Tesla's

Neillsville High School Team

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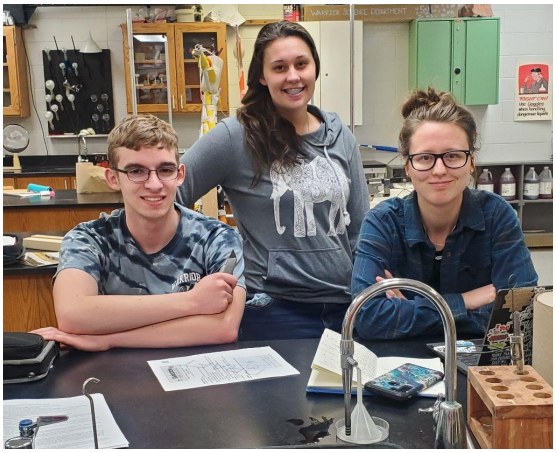

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Steps

1. Pull the stick
2. Battery falls
3. Hydraulic Syringes activate “Hydraulics”
4. Bottle is tipped over
5. Water wheel spins
6. Marble run blocker is removed
7. Marble hits cup
8. Cup hits dominoes
9. Dominoes land on lever
10. Lever releases car “Mechanical”
11. Car hits flag
12. Flag knocks over chemical reaction
13. Water is released “Chemical Reaction”
14. Weight falls through toilet paper
15. Hammer falls
16. Batteries turn on “Electrical”
17. Globe spins ‘round

Cost of Machine

The only thing we bought was alka seltzer. The cost of this was $9.00**.** Otherwise everything that we need was readily available from past projects and from various locations around our school. We reused the plywood, 2x4’s and screws from the original Machine in 2015. A student from the class of 2015 left the K’Nex we used. We raided the janitor shop for tools and 3 fasteners. Our school has an office supply room and our STEM club was able to use that for our tape, hotglue, string and note cards. We feel that 98% of our machine is recycled materials.

Advanced Steps

Mechanical

From years past we knew that having a mechanical step would not be very difficult to include. Our original idea was to have a lever arm that would have sand added to it so it lifts the far side starting the next step. Our end result was similar to this, but instead of using sand we were able to just use dominoes.

Chemical

On our last Machine we used an Alka Seltzer tablet and water to cause a chemical reaction. We decided to go with a similar idea. The plan was to use syringes and have the Alka Seltzer knocked into water inside of the syringes. This would create pressure causing another syringe to extend starting the next step. We had difficulties setting this up reliably so we scratched it and now have a film canister that gets knocked over. Once the cup is flipped the reaction starts. Once enough pressure is built the top comes off and releases water. This starts our next step.

Electrical

From the start we wanted to have our machine end with a globe spinning. After having some ideas of using a drill (power tool, thus the name) to spin the globe we decided to try to use some old computer fans, because the drill battery was not permitted in the competition because the battery is 18V. Our first plan for how to activate the fans was to use some snap circuits with a light resistor similar to a solar panel to go with the power theme. We would have a flash light aimed at this resistor, and it would be hit out of the way by the previous step. With the flashlight gone power would flow through the circuit and start the fans. This was difficult to implement so we went with a simpler back up plan. Now we have a switch being connected that completes the circuit which allows the fans to start.

Hydraulic

We have never attempted to include a hydraulic step, so we didn't know where to start. Our first idea was to have a textbook domino line like we have done before that would land on a syringe causing it to push another syringe starting the next step. We decided that this was a bad idea because it takes a lot of force to make the syringes extend any large amount of distance, and the text books falling is somewhat violent and we worried that this might cause an involuntary start of a different step. So we decided to make that hydraulic step as the first step where we could just manually push the plunger as our start. We worked with this idea for the length of the project until the end where our coach helped us construct a way where we could get another simple step at the start and still have a very safe way of activating the syringes.

Team Reflection

Initially, we thought we could use power tools in our machine, however we discovered the voltage was too high. With this in mind we had to change our game plan. We also had tried to find a way to have the chemical reaction happen in some syringes, but we couldn't find a way to utilize it. We switched it up by having it happen on a bottle over a bin to allow for dissolving of paper. Overall we had some parts that worked really well and some other parts that didn't work well and some not at all, but in the end we all feel that we have made a very good machine.

Successes and Challenges

It was very challenging to find steps that went with the theme. First we wanted to use things that made power or electricity. Thinking of things such as a water wheel, solar panel, wind turbine and a dam. After a failed attempt to get the solar panel and the photoresistor to work, we started scraping those power ideas. We decided to just go with the idea of Powering the World (Globe) around. Our first challenge was to figure out a way to get the Globe to move. To get the globe to move we started with small pieces of paper. The paper just flapped around and didn't move the globe. We then got bigger note cards to catch more air. They worked but not very well, so we bent in the corners and it was able to catch more air and turn the globe.

The next challenge we had was to get our Chemical step to work. We put Alka Seltzer in a syringe, but it didn't seal well and it didn't move. We scrapped the idea and found we could get an old film canister to seal and it would 'pop' the top.

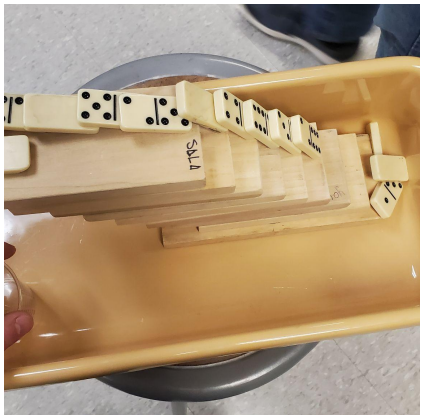
The last challenge was to get the pneumatic step to work. We tried to get it in the middle next to the car, but we couldn't get enough pressure on the syringe to put the second one.

Steps 3-8 were pretty easy to get to work. They worked well each trial, but once we take it down and reset for competition who knows.

Pictures of Machine

(not in the correct order. We had difficulty getting pictures to move around on doc.)

Computer **power** supply. Used to elevate our water step.

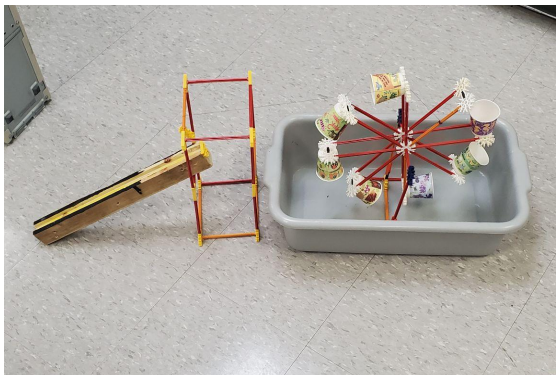


Dominoes: Needed to go up steps to get **power** from gravity.

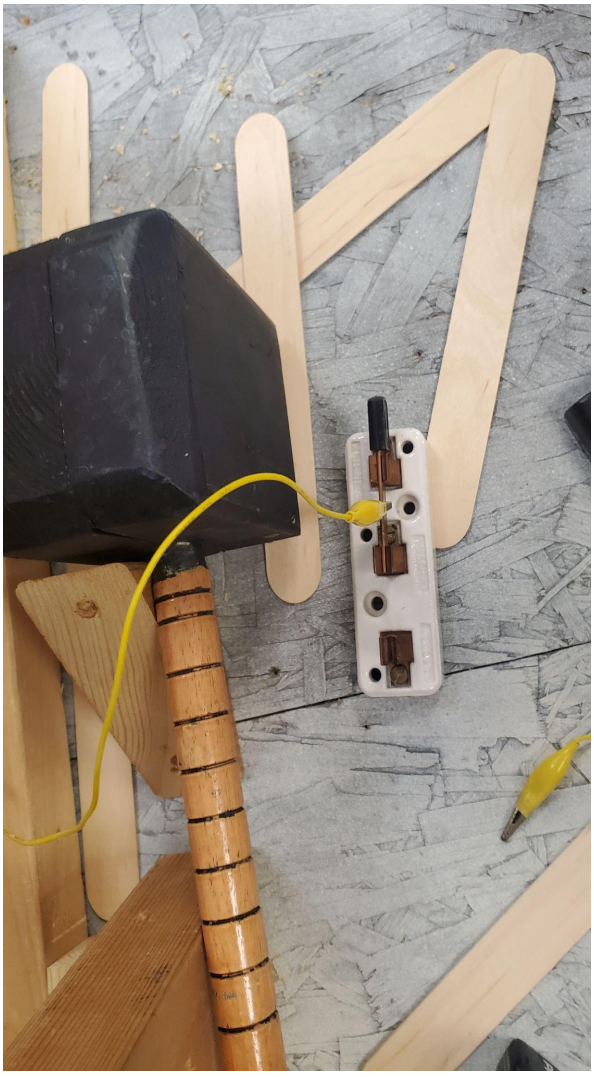
Plastic cup: Needs more **power** to move around the corner.

Lever made with K’Nex.

Hot Wheel track. We added more weight to the car to increase **power** into the next step.

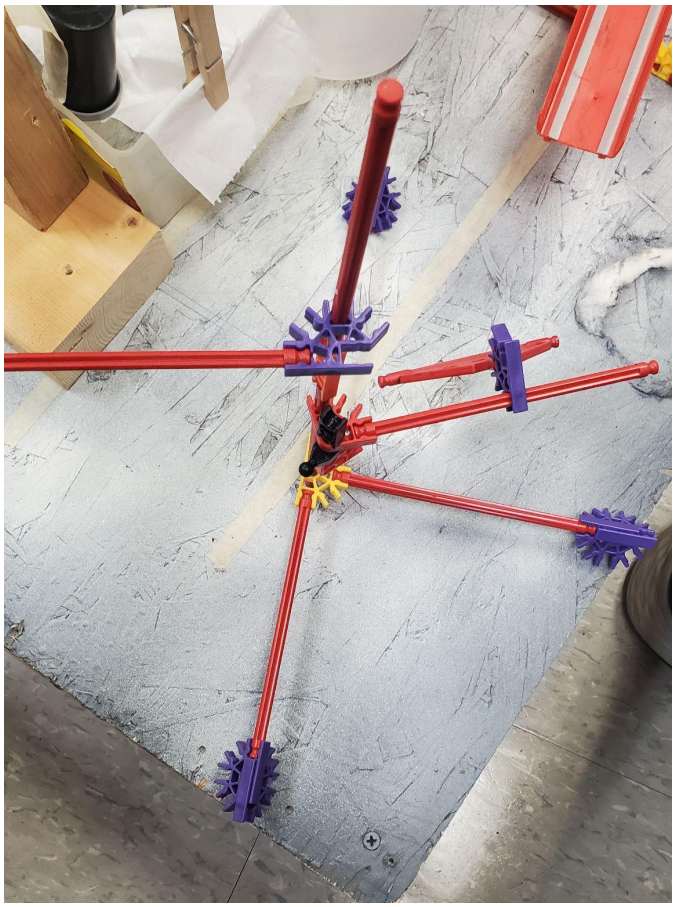


Water well. Adds **power** to the ramp.



Thors Hammer: Puts **power** into the switch.

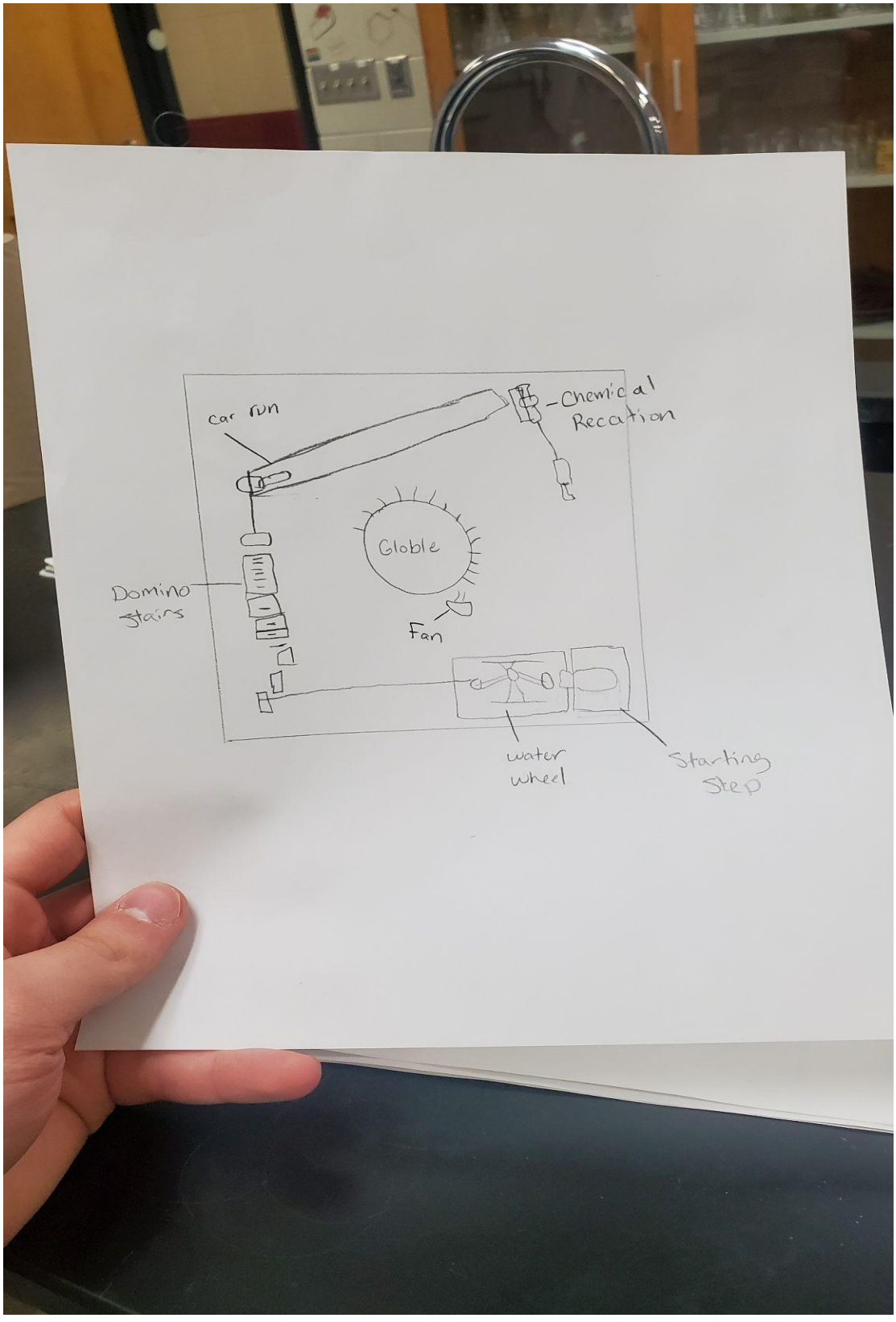
Used computer fans to… **POWER** the world around!



Lever to tip the chemical step.

The bottom of the film canister that will pop it’s top, melting the TP.

Original Sketch



Progress Reports

Day 1 February 25th: We looked at what resources available, brainstormed step ideas, read rules, and assembled starting step.
Day 2 February 28th: We tested water wheel and established next step.
Day 3 March 1st: Bridget assembled the domino stairs.
Day 4 March 2nd: We assembled the teeter totter of next step and tested domino stairs.
Day 5 March 3rd: We started setting up car run.
Day 6 March 4th: Completed car run and set up chemical reaction. Got the globe to spin.
Day 7 March 7th: We revised the starting step to be the hydrologic pump and added a marble run between the domino run and water wheel.
Day 8 March 8th: We set up cup roll and decide the steps following chemical reaction step.
Day 9 March 9th: We have completed first step and worked on the rest of the steps after chemical reaction.
Day 10 March 10th: We worked on the online work.

Rough Sketch Idea

Tip over bottle, waterwheel spins, domino gets pulled, sand gets knocked over, lever activates, car is released, syringe is knocked over, chem reaction pushes a block, hammer swings, flashlight removed, fans start, globe spins.