Fluids/Cables/Electric

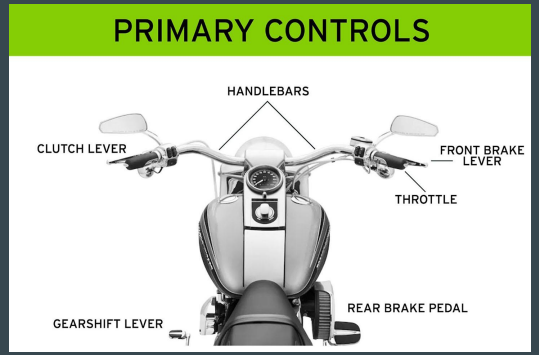
By Arlo, Isaac, Mia

Main Components

- Alternator
- Coil
- Cables
- Fittings and Spacer (Lab-made)
- Distributor
- Oil Reservoir
- Battery Box
- Handlebars:
  - Throttle
  - Brakes
  - Clutch

Cables

- All motorcycles require cables to operate the throttle and clutch systems, some models can also be equipped with cable-operated rear brakes. They are attached to the corresponding levers on the handlebars
- Front brakes are usually operated by the hydraulic pressure transferred via the brake line from the main cylinder on the handlebar to the pistons in the brake caliper
- The cables have three main components: outer cable (protective cover), inner cable and end cable clamps

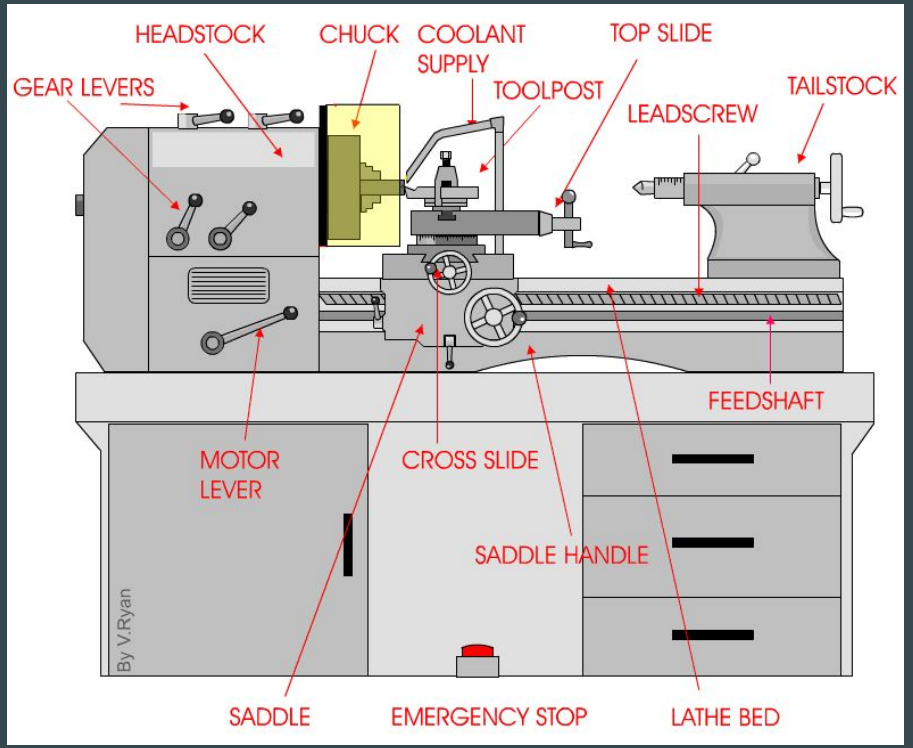


Using the lathe

- We ran into a few issues of our cables not fitting properly into the parts.
- To solve this problem we used the lathe to hand make several new pieces to ensure that the cables fitted correctly.
- Our parts were made out of aluminum

Steps using the lathe:

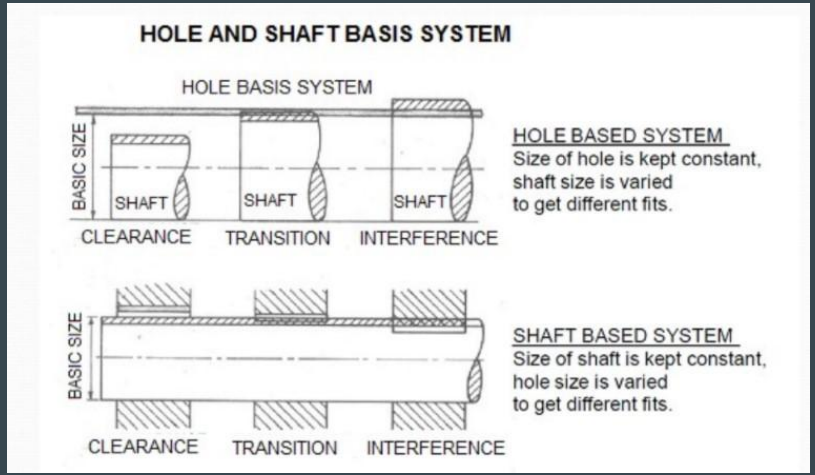
1. Cut aluminum to correct size and put in chuck
2. Select an appropriate sized drill and put it in the tailstock
3. Use the handle at the back of the tailstock to move and drill into the part
4. Use the saddle handle to finish parts

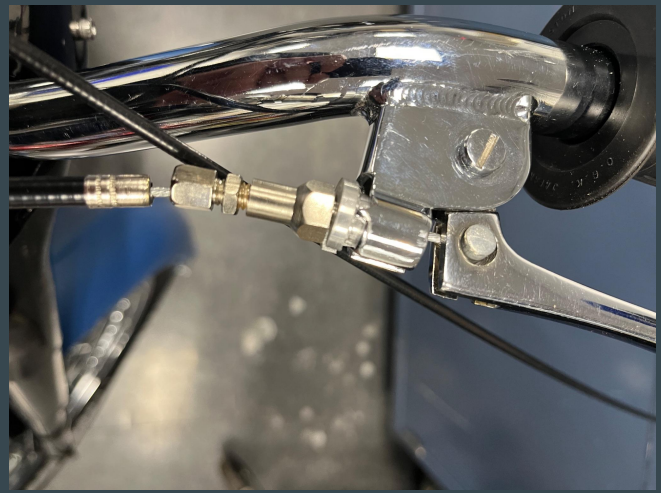


http://technologystudent.com/equip1/mlathe1.htm.

Our Parts

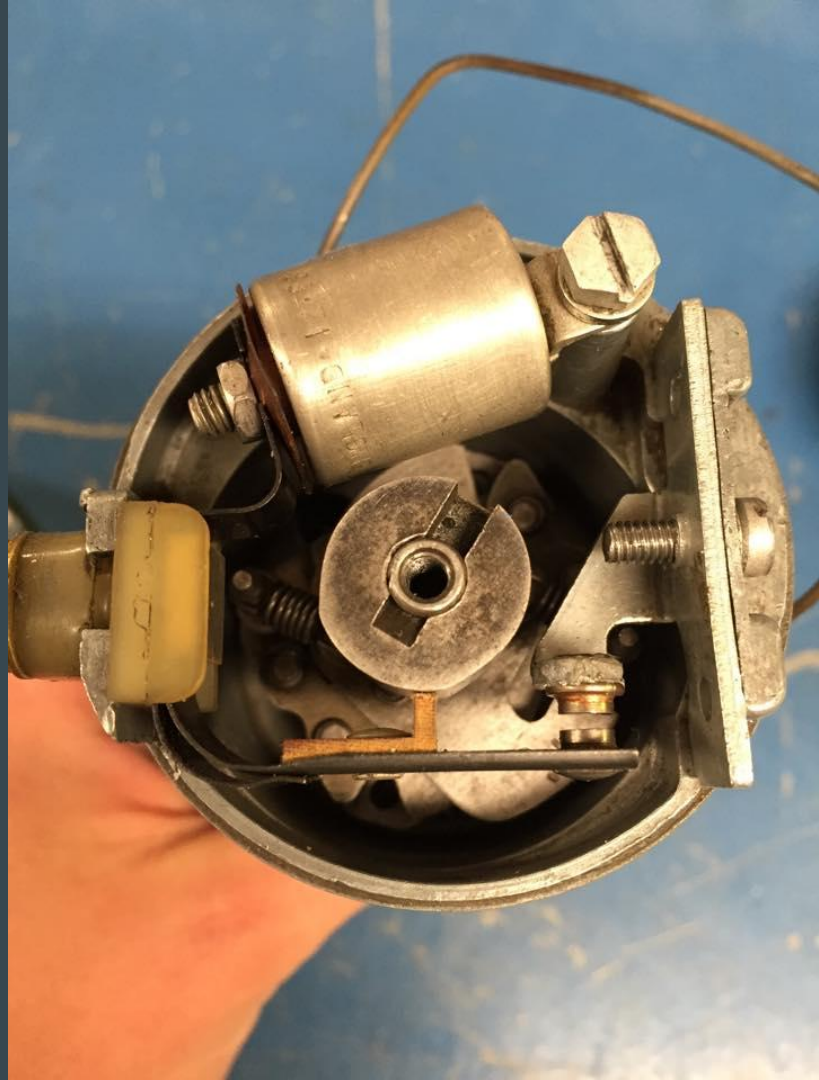
- We created the parts to achieve an interference fit
- This is when two parts of a very similar size are pushed together and are held together by the friction between them





Distributor

- Cam/Camshaft
- Points
- Weights/Springs
    - Determine Mechanical Advance Timing



Advance Timing

- Sets spark off before piston reaches top dead center
  - Spark takes time to travel, air//fuel mixture takes time to combust
- Base Advance Timing
  - Makes it harder to kick start
- Mechanical Advance Timing
  - Better for sports bikes
  - Only reaches full advance at high RPM
  - Multiply by 2
    - Camshaft vs. Crankshaft

Information from:
https://www.tigercubandterrier.com/

Specifications for 1954/55 model

Electrics
Type: Lucas Ignition Coil (under seat on early models, on the rear mudguard behind the gearbox on later models)
Voltage: 6
Charging Type: Alternator / Rectifier
Ignition Timing: 8 degrees BTDC (0.4mm or 1/64in measured down the bore) static. 32 degrees fully advanced
Points Gap: 0.014in - 0.016in
Spark Plug: Champion L7 or equivalent
Spark Plug Gap: 0.025in

Our Distributors

<-6°

12°->

Which is Right?

- Number on Cam (should be):

(Fully Advanced-Static)

2

Information from:
https://www.tigercubandterrier.com/

Specifications for the T20SM & T20M 1964-67

Electrics
Type: Lucas Energy Transfer
Voltage: 6
Charging Type: RM 19 Alternator
Ignition Timing: 22 degrees BTDC static. 32 degrees fully advanced
Points Gap: 0.014in - 0.016in
Spark Plug: Champion L7 or equivalent
Spark Plug Gap: 0.020in

Specifications for 1954/55 model

Electrics
Type: Lucas Ignition Coil (under seat on early models, on the rear mudguard behind the gearbox on later models)
Voltage: 6
Charging Type: Alternator / Rectifier
Ignition Timing: 8 degrees BTDC (0.4mm or 1/64in measured down the bore) static. 32 degrees fully advanced
Points Gap: 0.014in - 0.016in
Spark Plug: Champion L7 or equivalent
Spark Plug Gap: 0.025in

Specifications for T20SL 1961

Electrics
Type: Lucas Energy Transfer
Voltage: 6
Charging Type: RM 19 Alternator
Ignition Timing: 16 degrees BTDC static. 40 degrees fully advanced
Points Gap: 0.014in - 0.016in
Spark Plug: Champion L5, L7 or equivalent
Spark Plug Gap: 0.020in

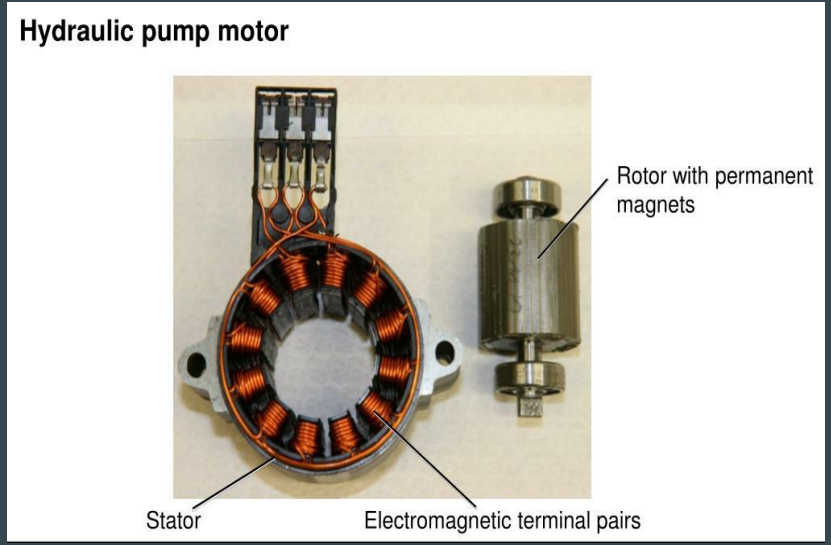
Alternator

Main Parts:

- Rotor
  - Rotating rod surrounded by permanent magnets
- Stator
  - Six coils of different windings connected in series

Function

- Charge the battery
- Creates alternating current to power the bike



Operation of the Alternator

Varying Voltage levels:

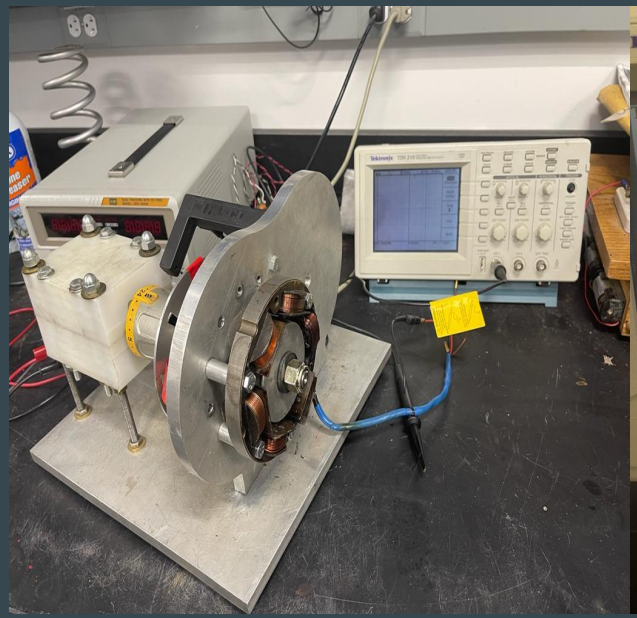
- Ground: 0V
- Low: 2V
- Medium: 4V
- High: 11V

Components that use the varying voltages:

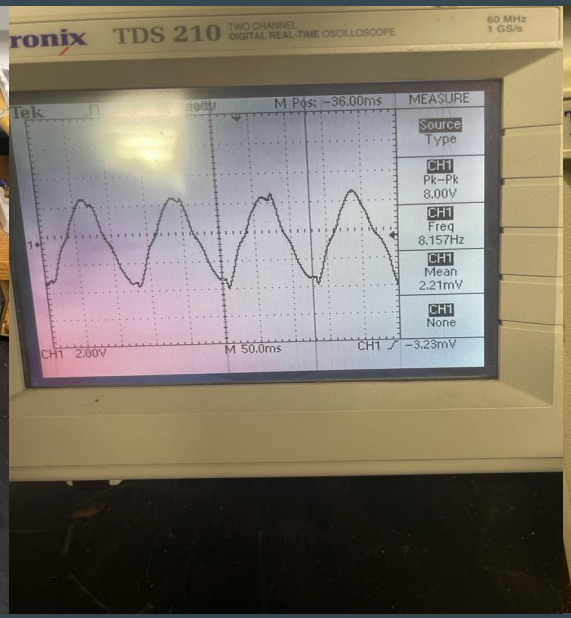
- Ground: Attached to the frame
- Low: Headlight, Blinkers, Tail Light
- Medium: Stoplight
- High: Coil, spark, points

Pictures from Stator Testing

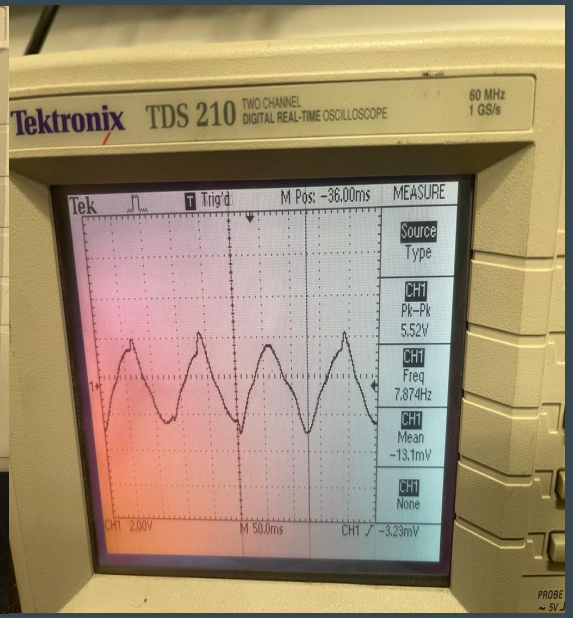
Alternator-Crankshaft Prototype



Medium Voltage

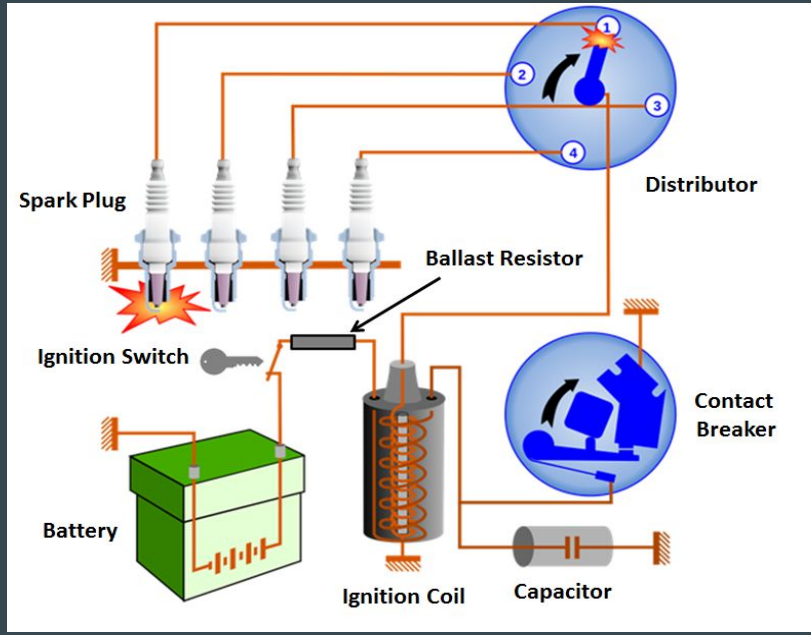


Low Voltage



Coil

- Important component in gasoline engines.
- A form of a step-up transformer.
- It produces a high voltage for the spark plug.



PHYSICS REVIEW (I)

SOURCE OF MAGNETISM

- Moving charges produce magnetic fields
- The direction of the magnetic field is determined by the “Right Hand Grip Rule”

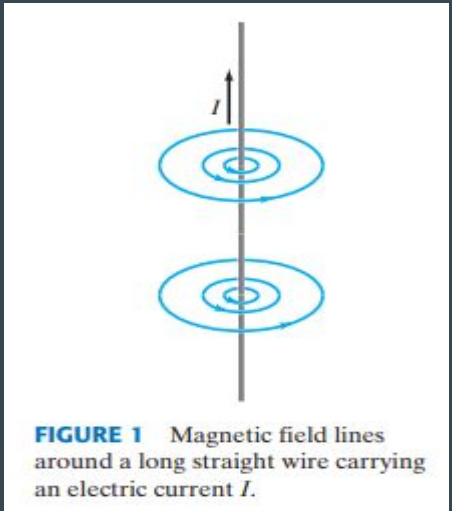
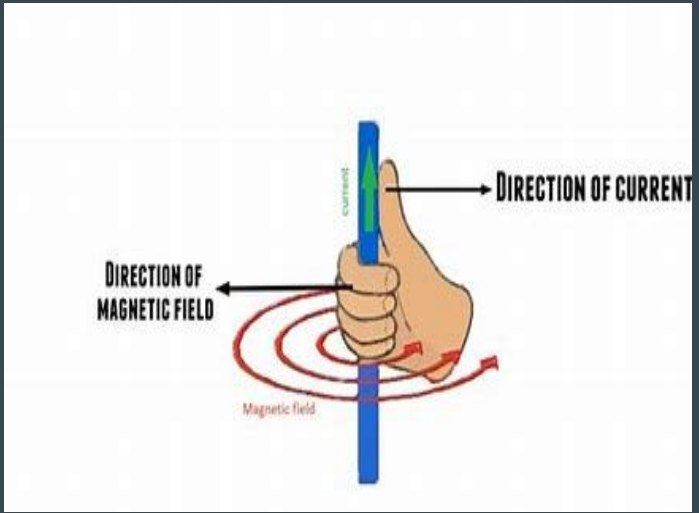


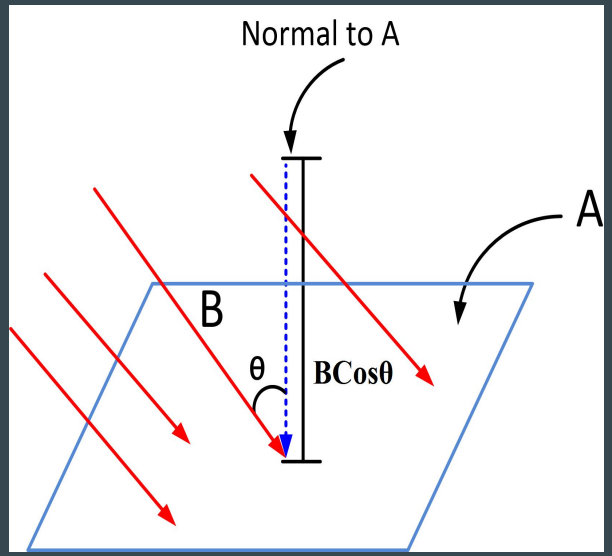
FIGURE 1 Magnetic field lines around a long straight wire carrying an electric current *I*.



PHYSICS REVIEW (II)

ELECTROMAGNETIC INDUCTION

Magnetic Flux, $\phi_B = B.A = BA\cos\Theta$



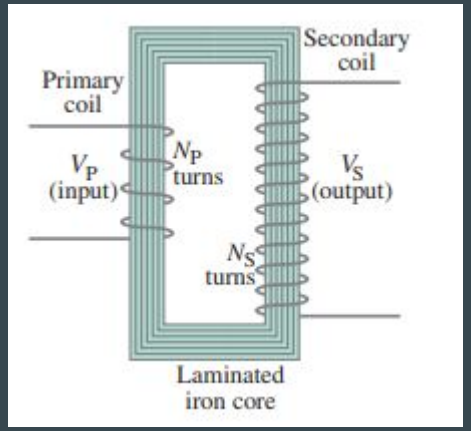
Faraday's Law, $\mathscr{E} = -N\frac{d\Phi_B}{dt}.$

Ways in which flux changes:

1. Relative motion between loop and magnet
2. Change in the area of the loop

PHYSICS REVIEW (III)

STEP-UP TRANSFORMERS



$$\frac{V_S}{V_P} = \frac{N_S}{N_P}.$$

References

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