

Electricity (or current) is a stream of very small particles with a negative charge (called electrons) that are able to move through a solid material. You can compare it with a very large group of people closely packed together that pass each other buckets of water. If one place contains less electrons than another, they will move to the place with the least electrons until levels become equal again. This movement of the electrons (the current) is what we call electricity.

What is electricity?
Electricity originates from the Greek word for amber: elektron. This was the material where electric charge was discovered by rubbing it against fur.

Introduction
What if there is a power failure and you have to charge your cell phone? With the instructions on the inside, you can build your own charger that works with a bicycle dynamo. This way, you can produce electricity by using your muscles!

AC and DC
With direct current (DC), electricity flows in one direction, while with alternating current (AC) the flow direction of the electrons changes very, very rapidly. It may sound strange, but this alternating current makes it possible to transport currents over long distances. High voltage cables and your wall socket use AC, whereas many small devices in your home use DC. That's why your computer and telephone need a power adapter. With the instructions on the inside you will make an adapter that can transform the AC of the dynamo into DC for your telephone or tablet.

To produce electricity, there has to be a difference in the amount of electrons between two places. This difference is called voltage. The strength of the current, called ampere, is the quantity of electrons that pass a certain place per second.

Tip: No bicycle? You can perhaps put your charger on a buggy or wheelbarrow wheel.

DO-IT-TOGETHER SCIENCE BUS



collecting folk remedies
do it together & find out how things work

DIY phone charger

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Look for the parts and instructions at the attachment. This is how the end result looks like:



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DIY phone charger

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Charging your cell phone when there is no socket available? You can! Follow the instructions below to charge your device by using a bicycle dynamo.

1



Cut the stripper board to the right size: 4 holes wide by 34 holes long. Do this by carefully cutting into the board and subsequently breaking it with flat nose pliers.

2



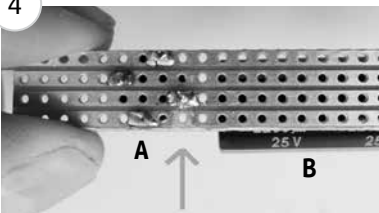
Put all the parts in the order above on the matte side of the board. See appendix (page 4) for a detailed view. **ATTENTION:** the long leg of all parts is always the plus side (+), place this on the plus line of the board. Reading downwards, the board has a +, -, + and a - line.

3



Solder the parts to the shiny, copper side of the board (look for soldering instructions in the attachment). **ATTENTION:** the copper side of the board is conductive. Do not connect the copper strips to each other! Cut off the long legs.

4



Scrape some of the copper away from the bottom with a stanley knife on 3 points. See appendix for a detailed view of which points. By doing so, there will be no contact between the leg of the rectifier and the rest of the line on the board.

5



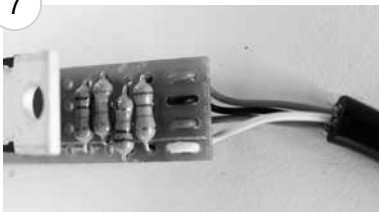
Cut off the USB connector (male) from the USB extension cable. Strip all 4 wires to attach them to the board. In the appendix you find a detailed view for the exact locations on the board.

6



Drill a hole in the screw cap and cut a smaller hole in the rubber inside of the cap. Next, glue both ends to the pvc tube.

7



Pull the wires (USB + the wires that lead to the dynamo) through the hole in the screw cap. Solder the wires to the USB as pictured above. Place the red wire on the top (+) line, followed by the black, green and white wire on the lines below.

8



Now solder the wires that run to the dynamo as pictured above. In this case the way of wiring does not matter. **ATTENTION:** solder the wires to the shiny, copper side of the board.

9



Place your device in the PVC tube and connect the wires to the dynamo.

ATTENTION: before you connect your phone, first test if your device works properly with a multimeter.

What do you need?

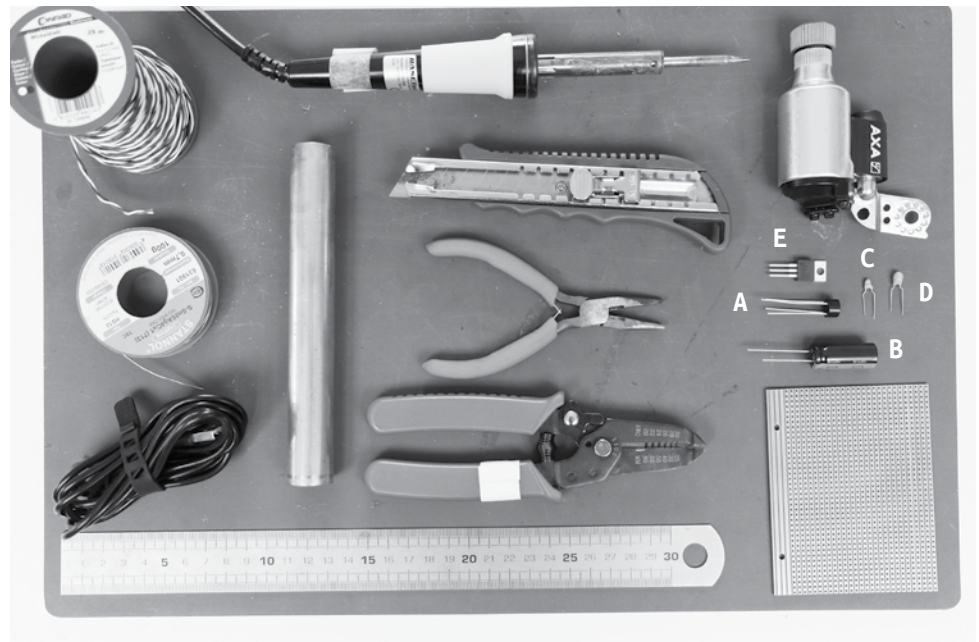
Find a list below of all tools and parts that are needed to build a cell phone charger.

Tools:


- Soldering iron
- Soldering tin
- Stripping pliers
- Flat nose pliers
- Cutting pliers
- Stanley knife
- Metal ruler
- Handsaw
- PVC glue
- Multimeter

Parts:

- Dynamo
- Stripper board (hard paper)
- USB extension cable
- Twin-core wire to put between dynamo and charger
- 12 cm PVC tube, min. \varnothing 25mm
- PVC cap
- PVC cap with screw cap



- A = Bridge-rectifier (converts DC into AC)
- B = Capacitor 1
- C = Capacitor 2
- D = Capacitor 3
- E = 5 Volt regulator (converts 6V into 5V)
- F = 2 Resistors 51 kOhm
- G = Resistor 43 kOhm
- H = Resistor 75 kOhm

Note: Part F, G and H look like this: 

Learn how to solder

Never soldered before or was it a long time ago? Read the instructions below to safely handle the soldering iron. ATTENTION: soldering tin may contain lead, which is poisonous. Some may get on your skin – always wash your hands afterwards.

1



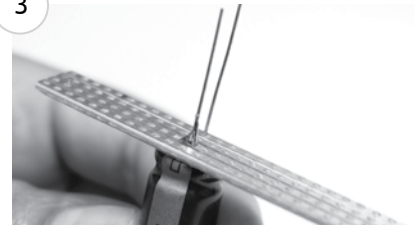
Turn on the soldering iron. Heat the metal you are going to solder with the iron.

2



Add some soldering iron underneath the soldering iron.

3



Form a small pyramid around the soldered leg with the iron. First take away the soldering tin and next the iron.

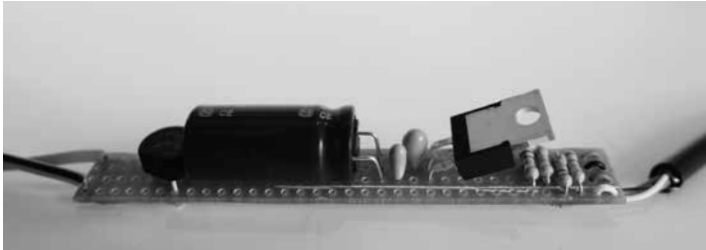


Where to place what?

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Find a detailed picture and illustrations from the populated board below. Here you can see clearly where to place what component on your board:

Picture of the end result:



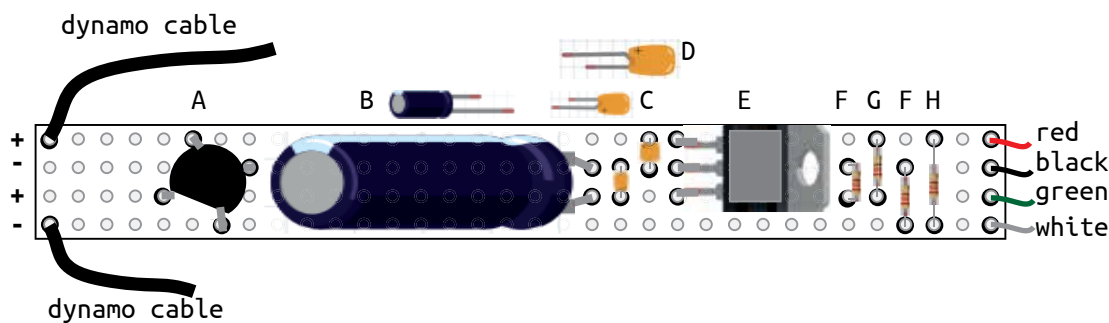
This is how the **top** of your board should look like after populating it at step 2 and after connecting the wires at step 7 and 8.



SCIENCE



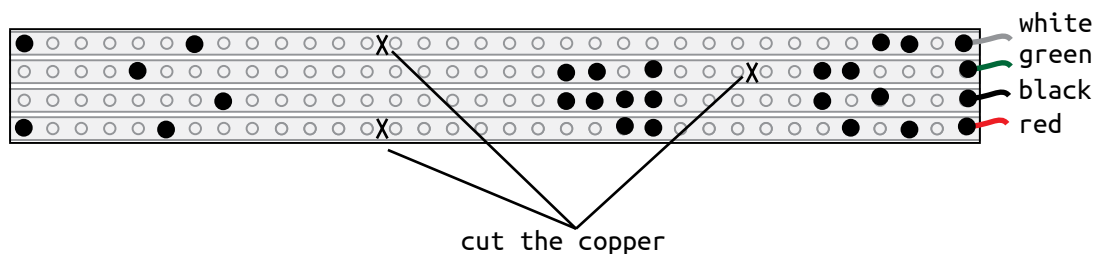
Illustration 1. top of the board:



This is a detailed illustration of where to place the component and the wires on the **top** (the matte side) of your board.

ATTENTION: the long leg of all parts is always the plus side (+), place this on the plus line of the board. Reading downwards, the board has a +, -, + and a - line.

Illustration 2. bottom of the board:



This illustration shows how the **bottom** of your board should look like after soldering all components. At step 4 you scrape some of the copper away with a stanley knife on these 3 points.