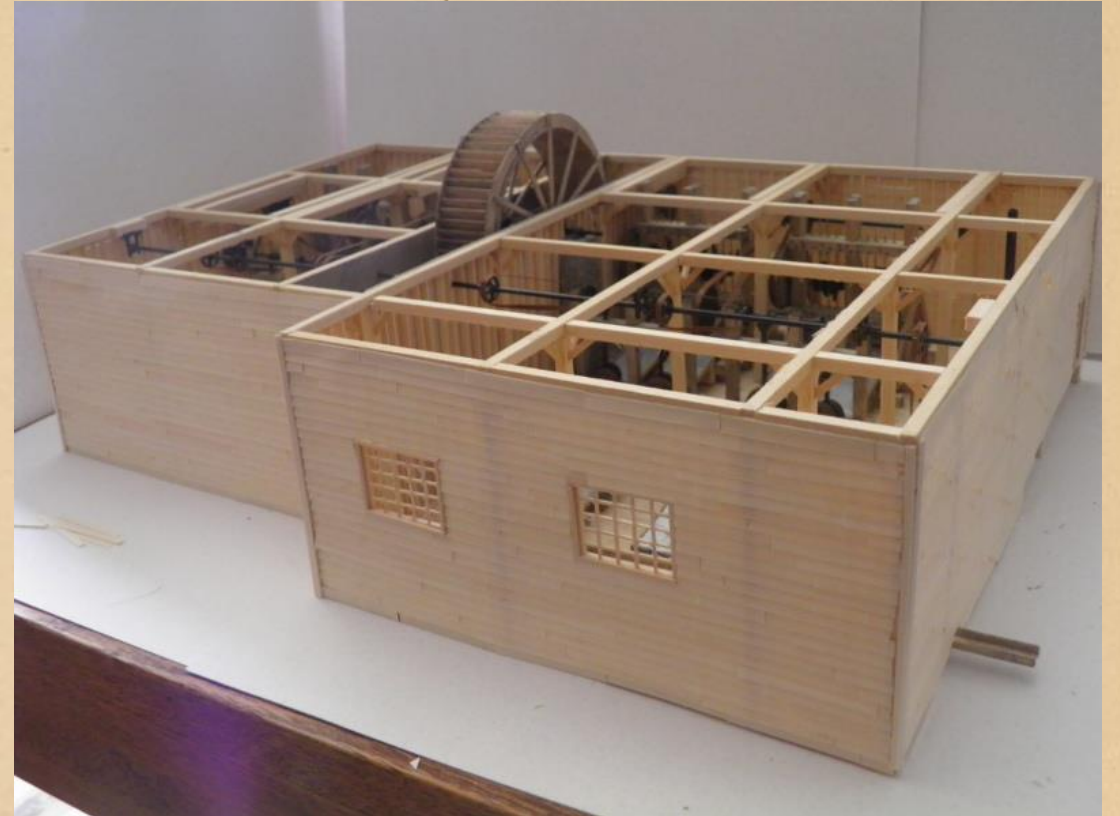
# Assembly IV



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# Siding

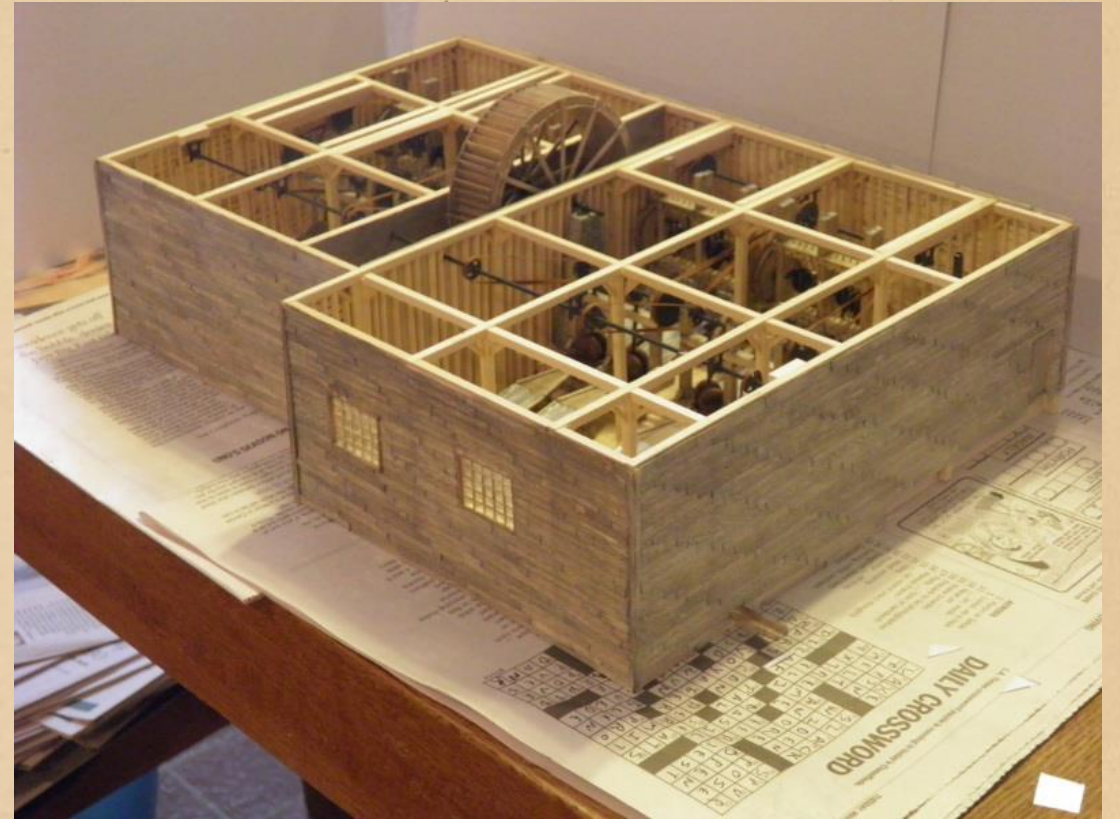
- Siding
  - 1" x 12" on 10" reveal
  - Staggered
  - Framed by 2" x 6"



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# Windows

- Built via 3-D printed jig
- Glazed with canopy glue



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Finishing up?



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Well... maybe not 😊

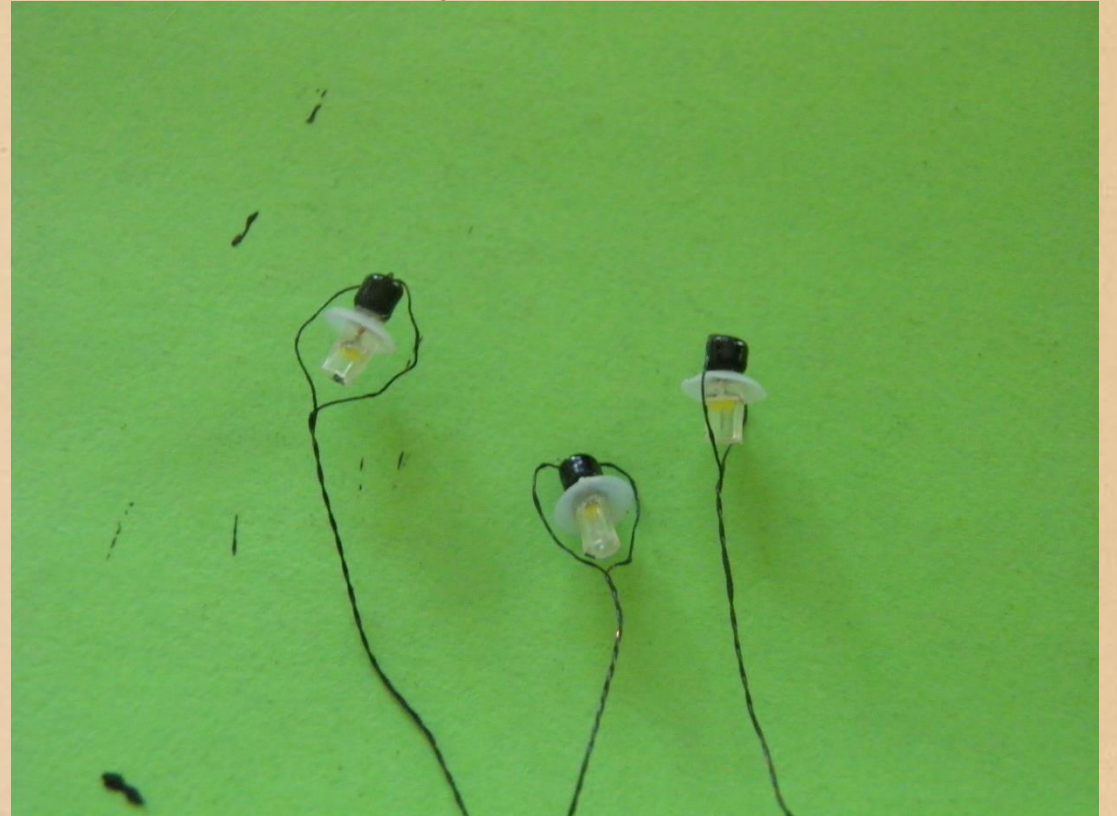
- Weathered the leather belts
- Added dirt in the corners
- Dull coated the roof



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# Lamps

- sLED
- Grandt Line 5062W
- 10/0 Bead
- grimy black paint



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# Lamps - 2

- Copper foil for bracket
- 0.019" brass wire for hanging hook



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Thanks for attending!

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