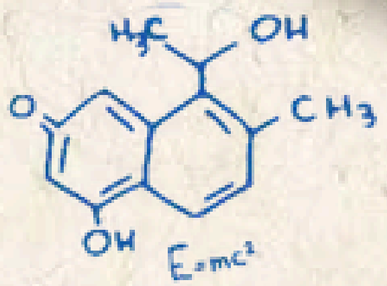


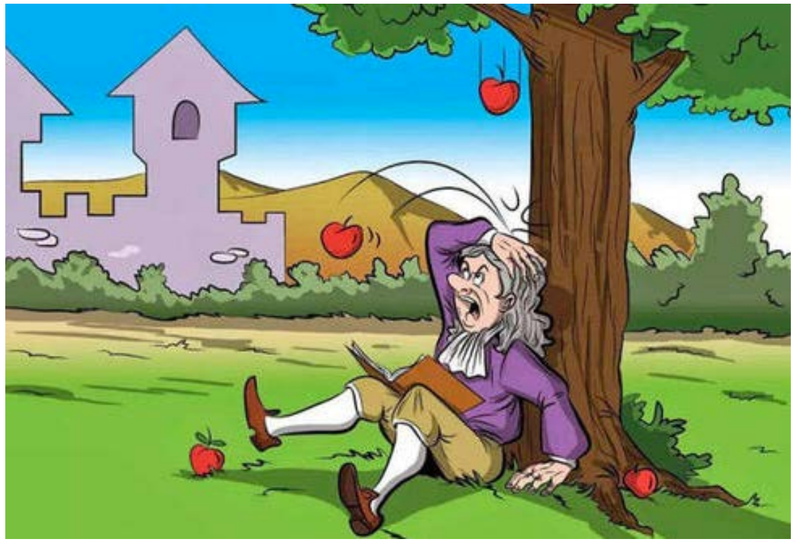
Tower Crane

探 教 教 育

Introduction

Do you know the story of Newton and the apple?

Do you know how the apple fell on Newton's head?



Gravity

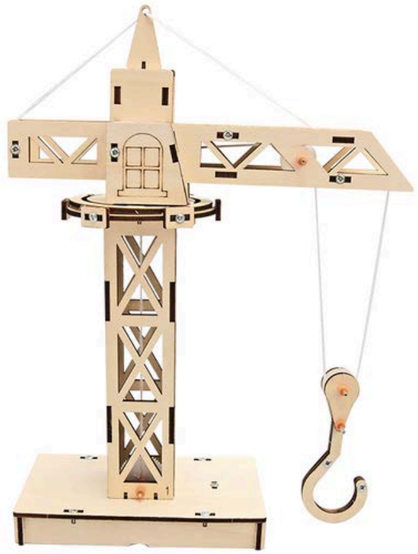
The force that an object experiences due to the Earth's attraction is called gravity.

The acting body of gravity is the Earth, and the direction of gravity is always vertically downward.

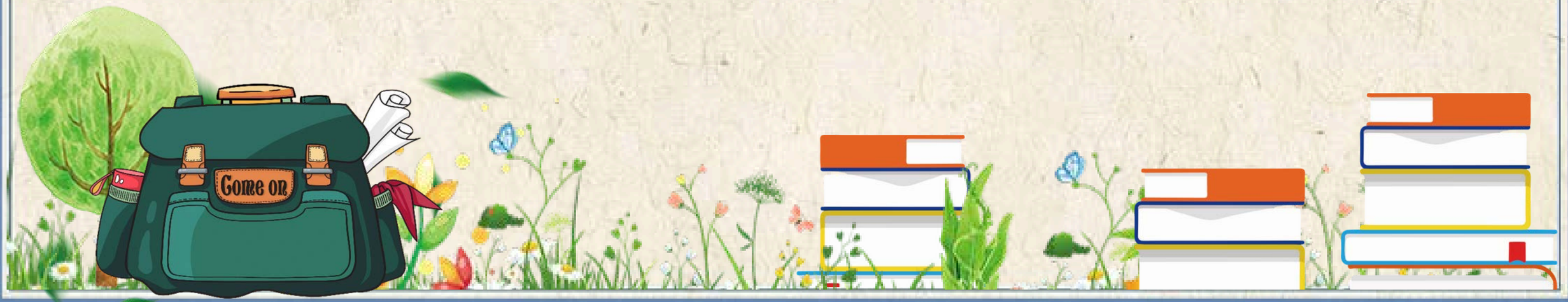
The magnitude of gravity is proportional to the mass of the object.

Let's do an experiment today related to pulleys and gravity

"Tower Crane"



Experimental Steps



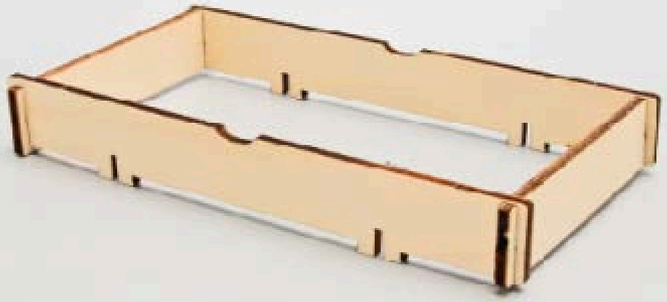
Materials

- Switch
- Motor
- Belt wheel ×3
- T12 nails
- Shaft sleeves ×16
- 7 mm screws ×38
- Cotton rope ×1 (100 cm)
- 45 mm optical shaft ×1
- White gear
- 30 mm optical shaft ×2
- 4 mm screws ×8
- Spiral gear
- 35 mm optical shaft ×2
- Double-sided tape

HAPPY

Combine Board 1 and Board 2 to form the base frame.

2

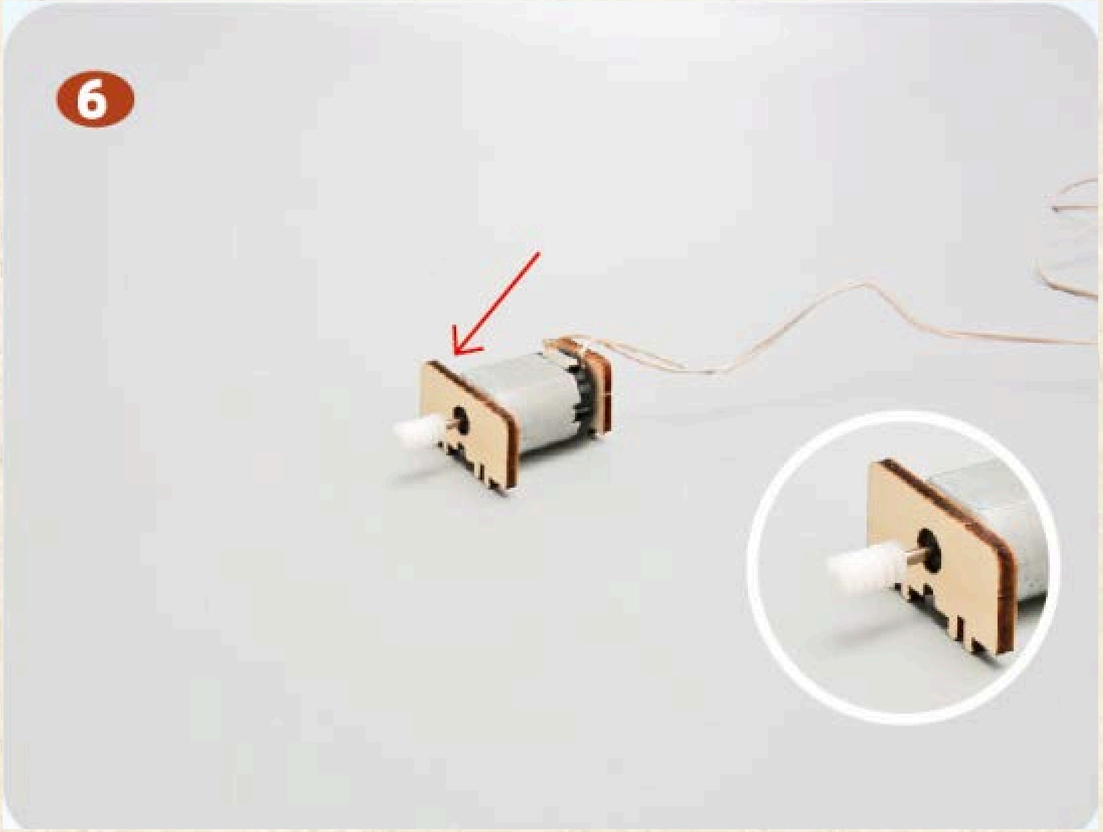


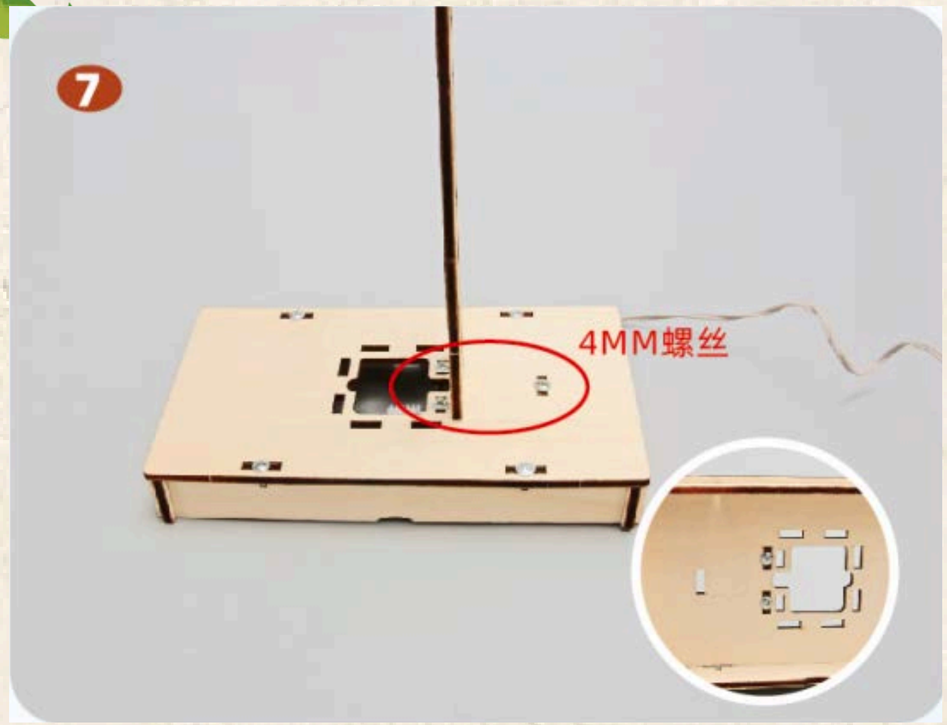
Install the base frame onto Board 3.

Attach Board 4 vertically onto the base.

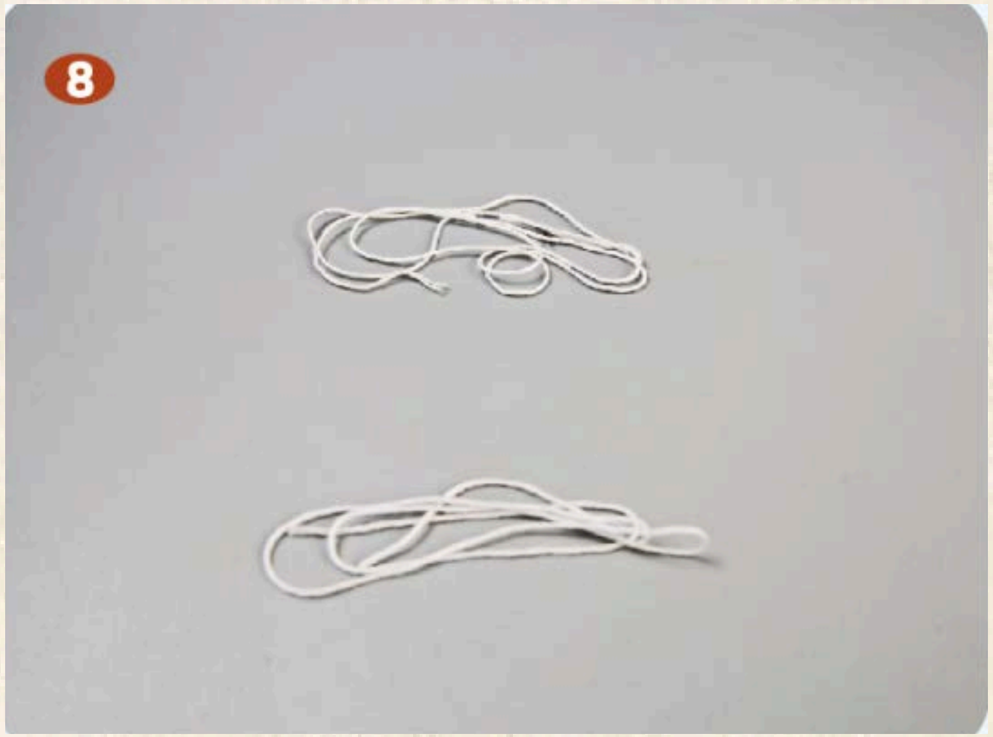
Connect the switch
and motor with wires.

Use Board 6 and Board 7 to hold the motor in place, then insert the spiral gear into the motor.





Fix the motor assembly onto the base using 4mm and 7mm screws.

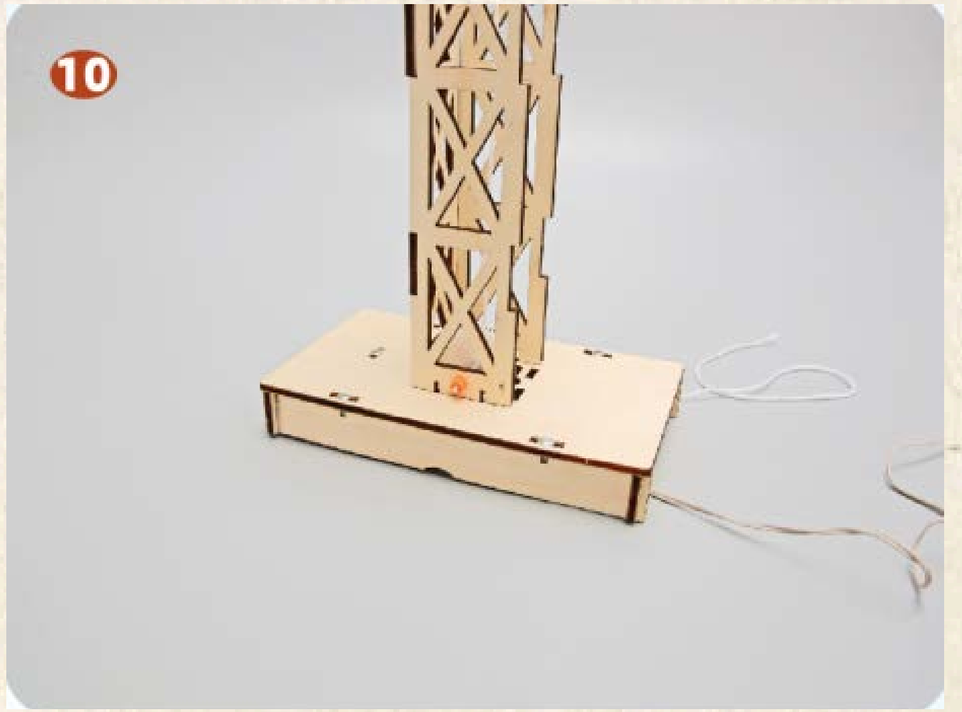


Cut two cotton ropes: one 75 cm and one 25 cm long.

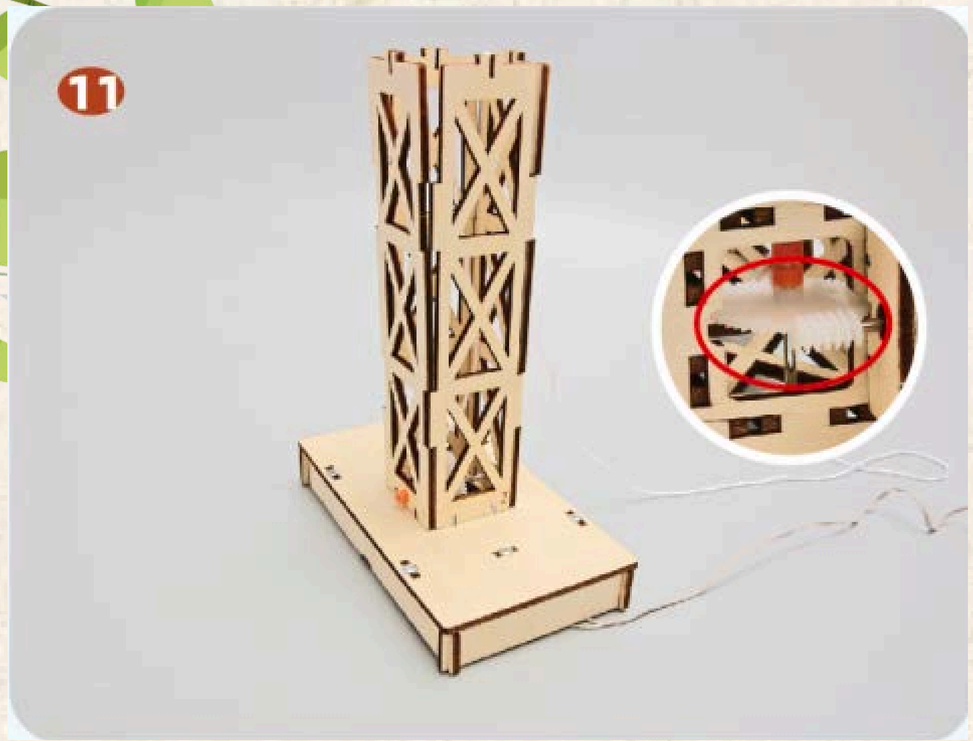
9

Pass the gear through the 45 mm shaft, fix the 40 cm rope to the gear with a shaft sleeve.

10



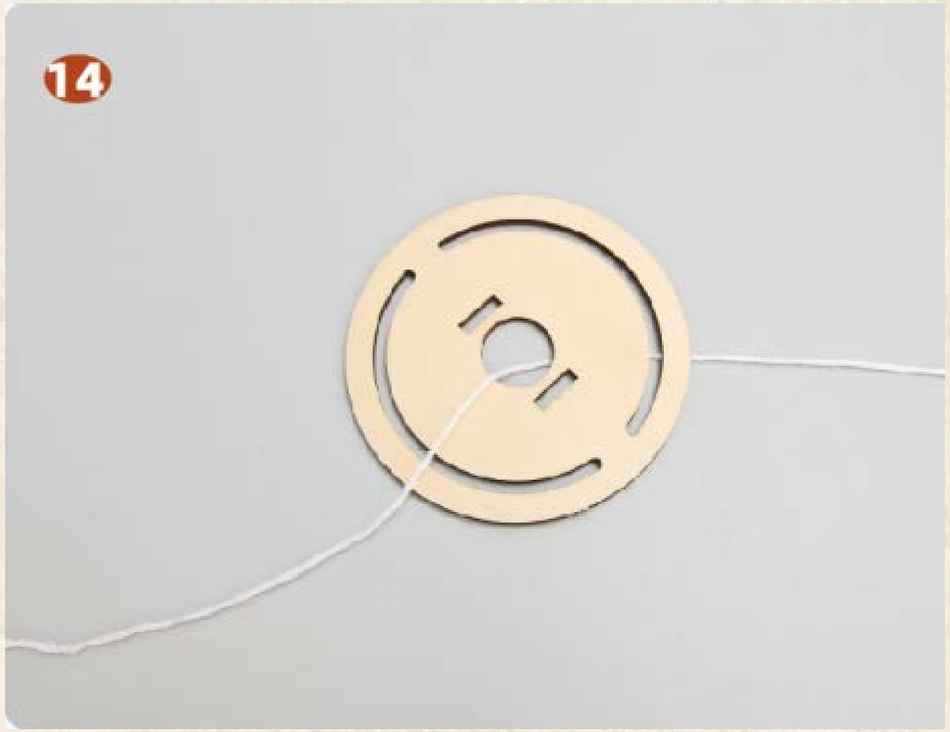
Install two Board 5 pieces on both ends of the shaft, then mount them onto the base (Board 3).



Assemble the other No. 4 board with the No. 3 base frame, and secure the bottom with 7 mm screws (make sure the gears are properly aligned).

Thread the cotton rope through the center round hole of Board No. 8 first, then assemble the parts from Step 11 and secure them with 7 mm screws.

Use six pieces of Board 9 and fix them onto Board 8 with 7mm screws.



Thread the rope through Board 10.

15

Install Boards No. 13 and No. 14 in sequence onto Board No. 11.

16

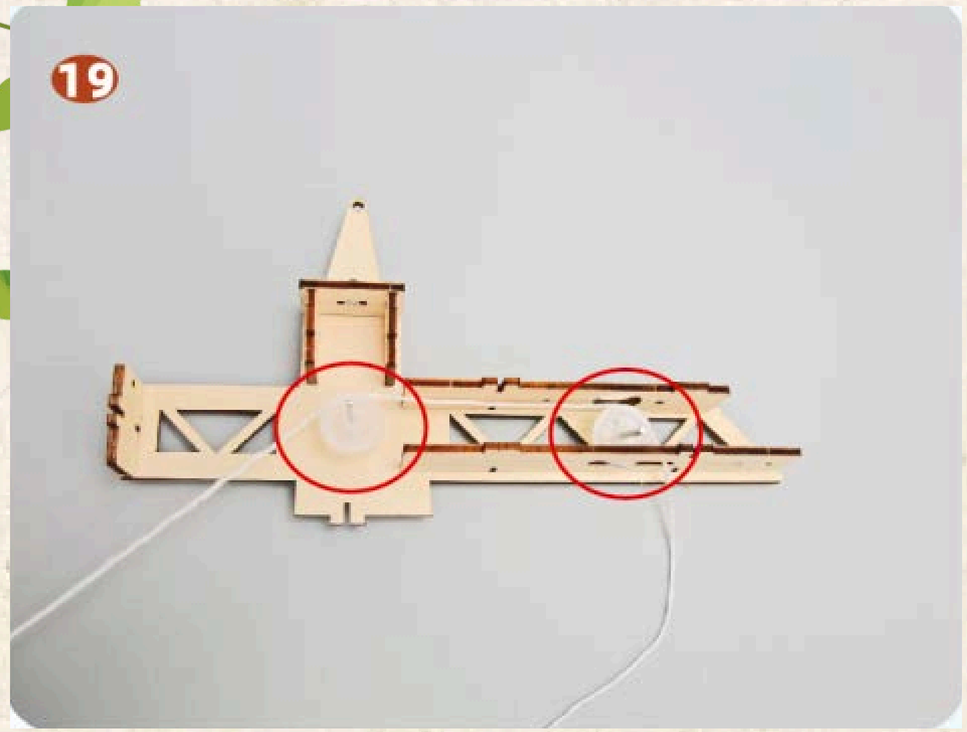
Use 7 mm screws to fix Board No. 15 onto Board No. 11.

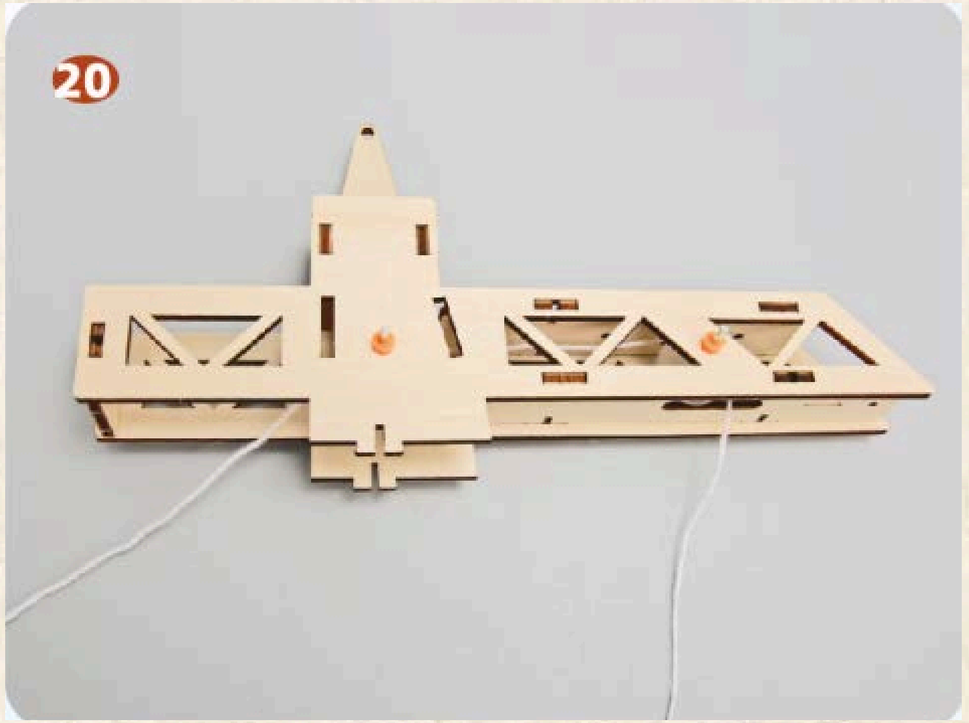
17

Combine the two No. 15 boards with the No. 17 board, then install No. 18 and secure it with 7 mm screws.

18

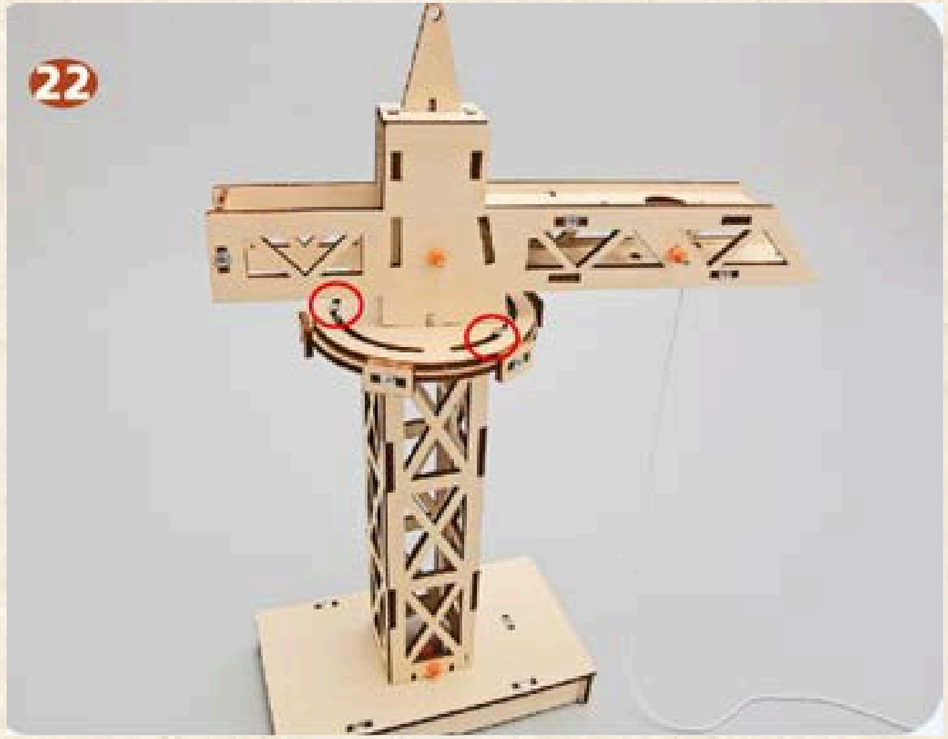
Install the top compartment onto Board No. 11.





First, attach the white pulley to the 35 mm optical shaft, secure it with a shaft sleeve, then install it into the round hole on Board No. 11. Next, thread the cotton rope through the pulleys in sequence.

Combine Board No. 12 with the assembly from Step 19 and secure it with 7 mm screws.



Install Board No. 8 onto Board No. 11 and secure it with screws.

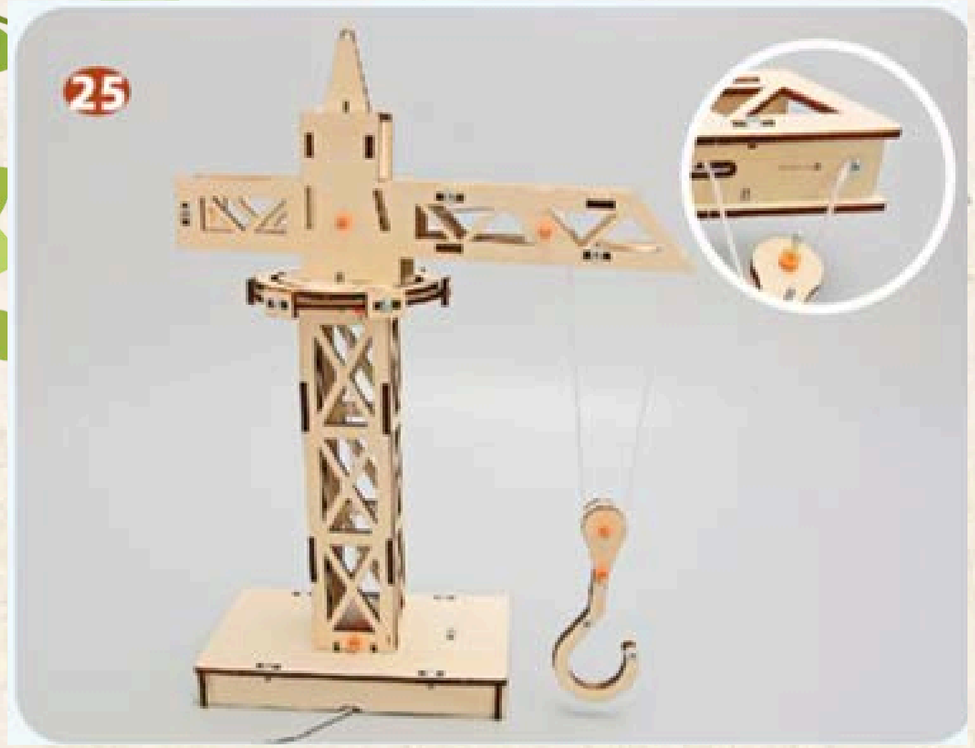
Connect Step 13 and Step 21 using DT12 nails and secure them with shaft sleeves.

23

Secure the two No. 19 boards together with 4 mm screws.

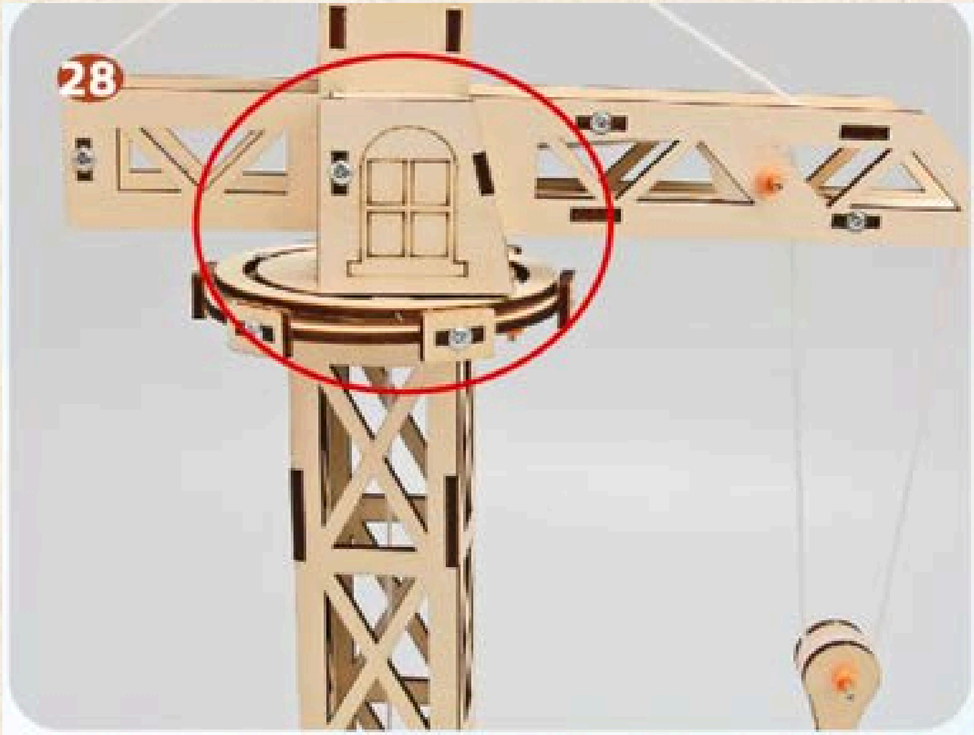
24

First, install the white pulley onto the 30 mm optical shaft, secure one side with a shaft sleeve, then attach the two No. 20 boards on both sides in sequence.



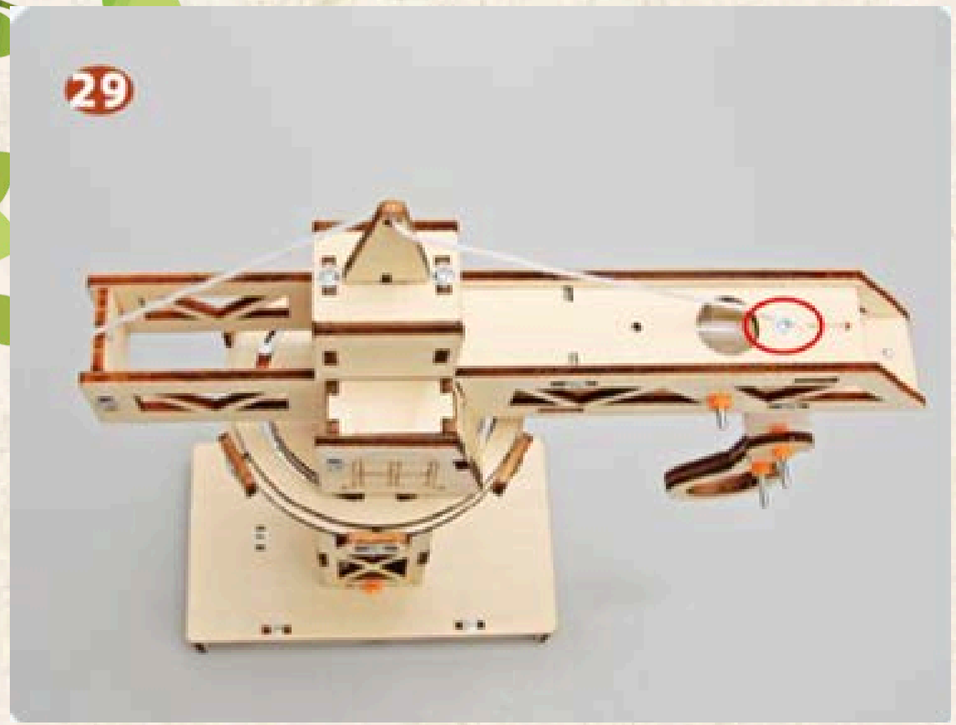
First, thread the cotton rope through the white pulley on the hook, then use a 4 mm screw to secure the end of the rope at the lower hole.

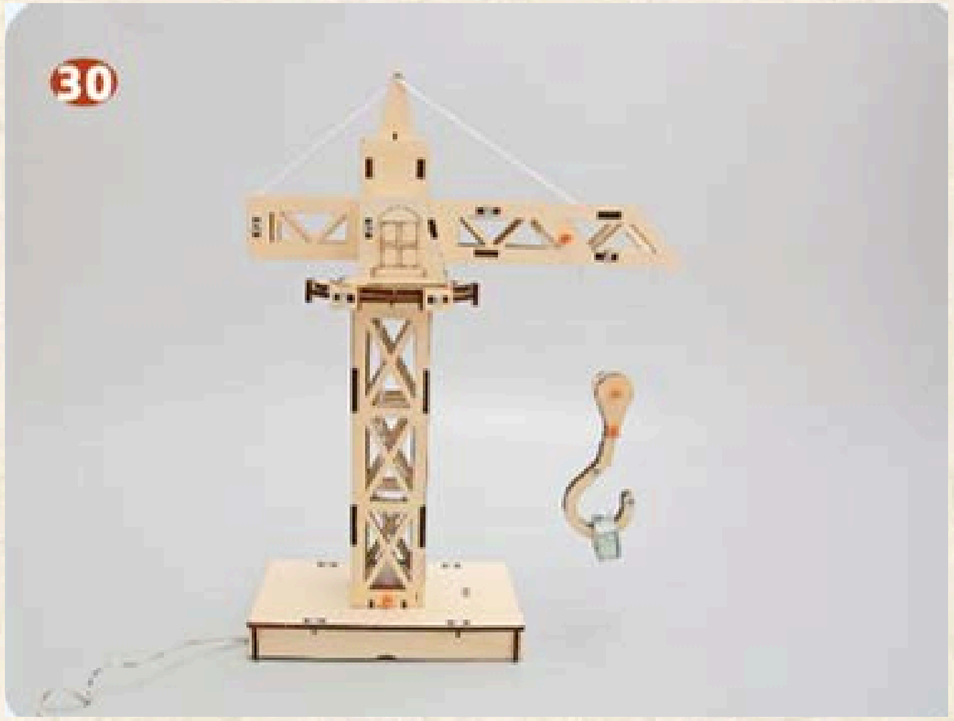
Combine the two boards No. 21 and No. 22.



Combine boards No. 23 and No. 24 and secure them with 7 mm screws.

Snap the assembled cabin onto Board No. 12, applying gentle and even pressure.





Use a 4 mm screw to attach the remaining cotton rope to the top position.

COMPLETE

Science Knowledge

Tower Crane

A tower crane (also called a tower hoist) originated in Western Europe.

It is a rotating crane with a boom mounted on the upper part of a tall tower.

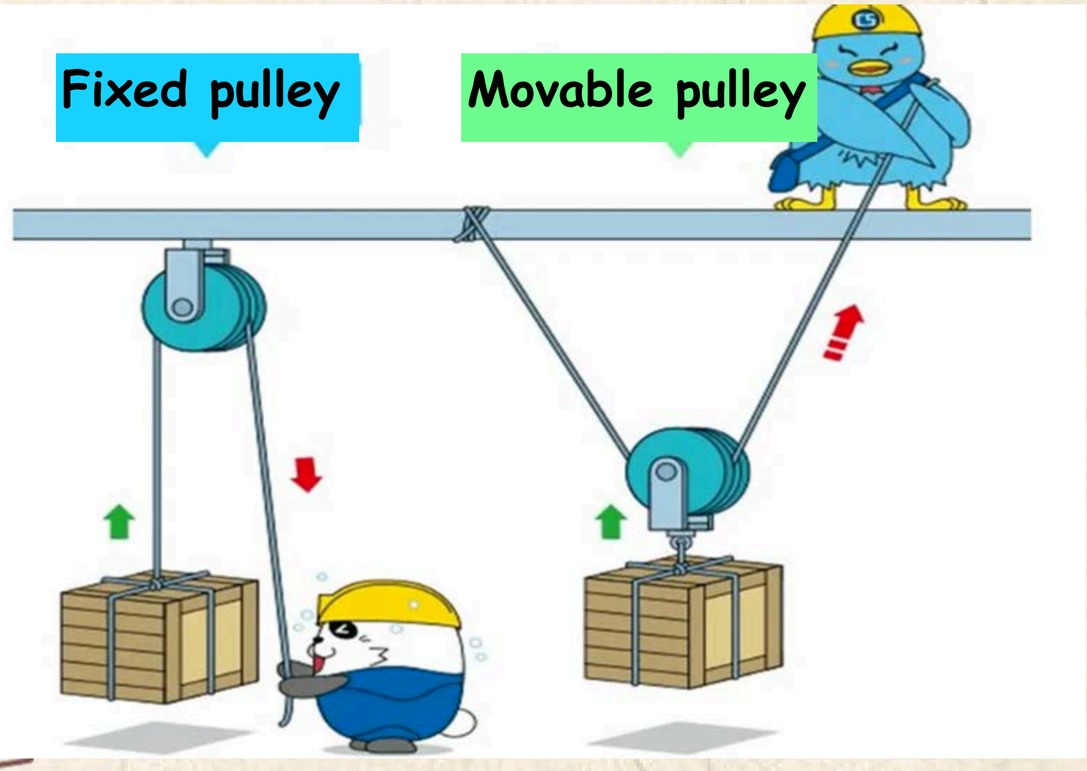
It has a large working range and is mainly used in building construction for vertical and horizontal transportation of materials and installation of building components.

The tower crane uses an electric motor as its main power source.

Through the reduction and self-locking characteristics of the worm gear set, the crane can lift heavier objects and prevent them from falling.

Pulley

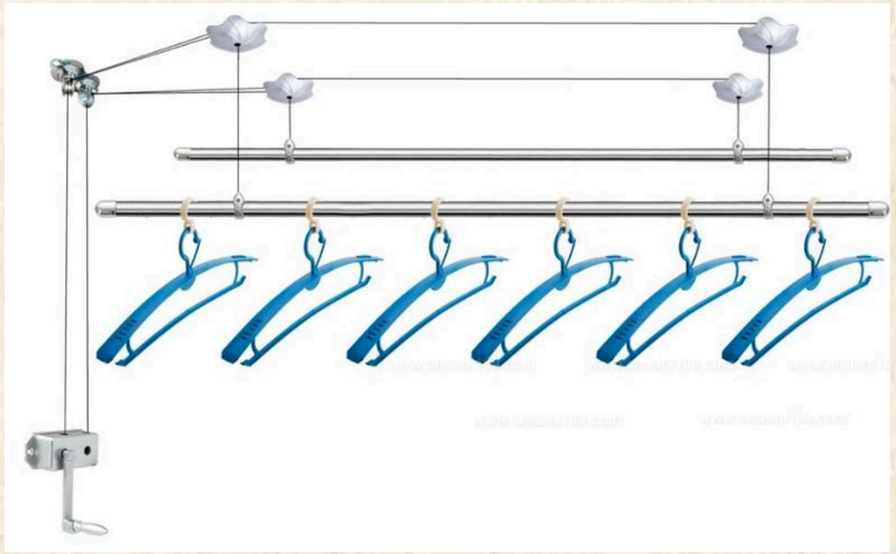
The pulley system is an important part of a crane.
It consists of fixed pulleys and movable pulleys working together with the hook assembly.
It can both save effort and change the direction of force.

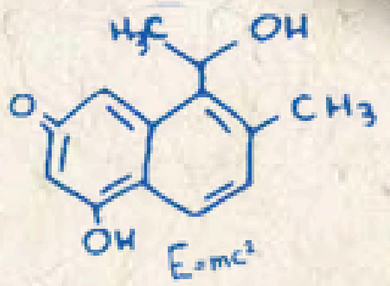


Applications of Fixed Pulley Principles in Daily Life

Elevators

Clothes drying racks





Thank you for watching!