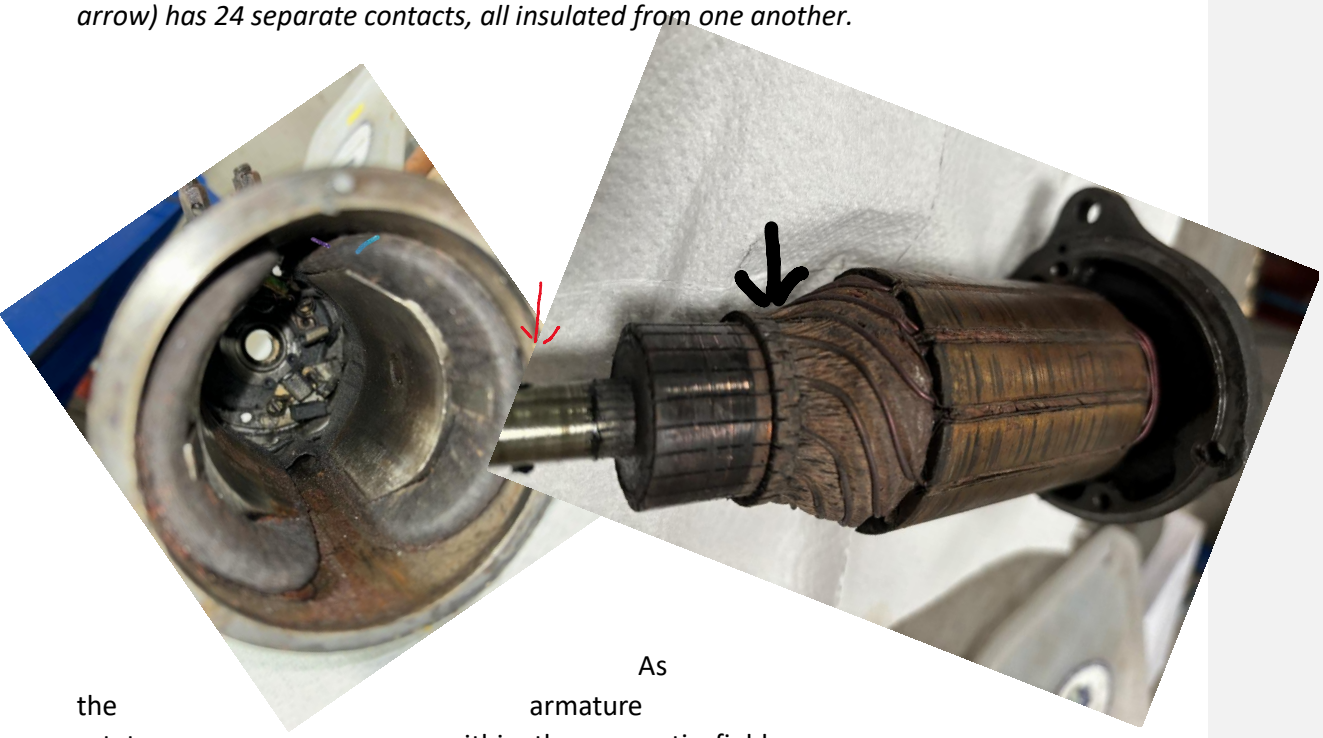
Beginner's guide to the Dynamo Frank Sibly

I was so enthused by Eddie's shed night that I took apart my dynamo, which consists of a central spindle, driven by the engine. Around this spindle ("rotor") are 12 tightly packed longitudinally coiled wires, each one insulated from the other, and which together make up the armature. Each end of a wire is brought out to an individual insulated contact on the rotor, called the commutator, and each end is 180° from the other wire end.

On right is armature or rotor (black arrow), which rotates inside the stationary casing, which is on the left. Inside the casing is the field coil or "stator"(purple arrow). Commutator (red arrow) has 24 separate contacts, all insulated from one another.



As the armature rotates within the magnetic field, a current is induced to flow through its wires. This current changes direction each 180° of rotation of the armature coil, as the rotation takes it from the North to the South pole of the static magnetic field. This is alternating current (a.c.), and is converted to direct current (d.c.) by the **commutator.** The live and earth brushes for the commutator are at 180° to each other, and when an armature wire is in its negative half, the commutator segment is touching the negative brush and vice versa. These two main brushes on the commutator are the live one, which is connected to the D (dynamo) terminal, and the other brush is earthed to the dynamo casing, and thus via the chassis back to the battery earth.

Dynamo Controls:

At low engine revs a mechanism is needed to stop the dynamo taking current from the battery. When the dynamo output is less than the battery voltage, the current will flow from the battery to the dynamo, rather than vice versa. The dynamo will then work as an electric motor, and will use up the charge in the battery.

The **cut-out** located on the bulkhead prevents this

This is an automatic switch, which at low revs keeps the contacts open by means of a spring, thus breaking the circuit between dynamo and battery. When the dynamo voltage is high enough it operates a solenoid that closes the contacts, making the circuit between the dynamo and the battery.

At high engine revs, a mechanism is needed to prevent the dynamo output becoming too high and damaging the battery. The **third-brush** prevents this:

The magnetic coil has a live supply from the commutator, but is earthed by the third brush (white arrow) which is a few degrees away from the main earth. Thus it has a voltage slightly higher than the earth, and this increases as the dynamo output increases with higher revs. As a result of the increased earth voltage, the voltage across the magnetic field coil diminishes, and this therefore reduces the dynamo output.

Partly dismantled Lucas C35M (1936 on) dynamo. Brush Inspection portals seen near top of photo (purple and white arrows). The 3rd brush (white arrow) is in the RH portal and can be moved. The portal for the earth brush is not visible here as it is behind the dynamo. The very top of the photo is for the distributor drive (red arrow). At bottom is the arrow (green arrow) showing direction of rotation.

Dynamo output can be increased by moving the third brush downwards, i.e. closer to the earth brush, and thus increasing the voltage across the field coil. This uses more of the engine's power, and if you exceed about 8amps the dynamo will get too hot.

Resetting the residual magnetic field of the dynamo. Whenever a dynamo is taken out, eg to renew the brushes, it is best to reset its magnetic field to match that of the car by:

i) ensure the car is out of gear
ii) switch on ignition
iii) remove cut-out cover to expose cut out points
iv) carefully, using your fingertip, close the points several times in quick succession,

v) when you close the points, there should be a bluish spark, showing that the electrical circuit is being reversed.

vi) Ensure the cutout points return to the open position afterwards, otherwise the dynamo will burn out

vii) Remember to turn off the ignition.

Note the distributor is attached to the dynamo. This is not for electrical reasons, but mechanical, as the distributor is driven by the same engine feed as the dynamo. The brush inspection portals have their cover (blue arrow) in place (RH end of dynamo)

Bench testing a dynamo can be done by turning it using a mains electric drill (a battery drill is not fast enough) connected to the dynamo drive shaft nut by a socket. A 24V bulb attached by wires to the output terminal and the earth will light up if the dynamo is charging.

The difference between a magneto and a dynamo is that the former uses a permanent magnet, whereas the latter uses an electro-magnet coil powered by the dynamo itself.

The early cars needed a magneto as well as a dynamo, and the magneto was used to generate the high voltage spark, as the coil had not yet been developed.