



Out Of Marbles “The Bucket Lift” Motor & Hand Crank

3D Printable model

DOCUMENTATION UPDATED ON: 18. January 2023

Fully printable Marble Machine for your 3D Printer

This is the third marble machine released by **Out Of Marbles**. We will keep all of the modules interchangeable between the machines.

Details

Length	180mm
Width	180mm
Height	180mm
Marble Size	7.14mm 9/32"
Motor Speeds	N20 Motor 15 RPM
Battery type	2x AA or 2x AAA
Printing time	Less than a day
Minimum printer bed	180x180x180 mm
Recommended Filament	PLA Extrafill
Amount of filament	/

Chat Support

I have created a **Discord channel** where we can talk in real-time and try to resolve any potential issues that you have or any questions or suggestions that you have. Everyone is welcome. It is very important to me that you are happy with your marble machine :)

Use this link: <https://linktr.ee/outofmarbles>

Requirements

3D printer:

- Minimum 3D printer build volume: 180 x 180 x 180 mm
- Any standard slicing software (*PrusaSlicer, Cura, Simplify3D, etc*)
- 0.4mm nozzle

Tools

- Craft / Exacto knife
- Sandpaper 240-600 Grit
- Hot glue gun OR instant glue OR similar
- 2.5 Hex (Allen) key
- Pliers
- Tweezers

Bill of materials

- Filament of your choice. *PLA works perfectly. I use [PLA Extrafil](#) in two different colors.*
- [50x 7.144mm | 9/32" Stainless steel ball bearings](#)
- [Motor N20 3V 15 - 60RPM](#) (*I use 15RPM*)
- 2x AA or AAA 1.5V battery
- [AA or AAA battery holder](#)
- CA Super/instant glue or Hot glue gun
- [12mm metal Locking Latching switch](#)

Print settings:

Using PrusaSlicer and my settings

I suggest that you use **PrusaSlicer** at least for the printing of this model because you can simply open my provided .3mf files and all of the proper settings will already be applied. You just need to change the **Filament setting** option to match yours if you are not using Fillamentum PLA and also change **bed size** if using a different printer than Prusa mk3s.

Using your slicer and settings

If you want to slice it yourself in some other slicer, then follow these print settings for best results:

- Use **Adaptive Layers** height function in your slicer and make rolling surface as smooth as possible
 - In CURA: To access Adaptive Layers go to the |Top Tool Bar > Settings > Configure Setting Visibility > Type 'Adaptive Layers' in search bar > Click on Checkbox| to make it visible. You can now find Adaptive Layers in Print Settings Custom under Experimental Modes. Then turn on Adaptive Layers, and you can leave settings on default.
- TBL_Base - Print at 0.3mm or lower. Use Adaptive Layers.
- TBL_Non Colored Parts - Print at 0.3mm or lower. Use Adaptive Layers.
- TBL_Colored Parts - Print at 0.3mm or lower. Use Adaptive Layers.

Supports

No supports needed anywhere

A tray to store your marbles



This is a tray that you can print with the lid where you can store 50 marbles when you are not using them in the marble machines.

It was suggested on my discord channel and it was a super fun project to do.

[Download it here for free.](#)

Assembly instructions

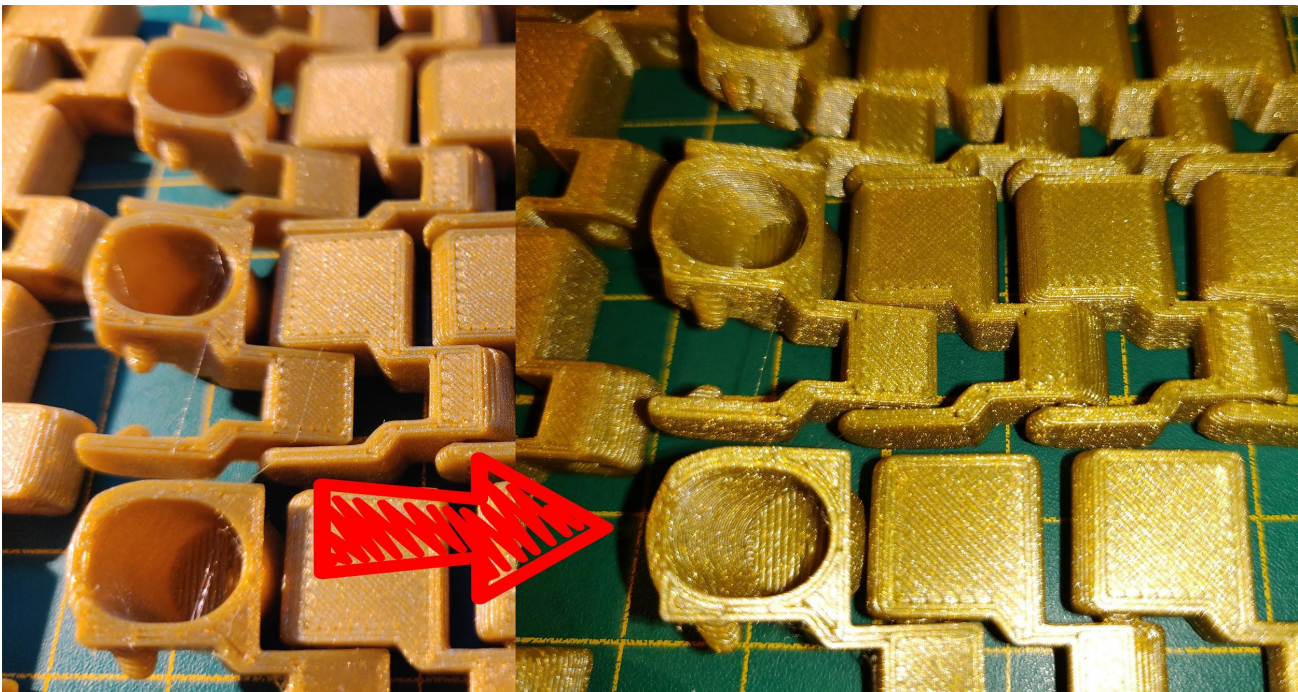
I. Calibrate your printer with Test Fit print

Please go to our [FAQ](#) and follow instructions.

II. Print all the parts

Print the parts with recommended settings found on the previous page.

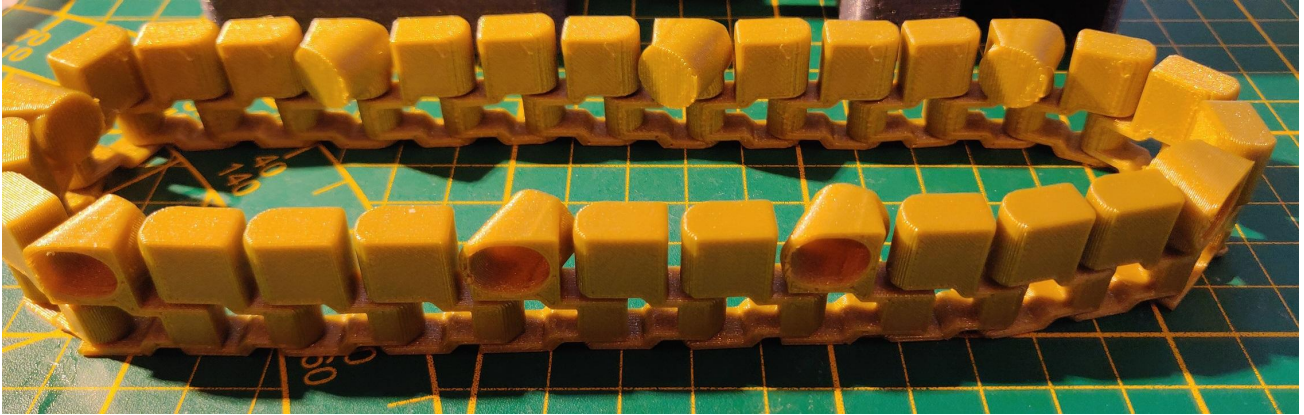
III. Cleanup



Postprocess all the parts. Remove loose strands, sand down any 3d printing imperfections, etc... Check also the insides of the buckets.

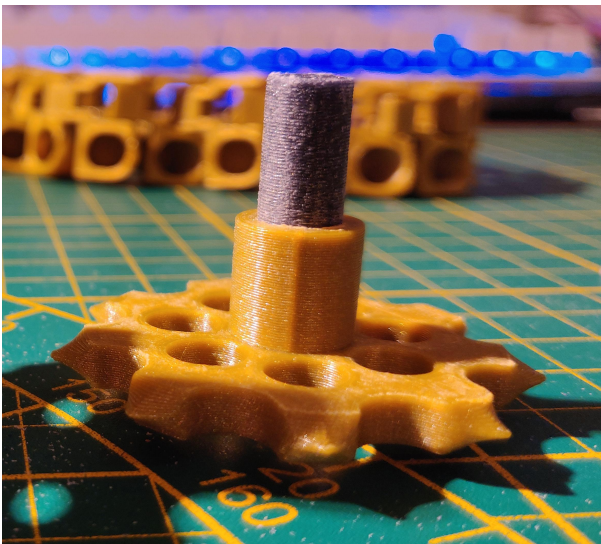
Step 1

Snap the chain together so that the buckets will be facing outside.



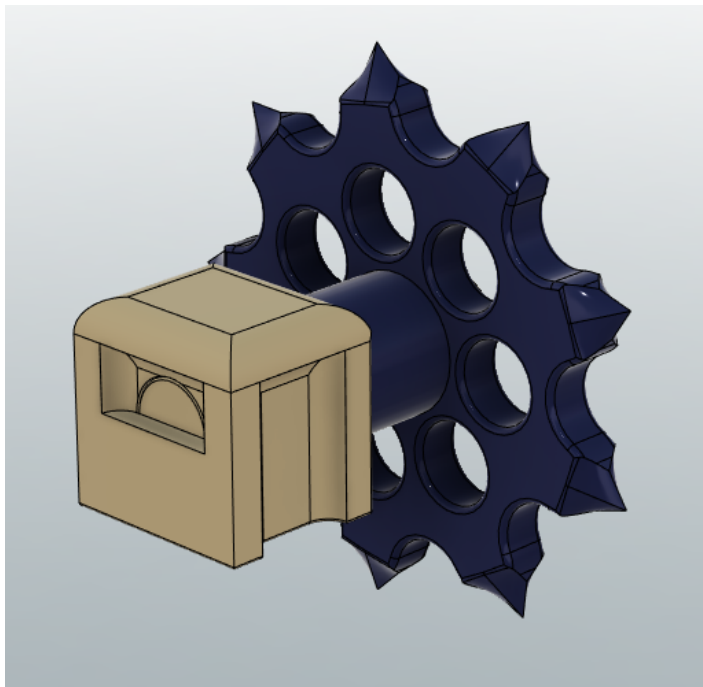
Step 2

Assemble the top gear assembly. Take the axle and place the gear on it.



The gear needs to rotate on the axle as smoothly as possible. If it does not, you should sand down the 3d printing seams and any imperfections. The smoother the gear rotates, the easier it will be for the motor to turn, prolonging its life and noisiness, so it is worth getting them as smooth as possible.

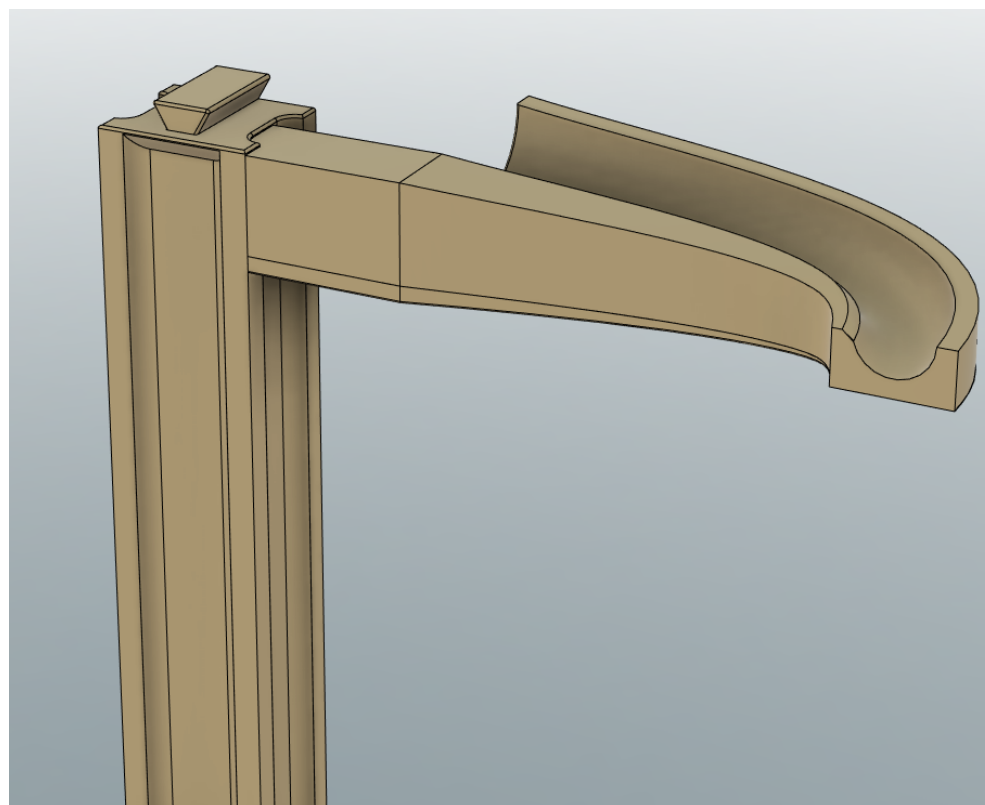
Step 3



Then take the top piece of the pillar, and insert the top gear assembly into it.

DO NOT GLUE IT YET

Step 4



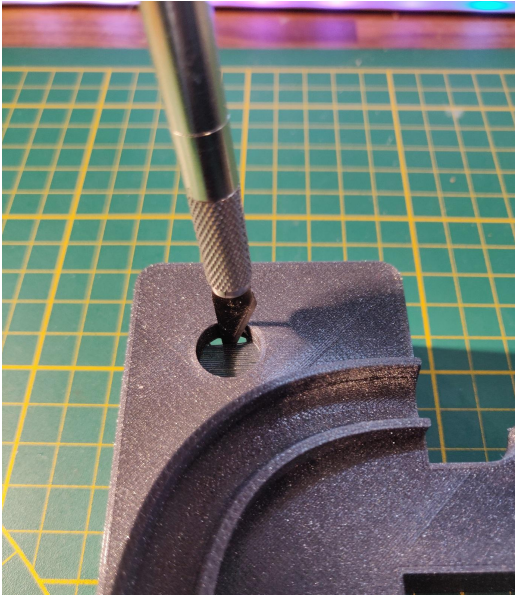
Take the pillar and insert the top path into it. You can glue it if needed.

Try to push it all the way in and sand any imperfections if it will not go in.

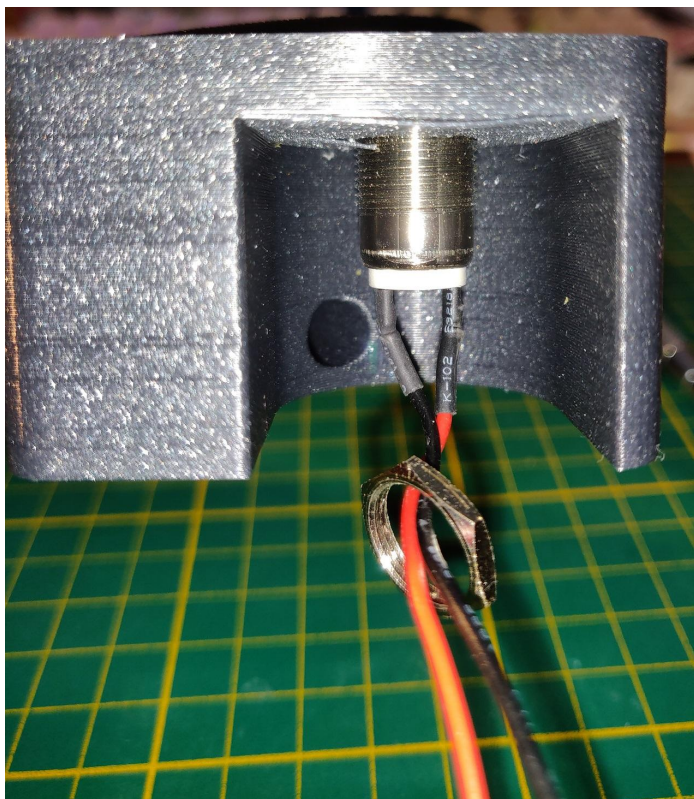
Be mindful of the orientation of the pillar and the path.

Step 5

Cut away the built in support layer, for where the on/off switch will go.



Step 6



Insert the on/off switch from the top, and then secure it with the nut that came with the switch.

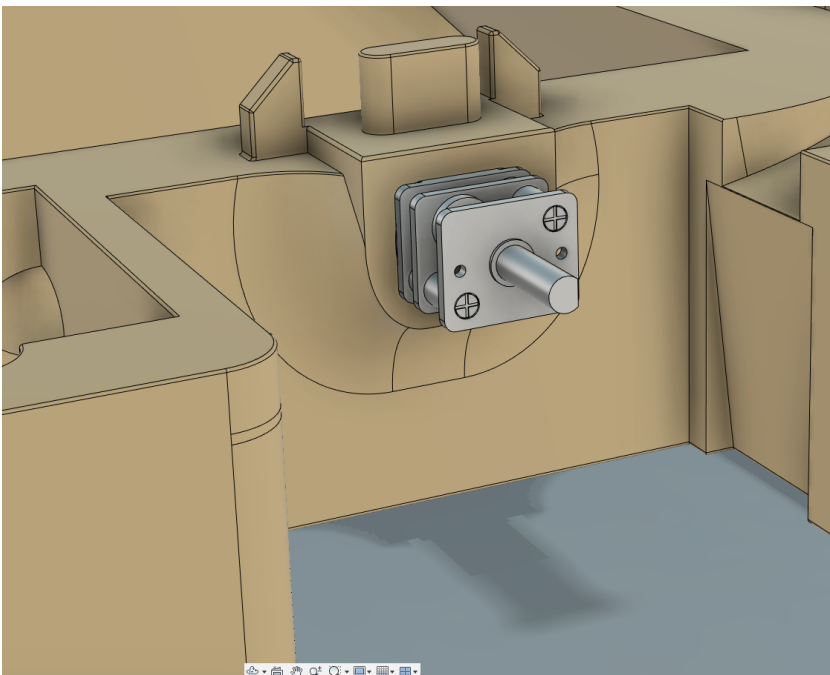
Step 7



Insert the wires through the hole.

Step 8

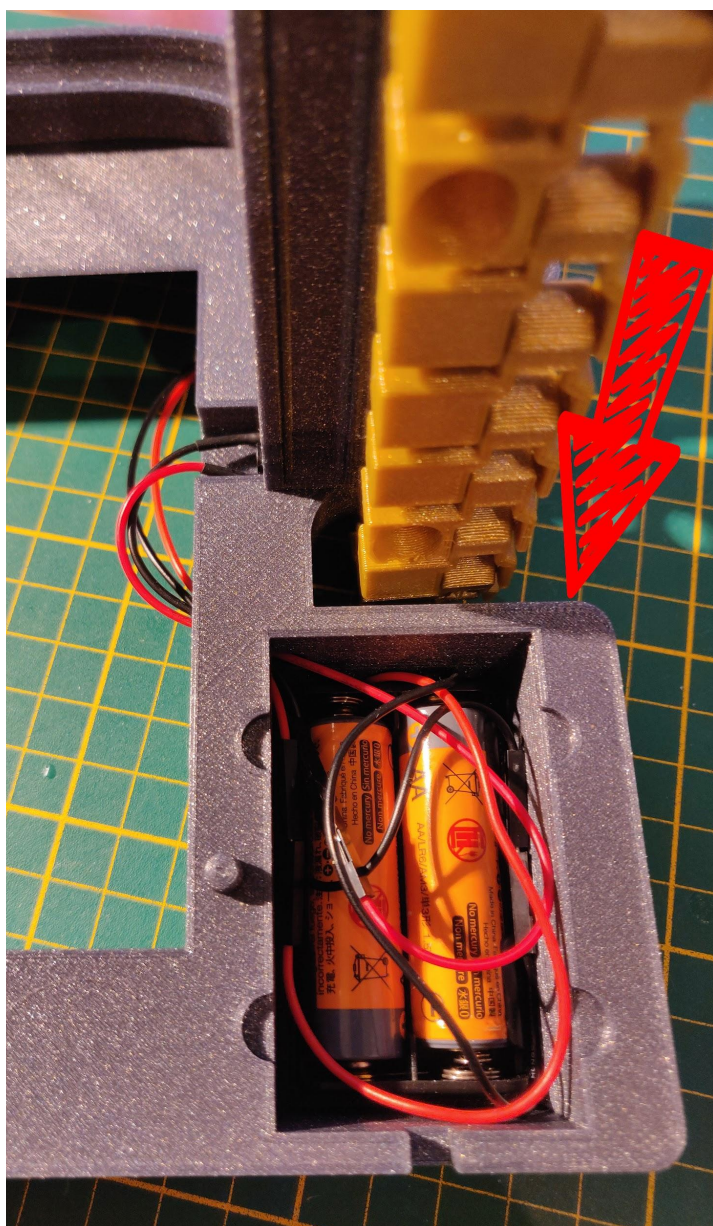
Place the wires through the hole and the motor in its place.



Step 9

Insert the batteries into the battery holder and then place it into the compartment on the marble machine.

Next, guide the 4 wires through the hole into the battery compartment.



Electrical wiring -Buying our Hardware Kit



Here is a link to our **Hardware Kit**:

<https://outofmarbles.com/hardware>

We ship you a motor, battery holder and switch already pre-wired. This is the simplest option.

Connect the wiring like this:

Black from motor, to **black** on battery holder

Red from motor to **red** on switch

Red from switch to **red** on battery holder

(Both red wires on the switch are the same)

When you turn it on, the chain/motor should move in the direction of the red arrow.

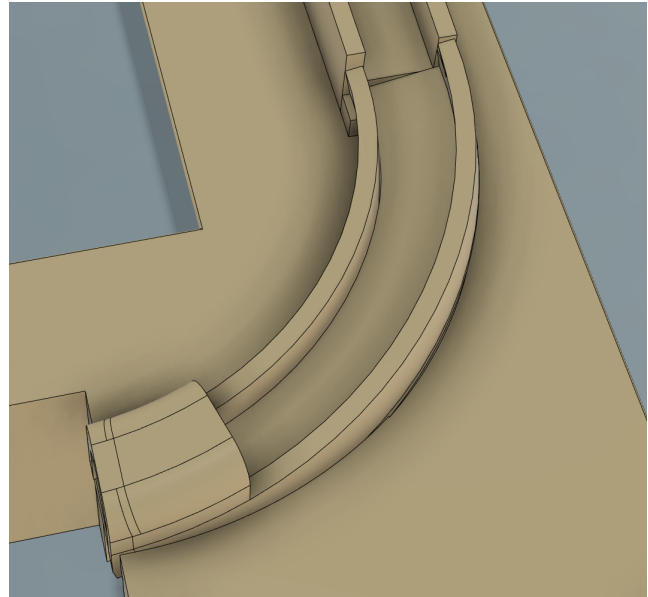
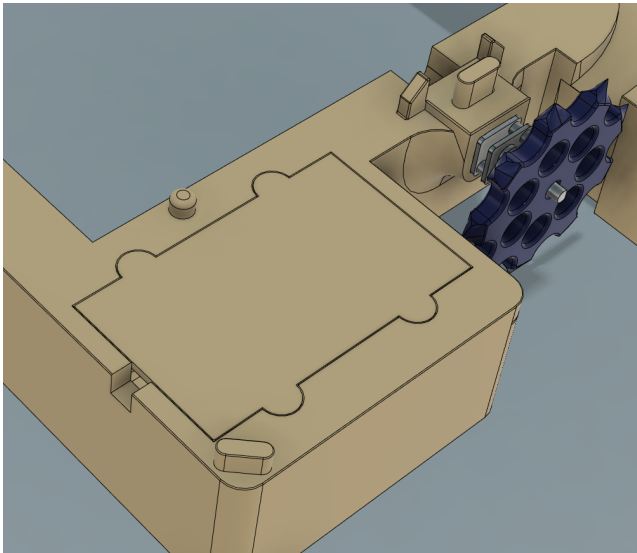
You can use hot glue to secure wires in place, but don't glue the batteries in.

Electrical wiring - DIY

You can also source the parts on your own, but you will need to solder the wires together.

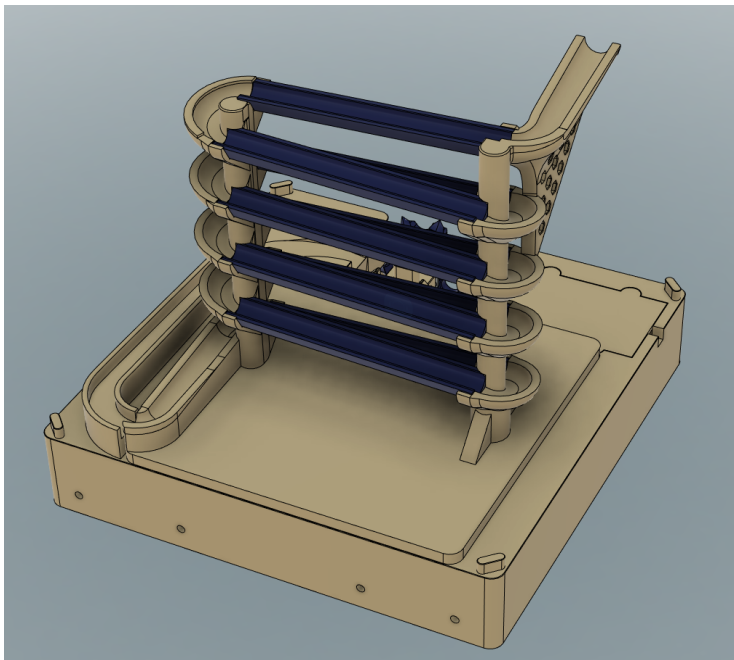
Step 10

Cover the battery compartment. Then place the bottom path in its position. You can glue the path.



Step 11

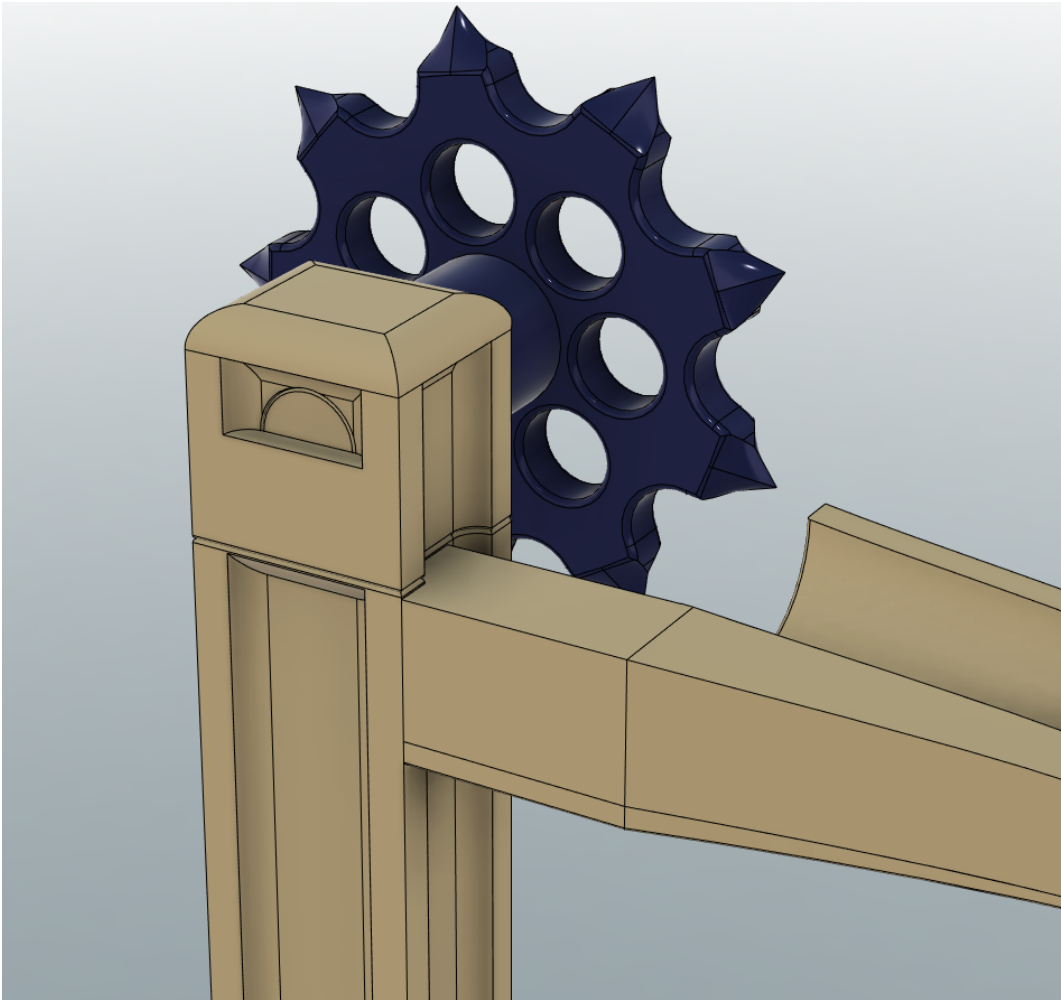
Place one module in its position. If you don't have the module yet. Then I suggest you print and assemble on first and come back to this step when you do that.



Step 12

Slide the top pillar assembly onto the pillar. It will only slide from one direction. If it is too hard to slide, then sand down any imperfections.

DO NOT GLUE IT YET

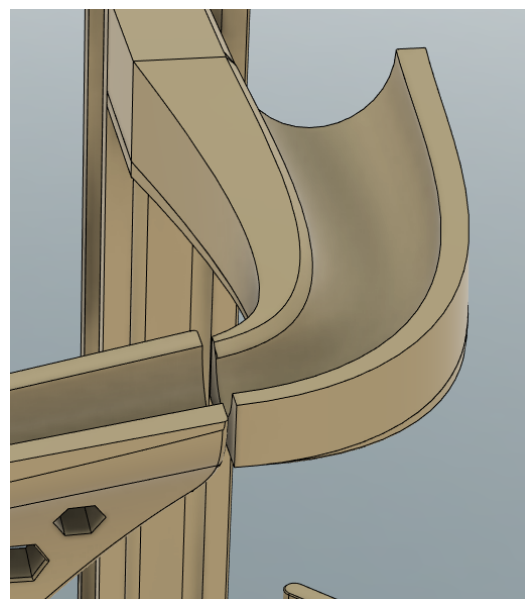
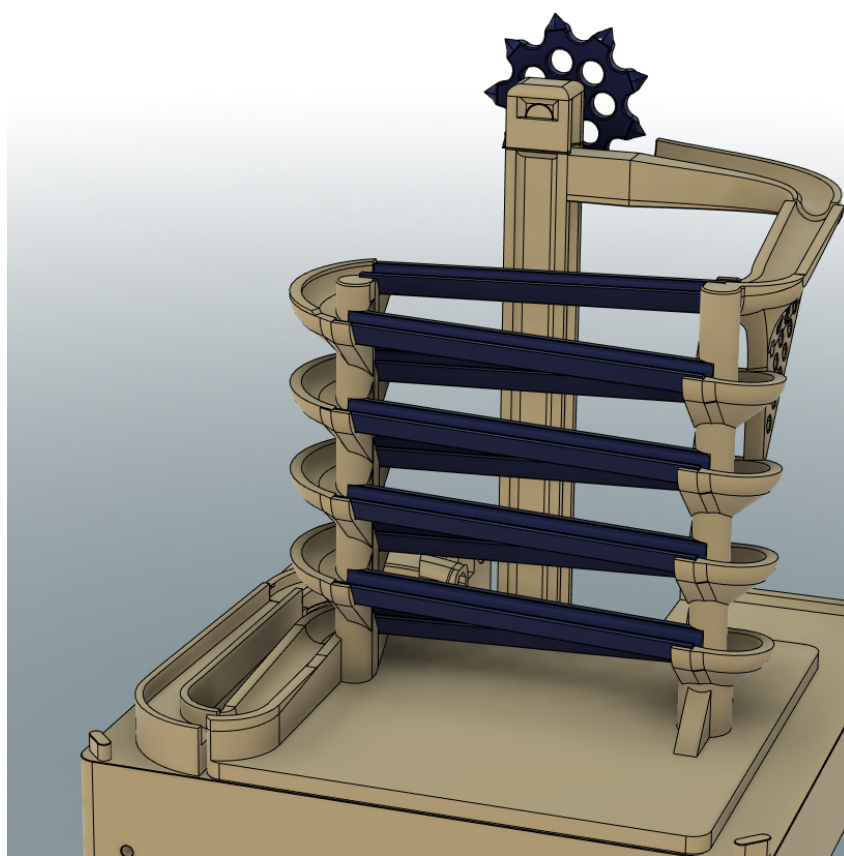


Step 13

With the module in place, place the pillar onto its position. You should first check that the mating surfaces between the pillar and the base are perfectly flat. Use superglue to secure the pillar.

Make sure that the pillar is perfectly straight and that the top path aligns nicely with the module entry path. Wait for glue to do its thing and then continue on.

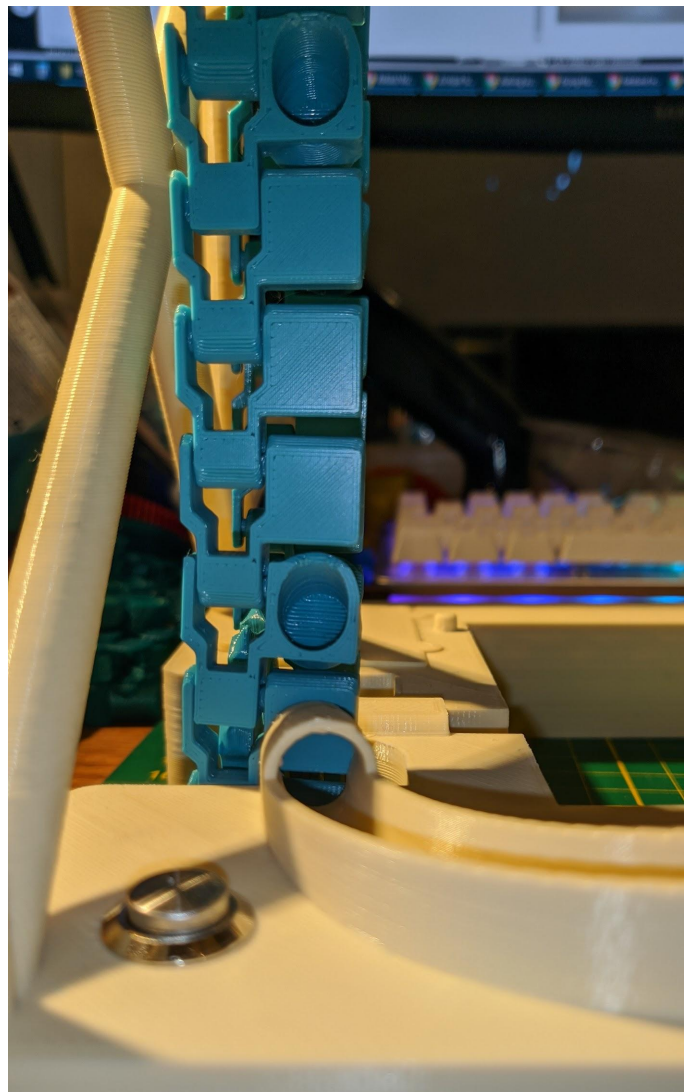
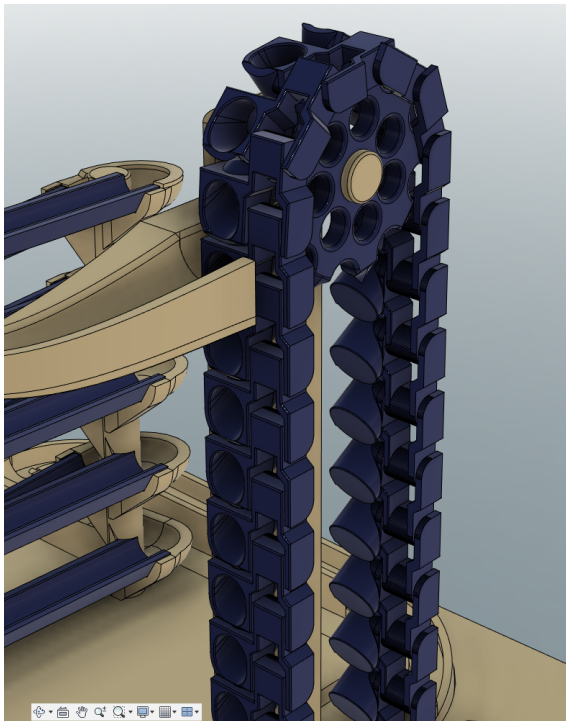
If for some reason the top path has too big of a gap between it and the module, use heat gun to bend it closer.



Step 14

Hang the chain onto the gear from the top.

Observe how you will be putting on the chain. If you look at it from the point where the marbles enter the chain: the buckets need to be in line with the path and buckets need to be turned downward so that marbles roll in.



Step 15

Take the bottom gear and put it **on the chain** and then slide the bottom gear with the chain attached onto the motor shaft.

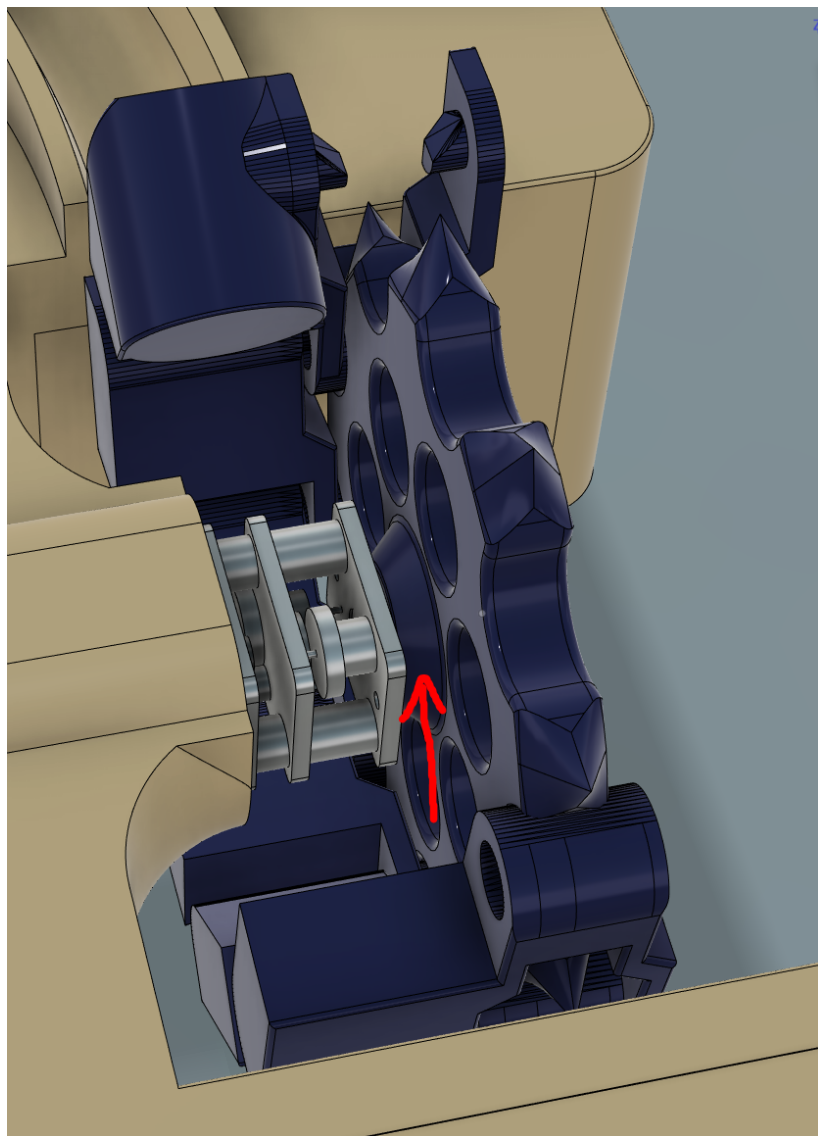
IMPORTANT: bottom gear has a groove that matches with the groove on the motor shaft. You need to align those when sliding on the gear.

Make sure that the spacer on the gear is facing towards the motor. **RED arrow** on the picture.

If the chain is too tight and you cannot get the bottom gear on, then continue onto step 16.

You can also use silicone spray, to reduce friction between gears and the chain.

In the picture, the chain was removed so that it is easier to see.



Step 16

Turn on the marble machine and observe how the chain is tensioned. If you hear the motor struggling, then you will need to loosen the chain.

If the chain is too wobbly, then you need to tighten it, otherwise marbles might fall out of the buckets if the chain wobbles too much.

There is a file **"Pillar Top"** located in the folder. It contains different height versions of the pillar top piece. This is used to tension the chain. For some yet unexplained reason, the chain prints a bit differently for every printer, so this is the way to tension it. We already printed pillar top 0, this is the baseline. *(correction, I forgot to include pillar top 0 in the files, I will fix that soon)*

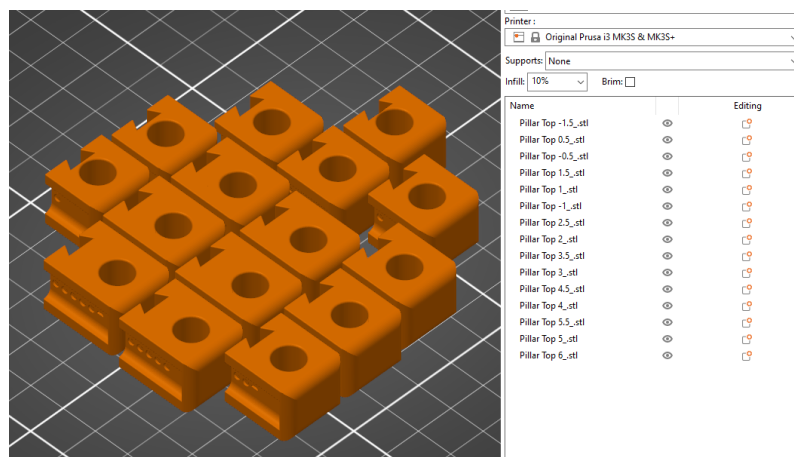
Now in this file there are all others ranging from -1.5 to 6. That means -1.5 is 1.5 millimeters shorter than 0. And 6 is 6 millimeters taller than 0.

So, if you observed that the chain is too tight, then you have to print a pillar top with a lower number than 0. And if it is too loose, then you need to print it with a higher number.

Rinse and repeat until you get it just right and also of course try it with marbles.

Cura and Prusaslicer allows you to select which pillar tops to print, so you don't need to print all of them.

After you have found the perfect chain tension, you can superglue the top pillar piece and the shaft, BUT not the gear!



On the sides of the pillars you can see markings for heights.

- One full dot means 1 mm
- Half dot means 0.5mm
- - in front of it, means it goes into negative

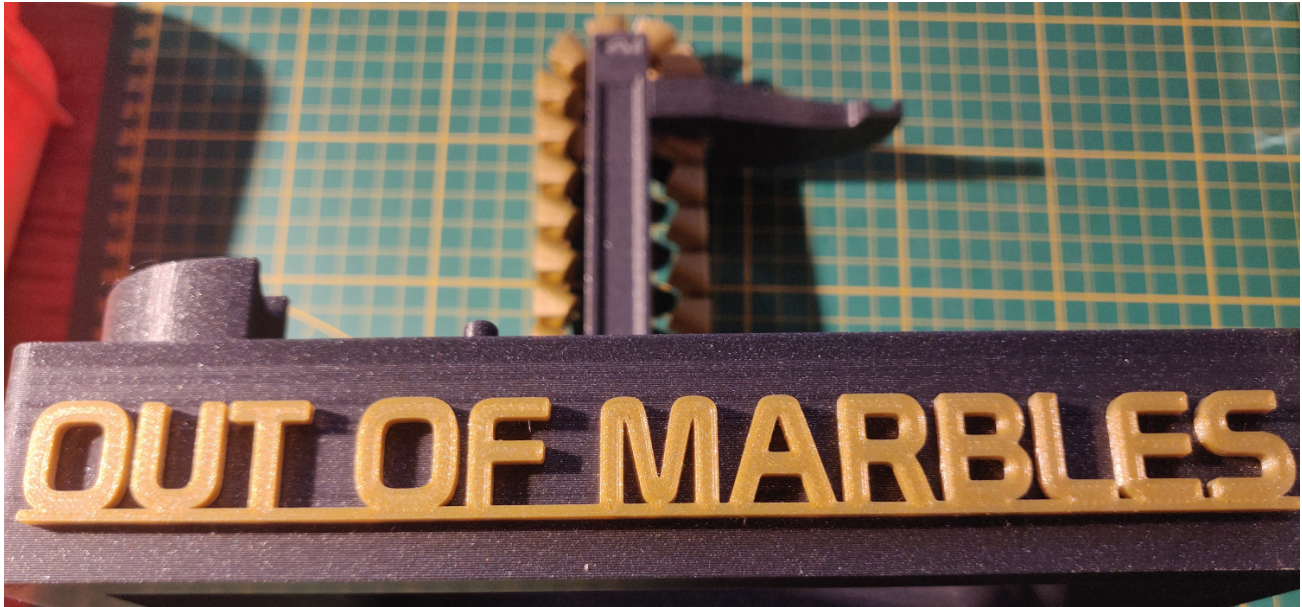
Please fill out this **poll** and overtime I will make the default pillar top to the one that is the most used, so that hopefully less and less people need to tension it! :)

<https://strawpoll.com/polls/XOgOJqvpan3>

Step 17

Snap the logo in place and voila, you are **finished** :)

Now you also need some modules to place on. Head on over to our [module assembly guide](#).



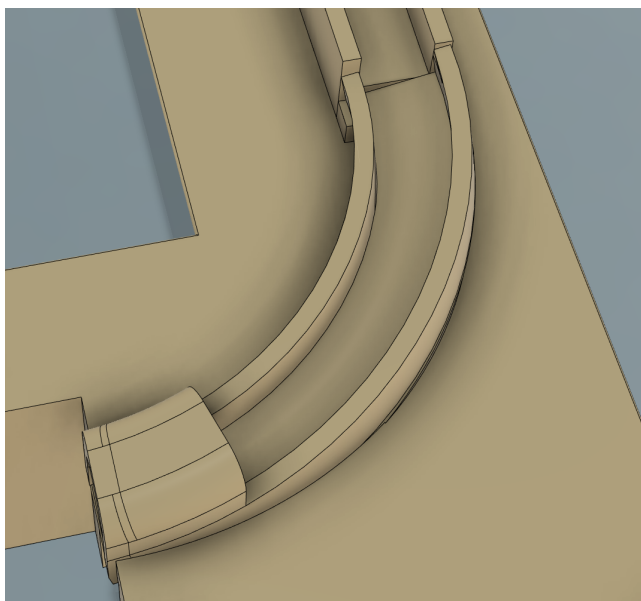
Hand Cranked version assembly instructions

Step 1

Do the same as motorized version step 1-4

Step 2

Place the bottom path in its position. You can glue the path.



Step 3

Do the same as motorized version step 11-14

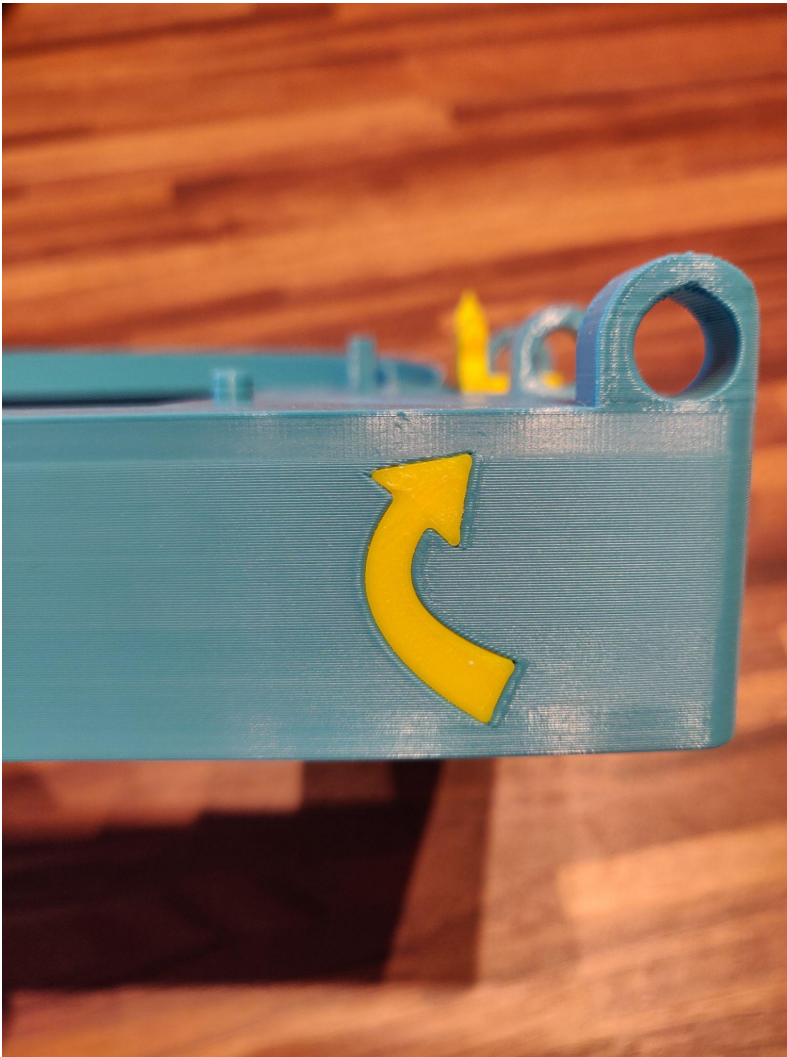
Step 4



Insert the handle into the shaft.

It helps to use a heat gun on the tabs that get inserted, to make them a bit more bendable

Step 5

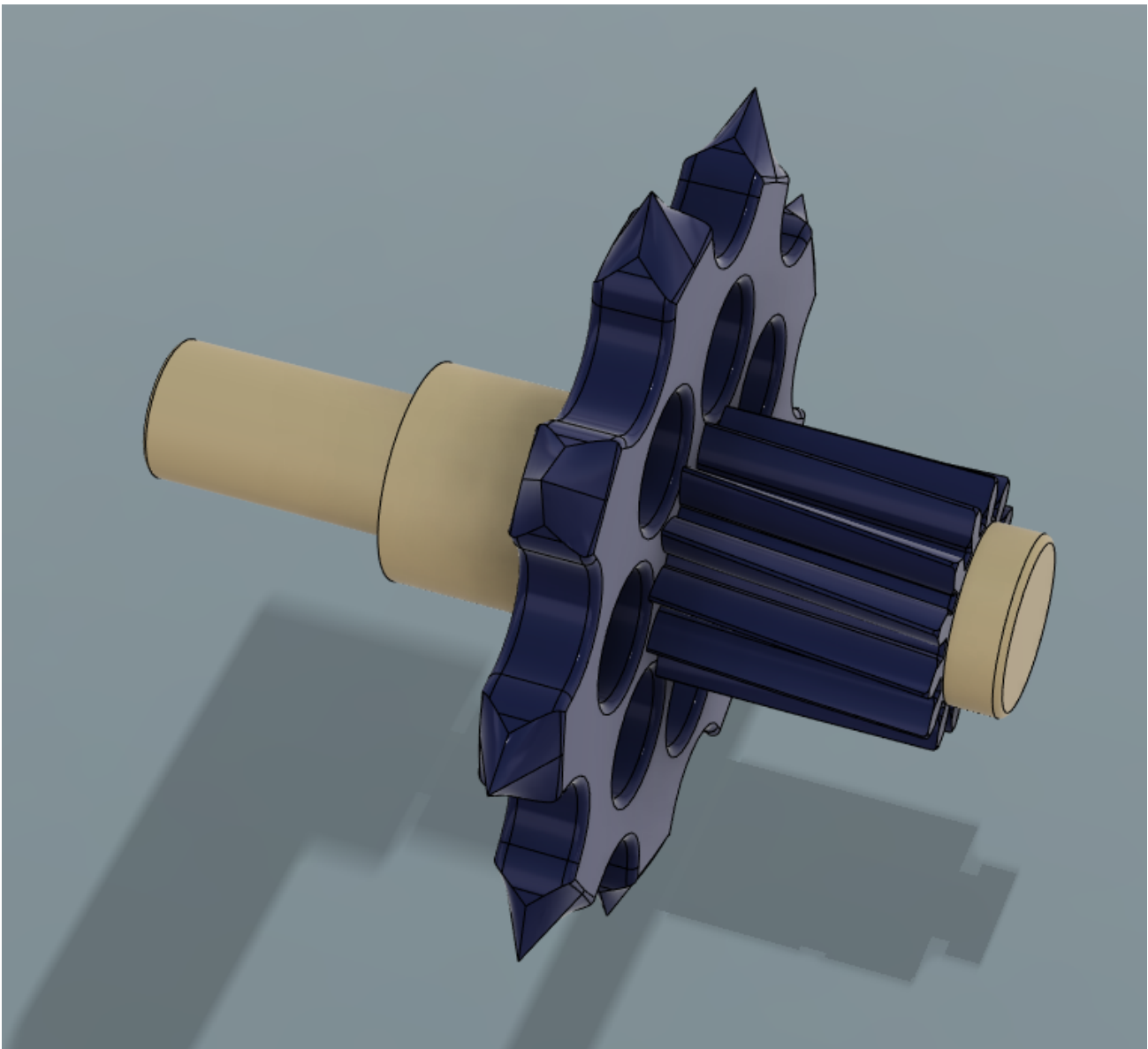


Insert the arrow into its place. Glue it if needed.

Step 6

Prepare the Bottom Gear assembly. Take the long shaft and place the gear with the teeth on it.
(Teeth direction goes first)

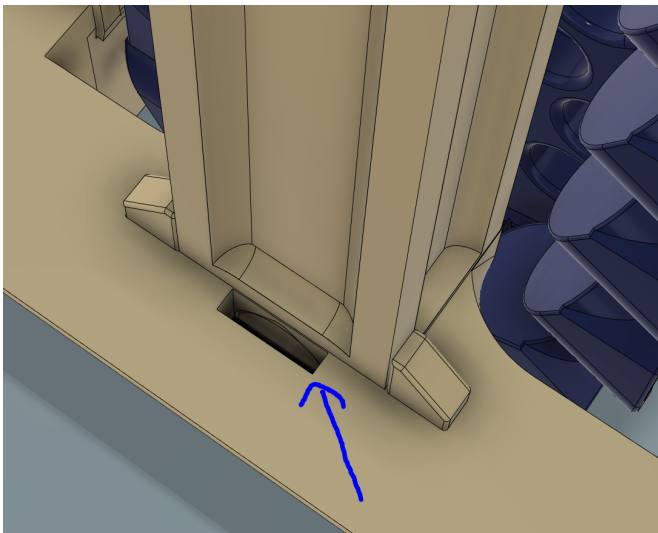
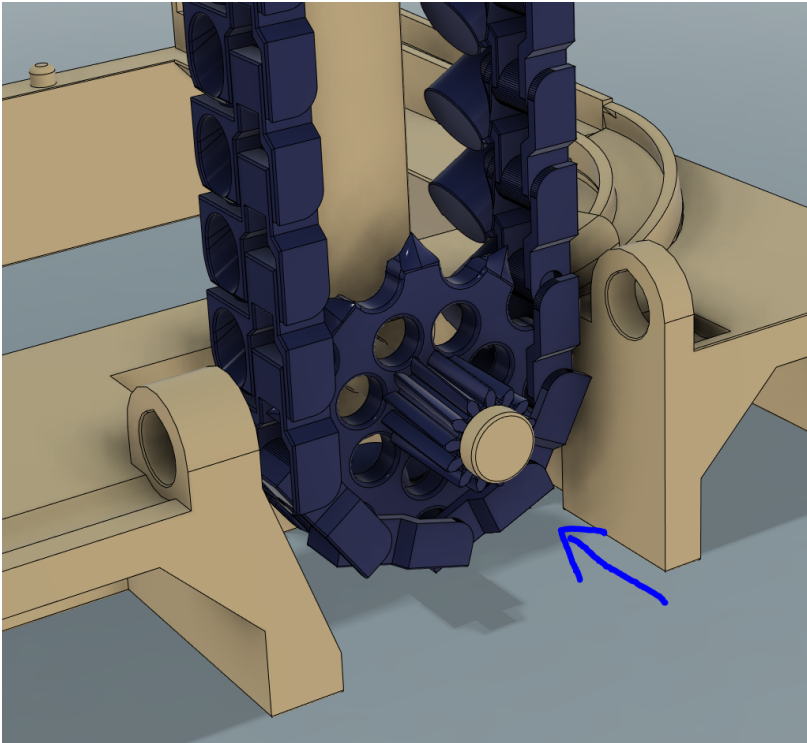
Then the spacer goes behind the gear.



Step 7

Place the bottom gear assembly onto the chain and then slide it into the hole.

If the chain is too tight and you cannot get the bottom gear on, then leave the chain open ended for now.



There is an opening at the front of the pillar to superglue the bottom shaft into place

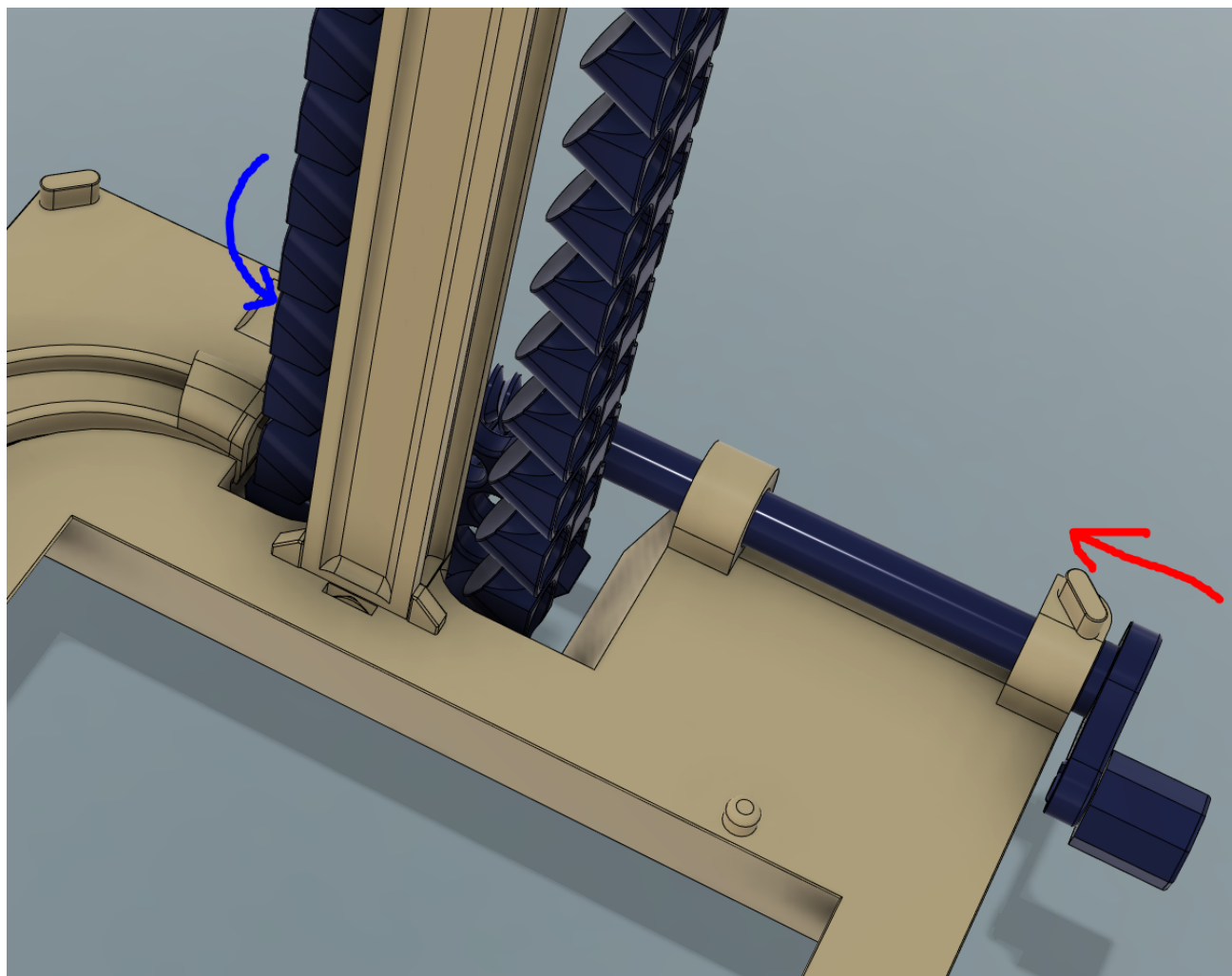
Step 8

Push the shaft in and check that it is rotating smoothly. If it isn't, sand down the parts where the binding is happening.

When you are happy with the results, place the cap onto the shaft (**Blue Arrow**). The shaft still needs to turn smoothly, if not then sand the contact point between the cap and the base.

There is a spot for glue on the outside of the cap. Only use a little bit of glue and make sure not to glue the shaft to the base.

Wait for the glue to set, and then continue.



Step 9

Do the same as motorized version step 17

Module Assembly

You can find the module assembly [documentation here](#)

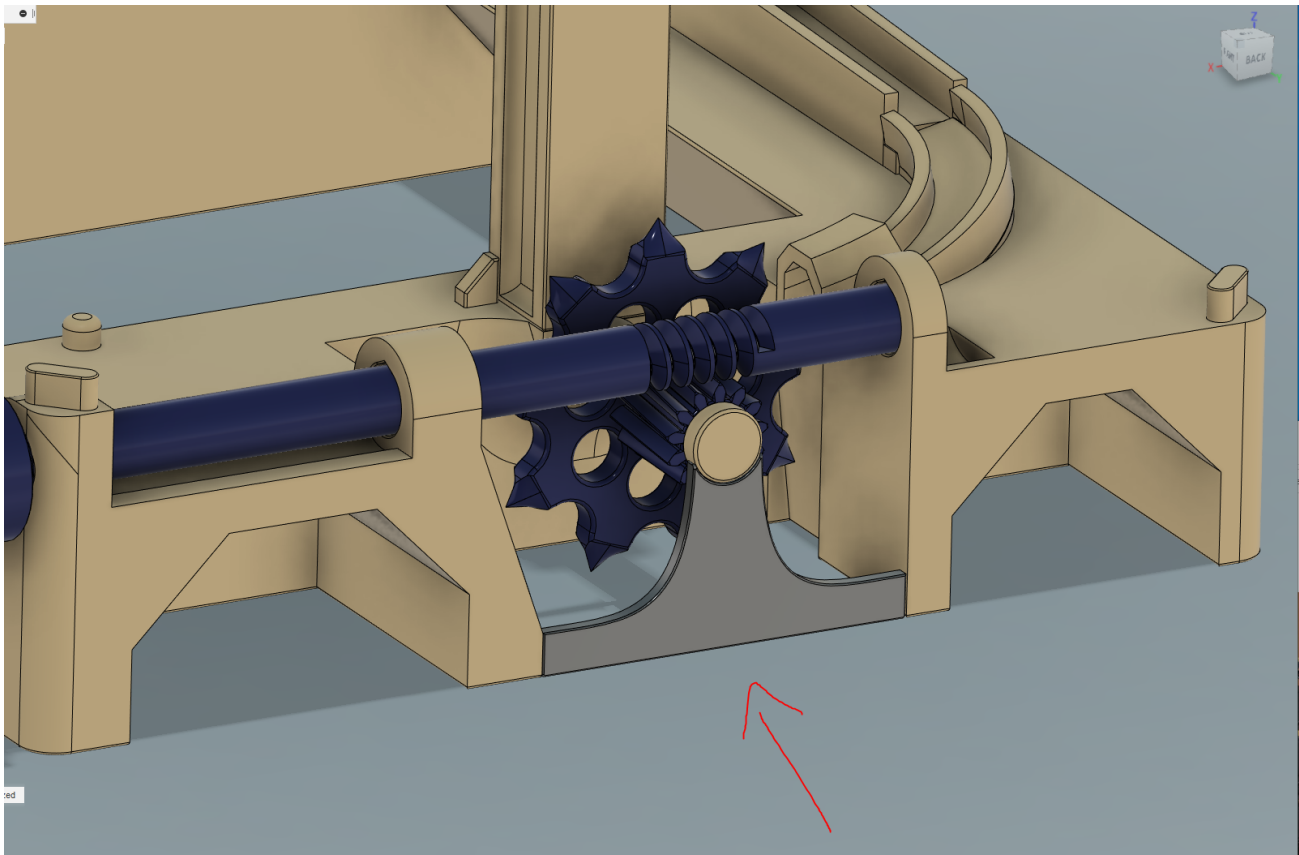
Troubleshooting:

The belt is too loose/tight

Check step 16

The gears are not tightly together

Download **Gear Support** from the optional folder and glue it in place. Make sure it is not touching and rubbing against the gear. It should only be touching the gear axle.



Chat Support

I have created a **Discord channel** where we can talk in real-time and try to resolve any potential issues that you have. It is very important to me that you are happy and that your marble machine works :)

Use this link: <https://linktr.ee/outofmarbles>

Discord enables text, image, video and audio communication between users in a chat channel. You can use it in an online browser or desktop app.

By supporting this project you've made it possible for me to continue developing exciting 3D printed projects. I ask that you please keep these files for yourself and don't share them on - this makes it possible for me to continue creating new projects. Thank you!

Changelog

v1.1 - Added chain tensioning system, you can find it in the "optional" folder

- Prusa MK3s gcode files are now included

v1.05 - Base for Prusa Mini is now 178x178 instead of 180x180

v1.04 - Added Prusa Mini folder

- Added guard rail to the base path

v1.03 - Release

