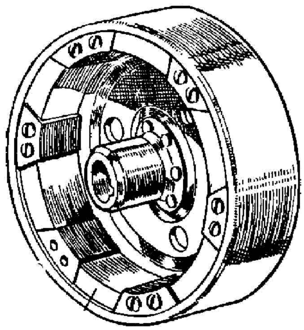
9 Ignition

The Villiers ignition system has come in for more abuse over the past three decades than any other part of the engine. This abuse is not unfounded, as the sparks department is notorious for its failures. In standard form it is heavy and suffers from age and the weather.



9E magneto flywheel

There are many courses of action that can be taken
a) remain standard, if you must
b) modify the standard system
c) use coil ignition
d) go electronic.

If the bike must remain standard, and the original parts used, then they must be in a clean and serviceable condition. The flywheel housing must be waterproofed to keep out the elements, the points must be adjusted correctly and the wiring must be in good condition. The points cam should be of the sports type, which give a longer dwell and a greater degree of accuracy, finally the condenser should be replaced with a modern car type preferably placed next to the points and not in the flywheel housing. As the high tension side of the system is prone to moisture problems, resulting in it tracking across to earth or shorting internally, it should be protected by painting with a waterproofing agent like Shellac. The HT lead needs to be soldered directly onto the coil, thus getting rid of the Bakelite pick-up, which makes a super water trap. The pick-up can still be used, the HT cable passing straight through it, but a better idea is to reroute the HT cable, so that it exits the housing high to the rear, the original pick-up hole being blanked off. Finally don't forget the mica insulating pad underneath the coil.

Villiers got it wrong, in that they placed the components that suffer under extremes of temperature, next to the major source of heat, ie the HT coil and the condenser. These items if of modern manufacture and materials (beware of rewound coils that are reconditioned in the old fashioned way) should not suffer in the same way, as they use modern resins and are oven baked on completion of the rewind.

A magneto is an electrical generator that uses rotating permanent magnets to create an alternating current in a stationary coil. The moving magnets induce a voltage in the coil windings as described by Faraday, and at a well timed moment when the voltage is high the ignition cam breaks the circuit causing the electromagnetic field to collapse. This should cause a spark at the points, but we (hopefully) have a working condenser and this has absorbed the energy and is in a resonant circuit with the ignition coil. The secondary windings in the coil act as a transformer to boost the voltage high enough to create a decent spark at the sparkplug. Lots of flashing and arcing at the points indicates that the condenser is not working. If the magneto coil only has a primary winding and is pared with an external ignition coil then this is known as an “energy transfer system”.

All metal moving objects in a moving magnetic field will experience “induction” which results in low voltage currents and this gives out heat. These “eddy currents” as they are known, are caused by the outer edges of the metal cutting more lines of force than the inner edges. To reduce or prevent this, the cores are made of laminated not solid steel with the laminations rivetted together. A contact breaker-less system, known as a “capacitor discharge ignition (CDI)” was created to circumvent points bounce and other irregularities such as whirling cranks on loose or worn main bearings. A flywheel charges a high voltage capacitor and when a preset voltage is achieved, it discharges through a coil and sparking plug. These systems typically require 400 or 500 revs before they give a decent spark compared with a magneto which sparks at practically no revs.

Use of external ignition coil

As the high tension side of the system gives most problems, why not replace it with an external HT coil, wiring diagram schematic Fig 62 . To do this strip off the fine HT windings of the flywheel coil and find a Japanese single wire energy transfer coil (FS1E or C50) and mount it under the tank. If a wire is taken from the contact breaker/LT coil connection, out via the redundant HT pick up hole, encased in a 1/4" black plastic tube, and connected to the new HT coil, no one will be the wiser. Should the LT current prove to be insufficient then the original coil can be rewound to provide more power, or one of the lighting coils can be wired in parallel to provide the necessary extra urge. As the flywheel is going to be some 30 years old, it might be a wise idea to have it re-magnetised, which will in turn restore the power output of the LT coil. As an alternative a LUCAS 6V two wire battery operated coil can be used to provide the spark, if the negative (-) terminal is wired to earth and the positive (+) terminal to the contact breaker. This system will work from the standard LT coil with no extra power needed.

As many racers use a foolproof total loss battery system, why not opt for a battery coil system, using the existing contact breaker. This can even be a rechargeable 6 or 12 volt system if required, running off the internal lighting coils, or with the flywheel removed, a total loss 12 volt system. To further improve the now reliable spark of the battery/coil system a Boyer Inductive Discharge Unit should be fitted. This unit which runs on 6 to 12 volts, involves no changes to the wiring as it plugs into the coil connections, and takes away all the destructive power from the contacts using them only as

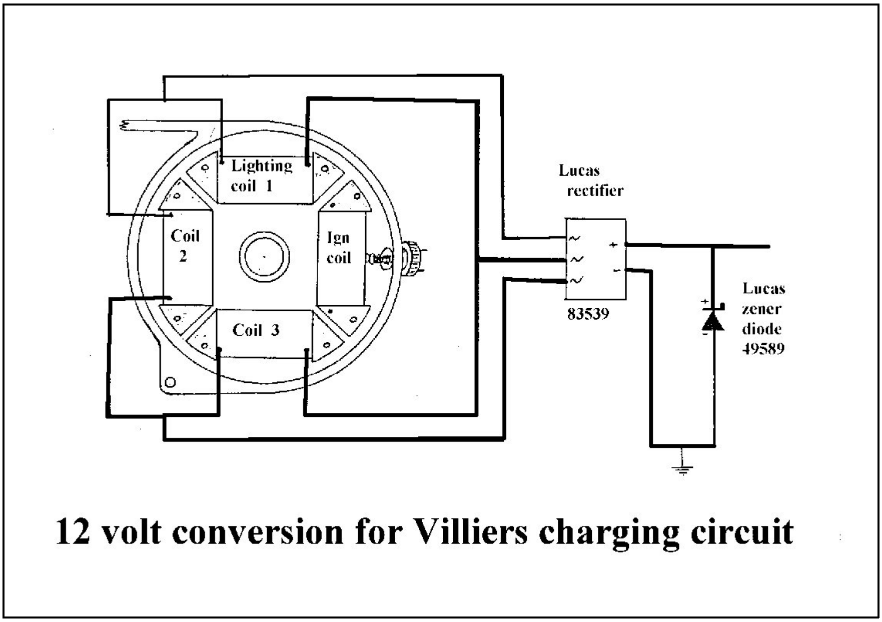


Figure 62 External ignition coil wiring diagram

a trigger switch. Large and ungainly 12 volt coils can be dispensed with and a change made to a Japanese single wire (CDI type) coil, but be careful of the primary coil resistance as this is critical to the spark strength. An added bonus to this type of system is that the contact breaker gap no longer becomes critical, as only a small amount of dwell is required to signal the discharge unit. Gaps of between 5 and 25 thou can be used, allowing a finite setting of the ignition timing to be carried out.

Nicad batteries

Lead acid batteries are bulky and difficult to mount, but modern rechargeable NI-cad cells are both small, light and easily hidden. If five of these cells are used (5 x 1.2 volts = 6.0 volts) they can fire a 6 volt coil and be recharged from one of the lighting coils via a bridge rectifier. The initial charge for these 6V packs coming from the 12V car battery, via a current limiting resistor. This system could even be amplified to provide 12 volts, (2 x 6V packs) if two lighting coils are wired up in series.

Electronic and CDI systems
To further reduce the possibilities of a mechanical failure, the contact breakers can be replaced by an electronic detection system, magnetic or infra red. Some good systems are available after market, that use this principle, or the pick up and electronic black boxes can be taken from a modern battery powered Japanese machine. Some modern 4 cylinder