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500 SELON NO 11.0 TUNITYC ROYAL THE STATE CINITALIN MOM MOILIUMANO SESOANI AND

tne standard epecial Short Circuit Specially propared "Tullets" irouit Recing events. parts available this owing notes describe the and 500 "Bullet" machines this fact There E indicated by these machines 000 eveilable components various for incorporate available s types of Triels, Scrambles competi 00

### Compression Ratios:

Pistons giving the following ratios ere available

Motos:	500 0.0.	15 To	350 o.o.
8:14 8:14	= =	103.11	62:1 Part
" 39596 17/ " 39597 45/	38504	3545 00	Part No. 37714 " " 40220 " " 35214
17/32" dome. 45/64" dome.	E" dome.	35445 to 8" dome. 12.16	1.9/64" dome. 9/32" dome. 11/32" dome.
Racing on Petrol.  Recing on Petrol (80 octane +) or Petrol,  Benzol.  Racing on Methenol.	Racing on Methanol Standard.	Recing on Petrol (80 octane +) or Petrol Benzol.	Standard 1947/54. Standard 1955.
1. (80)	·	100	

\*These pistons are made of skirts. low expansion alloy and have aplit t

3 by lapping These pistons All other pistons ou) are intended gasket) are heat St treated 000 run with "Y" alloy the mi th heed solid joint skirts made

Syca

E

SThis piston. Petrol) when gasket). when .gives run पंते देख a ratio head of 72:1 il (suitable joint made by made by for lapping reging

olearance: ni gher do th 82000 Quick the nose they acceleration on injtial opening G. इक्षिय द्या विष्ठ BATS 200 Of 05 cams the following the engine. o am (standard on valves) (thus permitting Exhaust They have and a longer Surmedo pure closing final poined Survedo Cirouit LOUE CAL ひせのはたばの closing, tow Byurod samer, Racer) to to lower extra lift 010" from Then accel

Inlet closes, 0 opens 10268 3446 after before af tor before 0000 0000 0000 0000

standard cams g .012" tappet clearance ST VO the following figures:

	350 Bullet	500 Bullet
ast opens	750 before B. D. C.	75° before B.D.C.
Segond 9	30 before T.D.C.	35° after T.D.C.
CLOSES	60° after B.D.C.	70° efter B.D.C.

Inlet

Exhaust

importance bends or One-Day or cancel retios in maximum those the rate of one Close These opening are effect of the condi tions out are ತ್ತರಾಗ್ರಹ therefore beneficial desirable, the the benefit to be speed which they proceed which they proceed the second that they are second to be second to ratio tho quick r.p.m. opening inclines where the real goars can usofully be capleyed and to be above 4,500 r.p.m. special lift and closing points, however, do no pecial cams which is largely in and closing which they provide. Days' comit. recommended 00 quick lift cans Cama acceleration from a spec gained from the mile or ormit. For Trials of the nature of English events where low speed pulling is of paramount are, of course, definitely detrimental. road speed must when short circuit pue ere of doubtful value the course detrimental below ಕ್ರಾಂತ ನಡ fell no t influenced by courses tho is of two per hour increase STVO engine kept always The quick that with many sharp such a nature true picture by the more wider sinco speed. ちたけ Scar under

### Valves and Valve Springs:

strong

bounce. enou gh Bullet" engines recommended. (now.standard) corner between to be opened out but ठ "Bullet" enable enable the peak of the Further lightoning of s can be improved instead of 13" dans do out but the s The high engines the soat ming of valves or troches 754 and prespeed performance of early 1954 and prespeed to the relief of the relief relief to the relief of the reli 0 ere and the fitted with light scat must bo diamoter. valves or fitting stronger springs is by fitting an inlet tho B. H. P. borc curve to Thi s cut wider the does not require the inlivider to suit the valve valves and port carofully radiused. be exceeded previous top di thout the inlet ameter valve t ou

## Carburet ter:

B 74

should The Racers) following The use of always be carried out 81 Ves ere affected table gives n different : an Amal small improvement ð G.P. some the carburetter to arrive extent by opput ordus maximum local (standard on the setting Towod. conditions en d ng giving the best resul the speed. Short Circui Carburet

ttor on fuels.

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	.500 Bullet (S.C:Racer)	500 Bullet (S.C.Racer)	500 Bullet (Scrembles)	or Scrambles	500 Bullet	350 Bullet (S.C.Racer)	350 Bullot (s.c.Racer)	350 Bullet (Sorembles)	350 Bullet (Std. or Scremblos)	350 Bullet (Triels)	Machino	carburetter on unitereme inches
0.1	Methanol	Petrol or Pet-Benzol	Methanol	-	Petrol or	Methanol	Pet-Berwin	Mothanol	Petrol or Pot-Benzol	Petrol	Fuel	on officeron
	<b>ਰ.</b> ਸ	7 G. P.	Std.	are discovered and a	Std.	4 . 6 .	٠ به	Std.	Sta.	Std.	Type of Carb.	TKCTO.
	1.3/16	1.3/16	α;,,		۵ħ.	1.1/16	1.1/16	h-d	. н	15/16	Bore ins.	
	640	250	460		180	530	210	360	140	140	Jet	
	G. P.	G. P. 6	S tt d.		std.	ភ ម	9. p. 6	Sta.	۵ د د د د د د	Std.	Needle	-
	3	22	W	-	N	<b>.</b>	10	V	W	W	Posi tion	Woodl o
	125	109	113	•	Sta.	125	109	113	Std.	s t a	C 0 t	Wandle
ことがい	No. 5	· 6	29/5	}	29/3			6/4	6/4	6/3	Velve	Thro ttle
												!

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engine inlet port will require boring out

carburetter.

The Lucas "Wader" Magneto, fitted standard to Circuit Racing Bullets, not only gives a powerful speeds but is completely waterproof. 6 and reli Trials, able spark Scrambles and at high

be encountered the contact breaker, H.T waterproof as possible with plasticine, should be removed and replaced with a wooden tored the contact breaker, H.T. pic standard machine is bo used insulation pick-up, tho block. dynamo portion of block. If water etc., should be made as tapo, otc. water the is likely

the ev re contect points open with the control in lever which gives the best erolod required and ratio. oxcollent control this sotting when fully Magneto and a setting slightly later T.D.C. for the "350 Bullet" a permanently general plan then timing varies is to find by experiment the position the higher time the engine rotarded results. according to advanced. the compression ratio the less advance is t pus than Check with more advance the fuel used and cak the piston position at this position and then restandard may be din. before T.D.C. of the ignition control desirable, e.g. a let". then the compression is likely unz 6d time to which to bo

## Gear Retios:

acceleration is of partor or two which is at the highest speed engine is running at or tear, will 500 revs. high or importence. two speed of the machine. safe maximum 34 18 points the engine to o Gear. The per minute before be reduced and rel low will reduce running and r.p.m. Choice power at or near the speed giving maximum power. Gears gine speed. On the other particular value it may po and reliability of 01 dop which can be reached on available from exceeds the Scar reaching its Tho rees 0n ratio power should r.p.m. giving meximum curve is ပ်ဝ the engine increase yeo d sui t engine cho sen so hond, and on fast courses wear any depends on gear low course on slow courses where goar low so that at one particular course the that when ω Ή. power Уď tho the Gearing the machine gearing speed at and therefore sodos ordās too hi gh and about

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ತ್ತಾ ಅಂದೆ ತ depend on engine The following spoods, 20 tho power for the higher gear tyre machine. table available Sizes gives got bas puc the road gear ratios. ratios and engine the ability of the speeds corresponding The speeds o ridor abili ty will, 60 reach the different of course,

				1		
38	38	38	. 8	38	38	Rear Spkt
25	25	8	8	8	8	Engine Spkt.
15	14	17	16	15	14	C/shaft Spkt.
5.67:1	6.07:1	6.25:1	6.65:1	7.1:1	7.6:1	Non Gear Ratio
3.25-19 3.50-19 4.00-19	3.25-19 3.50-19 4.00-19	3.25-19 3.50-19 4.00-19	3.25-19 3.50-19 4.00-19	3.25-19 3.50-19 4.00-19	3.25-19 3.50-19 4.00-19	Rear Tyre Size in.
82 080	75 76	774 222	· 68	0000	62	M. C.
988 908 %	81 82 84	78½ 80 82	7774	70 72	8 6 0 0 6 6 0 0	M.P.H. Road Spe Corresponding 6,500
9598	87 88 902	842 862 882	.60 83 08.	76 70	70 71 73	s to
	25 15 5.67:1 {3.25-19 80 86½ 9 85.50-19 81 88 9 90 9	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

Spirit.   Spir	1	A P.	14.4			-			1	1	1		and the second s										1	
Selet.   Ratio   Size   George   Size   Si	46	45	46	\$	\$	\$	8	\$	Rear Spkt.		\$	46		46	\$	, \$	\$	A	Rear Spk t.		38	· 1.	Rear Spkt.	00000
Ratio   Siso   Good	29	29	29	8	29	83	28	23	Engine Spkt.		25	25	25	25	25	25	25	25	Engine Spkt. T.		25	25	Engine Spkt.	
Tatto	22	8	19	18	17	16	15	14	C/shaft Spkt.		21	20	19	<b>L</b> 8	17	16	75	14	C/shaft Spkt.	350	17	. 16	C/shaft Spkt. T.	
\$1.00 \$1.00	4.23:1	43.	67:	4:93:1	22:	5.54:	91:	35:	Top Gear Ratio		91:	2	5. 42:1	72:	6.06:1	•	•	•	Top Gear Ratio	R 500 B	H.	5.32:1	Top Gear Ratio	Belletins of the second or the Bridge Belletins of the second by the second of the sec
COLTES BONDAINS TO COLOR B5 92 92 99 96 96 104 99 105 99 107 942 101 100 105 99 105 99 107 942 100 100 105 99 100 105 99 100 100 100 100 100 100 100 100 100	4.00	\$3.50-19 \$4.00-19		201	V CM	\$3.50-19 4.00-19	\$3.50-19 {4.00-19	₹3.50-19 ₹4.00-19		TOP	3.50	3. 50- 4. 00-	\$3.25-19 \$3.50-19 \$4.00-19	₹3.25-19 ₹3.50-19 ₹4.00-19	\$3.25-19 \$3.50-19 \$4.00-19	3.50-19	3. 50-19 (00-19	(3. 25-19 3. 50-19 (4.00-19	Rear Tyro Siso in.	TET TOP	40.55	DUN	Rear Tyre	3
1000   7,000   7,000   9,000   9,000   10,000	103	98 98	902	85 <u>5</u>	81	-70 100 100	7117777777	67 68			10ing								8	FEAR	90 92 94	*8 657 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Control	
7,000 7,000 101 102 103 104 105 107 107 107 107 108 88 88 88 88 88 88 88 88 88	112	104	101	993	50.3 88	8 8 57.3 133	78 80	73 75	no ad Sp						······································			arabitatigan samburunt tiphiliphiri vil 140			10 25 E	96 96 96	E. Road Sp	
	NI	1163	107	101	95	90		79	to 6,50				97 <u>₹</u> 99	964 94 964 964	872 89 91	84 86	77 782 80	72 73 75	7007		105 107 110	99 101 104	,000	

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for the you of, 500 r.p.m. unnecessary high 6,000 r.p.m. is r represent approximately distance events where it course the combination corresponding advantage at taken as tho p.m. made of The above fitted with any loss in maximum speed. sprockets. r.p.m. . table c.c. which will enable the engine this particular road speed. o safe limit for the 350 c.c. for 500.  $\omega$ tables not likely to be where it r.p.m. the engino. 7111 different the 350 counter These indicato Con Spoed. 644 the speeds other for the 350 Mormally and 6,000 r may gear lower engine speeds r the tak which be desi hand, the ratio should be chosen seasocded for the 350 or cagine speeds will ente r.p.m. for the string maximum psirable to save speeds peeds for any given combination if a reasonable estimate can can be reached on any particular Sear there is d ratio to be used to its 7,000 r.p.m. man ongine and 6,500 e is no point in e SIMONS Save ಶಿಜ್ the etite power. In the engine sprocket road speed CO, since to its or 5,500 entail little the combination 60 may be machine exceeding particular ... p.m. that best H from these Jong

dorp tou can bo t tom usefully quick lift cams are used. determined by chose ာ် **ဝ** Having goar at riddon. below 4,000 when standard coms the correct internal ratios amployed on fixed the slowest point in the In Racing or tho goj speed at gear to suit the maximum such the particular course it is Scremble events which sui t the maximum the slowest part of H. are used and 5,000 r.p.m course should preferably the gearbox. the engine r.p.m. speed likely very important Bottom gear the course מו

sprockets size and internal ratios in the gearst possible different bottom gear ratios, it is impressible that sized table showing the relationship road speed for all the possible hetter gear ratios. geardox, impossible combinations between giving ઇ 192 Sive

6,500 a meximum desirable minimum when negotiating siew sections engine r.p.m. number 3. 50-19" corresponding ratio congine r.p.m. on top or responding to 2,000 following table, however, shows thatio from 7:1 to 25:1. The table and 4.00-19" tyres, not only for a stated when recing or according r.p.m., above may be to circumstances which may be taken not only for 4,000 and 5,000 r.p.m., not only for 4,000 and 5,000 r.p.m., looked upon as the minimum desirable looked upon as the minimum desirable for 5,500, 6,000, ecor). r.p.m. which may be 007 en as desirable maximum (see note affect tho table clse he figures gives mad note above regarding in observed taken SHOWS for ខ្ល every whole the the road

															3					
	25	24	23	22	2	20	19	, 8 Ļ	17	16	<u>5</u>	14	13	12	11	10	9	۵	7	Gear Ratio
	\\\ 3.50-19\\\\ 4.00-19\\\\\	\$3.50-19 \$4.00-19	(3.50-19	{3.50-19}	(3.50-19	(3.50-19	(3.50-19	(3.50-19	{3.50-19	3.50-19 (4.00-19	<pre>{3.50-19 {4.00-19</pre>	{3.50-19 {4.00-19	{3.50-19}	{3.50-19 {4.00-19	{3.50-19 {4.00-19	{3.50-19 {4.00-19	{3.50-19 {4.00-19	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	3.50-19 4.00-19	Rear Tyre Size in.
,	్ట్రోం	.2.2 2.2	7 62	7	777	8 72	ගු හ	\$\f\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	91.9	10	100	HH	122	13	14		171	19	225	2000
	11 22,22 11	13	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	141	15条	15.7 15.7 15.7	163	172	200	10,7	223	222	242	10 Kg	28 25 <u>1</u>	777	44.57	33 85 24 857	46	1000 ad
	2012 P. F.	163.	162	172	182	191	220	222	222	42	200	27 27	30±8±	SUN	33	38 <u>1</u>	422	43	55 55	Speed Co
	172	17差	19%	192	20 20 20	22	222	272 24	223	26 <u>1</u> 27	29	30 31	21 KG 12 KG 13 KG 14 KG	800	39 E	42 432	47	500	60	5500
	1921	192	20. 20.	21.2	222	232	25	22.25	27	29 29 29	400	35	355. 355.	30 30 20 20	445	46	522	572	000	0000 t
	202	212	212	222	24. 24.	25 25 25 25	26 27	28±2	30	32	200	200 200 200 200	38 392	43%	453	55 50	57	60 44 43 44	724	6500 engine
	212	22½ 23	23 <del>2</del> 24	24。	26	27 27 27 27 27 27 27 27 27 27 27 27 27 2	28 29	30 <u>2</u>	322	333 343	1318	392	422	25	50	554	19 60	67 69	77 .	7000
-																				

## Intermediate Gear Ratios:

Having selected the most suitable top and bottom gear ratios the intermediate ratios should be selected to give the most suitable steps. For Racing these should be as eyen as possible unless there are some peculiar features of the course demanding for example an exceptionally low bottom gear at one particular point. For Trials it is desirable to have bottom and second fairly close with a wider jump to third and top. For standard use it is usual to have the widest gap between first and second gear and the closest between third and top.

# Intermediate Gear Ratios cont.):

The following table gives particulars of the alternative gearbox ratios which are available, showing the number of teeth on each pinion and the internal ratio.

								1		.
16	1.4	13	12	Vi	W	2	Н	std.	0	Ref.
. 27	31	30	31	29	27	28	27	ઝ	184	
24 <b>x</b> 21	25 × 21	26 * 21	26 × 21	24 × 22	24 × 22	24 🛪 22	24 × 22	25 x 21	Slider	Number of Teath
Ø	7	17	7	8	8	21	12	Д Э	Top	Teeti
27	17	18	17	19	21	20	21	18	15t	on Geer
22	23	22	22	24	24	24	24	23	2nd	r Pinions Layshaf
10	27	27	27	23	25	26	26	27	3rd	naft
30	以	31	21	28	28	27	27	30	don	
N. +		3.0	3.3	2.13	8	CO	1.65	2.78	Lat	1 1
1.0	1 98	2.15	2.15	1.4	₽. ₽	1.28	1.28	00	2nd	1 2
-	1 1-1	4	1.4	1.18	1.18	1.09	1.09	2.4	pro	Rati
ŀ		1-1	٦	سو	۳	سا	1-1	۲	don	0
gath Kick-	As 12 but higher 2nd.	Standard on Trials Mods.	Wide Ratios.	=======================================		11	Mo K/starter	Standard on Sorambles.		Romarks

The following table, which shows the engine r.p.m. in each gear efter changing up at 6,000 r.p.m. (assuming no drop in road speed), may give a oleanor indication of the steps provided by the alternative sats gear ratios.

16	14	13	12	J	OI.	Ν.	سر	Std.	Ref. Mo.
4570	3580	4250	3890	3930	4670	4280	4570	3910	2nd
4570	4290	3950	3950	5080	5080	5080	5080	4290	3rd
46 30	4230	4230	4230	5070	5070	5520	5520	46 50	Top

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### NOTES ON TUNING ROYAL ENFIELD "350 BULLET" AND "500 BULLET" FOR COMPETITION PURPOSES

### **PART ONE**

These notes were produced by the Enfield Cycle Company in about 1955 or 1956. They were sent to the club library by Farrell Flanagan from Australia, to whom many thanks.

There has been a lot of interest in the trials models and many club members own one. In addition Steve Linsdell's racing exploits have aroused interest in the Bullet's potential in that area.

I intend to reproduce the notes in three parts. This first'one will cover pistons, carns, valves, carburretor and magneto. The other two will deal with gear ratios, for which there are extensive tables.

The following notes describe the special components available for tuning the standard 350 and 500 "Bullet machines for use in various types of competitive events. Specially prepared "Bullets" are available for Scrambles, Trials and Short Circuit Racing events. Where these machines incorporate any of the special parts available, this fact is indicated by a note in the text.

### Compression ratios

Pistons giving the following ratios are available

350c.c.	* 6½	:	, 1	Part	No.	37714	19/64"	dome	Standard 1947/54
	* 71/4	:	1	**	**	40220	9/32"	dome	Standard 1955
	7½	:	1	**	**	35214	11/32"	dome	Racing on petrol
	8½	:	1	** •	**	35445	5/8"	dome	Racing on petrol (80 octane +) or petrolbenzol.
	† 10½	:	1	**	**	35663	11/16"	dome	Racing on Methanol
500c.c.	\$ 6½	:	1	**	"	38504	3/8"	dome	Standard
	7¼'	' :	1						Racing on petrol
	† 8	:	1	**	**	39596	17/32"	dome	Racing on petrol (80 octane +) or petrolbenzol
	† 9½	:	1	**	"	39597	45/64"	dome	Racing on Methanol

### **Notes**

- \* These pistons are made of low expansion alloy and have split skirts.

  All other pistons are heat treated "Y" alloy with solid skirts.
- † These pistons are intended to be run with the head joint made by lapping (no gasket).
- \$ This piston gives a ratio of 7½: 1 (suitable for racing on petrol) when run with the head joint made by lapping (no gasket)

### Cams

Quick lift cams (standard on the Short Circuit Racer) are available for both sizes of engine. They have no quietening ramps, extra lift, higher acceleration on initial opening and final closing, lower acceleration over the nose of the cam (thus permitting higher r.p.m. free from bounce with same springs and valves) and a longer opening period. When set to the marks they give the following opening and closing points at .010" tappet clearance:—

Exhaust opens	820 before B.D.C.
" closes	430 after T.D.C.
Inlet opens	430 before T.D.C.
" closes	700 after B.D.C.

The standard cams at .012" tappet clearance give the following figures:-

	350 Bullet	500 Bullet
Exhaust opens	750 before B.D.C.	750 before B.D.C.
" closes	350 after T.D.C.	350 after T.D.C.
Inlet opens	300 before T.D.C.	400 before T.D.C.
Inlet closes	600 after B.D.C.	70° after B.D.C.

These opening and closing points, however, do not give a true picture of the effect of the special cams which is largely influenced by the more rapid rate of opening and closing which they provide. The quick lift cams are beneficial above 4,500 r.p.m. and detrimental below that speed. They are therefore to be recommended when the course is of such a nature that close ratio gears can be usefully employed and the engine always kept above 4,500 r.p.m. On scrambles or short circuit courses with many sharp bends or steep inclines where the road speed must fall so that wider gear ratios are desirable, the quick life cams are of doubtful value since under these conditions the loss of acceleration from a speed below 4,500 r.p.m. may cancel out the benefit to be gained from the mile or two per nour increase in maximum speed which they permit. For Trials of the nature of English One Day or Scottish Six Days events where low speed pulling is of paramount importance the cams are, of course, definitely detrimental.

### Valves and valve springs

All Bullet engines are fitted with light valves and springs strong enough to enable the peak of the B.H.P. curve to be exceeded without valve bounce. Further lightening of valves or fitting stronger springs is not recommended. The high speed performance of early 1954 and previous "350 Bullet" engines can be improved by fitting an inlet valve 1<sup>7</sup>/8" top diameter (now standard) instead of 1½" diameter. This does not require the inlet port to be opened out, but the seat must be cut wider to suit the valve and the corner between the seat and the bore of the port carefully radiused.

### Carburettor

The use of an Amal G.P. carburretor (standard on the Short Circuit racers) gives a small improvement in maximum power and speed. Carburretor settings are

### 350 OR 500 BULLET TOP GEAR

Rear Spkt. T.	Engine Spkt. T.	C/shaft Spkt. T.	Top Gear Ratio	Rear Tyre Size in.	5500	1.P.H. Re Correspo	oad Spee onding to 6500	d 7000
46	25	14	7.35:1	3.25-19 3.50-19 4.00-19	56½ 57½ 59	62 63 64½	67 68 70	72 73 75
46	25	15	6.86:1	3.25-19 3.50-19 4.00-19	61 61½ 63	66 67 69	72 75 75	77 78½ 80
46	25	16	6.43:1	3.25-19 3.50-19 4.00-19	65 66 67½	70½ 72 74	76½ 78 80	82 84 86
46	25	17	6.06:1	3.25-19 3.50-19 4.00-19	69 70 71½	75 76 78	81 82½ 85	87½ 89 91
46	25	18	5.72:1	3.25-19 3.50-19 4.00-19	72½ 74 76	79 80½ 83	86 87½ 90	92½ 94 96½
46	25	19	5.42:1	3.25-19 3.50-19 4.00-19	77 78 80	83½ 85 87	90½ 92 94½	97½ 99 102
46	25	20	5.15:1	13.50-19 4.00-19	82 84	89½ 92	97 99½	
				3.50-19   4.00-19	86 88½	94 96½	102 104½	

### **500 BULLET TOP GEAR**

	•						
Rear Spkt. T.	Engine Spkt. T.	C/shaft Spkt. T.	Top Gear Ratio	Rear Tyre Size in.	M.P.I Corr 6,000		
46	29	14	6.35:1	13.50-19 14.00-19	67 68	73 75	79 81
46	29	15	5.91:1	3.50-19 4.00-19	71½ 73½	78 80	84½ 87
46	29	16	5.54:1	13.50-19 14.00-19	76 78½	83 85½	90 93
46	29	17	5.22:1	13.50-19 14.00-19	81 83	88 90½	95½ 98½
46	29	18	4.93:1	13.50-19 14.00-19	85½ 88	93½ 96	101 104
46	29	19	4.67:1	3.50-19 14.00-19	90½ 93	99 101	107 110
46	29	20	4.43:1	3.50-19 14.00-19	95½ 98	104 107	113 116
46	29	21	4.23:1	3.50-19 4.00-19	100	109 112	118 121

### PART 2

The above tables can be used in two ways. If the machine is fitted with a rev. counter the table shows the road speed corresponding to different engine speeds for any given combination of sprockets. On the other hand, if a reasonable estimate can be reached on any particular course the table will indicate the gear ratio and sprocket combination which will enable the engine to be used to its best advantage at this particular road speed. 7,000 r.p.m. may be taken as the safe limit for the 350 c.c. engine and 6,500 r.p.m. for the 500 c.c. engine. Normally there is no point in exceeding 6,500 r.p.m. for the 350 and 6,000 r.p.m. for the 500, since these represent approximately the speeds giving maximum power. In long distance events where it may be desirable to save the engine from unnecessary high r.p.m. the gear ratio should be chosen so that 6,000 r.p.m. is not likely to be exceeded for the 350 or 5,500 r.p.m. for the 500. These lower engine speeds will entail little if any loss in maximum speed.

### CONTINUED FROM PART DHE

Bullet. An excellent plan is to time the engine with more advance than is likely to be required and then find by experiment the position of the ignition control lever which gives the best results. Check the piston position at which the contact points open with the control in this position and then re-time to give this setting when fully advanced. The magneto should never be run with the control permanently retarded.

### CONTINUED FROM PART?

The following table, which shows the engine r.p.m. in each gear after changing up at 6,000 r.p.m. (assuming no drop in road speed), may give a clearer indication of the steps provided by the alternative sets of gear ratios.

2nd	3rd	Top
3910	4290	4630
4670	5080	5520
4280	5080	5520
4670	5080	5070
3930	5080	5070
3890	3950	4230
4250	3950	4230
3580	4290	4230
4670	4670	4630
	3910 4670 4280 4670 3930 3890 4250 3580	3910 4290 4670 5080 4280 5080 4670 5080 3930 5080 3890 3950 4250 3950 3580 4290

### NOTES ON TUNING ROYAL ENFIELD "350 BULLET" AND "500 BULLET" FOR COMPETITION PURPOSES

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### PART THREE

Having fixed top gear to suit the maximum speed likely to be usefully employed on the particular course it is very important to choose the correct internal ratios in the gearbox. Bottom gear is determined by the speed at which the slowest part of the course can be ridden. In Racing or Scramble events the engine r.p.m. in bottom gear at the slowest point in the course should preferably not drop below 4,000 when standard cams are used and 5,000 r.p.m. if quick lift cams are used.

Since there are no less than 216 possible combinations of sprockets size and internal ratios in the gear box, giving 192 possible different bottom gear ratios, it is impossible to five a reasonably sized table showing the relationship between engine and road speed for all the possible bottom gear ratios.

The following table, however, shows the figures for every whole number ratio from 7:1 to 25:1. The table gives road speeds for 3.50-19" and 4.00-19" tyres, not only for 4,00 and 5,000 r.p.m., which as stated above may be looked upon as the minimum desirable engine speed when racing or scrambling, but also for 5,500, 6,000, 6,500 and 7,000 r.p.m., which may be taken as desirable maximum engine r.p.m. according to circumstances (see note in part 2 regarding maximum engine r.p.m. on top gear). The table also shows the road speeds corresponding to 2,000 r.p.m. which may be taken as the desirable minimum when negotiating slow sections in observed Trials.

### SPEEDS IN BOTTOM GEAR

Gear Ratio	Rear Tyre	r Tyre Road Speed Corresponding to Engine R.P.M.									
to 1	Size in.	2000	4000	5000	5500	6000	6500	7000			
7	(3.50-19	22	44	55	60	66	71	77			
	(4.00-19	22½	45	56½	62	68	73	79			
8	(3.50-19	19	38½	48	53	57½	62½	67			
	(4.00-19	20	39½	49	54	59	64	69			
9	(3.50-19	17	34	42½	47	51	55½	60			
	(4.00-19	17½	35	44	48	52½	57	61			
10	(3.50-19	15½	31	38½	42	46	50	54			
	(4.00-19	15½	31½	39½	43½	47	51	55			
11	(3.50-19	14	28	35	38½	42	45½	49			
	(4.00-19	14½	28½	36	39½	43	46½	50			
12	(3.50-19	13	25½	32	35	38	41½	45			
	(4.00-19	13	26	33	36	39½	43	46			
13	(3.50-19	12	23½	29½	32½	35½	38	41			
	(4.00-19	12	24	30½	33½	36½	39½	42½			
14	(3.50-19	11	22	27½	30	33	35½	38½			
	(4.00-19	11	22½	28	31	34	36½	39½			
15	(3.50-19	10½	20½	25½	28	31	33	36			
	(4.00-19	10½	21	26½	29	31½	34	37			

Gear Ratio	Rear Tyre				responding	to Engine		
to 1	Size in.	2000	4000	5000	5500	6000	6500	7000
16	(3.50-19	9½	19	24	26½	29	31	33½
	(4.00-19	10	19½	24½	27	29½	32	34½
17	(3.50-19	9	18	22½	25	27	29	31½
	(4.00-19	9½	18½	23	25½	28	30	32½
18	(3.50-19	8½	17	21½	23½	25½	28	30
	(4.00-19	8½	17½	22	24	26	28½	30½
19	(3.50-19 (4.00-19	8 8½	16 16½	20 21	22 23	24 25	26 27	28 29
20	(3.50-19	7½	15½	19	21	23	25	27
	(4.00-19	8	16	19½	22	23½	25½	27½
21	(3.50-19	7½	14½	18½	20	22	24	25½
	(4.00-19	7½	15	19	20½	22½	24½	26
22	(3.50-19 (4.00-19	7 7	14 14½	17½ 18	19 19½	21 21½	22½ 23	24½ 25
23	(3.50-19	6½	13½	16½	18½	20	21½	23½
	(4.00-19	7	13½	17	19	20½	22½	24
24	(3.50-19	6½	13	16	17½	19	21	22½
	(4.00-19	6½	13	16½	18	19½	21½	23
25	(3.50-19	6	12½	15½	17	18½	20	21½
	(4.00-19	6½	12½	16	17½	19	20½	22

### Intermediate Gear Ratios:

Having selected the most suitable top and bottom gear ratios the intermediate ratios should be selected to give the most suitable steps. For racing these should be as even as possible unless there are some peculiar features of the course demanding for example an exceptionally low bottom gear at one particular point. For Trials it is desirable to have bottom and second fairly close with a wider jump to third and top. For standard use it is usual to have the widest gap between first and second gear and the closest between third and top.

The following table gives particulars of the alternative gearbox ratios which are available, showing the number of teeth on each pinion and the internal ratio.

	Num	ber of Tee	th on	Gear 1	Pinions							
Ref.	Mainshaft			Layshaft				li	nternal l	Ratio		Remarks
No.	lst	Slider	Top	1 st	2nd	3rd	Top	1st	2nd	3rd	Top	
d.	30	25 x 21	18	18	23	27	30	2.78	1.8	1.3.		Standard on Scrambles
	27	24 x 22	21	21	24	26	27	1.65	1.28	1.09	1	No K/starter
	28	24 x 22	21	20	24	26	27	1.8	1.28	1.09	1	
	27	24 x 22	20	21	24	26	28	1,8	1.4	1.18	1	"
	29	24 x 22	20	19	24	26	28	2.13	1.4	1.18	1	
	31	26 x 21	17	17	22	27	31	3.3	2.15	1.14	1	Wide Ratios
	30	26 x 21	17	18	22	27	31	3.0	2.15	1.4		Standard on Trial Mods.
	31	25 x 21	17	17	23	27	31	3.3	1.98	1.4	1	As 12 but higher 2nd
İ	27	24 x 21	18	21	24	27	30	2:14	1:67	1:3		Close Ratio with Kick stärter

### NOTES ON TUNING ROYAL ENFIELD "350 BULLET" AND "500 BULLET" FOR COMPETITION PURPOSES

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### PART THREE

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The following table, however, shows the figures for every whole number ratio from 7:1 to 25:1. The table gives road speeds for 3.50-19" and 4.00-19" tyres, not only for 4,00 and 5,000 r.p.m., which as stated above may be looked upon as the minimum desirable engine speed when racing or scrambling, but also for 5,500, 6,000, 6,500 and 7,000 r.p.m., which may be taken as desirable maximum engine r.p.m. according to circumstances (see note in part 2 regarding maximum engine r.p.m. on top gear). The table also shows the road speeds corresponding to 2,000 r.p.m. which may be taken as the desirable minimum when negotiating slow sections in observed Trials.

### SPEEDS IN BOTTOM GEAR

Gear Ratio	Rear Tyre										
to 1	Size in.	2000	4000	5000	5500	6000	6500	7000			
7	(3.50-19	22	44	55	60	66	71	77			
	(4.00-19	22½	45	56½	62	68	73	79			
8	(3.50-19	19	38½	48	53	57½	62½	67			
	(4.00-19	20	39½	49	54	59	64	69			
9	(3.50-19	17	34	42½	47	51	55½	60			
	(4.00-19	17½	35	44	48	52½	57	61			
10	(3.50-19	15½	31	38½	42	46	50	54			
	(4.00-19	15½	31½	39½	43½	47	51	55			
11	(3.50-19	14	28	35	38½	42	45½	49			
	(4.00-19	14½	28½	36	39½	43	46½	50			
12	(3.50-19	13	25½	32	35	38	41½	45			
	(4.00-19	13	26	33	36	39½	43	46			
13	(3.50-19	12	23½	29½	32½	35½	38	41			
	(4.00-19	12	24	30½	33½	36½	39½	42½			
14	(3.50-19 (4.00-19	11	22 22½	27½ 28	30 31	33 34	35½ 36½	38½ 39½			
15	(3.50-19	10½	20½	25½	28	31	33	36			
	(4.00-19	10½	21	26½	29	31½	34	37			

Gear Ratio	Rear Tyre		Road S		responding	to Engine	R.P.M.	
to J	Size in.	2000	4000	5000	5500	6000	6500	7000
16	(3.50-19	9½	19	24	26½	29	31	33½
	(4.00-19	10	19½	24½	27	29½	32	34½
17	(3.50-19	9	18	22½	25	27	29	31½
	(4.00-19	9½	18½	23	25½	28	30	32½
18	(3.50-19	8½	17	21½	23½	25½	28	30
	(4.00-19	8½	17½	22	24	26	28½	30½
19	(3.50-19	8	16	20	22	24	26	28
	(4.00-19	8½	16½	21	23	25	27	29
20	(3.50-19	7½	15½	19	21	23	25	27
	(4.00-19	8	16	19½	22	23½	25½	27½
21	(3.50-19	7½	14½	18½	20	22	24	25½
	(4.00-19	7½	15	19	20½	22½	24½	26
22	(3.50-19	7	14	17½	19	21	22½	24½
	(4.00-19	7	14½	18	19½	21½	23	25
23	(3.50-19	6½	13½	16½	18½	20	21½	23½
	(4.00-19	7	13½	17	19	20½	22½	24
24	(3.50-19	6½	13	16	17½	19	21	22½
	(4.00-19	6½	13	16½	18	19½	21½	23
25	(3.50-19	6	12½	15½	17	18½	20	21½
	(4.00-19	6½	12½	16	17½	19	20½	22

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No.	1st	Slider	Top	1st	2nd	3rd	Top	1st	2nd	3rd	Top	
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	27	24 x 22	21	21	24	26	27	1.65	1.28	1.09	1	No K/starter
	28	24 x 22	21	20	24	26	27	1.8	1.28	1.09	1	
	27	24 x 22	20	21	24	26	28	1,8	1.4	1.18	1	
	29	24 x 22	20	19	24	26	28	2.13	1.4	1.18	1	
	31	26 x 21	17	17	22	27	31	3.3	2.15	1.14	1	Wide Ratios
	30	26 x 21	17	18	22	27	31	3.0	2.15	1.4		Standard on Trial Mods.
	31	25 x 21	17	17	23	27	31	3.3	1.98	1.4	1	As 12 but higher 2nd
	27	24 x 21	18	21	24	27	30	2:14	1:67	1:3		Close Ratio with Kick starter