**ART 35** **Handout #8: WELDING BRONZE** Name_____

**Welding**: fusion of separate pieces of metal into one. (**Note:** Bronze rod is not magnetic and will not spark. **All valves** are 'righty-tighty' (clockwise) to close, 'lefty-loosey' to open**. Fuel line** threads are reverse to prevent incorrect connections. **Regulators** open as they turn clockwise, and vice-versa.)

## Bronze Welding with Oxygen and Acetylene (Also known as 'Gas' welding)

**SAFETY: Use #3 goggles (or face shield) for gas welding bronze (use #5 to weld steel). Provide adequate ventilation. Wear good gloves, long sleeves, long pants and close-toed shoes.**

1. **Prepare**: Clean and bevel the metal to be welded. Level and secure the piece(s) with bricks, etc.
2. Turn on ventilation switch at wall. Check that the valves of the torch body are snugly closed.
3. Select the appropriate torch tip, usually #**1** or #**2**. (Ranges: #000, #00, #0, #1, #2, #3, #4, #5)
4. Check that wing-nuts on regulators are closed (*counter-clockwise & loose... but not falling out*).
5. Open the main valve of the Acetylene about one-half turn (so that it can be quickly closed).
6. Open the main valve of the Oxygen until it is fully open (this will seal the valve from leaking).
7. Open regulators to adjust gas pressure: about **5** psi for Acetylene, about **10** psi for Oxygen.
8. **Light the torch:** Opening the Acetylene at torch body about 1/4 turn. Ignite with striker. Point toward ventilation. Adjust Acetylene until the flame 'splay' is about one inch from tip. Adjust Oxygen at torch to achieve a 'neutral' flame (when the two small cones come together).
9. Heat area to be welded by circling torch, keeping blue cone *just* above the surface. Pull torch away *frequently* to check that heat is an even orange. Heat welding rod and dip into flux. Continue to heat evenly until a 'shiny puddle' appears at weld site. Introduce rod into puddle and keep circling.
10. **To shut down**: Reverse operation. At torch body: turn off Oxygen first, then Acetylene. Next, close the main valves on the Acetylene and Oxygen. Close both regulator wing-nuts, and bleed lines by opening both valves at the torch body, then closing them. Leave wing-nuts loose. Use care when moving hot pieces! Hang hoses and clean up. Move piece to a safe area. Sandblast flux.

## Bronze Welding with TIG (Tungsten Inert Gas, also known as 'Heliarc' or 'Electrode' welding)

**SAFETY is identical to gas welding with two vital exceptions: you must wear a #10 helmet, and never expose your eyes or your skin or those near you to the light emitted from the torch.**

1. Prepare work the same way as for gas, except metal must be grounded, and no flux is needed.
2. Turn on the TIG: flip the switch from "**O**" up to "**I**." Fully open the 'noble' gas tank (Argon).
3. Check that Electrode Polarity (large black handle next to power switch) is at DC- (horizontal).
4. Four green lights: *Process*> TIG, *Amperage*> RMT, *Output*> RMT and *Start Mode*> START.
5. Set the *Amperage Adjust* as needed, usually at about 180 for most bronze pieces at 3/16" thick.
6. The tungsten electrode should be clean, pointed, and protrude about 1/8" past ceramic nozzle.
7. **To weld:** Position tungsten electrode at a 70° angle, about 1/8" above level work, with your welding arm supported. Close helmet and press the foot-pedal. An arc will form spanning from the electrode in the torch to the work. Do not touch work with electrode. As a shiny puddle forms, introduce rod. Continue as needed, gently circling torch and gauging heat by pressing more or less on the foot pedal. To stop, release pedal and pause momentarily with torch over new weld. TIG tip is very hot! Repeat as necessary, turning work to keep it level.
8. **To shut down**, turn off the TIG welder and fully close the tank of gas. TIG is more efficient than gas, but work still gets very hot. Move work to a safe area, secure the torch and clean up.