

Featured "Engine" No. 35 Three-brush dynamos

By Rob. Armstrong

I take a liberty here in order to get the whole of this excellent article into one edition of Cranking. Ed.

Do any of you remember Rolf Harris' brilliant sketch, "Jake the Peg"? Jake had three legs, one of which was useless! But all of the three brushes on that sort of car dynamo are really useful, and it may not be at all obvious how they work together.

In the very early days of motoring, there wasn't much need for a dynamo. A magneto would see to the ignition, and paraffin or acetylene lamps to the night visibility. If you picked (the cheaper) coil ignition, you might also choose to have a set of large dry cells, just to work the coil and nothing else. But with progress came useful items like electric lights, electric starters and luxuries like windscreen wipers, electric horns and stoplights. All of these demanded a reliable dynamo on the car to charge the battery and keep it up to its work.

A plain shunt-wired dynamo has its field coils connected directly across the main brushes. Its output will increase as the speed with which it is driven increases. At low speed, it probably won't generate enough juice to charge the battery at all. At high engine speed, it will make far too much, enough perhaps to burn the windings out or (on a really bad day) to boil the acid in the battery and wreck the plates. Some form of automatic output regulator is needed, and either the output voltage or the output current can be controlled.

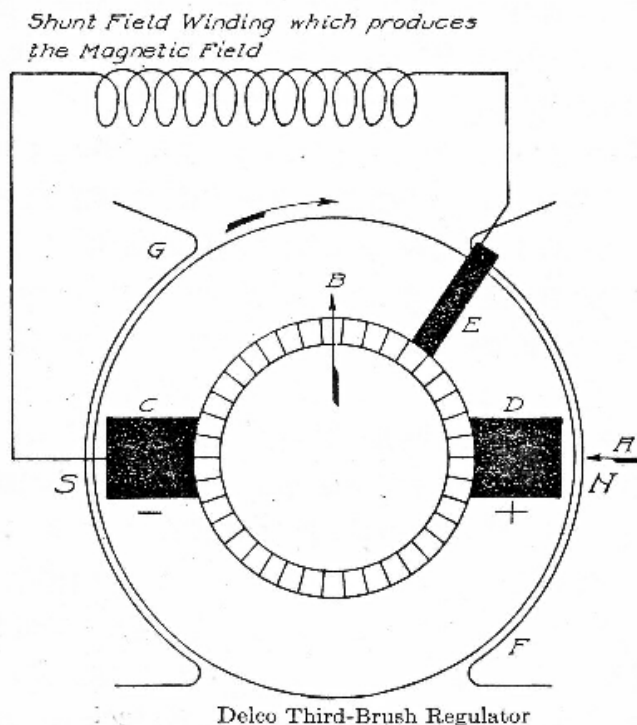
The third-brush system is a current regulator. It was robust, simple and reliable. It depends upon "armature reaction". When a simple two-brush shunt dynamo is driven slowly, the magnetic lines of force run directly between the two pole pieces of the field magnet, and the wires on the armature will cut them at about 90 degrees to generate a small current. As the speed rises, the current generated also rises. This current (the current flowing through the armature winding) will also generate a magnetic field, but this field will be at right angles to the field produced by the field magnet. The two fields combine, and the result will be a magnetic field skewed in the direction of rotation of the armature.

This skewed field can be used to advantage if the dynamo field coil is connected, not between the two main brushes but between one main brush and a third, smaller and thinner brush. I insert here a drawing of the end of a third-brush dynamo made by "Delco" in America in about 1918. The drawing, and the accompanying text are taken from Hayward's book, detailed later on in this note. I am grateful to Mr Hayward (or perhaps I should now say his heirs and successors) and his publisher for this extract — I have tried and quite failed to make it any clearer, it describes the action of the third-brush system perfectly. I quote:-

"A current always produces a magnetic field, whether the latter is desired or not, the theory of this method of regulation will be clear from the diagram. The full voltage of the generator is obtained from the brushes C and D. When the magnetic field from the pole pieces N and S is not disturbed by any other influence, each coil is generating uniformly as it passes under the pole pieces; the voltage from one commutator bar to the next is practically uniform all around the commutator. Therefore, the voltage from brush C to brush E is about 5 volts, when the total voltage between the main brushes C and D is 6½ volts and current at 5 volts' pressure is supplied to the shunt-field winding. This

voltage is sufficient to cause approximately 11 amperes to flow through that winding.

As the speed increases, the voltage does likewise, charging the battery. This charging current flows through the armature winding causing a magnetic effect in the direction of the arrow B and the latter acts upon the main magnetic field, which is in the direction of A, with the result that the latter is twisted or distorted out of its original position, in much the same manner as two streams of water meeting are deflected from their original directions. This deflection causes the magnetic field to be strong at the pole tips G and F, and weak at the opposite tips, with the result that the coils generate a very low voltage while passing from brush C to brush E (the coils at this time are under the pole tips having a weak



field) and produce the greater part of their voltage while passing from brush E to brush D. The amount of this variation depends upon the speed at which the generator is driven, thus decreasing the current supplied."

The overall result, given careful design, is a dynamo which will generate a current which rises with driven speed up to a certain limit, and stays more-or-less constant thereafter up to the maximum speed used.

The design points include special shaping of the pole shoes (it is really important if you should be dismantling such a dynamo always to replace the pole shoes the same way round and in exactly the place from which they came.

My own experience of the system may be helpful. My first car, a Rover 10/25, had a third-brush dynamo, but I didn't worry about it much — the car had magneto ignition and an Autovac to supply the petrol, so all I needed was to work the lights at night and the starter motor, and the battery was so old that it didn't even manage that very well! Later, I had a Morris 8 with a 6-volt third-brush dynamo. The light switch had four positions, "Summer", "Winter", "Side", and "Head". The last three allowed the dynamo to work as it was designed to: the "Summer" position didn't alter the third brush at all, but put a small resistor in between the third brush and the dynamo field terminal to moderate the output.

Then a 1936 Austin Ruby, which I completely restored to use as a second car. Its dynamo was shot, so I bought a

replacement from a car breaker, a lovely 4-pole CAV Austin 7 dynamo in perfect condition, probably at least a decade older than the car, made before Lucas had taken over the CAV firm in 1926. This could generate at up to 10 amps, but I set the brush back a little to get a steady 8 amp output and a long, uneventful life for the unit. This was fine until I was given a Philco "Transitone" car radio to restore –not the type 5 with the dynamotor to supply the H.T and the amazing class "B" output stage with a type 79 tube to pour out eight watts, but the later 1935 type 10 with vibrator power pack and a single type 42 output tube which could give almost five watts, quite enough though in a "7". This radio clawed 71/2 amps from the six volt battery, and I loved it! My battery was new, a 15-plate Exide, and really coped well – I only had to charge it about once a month to keep all working. It was a great grief when my (first) wife ran it into the rear of a dustcart – but that's another story!

The third brush system was not ideal, but it was much better than nothing. If you are seriously interested, a good 700-page book describing all the early systems is Charles B. Hayward's "Automobile Ignition, Starting and Lighting", published by the American Technical Society in Chicago, U.S.A. in 1918 – fine for all the Americans, not at all for British cars of course, but quite essential if you have a Ford model "T"! Vibrating contact systems (which regulate the battery voltage rather than the current) by Remy, Bijur and others are described there but clearly not liked. The comment is "There is, however, a certain disadvantage in the vibrating type of regulation, and manufacturers (have sought).... a method of control much simpler in operation and less expensive to manufacture. The result is the third-brush method

But the CVC vibrating contact control system of the 1940 – 60 period won the day in Britain until the modern alternator/regulator was invented.

Obituary

It is with sadness we learn of the death of Marg Appleby who passed away at Bath RUH, Marg and her late husband Bill had belonged to our club since it was first formed and both helped to make it into what we have today. Marg will be sadly missed by all who knew her. Our condolences go out to her family.

Calendar of Events for 2009

Dec 6th **Event.** Winter Crank Up at Nunney Catch.

Dec 27th **Event.** Mince Pie Crank Up, The Court Hotel (**Note change of venue**)

Chairman's report *(printed as received)*

The Autumn Sortout at Cranmore Railway Station on Saturday 17th October was the best attended yet. The last sortout in March was the best so far, but this one exceeded that. We had more sellers and more buyers than previous sales, long may it continue. This event provides a nice sum of money for club funds with very little effort to put it on. I would like to thank the members who manned the gate during the morning, their help was invaluable. The cafe was doing a good trade, this time the food was good and we didn't have to wait long for it to be served.

The last meeting at the Old Down Inn on October 26th saw a good crowd of members turn up to listen to Bot Burgess and

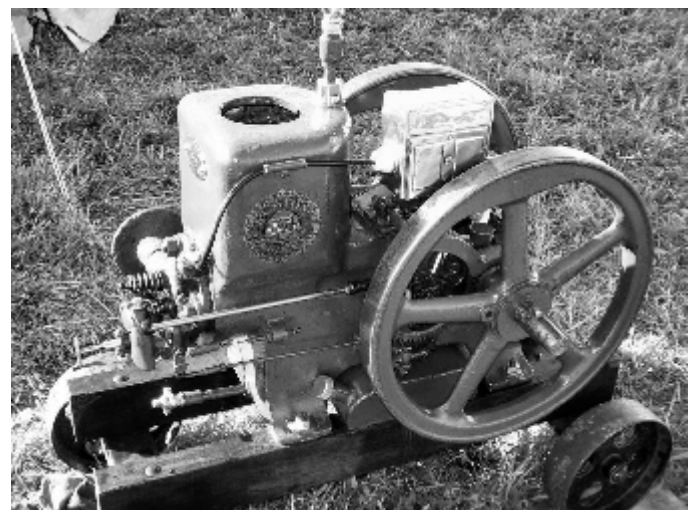
Colin Dipper give their talk on Traditional English Folk music, and what a treat we all had. (I was pleased to see one of our founder members, Tom Randall and his wife in the audience; you must come more often Tom.) Bob and Colin were supported by Colin's son, who is a professional musician, his fiddle playing was brilliant. Bob and Colin gave an explanation of English Folk Music and the instruments used; this talk was interrupted with periods of singing, which echoed throughout the pub. This was the last meeting at the Old Down Inn after meeting there since the club was formed over thirty years ago, and in my opinion it was one of the best, I usually close the meetings at around 10-15 but this time it was over 1 pm when Bob and Colin finally called it a day. A super evening's entertainment enjoyed by all present, especially young Oliver who is really into music and instruments. The usual raffle was held during the meeting with a very large selection of prizes or offer, many thanks to the members who contributed to them. Our meetings in future as you know will be at The Court Hotel just down the road from the Old down.

I said in the last news letter that we required members to come on the committee as several members were standing down; the response to this request has been completely negative. One of the committee retiring is Arthur our secretary, we cannot function without a secretary as this is a requirement by Company House as we are a limited company. There are six members of the present committee standing down, and so far there are no volunteers coming forward to take their place, so come on members the club cannot function without someone to run it.

Don't forget the last events of this year, the Anti-freeze crank up at Nunney Catch on December 6th, and the Mince-Pie crank up on December 27th at The Court Hotel. Let's have a good turn out of engines at these events, and any raffle prizes will be greatly appreciated.

Upper Test Valley Vintage Club Working Weekend 12/13th Sept - By Robin Lambert

This was to be my second visit to this event at Longstock Near Stockbridge, but only my first actually getting into the field! Last year the show had been abandoned owing to adverse weather, and it was easy to see why with the mud was running out of the sloping field show entrance.



I can imagine the hard work the organisers had in assisting all the exhibitors out of the field. But this year it was blue skies all of the weekend, we arrived on Friday PM and were greeted by stewards Keith Vickery and Ray Bassett who showed me some 200 metres of engine line and said set up where you like, that is how I like it free and easy. Saturday soon came and the line was full Keith said he had some 60 engines entered for the two days with some one day'ers coming on Sunday. There was some real eye catchers in the line that were brought by WSEC members including a nice little Ruston & Horsby ZPR 1 1/2 hp exhibited by Andrew Dry and yet another brought along by Bert & Geoff Holloway, Roger Pitt had a nicely restored 1 1/2hp Petter apple top and even went home with another one he acquired at the show. There was an unusual horizontal air cooled enclosed crank engine made by The Ideal Lawnmower Co. Of the USA brought all the way from Devon by its owner John White – although obviously not a lawn mower engine. I guess the



company made allsorts of machinery.

It's not too often I look at new machines, but at the rear of the steam powered stone crusher was a very modern looking saw bench, it was almost brand new and computer controlled, the bench bed was around 20ft long with two side lifting arms that could raise a tree trunk from the ground upon to the bed and when secured with clamps could have its first cut what was unusual was that the log did not pass through the saw, the saw passed through the entire length of the tree, the unit was powered by a twin cylinder Kohler engine that was mounted high up on the band saw frame with water being fed to cool the saw blade.

The owner told me he did lots of work on big country estates that had felled hard wood trees and he would go to site and plank them out to any size that was required. The bench could be towed by a Land Rover and was fully portable, I found this to be most impressive and spent at least an hour chatting to and watching the operator

There was no shortage of stalls here. Around 50 were expected and most were on site. Every thing you could think of was here and would quench any browsers thirst. a nice set of old fashioned juvenile swing boats kept the youngsters happy and there was even a fire eater entertaining the little ones,

Lots of vintage vehicles of all descriptions including a nice AEC matador complete with a timber winch which I am sure could still do a hard day's

work in a wood. I had a brief look at what appeared to be a stored Victorian railway carriage mounted on rubber wheels and used as a showman's caravan it looked too long to have been made for the showmen



- perhaps next year I will have a better look. All the usual ring events took place and as I had my head on the pillow on Saturday night I nodded off to sleep with great music from the '50s & '60s drifting across the field from the beer tent. What more can one ask for, a thoroughly enjoyable great weekend.

Holwell Gathering, 24/25th October

By Tony Davis

Taking place in the car park of The Bear Inn, Holwell, the event was organised by Garry Chambers. I understand it was a bit of a washout on Saturday because of the weather, but Sunday looked good first thing. I popped my little Norman twin into the car & got out there early while the campers were sleeping off a late night session in the pots.

I managed to find a space between the puddles left by the overnight rain and the weather cleared into a fine sunny day.

About seven stationary engines were displayed and a similar number of tractors including a Twin Unit Fordson – a Triple Doe I believe it's called.

I think the highlight of the day was Mr (Spud) Taylor coming round with a plate bearing small pieces of cooked meat – and very nice it was too! After eating it, we were informed that it was a road kill Sparrow Hawk. It seemed to be a lot of meat from a small bird – it was suggested that he should go off & knock down a few more, enough for hawk & chips!

All in all, a very nice day out for me – I look forward to the next one Garry!

From the Treasurer

Jackie Lambert asks me to remind everyone that their subscription runs out on December 31st. They will not then be covered by the club's Third Party Liability insurance.

There is no change in subscriptions from last year & are £11 single, £13 Joint - Juniors, £1.