10.4 S.P.D.G. - The Tom Ward Notebooks

S.P.D.G.

Among the many men who devoted their lives to the Scott motorcycle—and the list is impressive—few did it in such an admirable way as the late Tom Ward, the 'Wizard of Wilfred Street'. From early formative manhood until he was too old and weak to wield a file, this long-lived and modest Yorkshireman tended every need by every kind of Scott Owner. Like the late Harold Scott, he answered every letter, often at some length and with a selection of anecdotes and useful tips. If his lifetime's experience with the make was invaluable, so too was his complete independence from the Scott Company (except for those few early years when he worked with Alfred Scott).

He was a fine example of the traditional tyke: hardworking, painstaking and thrifty; plainspeaking, too, although he usually gave the foolish or ignorant a very gentle 'let-down'. The following articles by T.B.W. were originally papers for the S.P.D.G. (Scott Postal Discussion Group), a casually constituted body which flourished during and just after World War II. The leading lights were T.B.W., W.C. Fox (who died last year), Syd Lumley, Walter Low, S. Andrews, W.F.A. Way, G.B. Cooper and C. Ratcliffe, Some of this material has been reproduced before in *Yowl*, but it is repeated here for the benefit of a rising generation. Tom's spirit and outlook shines from these wartime jottings, when he was employed at the Rolls-Royce factory in Derby, producing bigger and better engines for the War Effort. As soon as conditions permitted, he got back to self-employment and Scott service, as hundreds (if not thousands) of Scott riders knew. Never did so many owe so much to one man! Tom gave me copies of his voluminous Scott lore as soon as he realised the extent of my interest, and here are some typical examples of his S.P.D.G. notes. He would have been in his fifties when they were written—*Ed.*

T.B. WARD **26th Dec. 1944.**

This Scott Postal Discussion scheme of Mr. Cooper's is proving even more fascinating than anticipated. It is a good plan to keep to one subject at a time. Unfortunately, due to having visitors this Christmas, I have not been able even to read the Note Book until today, and I am awfully sorry about this and hope fellow members will accept my apologies.

The Scott 2-speed Gear

Cooper: I like the term 'Engineering Artistry' in reference to this gear. You have hit the nail bang on the head. Perhaps journal ball races would have been better than cups and cones for the hub bearings. No doubt if Alfred Scott had been designing it today instead of in 1908 he would have fitted them. I think he would undoubtedly have fitted rollers instead of balls in the brass cages, and also the conventional type of grooved thrust races instead of flat surfaced ones. But consider again when it was designed—36 years ago—and the final design was brought out in 1914, embodying all the improvements unaltered. One of my favourite daydreams is to imagine myself, after the war, making myself a 'super' Scott 2-speed gear exactly like I imagine Alfred Scott would have designed the job in 1948 instead of 1908! If I can throw in a bit of Henry Royce's imagined

work too! By-the-way, members will probably know that on most Rolls-Royce Merlin and Griffon Aero Engines, there is a beautifully made 2-speed gear which drives the 2-sp. supercharger. Do you know that it has points of resemblance with the Scott gear? There is a clutch for each gear, but instead of expanding rings there are Ferodo faced plates and steel plates. These clutches are even lighter of course, in proportion to the hundreds of horse power which they transmit, than is the Scott gear.

Ratcliffe: Stout effort whilst recovering from 'flu. It is a good thing that I did not write my notes in advance or they would have been scrap after reading your interesting account of the early days. I agree about the minor defects—or shall we say the partly unfinished nature of the Scott design—being part of the fascination of the Scott—especially to the mechanically inclined rider.

On one point however I profoundly disagree. You say Alfred Scott produced one glorious masterpiece and then his mind was drained as empty as a squeezed orange—or words to that effect. Well, I lived in the same city as Alfred Scott throughout his engineering career, so please let me put matters in a very different light. That career extended roughly from 1904 until his death in 1923; only 18 years altogether, and in that time he took out at least 46 patents, of which only the first 21 related to the Scott motor cycle. The unfortunate thing is (and this fact does not seem to be widely known) that *Alfred Scott entirely sold out his interests, in the motor cycle bearing his name, in 1918, and he had no further hand in the development of that machine.* You will admit that this fact explains a lot of things which are otherwise hard to understand.

You will ask, why did he do it? One can only assume that he regarded his motor cycle as sufficiently matured for other hands to carry on, whilst he pioneered in fresh fields.

We know that he had become immersed in the complicated job of designing the ideal three-wheeler, which he believed would supersede the motor cycle and sidecar, then becoming very popular. In 1915 alone he took out no fewer than nine patents in connection with this 3-wheeler, working all hours of the day and night to do it.

But! you will say, was the Scott Sociable, as it was called, a second masterpiece within the meaning of the act? Well! A friend of mine recently bought one for a few pounds. Like thousands of others he knew nothing whatever about them but this is what he wrote after sampling its qualities: 'My admiration for the genius of the late Alfred A. knows no bounds. The independent springing, rotary valve induction, hand starter with steering wheel which folds away to make same easier used, all shaft and gear drive, smooth running, etc, etc, make the machine 20 years ahead of its time. I have tried it up an incline of 1 in 3 which was boulder strewn and very rough, and the Sociable went up like an army 'Jeep'. The Sociable was original from sparking plug to wheel cap, and quite as big a masterpiece as the bike, and the only reason it did not survive the between wars slumps was purely financial. There were 22 patents involved in the Sociable design altogether.

Lumley: Agree with 99% of your remarks and it is extremely difficult to supplement them. The only point is that dodge of easing the tops of the threads to reduce the frictional hold of the pedal in low gear. Quite a number of riders do this but it has a serious drawback. If you are tempted to put your machine at a steep bank and fail to get up, the moment the machine stalls and you begin to put your feet down the gear slips out with the throttle full open, with often unpleasant results—especially as for some reason most riders when they hear the engine screaming its heart out, instead of shutting the throttle seem to put their foot back on the low gear pedal hard!

I have used the *headless nail on a calibrated post* dodge for measuring chain lengths for a long time and can testify that it saves a lot of worry. It also enables you to see at a glance how much a chain has 'stretched' and to compare it with another one in that respect.

With regard to *speed of the old models,* the ordinary 1912 Scott (stripped but otherwise unaltered) with heavy cast-iron pistons, would do 58 m.p.h. on a timed level stretch of Penny Pot Lane nr Harrogate. The T.T. that year was won by Applebee on a Scott at an average speed of 48.7 m.p.h. Do you know that Scotts achieved the fastest T.T. lap 3 years in succession? *After 1914* they were completely out of the picture except for H. Langman 3rd in 1922 and 2nd in 1924, and T.L. Hatch 3rd in 1928 (at an average speed of 60.89 m.p.h.) Note the date underlined above in connection with what I said about A.A.S.

After reading the first three contributions I did not think it possible that the next man could keep up the standard of interest, but Mr Low has done it and so has Mr Andrews. Am adding two other test cards to yours for comparison, and will collect them next time round. They are interesting souvenirs, being signed by Wood and Langman of T.T. fame as aforesaid. I hope you don't mind my forestalling you with a drawing of the 2-speed gear, as I had got one ready for the purpose.

I join issue with you one one point. You say that the *bearings of the Scott gear are never called upon to rotate under load.* They *can* be called upon to rotate under very severe load under the following circumstances:–

(1) When taking up the drive in any gear.
(2) If there is a tight spot in the idling chain.
(3) When letting in the gear after coasting.

That is why, in careless hands (but not otherwise), the bearings wear grooves on the ball tracks.

I was exceedingly interested in your figures of *shaft centre distances* calculated for 66 link high gear chain and 78 link low-gear chain. This confirms what we always found in practice—that the low gear chain is slack at first when two new chains are fitted, but of course equalizes in use. Here is a little information which may be new to some members. Mr Scott did not design his low gear sprocket with 47 teeth, but with *46,* and the low gear chain had *77 links.*

Not to be outdone, I have unearthed a formula for shaft centres and worked out the distance for the above chain and sprocket, and get it to *10.8".* I wish you would check

this as there must be a slight error somewhere because in practice this combination gave exactly the same tension in the two chains *when new.* I know that Mr Scott was very proud of having achieved equal chain tension in theory and confirmed it in actual use, and it is doubtful whether there were any formulae or tables in those days.

By-the-way, my formula is: (from 'Machinery' Handbook)

C equals $^{P}/_{8}$ 2L−N−n $(2L-N-n)^2$ −.824 $(N-n)^2$.
where C = centre distance in inches
P = pitch in inches
L = chain length *in pitches.*

If you are fortunate enough to have a simpler method will you please work out the centre distances for the 36T and 40T sprockets, with chain lengths of 72 links and 74 links respectively. Thanking you!

Low: Your list of Scott 2-speeders speaks for itself. Was specially impressed with the fact that your faith in the 2-speeder led you to get the makers to build one for you specially two years after normal manufacture had been discontinued. I am glad you brought up that point about coasting unscrewing the high-gear drum lock ring because it is a point apt to be forgotten. Personally I have my lock ring very tight and am always careful to engage high gear, after coasting, with the half compression valves lifted to reduce the initial resistance, (It is of course a mistake to go into *low* gear after 'free-wheeling'), and I have never had a lock-ring unscrew—thanks I expect to the oily floating thrust washer interposed against the lock-ring.

Some general notes on the Scott 2-speed gear. My experience of this gear is based on the fact that my firm at one time had over 500 Scott riders on its books and we overhauled hundreds of these gears which must have done a combined mileage of many millions of miles. They stood up to that remarkably well but naturally we came across a few recurring troubles. I will try to give a list of these:-

(1) *Hubs scored on ball tracks.* Our cure for this was at first the bushing of the drum with a plain phosphor bronze bush. Then we went onto needle rollers as per Hemmings, but finally we found that the most satisfactory method was to broach the $^{3}/_{16}$" holes in the brass ball cages into perfect squares and then fit $^{3}/_{16}$" Hoffman Steel rollers. This made a 100% satisfactory job. Of course it was necessary to replace the worn drum and hub if the wear was more than very slight.

(2) *Thrust races badly worn.* This nearly always coincided with excessive thrust loading due to the thrust rollers being too big to enter the gradual taper portion of the expanding ring gap. When pushed home the rollers should just top the rise at the curved entrance to the gap. After topping this rise the going is easy and there is no excessive thrust set up in the bearings.

(3) *Expanding ring drag.* Just once in a very long while we used to come upon this trouble. A ring had for

some reason opened out slightly until it acted as a permanent brake when it should have been quite free. The braking caused over heating until the ring became blued and braked harder than ever with great loss of power when in the other gear. If you suspect this trouble at any time feel at the gear after pulling up, or pull the rear wheel round in neutral.

(4) *Cup and cone worn.* due to excessive thrust on that side. Expanding ring gap too narrow for thrust rollers to 'top the rise'. Remedy is to try different rings until you find one just right. Always see that the cups have a groove at back for oil to circulate to the hub bearings. Otherwise they never get any oil.

These last few remarks are very hurried as I want to get the note book on its next journey.

Cheerio!

Tom B. Ward

27th Feb. 1945

It's me again chaps! Sorry and all that, but my turn has come early this time, and I am going to try to beat the schedule this time to make up for the delay on the last round. As there has been only one set of notes to peruse, I can stick some paper in my typewriter and start straight away.

I do like that orange coloured paper of Bro.Cooper's. But I wonder what is the idea of wanting us all to go on to quarto size paper? Mine is all foolscap size and it seems rather wasteful to cut it down, but I expect there is a reason.

There is one remark which Bro.Cooper makes which give me the necessary cue for a flying start. He says that we "can sit, imagine and ponder the probable action of a *solid front fork*". Well there is the experience of riding push bikes to help us to imagine this. Also, many Scott Squirrel riders have had the experience of riding a machine which has had a bump which has knocked the fork members out of line so that they will not slide, or they have had a compression spring break in pieces. It is quite possible to ride such a machine on ordinary roads without much discomfort, especially if the front tyre is slightly deflated. On a sharp, rough, corner you notice the front end making little hops sideways—in fact that is often the first sign of a broken fork spring.

On several occasions I have known Scott Squirrel riders to ride for days with a broken spring and not know it was broken, due to the spring being enclosed. (Of course that was in Yorkshire where the riders are supposed to have particularly tough behinds! besides being obviously a bit thick in the head!!!)

The first motor cycle that I ever owned had solid forks with the exception of rubber sleeves between the blades and the crown, and I certainly cannot remember any discomfort at the speed that the bike was built for. What caused the demand for spring forks was the desire to go faster and to avoid the discomfort which occured when you struck a bad piece of road.

Now the demand for forks with a greater range of movement is due to the same cause, but there is a limit to the improvement possible, and even that improvement has to be dearly bought in wear, spit space, weight, and loss of lateral rigidity. For myself I have not the slightest desire at present for more comfortable suspension as I do not want to go any faster, or do much riding across fields.

However, development and improvement will continue and rear springing is one of the next steps as it is futile to try to design ideal suspension for one end of a motor cycle only. What would be thought of a railway coach, tram car, or motor car, which was only sprung at one end? The only logical reason for the usual motor cycle arrangement is that we hold the machine at the front end, and handlebar vibration is particularly annoying.

Have you ever pondered about what happens when the rear wheel of a motor cycle strikes a hump in the road? Suppose we try to do so now. Let us reduce the thing to its simplest form and denote the frame by a steel bar AB, with a spring to denote the front suspension. It also helps to imagine the machine stationary and the road surface moving under it in the direction of the arrow. When the obstruction strikes the rear wheel what will the frame do? Will it pivot about its centre of gravity? Or will it pivot about the front end A?

Well! just try a simple little experiment. Lay a smooth flat bar AB on the smoothest surface that's handy—say on a polished floor. Mark its position with chalk. Then hold a piece of wood at one end and strike same smartly with your hand. This represents a "roadshock" inflicted to the rear of "frame" AB. It will be found that the bar or frame pivots on a point about a quarter of the way from front end, and the front end therefore moves in the opposite way from the blow, as shown by the new position AA-BB. The motor cycle frame would therefore do the same and pivot about the point represented by C.(Mind you I am not saying that AC is exactly one quarter of CB).

I do hope that it is now a little clearer why Torrens, and other riders who have sampled rear springing, are so enthusiastic about it. What you really get with the old arrangement is a rapid succession of pitching movements of the whole motor cycle. The point least affected is not amidships but somewhere near the oil tank (in the Super), but even this gets a pitching movement, and this type of movement is far more uncomfortable and unnatural than a straight up and down movement.

Of course our flat bar is of uniform section and weight, whereas our motor cycle has a heavy engine in the middle. This will tend to bring the pivotal point nearer to the engine on account of the inertia which Bro.Cooper reminds you of.

By the way, I don't know if I have convinced anyone else but I have certainly succeeded in convincing myself that rear springing is bound to come. But that is not to say that any sort of rear springing will be a success. It is likely that some of them will be an awful mess after a few years running when all the moving parts have become worn. Personally I cannot take to the Master type of rear springing, as fitted to Nortons, B.M.W. etc. And cannot help thinking that something much better will supersede that type in the end. For one thing I would not like to run a sidecar on such a machine.

I remember something which Lumley said which took my fancy. He said that comfort was a comparative quality, and one appreciates an improvement, and at once notices any deterioration. Apart from suddenly getting a flat tyre what do you consider gives the most noticeable deterioration of comfort? My guess is that you notice it most after dropping your pillion passenger after a long run. You notice it in reverse—a sudden improvement in comfort—if you take the sidecar off after a winter with it on.

With a sidecar on, you always get *transverse* shocks which are very uncomfortable, and entirely absent when riding solo.

Tyres. This is where such a lot of motorcyclists make a big mistake. I do not mean just that they are careless about pumping their tyres to the specified pressure, but they do not show enough imagination in *suiting the pressure to the load.* Times without number I have seen pillion passengers picked up without any thought about the extra pressure required in the back tyre to support the extra 10 stones or so. But there are two riders riding with tyres too hard to every one riding with tyres too soft. In the days a good while ago when I had to try *other people's* machines (a rotten job which I never intend to have anything to do with in the future) I often found them a sheer misery to ride until I let some air out of the tyres.

I know that too much flexing of the walls of a tyre is damaging to the life of the tyre, but I am not talking about *too much* but just the *happy mean.* Just so much that when you bounce the machine or sit on it you can see that slight bulging of the tyre which allows it to absorb the small road irregularities, but will never in this world be detrimental to the life of the tyre. After all, if we are going to pump all tyres up board hard we might as well not have pneumatic tyres at all.

Why won't people use more discretion? Tyre makers advertise "Pump your tyres hard" and there are always some who will overdo it. Tell them to mix a third of a pint of oil to one gallon of petrol (for total petroil lubrication) and they will put in well over half a pint. Tell them to tighten anything up well, and they will probably bust it straight away!

Here are a few random facts about tyres which may be of interest to members. I came across them when I was delving into those technical journals. First the well known fact that road shock and therefore tyre wear varies as the square of the speed is. For instance wear at 60 m.p.h. will be *nine times* the tyre wear for the same distance at 20 m.p.h.

Very *slow* rolling, such as you get with a Steam Road Roller, improves and levels the surface as it goes along. But fast rolling, such as that of motor traffic, aggravates the road irregularities and tends to made the lumps higher and the hollows deeper.

Increased wheel diameter has the same effect as smoothing out the road, and would be desirable on that account if it were not for the increased weight and inconvenience.

Dunlops say that the correct pressure for a tyre is that pressure which will give a deflection of the tyre when loaded of one eighth its section diameter. (½" on a 4" tyre). A tyre has the same properties, in relation to the wheel, as a stiff spring interposed between wheel and road. But it is the additional property of *absorbing* the small road irregularities which is the real function of the pneumatic tyre. That is why the spring wheels which the Germans used on some of their lorries in the last war, when they were so short of rubber, were so unsatisfactory. You will perhaps wonder at the tyre being called a *stiff* spring, but stiffness is measured by the load required to give a deflection of one inch. The stiffness of a 27 × 4.40 balloon tyre for instance is *750 lbs per inch,* so that you will see that it is stiff all right, as evèn a 30 cwt lorry rear spring has only got a stiffness of *660 lbs per inch.*

So much for tyres. There is one point about springs which no one has mentioned. You sometimes hear it claimed that on the Scott Squirrel forks the action of the tension spring inside the compression spring tends to damp out oscillation as the two springs have different periods. Well! I don't think there is anything in this. A combination of two or more springs of various periods has a combined period and there is no damping. Even some of the more elaborate suspension

systems with combinations of springs and levers of varying moment still do not damp out oscillation except where there is internal or external friction. In fact, on the face of it, it is obvious that elastic oscillation cannot be damped by another perfectly elastic oscillation, but only by some dissipation of energy.

The tension spring therefore is only to take the rebound. In modern forks such as the Scott Girder, the rebound is taken by the anchorages being actually screwed into the ends of the spring of course, and it seems perfectly satisfactory.

A friend of mine has asked me to mention a bit of information about the Tededraulic Fork. It seems that Alfred Scott not only invented the first *telescopic* motor cycle forks, but we heard on good authority that he had the drawings of an *hydraulically damped* telescopic fork amongst his papers.

Bro.Cooper puts in a word in defence of leaf springs and says that they seem all right on sidecars. But do not let us forget that Alfred Scott used only tension springs on his sidecar and on his Sociable, and both are notorious for comfortable riding and light weight. You could get hold of the near side of a Sociable and lift it a couple of feet off the ground. Then, when you let go, it just dropped onto a level keel again "with a sigh of content".

Just one thing more before I pass the book along—(I see friend Fox is the next customer this time)—no talk on suspension would be complete without mentioning the "Silentbloc" bush. I tried some on my sidecar as no matter how good a fit the ordinary brass bushes were made you could hear them when you were riding with an empty sidecar, and it was most annoying. Well they are dead silent and the finest invention that has been thought of in that line. They are self damping too and an asset to any suspension system which has bushes subject to a partial rotary movement, of not too big an angle.

After the war there will be a competitor of the S.B. as it is now possible to what is called "weld" rubber to metal, and this has great possibilities for suspension.

Cheerio!

Tom B. Ward

12th April 1945.

I have been as interested as ever in reading all the latest notes, and the first job is to make a few comments on the various points which have been raised—and there are about as many as there are spokes in a wheel.

Fox. Rubber mounted handlebars by all means—I am sure they must be good for it's the same as the 'Silentbloc' idea exactly—but not a rubber mounted engine in a Scott please! The reason is that in the Scott design the engine is an integral part of the frame, and this applies to all models. The engine forms a strut in the frame structure, and until it is in position, *and bolted up tight,* the frame is weak and incomplete.

When it comes to a question of Chain drive versus shaft drive I am in disagreement again. All the advantages are not on the side of the shaft. And it is not always safe to use motor car development as a guide to what we should do with motor cycles. In the case of the pedal cycle development has just been the opposite—from the early shaft drive (the "Quadrant") to the now universal chain.

But I congratulate you on your investigations into the action of the chain when the rear wheel is sprung. You've certainly got something

there. But Way, in his notes, reminds us how Bradshaw overcame this problem in the A.B.C. He first had the pivot in the right place, and secondly he had a big primary reduction so as to get the final reduction as small as possible. If the two sprockets could be the same size the angular velocity of the rear wheel would be entirely free from any jerkiness even with violent spring action. You can test this with two pennies and a rubber band. Set both pennies with the King's head upright. Then however you move the one representing the rear sprocket; the head still keeps perfectly upright.

My remarks about the Scott Company's reasons for not enclosing the gear chains, when a successful design had been produced, were pure guess work, so please don't get me wrong. It was probably more a matter of cost than anything. All the same, I for one would give a lot to be able to listen in at some of those Board Meetings, where policy is decided!

Lumley. You are a marvel for keeping up with your notes in spite of such difficulties; albeit with Mrs Lumley's able assistance. I am sorry to hear that you have been having a rough time and hope things are going smoothly now.

With regard to the reasons for the numerous changes of forks, no doubt you are right, but I am certain that it is always a big mistake for a manufacturer to chop and change like that. It gives a very bad impression. Don't you think so? I have always thought that their own Girder fork should have been improved and stuck to *at all costs.*

That is a good point about the 16-tooth magneto sprocket on the Super. The only way to get over this difficulty would be to fit sprockets and chain of ⅜" pitch. The sprockets would have to be 25T on the high gear drum, and 20T on the magneto. (Or possibly 30T and 24T if the above were found to be too small).

Re the broaching equipment, I am sorry to say that this cannot be found. When removing from Bradford lots of 2-speeder stuff was discarded, and I am afraid. . . . .!

Yes! What is all this about dating? It really is a funny thing how we are all apt to give ourselves away when we get older, by talking of things which happened before the last war, as if it was (as it seems) just the other day! However, I certainly think that an interest in motorcycles helps to keep one young.

I am much indebted to you for passing round the Cuttings Book. Some of the items were of particular interest and had not been seen before. To name a few—The 1922 T.T. Levis; A Scott Petroil Patent; Beryllium-Copper; and Duckham's Keenol (which I did not know much about although we use it at Royces, on the sparking plug threads and when assembling parts which press together and might "fret" if assembled dry.

That article by "Wharfedale" on Alfred Scott is very good indeed, and although I have it myself, I read it all through once more. I can vouch for the truth of what he says. "Ixion" was talking through his hat when he described Scott as a "rather shabby little man from Yorkshire" He was rather tall and anything but shabby. As a point of interest I might also mention that "Ixion" was romancing likewise when he described Scott's school days, as he once did, for I have paid a visit to Abbotsholme School and it was not as described, much to my disappointment I might say. By-the-way; does anyone know "Wharfedale's" real name? He shows a remarkable knowledge of Alfred Scott and I am very curious to know who he really is.

(to be continued).

S.P.D.G.

T.B.WARD **12th April 1945***(continued)*

I like that bit about what Scott said about the dummy radiator. It was typical of him. It made me think that if Scott had seen "Wharfedale's" idea for converting a Super to take a Flyer engine by putting a window in the frame, his remarks would have been more scathing still!!

Well! How's that for a double ration of comment for you? That's what you get for being in hospital!

Low. It was nice to be reminded of the days when steel-studded tyres were the vogue. When tar Macadam was unknown and summer riding meant being smothered with dust, and winter riding meant thick mud. It is an honest fact that I once tracked four cyclists for two hours along main roads and country lanes, without having the slightest idea where they were going, and eventually caught them up. You could not do that now.

Yes! tyres used to puncture very easily. They were too small; too thin; too smooth; and not tough enough. The Palmer was the ace of tyres in those days and if a cycle or motor cycle had Palmer Tyres it was always given a prominent place in any advert. The Palmer invention of the cord structure was the fore-runner of the present simplified tyre construction all over the world. Large section tyres would be next to impossible with the old canvas structure.

Chief bugbears of early machines were the high saddle position and the long bars. Hair raising on tram lines. Horses and dogs took many years to reach their present indifference to motor bikes. Dogs used to run savagely at the front tyre and try to bite it. Horses used to take fright unless you treated them with proper consideration. I once nearly caused a tragedy by riding a Levis which was fitted with a compression release opening direct into the air instead of into the exhaust system. It was simply deadly to farm carts, butchers' carts, and even funerals.

Way. I was glad to hear that you had enjoyed my notes in No 2. and consequently have just looked up the duplicate to see what these were about. Well I am glad you like the technical stuff because I was a little afraid it might be boring. However, in any case I'm afraid that I shall have to come down out of the Stratosphere—due to shortage of petrol! (That means shortage of time chiefly. It takes up a long time to marshal technical information).

Re steering ball races, I will look through my stock and write you direct if there are some in good condition.

Your remarks about cleaning out the Burgess Silencer by Bro. Fox's method remind me that I meant to give a word of warning about this. The sound-absorbent material which surrounds the perforated tube is not steel wool, but I believe some sort of glass wool or slag wool. It can be destroyed by excessive heat. The makers say that it will only stand 900°F., which is well below red heat. In their instructions, of which I am inserting a copy, they do not mention the burning out method, but as you will see they advocate the caustic soda method.

Andrews. You deserve full marks for noticing that point about Way's front fork idea. Yes! after a wee bit of consideration, I back you up. The fork compression spring would need to be twice as strong, because the upward force on the front spindle would be working with twice the leverage against the spring. It would mean discarding the spring case altogether and fitting an exposed spring. But I would condemn the idea chiefly on account of the link action, which is a retrograde step and taking us back about 30 years!

Talking about the interesting A.B.C. machines which came out after the last war, I never had the pleasure of riding one of these, like you and Fox. Have never been able to understand why it was dropped with such suddenness. It was a most promising design and the firm had any amount of money behind them. Here again, it would have been interesting to have listened in at the board meeting! Some of the most interesting news never gets into the papers. How about it Fleet Street Fox?

Ratcliffe. I think you and I have used so much ink in writing direct to one another that there is not much left to say! Talking about your policy of leaving the Super as it was intended as far as possible, I heartily agree. That was always our policy. We had to be very very sure that we had found a genuine improvement before departing in any way from standard. That is why I was so interested to read Wharfedale's remarks that "*The two-speed Scott was logically designed as a complete whole and was not really capable of being altered. Scott himself was quite clear in his own mind that it was unalterable, and was not at all enthusiastic about the development which transformed it into a three-speed model*". (Every word of this article, that Lumley is circulating with this book, is worth reading two or three times over. I wonder if you had come across it before?)

But I think Wharfedale is slightly overstating when he says "unalterable". No one knew better than Scott how thoroughly the bike had been thought out, and how carefully every possibility had been explored. Naturally he resented any suggestion that his ideas were all wrong and that he should turn them upside down, but I am sure that he never considered that the development of the design was at a dead end. That he thought many people were wanting to develop it on wrong lines I can well believe. Very well indeed!

I hope you and Low will tell us more about the Scott Machine Gun Carriers (forerunners of the Bren carriers when you come to think of it) I have some illustrations of them which appeared in the Yorkshire Observer and the Motor Cycle Trader at the time, and I will enclose them just to remind you of old times. Incidentally, I worked on them myself for a few weeks, so am keen to recover these cuttings when they come round again. Any one interested can see the X.L. All saddle in all its glory, and I had nearly forgotten to point out that Alfred Scott is in the saddle of No. 1. Gun Carrier.

Now for tackling Bro.Cooper's 17 pages—with supplements!

Cooper. I am glad that you are gratified by our progress in this Circle, and am sory that I omitted to comment on the proposed 'Interesting Experience' scheme last time. To tell you the truth, I was highly delighted at the idea of reading other members' efforts, but not quite so enthusiastic at the idea of writing my own. I don't see how I can find the time unless we can have a round specially devoted to that scheme to the exclusion of all comments and any set subject. It is no use saying, "prepare yours whilst waiting for the Note Book to come round" That simply does not work with me for as soon as it has been posted off on one journey I have to dismiss it from my mind until it comes round on the next.

Re broken Super fork springs; what an argumentative chap you are! But it is a very pretty argument nevertheless. Well! I told you that it happened in Yorkshire, where the lads are a bit thick in the head—and in other places! Often they would not believe us when told that their fork spring was broken, and then we would have a bet as to how many parts the spring was in.

I think you got me wrong about comfort with a pillion passenger. What I said, or meant, was that after riding for some time with a pillion passenger, you notice a striking deterioration of comfort when he, or she, steps off. I can remember that the first time I even took a p-p, in the old days when you just tied an ordinary cusion onto the carrier with string, and there were no footrests, I could hardly ride the bike for the first few yards when the p-p eventually got off.

Silentbloc bushes are usually in units like journal ball races. By that I mean that they have their own inner and outer (thin steel) sleeves, with the rubber bearing material sandwiched between. To accommodate the unit a bigger eye is required in the spring. I am sending you an old but informative Silentbloc catalogue which you can keep, and as it might interest others I will pass it along with this Note Book.

You have not understood my analysis of the action of a bike with an unsprung back wheel, and I am afraid that it is hard to explain. It is not something that you can understand by just using ordinary common sense, no more than anyone could undertand radio by that means for instance. The friction of the bar on the polished floor can be ignored as it is small compared with the other forces at work. Remember we are dealing with a sharp blow and not a slow push. The result is not haphazard but always the same. However, it is no use saying any more about the matter or everyone will get bored.

You do get some moments of insight sometimes! For instance your suggestion that Scott would have had the frame in two triangulated sections, pivoted together, with the lower one carrying the engine, gear-box, and rear wheel, is quite brilliant.

With regard to Connell; I wish you would tell us something about the correspondence which you have had with him. At present, labouring in ignorance, I am certainly under the impression that he has been approached in the wrong spirit. Is he actively engaged in the motorcycle trade for a living? If so just put yourself in his place, or better still consider the nearest analogy. Suppose that you, as a member of the legal profession, I understand, had been prominent in the papers in connection with some case. What would be your reaction on receiving correspondence from a stranger obviously out to 'get at' you? I won't say any more as I always get bad tempered when I think of lawyers.

Well! I have just been reading about your tussle with that control stop which fell into the flywheel zone. Very realistic, and I much admire your perseverance in retrieving it. The same thing once happened to me with a similar Flyer. I fished and cursed and fished again but could not even get a solitary tinkle. In the end I had to lash the machine to a transverse piece of wooden pole, pushed through the frame, erect a pile of boxes under each end of the pole, and then somersault the whole 400-pounder upside-down. I should have mentioned that the machine was on a wooden bench, which had been duly slid out of the way. The dodge was successful, but I cannot really recommend it as there is too much preparatory work!

Now do you see what I have done? I have taken so long to ramble through all your notes that there is not much time left for the subject of the day. I am certainly slipping from my good resolution to stick to the point, and must do better next time. Fortunately ignition is an easy subject, so here goes:—

SCOTT IGNITION.

Bro.Cooper has had another of his flashes of real insight, as I am sure he is dead right about the logical way to time a mag. *In the fully advanced position with the points just breaking.* That is how I have always

timed them, and of course having to time all sorts of strange engines without any timing mark on the flywheel, we removed the crankcase door and set the crankpin pointing at the rear cylinder bolt head (knowing just the spot by experience).

The electrical method of determining break is not necessary in my opinion as you can tell by eye to 2 or 3 degrees if you flash a torch on the points. Different engines vary by as much as 10 degrees, and after all the ignition *is* variable. (On an aero engine with dual ignition the electrical method is necessary as the two sparks must synchronize correctly).

The big point about timing a magneto is:— After pushing the sprocket onto the taper and tightening the nut, *check the timing again;* by pulling the engine round until the points just break and noting position of crank. Always take up any backlash in the chains (if excessive) by holding back on the mag sprocket.

You may ask why one Scott engine should require more advance than another. It is chiefly due to the compression ratio being different. A lower ratio, or anything which lowers the rapidity of combustion, calls for more advance to compensate. In the old days when the sparking plugs were in the very inefficient position at rear of cylinders, more advance was required than now with the plugs at the top. As a rule, the better the engine, the less the advance required.

I promised some time ago to get into touch with two friends who had fitted coil ignition to their Scotts, and to let you know if they found it an improvement. One rider reports very fully and I condense his remarks as follows:—

"I have only been able to do 2000 miles on my Scott Flyer with the coil ignition, as I have had to save it until after the war and use my other Flyer for going to work. I think that coil ignition knocks spots off mag. I have used a Lucas "Sports" coil, which under good conditions will give a ¾" spark in free air, and allow a 50 thou. gap at the plug points. I seem to be able to run with a leaner mixture and get very even running when idling. Under riding conditions the mag is not in same street as the coil. There is none of that occasional miss that one gets. Starting was so good that with ignition fully retarded I could press the kickstart down quite slowly and the engine would start. The same would happen if back wheel was pulled round by hand. I always choke carb on stopping of course".

"The other rider just says:— "I am at present carrying out another coil conversion and will let you have particulars when completed. I can pick out several faults with the Victor job".

So Cheerio!

Tom B. Ward

30th. August 1945

Well! as I've said before, I simply don't know how you fellows do it. Barging straight into the book as soon as it arrives and reeling off umpteen pages without any effort. It has been exactly one week since I received the book and it was not until last night that I was even able to open the parcel and settle down to reading the notes. I rather sympathize with Bro.Ratcliffe, but I had better not follow his example or it will look as if an epidemic has set in.

Last time I had to be rather unsociable in my notes, and say my say on IGNITION without seemingly paying much attention to what other members had written. So now I am going right back to the beginning of Note Book 5 to remedy previous shortcomings.

The Skipper reminds me (in red ink) that I did not rise to his bait on the question of "Monarch" Forks. The question was:– *"Do you consider the Brampton and Castle bottom link forks to be retrograde, and if so why?"* Well! a thing cannot be retrograde in itself, but only in relation to something else which has gone before. Therefore the answer—loud and clear—is, that Brampton "Monarch" forks are *not* retrograde, but a definite improvement on the (shall we call them) "top link" forks which they were designed to replace.

I said that Bro.Way's bottom links would be a retrograde step because it would mean going back to links in a design which had brilliantly discarded them years ago. Perhaps the Skipper is thinking; would it be a retrograde step to scrap a pair of Scott Girder Forks on a Flyer, and to replace then with Monarch? Yes! I should say that it would. It would be much better to give the Scott forks a real good overhaul. (I know that this advice does not apply to his own machine because I see in that most excellent photograph that his are Webb type. Brampton make he says. It is hard to tell the difference)

As the Skipper is fairly new to the Scott, and we—his motley crew—have one and all had years of experience with that particular make, it is, when you come to think of it, up to us to give him all the guidance we can. Especially as we are indebted to him for bringing the Club into being. So I am going to comb his notes through pretty thoroughly this time.

But I do wish that he would get that bee out of his bonnet about the mystery of Scott mag timing and the necessity for a vernier coupling. I think that he has got the problem out of proportion and that he will change his views in the course of time. It is not correct to say that Scott mag timing is a matter of trial and error. But no more about this subject which as already become rather boring.

Steering Head Cups to suit Brampton Forks. I am afraid that I am not very familiar with the steering head bearings of these forks. No doubt they are the same for the conventional type Bramptons as for the bottom link type. Of course the correct people for spares are the Scott Co. The actual makers of the forks were Brampton Bros Ltd., Oldbury, Birmingham. My recollection is that for several years the chain combine carried on the marketing of Brampton fittings, and presumably forks, and that later this branch of the business was split off under the above title, but I may be wrong.

Yes! if get any "enforced leisure" I will certainly get busy and write out my most interesting Scott experience. In fact I won't wait for enforced leisure but will try to make some. In the meantime I am looking forward to reading other blokes' experiences. Do I understand that the Skipper has one member's effort already in the safe? Three Cheers!

Sorry if I have misjudged the correspondence with Victor Connell. I will reserve further remarks until we get the Connell conversion up for discussion. I hope that Chas.R. really will go up in smoke on the subject. Yes! I admit that I am rather down on lawyers. I would not have mentioned it but I know that the Skipper has a keen sense of humour. I could give my reasons but there is not time now and this is not the place. Besides, we don't want to have the Skipper throwing up his job, with tears of remorse streaming down his face!! though I am not certain that his heart isn't really in Automobile Engineering already.

Yes! you need a good cracking spark on a Scott at low speed, or rather I should say, when throttled down, because under those conditions there is only a whiff of gas going into the cylinder and mixing with the cylinder full of burnt charge. It is wonderful that it ignites at all. The method used on tiny two-stroke engines, of keeping the throttle open, and controlling on the ignition advance and retard, was very interesting. No doubt that is where Connell got his idea from.

If the Skipper really wants to try that experiment by rigging his machine with dual ignition, so as to be able to switch over to coil ignition or magneto, I could supply a Pilgrim Pump driver and bracket as used when the pump was driven from the hole in sprocket, but this would not be suitable as there would be too much backlash. A better job would be required and I regret that I could not give much assistance towards making anything of the sort at present, much as I should like to do so later on. It would be a valuable experiment; although of course it has been tried before by people who have mostly kept the results to themselves.

In the early days of magneto ignition on cars it was the usual thing for both coil and mag to be fitted on high class models, and I think it was agreed that there was not much advantage either way. The coil scored up to about 1000 r.p.m. and above that speed the mag scored.

The philosophising on sociability interested me. I love that sort of thing, but will refrain and get on with the job, or our friend Fox will be after my blood. Who is this Lord Dawdle please? He seems to be the ideal interested helper when doing jobs on the bike.

Would not that problem of spring load with Way's fork idea make a delightful subject for expounding in Will Hay's schoolroom? What tangles they would get into.

Yes! contact-breaker keys are decidedly cut to an accurate plan so that the break occurs (with correct gap) at the position of maximum magnetic and electrical flux. But this ideal state of affairs only applies to the fully advanced position, which seems to be all that most mag manufacturers bother about.

Fox. You have not done so badly with your "few points" after being knocked completely off your stride by the change of subject. You would like the Note Book to come round every fortnight! Well there does not seem to be much danger whilst I am in the schedule, judging by results to date, though I keep trying to reform myself. However, I think my latest scheme will result in some improvement, but you will only get short contributions.

Oh! it is your interesting experience which is in the headquarters safe is it? I shall have to have a shot at writing mine. I shall get a kick out of it if no one else does. It is nice to look back on one's adventures occasionally, and I find that I owe quite a big proportion of my

interesting experiences to the Scott (invariably the two-speeder. That is why I have such an affection for it)

I agree with you about the centrifugal loads on the dynamo armature winding, but I think that it is the inertia loads due to the varying speed which are most destructive in armatures, and these loads can be practically taken off a dynamo armature by a slipping device, whereas in the case of a magneto armature the drive must be quite rigid to keep the timing exact. In any case we *have* to put up with the dynamo armature, but we *can* now eliminate the magneto armature. Not that there is any hurry.

Yes! I remember "modernising" your induction flange, and I am interested to learn that the new arrangement was not quite as good for idling. It just shows the difficulty of "improving" on Alfred Scott, without introducing some snag.

Am right glad to hear that my recommendation of the book "Portrait of Churchill" was seen by the author, and I am therefore doubly glad that I put it in. Any pal of Churchill's is a friend of mine, and I think that the way those colossal problems were tackled and overcome will be an inspriation to future generations; so probably your friend Guy Eden's book will be asked for in the reference libraries of 2945!

Cannot give you any further information about how mags were made to function at high altitudes, but I will make enquiries.

I'm not keen on a Rally just yet either. *One at a time,* or two at a time, suits me better when I get something to go visiting on.

Lumley. Diversity is the spice of life so I was quite pleased to see that you disagree about Coil Ignition. Talking about batteries those Ni-Fe (Nickel-Iron) batteries were the goods I believe. They were very expensive but I mean to try one as soon as postwar ones become available. They did not deteriorate with storing, or with excessive discharge rates.

I might have known that you would have tried a Delco-Remy distributor off a Trojan on the crankcase door. Mine was made to the special order of a customer and I never heard anything further after it was delivered. (and I dare not ask for fear it was a dud) It cost me more to make than I got for it so all I got out of it was the experience.

That idea of your of converting the distributor to spark gap instead of carbon brush seems really good. You will get a much better spark, especially if the plugs are at all carboned up. There must *some* snag in it surely? or the makers would do it you would think. It would be interesting if someone would ask them why they don't.

I understood your idea for moving forward the range of advance and think your description was perfectly clear. It is my belief that some of these young fellows are so used to arguing the point that they do not *try* to understand!

Re timing the mag without removing the Pilgrim Pump, I have sometimes been successful with a Lucas Girder spanner. There are plenty of worse jobs on some engines I could mention.

Low. Was interested to hear that you once had a 1908 3½ h.p. Rex, as I had one too for my second venture. It had a wonderful Bosch mag (open magnet type) which afterwards did fine service in place of tube ignition on the shop gas engine.

I bought the Rex (S.H.) because it was a long-stroke and just right for my purpose, which was to convert a 4-stroke engine into a 2-stroke, using the same cylinder, piston, and valves. I succeeded with this to the extent that I could do 50-mile runs with the converted job. It had plenty of power but used to overheat of course. I had a lot of fun

out of it for about 12 months. Incidentally, hadn't the Rex a grand design for its day? Saddle position of mine was quite low and it had no pedals. The forks and frame were also quite good. The tank would look funny now as it was only about 4" wide. Chaps did not ride with their knees stuck out very far in those days!

It must be very nice having F.A.Applebee for a neighbour, as I believe you said that you had. I remember him winning the T.T. in 1912. The attached leaf from one of those nice little John Bull booklets is raked up as it is worth placing on record in the club's archives. The mag which Tim Wood used was not exactly a 4-cylinder mag. It was a *4-spark* mag with two slip rings side by side. I have one of these mags and should like to suggest that members might look out for interesting Scott relics with a view to putting them on show sometime.

Andrews. I can usually get some enlightenment from your notes. Was very interested to learn how easily you could start the Austin on the dynamo alone. I do not know much about this subject and shall have to study out your method at leisure. It is likely that magneto ignition will always be preferred for hot stuff cars. I think we have established however that on account of the diluted mixture there is a *special* case for coil ignition on two-strokes.

Way. Your observations on the earlier Scotts (1913-18), with the sparking plug over the transfer port, bear out my own experience. The gain in maximum speed with the plugs moved to the head was very considerable, but the slow running suffered slightly. Similarly with the removal of the transfer port gauzes (I still fit them) and the change from cast iron to aluminium pistons. All these little losses of docility have added up and necessitate extra care in other respects. One modern change which improved *both* the performance *and* the docility seems to have been the Flyer centralized induction system.

You have made a very original suggestion re using a booster coil for starting. I take it that this boosts up the mag primary current through the earth terminal of the contact breaker, but I have never investigated this idea though I have seen it used on aero engines. This too is something which calls for a little further thought when not so pushed.

Ratcliffe. Cheerio! I believe you are making all the brass whilst I am sweating over this typewriter!

Adventures of Stupid, the Rogue Scott. Have read the further trials and tribulations and felt like taking the first train to Blackpool to join in the hunt with you and Lord Dawdle. On second thoughts, however, I thought it best to put the fare back in the old oak chest. I still think that the trouble is simply detonation due to an excessive compression ratio. i.e. small clearance volume. Have you tried those washers? if not it would be well worth doing so. Or you could try anti-knock fuel if you can get some. Pity that Way has not got that 40 gal drum of benzol left.

Skipper Cooper. No! I do not run for twelve months without adjusting the magneto chain, but I never retime after doing that. It is not necessary. Both sides of the chain stretch equally and therefore the timing is not affected.

The Scintilla magneto, which you and Andrews talk about, must be really good to inspire such enthusiasm. It certainly does not seem to require any booster coil. The old Dixie Mag would seem to have been on the right track. I wonder why we did not appreciate it at the time? Probably because of its poor finish and rather clumsy appearance. Does anyone know whether the make is still in existence?

You ask "How does one determine the most effective magneto timing from the engine feel". This seems a very innocent question. Is there anything behind it? Well! I should say that the most effective mag timing is the one which feels to be pushing you along most strongly and smoothly. I think that the rule can be stated simply like this:– *The timing should be advanced until the point is reached at which either there is no gain in power or else the running becomes harsh. It should not be advanced short of this point or there will be inefficiency and overheating. It should not be advanced past that point, even if there is no actual falling off in power or noticeable harshness, or there will likewise be overheating.* It is of course understood that, as Way says, the point is not a critical one on a Scott.

The "Motor Cycle" cuttings are new to me and therefore very welcome. The war has left me a little out of touch with motor cycle matters but we are rapidly progressing.

I have now combed through all the present notes, but still have not done justice to some of the notes in Note Book 4 and it is now too late. But I assure you, one and all, that I read every word. There are just one or two points that I remember, *Fox*. For aligning chains (and also wheels) there is nothing to beat sighting down them in marksman fashion. If necessary, put the bike on boxes at front and rear and get a "worms eye view" of the gear chains. *Lumley*. I too thought those Rudge fork links were a grand job. They ought to have been widely adopted.

(to be continued)

V4/9 Dec. 1965

SOME COMMON MISTAKES MADE BY INEXPERIENCED SCOTT RIDERS.

by *T. B. Ward*

(ORIGINALLY PUBLISHED IN THE SCOTT POSTAL DISCUSSION GROUP PAPERS IN MAY, 1945).

Some of these are quite elementary but deserve to be put on record as during the many years we spent repairing Scotts, we came across them repeatedly. I am only dealing with engines of course.

Rollers. Not taking sufficient care when dismantling so as not to mix rollers from different bearings, as all the rollers in a bearing must be the same size to one tenth of a thou. For the same reason it is of course fatal to add new rollers to a used set if you lose any. Big end rollers are gradually wearing all the time and so should be replaced (usually at the annual overhaul), whilst main bearing rollers wear very little indeed and last for years. The reason for the difference is that the big end rollers revolve at varying speed—fastest at top of stroke and slowest at bottom of stroke due to angularity of conrod.

Piston Rings. Two common mistakes are to damage the sides of the ring grooves when scraping the carbon, and to change the positions of the rings. The bottom edge of the groove is the one which needs special care as the least mark will allow leakage past the back of the ring. And rings, unless they are being replaced by new ones, should be put back in the same grooves in which they have run before, and the same way up (i.e. bright side downwards).

Pistons. It will be a good thing when there are plenty of new pistons to be had because nothing else contributes so much towards a good engine (starting, power, and economy) as good fitting pistons. The common fault in the case of pistons is careless cleaning. The best stuff is very fine steel wool for the walls.

Flywheel sprockets. When these come loose it is due to a crushing of the rather weak spigot on the flywheel and fitting new rivets will only effect a temporary cure if the sprocket is a loose fit on the spigot. Look out for a good second-hand flywheel. The cause of the trouble may have been a tight spot in the primary chain, hanging on too long in top gear, or using the mag cut-out with the throttle wide open.

Cranks. I have never broken a crank myself but have seen quite a lot broken —always in the same place and with the same sort of fracture. It indicates fracture by firing pressure and as it is a fatigue fracture it can be contributed to by many factors. The following factors are particularly hard on the cranks. (1) Too high compression ratio, causing detonation or at any rate harsh running. (2) Too much mag. advance. (3) Use of cut-out, as this clears the cylinders of all dilution and results in a severe "clonk" when mag is cut in again. In the old days the cut-out was coupled to the half compression control so that the first explosion was subdued automatically as a safeguard. A mag. cut-out should never be used on anything like full throttle or it is asking for trouble.

Crankshaft bolts. Here is a small point, but it is found that riders rivet the end of the bolt over excessively with the result that a new bolt is required (and you cannot get them at present). No rivetting over is really required, but just a couple of taps does no harm for peace of mind. It is the fitting of the cranks which is important.

Now! Just a few remarks on some of the alterations which have been made in the design of the Scott engine during its development over the years, and the significance of same.

Piston Well Blocks. These were only fitted for about one year and were dropped because the disadvantages outweighed the slight advantage in speed. They did this by filling up some of the crankchamber space. A few riders still use them for racing.

Half-compression valves. These too were more bother than they were worth as carbon was bound to get onto the seat and cause leakage of compression. Also, a very small amount of the charge was pocketed on each compression stroke and completely wasted.

Pistons. One of the biggest jumps forward in development was the fitting of aluminium alloy pistons and narrower rings to the sports models in 1922. The lighter pistons gave a sweeter running engine. The better thermal conductivity allowed the compression ratio to be raised, and the narrower rings gave reduced frictional losses. Unfortunately the wonderful surface qualities of cast-iron had to be sacrificed. Also the lower clearances.

Crankcases. When the Scott was redesigned in 1927 and the Flying Squirrel appeared the following alterations were in the right direction: (a) Larger crankcase giving increased cooling surface. (b) Better spacing of engine bolts so as to give a more rigid fixing in the frame. But the solid five-eighths ins. steel bolts are far too heavy and should be either replaced by tubular ones or reduced in diameter where they go through the crankcase, in the manner of aero-engine bolts.

Detachable Aluminium heads. This was another good step forward, as besides the convenience of the compression plate and ease of decarbonizing, the better thermal conductivity allows the compression ratio to be raised further without danger of detonation.

Ports. These have become deeper and deeper as time has gone on and therefore the modern Scott is feeble at slow speeds and very wasteful compared to the early shallow port engines. That of course is the price paid for increased maximum speed, and for my own purpose not worth it.

Now for a few random remarks to finish off what will be rather a disappointing contribution I am afraid, but time presses.

How to tell whether the bores require grinding. As the ordinary rider does not possess a Starrett gauge, which slides in the bore and records variation in diameter on a dial, and is awkward to use in a Scott in any case on account of the ports, the following is the best and simplest method that I know. It consists merely of comparing the (a) greatest worn diameter with the (b) least worn in diameter by means of ordinary inside callipers. (b) is always the diameter from side to side at the bottom, and (a) is always the diameter from back to front at the top of bore.

S.P.D.G. *(Continued)*

30th August 1945

The Weller tensioner has always seemed barbarous to me. Only an oil bath saves it. *Low.* I remember Parker of Kendal. He was about the first Scott Specialist and brought out some excellent ideas, including a rotary valve for Scott engines. *Andrews.* Was surprised to hear you advocate *Raw* Linseed Oil to mix with the red lead primer, as I always thought that *Boiled* Linseed Oil was the thing and that the Raw variety would not dry. *Way.* Thanks for the tip about getting a compression spring from Terry's. *Ratcliffe.* Your notes were very entertaining.

Well Shipmates, I have ended up by doing it after all but it has taken me all day, from morning to night, to do these few remarks. But it is worth it. The practice in expressing one's ideas clearly in the minimum words is valuable. If too many words are used the picture conveyed becomes less and less distinct. I cannot help wondering whether these five pages, having served their purpose, could not be usefully condensed into three, then reduced to a one page summary, and then torn up for salvage!

There is just one bit of guidance that I seem to have missed giving the Skipper. Unless a Scott engine is needing decarbonizing, is overheated, running with too weak a mixture, has too high a compression ratio for the fuel, or something else wrong, there will be little or no sign of harshness even if the timing *is* too far advanced. I once advanced a correctly timed engine a whole tooth as an experiment. The engine "kicked" a bit when starting on a rich warm mixture but ran as well as ever for exactly six miles. Then it rapidly came to a stop with loud complaints. When, on the other hand, the mag was *retarded* a whole tooth, the power was much reduced immediately and there was some banging in the silencer.

Cheerio!

Tom B. Ward

27th Feb 1946

Dear Friends,

Sorry for being so long in starting these notes. As a matter of fact I have had half a sheet of notes stuck in this typewriter for a whole week and had no chance to continue then. Lots of times I have wanted to use the typewriter — but no! that sheet must not come out — must use a pen! Now at last, when I come to re-read through that half sheet I find that I have been using a pen all week for nothing, as that half sheet of notes are now quite out of date, and I shall have to start afresh!

You all seem to have been in remarkably good form during the last circuit of the Note Book. Congratulations! I really think that it was a remarkably good achievement. If I were in the Skipper's shoes I should feel highly gratified, so I am sure he does feel that way. It was nice to see a large helping this time from Andrews who is a comparative stranger. I must say that I much admire his handwriting, and Way's also is marvellous.

I seem to notice, in reading the notes, a disposition to hang on to the subject of Ignition. When we started on the subject I thought that it would not be very interesting. But I was sadly mistaken. It has been *most* interesting to me, and most instructive, and it has stimulated me to try to find out more about a subject on which I was very ignorant.

But the most illuminating item in the last lot of notes was the observation by Fox — confirmed by Low — that Mosquito netting can tame the wind to such an unexpected extent. It was news to me, and as a phenomenon almost on a par with the damping property of oil on troubled waters!

Last summer I had a go at making a fly-swat and made the first one of too fine a mesh, with the result that it wafted the flies gently out of the way, instead of killing them! But when I made one out of the gauze used for transfer port gauzes it was effective. Also, we know that the wires of last war aeroplanes had a very definite slowing effect. In fact they used to be very audible evidence of waste of power because they used to fairly howl in a dive. Still, I expect it is just a question of degree, and that a pair of trousers made of mosquito netting would be poor protection in a cold wind!!

Recently I have been using a pedal cycle a good deal again, and have been much impressed by the terrific resistance of a 40-mile-an-hour headwind. You feel as if your cycle is in danger of being blown *backwards*, and then when you dismount you are surprised how calm it is! Can it be that the wind resistance of the bike tubes and spokes etc., is far higher than we have been thinking? The man who can reduce this high wind resistance will confer a great boon on cyclists because it is the one thing which spoils a delightful method of transport.

I have been reading *"Electrical Characteristics of Spark Gaps" by E.A. Watson, M.Sc.* and so before proceeding to discuss the two special Scotts, I cannot resist showing off some of my newly acquired knowledge to Fox's admiring (?) gaze. Unlike any knowledge which I possess on the mechanical, which is based on years of practical experience and close observation, this electrical information is of course "second-hand from a reliable source" so there is always the possibility of wrong emphasis as has already been pointed out.

But had you ever thought, for instance, that on our two-spark magnetos (and all revolving armature mags are called that because they produce two possible sparks per revolution of armature), that on these magnetos of ours, one spark is negative and the next positive? and the same applies to the primary current.

The effect of this alternating polarity is beneficial to the contact-breaker points in making them wear more evenly. When the polarity across the points is always the same, as in the single cylinder machine, one point wears hollow and the other convex.

I also learn that there is a *slight* difference in appearance between the negative spark and the positive one and that there is a very slight advantage when the sparking plug electrode is negative.

But a matter of far more importance is the effect of heat on the sparking ability of the plug. Heat is *very beneficial* to the passage of the spark. It considerably lowers the voltage across the gap and makes the work of your magneto easier, with consequently much greater length of service without breakdown (i.e. electrical breakdown).

The reason that heat lowers the sparking voltage is thought to be that a layer of hot gas round the points will have a lower density and therefore less electrical resistance. Of course the *density of the air gap is all-important.* For instance on a Bosch ZE2 magneto which I have before me, and which I have used for years on a Scott, the safety spark gap is set at just under ⅜" (23/64" to be precise). That means that I can get about a ⅜" spark from the lead in air at 15 lbs per sq.inch pressure. In the cylinder of the engine with, say, a 6 to 1 compression ratio, the maximum spark that I could get would be reduced in just

about that proportion, to somewhere about 1/16".

Fox has supplemented my remarks on the reverse effect of the *reduced* resistance of the *rarified* air at altitude. For instance if I were to feel very energetic and take this Bosch mag. to the top of Mount Everest! (29,000 feet), the density of the air would be about one third so I should certainly have to do away with the safety spark gap as he says, as the low voltage spark which would jump ⅜" at that altitude with ease would only be powerful enough for a very much reduced gap at the sparking plug points in a supercharged aero engine cylinder.

At 29,000 feet my Bosch mag, with no safety gap, would give a 1–⅛" spark, but when I came "back to earth"—or rather sea level—the absence of a safety gap would be risky, as it would permit excessive voltages in the event of a "dis" as Andrews calls it. As a rough guide, I think I am right in saying that the safety spark gap is designed to "blow off" at 10,000 volts (at sea–level) and that our sparking plugs, with the usual .020" gap, normally require 4,000 to 8,000 volts.

To overcome the problem of mags at high altitude, with all due respect to Fox's sleuth, I feel convinced that there is more to the problem than just doing away with the safety gap and improving the insulation. Because—what about the distributor? there are plenty of air gaps there which the spark could jump.

I am glad that Fox mentioned ionisation, which occurs wherever there are high voltages about with air between. It is this ionisation which builds up a bridge for the spark. I take it that it is something analogous to the stream of electrons which we make use of in our wireless valves. The higher the voltage the greater the ionisation even if there is no actual spark and this has to be taken into account, as it is accompanied by the formation of ozone, which is destructive to mag insulation.

Ionisation is taken into account in the following ways:–

(1). By ventilation so that the ozone can be dissipated. You will notice that even "waterproof" mags are ventilated. And aero-engine mags, which have to be closely screened, are nevertheless carefully venti lated by those clever corrugated brass foil windows.

(2). By filling up air gaps if possible. This is now done in the armature windings by impregnating all spaces with synthetic resin.

(3). By oil–immersion, which is really liquid insulation, and is not possible with a magneto, but is used in power station transformers and switch gear. It is interesting to learn that 15,000 volts is considered the limit by electrical engineers for revolving electrical generators of even large size, so that our little mags with their 10,000 volts are very near the limit and that is why mag rewinding specialists are kept so busy.

Your mag will last longer if you avoid excessive voltages for long periods by (a) keeping the plug points to 20 thous. (b) refraining from using racing plugs for road work, as these run too cool and therefore have the same effect as an excessive gap.

Here are a few items of information taken at random:–

That Tungsten points for the contact–breaker, though much cheaper, are *not* inferior to platinum points, *provided that* the magneto has been properly designed for tungsten. That 3–point sparking plugs are best because they do not burn away as fast and also spark at a lower voltage. The only advantage of the single point plug is that it has a better chance in excessive oil (which should not be there).

In those special mags with two slip-rings, side by side, which Scotts used in the T.T. one year, (firing two separate plugs to each cylinder)

it is interesting to learn that one slip–ring is connected to the negative end of the high tension, and the other to the positive end, so that both sparks are therefore in the same circuit.

Whilst on the job I have looked into that point which Andrews mentions re the *Scintilla Vertex* —whether it is of the inductor type or revolving magnet. There are illustrated particulars in A.P. Young's book, and this is what I learn. The Scintilla Vertex Magneto is of the rotating magnet type but very special design. Unlike the usual revolving magnet magneto, which only gives two sparks per revolu tion, this mag can give 4,6, or 8 per revolution, and it has a cobalt steel magnet shaped like the spokes of a wheel (one spoke per spark) and the spokes are negative and positive alternately—a truly wonderful magnet. The magnetic circuit is somewhat long and tortuous, but it must work quite well nevertheless. By the way, I always thought that the Scintilla was an American firm, but it seems to be Swiss. Here is a bit which will be of interest to Lumley, with reference to the Scintilla. "It is interesting to note that the early form of carbon brush distributor has been replaced by a spark–gap type as standardised by British manufacturers"

I have finished with Ignition now for a long time. Here are a few observations in reply to points raised by some of you.

Skipper —I am advising everyone to have any cylinder regrinding done by the works. They undoubtedly make a better job, which is well worth any extra cost. This stands to reason as they know from experience just what piston clearances are required in their own engines. I am not saying that the job could not be much better still, but it is definitely better than any of the cheaper jobs that I have tried so far.

Lumley. Excessive end–play in crankshaft is not very nice but I have never actually known it cause any trouble, and I feel quite sure that it could not cause a clank. (When kicking over a cold engine you always get a bit of a clank as the cold pistons change over from front to back of the bores at top of stroke.)

Oversize pistons fouling crankcase. To clear up some misunderstanding which seems to exist, I am attaching opposite a drawing of the Scott engine and have marked in red ink the sides of the aluminium wells of the crankcase where oversize pistons *may* rub. But I should like to repeat that I have *never known this to happen with anything less than 30 or 35 thous oversize,* as naturally Scotts have made provision for moderate ly oversize pistons.

Low. Yes! the 498 and 596 crankcases (either Flyer or Super) are exactly the same. (please understand that I am not saying that the Flyer crankcase is the same as the Super). The only difference between a 498 Super crankcase for instance and a 596 Super crankcase, that I have ever found, is that the 498 is stamped Z in front of the engine number, and the 596 is stamped Y.

In the Flyer this becomes	FZ and FY.
In the Replica this becomes	RZ and RY.
In the Power-Plus this becomes	PZ and PY.
later	DPZ and DPY
Longstroke Flyer	LFZ and LFY.

Low's reminiscences are reminders of happy days. A customer of mine bought a 1913 Scott and Sidecar and ran it for 25 years! He bought it new from the works and thought a tremendous lot about it from first to last. Even towards the end of its career he considered it superior to "the new fangled models"!

Fox. From what Lumley says, I should certainly like to hear that exhaust note. And your petrol consumption is sensational. Did the direction of the wind enter into it at all do you think? Sometimes one has a strong S.E. wind going in that direction, which can easily drop for the return journey. But in any case your petrol consumption is wonderful. How much for the sole selling rights for the streamlined induction for England, Wales, and The Isle of Man?!! You are always very mysterious about it but I have a rough idea what you mean.
Skipper. The standard Burgess Silencer now being supplied by Scotts, 3-⅛" external diameter, has a body 15" long. The total length is 23". The perforated central tube is 1¼" inside. The price (black) is 15/- pre-war, plus the 50% advance, i.e. 23/4d with the 10d post. (I could say more but I am in this club in my private capacity and certainly not to obtain any trade advantage)

Now for the *KIRK BLOWN SCOTT*, and the *CONNELL VICTOR SCOTT*. It is a good idea to lump these together as they are both good examples of the more drastic owner modifications which we find happen to Scott motor cycles more than any other make.

My own attitude to these modifications, as long as they are presented as interesting experiments and not as prototypes of ideal design, is one of toleration for the ideas, and admiration for the vast amount of patience, industry, skill, which I know must have been used to carry them out. As experiments I think they are praiseworthy and instructive. We have certainly learned something from the articles on the Victor with its big range of retard. And Kirk's blown induction is also provocative of useful thought.

But if either of these machines were presented to me as ideal designs I should at once become extremely critical, as they don't coincide with my ideal at all. By the way, did you notice the list of machines which Graham Kirk had in his garage? — "A pair of B.M.Ws, the first Clubman Special, a D.K.W. 2-stroke car, and lots of D.K.W. bikes. A very interesting collection. Perhaps Way can tell us something more about this Scott and 2-stroke fan? Torrens is always worth reading and he has certainly given this Scott a good write-up.

Let us look at this idea of using a blower to feed the charge into the cylinders, instead of crankcase compression. It means first of all discontinuing to use an existing pump, incorporated in the engine and requiring no extra parts, and adding another heavy piece of mechanism requiring some extra power to drive. Also, it is necessary to go to the trouble of connecting the discarded crankcase "pumps" by a balance pipe. They cannot of course be just blanked off. It looks like a very wasteful arrangement, but of course there are advantages.

The volumetric efficiency is increased. More charge will be pushed into the cylinder on account of the uniform pressure, in place of the usual "peak" pressure. But what happens when neither cylinder port is open? The blower will then be blowing against a dead end. And this will happen twice per revolution. No doubt the pressure will partly build up, and partly leak back past the vanes.

The effect of increasing the volumetric efficiency is that you make the engine equivalent to one of greater capacity. For instance when you fit 596 cc blocks and pistons in place of 498 you are getting a similar result, but not exactly, as in that case you are also burning and expanding the charge in a bigger cylinder. But remember that it is *the weight of air handled per revolution of an engine which matters,* provided that efficiency remains constant.

(to be continued)

S.P.D.G. *(Continued)*
27th Feb 1946

Personally I do not want an engine of greater capacity than the simple 596 Scott. All the tendency during recent years has been to *reduce* the capacity of motor cycle and car engines. When riding a Scott I find myself hankering after lots of improvements, but seldom do I hanker after bigger capacity. Only when pulling a sidecar laden with luggage against a strong headwind, with an engine which needs attention. And then the remedy is to *give* the engine that required attention.

The list of things that I *do* really hanker after when riding or working on a Scott must wait for another time. I should expect the Kirk Scott to do fewer miles per gallon than 45, and even 45 would not suit me.

As the blower will be delivering at its full pressure right to the moment when the piston has shut off the port as it ascends, and as the exhaust port is of course open all this time, I should expect a much greater wastage of unused charge down the exhaust pipe.

It is interesting to note that Mr Kirk runs on petroil! But this is not done for simplicity but for the benefit of the blower, whilst *three* oil pumps (two of them duplex) take care of the rest. This really amounts to 5 *plunger pumps and petroil!!*

And nothing would induce me to fit Teledraulics on a Scott, because I feel sure that equally good results can be obtained by something nearer Alfred Scott's design. And what do you think of that blower platform made out of half-inch plate? The total weight of the machine must be terrific.

No! As an experimental machine I call it a jolly good effort, but further than that I cannot go in appreciation. And I cannot help feeling that a modification should be reviewed from the standpoint of the original inventor and the sort of design that he had in view. If this is done, the Kirk Blown Scott stands condemned.

Sorry this criticism is destructive rather than constructive. Please do not think that I am "against everything new". Here are a few particulars of Jet Engines which may be of interest. First of all, they are definitely the coming thing for aeroplanes. They will be of many different types as different firms are developing their designs on different lines. This development is only in its infancy yet and there are great possibilities for other purposes besides aeroplanes — though not for motorcycles perhaps.

Starting is so simple that it only requires an ordinary starter motor and battery to motor the engine round slowly, and there only seem to be a couple of sparking plugs to provide the initial spark — after which no further spark is required.

The reduction of weight compared with a reciprocating engine is of course sensational. The jet engine shines especially at high speeds and high altitudes. Though it will probably always be called a Jet Engine the jet method of propulsion is not an essential feature. The essential thing is the gas turbine, *which has definitely come at last.* It can of course be used to propel the aeroplane via a propeller, or on the Italian principle with a fan inside a sort of wind tunnel running through the fuselage from front to rear. The gas turbine, now that it has arrived, is extremely simple, but it has to be made of very special steel to stand the high temperature. Neither the turbine or the blower could have been made ten years ago, even if we had known what they should be like.

I have always thought that the exhaust of a car or motor cycle must help in the propulsion. It would be interesting to suspend a motor cycle by ropes from a beam, and fix a spring balance to the rear registering very little pull with the engine stationary. Then see what the pull would be with the engine running and the exhaust doing its stuff. Of course with the machine under way the effect would be greater, until the bike was going forward just as fast as the exhaust was issuing from the pipe — under which conditions the exhaust would remain stationary and just lay down on the road like the track of a tank whilst the exhaust pipe and bike shot forward from it. All the energy in the exhaust would then obviously be extracted and efficiency would be at a maximum.

Hoping that I have given you something to think about when you feel that way inclined.

Good old Fox! It's your turn now. Sorry for the hold-up.

7th Jan 1947

I have just read through once more the Skipper's account of his joyride in the Bentley, and have enjoyed following it on the map. It must be grand to be the owner of such a car; assuming of course income to match! The first cost, tax, and insurance may be high, but we have seen that petrol consumption will be reasonable, and repairs and renewals due to wear and tear will be probably be insignificant — much less than on a Scott Flying Squirrel per mile.

Those villages in the Thames Valley and the Cotswolds, which charmed the Skipper so much, have been carefully noted, in the fond hope that a trip through them on the Scott may be one of the pleasures to look forward to in 1947. Talking about charming scenery, one spot in the south sticks out in my memory above all others, although it is 30 years since I happened to pass through it on my way to visit an uncle in Bournemouth. I refer to the *New Forest*. I should very much like to see it again (on a fine summer day) assuming that half the trees have not been sacrificed during the war! After all this time I still remember the names Romsey, Lyndhurst and Ringwood, although the make of motorcycle that I was on has been quite forgotten!

As I want to "knock on" with these notes, I will leave the Skipper's continued mechanical education in the able hands of Fox, who seems to be making a very good job of it! There is just one thought which occurs to me. When trying to visualize what happens in an induction system it is helpful to remember that there is a *super hurricane* blowing throughout the system. At a rough estimate I should say it is blowing at 180 miles per hour when we are all-out on a Super.

I agree with Lumley that we are some of us getting too fascinated with visions in the clouds, and that it is time we returned to earth, and practical *Scott Rider Problems*. What a darned good job it is that women are more practical than men! My wife plays pop about the S.P.D.G., but fortunately she does not know the full extent of the practical jobs that I have been neglecting on the Scott during the last three months.

Low's description of Frank Applebee's makeshift carb was very interesting and amusing. Ingenuity in getting a bike home under difficulties has always appealed to me. I wonder how we should fare with a wick feed carb as a regular thing? Probably, with modern knowledge, quite a good job could be made of the method now, if it were necessary.

Andrews has certainly surpassed himself this time, and given us a magnificent effort. And did you notice that he only seems to have kept

the book *one day?!* His notes are a complete refresher course in supercharging. I read them through three times, and have a few remarks to make. One bit of information interested me particularly about the *Racing D.K.W.* That it *peaks at 3500 r.p.m.* What I should like to know, amongst other things, is the displacement of the 'phased pump' (or the 'displacer piston' as I have become used to calling it). To my way of thinking the racing D.K.W. engine is more interesting even than the Kirk Blown Scott.

Now with regard to racing motors *blowing up on the overrun.* Has anyone ever heard of this happening on a Scott? I never have although the design of the con–rod is far from robust, and I attribute Scotts' immunity to the fact that they *always compress a full potful,* even when the throttle is closed and one simply compresses a burnt charge, so there is always full compression pressure holding the piston on to its 'handle' at top dead centre where inertia forces are greatest.

On my own Scott, where the area of the piston is 6.78 square inches, and the compression pressure by gauge is 120 lbs per square inch, the force holding the piston is therefore *813 lbs.* (If we want a comparison we can think of it as the weight of six 10-stone men)

I thought it would be interesting to work out what the opposing inertia forces are at various high revs. so I looked up 'Automobile Engineering' by H. Kerr Thomas. With some very painstaking maths he works out a formula, which boils down to the following for my 596 Super (where the ratio of con-rod length to crank radius is 4.2)

Inertia force at T.D.C. $= \dfrac{35.15 \times W\, r\, N^2}{1{,}000{,}000}$

where W weight of reciprocating parts (1¼lbs in my case)

$r =$ crank radius (1.344)

N = crankshaft revs per minute.

Now the question is;– what revs shall we consider? My top gear is the highest standard ratio obtainable of 3¾ to 1 and according to the table in my 'John Bull' T.T. Souvenir, this ratio at an 'imaginary' road speed of *80 m.p.h.!!* would require the engine to turn over at *3876 r.p.m.* Substituting in the above formula we get under these conditions:–

Inertia force at T.D.C. $= \dfrac{35.15 \times 1.25 \times 1.344 \times 3876 \times 3876}{1{,}000{,}000}$

$= 35.15 \times 1.68 \times 15$

$= 890$ lbs.

So at 80 m.p.h. on my machine the inertia force would *only just about balance* the downward force of the compressed gas. (813 above)

Another speed which we might consider is the 5200 r.p.m. which the Clubman's Special Scott engine is said to do on the test bed. At this speed the inertia force will be *1600 lbs,* and this is only double the opposing force. Of course when the engine is firing the downward pressure is very much greater, but we have considered the worst possible conditions with the throttle banged shut, or the spark cut.

I think that I am right in saying that it is rare for a Scott engine to crack up suddenly at speed, and when it does it is usually due to piston seizure, resulting in the big end being burst open. Of course cranks sometimes break (generally the disc portion parting clean off at the shank) but this is due to fatigue. Naturally in such a large number of years on Scott repairs we came across several cases, and it mostly happened to riders who used their Scotts for their business and did a big mileage with a heavy load. It usually happened at quite low speed to chaps who were anything but speed merchants.

Now with regard to *supercharging.* Andrews would like to go the whole hog and force the charge in *at 10 lbs boost.* But it is impossible to boost a Scott engine because it has an open exhaust port. That is why Kirk, who knows a thing or two, did not attempt to do it. What would happen to the charge which came through the port at 10 lbs boost? The gas would immediately expand to the surrounding pressure and surplus would go out with the exhaust. How can you pack 833 cc of charge into a 500 cc cylinder with a wide open exhaust?

You would require a totally different exhaust system, such as the D.K.W. where the inlet stays open a good while after the exhaust has closed. As a matter of fact you cannot even fully charge a Scott cylinder whatever sort of blower or supercharger you fit, because the effective stroke only commences when the piston has come up a little way and partly closed the exhaust port. But what you *can* do is to blow in more nearly a full charge than you can get in with the existing arrangement. That much is granted. But the fact that Kirk broke a crank means absolutely nothing in itself.

Just for the sake of argument, suppose you could supercharge a Scott. You would have to start with 1 lb. boost and spend years of development on every part of the engine, cooling system, lubrication, plugs etc. before you could work up to 10 lbs boost. And it would cost a small fortune.

The aero engines we started with in the war had a quite moderate boost. It was not just a case of someone deciding that we would have a higher boost. It was a case of a bit more and then see what happens. Then a bit more strength here, and a bit better material there; costly research and experiment on oils, pumps, rings, pistons, petrols, etc. With many setbacks, but on the whole, steady advance. But in spite of the fact that our very lives were at stake, and the national wealth was being poured out without stint, it took several years to double the boost.

So what about returning to our slogan, *Scott Riders' Practical Problems?* There is plenty of scope. There are hundreds of things which the rider *can* do.

An interesting fact about our aero engines during the war was that although several new designs were tried regardless of expense, as it turned out we should have managed to win the war, probably just as well, without any of them. It was the *steady development* of existing designs which did it. It is development on existing lines which the Scott engine really needs. There is plenty of room for it.

Thanks all the same Andrews for a very stimulating contribution. (I think you have slipped up on the supercharger drive ratio, but that's of no consequence as it does not affect the argument one way or the other).

Way's preference for the Scott, in spite of all its faults, is most interesting. I have heard others say that they don't like control to be too automatic, but like plenty of levers to twiddle. Well there is plenty of twiddling (and fiddling!) on Scotts, bless em!
