Mystery Box: The Nautical Crate

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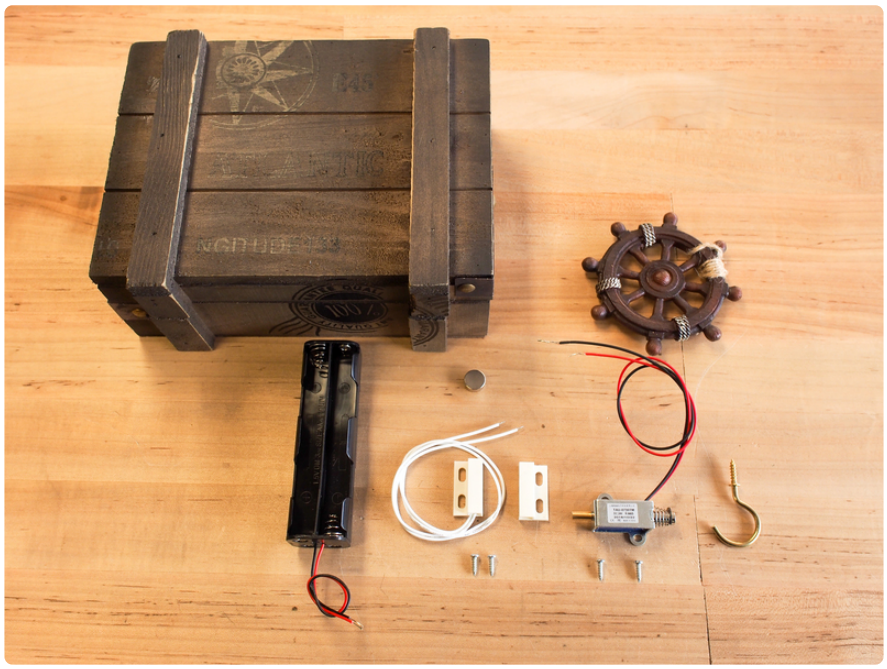
Overview and Circuit

Welcome to Mystery Box: The Nautical Crate

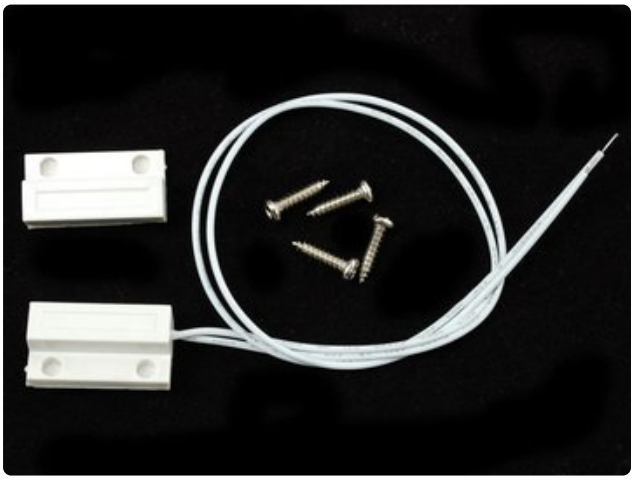
This intriguing box contains the answer to a diabolical riddle -- or is it actually a clue for solving a future puzzle? I'm not telling. But, I will tell you how to build your own magnetially activated, locking Mystery Box. This can be used as a prop for an escape room, as part of a magic act, or even as a launching point for other locking effects.

Not only is this effect mysterious and satisfying to use, it is also incredibly simple and efficient, using very few parts. In fact, it uses no microcontrollers and no programming. You can even use cold wire splices for no soldering!

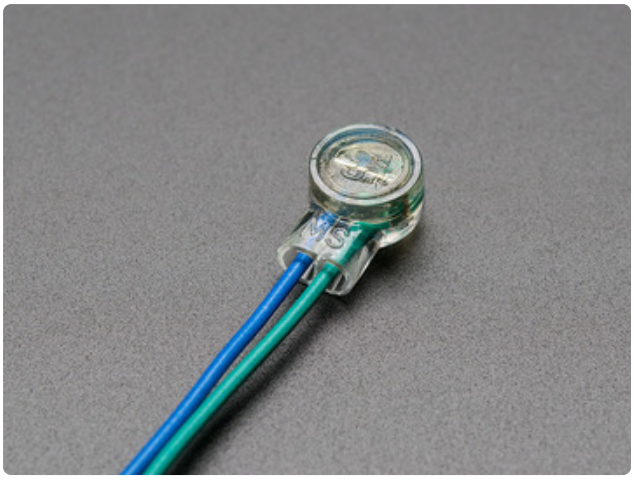


Parts

To build a magnetically activated lock box, you will need the following parts:



Small push-pull solenoid
Magnetic contact switch, a.k.a. reed switch (and included screws)
High-strength magnet
8 x AA battery holder and batteries
Cup hook
Flat washers #6 (optional)
Small wooden box (from a hobby store)



Optional

You can dress things up to fit the theme with some additional materials:

- Thin sheet of cardboard, chipboard, luan, etc.
- Adhesive felt sheet
- Object within which to hide the magnet, such as a resin ornament
- Acrylic craft paint for disguising hidden magnet

Tools

This project can be built with just a few hand tools, and no soldering is required (although you may if you would like to):

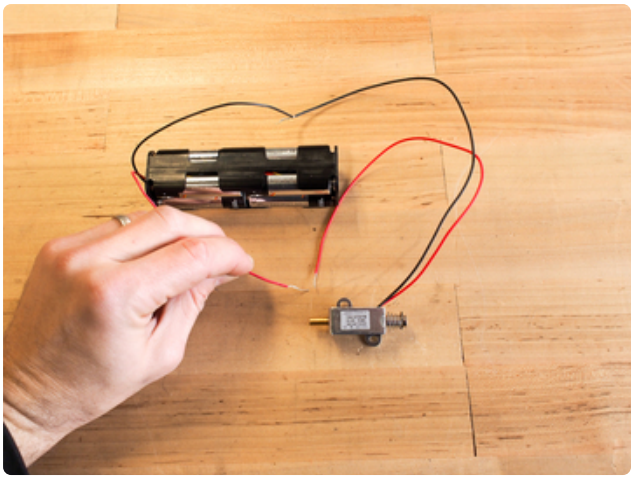
- Small Philips screwdriver
- Pencil
- Awl (or ice pick, or small nail)
- Hot melt glue gun
- Wire cutter/stripper (optional)
- Scissors (optional)
- Small paint brush (optional)

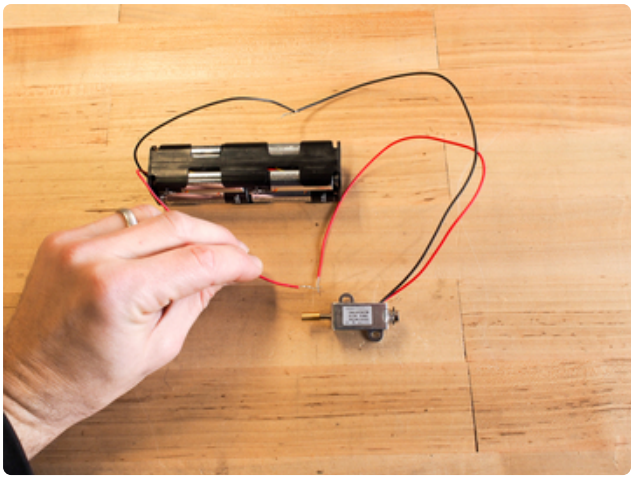
Circuit

Solenoids are excellent for pushing and pulling small things. They are electromagnets that, when on, will push or pull a small metal slug a short distance. A built in spring is used to return the slug to its resting position when off.

When arranged a certain way, the solenoid shaft will block the box lid from opening until the solenoid receives power, thus allowing the lid to open.

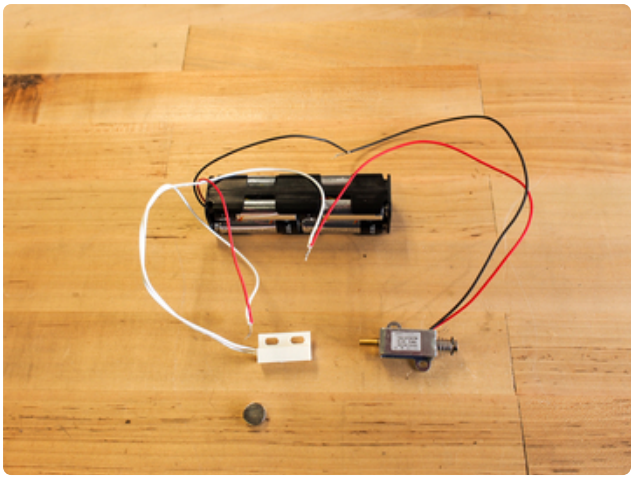
The circuit used in the box is simple. The battery pack ground (black) wire is connected to the solenoid ground wire, and the reed switch is connected on one side to the voltage (red) wire on the battery pack and on its other side to the voltage wire of the solenoid. This means the solenoid is normally off, as the reed switch is normally open, and when a magnet is placed close to the reed switch, it will close the circuit, and allow the solenoid to receive power.

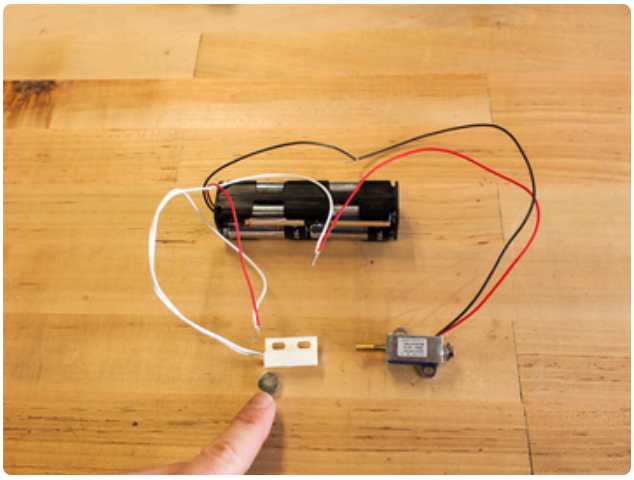




Test the solenoid by twisting together the black wires from the battery pack to the solenoid, and then touching the two red wires. The solenoid will open. (Hover over these images to see it in action.)

This is not meant as a robust lock box, it is a lightweight prop that could be easily smashed open should you store within it your most prized valuables. Don't do that.





Now, try the same test, but with the reed switch inserted between the two red wires. When you move a magnet close to the switch, the solenoid will throw.

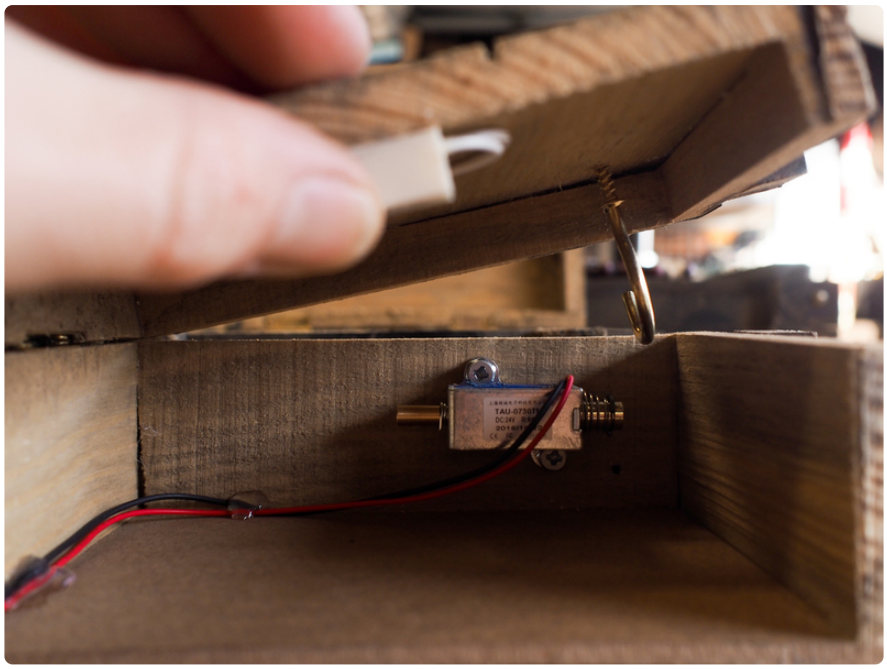
This is the entire circuit for your mystery box! Next, we'll look at assembling the lock mechanism inside the crate.

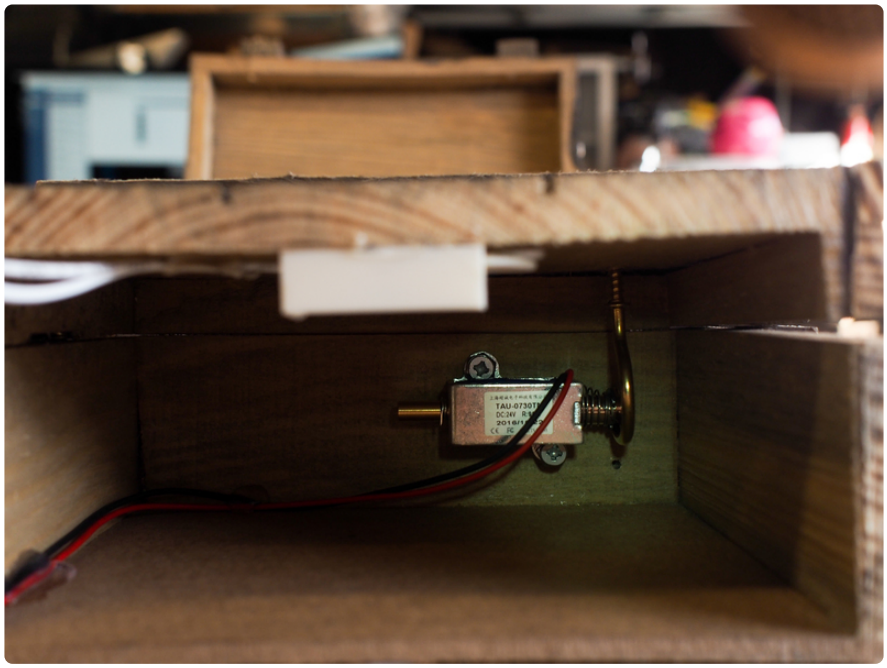
Mounting the Lock

Mounting Cutaway

One of the most difficult parts of any latching box prop is getting proper alignment of the solenoid and the catch that holds the lid shut. After trying many different methods, I've come to this one as the easiest to align and most forgiving. It is the humble cup hook.

Here's a cutaway of the solenoid mounted inside the box with the hook engaging the shaft:



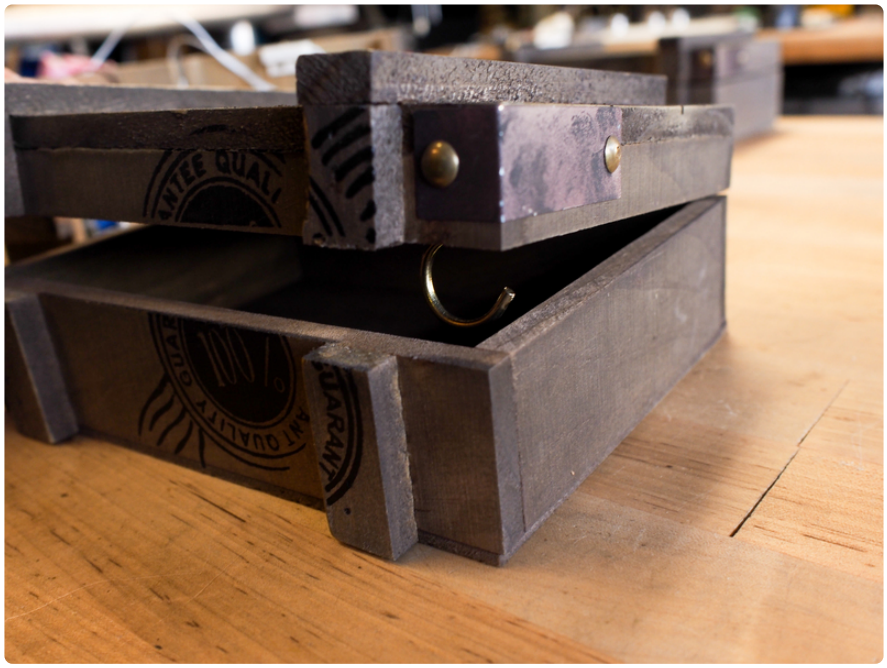


The cup hook's round profile slides over the shaft, compressing the spring slightly and allowing it to slip past and engage the locked position.

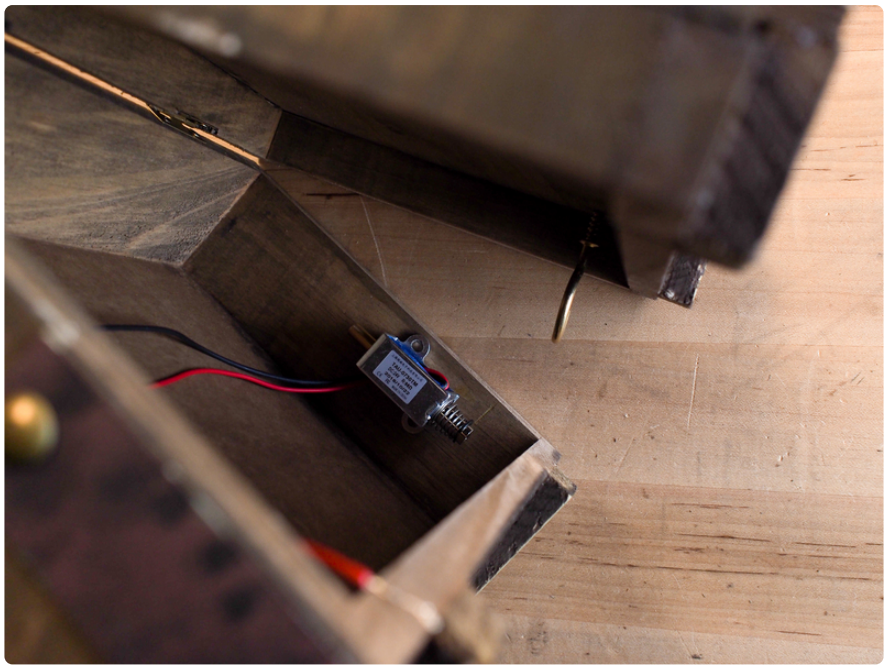
Since each box is different, I can't provide precise measurments that will work in all cases. Instead, try moving both hook and solenoid around until you find a position that will work where the lid can open and close freely, and still engage the shaft with enough room for the shaft to throw open.

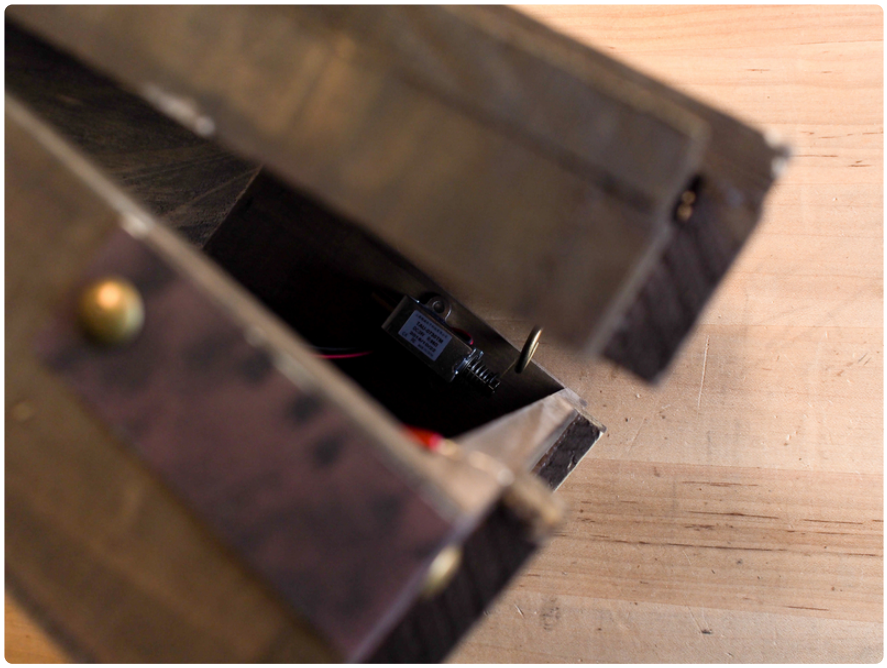
Here are some photos to serve as a guide.

Mark positions with a pencil and then create a starte hole with an awl or nail.

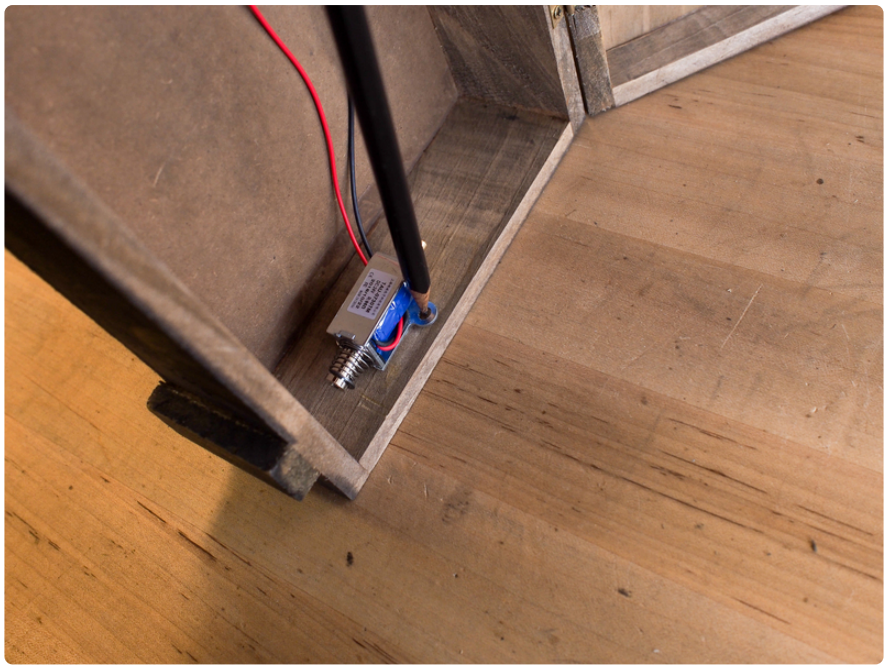


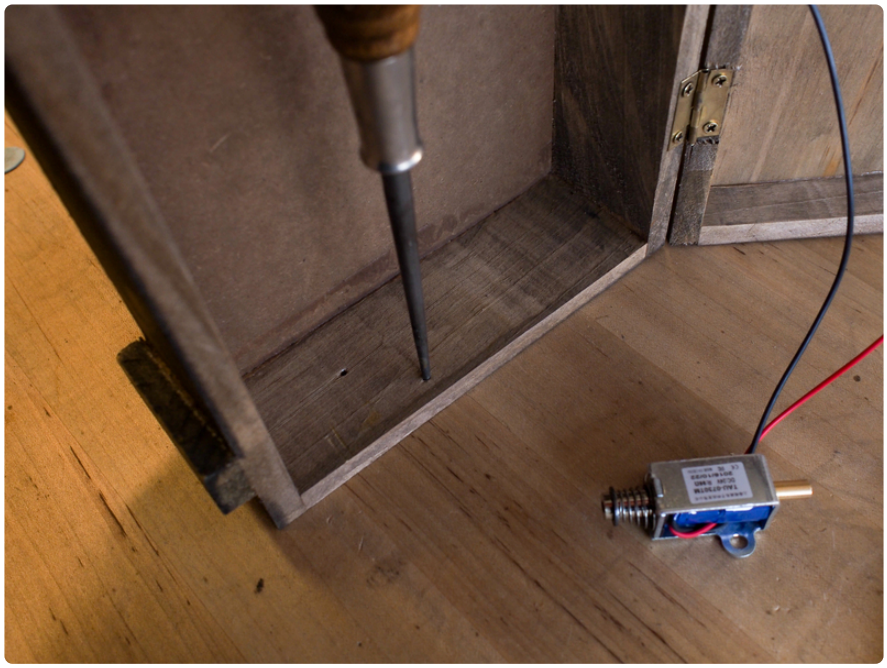
Test the solenoid position freely or with some poster putty underneath to find the correct placement.

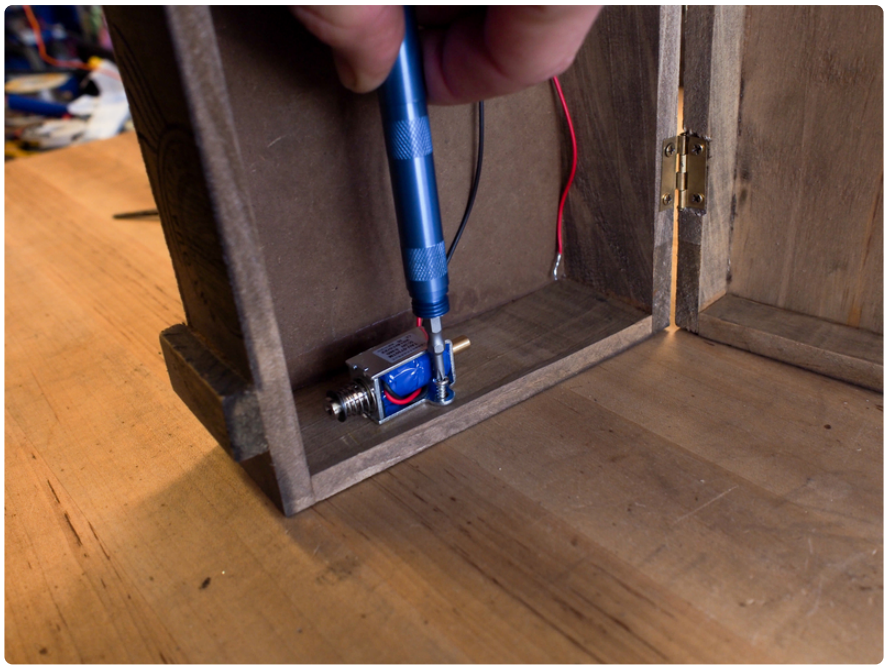


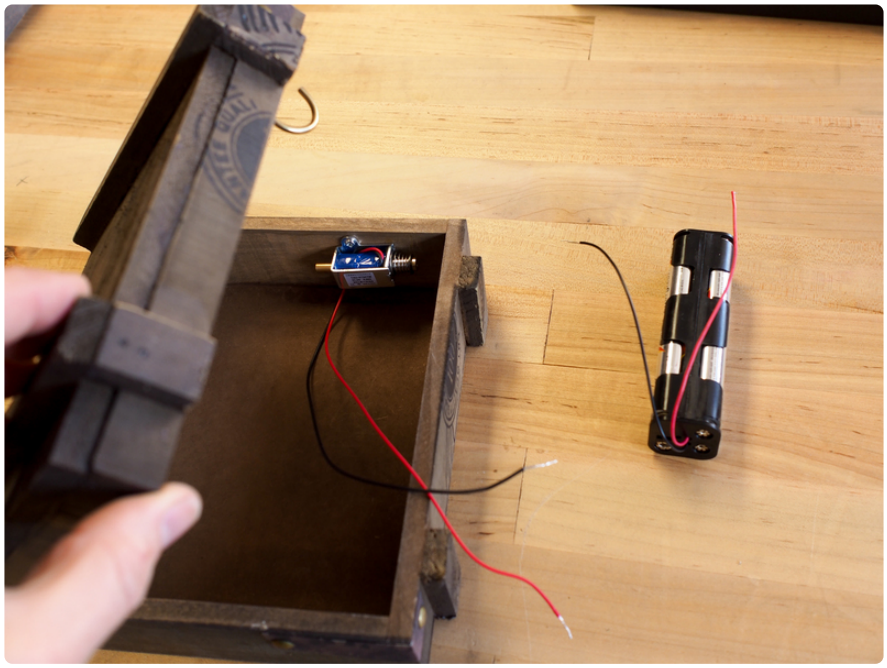


When you find the spot, mark it and create a starte hole, then screw in the solenoid using two of the screws that came with the reed switch. You'll be able to fine tune the hook to dial thing in to perfection later.

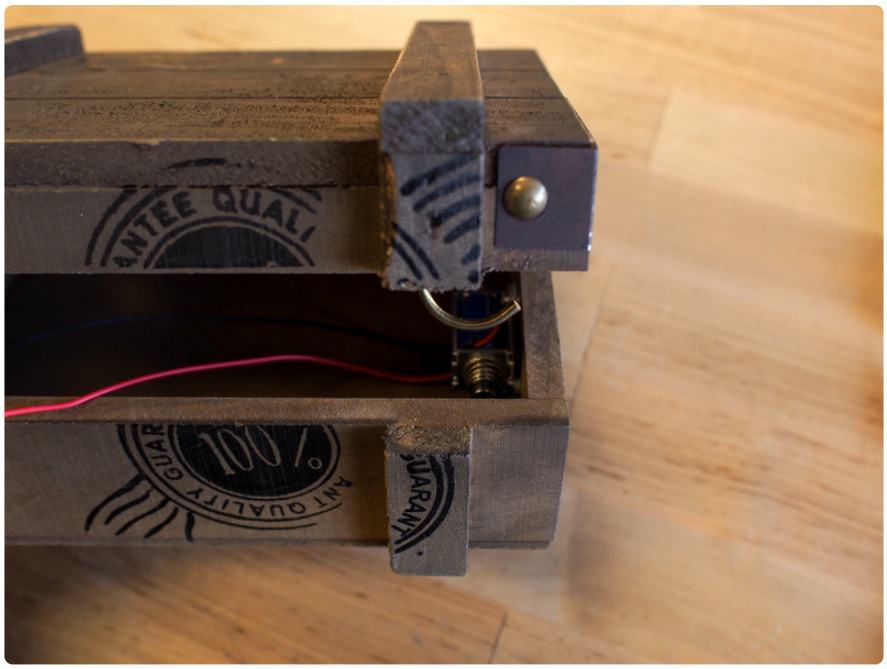




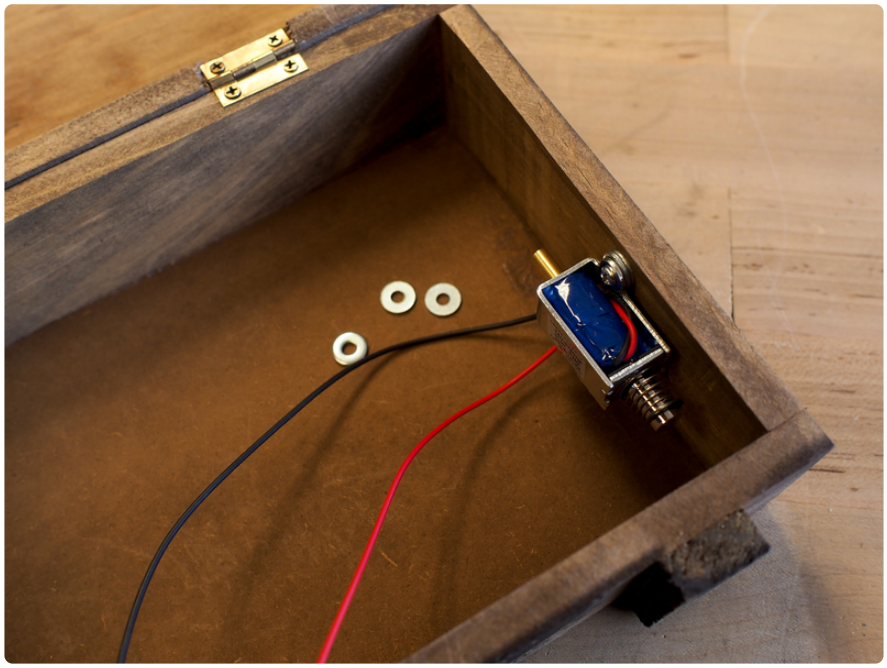




Leave the wires exposed outside the box when testing the latch, otherwise you may find yourself locked out!



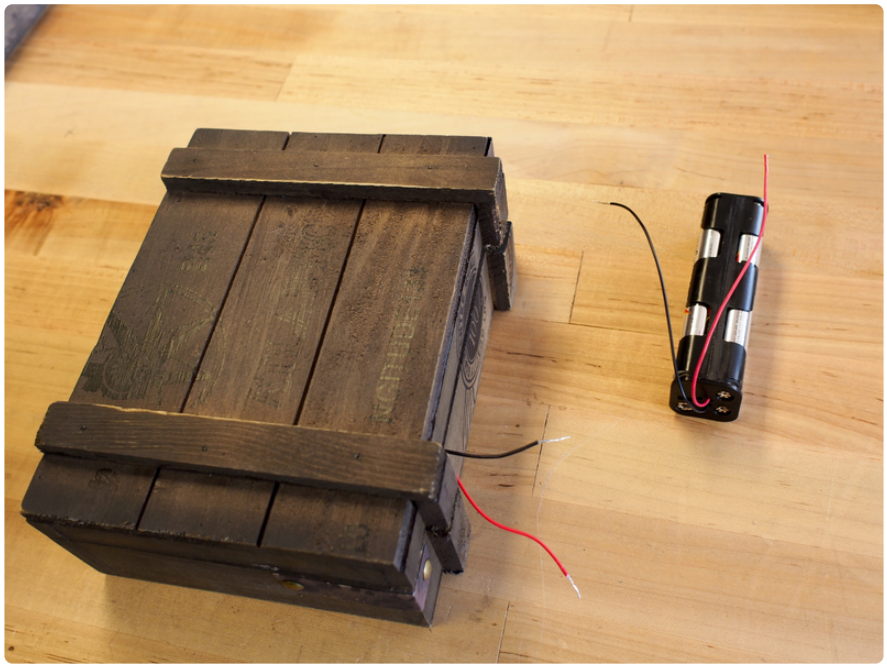
You may add flat washers between the box wall and solenoid to adjust the left-right position of the solenoid in case the hook can't be moved any further right and it won't align properly.



Now, try rotating, turning, angling, and shifting the cup hook until the action works smoothly and latches securely. This can take some patience, but is well worth it! Once the position is ideal, you can use hot glue at the base of the hook to prevent it from shifting.

It can be difficult to position the hook so it slides closed while pushing the shaft, but there's a second, easier option: Engage the solenoid with the magnet key as

you close the lid and then release the magnet to disengage the solenoid shaft into the hook, thereby locking it.



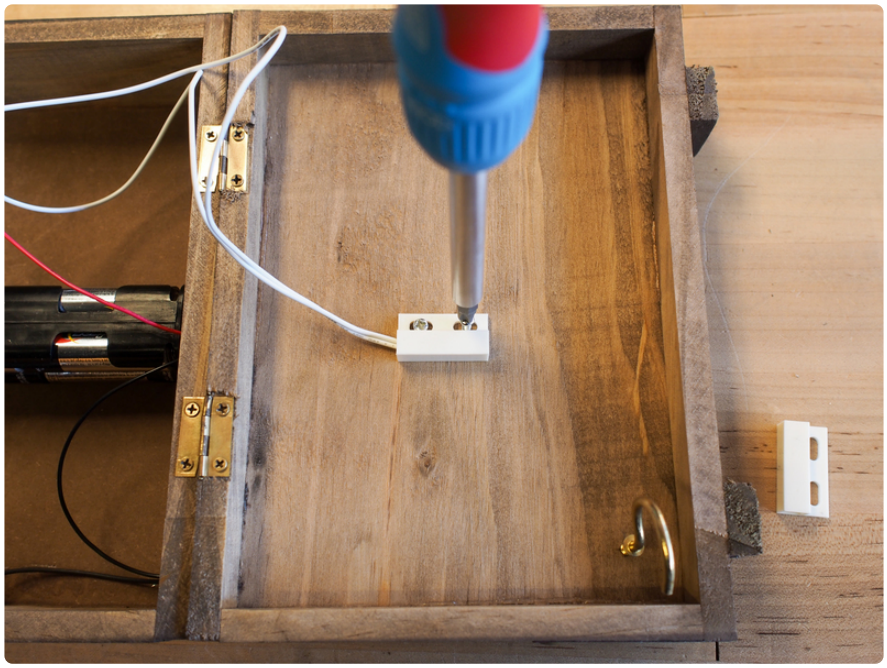
Now that the latch positioning is complete, you'll wire up the switch.

Final Crate Assembly

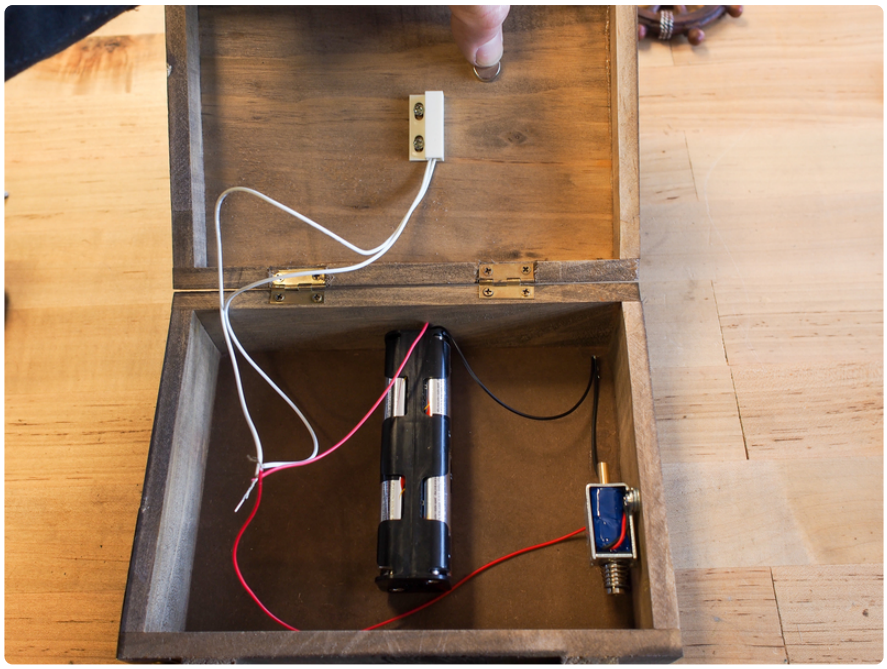
Reed Switch

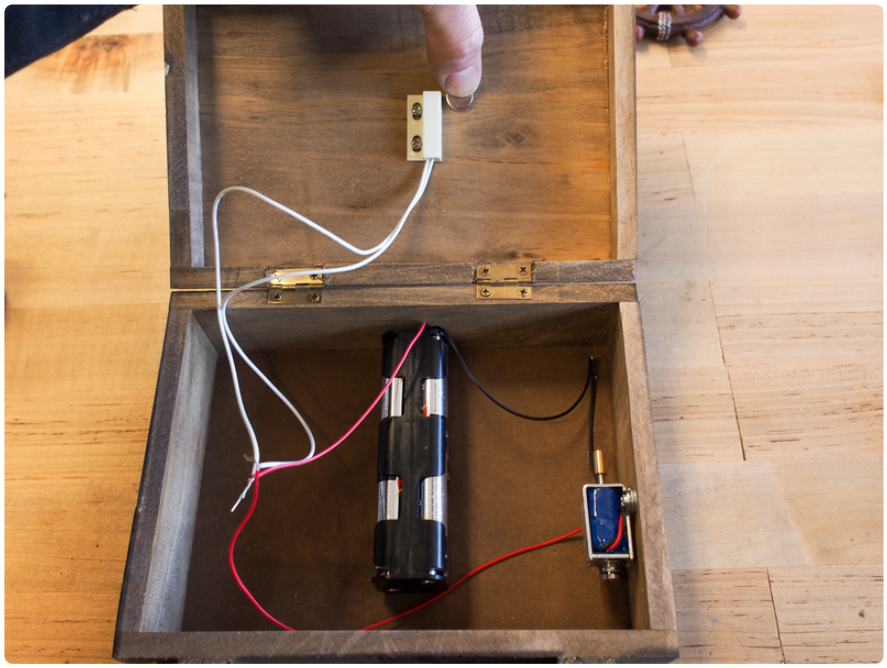
Position the battery pack and switch where you'd like them -- the switch position will be a secret that is conveyed through a previous puzzle, so position it under an identifiable mark or image on the outside of the lid. Mine is under the "N" of the word "ATLANTIC".

Determine where the wires will lie, including some slack, then cut them down to size and strip the ends. Now, connect the circuit as before -- battery ground to solenoid ground, battery voltage to reed switch, other side of reed switch to solenoid -- and twist the wires together. You may choose to use cold splices or other connectors, solder them, or simply twist and then hot glue them.

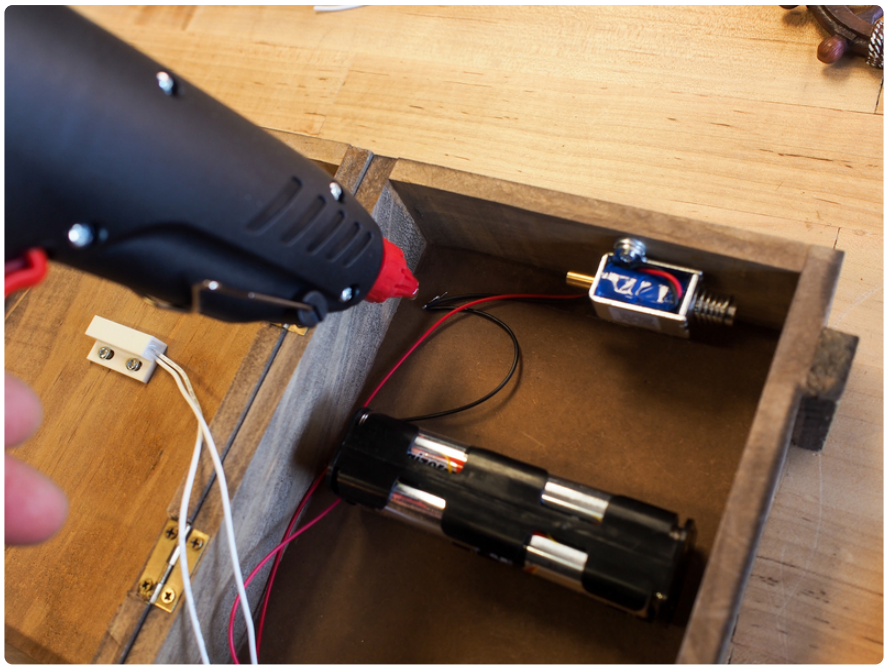


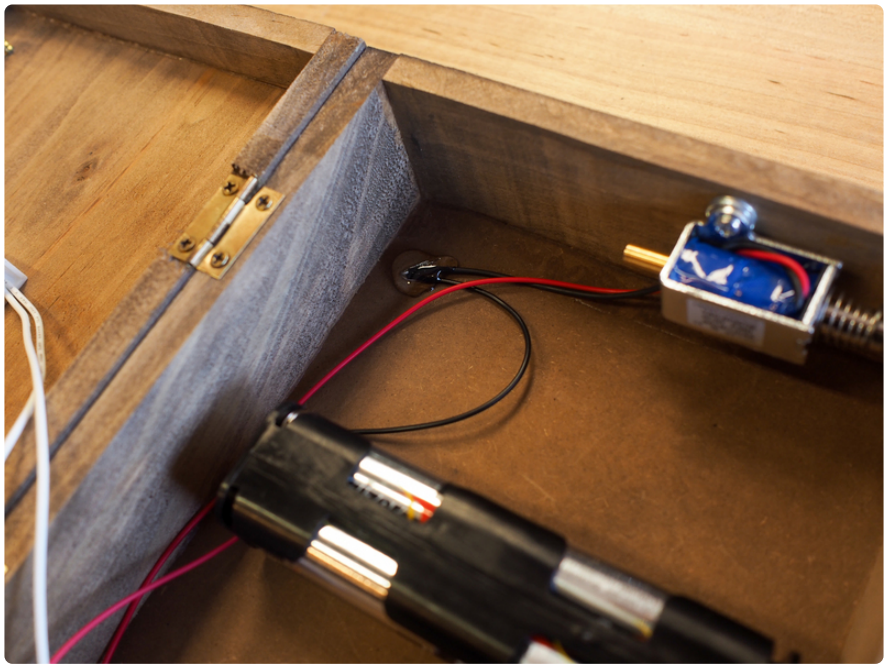
Test that the circuit works using the magnet, then mount the switch with two screws, as seen here.

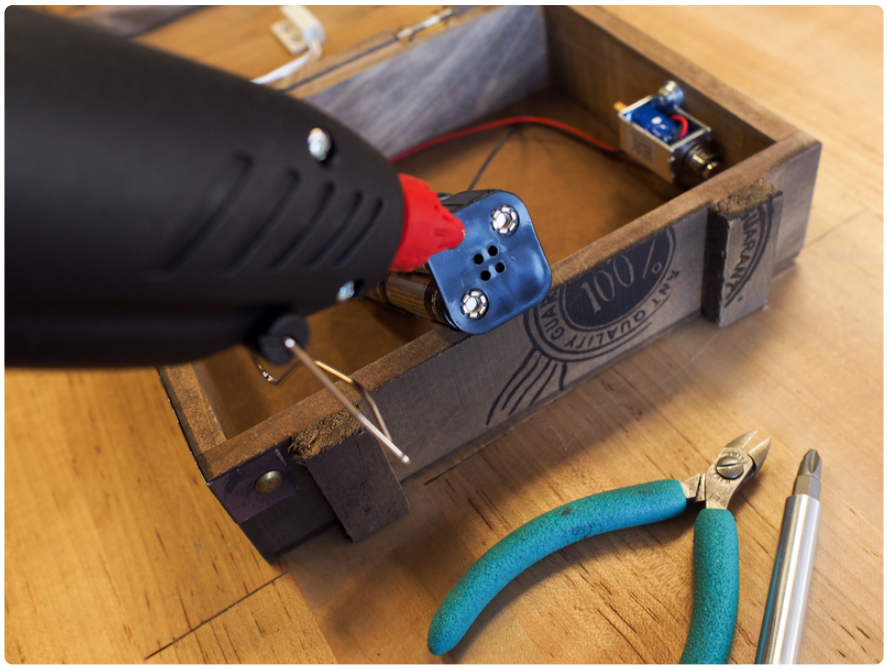


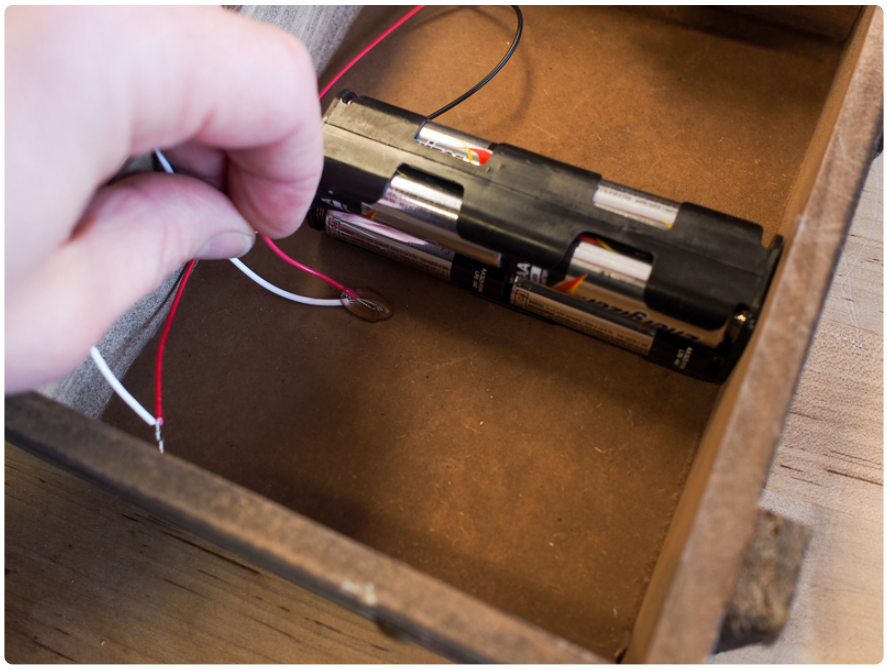


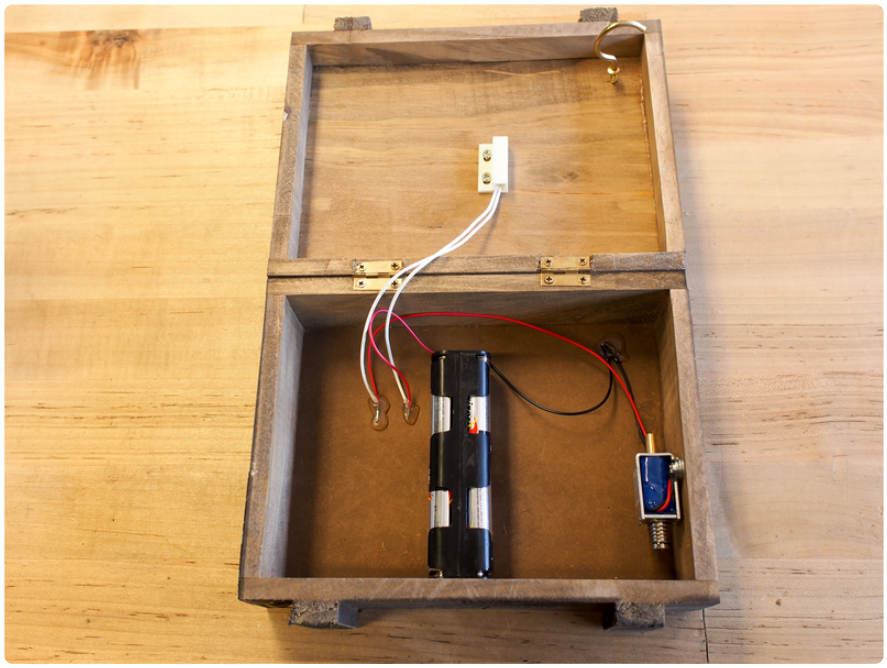
Once you're satisfied that everything works properly, use hot glue to affix the wires neatly inside the box. You may use a small dot of hot glue to mount the battery pack, as well, but not so much that you can't pop it off later for changing batteries.







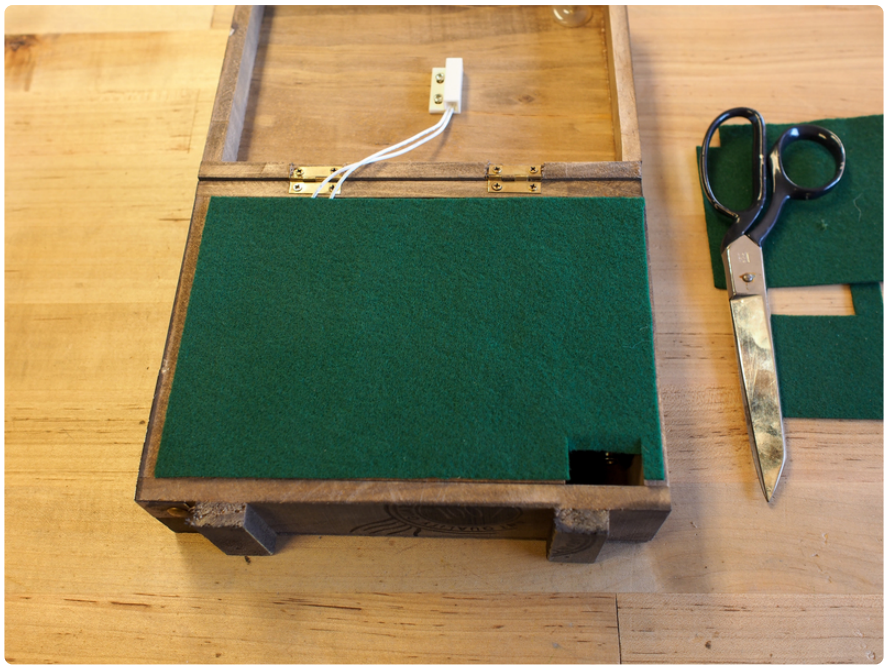




False Bottom

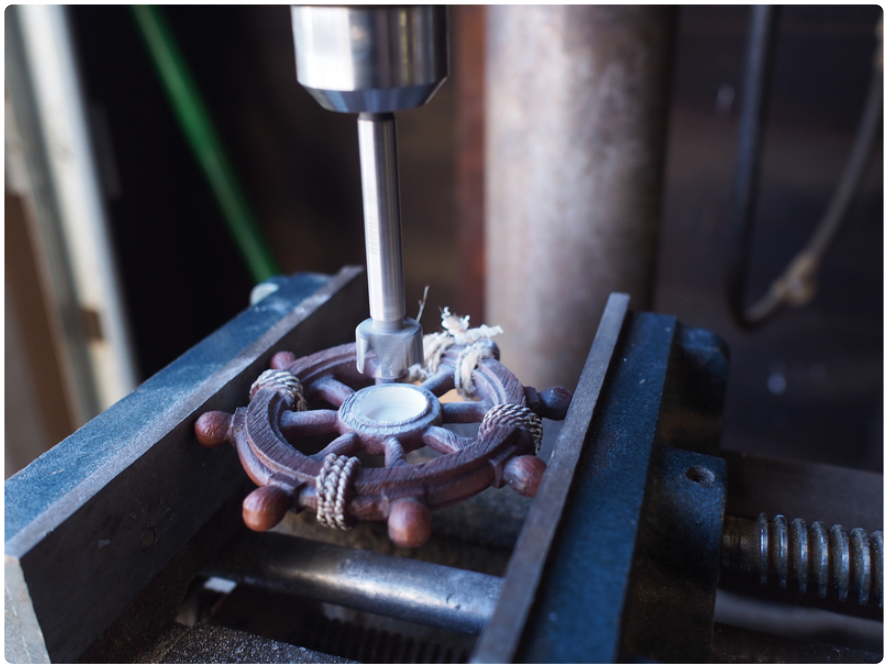
How you use the box will determine if you can stop here, or if you'd like to add a false bottom to neaten things up a bit more. Here I've cut out a thin piece of MDF to cover the guts while leaving a slot open for the latch to pass.

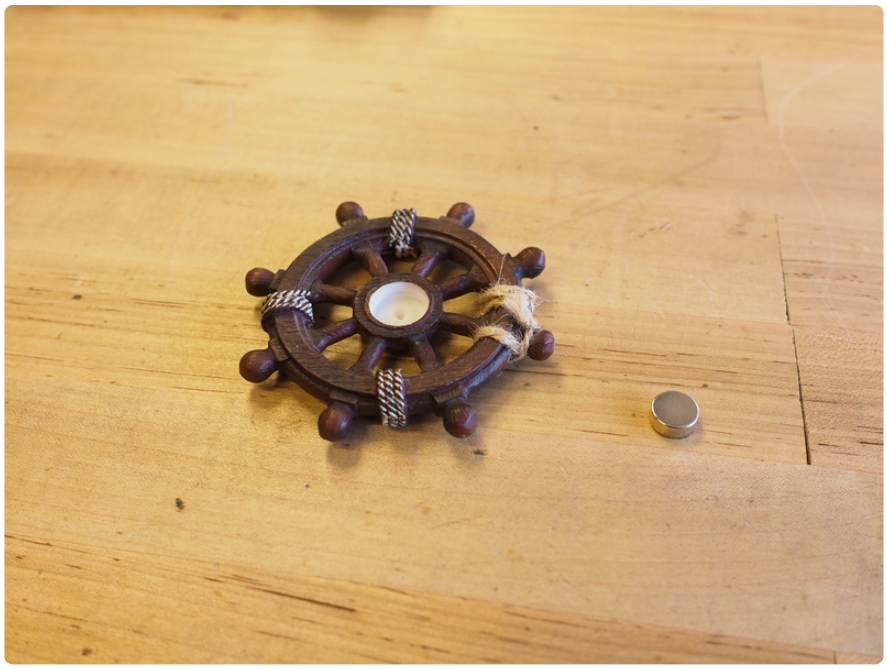
Some self adhesive felt finishes the job.

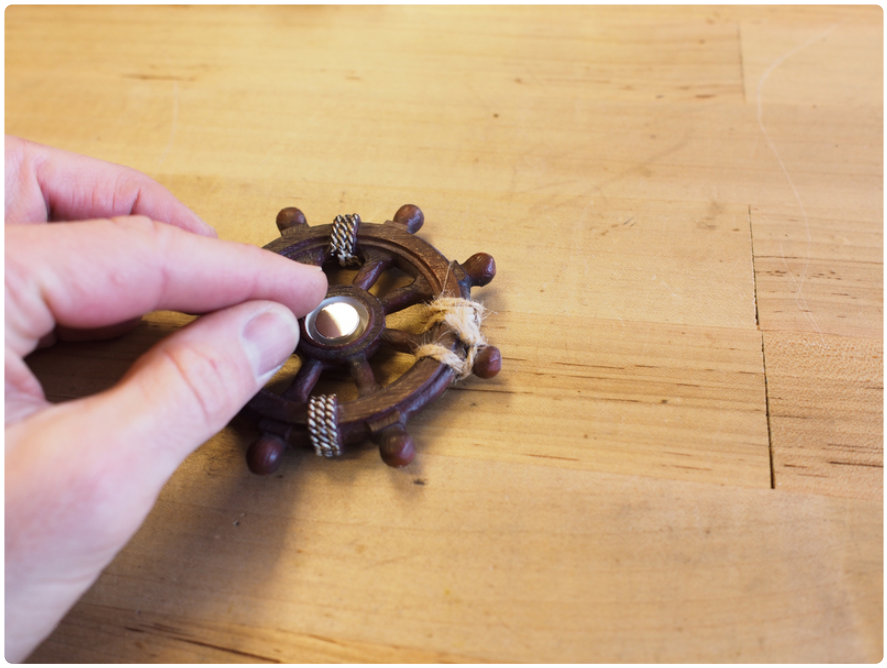


Magnetic Artifact Key

Hide the magnet inside a small object, such as a statue, bottle, or in this case, a resin ship wheel ornament. I decided to mill out a small section at the hub of the wheel on a drill press with a Forstner bit, and then embed the magnet with hot glue. I sealed the illusion with some brown paint.







Use The Nautical Crate

The prop is ready for use in your next escape room, magic show, play, cosplay act, or however you like! In this case, a previous clue leads players to find the ship wheel artifact and place it upon the Nautical Crate in the proper position. The latch is thrown with a satisfying "thunk", and the box is opened to reveal... three playing cards?!

The mystery continues...

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