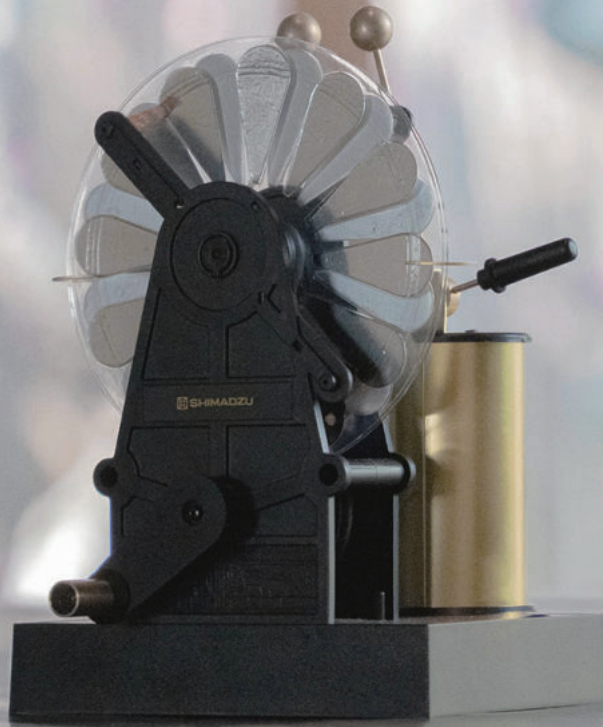
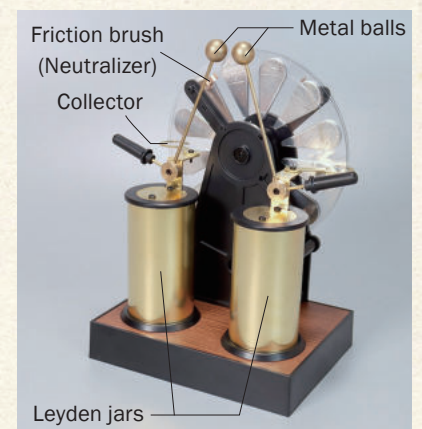


How to assemble and use

The Wimshurst Machine



The Wimshurst generator that we will assemble is a device that generates static electricity. When the handle is turned clockwise as shown in the diagram, the two disks with aluminum metal sectors on them rotate in opposite directions. The electric charge that is generated on the disks is stored in Leyden jars via friction brushes and charge collectors. When a certain amount of electric charge has accumulated, a discharge occurs between the metal balls.



Caution : Please read carefully before assembling the kit.

- When static electricity has accumulated in the Leyden jar or the charge collector, you may feel a shock if you touch both the positive and negative poles at the same time. Do not perform experiments with this kit if you are sensitive to shocks or use a pacemaker. The static electricity generated by the kit is harmless to the human body due to the low current flow.
- Do not use near flammable materials.
- Discharge may be difficult in humid environments such as rainy days.
- Be careful when handling sharp parts. There is a risk of injury.
- Do not accidentally shock others. This may result in an unexpected accident.
- Read the instructions and precautions carefully before conducting any experiments.
- For safety, always follow the instructions in the instruction manual. Also, do not use any parts that have been damaged or deformed during use.



What's included

Estimated assembly time: about 60 minutes



Main body (front)



Main body (rear)

Note: The disks and main body are packaged using flanged screws to secure them in place. Please remove the (spare) flanged screws.



Rubber drive belt (small)



Disk

Rubber drive belt (large)



Base



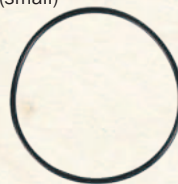
Metal sector plates



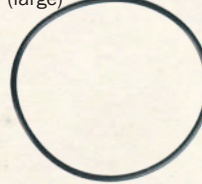
Large pulley



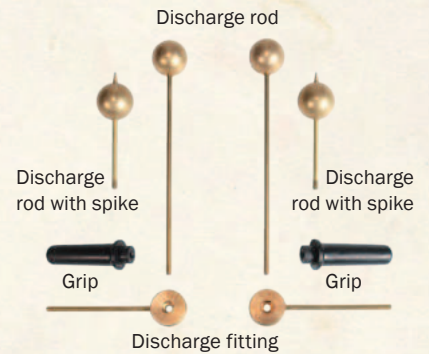
Disk pulley



Disk shaft



Rotating shaft



Discharge fitting



Electrode fitting



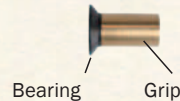
Collector



Base self-adhesive sheet



Electrode cover

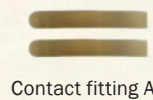


Bearing

Grip



Handle



Contact fitting A

Contact fitting B



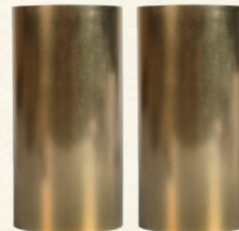
Screwdriver



Electrode tube (upper)



Electrode tube (lower)



Electrode (outer)



2 Electrodes (inner)



Plastic materials used in this kit

Main body, base, and other parts: ABS, Disk: PMMA, Rubber drive belts: PU

Metal materials used in this kit

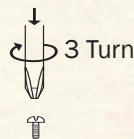
Screwdriver and screws: steel, Discharge rod, collector, and electrodes: brass, Metal sector plates: aluminum

*When no longer needed, dispose of according to the rules of your local government.

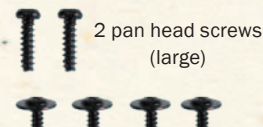
Note on tightening screws

These screws are self-tapping and cut a thread into the plastic when being screwed into place. When tightening screws, hold the screwdriver perpendicular to the screw and push on it firmly while turning. The general rule is to apply 7 parts pressure and 3 parts twist.

7 Press

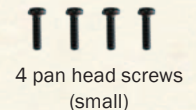


13 pan head screws (medium)



2 pan head screws (large)

4 flanged screws



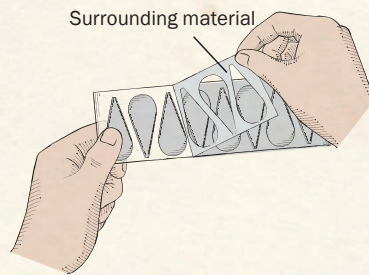
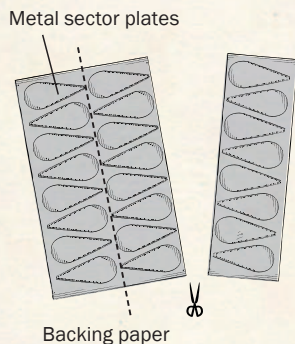
4 pan head screws (small)

How to assemble

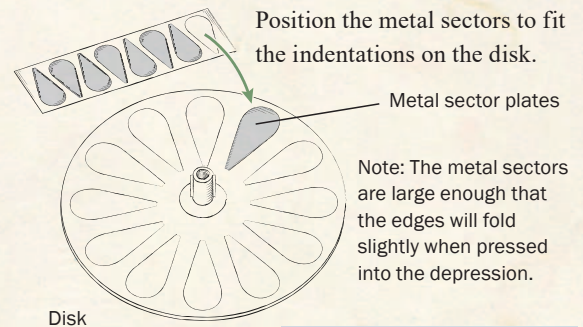
Materials required: Cellophane tape, scissors, work gloves

Assemble the generator unit

01 Affix the Metal sector plates to the disks.



It is easier to work if you first cut the backing paper with scissors and remove any unnecessary surrounding material.



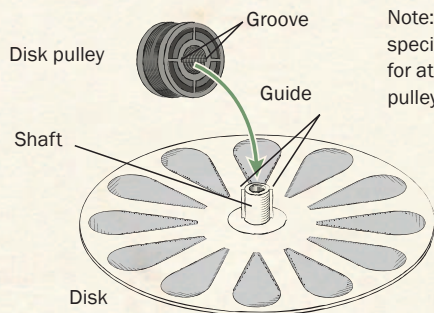
Note: The metal sectors are large enough that the edges will fold slightly when pressed into the depression.



Affix them to both disks.

02 Put the disk pulley onto the disk shaft.

Align the grooves in the disk pulley hole with the guides on the disk shaft and press the pulley firmly until it clicks into place.



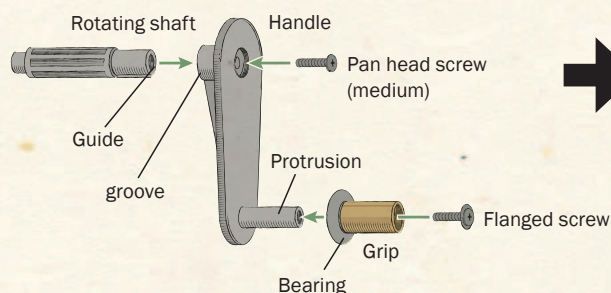
Note: There is no specific orientation for attaching the pulley.



Attach to both disks.

03 Assemble the handle.

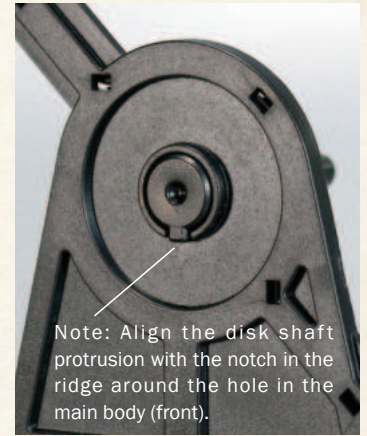
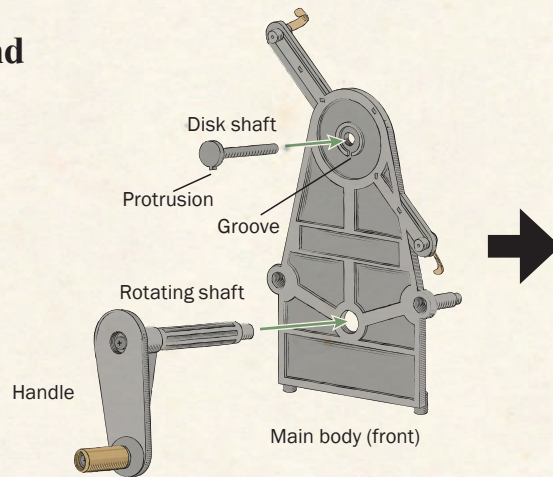
Align the guides on the rotating shaft with the grooves in the hole in the handle, fit into place and secure with a pan head screw (medium). Pass the protrusion on the handle through the bearing on the rotary grip and secure with a flanged screw.



The handle is completed.

04 Fit the disk shaft and handle on the main body.

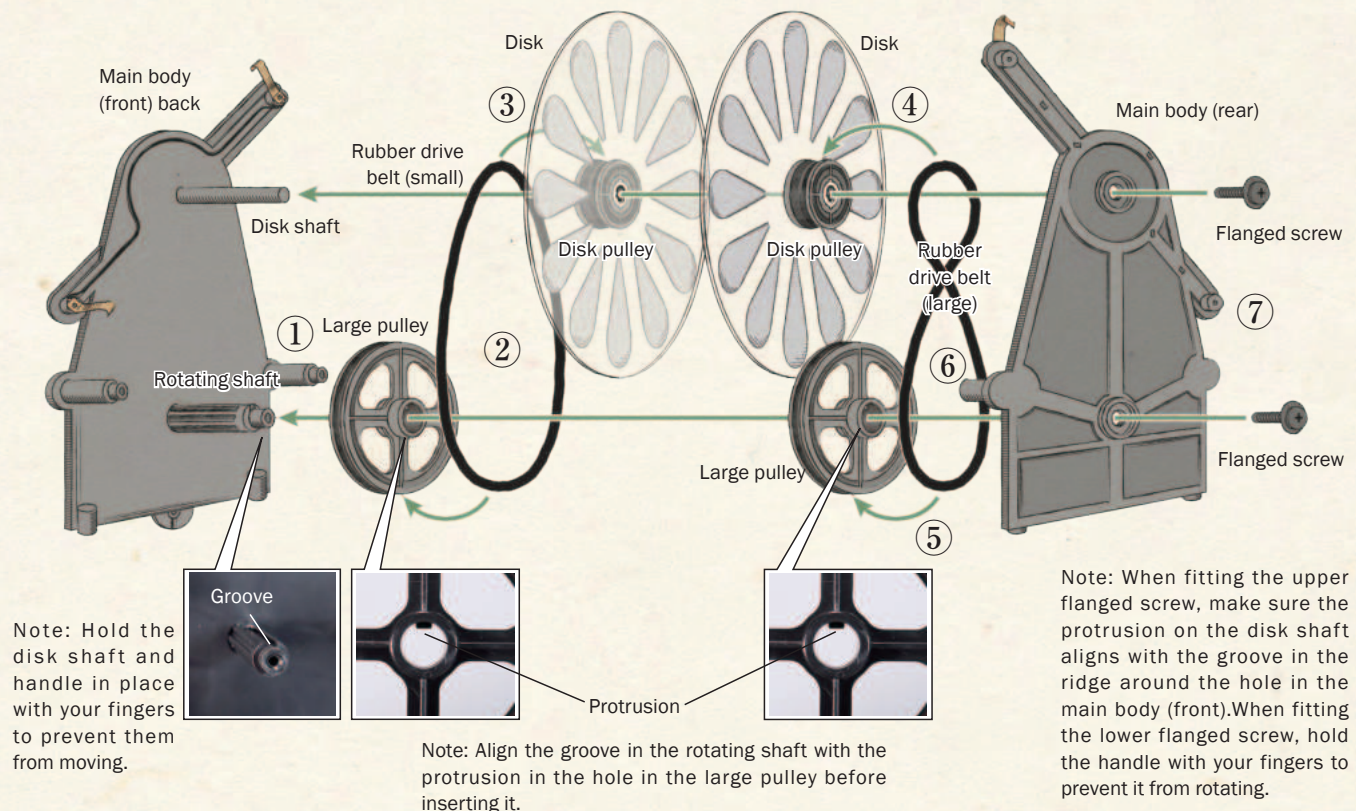
Insert the disk shaft into the top hole of the main body (front) and the rotating shaft through the bottom hole.



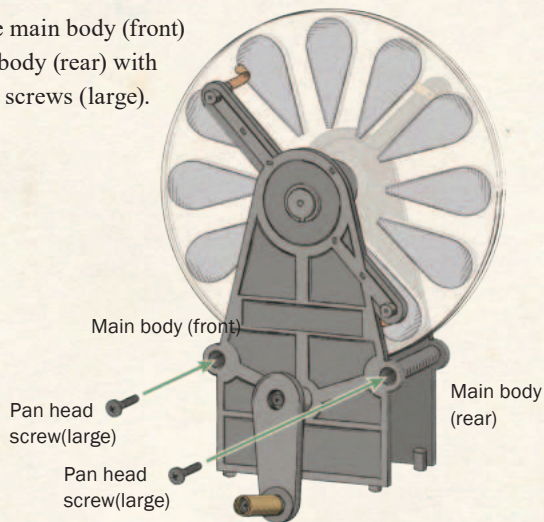
05 Assemble the pulley, rubber drive belts, and disks onto the main body.

- ① Slide a large pulley onto the rotation shaft.
 - ② Hook the small rubber drive belt onto the large pulley and the disk shaft.
 - ③ Slide the disk pulley onto the disk shaft.
- At this point, take the small rubber drive belt that was set on the disk shaft and hook it onto the disk pulley.
- ④ Slide the second disk onto the disk shaft.

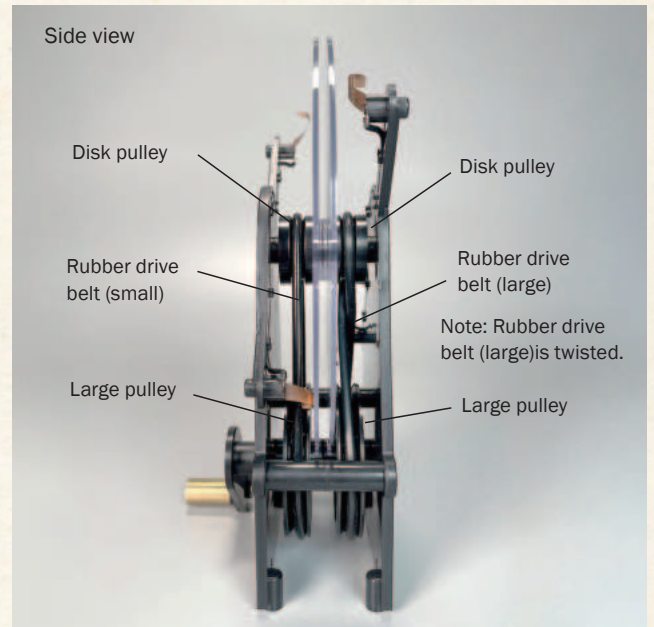
- ⑤ Slide the other large pulley onto the rotation shaft.
- ⑥ Twist the large rubber drive belt into a figure-eight shape and hook it onto both the disk pulley and the large pulley.
- ⑦ Insert the disk shaft and rotation shaft into the holes on the (rear) main body, and secure them in place with flanged screws.



Secure the main body (front) and main body (rear) with a pan head screws (large).

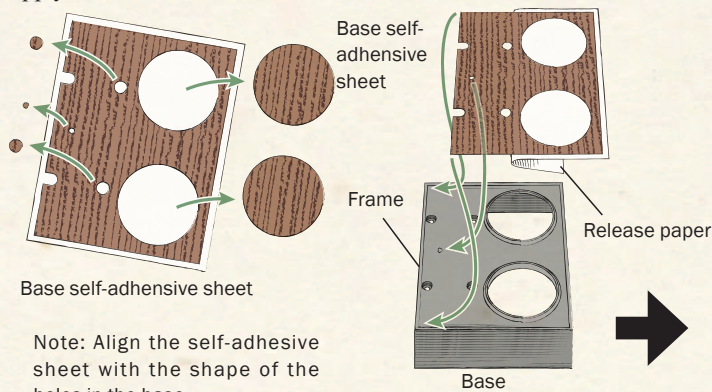


The generator unit is complete.



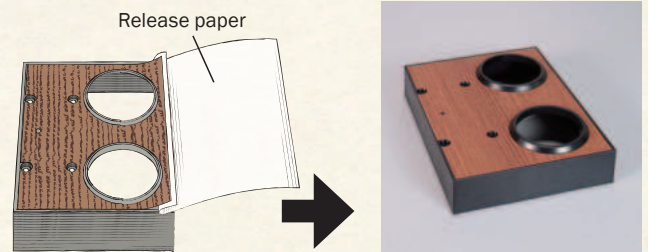
06 Affix self-adhesive sheet to the base.

Remove the unwanted circular pieces of the self-adhesive sheet, peel off half of the release paper, and fold it. Align the edge of the self-adhesive sheet with the rim of the base and apply it.



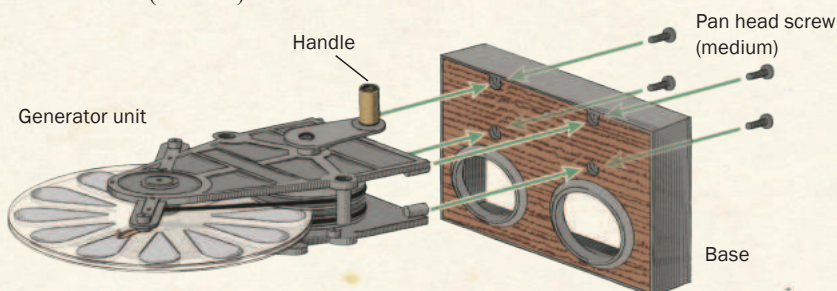
Note: Align the self-adhesive sheet with the shape of the holes in the base.

Slowly peel off the release paper while applying the self-adhesive sheet to the top of the base.



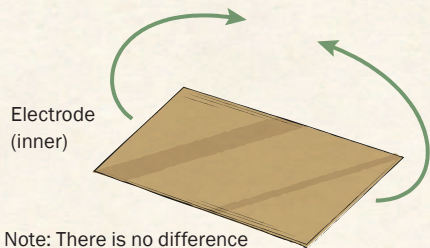
07 Attach the generator unit to the base.

Insert the four prongs of the electromotive unit into the four holes in the base and secure with a pan head screw (medium) from the back.



08 Assemble the Leyden jars.

Carefully roll the long edge of the electrode (inner) into a cylindrical shape, taking care not to crease it.

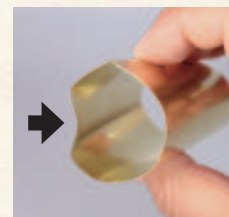
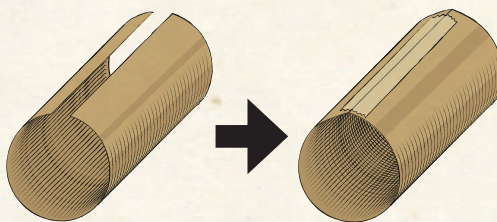


Note: There is no difference between the front and back.

Note: Wear gloves to avoid getting oil from your fingers on the electrodes, and avoid touching them directly with your fingers as much as possible.

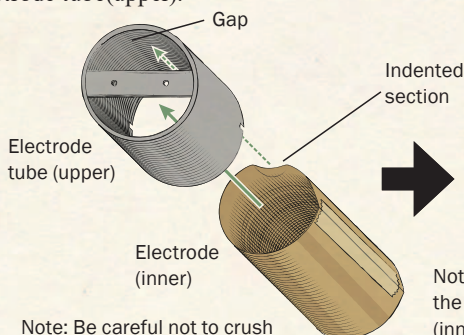
Note: The edges and corners of the electrodes are sharp, so handle them carefully to avoid injury.

Align the edges perfectly and secure them with cellophane tape.



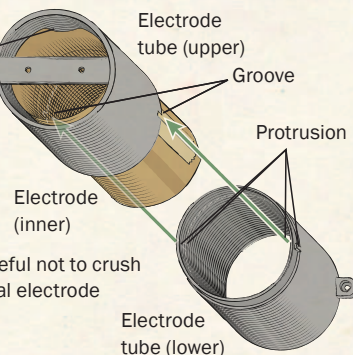
Bend the part shown by the arrow with your fingers to make a dent.

Insert the cylindrical electrode(inner) into the electrode tube(upper). Position it so that the indented part is visible through the gap in the electrode tube(upper).



Note: Be careful not to crush the cylindrical electrode (inner).

Place the electrode tube(lower) over the cylindrical electrode(inner) and align the notches on the electrode tube(upper) with the protrusions on the electrode tube(lower), then secure them together.

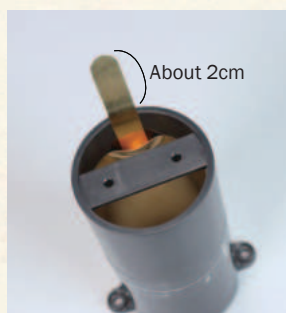
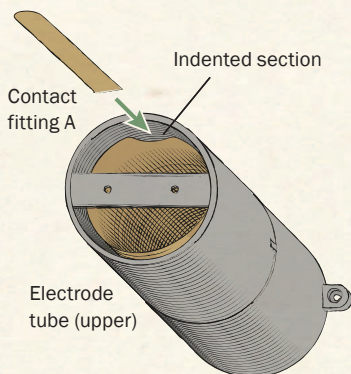


Note: Be careful not to crush the cylindrical electrode (inner).

Secure the joint between the upper and lower electrode tubes with cellophane tape.

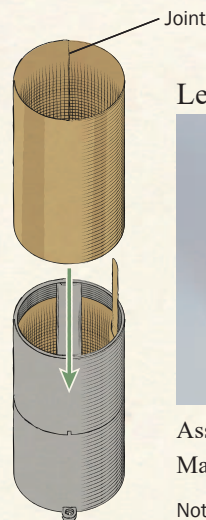


Insert contact fitting A into the indented part of the electrode (inner). Make sure the round tip of contact fitting A protrudes about 2 cm.



Cover with the electrode (outer).

Electrode (outer)



Leyden jar is complete.



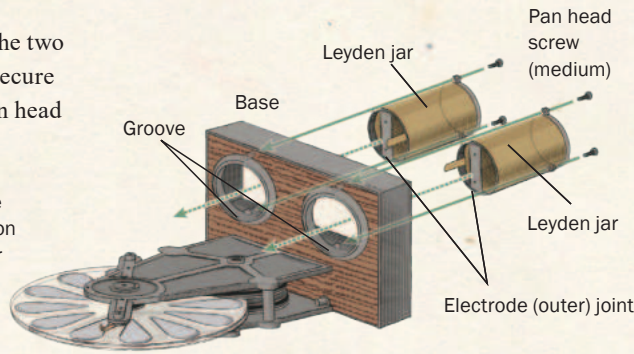
Assemble two identical units. Make sure they are

Note: In this state, make sure that the joint of the electrode (outer) is at the back.

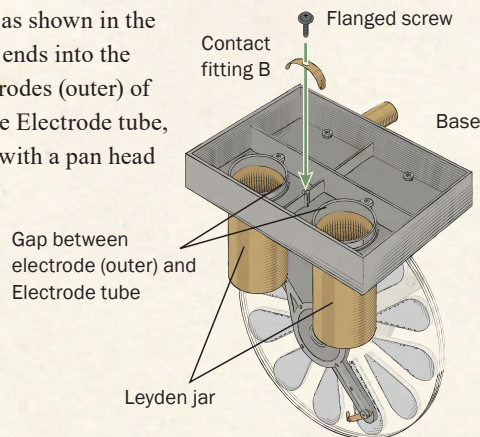
09 Attach the Leyden jars to the base.

Insert the Leyden jars into the two large holes in the base and secure them from the back with pan head screws (medium).

Note: The large holes have grooves in them, so position the joints of the Leyden jar outer electrodes in the grooves.

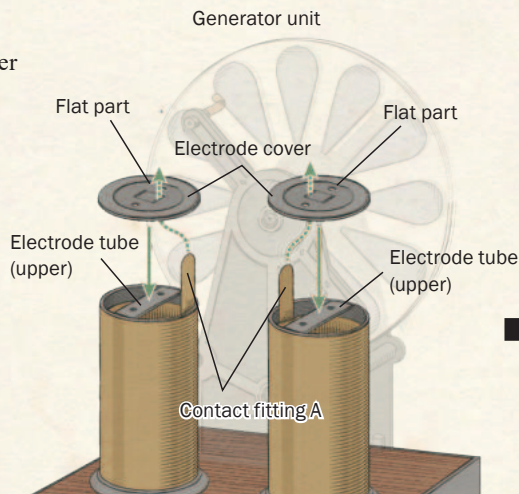
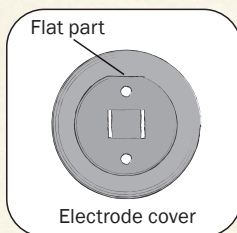


Bend contact fitting B as shown in the figure, and insert both ends into the gaps between the electrodes (outer) of each Leyden jar and the Electrode tube, and secure to the base with a pan head screw (medium).

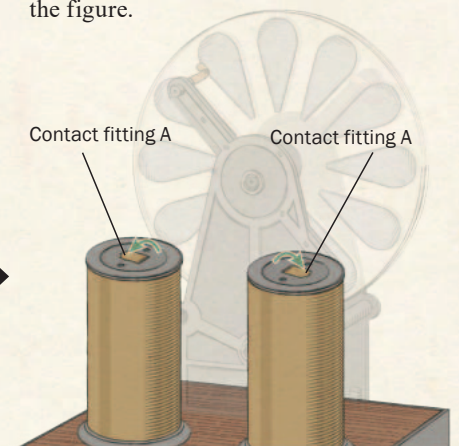


Pass the tip of contact fitting A through the hole in the electrode cover and attach the electrode cover to the electrode tube (upper).

Note: Pay attention to the orientation of the electrode covers. There is a flat section on the round part at the top of the covers. The flat part faces towards the generator unit.

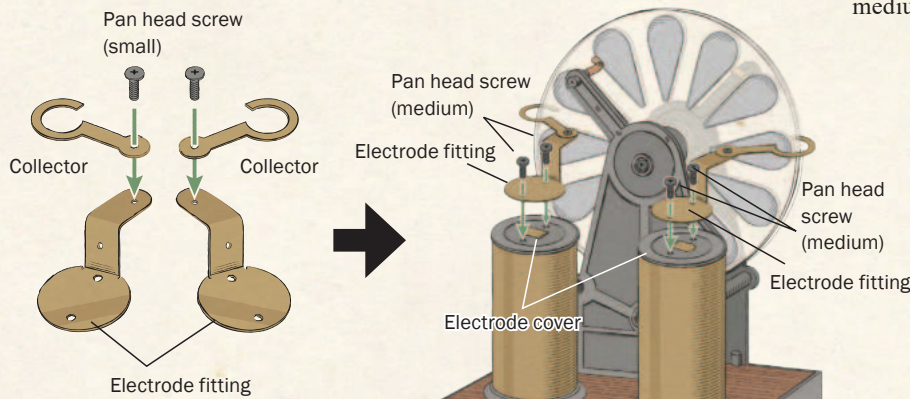


Fold the tip of contact fitting A sticking out from the electrode cover, as shown in the figure.

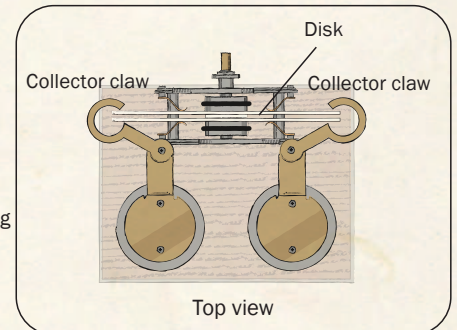


10 Attach the collectors.

Attach the collectors to the electrode fitting with pan head screws (small). Make sure they are symmetrical.

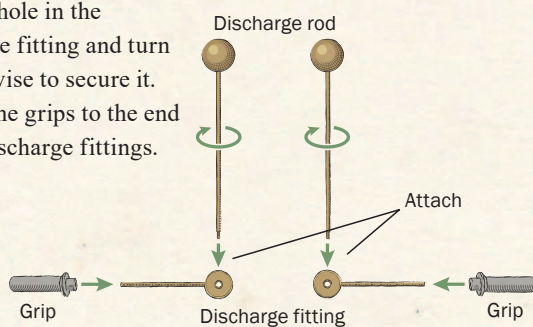


As shown in the top view, hook the claw part of the collector over the disk, then attach the electrode fittings to the electrode covers using medium pan head screws.

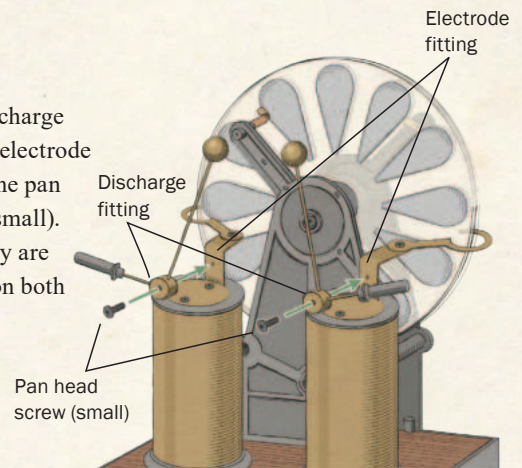


11 Attach the discharge fittings.

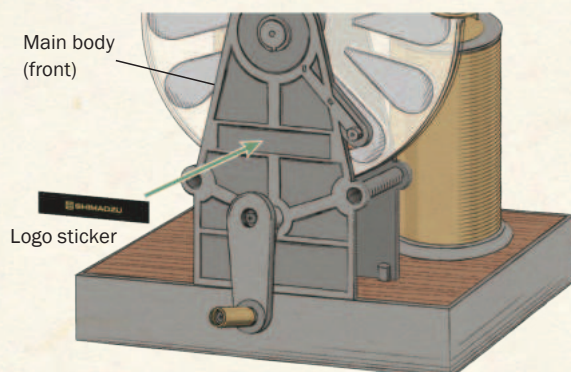
Insert the discharge rod into the hole in the discharge fitting and turn it clockwise to secure it. Attach the grips to the end of the discharge fittings.



Attach the discharge fittings to the electrode fittings with the pan head screws (small). Make sure they are symmetrical on both sides.



12 Complete assembly by affixing the logo sticker.



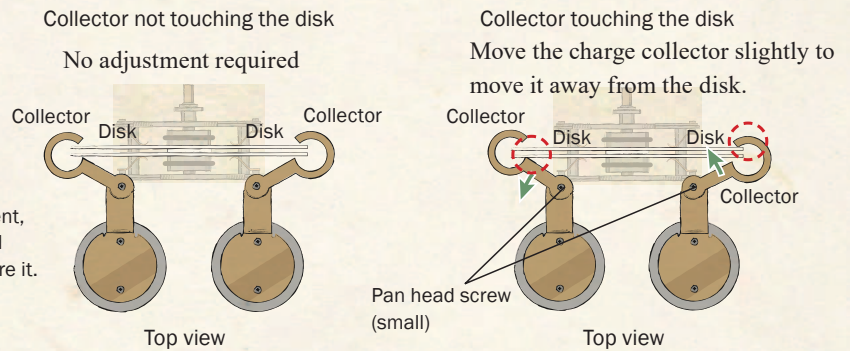
Finished!

How to use

Basics

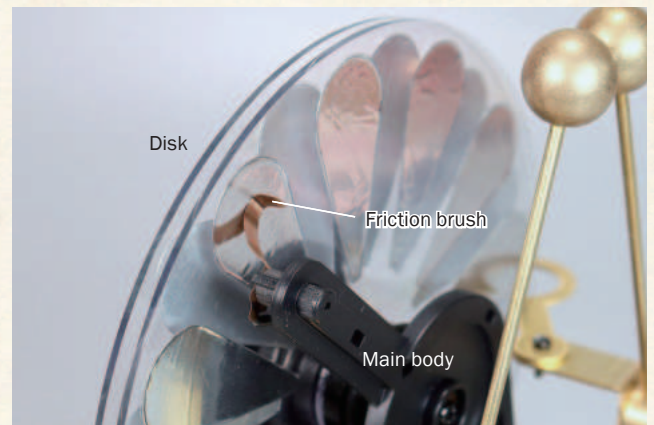
01 Adjust the position of the collectors so that they do not touch the disk.

Note: After adjustment, tighten the pan head screw (small) to secure it.



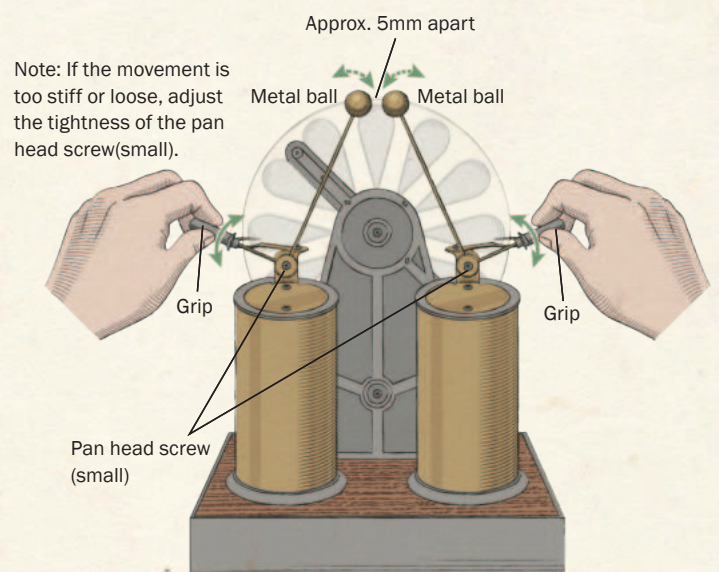
02 Adjust so that the friction brushes so that they touch the disk.

At the end of the arm extending from the main body is a thin, curled piece of metal called a friction brush. If the tip of the friction brush is not touching the disk, gently bend it so that its tip touches the disk.



03 Adjust the spacing between the metal balls.

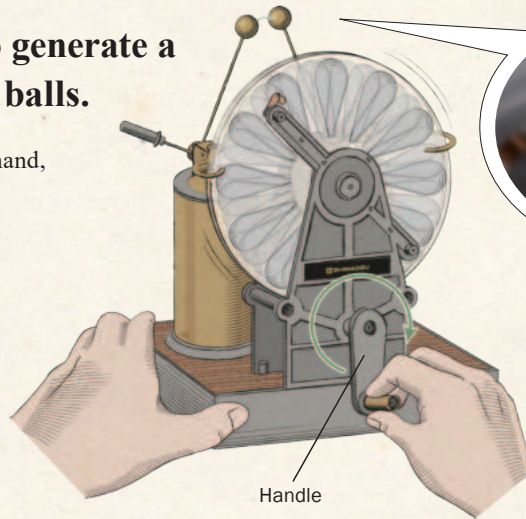
Use the grip on the discharge fitting to move it up and down so that the distance between the metal balls is about 5 mm.



04 Turn the handle clockwise to generate a discharge between the metal balls.

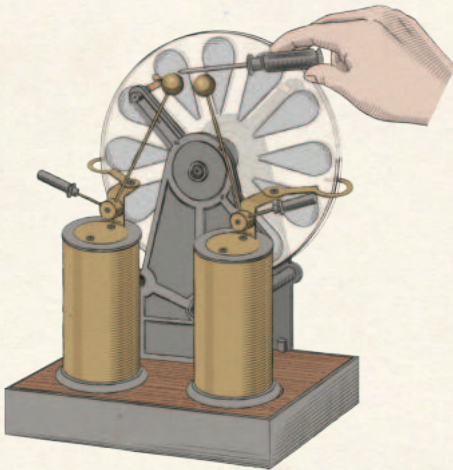
Place the device on a flat table, hold the base with your hand, and turn the handle clockwise 2-3 times to generate a discharge between the metal balls.

Note: Be sure to turn the handle clockwise. Turning it in the opposite direction may damage the friction brushes.



Once you have successfully discharged the electricity, try moving the metal balls further apart and test how far apart they can be moved and still discharge.

After the experiment



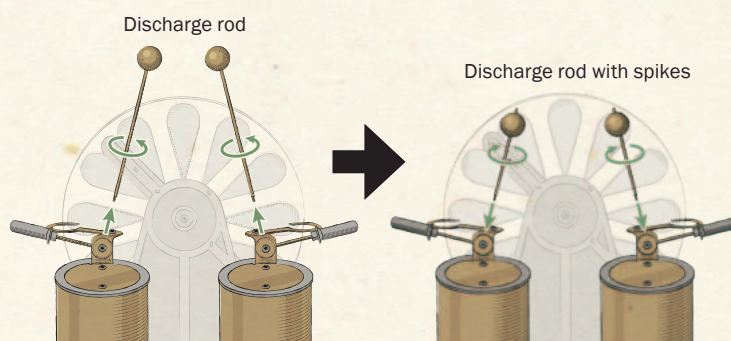
After the experiment, touch the metal part of a screwdriver to both metal balls to discharge them. Be careful not to touch the metal parts without discharging the charge, as you will receive a small, sharp electric shock.

Options

Let's try an experiment by replacing the discharge rod with a spiked discharge rod.

01 Replace the discharge rod.

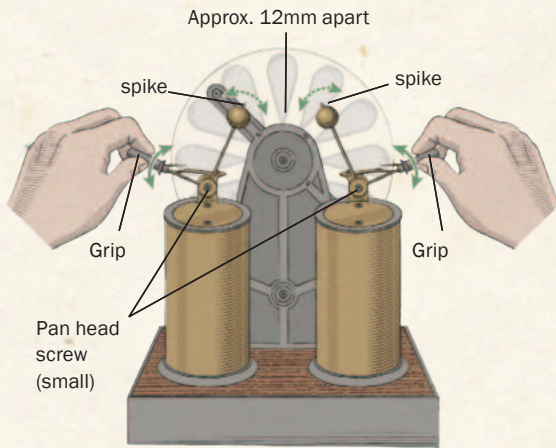
Turn the rod of the discharge rod counterclockwise to remove it, and turn the rod of the spiked discharge rod clockwise to attach it.



Discharge rod with spikes

02 Adjust the metal ball.

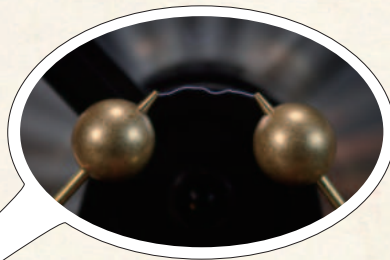
Use the grip on the discharge fitting to move it up and down so that the distance between the spiked tips of the metal balls is about 12 mm.



Note: If the movement is too stiff or loose, adjust the tightness of the pan head screw (small).

03 Discharge.

Turn the handle clockwise 2 to 3 times, and a large discharge will occur between the spike on the top of the metal balls.



Let's try an experiment to see if changing the position of the spike or the metal ball changes the discharge behavior.



Q&A

Q: No discharge occurs when I turn the handle.

A: Check the friction brush and the charge collector.

Check that the friction brush is in contact with the metal sectors of the disk and that the charge collector does not rub against the disk. If this is the case, adjust accordingly.

A: Check and adjust the spacing between the metal balls.

If you are using a discharge fitting, try spacing the metal balls at 5 mm or less apart, and once a discharge occurs, gradually increase the spacing. If you are using a discharge fitting with a spike, adjust the spacing between the tips of spikes on the metal balls to about 12 mm and try again.

A: Check the contact between the Leyden jar contact fitting and the electrode.

If the contact fitting inserted into the Leyden jar electrode is not touching the electrode, bend the contact fitting slightly so that it makes firm contact with the electrode.

A: Check the humidity.

Discharge is more difficult on humid days. Place the metal balls closer than usual and perform the experiment in conditions that make it easier to discharge.

We take every precaution to ensure that our products are of the highest quality, but if you find any defective or missing parts, please contact us via the website below.

<https://corp-gakken.co.jp/contact/>



How to assemble and use The Wimshurst Machine

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