

# **Forced Air Ribbon Burner Forge**

## **Complete Design & Build Guide**

Bolted Assembly with 1.5" Air System  
and Sliding Firebrick Doors

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# 1. Materials & Design Overview

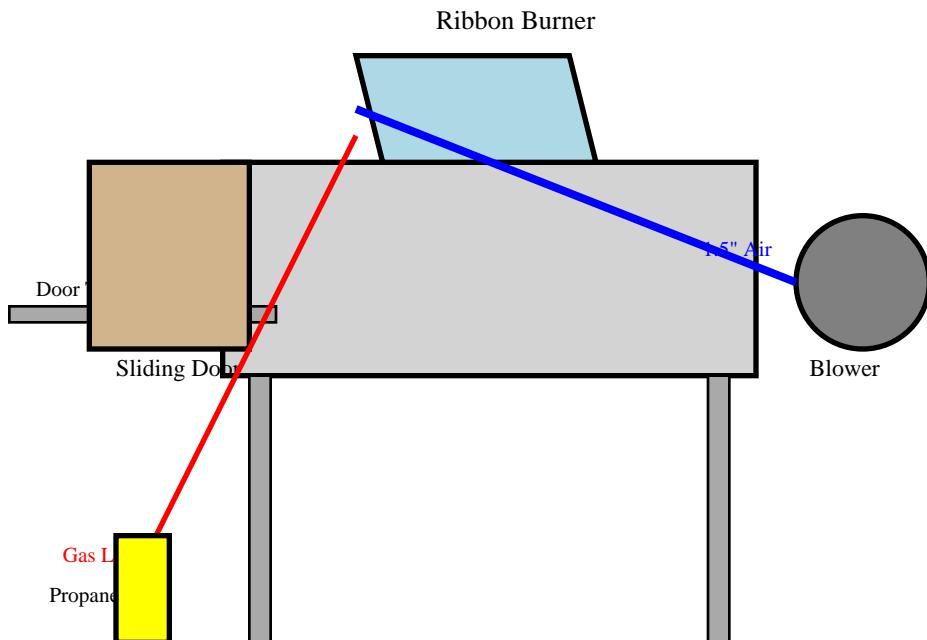
## Materials Available:

Qty	Dimension	Purpose
2	1/4" x 14" x 30" steel plates	Side panels
2	1/4" x 12" x 14" steel plates	End panels (doors)
2	1/4" x 12" x 30" steel plates	Top & bottom
TBD	1/8" x 2" angle iron	Frame & tracks

## Design Features:

- **Bolted construction** using angle iron frame for easy disassembly
- **1.5" air system** with 120-150 CFM blower
- **Ribbon burner** with 24 holes for even heat distribution
- **Sliding firebrick doors** on front and rear
- **Internal chamber:** 7.5"W x 9"H x 25.5"L (after lining)
- **Temperature range:** Up to 2400-2500°F (forge welding heat)

Complete Assembly View

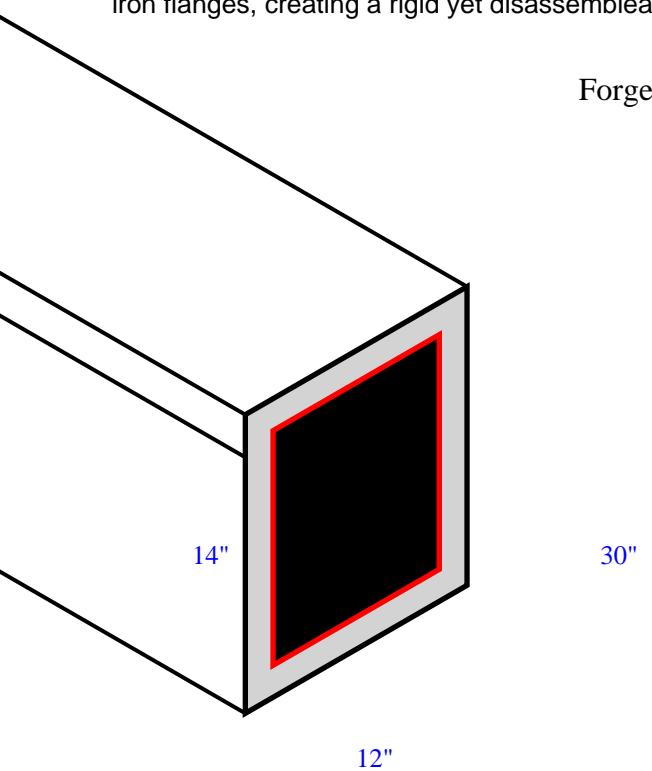


## 2. Forge Body Construction

### Bolted Box Assembly:

The forge body is assembled using 1/8" × 2" angle iron as an internal corner frame. All six steel plates bolt to the angle iron flanges, creating a rigid yet disassemblable structure.

Forge Body Assembly



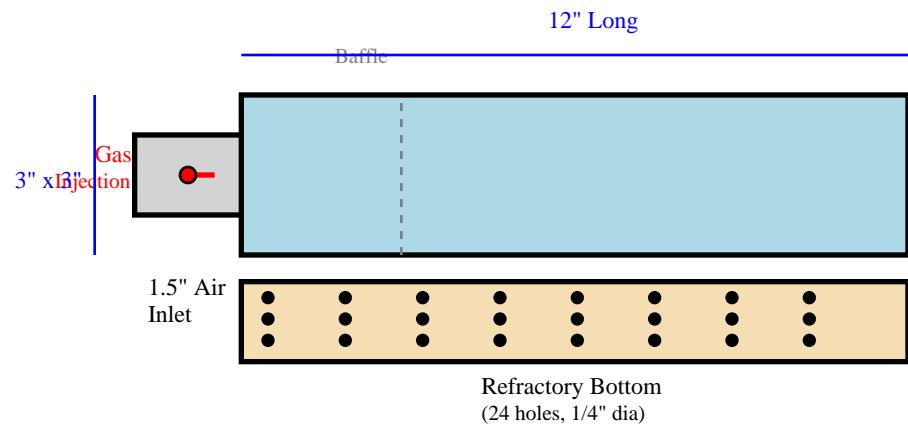
### Dimensions:

Measurement	External	Internal (Before Lining)	Internal (After Lining)
Width	12"	11.5"	7.5"
Height	14"	13.5"	9"
Length	30"	29.5"	25.5"

### 3. Ribbon Burner Assembly

The ribbon burner is the heart of the forge, providing even heat distribution across the chamber width.

Ribbon Burner Assembly



#### Specifications:

Component	Specification
Housing	3" x 3" square steel tubing, 12" long
Air Inlet	1.5" diameter pipe, 6" stub
Refractory Head	3" deep castable refractory
Flame Holes	24 holes, 1/4" diameter
Hole Pattern	3 rows of 8, staggered
Gas Injection	1/4" pipe into air inlet
Mounting Angle	30-45° downward

#### Construction Steps:

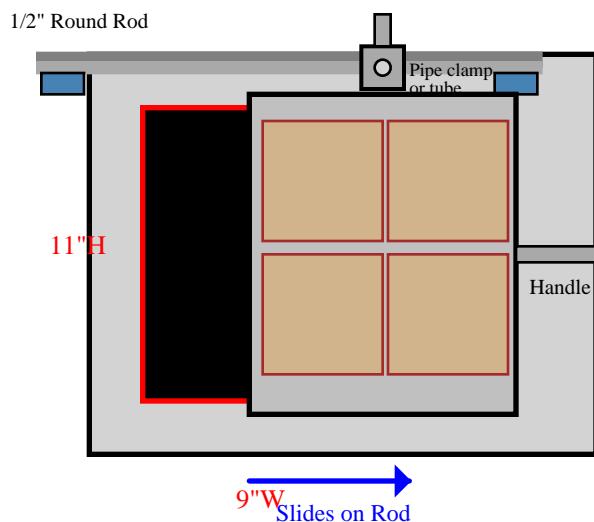
1. Cut 3"x3" square tube to 12" length
2. Drill 1.5" hole and weld air inlet pipe stub
3. Install internal baffle plate for gas/air mixing
4. Drill 1/4" hole for gas injection pipe
5. Build mold and cast refractory head with 24 straws

6. Cure 24-48 hours, then oven cure at 200-250°F

## 4. Sliding Firebrick Door System

The sliding door system provides superior control over heat retention and chamber access. Firebrick insulation in steel frames slides on angle iron tracks.

Round Rod Sliding Firebrick Door



### Door Specifications:

Feature	Front Door	Rear Door
Opening Size	9"W x 11"H	7"W x 9"H
Door Frame Size	10"W x 12"H x 3"D	8"W x 10"H x 3"D
Firebricks	4-6 IFB	2-3 IFB
Track Length	24" (extends 12")	18" (extends 8-10")
Operation	Slides horizontally	Slides horizontally

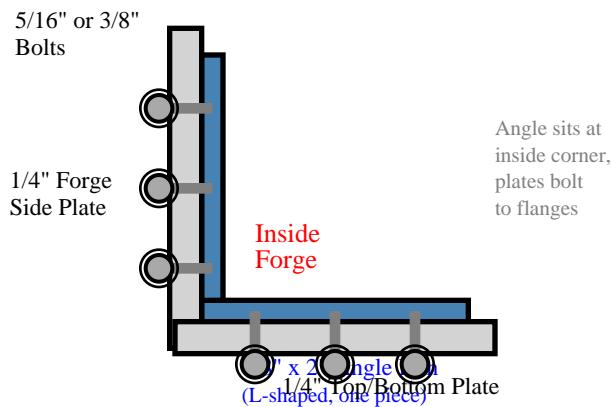
### Advantages of Sliding Doors:

- One-handed operation
- Infinite positioning (not just open/closed)
- Doors stay in place (won't fall out)
- Firebrick provides excellent insulation
- No need to find place for removed door

## 5. Bolted Frame Construction Details

The angle iron frame creates a strong, rigid structure while allowing complete disassembly. This is especially valuable for maintenance and modifications.

Bolted Corner Assembly



### Frame Components:

Component	Quantity	Length	Purpose
Corner Posts	4	14"	Vertical corners
Edge Reinforcement	4	30"	Top/bottom edges (optional)
Door Frame Pieces	8	13"	Around door openings
Sliding Tracks	4	18-24"	Door slide rails
Burner Mount	4	4-14"	Angled burner support

### Bolt Specifications:

- **Size:** 5/16" or 3/8" diameter
- **Grade:** Grade 5 minimum (Grade 8 recommended)
- **Quantity:** 60-80 bolts for complete assembly
- **Hardware:** Use flat washers and lock washers
- **Spacing:** 3-4" on center along angle iron

### Assembly Advantages:

- ✓ Complete disassembly for maintenance
- ✓ Easy to replace damaged components
- ✓ No welding distortion
- ✓ Can modify or upgrade later
- ✓ Easier to transport (disassembled)

## 6. Air & Gas Supply Systems

### 1.5" Air System:

Component	Specification
Blower	120-150 CFM centrifugal forge blower
Pipe Size	1.5" throughout
Control Valve	1.5" gate valve
Speed Control	Variable (ceiling fan controller, NOT dimmer)
Flexible Connection	1.5" silicone hose, 12-18"
Total Length	Under 6 feet recommended

### 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 (optional but recommended)
Fine Adjustment	1/4" needle valve
Gas Line	1/4" black iron pipe or propane hose
Operating Pressure	5-10 PSI typical

**Safety Note:** Always leak test the entire gas system with soapy water before operation. Install a solenoid valve wired to blower power to prevent gas flow without airflow.

## 7. Assembly Instructions Summary

Phase	Tasks	Time
1. Frame Fabrication	Cut angle iron, drill holes, create template	4-6 hrs
2. Plate Preparation	Cut openings, drill bolt holes, deburr	4-6 hrs
3. Test Fit	Bolt together, check square, adjust	2-3 hrs
4. Door System	Install frames, build door assemblies	6-8 hrs
5. Burner Build	Fabricate housing, cast refractory	4-6 hrs
6. Final Assembly	Bolt forge, install burner, seal	2-3 hrs
7. Refractory Lining	Install floor, blanket, rigidizer	4-6 hrs
8. Plumbing	Build stand, run air/gas lines	6-8 hrs
9. Curing	Low heat burns, increase temp	3-7 days

**Total Active Build Time:** 30-43 hours (plus cure time)

### ***Critical Assembly Notes:***

- Use the angle iron frame as a drilling template for plates
- Drill bolt holes slightly oversize (1/64") for easy alignment
- Check for square during test fit before final assembly
- Allow refractory to cure fully before firing
- Leak test gas system before first use
- Break in forge gradually over 3-5 burns

## 8. Complete Bill of Materials

### **Steel & Metal Components:**

Item	Quantity	Notes
1/4" steel plates	As specified	Already have
1/8" x 2" angle iron	150-300 ft	Already have (partial)
3" x 3" square tube	12"	Burner housing
1.5" pipe	24-36"	Air inlet & line
1/4" pipe	12"	Gas injection
1/8" steel sheet	4-5 sq ft	Door faces, baffle
1/2" rod	2 ft	Door handles
2" square tube	25-30 ft	Stand (if not using angle)

### **Refractory Materials:**

Item	Quantity	Purpose
Ceramic fiber blanket 2"	15 sq ft	Wall/ceiling lining
Castable refractory	5-8 lbs	Burner head
IFB (Insulating Fire Brick)	26-32 bricks	Floor & doors
Rigidizer	1-2 quarts	Seal blanket
ITC-100 (or equivalent)	1 pint	IR coating (optional)
Stainless pins/staples	50-100	Secure blanket
Refractory cement	1 quart	Sealing

### **Hardware & Components:**

Item	Quantity	Notes
5/16" or 3/8" bolts	60-80	Grade 5+, with washers
Forge blower	1	120-150 CFM
1.5" gate valve	1	Air control
Variable speed controller	1	Ceiling fan type
Propane regulator	1	0-30 PSI adjustable
Pressure gauge	1	0-15 PSI
1/4" ball valve	1	Main gas shutoff
1/4" needle valve	1	Fine adjustment
1/4" solenoid valve	1	Safety (optional)
1/4" pipe fittings	Various	Tees, elbows, nipples

Fire extinguisher	1	ABC rated
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**Estimated Total Cost:** \$675-1,100 (excluding steel plates and angle iron you already have)

## 9. Operation & Safety

### **Startup Procedure:**

1. Slide doors to desired position
2. Open air gate valve fully
3. Start blower, wait 10-15 seconds
4. Open gas main valve
5. Slowly open needle valve
6. Ignite at door opening with long lighter
7. Adjust gas for desired heat
8. Fine-tune air for proper atmosphere

### **Flame Tuning Guide:**

Flame Appearance	Air/Gas Ratio	Use Case
Purple-blue with orange streaks	Neutral (balanced)	General forging
More orange/yellow	Reducing (less air)	Forge welding
Bright blue	Oxidizing (excess air)	Maximum heat (causes scale)

### **Shutdown Procedure:**

1. Close gas needle valve
2. Keep blower running 60 seconds (purge gas)
3. Turn off blower
4. Allow forge to cool before fully closing doors
5. Never move forge while hot

### **Safety Requirements:**

#### **Required Safety Equipment:**

- ABC-rated fire extinguisher (within reach)
- Safety glasses (always wear)
- Leather gloves and apron
- Hearing protection (blower noise)
- Proper ventilation or exhaust hood
- CO detector in shop (recommended)

#### **Operational Safety:**

- Never operate in enclosed space without ventilation
- Keep combustibles 3+ feet from forge

- Leak test gas connections before each use (first few times)
- Never leave running forge unattended
- Check bolt tightness periodically (thermal cycling)
- Watch for pinch points on sliding doors

**Emergency Procedures:**

- **Gas leak:** Close tank valve immediately, ventilate area, find and repair leak
- **Fire outside forge:** Use fire extinguisher, close gas supply
- **Blower failure:** Close gas valve immediately
- **Flame blowing out:** Reduce both air and gas, let forge heat up first

**Expected Performance:**

Parameter	Specification
Heat-up Time	10-15 minutes to 2000°F
Maximum Temperature	2400-2500°F (forge welding heat)
Even Heating Zone	~12" from ribbon burner
Fuel Consumption	5-10 PSI propane (varies with heat demand)
Operating Cost	Approximately \$1-3/hour (propane prices vary)

# Additional Notes & Tips

## **Maintenance Schedule:**

### **Monthly (heavy use):**

- Check bolt tightness
- Inspect door firebricks for cracks
- Clean sliding tracks

### **Quarterly:**

- Inspect ceramic blanket condition
- Check for gas leaks
- Inspect refractory floor

### **Annually:**

- Disassemble top plate, inspect chamber
- Replace damaged refractory
- Replace door firebricks if needed
- Deep clean entire forge

## **Design Advantages:**

- ✓ **Bolted construction** allows complete disassembly
- ✓ **1.5" air system** is economical and adequate
- ✓ **Ribbon burner** provides even, efficient heating
- ✓ **Sliding doors** offer superior control and convenience
- ✓ **Professional-grade** performance for home shop
- ✓ **Materials on hand** reduces overall cost

## **Troubleshooting Quick Reference:**

Problem	Solution
Not reaching temperature	Close doors more, increase gas, check for leaks
Uneven heating	Adjust burner angle, check all holes clear
Excessive fuel use	Fix gas leaks, repair refractory cracks
Door binding	Check track parallel, clean scale, adjust spacing
Bolts loosening	Use lock washers or Loctite, re-torque after first burns
Flame blowing out	Reduce air and gas, let forge heat up first

## **Design Attribution:**

This forced air ribbon burner forge design incorporates principles from the blacksmithing community's proven ribbon burner designs, adapted to utilize specified steel plate dimensions and bolted construction for optimal performance and maintainability.

*Document generated with technical illustrations for complete forge construction.*