

Phantom Plastic Press v2.0

Full Project Manual

Version 0.2

Updated October 15, 2024



A passion project by Nick Phan started in September of 2023

Press Overview

I have always dreamed of having a press that was portable yet powerful and that I could take anywhere. My body of work consists of making postcard sized prints and having conversations through art within the mail system.

I have made a few table top presses by welding scrap steel together, but those presses were heavy, finicky, leaked oil, and laborious to produce. Even if I passed the plans the those presses to people, it would still be inaccessible to people without welding equipment and skill. This press is designed so that anyone with a 3d printer should be able to reproduce it. Which means people across the world can enjoy this design, even if I cannot sell you one directly.

3d Printing Instructions

PLA

The software I am using is Cura 5.8.0, your results may vary with other slicers but it shouldn't matter.

I print with a 0.4mm nozzle but with a 0.6mm line width for faster printing and better squish for layer adhesion. If you want to try and print like this you may need to print slower than usual to ensure you stay within your max extrusion flow rate.

I print with 0.2mm layer height.

I print the outer wall first then the inner walls.

All parts are printed with 15% infill, but you can use more infill for a more robust press. The little gear I print with 100% infill because it is under the greatest stress and is very thin. It is also prone to getting snagged or hitting the ground first if the press is dropped, thus I choose to print it solid.

The press body has some weird internal geometry around the hole where the screw meets the frame. This is by design to trick your slicer into adding extra walls and filament in those areas to reinforce them.

Most parts are printed without brim build plate adhesion, but some parts I find need a brim, you may need to use a brim to print some parts that I had no trouble printing. I recommend using build plate adhesive for insurance.

The wall thickness listed below is the minimum I need to get a press capable of printing etching, you can always print thicker walls for a more robust press. Mostly only the top roller, bottom roller, and gears would benefit from having more wall thickness.

The top and bottom thicknesses are set to 1mm (5 layers), you could add more for a more robust press.

You need to print 3 pressure knobs, the third one helps you attach the other two.

If you are printing split top and bottom rollers you need to print the body and two keys. The top roller uses two smooth keys, and the bottom roller uses a smooth key and a key with a hex whole which interfaces with the gearbox. The split roller parts are not mentioned in the chart but will use the same wall thickness, z seam placement, infill, but without support.

Parts in Parenthesis () are part of the optional extending wings upgrade. They are not necessary for the press to function, but most people appreciate the extra support for feeding and catching the press bed.

Parts Checklist						
Part Name	# of parts	Wall thickness	Z seam placement	Infill type	Print with Brim	Support
Press Frame	2	1.2mm	Sharpest corner	cubic	sometimes	No
Gearbox mounting plate	1	1.2mm	Sharpest corner	cubic	No	No
Gearbox cover	1	1.2mm	Sharpest corner	cubic	No	No
Lock Pin	1	1.2mm	Sharpest corner	cubic	No	No
Pressure Knob	3	1.2mm	Sharpest corner	triangle	No	No
Handle	1	1.2mm	Centered if possible	cubic	No	No
(Extending wings left)	(2)	1.2mm	Sharpest corner	cubic	No	No
(Extending wings right)	(2)	1.2mm	Sharpest corner	cubic	No	No
Big gear	1	1.8mm	Sharpest corner	triangle	Yes	No
Middle gear	1	1.8mm	Sharpest corner	triangle	Yes	No
Little gear	1	1.8mm	Sharpest corner	solid	Yes	No
Top roller	1	1.8mm	Random	cubic	No	yes
Bottom Roller	1	1.8mm	Random	cubic	Yes	No
Bed support roller	2(4)	1.2mm	Sharpest corner	triangle	Yes	No
(Extending wings connector)	(2)	1.2mm	Sharpest corner	triangle	Yes	No

ABS/ASA

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The wall thickness listed below is the minimum I need to get a press capable of printing etching, you can always print thicker walls for a more robust press. Mostly only the top roller, bottom roller, and gears would benefit from having more wall thickness. Because ABS/ASA is not as stiff as PLA I find that you need an extra wall for the top roller, bottom roller, and gears to compensate.

The top and bottom thicknesses are set to 1mm (5 layers), you could add more for a more robust press.

You need to print 3 pressure knobs, the third one helps you attach the other two.

If you are printing split top and bottom rollers you need to print the body and two keys. The top roller uses two smooth keys, and the bottom roller uses a smooth key and a key with a hex hole which interfaces with the gearbox. The split

roller parts are not mentioned in the chart but will use the same wall thickness, z seam placement, infill, but without support.

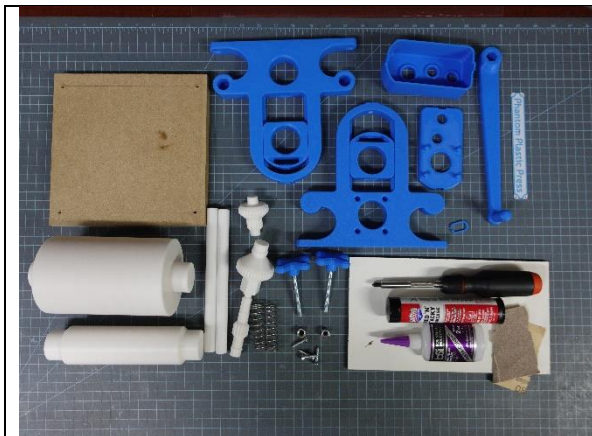
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Lock Pin	1	1.2mm	Sharpest corner	cubic	No	No
Pressure Knob	3	1.2mm	Sharpest corner	triangle	No	No
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(Extending wings left)	(2)	1.2mm	Sharpest corner	cubic	No	No
(Extending wings right)	(2)	1.2mm	Sharpest corner	cubic	No	No
Big gear	1	2.4mm	Sharpest corner	triangle	Yes	No
Middle gear	1	2.4mm	Sharpest corner	triangle	Yes	No
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Top roller	1	2.4mm	Random	cubic	No	yes
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Bed support roller	2(4)	1.2mm	Sharpest corner	triangle	Yes	No
(Extending wings connector)	(2)	1.2mm	Sharpest corner	triangle	Yes	No

Assembly Instructions

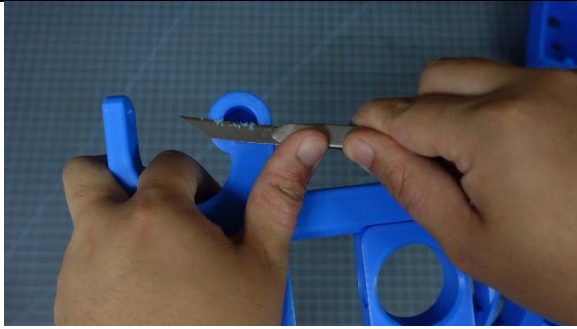
Basic Press

Project time: 1 hour 30 minutes.



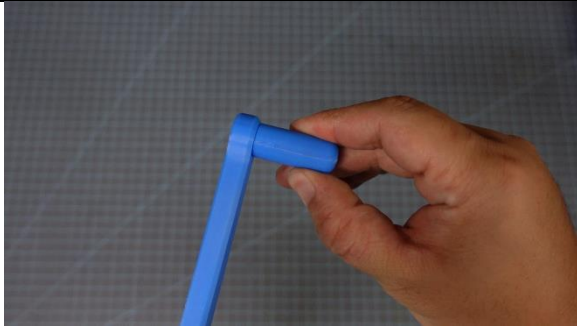
External hardware:

- Two 5/16" x 3" threaded rods (8mm x 80mm threaded rod)
- Two 5/16" nylon lock nuts (8mm nylon lock nut)
- Superglue such as Cyanoacrylate or E6000
- Lubricating grease (Red "n" Tacky works best, super lube synthetic works decently)
- Sandpaper (60 or 80 grit)
- Four screws
- Screwdriver
- Drill for pilot holes (optional)
- Piece of wood for a base (8"x8" or 205mmx205mm minimum)
- Masking tape (optional)
- Two 3/4 x2-3/16 x .063WG compression springs (18mm x 60mm x 1.5mm) (optional)
- Skateboard grip tape (optional)



Preparation Step one(optional):

Clean up some rough ridges on the print's surface. Using a razor blade or scraper you can flatten the part of the press by the bed support rod holes. This spot often gathers ridges if your pressure advance isn't dialed in perfectly. The press bed slides along this area so it is beneficial to smooth it out. If you use ironing or printed this side contacting the buildplate then you may not have to do this.



Preparation Step Two:

Free the handle knob so that it can spin freely. Wiggle this knob back and forth until it is free spinning. If your printer's tolerances are off by .2mm or more then it may be possible that this will not break free.



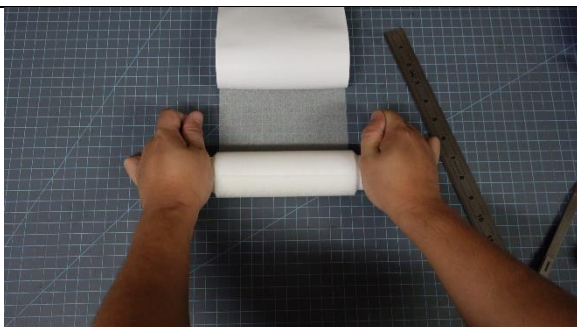
Preparation Step Three:

Using rough sandpaper, like 60 or 80 grit, sand the top drum of the press. You do not need to sand the smaller ends of the roller where it will connect to the press frame. Sand this roller until the seam bumps can no longer be felt when running your hand across it. Leave the roller texture rough, as it will be less likely to let your paper or felts slip if the texture is rough.



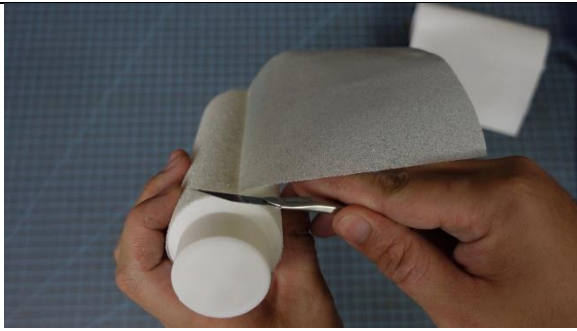
Step Four:

Using rough sandpaper, like 60 or 80 grit, sand the bottom drum of the press. You do not need to sand the smaller ends of the press where the roller would connect to the press frame. Clean off all dust made from sanding this area



Preparation Step Four(b) (optional):

Cut a piece of grip tape to the same width as the middle portion of the bottom roller, ~6 inches (150mm) or ~8 inches (200mm). Then wrap your bottom roller in this grip tape. I lay the grip tape sticky side up on a table, and then roll the roller across the tape.



Preparation Step Four(c) (optional):

Once you wrap the grip tape all around the roller, make a crease where it meets the beginning. Using your knife you can make a cut mark on both ends of the crease.



Preparation Step Four (d) (Optional):

Unravel the grip tape so you can place it flat on the work surface and use a ruler to cut a straight line across the crease, or from cut mark to cut mark. You may need to trim off some excess if you roll the grip tape back up and find that the end overlaps the beginning. Make sure there is no overlap.



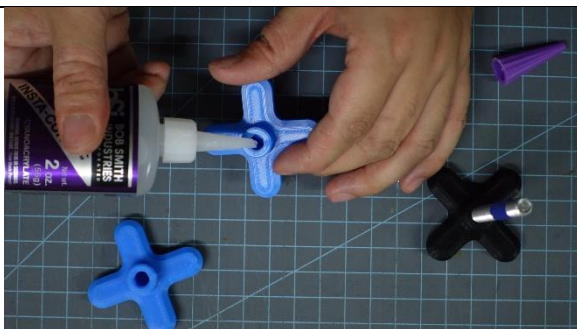
Preparation Step Four (e) (optional):

Place a generous amount of superglue on the roller where the ends of the grip tape meet. Then stick down the ends of the grip tape to the roller. Put a protective sheet of paper on your table and roll the roller back and forth to ensure even pressure across the entire roller, continue this until the glue has set. This will prevent the grip tape from unraveling over time.



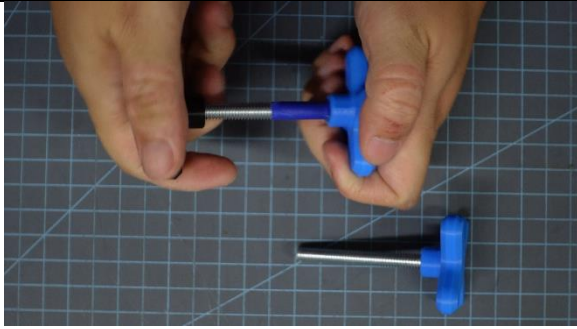
Assembly Step One

First measure 15mm off the end of the threaded rod and mark it. That is how deep we are going to thread the knobs onto it. The tape on the threaded rod in this picture marks 15mm for me.



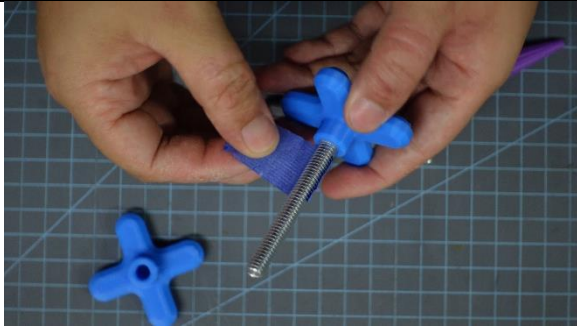
Assembly Step Two:

Then put a few drops of epoxy or superglue into the cavity of the knob. Avoid letting it drip down the side, and try to apply it at the bottom of the cavity. A slower epoxy like e6000 works well for this.



Assembly Step Three:

Then thread knobs on both sides of the threaded rod and keep twisting them together until your knob reaches the 15mm mark. DO NOT use pliers to turn the threaded rod because you don't want to crush the threads. Crushed threads will cut wider grooves than desired into the frame, causing critical failure to the press.



Assembly Step Four:

Once the glue has settled, take off the other knob and then repeat the process for the second pressure knob.



Assembly Step Five(optional):

Apply a generous amount of grease to the teeth of the gears. While the gears do not reach insane speeds or amounts of friction, it is good to heavily lubricate them since we will never open the gear box again. This will ensure smooth operation for a long time.



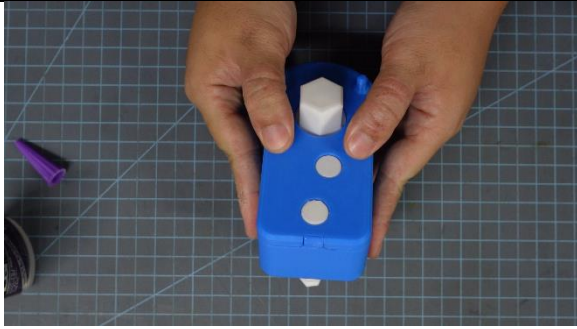
Assembly Step Six:

While holding the gearbox cover with the round side to your right, Insert the gears from left to right. First, place the crank gear with the hex side through the cover. Next, place the middle gear with the wider side at the bottom of the cover, the teeth should engage the crank gear. Lastly, place the hex keyed gear with the hexagonal side facing up.



Assembly Step Seven:

Place a line of super glue around the lip of the open side of the gearbox cover.



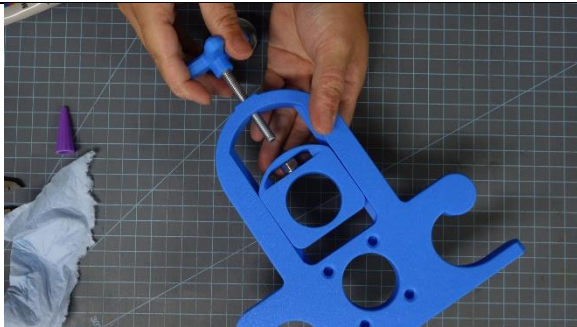
Assembly Step Eight:

Place the gearbox mounting place overtop this gap, making sure all the gears are aligned with the corresponding holes. You may have to slot one side into the locking tab first and then force the other side under its locking tab. These tabs aid in alignment and hold the two halves together while the glue dries.



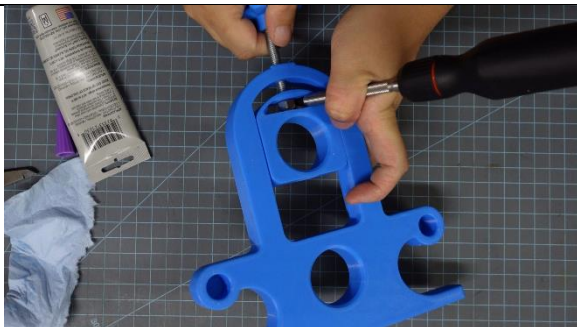
Assembly Step Nine (optional):

Apply grease to the threaded rod, this will make raising and lowering the pressure knobs a smoother action.



Assembly Step Ten(a):

Thread your knob through the top portion of the press body. Once it is through to the other side insert a lock nut (with the nylon side facing the roller hole) in the top gap of the bearing block. Using your fingers or a pair of pliers, hold the lock nut in place and screw the threaded rod into the lock nut until it is securely fastened.



Assembly Step Ten(b):

If you don't have pliers I have found success by jamming a screwdriver between the wall and the nut to prevent it from turning. You want to put the lock nut on tightly so that it does not unscrew itself when raising and lowering pressure, but not tightened so far that it sticks out the other side of the nut.

Repeat steps 9 and 10 for the other press frame.



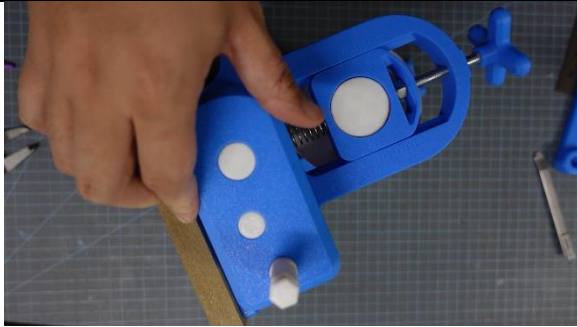
Assembly Step Ten(c) (optional):

Place your spring between the bottom of the press frame cavity and the bearing block, there should be two recessed cavities for the spring to sit in. I like the spring as it eliminates a little bit of play with the bearing block, but the press functions perfectly without it.



Assembly Step Eleven:

Pick one of the press bodies and attach the gearbox to it. Apply superglue into the peg holes and on the body of the press in between the peg holes. Take care not to get glue in the hole where the roller will be.



Assembly Step Twelve:

When staring down at the press body, the curved side of the gearbox will be on the left side. Fasten the gearbox into the peg holes, the gearbox will only work in one direction. If you put the gearbox in facing the other direction it will not align with the bottom roller.



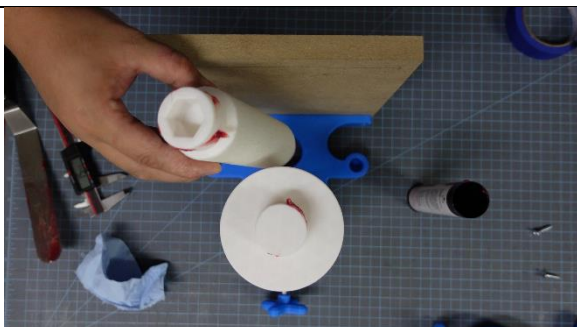
Assembly Step Thirteen:

Screw the press body half that does not have the gearbox into the wooden base. Drilling pilot holes can help with this. Driving these screws in at an angle makes this easier, since the arms of the press frame are directly above this screw hole. Do not use a drill to drive this screw, and do not over tighten the screws as excessive pressure may crack the 3d print.



Assembly Step Fourteen (a):

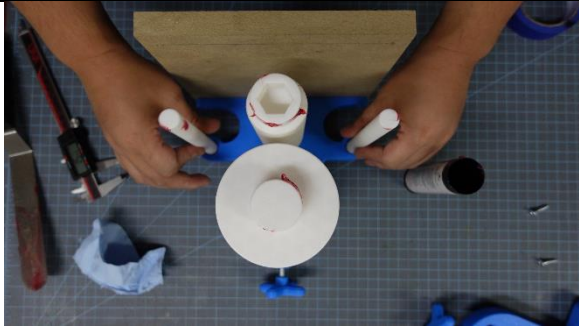
Apply grease to the ends of the top roller and bottom roller. It is important to apply a generous amount of grease if you plan to print etchings, otherwise, the press will make a lot of noise when under extreme pressures.



Assembly Step Fourteen (b):

Place the smaller roller in the fixed bottom hole, and the bigger roller in the top hole within the bearing block. Spin the rollers to work the grease around.

If you are adding extending wings, then stop here in this section. Move on to the “extending wings version” section.



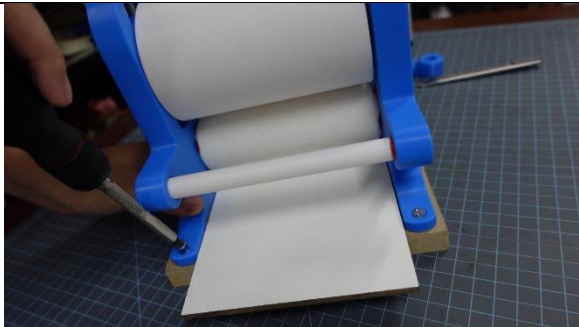
Assembly Step Fifteen:

Place the two press bed support rods into the two remaining holes on the side. You do not need to lubricate these but can if you wish.



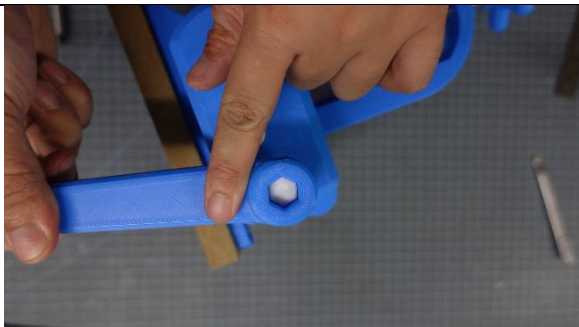
Assembly Step Sixteen:

Place the other press body overtop this stack like a sandwich. If you are having trouble getting rods and rollers into their holes try adjusting the bearing blocks so they are approximately the same distance down the frame. If the bottom roller wont fit try rotating the bottom roller or crank gear until the hexagons align.



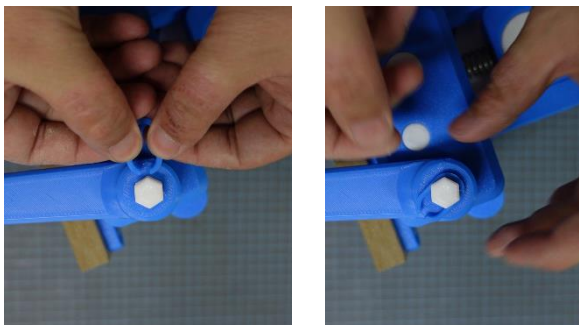
Assembly Step Seventeen:

Screw in the other press body to the wood base. You can use a clamp to hold the two halves together, I use the press bed as a spacer to determine the spacing between press bodies. If you have the 6inch version of the press you can use the nameplate as a spacer.



Assembly Step Eighteen:

Slide the handle onto the crankshaft which sticks out of the gearbox. Push it down as far as you can, it will not touch the gearbox cover, it is designed to stop before that.



Assembly Step Nineteen:

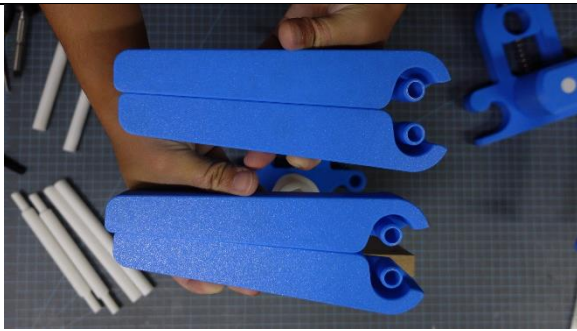
Open the gap on the lockpin and then slide it over the narrow section of the crank gear.

Extending wings version



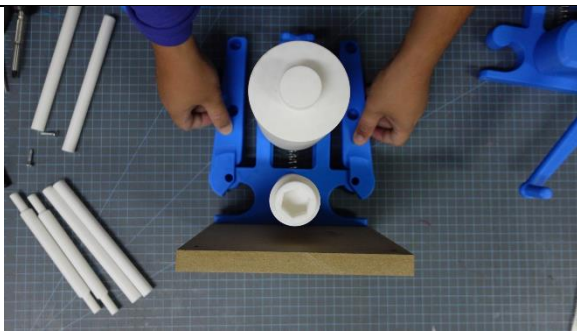
Assembly Step Fifteen:

Remove the built in support rings from the extending wing frames. Use pliers or a utility knife to wedge it off.



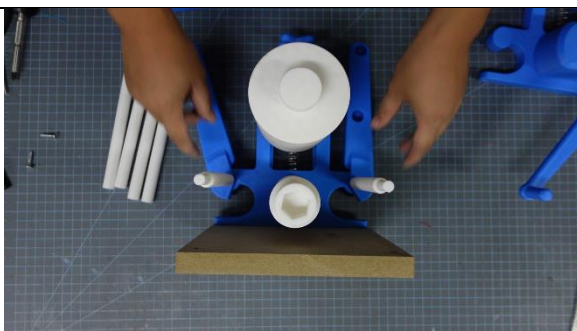
Assembly Step Sixteen(a):

Grab one left wing frame and one right wing frame, they should look like mirrored versions of each other.



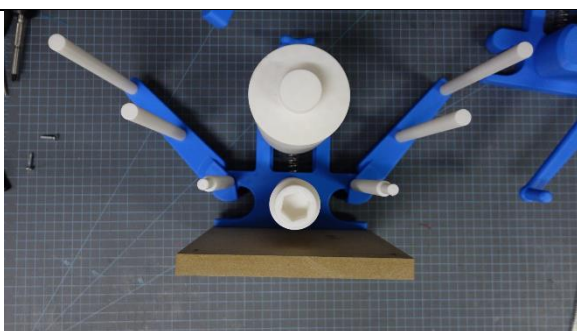
Assembly Step Seventeen(b):

Place the cylinder side of the wing into the hole where the bed support rod used to be. These wings should be able to rotate 90 degrees and stop when outstretched. If the wing doesn't fit as shown, you may need to try the other one.



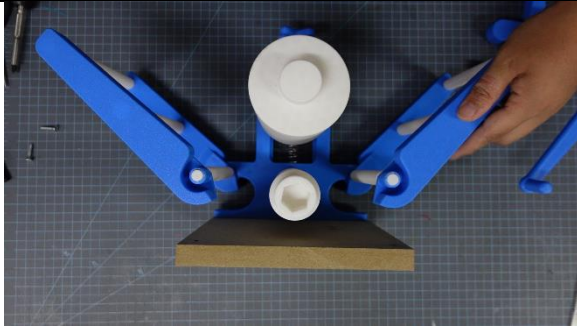
Assembly Step Eighteen(a):

Take the two roller connectors, they look like bed support rods but have tapered ends, and place them in the holes closest to the bottom roller.



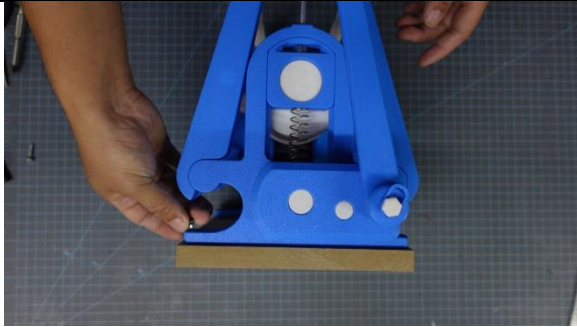
Assembly Step Eighteen(b):

Populate the remaining holes with the 4 bed support rods.



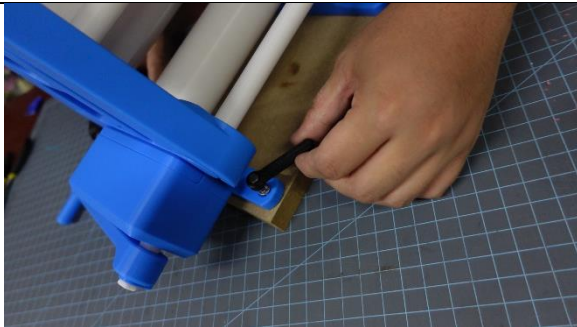
Assembly Step Nineteen:

Place the 2 remaining left and right wing frames over the rods. Each rod should slot into the corresponding holes of the frame.



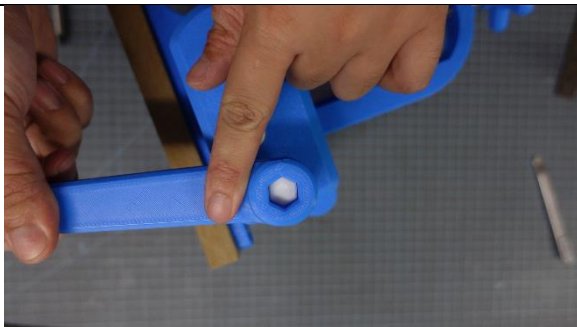
Assembly Step Twenty:

Replace the frame of the press overtop the remaining parts. The wings should slot into the bed support rod holes, and the top and bottom rollers should fit into their corresponding holes. You may need to turn the crank handle of the press to get the gear to align with the bottom roller hole.



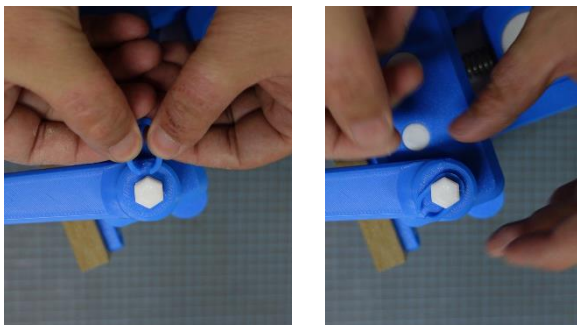
Step Twenty one:

Reattach the frame to the base. Place both of the screws back into the holes connecting the press frame to the base. Tighten both screws at the same time little by little, this will keep the frame centered and not pulled towards one side. If your screwdriver cannot engage the screw at this steep angle, make a low profile screwdriver with a screwdriver bit and the 1/4" 3d printed handle.



Assembly Step Twenty Two:

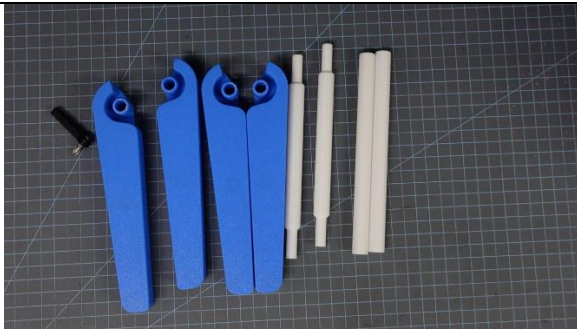
Slide the handle onto the crankshaft which sticks out of the gearbox. Push it down as far as you can, it will not touch the gearbox cover, it is designed to stop before that.



Assembly Step Twenty Three:

Open the gap on the lockpin and then slide it over the narrow section of the crank gear.

Adding Extending wings to an existing press



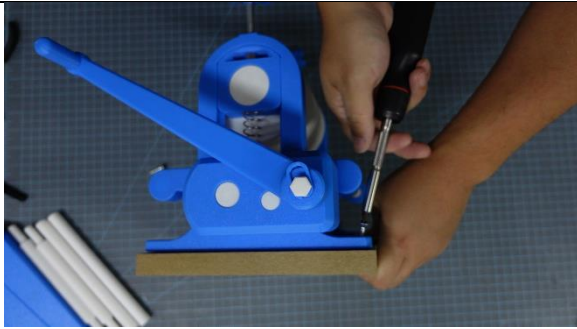
Project time: 10 minutes

The Kit should include:

- 2 left wing frames
- 2 right wing frames
- 2 roller connectors
- 2 bed support rods
- 1 low profile Phillips head screwdriver

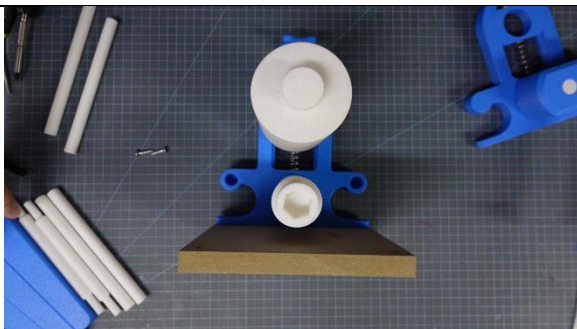
Additional hardware:

A screwdriver with a 4in(100mm) shaft can help speed up this process



Step One:

Remove the half of the press with the gearbox attached. To do this remove the two screws that are holding it into the base. Do not lose these screws since we will need them to reassemble the press.



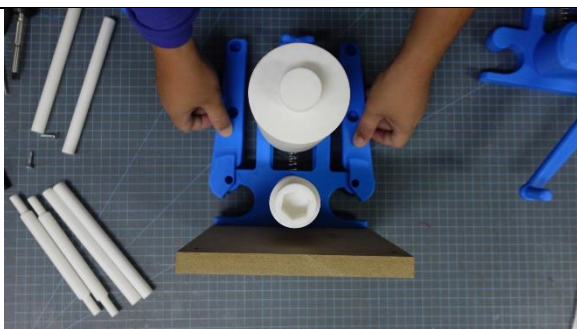
Step Two:

Remove the half of the frame with the gearbox attached and the 2 bed support rods. Set your press on its side as shown in the image to the left.



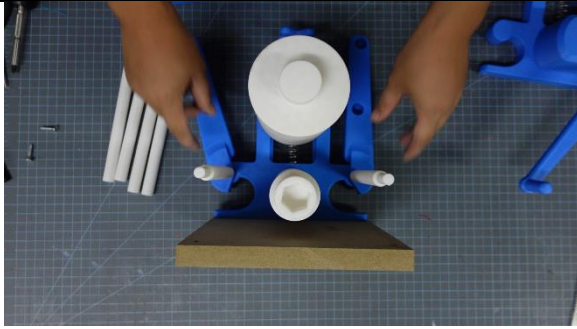
Step Three:

Grab one left wing frame and one right wing frame, they should look like mirrored versions of each other.



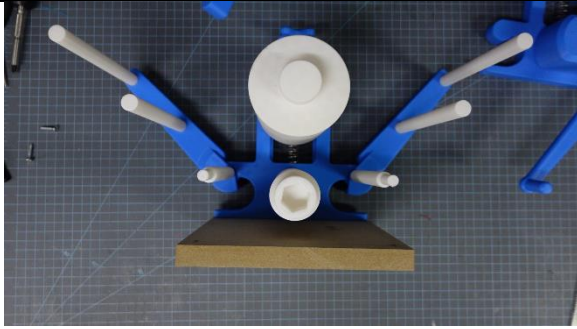
Step Four:

Place the cylinder side of the wing into the hole where the bed support rod used to be. These wings should be able to rotate 90 degrees and stop when outstretched. If the wing doesn't fit as shown, you may need to try the other one.



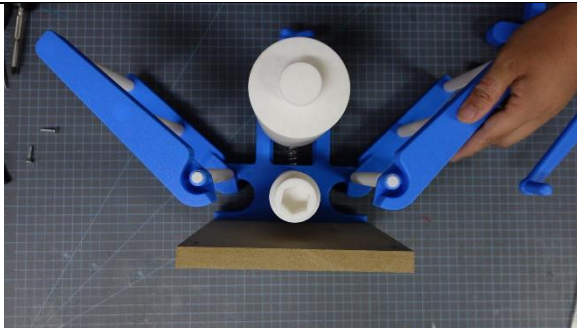
Step Five:

Take the two roller connectors, they look like bed support rods but have tapered ends, and place them in the holes closest to the bottom roller.



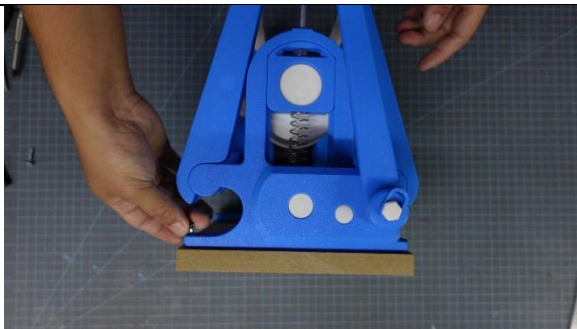
Step Six:

Populate the remaining holes with the 4 bed support rods.



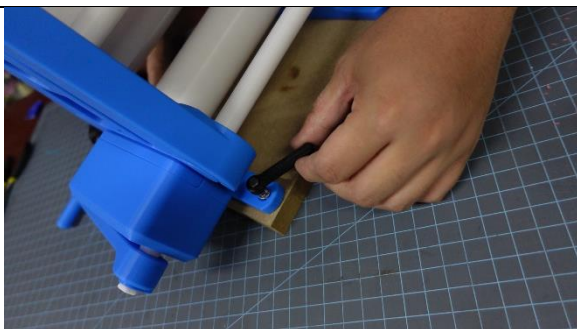
Step Seven:

Place the 2 remaining left and right wing frames over the rods. Each rod should slot into the corresponding holes of the frame.



Step Eight:

Replace the frame of the press overtop the remaining parts. The wings should slot into the bed support rod holes, and the top and bottom rollers should fit into their corresponding holes. You may need to turn the crank handle of the press to get the gear to align with the bottom roller hole.



Step Nine:

Reattach the frame to the base. Place both of the screws back into the holes connecting the press frame to the base. Tighten both screws at the same time little by little, this will keep the frame centered and not pulled towards one side. If your screwdriver cannot engage the screw at this steep angle, use the provided low profile screwdriver.

Maintenance



Since this press is using 5/16" – 18 threaded rods, then a quarter turn of the pressure knobs will raise/lower the roller by 1/72 of an inch. So we can at least calibrate the rollers to be parallel within 1/72 of an inch. Go ahead and place your press bed onto the rollers and lower both sides of the top roller until it is touching the press bed.



Grab a strip of copy paper and try to slide it under the left half and the right half of the roller. It should not be able to slide under either side, if it can then lower the rollers until it cannot slide under. Raise both sides of the press bed a quarter turn at a time until you can slide the paper under either of the two sides.



If you can slide the paper under one side but not the other: Raise the side of the roller that is blocking your paper a quarter turn. If you cannot slide the paper underneath still, then repeat.
If you can slide the paper under both sides: then lower both sides of the press a quarter turn at a time and see if you cannot slide the paper underneath. If you cannot slide the paper under then congratulations your rollers are in sync.



You will want to keep your rollers in sync so you know you are keeping even pressure across your press. To keep track of this, use some tape or a marker to mark a set of knob arms. Choose an arm on both knobs that are pointing in the same direction. In the future when changing pressure try to move both knobs at the same time and keep them oriented in the same direction to ensure even pressure.

Using the press