Ribbon Burner Forge

Complete Build Guide

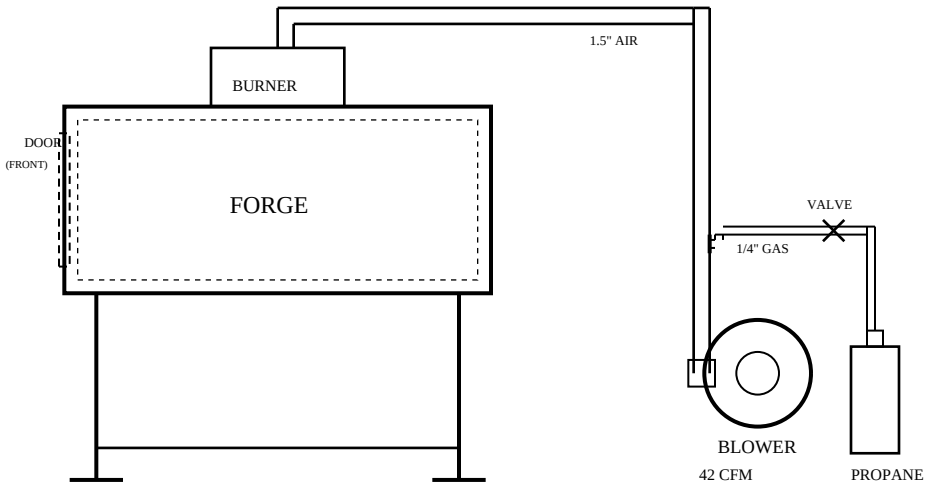
Chamber Volume: 504 cubic inches

Internal Dimensions: 6.0" × 6.0" × 14.0"

Estimated Cost: $371.0

■■ **WARNING:** Building and operating a forge is extremely dangerous. The creator of this tool accepts no responsibility for injuries, death, or property damage. Do not attempt unless qualified. See Safety section for full disclaimer.

SYSTEM SCHEMATIC



SPECIFICATIONS
Chamber: 504 cu.in.
Burner: 27 holes
Blower: 42 CFM

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1. Safety Requirements & Warnings

■■ DANGER - IMPORTANT SAFETY DISCLAIMER ■■

Building and operating a forced air ribbon burner forge is EXTREMELY DANGEROUS and can result in serious injury or death. Risks include but are not limited to: fire, explosion, severe burns, carbon monoxide poisoning, and toxic fume exposure.

DO NOT attempt to build or operate a forge unless you are qualified, have done your own independent research, and have verified the safety of your construction and operating procedures.

THE CREATOR OF THIS TOOL ACCEPTS NO RESPONSIBILITY for any injuries, deaths, property damage, or other losses resulting from the use of this tool or any forge built using information it provides. **USE ENTIRELY AT YOUR OWN RISK.**

Required Safety Equipment:

- ABC-rated fire extinguisher (within arm's reach during operation)
- Safety glasses (wear at ALL times near operating forge)
- Leather gloves (minimum 14" gauntlet style)
- Leather apron or jacket
- Hearing protection (blower noise can cause hearing damage)
- Steel-toed boots (protection from dropped hot material)
- Face shield (for forge welding operations)

Workspace Requirements:

- NEVER operate indoors or in enclosed spaces
- Minimum 10' × 10' clear area around forge
- Concrete, gravel, or dirt floor (NO wood decking)
- Overhead clearance minimum 8' (no combustible ceiling)
- Remove all combustibles within 5 feet of forge
- Install CO detector in adjacent enclosed spaces
- Ensure adequate ventilation even outdoors

Gas System Safety:

- Leak test ALL connections with soapy water before EVERY use (first month)
- Use only approved gas fittings and hoses rated for propane
- Install shutoff valve within reach of operating position
- NEVER use Teflon tape on flare fittings
- Keep propane tank upright and secured
- Store spare tanks outdoors, away from forge
- Replace hoses showing any wear, cracking, or damage

Emergency Procedures:

- **Gas leak detected:** Close tank valve immediately, evacuate area, ventilate, do NOT operate any electrical switches
- **Fire outside forge:** Close gas valve, use fire extinguisher, call 911 if not immediately controlled
- **Blower failure:** Close gas valve IMMEDIATELY - gas will accumulate without airflow
- **Burns:** Cool with water, seek medical attention for burns larger than 2" or on face/hands/joints
- **CO symptoms (headache, dizziness):** Leave area immediately, get fresh air, seek medical attention

2. Design Overview & Specifications

This forge design features a 504 cubic inch internal chamber with a 27-hole ribbon burner. The bolted construction allows complete disassembly for maintenance and repair.

FORGE BODY - EXTERNAL: 10.5" × 10.5" × 15.0"

Dimensional Specifications:

Measurement	Internal	External
Width	6.0"	10.5"
Height	6.0"	10.5"
Length	14.0"	15.0"
Volume	504 ci	—
Insulation	2.0"	Ceramic blanket + IFB

System Specifications:

System	Specification	Notes
Ribbon Burner	27 holes (1/4")	8.2" casting length
Blower	42 CFM	Static pressure: 3.0" WC
Refractory	Kast-O-Lite 30 LI	1.1 bags (55 lb)
Ceramic Blanket	4.8 sq ft	2" thickness
BTU Requirement	226,800	Approximate

Front Door	5.1" × 5.1"	Sliding firebrick

3. Complete Bill of Materials

Steel Components:

Item	Quantity	Notes
1/4" Steel Plate	See cut list	6 panels total
2" × 2" × 1/8" Angle Iron	~246"	Frame corners
3" × 3" Square Tube	10.2"	Burner housing
1.5" Pipe	24-36"	Air inlet
1/4" Pipe	12"	Gas injection
1/8" Sheet Steel	4 sq ft	Door frames, baffle
1/2" Round Rod	24"	Door tracks, handles

Refractory Materials:

Item	Quantity	Purpose
Ceramic Fiber Blanket 2"	4.8 sq ft	Wall/ceiling lining
Castable Refractory	1.1 bags	Burner head (Kast-O-Lite 30)
IFB (Insulating Fire Brick)	6 bricks	Floor and doors
Rigidizer	1-2 quarts	Seal blanket surface
ITC-100 (optional)	1 pint	IR reflective coating
Stainless Pins/Staples	50-100	Secure blanket

Hardware & Components:

Item	Quantity	Notes
5/16" or 3/8" Bolts	40-50	Grade 5+, 4 per corner
Forge Blower	1	42 CFM, 3.0" WC
1.5" Gate Valve	1	Air control
Variable Speed Controller	1	Ceiling fan type (NOT dimmer)
Propane Regulator	1	0-30 PSI adjustable
Pressure Gauge	1	0-15 PSI display
1/4" Ball Valve	1	Main gas shutoff
1/4" Needle Valve	1	Fine adjustment
1/4" Solenoid Valve	1	Safety (wired to blower)
Fire Extinguisher	1	ABC rated, 5+ lb

Estimated Total Cost: $371.0 (excluding steel you may already have)

4. Steel Cut List

1/4" Steel Plate Cuts:

Panel	Qty	Width	Height	Notes
Side Panels	2	15.0"	10.5"	—
Top Panel	1	15.0"	10.5"	—
Bottom Panel	1	15.0"	10.5"	—
Front End Panel	1	10.5"	10.5"	Cut 5.1"x5.1" door opening
Rear End Panel	1	10.5"	10.5"	—

Angle Iron Cuts (2" × 2" × 1/8"):

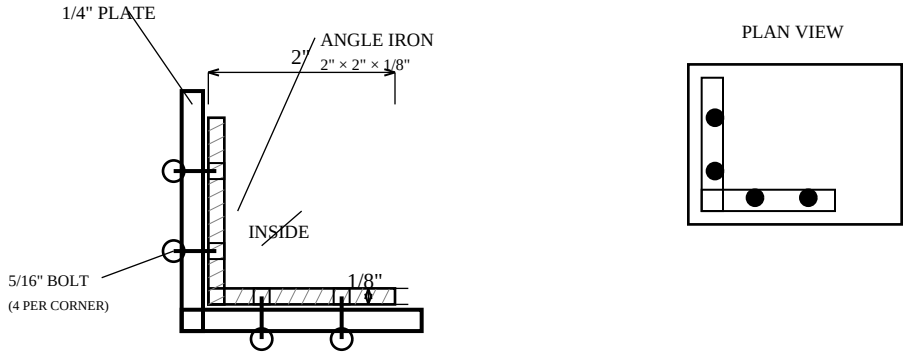
Component	Qty	Length
Corner Posts	4	10.5"
Top/Bottom Rails	8	11.0"
End Rails	8	6.5"

Cutting Notes:

- Cut angle iron ends at 45° for miter joints at corners
- Drill bolt holes slightly oversize (1/64") for alignment tolerance
- Deburr all cut edges to prevent injury during assembly
- Use angle iron as drilling template for plate holes

5. Forge Body Construction

The forge body uses bolted angle iron construction for easy assembly and future maintenance. All six panels bolt to the internal angle iron frame.



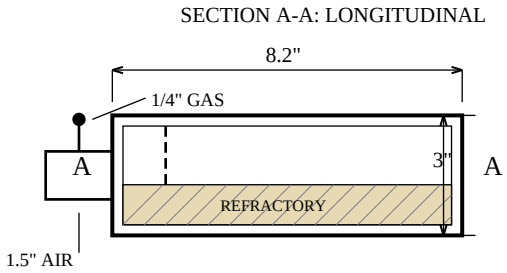
CORNER ASSEMBLY DETAIL

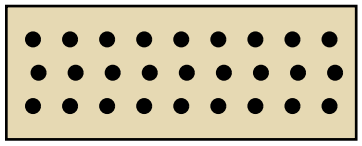
Assembly Sequence:

1. Cut all angle iron pieces to length per cut list
2. Drill bolt holes in angle iron at 3-4" spacing
3. Assemble angle iron frame (dry fit, no plates)
4. Verify frame is square using diagonal measurements
5. Use frame as template to drill plate holes
6. Cut door opening in front panel
7. Cut burner hole in top panel (3.5" diameter)
8. Bolt bottom panel to frame first
9. Attach side panels
10. Install front and rear panels
11. Top panel installs after refractory lining

6. Ribbon Burner Assembly

The ribbon burner provides even heat distribution through 27 flame ports. Sized for your 504 ci chamber.





RIBBON BURNER ASSEMBLY

Burner Specifications:

Component	Specification
Housing	3" × 3" square tube, 10.2" long
Air Inlet	1.5" pipe, 6" stub
Refractory Head	8.2" × 3" × 3" deep
Flame Holes	27 holes, 1/4" diameter
Hole Pattern	3 rows × 9 holes, staggered
Gas Injection	1/4" pipe into air stream
Mounting Angle	30-45° downward into chamber

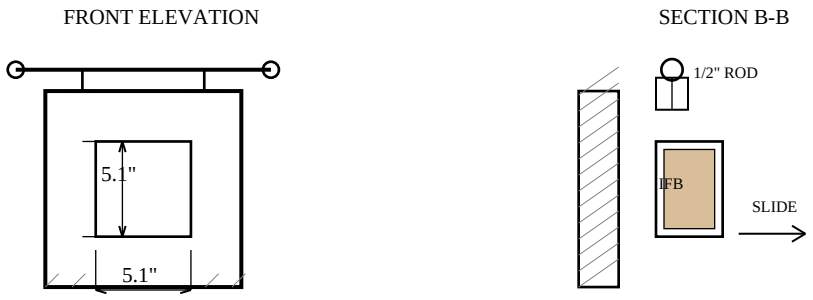
Casting the Refractory Head:

1. Build mold: 8.2" × 3" × 3" deep (plywood or melamine)
2. Insert 27 drinking straws in 3×9 pattern
3. Space straws ~3/4" apart in staggered rows
4. Mix Kast-O-Lite 30 to peanut butter consistency
5. Pack refractory firmly around straws
6. Vibrate or tap mold to release air bubbles
7. Cure 24-48 hours before demolding

8. Remove straws (burn out or pull)
9. Oven cure: 200°F for 2 hours, then 350°F for 2 hours
10. Mount to burner housing with refractory cement

7. Sliding Door System

Sliding firebrick doors provide excellent heat retention and one-handed operation. The doors hang from a round rod track above the opening.



SLIDING FIREBRICK DOOR DETAIL

Door Specifications:

Feature	Front Door	N/A
Opening	5.1" × 5.1"	—
Door Frame	6.1" × 6.1" × 3"	Similar
Track Length	17.1"	Similar
Firebricks	4 IFB	—

Door Construction:

1. Weld 1/8" angle iron into rectangular door frame
2. Add tube or pipe hanger on top to slide on rod
3. Cut firebricks to fit inside frame
4. Secure bricks with high-temp cement or wire
5. Weld handle to one side
6. Weld rod supports above door opening
7. Install 1/2" round rod through supports
8. Hang door and test slide action

9. Air & Gas Supply Systems

Air Supply System:

Component	Specification
Blower	42 CFM centrifugal forge blower
Static Pressure	3.0" WC minimum
Pipe Size	1.5" throughout
Gate Valve	1.5" for coarse air control
Speed Controller	Ceiling fan type (NOT lamp dimmer)
Flex Connection	1.5" silicone hose, 12-18"

Propane Gas System:

Component	Specification
Propane Tank	20-100 lb cylinder
Regulator	Adjustable 0-30 PSI
Pressure Gauge	0-15 PSI display
Main Shutoff	1/4" ball valve
Solenoid Valve	1/4" normally closed (wire to blower power)
Needle Valve	1/4" for fine adjustment
Gas Line	1/4" black iron or approved propane hose
Operating Pressure	5-10 PSI typical

SAFETY: Wire gas solenoid valve to blower power so gas cannot flow when blower is off. Leak test entire gas system with soapy water before first use.

10. Refractory Lining & Curing

Lining Installation:

1. Cut ceramic blanket to fit chamber: 4.8 sq ft total
2. Install floor first: layer of IFB bricks on thin refractory cement bed
3. Line walls with 2" ceramic blanket
4. Secure blanket with stainless pins every 4-6"
5. Line ceiling with 2" ceramic blanket
6. Apply rigidizer to all blanket surfaces (wear respirator!)
7. Allow rigidizer to dry completely (24 hours)
8. Optional: Apply ITC-100 coating for IR reflection
9. Install top panel after lining is complete

Curing Schedule (CRITICAL):

Improper curing will cause refractory to crack and fail. Follow this schedule:

Day	Temperature	Duration	Notes
1	200-300°F	2-3 hours	Low flame, doors open
2	400-500°F	2-3 hours	Doors cracked
3	700-800°F	2-3 hours	Doors partially closed
4	1000-1200°F	2-3 hours	Normal operation
5+	Full heat	As needed	Ready for use

Steam escaping during initial cures is normal. Cracking sounds may occur. Do NOT rush the curing process.

12. Operation Procedures

Startup Procedure:

1. Inspect forge and gas connections (leak test if needed)
2. Ensure fire extinguisher is within reach
3. Clear area of combustibles
4. Position doors for desired opening
5. Open air gate valve fully
6. Turn on blower, wait 10-15 seconds
7. Open main gas ball valve
8. Slowly open needle valve
9. Ignite at door opening with long lighter or torch
10. Adjust gas for desired heat
11. Fine-tune air for proper flame

Shutdown Procedure:

1. Close gas needle valve
2. Close main gas ball valve
3. Keep blower running 60 seconds (purge chamber)
4. Turn off blower
5. Leave doors cracked until cool (thermal shock prevention)
6. Never move forge while hot

13. Flame Tuning Guide

Proper flame tuning is essential for efficient operation and quality work. The air-to-fuel ratio determines the forge atmosphere.

Flame Type	Appearance	Use Case
Neutral	Short blue cones, purple tips	General forging
Reducing	Longer flames, orange/yellow streaks	Forge welding, minimizes scale
Oxidizing	Short, loud, hissing blue	Maximum heat (causes heavy scale)

Tuning Adjustments:

- **Too much scale on steel:** Reduce air (more reducing atmosphere)
- **Not reaching temperature:** Increase gas, close doors more
- **Flame blowing out:** Reduce both air and gas, let forge warm up
- **Loud roaring/hissing:** Too much air - reduce blower speed
- **Lazy, yellow flames:** Not enough air - increase blower

14. Troubleshooting

Problem	Possible Causes	Solutions
Won't ignite	No gas, no spark, wrong air/gas	Check gas valve, test igniter, reduce air
Flame blows out	Too much air, forge cold	Reduce air, preheat with low flame
Won't reach temp	Gas leak, poor insulation, doors open	Leak test, check blanket, close doors
Uneven heating	Blocked holes, burner angle	Clear holes, adjust mount angle
Excessive scale	Oxidizing atmosphere	Reduce air, increase gas slightly
High fuel use	Gas leak, damaged insulation	Leak test, inspect/repair lining
Door binding	Scale buildup, track bent	Clean track, check alignment
Bolts loosening	Thermal cycling	Use lock washers, retorque after cures
Smoke from chamber	Contamination, flux residue	Clean chamber, normal with flux
Blower overheating	Blocked inlet, undersized	Clear obstructions, check CFM rating

15. Maintenance Schedule

After Each Use:

• Visual inspection of chamber for damage

• Remove scale and debris from floor

• Check door operation

Monthly (Heavy Use):

• Check all bolt tightness

• Inspect door firebricks for cracks

• Clean sliding tracks

• Leak test gas connections

Quarterly:

• Inspect ceramic blanket condition

• Check burner holes for blockage

• Inspect refractory floor for wear

• Clean blower intake filter

Annually:

• Disassemble top panel, full chamber inspection

• Replace damaged refractory

• Reapply rigidizer to worn areas

• Replace door firebricks if needed

• Deep clean entire forge

Expected Performance:

Parameter	Specification
Heat-up Time	10-15 minutes to 2000°F
Maximum Temperature	2400-2500°F (forge welding heat)
Even Heating Zone	~8" from burner
Operating Pressure	5-10 PSI propane
Operating Cost	~$1-3/hour (varies with propane prices)