

How to Build a Metal Melting Furnace for Casting

Melting aluminum, brass, or other mid-temperature melting point metals requires over 1000 degree temperatures. To build a simple home made furnace for casting metals you need to meet some simple design requirements and use appropriate materials. Here is an article that may help you successfully melt these metals with ordinary tools and materials.

Steps

- 1 Determine the size of the furnace for your needs.** For casting a small item such as a hand print or other object weighing less than a few pounds, a 12 inch (30.5 cm) burning chamber with a 1 quart volume crucible should work.
- 2 Choose materials that will withstand the flame temperature of your fuel.** We are using charcoal here because it is readily available and inexpensive. It has a flame temperature (heat value) of about 2,300 °F (1,260 °C) with a forced air blower. Coal has a flame temperature over 3,000 °F (1,650 °C) with forced air, so charcoal is more practical as far as construction materials are concerned, even steel will burn out with a coal fired assembly and forced air. This project uses 14 gauge galvanized steel for the burner container.
- 3 Form two cylinders using available materials.** The images show one built by bending 12 inch (30.5 cm) pieces of sheet metal, but people have successfully melted aluminum in steel paint cans and garbage cans. These burn out after a few uses, so you need to weigh the cost of building a more substantial furnace with the length of time you hope to use it.
 - The inside cylinder should be large enough to accommodate the melting pot crucible you plan on using, allowing space for the fuel to encircle it, and deep enough to allow the crucible to sit beneath the lid you will be adding later. An 8 inch (20.3 cm) crucible will require a 14 inch (35.6 cm) burning chamber, and if the crucible is 8 inches (20.3 cm) deep, the chamber should be at least 12 inches (30.5 cm) tall.
 - While an outside chamber is required, it adds a significant safety factor in the event the inner chamber burns out, and increases the efficiency of the burning fuel by insulating the inner chamber somewhat. This chamber should be 4 inches (10.2 cm) larger in diameter than the burning chamber, and at least a few inches taller. An outside cylinder suited for the measurement described above would be about 16–18 inches (40.6–45.7 cm) tall, and have a diameter of 16 inches (40.6 cm).
- 4 Attach your outer cylinder to a metal base to help support it.** It can be welded or screwed down. If you build your base larger than the cylinder, it will be more stable and safer to operate.
- 5 Fit firebrick into the bottom of the outer cylinder, making them as tight as possible.** These will be the material the burning fuel will rest on, and firebrick have a very high temperature resistance, and will help keep the heat inside the burning chamber as well.
- 6 Set the inner cylinder inside the outer cylinder with an equal space around it.** You can fill this space with flamestop mortar or dry sand to stabilize it, or simply wedge it with metal pieces to keep the cylinder centered.
- 7 Drill or cut a 2 1/4 inch (5.7 cm) hole through the outer and inner cylinders just above the top of the firebrick bottom, at an angle off center so the air will swirl around the crucible feeding the burning fuel with oxygen most effectively.**
- 8 Cut a section of 2 inch (5.1 cm) metal pipe (EMT conduit works well) two or more feet long to act as the air feed to the burning chamber and attach it to the outer cylinder with sheet metal screws, or by welding it.**

- 9 Cut another piece of sheet metal large enough to cover the top of the furnace.** Cut a 6X6 inch hole in the center to allow air flow and so you can add metal to the crucible. You may find it handy to hinge this piece to the outer cylinder or to add a handle to make removing it during use easier.
- 10 Fabricate your crucible (melting pot).** An expended refrigerant canister can be used in a furnace of the dimensions described above, or an old stainless steel boiler might be used. You will need to attach a steel handle extending above the burning chamber so you can pull the crucible out to pour your molten metal.
- 11 Attach your air blower to the 2 inch (5.1 cm) pipe.** People have used old hair dryers duct taped to the tube, or a low velocity leaf blower, but if you don't have these available, anything which blows air in sufficient volume that can be adapted to your air tube will work. Keep in mind that too much air will over-burn your fuel, wasting it, and too little will not provide enough air to burn your fuel efficiently.
- 12 Set a half fire brick or build a support for your crucible so that it will remain stationary during use.** Set your crucible in place on this support after placing a layer of charcoal in the bottom of the burning chamber and soaking it with charcoal lighter.
- 13 Fill the space between the burning chamber and the crucible with charcoal to within an inch or so of the top of the crucible.** Add your metal scrap you plan on melting, and light the charcoal.
- 14 Turn the blower on when the charcoal is ignited sufficiently to sustain fire.** This should only take a few minutes, as the charcoal will begin to burn quickly when the air is turned on. Lay your lid on the furnace to trap as much heat inside as possible.
- 15 Tend the furnace until your metal is melted, removing ash and trash that accumulates as it melts, then remove the crucible to pour your melted metal into ingot molds or other castings.**

Community Q&A

What is the difference between coal and charcoal?

 Coal is extracted from the earth. Charcoal is made from burnt wood.

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What would be a good crucible?

 A clay crucible, which needs to be fired, or a graphite crucible, which can be bought online.

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What is suitable for measuring the temperature of a metal melting furnace?

 You will need a Type K Thermocouple and a digital temperature meter. I purchased one on Amazon that goes up to 2300 degrees F.

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If 660 degrees is aluminum's melting point, what should the temperature of the furnace be?

 In short, the temperature of the furnace will be irrelevant, as the fuel will be burning at a constant temperature. (For example, charcoal will burn around 1,260 °C, thus heating up the furnace to around that temperature.)

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Tips

- Alternate construction materials could include a stainless steel beer keg for the burning chamber, or even building with steel plate formed and welded if you have the resources.
- Prepare all casting work before firing your furnace, as tending the furnace demands your full attention.
- Fill as much charcoal as possible into the furnace to be sure your fuel will last long enough to complete the project. Re-stoking the burner is dangerous and difficult while it is burning.

- Galvanized metal vents toxic fumes when heated to high temperatures, so do not breath exhausting fumes while burning.
- Cast aluminum melts more cleanly and at lower temperatures than soft drink cans or other items made with more pure aluminum.

Warnings

- Do not allow water to drop into the crucible with molten metal; it will react explosively.
- This project involves extremely high temperatures; use appropriate safety equipment such as sturdy boots, long pants, a leather apron, and welding gloves, as well as eye and face protection.
- Have a fire extinguisher handy during use.

Things You'll Need

- Sheet metal or steel as described and required for you design parameters.
- Fire brick
- Metal tubing
- Hair dryer or other air source/supply.
- Metal for casting
- Charcoal and lighter
- Tongs and a dipper
- Safety equipment, described above

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