



# Hydraulics

## Hydraulic Lift



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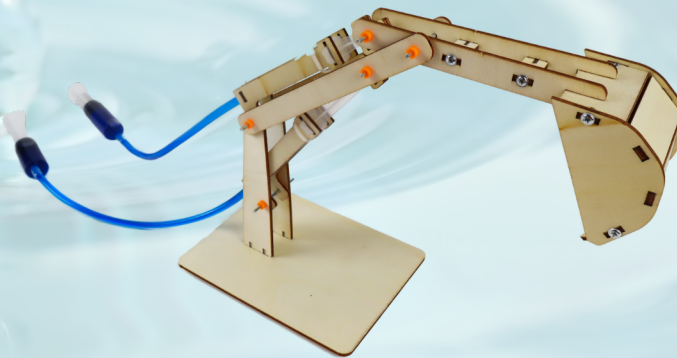


Early peoples learned how to use flowing water to do work. Water was used to power water mills and to provide irrigation for farming. Later, people were able to use liquids to do even more after scientists learned that all liquids follow certain rules.

People learned that **pressure in a liquid is transmitted equally in all directions**. That is, when one pushes down on the liquid in a tube the liquid will push against whatever it comes up against, even if it is bigger than the original tube. Therefore, it is possible to use a small amount of force to create a larger force somewhere else.



These projects require to handle small screws using a screwdriver, which possibly needs parent's assistance.



Hydraulic Excavator

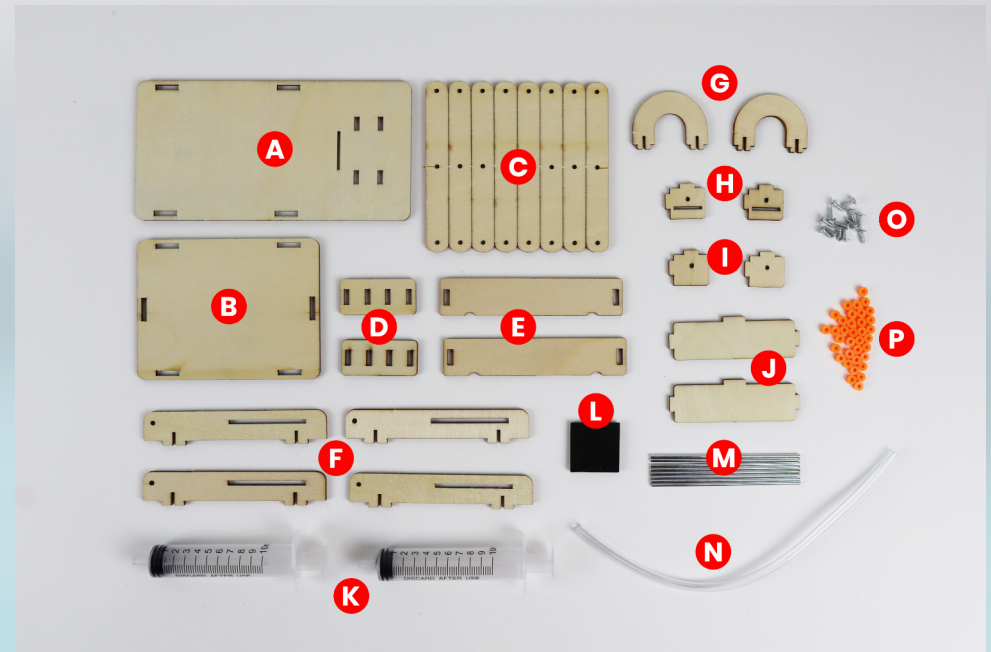
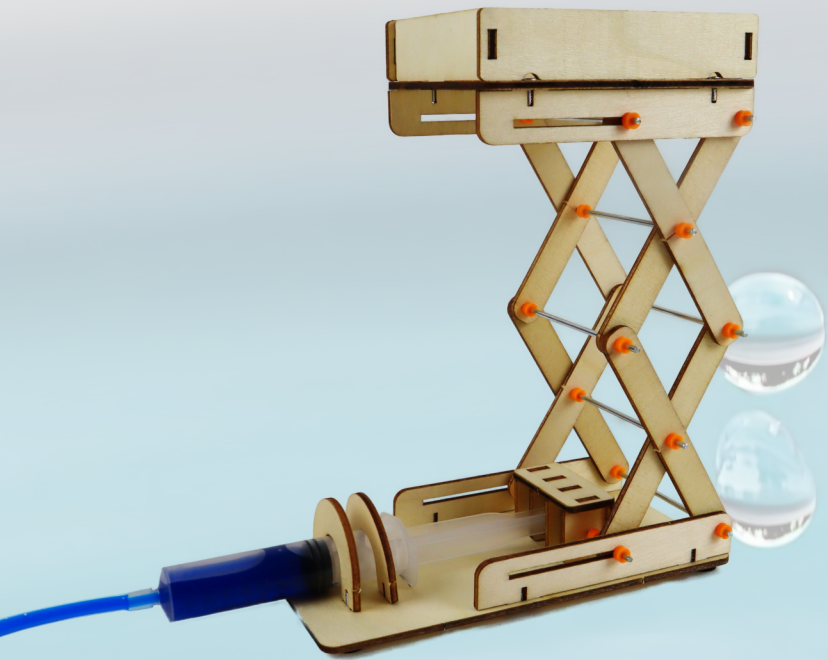


Hydraulic Lift

**⚠ WARNING:**  
CHOKING HAZARD - Small parts  
Not for children under 3 years.

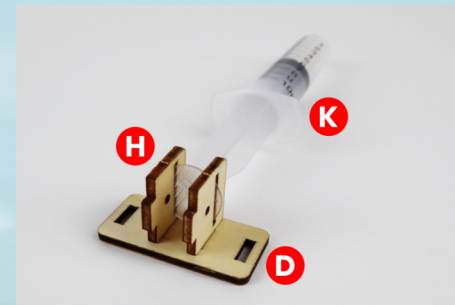






A hydraulic lift is used to lift very heavy objects. It is a machine that uses pressurized liquid in a confined space to transfer pressure. The pressure of the fluid is transferred from one end of the hydraulic system to the other.

The principle of hydraulics is used in many systems, and is found in machines as varied as car brakes and the human circulatory system.



**Step 1:** Clamp the syringe head with two H, and insert them into D.



**Step 2:** Insert two part I into D.



**Step 3:** Install another D.

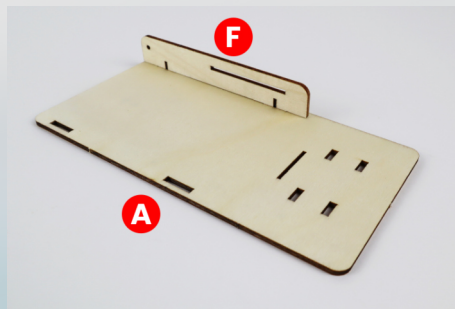


**Step 4:** Insert an iron rod and put orange fixing rings on each side.

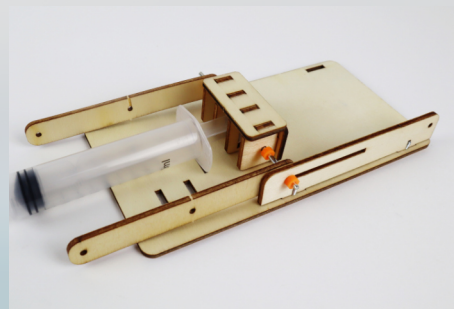




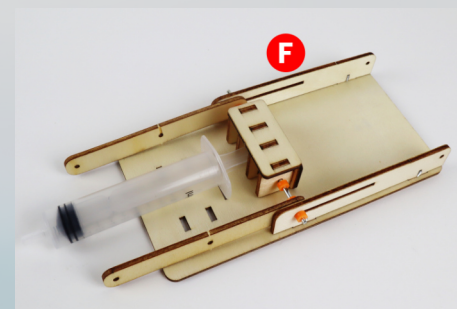
**Step 5:** Put orange fixing rings then insert C on each side.



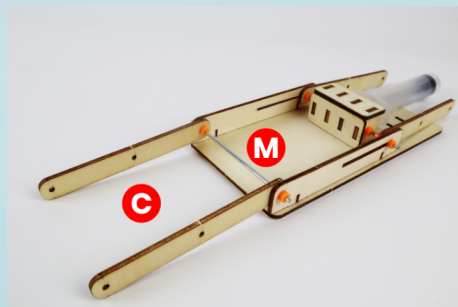
**Step 6:** Install F on board A and put two screws.



**Step 7:** Use an orange fixing ring to hold the rod in the slide rail.



**Step 8:** Repeat steps 6 and 7 to finish the other side.



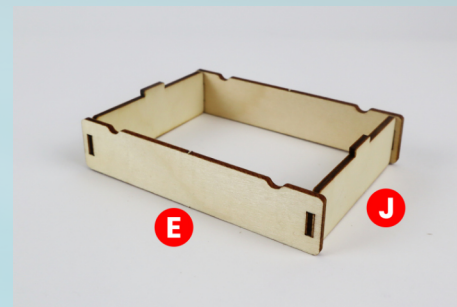
**Step 9:** Install two C using a rod and four orange fixing rings.



**Step 10:** Complete two X frames using a rod and four orange fixing rings.



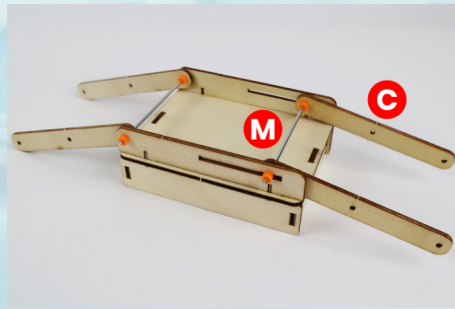
**Step 11:** Install two F on board B and put four screws.



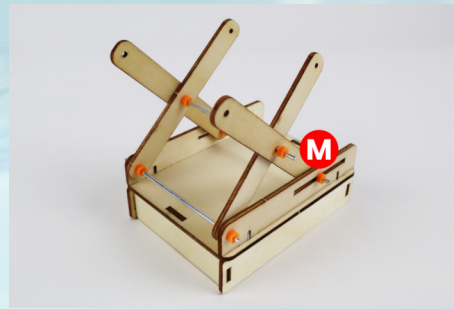
**Step 12:** Install two E and two J together.



**Step 13:** Install the finished parts from step 12 on top of board B from step 11.



**Step 14:** Use two rods and eight orange fixing rings to install four C.



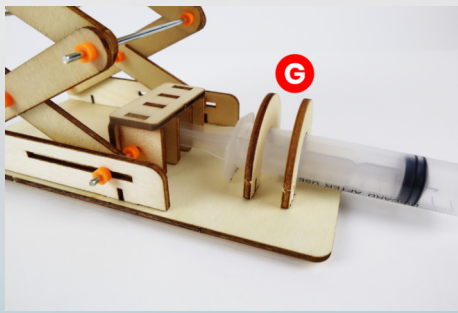
**Step 15:** Complete two X frames using a rod and four orange fixing rings.



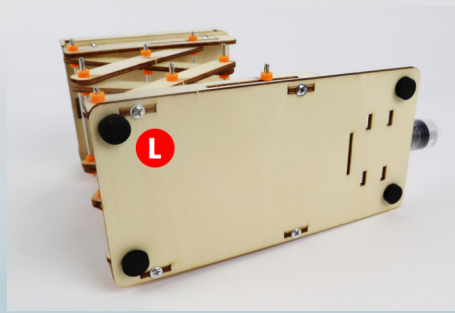
**Step 16:** Connect X frames from step 10 and 15 using two rods and eight orange fixing rings.

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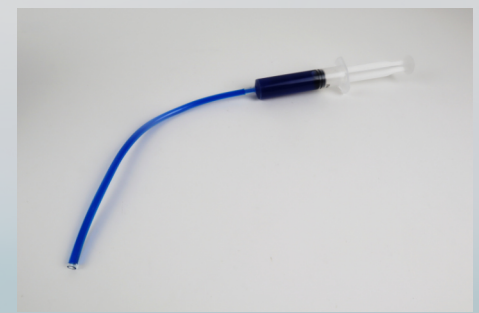
**Step 17:** Install two G with four screws to hold the syringe in place.



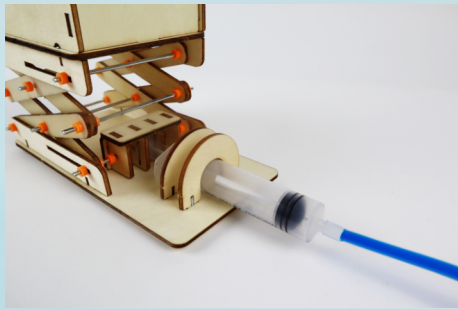
**Step 18:** Attach four black pads on the bottom.



**Step 19:** Fill another syringe with 10ml water.



**Step 20:** Connect the hose to the syringe tightly. Push water into the hose.



**Step 21:** First push the syringe to expel the air completely. Connect the hose to the syringe tightly.

This step completes the Hydraulic Lift project!



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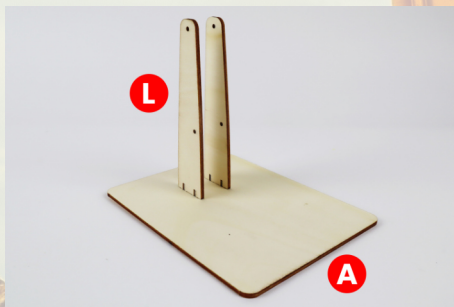
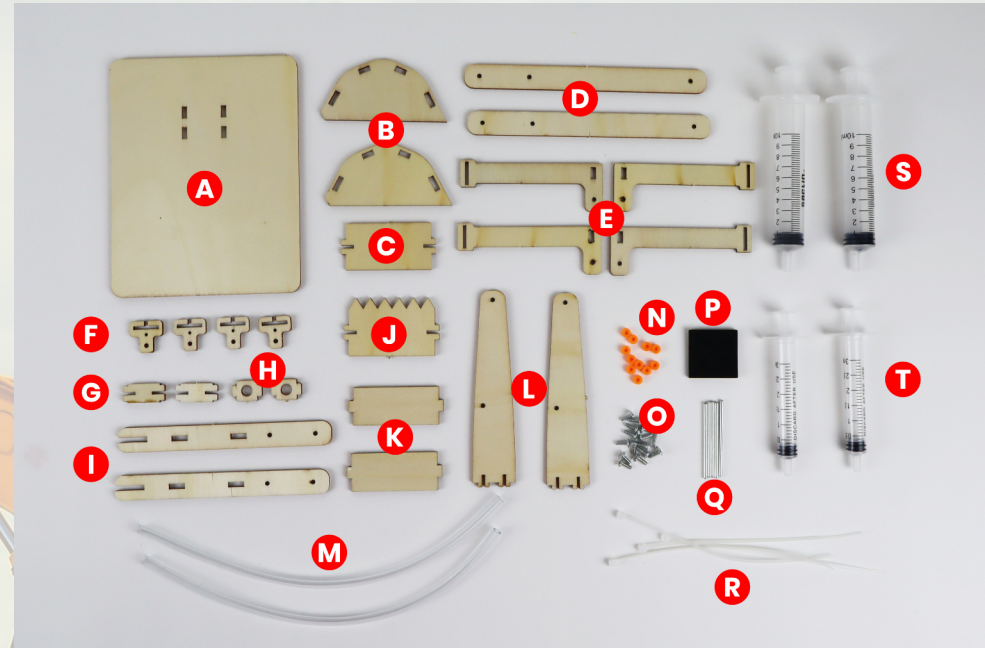
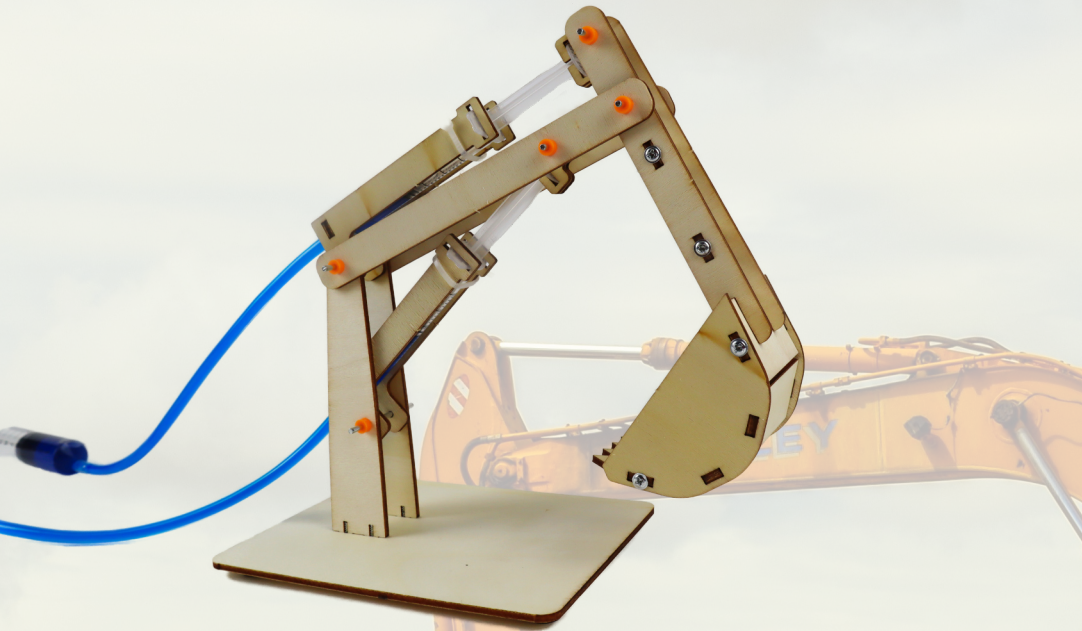


# Hydraulics

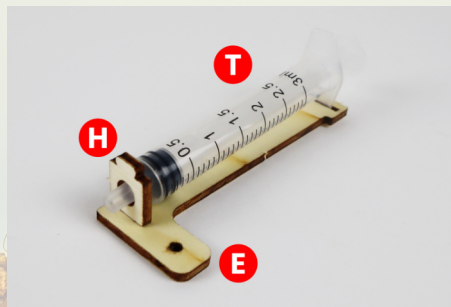
## Hydraulic Excavator



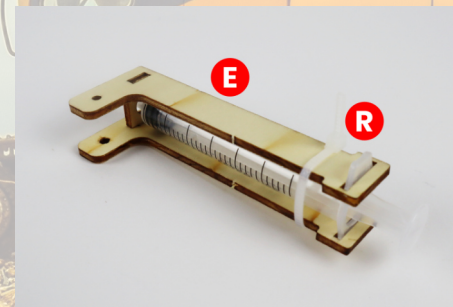
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**Step 1:** Install two L on board A and put four screws.



**Step 2:** Install H and a 3ml syringe on E.



**Step 3:** Install another E and use a zip tie to hold all parts tightly.



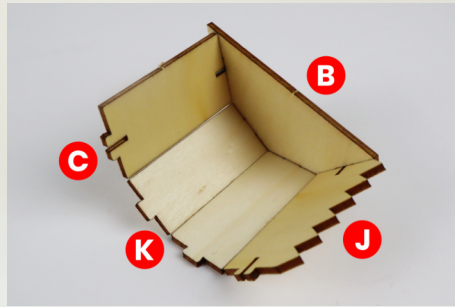
**Step 4:** Clamp the syringe head with two F and put a screw. Repeat steps 2, 3 and 4 to assemble the other syringe.

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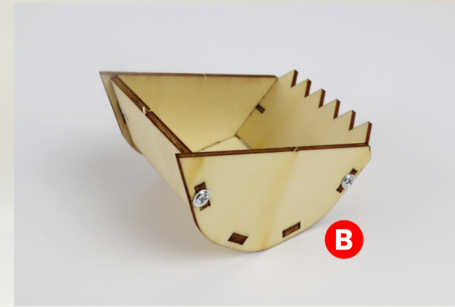




**Step 5:** Install two G and two I together and put four screws to complete the excavator arm.



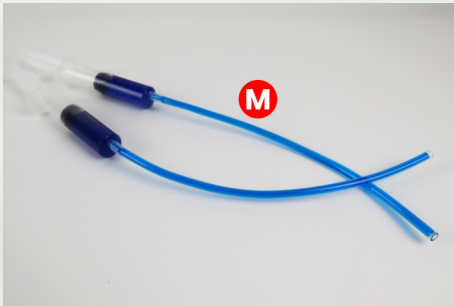
**Step 6:** Install B, C, K, and J. Put two screws.



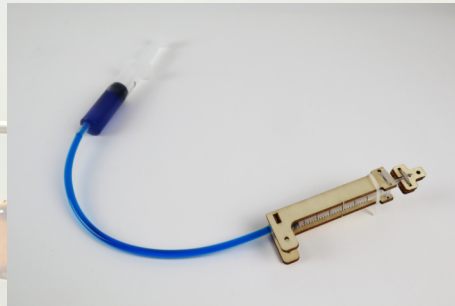
**Step 7:** Install another B and put two screws to complete the excavator bucket.



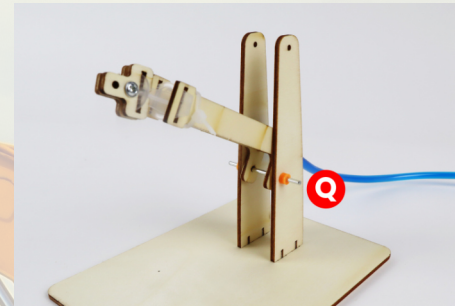
**Step 8:** Fill two 10ml syringes with about 8ml water.



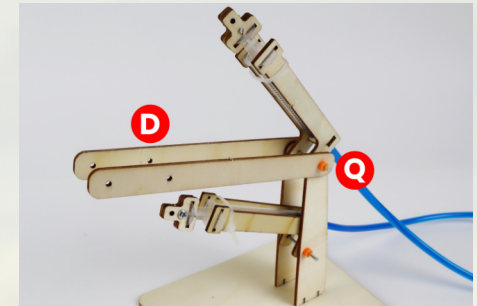
**Step 9:** Connect the hoses to the syringes tightly. Push water into the hose.



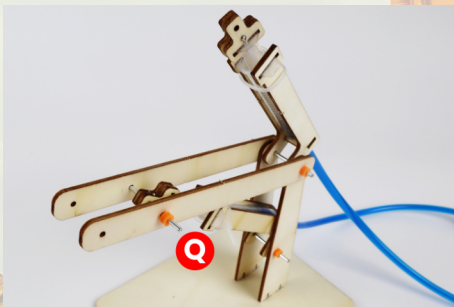
**Step 10:** First push the syringe to expel the air completely. Connect the hose to the syringe tightly.



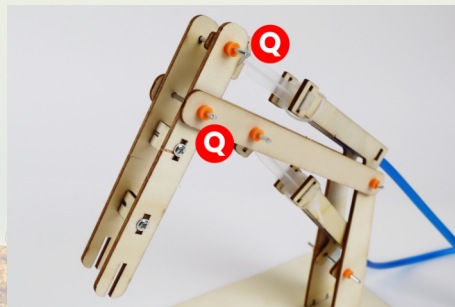
**Step 11:** Use a rod and two orange fixing rings to install the syringe.



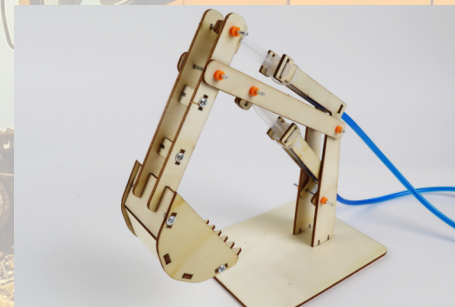
**Step 12:** Use a rod and two orange fixing rings to install the other syringe and two D.



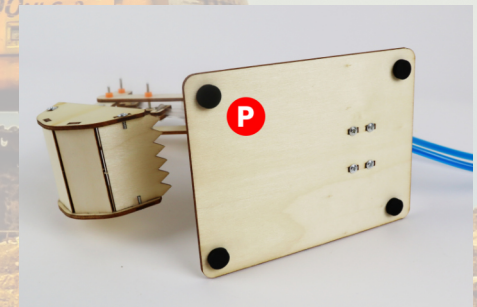
**Step 13:** Use a rod and two orange fixing rings to connect the lower syringe and D (the second holes on D).



**Step 14:** Connect the arm to the upper syringe and D (the first holes on D) using two rods and four orange fixing rings.



**Step 15:** Insert the bucket into the arm.



**Step 16:** Attach four black pads on the bottom. This step completes the Hydraulic Excavator project!



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