

T.I.M. No. 33.

TUNING INFORMATION MEMO.

M.G.A. TWIN CAM.

GENERAL DATA.

TUNING THE ENGINE FOR MORE POWER.

CHECKING AND REBUILDING ENGINE FOR RACING USE.

ADJUSTING SUSPENSION FOR TRACK USE.

SEE ALSO BOOKLET "GETTING THE BEST FROM YOUR M.G.A. TWIN CAM"

(Publication No. A.K.D. 1412.)

Reference prints :-

E.X. 187/308
AHH 5994
AHH 5995
S.K. 7237.

Valve Guide.
Accelerator Cable Bracket.
Return Spring Bracket.
Steel insert - Chain Tensioner Adjuster.

GENERAL DATA.

M.G.A. Twin Cam.

ENGINE.

Type	B.C. 16. G.B.
Number of Cylinders	4.
Bore	2.969 in. (75.414 m.m.)
Stroke	3.5 in. (89 m.m.)
Capacity	96.906 in (1588 c.c.)
Firing Order	1, 3, 4, 2.
Compression ratio :	9.9 to 1. (8.3 : 1 Service).
Capacity of Combustion Chamber. (Valves fitted)	86.572 c.c. (5.28 cu. in).
Effective Combustion Space	44.543 c.c.
Valve Operation	Twin Overhead Camshafts.
Safe Maximum R.P.M.	7000.
Valve Crash R.P.M.	7400 Ceased Eng. No. 2250. (7700 Commence No.
B.H.P.	108 at 6700 R.P.M. (100 8.3 : 1) 2251.
B.M.E.P.	163 at 4500 R.P.M.
Torque : (Foot Lbs.)	105 at 4500 R.P.M.
Octane Rating :	Minimum requirements for knock - free operation 93 to 97 Octane.
Cooling System.	Thermo-syphon, pump and fan assisted.
Oversize Bore : 1st.	.010 in. (.254 m.m.)
Max.	.040 in. (1.016 m.m.)

CRANKSHAFT.

Main journal diameter	2 in. (50.8 m.m.)
Crankpin Journal diameter	1.8759 to 1.8764 in (47.65 to 47.66 m.m.)

MAIN BEARINGS.

Number and type.	Three. Shell-type.
Material bottom half	Steel Backed. Lead-indium-plated.
Material top half.	Steel Backed. White metal.
Length.	1.25 (31.754 m.m.)
End clearance	.006 in. Max. (.152 m.m.)
End thrust	Taken by thrust washers at centre main bearing.
Running clearance	.002 to .0037 in. (.051 to .0938 m.m.)

GENERAL DATA. (Continued).

CONNECTING RODS.

Length between centres	6.5 in. (165.1 m.m.)
Big-end bearings.	
Material top half	Steel Shell and Lead Indium.
Material bottom half.	Steel Shell and Lead Indium.
Bearing side clearance.	.008 to .012 in. (.203 to .305 m.m.)
Bearing diametrical clearance.	.002 to .0037 in. (.051 to .0938 m.m.)

PISTONS.

Type	Aluminium Alloy.
Clearances :	
Bottom of Skirt.	.0035 to .0066 in. (.089 to .167 m.m.)
Top of Skirt.	.0058 to .0083 in. (.1473 to .2106 m.m.)
Oversizes.	+ .010 in., + .020 in., + .030 in., + .040 in. (+.254 m.m.), (+.508 m.m.), (+.762 m.m.), (+1.106 m.m.)

PISTON RINGS.

Compression :	Plain	Top ring.
	Tapered.	2nd. and 3rd. ring.
Width		.054 to .055 in. (1.372 to 1.397 m.m.)
Thickness		.124 to .131 in. (3.15 to 3.327 m.m.)
Fitted gap		.008 to .013 in. (.20 to .33 m.m.)
Clearance in groove.		.0015 to .0035 in. (.038 to .089 m.m.)
Oil-control ring :		Twin segment scraper.
Width		.1552 to .1562 in. (3.94 to 3.99 m.m.)
Thickness		.124 to .131 in. (3.15 to 3.327 m.m.)
Fitted gap.		.008 to .013 in. (.20 to .33 m.m.)
Clearance in groove.		.0015 to .0035 in. (.0375 to .0885 m.m.)

GUDGEON PIN.

Type	Fully Floating.
Fit	.0001 to .00035 in. (.0025 to .009 m.m.)
	Hand push fit to 68° F.
Diameter	.8748 to .875 in. (22.2223 to 22.2250 m.m.)

GENERAL DATA. (Continued).

CYLINDER HEAD.

Thickness of Cylinder Head Gasket.	.0315 in (compressed).
C.C. of Cylinder Head Gasket	3.897 c.c.
C.C. of Combustion Space.	44.543 c.c. (valves fitted)
C.C. of Piston Head above block face.	2.8336 cu. ins. each.
C.C. of plug centre hole	.2 c.c.
Inlet and Exhaust Manifold Gasket.	Pt. No. AEC 731.
Valve seat angle in Cylinder Head	45°

VALVES AND VALVE GEAR.

Valves		
Seat Angle	Inlet	45°
Seat Angle	Exhaust	45°
Head diameter	Inlet	1.591 to 1.597 in (40.415 to 40.568 m.m.)
	Exhaust	1.435 to 1.441 in (36.447 to 36.605 m.m.)
Stem diameter	Inlet	<u>.34175 in.</u> (8.74047 m.m.)
		<u>.34225 in.</u> (8.69189 m.m.)
	Exhaust	<u>.34175 in.</u> (8.74047 m.m.)
		<u>.34225 in.</u> (8.69189 m.m.)
Valve Lift		.357 in. (9.06 m.m.)
Exhaust Valve Throat diameter.		1.22 in (30.988 m.m.)
Inlet valve throat diameter		1.312 in (33.325 m.m.)
Valve stem to guide clearance.	Inlet	<u>.00155 in.</u>
		.00255 in.
Valve stem to guide clearance.	Exhaust	<u>.00155 in.</u>
		.00255 in.
Valve clearance :	Running	.014" to .015" (.356/381 m.m.) Cold.
	Timing	.021 in. (.53 m.m.)
Timing markings.		'T' marks on Crankshaft and Half speed Shaft Gears to be opposite on assembly
Chain pitch and number of pitches		3/8 in (9.52 m.m.) 132 Pitches.

GENERAL DATA (Continued).

VALVES AND VALVE GEAR. (Cont'd).

Inlet Valve :	Opens	20°	B.T.D.C.
	Closes	50°	A.B.D.C.
Exhaust Valve :	Opens	50°	B.B.D.C.
	Closes	20°	A.T.D.C.

VALVE GUIDES.

Length.	Inlet	2.0625 in. (52.3878 m.m.)
	Exhaust	2.4375 in. (61.9108 m.m.)
Diameter.	Inlet	
	Outside.	$\frac{.5645 \text{ in.}}{.5655 \text{ in.}}$ $\left(\frac{14.3347 \text{ m.m.}}{14.3597 \text{ m.m.}} \right)$
	Inside	$\frac{.3438 \text{ in.}}{.3443 \text{ in.}}$ $\left(\frac{8.7354 \text{ m.m.}}{8.7452 \text{ m.m.}} \right)$
	Exhaust	
	Outside.	$\frac{.5645 \text{ in.}}{.5655 \text{ in.}}$ $\left(\frac{14.3347 \text{ m.m.}}{14.3597 \text{ m.m.}} \right)$
	Inside.	$\frac{.3433 \text{ in.}}{.3438 \text{ in.}}$ $\left(\frac{8.71982 \text{ m.m.}}{8.7354 \text{ m.m.}} \right)$

VALVE SPRINGS.

Free Length	Inner	2.305 in (58.5471 m.m.)	Ceased Eng. No.
	Outer	2.54 in. (64.5201 m.m.)	2250
	Inner	2.415 (61.3371 m.m.)	Comm. Eng. No.
	Outer	2.695 (68.4571 m.m.)	2251
Fitted Length.	Inner	1.625 ins. (41.277 m.m.)	
	Outer	1.78 in. (45.21 m.m.)	
Number of working.	Inner	7.8	
Coils.	Outer	6.2	
Pressure: Valve Open	Inner	65 lb. (29.484 Kg).	Ceased Eng. No. 2250
	Outer	125 lb. (56.699 Kg).	
	Inner	72 lb. (32.659 Kg)	Comm. Eng. No. 2251
	Outer	138 lb. (66.679 Kg)	
Valve Closed.	Inner	42 lb. (19.051 Kg)	Ceased Eng. No. 2250
	Outer	84 lb. (38.102 Kg)	
	Inner	49 lb. (22.226 Kg)	Comm. Eng. No. 2251
	Outer	98 lb. (44.453 Kg)	

GENERAL DATA (Continued).

TAPPETS.

Type	Inverted Bucket.
Diameter : Body) $\frac{1.4995 \text{ in. (38.079 m.m.)}}{1.4990 \text{ in. (38.0917 m.m.)}}$
Working face.	
Length.	1.5 in. (38.099 m.m.)

CAMSHAFTS (2).

Journal Diameters. (Front	1.25 to 1.2505 in. (31.75 to 31.763 m.m.)
(Centre	1.25 to 1.2505 in. (31.75 to 31.763 m.m.)
(Rear	1.25 to 1.2505 in. (31.75 to 31.763 m.m.)
End Float	.001 to .005 in. (.0254 to .127 m.m.)
Bearing : Number and Type	Three V.P. 5 Lead Indium. WHITE METAL
Clearance.	.001 to .0025 in. (.0254 to .0637 m.m.)

ENGINE LUBRICATION SYSTEM.

Oil Pump	
Type	Eccentric rotor.
Relief pressure valve. operates.	50 lb/sq.in (3.5154 kg/cm ²).
Relief valve spring :	
Free length.	3 in. (76.2 m.m.)
Fitted length	2.5/32 in. (54.77 m.m.) at 16 lb. (7.26 kg.) load.
Oil filter	
Type	Tecalemit.
Capacity	1/2 pint. (.28 litre).
Normal Oil Pressure	
Running. Minimum	50 lb/sq.in. (3.5154 kg/cm ² .)
Maximum.	60 lb/sq.in. (4.2185 kg/cm ² .)
Idling	
Minimum	10 lb/sq. in. (.7031 kg/cm ² .)
Maximum	15 lb/sq.in. (.0546 kg/cm ² .)

GENERAL DATA. (Continued).

TORQUE WRENCH SETTINGS.

Cylinder head nuts	70 lb/ft. (9.7 kg/m)
Main bearing nuts	70 lb/ft. (9.7 kg/m)
Connecting rod set screws	35 lb/ft. (4.83 kg/m)
Clutch assembly to flywheel	50 lb/ft. (6.91 kg/m) [?] NO

FUEL SYSTEM

Carburetter	S.U. Twin H.6. Semi-downdraught.
Make and type	1.3/4 in (44.45 m.m.)
Diameter	O.A. 6. (Richer-K.W.1, Weaker O.A. 7.)
Needle	.10 in. (2.54 m.m.)
Jet	Pt. No. A.U.C. 8056.
Carburetter Piston	Red. (Pt. No. AUC 4387)
Piston spring	

AIR CLEANER.

Make and type	Vokes - oil-wetted. LATER VENTURI TYPE RECOMMENDED
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FUEL PUMP.

Make and type	S.U. electric - High pressure. L.C.S. A.U.A. 73.
Delivery test	1.65 Pts./min.
Suction Lift	33 in. (83.8 cm).
Output Lift	48 in. (121.9 cm).

COOLING SYSTEM.

Type	Pressurised radiator - Thermo-syphon, pump and fan assisted.
Thermostat setting.	50°/55°C. (122° / 131° F.).
15° frost	1 pint (.57 litre)
25° frost	1.1/2 pints (.85 litre).
35° frost	2 pints (1.1 litres)

GENERAL DATA (Continued).

IGNITION SYSTEM

Sparking Plugs	Champion N.3.
Size	14 m.m.
Plug gap	.024 to .026 in. (.610 to .660 m.m.)
Coil	Lucas H.A. 12.
Distributor	(Lucas Type D.M. 2. Ceased Engine No. 2221
Distributor contact points	(Lucas Model 23.D.4. Commenced Engine No. 2222.
Suppressors type	gap .014 to .016 in. (.35 to .40 m.m.) Lucas No. 78106.A. fitted on each H.T. cable.
Timing.	T.D.C. (8° B.T.D.C. Service) (8.3 : 1 Compression Ratio)

CLUTCH.

Make and type	Borg & Beck. B.B.8/98 Single dry-plate.
Diameter	8 in. (20.3 cm).
Facing material	Wound yarn - "Borglite".
Damper springs	6.
Colour	Maroon and Light Green.
Release lever ratio	11.7 : 1 overall.
Details of Clutch Pressure springs	6 springs x 195-205 lbs. Light Grey.

GEARBOX.

No. of forward speeds	4.
Synchromesh	2nd. 3rd. and 4th. gears.
Ratios : Top	1.0 : 1.
3rd.	1.374 : 1.
2nd.	2.214 : 1.
1st.	3.64 : 1.
Reverse	4.76 : 1.
Overall Ratios : Top	4.3 : 1. 17.18 M.P.H.
3rd.	5.908 : 1. 12.59 per
2nd.	9.520 : 1. 7.84 1000
1st.	15.652 : 1. 4.72 R.P.M.
Reverse	20.468 : 1. 3.61
Speedometer gears ratio	5 : 12.

GEARBOX CLOSE RATIOS (COMPETITIONS).

Top	1.0 : 1.
3rd.	1.266 : 1.
2nd.	1.618 : 1.
1st.	2.444 : 1.

GENERAL DATA (Continued).

GEARBOX (CONT'D).

Optional Axle ratio :	<u>Overall Ratios.</u>	<u>M.P.H. per 1000 R.P.M.</u>
Top	4.55 : 1	16.24
3rd.	6.25 : 1	11.8
2nd.	10.07 : 1	7.33
1st.	16.55 : 1	4.46
Reverse	21.61 : 1	3.42
Alternative Axle Ratios :	<u>Overall Ratios.</u>	<u>M.P.H. per 1000 R.P.M.</u>
Top	4.1 : 1	18.0
3rd.	5.63 : 1	13.12
2nd.	9.06 : 1	8.15
1st.	14.9 : 1	4.95
Reverse.	19.5 : 1	3.78
Top	3.9 : 1	18.8
3rd.	5.36 : 1	13.78
2nd.	8.63 : 1	8.56
1st.	14.2 : 1	5.2
Reverse	18.6 : 1	3.98
Top	4.875 : 1	15.5
3rd.	6.7 : 1	11.28
2nd.	10.8 : 1	6.84
1st.	17.72 : 1	4.16
Reverse	20.2 : 1	3.65

STEERING.

Track : Front	Disc Wheels 47.29/32 in. (1.2168 m.)
Rear	Disc Wheels 48.7/8 in. (1.2414 m.)
Type	Rack and Pinion.
Steering Wheel turns - Lock to Lock	2.2/3
Steering Wheel diameter	16.1/2 in.
Camber angle	1° positive to 1/2° negative on full bump.
Castor angle	4°
King-pin inclination	9° to 10.1/2° on full bump.
Toe-in	Wheels parallel.

GENERAL DATA. (Continued)

FRONT SUSPENSION.

Type	Independent coil.
Spring detail :	
Coil diameter (Mean)	3.28 in. (82.25 m.m.)
Diameter of wire	.54 in. (13.72 m.m.)
Free Height	9.09 ± 1/16 in. (23.088 cm ± 1.6 m.m.)
Number of free coils	7.2
Static laden length	6.65 ± 1/32 in. (16.89 cm ± .8 m.m.)
Static laden length at load of :	1193 lbs. (541.133 kg).
Maximum deflection	4 in. (10.16 cm)
Dampers (Front)	Piston type.

REAR SUSPENSION.

Type	Semi-elliptic.
Spring Detail :	
Number of leaves	6.
Width of leaves	1.3/4 in. (44.45 m.m.)
Gauge	7/32 in. (5.56 m.m.)
Working load	450 lb. (203.7 kg.)
Free camber	3.60 in. (91.44 m.m.)
Dampers (Rear)	Piston type.

PROPELLER SHAFT.

Type	Tubular, Reverse spline.
Make and type of joints.	Hardy Spicer, Needle roller.
Propeller shaft length. (Between centres of joints)	30.5/16 in. (76.993 cm).
Overall length	32.11/16 in. (83.0264 cm.)
Diameter	2 in. (50.8 m.m.)

REAR AXLE.

Make and Type	B.M.C. "B" type, three-quarter-floating.
Ratio : Standard	10 / 43.
Adjustment	Shims.

GENERAL DATA. (Continued).

ELECTRICAL EQUIPMENT.

System	12 volt. Positive earth.
Charging system	Compensated voltage control.
Battery	Two. 6 volt. Lucas S.G. 9. E.
Starter Motor.	Lucas 4 brush. M.35. G.1.
Dynamo	Lucas C.39. P.V. 2.

BRAKES.

Type	^{DUNLOP} Lockheed Hydraulic Disc. (Front and Rear)
Lining area : Front	16 sq. in. (103.23 cm.2.)
Rear	16 sq. in. (103.23 cm.2.)
Material	Ferodo V.G. 98.

WHEELS.

Type : Ventilated Disc. Centre Lock.	4.J. x 15.
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TYRES.

Size	5.90 - 15.
Tyre pressures : Normal	Front. 18 lb/sq. in. (1.265 kg/cm.2.) Rear. 20 lb/sq. in. (1.4 kg/cm.2.)
Fast motoring.	Front. 22 lb/sq. in. (1.546 kg/cm.2.) Rear. 24 lb/sq. in. (1.69 kg/cm.2.)
Competition work. and sustained high speed motoring.	Front. 24 lb/sq. in. (1.69 kg/cm.2.) Rear. 26 lb/sq. in. (1.83 kg/cm.2.)
Racing Circuits	Front 35 lb/sq. in. (2.47 kg/cm.2.) * Rear 35 lb/sq. in. (2.47 kg/cm.2.) *

* (Approx. or as recommended by Tyre suppliers).

GENERAL DATA (Continued.)

CAPACITIES.

	<u>Imp.</u>	<u>U.S.</u>	<u>Litres.</u>
Engine Sump (Incl. Filter)	13 pts.	15.786 pts.	7.5
Gearbox	4.3/4 pts.	5.837 pts.	2.76
Rear Axle	2.3/4 pts.	3.1/4 pts.	1.56
Cooling System	13.5/8 pts.	16.35 pts.	7.73
Steering rack	1/2 pt.	.6 pt.	.28
Fuel tank	10 gals.	12 gals.	45.4
Brake system	1 pt.	1.2 pt.	.568

GENERAL DIMENSIONS.

Wheelbase	94 in.	(238.8 c.m.)
Overall length	156 in.	(396.2 c.m.)
Overall width	58 in.	(147.3 c.m.)
Overall height	50 in.	(127.0 c.m.)
Ground clearance	6 in.	(15.24 c.m.)
Weight : fully equipped with tools, spare wheel, oil, water, and 2 gallons of fuel (2.5 U.S., 9.1 litres)		2108 lb. (956.188 kg.)
Turning circles	28 ft.	(8.534 metres).

TUNING THE ENGINE.

Attention to Cylinder Head for performance improvement.

Bore out inlet throat at valve seat to 1.436".

Bore out exhaust throat at valve seat to 1.280".

When boring out the valve throats, machine them with a light cut, as a heavy cut may disturb the valve seat insert.

The boring must be concentric with the valve guide and the valve seat. If after boring out the valve throats, a fraze or edge is left in the port, this should be blended into the port by grinding and polishing.

Grind away completely the inlet valve guides and bosses where they protrude into the ports so that the guides are at an angle and are smooth to the port wall.

Fit bronze exhaust valve guides E.X. 187/308 and ream in position to give .0025" min. running clearance. (Make up locally in Aluminium Bronze).

Polish all valve ports and line up the inlet manifold at the rear face with the cylinder head inlet port holes. *HIDURALS now COLSI BRO*

mm Radius the edge of the sparking plug hole approx. 1/16" radius, around the upper part of the hole, but not around the lower edge as this will expose the plug thread.

Larger Carburettors.

Fit 2" Carbs. AUC 938. Bore out manifold to suit.

These carburettors are fitted with V.B. Needles and Blue and Black dashpot springs.

Remove vacuum advance pipe and plug carburetter with plug AUC 1289, leave vacuum advance union at distributor open, (if distributor, Lucas No. 40510 is fitted.)

Fit carburetter extensions AHH 5962 (2 off required).

To prevent vibration of the carburettors it is necessary to use a synthetic rubber gasket (Part No. AHH 5968) between the carburetter and the manifold 3/16 in (4.7623 m.m.) thick, use double coil spring washers, with flat washers on top, under the carburetter fixing nuts, so that the carburetter may be left firmly but otherwise flexibly spring mounted. Wire the nuts in pairs to prevent them becoming slack.

You will need to make your own accelerator cable brackets AHH 5994, and return spring brackets AHH 5995, which can be taken up to the valve cover bolts, one spring each end of carbs. The throttle works opposite to the standard car and the lever should be fitted inwards instead of outwards.

The carburetter dashpots have springs fitted. These can be removed as it should be satisfactory without them, but if the pick up is bad you may find an advantage to leave them in.

✓ You may find it is necessary to improve pick up, by raising the levels in the float chambers, this can be done by setting the float levers upwards so that a 5/16" bar just passes between underside of lever bow and the float chamber top edges.

Sparking Plugs.

Sparking plugs must be Champion N.58.R. for competition work.

Distributor.

If latest distributor AEJ 41 is fitted to above tuned engine the static setting required is 4° B.T.D.C. It is desirable to use distributor AEJ 41.

Checking and rebuilding Engine for Racing use.

Valve Springs.

Valve Springs - Outer, Part No. AEH 668, and Inner, Part No. AEH 669, should be fitted, so that, with the Standard Camshafts, these give a minimum valve crash position of 7400 R.P.M. after continual use.

AEH 668	=	138 lbs.	Valve Open.
AEH 669	=	72 lbs.	Valve Open.

The above springs are now standard fitment from Chassis No. 2610. ?

Tappets.

It would be desirable to use the latest tappet buckets AEH 677 ~~is~~ not already fitted to your engine.

These can be identified by a 5/64" by 45° chamfer on the outer edge of the top face.

These are for use in conjunction with cyl. heads fitted with tappet sleeves (commenced at Engine No. 16.G.B./U/1587).

Old type heads can be bored out and fitted with these ~~cast iron~~ sleeves, Pt. No. AEH 657, and locked with screwed plugs AEH 658. AUSTENITIC IRON

Valve collars.

To increase the durability of the valve mechanism it would be preferable to use the latest hardened top valve spring cup AEH 564. You can ascertain if the soft ones are fitted to your engine by checking with a fine file. The hardened ones are light grey and will have a hard glassy surface when rubbed with a file.

Valve Timing.

The Valve Timing (when checked at .021" tappet clearance) is :-

Inlet Opens	-	20°	B.T.D.C.
Inlet Closes	-	50°	A.B.D.C.
Exhaust Opens	-	50°	B.B.D.C.
Exhaust Closes	-	20°	A.T.D.C.

X The only requirement to set valve timing is to put crank on T.D.C. No. 1. and 4, pull the timing chain tight around the lower timing sprocket, over the idler and tight around both camshaft sprockets, put the locating keys in the sprocket and adjust the verniers to coincide. As a new chain stretches with running the timing does go off the correct position, and it is sometimes advisable to reset when chain is settled down.

Tappet Clearance.

The Running clearance at tappets (Cold) is .014" / .015".

Camshafts.

Camshaft breakage can occur due to incorrect bolting down of the Camshaft Bearing Caps.

Overloading may also occur if more than the recommended tappet setting of .014" to .015" is used.

FITTING OF CAMSHAFT BEARING CAPS.

The following procedure for tightening the Camshaft Bearing Cap Nuts should be followed. This is to ensure that no distortion of the Camshafts takes place.

Set the Crankshaft at 90° B.T.D.C. on Number 1 Cylinder. This is to give adequate clearance between Valves and Pistons.

When fitting the Camshaft Bearing Caps, the Camshaft should be positioned so that the timing slots in the Cap and Shaft are approximately in line.

To prevent Camshaft distortion a regular sequence of tightening the Camshaft Bearing Cap Nuts should be used. It is essential to commence at the Front Cap to ensure that the Camshaft Thrust Flange enters the thrust slot in the Cylinder Head clearly. When removing the Caps it is again essential to follow the above sequence to ensure a clean withdrawal of this Flange.

Finally, any slight adjustment to the Camshaft should be made to enable the timing keys to be fitted, and the Crankshaft turned to T.D.C. on Number 1 Cylinder ready for timing the engine.

Bearings.

V.P.3. (Copper lead, indium flashed) bearings are used throughout, except for 'Whitemetal' Camshaft Bearings. No trouble should be experienced with bearings, except in cases of dirty engines caused by bad maintenance etc.

To ensure perfect running and condition of bearings the engine must be assembled spotlessly clean.

Clean out all oilways and squirt out with kerosene, wash all parts with kerosene and brush and wash all with high pressure water, drying off thoroughly.

Don't clean things with emery paper unless you make sure of eventual cleanliness.

Don't do grinding or polishing adjacent to the assembling.

Distributor and Ignition Tuning.
(Standard Engine).

It is important that the ignition timing is not advanced beyond the engine requirements, or excessive combustion temperature will occur with consequent damage to the engine.

The standard static setting of the distributor is T.D.C. But it is preferable to check the engine (with stroboscope equipment) to ensure that the advance does not exceed 26° crankshaft at 5000 R.P.M., if it does so, it is permissible to retard the static setting as far as 3° A.T.D.C., to obtain this result.

The original standard distributor, which has a vacuum advance unit, is Lucas No. 40510 (static setting T.D.C.), and has 22°/26° auto advance.

The later distributor now fitted, which has an improved roller weight mechanism and no vacuum advance unit, is Pt. No. AEJ 41 (static setting T.D.C.), and has 24°/28° auto advance (Lucas Pt. No. 40718). 80 BEFORE
ON 8-3.

For competition high output purposes it is desirable to have distributor AEJ 41.

If you replace the H.T. leads, use racing quality material.

For racing the plug suppressors may be removed and racing push on plug terminals fitted.

On fitting distributor AEJ 41 to early cars, remove the vacuum advance pipe and plug carburettor union with plug AUC 1289.

Distributor Clamping.

Excessive wear has occurred on the distributor driving gears on some engines, this is due to misalignment of the distributor with its drive, causing a tightening up of the distributor shaft and consequent excessive gear loading and gear wear.

The misalignment of the drive is due to incorrect method of tightening the distributor clamp, the tightening of the two set bolts holding the plate first and then the clamping bolt last will bring about this misalignment of the distributor with its drive.

The correct method is to leave slack the two bolts holding down the clamp to the distributor drive housing, finally tightening following the clamping screw adjustment, then no stickiness or misalignment will take place.

It would be advantageous to give the engine a few turns with the two holding down bolts slacked off to allow alignment to take place after any adjustment of clamping screw is made.

Over Ignition Advance due to excessive end float on Half Speed Shaft.

The standard limits for end float of the half speed shaft should be between .003" - .006". If due to wear, the end float exceeds .010" - shims must be removed from behind the thrust plate to obtain the standard limits.

Excessive end float of the half speed shaft over advances the ignition, but wear between crank and half speed gear wheels retards ignition.

Running on.

It must be ensured that no sharp edges of any kind are present in the Combustion Chamber, especially around the sparking plug aperture.

Carburettors must be set to give the minimum slow running, with accurate and equal setting of each throttle plate.

Chain Tensioner Adjuster.

To prevent any possibility of the chain adjuster bolt stripping (due to overtightening) in its housing and the chain jumping the sprockets, it may be thought advisable to modify the adjuster housing by boring the housing and making up and pressing in a small steel insert as illustration S.K. 7237.

Connecting Rods.

Torque up your connecting rod bolts to the correct figure on data sheets. For racing purposes it is preferable to use the latest type of connecting rod. The Part. No. of these is AEH 642 (R.H.), AEH 644 (L.H.) You can recognise these by the two balancing lugs, one each side of the Gudgeon pin boss, which lugs have a width of 1.3/4" approx.

Engine Vibration.

1. It is usual to experience some vibration at 5500 R.P.M. A torsional vibration at low speeds is always there, but should not prove troublesome.
2. The most likely cause of an excessive amount of vibration is "out of balance" of the clutch. Turning the clutch round 180° often effects a big improvement. The clutch should be balanced to within 1/4 oz. inch. If turning the clutch round 180° produces no improvement then individual checking of the balance of Crankshaft, Flywheel, and Connecting Rods should be undertaken and correction made accordingly. The Crankshaft should be within 1/4 oz. inch, and Connecting Rods within two drams overall weights. The whole assembly of Crankshaft, Flywheel and Clutch Unit balanced should be within 1/4 oz. inch.
3. Balance of Propellor Shaft.
Dis-connecting at the coupling flange and moving the shaft round 180° may show an improved condition of vibrations affecting the gearbox.

Pistons and Rings.

To ensure reasonable oil consumption, check that the pistons are fitted with the twin rail scraper ring, Pt. No. AEH 672, including the spring expander ring fitted behind it, Pt. No. AEH 680.

The top compression ring is chromium plated for prevention of bore wear, but if desired a plain ring, Pt. No. AEH 682, may be fitted in place of this, to further improve the oil consumption, or prevent plug fouling with the racing 58.R. plugs.

Piston clearance for racing purposes.

To allow for increased expansion under high output conditions, it is advisable to increase the ovality (or clearance of the piston skirt at the gudgeon pin sides).

The Standard ovality of the Piston skirt is :-

.004" / .006" at bottom of skirt to .008" / .010" at top of skirt, both measured on gudgeon pin axis.

It is possible to very carefully set the pistons up in a lathe, machining one side at a time, and increase the ovality to .012" / .013" at bottom of skirt and to .016" / .017" at top of the skirt, leaving an unmachined portion all down each thrust face approx. 1" wide. Polish edges where machining runs out at thrust faces.

Note :

The standard piston of 9.9 to 1 compression ratio is Pt. No. AEH 681 to Modification No.3., with skirt ovality of .004" / .006" - .008" / .010", and these were fitted to most engines, but new pistons now supplied as spares, to Pt. No. AEH 688 and 9.9 to 1 compression ratio, have a new skirt ovality of .012" / .014" - .016" / .018", these are also round top pistons.

Pistons 8.3 to 1 compression ratio, Part No. AEH 690.

Note these pistons have a stepped lower compression ring, the undercut being fitted towards the bottom of the piston, this acts as a scraper in reducing oil consumption.

The top ring is plain high tensile cast iron, not chrome plated.

These pistons produce a smoother engine for general use and the B.H.P. is still 100 plus.

The ignition static setting with distributor AEJ 41 is 8° B.T.D.C. with these 8.3 to 1 compression ratio pistons.

The Sparking plug to be used is Champion N.3.

Thermostat and Fan.

The Thermostat and Fan may be removed for racing purposes.

Cool Air to Carburetter.

On the right hand side of the radiator grille, a hole may be cut in the body approx. 4" dia. and a tube may be bolted into this by a flange. The inner flexible air hose may be fitted and clipped over this pipe to ensure a separate and slightly forced cool air flow over the carburetters.

Crankcase Breather Pipe

In cases where oil has been lost through the breather system during hard cornering the following modification incorporating further vent pipes which are interchangeable in sets will improve this condition and reduce oil consumption.

Commencing Engine No. to be notified later.

CANCEL

12H.155.	Cylinder Side Cover Rear Complete	1 off
" 1A.2202	Rear Elbow for Cover.	1 off
" 1A.2201	Rear Baffle for Cover.	1 off

REPLACE BY

12H.156.	Cylinder Side Cover Front Complete	1 off
" 1H.772	Baffle for Side Cover.	1 off
" 1H.874	Elbow for Vent Pipe	1 off
" 1H.875	Pipe for Elbow Vent Pipe End.	1 off
" 1H.876	Pipe for Elbow Side Cover End.	1 off

CANCEL

AEH.584	Heat Shield Assembly for Cylinder Side	
"	Cover	1 off
" AEH.586	Asbestos Sheet for Heat Shield	1 off
AEH.628	Crankcase Vent Pipe	1 off
1G.1309	Clip for Crankcase Vent Pipe	1 off

REPLACE BY

AEH.684	Heat Shield Assembly for Cylinder Side	
"	Cover	1 off
" AEH.683	Asbestos Sheet for Heat Shield	1 off
AEH.662	Vent Pipe Complete	1 off
" AEH.661	Vent Pipe	1 off
" 1G.1309	Clip for Vent Pipe	1 off

Oil Pressure.

For racing purposes it is advisable to increase the oil pressure. This can be done by packing the oil pump release valve spring with a packing .200" thick by 1/2" dia.

Water Loss.

It is extremely unlikely, but if water loss is found to occur under high ambient temperatures and racing conditions, it may be alleviated by fitting a 3/8" bore pipe from the centre plug in the cylinder head, around the rear of the cylinder head and forward into the heater connection hole in the thermostat housing.

Clip pipe on so that it does not vibrate.

Oil.

An oil such as Castrol R oil is suitable for racing.

Oil Cooler.

For racing purposes an oil cooler should be fitted, list of parts are as below :-

ARH 113.	Oil Cooler	1 off
HZS.0406	Screw 1/4" UNF x 3/4" Hex.	4 off
PWZ 104	Plain Washer 1/4"	4 off
LNZ 104	Nut - "Aerotight" 1/4" UNF	4 off
AHH 5883	Flexible Pipe	2 off
AHH 5884	Oil Pipe - Block to Cooler	1 off
AHH 5885	Oil Pipe - Cooler to Filter	1 off
AHH 5886	Support Brkt - Cooler Pipes	1 off
HZS 0508	Screw 5/16" UNF x 1" Hex.	2 off
AHH 5887	Clip - Cooler Pipes	1 off
HZS 0406	Screw 1/4" UNF x 3/4" Hex	1 off
PWZ 104	Plain Washer 1/4"	1 off
LNZ 104	Nut - "Aerotight" 1/4" UNF	1 off
AHH 5902	Packing - Oil Cooler	1 off
S.K. 7203	Sketch showing mod to front apron for cooler fitting - Horn positioning.	
A.7101	Arrangement of Oil Cooler.	

Adjusting Suspension for Track use.

Anti-Roll Bar.

Prior to Chassis No. 2275

The following list of Parts (which also includes the Anti-Roll Bar Assy and fittings) will be required to convert existing cars to Front Anti-Roll Bar model.

AHH.5924	Assembly - Front Extension	1 off	
AHH.5925	Spring Pan Assembly	2 off	
AHH.5927	Bottom Wishbone Assembly	1 off	
	R.H. - Front		
AHH.5929	Bottom Wishbone Assembly	1 off	
	L.H. - Front		
AHH.5940	Anti-Roll Bar Assembly	1 off	
AHH.5935	Housing - Bush	2 off	
HZS.0505	5/16" UNF x 5/8" Hex. Screw	4 off	} Housing } Main } Member
LWZ.205	5/16" Spring Washer	4 off	
FNZ.105	5/16" UNF Hex. Nut	4 off	
AHH.5931	Link - Anti-Roll Bar - R.H.	1 off	
AHH.5932	Link - Anti-Roll Bar - L.H.	1 off	
AHH.5941	Clamping Bolt	2 off	} Link } to } Bar
LNZ.107	7/16" UNF Aerotight Nut	2 off	
PWZ.107	7/16" dia. Plain Washer	2 off	
FNZ.108	1/2" UNF Hex. Nut	2 off	} Link } to } Pan
LWZ.208	1/2" dia. Spring Washer	2 off	
AHH.5934	Bush - Anti-Roll Bar 9/16" dia.	2 off	
A7009W	General Arrangement Reference.		

Hydraulic Dampers.

If the above car is to be used for circuit racing, and higher setting hydraulic dampers are required, this can be done by removing the standard damper valves and fitting higher setting valves as below :-

High set hydraulic damper valve (Front) Pt. No. EHA.4135 2 off

High set hydraulic damper valve (Rear) Pt. No. EHA.4136 2 off

<u>Settings.</u>	<u>Front</u>		
		1240	Rebound
		900	Compression.
		1030	Total leak.
	<u>Rear</u>	1800	Rebound
		600	Compression.
		420	Total leak.

Axle and Gearbox Ratios.

The standard axle ratio is 4.3 to 1.

For track racing the 4.55 to 1 may be found more suitable.

Diff Assembly ATB 7280.

Including :-

Crown Wheel and Pinion ATB 7146.

The Standard gearbox ratios are :-

1st. 3.6363 : 1.

2nd. 2.2143 : 1.

3rd. 1.3736 : 1.

The close ratio gears are :-

1st. 2.444 : 1.

2nd. 1.618 : 1.

3rd. 1.266 : 1.

Parts required for conversion to close ratio are :-

1.H. 3297 - First Motion Shaft 1 off

1.H. 3298 - Laygear. 1 off

1.H. 3299 - 2nd. Speed - Mainshaft Gear 1 off

1.H. 3300 - 3rd. Speed - Mainshaft Gear 1 off

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T.I.M. No. 28.

TUNING INFORMATION MEMO.

Sheet No. 1.

No. Sheets 1.

M.G.A. Twin Cam.

Distributor and Ignition Tuning.

It is important that the ignition timing is not advanced beyond the engine requirements, or excessive combustion temperature will occur with consequent damage to the engine.

The standard static setting of the distributor is T.D.C. But it is preferable to check the engine (with stroboscope equipment) to ensure that the advance does not exceed 26° crankshaft at 5000 R.P.M., if it does so, it is permissible to retard the static setting as far as 3° A.T.D.C. to obtain this result.

The original standard distributor, which has a vacuum advance unit, is Lucas No. 40510 (static setting T.D.C.).

9-9
The later distributor now fitted, which has an improved roller weight mechanism and no vacuum advance unit, is Pt. No. AEJ 41 (static setting T.D.C.). On fitting this distributor to early cars, remove the vacuum advance pipe and plug carburetter union with plug AUC 1289.

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Sheet No. 1.

TUNING INFORMATION MEMO.

No. Sheets 1.

M.G.A. Twin Cam.

Larger Carburetters.

Fit 2" Carbs. AUC 938. Bore out manifold to suit.

Remove vacuum advance pipe and plug carburetter with plug AUC 1289, leave vacuum advance union at distributor open, (if distributor, Lucas No. 40510 is fitted).

Fit carburetter extensions AHH 5962 (2 off required).

Rubber mounted with Klingerelastoc gaskets AHH 5968 (2 off required), and D.C. spring washers, wired.

Note :-

You will need to make your own accelerator cable brackets and return spring brackets, which can be taken up to the valve cover bolts, one spring each end of carbs. The throttle works opposite to the standard car and the lever should be fitted inwards instead of outwards.

The carburetter dashpots have springs fitted. These can be removed as it should be satisfactory without, but if pick up is bad you may find an advantage with them.

The carburetters must be flexibly mounted (in a similar manner as tuning book on M.G.A.) to prevent incorrect mixture due to vibration.

For Competition purposes Sparking Plugs should be Champion N.58.R. or Lodge R.L. 47.

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T.I.M. No. 26.

TUNING INFORMATION MEMO.

Sheet No. 1.

No. Sheets 1.

1600 c.c. Twin Camshaft Engine Vibration.

1. It is usual to experience a vibration at 5500 r.p.m. A torsional vibration at low speeds is always there but should not prove troublesome.
2. The most likely cause of the vibration complained of is "out of balance" of the clutch. Turning the clutch round 180° often effects a big improvement. Borg and Beck are now delivering clutches balanced to within $1/4$ oz. inches. If turning the clutch round 180° produces no improvement then individual checking of the balance of Crankshaft, Flywheel, and Connecting Rods should be undertaken and correction made accordingly. The Crankshaft should be within $1/4$ oz. inches and Connecting Rods within two drams overall weights. The whole assembly of Crankshaft, Flywheel and Clutch Unit Balanced should be within $1/4$ oz. inches.
3. Balance of Propellor Shaft. Dis-connecting at the coupling flange and moving the shaft round 180° , may show an improved condition.

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T.I.M. No. 25. Issue 2.

TUNING INFORMATION MEMO.

Sheet No. 1.

No. Sheets 1.

M.G.A. Twin Cam - Valve Springs.

Valve Springs, - Outer, Part No. AEH 668, and Inner, Part No. AEH 669, may be fitted, so that, with the Standard Camshafts, these give a minimum valve crash position of 7400 R.P.M. after continual use.

AEH 668 = 138 lbs. Valve Open.

AEH 669 = 72 lbs. Valve Open.

The above springs are now standard fitment from Engine No.....

It would be desirable to use latest tappet buckets AEH 677 if not already fitted to your engine.

These can be identified by the larger 5/64" by 45° chamfer on the top face.

1.7.59.

T.I.M. No. 24.

Sheet No. 1.

No. Sheets 1.

Provisional only.

Weber Carbs.

Weber Carbs.

Type 40 D.C.O.E. Weber Carbs, or Larger size, Type 42 D.C.O.E.

Choke	-	36 m/m
Main Jet	-	155
Pump Jet	-	70
Slow Running Jet	-	Fuel 65.
Air Jet	-	Slow run 120 - Cal. Air Jet 240.
Needle Valve	-	250.

With air horns approx. 2.1/2" long.

		<u>Morris Engines</u>	<u>No</u>
		<u>Experimental Pt. No.</u>	<u>off.</u>
Suits 40 or 42 DCOE Carburettors	Inlet Manifold	695/561	1
	'O' Ring	695/1124	4
	'O' Ring	695/1125	8
	Stud (Carb. to Manifold)	695/1121	8
	Nut	695/1123	8
	Cup Washer	695/1122	8