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Lock Making and Picking - Woodford 2016

During this workshop you will learn how to make and pick a lock.



This workshop was developed at The Edge by Phil Gulberg and this is second delivery at woodford.

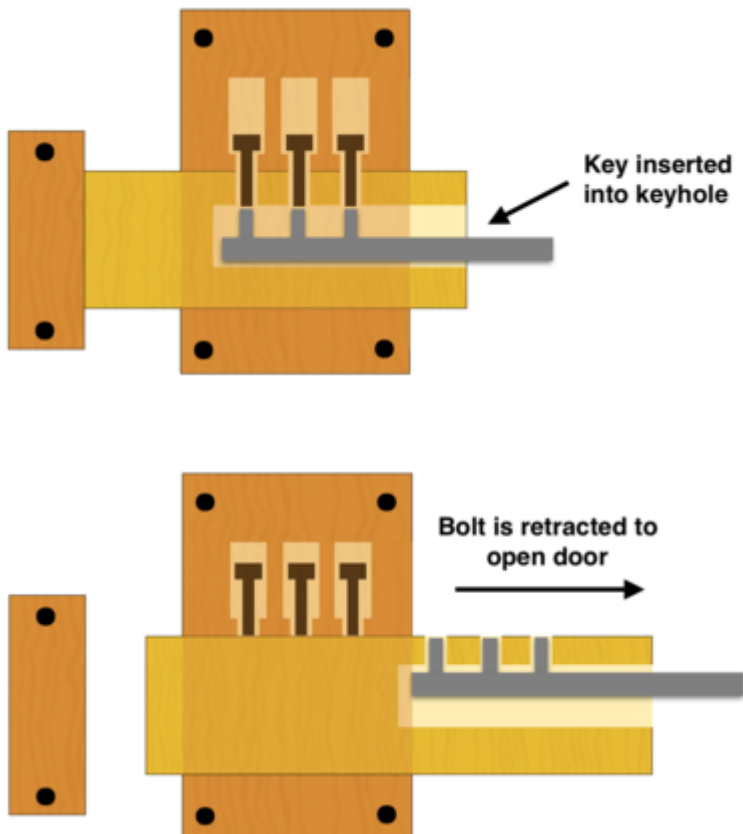
While at Woodford, you can follow along and download a PDF of this Workshop by connecting to our wifi network: [TheEdgeWorkshop](#)

Step Zero: The Pin Tumbler Lock and Your Kit

Basic principles of the pin tumbler lock may date as far back as 4000 BC in Egypt.

The lock consisted of a wooden post affixed to the door, and a horizontal bolt that slid into the post. The bolt had vertical openings into which a set of pins fitted.

These could be lifted, using a key, to a sufficient height to allow the bolt to move and unlock the door.



In 1848, Linus Yale, Sr. invented the modern pin-tumbler lock.

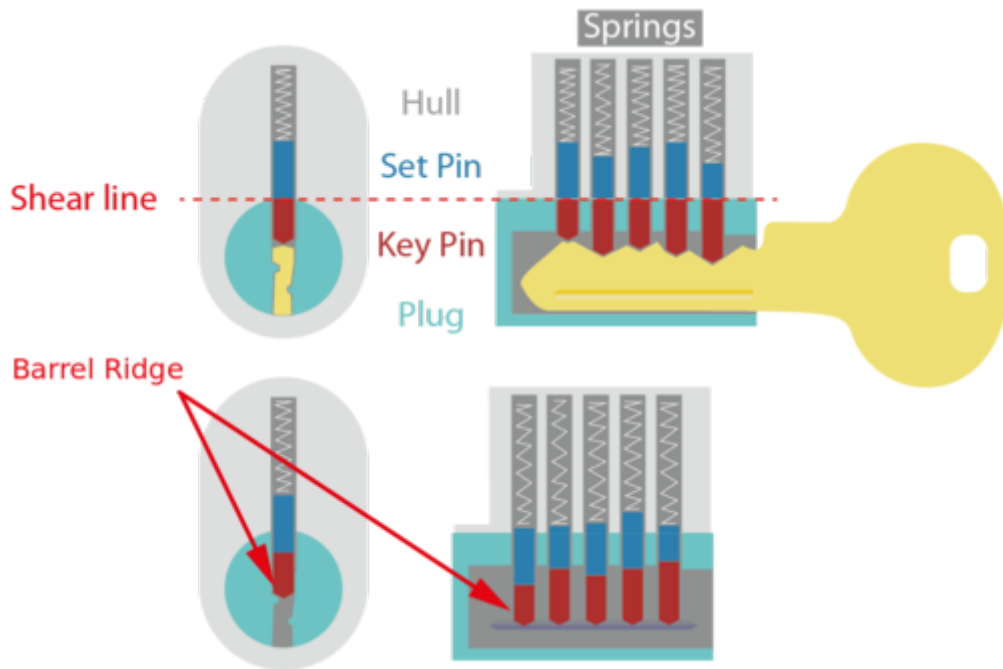
In 1861, Linus Yale, Jr. was inspired by the original designed by his father.

He invented and patented a smaller flat key with serrated edges as well as pins of varying lengths within the lock itself.

The same design of the pin-tumbler lock is in use today.

How a Modern Pin Tumbler lock Works

The **set pins** keep the lock shut. They rest on top of the **key pins** which are kept in place by the **barrel ridge**. The key lifts the **set pins** above the **shear line**, allowing the lock to turn.



Your Lock

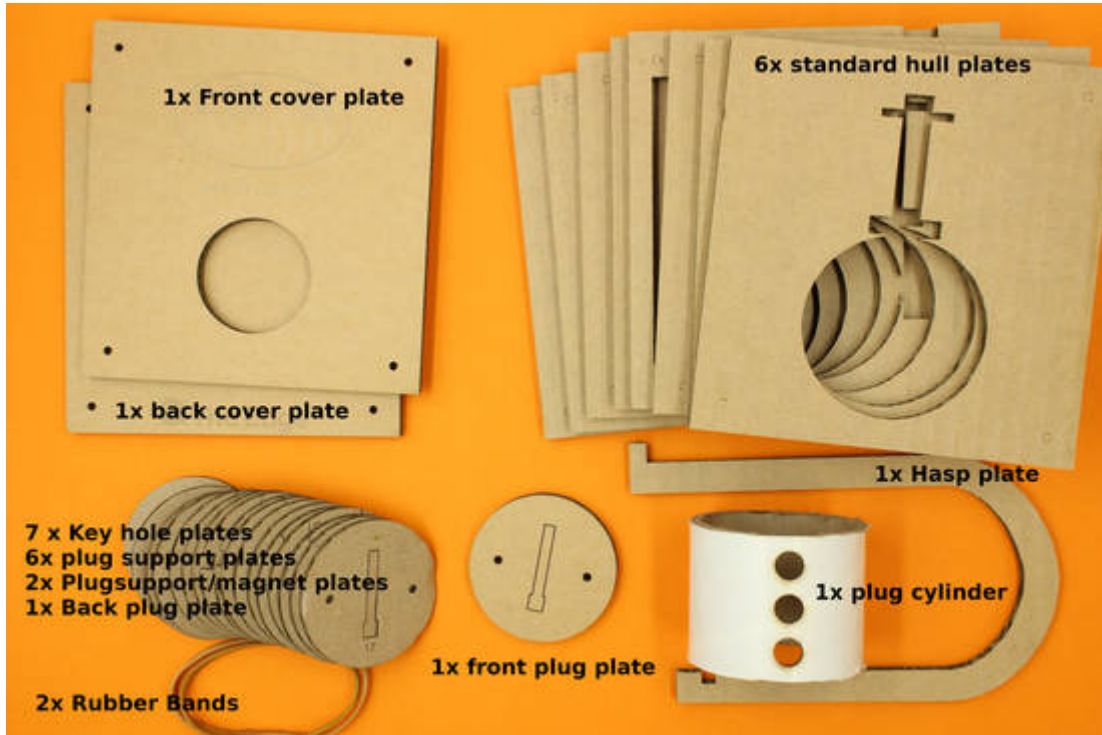
Your lock kit contains a pin tumbler lock set in a padlock. The padlock is held shut with magnets when locked.

The bulk of your kit is made from cardboard to keep costs as low as possible.

This means that we can't make a barrel ridge that will stand up to the test of picking. So we've modified the mechanism, with Orings on the **key pins** to keep them in place when locked.

Kit Parts

Please check you have all your cardboard parts.



And all your other parts.



Shared Tools

Some simple tools required during the workshop, these are shared.

1. Side cutters (for biting off skewers)
2. electrical tape
3. Scissors (for cutting tape)

Step One: The Plug

We'll start with putting our plug together. Before we start, make sure that the skewer holes in your cardboard segments are punched out, and note each plate has a number on the bottom front side.

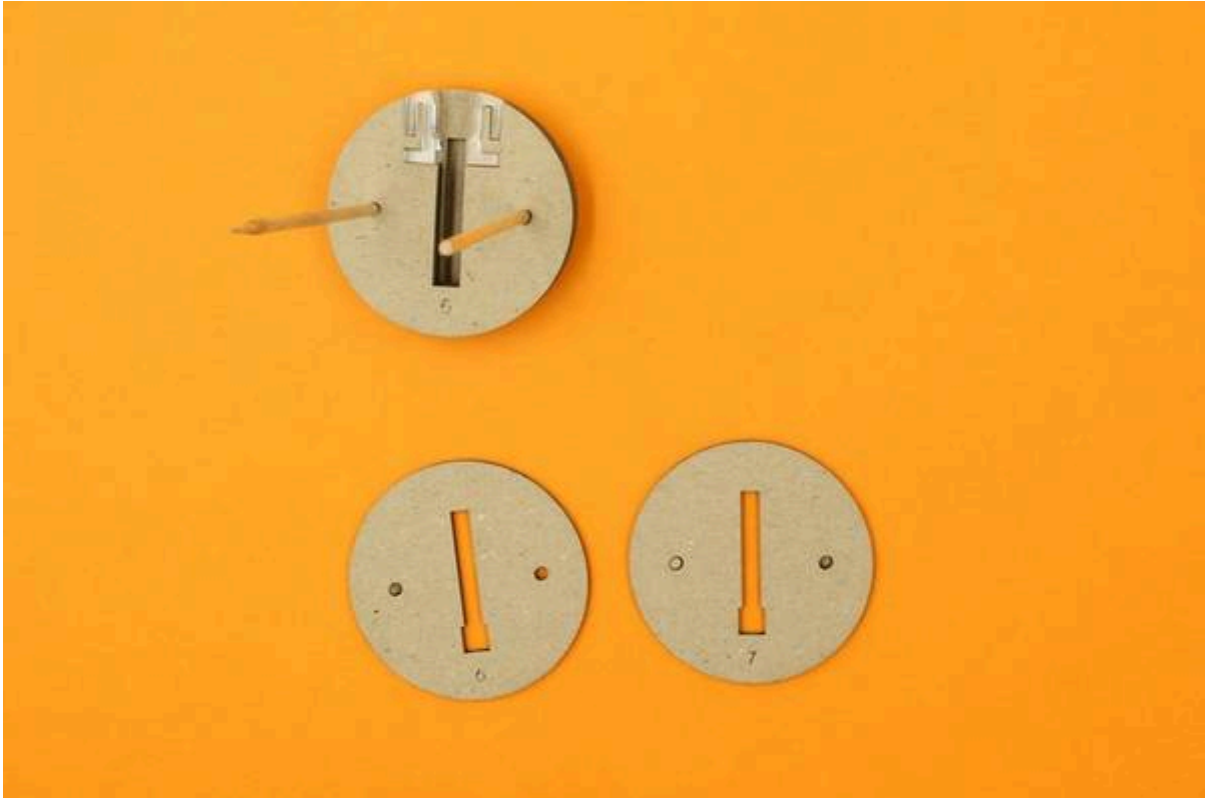
Assemble the first five plates of the plug.



Add the plastic plug supports. Carefully use the pointy end of a skewer to nudge the plastic plug supports into place.

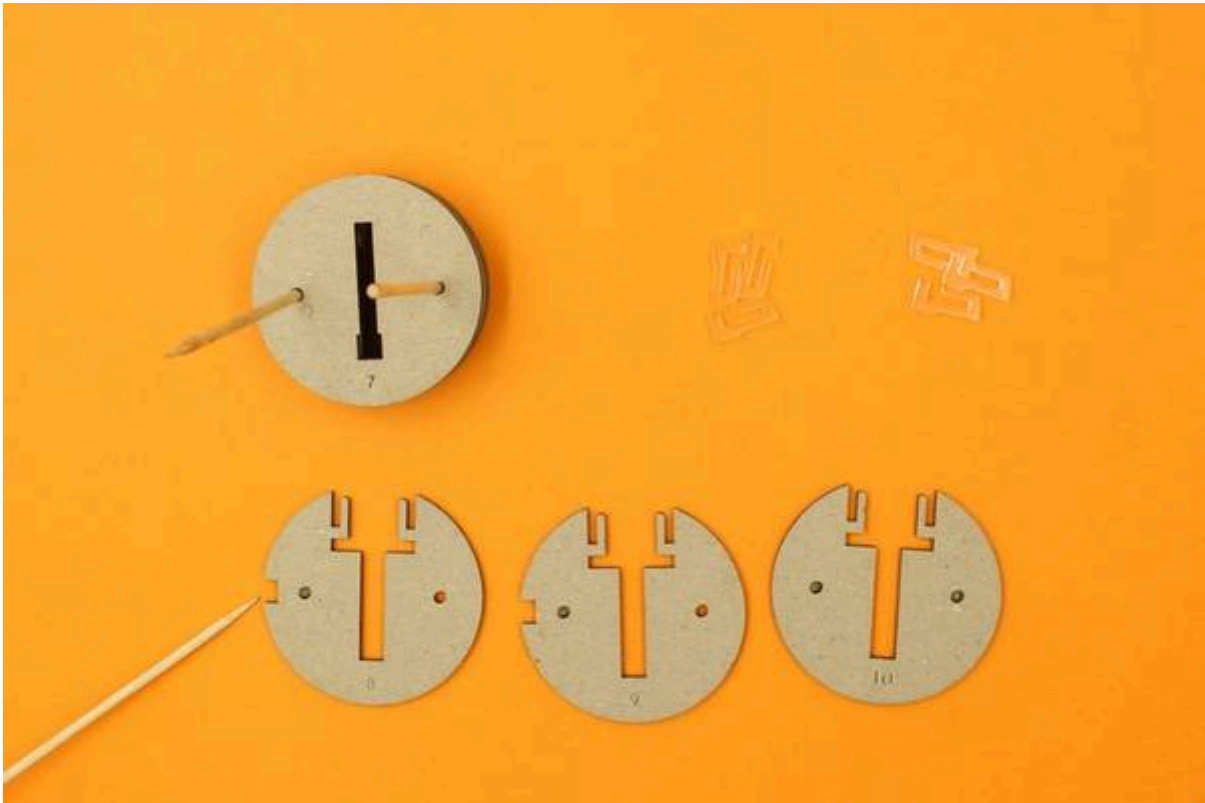


Then we'll add 2 cover plates, to hold it all together- plug plates #6 & #7.



Now we will add another 3 plates.

(Note the notch in the left hand side of plates #8 & #9.) This is where one of our magnets will go... but we'll come to that in a moment.



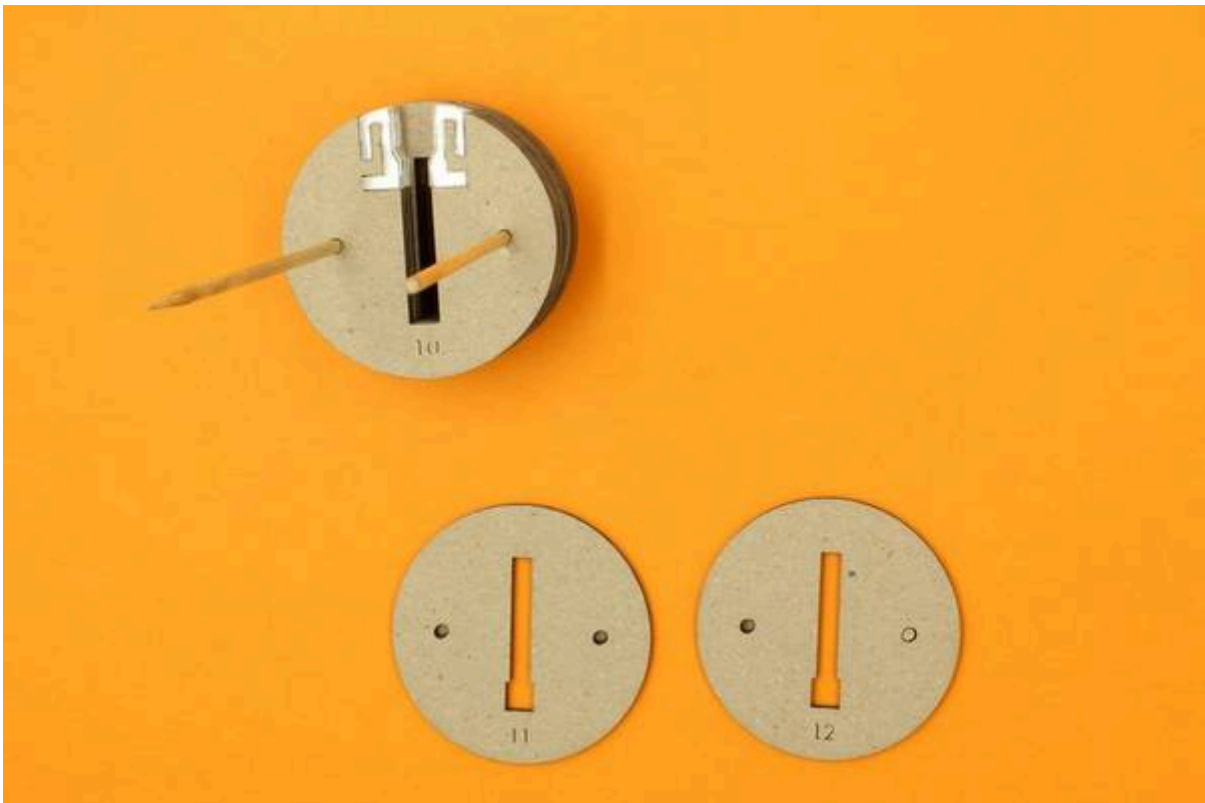
And again we add the plastic plug supports to these three layers.



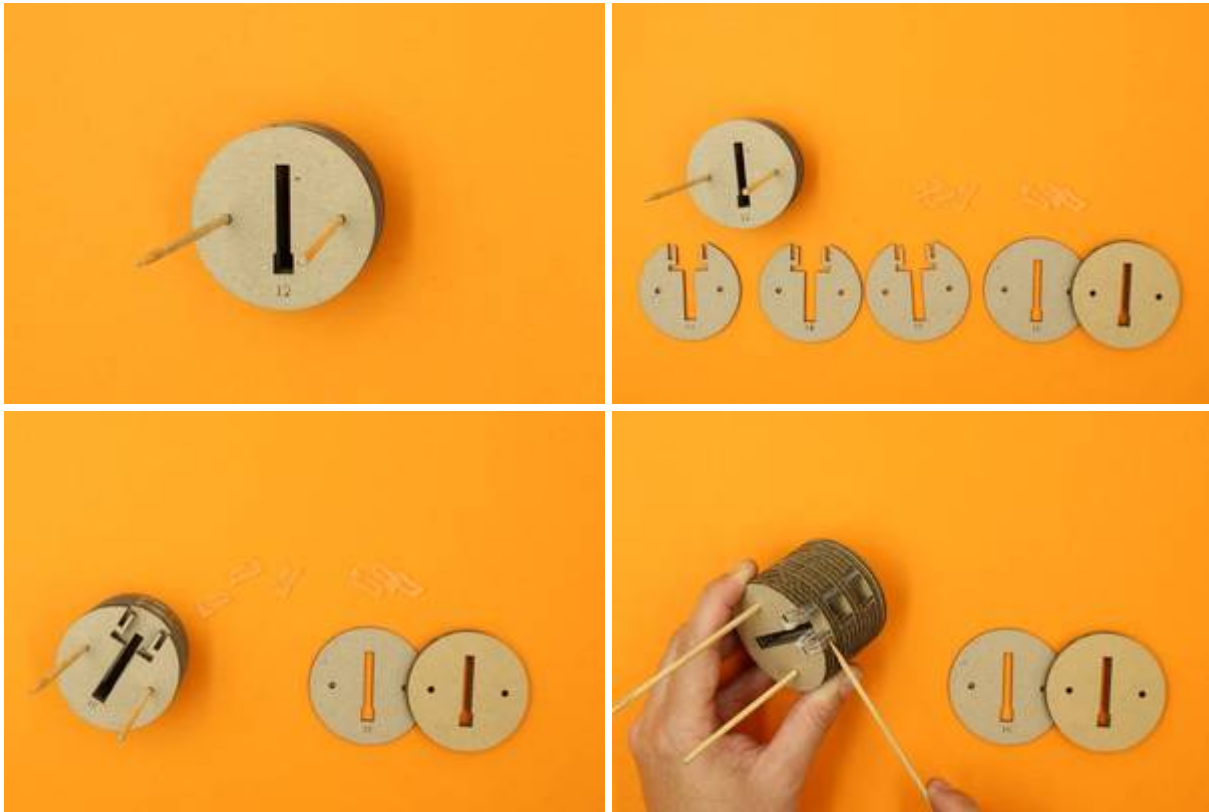
And then two more cover plates.



You should be up to plug plate #12.



Now add the last three layers of plug plates and the two plastic plug supports for each layer.



And now get plug plate #16 on top to hold it all in place. you don't want it to fall apart.



Step Two: Tape in Plug Magnet

Now we are going add the magnet and tape it all together.

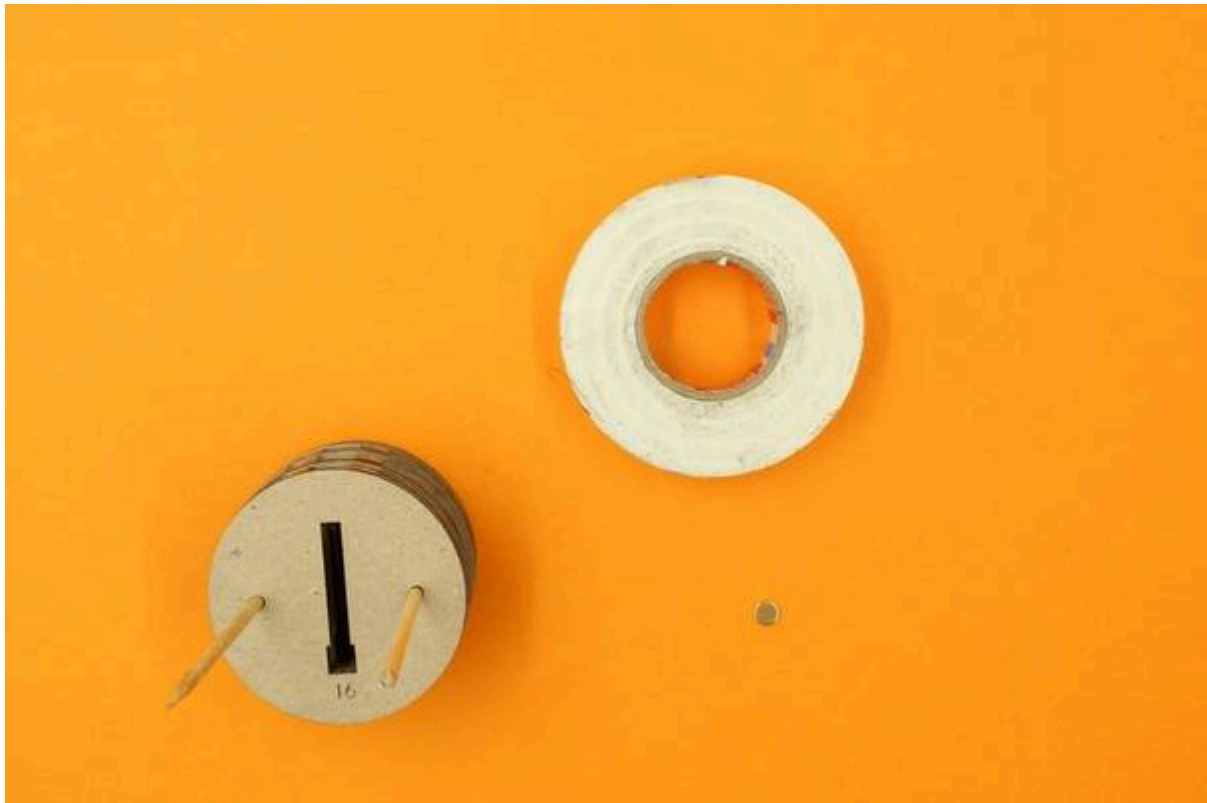


Can you see the magnet in its notch on the left hand side? (if you are looking at it from the front.)

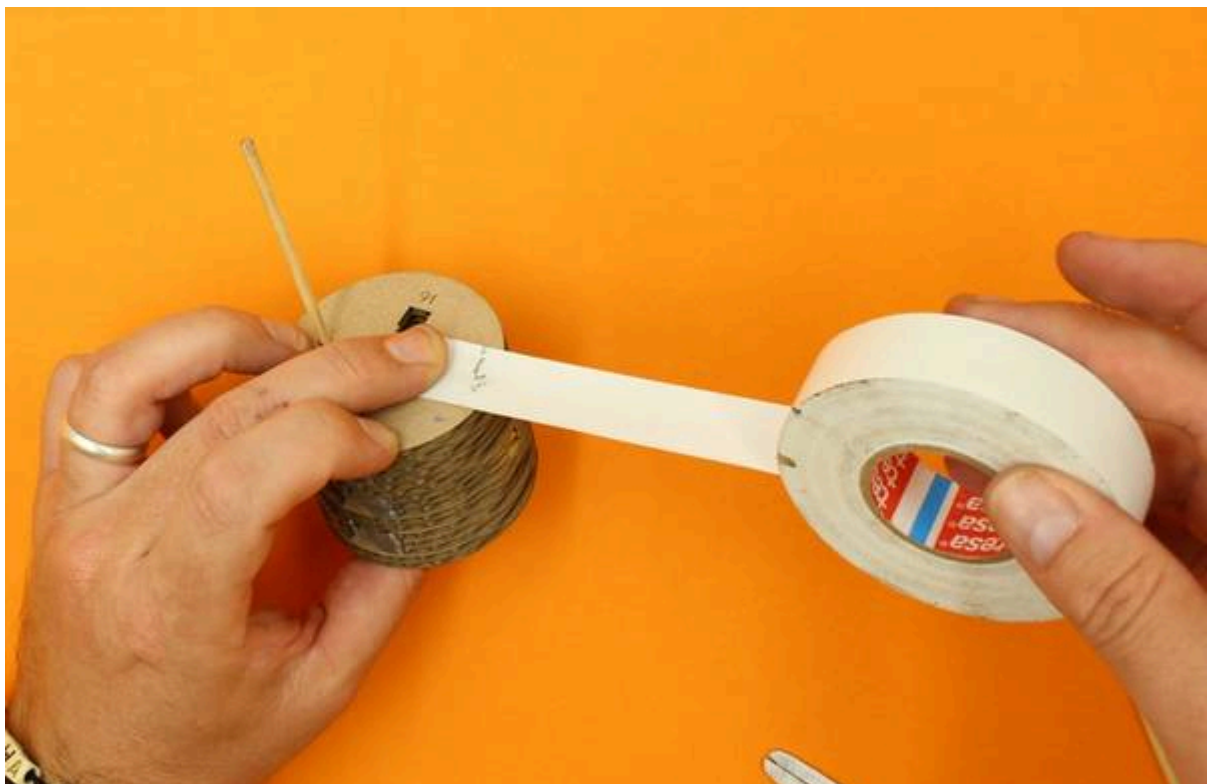
Carefully remove the skewer on the left hand side of the assembled plug ...



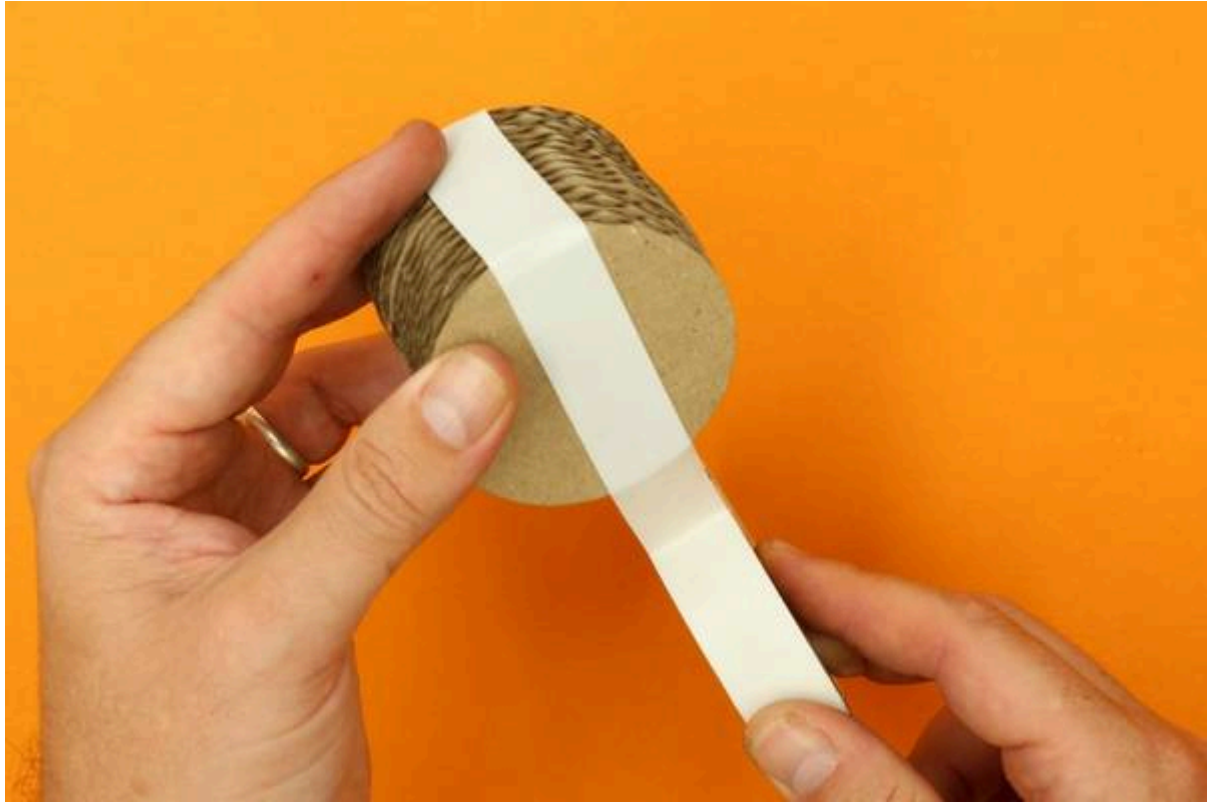
and starting here, tape around the "equator" of your plug...



Tape over the magnet...



Around the back...



Carefully remove the second skewer with out disturbing the alignment of the layers.



Trim the tape to the required length.

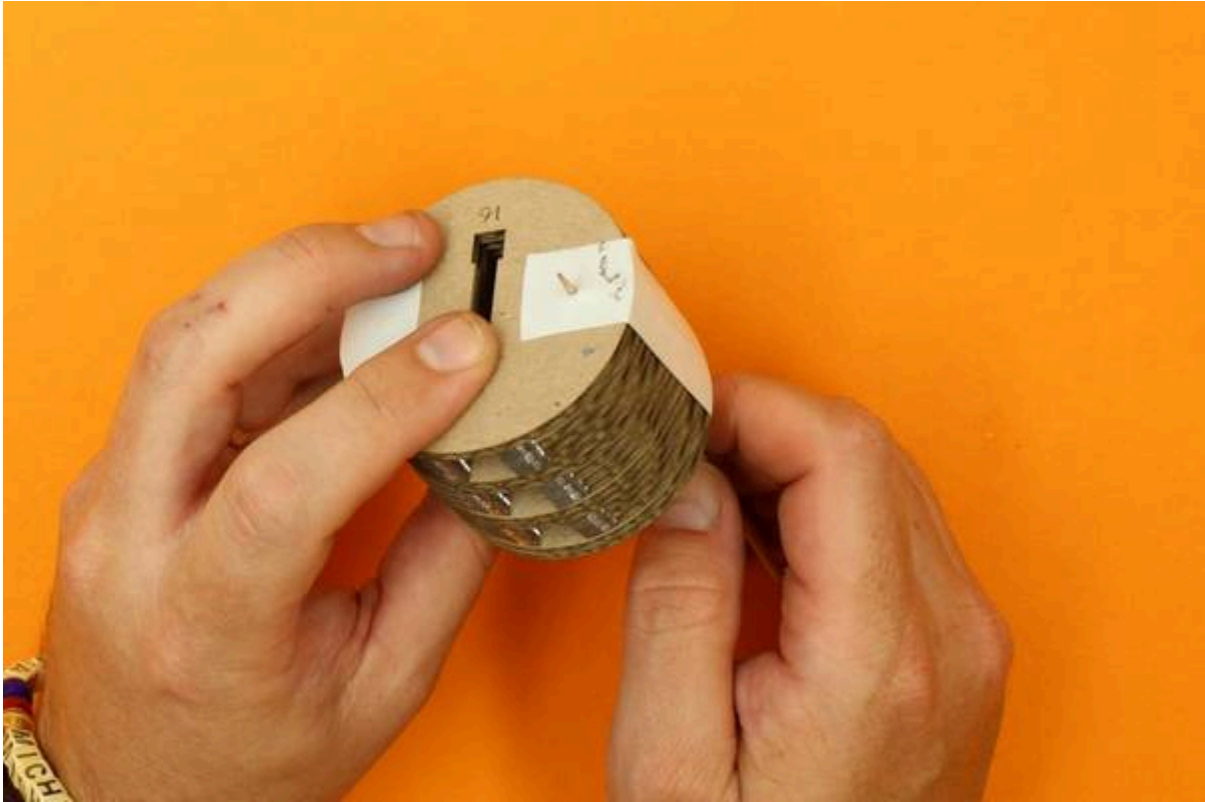
Make sure you are not compressing the cardboard too much but also that there isn't any space between the layers.



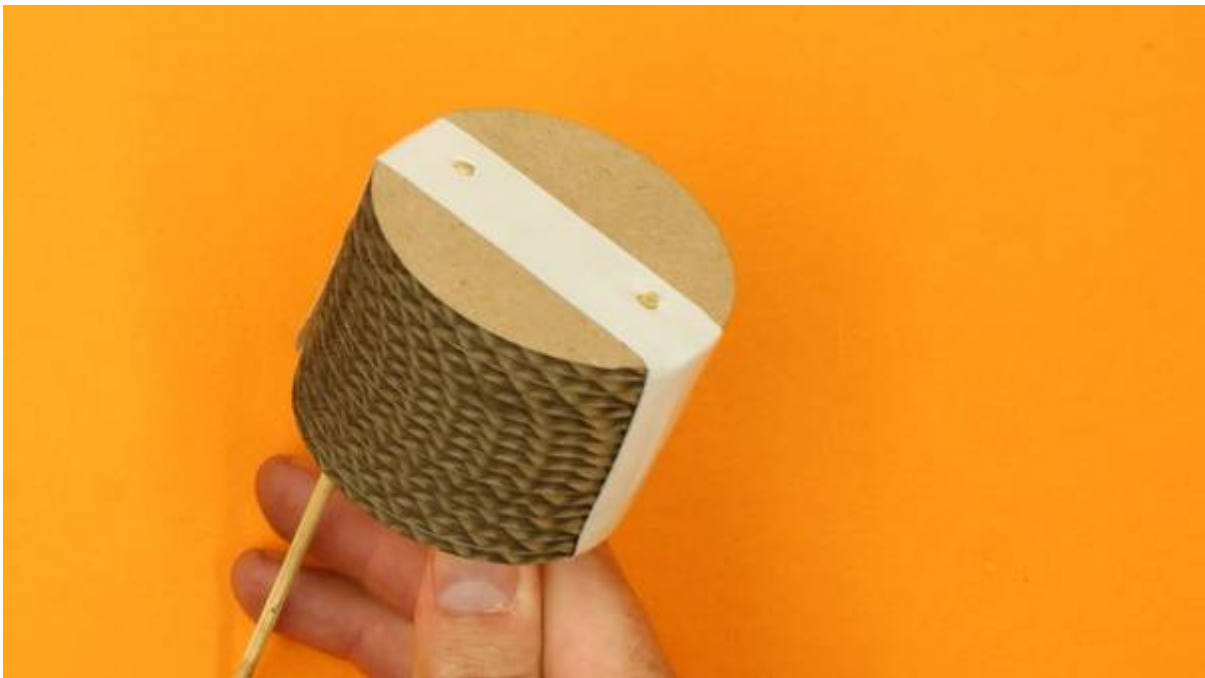
Now we are going to push the pointy end of the skewers through the tape and back into their holes.



All the way through the plug and out the tape on the front.



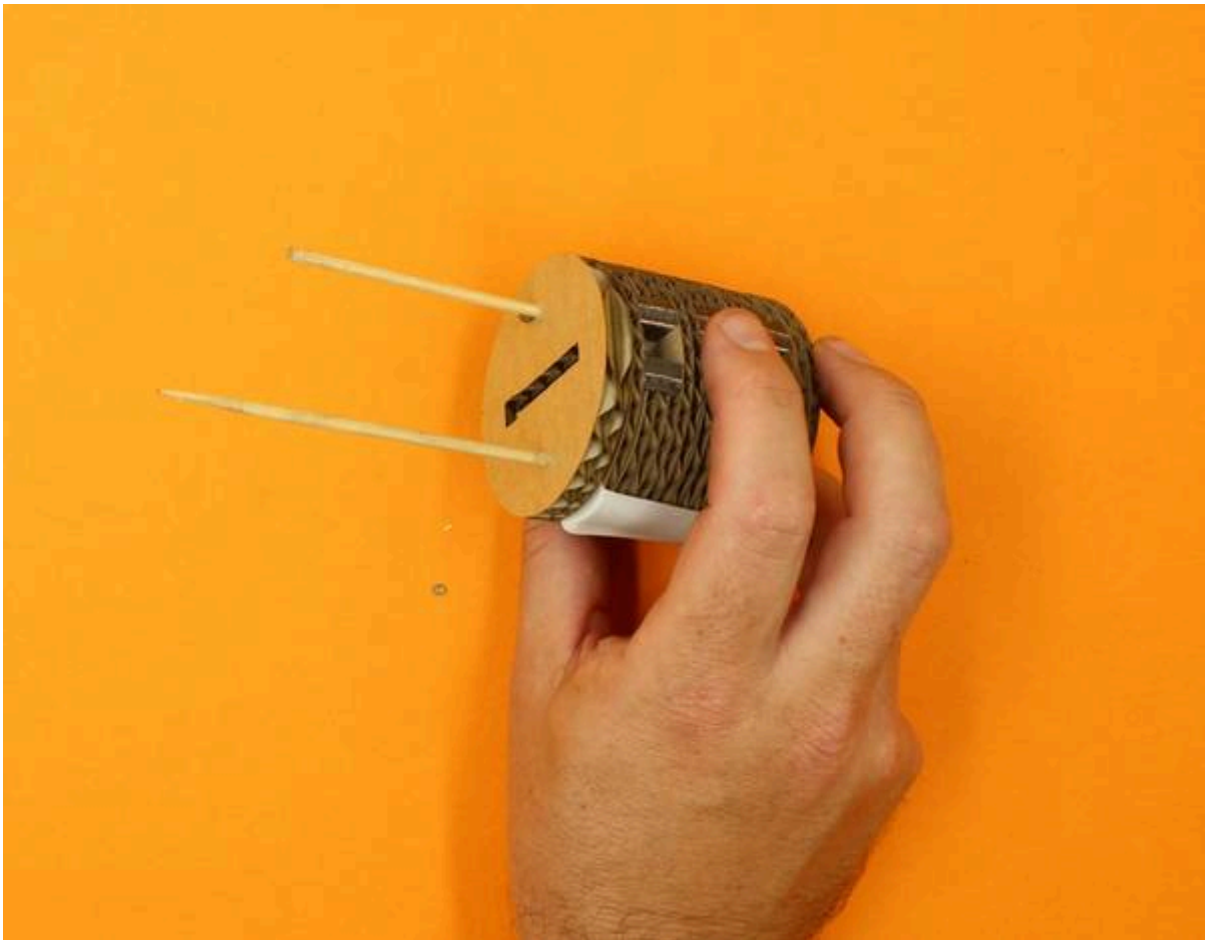
Make sure the two skewers are flush on the back of the plug...



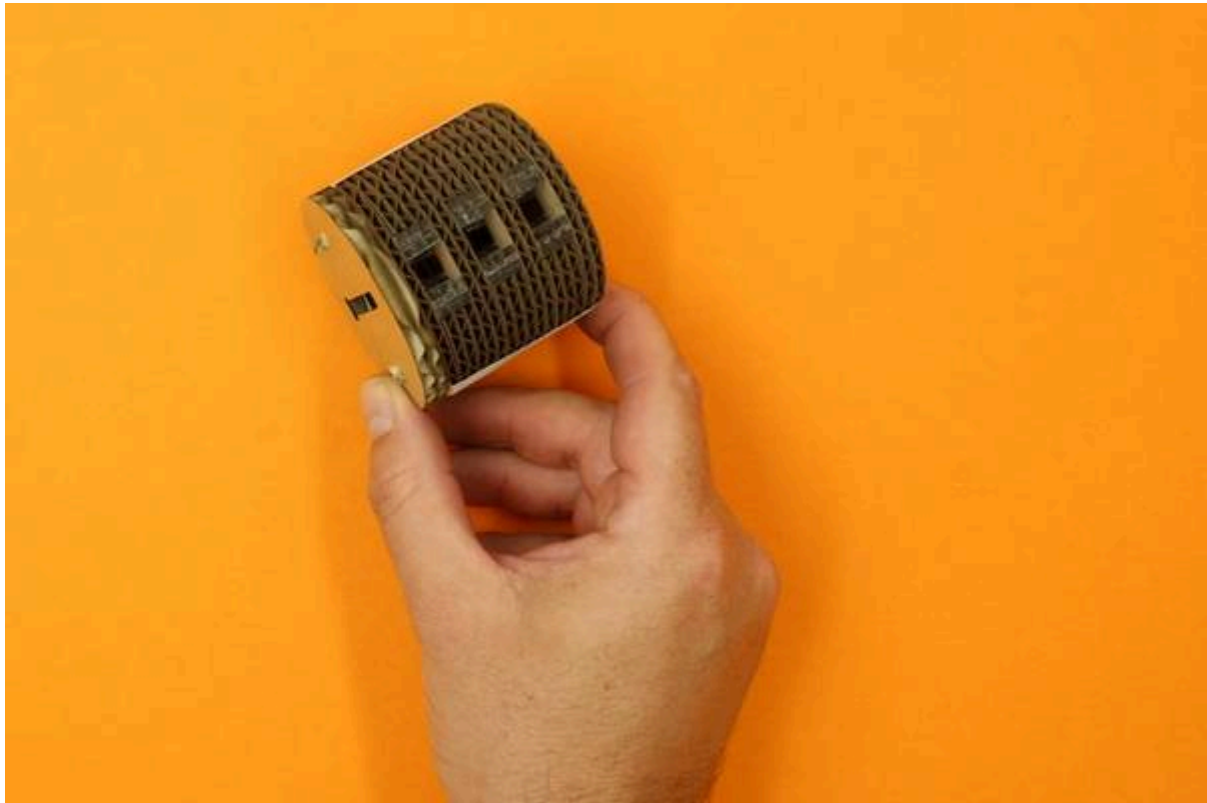
Now we are going to add the front cover for the plug.



This front cover is 6mm, a bit thicker and cut out of the double-ply corrugated cardboard that the hull parts are cut from.



When you have that in place, trim the skewers to the required length with the side cutters. *Make sure you hold on to the bit you're cutting so it doesn't fly off and take out an eye!*



Step Three: Fit Plug Sleeve

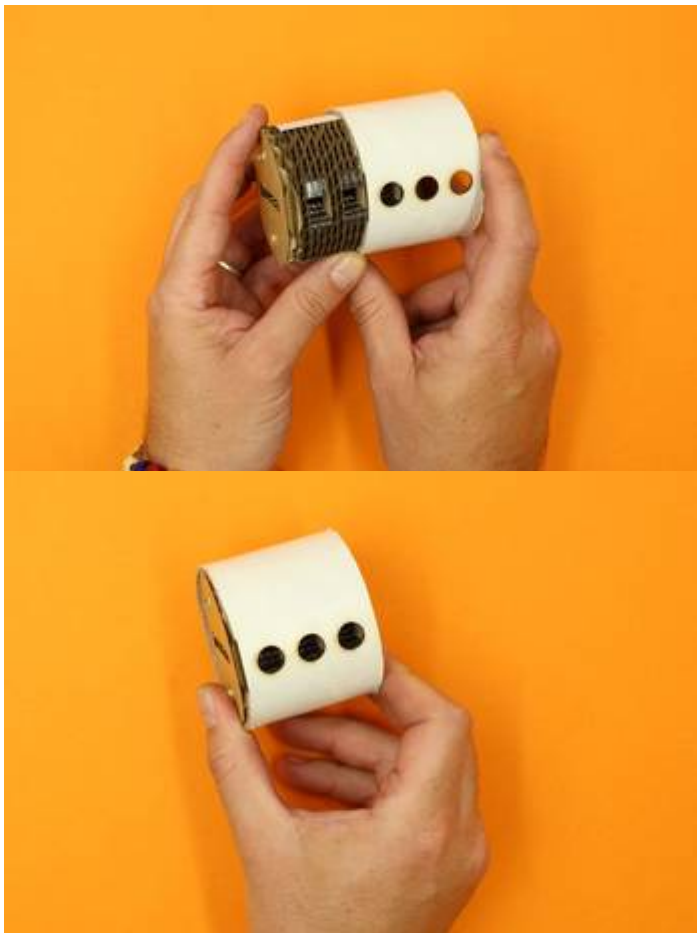
Now we are going to get our plug sleeve ready and test that plug will spin smoothly inside it



Take your little piece of sandpaper and smooth off the rough edges on the plug sleeve.



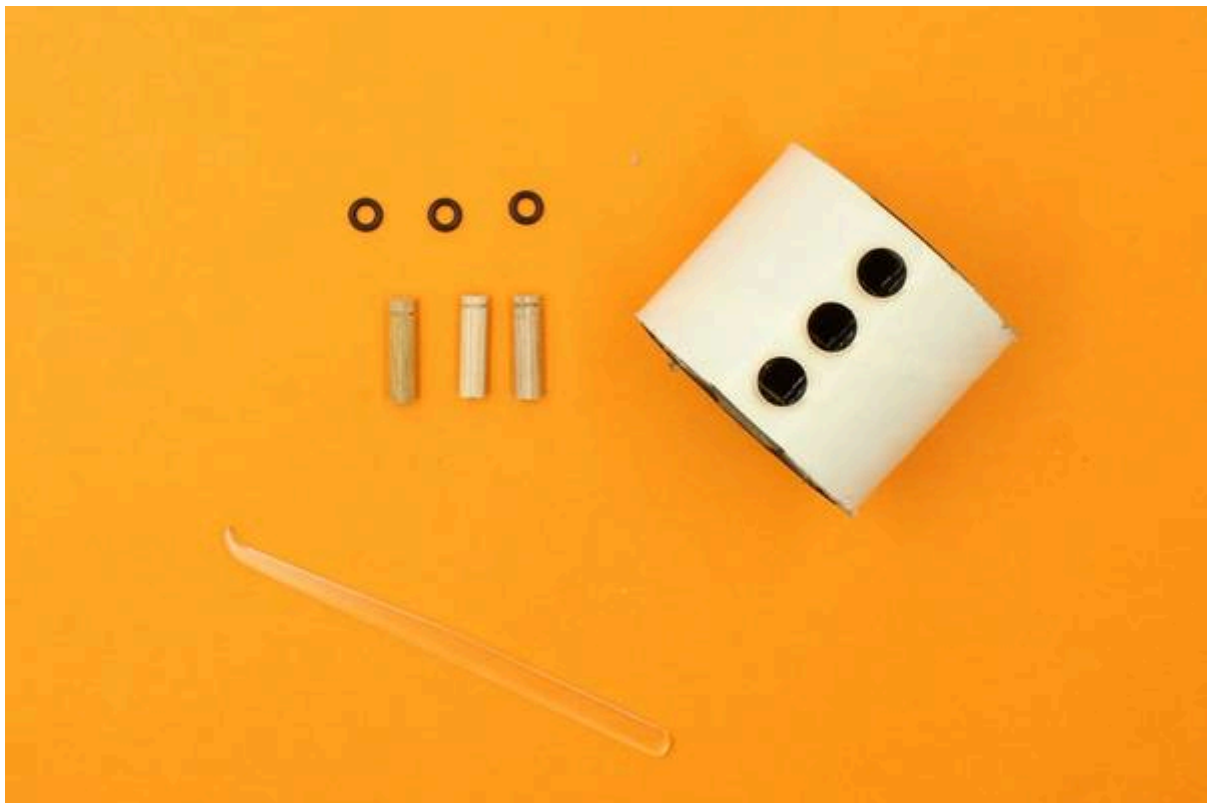
When you've done this insert the plug and check it turns smoothly in the sleeve.





Step Four: Install Key Pins

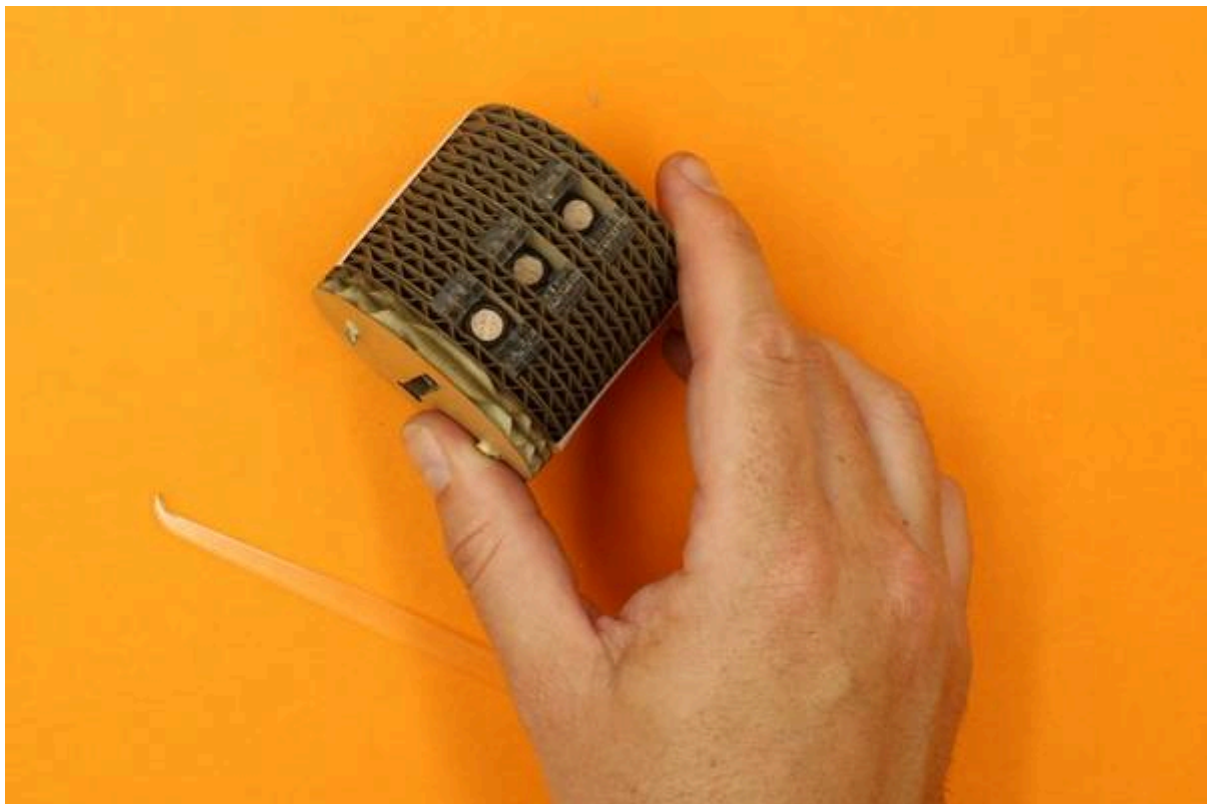
Now we are going to install our key pins and test their function.



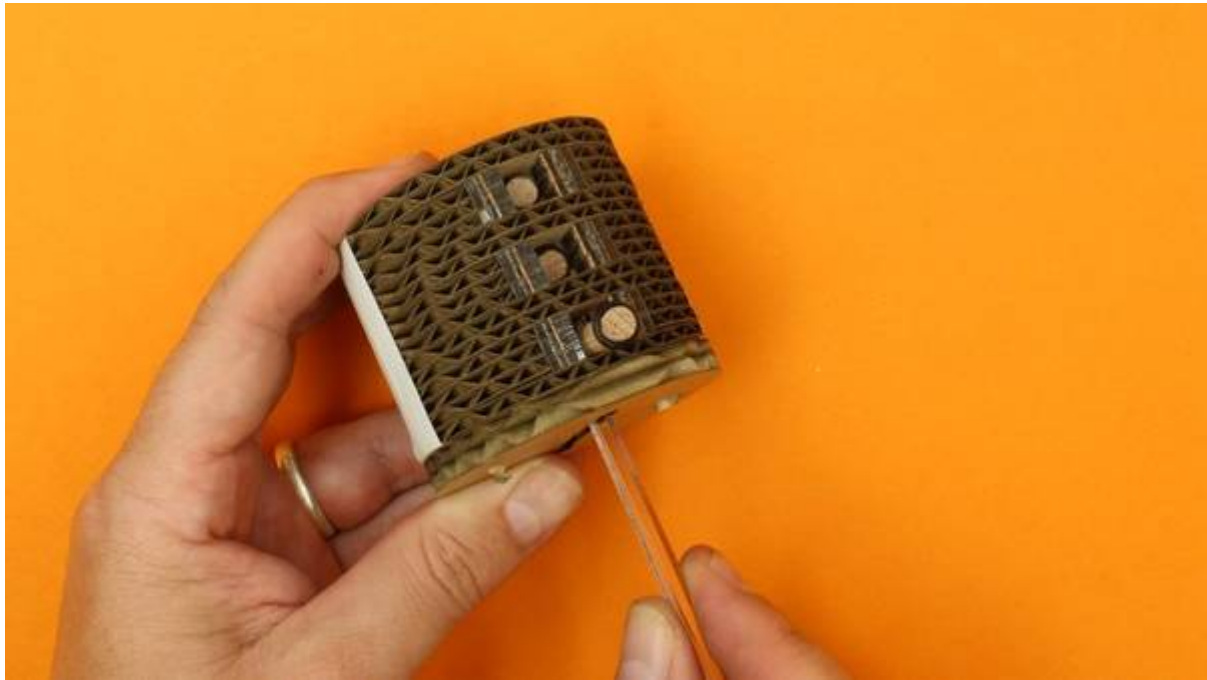
The key pins are the three shorter dowels (24mm long) with a groove cut into them. Seat the Orings on the three key pins.



Insert the pins into each of the chambers...

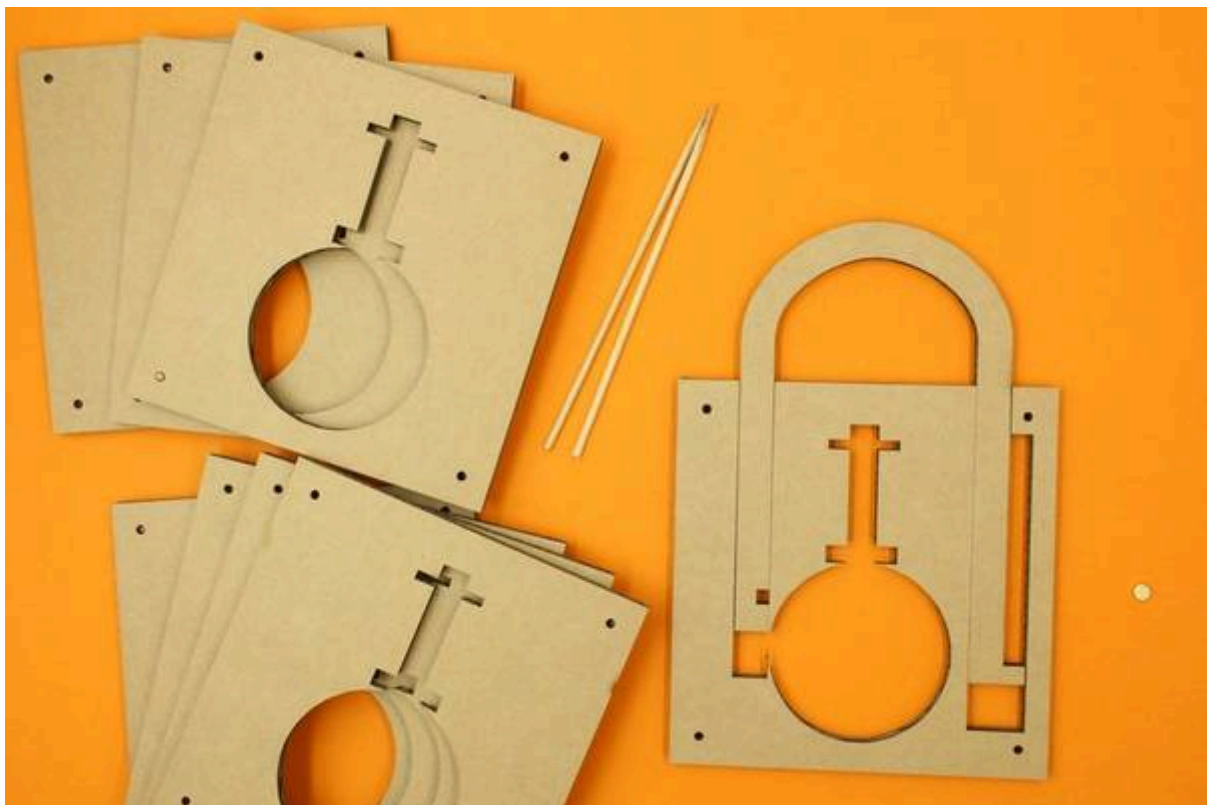


and check their function (that the move up and down freely) by manipulating the using you pick via the key hole.



If you have gotten this far...Congratulations!

Step Five: The Hull



The hull consists of 10 layers.

- 1x front smaller hole (and has etching on it),
- 1x back no hole (has The Edge logo on the back),
- 1x hasp layer and
- 7x filler layers.

First of all grab your hasp layer and carefully remove it. We are attaching the other magnet to the hasp.



Make sure the polarity matches the polarity of the magnets in the plug.

An easy way to do this is to put your plug in the white tube (to make the removal of magnets easier) and let the magnets snap together on the outside. This way you'll know which side should point in or out.

Make sure the magnets in the hasp don't stick out too much and add a piece of tape to keep it in place.





Don't use too much as it will add unwanted friction.



Put the hasp back into it's layer before the next step.



Now we start putting our Hull together.



Just as we did with the Plug , start by aligning 3 of (the the Hull “Filler” plates on 2 of your skewers. Then add the Hasp layer of your lock.

Step Six : Construct Top Pin Chamber Assembly

The following parts make up the Top Pin Chamber Assembly :

- 3x metal tubes 45mm
- 2x plastic supports with regular size holes (same diameter as the tubes)
- 1x plastic support with smaller holes



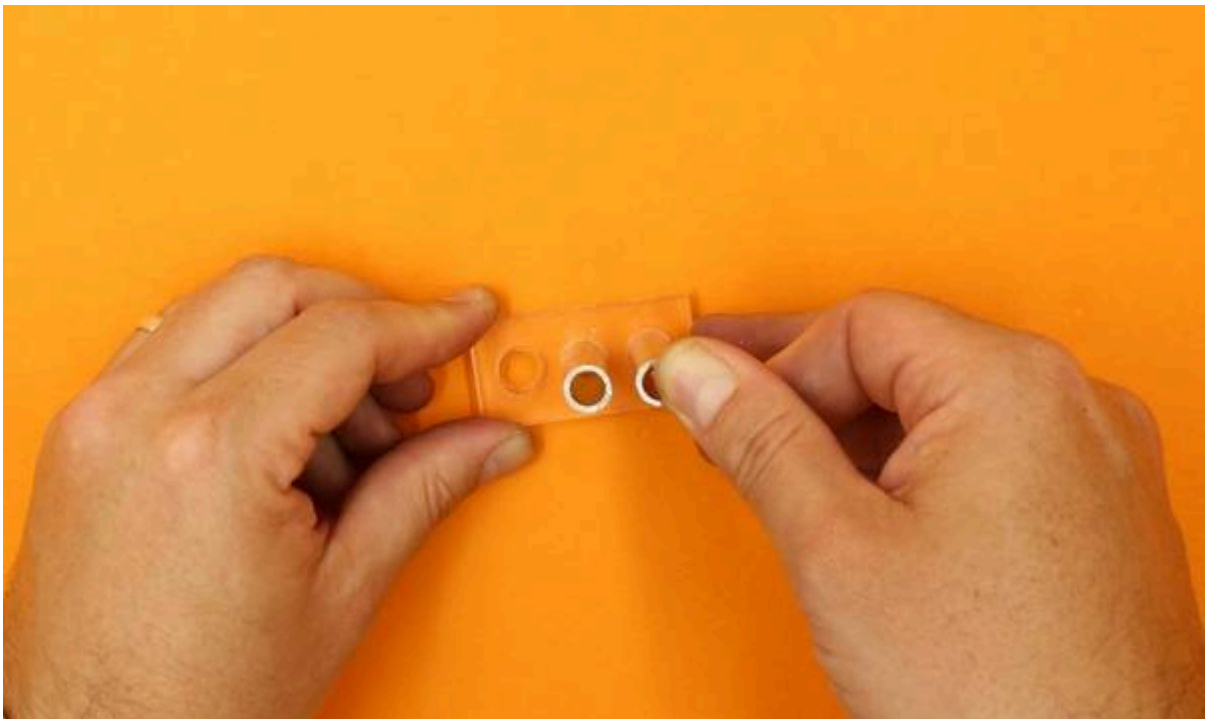
Start by fitting the middle metal tube into the centre hole on one of the plastic supports.



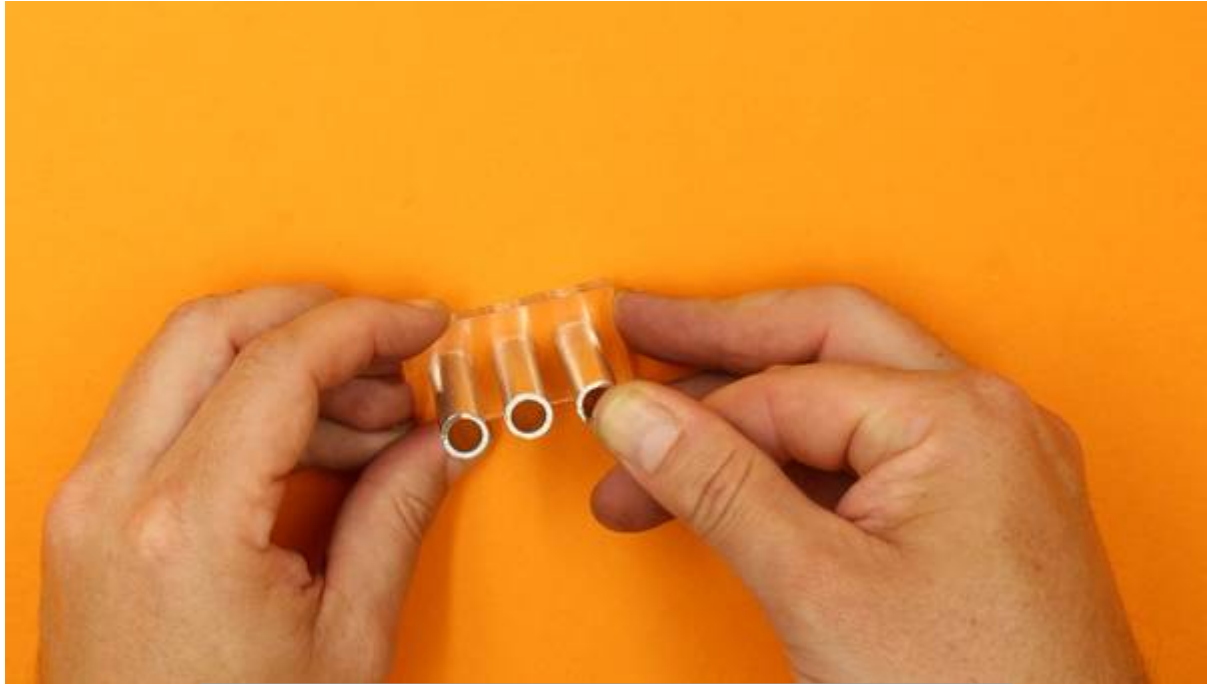
Now add the 2nd plastic support.



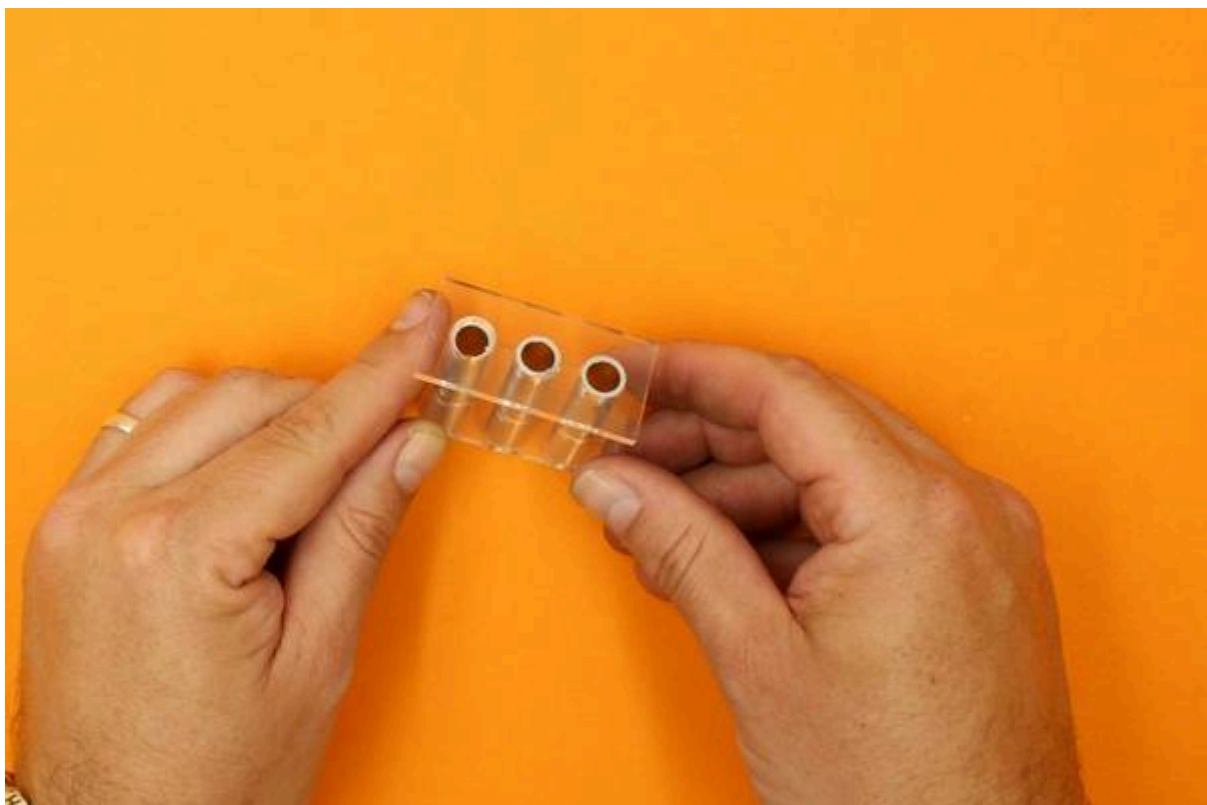
Align the outside holes on the plastic chambers supports and fit the other 2 metal chambers.



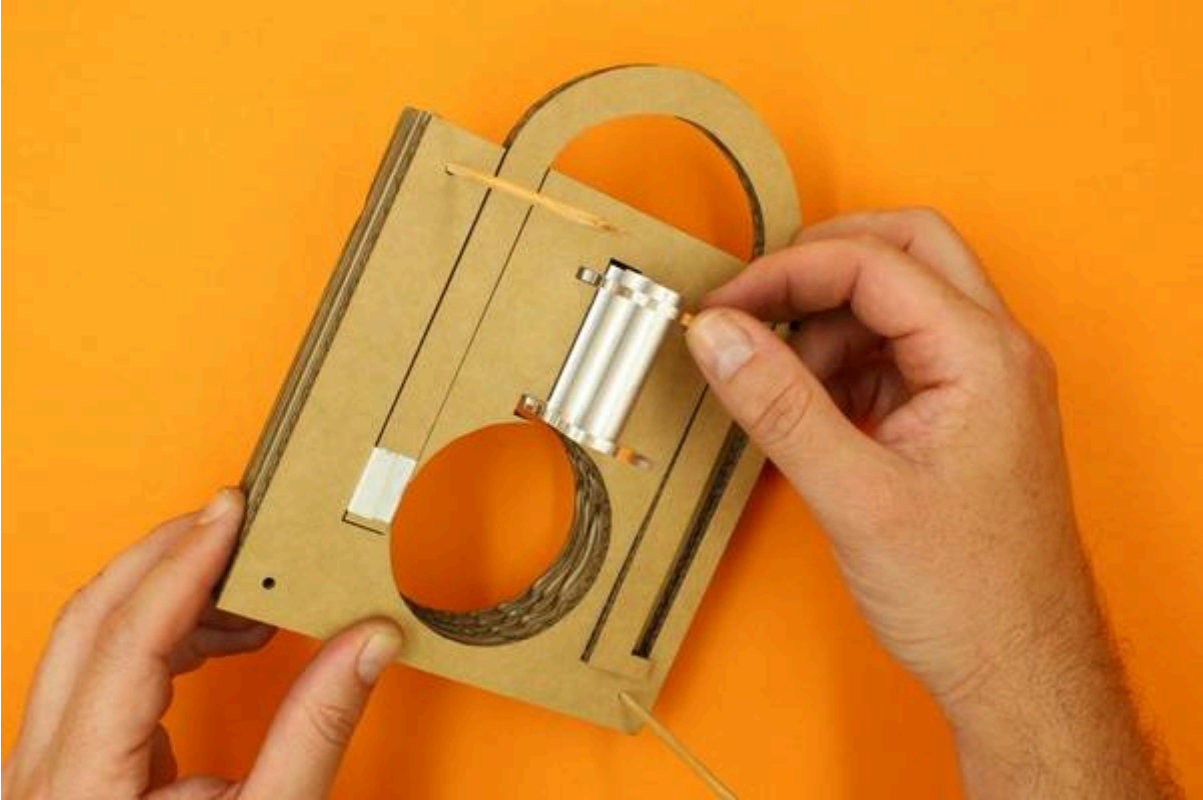
Now *shimmy* the top plastic support up the metal chambers until it is about 5mm from the top of the chamber.



It helps if you keep it as level as possible as you shimmy it up
Make sure the metal chambers stay flush with the bottom surface of the the lower support.



We'll now install the Top Pin Chamber Assembly into our half built Hull...



And slide the 3rd of our plastic Chamber Supports (the one with the smaller holes) into the gap between the lower chamber support and the floor of the Chamber Assembly hole in the Hull Plates.



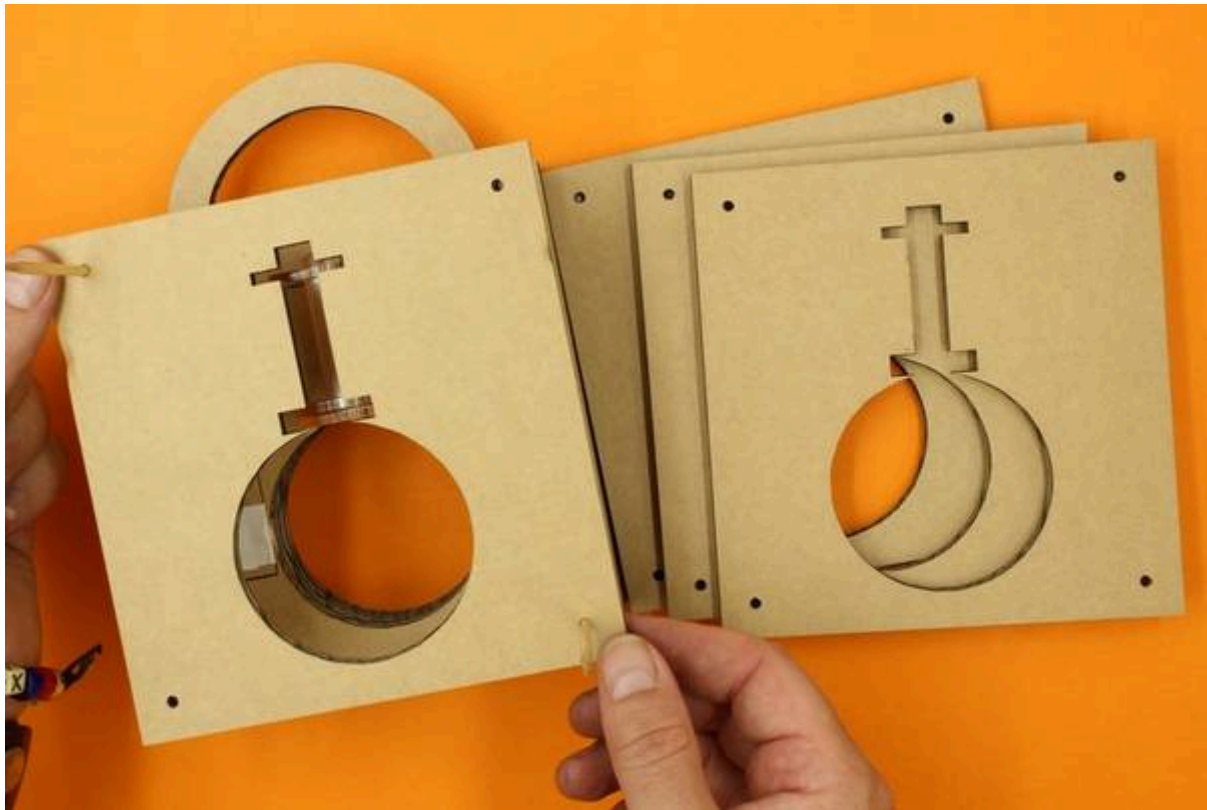
This may require more patient shimmying.



Step Seven: Complete Hull Assembly



We are now ready to complete the assembly of our Hull.



Just add the remaining Hull Filler plates.



Step Eight: Fit Plug in Hull

We use tape to ensure the sleeve fits snugly inside the hull and wont rotate when we operate the lock.

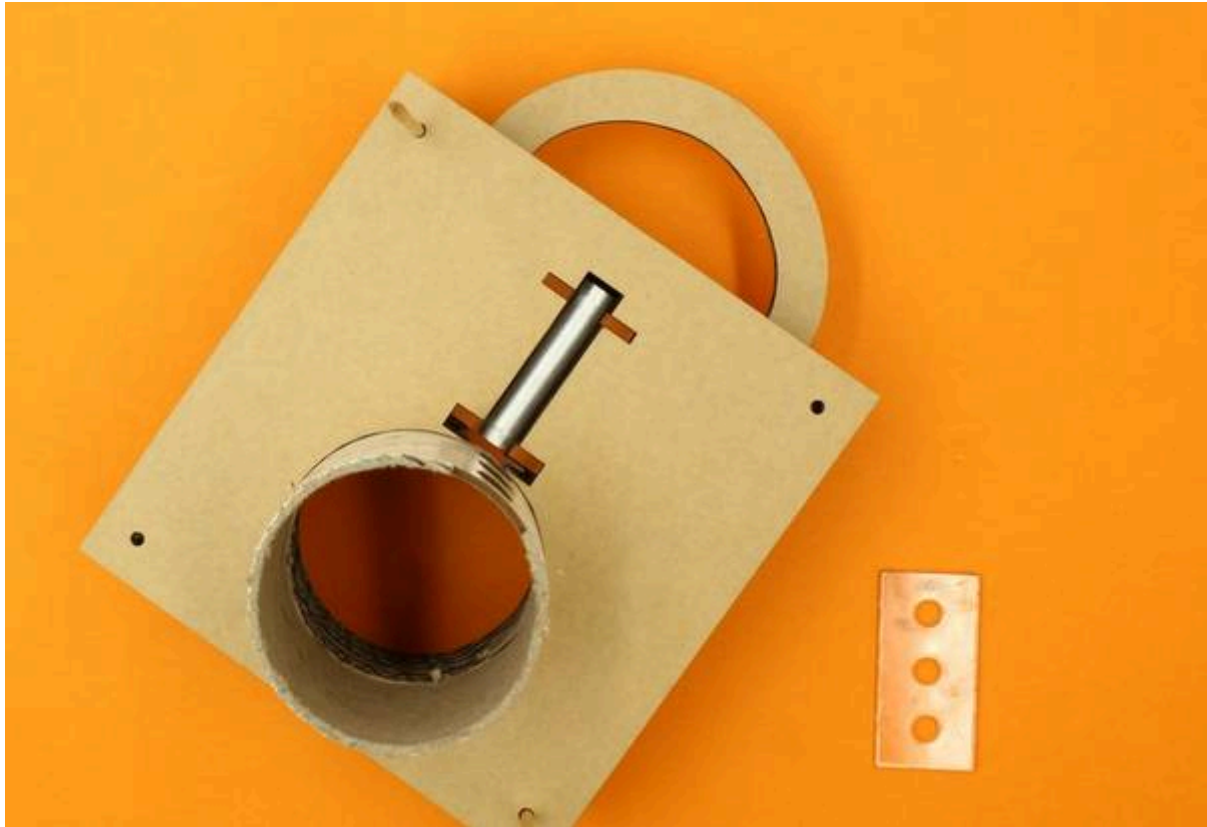
First, add a strip of tape around the circumference of the Sleeve (postal tube)

Start the tape next to the middle hole, wrap it around the sleeve and trim the tape near the other side of the hole.



This snug fit also means that if we get the next bit wrong, it can be hard to reposition. So we need to be accurate as we fit the Plug Sleeve in the hull.

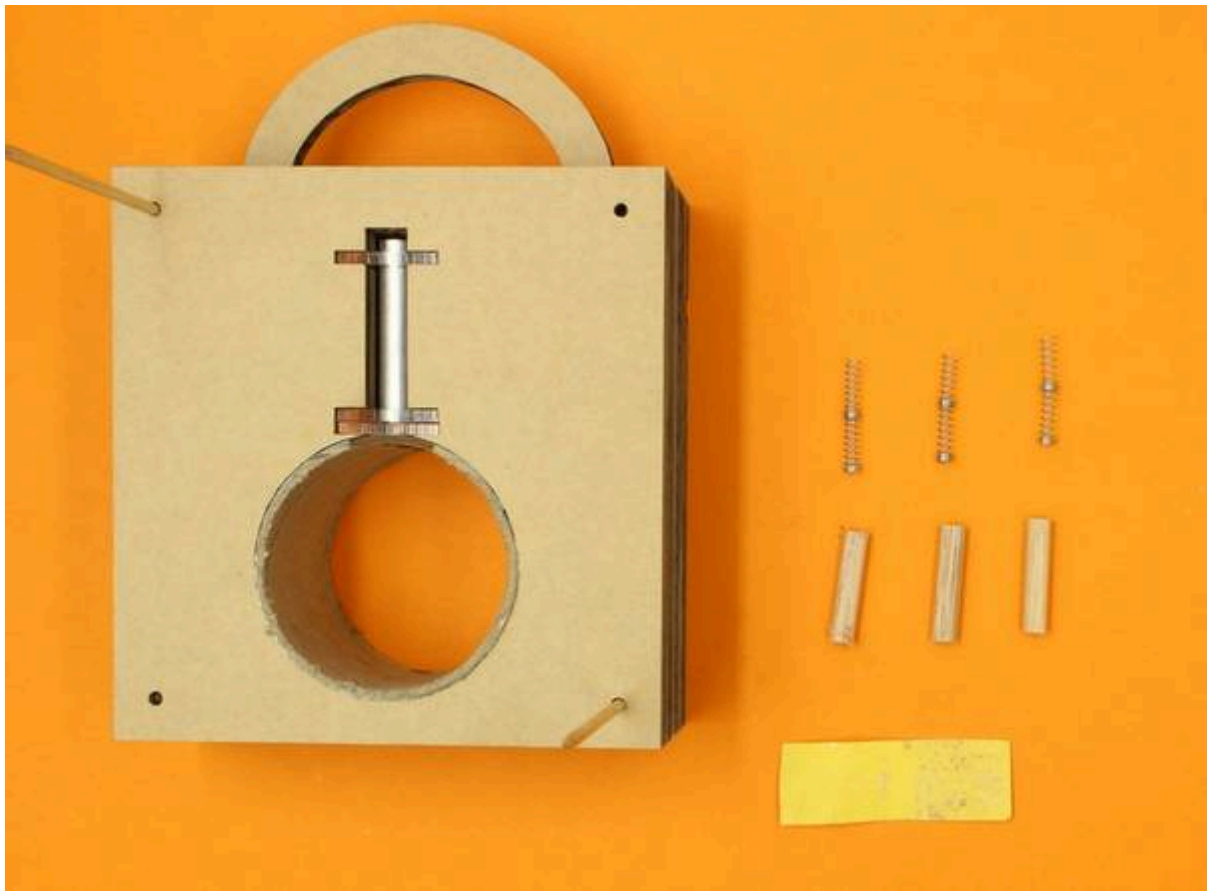
Now remove the bottom plastic chamber support (the one with the smaller holes) and line the hole in the Plug Sleeve (postal tube) with the Chambers. When you have this accurately aligned fit the sleeve by pushing down into the Hull.



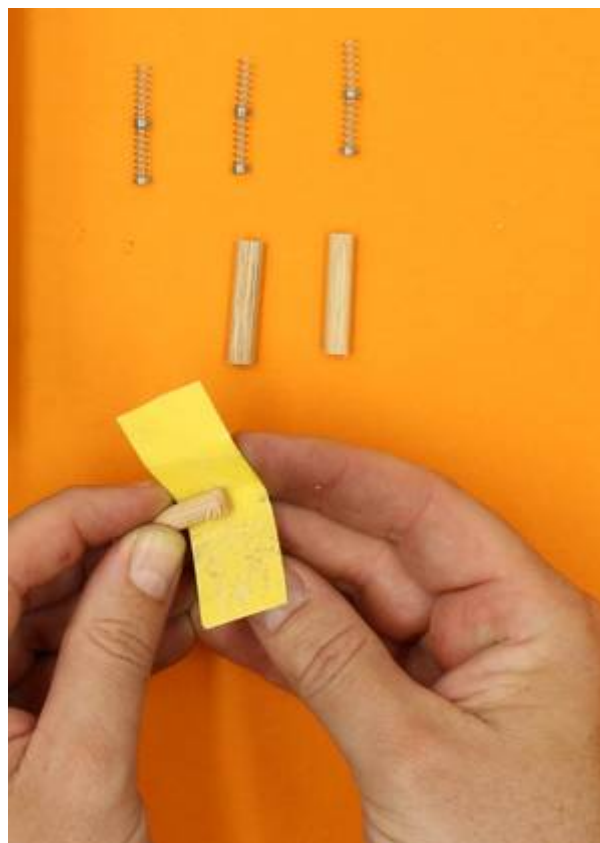
Now replace the bottom plastic Chamber Support.



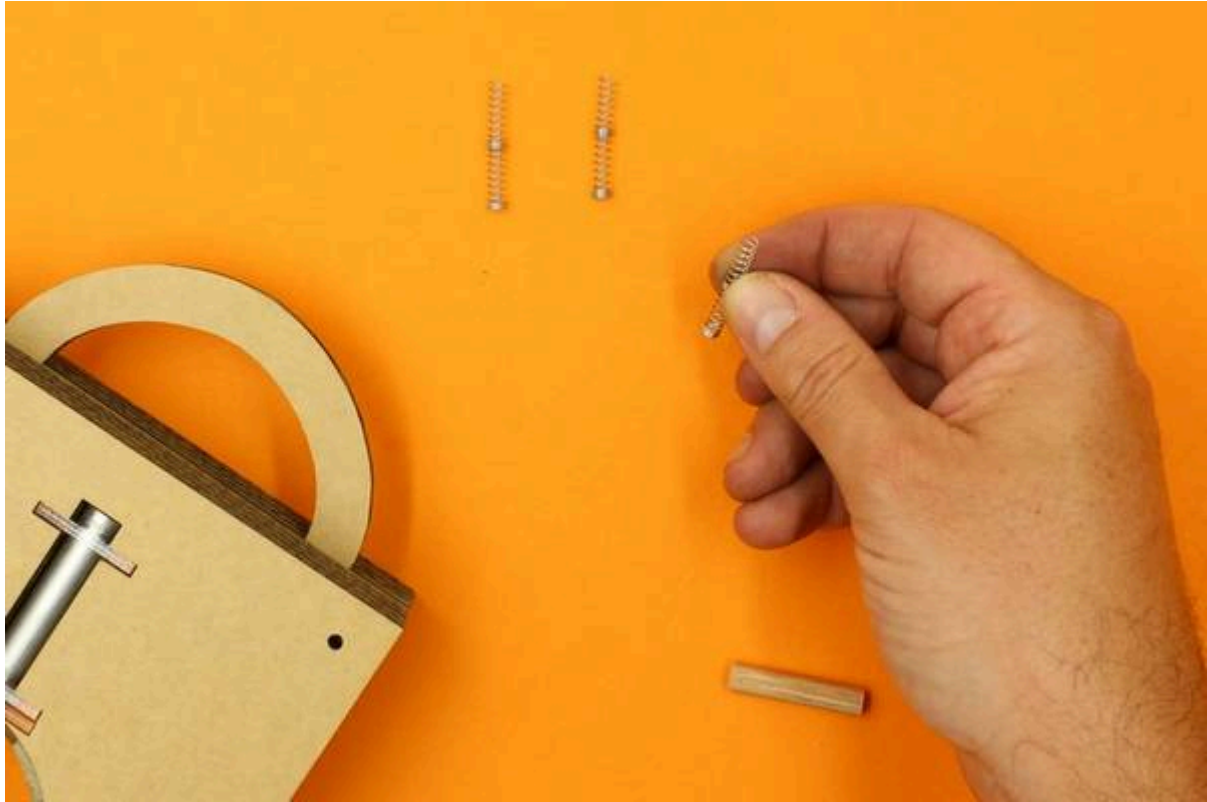
Step Nine: Install Set Pins



First we'll deburr our **set pins** using our bit of sandpaper... to ensure they move freely in their chambers.



Now we'll install the springs. Make sure you have the springs up the right way.

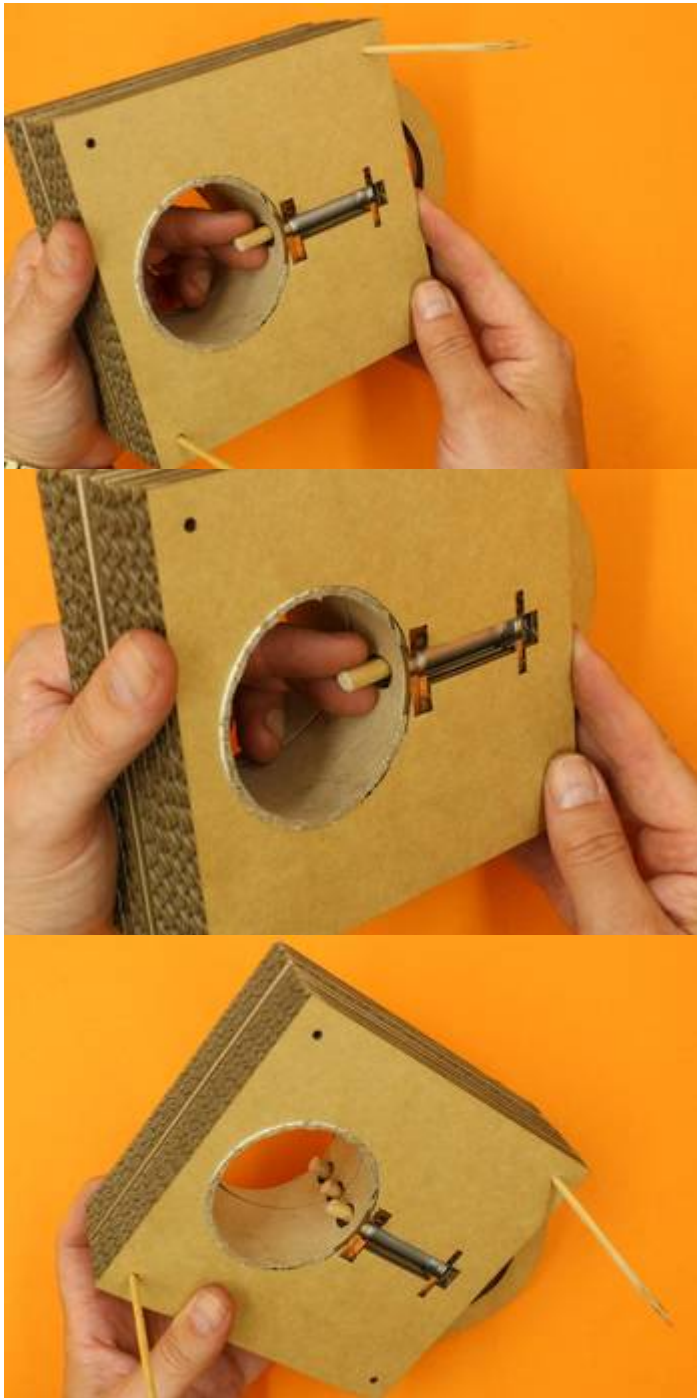


We want the smooth end at the bottom of the chamber and the rough end at the top of the chamber.

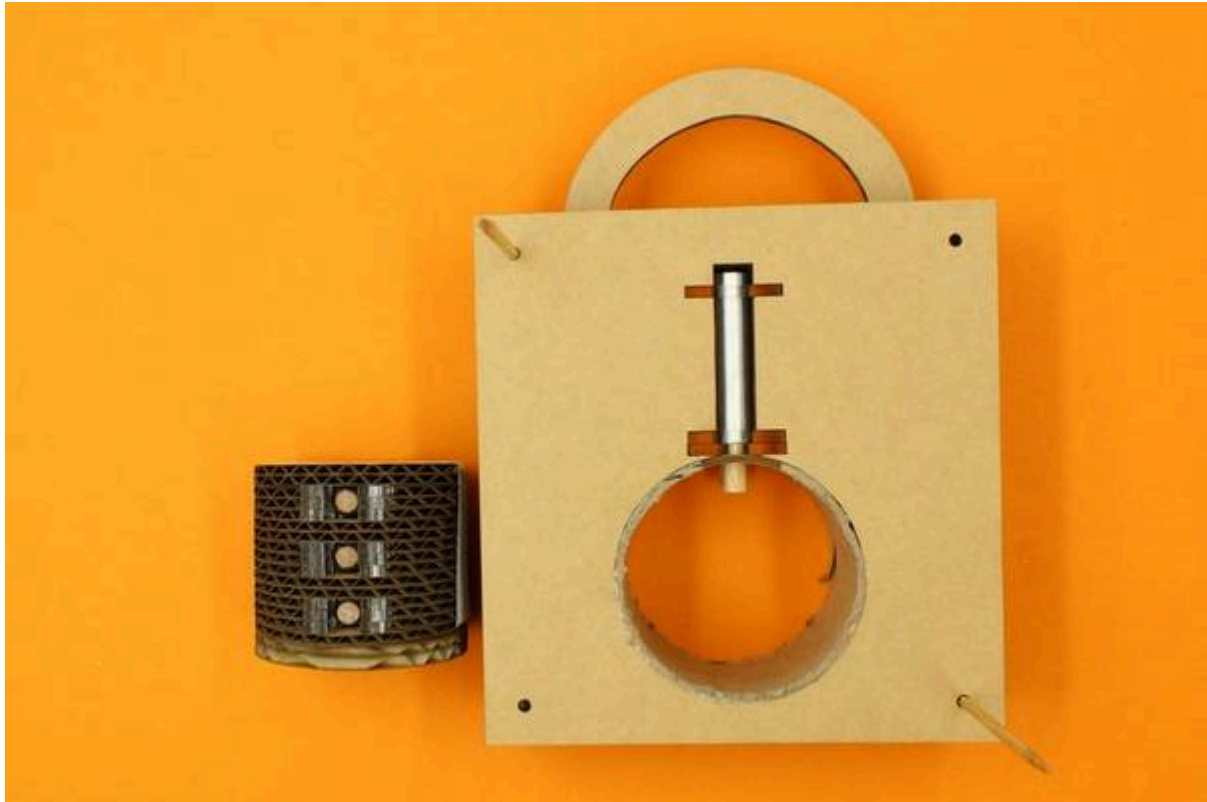
Hold your lock upside down so the springs and pins don't fall out.



Now install the pins into their chambers.



Step Ten: Install Plug in Hull to complete the Lock Mechanism



Start by checking that your Key Pins are all sitting neatly in their Plug Supports...

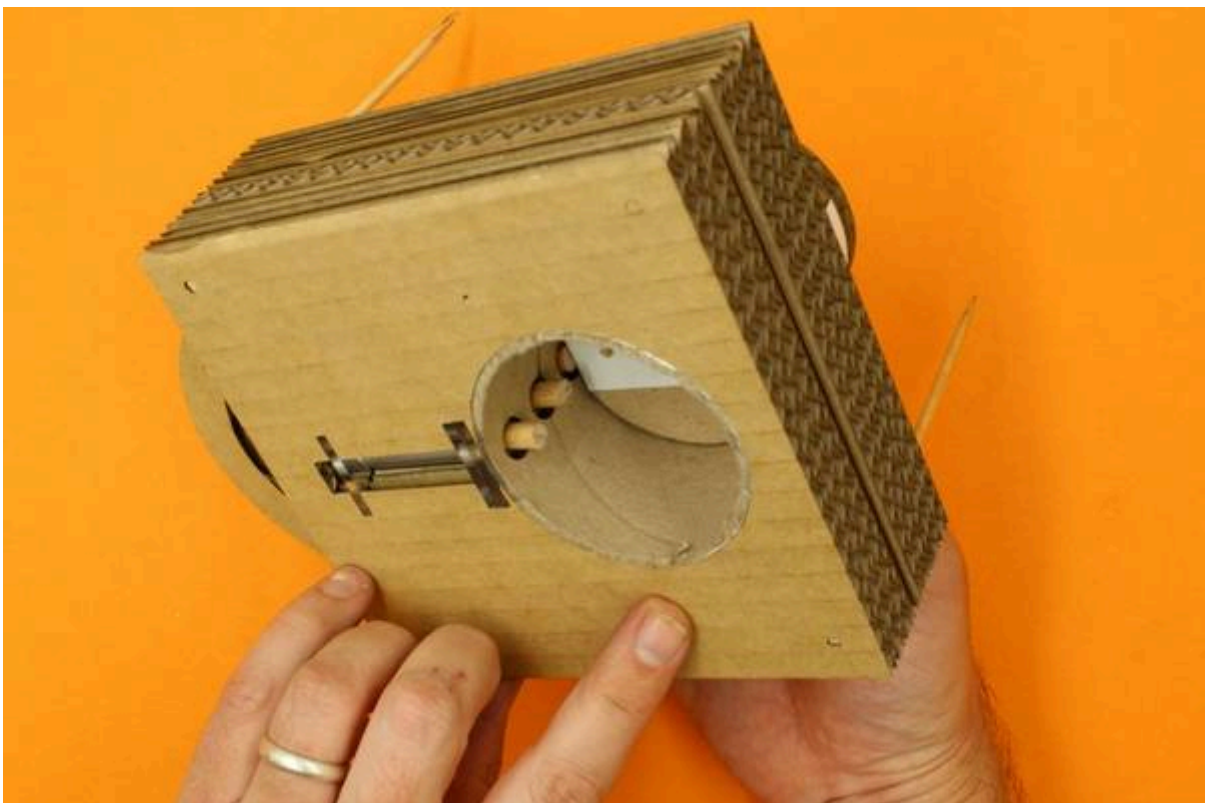
And that none of the Set Pins or their springs have fallen out. (Patience)



Orient the Plug so that the Key Pins and Plug Support are 90Deg from Chambers (9 O'clock Position). The Chambers should actually be lined up with your tape.



In one hand hold The Hull and Plug in position...



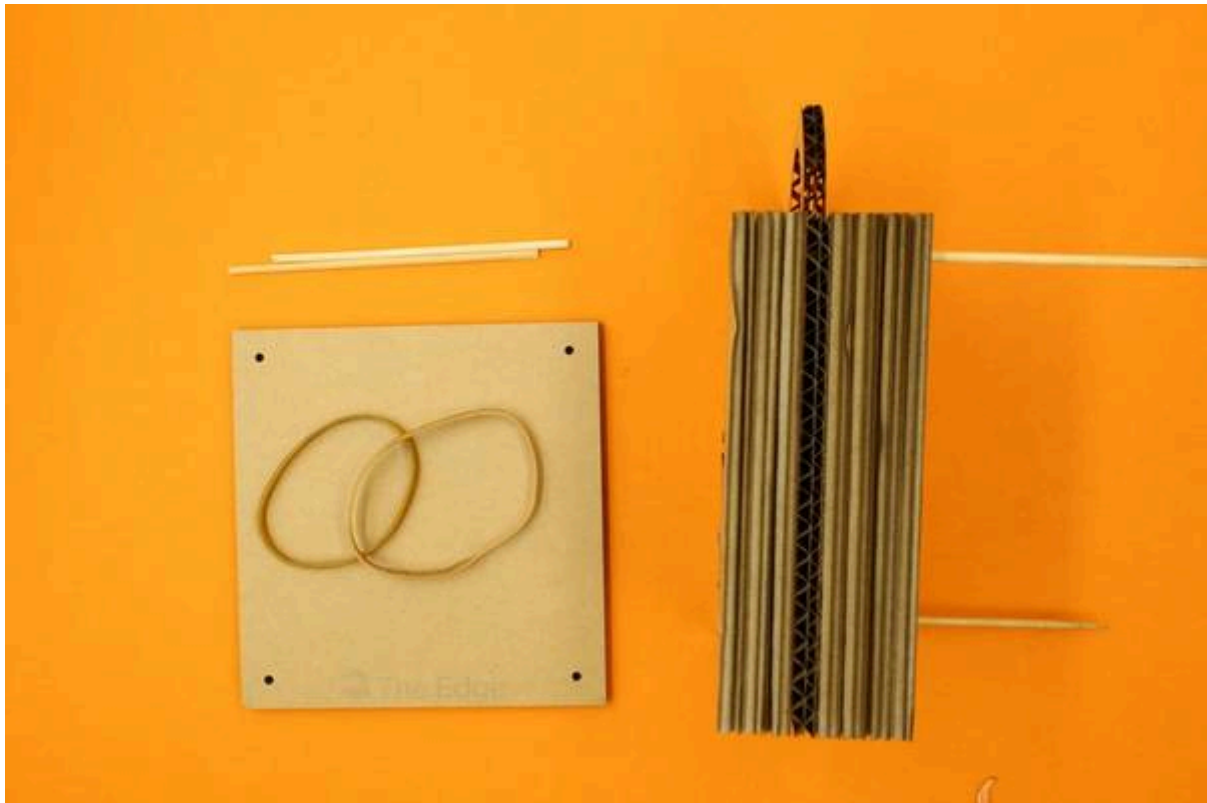
press the Set Pins one at a time so you can slide the plug into position.



The back should look like this..



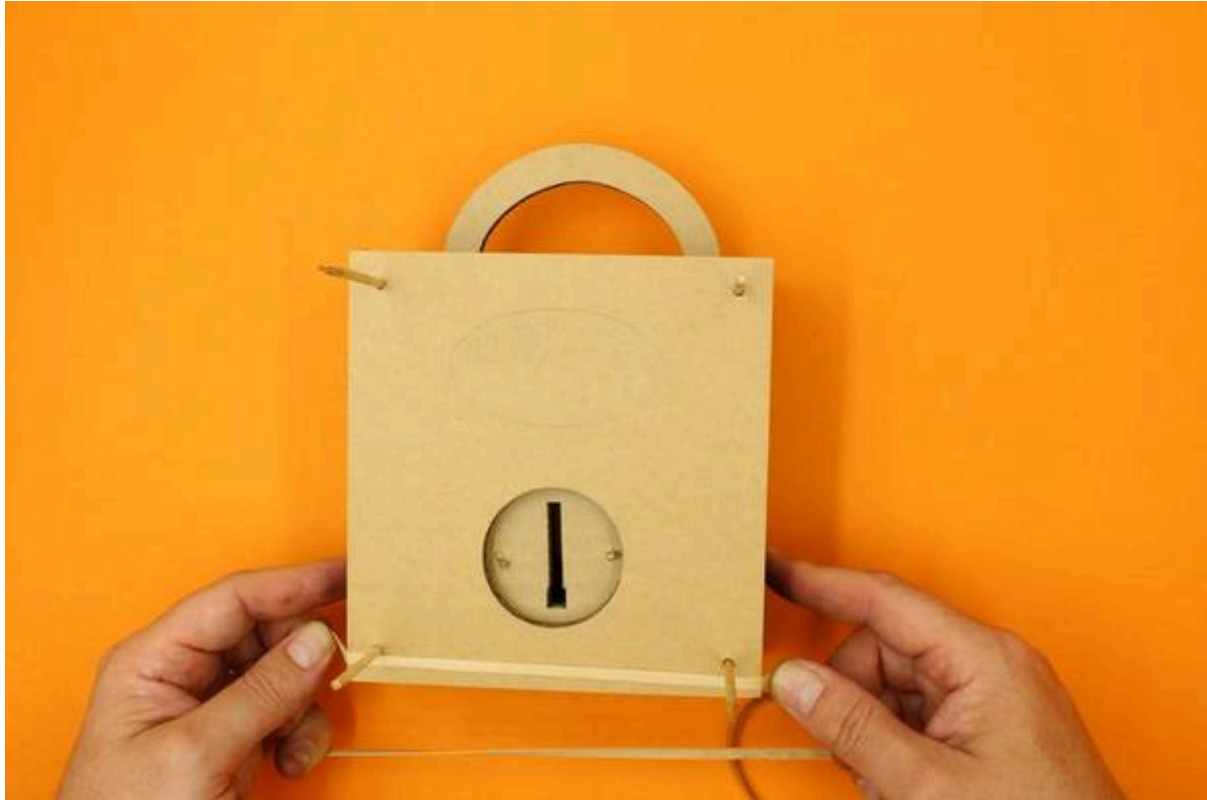
by adding the attractive "Limited Edition" back...



And Front Plates...



Add some Rubber bands to keep it all together...



Add the last 2 skewers into their registration holes.

Finally, trim your skewers...

Congratulations!

You just made a cardboard Tumbler Lock!

The only thing now is to test if it actually **locks**.

And to pick it!

Step Twelve: Test and Pick Your Lock

To test your lock insert the long end of your tension bare (plastic "L" shape) into square hole at the bottom of your key hole and rotate the plug until its in the vertical home (12 O'clock) position.



As you do this you should hear you lock **click** as the springs force the pins into position.



Once its in the 12 O'clock position and the pins are engaged, you should not be able to rotate the plug.



To pick the lock insert your tension wrench and use it to apply a slight rotational force (torque) to the plug.



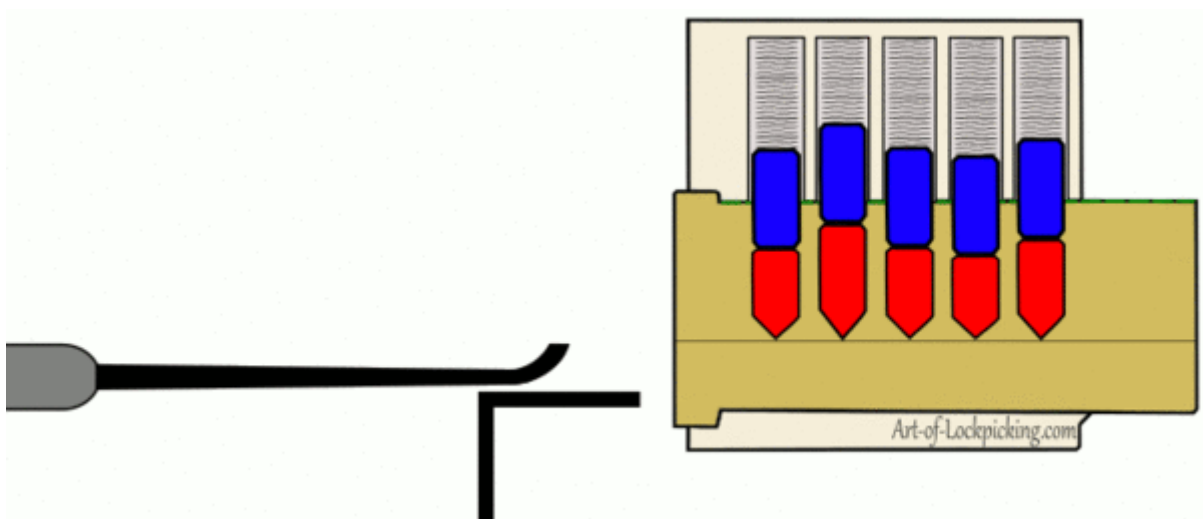
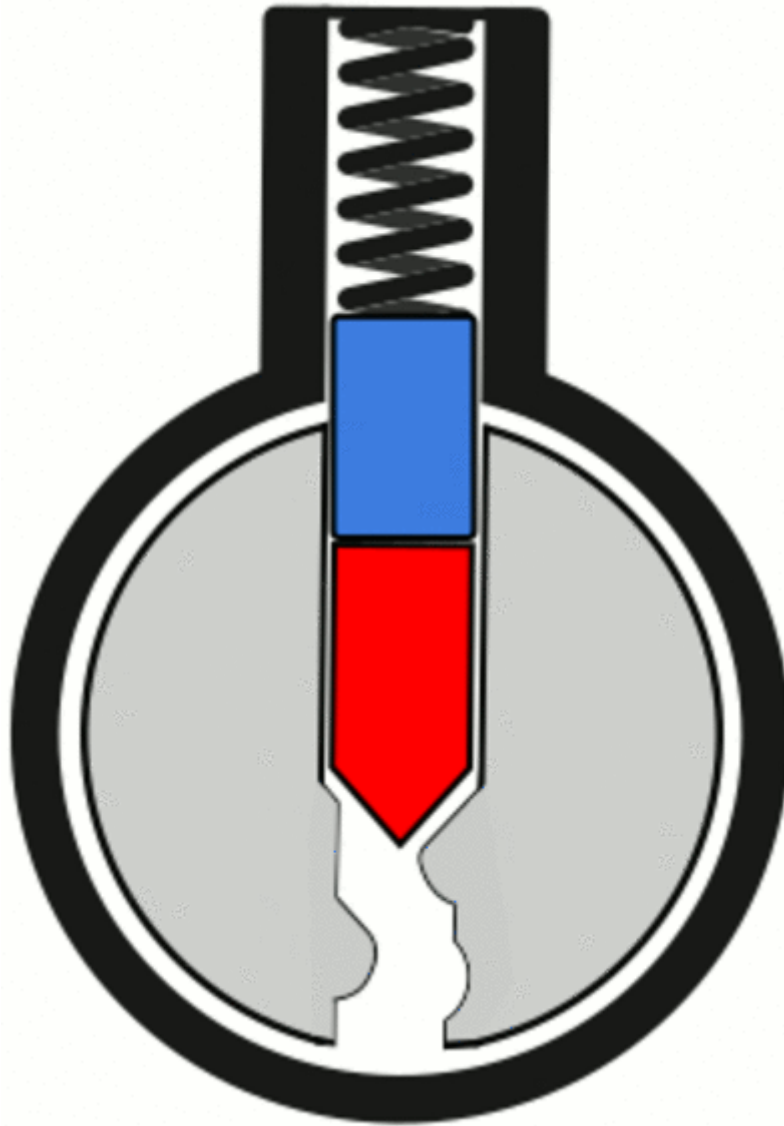
Then use your pick, via the keyhole, to momentarily raise the each of the Key Pins.



If you are doing this correctly the torque on the plug should provide a small ledge for the set pin to rest on at the "Shear Line".

In our lock the shear line is the interface between the Plug Support and Plug sleeve.

It might help you to visualise this.



Keep "picking" until you have all Set Pins resting on the ledge... when you do, the Plug will turn.

Good Luck!

And Remember

