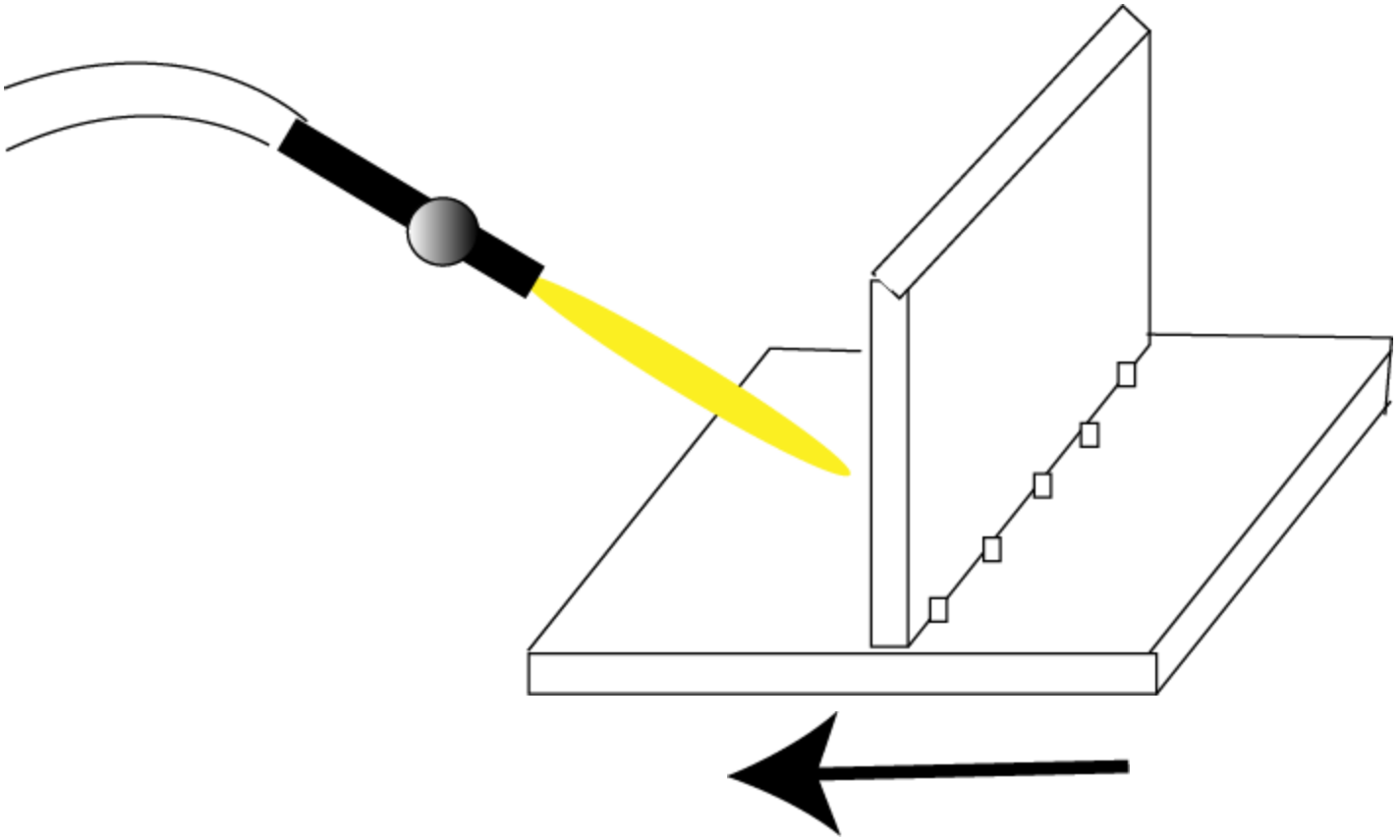
Soldering A to Z
Part Two

- Controlling the Solder
- The Solder Ball Method
- Pick Soldering
- Surfaces to Solder On
- Heat Source
- About Torches and Fuels
- Flame Types
- Exercise 4, T-Joint

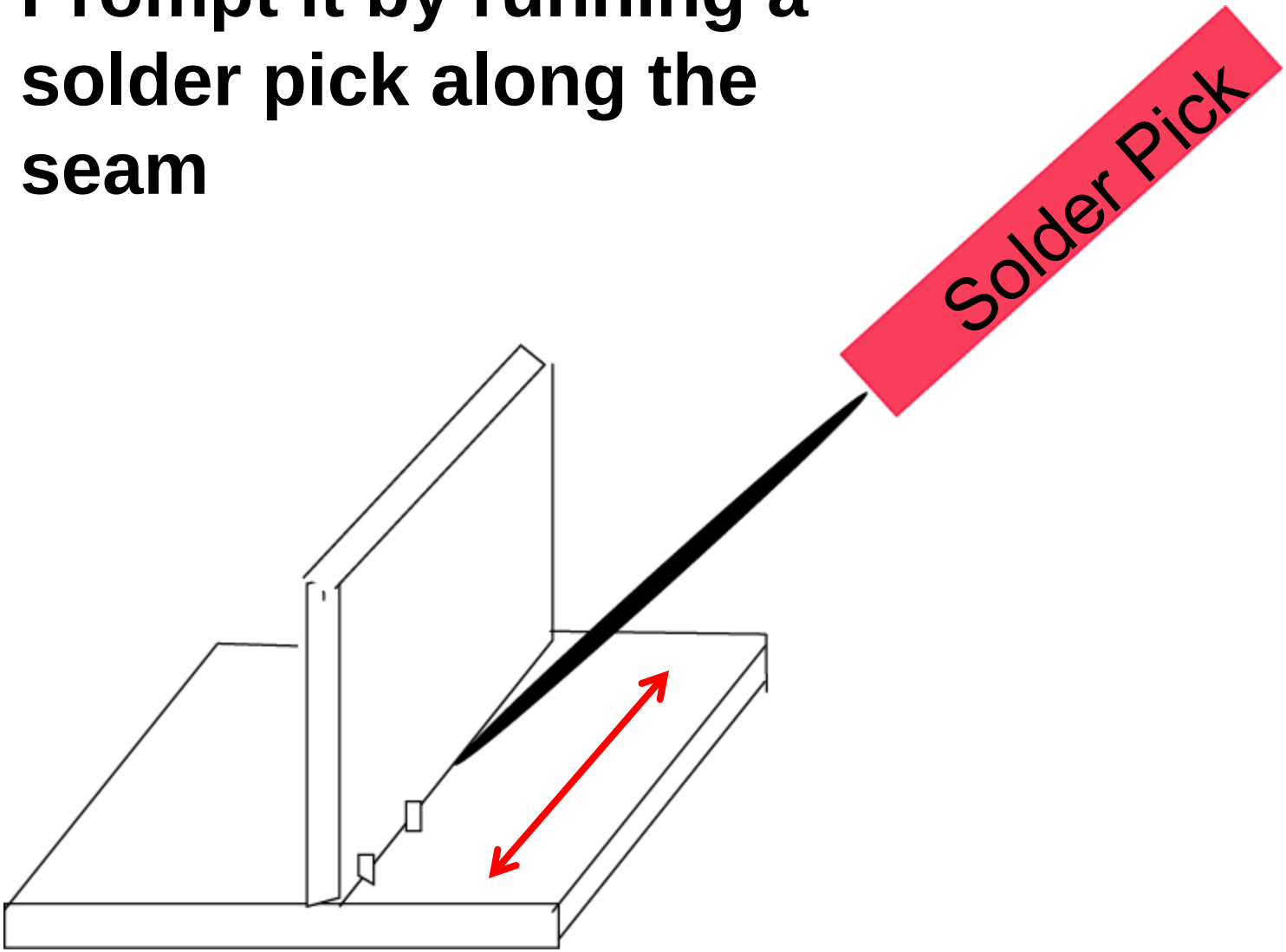
Controlling the Solder

Control the direction solder moves by leading it with the torch

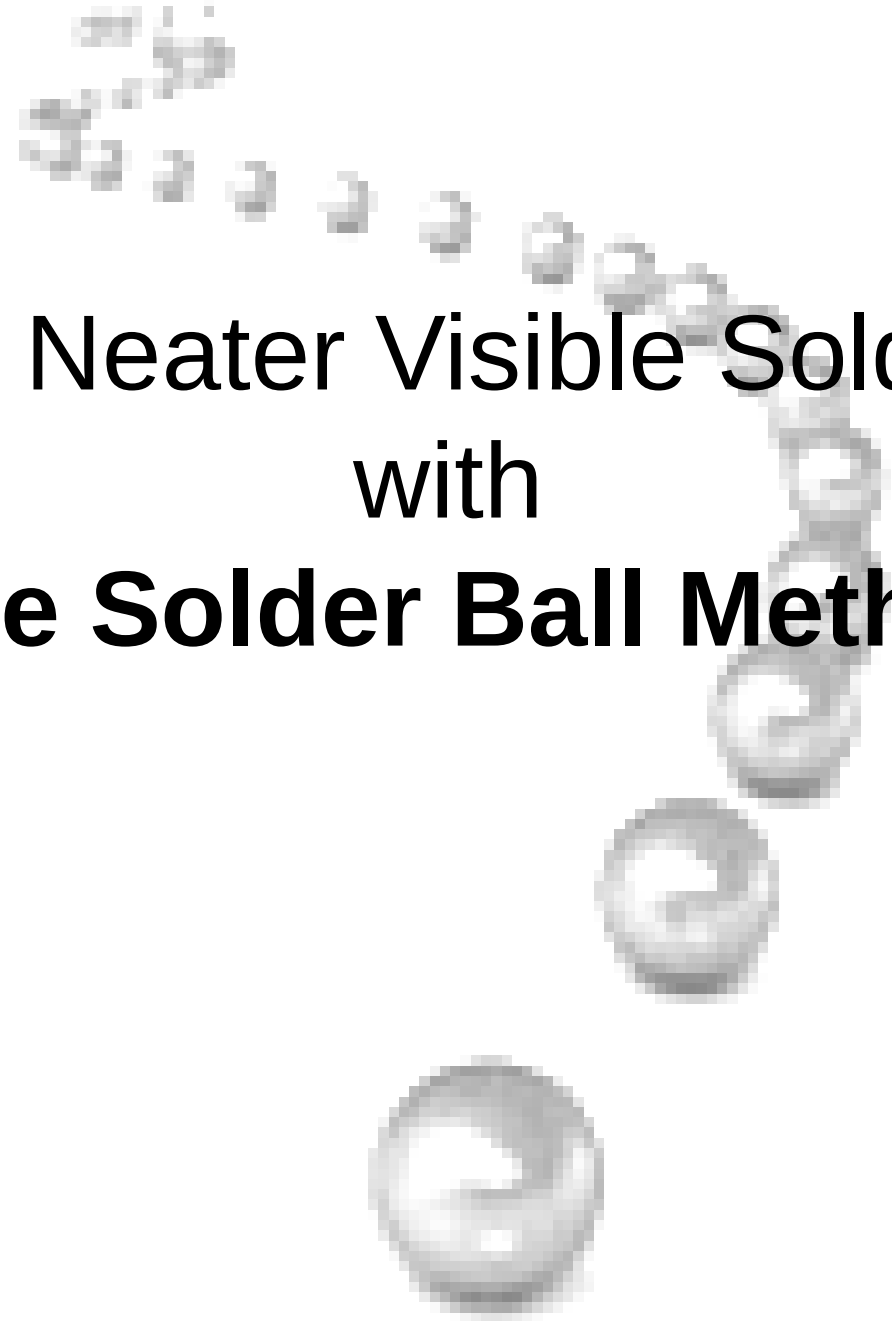


Remember, solder flows toward the hottest part, usually the heat source itself.

Prompt it by running a solder pick along the seam



Drag solder pick along contact area to coax solder along seam.



Making a Neater Visible Solder Seam with **The Solder Ball Method**

1.) Use your flux brush (with flux on it) to lay out rows of small, fluxed solder pallions on a compressed charcoal block

Don’t forget the flux!!

Note: Compressed charcoal blocks cost more but hold up much better and longer than non-compressed charcoal blocks

2.) Using a small torch tip, melt each solder pallion into a ball

Take the flame away as soon as the solder melts and forms a ball

When you're ready to apply the solder ball to the parts being joined, warm the pick and the solder ball lightly and scoop it up with your solder pick, then place it on the joint to be soldered.

- The warming of the solder ball is important – it makes the flux sticky so that the solder ball can be picked up and placed onto the joint being soldered.
- Keep playing the soft flame over the solder while you are picking it up or placing it – if you don't keep the flux warm and sticky, it will cool and harden and the solder won't move
- Be patient – it is a slow process and takes practice !!!

Pick Soldering with Solder Balls

Use solder balls instead of flat pallions

This works well for soldering jump rings closed and tack soldering operations.

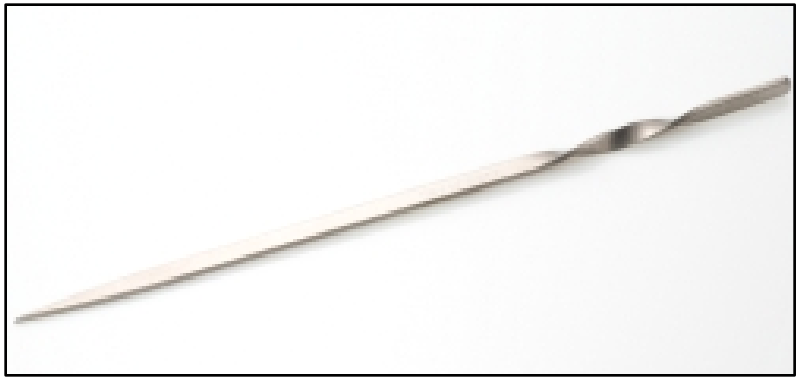
Using a brushy flame, heat the piece to be soldered all over. When the flux becomes clear and/or bluish-green, bring the flame closer to the joint and touch the solder pick with the solder on the joint. If the work is hot enough, the solder should flow into the joint within seconds.

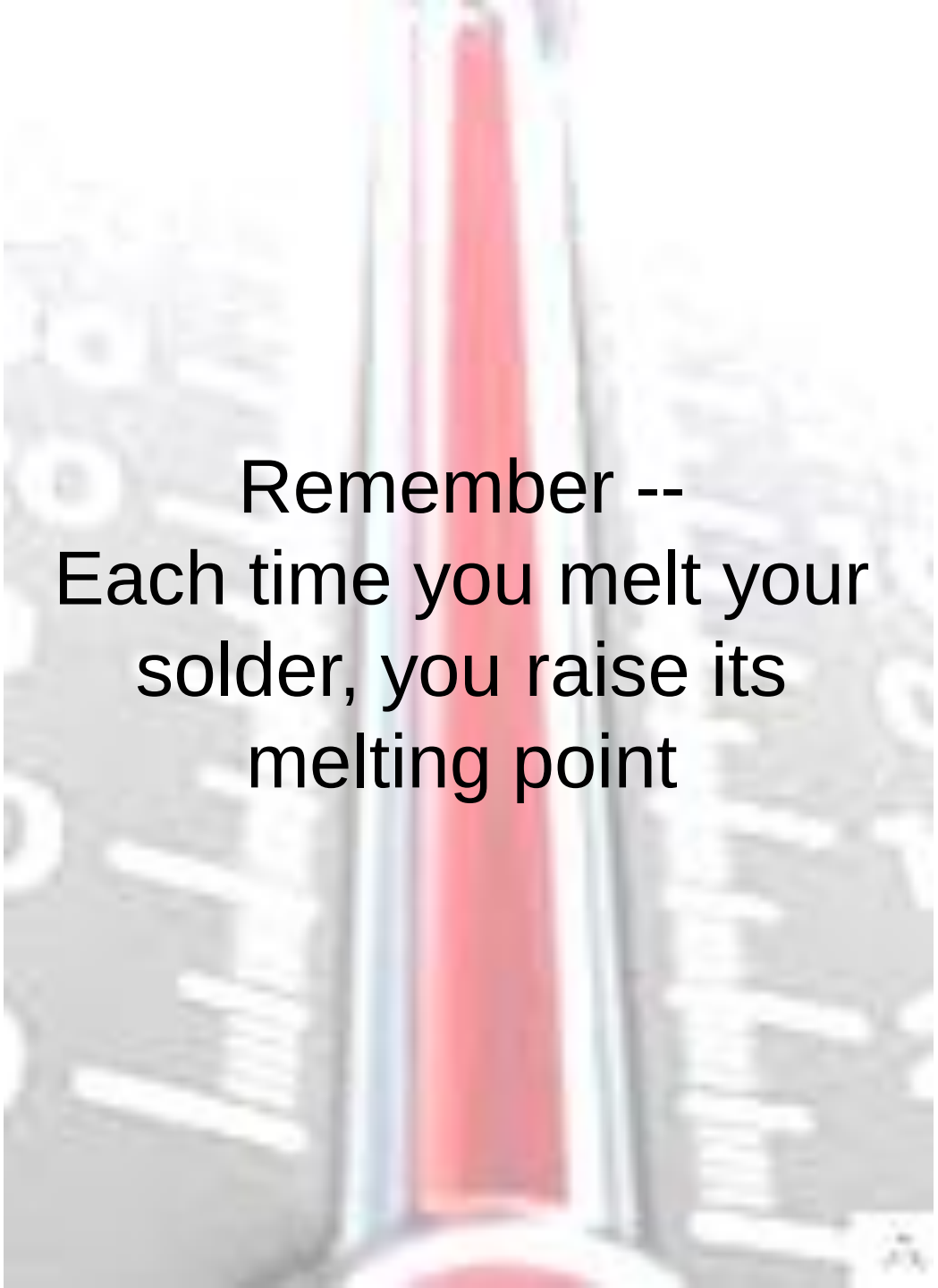
The best solder pick is made of titanium

It doesn't bend too easily

Solder will not stick to it

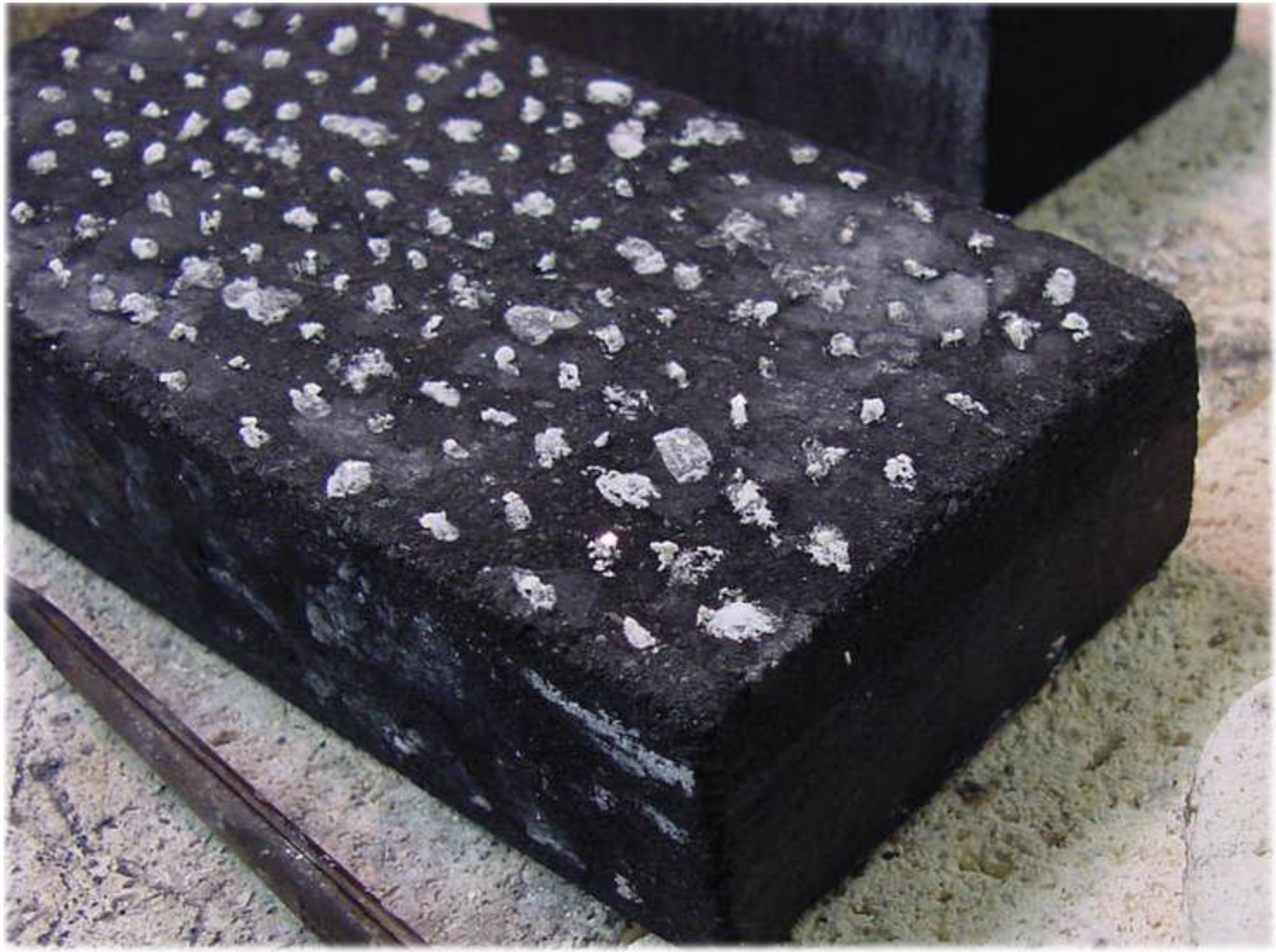
Titanium has low conductivity and therefore is not too great a heat sink





Remember --
Each time you melt your solder, you raise its melting point

make extra solder spheres for future use and store them in a labeled, air-tight container!



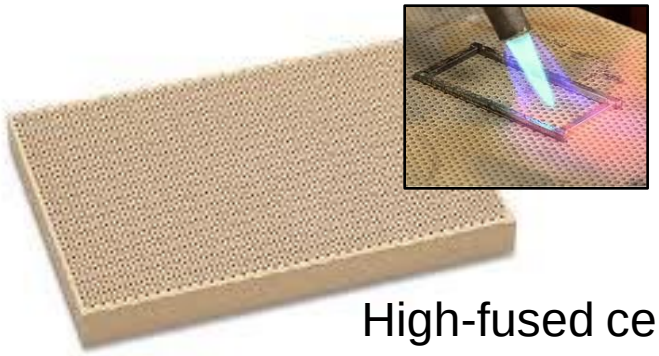
Surfaces to Solder On

Tripod and iron screen

Annealing pan with pumice stones

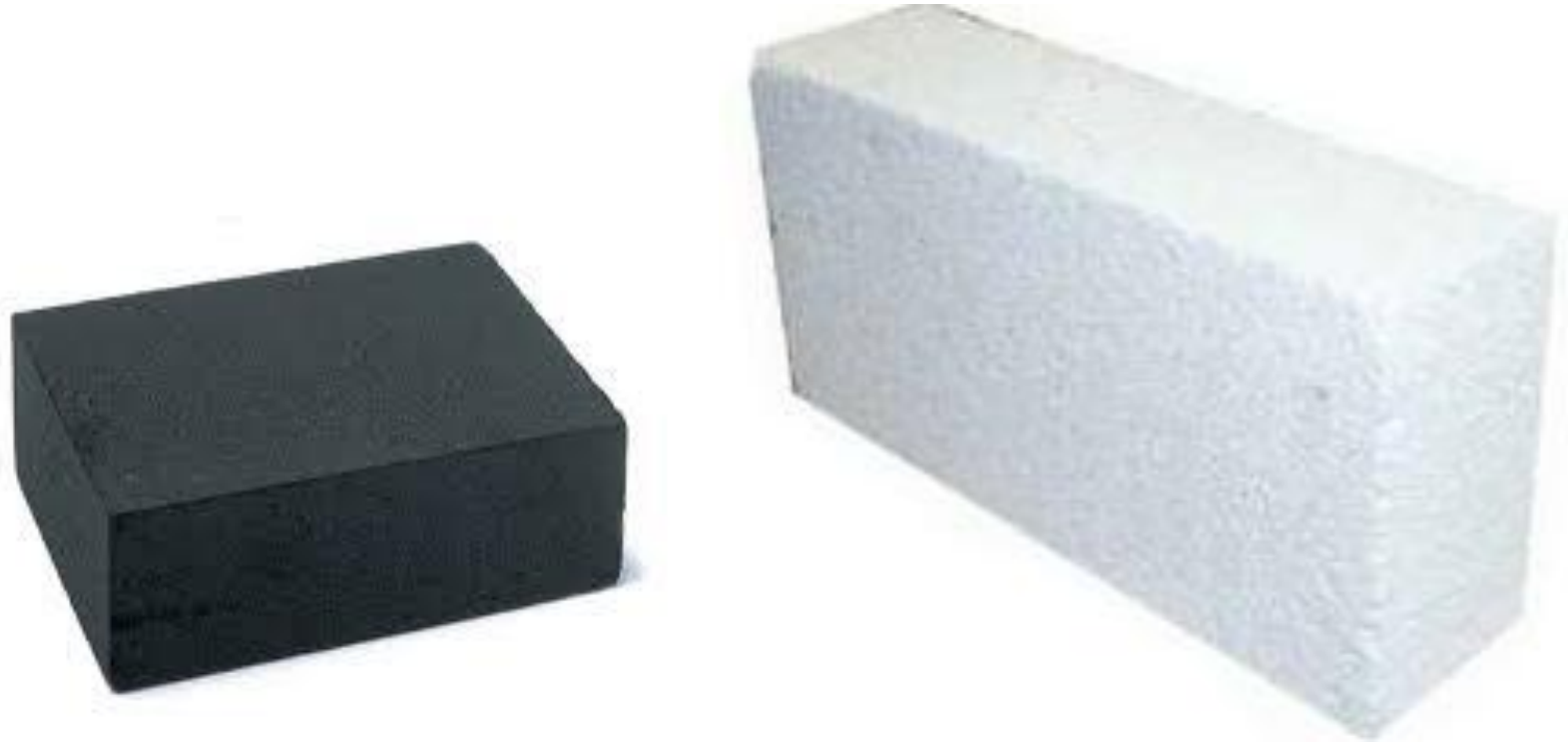
carbon ring mandrel reflects heat and helps to maintain a clean reduction atmosphere

Third Arm Tweezers



High-fused ceramic block -- the small holes throughout this lightweight block help quickly dissipate heat from the workpiece. Withstands temperatures up to 2000°F

Two of the most popular surfaces to solder on are charcoal block and soft firebrick



Soft fire brick is a refractory material.

It maintains its integrity at high temps.

Soft Firebrick

Pros:

- It has low conductivity and is therefore highly reflective; aids in even heating
- It can be cut, rasped, filed, scraped, gouged into or sanded into any shape desired
- Can easily be pinned into
- Surface can be renewed easily by sanding or by rubbing it vigorously on a coarse, flat concrete surface

Cons:

- Cutting, shaping and grinding it creates dust that is not good to breathe

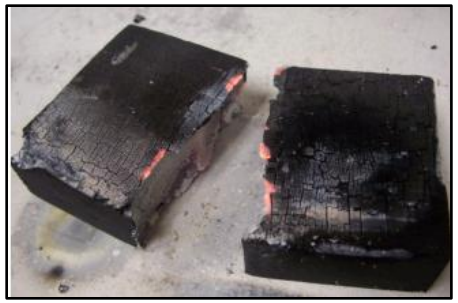
Firebrick is a ceramic product and contains silica

Do not breath the dust produced by breaking, sawing, filing, rasping or sanding the brick

ALWAYS MAKE ALTERATIONS TO YOUR FIREBRICK OUTDOORS AND AWAY FROM OTHERS

AND ALWAYS WEAR A DUST MASK!

Charcoal blocks



Note:

- Regular charcoal blocks burn and crack easily – bind them with wire to make them hold together longer

- Buy *compressed* charcoal for longer lasting blocks – it is not necessary to bind this type of charcoal

Charcoal Pros and Cons

Pros:

- Creates a reducing atmosphere around your work; your work will stay cleaner and have less firescale
- Reflect Heat back onto your pieces aiding in even heating
- Canbe cut, shaped, drilled or carved into

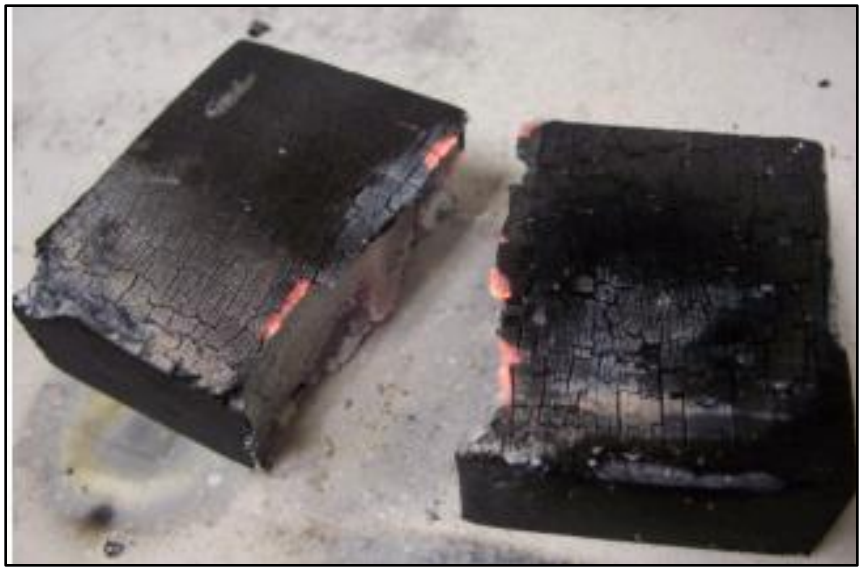
Cons:

- Charcoal is messy
- Blocks can break easily if you are not careful
- They are expensive
- Soft charcoal blocks burn up quickly with repeated use

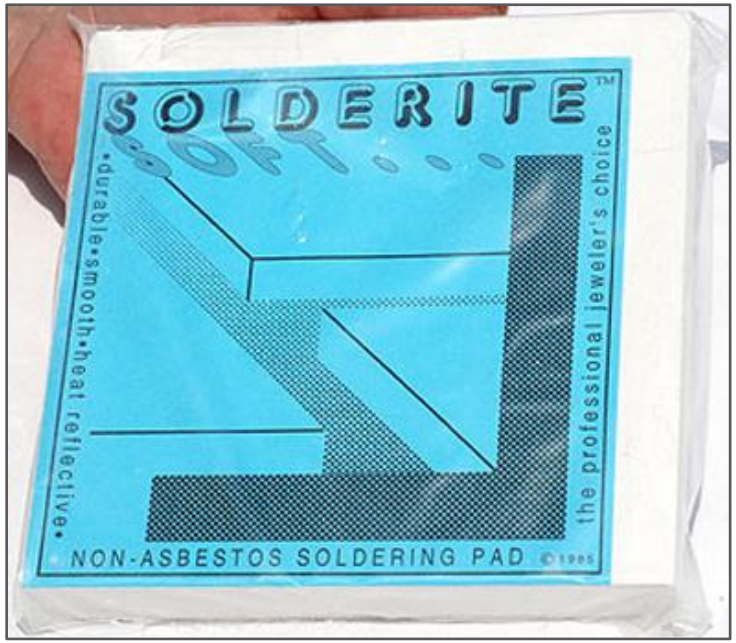
•**Tip:**

Keep a spray bottle with water near your soldering area

Spritz your charcoal block after using it. This will cool it down quickly so it doesn’t keep smoldering and burning after the soldering operation is finished



Another type of soldering surface is the **Solderite pad**. It is also heat reflective, and comes in hard and soft versions. The soft pads are soft enough to pin into. You can modify Solderite pads with burs and drill bits.



Tripods with screens

Pros: Allows you to heat from below

Cons: Loss of heat because there is nothing to reflect the heat back onto the work

A soldering nest is a loosely wound bundle of thin iron binding wire

Several sizes of nests are useful

Nests get the work being heated off the firebrick, allowing heat reflected from the brick to evenly heat the back side of the work

Note: Other names for this are: soldering mop, soldering boss, soldering wig

Combination soldering mop and tripod!

Revolving Annealing pans

Pros: The pumice helps support oddly-shaped items and it is heat-reflective

The revolving pan allows you to see the work from all sides and heat the work more evenly

Pan can work well in combination with a soldering mop

Cons: Difficult to secure or pin work down

Things to Remember About The Heat Source:

- Solder flows toward the hottest area – which is usually the point of contact with the torch
- Heat the entire piece first, then zero in on the joint area
- T-pins, Third Hands, binding wire, etc., all act as “heat sinks” -- stealing heat away from the source

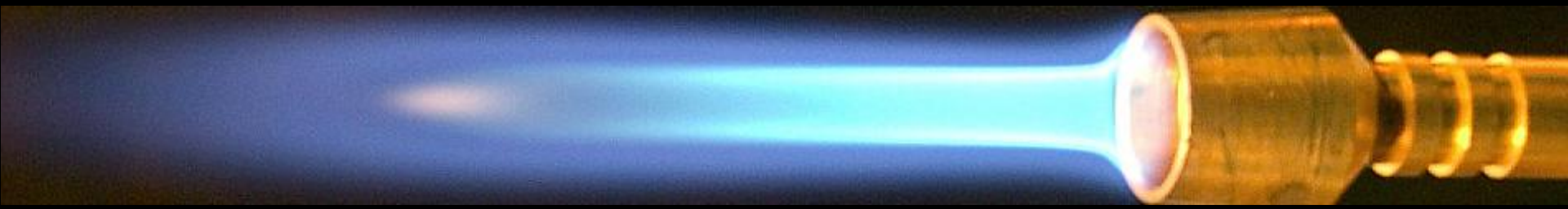
- Use only the amount of heat necessary to flow the solder adequately, no more.
- Don’t overheat your solder or your metal parts – this will cause the solder to alloy itself into the metal and will result in a pitted looking seam/joint
- Keep the torch moving at all times
- Don’t take the torch off the metal once you start heating

Pull the solder through the joint by positioning the flame on the side opposite the solder

Draw the solder along the seam with your solder pick if necessary

Be careful not to disturb or dislocate your parts

The Heat Source



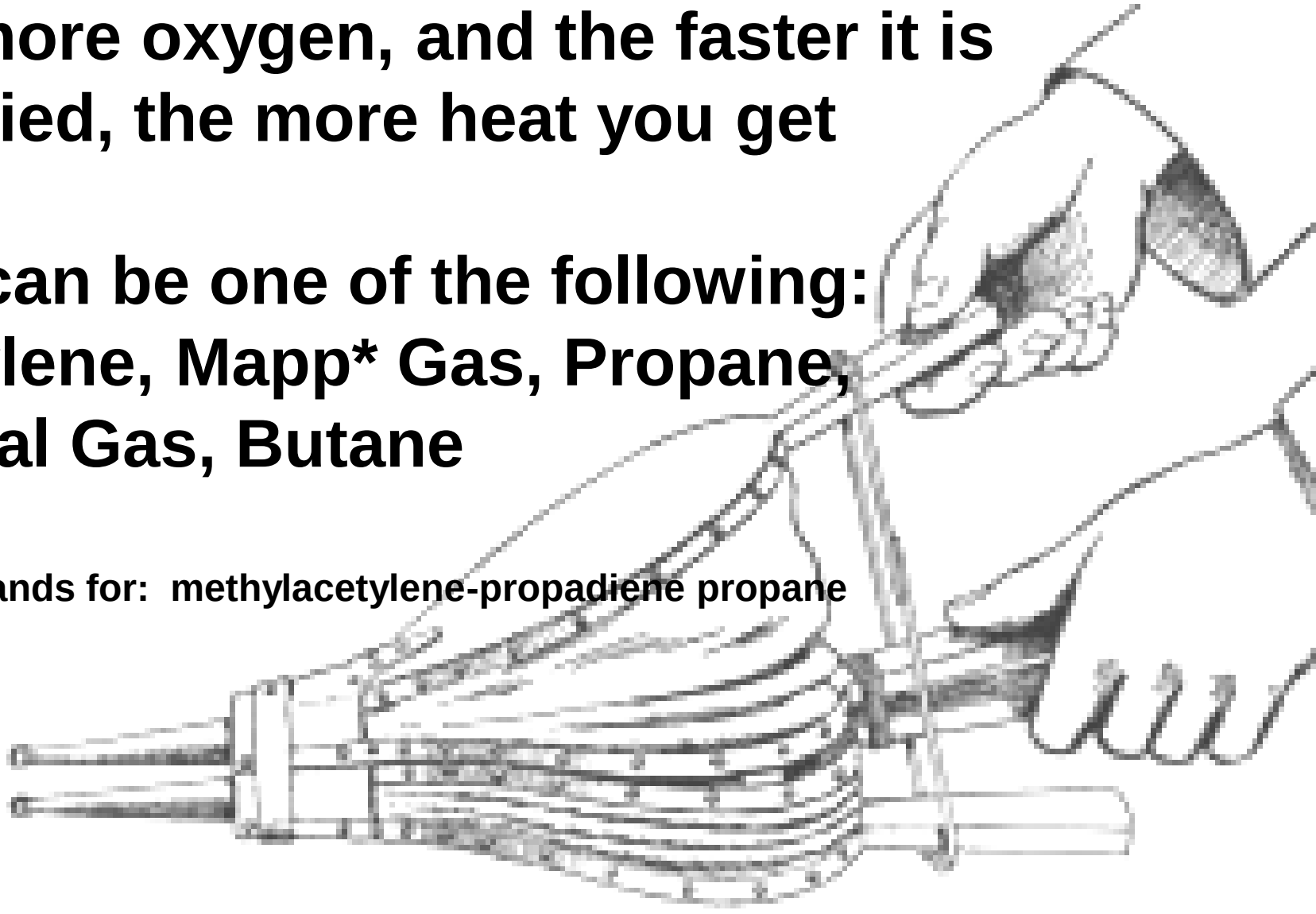
Oxidizer + Fuel = Combustion

(The most common oxidizer is oxygen)

The more oxygen, and the faster it is supplied, the more heat you get

Fuel can be one of the following: Acetylene, Mapp* Gas, Propane, Natural Gas, Butane

***MAPP stands for: methylacetylene-propadiene propane**



Oxy-Acetylene – Hottest!

Smith Mini torches are also available in a propane and oxygen version

Air torch (Presto-Lite or Smith) – acetylene and ambient air
Second Hottest!

Some Types of Torches and Fuels

National - natural gas, propane, or butane with oxygen or compressed air

Propane and oxygen
Cleaner!

Hoke – natural gas and oxygen
Also clean!

- Acetylene produces the highest flame temperature of all the fuel gases but it is dirty; Acetylene mixed with compressed oxygen is hotter than acetylene mixed with air
- MAPP gas produces a relatively hot flame – second hottest , and is a bit more stable than acetylene for storage
- Propane produces a lower flame temperature but is cleaner than acetylene; it is easily available, however it is more dangerous to store (should store outdoors)
- Natural gas is clean but has a low flame temperature; it is often conveniently plumbed in; natural gas mixed with compressed oxygen is hotter than natural gas mixed with compressed air
- Butane has the lowest flame temp but is the cleanest; it is not generally used in jewelry production

Fuel Gas	Max Flame Temp - F ˚
Acetylene	5720
MAPP	5301
Propane	5090
Natural Gas	5018
Butane	3578

Note: There is also such a thing as a Water Torch - it produces hydrogen and oxygen gas from distilled water! There is no pressurized gas storage, making it one of the safest systems →

Make sure you know what type of fuel your torch and hoses were designed for

Never mix and match your fuels and torches unless the equipment manufacturer lists alternative fuels that can be used

Never apply oil or grease to oxygen regulators, torch, tank fittings, hoses, valves or any other part of your equipment

When exposed to pure oxygen, oils and greases oxidize easily and can combust quickly

Always transport acetylene cylinders in an upright position

If you must lay them down, allow them to stand for several hours after up-righted and before use

It is never a good idea to transport fuel cylinders inside a passenger car

When transporting cylinders, always use the screw-on caps to protect protruding valves

Always use ventilation

Report gas smell if you suspect a leak

Avoid fires – keep flammable items out of the soldering area

Watch out for your soldering neighbor

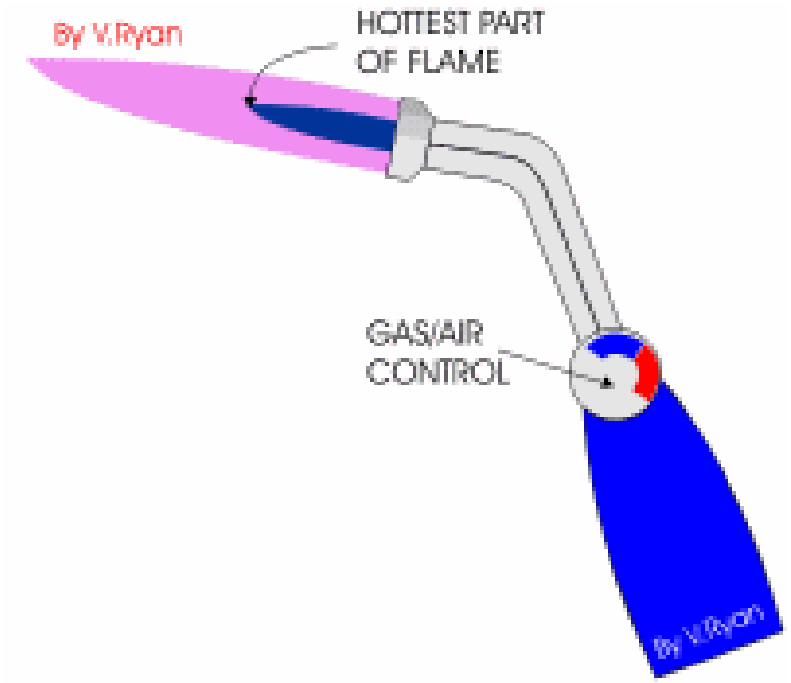



There are many different types of torches and each type has a unique set of tips that are not interchangeable with other torches

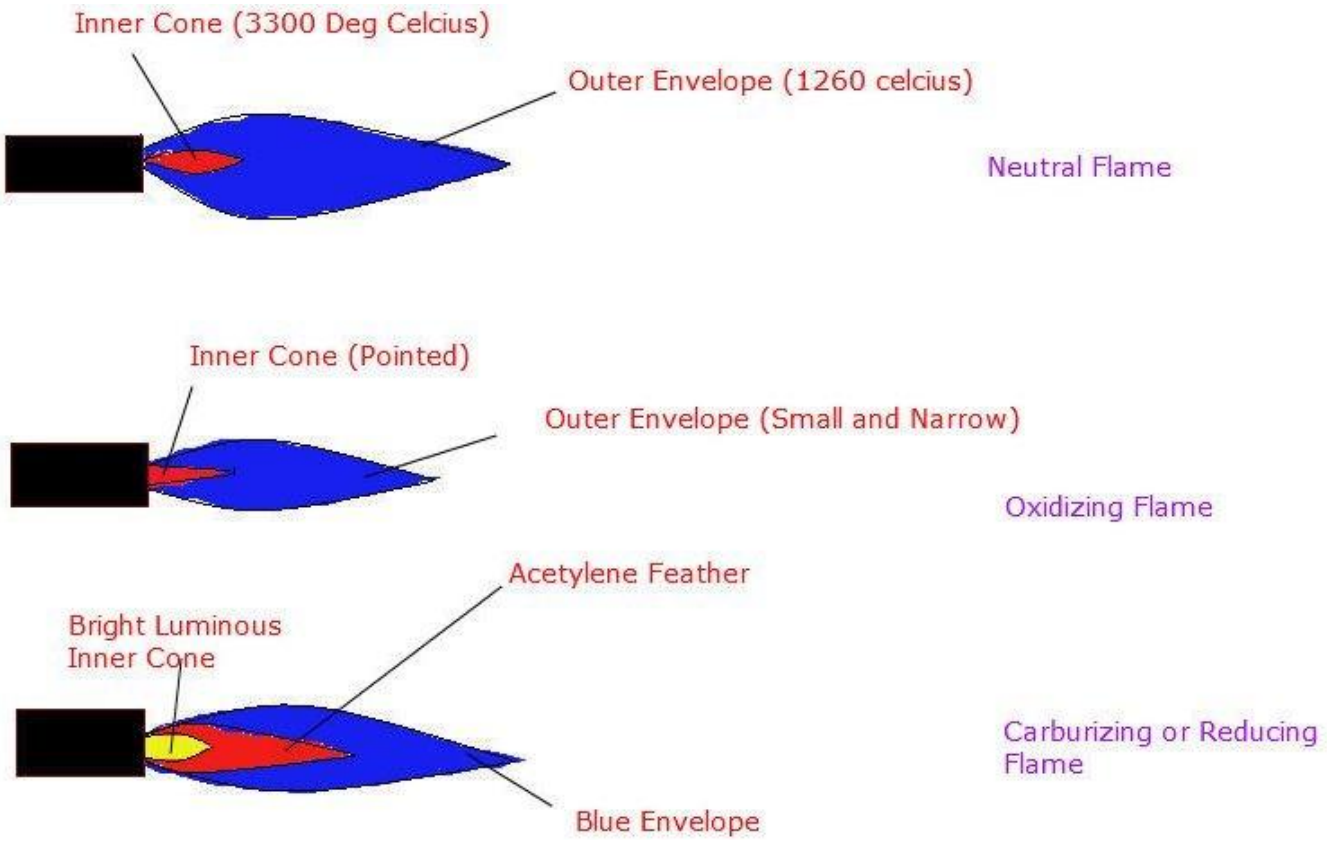





Anatomy of a Flame



The hottest part of the flame is at the tip of the inner cone



An **oxidizing flame** is a flame produced with an excessive amount of oxygen.

It is characterized by its well-defined and pointed inner cone, shorter outer flame, and hissing/roaring sound

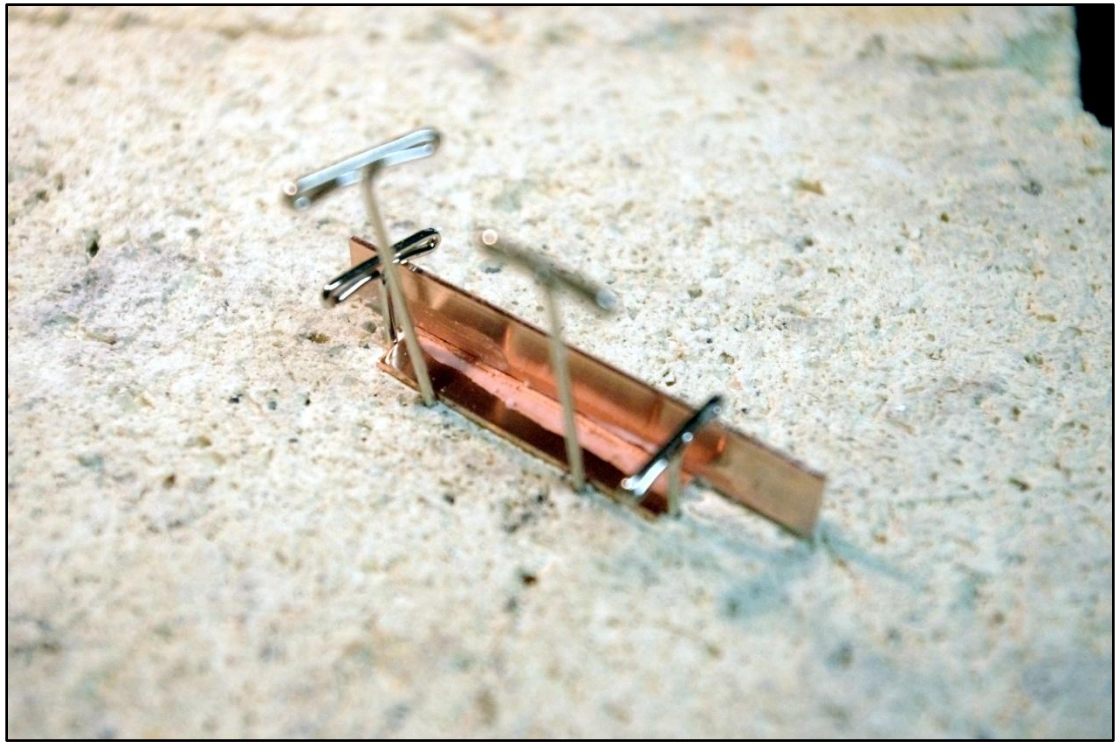
An oxidizing flame is not desirable for silver soldering

A **neutral flame** has just enough oxygen for burning, and neither oxidation nor reduction occurs. It is characterized by large and sharply defined inner cone.

A **reducing flame** (or carburizing flame) is low in oxygen. It has more yellow and is characterized by a feathery area at the tip of the inner cone, a large and longer bushy outer flame and a low roar.

A slightly reducing/neutral flame is desirable in silver soldering

Exercise 4: T Joint Exercise



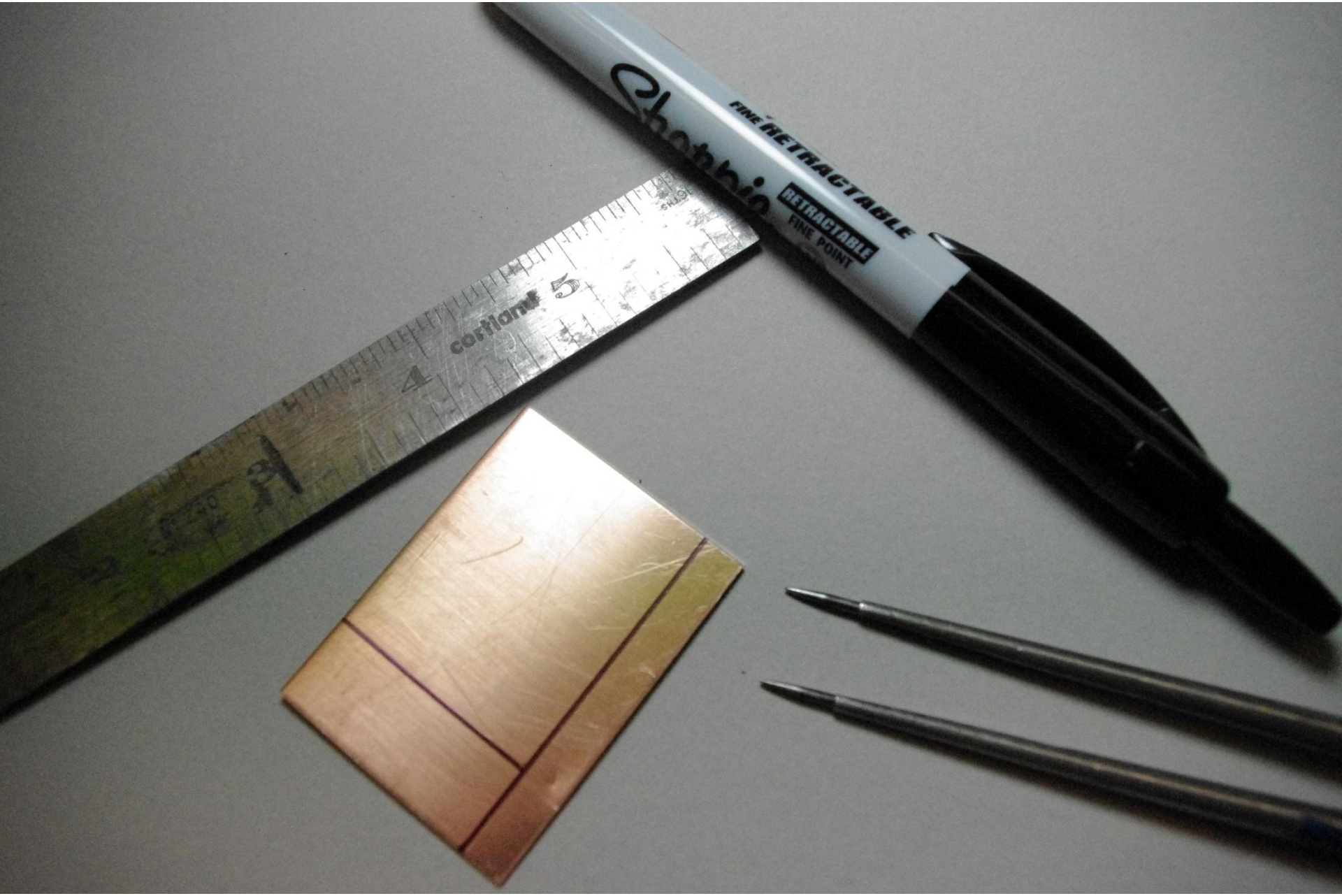
- Cut two strips off of your copper sheet, one longer and about ½” wide and the other shorter and about ¼” wide

- Draw a straight line down the center of the shorter strip

- Using “T” pins and a soft fire brick, pin your narrow, longer strip upright on the surface of the other strip

- Place solder balls at intervals along one side of the T-joint

- Use the solder ball method to solder your T-joint!


RETRACTABLE
FINE POINT
5
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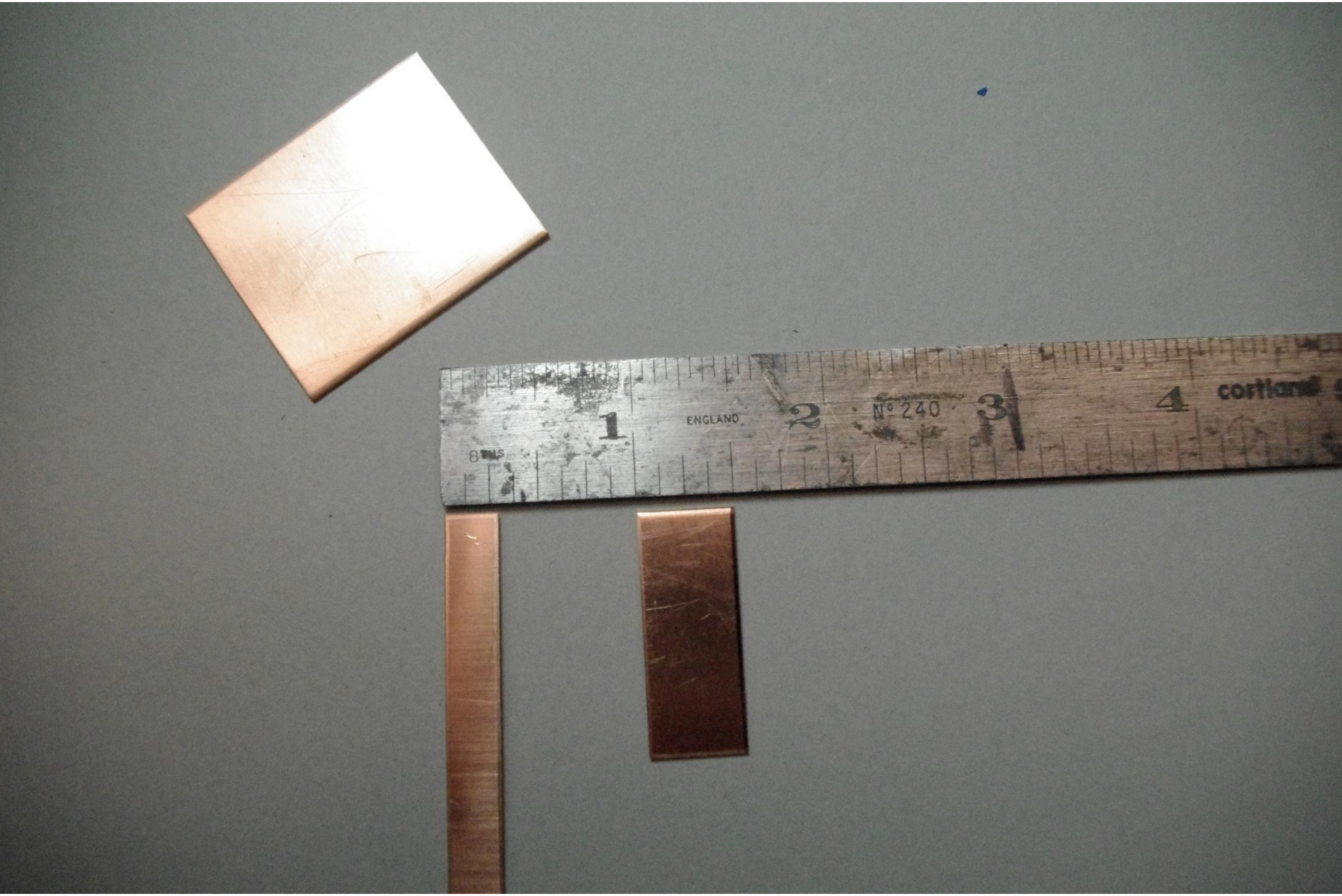
1
ENGLAND
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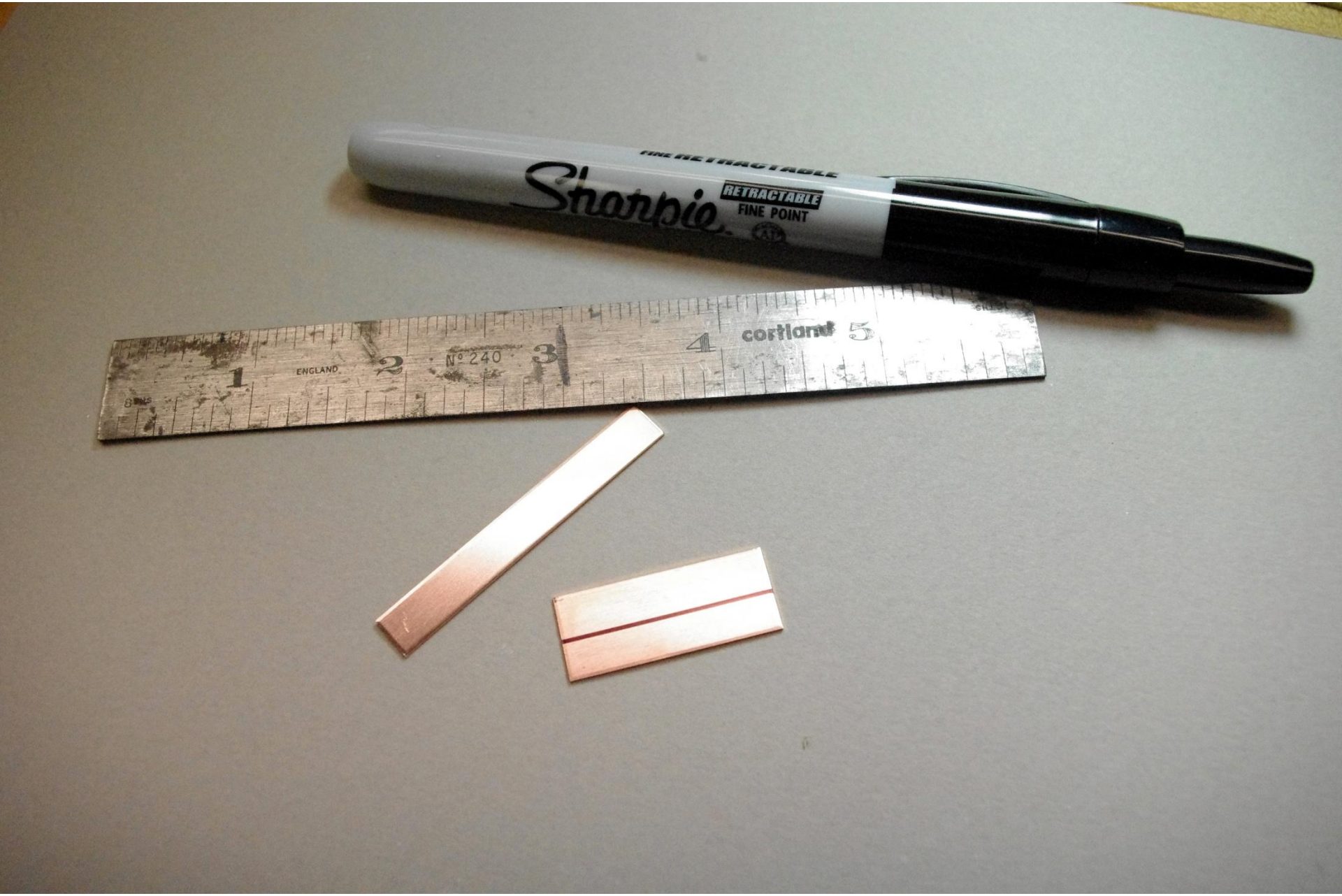
Sharpie
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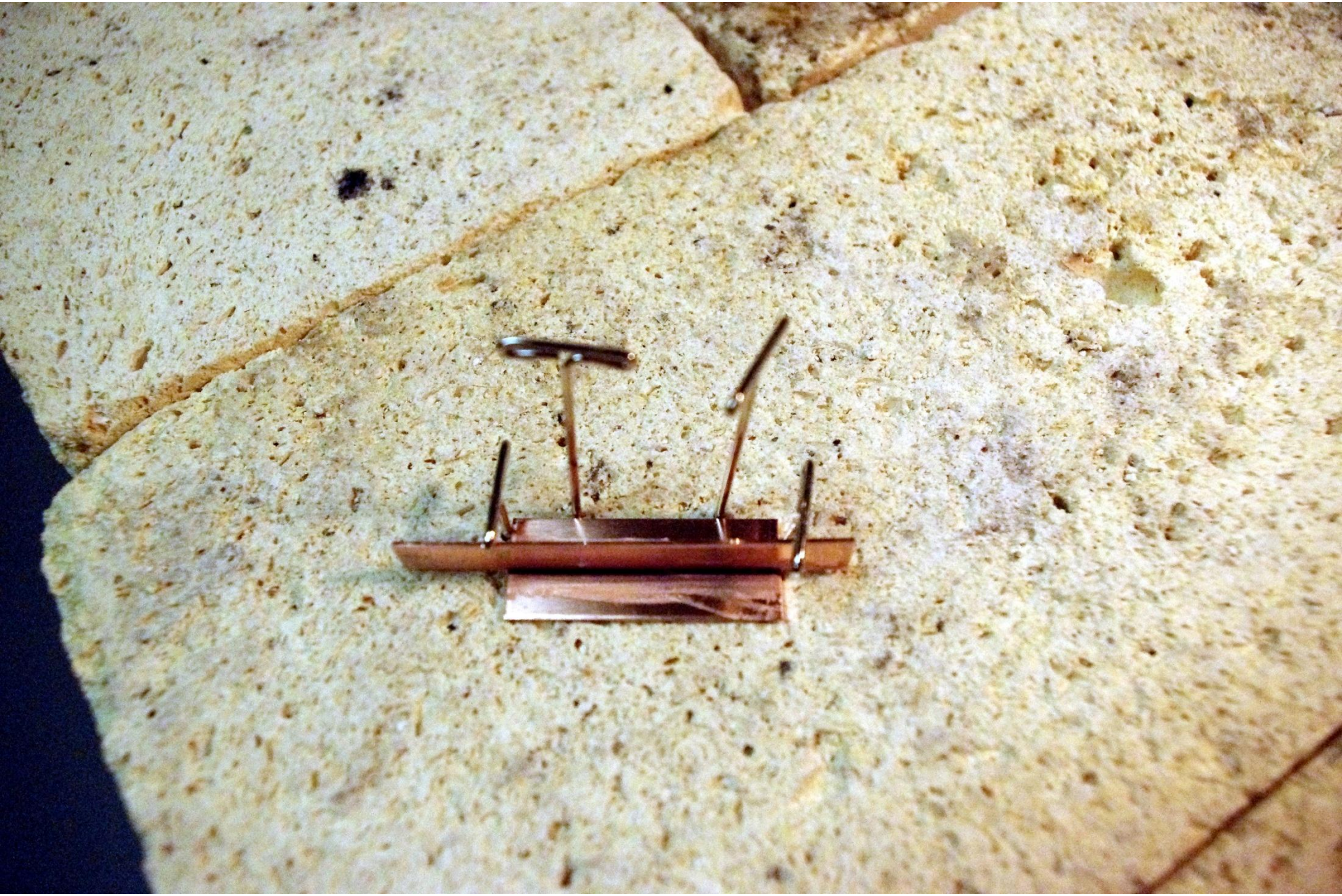

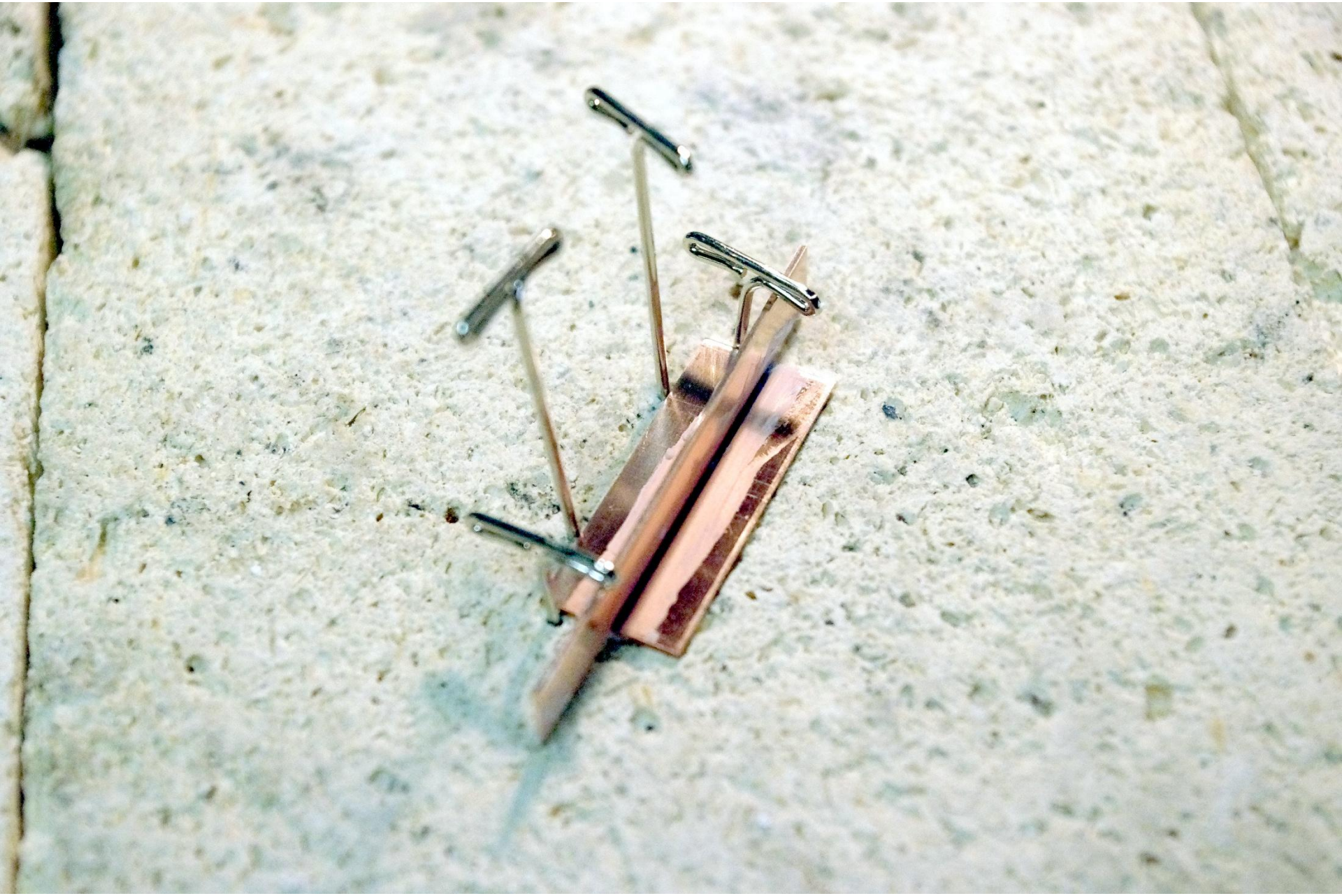

Challenge yourself further!

Cut three narrow strips instead of one, and soldering all three strips (in a T-joint orientation) to the base sheet metal in separate soldering operations.

Use hard solder for the first strip, medium solder for the second strip and easy solder for the third strip.

Use white out correction fluid to prevent the first and second solder joints from re-flowing.

End Part Two