INDEX

U.S.A. MODELS

HOME AND STANDARD EXPORT MODELS:

MODEL A65 LIGHTNING (650 c.c.)

PISTON

Material	"Lo-Ex" aluminium alloy	
Compression ratio	9·0 : 1	
Clearance:		
(bottom of skirt)	0·0039—0·0054″	(0·0990—0·137 mm.)
(top of skirt)	0·0094—0·0109″	(0·2387—0·2768 mm.)
(*both measured on major axis*)		
Gudgeon pin hole diameter	·750—·7502″	(19·05—19·055 mm.)

PISTON RINGS

Material	Cast-iron	
Compression rings — lower compression ring is tapered to same dimensions:		
Width	·0615—·0625″	(1·5621—1·5875 mm.)
Thickness	·114—·121″	(2·9972—3·0734 mm.)
Clearance in groove	·001—·003″	(·0254—·0762 mm.)
Fitted gap	·008—·013″	(·2032—·3302 mm.)
Oil control ring:		
Width	·124—·125″	(3·1496—3·175 mm.)
Thickness	·114—·121″	(2·9972—3·0734 mm.)
Clearance in groove	·001—·003″	(·0254—·0762 mm.)
Fitted gap	·008—·013″	(·2032—·3302 mm.)

GUDGEON PIN

Material	Nickel-chrome high tensile steel	
Diameter	·750—·7502″	(19·05—19·055 mm.)
Length	2·368—2·373″	(60·147—60·275 mm.)

SMALL-END BUSH

Material	Phosphor-bronze	
Outside diameter (before fitting)	·8775—·8785″	(22·2885—22·3139 mm.)
Length	·940—·950″	(23·876—24·130 mm.)
Finished bore (fitted)	·7503—·7506″	(19·0576—19·0652 mm.)
Interference fit in rod	·002—·004″	(·0508—·1016 mm.)

CONNECTING RODS

Length between centres	6·0″	(152·394 mm.)
Big-end bearing type	Vandervell VP/D2	
Rod side clearance	·024″	(·6049 mm.)
Bearing diametrical clearance	·001—·0025″	(·0254—·0635 mm.)
Small-end bore diameter	·8745—·8755″	(22·212—22·237 mm.)

CRANKSHAFT

Type	One-piece forged, two-throw crank with bolt-on flywheel.	
Main bearing (drive-side)	Hoffman RM11L (roller)	
Journal diameter	1·125″	(28·574 mm.)
Outer diameter	2·812″	(71·435 mm.)
Width	·812″	(20·637 mm.)
Main bush (gear-side):		
Inner diameter	1·5000—1·5005″	(38·10—38·113 mm.)
Outer diameter	1·6245—1·6255″	(41·262—41·288 mm.)
Width	·940—·960″	(23·876—24·384 mm.)
Crankpin diameter	1·6865—1·687″	(42·837—42·849 mm.)
Minimum regrind	—·010″	(·254 mm.)
Second regrind	—·020″	(·508 mm.)
Third regrind	—·030″	(·762 mm.)
Gear-side journal regrind (two only)	—·010″	(·254 mm.)
	—·020″	(·508 mm.)
Crankshaft end-float	·0015—·003″	(·038—·076 mm.)
Crank throw	1·4567″	(37·00 mm.)

OIL PUMP

Pump body material	Zinc-base alloy	
Pump type	Double gear	
Pump drive ratio	1 : 3	
Pump non-return valve spring free length	·8125″	(20·637 mm.)
Pump non-return valve ball, size	¼″	(6·35 mm.)
Oil pressure relief valve spring free length	·609″	(15·478 mm.)
Oil pressure releief valve ball, size	$\frac{5}{16}$″	(7·937 mm.)
Blow-off pressure	50 lbs. per square inch	
(1970) Oil pressure relief valve spring free length	1·370″	(34·798 mm.)

VALVES

Seat angle (inclusive)	90°	
Head diameter:		
(inlet)	1·595—1·60″	(40·513—40·64 mm.)
(exhaust)	1·407—1·412″	(35·737—35·864 mm.)
Stem diameter:		
(inlet)	·3095—·310″	(7·861—7·874 mm.)
(exhaust)	·309—·3095″	(7·848—7·861 mm.)

VALVE GUIDES

Material	Hidural 5	
Bore diameter (inlet and exhaust)	·312—·313″	(7·9248—7·950 mm.)
Outside diameter (inlet and exhaust)	·5005—·501″	(12·7127—12·7254 mm.)
Length (inlet and exhaust)	1·96—1·97″	(49·784—50·038 mm.)
Clearance on valve stem:		
(inlet)	0·002—0·0035″	(0·0508—0·0889 mm.)
(exhaust)	0·0025—0·004″	(0·0635—0·1016 mm.)

VALVE SPRINGS

Free length:		
(inner)	$1\frac{7}{16}$"	(36·512 mm.)
(outer)	$1\frac{3}{4}$"	(44·45 mm.)
Fitted length:		
(inner)	1·277"	(33·00000 mm.)
(outer)	1·37"	(34·798 mm.)

VALVE TIMING (Sports Camshaft)

Tappets set to ·015" (·381 mm.) for checking purposes only:	
Inlet opens	51° b.t.d.c.
Inlet closes	68° a.b.d.c.
Exhaust opens	78° b.b.d.c.
Exhaust closes	37° a.t.d.c.

TIMING GEAR

Crankshaft pinion:		
Number of teeth	22	
Fit on shaft	—·0005" +·0005"	(·0127 mm.)
Camshaft pinion:		
Number of teeth	44	
Interference fit	·0000—·001"	(·0254 mm.)
Idler pinion:		
Number of teeth	44	
Spindle dimensions , both ends	·6875—·6870"	(17·449—17·463 mm.)
Bush dimensions, both (inside)	·6885—·6880"	(17·475—17·488 mm.)
Bush dimensions, both (outside)	·939—·940"	(23·851—23·876 mm.)
Spindle working clearance	0·0005—0·0015"	(·0127—·0381 mm.)

TAPPET CLEARANCE (Cold)

Inlet	·008"	(·2032 mm.)
Exhaust	·010"	(·254 mm.)

IGNITION TIMING (Standard Ignition System)

Piston position (b.t.d.c.) full advanced	·304"	(7·216 mm.)
Crankshaft position (b.t.d.c.) full advanced	34°	
Contact breaker gap setting	·015"	(·381 mm.)

CAMSHAFT

Journal diameter:		
(left)	·810—·8105″	(20·574—20·586 mm.)
(right)	·8735—·874″	(22·188—22·2 mm.)
End float	Nil (spring-loaded)	
Cam lift	·306″	(7·772 mm.)
Base circle diameter	·812″	(20·624 mm.)

CAMSHAFT BEARING BUSHES

Bore diameter, fitted (left-hand)	·8115—·8125″	(20·612—20·637 mm.)
Outside diameter (left-hand)	·906—·907″	(23·012—23·037 mm.)
Interference fit in case (left-hand)	·002—·004″	(·0508—·1016 mm.)
Bore diameter, fitted (right-hand)	·875—·876″)	(22·225—22·25 mm.)
Outside diameter (right-hand)	1·065—1·066″	(27·051—27·076 mm.)
Interference fit in case (right-hand)	·002—·004″	(·0508—·1016 mm.)
Material	"Clevite 10" and bronze	

CYLINDER BARREL

Material	Cast-iron (close grained)	
Bore size (standard)	2·9521—2·9530″	(74·983—75·0062 mm.)
Maximum oversize	2·9921—2·9930″	(75·999—76·022 mm.)
Tappet bore size	·3745—·375″	(9·5123—9·525 mm.)
Stroke	74 mm.	

TAPPETS

Material	20 carbon steel body (stellite tipped)	
Tip radius	1·250″	(31·75 mm.)
Tappet diameter	·3735—·375″	(9·488—9·5 mm.)
Clearance in barrel	·0005—·0015″	(·0127—·0381 mm.)

CYLINDER HEAD

Material	DTD424 aluminium alloy (B.S.)	
Inlet port size	1½″	(38·1 mm.)
Exhaust port size	1 5/16″	(33·337 mm.)
Valve seatings	Cast-iron (cast-in)	

INLET BALANCE PIPE

Length	4″	(101·6 mm.)
Bore diameter	7/32″	(5·56 mm.)

CARBURETTER (Concentric) A65 Lightning

Type	Amal R930/34 (right-hand, concentric) Amal L930/35 (left-hand, concentric)	
Main jet	190	
Pilot jet	20	
Needle jet size	·106″	(2·6924 mm.)
Needle position	1	
Throttle valve	3	
Nominal choke size	30 mm.	
Air cleaner type	Dry surgical gauze	
Throttle slide return spring	3″ (free length)	(76·2 mm.)
Air slide return spring	2¾″ (free length)	(69·8 mm.)

CLUTCH

Type	Multi-plate with built-in cush drive	
Number of plates:		
Driving (bonded)	6	
Driven (plain)	6	
Driving plate segments:		
Number	288	
Overall thickness	·140—·145″	(3·556—3·683 mm.)
Clutch springs	3	
Free length	1-13/16″	(46·03 mm.)
Working coils	9½	
Spring rate	113 lbs. per inch	
Clutch sprocket:		
Number of teeth	58	
Bore diameter	1·8745—1·8755″	(47·612—47·638 mm.)
Clutch hub bearing diameter	1·3733—1·3743″	(34·882—34·907 mm.)
Clutch roller diameter (20)	·2495—·250″	(6·337—6·35 mm.)
Clutch roller length	·231—·236″	(5·8674—5·994 mm.)

SPROCKETS

Number of teeth:		
Engine sprocket	28	
Clutch sprocket	58	
Final drive sprocket	20 solo (18 sidecar)	

PRIMARY CHAIN

⅜″ triple roller (80 links)

CLUTCH OPERATING ROD

Length	11 1/16″	(280·987 mm.)
Diameter	7/32″	(5·5562 mm.)

GEARBOX

	Top	Third	Second	First
Internal ratios (standard)	1 : 1	1·144 : 1	1·60 : 1	2·51 : 1
Overall ratios (standard)	4·87 : 1	5·57 : 1	7·79 : 1	12·23 : 1

(*see page GD00 for alternative ratios*)

GEAR DETAIL

Mainshaft top gear:		
Bush diameter (fitted)	·813—·814″	(20·6502—20·6756 mm.)
Bush length	3⅛″	(79·375 mm.)
Bush protrusion	31/64″	(12·3031 mm.)
Working clearance	·0027—·0042″	(·0685—·1066 mm.)
Layshaft first gear:		
Bush diameter (fitted)	·7495—·7505″	(19·0273—19·0627 mm.)
Working clearance	·0005—·001″	(·0127—·0254 mm.)
Gearbox shafts:		
Mainshaft left-hand end diameter	·8098—·8103″	(20·568—20·581 mm.)
Mainshaft right-hand end diameter	·7495—·7499″	(19·047—19·057 mm.)
Length	10⅝″	(269·875 mm.)
Layshaft left-hand end diameter	·7495—·750″	(19·057—19·05 mm.)
Layshaft right-hand end diameter	·7495—·750″	(19·057—19·05 mm.)
Length	6-11/16″	(169·862 mm.)

GEARBOX BEARINGS

Mainshaft top gear bearing	2½ × 1¼ × ⅝″ ball journal
Mainshaft bearing right-side	¾ × 1⅞ × 9/16″ ball journal
Layshaft bearing left side	1 × ¾ × ¾ needle roller
Layshaft bearing right-side	1 × ¾ × ¾″ needle roller

KICKSTART RATCHET

Pinion bore diameter	·937—·938″	(13·799—23·825 mm.)
Bush (outside diameter)	·933—·935″	(23·698—23·749 mm.)
Bush (inside diameter)	·750—·751″	(19·05—19·0754 mm.)
Outside working clearance	·002—·005″	(·0508—·127 mm.)
Inner working clearance	·0001—·0015″	(·00254—·0381 mm.)
Ratchet spring free length	½″	(12·70 mm.)

GEAR SELECTOR QUADRANT

Plunger diameter	·3352—·3362″	(8·514—8·539 mm.)
Housing diameter	·3427—·3437″	(8·7045—8·729 mm.)
Working clearance	·0065—·0085″	(·1651—·2159 mm.)

CAM PLATE PLUNGER

Plunger diameter	·4355—·4365″	(11·0617—11·0871 mm.)
Housing diameter	·437—·4375″	(11·0998—11·1125 mm.)
Working clearance	·0005—·002″	(·0127—·508 mm.)
Spring free length	2¼″	(57·15 mm.)

FRAME AND FITTINGS

STEERING HEAD

Number of steel balls	40	
Diameter of balls	¼″	(6·35 mm.)

SWINGING ARM FORK

Bush type	Clevite 10	
Housing diameter	1·562—1·561″	(29·6748—29·6794 mm.)
Spindle diameter	0·5585—0·5625″	(14·1859—14·2875 mm.)
Spacer tube outer diameter	0·807—0·817″	(20·4978—20·7518 mm.)
Spacer tube length	6·635—6·633″	(168·529—168·478 mm.)
Bobbin outer diameter	1·4445—1·4450″	(36·6903—36·703 mm.)
Bush bore (fitted)	1·4455—1·4475″	(36·7157—36·7665 mm.)
Clearance	0·003—0·0005″	(0·0762—0·0127 mm.)

REAR SHOCK ABSORBERS

Type	Coil-spring hydraulically damped	
Springs:		
Fitted length (solo)	9·4″	(238·76 mm.)
Fitted length (sidecar)	9·4″	(238·76 mm.)
Spring rate:		
(solo)	90 lb. per inch	
(sidecar)	110 lb. per inch	

FRONT FORKS

Type	Coil-spring hydraulically damped	
Springs:		
Free length (solo)	10″	(254 mm.)
Free length (sidecar)	10½″	(266·7 mm.)
Spring rate (solo)	34 lb. per inch	
Spring rate (sidecar)	50 lb. per inch	
Number of coils (solo)	21 (19½ working)	
Number of coils (sidecar)	19 (17½ working)	
Colour code (solo)	Green/red	
Colour code (sidecar)	Yellow	

BUSHES

Material	Sintered bronze	
Outer diameter:		
(top)	1·498—1·499″	(38·49—38·074 mm.)
(bottom)	1·4935—1·4945″	(35·648—35·674 mm.)
Inner diameter:		
(top)	1·3065—1·3075″	(33·185—33·21 mm.)
(bottom)	1·2485—1·2495″	(31·7—31·73 mm.)
Working clearance:		
(top)	0·0035—0·0050″	(·0889—·127 mm.)
(bottom)	0·0035—0·0065″	(·0889—·1651 mm.)
Length:		
(top)	1″	(25·4 mm.)
(bottom)	0·870—0·875″	(22·098—22·225 mm.)
Shaft diameter	1·3025—1·3030″	(25·463—25·476 mm.)
Sliding tube bore diameter	1·498—1·500″	(38·049—38·1 mm.)

WHEELS, BRAKES AND TYRES

WHEELS

Rim size and type:	
(front)	WM2–19
(rear)	WM3–18
Spoke sizes:	
Front right-hand (20)	8/10 s.w.g. × 4-11/16″
Front left-hand (20)	8/10 s.w.g. × 5⅝″
Rear right-hand (20)	10 s.w.g. × 7 7/16″
Rear left-hand (20)	10 s.w.g. × 7⅜″

WHEEL BEARINGS (4)

Front (left- and right-hand)	Hoffman 120	
Front wheel bearings, size	20–47–14 mm.	
Rear (left- and right-hand)	Hoffman LS90R	
Rear wheel bearings, size	⅞ × 2 × 9/16″	
Rear brake drum	Hoffman 125	
Rear brake drum, size	25–52–15 mm.	
Spindle diameter:		
(front)	0·7868—0·7873″	(19·98—19·997 mm.)
(rear)	0·685—0·686″	(17·399—17·424 mm.)

REAR WHEEL SPROCKET

Number of teeth	47
Chain size:	
(solo)	⅝″ × ⅜″ × 106L
(sidecar)	⅝″ × ⅜″ × 103L

BRAKES

Front:		
Diameter	8″	(203·2 mm.)
Width	1⅝″	(41·275 mm.)
Lining thickness	$\frac{3}{16}$″	(4·702 mm.)
Lining area, sq. in. (sq. cm.)	25·6	(165·0)
Rear:		
Diameter	7″	(177·8 mm.)
Width	1⅛″	(28·575 mm.)
Lining thickness	$\frac{3}{16}$″	(4·702 mm.)
Lining area, sq. in. (sq. cm.)	16·5	(106·425)

TYRES

Size:		
(front)	3·50 × 19″	
(rear)	4·00 × 18″	
Pressure:		
(front)	18 lbs. per sq. in.	(1·221 atm)
(rear)	20 lbs. per sq. in.	(1·36 atm)

ELECTRICAL EQUIPMENT (12 volt)

Alternator, type	Lucas RM19	
Zener diode	Lucas ZD715	
Rectifier	Lucas 2DS506	
Coils (2)	Lucas MA12	
Contact breaker	Lucas 6CA	
Battery (12 volt)	Lucas PUZ5A	
Horn	6H (12 volt)	
Bulbs:	Number	Type
Headlight	Lucas 446	50/40 watt
Parking light	Lucas 989	6 watt
Stop/tail light	Lucas 380	21/6 watt
Speedometer light	Smiths	2·2 watt
Headlight main beam indicator bulb	Lucas	2 watt
Oil pressure warning light	Lucas	2 watt

SPARK PLUGS

Type	Champion N3	
Gap setting	·025″	(·635 mm.)
Thread size	14 mm. diameter ×	19 mm. reach

CAPACITIES

Fuel tank	2 galls./2·4 U.S.	(9 litres)
Fuel tank (to order only)	4 galls./4·8 U.S.	(18 litres)
Oil tank	5 pints	(3 litres)
Gearbox	⅞-pint	(490 c.c.)
Primary drive (approximate)	¼-pint	(140 c.c.)
Front forks (each leg)	1/3-pint	(190 c.c.)

BASIC DIMENSIONS

Wheelbase	56″	(142·2 cm.)
Overall length	85¼″	(216·5 cm.)
Overall width	30″	(76·2 cm.)
Overall height:		
(Western handlebars)	44″	(111·8 cm.)
(standard handlebars)	40½″	(102·8 cm.)
Ground clearance (unladen)	8″	(20·3 cm.)

WEIGHTS

Machine (unladen)	391 lbs.
Engine/gearbox unit (less carburetters)	138 lbs.

MODEL A65 LIGHTNING (650 c.c.)

(HOME AND STANDARD EXPORT)

All general data is the same as data given for A65 Lightning (U.S.A.) model, except for the following:—

GEARBOX

Standard ratios as for A65 Lightning (U.S.A.) model:

	Top	Third	Second	First
Internal ratios (close ratio)	1 : 1	1·10 : 1	1·47 : 1	2·03 : 1
Overall ratios (close ratio)	4·87 : 1	5·36 : 1	7·16 : 1	9·89 : 1

(*see page* GD16 *for alternative ratios*).

WHEELS

Front tyre 3·25 × 19″ (ribbed)
Rear wheel and tyre, as for A65 Lightning

ELECTRICAL EQUIPMENT

Bulbs:	Number	Type
Headlight (France)	As A65 Lightning (U.S.A.)	
Headlight (Continental)	Lucas SS700P	50/40 watt

CAPACITIES

Fuel tank	4 gallons	(18 litres)

MODEL A65 THUNDERBOLT (650 c.c.)

All general data is the same as data given for the A65 Lightning (U.S.A.) model, except for the following:—

CARBURETTER (Concentric) A65 Thunderbolt

Type	Amal R928/2 (right-hand, concentric)	
Main jet	230	
Pilot jet	20	
Needle jet size	·106″	(2·6924 mm.)
Needle position	1	
Throttle valve	3½	
Nominal choke size	28 mm.	
Air cleaner type..	Dry surgical gauze	

SPARKING PLUGS .. .. Champion N4

INLET MANIFOLD

Carburetter port size	1⅛″	(28·575 mm.)
Cylinder head port size	1 1/16″	(26·987 mm.)

HOME MODELS

CAPACITIES

Fuel tank	4 gallons	(18 litres)

ELECTRICAL EQUIPMENT .. .. As for A65 Lightning (Home and standard Export models)

FIREBIRD SCRAMBLER (650 c.c.)

All general data is the same as data given for the A65 Lightning (U.S.A.) model, except for the following:—

CARBURETTER (Concentric) Firebird Scrambler

Type	Amal R930/34 (right-hand, concentric) Amal L930/35 (left-hand, concentric)	
Main jet	190	
Pilot jet	25	
Needle jet	·106″	(2·6924 mm.)
Needle position	3	
Throttle valve	2½	
Nominal choke size	30 mm.	
Air cleaner type	Dry surgical gauze	

ELECTRICAL EQUIPMENT (1968)

Same as Lightning (U.S.A.) model except provision is made for fitting a capacitor for competition purposes.

SPARK PLUGS

Type	Champion N3	
Gap setting	·025″	(·635 mm.)
Thread size	14 mm. diameter × 19 mm. reach	

MODEL A50 ROYAL STAR (500 c.c.)

All general data is the same as data given for the A65 Lightning (U.S.A.) model, except for the following:—

PISTON

Compression ratio	9·0 : 1	
Clearance:		
(bottom of skirt)	·0015—·0029″	(·0381—·07366 mm.)
(top of skirt)	·0040—·0055″	(·1016—·1370 mm.)
(both measured on major axis)		
Gudgeon pin hole diameter	·7498—·7500″	(19·0444—19·050 mm.)

PISTON RINGS

Compression ring, lower ring is tapered to same dimensions:		
Width	·0615—·0625″	(1·5621—1·5875 mm.)
Thickness	·098—·104″	(2·489—2·6416 mm.)
Clearance in groove	·002″	(·0508 mm.)
Fitted gap	·007—·012″	(·178—·3084 mm.)
Oil control ring:		
Width	·124—·125″	(3·1496—3·175 mm.)
Thickness	·098—·104″	(2·489—2·6416 mm.)
Clearance in groove	·002″	(·0508 mm.)
Fitted gap	·007—·012″	(·178—·3048 mm.)

GUDGEON PIN

Material	Nickel-chrome high tensile steel	
Fit in small-end (clearance)	·001—·0006″	(·00254—·01525 mm.)
Diameter	·750—·7502″	(19·05—19·055 mm.)
Length	2·198—2·208″	(55·73—56·083 mm.)

VALVES

Head diameter:		
(inlet)	1·450—1·455″	(36·83—36·957 mm.)
(exhaust)	1·312—1·317″	(33·325—33·452 mm.)

CYLINDER BARREL

Bore size (standard)	2·578—2·579″	(65·481—65·506 mm.)
Maximum oversize	2·618—2·619″	(66·497—66·522 mm.)

CYLINDER HEAD

Inlet port size	$1\frac{5}{16}$″	(33·337 mm.)
Exhaust port size	1-7/32″	(30·956 mm.)

INLET MANIFOLD

Carburetter port size	1″ diameter	(25·4 mm.)
Cylinder head port size	15/16″ diameter	(23·8125 mm.)

CARBURETTER (Concentric) A50 Royal Star

Type	Amal R626/19 (right-hand, concentric)	
Main jet	200	
Pilot jet	25	
Needle jet size	·106″	(2·6924 mm.)
Needle position	2	
Throttle valve	3½	
Nominal choke size	26 mm.	
Air cleaner type	Dry surgical gauze	

VALVE TIMING (Standard Camshaft)

Tappets set to ·015″ (·381 mm.) for checking purposes only:

Inlet opens	40° b.t.d.c.
Inlet closes	60° a.b.d.c.
Exhaust opens	65° b.b.d.c.
Exhaust closes	35° a.t.d.c.

SPARK PLUGS

Type	Champion N4	
Gap setting	·025″	(·635 mm.)
Thread size	14 mm. diameter × 19 mm. reach	

SPROCKETS

Final drive sprocket:

(solo)	18 teeth
(sidecar)	17 teeth

GEARBOX

	Top	Third	Second	First
Overall ratios (standard)	5·41 : 1	6·19 : 1	8·65 : 1	13·58 : 1

(see page GD00 *for alternative ratios)*

REAR CHAIN

Chain size	⅝″ × ⅜″ × 105L

MODEL A50 ROYAL STAR (500 c.c.)

(HOME AND STANDARD EXPORT)

All general data is the same as data given for the A50 Royal Star (U.S.A.) model, except for the following:—

ELECTRICAL EQUIPMENT	As A65 Lightning (Home and standard Export model)

CAPACITIES

Fuel tank	4 gallons	(18 litres)

SPEEDOMETER GEARS

As fitted to all models with "Quick Release" Hubs and 47-tooth Rear Wheel Sprocket.

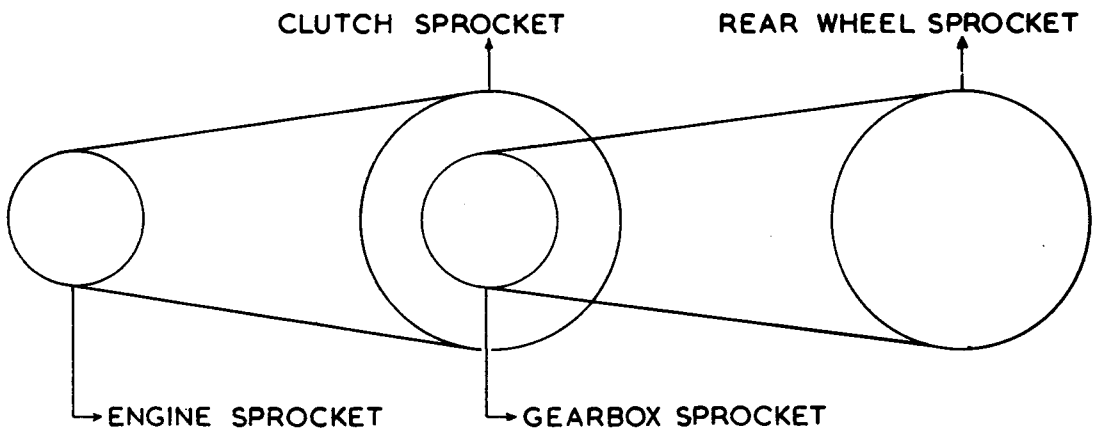
Speedometer Gearbox Ratio	Rear Tyre Size
2—1	4.00 × 18

GEARBOX RATIOS

Standard and Close Ratio Gears available for models with "Quick Release" Hubs, all with 28-tooth Engine, 58-tooth Clutch, and 47-tooth Rear Wheel Sprockets.

GEARBOX SPROCKET				17	18	20	21
INTERNAL RATIO	1:0	STANDARD GEARS	Top	5.73	5.41	4.87	4.63
	1.144		Third	6.56	6.19	5.57	5.29
	1.60		Second	9.17	8.65	7.79	7.41
	2.51		First	14.38	13.58	12.23	11.62
INTERNAL RATIO	1.0	CLOSE RATIO GEARS	Top	5.73	5.41	4.87	4.63
	1.10		Third	6.30	5.95	5.36	5.09
	1.47		Second	8.42	7.95	7.16	6.80
	2.03		First	11.63	10.98	9.89	9.39

FINDING THE RATIO



To find the gear ratios of a machine, calculate the top gear as follows:—

Divide the number of teeth on the clutch sprocket by the number of teeth on the engine sprocket and multiply the result by the number of teeth on the rear wheel sprocket, divided by the number of teeth on the gearbox sprocket, as example:—

$$\frac{\textit{clutch sprocket}\ (43)}{\textit{engine sprocket}\ (17)} \times \frac{\textit{rear wheel sprocket}\ (42)}{\textit{gearbox sprocket}\ (19)} = \frac{1806}{323} = 5.591$$

To find the intermediate gear ratio, multiply the overall top gear by the internal gear ratio concerned, as example:—

top gear 5.591 *or* 5.6 × *bottom gear internal ratio* 2.58 = 14.4 *bottom gear overall ratio*

$$\text{Gearbox internal ratio} = \frac{\textit{layshaft gear}}{\textit{mainshaft gear}} \times \frac{\textit{mainshaft top gear}}{\textit{layshaft top gear}}$$

as example:—

$$\frac{(\textit{layshaft}\ 3\text{rd})\ 22\text{T}}{(\textit{mainshaft}\ 3\text{rd})\ 26\text{T}} \times \frac{(\textit{mainshaft top})\ 23\text{T}}{(\textit{layshaft top})\ 17\text{T}} = 1.144$$

(see FIG. B50 to identify gears)

MODEL A50 AND A65
PISTON DISPLACEMENT AND CRANKSHAFT DEGREES

Degrees	Piston Displacement		Degrees	Piston Displacement		Degrees	Piston Displacement	
	Inches	mm.		Inches	mm.		Inches	mm.
1	.0001	.00254	16	.0697	1.7703	31	.2559	6.499
2	.0010	.0254	17	.0793	2.01422	32	.2711	6.885
3	.0024	.06096	18	.0880	2.2352	33	.2876	7.305
4	.0043	.1092	19	.0980	2.4892	34	.3045	7.7343
5	.0067	.17018	20	.1084	2.7533	35	.3218	8.1737
6	.0098	.2489	21	.1194	3.0427	36	.3395	8.6233
7	.0134	.34036	22	.1307	3.3197	37	.3577	9.0855
8	.0175	.4445	23	.1427	3.6245	38	.3760	9.5504
9	.0224	.56896	24	.1551	3.9395	39	.3950	10.033
10	.0274	.69596	25	.1679	4.2646	40	.4143	10.5232
11	.0331	.84074	26	.1813	4.605	41	.4339	11.021
12	.0394	1.0007	27	.1952	4.918	42	.4538	11.5265
13	.0460	1.1684	28	.2094	5.3187	43	.4741	12.0421
14	.0535	1.3589	29	.2243	5.6972	44	.4947	12.5653
15	.0614	1.5595	30	.2393	6.0782	45	.5158	13.101