The Kettering ignition system

- 1908 Charles Kettering designed a system to replace the magneto system
- Introduced to be centred around a battery and auxiliary apparatus.
- Simpler than a magneto
- Easier to maintain
- Advance curves easier to implement

The Dwell Angle journey

The mystery explained

Dwell Angle

- Points and cam lobe relationships
- Cam lobe explained and the “dwell angle”
- Capacitor (Condenser) purpose & use
- Simple wiring relationships & dwell meter connections
- Frequently asked questions
- What type of coil do I use ?

Fig 1

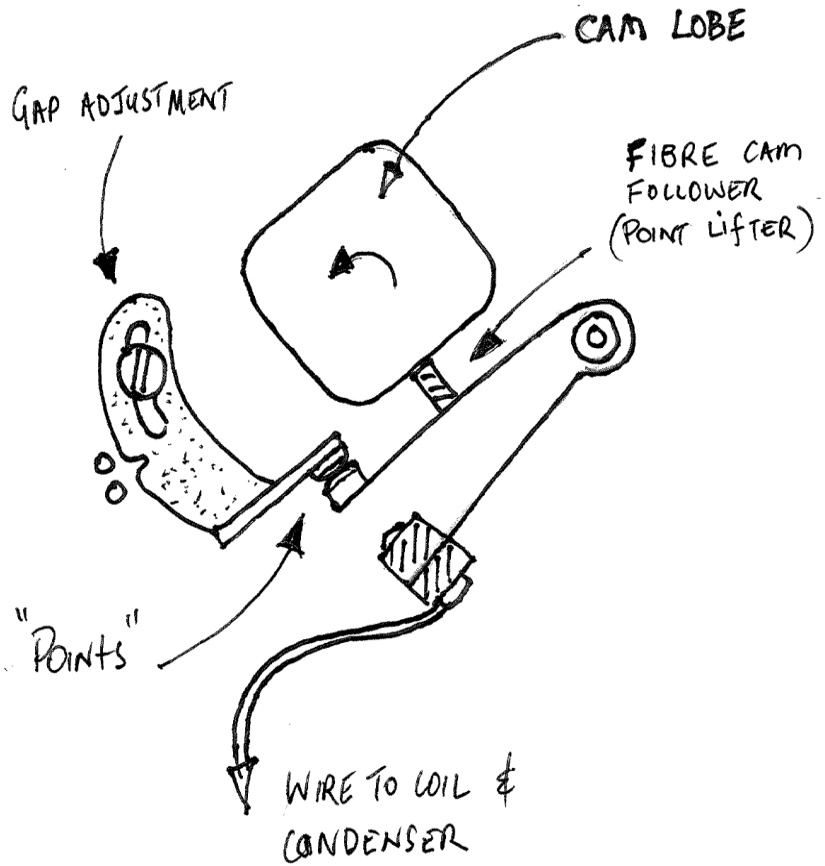

CAM LOBE
GAP ADJUSTMENT
FIBRE CAM FOLLOWER (POINT LIFTER)
"POINTS"
WIRE TO COIL & CONDENSER

Fig 2

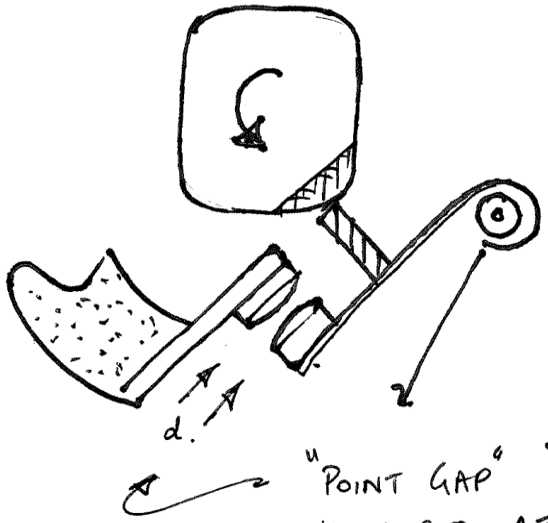
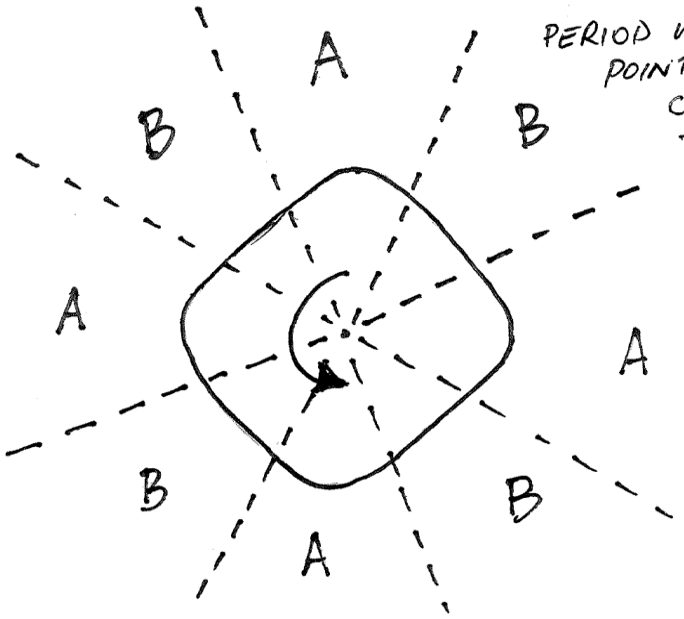

d
"POINT GAP" "d"
MEASURED AT PEAK OF CAM LOBE

Fig 3



PERIOD WHERE POINTS ARE CLOSED

PERIOD WHERE POINTS ARE OPEN

PERIOD OF ANGULAR ROTATION WHER POINTS ARE CLOSED IS MEASURED IN DEGREES OF DWELL OR DWELL ANGLE

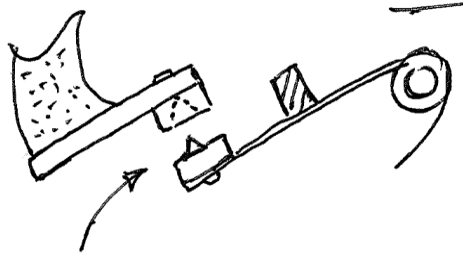
NOTES:

- THE AMOUNT OF DWELL ANGLE IS DETERMINED BY THE POINT GAP.
- THE DWELL ANGLE DETERMINES HOW MUCH THE COIL GETS "FLUXED" OR CHARGED TO ENABLE A STRONG SPARK TO THE DISTRIBUTOR
- TOO MUCH "GAP" WILL NOT ALLOW THE COIL TO "FLUX" FULLY TO RESULT IN A GOOD SPARK.
- TOO LITTLE "GAP" WILL OVER "FLUX" OR "SATURATE" THE COIL, HENCE THE COIL WILL OVERHEAT REDUCING THE SPARK GENERATION EFFICIENCY.

THE CAPACITOR OR CONDENSER HAS AN IMPORTANT ROLE!

- IT PREVENTS CONTACT "POINTS" BURN.
- IT REDUCES POOR HIGH TENSION DEVELOPMENT
- FAULTY CAPACITOR – NO SPARK.

FIG 4



SPIKES DEVELOP AS RESULT OF IN EFFICIENT CAPACITOR

TIPS FOR DWELL ADJUSTMENT.

- NEW OR NON PITTED POINTS
- GOOD QUALITY FEELER GUAGES
- ADHERE TO "GAP" TOLLERANCE
- USE GOOD QUALITY TOOLS

ELECTRONIC DWELL METER

- KNOWN BRAND – GOOD QUALITY
- KNOW YOUR CONNECTIONS
- KNOW YOUR METER SETTINGS

ATTENTION!

WHENEVER DWELL IS ADJUSTED TIMING IS AFFECTED – RECHECK YOUR TIMING.

Dwell angle data

- Dwell angle approx 45-47 degrees typical for a 4 cylinder engine
- Can be measured as a %, eg 45 degrees = 50% (45/90 x 100/1= 50%)
- 6 cylinder = ~ 30-35 degrees (30/60 x 100/1= 50%)

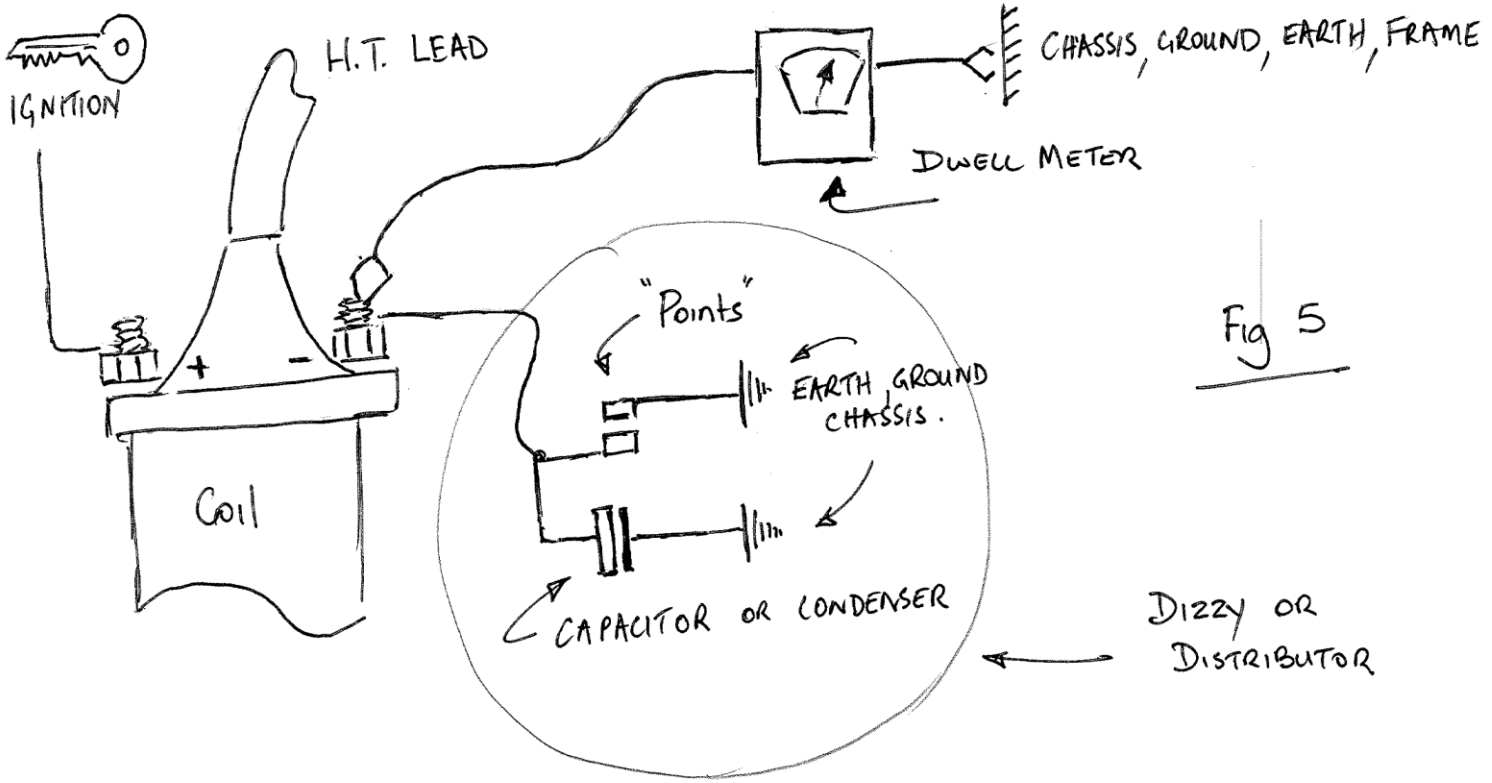


Fig 5

NOTE; Connection of dwell meter to wrong side of coil will give a false reading

Typical questions

Q. Does the coil need to be earthed or grounded ?

A. The electrical circuit does not require the coil to be at ground or frame potential.

Q. Are there different types of coils?

A. Yep,… sports, standard (no ballast), ballast, special design for electronic ignitions.

Q. What type for my FVEE? (or kent)

A. Sports or standard (non ballast type)

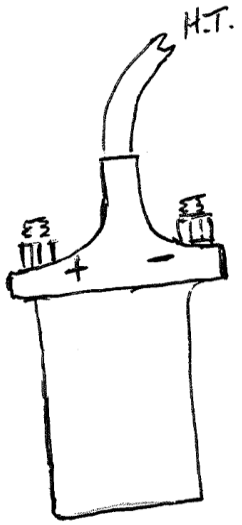
Q. Does the shape or physical appearance matter?

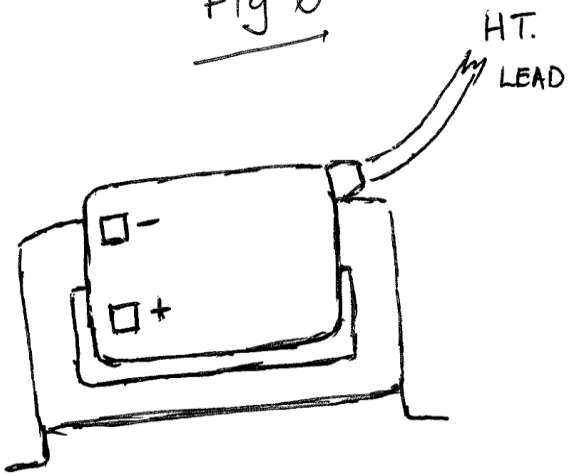
A. No, they all function the same, two main types eg. Cylinder /canister, Yoke/ transformer

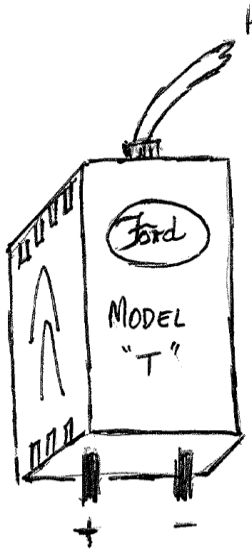
Q. What are the + ve & - ve signs on the coil for?

A. Always a controversial topic, electrically makes no difference, its an identification aid for connecting wires

Fig 6







A WOODEN BOX FULL OF PITCH & SOME MASS OF WIRES. "HASN'T CHANGED MUCH."

TERMS

HT = HIGH TENSION – "THE BIG SPARKY END". ~ 20,000 VOLTS WOW!

\+ = POSATIVE – USUALLY GOES TO THE IGNITION SWITCH (+ve BATTY, NEG EARTH)

− = NEGATIVE – USUALLY GOES TO THE DISTRIBUTOR POINTS

More questions & tips

Q. Do I have to re-time my distributor after resetting the gap ?

A. ***Yes sir ee !*** *Any change in gap adjustment re defines the position of the contact opening on the distributor cam lobe.*

Q. Are copper wire HT leads better than carbon ?, large vs small ?

A *No,…..Always a Point of discussion at the "speed shop"…..*

Q. What causes my points to burn and pit?

A. Most often a faulty capacitor or capacitor connection to chassis

Q. Why is it sometimes the fine wire connected to the points in the distributor melt & burn ?

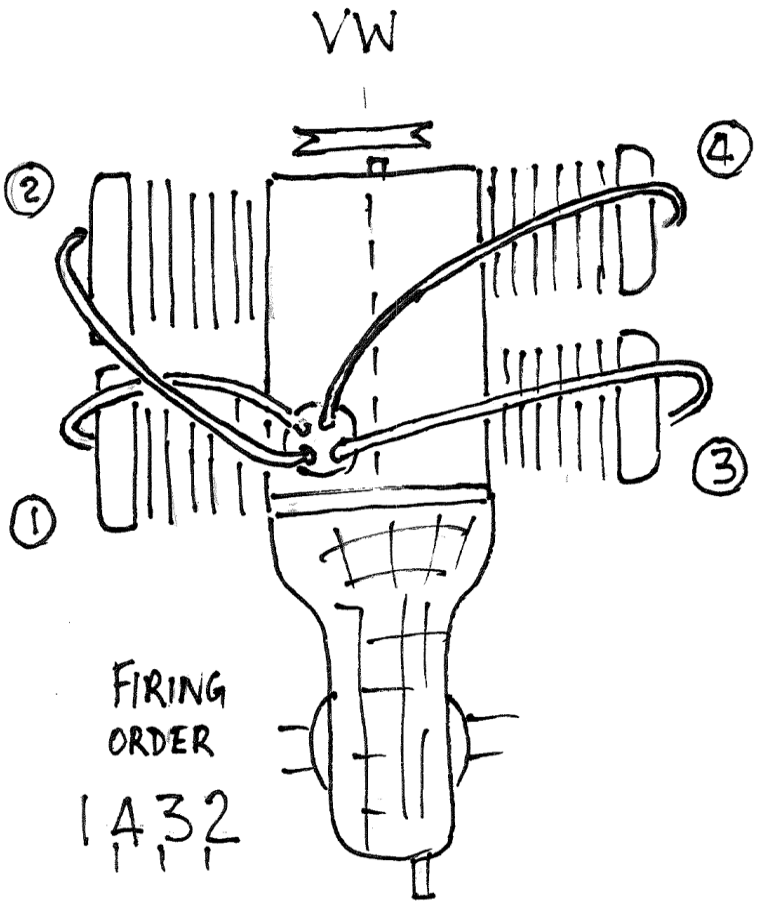
A. Usually a wrong connection of the Tacho or caused by some other auxiliary device. Or ignition wire connected to points wire.

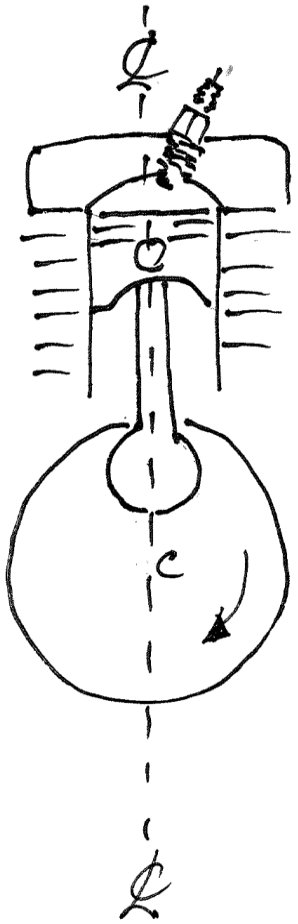
Helpful Tips;

- *Always keep data in your toolbox of the colour of wires and to what part of the coil these wires are connected, will save you time and money and will assist your mechanic, as tracing wires back to the source takes valuable time. "Label the wires"*
- *Keep spare points, dizzy cap, rotor button and capacitor in your kit*

Ignition Timing Topics

- What is ignition timing ?
- Why do we change the timing?
- What is ignition “advance” (or retard) ?
- What is a stroboscope timing instrument ?
- How is it connected ?
- Simple connections to HT lead and coil


VW
2
4
1
3
FIRING ORDER
1 4 3 2


TDC = TOP DEAD CENTRE
"0" DEGREES
C

Advance the spark, why ?

“All fuels have a different octane rating and therefore have different burning characteristics under varying amounts of pressure”

What happens deep inside your race engine ???

- Fuel air mixture is induced into the cylinder
- Piston is rapidly compressing the fuel air mix toward TDC
- Fuel and air mix under compression changes its “characteristics.”

So

- The spark has to be “set off” early enough to allow a full and complete “burn” or “explosion”
- This will allow a maximum downward power stroke to the piston.
- Precise time of spark gives optimum power “Best kick for your buck”
- Reduces the amount of unburnt fuel “going down the tube”

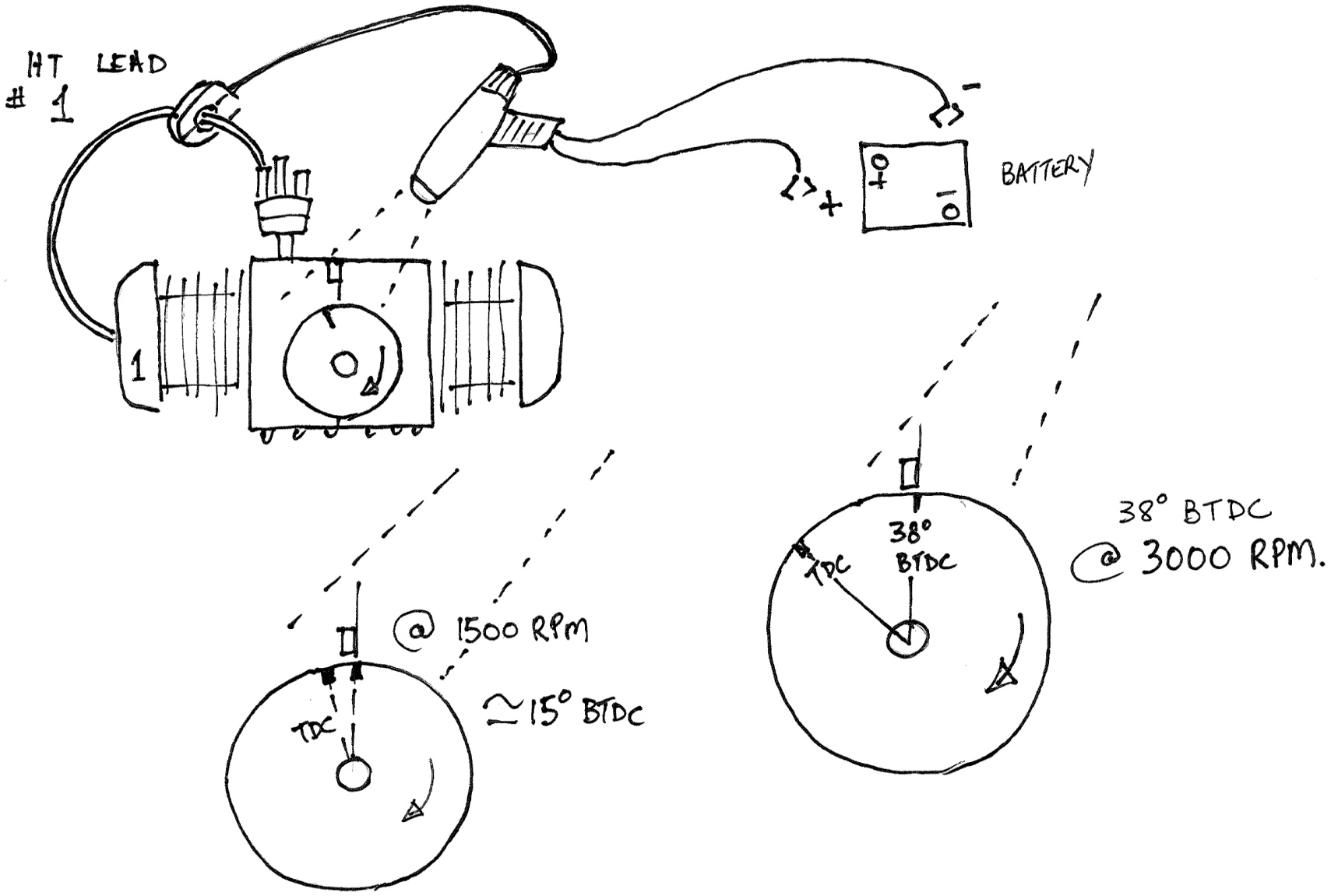

Zündfolge
TDC
10
20
30
40
50
10
20
30
40
50

V W Dizzy

- No vacuum advance
- Purely mechanical advance system
- Relies on centrifugal force applying inertia to weights in order to reposition the points.
- Weights are controlled by spring pressure, the greater the spring pressure = less advance at lower revs.
- More RPM = more advance
- Rotor rotates 1 rev to 2 revs of crankshaft


Zündfolge 1-4-3-2
TDC
10
20
30
40
50
60
70

Stroboscopic timing instrument
AKA Timing light


HT LEAD
1
1
BATTERY
+
-
@ 1500 RPM
≃15° BTDC
TDC
38° BTDC
@ 3000 RPM.
38°
BTDC
TDC

Dizzy advance adjustment

- Release 10mm bolt under dizzy
- Rotate dizzy anti clockwise to advance
- Rotate dizzy clockwise to retard (delay)
- Check dynamic “position in time” of spark firing with timing light
- Readjust dizzy position until nominated degrees advanced at > 3000 RPM
- Retighten 10mm bolt & recheck advance

Advance Data

Most of the track work under race conditions has the engine running over 3000 RPM

- FVEE 1600 requires min 38 Degree advance at 3000 - 3500 RPM
- F Ford 1600 requires min 42 degree advance at 3000 – 3500 RPM

No more questions, its time to go !

- I can answer simple stuff, because I don’t know everything
- Try all of this with someone who can assist you. Its not that hard.
- Seeing is believing, doing is even better
- Tinkering is good fun.
- On your race day avoid an inexperienced adjustment, as if its wrong too close to a race, this can cause panic & havoc.

MECHANICAL ADVANCE CURVE