

Build Your Own Amazing Steam Engine

- › real steam emission & whistle blowing sounds
- › watch locomotive valve gears at work
- › learn the science behind steam power
- › learn steam engine technology
- › explore valve gear mechanism

10+
years

STEM

SCIENCE
TECHNOLOGY
ENGINEERING
MATHS

**BATTERY
POWERED**



WARNING: HAIR ENTANGLEMENT MAY RESULT IF THE CHILD'S HEAD IS TOO CLOSE TO THE MOTORISED UNIT OF THIS TOY. ADULT SUPERVISION AND ASSISTANCE IS REQUIRED.

WARNING: BATTERIES ARE TO BE INSERTED WITH THE CORRECT POLARITY (+ AND -). DO NOT MIX DIFFERENT TYPES OF BATTERIES OR NEW AND USED BATTERIES. NON-RECHARGEABLE BATTERIES ARE NOT TO BE RECHARGED. RECHARGEABLE BATTERIES ARE ONLY TO BE CHARGED BY AN ADULT. RECHARGEABLE BATTERIES ARE TO BE REMOVED FROM THE TOY BEFORE BEING CHARGED. THE SUPPLY TERMINALS ARE NOT TO BE SHORT-CIRCUITED. REMOVE BATTERIES FROM THE TOY WHEN NOT IN USE FOR AN EXTENDED TIME OR WHEN BATTERIES BECOME EXHAUSTED. BATTERY INSTALLATION BY AN ADULT IS REQUIRED. DISPOSE OF BATTERIES RESPONSIBLY. DO NOT DISPOSE OF IN FIRE.

 **WARNING:** CHOKING HAZARD
SMALL PARTS. NOT FOR CHILDREN UNDER 3 YEARS.

WARNING: FOR SAFETY REASONS, REMOVE ALL TAGS, LABELS AND PLASTIC FASTENERS BEFORE GIVING THIS TOY TO YOUR CHILD.

PRODUCT MAY VARY SLIGHTLY FROM IMAGE SHOWN.
PLEASE KEEP PACKAGING FOR FUTURE REFERENCE.



REQUIRES 4 X 1.5V AA BATTERIES (NOT INCLUDED).

WARNING

Adult supervision and assistance is required.

This unit is only for use by children aged 10 years and older.

Not suitable for children under age 3 years old due to small part(s) and component(s)- CHOKING HAZARD.

Read and follow all instructions in the manual before use.

This toy contains small parts and functional sharp points on components.

Keep away from children under age 3 years.

Please retain the information and this manual for future reference.

Follow the instruction manual to perform the circuit connection.

Instructions for supervising adults are included and have to be observed.

Do not lock the motor or other moving parts, otherwise it may cause overheating.

The toy is not to be connected to more than the recommended number of power supplies.

Warning. Do not use close to the ear! Misuse may cause damage to hearing.

BATTERY INFORMATION

Use 4 x AA size batteries (not included)

Remove batteries when not in use.

Batteries must be inserted with the correct polarity.

Non-rechargeable batteries are not to be recharged.

Rechargeable batteries are only to be charged under adult supervision.

Rechargeable batteries are to be removed from the toy before being charged.

Different types of batteries or new and used batteries are not to be mixed.

Only batteries of the same or equivalent types are to be used.

Exhausted batteries are to be removed from the toy.

The supply terminals are not to be short-circuited.

Do not dispose of the batteries in fire.

Do not mix alkaline, carbon zinc and rechargeable batteries.

STEM Educational Hints:

S: ★★★★★☆ T: ★★★★★☆ E: ★★★★★★ M: ★★☆☆☆☆

Energy: Steam Power

In the steam engine, chemical energy from coal is converted into heat energy by burning. The heat energy boils water to generate steam power. The steam power is converted into mechanical power by the steam engine.

This mechanism can be observed in our daily life. For example, if we boil water in a kettle, steam will come out from the outlet. If we use a piston to block the outlet while the water is boiling, the piston will be pushed out by the steam. We know that there is a force, a power, or an energy to push it. So, if the steam can push the piston, when its power is directed correctly, the steam can push a train to travel and run.

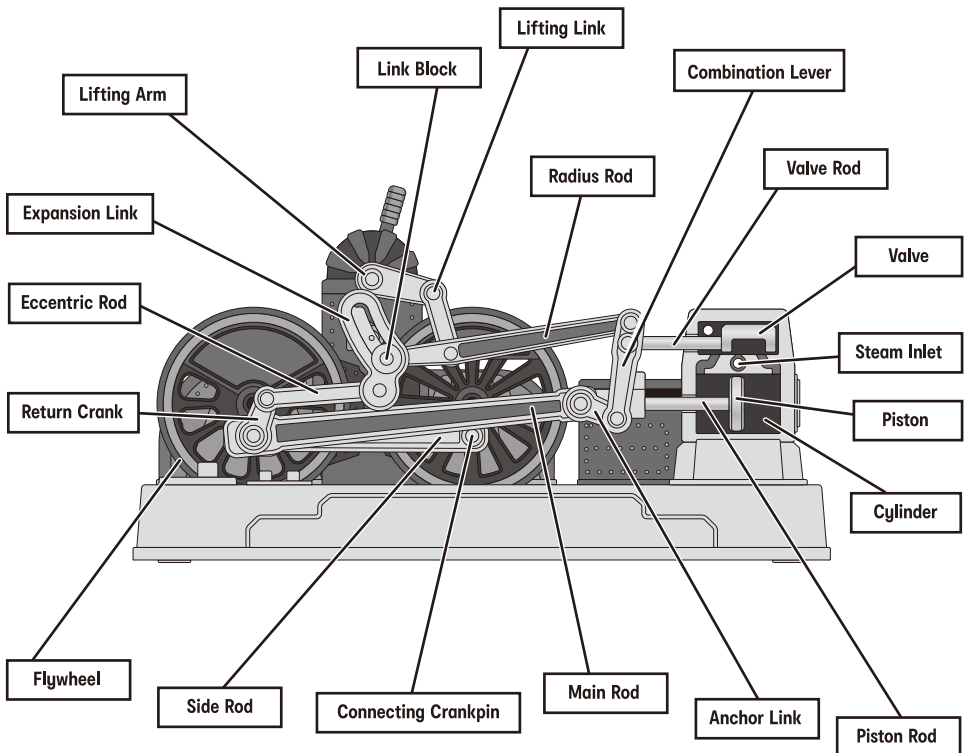


Machine: Steam engine

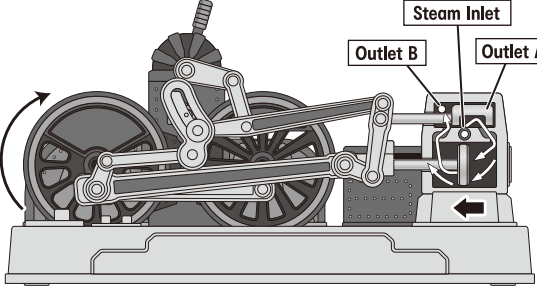
People already knew that steam is an energy source. But how to use it?

Thomas Savery (An English inventor and engineer) invented the first steam engine in 1698 but it wasn't useful at that time. Many people have tried to improve Thomas' engine and finally James Watt (A Scottish mechanical engineer) came out to improve with a better engine in 1778 using less coal, but producing more power and in a regular base. The steam engine changed the world and people call that Industrial Revolution because it was used in machines to help people pushing trains, ships and producing different products in a faster and more efficient way.

This DIY Steam Engine is a Walschaerts valve gear which is widely used in locomotives back in those ages.



The relationship between steam, valve, piston and wheel in a real steam engine are described as below:

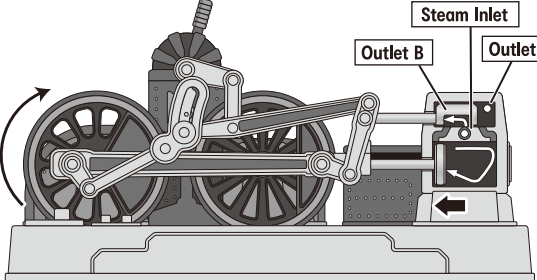


(1) As the valve moves toward the right, the steam comes into the right side of the cylinder from the steam inlet.

It pushes the piston towards the left.

The residual steam will exhaust from outlet B.

The Wheel will rotate in a clockwise direction due to the piston movement, which will push the train forward.

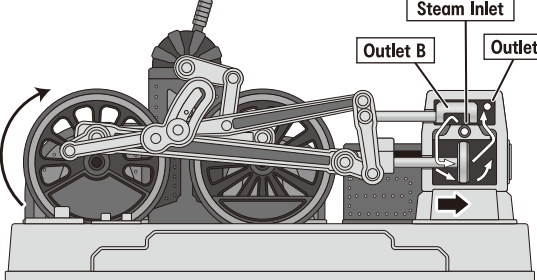


(2) The steam fills the right side of the cylinder and becomes residual steam. Outlet A opens.

It pushes the piston to the end of the left.

As the valve moves toward the left, the steam starts to come into the cylinder from the steam inlet. Outlet B closes.

The Wheel will rotate in a clockwise direction due to the piston movement, which will push the train forward.

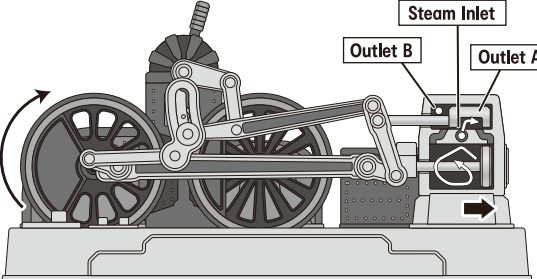


(3) The residual steam will exhaust from Outlet A.

The piston moves towards the right.

As the valve moves towards the left, the steam starts to come into the cylinder from the steam inlet and push the piston.

The Wheel will rotate in a clockwise direction due to the piston movement, which will push the train forward.

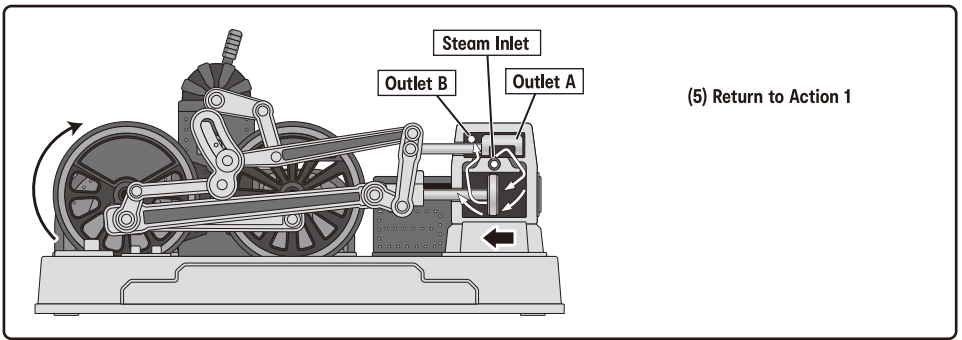


(4) As the valve moves to the right side, the steam starts to come into the cylinder from the steam inlet. Outlet A closes.

The piston moves to the end of the right.

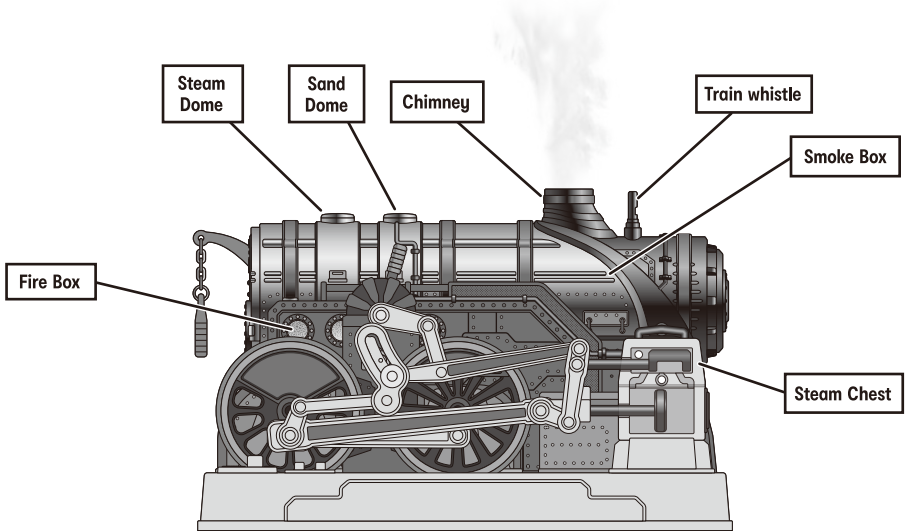
The steam fills the left side of the cylinder and becomes residual steam. Outlet B opens.

The Wheel will rotate in a clockwise direction due to the piston movement, which will push the train forward.



In this design, the upcoming pressured steam can push the wheel and as a result move a train.

Construction:



Fire Box: A furnace chamber. Coal will be added into the fire box for fire. The fire will heat up the water in the boiler. After the water is boiled, steam comes up and goes through pipes.

Steam Dome: A tank that stores steam and connects to steam pipe. It also prevents water from entering the steam pipe.

Sand Dome: A tank that stores sand. Sand is used to increase traction when the rail is icy or wet. Sand will be sprayed in front of the wheel when it is needed.

Steam Chest: The valve chamber that pushes the piston and moves the train.

Smoke Box: The used steam comes from Outlet A and Outlet B will be exhausted into the smoke box.

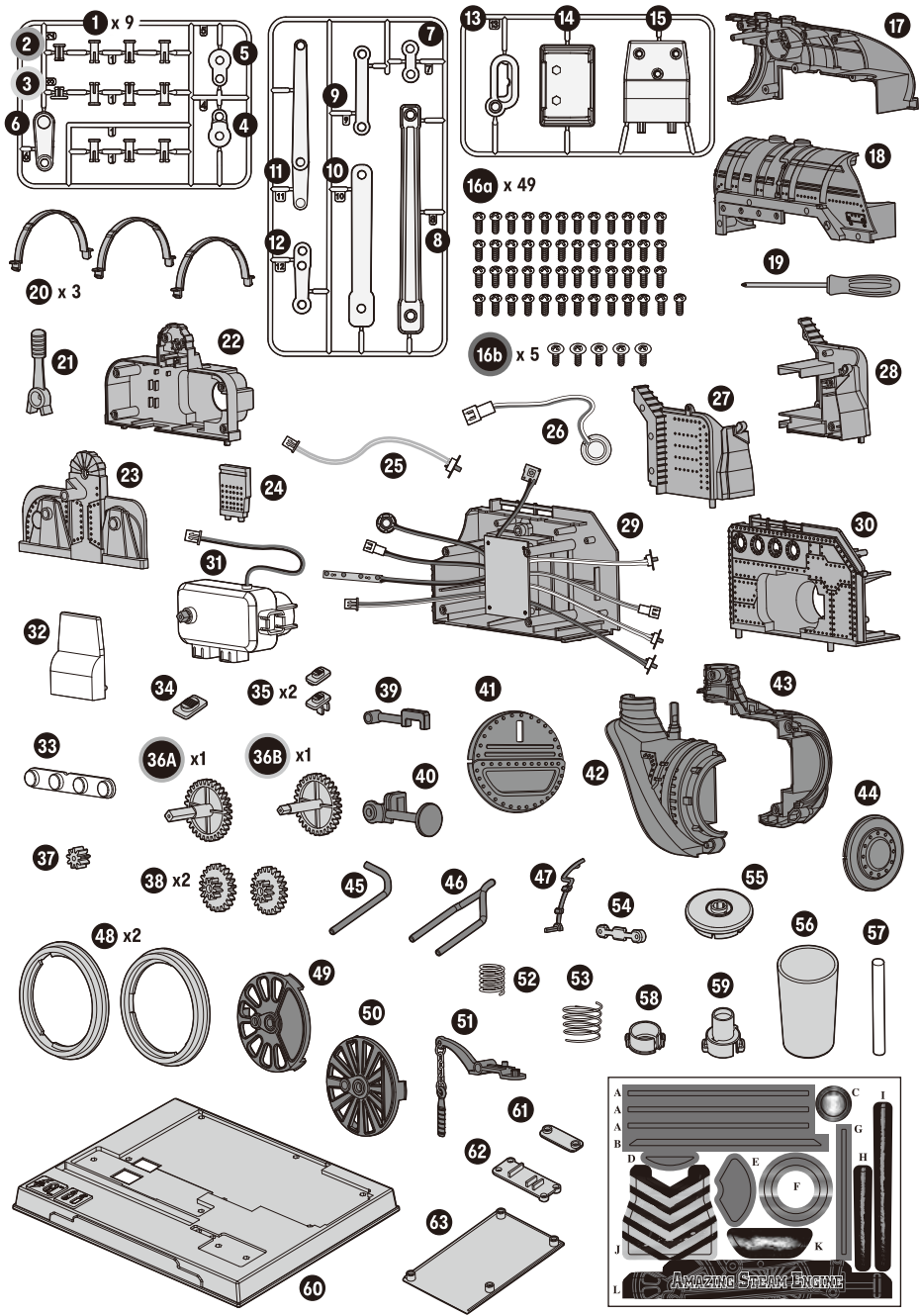
Chimney: Steam in smoke box will be exhausted to the outside by the chimney.

Train Whistle: A whistle for signal and warning. When steam exhausts out, it will create sounds. The whistle can be long or short and they combine together as whistle code. For example, a single long whistle means the train is stopped and two short whistles mean acknowledgement of the signal.

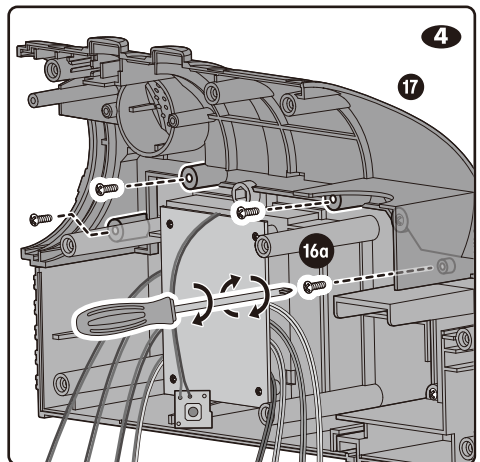
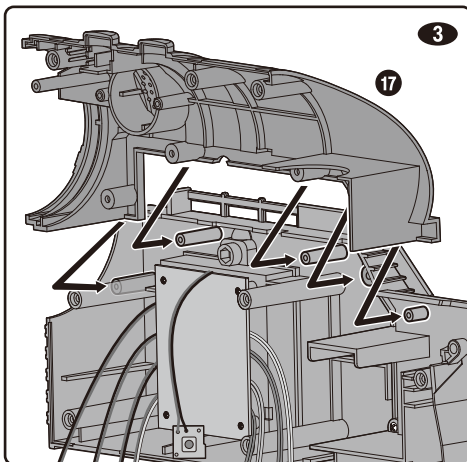
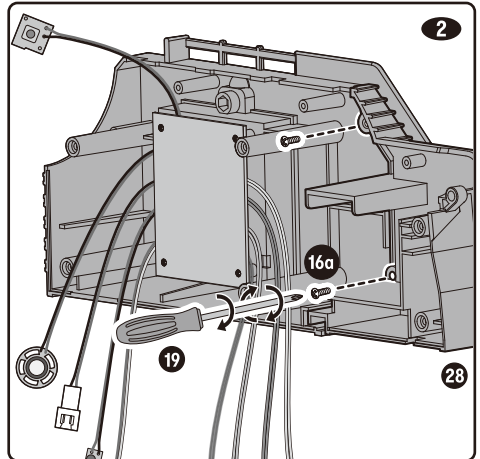
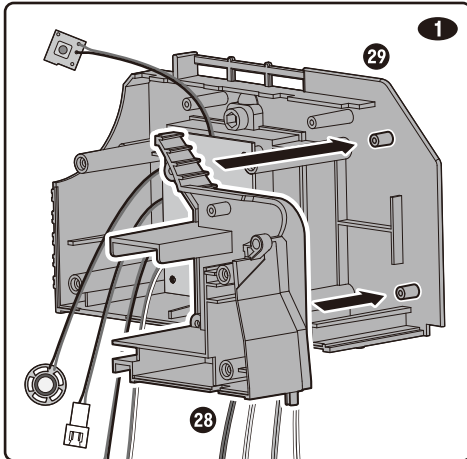
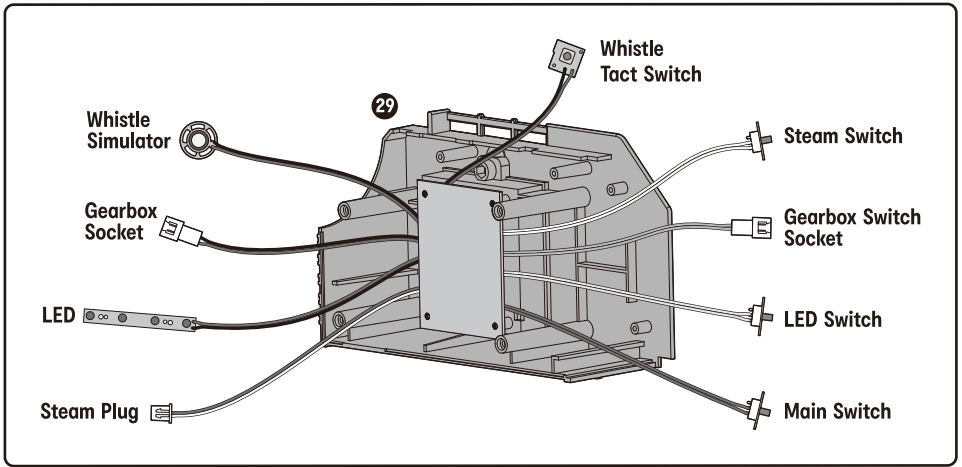
You can pull the pull cord at the back to generate the whistle.

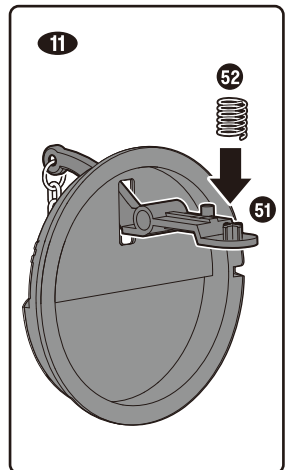
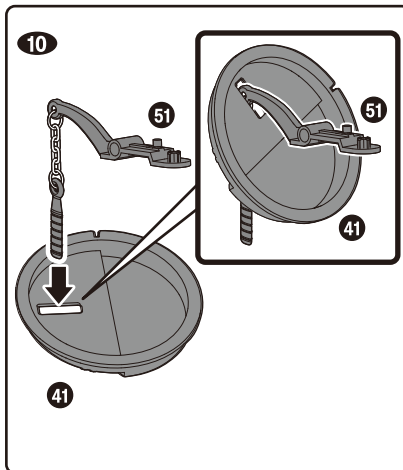
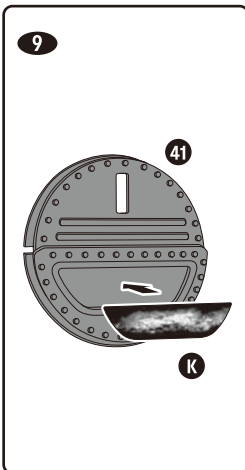
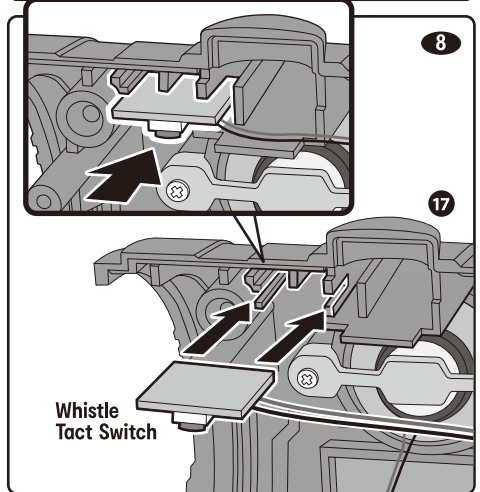
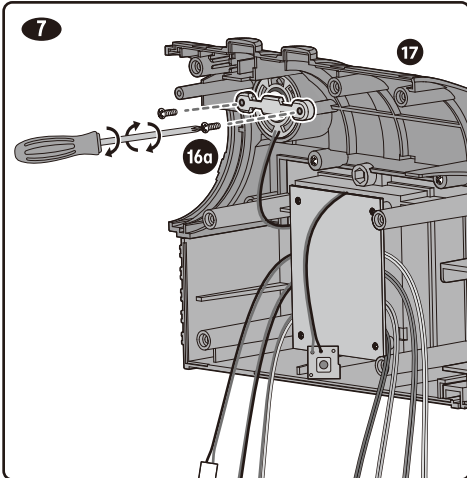
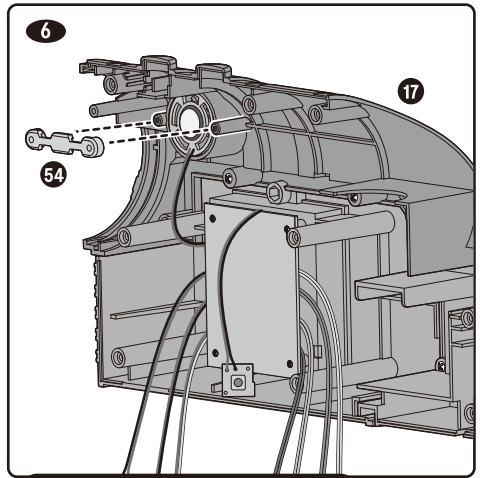
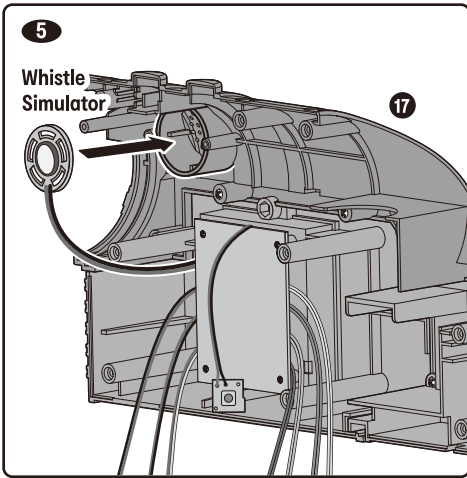
COMPONENTS

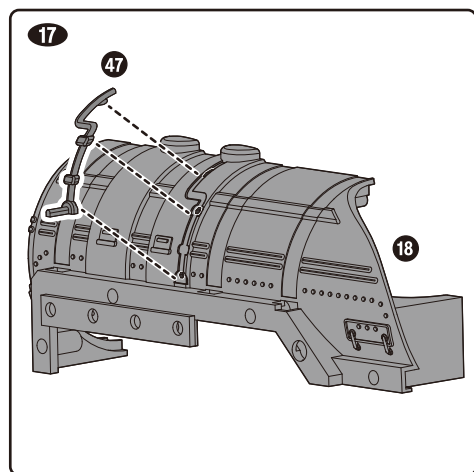
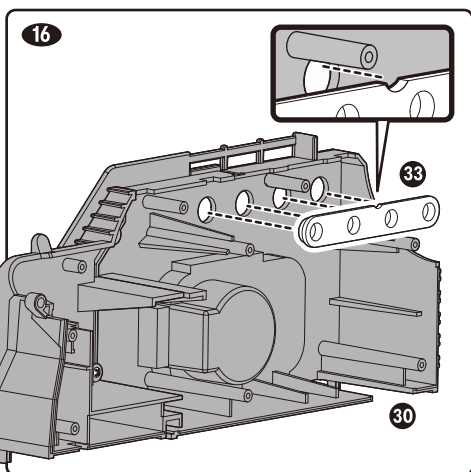
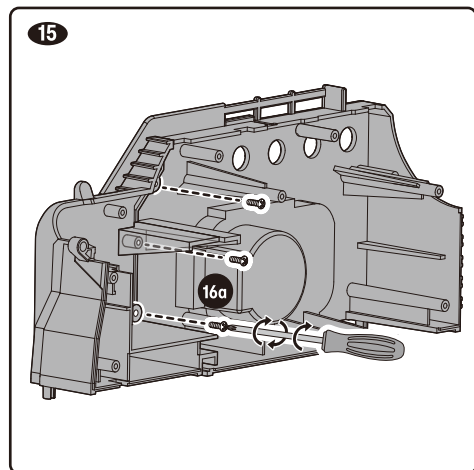
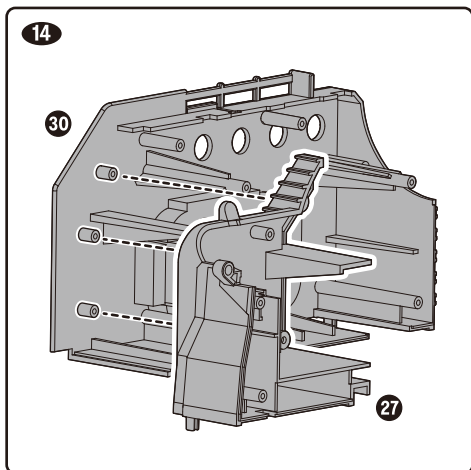
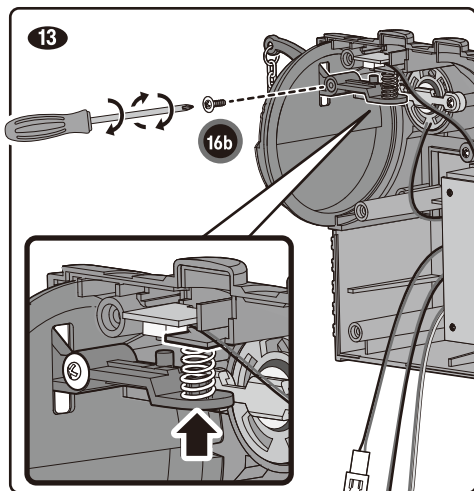
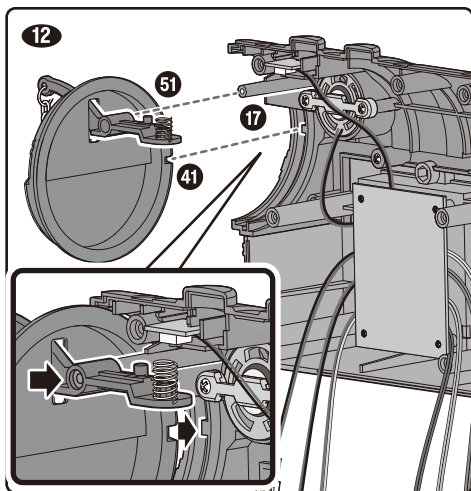
- Gently remove all rods and make sure each part has no sharp point or any scraps remain in order to operate.

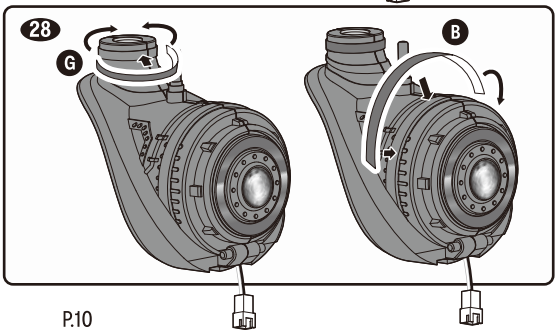
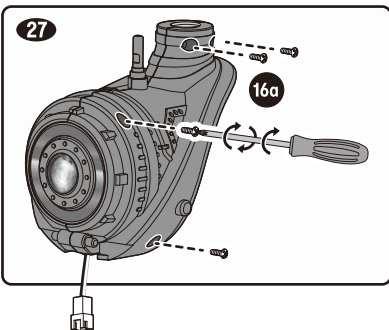
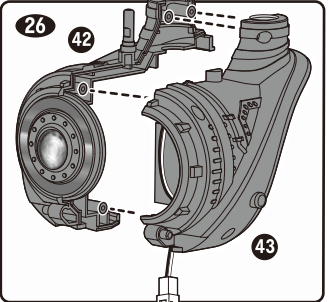
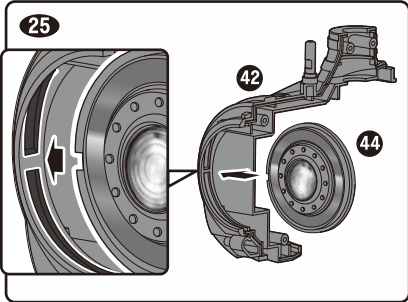
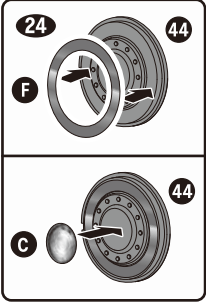
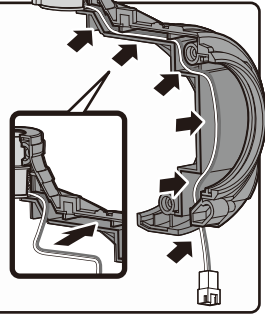
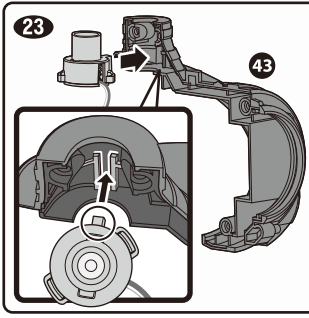
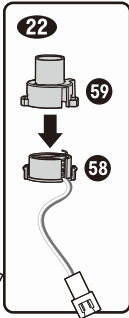
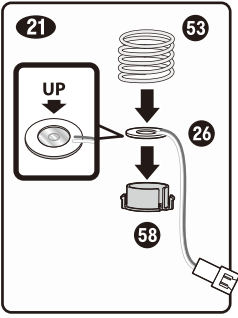
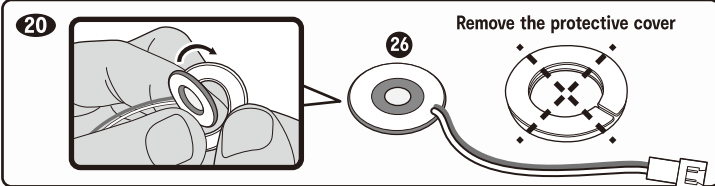
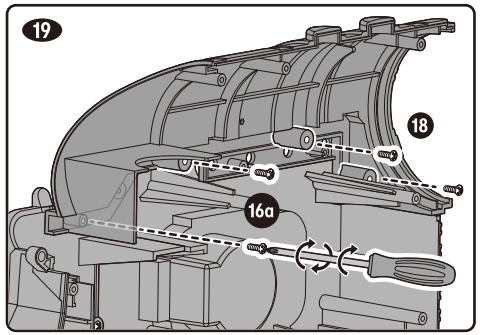
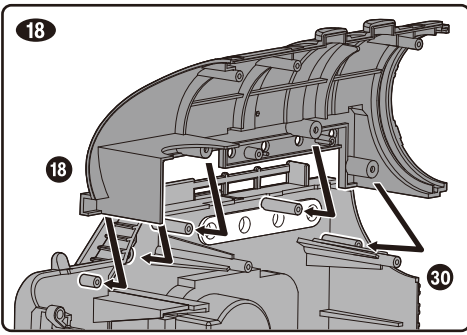


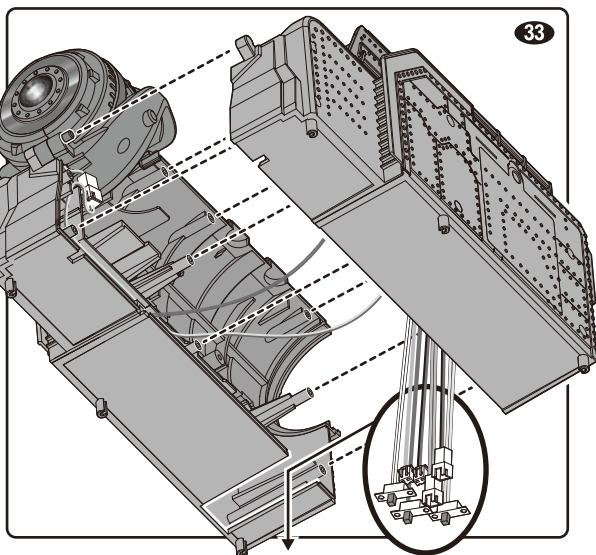
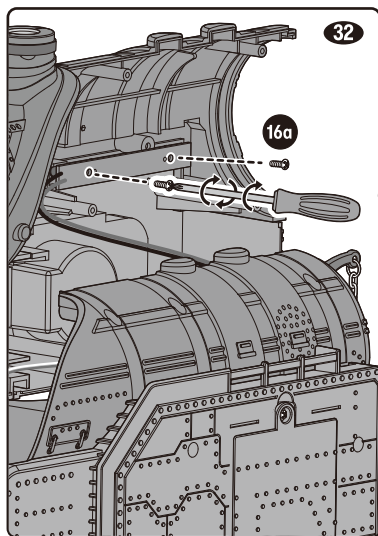
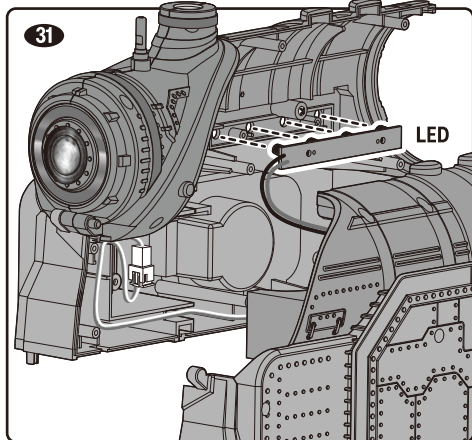
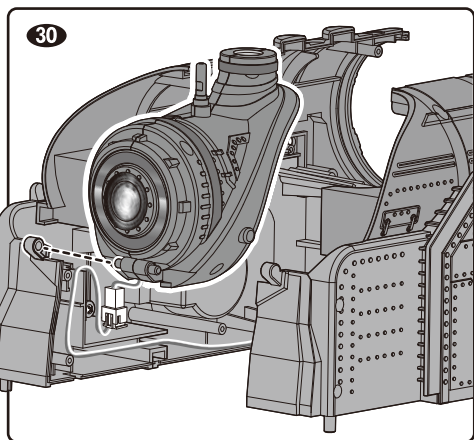
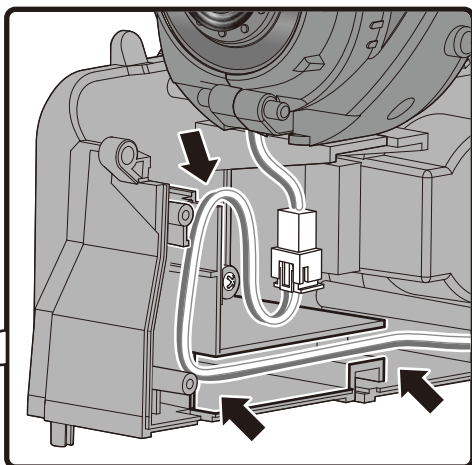
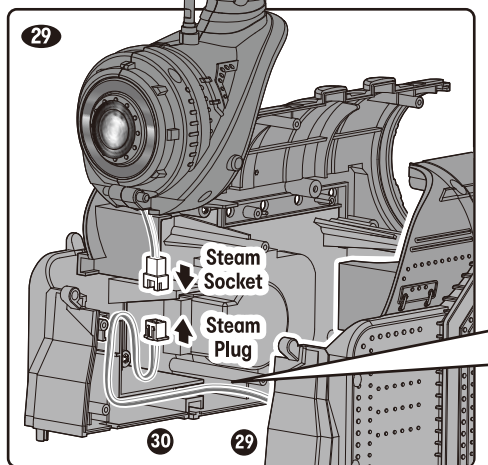
ASSEMBLY

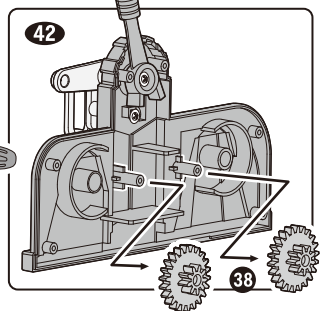
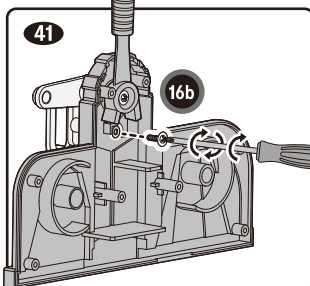
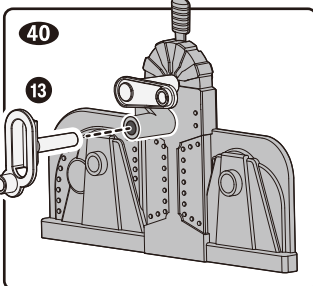
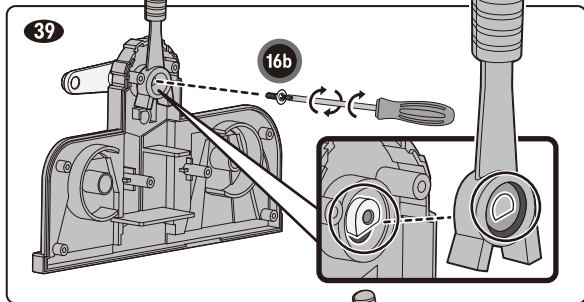
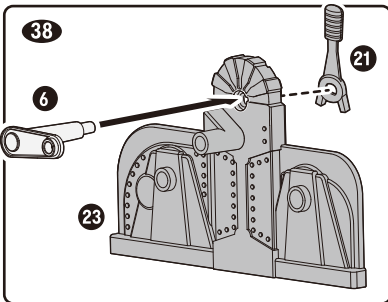
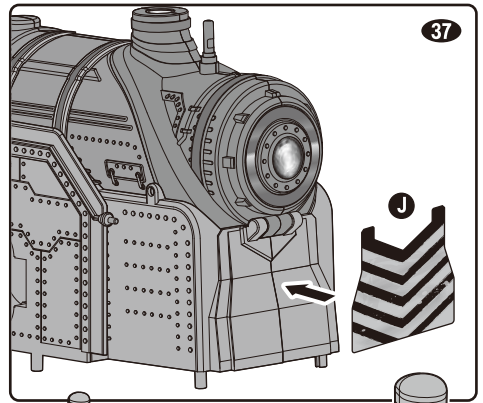
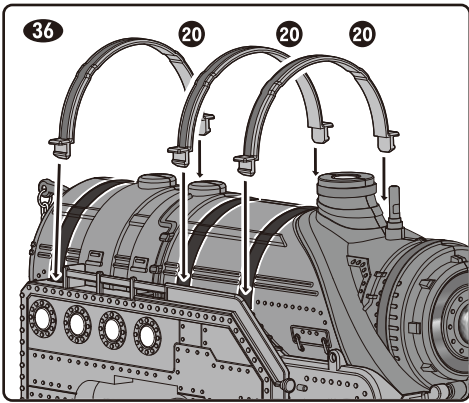
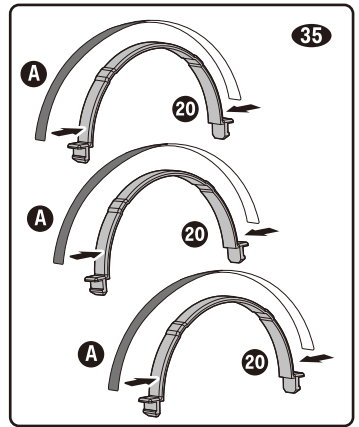
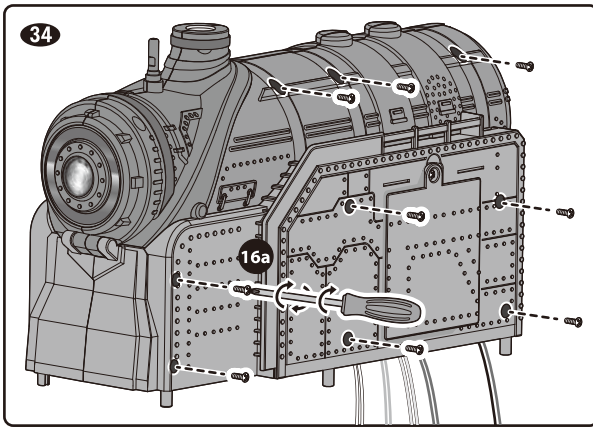


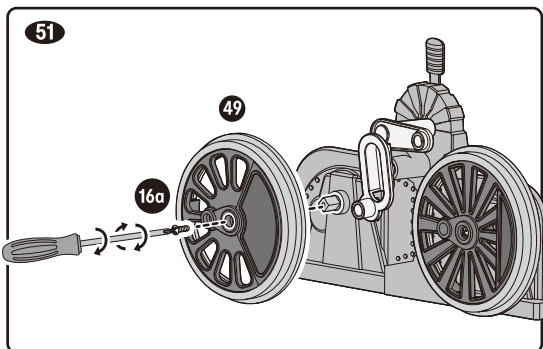
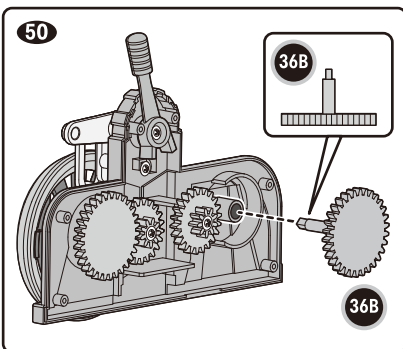
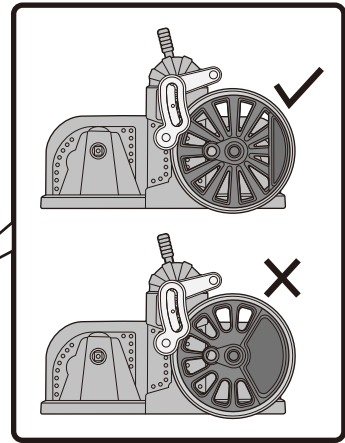
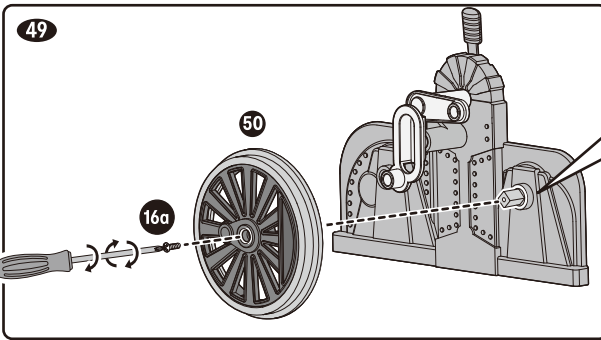
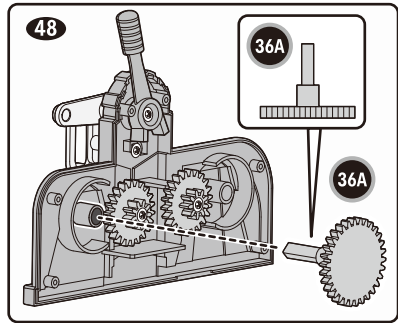
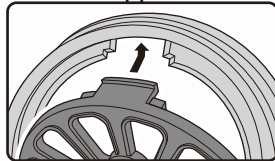
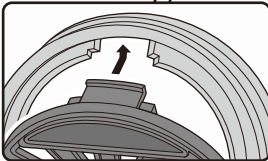
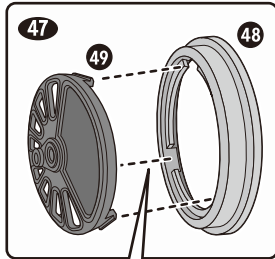
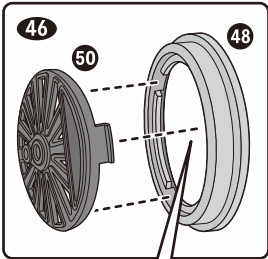
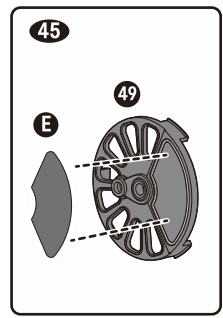
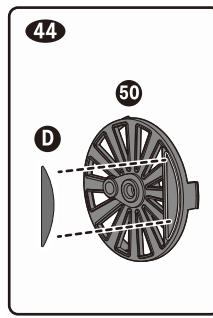
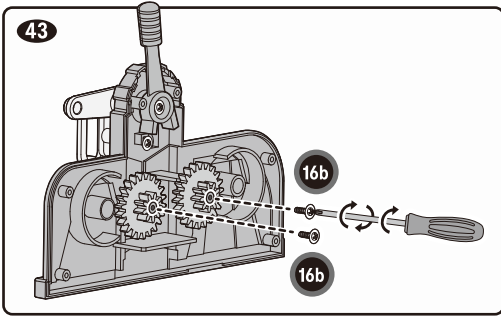


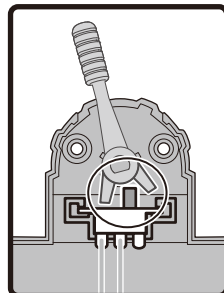
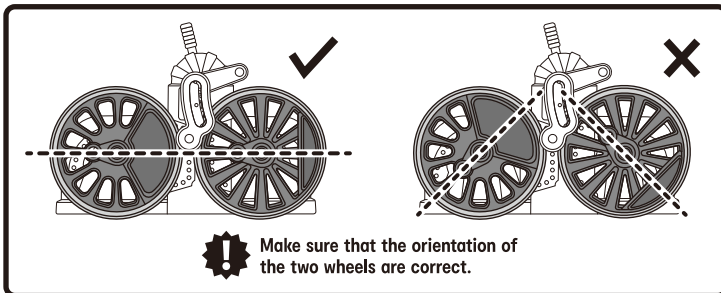
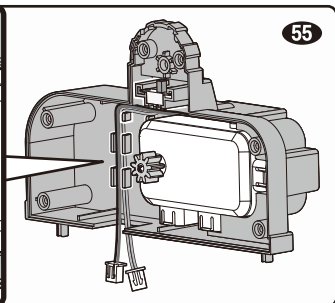
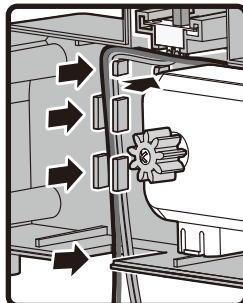
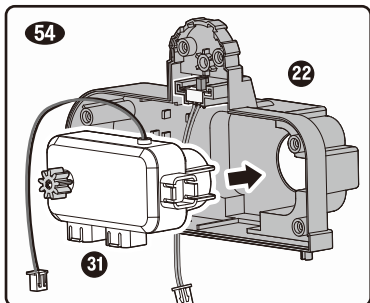
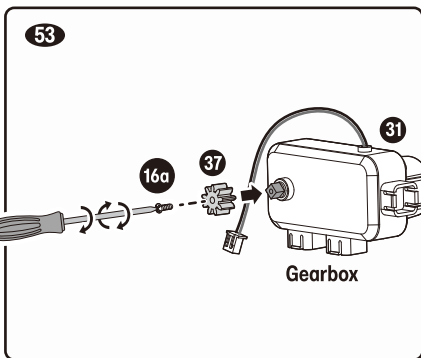
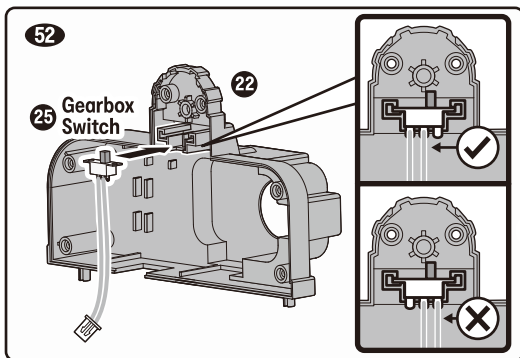




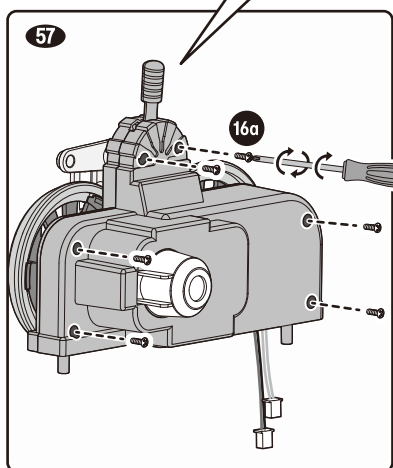
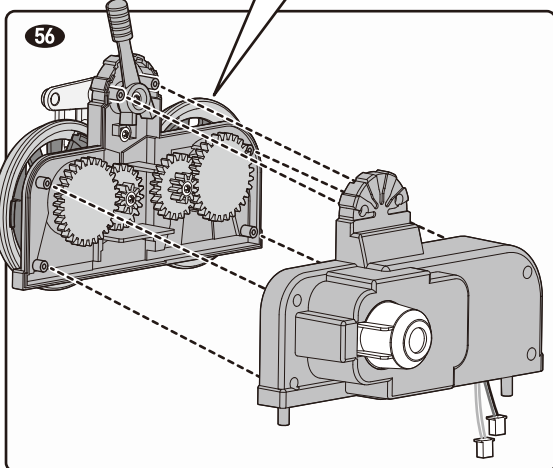




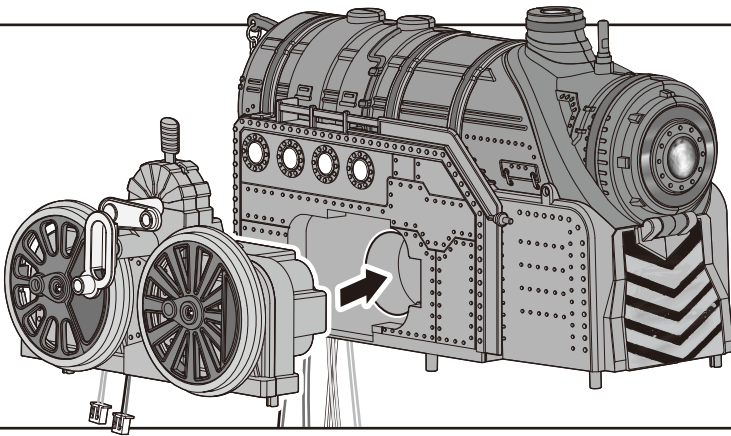




! Make sure that the orientation of the two wheels are correct.



58



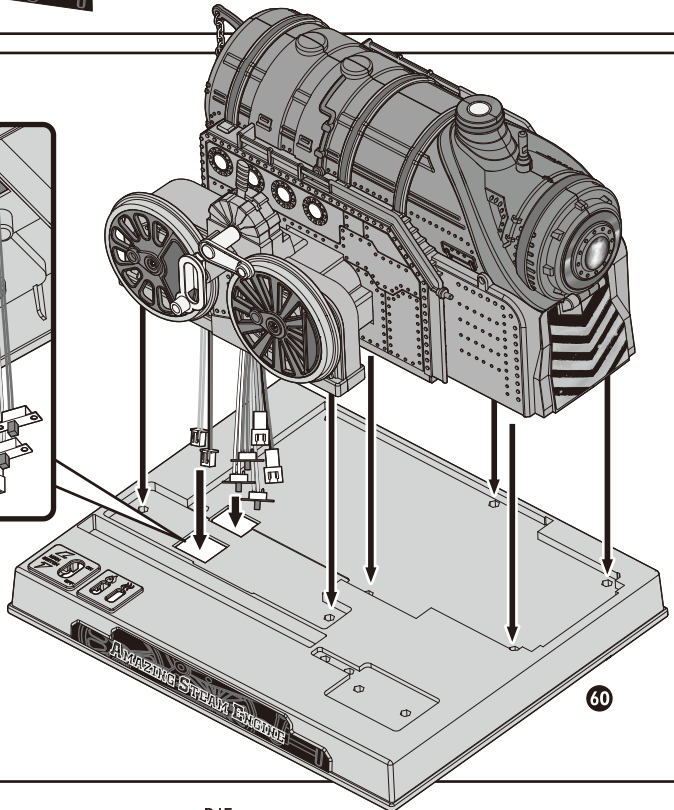
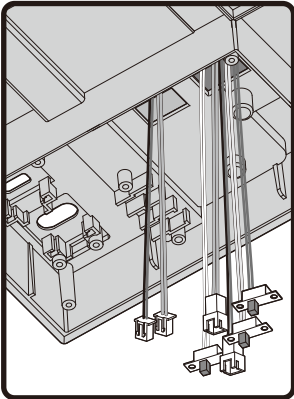
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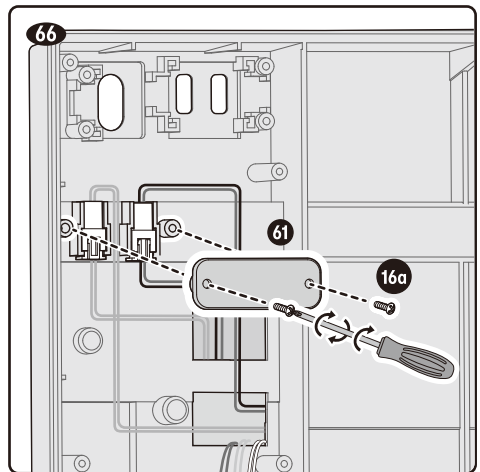
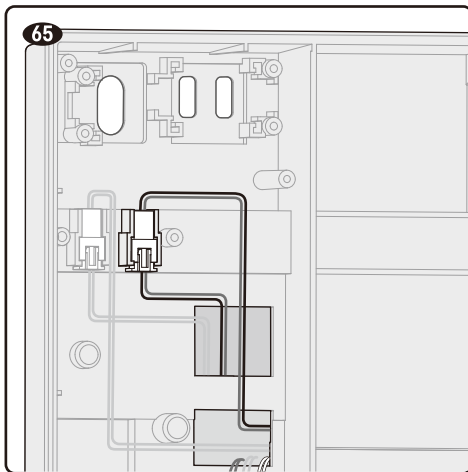
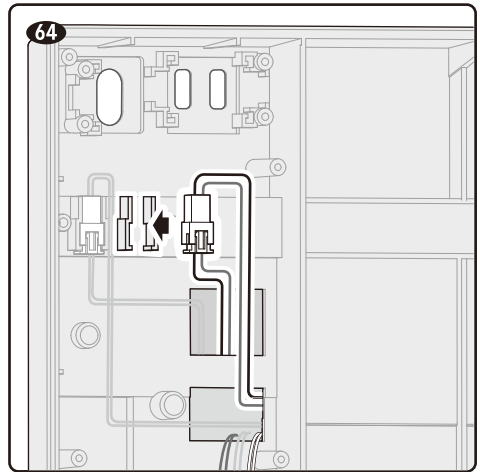
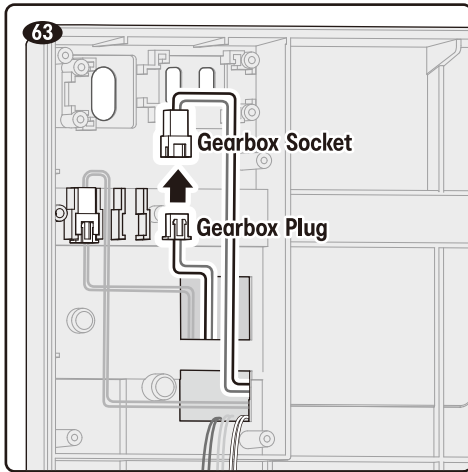
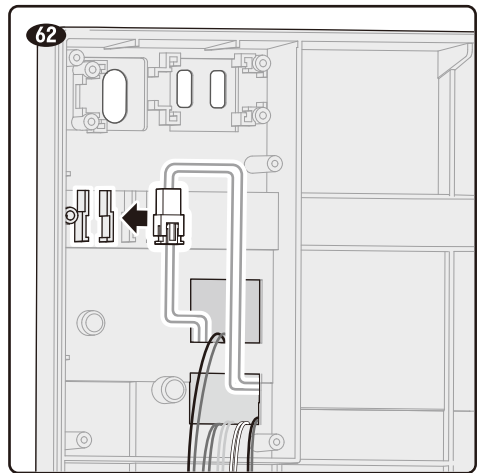
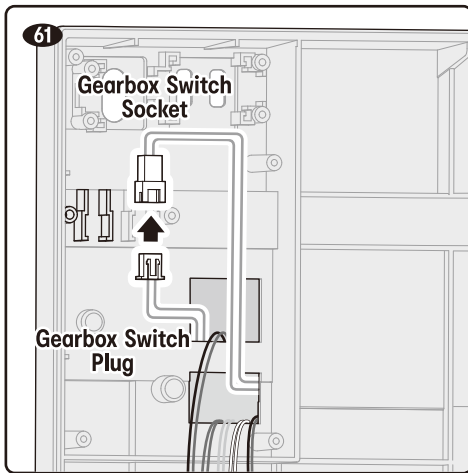


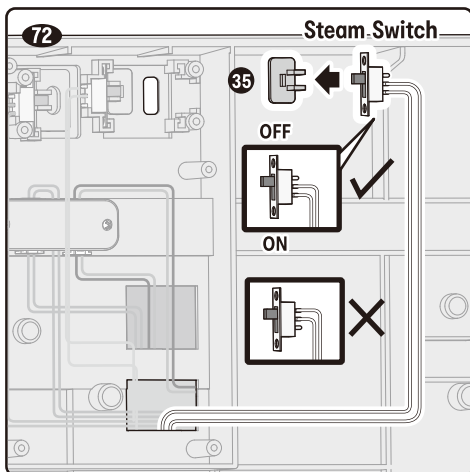
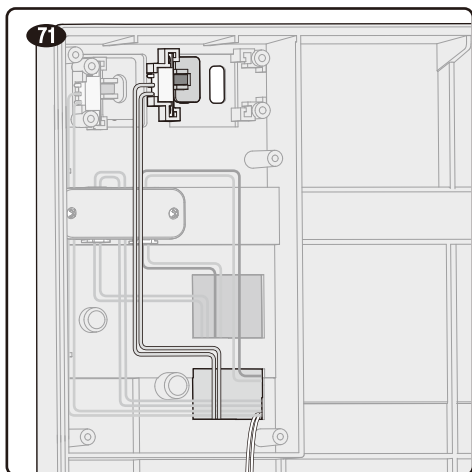
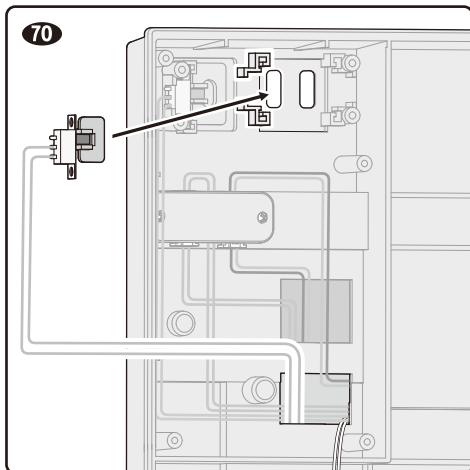
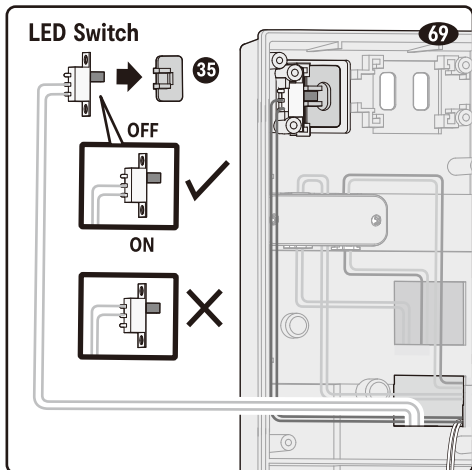
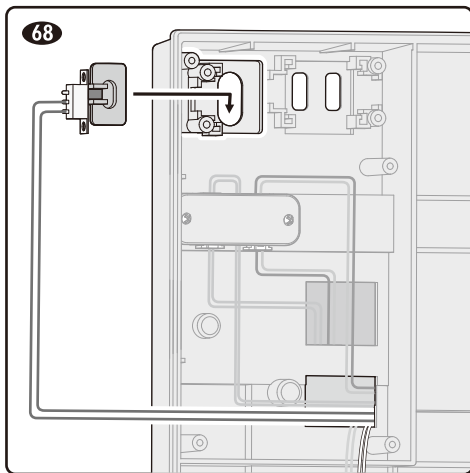
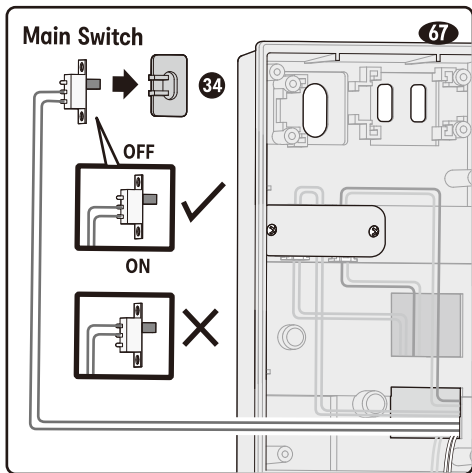
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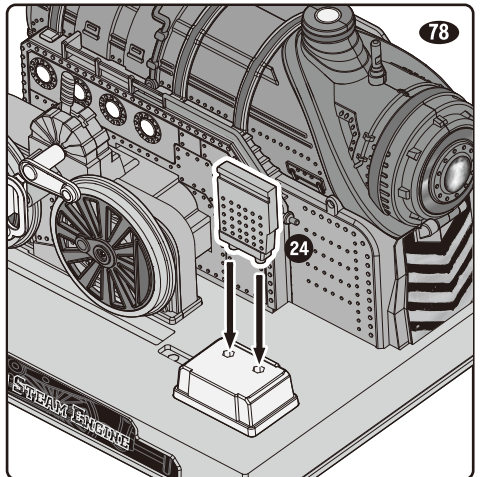
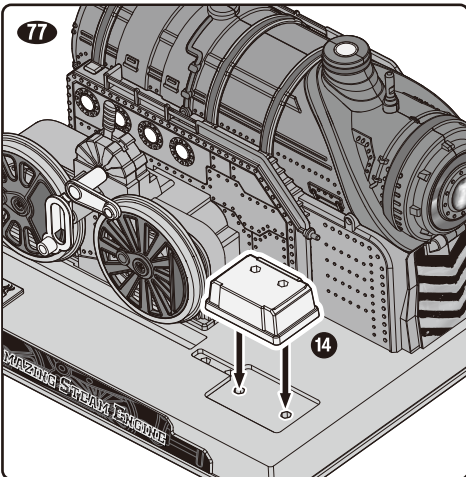
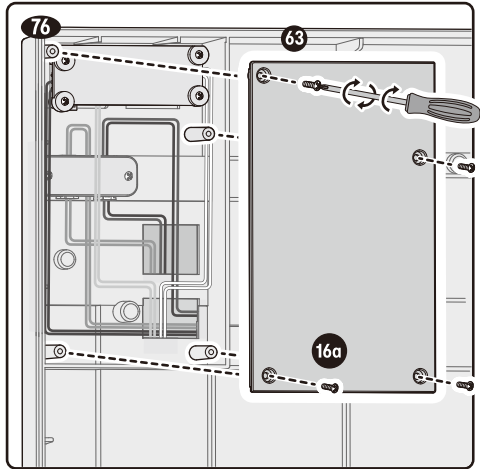
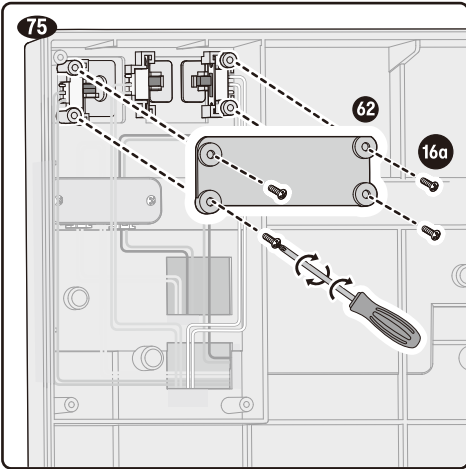
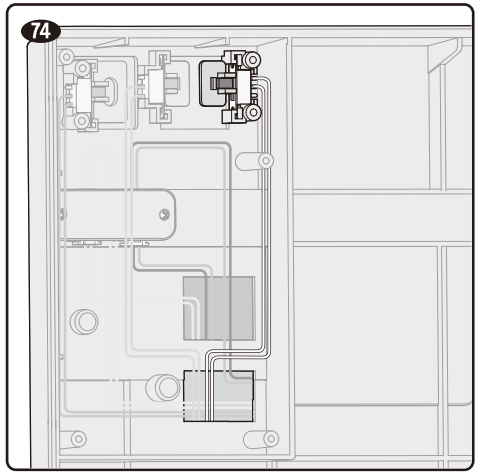
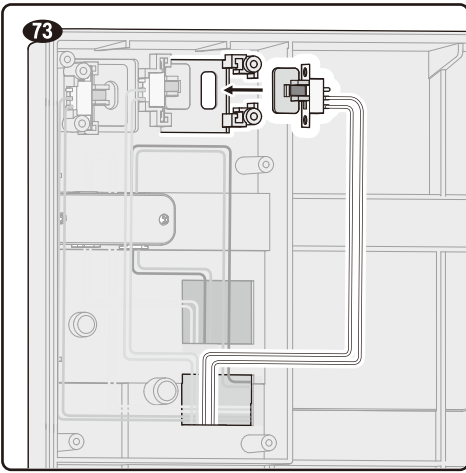
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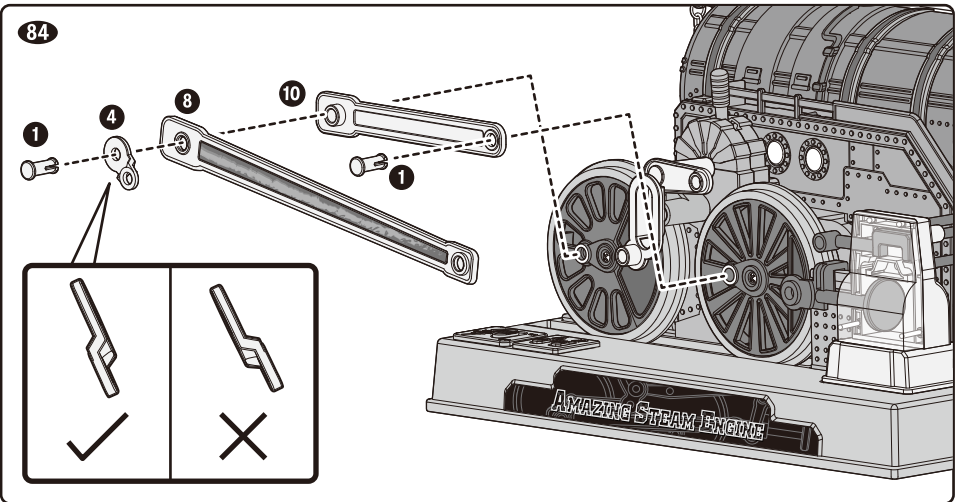
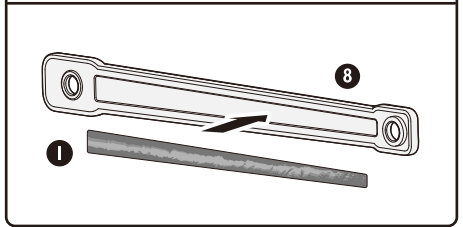
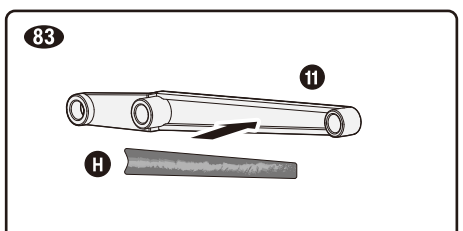
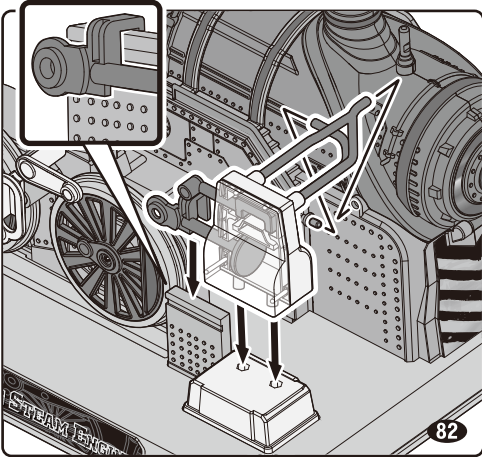
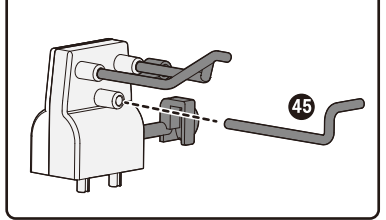
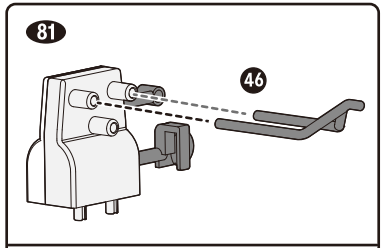
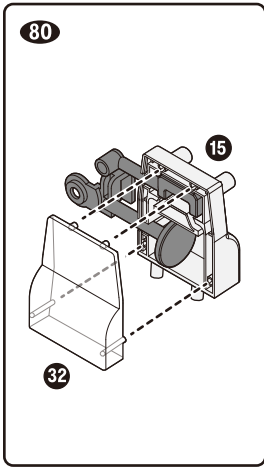
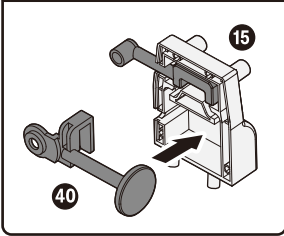
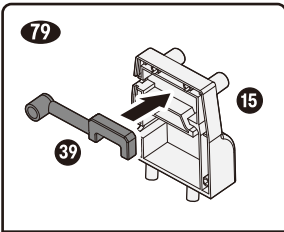


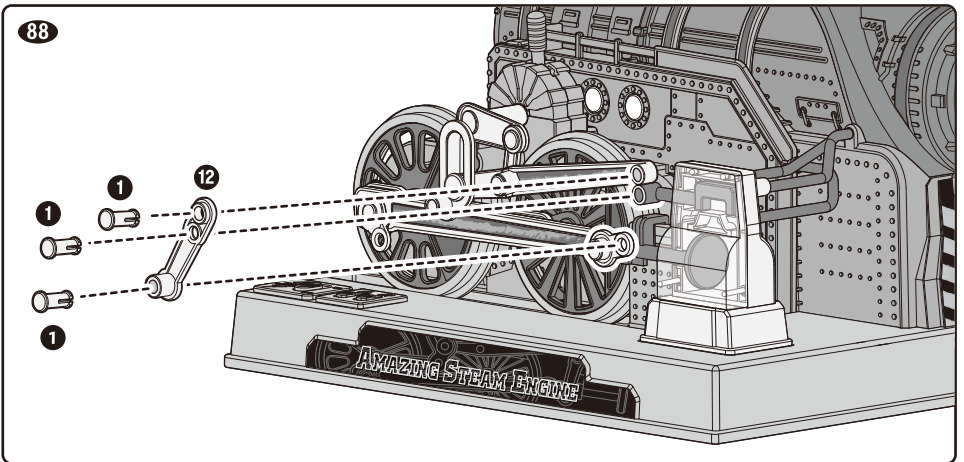
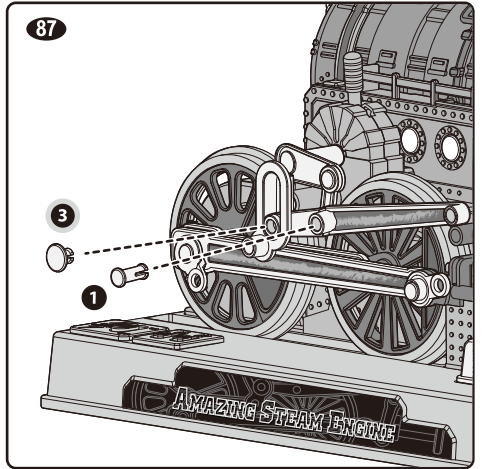
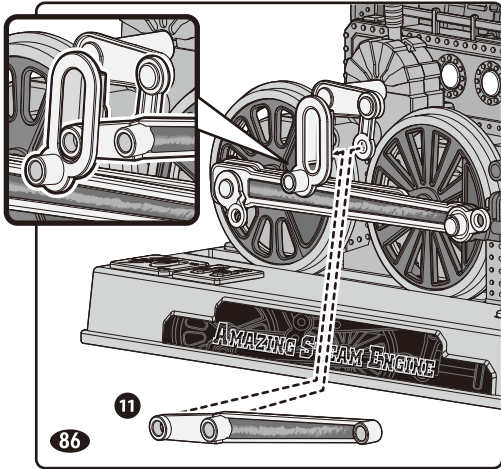
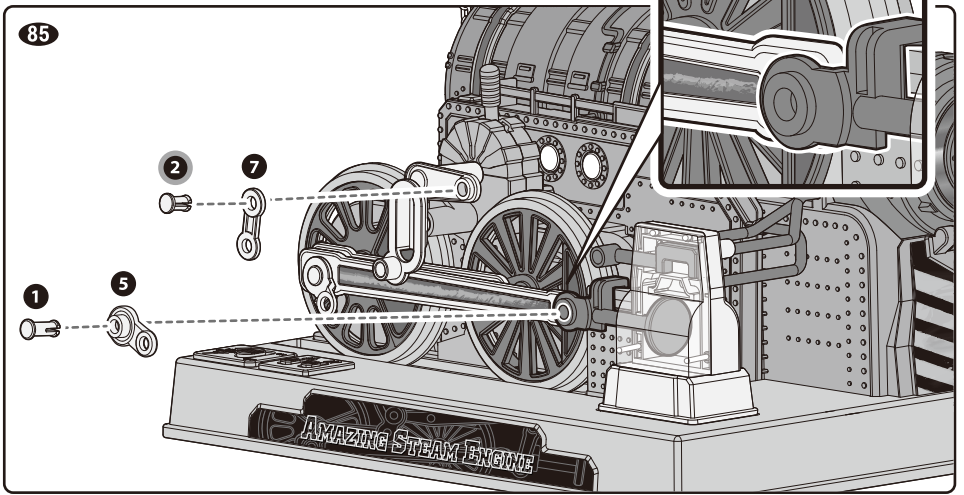
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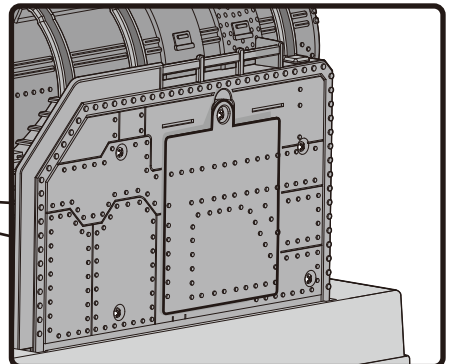
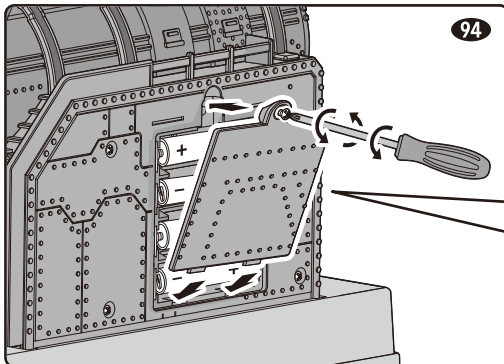
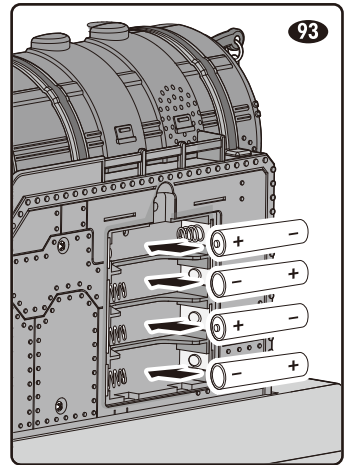
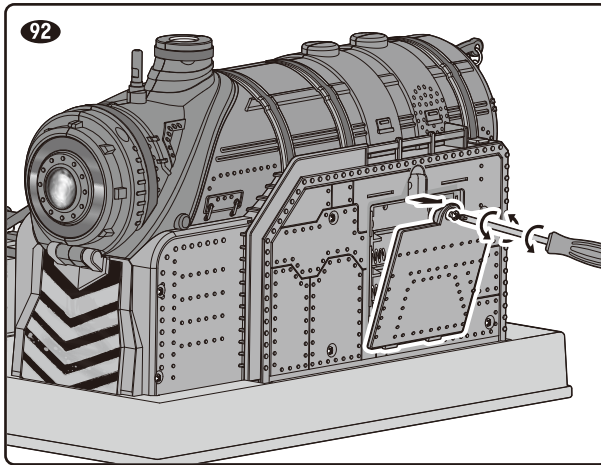
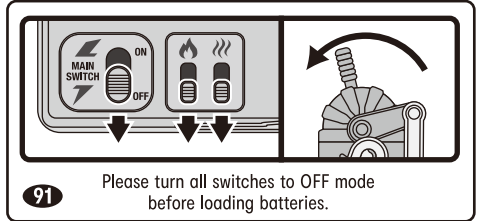
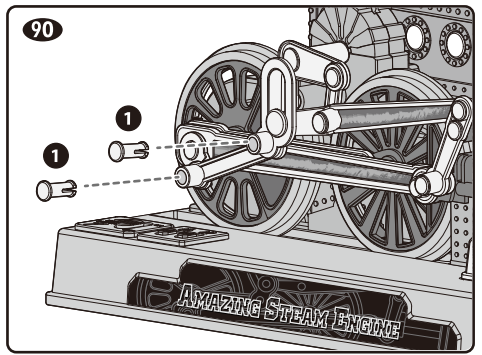
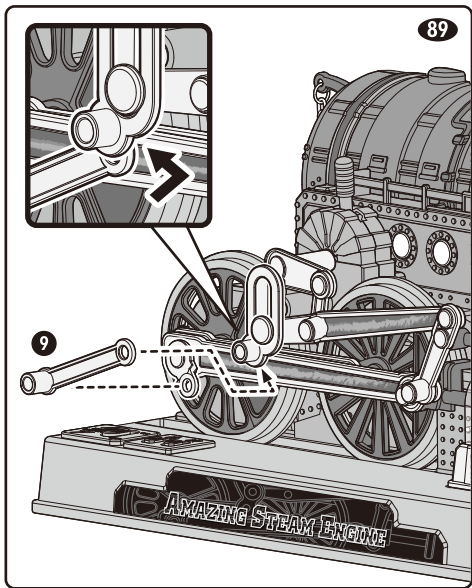


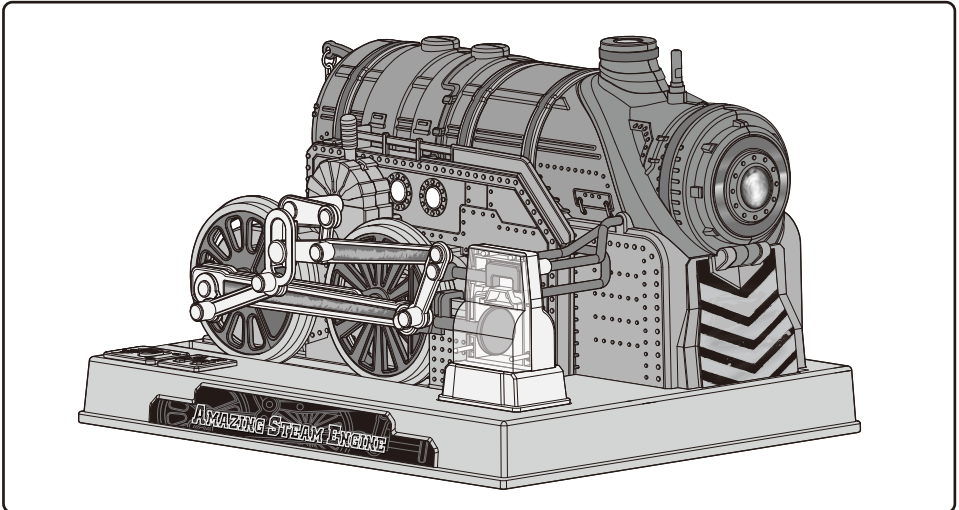
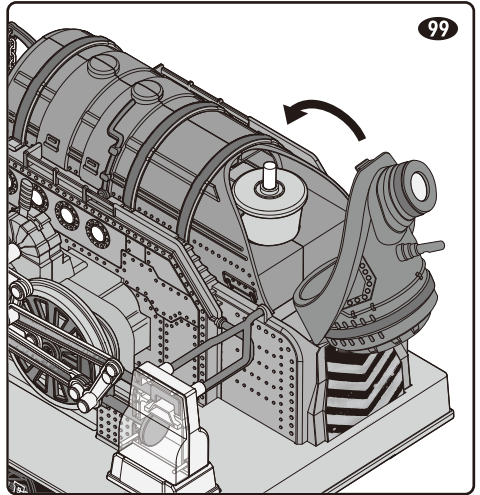
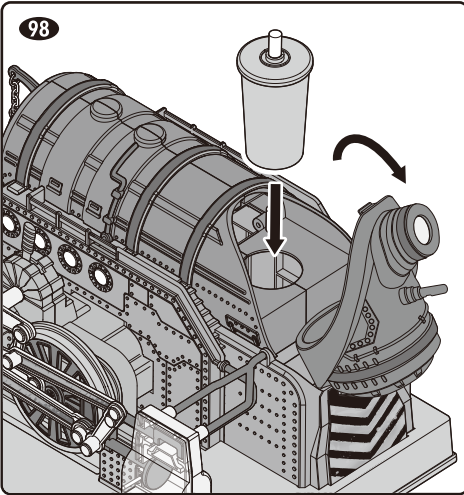
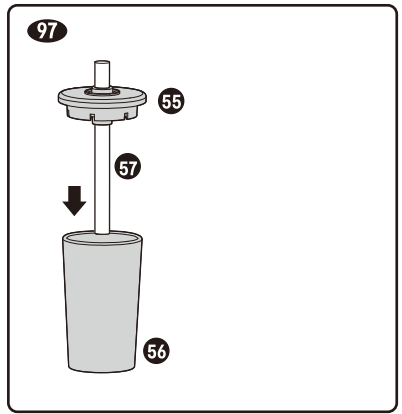
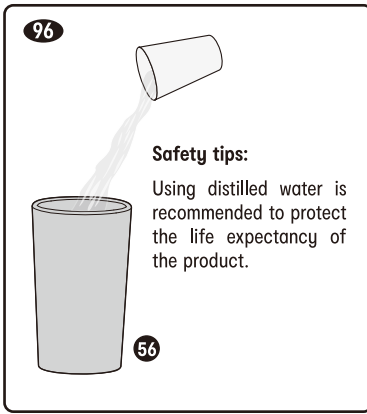
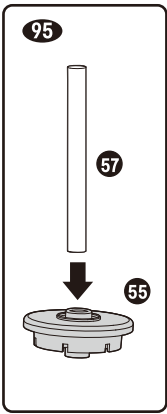












How to Play

1. Assemble the Amazing Steam Engine set as shown in ASSEMBLY. Insert 4 AA batteries into the battery case (batteries not included).

2. Pour appropriate amount of water into the water tank.

3. Turn ON the device by switching on the Main Switch.

4. If you switch on the Fire Box Switch, LEDs will be ON.

5. If you switch on the Steam Generator, steam will be generated and come out from the chimney.

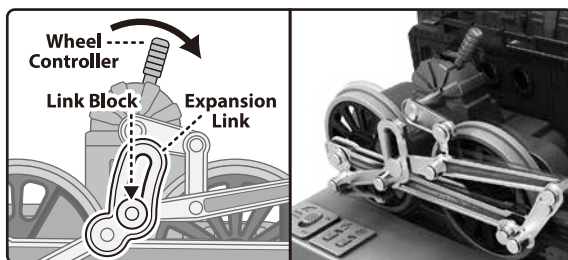
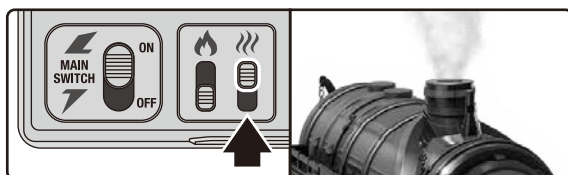
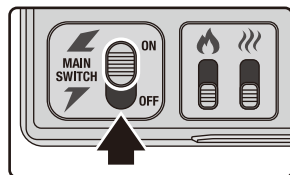
6. If you push forward the Wheel Controller, the valve gear will push the wheels to move forward.

Note: When starting up, make sure the Link Block is pushed to the bottom of the Expansion Link.

7. If you pull the Whistle Control Chain, the whistle sound will ring for few seconds and stop, or it will stop when you release the chain.

8. When you finish playing you need to switch OFF the device by switching off the Main Control.

9. When you finished playing, please turn off the set and remove all the batteries from the battery case.



Safety tips:

If the steam is not releasing smoothly or the steam is greatly reduced, please gently clean the atomizer positive side with alcohol. Please do not clean the atomizer reverse side.



Warning! Do not short-circuit the battery terminals and spring connectors. Otherwise it may cause overheating. Do not lock the motor or other moving parts. Otherwise it may cause overheating. Water toys sometimes get messy. Protect play surfaces before use. Drain, rinse, clean and dry all items thoroughly before storing.

43-264-339

MADE IN CHINA

FOR AU / NZ: IMPORTED FOR KMART STORES IN AUSTRALIA AND NEW ZEALAND.