Step 5: Making a Larger Wet-Cell Battery

Here's another way to make the battery if you don't have access to zinc washers:

Take 10 pennies newer than 1982, and use 100-grit sandpaper to sand one face of the penny. The entire inside of the penny is zinc, so sand the face until the whole surface exposes the zinc.

Once again, cardboard needs to be cut and soaked in an electrolyte like vinegar, salt water, or lemon juice. In this case, I didn't round the edges. You can see the sharp corners, and that's ok as long as they don't touch. If the cardboard pieces touch, that section of the battery will short out and decrease the performance of the unit as a whole.

You can build your battery cells the same way you did with the washers, as long as the pennies are all facing the same direction. With this method, the zinc top is the positive, and the copper bottom is negative.

By connecting 10 cells in series (stacking them on top of each other), the electrical potential will jump to nearly 6 volts! This should be more than enough voltage to drive an LED... or TWO!??

You can get an LED to light up by pressing the long lead of the LED (positive) on the top, and the short lead of the LED (negative) on the aluminum foil base.

LEGALITIES: Some people have asked about the legality of treating pennies in this manner. The federal law states that there are exceptions made for use as "educational, amusement, novelty, jewelry, and similar purposes as long as the volumes treated and the nature of the treatment make it clear that such treatment is not intended as a means by which to profit solely from the value of the metal content of the coins." For more information, click here!
Step 6: How Long does an LED Stay On?
With the stack of 10 pennies, I attached a green LED and wrapped it all up with electrical tape in hopes to make it air-tight.

I put it on my shelf and watched it for a few hours to see when it would die out.

I was amazed that the light actually stayed lit for over 16 days!! I really am impressed at how well that worked out!

Well, there's an energy idea that's worth a few cents.

Haven't seen the video yet? You can still see it here!

If you like this project perhaps you'll like some of my others. Check them out at www.thekingofrandom.com

Related Instructables
- Battery: Power an LED Flashlight with Penny Change! by GuiltyPixel
- Penny Battery by goldfish408
- Penny and Nickel Battery by Brenn10
- 6 Cent LED Throwie by drinkmorecoffee
- DIY Batteries with This Penny Power Hack (video) by The King of Random
- The Penny Battery by Tool Using Animal
Craft Stick Catapult
**Intro: Craft Stick Catapult!**
The craft stick catapult isn't going to invade itself! With a quick craft stick catapult, you'll be launching pom-poms over pipe cleaner parapets in no time. Whether you're using it to learn about levers, simple machines, or want to join in a 2,400 year history of launching projectiles, the craft stick catapult can be your new favorite toy.

- **What:** Craft Stick Catapult
- **Concepts:** levers, simple machines, projectiles
- **Time:** ~ 3 minutes for your first
- **Cost:** ~ $0.05
- **Materials:**
  - 6 rubber bands
  - 7 craft sticks
  - catapult basket (bottle cap, plastic egg, etc)
  - pom-poms or other projectiles
- **Tools:**
  - hot glue gun

Let's launch!
Step 1: Prep Thy Fulcrum
Step five craft sticks together, and rubber band them at both ends, wrapping the rubber bands until tight. You can add more or take some away later to test different build options.

Step 2: Attach Thy Flinger
Take your two remaining craft sticks, and rubber band them at one end. Wedge the fulcrum in the middle so they splay apart. You can change the lever length of your catapult by moving your fulcrum to different positions. This is great for learning about leverage.
**Step 3: Secureth In Place**
Use two rubber bands to make an "X" around the entire finger and fulcrum. Leave it loose enough so that you can change the lever length when you want to.

![Step 3 pictures]

**Step 4: Attach Thy Basket and Launch!**
Be it plastic egg, bottle cap, clay, or folded paper, hot glue it to the end of the finger. Load it up with some projectiles, pull back, aim (not at humans or animals), and fire away!

After you fling a few pom-poms around, try making some targets out of paper or cups, and adjust the fulcrum height and lever length to play with different designs.

Which lever length works the best? How does it change the flight path of the pom-pom?

Have fun, and keep exploring!

![Step 4 pictures]

Related Instructables

- The Marshmallow Trebuchet by onebrokenneck
- Popsicle Stick Bomb by EmilyR4
- Disc Shooter Physics Challenge (Photos) by CitizenScientist
- Cork Shooter by WYE_Lance
- Building Machines From Paperclips by biochemtronics
- 3D Printed Vertical Ball Launcher (video) by Ben Finio
Solar Oven
**Intro**: How to Make a Simple Cardboard Solar Oven

The sun is arguably one of humanity's most important tools for survival. It gives off practically unlimited amounts of light that is used by plants to generate energy and warm animals for heat. It can be used to generate electricity with solar panels, hot water with solar hot water heaters, and many other uses. Even though technology can be useful, for example gas ovens, natural and simple technologies like solar ovens can reduce fossil fuel use or even replace fossil fuels in places that don't have abundant resources, and it's an enjoyable project. The materials used can mostly be found locally from recycled sources which makes it even more sustainable.

![Cardboard Solar Oven](image)

**Step 1: Finding Tools and Materials**

I recommend taking one trip to locate/buy tools and materials for this job. The following materials are necessary:

- 2 medium to large cardboard boxes that fit inside each other with 3-4 inches or so of space around the sides of the box. Also necessary is a large piece of cardboard for the reflector that is as wide as the widest part of the large box and about 2-3 feet long. These can be found at most stores, just ask an employee for boxes they don't need anymore.
- 1 roll of aluminum foil (75 feet is enough)
- piece of glass or plastic fits over top of the larger box. This can be found at window stores; they often have extra glass laying around for free.
- tape measure
- box cutter
- construction paper
- black spray paint or black construction paper
- enough newspaper that will, crumpled, fill a bottom row and the sides in between the two boxes. This can be found at recycling centers.
- duct or foil tape
- two small pieces of wood (optional)

**Step 2: Cutting Off Flaps of Smaller Box**

Cut off the four flaps of the smaller box so they don't get in the way.
Step 3: Crumpled Paper on the Bottom
Crumple up pieces of newspaper one at a time until the bottom of the large box is lined. This will be an insulation that keeps retains heat in the box.

Step 4: Spraypaint the Small Box Black
Either spraypaint the inside bottom of the small box black or glue a sheet of black construction paper, fitted to the size of the box, to the inside bottom of the small box. I recommend doing this outside and try to not inhale the fumes.
Step 5: Glue Aluminum Foil on Insides of Small Box
Squeeze a generous amount of glue on one side of the inside of the small box and then cover it with aluminum foil with a little bit extra over the top of the box so it the foil stays in place. Then do the same for the remaining three sides.

Step 6: Insulating the Sides
Crumple up one piece of newspaper at a time and fit it around the sides up to the top.

Step 7: Cut the Flap for the Reflector
Cut a piece of cardboard that is as wide as the widest part of the large box and about 2-3 feet long.
Step 8: Installing the Reflector Flap
Put the cut piece of cardboard a few inches down on one side of the box and then tape it to a flap of the large box. (Optional: you can cut two small holes in the piece of cardboard and flap of large box once they are together and put two small pieces of wood in place to help hold the cardboard pieces together.)

Step 9: Putting Aluminum Foil on Reflector Flap
Apply a generous amount of school glue on one side of the reflector flap and cut aluminum foil to cover the entire side of the flap.

Step 10: Place Glass or Plastic on Top of Large Box
Lastly, place the piece of glass or plastic on top of the large box and tilt the reflector in towards the center of the boxes. To cook something, find out how hot your new solar oven gets by putting solar oven in an open place with as few obstacles around to reduce shadows, and then face the reflector towards the sun. Then, place a thermometer inside and check it occasionally to determine how hot your solar oven gets. Feel free to experiment with different methods of cooking things, or look online for guides on how to cook using your solar oven. Thanks for reducing your fossil fuel use, cooking a more natural way, and I hope you make some scrumptious meals!
Related Instructables

- Solar parabolic cooker with the mechanical mathematician! by galatechnician
- Kyoto trough solar cooker mimics a parabolic dish without a thousand cuts! by galatechnician
- Solar Cooker by wsalazar
- The parts of the mechanical mathematician (video) by galatechnician
- A mould for cardboard and plastic solar cookers (video) by galatechnician
- CERC Green Solar Oven by Spoint2

Comments

12 comments  Add Comment

mistdemon123 says:
May 25, 2010, 10:58 AM
how hot can the internal temperature get?

solaroven says:
Jan 9, 2011, 5:23 PM
I haven't tested the internal temperature yet, there hasn't been much sun lately.

solaroven says:
May 29, 2010, 2:57 PM
Hi there,
I made it for a school project and haven't used it yet, but when I do I'll message you.

 Thanks for your interest.

Micanale says:
Sep 27, 2010, 8:20 PM
I have a fear of the cold and would like to go camping. How can I make a solar heater for a small tent?
Micanale@aol.com

oakleaf1 says:
Jan 6, 2011, 6:21 PM
Try this concept from THE MOTHER EARTH NEWS. You'll have to figure out the modification to adapt to a tent, but the design should work.

profpat says:
Sep 25, 2010, 9:43 PM
great simplicity idea!
Cardboard Challenge
Cardboard Challenge

Supplies—
Cardboard
Recyclables
Scissors
Paints
Markers
Assorted tapes
Paper clips
Glue

Cardboard Challenge—build something out of cardboard and recycled materials
THE SKY IS THE LIMIT! You can do simple challenges or extensive projects. We encourage you to do both!

Simple challenges—build a...
- robot
- train
- tall tower
- refrigerator
- office building
- house

We encourage you to be creative and to visit the following two websites with extensive information about cardboard challenges. You can participate in the national cardboard challenge and register your event!

https://cardboardchallenge.com/

http://cainesarcade.com/
About Caine’s Arcade

Caine’s Arcade is a short film about a 9 year old boy’s cardboard arcade, and his dream of having customers. The 11 minute short film became a global phenomenon in 2012, with over 10 million views online. It received international media attention and was added to MoMA’s permanent collection. The filmmaker, Nirvan Mullick, set up a scholarship fund for Caine as part of the film. To date, over $240,000 has been donated for Caine to go to college. Tens-of-thousands of customers visited Caine’s Arcade to play, and kids around the world began making their own cardboard arcades. Shortly after
posting the film, Nirvan founded a non-profit called Imagination.org which launched a Global Cardboard Challenge to foster kid creativity worldwide.

Backstory

In 2011, at the age of 9, Caine Monroy spent his summer vacation building an elaborate DIY cardboard arcade in his dad’s used auto parts store in East Los Angeles.

Caine loved arcades, and dreamed of the day he would have lots of customers come play. He spent months building and preparing his arcade, perfecting his game design, making displays for prizes (his toy cars), designing elaborate security systems for his Fun Pass, making his own Caine’s Arcade STAFF shirt, and even hand labeling paper-lunch-bags for customers to carry home prizes.

However, his dad’s auto part store (located in an industrial part of Boyle Heights) received very little foot traffic, so Caine’s chances of getting a customer were very small, and the few walk-in customers that came through were always in too much of a hurry to get their auto part to stop to play Caine’s Arcade. Caine never had a single customer, but Caine never gave up.

On the last day of summer, by chance, Nirvan Mullick walked into the auto parts store to buy a door handle for his ’96 Corolla. Caine asked Nirvan if he would like to play his arcade. Curious, Nirvan asked how the arcade worked. Caine explained that for $1, Nirvan could get two turns, or for $2 he could get a Fun Pass (with 500 turns). Nirvan bought the Fun Pass.

Nirvan became Caine’s first and only customer, and he loved Caine’s Arcade. It turned out that Nirvan was also a filmmaker, and he came back to ask Caine’s dad if he could make a short film about Caine’s Arcade. It was at that point Nirvan learned that he had been Caine’s first and only customer. Nirvan decided to organize a surprise flash mob of customers to come play Caine’s Arcade, and make Caine’s day.

Words can’t describe Caine’s response – so watch the film. After the flashmob, Caine told his dad that that was the best day of his whole life.

FROM A MOVIE TO A MOVEMENT (POST-FILM UPDATE):

Caine’s Arcade was posted online on April 9th, 2012, and became an global viral phenomenon. The film received over 1 million views in the first 24 hours, and trended worldwide on twitter. As part of the film, Nirvan set up a scholarship fund for Caine, hoping to raise $25,000 for Caine to go to school. The first day the film was posted, over $60,000 was raised for Caine’s Scholarship Fund! The next day, we had raised over $110,000. To date, over $240,000 has been raised for Caine. Kids all over the world were also inspired to create cardboard games and creations. And we received thousands of emails from educators and parents, sharing stories of kids in their communities, and asking what we could do to help support the imaginations and dreams of kids worldwide. Inspired by the response to the film, two days after the film was posted Nirvan began to form a non-profit with a mission to “find, foster, and fund creativity and entrepreneurship in more kids like Caine.” Just 5 days later, the Goldhirsh Foundation awarded a $250,000 Challenge Grant to help start the Imagination.org, which launched an annual Global Cardboard Challenge that has engaged over 750,000 kids in creative play.

Watch the follow-up film: “Caine’s Arcade 2: From a Movie to a Movement”
The Global Cardboard Challenge is brought to you by:

AT&T  
aspire  
Disney

Making & Science
ozobot  
sparkfun.  
makedo

The LEGO Foundation
Champion of the LEGO Foundation Reimagine Learning Challenge

Inviting the World to Play

Since 2012, in the fall of each year, kids everywhere take part in the Cardboard Challenge as a way to gear up for Imagination’s Day of Play. It all began

Watch "Caine’s Arcade Part 2"
Nature
Weave
**Nature Weave**

This can be made with items found in nature or a mixture of hand made and nature (see example).

You will need:

- Sticks
- Flowers, leaves, greenery

**Step 1: Collect Nature Items**

Collect sticks. Collect flowers, leaves and greenery. For longer lasting art work, either hand make or purchase flowers and greenery. If no access to sticks, can purchase dowels as well.

**Step 2: Start Making The Frame**

Take 2 of the sticks and start winding yarn to hold them perpendicular to each other. Repeat until you have a rectangle.