Rover Repair Manual for 1931 10/25 & 6-cyl. models.



As issued to Rover service agents.

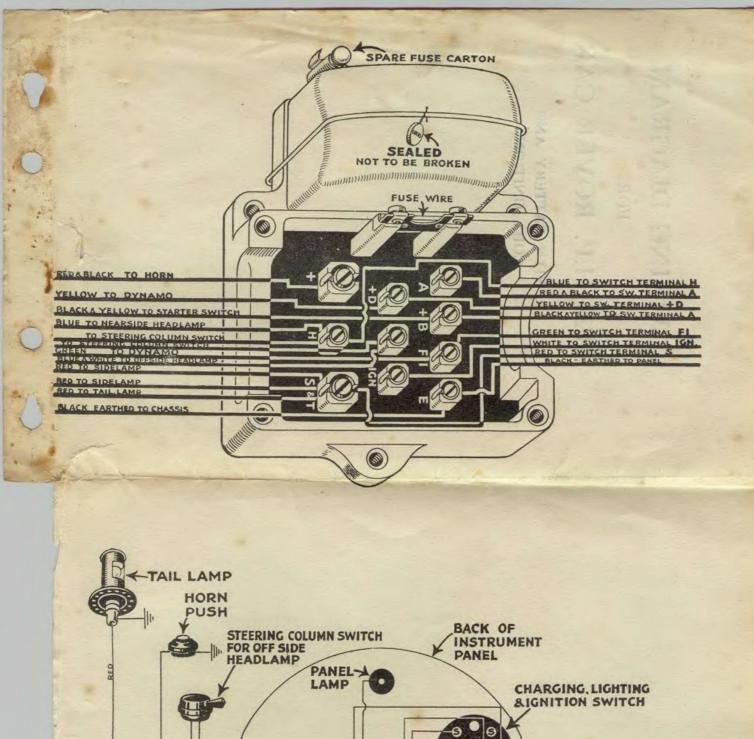
Scanned and compiled January 2010 by Steve Sheppard from an original donated by Chris Morgans.

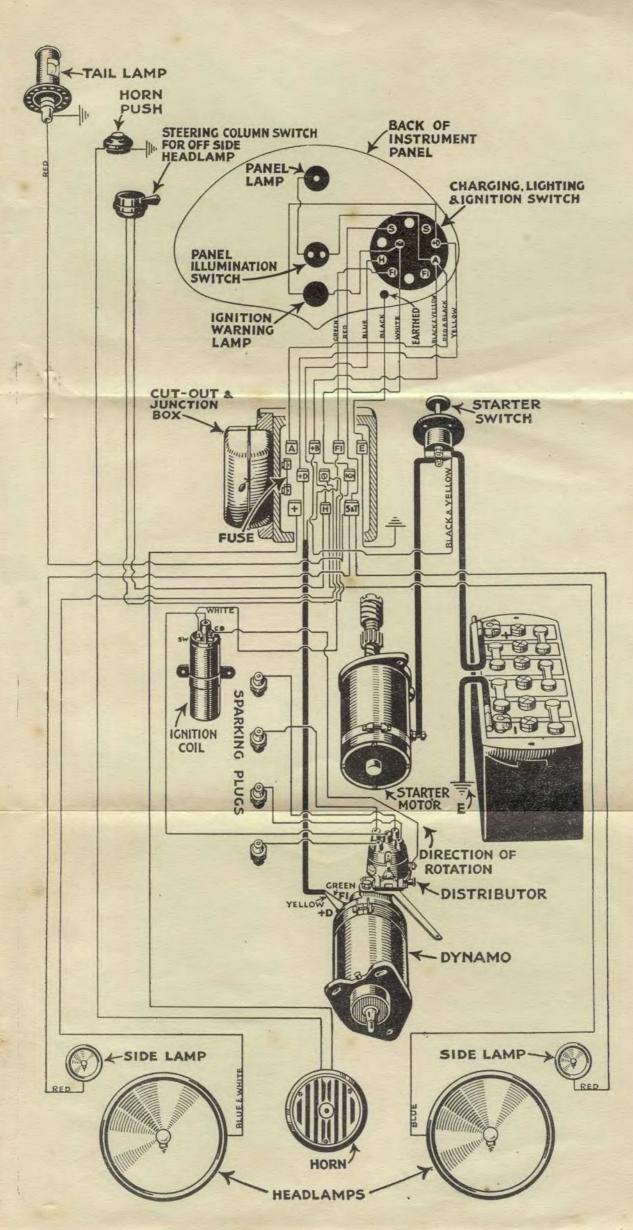
WIRING DIAGRAM

FOR

10/25 H.P. ROVER CAR

WITH BATTERY AND COIL IGNITION.



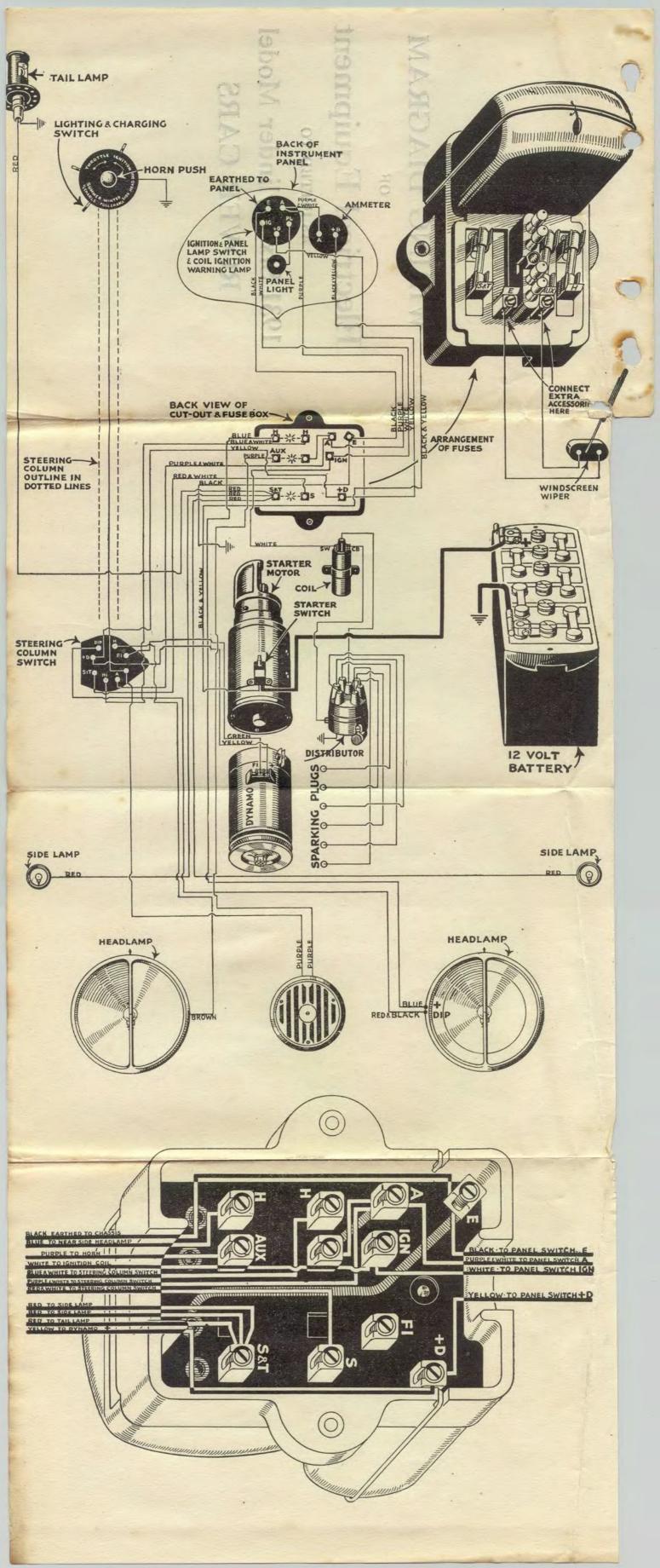


WIRING DIAGRAM

Electrical Equipment

AS FITTED TO

1931 Six-Cylinder Model ROVER CARS



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"MA/1," "AN" and "M" MODELS.

RADIATOR.

CUSTOMER'S COMPLAINT (A).

BOILING OR LOSS OF WATER.

Boiling may be caused by:-

- (1) Efficiency of Impellor too high.
- (2) Defective Radiator Block.
- (3) Defective Filler Cap.
- (4) Choked Steam Vent.

To Check:-

Fill radiator to within 1in. of neck.

Jack up both rear wheels. Start up engine.

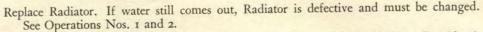
Engage bottom gear.

Rev. up engine until 14 m.p.h. is shown on speedometer.

If water surges from top of filler, fit standard pattern restriction washer at rear end of Cylinder Head outlet pipe (See Operation No. 3).

If water still comes out, clean radiator as trouble may be due to silting. To do this, remove radiator and flush out. Turn Radiator upside down and reverse flow of water by flushing from Bottom Water Pipe.

This is chargeable labour.



LOSS OF WATER will be overcome by the same process, except that the Impellor Gland, Water Joints and Radiator must be checked for leakage.

Time to check and change radiators—I hour.

"G" MODELS.

CUSTOMER'S COMPLAINT (B).

BOILING OR LOSS OF WATER.

To Cure:—Fit reduced Impellor (27/8in. diam.). Fit modified water pipe and steam pipe. Steam vent in cylinder head should be at least 5/16in. in diameter.

Remove Thermostat for Summer months. (See Operations Nos. 3 and 4.)

Time to rectify-11/2 hours.

Time to test depends on local facilities for road testing.

AS FITTED TO "AN" MODELS.

HEADLAMP DIPPERS. SUCTION.

CUSTOMER'S COMPLAINT

DIPPERS DO NOT WORK.

To Check :-

Remove rubber coupling from nearside head lamp.

Couple up to gauge fixed to radiator. Check pressure—approximately 15 lbs.

Repeat process with offside head lamp, making sure that nearside head lamp has been coupled properly.

If pressure is satisfactory (15 lbs.) the dipper mechanism is defective, or the reflectors are fouling.

Check for fouling of reflectors.

If free, lubricate pistons with 2 drops of light sewing machine oil through hole at bottom of cylinders.

If there is no pressure at head lamps, couple gauge direct to pump on steering column. If no pressure can be obtained here, dismantle pump and lubricate as demonstrated.

If pressure at pump is satisfactory, the trouble is due to defective pipes—replace pipes.

Time required to check—15 minutes. Time required to lubricate—5 minutes. Time required to replace pipes—1 hour.

"MA/1," "AN," "M" and "G" MODELS.

CUSTOMER'S COMPLAINT

INTERMITTENT WHIRRING NOISE AT FROM 40 TO 50 M.P.H.

Trouble due to slack belt or to belt bottoming on fan pulley.

Check Belt for Tension.

Tighten up Belt, if necessary, or if bottoming, fit new one wide enough to ride high up on the pulley.

It is important to note that any fan belt which is run either too tight or too slack will tend to set up a noise and will eventually break.

A belt breaking when running at high speed may cause a considerable amount of damage. Trouble of this sort is only due to neglect.

Time required for tightening and lubricating belt-5 minutes.

Time to fit new belt—20 minutes. (See Operation No. 4.)

"G2" and "GM/1" MODELS.

FAN BELT.

CUSTOMER'S COMPLAINT

BELT SLACK.

To adjust, slacken off three 3/8 in. nuts retaining Dynamo to front engine bearer and move dynamo away from engine.

Time required—10 minutes.

"M," "AN," "G," "G2," "MA/1" and "GM/1" MODELS.

IMPELLOR.

CUSTOMER'S COMPLAINT (A).

WATER LEAKING AT GLAND

Procedure.

Tighten up Gland Nut, or re-pack if necessary as per Operation No. 7. Lubricate Gland.

CUSTOMER'S COMPLAINT (B).

GRINDING NOISE FROM GEARBOX AT 40 MILES PER HOUR.

"MA/1," "AN," "M" and "G" MODELS.

NOTE.—This noise is so severe at times that one is led to suppose that severe trouble has developed in the Gearbox. Rev. up Engine whilst listening near the impellor. The noise can then be distinctly heard to come from that component.

Procedure.

Tighten gland nut or re-pack if necessary (see Operation No. 7). Lubricate gland.

CUSTOMER'S COMPLAINT (C).

ALL MODELS.

WATER LEAKING AT GLAND AND GRINDING NOISE FROM GEARBOX AT 40-50 M.P.H.

Procedure.

Replace water impellor.

NOTE.—There are 4 types of impellors:—

- (1) Single ball race with no lubrication to gland.
- (2) Single ball race with lubrication to gland.
- (3) Double ball race with lubrication to large gland.
- (4) 1931 type with non-adjustable fan flanges.

If trouble occurs with No. 1 or 2, replace with No. 3. If trouble occurs with No. 3 or 4 it will be found that lubrication has been neglected.

Proceed as above and warn Owner with regard to lubrication.

Pump packing will last 5,000 miles.

Time required to check-5 minutes.

Time required to re-pack gland on types 1 and 2—10 minutes; on types 3 and 4—20 minutes (see Operation No. 7).

Time required to change impellor-45 minutes. Operation No. 4.

"AN," "M" and "G" MODELS.

DISTRIBUTOR.

CUSTOMER'S COMPLAINT (A).

LACK OF POWER.—LACK OF POWER ACCOMPANIED BY EXPLOSIONS IN SILENCER.

FAILURE TO START ACCOMPANIED BY EXPLOSION IN SILENCER.

Cause.

Partial seizure of distributor spindle (spindle above, and coupled to, vertical shaft).

Procedure.

Use grease gun freely on distributor nipple and screw up grease cup. Re-time as per Operation No. 24.

Time required—20 minutes.

"AN," "M" and "G" MODELS.

DISTRIBUTOR.

CUSTOMER'S COMPLAINT (B).

WIRES TWISTED OFF DISTRIBUTOR.

Complete seizure.

Dismantle Distributor and ease bush as per Operations Nos. 15 and 16.

Re-time ignition as per Operation No. 24.

In this case it is necessary to remove vertical shaft and check it for distortion.

Time required to ease bush-1 hour.

Time required to re-time-15 minutes.

EARLY TYPE "A.N." ENGINE ONLY.

VERTICAL SHAFT CLAND.

CUSTOMER'S COMPLAINT

OIL ON TOP OF GLAND NUT AND DOWN NEARSIDE OF ENGINE.

Procedure.

Release gland nut, remove packing and replace nut without packing. Time required—15 minutes.

Alternative Method.

Remove vertical shaft as per Operation No. 11. Remove vertical shaft top bush and groove against direction of rotation for oil return.

Re-time engine as per operation No. 24.

Time required—11/4 hours.

"AN," "M," "G," "G2," "MA/1," and "GM/1" MODELS.

OIL PRESSURE.

CUSTOMER'S COMPLAINT

INDICATOR SHOWS RED UP TO 30 MILES PER HOUR OR MORE.

The danger of this condition cannot be over emphasised.

If not tackled at once, serious trouble may develop in the engine bearings and may result in a seized camshaft.

Procedure.

(1) Check level of oil in sump.

(1) Check level of oil in sump.
(2) Clean filter (Operation No. 11). Q2, GM/14 MA clean filter (operation No. 11).

(3) Check oil indicator and pipe from engine and rubber coupling. To check oil indicator (indicator should show white at 18 lbs. per square inch). Remove indicator from instrument board. Attach adaptor and connect to dipper pump as demonstrated.

(4) Remove valve cover and see that release valve at rear end of rocker shaft is seating properly.

(5) Check flow of oil from chain lubricating pipe.

Time required to check-45 minutes.

See Operation No. 21.

NOTE.—On models where dial oil indicator is fitted, hand should show a minimum of 18 lbs. per square inch at 30 m.p.h.

EARLY "A.N." TYPE ENGINE ONLY.

ROCKER AND CAMS.

CUSTOMER'S COMPLAINT

NOISY ENGINE OR NOISY TAPPETS.

Cause. Flats on rollers.

These are caused by running engine with tappets out of adjustment.

Procedure.

Trouble is located by inability to make valves operate quietly with standard tappet

Replace damaged roller. (See Operation No. 11.)

CUSTOMER'S COMPLAINT (B).

NOISY ENGINE OR TAPPETS ACCOMPANIED BY LOSS OF POWER. .

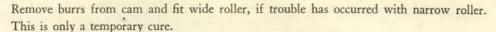
Cause. Worn cam.

This is also due to tappets being run out of adjustment.

This can be proved by testing damaged cam for hardness.

Procedure.

Trouble is located by measuring valve opening with steel rule. Damaged cam will only open valve partially.



For permanent cure—replace camshaft.

NOTE.—Cylinder head and push rods must be removed before rockers can be withdrawn.

Time required to check-30 minutes.

Time required to fit new roller-31/2 hours.

(Operation Nos. 11.)

Time to fit new camshaft—2 men, 9 hours.

(Operations Nos. 8 and 11.)

NOTE.—These troubles do not affect engines fitted with Halford Gear.

"AN," "M," "G," "G2," "MA/1" and "GM/1" MODELS.

PISTONS.

CUSTOMER'S COMPLAINT

NOISY ENGINE OR TAP IN ENGINE.

All aluminium pistons slap. A difference of .0005in. will cause slap.

Piston slap seldom occurs when the engine is warm and only on rare occasions can it be heard from the driver's seat. It does not affect performance.

A customer, however, may be very exacting with regard to piston slap and we have devised a special treatment to meet such cases which has proved invariably effective. We do not guarantee to cure piston slap on a cold engine.

This method will be demonstrated

Time required to cure piston slap-5 hours.

(Operation No. 22.)

"AN," "M" and "G" MODELS.

TENSION SPRING.

CUSTOMER'S COMPLAINT

SIZZLING NOISE FROM ENGINE.

The engine may be running perfectly normally except for sizzling noise from clutch housing or gearbox.

This may be checked by pulling up adjusting screw to the right of timing chain cover. If the spring is broken there will be no tension on this screw.

Time required to check-I minute.

Time to fit new spring-7 hours. (See Operation No. 31.) and 18

NOTE.—A number of 1930 engines have the tensioner fitted to the timing chain inspectory of these cases it is only necessary to remove cover to fit new spring.

Time required—45 minutes.

30

ALL 6-CYLINDER MODELS

CLUTCH.

CUSTOMER'S COMPLAINT (A).

CANNOT ENGAGE GEAR WHEN COLD.

Will not free when engine is cold.

Make sure that clutch stop is operating correctly. To do this, insert .004in. feeler between clutch stop and clutch plate and depress clutch pedal fully. If feeler can be withdrawn, stop is not working and must be re-lined. (See Operation No. 32).

Time to check-30 minutes.

If stop is O.K. fit new clutch.

Time required—63/4 hours. (Operations Nos. 26 and 31.)

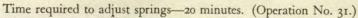
CUSTOMER'S COMPLAINT (B).

CLUTCH SLIPS.

Clutch slip is always due to ill-usage.

A slipping clutch is sometimes difficult to detect, but a sure indication is given when car is travelling at about 40 m.p.h. and encounters a slight incline. Releasing the accelerator pedal allows the car to surge forward at increased speed momentarily. Slip may be cured by increasing tension on clutch if trouble is slight. If trouble is serious, fit new cork plates.

Time required to check—30 minutes. (This varies in accordance with local facilities for road testing).



Time required to fit new plates—61/4 hours. (Operations Nos. 26 and 31).

NOTE.—The clutch bearing is fed with oil by the engine. For that reason the car must NOT be run down hill with the clutch out and the engine stationary, or seizure of the bearing will result.

A rough test for clutch slip may be carried out in the shop as follows:-

Pull hand brake hard on, engage top gear and let in the clutch gently, at the same time gradually "revving" up the engine.

If the engine continues to run with the clutch right "home" tighten up the clutch 21/2 turns. Check again and if engine still runs, fit new cork plates.

CLUTCH SHUDDERS.

"G2" and "GM/1" MODELS.

Procedure :-

Remove clutch driven plate and friction rings and substitute for one with friction discs rivetted to plate, Part No. 11107.

See Operations 28, 29 and 31A in 1931 Instruction Books.

This DOES NOT apply to the following Cars:-

Nos. 10769, 10831, 10894, 10905, 10908, 10911, 10913, 10920, 10926, 10934, 10935, 10939, 10942, 10944, 10947 to 10958 inclusive, 10960 to 10977 inclusive, 10979 to 11011 inclusive, and 11013 onwards.

6-CYLINDER MODELS.

CEARS, 3 SPEED BOX.

CUSTOMER'S COMPLAINT (A).

2ND GEAR SLIPS OUT WHEN CLIMBING.

Procedure.

Check selector locks in gearbox turret.

If these are sound and of wedge type, fit new gear (see below).

Time required to check selector locks—30 minutes.

Operation No. 32, 33 or 34.

NOTE.—There are two types of selector shafts and plungers fitted on 3 speed boxes. One is fitted with a round headed plunger and shaft to suit, the other with wedge shaped plunger and shaft to suit. If trouble occurs with No. 1, fit No. 2. If trouble occurs with No. 2, make sure that the plunger is not sticking in the guide.

CEARS. 4 SPEED BOX. (Spur Cears only.) CUSTOMER'S COMPLAINT

3RD GEAR SLIPS OUT OF MESH.

Procedure.

Check gears. There are two types fitted to these boxes:-

(1) The dogs are "DEE" shaped.

(2) The dogs are square cut. If the first type are fitted they must be changed for the second. (See Operations Nos. 31 and 32.)

Check selector shafts and plungers.

If the round type plunger is fitted it must be changed for the wedge shaped plunger and shaft to suit, making sure that plunger slides freely in guide. If a cure is not effected, new 3rd speed and 2nd speed gears must be fitted. (See Operations Nos. 32 and 34.)

Time to check selector and fit new shaft and plunger—2 hours. See Operation No. 34.

CEARS. (4 Speed Herring Bone.)

CUSTOMER'S COMPLAINT (C).

3RD OR TOP GEAR JUMP OUT OF MESH.

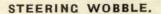
Procedure.

Check selectors, making sure that wedge shaped plunger and shaft to suit are fitted and that V shaped grooves in shaft are all of the same dimensions; if incorrect fit new type selector shaft and plunger (see Operation No. 34).

Time to check and fit new shaft-2 hours.

This applies to 3rd and top selector shaft only.

If still unsatisfactory, fit new 3rd and 2nd gears. (See Operations Nos. 32 and 34.)



First of all it must be understood that 90 per cent. of the steering wobble experienced on modern cars is due to tyres or wheels, or both. Efforts are being made by some tyre manufacturers to overcome the difficulty.

Although the car manufacturer can do a lot towards preventing bad tyres and wheels from setting up wobble, he cannot prevent it enirely for long.

We, as Car Manufacturers, realise the practical impossibility of the Owner being able to check his tyres and wheels sufficiently accurately to be able to overcome the trouble himself and we, having spent thousands of pounds and many months in steering wobble research, have settled down to the job of holding tyres and wheels in their proper place at higher speeds than 70 m.p.h.

Time required—3 hours.

(See Operations Nos. 45, 46 and 47.)

ALL MODELS.

BRAKES INEFFECTIVE.

CUSTOMER'S COMPLAINT

This may be due to inattention to adjustment or lubrication, worn linings or oil on rear linings.

Method of adjustment and cure of all braking troubles is described in Operations Nos. 51 to 59.

ALL 6 CYL. MODELS.

BACK AXLE.

CUSTOMER'S COMPLAINT

LOUD CLONK IN REAR AXLE ON TAKING UP DRIVE.

Back lash in diff.

Before axle is dismantled, remove inspection cover to test diff.

Test pinions for end play. If this is excessive, remove rear axle and fit axle tubes to new differential assembly.

Time required to check-15 minutes.

Time required to fit new differential assembly-51/2 hours.

See Operations Nos. 50 and 50A.

"AN" MODELS.

STEERING.

CUSTOMER'S COMPLAINT

STIFF STEERING.

We fit a high geared steering, as this has been found to be most satisfactory.

Some people, however, find the steering too heavy. This is mostly due to inadequate lubrication. We have, however, produced a shorter drop arm which gives a lower gear to meet exceptional cases.

This is supplied at a cost of 11/6.

Time required to fit drop arm-45 minutes.

Operation No. 42. 40A.

To cure stiff steering see Operation No. 40 for all models.

"AN," "M," "G" and "MA/1" MODELS.

DYNAMO CHAIN.

CUSTOMER'S COMPLAINT

WHIRRING NOISE FROM GEARBOX.

Dynamo chain becomes noisy owing to being out of adjustment, or worn.

Wear is accelerated by neglecting adjustment.

To adjust—remove dynamo cover, slack off strap and turn dynamo till correct chain tension is obtained, this being ½ in. up and down movement on top run.

A worn chain will run tight in places. This being the case, replace chain.

Time required to check-20 minutes.

Time required to replace chain-40 minutes.

See Operation No. 32.

NOTE.—On late models the dynamo chain is endless, so it will be necessary to remove gearbox to replace chain.

Operations Nos. 31, 32 and 33.

Time required—7 hours.

"AN," "M," "G," "G2," "MA/1" and "G/M1" MODELS.

PERFORMANCE.

CUSTOMER'S COMPLAINT

MAXIMUM SPEED AND ACCELERATION BAD.

The car must always first be checked against standard, as it will be found in many cases to be up to standard. Standard performance on a flat road is as follows:—
"AN" Models.

Maximum speed-60 m.p.h.

Acceleration—Standing start to 50 m.p.h., 30 secs.

On top gear, 10 to 30 m.p.h., 14 secs.

"M" MODELS.

Maximum speed-65 m.p.h.

Acceleration-Standing start to 50 m.p.h., 30 secs.

On top gear, 10 to 30 m.p.h., 12 secs.

"G" AND "G2" MODELS.

Maximum speed-65 to 70 m.p.h.

Acceleration—Standard start to 50 m.p.h., 23 secs.
On top gear, 10 to 30 m.p.h., 10 secs.

"GM/I" MODELS. "

Maximum speed-70 m.p.h.

Acceleration-Standing start to 50 m.p.h., 21 secs.

On top gear, 10 to 30 m.p.h., $9\frac{2}{5}$ secs.

"MA/I" Models.

Maximum speed-60 to 65 m.p.h.

Acceleration—Standing start to 50 m.p.h., 36 secs.

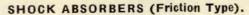
On top gear, 10 to 30 m.p.h., 14 secs.

The method of checking above will be demonstrated and is also described in Item L. (See Operation No. 69.)

It is essential that an accurate stop watch be used on this test and the car handled in the correct way.

It should also be noted that the car must have been run in before maximum performance can be obtained.

Should the performance be below standard the trouble may be due to a variety of causes. These are detailed under "Fault Finding" Instructions No. 3, Operation No. 68.



CUSTOMER'S COMPLAINT (A).

CAR DOES NOT HOLD ON THE ROAD.

If the car does not hold on the road the trouble is probably due to the Shock Absorbers being out of adjustment. A sure indication of shock absorbers being too slack is wheels pounding on uneven surfaces.

Tighten front absorbers half a division, and rear half a turn at a time.

Car should be taken on a fairly rough surface for this test.

Shock absorbers too tight cause uncomfortable riding, road shocks being transmitted to the body, slack off front half a division and rear half a turn at a time.

CUSTOMER'S COMPLAINT (B).

CAR ROLLS ON CORNERS. Rolling on corners is due to rear shock absorbers being too slack.

Tighten up half a turn at a time and test.

SHOCK ABSORBERS (Smith's Type only).

CUSTOMER'S COMPLAINT (C).

GROANING NOISE OR KNOCKING FROM REAR OF CAR.

Noisy shock absorbers set up a groaning or knocking sound. This only occurs on rear shock absorbers and indicates lack of lubrication.

Smith's Shock Absorbers are filled with a special lubricant which on some types is fed to the friction surfaces by turning an impellor in the centre of the casing, operated by the hexagon projecting through this casing. Turn this backwards and forwards two or three times while the car is moved up and down on the springs. If this has no effect the shock absorbers must be stripped down and the friction surfaces smeared with the special Smith Lubricant or Graphite Grease.

Other types have special self lubricating linings. A cure in this case is also effected by smearing the friction surfaces as above.

Time required to adjust __ I hour.

Time required to strip down shock absorbers—2 hours.

For instructions regarding care and maintenance of Luvac Shock Absorbers see Operation No. 60.

For Smith's Shock Absorbers see Operation No. 62.

For Andre Shock Absorbers see Operation No. 61.

For Armstrong Shock Absorbers see Operation No. 63.

ALL 6 CYLINDER MODELS.

STARTER.

CUSTOMER'S COMPLAINT

STARTER WILL NOT WORK.

Apart from ordinary electrical troubles it will sometimes be found that the Starter Shaft seizes in the front and centre bush. Should this occur, the starter must be removed from the engine, the bush housing disconnected from the starter and the bush eased.

Care must be taken to ensure that the oil grooves in the bush are clean and that the oil can pass freely into them.

Time required to cure the trouble-I hour.

10/25 H.P. MODELS-FROM 53001 to 59601.

TIMING CHAIN.

CUSTOMER'S COMPLAINT (A).

NOISE FROM FRONT OF ENGINE.

Cause.

Worn or slack timing chain.

NOTE.—There are three types of chains on the above range of cars:—

- (1) Narrow type "Reynolds" or "Coventry".
- (2) Wide type "Coventry".
- (3) Wide type "Reynolds".

These chains are not interchangeable, so engine number must be quoted when ordering replacements.

The first type are fitted on engines from 53001 to 56500.

The second type are fitted on engines from 56501 to 57700.

The third type are fitted on engine from 57701 to 63400.

Cure.

Fit new timing chain from crankshaft to camshaft.

Time required to fit new chain-21/2 hours.

(See Operation No. 77).

CUSTOMER'S COMPLAINT (B).

ENGINES Nos. 59602 to 63400.

NOISE FROM FRONT OF ENGINE, OR RATTLE IN ENGINE WHEN DECELERATING.

Cause.

Timing chain very slack or tensioner broken.

Cure.

Replace timing chain or tensioner as required. See Operation No. 77.

CUSTOMER'S COMPLAINT (C).

ENGINES Nos. 63401 and onwards.

RATTLE FROM FRONT OF ENGINE.

Cause.

Timing chain slack.

Cure.

Adjust chain. To do this, slacken three 3/8in. nuts retaining dynamo and move dynamo away from the engine, exerting only moderate hand pressure. Retighten nuts.

Time required—10 minutes.

10/25 N.P.

MACNETO DRIVE.

CUSTOMER'S COMPLAINT

CLATTERING NOISE FROM ENGINE OR MAGNETO DRIVE LOOSE.

Cause.

Worn magneto coupling.

Procedure.

Fit new type four point coupling. This does not apply after Engine No. 59602. Time required—30 minutes.

CLUTCH.

CUSTOMER'S COMPLAINT (A).

CLUTCH FIERCE.

Procedure.

If fabric clutch is fitted, fit new type cork clutch.

Time required-5 hours.

See Operation No. 81A.

If cork clutch is fitted drain off clutch sump, swill out with petrol and refill with one pint of engine oil.

Time required—15 minutes.

CUSTOMER'S COMPLAINT (B).

CLUTCH SLIPPING.

This can only be due to ill-usage.

Procedure.

If trouble is slight it may be overcome by tightening clutch springs. If trouble is severe, fit 75 lbs. springs, unless corks are damaged, when new plates will be required.

See Operation No. 81A.

Time required to tighten springs-20 minutes.

Time required to replace plates or springs hours.

CUSTOMER'S COMPLAINT No. 23A.

10/25 h.p. MODELS. "T1" 53401 Onwards.

CLUTCH SLIP.

The following information is additional to Complaint No. 23, and applies to Car Nos. \$3401 onwards.

On receipt of the complaint of Clutch Slip, examine for broken Clutch Springs or for the wrong type Spring and Nut being fitted. If the wrong type are fitted, they must be changed for the latest pattern.

> Aero Clutch Spring Part No. 2879. Retaining Nut Part No. 10154.

The wrong type springs can be recognised by the fact that they are painted black, the latest type are polished.

The dimensions of the old and new type nuts are as follows:-

OLD Type ... Diameter .75in. Overall Length ... 1.125in. New Type ... Diameter .7in. Overall Length ... 1.3125in.

CEARS.

CUSTOMER'S COMPLAINT

SECOND GEAR SLIPS OUT WHEN CLIMBING A HILL.

Procedure.

Examine selector gear, as trouble is due to collapse of selector spring. Fit new spring.

Time required—5 hours.

Operations Nos. 80 and 81.

BACK AXLE.

CUSTOMER'S COMPLAINT

GRINDING NOISE FROM BACK AXLE OR DRIVE JERKY.

Jack up one rear wheel.

Remove inspection cover.

Rotate wheel and examine worm wheel. If this is damaged fit new differential assembly.

NOTE.—Trouble in back axle is very often due to bad handling of the clutch.

Time required to examine—15 minutes.

Time required to fit new assembly-5 hours.

Operations Nos. 84 and 85.

STEERING.

CUSTOMER'S COMPLAINT

STEERING WANDERS.

This may be caused by:-

- (1) Inaccurate tyre pressure.
- (2) Inattention to lubrication.(3) Back lash in steering.
- (4) Play in wheel bearings.
- (5) Tight swivel pins.

Procedure.

- (1) Check tyre pressure. This should be:—
 Front—26 lbs. per square inch.
 Rear—28 lbs. per square inch.
- (2) As 75 per cent. of steering wander is caused by insufficient lubrication of the swivel pins, thoroughly grease these points as follows:—

Jack up front of car until wheels are clear of ground. Apply grease gun freely to nipples on swivel pins, ball joints and steering box. Castrol "D" only may be used.

Time to lubricate—20 minutes.

(3) Test steering for back lash. Adjust as necessary on steering box and take up any play present in ball joints.

Time to adjust steering-1 hour, as per Operation No. 82B.

- (4) Test front wheels for play in bearings. There should be only a trace—.oo6 at hub centre. If front wheels bearings are slack but in good condition, adjust by reducing length of distance piece. If bearings are badly worn, replace (Operation No. 82). Undue wear on front wheel bearings indicates that lubrication has been neglected. Proceed as above and warn owner with regard to lubrication.

 Time to adjust bearings or fit new ones—I hour.
- (5) Swivel pins which are tight should be checked by disconnecting the track rod, leaving the hub assembly free to swing. First lubricate freely. If this does not cure trouble, pull out swivel pin and ease bushes as necessary.

 Time to ease swivel pins—15 minutes to 3 hours. See Operation No. 82.

10/25 H.P. ALL MODELS.

PERFORMANCE.

CUSTOMER'S COMPLAINT

MAXIMUM SPEED OR ACCELERATION BAD.

Procedure.

Test car against standard.

Standard performance on a level road is :-

10/25 h.p. Models prior to Engine No. 63401:-Maximum speed—50 m.p.h.

Acceleration 10 to 30 m.p.h. in top gear-15 secs.

See Items AF and L. Operation No. 89.

Models after Engine No. 63400:-Maximum speed-55 m.p.h. Acceleration—10 to 30 m.p.h.—15 secs.

It is essential that an accurate stop watch be used for this test and that the car be handled correctly.

The car must be fully run in before maximum performance is obtained.

Should the performance be below standard, the trouble may be located as per "Fault Finding" Instructions No. 3, 10/25 h.p. Operation No. 88.

OIL SYSTEM.

CUSTOMER'S COMPLAINT

LACK OF PRESSURE OR BROKEN OIL PIPE.

Procedure.

Replace existing top oil pipes by steel ones.

Time required—30 minutes.

NOTE.—Gauge threads differ. New steel unions are B.S.F. thread. Old unions are Gas.

10/25 H.P. up to ENGINE No. 63400.

SHOCK ABSORBERS.

CUSTOMER'S COMPLAINT (A).

CAR DOES NOT HOLD THE ROAD, WHEELS POUND ON ROUGH SURFACES Procedure.

Tighten up shock absorbers half a turn at a time and test. Car should be taken on a fairly rough surface for this test. Shock absorbers too tight cause uncomfortable riding, road shocks being transmitted to the body. Slack off half a turn at a time.

CUSTOMER'S COMPLAINT

CAR ROLLS ON CORNERS.

Procedure.

Tighten up rear shock absorbers half a turn at a time and test.

CUSTOMER'S COMPLAINT (B)-SMITH'S TYPE ONLY.

GROANING NOISE OR KNOCKING WHEN CAR RUNS OVER UNEVEN SURFACE.

Procedure.

Lubricate shock absorbers.

Smith's shock absorbers are filled with a special lubricant which is fed to the friction surfaces by turning an impellor in the centre of the casing and operated by the hexagon projecting through this casing. Turn this backwards and forwards two or

three times while the car is moved up and down on the springs. If this has no effect the shock absorbers must be stripped down and the friction surface smeared with the special Smith Lubricant or graphite grease.

Time to adjust-1 hour.

Time to lubricate shock absorbers—10 minutes.

Time to strip down shock absorbers—2 hours.

For Maintenance Instructions see Operation No. 62.

On 10/25 h.p. models where Armstrong Absorbers are fitted (after Engine No. 63400), adjustment is carried out by removing adjusting nut, removing one plain washer and replacing and tightening nut.

Time to adjust and test-I hour.

NOTE.—A late type Smith Shock Absorber is self-lubricating and will only require re-packing with lubricant.

10/25 H.P. CARS Nos. 53001 to 63400.

CUSTOMER'S COMPLAINT

RATTLE AT REAR OF CAR.

Cause.

Spring rollers too slack on sides of spring.

Cure.

Dress up springs with smooth file and fit undersize rollers as per Operation No. 85A.

On 1931 cars a divided roller is used, the faces of these can be filed and shims inserted on the outside to take up any play which may develop.

10/25 H.P. ALL MODELS.

CUSTOMER'S COMPLAINT (A).

OIL CONSUMPTION OF REAR AXLE VERY HIGH AND THERE IS NO EVIDENCE OF A LEAKAGE.

To Cure.

See Operation No. 83. A

Time required—2 hours.

CUSTOMER'S COMPLAINT (B).

OIL ON REAR BRAKES.

To Cure.

Fit new leather washer on torque tube centre bearing, and check propeller shaft bearing for wear.

See Operation No. 83 for 10/25 h.p. Models.

See Operation No. 53 for all other Models.

"MA/1," "GM/1," "G2" and "G" MODELS.

REMOVAL OF RADIATOR ON CARS.

- Remove bonnet by undoing two ¼in. nuts and washers at front, one ¼in. nut and washer at rear.
- 2. Drain radiator, drain plug in base.
- 3. Drain cylinder block, drain plug in O/S of block.
- 4. Disconnect six rubber hose clips.
- 5. Remove two 3/sin. nuts and washers securing radiator to front of chassis.
- 6. Disconnect radiator tie rod, two 3/8in. nuts at rear near dash.
- 7. Disconnect horn wires and draw clear from stoneguard. (Not "G" model).
- 8. Lift radiator, taking care of two packing washers between radiator and chassis. Time to change radiator—r hour.

"AN" MODELS.

REMOVING RADIATOR.

Drain radiator, removing %6in. plug.

Remove bonnet, 1/4 in. nut at rear end of hinge rod.

To release bottom end of ignition control rod unscrew socket complete.

Remove top water connection and bottom water connections, sliding hose off radiator pipes on to water pipes.

Remove two 5/16 in. nuts, spring washers and packing pieces holding radiator to chassis cross member.

Slacken off %6in. nut holding radiator tie bar to dash bracket and lift bar out of bracket.

To refit radiator, reverse operations.

NOTE.—When a new radiator is fitted the bonnet must be placed in position before tightening up tie bar, so as to bring radiator in correct position to allow bonnet to fit at all points.

In some cases, slotted washers will be found on radiator base studs between radiator and chassis. These are used to ensure that the radiator is vertical. Pack up radiator as necessary.

TOOLS.

One 1/8in. open ended spanner.

One 1/4 in. open ended spanner.

One 5/16in. open ended spanner.

One pair pliers.

One screwdriver.

Time-45 minutes.

After changing radiator check ignition timing. A different radiator may upset ignition timing through bringing radiator tie-rod and ignition controls into a slightly different position.

MA/1 "AI

"AN" and "M" MODELS.

FITTING WATER FLOW RESTRICTION WASHER.

Drain radiator. 5/16in. plug.

Detach top water connection cap from rear of cylinder head leaving it attached to pipe.

Three %in. nuts and spring washers.

Remove cork washer.

Place restriction washer in position (steel washer 23/8 in. outside diameter with 11/46 in. diameter hole).

Fit new cork washer.

Re-assemble reversing operations.

TOOLS.

One 3/16in. spanner.

One 5/16in. spanner.

Time-15 minutes.

TYPES "AN," "M," "G" and "MA/1"

ADJUSTMENT OF FAN BELT.

Slack back two 1/4 in. sets screws locking fan blades flange to body.

Holding body by means of a short bar in slots on back of flange, rotate blades until the required tension is obtained on the belt.

Lock set screws, taking care that these register in two of the four grooves cut in the thread portion of the body.

If belt bottoms on the pulley it should be replaced.

The adjustment of fan is sometimes found to be very stiff. This is due to the set screws having been tightened down on the thread and damaging it.

The impellor assembly should be removed as in Operation No. 4 and the thread recut. If the job is urgently required, however, the damaged portion on the thread can be removed by drilling out through the set screw hole, using a 5/6 in. drill. This must be done carefully, removing only a very slight amount of metal.

TOOLS.

One 1/4 in. socket and ratchet attachment.

One short bar.

Time-5 minutes to 45 minutes.

ALL 6 CYLINDER MODELS.

REMOVING WATER IMPELLOR. All 6 Cyl. Models.

Remove bonnet, one 1/4 in. nut at rear end of hinge rod. also 2 at front when fittee.

Drain radiator, 5/16 in. plug at base of front. Slack off clip on top hose. Slacken back one 5/16 in. nut at rear end of radiator tie rod. Lift rod out of dash bracket.

Remove fan belt, undoing screw in one link and prising leather link off steel connectors.

NOTE.—Where rubber belt is fitted, dynamo must be slackened off by releasing three 3/sin. nuts and moving dynamo towards engine.

Remove two clips from impellor water connection.

Slide hose downwards until clear of connection.

Slacken off two 5/16 in. nuts at base of radiator, holding same to chassis.

Unscrew six % in. bolts and spring washers, withdrawing four of them holding flange to head. Incline radiator forward till it touches lamp bar. Bring impellor forward with fan blades vertical. Incline towards nearside of car until impellor comes clear of cylinder head, withdraw assembly towards offside of car.

To refit assembly, reverse operation for removing, fitting new cork flange washer. (No jointing compound to be used.)

NOTE.—Start all flange bolts before tightening up. Screw up till bolts hold flange to face without pressure. Then tighten up half turn at a time in following order, top bolt, bottom, top left, bottom right, top right, bottom left, top, bottom and so on. Do not use undue pressure as bolt may break, or flange may crack.

TOOLS.

One 3/16in. spanner. One 1/4 in. spanner. One 5/16 in. spanner. One 5/16in. socket spanner. One small screwdriver. Time-45 minutes.

MA/2." G2" and "GM/1" MODELS.

DISMANTLING IMPELLOR.

Remove 1/8 in. split pin and 1/2 in. castellated nut from front end of fan spindle.

Fan blades and pulley will then draw off.

Remove spring ring from lock nut.

Remove lock nut using special "C" spanner. (NOTE.—Steel washer and felt packing inside lock nut).

Remove front half of spindle complete with double ball race, distance piece, steel washer and felt packing, by prizing the two halves of spindle apart with small screwdriver, replace ½ in. castellated nut and tap out.

Remove water impellor and steel distance washer from behind impellor.

Tap rear half of spindle forward and remove, leaving gland nut in position.

Remove gland nut, bronze ring and two split asbestos packings.

To re-build—reverse operations.

TOOLS.

One pair of pliers.

1/2 in. spanner.

One small screwdriver.

Special "C" spanner.

Time-I hour.

"AN," "M," "G" and "MA/1" MODELS.

DISMANTLING IMPELLOR ASSEMBLY.

Remove fan blades, four 1/16 in. pins, four castellated nuts and plain washers.

Remove two ¼in. set pins, locking front pulley flange to body. Screw flange off body. (When assembling make sure that set pins are tightened down into the grooves or serious trouble will result if threads are damaged).

Remove rotor, one 3/12 in. split pin, screw rotor off spindle, remove split collar.

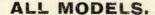
Remove inner flange, one din. split pin and 1/2 in. castellated nut holding the other end of spindle in vice with tin clamps.

Remove wire locking ring.

Remove fan pulley lock nut (right hand thread). Screw back gland nut (special spanner). Remove spindle locating washer. Ball bearing and spindle come away carrying gland nut. TO RE-ASSEMBLE—reverse operations.

NOTE.—Before assembling all the old packing must be removed and four new pieces of standard length fitted.

Time required—45 minutes.



REPACKING IMPELLOR CLAND. All Models.

Slacken off gland nut using special spanner.

Bend 21/4 in. strip of standard packing round spindle and insert same into gland. ("AN," "M" and "G" Models).

NOTE.—There are three types of packing:—

Asbestos string, lead loaded ("AN" and "M" types).

Asbestos string, graphite loaded ("G" type).

Asbestos rings, graphite loaded ("G2", "MA/1" and "GM/1" types).

Screw gland nut back into position until resistance is felt to further movements of spanner, beyond effort required to tighten up the gland nut itself.

Lubricate gland with grease gun.

TOOLS.

One gland nut spanner.

One grease gun.

Time required—10 minutes for "AN" and "M" types.

20 minutes for "G", "G2", "MA/1" and "GM/1" types.

"G," "AN" and "M" TYPE.

REMOVING ENGINE FROM CAR.

NOTE.—Work must be done by two men-one working on engine, one on gearbox.

Disconnect positive lead from battery. Remove radiator—Operation No. 1 or 2.

Remove gearbox from car—Operation No. 31.

Disconnect distributor cover by releasing two spring clips.

Disconnect coil lead from distributor loosening wire locking cap with screwdriver.

Remove plinth plates by releasing front end of front brake rods, undoing two 3/sin. nuts and removing eight screws, packing pieces and 3/sin. nuts and spring washers; disconnect air strangler return spring and draw plates off rod.

Remove petrol pipe, 3/8in. union at each end.

Remove Autovac suction pipe, %6in. union at each end (if fitted).

Remove vacuum Servo suction pipe (if fitted), 716 in. union at each end.

Remove strangler wire from carburetter, undoing two screws.

Disconnect slow running throttle control.

Remove carburetter, undoing two ¼in. nuts and spring washers. Disconnect exhaust pipe from manifold, removing four ‰in. nuts.

Disconnect exhaust pipe sump clip, removing two 1/4 in. sump nuts and spring washers, replace nuts and washers on studs.

Remove junction box for front lamp wiring from base of vertical shaft. Remove throttle control, withdrawing sain. split pin and fulcrum pin.

Remove gauge oil pipe, ¼in. union. Remove starting cable, ¼in. nut.

Remove steering, Operation No. 35 or 36.

Remove three engine bolts, taking out from each 3/2 in. split pin and undoing 1/6 in. nut. Lift engine out by means of suitable chain tackle (weight of engine is 6 cwt.), placing the lifting chains under the cylinder head projection at front and rear, and remove feet from each of rear supporting arms, removing one 5/16 in. nut and spring washer from each, and refit feet to new engine.

To refit proceed in reverse order.

TOOLS.

One pair of pliers. One screwdriver.

One 3/16 in. open ended spanner and socket.

One 1/4 in. open ended spanner.

One %in. open ended spanner.

One 3/8in. open ended spanner.

One 1/16in. open ended spanner.

Lifting tackle.

Time-two men-9 hours.

TYPE "MA/1"

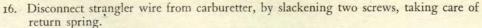
REMOVE ENGINE FROM FRAME.

Proceed as Operation No. 10. and in addition remove three 1/16 in. bolts securing steering column to engine.

TYPE "G2" and "GM/1." MA/2.

REMOVE ENCINE FROM CHASSIS.

- 1. Remove bonnet and radiator-see Operation No. 1.
- 2. Remove floor boards—see Operation No. 29.
- 3. Remove gearbox complete—see Operation No. 31A.
- 4. Remove Thermo gauge pipe from cylinder head, one knurled nut.
- 5. Remove Servo pipe from induction pipe, if fitted.
- 6. Remove small water pipe, two union nuts.
- 7. Remove water pipe from radiator to impellor—two hose clips.
- 8. Remove high tension leads and carrier complete as follows:-
 - (a) Detach leads from spark plugs.
 - (b) Detach low tension wire from coil and distributor.
 - (c) Pull out high tension wire from coil on dash.
 - (d) Remove distributor cap and wire complete by releasing two spring clips.
 - (e) Remove two 3/16 in. set pins securing lead carrier to water pipe.
- Remove water pipe from top of radiator to thermostat housing on cylinder head by releasing two hose clips and two steam pipe hose clips.
- 10. Remove solenoid switch and three leads complete from starter motor.
- 11. Remove two leads from dynamo.
- 12. Remove ignition control rod—one split pin, washer and spring.
- 13. Remove two oil pipes which lubricate front brake shafts.
- 14. Disconnect exhaust pipe, four 1/46 in. nuts and two 1/46 in. nuts which attach clip to sump. Remove filter, two 1/46 in. bolts and washers.
- 15. Disconnect oil gauge pipe, one union nut.



17. Disconnect petrol feed pipe from petrol pump, one union nut.

18. Disconnect control rod from dash lever to carburetter by pulling off two spring loaded ball joints.

19. Remove split pins, nuts and bolts securing rear of engine to frame.

20. Swing top silent blocks clear of engine feet.

21. Remove two front engine bolts.

22. Lift engine clear of chassis.

23. To refit, reverse operations. Time required—two men, 9 hours.

NOTE.—On "GM/1" Model it is necessary to remove three % in. bolts securing steering column to engine.

TOOLS.

Pliers.

Screwdriver.

Hammer.

1/4in. to 3/16in. spanner. 5/16in. to 3/8in. spanner.

7/16in. to 1/2in. spanner.



"AN," "M" and "G" MODELS.

DISMANTLING ENGINE.

Remove fan and impellor assembly, six 3/16 in. bolts and spring washers.

Remove distributor by releasing pinch nut at top of vertical shaft (pinch nut is left hand thread). Withdraw three % in. bolts and nuts and spring washers, lift distributor off vertical shaft.

Remove exhaust and inlet manifolds, four 5/16 in. bolts and bridges, four copper asbestos washers.

Remove valve rocker assembly, nine ½ in. nuts and spring washers, two of which hold the oil release valve plate and spring in position. Prize assembly off head with screw-driver and remove release valve.

Remove six sparking plugs (%in. spanner).

Remove main oil feed pipe, two 1/16in. unions.

Remove oil pipe from three-way union to A.C. filter, one 5/16in. union, one 1/4in. union.

Remove eighteen 516 in. cylinder head bolts, break cylinder head joint by tapping with lead hammer under thermostat housing. Lift head off block with special bar.

Remove cylinder head gasket.

Remove twelve push rods, using special tool. On models fitted with Halford Gear push rods are not spring loaded, so special tool is not required.

Remove A.C. filter and starter motor by releasing 5%in. lock nut and set pin, then prize

out of housing.

Remove camshaft chain cover, six %in. bolts and spring washers (anchorage plate for accelerator pedal return spring is fitted to central bolt nearest cylinder block).

Remove carburetter, control rod, four %in. bolts and spring washers. (When assembling, control rod must be finger easy).

Remove oil filter box, two 5/16 in. bolts, two copper absestos washers.

Remove vertical shaft, four %in. bolts and spring washers (vertical shaft bushes are dowelled to bracket, longest bush to shortest end of bracket).

Remove camshaft rocker plates and rollers, fourteen %in. bolts in each of the two end plates and twelve in the centre. (Plates are not interchangeable.)

Remove camshaft front end cover, eight 3/16 in. bolts.

Remove flywheel, six 3/2 in. split pins and 3/6 in. castellated nuts, use special extractor.

Remove camshaft timing chain, withdrawing rivetted pin and small washer.

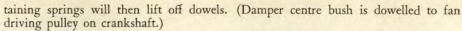
Remove camshaft chain wheel by removing locking wire and four 5/16 in. eye bolts. (Note. Mark on wheel and dowel).

Remove sump, thirty-two 5/16 in. nuts and spring washers, two 7/16 in. nuts and spring washers (break joint by tapping corners with lead hammer).

Remove oil pump, one sain. split pin, one sin. castellated nut. Assembly lifts out, releasing helical drive from camshaft.

Remove connecting rods and pistons, two 3/2 in. split pins, two 3/8 in. castellated nuts on each rod. (Con. rods, shims and bearing caps are numbered with large and small numbers. When re-building, care must be taken to see that the small numbers come to the camshaft side of the engine and pistons numbered to front of engine. Piston numbers, i.e., 1, 2, 3, 4, 5, 6, come to the front of the engine.

Remove vibration damper. Place two "U" clips over plate and pulley. Remove starter dog and washer, damper centre bush, friction discs, pulley and pulley flywheel, con-



Remove fan driving pulley which is keyed to crankshaft (this is a sliding fit).

Remove brass damper bush by prizing out with screwdriver (this is a sliding fit and is held in position by steel dowel in the centre of damper bush housing in sump).

To remove crankshaft, eight 1/8 in. split pins, eight 1/8 in. castellated nuts, remove bottom half of main bearings and cap, lift out crankshaft (both halves of main bearings are numbered and must be kept to camshaft side of engine when re-building).

Remove camshaft, first withdrawing 1/16 in. bolt from front end, holding vertical shaft driving wheel. Vertical shaft driving wheel is keyed to camshaft, screw 1/16 in. bolt in two or three threads and tap until it comes off camshaft, camshaft will then slide out towards rear end of engine.

Remove chain oil feed pipe, two 1/16 in. split pins, two 3/16 in. castellated nuts.

To re-build engine proceed with operations in reverse order, except that sump, flywheel and timing chain must be left off until cylinder head has been fitted and tappets set to .004 for the valve timing.

Set Nos. 1 and 6 pistons on top dead centre, checking position of pistons with depth gauge.

Turn camshaft timing wheel until No. 1 inlet and exhaust valves are on the balance, that is, both valves are just open.

Fit timing chain without moving pistons or timing wheel more than can be helped, as one tooth out on wheel gives 2in. on flywheel. If timing is O.K. this setting will read, inlet valve opens 20 mm. before top dead centre, proceed with ignition timing. (See Operation No. 24.)

NOTE.—A simple depth gauge consists of a plug body through which a rod about 6in. long is passed and is a sliding fit.

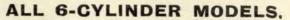
Time to strip-3 hours.

Tools required—
One flywheel extractor.
One pair pliers.
One screwdriver.
%in. to 3/4 in. spanners.
%in. to 1/2 in. socket, ratchet and T handle.

"92", GMII 4 MA/2.

TO DISMANTLE ENCINE.

Dismantle as in Operation No. 11, with the addition of Operations Nos. 18, 19 and 27. Time required—3 hours.



REMOVAL OF CYLINDER HEAD.

Remove bonnet, one 3/8 in. nut at rear end of hinge rod.

Drain radiator, 5/16 in. plug at base of front.

Drain cylinder block, % in. plug (offside).

Remove valve cover, four hand nuts. Note.—Where Smith air cleaner is fitted, pipe from valve cover to carburetter to be removed by releasing spring clip.

Remove valve rocker assembly, nine 1/4 in. nuts and spring washers, one oil release valve cover, one oil release valve spring.

Prize assembly off head with tommy-bar.

Remove oil release valve (NOTE-longer part of body fits in cylinder head).

Remove four 5/16 in. bolts and bridges releasing exhaust and inlet manifolds disclosing manifold washers which it is usually necessary to replace.

Remove six sparking plugs, %in. box spanner.

Disconnect top water joint to radiator, undoing two clips, sliding hose on to water pipe until clear of connection.

Slacken off bottom steam vent pipe clip, undoing screw.

Slacken off clip holding hose to thermostat cover.

Take off distributor cover from distributor assembly, releasing two spring clips.

Disconnect low tension lead (thin cable) from distributor, loosening wire locking screw with screwdriver, and in the case of M.L. unit pulling wire out of the hollow socket.

Slide water pipe and hose off thermostat cover. Where a thermostat is fitted remove connection to gauge.

Pull pipe and hose off steam vent union upward.

Swing water pipe and high tension lead assembly towards rear of car, letting them rest clear of engine.

Remove fan belt withdrawing screw and splitting one link. If rubber belt is fitted release dynamo.

Release impellor water connection, undoing two clips, and slide hose downward on pipe until clear of connection.

Detach oil pipes from three-way junction, one 1/4 in. union, one 1/4 in. union.

Detach distributor from cylinder head (when fitted in that position), two % in. bolts holding distributor to front of head.

Tap distributor gently forward till it comes off dowels.

Remove eighteen 5/16 in. cylinder head bolts.

Fit lifting bar to four studs retaining valve cover.

Break cylinder head joint by tapping bottom edge of thermostat housing with lead hammer.

Stand astride of engine facing towards radiator with feet on chassis. Lift head off block with fan blades vertical, swinging front end towards offside of car, where assistant takes head.

To refit head, reverse above operations, first, however, cleaning face of head and block and painting both sides of gasket with jointing compound.

Adjust tappets as in Operation No. 23.

NOTE.—Great care must be taken to tighten up head bolts evenly in the order stated in illustration on following page.

TOOLS.

One %in. box spanner.

One 1/4 in. open ended spanner. One 5/4 in. open ended spanner.

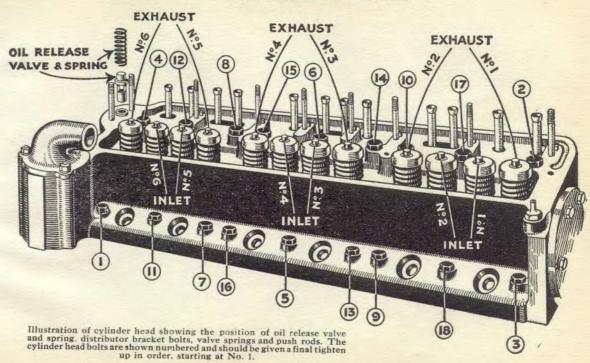
One 7/16 in. open ended spanner.

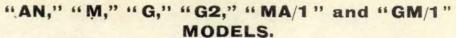
One 5/16 in. box spanner and tommy bar.

One ¼in. socket and "T" handle. One ¼in. socket and "T" handle.

Time required—21/2 hours.

ALL 6 CYLINDER MODELS





DECARBONISE.

Remove cylinder head, Operation No. 13.

Remove water impellor, Operation No. 4.

Remove valves from head by removing from each one 5 in. split pin and one 6 in. castellated cone nut.

Hold valve by means of screwdriver in head slot if it is inclined to turn when running off nut.

Clean carbon off valve head and stem, reface valves.

Remove carbon and jointing materials from cylinder head.

Recut valve seats.

Grind valves into seat using finest emery and oil only until gastight seat is obtained.

Reassemble valves into head taking care to screw nuts down equally.

Repack water impellor gland, Operation No. 7.

Fit water impellor to head, Operation No. 4.

Remove carbon from pistons and cylinder block.

Always fit new cylinder head gasket.

Paint both sides of gasket with jointing compound.

Refit cylinder head, Operation No. 13.

NOTE.—Before fitting sparking plugs clean them and set points to a gap of .010in.

TOOLS.

One %6 in. spanner.
One pair pliers.
One %6 in. socket and "T" handle.
One screwdriver.
One .010 feeler,
Using valve and seat grinding plant.

Time-61/2 hours.

NOTE.—After decarbonising set all tappets to .008in. Set contact breaker points .012in.

"AN," "M" and "G" MODELS.

DISMANTLING DISTRIBUTOR.

Remove distributor cap.

Remove distributor rotor and contact breaker assembly.

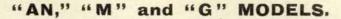
Remove splined coupling, two 1/16 in. split pins, two 3/16 in. castellated nuts and bolts.

Remove 3/8in. castellated nut and plain washer from spindle and remove inner coupling. (Note.—Inner coupling is held on taper, not keyed.)

Remove spindle locating collar by removing 1/8 in. peg, draw spindle out of bush.

TO RE-ASSEMBLE—reverse operations.

Time required—I hour.



EASING SEIZED DISTRIBUTOR SHAFT BUSH.

Disconnect top half of distributor bracket, removing three % in. bolts, nuts and spring washers.

Remove distributor assembly off engine (after detaching distributor head, undoing two spring clips) by slacking off left hand threaded nut at top of vertical shaft and drawing assembly off shaft.

Remove rotor.

Remove contact breaker assembly.

Disconnect coupling by removing two %in. bolts nuts and split pins.

Remove 3/8in. spindle nut.

Draw half coupling off spindle. This is held on taper.

Remove spindle locating collar which is pegged to spindle.

Draw spindle out of bush. Ease bush as necessary.

Re-assemble—reversing operations.

TOOLS.

One %6in. and 5/16in. spanners.

One 3/8in. box spanner.

One pair pliers.

One screwdriver.

One adjustable spanner.

Time-I hour.

ALL 6 CYLINDER MODELS.

TO REMOVE AND EASE SIEZED VIBRATION DAMPER.

Remove fan belt. NOTE.-There are two types of belts:-

1. Whittle.

2. Endless rubber.

Whittle can be removed by taking out one small screw and splitting a link.

To remove rubber belt on "MA/1" models, slacken off fan adjustment and lift belt over fan blades.

To remove belt on "G2" and "GM/1" models, slacken off dynamo, three %inbolts, turn dynamo towards engine and lift belt off pulley.

Place two "U" clips over damper pulley and plate, remove starter dog and washer, damper will then lift off dowels on crank damper sleeve.

Place damper complete in vice and remove damper centre.

Remove two "U" clips, damper pulley and plate will then come apart, releasing ten small coil springs.

Ease damper centre, clean and grease springs.

NOTE.—Damper is balanced as a body and marked with a file cut on pulley and plate. Care must be taken when re-assembling to keep marks together.

To re-assemble—reverse operations.

TOOLS.

One ¼in. spanner.

One %in. spanner.

Two "U" clips.

Small screwdriver.

One hammer and brass drift.

Time-45 minutes.

MA/2."G2" and "GM/1" MODELS.

TO REMOVE FLYWHEEL.

Dismantle clutch as in Operation No. 27.

Then remove six 3/32in. cotter pins.

Undo six 3/8 in. castellated nuts, flywheel will then pull off complete with ball race, by screwing up two 1/16 in. bolts through holes provided.

In assembling flywheel and clutch, care should be taken that the mark O on the flywheel is in line with the mark O on the declutch plate.

Time required—30 minutes.

MA/2. "G2" and "GM/1" MODELS.

TO REMOVE FRONT PLATE AND DYNAMO.

A. TO REMOVE DYNAMO.

1. Remove split pin and 1/6 in. nut from pulley end of dynamo.

2. Remove fan belt by slackening three 5/16 in. bolts securing dynamo to plate.

3, Prise dynamo pulley off shaft.

4. Remove dynamo, by removing three 5/16in. bolts, nuts and washers.

To assemble, reverse operations. Time to change dynamo ½ hour.

B. TO REMOVE FRONT PLATE FROM ENGINE.

1. Remove dynamo-as above.

2. Remove damper-See Operation No. 17.

3. Remove eight % in. set pins which secure plate to crankcase.

4. Straighten lips of lock plate, and remove two 1/16 in. bolts from centre of plate. Plate will then come away.

To assemble, reverse operations.

TOOLS REQUIRED.

%in. socket, spanner and T. wrench.

Two "U" clips.

One screwdriver.

One hammer.

One pinch bar.

One 3/16in. spanner.

One 5/16in. spanner.

ALL 6-CYLINDER MODELS.

DISMANTLING OIL PUMP. All 6 Cyl. Models.

Remove four 1/6 in. split pins, four 1/4 in. castellated nuts and bolts.

Remove one 4 in. split pin, 1/2 in. castellated nut and locating bolt, bottom plate will then come away.

TO RE-BUILD—reverse operations.

NOTE.—The steel gear is only splined half way, keep splines to the bottom, or re-build with pump spindle in position.

CA, GM/1 "AN," "M," "G" and "MA/1"

TO CHECK FOR BROKEN OIL SPRAY PIPE.

Drain oil from clutch housing by removing plug; with plug out, run engine at normal tick over, when oil is flowing out of plug hole regularly, test with stop watch the time taken to fill a pint measure.

If pipe is O.K. it will take 13/4 minutes or longer.

If time is less than 30 seconds, pipe is damaged and must be replaced, as in Operation Nos. 31 and 11.

If cause of lack of oil pressure has not been located and cured, it must be due to worn bearings, or partially seized camshaft. Replace engine.

Time required to check-45 minutes.

Time required to change engine-2 men, 9 hours.

(See Operation No. 8.

"AN", "M", "MA/1", "MA/2", "G", "GM/1" and "G.2" Models.

FITTING OF PISTONS.

TO REMOVE PISTONS.—Drain oil from sump. Raise front of car or bring it over pit. Drop sump. Thirty-two 3/sin. nuts and spring washers, and two ½in. nuts and spring washers.

Withdraw connecting rods and pistons downwards, removing bearing caps by taking

out two 3/2 in. split pins and two 3/8 in. nuts from each.

NOTE.—Small numbers face camshaft.

Remove pistons from connecting rods by removing 1/4 in. gudgeon pin clamp bolt, and pushing out gudgeon pin.

NOTE.—Scraper ring pegs to front of engine.

TO RE-FIT.—Reverse operations and fill sump with fresh oil to correct level. Badly worn or scored pistons must be renewed.

TO FIT NEW PISTONS.

1. Check pistons in cylinder bore without rings. To do this, use a feeler gauge attached to a spring balance. Insert piston, together with feeler gauge, into cylinder bore. Withdraw feeler, using spring balance and noting the pounds pull required to do so. A table is given below, stating pounds pull required.

NOTE.—Two types of pistons are fitted to 2-litre engines:—

(a). OLD PATTERN which have an eccentric scraper ring, with no anti-slap

ring underneath it.

(b). New Pattern which have corrugated anti-slap ring beneath the scraper and centre rings.

2. After checking bare piston, fit up centre ring and anti-slap ring and check pull again. NOTE.—The corrugations on the anti-slap rings are fitted to the camshaft side of the piston. Scraper ring peg goes towards the front of the engine.

- 3. Remove centre ring and anti-slap ring, and fit up scraper ring and anti-slap ring. Check pull again.
- 4. Assemble piston complete and check pull again.
- Correct poundage is obtained by increasing the "set" of corrugations on anti-slap rings.
- 6. When checking old pattern 2-litre pistons, it is only necessary to test pull with bare piston. Do not check with rings fitted.

TOOLS REQUIRED.

One 3/8in. open ended spanner.

One 3/8in. socket and ratchet and T handle.

One 1/2 in. socket and ratchet and T handle.

One pair pliers.

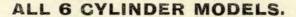
One 1/4 in. socket and T handle.

TABLE OF CLEARANCES AND POUNDS PULL FOR TESTING NEW PISTONS.

20 H.P. 72 m/m use .005in. feeler gauge.		
Pull with bare pistons must be	 	6 to 10 lb.
Pull with centre ring and slap ring	 	18 to 23 lb.
Pull with scraper ring and slap ring	 	8 to 12 lb.
Pull with all rings	 	28 to 35 lb.
2-LITRE. 65 m/m use .004in. feeler gauge.		
Pull with bare pistons must be	 	6 to 10 lb.
Pull with centre ring and anti-slap ring	 	8 to 12 lb.
Pull with scraper ring and anti-slap ring	 	8 to 12 lb.
Pull with all rings	 ***	25 to 28 lb.

Thickness of anti-slap rings: - Centre ring .018in. Scraper ring .015in.

Clearance between side of rings and groove in Piston .oozin. Piston ring gap .oo6in. SPECIAL NOTE.—Feeler gauge is only used when checking bare piston. When testing pull with rings fitted to piston, hook balance to gudgeon pin.



ADJUSTMENTS OF TAPPETS.

Run engine until warm.

Remove valve cover plate, 4 hand screws.

Bring No. 1 piston to top dead centre on compression stroke (both valves shut).

Check tappet clearance as follows:-

Place small screwdriver (not more than 6in. long overall) so that the metal end lies beneath the rocker shaft, and the centre of the screwdriver rests on top of the tappet locking screw.

Exert pressure (not great pressure) on handle, thus taking up the pressure of the push rod return spring. (On models fitted with Halford Gear no push rod return springs are fitted.)

It should now be just possible to insert a .oo4in. feeler between the rocker and valve stem.

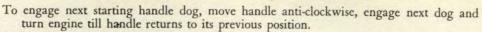
If clearance is not correct slack off 3/16 in. locking screw, and set adjusting screw so that .004in. clearance is obtained. NOTE.—On Halford gear a lock nut is substituted for the 3/16 in. locking screw.

Tighten up locking screw.

Check as before.

Note position of starting handle with No. 1 piston at top dead centre.

This will be approximately vertical.



No. 5 piston will now be at top of compression stroke.

Adjust tappets as for No. 1.

Proceed as above in order of firing (1, 5, 3, 6, 2, 4).

Replace valve cover.

TOOLS.

One %6in. open ended spanner.
One %6in. box spanner and tommy bar.
One small screwdriver.
One 4 thou. feeler.
Time—25 minutes.

"AN," "M," "G," "G2," "GM/1" and "MA/1" MODELS.

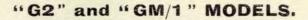
IGNITION TIMING.

Turn flywheel one complete circuit from valve timing, that is, Nos. 1 and 6 pistons on top dead centre compression stroke, check top dead with depth gauge. When top dead centre is obtained, mark red, level with top of plug body.

Take rod out of plug and measure 10 mm. up from top dead centre mark, mark rod and replace. Turn flywheel back until 10 mm. mark comes level with top of plug body.

Fit distributor with rotor parallel with engine pointing to the rear. Set distributor control arm fully advanced, that is, push the control arm towards the fan so that the stop pin is about %in. from the edge of slot, set points just breaking, tighten up pinch bolt and gland nut (left hand thread).

Time required—20 minutes.



TO FIT NEW TIMING CHAIN OR CHAIN OIL PIPE.

- 1. Remove floor boards. See Operation No. 29.
- 2. Remove gearbox and clutch case complete. See Operation No. 31A.
- 3. Remove clutch. See Operation No. 27.
- 4. Remove flywheel, six split pins and 3/8in. nuts.

TO FIT NEW CHAIN.

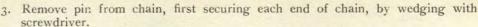
- A. Remove rivet from chain and remove chain.
- B. Fit new chain.
- C. Check valve timing. See Operation No. 25. //.
- D. Rivet up chain pin.

TO FIT NEW CHAIN OIL PIPE.

- A. Remove two split pins and %6in. castellated nuts, which secure flange of chain oil pipe to crankcase.
- B. Fit new pipe if necessary.
- C. Check new pipe for correct gap. This should be .006in.
- D. NOTE.—Paper joint is fitted between flange of pipe and crankcase.
- To assemble, reverse operations.

SPECIAL NOTE.—TO FIT NEW CHAIN WHEN ORIGINAL CHAIN IS NOT BROKEN.

- 1. Remove timing chain cover. Four 3/16in. nuts and spring washers.
- Remove washer from one pin of chain, with sharp chisel, taking care washer does not drop into engine.



4. Connect one end of new chain to one end of old chain.

5. Jack up one rear wheel and engage top gear.

- By rotating rear wheel very slowly, old chain will wind new chain into position.
 Every care must be taken when doing this to ensure chain not jumping teeth of chain wheels.
- 7. When new chain is in position, check valve timing as per Operation No. 25.

8. If O.K. rivet up chain and re-place cover.

9. It is an advantage to remove floor boards for this work. This operation can be performed on models with chain tensioners which are fitted in crank case, but in this case, nuts on tensioner adjusting screw must be slacked off to the limit.

Time-2 hours.

TOOLS REQUIRED.

One hammer.

One chisel.

One Rivetting punch.

One %in. spanner.

One jack.

Two screwdrivers.

One small pinch bar.

One pair pliers.

One 3/8in. box spanner.

TYPE "AN," "G," "M" and "MA/1."

DISMANTLING CLUTCH.

Remove dynamo cover, eight 1/4 in. nuts.

Release steel strap undoing set pin.

Remove dynamo leaving chain on shaft.

Slide clutch plates off clutch shaft complete with splined plate carrier.

NOTE.-Marking (Marked 1).

Remove yoke pin from clutch pedal (split pin) and remove yoke.

Take out 1/2 in. brass plug covering end of n/s clutch fork shaft.

Release two 1/16 in. nuts clamping clutch fork to shafts, shafts may then be removed, using 1/16 in. draw bolt for n/s and tapping offside out.

Lift out clutch fork and trunion through clutch inspection aperture.

Draw off clutch plate.

Draw dynamo drive splined sleeve off clutch shaft complete with dynamo chain and wheel, taking care not to drop out the four clutch stop pins and note the marking on sleeve and clutch shaft (marked O).

Thrust bearing is located by split retaining ring.

Remove hardened steel distance washer (this washer is fitted so that a working clearance of .oo6in. is left on parts assembled on clutch shaft when gearbox is in position.)

Remove clutch stop thrust race and plate.

Re-assemble, reversing operations, taking care that lips on clutch centre face flywheel.

NOTE.—Springs on clutch cork plates should be set out %in. It is essential that all springs be equal in set and tension, or plates may not free properly. When refitting dynamo, rotate assembly until chain has up and down movement of ¼in. on top run.

TOOLS.

One screwdriver.

One hammer.

One 1/4 in. spanner.

One 5/16in. spanner.

One 7/16in, spanner.

One 1/2 in. spanner.

One 5/16in. draw bolt.

Time-45 minutes.

MA/2. "G2" and "GM/1" MODELS.

DISMANTLING CLUTCH.

Remove nine 1/16in. cotter pins.

Undo nine castellated 1/4 in. nuts.

Declutch assembly will then withdraw complete with springs, toggle plate and toggle springs.

Remove two dowel pins, using small bent punch, two Ferodo rings and clutch driven plate will then come away.

To re-build—reverse operations, taking care that the mark "O" on the flywheel and declutch plate are in line.

To remove ball race from clutch withdrawal sleeve, and C.W.S. from clutch plate.

Force spring clip and distance piece towards declutch plate.

Push race towards declutch plate.

Remove split ring from clutch withdrawal sleeve, pull off race, distance piece and spring clip. Clutch withdrawal sleeve will then come away.

In assembling care should be taken that the mark "O" on the clutch withdrawal sleeve is in line with and nearest to the mark "O" on the declutch plate.

Time required—1 hour.

MA/2 "G2" and "GM/1" MODELS.

REMOVE CLUTCH AND BRAKE PEDALS AND CLUTCH WITHDRAWAL SHAFT.

- 1. Remove pedal and floor boards (see Operation No. 29).
- 2. Remove brake pedal, one yoke pin, one 3/sin. nut and two washers and oil pipe union.
- 3. Remove clutch pedal bracket, two 3/8 in. bolts and spring washers, and distance washer.
- 4. Remove clutch pedal by slackening pinch bolt, and removing return spring.
- 5. Remove offside bush.
- 6. Remove nearside bush by removing one 3/sin. nut and spring washer.
- 7. Remove inspection cover, four 5/16in. nuts.
- 8. Remove withdrawal shaft through inspection hole.

REMOVE FLOOR BOARDS ON CARS. "MA/1," "CM/1," "C/2."

- 1. Remove two 3/8in. pinch bolts from brake pedal and clutch pedal.
- 2. Withdraw pedal extensions.
- 3. Remove four 1/4 in. bolts, nuts and washers from pedal board.
- 4. Remove pedal board.
- 5. Remove wood screws from floor boards and remove board.

Time to remove boards-15 minutes.

MA/2. "G2" and "GM1" MODELS.

REMOVING CEARBOX.

Remove front seats by sliding backwards.

Remove seat channels, five screws in each.

Remove floor boards, four screws.

Remove pedal board, six screws.

Disconnect battery leads and remove two 1/4 in. nuts, battery will then lift out.

Remove the strap that goes under torque tube and holds the battery in position, two %6in. nuts, bolts and spring washers, also two %6in. bolts and nuts carrying battery seats, this will allow torque tube to be lowered to the floor.

Disconnect lubricating pipes, three 1/4 in. unions, also release pipe clips.

Disconnect ball joint, six %6in. nuts, bolts and spring washers holding torque ball cover to flange.

Remove two 5/16 in. nuts and locking bolts from torque tube ball, screw back until clear using tommy bar.

Remove four 1/16 in. split pins and 1/2 in. nuts releasing spider. (NOTE.—Spider and bushes are numbered, keep numbers together when rebuilding.)

Disconnect short brake rod coupled to hand brake lever, 1/8in. split pin, plain washer and yoke pin.

Detach brake rod and return spring from foot brake pedal.

Remove spring from centre of torque tube holding rear brake rods together.

Disconnect rear shock absorbers, four ½in. nuts and spring washers on each.

Disconnect hand brake chain, one ½in. nut.

Swing axle back on springs until spider drops clear, lower to the floor.

Remove gearbox turret, four ½in. nuts and springs.

Disconnect speedometer cable, one ¼in. pinch bolt, pull cable out of drive.

Remove four ½in. bolts and spring washers holding gearbox to clutch housing, move gearbox back and lower.

TOOLS.

One pair of pliers.

½in. to ½in. sockets.

½in. to ½in. spanners.

One screwdriver.

One tommy bar.

Time—4 hours.

"AN," "M," "G" and "M A/1" MODELS.

REMOVING CEARBOX.

Remove positive lead from battery. Remove mats and front floor boards.

In case of saloon, slide seats off runners and remove floor board undoing four 1/4 in.
nuts. on half remove Buth. July Circs cti. as in the transfer of the control of the

Drain oil from clutch housing.

Detach brake rods and tension spring from brake pedal.

Screw wing nut off brake connection on the hand brake lever.

Remove two 5/16 in. nuts, and locking bolts from torque tube ball.

Remove six 5/4 in. nuts, bolts, and spring washers holding torque ball cover to flange.

Screw ball back on to torque tube till clear of threads, using tommy bar.

Remove four split pins, and four ¼in. nuts releasing spider. Detach rear shocks from axle.

Remove 54in. split pins and 3/8in. eye bolts from front end of rear brake rods.

Swing axle back on springs till spider drops clear.

Rest torque tube on floor.

Remove gearbox turret complete, four 5/16 in. nuts and spring washers.

Remove speedometer drive, two 3/16 in. bolts and spring washers, one 1/4 in. nut holding cable clip.

Detach wiring from dynamo.

Remove clutch housing cover, eight 1/4 in. nuts and washers.

Turn engine until one of three clutch springs is opposite the cover opening.

Remove split pin, 1/6 in. castellated nut, clutch spring and bronze bush.

Proceed for the other two clutch springs as above.

Disconnect clutch pedal toggle, removing split pin and toggle pin.

Fit standard gearbox jig to 2, front turret studs.

Remove twelve, 516 in. nuts and washers holding gearbox to engine.

Move gearbox backwards and lower to floor.

TO REFIT.—Reverse operations, taking care not to drop clutch stop pins and bronze clutch spring collars.

Splined clutch plate carrier is fitted with lips on spline towards flywheel.

NOTE.—When assembling spider make sure that torque ball cover is in front of brake levers.

TOOLS.

One 3/16in. open ended spanner.

One 1/4 in. open ended spanner.

One 5/16 in. open ended spanner.

One %in. open ended spanner.

One pair pliers.

One screwdriver.

One tommy bar.

One % in. socket and ratchet.

Time-6 hours.

MA/2. "GM/1" and "G2" MODELS.

REMOVE CLUTCH CASE COMPLETE WITH CEARBOX.

- 1. Remove floor boards (see Operation No. 29).
- 2. Remove gearbox (see Operation No. 30), but do not separate gearbox from clutch case.
- 3. Remove clutch withdraw shaft (see Operation No. 28).
- 4. Remove six 5/16 in. nuts and spring washers securing clutch housing to crankcase. Remove six 5/16 in. bolts from ditto.
- 5. Gearbox and clutch case complete can now be withdrawn.

"AN" and "M" MODELS.

DISMANTLING CEARBOX.

Remove dynamo and clutch as in Operation No. 26.

Remove gearbox turret, four 5/16 in. nuts and spring washers.

Undo two 3/16 in. set pins and remove speedo drive.

Remove twelve ³/₂in. split pins and twelve ⁵/₆in. castellated nuts, two of which carry distance washers where vacuum servo is not fitted.

Withdraw gearbox rear end cover carrying on it main and layshafts.

Remove locking spring and locking ring (left hand threaded) from clutch shaft and tap out from front end towards rear.

Unscrew mainshaft shim bolt, (%in.) and remove shim.

Reverse idler wheel is carried on shaft bolted to rear of box, to remove take out split pin and remove 5% in. castellated nut. Tap out from back of box.

Gears are removed from mainshaft following order, 2nd gear pinion and top gear dogs, 1st and reverse sliding pinion.

Layshaft complete with bearings can be lifted out of bearing housing in back of gearbox.

To remove mainshaft from main cover, dismantle universal as in Operation No. 31. then remove split pin and %in. nut and tap mainshaft forward the front half of universal and speedo drive gear coming away at the same time.

To dismantle layshaft take out split pin and remove 5/8in. locknut at forward end (right hand thread). Bearing will then come away and pinions pressed off in this order.

Constant mesh, 2nd speed, 1st speed.

The reverse pinion is part of the shaft.

To remove bearing at rear of layshaft take out split pin and undo 5/8 in. locknut (left hand thread). Bearing will then come off layshaft.

TO DISMANTLE GEARBOX TURRET AND LEVER.

If required to remove selectors and shafts tap out pins at front end of shafts. Shafts may then be removed by tapping out and selectors will come away.

To remove lever undo two ¼ in. bolts and spring washers holding gate attachment, unscrew brass socket cap and lift out lever.

To reassemble—reverse operations.

TOOLS.

One pair of pliers.

One hammer.

One %iein. spanner.

One 1/4 in. spanner.

One %in. spanner.

One 1/6 in. spanner.

One 5/8in. spanner.

Time-2 hours.

DISMANTLING, GEARBOX. 4 Speed Box. As fitted to type "C2" and "CM/1" MA/Z Cars.

Remove gearbox turret, four 5/6 in. nuts and spring washers.

Remove selector shafts, three sin. split pins, castellated nuts and plain washers, shafts will then tap out. (NOTE.—Care must be taken not to allow plain washers, one on each shaft, and the distance piece on reverse gear shaft to drop into gearbox when tapping out shafts.)

Remove selector shaft carrier by forcing off studs with screwdriver.

Selectors will then lift out in the following order: 3rd and 4th, 1st and 2nd, and reverse last.

Remove oil filler cap.

Dismantle universal joint, four 1/4 in. split pins and 1/4 in. castellated nuts, rear half of gimbal ring and spider will then tap off. (NOTE.—Gimbal rings and bushes are numbered 1, 2, 3, 4—keep the numbers together when re-building).

Remove gearbox half of gimbal, one 1/8 in. split pin and 1/8 in. castellated nut, also plain washer, pull off shaft.

Remove universal joint housing, undoing one 5/16 in. nut and spring washer at base of housing.

Remove gearbox complete from clutch housing, four 1/16 in. set pins and spring washers, leave two 5/16 in. nuts and spring washers, tap gearbox off housing with lead hammer.

Remove two 3/8in. bolts and spring washers securing gearbox end plate to gearbox, tap apart with lead hammer; layshaft and primary shaft come away with plate.

Release layshaft and primary pinion shaft from front plate, three ¼in. nuts and spring washers, holding domed cap with centre adjustment for layshaft, both layshaft and primary shaft will tap out together. Tap out mainshaft front of box.

TO RE-ASSEMBLE gears into front plate, enter layshaft and primary shaft at the same time, having gears in mesh, as one cannot be entered without the other. Enter mainshaft into bush inside primary gear, making sure that 4th selector gear goes on first, followed by 3rd selector gear. Gears and shafts are then ready to enter into box.

TO RE-ASSEMBLE—reverse operations.

TOOLS.
One pair of pliers.
%16in. to 5/8in. spanners.
1/4in. to 1/2in. sockets.
One screwdriver.
One brass drift and lead hammer.

Time-2 hours.

"G," "AN," "M" and "MA/1" MODELS.

FOUR SPEED CEARBOX.

TO REMOVE SELECTORS AND SHAFTS FROM BOX.

- 1 Remove change speed turret, four 5/16 in. nuts and spring washers, one split pin and yoke pin from hand brake lever.
- 2. Remove pins which lock selector shafts in position. These will pull out with pliers.
- 3. Tap out selector shafts with hammer and punch and remove aluminium packing piece
- 4. Remove selector forks, noting position of same.
 - Viz.:—Large single fork to offside. This is the "reverse" fork.

 1st and 2nd gear selector fork in centre.

 Top and 3rd gear fork on nearside.
- 5. Remove split pins and washers from plungers, and draw out plungers.

TO ASSEMBLE—reverse operations.

Time-I hour.

TOOLS REQUIRED. Pliers. %6in. spanner. Punch. Hammer.

"AN" and "M" MODELS.

REMOVING STEERING.

Disconnect positive battery lead.

Remove mats and pedal floor boards.

Disconnect drop arm from vertical column by pulling out \%2in. split pin, undoing \frac{1}{2}in. nut and knocking out \frac{1}{2}in. bolt. Drop arm will then slide downward off serrated column.

Remove horn switch box and body, undoing wire.

Pull wire out of column.

Remove ignition control and bottom lever held by 1/4 in. nut and bolt.

Rod withdraws upward.

Disconnect tube from dipper pump and remove tube clips; in cases where solenoid dippers are fitted, remove dipper switch by undoing one screwed clip.

Disconnect steering column bracket, one %6in. nut and bolt.

Remove two 3/8 in. bolts and spring washers, holding inclined part of column to steering box.

Withdraw steering wheel and inclined column assembly inwards.

Disconnect throttle control rod from arm on inner gear by withdrawing split pin and fulcrum.

Remove three ½•in. bolts and spring washers holding vertical shaft to cylinder block. Tap shaft off dowels.

Remove column upwards.

To refit—reverse operations.

TOOLS.

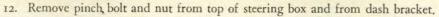
One pair of pliers.
One screwdriver.
One ½in. open ended spanner.
One ¾in. open ended spanner.
One ½in. open ended spanner.
One ½in. open ended spanner.
Time—1½ hours.

"GM/1" and "MA/1" MODELS.

TO REMOVE STEERING.

REMOVE CONTROLS COMPLETE.

- 1. Disconnect lead from battery, one 1/4 in. bolt and nut.
- 2. Disconnect horn wire by unscrewing knurled nut and unscrewing terminal screw. Pull wire through control tube.
- 3. Remove three leads from starter motor.
- Remove junction box, two ¼in. nuts and one bolt, box now slides off complete.
 NOTE.—Do not lose small copper sleeve which fits over control tube.
- 5. Remove ignition control lever, %6in. nut and bolt.
- 6. Remove throttle lever, 1/4 in. nut and bolt.
- 7. Remove ¼in. pinch bolt and two screws from brass flange at base of column and withdraw flange, taking care not to loose small felt washer which is fitted between flange and steering box. Tap out finger tip controls complete.
- 8. Remove locking washer from steering wheel nut by removing % in. set pin.
- 9. Remove steering wheel nut using box spanner supplied with service kit.
- 10. Remove steering wheel by tapping off with lead hammer.
- 11. Remove steering wheel key.



- Unscrew steering column outer tube.
 NOTE.—Ball race will come off with tube.
- 14. Remove steering lever, 1/16 in. bolt and nut and split pin.
- 15. Remove three 1/16 in. bolts which secure steering box to engine.
- 16. Tap steering box off dowels in engine and lift out steering.

To assemble—reverse operations.

TOOLS REQUIRED.

One pair pliers.

One 3/16in. by 1/4in. spanner. One 5/16in. by 3/8in. spanner.

One spanner supplied in kit for steering column tube.

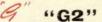
One box spanner supplied with service kit.

One hammer.

One lead hammer.

One screwdriver.

Time required—2 hours.



"G2" and "GM1" MODELS.

REMOVE MARLES STEERING.

1. Remove floor boards—See Operation No. 29.

Remove split pin and 78in, nut from steering drop arm.

3. Remove split pin and 3/sin. nut securing drag link to drop arm, and tap out ball ended pin.

4. Remove drop arm by sliding same off spline shaft.

5. Disconnect horn wire by unscrewing knurled cap under horn push, and unscrewing terminal screw. Pull horn wire out of column. NOTE.—Battery leads must be disconnected first.

6. Remove electric junction box from bottom of column. Undo two 1/4 in. nuts and slide junction box off complete.

7. Remove bolt and nut from steering column bracket.

8. Remove two 5/16 in. bolts and nuts securing pinch bracket to chassis frame.

9. Withdraw steering complete.

To re-fit.-reverse operations.

Time-2 hours.

TOOLS.

1/4 in. x 1/4 in. spanner. 3/8in. x 5/16in. spanner. %in. spanner. Lead hammer.

Screw driver.

Pair of pliers.

DISMANTLING MARLES STEERING. Type L.3. as fitted to "C" Models.

1. Remove ignition control by undoing 1/4 in. bolt and nut.

2. Remove throttle control by undoing 1/4 in. bolt and nut.

3. Remove control tubes complete by slackening %6in. pinch bolt. The controls can now be withdrawn from steering column complete.

4. Remove pinch bolt in steering wheel. Tap off wheel carefully, taking care not to

damage vulcanite.

5. Remove key from steering column. Remove steering column bracket clip.

6. Remove top pinch bolt, %in. bolt and nut. Remove outer tube, this is a sliding fit in housing.

7. Remove drop arm by undoing 7/8in. nut and washer, split pin. Remove felt washer.

8. Remove brass plate by undoing two ¼in. bolts and spring washers, taking care not to lose felt washer between brass and steel plates.

 Remove four %in. nuts and washers holding cover plate to box. Remove cover, taking care not to break paper joint.

10. Withdraw steering camshaft.

11. Remove 3/8in. pinch bolt, unscrew large adjusting nut and withdraw steering column

and worm complete, taking care not to lose two bronze thrust washers.

12. Strip control box by removing two screws in moulded cover. Lift off cover. Pull out controls, leaving serrated ring in position. Care must be taken not to lose plungers out of finger tip controls. Sharp plungers are for the serrated part of the ring, these being the ignition and throttle controls, rounded plunger for electrical control. Order in which controls pull away is (1) lighting; (2) ignition and (3) starting.

To re-assemble—reverse operations.

Time to strip—30 minutes.
Time to re-build—45 minutes.



DISCONNECT FINGER TIP CONTROL UNIT COMPLETE.

Remove 1/4 in. pinch bolt and nut from ignition control arm at base of steering box. Same will then tap off.

Remove 1/4 in. pinch bolt and nut from throttle control plate, then tap off.

Remove bronze bracket, undoing 1/4 in. pinch bolt and nut, two 1/4 in. set pins and spring washers; bracket will then come away, exposing a small felt ring washer. Finger tip control unit will then draw out.

DISMANTLING FINGER TIP UNIT.

Disconnect horn switch, undoing knurled lock ring directly under push button, switch will come away complete with wire and two insulating washers.

Remove three grub screws, retaining indication dial to lever positioning plates.

Remove three grub screws, retaining lever position plate.

Remove the three levers, lighting, ignition and carburetter controls, undoing three grub screws situated behind base plate retaining three distance pieces.

By rotating each lever in turn to the hole drilled in edge of base plate, spring loaded plungers will push through, enabling levers to be withdrawn.

Remove steering wheel, undoing one % in. bolt and nut, also two distance pieces, one

top and bottom, wheel will then tap off, using hide hammer.

Remove steering column, first removing key from steering shaft and undoing 5/16in. bolt and nut and two spring washers from underneath top end of steering box, the steering column can then be removed with adjustable roller race housing attached by rotating anti-clockwise, roller bearing can then be removed.

Remove thrust plate, from base of steering box, undoing four 1/4 in. nuts and spring washers, this will allow plates to come away complete with shims and roller race housing. Roller race can then be withdrawn. Remove drop arm, taking out 1/8 in. split pin and undoing rin. nut and plain washer. Tap same off serrations and remove felt washer.

Remove thrust plate from nearside of steering box, undoing five 1/4 in. nuts and spring washers.

Remove steering shaft with cam by rotating backwards and forwards, roller and rocker shaft can then be pushed out at the same time.

Special note should be made of the shims on the rocker shaft, as these centralize the roller in steering box.

Remove anchor bracket from steering box, undoing %6in. pinch bolt and nuts. These will now tap apart.

To re-assemble—reverse operations.

TOOLS REQUIRED.

Hide hammer.

Steel hammer.

One 1/4 in. set spanner.

One 5/16 in. set spanner.

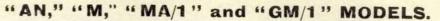
One 1/16in. set spanner.

One 1in. set spanner.

One medium sized screwdriver.

One small screwdriver.

Time required—1 hour.



CURING BACK LASH IN STEERING.

Slack off 1/2 in. locking nut on 1/4 in. thrust pin fitted to steering box cover bearing on top of vertical column.

Tighten up thrust pin till up and down play disappears in vertical column.

Do not tighten up too much or stiffness will result.

Tighten up lock nut.

If back lash is still too great, slacken off steering box bolts, five %6in. bolts and two 38in. bolts. Tap cover of box lightly towards the engine bringing worm further into mesh.

Tighten up bolts.

Repeat if necessary.

If steering becomes stiff owing to worm being too deeply in mesh, slack off bolts as above, turn steering wheel sharply to left.

This will throw worm outward.

TOOLS.

One 5/6 in. open ended spanner.

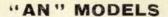
One 3/sin. open ended spanner.

One 76in. open ended spanner.

One 1/2 in. open ended spanner.

One 5/6 in. socket and ratchet.

Time—30 minutes.



CURING STIFF STEERING, IF LONG DROP ARM IS FITTED.

If a customer finds the steering too heavy in spite of adequate lubrication, correct adjustments and correct tyre pressure, a short drop arm may be fitted. Disconnect drop arm from drag link, removing split pin and 3/8 in. nut from ball pin. Ball pin is located in drop arm by a taper and taps out downward.

Remove drop arm as in Operation No. 42.

Fit short drop arm reversing operation. Ball must be tapped up into drop arm and the nut tightened against the gripping action of the taper.

After fitting the short drop arm the lock stops on the steering box MUST be re-adjusted.

Slack off two 1/4 in. lock nuts and screw out two 3/16 in. studs till correct adjustment has been obtained. This is as follows:—

Lock stop adjustment. Short drop arm, 8½ in. Long drop arm, 7½ in.

This measurement is taken from the centre of the tyre to the dumb iron at right angles to the dumb iron. After obtaining correct lock adjustments, tighten up lock nut on adjusting screws.

TOOLS.

One pair of pliers.

One 3/8in. open ended spanner.

One 1/4-3/16 in. open ended spanner.

Time-45 minutes.

ALL 6 CYLINDER MODELS.

CURING STIFF STEERING.

- If steering is found to be too heavy, car should be jacked up until both front wheels are clear of the ground and all ball joints, swivel pins, steering box, etc., thoroughly greased.
- Gear oil should be used, and the steering kept moving during this operation, this ensures that the oil reaches all bearing surfaces.
- If steering is still too stiff, check tyres for pressure, it may be found that this is too low. In that event, restore to correct pressure.
- If customer still finds steering too heavy, in spite of adequate lubrication, a short drop arm may be fitted. See Operation No. 40—for "AN" Models only.

Time required to check and lubricate—15 minutes.

"AN," "M," "MA/1" and "GM/1" MODELS.

DISMANTLING STEERING.

Release 3/16 in. clamp bolt at lower end of ignition control.

Remove control arm, washer and cork washer.

Draw control rod out from steering wheel end.

Slide bush, spring washer and cowl off tube.

Remove two 3/8in. bolts and five 1/16in. bolts on steering box.

Column, worm and top half of box will then come away.

Remove steel thrust washer between segment and adjusting screw.

Take out 1/2 in. pinch bolt, nut and split pin from drop arm.

Drop arm will now tap off shaft.

Withdraw segment and vertical shaft upward through bearings which remain in casing (segment cannot be removed from shaft).

TO STRIP INCLINE COLUMN.

Remove spring locking wire.

Remove 7/8in. locking nut and 11/4in. nut.

Tap off steering wheel (keyed on).

Withdraw shaft downwards.

Remove worm from shaft by first pressing it further on to shaft, removing locking wire and press worm off shaft.

To re-assemble, reverse operation.

TOOLS.

One 11/4 in. spanner.

One pair of pliers.

One screwdriver.

One 3/16in. spanner.

One 5/16in. spanner.

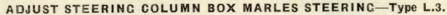
One 3/8in. spanner.

One 1/2 in. spanner.

One brass drift.

One 7/8in. spanner.

Time-I hour.



A. TO TAKE OUT LIFT IN STEERING COLUMN.

1. Slack off nut on 3/8 in. pinch bolt on top of steering box, also on dash bracket.

2. Screw up large nut on bottom of steering column. When satisfactory, lock up pinch bolts.

B. TO ELIMINATE BACK LASH IN WORM AND ROLLER.

 Remove drop arm by detaching split pin and 3/sin. nut securing drag link, also split pin and 7/sin. nut from camshaft.
 Drop arm will then slide off splines.

Remove steering box cover plate.
 Four ¼in. nuts and spring washers.

3. Remove camshaft complete.

4. Remove nuts from eccentric spindle on camshaft and rotate spindle in camshaft jaw. Get correct setting by inserting camshaft in steering box and checking. When satisfactory, lock up nuts.
NOTE.—It is advisable to fit new lock plates to nuts securing eccentric spindle.

5. Re-assemble, reversing operations.

6. These operations can be executed with steering box in position on chassis, but in case of adjustment "B" the A.C. filter and starter motor must be removed. See Operation No. 11.

Time—3 hours.

TOOLS.

¼in. x ¼in. spanner. ¾in. x ¼in spanner.

Large adjustable spanner.

"G2" MODELS.

TO ADJUST MARLES STEERING. Type "L7".

- A. TO ELIMINATE LIFT IN STEERING COLUMN
- 1. Slack off steering column bracket bolt.
- 2. Slack off 1/6 in. pinch bolt on steering box.
- 3. Screw up large nut fixed to column tube until satisfactory. Lock up bolts.
- B. TO ELIMINATE END PLAY IN ROCKER SHAFT.
- 1. Slack off lock nut which secures adjusting screw to rocker shaft cover plate.
- 2. Turn adjusting screw till samejust presses on to ball in end of rocker shaft.
- 3. When satisfactory, tighten lock nut.
- C. TO ELIMINATÉ PLAY BETWEEN WORM AND ROCKER SHAFT ROLLER.
- 1. Remove rocker shaft. See Operation No. 38.
- 2. Lift up lip of lock plate securing nut to roller spindle.
- 3. Unscrew nut and tap out spindle till splines are clear of jaw, at nut end of same.
- 4. Turn spindle round in jaw till it will engage next spline.
- Tap spindle back into position and check for play by inserting rocker shaft into steering box.
- 6. If O.K., lock up nut and re-assemble, making sure lock plate is turned over on to flat of nut.

Time-21/2 hours.

TOOLS REQUIRED.

%in. by 1/4 in. spanner.

%in. by 3/8in. spanner.

7/16in. by 1/2 in. spanner.

Screwdriver.

Hammer.

CURING WHEEL WOBBLE. All 6 Cyl. Models.

Remove and balance wheels as in Operation No. 46.

In all six cylinder models where Silent Bloc bushes are fitted, fit "wobble washers". See Operation No. 47.

Take up backlash in steering and all ball joints as in Operation No. 39, 43 or 44. When wheels are replaced see that tyre pressures are correct.

If tyres are badly worn, replace.

Time required—3 hours.

BALANCING WHEELS COMPLETE WITH TYRES AND TUBES.

Obtain an axle shaft and fit on it a hub with the ball race in the back only. This is to obtain line contact and consequently minimum frictional resistance. Fix shaft to a bench which is horizontal, so that the wheel will run quite freely.

Fit wheel complete with inflated tyre and tube to hub and fix all five nuts and distance pieces and revolve wheel slowly. When it stops, mark with a piece of chalk the highest point on the tyre wall. Revolve again, and if the chalk mark stops at the top a

second time the wheel is out of balance.

Have at hand some plasticine or putty and stick piece on the tyre wall at the chalk mark and revolve again. If the plasticine stops at the bottom it is too heavy. Take a piece off and try again until a balance is obtained. Then mark both tyre and wheel where the plasticine has been placed, by chalking the tyre and tying a piece of string on the spoke or round the two spokes nearest the chalk mark. Next weigh the plasticine and from a piece of sheet lead (3/2 in. roofing lead is suitable) cut a piece about 11/2 in. wide of sufficient length to equal the weight of the plasticine and tap the lead into the well of the rim (under the rubber band protecting the spoke heads from the tube) with the ball end of a hammer.

In refitting tyre and tube, care should be taken that the tyre and rims are in the same relation to each other, according to the marks made after balancing, also see that the

lead is immovable.

Owners should be warned against replacing tyres differently in the event of punctures. In the event of changing tyres, the lead should be temporarily discarded until the wheel can be rebalanced or, as new tyres often correct wobble, until the wobble reappears. Time required—45 minutes per wheel.

FITTING "WOBBLE WASHERS".

Jack up front of car, remove spring shackle bolts, taking out from each 3/2 in. split pins, 1/2 in. bolt and nut.

Fit special washers, one on each bolt, staggering same, i.e., fit washers on dumb iron bolt on outward side against silent block bush, at rear of spring on inward side of lower bolt, at rear of spring on outward side of upper bolt.

Tighten bolt dead tight, run up nut till this is also dead tight. Turn back nut to nearest castellation for split pin and turn back bolt until nut binds.

Proceed as above for other front spring.

Time required—I hour.

ALL 6 CYLINDER MODELS.

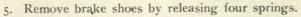
A. REMOVE FRONT AXLE AND DISMANTLE.

- Jack up car and place large block of wood under engine sump, remove road wheels.
- 2. Remove split pin and 3/8in. nut from ball joint pin at front end of drag link.
- Detach leather covers which are fitted to front brake expander shafts.To do this, remove screw, nut and clip securing leather to aluminium cap.
- 4. Disconnect bottom end of front shock absorbers, one split pin and nut each side.
- 5. Remove split pins and nuts from eight bolts securing axle to springs—drop axle to floor—sliding out splined expander shafts.

B. DISMANTLE AXLE.

- 1. Remove two split pins, and nuts from hubs.
- 2. Remove hubs and drums complete.
- 3. Remove inner timken bearings, prise same off stub axle.
- Remove grease retaining cups and felt washers, noting that lip of cup is inwards, partly covering felt washer.

SPECIAL NOTE.—A distance tube is fitted between two inner races of hub bearings. To adjust bearings, reduce the length of this distance tube till correct adjustment is obtained. This is .004in. to .006in. of end play in hub.



- 6. Remove track rod two 3/8 in. castle nuts and split pins.
- 7. Remove split brass bearings four 1/4 in. castle nuts.
- 8. Pull out brake cams and shafts.
- 9. Remove steel plate covering swivel pin two 1/4 in. set pins.
- 10. Remove two taper cotters from axle beam two 1/4 in. nuts.
- 11. Remove swivel pins-using "Rover" service extractor.
- 12. Remove two brake anchor brackets, by removing four split pins, %6in nuts and bolts from each.

To assemble—reverse operations.

Time-2 men, 11/2 hours.

TOOLS.

One pair pliers.

One screwdriver.

One %in x 1/4 in. spanner.

One % in x 3/8 in. spanner.

One 7/16in. spanner.

One hammer.

One hub nut spanner.

One swivel pin extractor—(supplied with service kit).

ALL 1931 6-CYL. MODELS

FRONT WHEEL BEARING.

The following instructions must be carried out when new roller bearings are fitted, or old bearings are removed for inspection:—

The brake shoes must be removed while bearings are being fitted. The new bearing must then be assembled on the stub axle spindle without the brake shoes, felt washer and and felt washer retaining plate. Bearings and spindle must be in a perfectly dry condition and free from grease. The new Bearing is assembled as follows:—

(1) The inner bearing goes on first, followed by hub.

(2) The small bearing next, followed by ring nut. The latter must be tightened until hub is binding on roller bearings.

(3) Release ring nut until perceptible movement is felt in hub, i.e., if the upper and lower edges of the brake drum are grasped, it should be possible to tilt drum a small amount.

(4) Fit perforated locking washer and take note that one hole in locking washer should correspond with one of the 4 holes in ring nut. It may be necessary to alter ring nut slightly, but if this is done, it must be by releasing ring nut and not tightening.

(5) Mark with a centre punch, ring nut and perforated washer, so that in re-assembling the same positions will again be obtained.

NOTE.—The stub axle spindle threads are 16 to the inch, so there is no need to mark the thread because one thread out in the adjustment means an additional ½ in. play in the hub.

(6) Dismantle bearings and prepare for final assembly.

(7) Fit brake shoes.

(8) Fit felt washer over shoulder projecting from inner diameter of felt washer retaining plate, and then fit both on stub axle spindle, with the felt washer facing

brake anchor plate. If the felt washer retaining plate is fitted the wrong way round the lip on the outer diameter will be facing the brake anchor plate and consequently will defeat its own object, which is to retain grease in the hub bearing. The complaint of grease on front wheel brakes and collapse of front wheel bearings can usually be traced to felt washer retaining plate being fitted incorrectly, bearings fitted with insufficient clearance, or lack of lubrication.

(9) Fit inner bearing on stub axle, after first smearing bearings with good quality grease, fill hub with grease and fit hub, followed by outer bearing. Screw up circular nut until binding and then slack off to centre punch marks and insert locating peg. Fit final locking plate and nut. Locking nut must not be overtightened, or the threads will stretch and take up the clearance allowed. Hammer locking plate over the flats on the locking nut and take care that plate does not fracture in the process. At the earliest opportunity after the car has been on the road, jack up both front wheels and check clearance, it should be possible to rock the road wheel perceptibly.

NOTE.—Both inner and outer bearings must be a good push fit on the stub axle spindle.

TO FIT NEW OUTER RACES.

To remove old races from hub, drive out small race first. A steel drift is required and must be a good fit or damage to the shoulders, to which the race fits, will result, and trouble will result when new race is fitted. An extractor is required to remove the large race, this consists of two pieces of flat steel and two 3/8 in. bolts and nuts. One strap under the race and one above, supported by packing pieces to give the required clearance. However, it can be driven out with a punch, but great care must be taken that the shoulders against which the race sits are not damaged, this can be avoided if the punch is ground on an angle to fit the job. The new races should be pressed into position, care being taken that they are right home against the shoulders. This can be checked by means of a .002in. feeler gauge.

TIME REQUIRED-1 hour each wheel.

ALL 6 CYLINDER MODELS.

REMOVE REAR AXLE.

- 1. Jack up car and support chassis frame-just in front of rear springs.
- Remove road wheels—five nuts and washers to each wheel—first remove hub dust cap—if fitted.
- 3. Disconnect brake return spring from centre flange of propshaft.
- 4. Remove centre anti rattle spring connecting two rear brake rods.
- 5. Disconnect oil feed pipes, if fitted 1/4 in. union nuts.
- 6. Disconnect universal joint behind gearbox as follows:—
 Remove six 5/16 in. nuts, bolts and spring washers from flange.
- Disconnect brake rods at rear—two yoke pins or two wing nuts, which ever are fitted.
- 8. Disconnect rear shock absorbers as follows:—
 (A) "LUVAX" absorbers—Remove split pins and 1/16 in. nuts connecting upper and lower arms of shock absorbers.
- (B) "SMITHS" absorbers—Remove split pins and nuts from bottom arms of shock absorbers.
- 10. Place jack under centre of rear axle.

11. Remove split pins and nuts from eight %in. bolts which secure rear axle to springs.

NOTE.—On "MA/1" and "GM/1" models only—drop rear end of rear springs by removing split pin, ½in. nut and bolt from each.

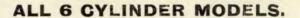
 Lower jack and draw out axle, sliding same backwards, withdrawing propshaft from spline in universal joint.

To assemble—reverse operations.

13. NOTE.—Torque ball must be adjusted so that rear shackles are vertical. Time required—2 hours.

TOOLS.

One ¼in. x %in spanner.
One %in. x ¾in. spanner.
One %in. spanner.
One hammer.
One pair pliers.
One screwdriver.
One wheel nut brace.



A. DISMANTLE REAR AXLE.

- 1. Drain rear axle four 1/4 in. nuts and washers and drain plate under diff. case.
- 2. Disconnect oil pipes if fitted, ¼in. unions.
- Remove torque tube from axle case. 16—% in. nuts, spring washers and bolts.
 Torque tube will then draw off.
 NOTE.—Position of distance pieces between torque tube and axle case.
- Pull out bevel pinion housing, complete, by slacking two %in. bolts.
 Detach propshaft from pinion—one split pin.
 Detach sleeve from propshaft—one split pin.
- Remove split pins and nuts and washers from axle shafts using "Rover" spanner. Remove grease nipple—if fitted.
- 6. Remove hubs, using "Rover" extractor.
- 7. Remove brake shoes-release two springs from each pair.
- Remove axle shafts by removing ring of six 5/16 in. bolts each side, shafts, bearings and oil retaining covers will then draw out.
 NOTE.—Spring washers are fitted between retaining covers and brake drum dust covers.
- 9. Press bearings and taper sleeves off axle shafts.

- 10. Remove axle sleeves—six %ein. bolts, nuts and spring washers, and six %ein. nuts and spring washers each side. Tap sleeves off diff. case with lead hammer. Remove oil retaining plates.
- 11. Split differential casing. Four %in. nuts and bolts and spring washers, and four %in. bolts, spring washers.
- 12. Lift diff. assembly complete. NOTE.—Teeth of crown wheel face O/S of chassis, also keep shims in correct position, as thickness of same varies.

B. STRIP DIFF. ASSEMBLY.

Remove split pins, nuts and bolts from diff. cages, noting position of cages, large diff. cage to offside.

Remove split pin, nut and washer from diff. cage, thus releasing diff. pinion spindle, withdraw spindle, thus releasing diff. pinions and axle pinion, also distance sleeve.

NOTE.—On "M" type differential, no distance sleeve is fitted and also two pins are fitted to secure diff. pinion spindle, in lieu of castle nut and bolt.

C. NOTES ON DIFFERENTIAL ASSEMBLY.

If new parts are fitted to a diff., following instructions must be carefully carried out.

Shims of suitable thickness must be fitted at either side of split casing to allow the crown wheel to mesh correctly with the bevel pinions. It is also important to note that suitable shims must be inserted between the bevel pinion housing and the flange of split case.

The minimum amount of back lash must be allowed consistent with freedom from binding between pinion and crown wheel.

D. TO REMOVE CENTRE BEARING FROM TORQUE TUBE.

 Remove ring of twelve %in. bolts, and nuts and washer from flange in centre of torque tube, noting position of special bolt which anchors brake rod return spring.

Bearing can then be withdrawn.

Note position of leather washers and compression plate.

Nose of bearing is inserted in front end of torque tube.

To assemble reverse operations.

Time—5 hours.

TOOLS REQUIRED.

One lead hammer.

One pair pliers.

One screw driver.

One 1/4 in. x 5/16 in. spanner.

One hub nut spanner.

One ¼in. socket spanner.

One hub extractor "Rover Service Kit".

One 5/16in. socket spanner.

One 7/6 in. spanner.

BRAKES, "AN" Model Cars.

TO ADJUST.

Take up master adjustment until one third of available pedal travel is allowed. Then take up the adjustment on each wheel until the drum does not ring when tapped with a spanner.

Screw back adjustment half a turn at a time until the drum does ring. A ringing drum is a sure indication that the brake is not binding, thus it is unnecessary to jack up the car for this operation.

After treating all wheels as above, take up the adjustment on the front wheels two extra half turns, and slack off the master adjustment two half turns. The front wheels will then be one half turn from binding, and the rear wheels three half turns from binding, giving the required lead on the front brakes. This extra adjustment on the front wheels is necessary, because a 2-Litre Rover, unladen, with a full petrol tank, weighs the same on both axles, consequently, as the car slows down when brakes are applied, the weight moves forward and piles up on the front axle, causing greater adhesion between front tyres and the road. The greater the adhesion the greater the braking required to bring the wheel to a standstill, so in order to brake all four wheels equally the front must start to brake earlier than the rear in order to stop at the same time.

At this point in the adjustment, the car should be taken on the road and the final adjustment made against results. Apply brakes hard at about 30 m.p.h. and hold steering wheel lightly, because if wheel is held firmly and there is any tendency to pull either to right or left the pull may not manifest itself.

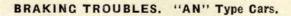
If car pulls to right or left, slack off adjustment on the side concerned, making sure that

it is a front or rear wheel as the case may be. If this cannot be readily ascertained by the feel of the car, car should be tested on a "tarmac" surface as this bears unmistakable wheel marks.

When brakes have been adjusted to pull "all square," rear should be checked against front. If rear wheels are locking it is definite that front brakes are not doing their share of work.

In that event, slack off rear half a turn at a time until all four wheels act equally. If front are locking, reverse operations. Hand brake must be hard on by the third notch, otherwise the hand lever comes so far back that application becomes difficult owing to the fact that lever fouls seat.

Time required—15 minutes to 2 hours.



INABILITY TO ADJUST FOR FRONT BRAKING.

- No matter how brakes are adjusted, front brakes do nothing. The first thing to check is freedom of operating gear. Every shaft and lever must be checked by hand, and all friction points, thirty-six in number, checked for freedom.
- Check for relative positions of levers. These should be as nearly vertical as possible. The position of rear levers (those mounted on rear axle), can be set back by removing cotters and entering same from opposite side of levers. Levers on compensating shaft can be set back by the same means or by altering the engagement of the teeth interconnecting the two shafts. Check for excessive wear on front levers. These may be found to be fouling the front cross members, in which case front shoes may need relining.
- In a great many cases it will be found that front linings have not worn sufficiently to require relining. In that event, shoes should be removed and an ½ in. plate welded (or fastened by any other suitable means) to the toe of the shoe. It may be necessary to file a certain amount off again in order to prevent rubbing. This will set the front levers back to their original position. If correct compensation cannot now be obtained, segments on cross-shafts should be examined.
- Owing to the fact that these segments carry the whole load of braking and that their movement is very small, flats are sometimes worn on these teeth. Should this be the case, when the brakes are applied the front shoes move until they make contact

with the drum, then the whiffle-tree allows the pull to take the path of least resistance, which is to *lift* instead of *turn* the front cross-shaft.

This can be checked by placing a pencil on the cross-shaft with the butt at right angles to the cross-member to which they are bolted, the point of the pencil just behind the upper and centre bolt in the universal joint flange, the body of the pencil pressed hard on the cross-shafts.

If the foot brake is then depressed with the foot the point of the pencil will be seen to rise as much as ½in., indicating that the front cross-shaft is lifting instead of turning.

For a temporary cure slacken off two bolts retaining cross-shafts to frame and insert anything up to .020in. packing between cross-shaft bracket and frame on the upper half of offside bracket.

This is only a temporary measure and will be useless if condition is very bad. For a permanent cure remove cross-shafts and file a rounded contour on teeth or replace segments.

For curing braking trouble no time can be given.

ALL MODELS.

OIL ON REAR BRAKES.

IF THERE IS OIL ON REAR BRAKES, PROCEED AS FOLLOWS:-

Ascertain where the oil is coming from. The first thing to check is the oil level in the axle itself. If this is above correct level, it is due to one of two entirely separate causes.

First. The axle has been overfilled.

Second. The centre bearing of the propeller shaft is not oil tight, consequently oil is leaking past same from the gearbox into the rear axle.

To check for this, examine the level of the oil in the gearbox. If this is low, it is a definite indication that the source of trouble has been located. An excellent method of ascertaining the cause of trouble is to examine the excess oil as it is drained from the axle. If a mixed oil is found in the axle, the trouble is due to centre bearing leakage.

The following table gives the brand of oil used in the gearbox and rear axle of our cars:—

TYPE	H.P.	REAR AXLE	GEARBOX
AN	16	Castrol "D"	Castrol "AA"
M	16	Castrol "D"	Castrol "AA"
G	20	Castrol "D"	Castrol "AA"
MA/I	16	Castrol "D"	Castrol "AA"
GM/I	20	Castrol "R"	Castrol "D"
G.2	20	Castrol "D"	Castrol "D"
T/I	10	Castrol "R"	Castrol "D"

It will be noticed that on the 1931 Meteor, type G.2., the same grade of oil is used in the gearbox and rear axle. In this case, an examination of the oil itself gives no clue to the cause of trouble, gear box level must be checked.

When the cause of trouble has been ascertained and rectified, brakes must be cleaned and re-lined if necessary. Another point to check, is the drainage holes in the axle sleeves. On 10 h.p. Cars, these holes are above the rear spring rollers. On 6 Cylinder Cars a %6in. hole should be drilled in each axle sleeve, 21/4in. from the flange bolted to the differential casing. Another hole should be drilled in the top of the sleeve corresponding to the drain hole. This second hole acts as an air vent.

NOTE.—On 6 Cylinder Cars, which have done a considerable mileage, it may be found that oil is leaking along axle shafts due to worn leather washers, which are fitted each side of the differential case. In this case, new washers must be fitted, care being taken that new leather washers are soaked in oil till pliable.

NOTE.—On 10 h.p. Cars which have done considerable mileage, it has been found in some cases that oil throwers have worked loose on axle shafts. These must be re-fixed.

To dismantle centre bearing—to h.p.—see Operation No. 83.

To dismantle centre bearing—6 Cyl.—see Operation No. 50A, Item D, page 119.

To dismantle brakes—10 h.p.—see Operation No. 85, page 196, Items 1, 2 and 3.

To dismantle brakes—6 Cyl.—see Operation No. 50A, page 117, Items 5, 6 and 7.

"M," "MA/1," "GM/1," "G" and "G2" MODELS.

BRAKES, TO ADJUST.

The above models are adjusted in the same way as the "AN" model, but there is no master adjustment, the segments on the cross-shafts have been dropped in favour of positive link motion, and there is independent thumb-screw adjustment to each wheel.

TO ADJUST, take up each wheel independently until the drum will not ring when tapped with a spanner, ease off until drum will ring, then slacken off rear wheels two half turns. The car should then be taken on the road and the final adjustment made as in instructions for "AN" type.

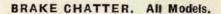
The same braking troubles apply to all other models with the exception of "flats on teeth" as these have been done away with on these models.

See Operations Nos. 53 to 59.

" G2"

BRAKE ADJUSTMENT.

Special attention must be given to brake adjustment on this model as too much travel allowed in brake pedal will allow it to foul the engine foot bolt. If the pedal is too far forward it can be set back by adjusting the rod from pedal to compensating link.



The trouble is usually caused by brake linings picking up.

What happens is this; the toe of the leading shoe is picked up by the drum and is carried forward until it meets resistance enough to cause it to fly back to its original position.

CURE.

Reduce the thickness of the lining for one inch at each end of the shoe by filing the lining to a chamfer with a *Dreadnought* file, gradual contact will then be made between lining and drum and the trouble overcome.

Should, however, the trouble still persist it may be due to slackness in brake camshaft bearings. Should this be found to be the case, slackness must be taken up as found necessary.

If trouble is still not cured, stronger return spring should be fitted.

There are several other causes of "brake chatter," but they are rather remote and do not often occur.

- 1. Worn or dented brake drums.
- 2. Brake back plates loose.

3. Slackness in wheel bearings.

In the case of No. 1, skim up drum in lathe or replace.

In the case of No. 2, tighten up bolts retaining back plate, so that relative movement between plate and axle is impossible.

Trouble No. 3 is not very frequent, replacement or adjustment of bearing will cure.

SHOES CONTINUALLY RUBBING. All Models,

When shoes have been in use for a very considerable period it will sometimes be found that no matter how much the adjustment is slackened off the shoes continue to make contact with the drum. This can usually be traced to excessive wear at the pivot point. This can be rectified by fitting oversize pivot pins, but it is far better to fit new shoes, as when shoes reach this stage they are usually badly worn at the toes also.

BUCKLED LININGS. All Models.

Due to linings being too thick, buckled locally during rivetting, or high spots caused by bad rivetting. This can be cured by hammering down on shoe held in vice, or re-rivetting.

TO REMOVE SERVO MOTOR.

- 1. Remove floor boards. (See Operation No. 29.)
- 2. Remove split pin and bolt from brake pedal.
- 3. Remove split pin from compensation lever.
- 4. Detach Servo suction pipe from Servo motor, one 7/16in. nut.
- 5. Remove bolts securing Servo motor to gearbox, two 3/8in. bolts.
- 6. Remove ½in, bolt securing Servo motor to gearbox at rear end, taking care not to lose distance washers.
- 7. Servo motor is now free.

To replace—reverse operations.

Time required—40 minutes.

ADJUSTMENT OF BRAKES FITTED WITH DEWANDRE SERVO SYSTEM.

In the main, the brakes are adjusted in the same manner as mechanical brakes. The braking troubles that apply to mechanical brakes apply to Servo brakes also.

When Dewandre Servo is fitted care must be taken to adjust brakes so that Servo comes into operation after a small amount of pedal movement. It is very important also that a return spring is fitted from bottom of brake pedal to any convenient point, usually the bottom right hand corner in the front of the Servo cylinder. This is necessary because Rover brakes are interconnected. Consequently, when the car is stationary and the hand brake is applied, the foot pedal falls forward and opens the vacuum valve in the Servo box, and difficulty would be experienced in starting the engine. The spring is fitted to prevent this. Also, it should be noted that on no account should the floor boards foul the foot pedal or the same trouble will be experienced. Do not touch the Servo valve adjustment unless Servo itself fails, a very rare experience.

The correct adjustment of this valve will be demonstrated. If Servo piston sticks, examine oil level in cylinder. There should be enough oil in cylinder to touch bottom of piston.

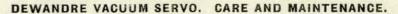
Thick oil must on no account be used.

If power of Servo drops, examine suction pipe and unions to induction manifold for air leaks.

Engine must be set with a strong tick-over when Servo brakes are fitted as it is quite easy to stop the engine owing to the weakening of the mixture when brakes are applied.

Hesitation in Servo action is sometimes caused by carbon deposit on the valves and can be

cured by cleaning same.



TESTS.

When all the brake gear has been checked over and it has been ascertained that:-

(1) No undue stiffness exists anywhere in the system.

(2) No oil exists on the shoe surfaces.

(3) Linings do not require renewal.

(4) All levers are set at the recommended angles.

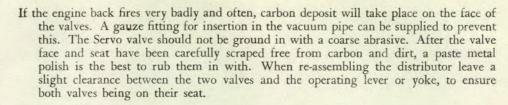
The following tests can be made to locate Servo trouble:-

(a) Press the foot pedal down hard without the engine running. When the engine starts up you should be able to feel the pedal go still further down. This is due to the assistance received from the Servo.

(b) With the engine running, press the brake pedal down hard. If you now open the throttle you should feel the pedal kick back slightly. This is because opening the throttle partly destroys the vacuum in the induction and lessens the effect of the Servo.

(c) With the engine running, when the brake pedal is depressed, the engine will accelerate slightly, but should settle down at once. If it continues to run faster, this is a sign of an air leak.

Leaks can often be located by listening close to the Servo. If a continuous sissing is heard, the trouble will mostly be found in the distributor, dirt being found on the face of the valves. A piston leak will give the same sign, but cannot often be heard. An air leak in the vacuum pipe between the Servo and the engine will give bad starting.



RE-FITTING.

In the event of the Servo being for any reason detached, e.g., for a general overhaul of the vehicle, the following should be carefully observed in re-fitting:—

- (a) The adjustment of the length of the pedal rod must be made so that when the pedal is in its "off" position the levers inside the Servo are as far back as possible (i.e., against the stop).
- (b) The length of the rod connecting the rocking levers with the distributor lever must not be altered.
- (c) Great care must be taken that the vacuum pipe washers on the Servo and the induction pipe are perfectly air tight.

(d) See that the Servo is not strained when bolted in the chassis. The Servo should be coupled up from the rear first, and the pedal rod last.

(e) In setting the valves, the rocking movement, i.e., the enlarged hole in the reaction lever should have equal clearance each side of the spindle when both valves are closed. This can be obtained by lengthening or shortening the yoke rod between

levers and distributor. It is advisable—as stated (b)—to take care not to alter the length of this rod when dismantling and cleaning and on replacing, correct setting will be obtained without trouble.

In connection with the operating mechanism, special attention should be paid to the brake pedal and rod in order to ensure they are perfectly free. These are operated by the driver's effort only and a stiff brake pedal will cause a very slow release; it requires very little stiffness at this point actually to destroy release action. All other foot brake gear is operated by the Servo and stiffness in working is not so readily noticed, but similar attention should be given nevertheless. It is advisable, therefore, that release or pull off springs should be fitted to brake gear behind the Servo and not on the pedal as any extra pull off spring on the pedal increases the driver's effort required.

If, however, the pedal is of such design and weight that there is a tendency for it to hang forward and keep the vacuum slightly open, a return spring to counteract this is permissible. Springs should be of such length that the application of the brake does not greatly alter the tension.

LUBRICATION.

Normally the rear end of the Servo cylinder should be about one third full of oil and to prevent over oiling, a drain aperture is provided about zin. from the base of the Servo Cylinder.

The small cap or breather on the body of the Servo acts as an air vent or release.

The oil from the Cylinder should be drained off monthly by means of the drain plug and fresh oil supplied. This can be arranged when the vehicle is in the Depot for periodical overhaul and long service of the piston leathers will thereby be obtained.

No Servo should be kept in operation where grit is suspected in the Cylinder.

The best oil for use in the Servo is a light grade of commercial castor oil. On no account use a mineral oil containing acid. In re-assembling the cylinder see that the brass spring is opened out to ensure the cup leather making a contact with the cylinder walls. The piston must work quite freely in the cylinder.

REMOVE VALVES.

Remove suction pipe, ½ in. union nut.
 Remove dust cover, two ¾ in. set screws.

(3) Remove small yoke pin which secures connecting rod to lever on distributor body.

(4) Remove distributor body, four 1/4 in. screws.

(5) Remove round castle nut, one 716 in. split pin.

(6) Remove operating lever, two ³/₁₆in. screws.(7) Remove pull out valves.

(7) Remove pair out varves

TO GRIND IN VALVES

(1) Remove carbon from valves.

(2) Carefully lap valve and seating, using a good quality metal polish paste.

(3) Thoroughly clean, lubricate and re-assemble.

TIME REQUIRED-1 hour.

LUVAX HYDRAULIC SHOCK ABSORBERS. MAINTENANCE AND RECULATION INSTRUCTIONS.

FITTING.

In the event of any part of the shock absorbers requiring replacement, care must be taken that the new part is the same as the part that is being replaced, as all parts vary a great deal on different makes of cars.

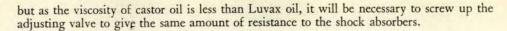
Where the shock absorber itself only needs replacement, the link and lever arm being in good condition, the arm may be removed from the shock absorber, care being taken that the arm is replaced on a similar type shock absorber, in the same position as the one removed; that is to say, the lever arm must be in a correct position in relation to the arrow stamped on the cover, as there are two keyways in the lever arm, therefore, two positions, only one of which is correct.

Shock absorbers are made clockwise and anti-clockwise, as indicated by the arrow on front of the recuperator cover. Care must be taken to see that all retaining bolts are tight, as more trouble is caused by attachments coming loose than by the shock absorber itself.

REPLENISHMENT.

This should only be necessary every 8,000 to 10,000 miles. On no account must the recuperating chamber be allowed to become empty, otherwise air will enter the working chamber and affect the working of the shock absorber.

Replenishment is carried out by removing the filler cap and pouring oil into the filler orifice until it is just visible at the base of the adjusting nut. Do not fill quite full, or undue pressure may be set up by expansion. Luvax oil should always be used where possible; if this is not available, pure castor oil may be used as a temporary substitute,



CUSTOMER'S COMPLAINTS.

ABSORBER DOES NOT APPEAR TO BE WORKING.

Check oil level in recuperator chamber. Inspection can be made through the filler cap, and if no oil is visible, should be refilled. If the shock absorber has been run for some time with the working chamber partly empty, so that air has entered, this will need pumping out by working the absorber. Disconnect the lever and work by hand. Symptoms of air in the working chamber will be felt by springiness and weak resistance. As oil is pumped from recuperator chamber to working chamber, the resistance will increase and the springiness will disappear. Refil the recuperator chamber after this operation.

If a considerable amount of air has entered the working chamber, a quick method of expelling it is to remove the adjusting screw. This will allow the air, in the form of emulsified oil, to blow out. The adjusting screw must be replaced before again removing the lever arm, and absorber correctly adjusted before re-coupling the link, etc. If the absorber is full of oil and still has no resistance, it should be returned to makers and a new absorber fitted.

ABSORBER TOO HARSH.

Disconnect the links and make sure that all four are free on the return stroke. If it is found that one is not free, a sticking non-return valve is indicated and a new absorber must be fitted. Harsh riding may also be caused by unequal adjustment. Each pair should have the same resistance. Disconnect all four and check for equal resistance. In most cases, it will be found necessary to adjust the weaker ones to correspond.

If, owing to in-expert adjustment by the user, the original setting has been entirely lost, the valves of all absorbers should be screwed right home and then open each one 1½ turns. This will give an average setting which must be further adjusted by road test to give equal absorption.

For measuring the resistance of the absorber when fitted to the car, an approximation can be arrived at by pulling on a spring balance (attached to the end of the lever arm) with a pull to give 200 inch lbs. torque and measuring the time through one hundred degrees with a stop watch.

NOTE.—To obtain 200 inch lbs. torque, the length of the lever in inches multiplied by the lbs. pull on spring balance, should be two hundred.

HARTFORD SHOCK ABSORBERS.

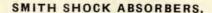
As fitted to all "AN", "M", "MA/1" and "CM/1" Models.

CARE AND MAINTENANCE.

These absorbers are fitted on the front of the above-mentioned models only, and are double acting.

They depend entirely upon friction to absorb shocks, and as they are fitted with silentbloc bushes, require no lubrication.

Should squeaks develop from friction surfaces, they can be cured by removing wooden discs from the body of absorbers and removing the smooth surfaces with a rasp. Pounding of front wheels indicates that absorbers are too slack; tighten half a division at a time and test on a rough road. If absorbers are too tight, road shocks will be transmitted to body of car. Never grease the friction surfaces on this type.



The "Smith" absorber is of the single-acting-coil friction type. They are fitted to the rear only on "AN", "M", "MA/1" and "GM/1" models, and both front and rear on 10/25 h.p. models up to engine No. 63658.

They consist of two arms, one of which carries a drum and the other a brake band.

The inside of the the drum is filled with a special lubricant called "Absorbite." This automatically feeds through two slots in the drum to the friction surfaces. To assist lubrication, a paddle is fitted inside the drum with a hexagon head projecting through the cover plate. By means of a spanner, this hexagon should be oscillated once or twice every 1,500 miles; the car should be rocked up and down during this operation.

It is important that the cover plate be removed and the drum re-packed with "Absorbite" every 10,000 miles.

On no account lubricate the flexible bearing on the shock absorber arms.

A later type of Smith shock absorber is fitted with a self-lubricating paddle and only requires to be repacked with lubricant as required.

CAR ROLLS ON CORNERS.

This indicates that rear absorbers are too slack. Tighten half a turn at a time, and test.

GROANING OR KNOCKING FROM REAR OF CAR.

Lubricate rear absorbers as per previous instructions. In the event of ordinary methods of lubrication failing to effect a cure, the absorbers must be stripped down and the friction surfaces smeared with "Absorbite."

Great care must be taken when re-assembling that this is done correctly, as it is possible to assemble "Smith" absorbers in several different ways, only one of which is right, otherwise they may be working in the reverse directions, and as they are single acting, this would be disastrous.

If they are assembled correctly, the cranked arm will come to the top, the straight arm to the bottom, the adjusting wing nut to the bottom, and the cover plate to the rear.

The only possible alernative to "Absorbite" is graphite grease.

ARMSTRONG SHOCK ABSORBERS. CAR No. 63659 AND ONWARDS.

The Armstrong shock absorber is of the friction type and is fitted with flexible joints at both ends, so no lubrication is required.

ADJUSTMENT is carried out by removing adjusting nut and removing one or more washers as required and replacing nut firmly. Never leave off the washer nearest to the adjusting nut as this holds the spring.

Should the absorbers become noisy at any time, strip down and clean out inside of drum and refit.

Time required—15 minutes each absorber.

Time to adjust all round and test-1/2 hour.

STROMBERG CARBURETTERS.

STROMBERG CARBURETTERS.

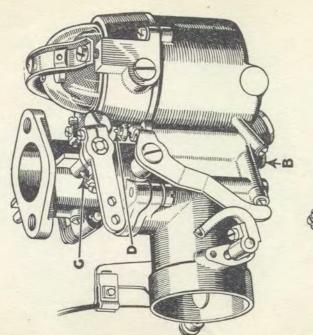
TYPE OF CARBURETTER—STROMBERG UI.

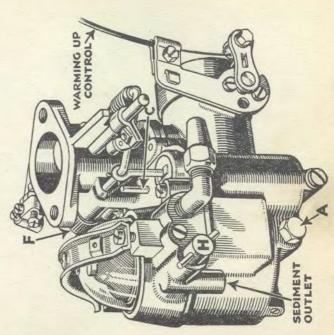
The Stromberg Ur Carburetter is of the Plain Tube type and incorporates the following special features:—A pump accelerating well which gives an additional supply of petrol when the accelerating pedal is depressed and enables the car to get away on top gear from any speed.—An economiser device allows the car to operate on an extremely weak mixture at ordinary touring speeds and which automatically richens up to give the best mixture for power if the throttle is wide open.—A warming-up control allows the engine to develop full power immediately after starting from cold which considerably shortens the warming-up period.—A large filter over float chamber which permits visual inspection of its condition at all times.

Description: Lettered illustrations.

The petrol is fed from the float chamber through metering jet marked "A," through which it passes to the main discharge jet. The metering jet is held in a carrier which, having a hexagon head, can be unscrewed from the outside by means of an ordinary spanner. In some cases, an adjustable needle valve takes the place of this metering jet, in which case a milled nut is used in place of the hexagon nut. All the petrol used passes through this metering jet and the additional supply for high speed and full throttle work is fed through the by-pass jet which comes into operation as soon as the plunger "C" is depressed. This plunger is controlled directly from the throttle and requires no adjustment.

The warming-up control shown at "D' operates in conjunction with the strangler and warming-up control so that the first movement of the strangler raises the auxiliary





STROMBERG CARBURETTER with "Visagas" float chamber cover.

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needle off its seat about %in. and allows a certain amount of petrol to be fed directly through to the venturi tube. This has the effect of enriching the mixture without materially affecting the area of the air intake. It is very important to see that the auxiliary needle valve returns to its seat when the strangler is in the normal running position, and in all cases, the control under the dash board must be returned to the normal running position as soon as the warming up period is completed. That is as far over to the left as it will go.

SLOW RUNNING ADJUSTMENTS.

The feed for idling or slow running is taken from the bottom of the main discharge jet and, before being sprayed into the throttle barrel, is mixed with air which is controlled by the knurled screw marked "F." Screwing this in, clockwise, cuts off the air supply and gives a richer mixture for slow running, and unscrewing (anti-clockwise) gives a leaner mixture. The mixture is discharged through two holes, one above and one below the throttle valve when this is in the closed position. The smallest is above the valve and is the right size to give a very slow "tick-over." The second and larger hole lies just below the edge of the throttle valve and is uncovered as the valve opens and carries the idle feed through until the main discharge jet is in operation. Since the petrol for the idle is taken through several passages before leaving the idle tube, it is extremely unlikely that any stoppage will ever occur either in the idle tube or in the discharge holes.

Once the correct setting for the idle adjustment needle has been obtained, the speed of idling is controlled by the throttle stop screw marked "G." Unscrewing this will allow the throttle valve to close more fully and give slower running, and vice versa. This adjustment should never be made until the engine has reached normal working temperature.

FLOODING. If flooding occurs, take out the pin holding the float to cover and rotate the needle valve on its seat, tapping lightly in two or three positions. Replace float and cover. In some cases, when the engine is stopped, apparent flooding may take place due to condensed mixture on the walls of the inlet pipe which, running down through the carburetter, causes a certain amount of petrol to drip for a few minutes. After this has drained out there should be no further dripping. Also, when the accelerator pedal is depressed, the pump comes into operation, and petrol is forced out of the main discharge jet and again drips from the carburetter, and this should not be confused with flooding, due to leakage past the float needle valve.

CENERAL INSTRUCTIONS.

DIFFICULTY IN STARTING FROM COLD. Make certain that petrol is feeding to the carburetter by depressing the accelerator pedal several times or opening the throttle, when petrol should drip from the carburetter due to pump action. In extremely cold weather make sure that the strangler is closing properly. The engine should, in all cases, fire before the motor has made half-a-dozen revolutions.

DIFFICULT STARTING WHEN HOT. This is generally due to too much petrol. Do not depress the accelerator before starting the engine, and have the control in the warming-up position and not fully closed. Difficulty in starting is more commonly due to air leaks between the carburetter and inlet manifold and between the manifold and cylinder block. It can also be due to defective ignition and, should the engine fail to start readily, always make certain that a proper spark is being generated before tampering with the carburetter.

ENCINE TROUBLE CHART.

- I. Engine refuses to start.
 - (1) Switch on ignition.

(2) Check petrol supply.

- (3) If ignition switch has been left on, ballast resistance of the coil may be burnt out: if not, let this cool and try again.
- II. Engine starts but will not keep on running.

(1) Wrong manipulation of controls.

(2) Obstruction in petrol supply.

(3) Loose connection on ignition circuit.

III. Engine runs but misses in certain cylinders at all speeds.

(1) Check sparking plug gaps.

(2) Engine cold, allow time to warm up.

(3) Check distributor points.

(4) Water in carburetter.

(5) Filter clogged.

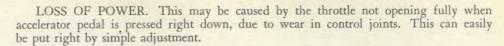
- (6) Short-circuit in wiring.
- IV. Petrol consumption unduly high.

(1) Engine new and stiff.

(2) Brakes binding.

- (3) Mixture control parts on carburetter shifted from proper position, so that the strangler does not open wide and warming up control sticks open.
- (4) Carburetter floods.

Tyre pressure low.



FLOAT LEVEL ADJUSTMENT. The level of the petrol in the float chamber is properly set and does not require adjustment. Re-adjustment would only be necessary in the case of the float being dropped or rough handled in any way when this has been removed.

Assuming that the level has been altered through any cause check the distance, by measurement, between the lower surface or gasket face of the float chamber cover to the centre of the top of the float itself. This distance should measure #4in.

Re-adjustment can be made by bending the float lever arm in the corner between where it touches the float needle and where it meets the float body. If float is low, bend arm so as to move float upward toward float chamber cover the same distance as the level needs correction, that is, to raise the level 1/4 sin., bend the float up 1/4 sin. To lower the level, hold the float arm tight where it touches the needle and bend the float downward away from the float chamber cover.

AIR CLEANER. On "Regal" models an Air Cleaner is fitted to the carburetter air intake. If it should be necessary to remove this Air Cleaner from the carburetter, do not unscrew the wing nut, but detach the clip from the engine by removing the hexagon-headed bolt. This will be apparent on examination. The Air Cleaner can be pulled clear of the carburetter when the clip has been freed. No adjustment is necessary to the Air Cleaner, but it may be dismantled after, say, a year's running and cleaned out internally.

FILTER. If water gets into the petrol, watch for it at the base of glass canopy. To eliminate water, flush filter by opening drain cock H, which permits the water and sediment to be flushed out through drain hole. NOTE THAT PETROL FROM VACUUM TANK MUST NEVER BE SHUT OFF WHEN THE FILTER IS BEING CLEANED.

Once or twice a season remove glass canopy to clean filter base and strainer. To accomplish this, remove the two screws holding the semi-circular clamp and slide clamp off. When replacing, be sure to tighten clamp securely to protect from leaks.

STROMBERG CARBURETTERS

The same instructions and principle of operations apply to all Stromberg Carburetters fitted to our various models as given in this book for "U1" type, with the exception of choke and jet sizes, which naturally vary according to H.P.

Standard jets and chokes fitted to our 2-Litre and Light Six Models:-

Main Metering Jet, .052. Pump Discharge Jet, 66. Choke Tube, 7/8in.

Standard jets and chokes fitted in our Light Twenty and Meteor Models:—
Main Metering Jet, .059.
Choke Tube, ³/₃₂in.

The pump discharge jet is not numbered.

BODYWORK.

TO FIT NEW CLASS TO ALL MODELS.

Remove stop strap from door.

Remove polished fillet on waist rail.

Remove sealing strip on top of door.

Remove packing piece, this being held by wood screws passing through horizontally from inside of door.

Care must be taken in levering this out, as it breaks easily.

Run windows up as high as possible and lift out of window winder.

The glass channels are held to the glass by strips of fabric, no fixing compound being used. The correct amount of fabric is folded over glass and the channel hammered on. Care must be taken that the top edge of the glass is placed in a level surface or or the glass will break. After channel is on, it must be inspected to make sure that it is not dented, as this will prevent winder operating smoothly. The position of the channel should be marked on the glass before fitting. It should be placed that that the winder ball just clears the lower edge when winder is fully extended. It may be found that the new glass is not exactly the same width as the old. The velvet channels which are pinned in should be removed and packed out or eased as the case may be. A slight amount of side play must be allowed or the glass will jam. Stiffness can sometimes be overcome by putting a trace of oil on the edges of the glass.

NOTE.-TO REMOVE CLASS FROM WINDERS.

- A. QUICKLIFT OR GEAR DRIVEN WINDER.
- 1. Wind window to top.
- 2. Lever ball out of channel with screwdriver and lift glass.
- B. CHAIN OPERATED WINDER.
- 1. Wind window to top.
- 2. Wind chain till button appears at top of garnish rail.
- 3. Lift out glass.
- C. ROLLER TYPE WINDER.
- 1. Release trigger to allow glass to move to top of window.
- 2. Detach coil from two hooks on glass channel.
- 3. Lift glass.
- 4. Remove wooden extension piece from inside of pillar and remove glass downwards.
- NOTE.—On this type, trimming must be partially removed from door to obtain access to winder mechanism.

FITTING NEW CLASS TO QUARTER AND REAR LICHTS.

Remove all internal beading.

Glass will then come away inward.

Refit with dum-dum, putting top and bottom strips in first.

TOOLS.

One screwdriver.

Time-30 minutes.

CURING DROPPED DOORS.

Dropped doors must not be cured by packing out hinges.

The bolts holding body to chassis should be slacked off and suitable packing inserted between chassis and door pillars.

CURING DOOR RATTLES.

Rattles coming from the doors themselves are usually due to the doors not coming right up against the body.

This is cured by packing out the lock striking plates.

Trimming will have to be removed to reach the striking plate screw.

The plates should be adjusted so that the door is stiff to close to allow for settling down.

So called door rattles are often found to be due to loose vulcanite on pull handle. The handle should be removed and one end screwed off. The small screwed rod which passes through the vulcanite should then be tightened into other end about half a turn and the handle refitted.

CURING WATER LEAK AT BOTTOM OF SCREEN.

Rain finding its way through the bottom of the screen usually runs down the glass into the metal framing on the screen. Packing fresh "Dum-Dum" (a black sealing compound) between the frame and glass may cure the trouble.

If this is not effective two small holes should be drilled in the bottom of frame at its lowest point, care being taken not to allow the drill to go too far or the glass will be damaged.

Two corresponding slots should be cut in the body fabric to allow drainage.

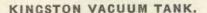
TO FIT REAR OR QUARTER LIGHTS TO 1931 CARS.

- 1. Extract gimp pins which are tacked through rubber surrounding edge of glass.
- Tap out glass. NOTE.—No jointing compound is used.
- 3. Reverse operation to re-fit.

 Lift rubber over lip of window frame with narrow rule or similar impelment.

 Average time to fit new glass—I hour.

TOOLS REQUIRED. One screwdriver. One pair pliers. One hammer.



Tank drained by removing "T" handled plug in base.

Tank operates by vacuum created by flow of air sucked into manifold past an orifice. Air is admitted to manifold pipe through a small hole situated at back of suction elbow.

THIS HOLE MUST BE KEPT CLEAR, or tank will not function.

To reach interior remove elbow, pull off lid, inner tank then slides out.

AUTOVAC VACUUM TANK.

If petrol does not reach tank, examine filter under petrol feed elbow, and clean it.

Inner tank and valve is reached by removing eight screws and disconnecting two %in. unions.

In case of trouble make sure that valve mechanism and drop valve are working freely.

Float is of self draining type. The drain hole in the base must not be touched.

Non-return valve on sunction side must not be touched.

When assembling take care to fit cover in correct position, so that air vent registers, jointing washers, must not be damaged, or tank will not work.

INSTRUCTIONS FOR FAULT FINDING.

"AN," "M," "G," "G2," "MA/1" and "GM/1" MODELS.

No. 1. POWER UNIT. Engine will not start. Check items A to K, K2.

No. 2.

Engine starts, but will not keep running. ENGINE COLD.
Check items A, B, C. Q.
ENGINE HOT.
Check items B, Q.

No. 3.

Engine sluggish, or loss of power.
Check performance against standard unless trouble is serious.
See item L.
Check for misfiring by means of Neon plug test.
OCCASIONAL MISFIRING.
Check items D, E, F, K, M.
CHRONIC MISFIRING.
Check items D to K, M, J2, K2.

ENGINE NOT FIRING ON ONE CYLINDER.
Check items D, J, K, M, J2, K2.
CHECK BRAKES TO SEE THAT THESE ARE NOT BINDING.
Adjust if necessary as in Operation No. 54.
Check for seized shafts on operating gear.
ENGINE HAS NO COMPRESSION.
Check by means of compression gauge.
Check items P, K, O, N, J2, K2.
Check plugs for water on plug points.
(Engine cold).
Check items J2, K2.
Engine will not reach its maximum revs.
Check items K, P, O, N, K2, L2.

No. 4.

ENGINE NOISY.

Tapping noise.
Check items J, O, M.
Whirring noise.
Check items R, S, W, T, M2, Z.
Clicking noise in engine.
Check items X, V, J.
Thumping noise.
Check item Y.
Severe whirring noise which sounds as if it comes from flywheel housing or gearbox.
Check item U.

Rattling noise from front of engine, or impeller. Check items V, U.
Whirring noise from front of engine accompanied by vibration. Check item Z.

No. 5.

Engine stops and will not restart. Check items B, F, K2.

No. 6.

Engine overheats. Check items B2, N, A2, R, G, K, H.

No. 7.

Petrol consumption. Check items C2, A2, N, J, G, K, O, H, D2.

No. 8.

Clutch slipping. Check item D2.

No. 9.

Clutch will not free. Check item E2.

No. 10.

Oil pressure drops. Check items B2, W, Y.

No. 11.

Popping back in carburetter. Check items C, G, A2, K, H, D, E, J.

No. 12.

BACK AXLE. Snatch when taking up drive. Check items F2, G2.

No. 13.

Noisy axle. Check item H2.

No. 14.

STEERING. Excessive back lash. See Operation No. 39.

No. 15.

Stiff steering. See Operation No. 40. No. 16.

Wheel wobble. See Operation No. 45.

No. 17.

BRAKES. All troubles. See Operations Nos. 51 to 59.

No. 18.

GEARBOX. Rattle in gear lever. Check item O2.

No. 19.

ELECTRICAL EQUIPMENT. See Operation No. 91.

ITEMS TO EXAMINE.

"AN," "M," "G," "G2," "GM/1" and "MA/1" MODELS.

- (A) Ensure that choke butterfly is coupled to control wire and is working properly, so that when open it is horizontal, when shut vertical. In order to check working of choke, if air filter is fitted it must be removed by removing butterfly nut and washer, loosening %in. bolt holding bracket, swinging bracket upward out of the way, and pulling assembly out of carburetter air inlet.
- (B) Check petrol supply at carburetter by undoing 3/sin. pipe union with Autovac tap turned on.

IF THERE IS NO PETROL.

Check supply at autovac by opening small tap in centre of base (in case of Kingston tap is replaced by small T handled plug). If petrol does not flow, make sure that tap is not stopped up with dirt (clear with pin or wire).

IF THERE IS NO PETROL IN VACUUM TANK.

Check quantity of petrol in rear tank and position of tap.

If there is ample petrol in tank, examine vacuum tank, as per Operation No. 67.

(C) Air leak in induction system.

Autovac Suction Pipe.

Servo Suction Unit when fitted.

Windscreen wiper pipe.

Manifold bolts and washers.

Joints between induction pipe and carburetter.

(D) Examine sparking plugs, using Neon plug tester. Set gaps to .010 inch.

Clean plugs if necessary, taking care not to damage the insulation of the central electrode.

(E) Examine contact breaker in distributor, for free movement of breaker arm.

Set spark gap to .012 inch.

See Electrical Instructions No. 91.

(F) CHECK IGNITION.

- 1. Examine all ignition leads.
 - (a) Distributor cap to plugs.
 - (b) Distributor cap to coil (high tension lead).
 - (c) Distributor cap to coil (low tension lead passing through tube in lead carrier. Trouble most likely at ends of tube).
- Examine safety coil situated on outside of coil. If it is burnt out it will be reddish in colour and will have broken at point of contact between wire and outside shell.

3. A rough test of the coil may be carried out as follows:-

While engine is running or is being turned over by hand, remove the master lead from the coil, holding it at the greatest distance from the coil terminal, which will allow a spark to pass. If spark is sharp and blue and causes a distinct crackle, the coil is O.K. If the spark is quite large, but is accompanied by orange coloured flames and a very weak crackle, the coil is failing and must be replaced. If no spark is obtainable and safety coil is O.K., examine battery leads and see if battery is charged. Easiest check is to switch on lights. If these burn brightly, check lead from coil is for the Production by some stuttle.

If O.K. coil is faulty. Replace coil.

(G) Check ignition timing.

Operation No. 24.

- (H) Check valve timing. Operation No. 25.
- (J) Check tappet clearance. .004in. as in Operation No. 23.
- (K) Check for sticking valves. Remove valve cover plate. Allow engine to tick over.

If a valve is sticking badly it will set up a noise (sharp metallic tap), as if a tappet is badly out of adjustment. Hold firmly, push rod end of each rocker in turn. A distinct tap will be felt when rocker corresponding with sticking valve is held. Check tappet clearance as in Operation No. 23 to make sure that tap is definitely due to sticking valve. If sticking valves are suspected, but will not show up in

the above test, take car on road. It will be found that sticking valves will cause a noise similar to tappets out of adjustment at about 40 m.p.h. when engine is hot, and running under heavy load such as climbing a hill; at the same time power will fall to a considerable extent.

After a burst of high speed and dropping back to a low speed, a further indication of sticking valves is apparent, in that the engine will not pick up properly.

(L) Check for standard performance.

To carry out this test, car must be taken on a flat piece of road carrying a test observer with an accurate stop watch. Check, using stop watch. Run car in top gear at about 5 m.p.h. Depress accelerator fully. As speedometer needle comes to 10 m.p.h. stop watch is started and car allowed to continue and accelerate to beyond 30 m.p.h. and as speedometer needle touches 30 m.p.h. watch is stopped. For accuracy, reading should be taken in both directions over same piece of road and the average taken.

(M) Broken valve spring.

Replace spring as per Operation No. 14.

(N) State of carbon deposit and valve seats.

To check for seating of valves run engine till warm. Check tappet clearances as per Operation No. 23. Turn engine over slowly with starting handle, thereby checking compression of each cylinder. A definite resistance must be felt on each individual cylinder, lack of compression indicates badly seating valves.

To check for carbon deposit take car on road with engine hot.

When engine is pinking, half retard ignition. If pinking stops engine is O.K. for carbon deposit.

(O) Fit of pistons and rings.

To cure piston slap, proceed as in Operation No. 22.

- (P) See that plugs are screwed in sufficiently tight.
- (Q) Check slow running control on carburetter.

If engine will not tick over, screw in. If engine runs too fast screw out. If this takes no effect, examine ball joints, making sure that these are free. The socket should turn easily on the ball. If the above points are O.K. check carburetter adjustment as per Operation No. 64.

(R) Slack fan belt.

Adjust fan belt as in Operation No. 4.

(S) Tight fan belt.

Adjust fan belt as in Operation No. 4.

(T) Noisy oil pump.

Check for above by listening at centre of N/S of engine by central camshaft rocker plate. Noise from pump will be distinctly heard at this point. (Deep whirring noise with vibration.)

Noise is occasionally set up by the drive from the camshaft, but is usually set up by the pump pinions. This noise increases when going fast round left hand bend with oil in sump on the low side.

To remedy, replace pump pinions by removing sump and pump as in Operations Nos. 11 and 20.

(U) Repacking impellor gland. See Operation No. 7.

(V) Impellor rotor loose on spindle (rattling sound).

Where this occurs a new type fan should be fitted. As a temporary expedient a new taper peg may be fitted.

To remove impellor assembly, see Operation No. 4.

If impellor rotor is loose on spindle, or spindle is broken, water will not be pumped and therefore, when engine is ticking over, no water will flow out of pipe into top of radiator. To check, remove radiator cap and if necessary drain a little water out until level is just below top of honeycomb.

(W) Chain tensioner broken.

To check for breakage.

If tensioner adjustment screw can be pulled up by hand spring is broken.

Proceed as in Operation No. 31, Engine Assembly.

Chain tensioner adjustment screw is located on top centre of flywheel housing and consists of a %6in. screwed rod carrying a %6in. locknut.

It is reached from nearside of engine after lifting bonnet. Fall in oil pressure due to above is caused by the chain oil pipe being broken off by the slack chain.

(X) Fan belt worn.

Fit new fan belt.

If fan belt is worn it will be seen that the steel connectors protrude through the leather links. It is these steel pins in connectors hitting pulleys which set up the clicking noise.

(Y) Fit of engine bearings.

If slack, engine overhaul required. Proceed as in Operation No. 11 or 12.

Slack bearings can best be heard when the engine is hot and the oil, therefore, thin. Engine should be allowed to tick over in neutral and the accelerator pedal sharply depressed. The bearing knocks can then be heard.

Care must be taken not to confuse piston tap with gudgeon pin knock. Main bearings set up a dull thud. Big end bearings set up a knock. Gudgeon pins set up a metallic tap duller than tappet noise.

(Z) Examine vibration damper bush for seizure.

To remove with engine in car, see Operation No. 17.

TO CHECK.

When vibration damper functions correctly there is relative movement between the centre and outer rings facing forward and located round starting handle dogs. If outer ring is seized on bush (that is, inner ring), there will be no movement between the two. Run chalk line vertically down the two rings. Rev. up engine. If lines still correspond, damper is seized.

- (A2) Carburetter setting. See Operation No. 64.
- (B2) Check oil level. If necessary, refill.
- (C2) Check petrol consumption with special tank. 20 m.p.g. is satisfactory. Petrol consumption must be checked at an average speed of 30 m.p.h.

(D2) Clutch slip. Due to ill usage only.

Increase spring pressure by tightening up nuts just sufficiently to overcome the trouble. This remedy is of no use if trouble is severe or recurring, when new plates must be fitted.

(E2) Old type clutch. Replace with light plates. Operations Nos. 26 and 31.

(F2) Slackness between torque ball and torque ball cover. See Operation No. 31.

(G2) Worn differential cages. Replace cages. See Operation No. 50A.

(H2) Bevel pinion and, or, crown wheel out of adjustment. See Operation No. 50A. Checking packing washers.

(J2) Damaged cylinder head gasket. Blown gasket allows gas to pass from cylinder to one adjacent. Leakage occurs only between cylinders 1 and 2, 3 and 4, 5 and 6. Test by checking compression for each cylinder, using gauge. Replace gasket as per Operation No. 13.

(K2) Cylinder head not tightened down sufficiently. Result of above will be lack of compression on all cylinders and sometimes water Will find its way into cylinders. The latter being the case, traces of water will be found on plug points.

Remove cylinder head and re-fit with new gasket as per Operation No. 14.

(L2) Brake binding. Adjust as in Operation No. 54. Check for seized shafts or operating gear.

(M2) Check tension of dynamo chain. See Operation No. 32.

REMOVING 10 H.P. RADIATOR after engine No. 63401.

Disconnect positive lead from battery.

Remove bonnet, by undoing two 1/4 in. nuts and washers.

Drain radiator, drain tap located in bottom water pipe.

Remove top water connection, two hose clips.

Remove bottom water connection, two hose clips.

Remove two 3/8 in. nuts, packing pieces and washers connecting radiator to front cross member.

.Undo radiator tie rod, one %6in. nut.

Inclining radiator to engine, undo two grub screws in electric horn terminal. Draw wires through stoneguard from bottom of radiator.

Lift out radiator.

To re-assemble—reverse operations, replace drain plug, and refill radiator with water.

The electric horn wires may be drawn through the stoneguard with a piece of wire.

Time to remove-30 minutes.

Time to change radiator-1 hour.

10/25 H.P. PRIOR TO ENGINE No. 63400.

REMOVING ENGINE FROM CAR.

Remove bonnet, one 1/4 in. square nut rear end of hinge.

Remove radiator. Slacken %in. nut at rear end of tie rod, lift rod out of socket, remove water hose clips, two on top joint, two on bottom, slide hose along pipes till clear of connections. Two %in. nuts and spring washers at bottom of radiator. Remove lamp wires from clips at back of reflectors and release wires from radiator. Lift radiator off chassis.

Remove plinths, six coach screws and square nuts (%in. spanner) at each side, lift off and remove packing.

Remove exhaust pipe. Three ¼in. nuts (brass) and spring washers.

Remove petrol pipe. Two %6in. unions.

Remove throttle control. Spring ball joint.

Choke control 1/6 in. split pin and washer.

Mixture contro! rod 1/6 in. split pin, spring washer.

Remove screen wiper suction tube.

Remove ignition control 1/4 in. split pin and spring ball joint.

Pull out high tension lead from centre of distributor.

Remove low tension lead 2BA nut and washers.

Remove starter motor lead. 1/4 in brass nut and washers.

Remove dynamo lead. Two %in. nuts and washers.

Remove oil guage pipe. 1/4 in union.

Remove gearbox. As in Operation No. 8o.

Remove engine suspension bolts, four %2 in. split pins, two castellated 3/8 in. nuts. at front, two castellated 3/8 in. nuts at rear.

Bolts withdraw downwards.

Remove starting handle and bearing, locking nut, special "C" spanner, unscrew bearing from front cover.

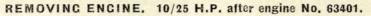
Remove four 3/16 in. nuts holding oil tray to sump.

Lift out engine, using suitable lifting tackle.

To refit, reverse operations.

TOOLS.

One pair of pliers.
One screwdriver.
One ¾6in. spanner.
One ¼in. spanner.
One ¾6in. spanner.
One ¾6in. spanner.
Time—2 men, 7 hours.



Remove bonnet, one 1/4 in. nut at rear end of hinge rod.

Disconnect positive battery lead.

Disconnect horn wires.

Remove gearbox as in Operation No. 8o.

Remove head lamp wires, release small clamp screw at bottom of lamp, lift out reflectors, wires will then pull out of clips.

Remove head lamp, horn and head lamp tie bar, two 1/2 in. nuts at bottom of lamps.

Drain radiator, 5/16 in. plug at bottom of water pump.

Release radiator tie bar, two 5/16in. nuts at each end.

Disconnect top and bottom water pipe connections, two 1/4 in. screws and clips on each.

Remove radiator, two 5/6 in. nuts, spring washers and distance pieces holding radiator to front cross member.

Remove petrol pipe from tank to carburetter, two 5/16 in. unions.

Remove carburetter and ignition controls.

Remove petrol tank, disconnect gauge from dash, release two 1/4 in. nuts and bolts from tank straps, lift out tank.

Remove carburetter, two \(^3\)/10 in. nuts. (NOTE.—Carburetter control return spring anchorage plate is fitted to the rear stud.)

Remove high tension wire from plugs, and lift distributor top off.

Remove low tension wire, 2 B.A. nut and washer.

Remove dynamo wires, two 3/16in. screws.

Remove starter cable from starter, one 1/4 in. nut and washer.

Disconnect earth wire from starter, one 1/16in. nut.

Remove exhaust manifold complete with exhaust pipe, six 3/16 in. brass nuts.

Remove oil pipe from sump to cylinder head, two 1/4 in. unions.

Remove four 3/2 in. split pins, four 3/8 in. castellated nuts and plain washers from engine suspension bolts.

Remove starting handle housing, unscrew lock nut with special "C" spanner.

Housing will then screw out of timing cover.

Remove grease nipple and distance piece from top of steering box.

Remove three 3/2 in. split pins and castellated nut from steering drop arm.

Remove 1/16 in. nut holding drop arm to splines and tap off.

Remove 1/8 in. split pin, 1/4 in. castellated nut and bolt holding steering box to frame. Lift steering out complete from driver's seat.

Tap out four engine bolts.

Lift engine out, using suitable lifting tackle.

(NOTE.—When re-building, to get horn wires back through radiator shell, insert length of wire through hole in radiator shell and starting handle hole in front cross member. Attach pulling wire to horn wires and pull into position.)

To refit—reverse operations.

TOOLS.

One pair of pliers.

%in. to 1/2 in. spanners.

%in to %in. sockets.

Large and small screwdrivers.

One hammer.

Time to fit new engine-2 men, 5 hours.

10/25 H.P. PRIOR TO ENGINE No. 63401.

TO DISMANTLE ENGINE.

Remove valve cover and Hallite washer, four 1/4 in. domed nuts and washers.

Remove water pump, two hose clips, slide hose along water pipe till clear of connection, two 1/4 in. nuts and spring washers.

Remove front cover plate, eight 1/4 in. nuts, paper washer.

Remove chain tensioners (if fitted), two spring strips, four springs and collar.

NOTE.—Before removing timing chains check timing for reassembling—retime as follows: Turn crankshaft round until marking on flywheel shows Nos. 1 and 4 cylinders on T.D.C. Rotate camshaft until No. 1 valves are on back of cam, i.e., valves closed. Set tappet clearance to .004in. (cold). Rotate camshaft in direction of rotation till No. 1 exhaust valve is just closed (using .004in. feeler).

Remove camshaft and water pump chains, split pin, smaller washer and loose chain-pin from each.

NOTE.—Before removing dynamo chain check timing of distributor for reassembling as follows: Turn engine in direction of rotation until S.F. ADV marking on flywheel is in line with mark on inspection aperture. Turn dynamo in direction of rotation (having first removed Distributor Cover) until rotor blade is on No. 4 segment with control lever fully advanced, contact breaker points just commencing to separate.

Remove dynamo chain, spring link.

Remove camshaft chain wheel, splin pin and 11/16 in. nut, special extractor. Remove key on shaft.

Remove water pump chain wheel by withdrawing from bush.

Remove camshaft driven wheel and starter dogs from crankshaft, locking ring and grub screw in dogs, withdraw wheel and dogs together with special extractor.

Remove dynamo chain wheel (driver) from crankshaft with special extractor.

Rmoeve camshaft bearing, two 1/4 in. nuts and spring washers.

Remove rocker shaft oil pipe, two 1/4 in. unions.

Remove rocker shaft, three 1/16 in. nuts and two 1/4 in. hexagon based studs, prize assembly off head.

Lift out eight push rods.

Remove sparking plugs, % in. box spanner.

Remove exhaust manifold, six 3/16in. brass nuts.

Remove carburetter, two 3/16 nuts and washers, spring bracket from 3/16 in. stud in rear of cylinder block.

Remove oil pipe to head, 1/4 in. unions.

Remove head, three 5/16 in. nuts, two 1/4 in. hexagon studs and washers, lift head breaking joint at front end.

Remove tappet cover plate, two 1/16 in. collared nuts and fibre washers, also Hallite washer.

Remove cylinder block, six 3/8in. nuts, paper washer at base.

Remove tappets from block, four screws, two strap bars.

Remove pistons, locking ring at each end of gudgeon pins, push out gudgeon pins.

Remove dynamo, three 5/16 in. nuts and washers.

Remove starter motor, three 5/16in. nuts and washers.

Remove clutch springs, four split pins 3/2 in., and four 1/2 in. collared nuts.

Remove clutch withdrawal gear, four ¼in. nuts, spring washers. Push end withdrawal plate forward, release split collar, slide off both plates.

Withdraw clutch plate complete with bearing. Withdraw cork insert plate.

Remove oil pipe from pump to front bearing, two 1/16 in. unions, two 1/16 in. nuts hold clip.

Remove oil pipe from pump to rear crankcase, two 5/16in. unions.

Remove pump cover and paper washer, 3/16 in. nut and three 1/4 in. nuts.

Remove sump, four locking nuts 3/16 in. and eight 3/16 in. nuts. Locking nuts on two middle bolts at each side.

Oil pump and drive also come away.

Remove flywheel, six 54in. split pins and six 3/8in. nuts (castellated).

Tap flywheel off shaft with piece of wood through inspection cover.

Remove connecting rods, undoing two 1/16 in. split pins and two 5/16 in. castellated nuts on each. Note position of numbers.

Detach rear main bearing housing, four 3/32 in. split pins, four 1/4 in. castellated nuts, six 1/4 in. nuts and spring washers.

Main bearing housing and crankshaft may then be withdrawn from rear of case.

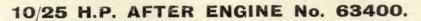
Remove rear main bearing housing from crankshaft; four split pins, four castellated nuts, four bolts, eight washers, one at each end of each bolt. The long inside bolts and nuts 3/8 in. The shorter bolts on rear side 5/16 in.

Remove camshaft by withdrawing from front end, first removing grub screw located on top of the case registering in middle camshaft bearing. Bearing comes away and is in two halves.

To reassemble engine reverse operations.

TOOLS.

One pair of pliers.
One screwdriver.
One %6in. box spanner and tommy bar.
%16in. to ½in. spanners.
%16in. to ½in. sockets.
Time to strip—2½ hours.



DISMANTLING ENGINE.

Remove valve cover and Hallite washer, four ¼ in. domed nuts and spring washers.

Remove carburetter, two ¾ in. nuts and spring washers. (Note—Carburetter control return spring anchorage plate is fitted to rear stud).

Remove rocker shaft oil pipe, two 1/4 in. unions.

Remove sparking plugs (%in. box spanner).

Remove exhaust manifold, six 1/4 brass nuts, also Hallite washer

Remove rocker shaft, three %in. nuts and two hexagon based studs, prize shaft off dowels with strong tommy bar.

Remove eight push rods.

Remove two oil pipes and three-way oil union, four 1/4 in. unions, 1/4 in. bolt, distance collar and copper asbestos washers.

Remove cylinder head, three 5/16in. nuts and two hexagon based studs.

Remove cylinder head gasket. (Note.—Cylinder head gasket should be replaced if at all damaged. If original is used, both faces must be carefully cleaned and jointing compound used on both sides).

Remove water connection from pump to cylinder block, two 3/16in. screws and clips.

Remove tappet cover, two 1/16 in. collared nuts and fibre washer (also Hallite washer).

Remove cylinder block, six 3/8 in. nuts. (Note.—When lifting cylinder block off, care must be taken not to drop a tappet into the sump.)

Remove water pump, two 1/4 in. nuts and spring washers.

Remove timing cover, nine 1/4 in. nuts.

Remove timing chain, first slacken off three 5/16 in. nuts holding dynamo, then carefully remove dynamo wheel by undoing 5/16 in. self extracting nut. (Note.—If dynamo wheel is very tight on spindle, give nut a sharp tap, as undue strain may break extracting flange off nut.)

Remove water pump wheel and spindle.

Timing chain will then lift off camshaft and crankshaft wheels. (Note.—Chain is of the endless type.)

NOTE.—Pistons are numbered. Keep numbers to the front of engine.

Remove pistons by taking out two spring clips which hold gudgeon pins in position, tap gudgeon pins out and lift pistons off.

Remove clutch inspection cover, two wing nuts and spring washer.

Remove clutch withdrawal gear, four 1/4 in. nuts and spring washers.

Push end withdrawal plate forward, remove split collar and slide off both plates.

Remove four 3/2 in. split pins, four 1/2 in. collared nuts and clutch springs.

Clutch master plates and cork insert plate will then lift off flywheel. (Note.—The splined plate in the centre of cork insert plate, must be fitted with the rivet heads to the flywheel.)

Remove starter, three hin. nuts and plain washer.

Remove flywheel, six sain. split pins, six 3/8in. castellated nuts.

Remove two oil pipes and oil union from sump, four % in. unions and % in. bolt, distance collar and copper asbestos washers.

Remove oil pump plates, three 1/4 in. nuts, one 3/16 in. nut.

Remove sump, nine % in. nuts, sump and pump gears will then lift off, lift out helical pump shaft.

Remove con. rods, two 3/32 in. split pins and 5/46 in. castellated nuts. (Note.—Con. rods, shims, and bearing caps are numbered, with large and small numbers, when rebuilding, keep small numbers to the camshaft side of engine.)

Remove split pin and nut from camshaft.

Remove camshaft timing wheel, using special extractor.

Remove starter dog and crankshaft timing wheel, using special extractor.

Remove camshaft front bush, two 1/4 in. nuts and spring washer.

Remove camshaft, first taking out 3/16 in. grub screw from split bearing in centre of camshaft, draw out shaft. Note.—The two halves of bearing are marked, keep marks together.)

Remove rear bearing housing, and crankshaft, 1/4 in. nuts holding housing to crankcase.

Crank will then withdraw from rear.

TOOLS.

One pair pliers.
%in. to 3/4 in. socket.
%in. to 1/2 in. spanners.
Two screwdrivers.
One strong tommy bar.
Special extractors.
Time—3 1/2 hours.

10/25 H.P., ALL MODELS.

ADJUSTING TAPPETS.

Remove valve cover. Four 1/4 in. domed nuts and washers.

Bring No. 1 piston to top dead centre compression stroke (both valves shut).

Check clearance No. 1 tappet by inserting .004in. feeler with engine hot, .006in. feeler with engine cold, which should be a sliding fit between rocker and valve stem.

If tappet requires adjustment, slack off 1/4 in. locking nut and set adjustment screw till clearance is correct.

Tighten up locking nut and check clearance.

Proceed with other cylinders in order of firing (1, 2, 4, 3), finding top dead centre by moving starting handle half a turn from its position No. 1 T.D.C.

TOOLS.

One 1/4 in. spanner.

One screwdriver.

One .004in. or .006in. feeler.

Time-15 minutes.

FITTING NEW TIMING CHAIN. 10/25 H.P. after engine No. 63400.

Disconnect positive battery lead.

Drain radiator, 5/16 in. plug at bottom of water pump.

Remove head lamps, horn, horn wires and head lamp tie bar.

Remove two 1/2 in. nuts at bottom of lamps.

NOTE.—To get horn wires back through centre of shell, insert length of wire through hole in radiator shell and starting handle hole in front cross member, join ends of horn wire together, attach pulling wire to ends of horn wire and pull up through centre of radiator shell.

Slacken off radiator tie bar, one % in. nut holding bar to dash bracket, lift bar out of bracket.

Remove top and two bottom water pipe connections, two 1/4 in. screws and clips on each.

Remove two % in. nuts, spring washers and packing pieces holding radiator block to front cross member, lift radiator clear.

Remove water pump, two 1/4 in. nuts and spring washers.

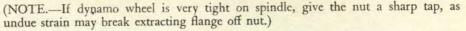
Remove timing cover, nine 1/4 in. nuts, pull cover clear of studs and turn over towards offside of car, lower on to the front axle.

Remove ignition control rod from distributor, open two small springs and lift socket off ball. NOTE.—Check timing before removing chain, as there is no marking on timing wheels.

Slacken off three % in. nuts holding dynamo in position, then carefully remove dynamo

wheel by undoing 5/16 in. self-extracting nut.





Remove water pump wheel and spindle, timing chain will then lift off camshaft and crankshaft wheels. (NOTE.—Be sure that dynamo wheel is on key when re-building.)

To re-assemble—reverse operation and re-time engine as per Operation No. 74.

TOOLS.

One pair of pliers.

1/4in. to 1/2in. spanners.
One 1/4in. socket.
One 1/4in. socket and T handle.

One screwdriver.

Time to fit new chain-2 hours.

10/25 H.P. UP TO ENGINE No. 63400.

FITTING NEW TIMING CHAINS.

Remove radiator. Operation No. 71.

Remove timing cover.

Remove chains and replace with new ones.

Re-time engine; see Operation No. 73.

Time required—3 hours.

.10/25 H.P., ALL MODELS.

REMOVAL OF CYLINDER HEAD.

Remove bonnet, 1/2 in. nut at rear end of hinge rod.

Remove valve cover and hallite washer, four 1/4 in. domes nuts and spring washers.

Remove rocker shaft oil pipe, two 1/4 in. unions.

Remove rocker shaft, three % in. nuts, two ¼ in. hexagon based studs.

Prise rocker assembly off head and take out eight push rods.

Remove four sparking plugs %6in. box spanner.

Remove exhaust manifold three 1/4 in. brass nuts from flange, six 1/4 in. brass nuts from head.

Remove carburetter take off ball joint to throttle, release two control rods removing from each one 1/32 in. split pin.

Remove two % in. nuts and washers.

Remove oil pipe to head two 1/4 in. unions.

Remove head three 16in. nuts, two 1/4in. hexagon studs and washers.

Lift head breaking joint at front end.

To reassemble reverse operations and adjust tappets as in Operation No. 75. NOTE.—Always fit new gasket. Use jointing compound on both sides of gasket. TOOLS.

One %in. spanner.

One 1/4 in. spanner.

One %in. spanner.

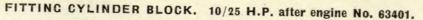
One %in. box spanner.

One pair pliers.

One screwdriver.

One small bar.

Time-11/2 hours.



Remove bonnet, one 1/4 in. nut at rear end of hinge rod.

Remove radiator tie bar, 5/16 in. nut at each end.

Remove petrol tank, two 1/4 in. nuts and bolts through tank straps.

Drain radiator, 5/16 in. plug at bottom of pump.

Drain cylinder block, 5/16 in. plug, nearside rear end.

Remove top, and pump to cylinder block water pipe connections, two 1/4 in. screws and clips on each.

Remove valve cover and Hallite washer, four ¼in. domed nuts and spring washers. Disconnect carburetter control ball joints, open two small springs and lift off.

Remove carburetter, two %6in. nuts and spring washers.

NOTE.—Carburetter control return spring anchorage plate is fitted to rear stud.

Remove rocker shaft oil pipe, two 1/4 in. unions.

Remove sparking plugs (% in. box spanner).

Remove exhaust manifold, six 3/16 in. brass nuts, also hallite washer.

NOTE.—It is not necessary to break flange joint.

Remove rocker shaft, three %in. nuts and two hexagon based studs, prise shaft off dowels with strong tommy bar.

Remove eight push rods.

Remove three-way oil union, 1/46 in. spanner.

Remove cylinder head, three 5/16 in. nuts and two hexagon based studs. Remove cylinder head gasket.

NOTE.—Cylinder head gasket should be replaced if at all damaged. If original is used, both faces must be carefully cleaned and jointing compound used on both sides. Remove tappet cover, two 1/16 in. collared nuts and fibre washers (also hallite washer). Remove cylinder block, six 3/8 in. nuts.

NOTE.—When lifting block off care must be taken not to drop tappets into sump. TOOLS.

One pair pliers.
One screwdriver.
%6in. to ½in. spanners.
One %6in. box spanner.
%6in. to ½in. sockets.
Time to fit new block—5 hours.

10/25 H.P.

FITTING NEW VALVE SPRINGS.

Remove valve cover, four 1/4 in. domed nuts.

Remove sparking plug on cylinder with broken valve spring-%in. spanner.

Bring piston to top dead centre.

Remove valve split collar.

Remove springs.

Fit new springs.

Re-assemble reversing operations.

TOOLS.

One screwdriver.

One 1/4 in. spanner.

One %in box spanner.

Time—15 minutes.

10/25 H.P. ALL MODELS.

DECARBONISING.

Remove cylinder head (see Operation No. 78).

Remove eight valves by depressing springs (special tool) and taking split collars off each valve stem.

Clean valves.

Reface valve.

Remove carbon and jointing material from head.

NOTE.—Head must NOT be put in caustic solution as aluminium core plugs are fitted.

Recut valve seats.

Grind valves into seats.

Re-assemble valves into head.

Remove carbon from pistons and clean cylinder block face.

Re-assemble head to engine, reversing instructions for Operation No. 78.

Time-4 hours.

10/25 H.P. ALL MODELS.

TO REMOVE CEARBOX.

Detach brake rod and tension spring from pedal, also spring from torque tube. Remove universal oil cup.

Remove two split pins and \%in. castellated nuts and bolts from torque tube ball. Remove six \%in. nuts, spring washers and bolts holding torque tube ball cover.

Screw ball back on to torque tube until free of threads, withdraw one 1/8 in. split pin from propellor shaft.

Disconnect brake rods from axle, screwing back two wing nuts.

Jack up rear of chassis, slide axle back on springs till torque tube and propeller shaft drop clear.

Disconnect clutch withdrawal link from operating arm removing split pin and yoke pin.

Remove clutch greaser.

Remove gearbox turret complete with lever undoing four 1/4 in. nuts and spring washers.

Disconnect speedo drive % in. nut and bolt.

Undo ten 5/16 in nuts and washers holding gearbox to engine.

Slide gearbox back and drop.

To re-assemble reverse operations.

Torque tube ball should be screwed up to universal housing until about 3/4 in. of thread shows on the torque tube.

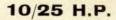
TOOLS.

One pair pliers.
One 3/6 in. spanner.
One 1/4 in. spannner.

One 5/16 in spanner.

One tommy bar.

Time-4 hours.



DISMANTLING CEARBOX.

Remove turret by undoing four 1/4 in. nuts and spring washers.

Disconnect speedo drive, one, %in. bolt and spring washer.

To remove universal joint spider take out 5in, split pin and undo 3/sin, castellated nut.

Draw spider off splines.

Draw oil retaining distance washer off shaft.

To remove rear gearbox cover, six 1/4 in. split pins, six 1/4 in. castellated nuts, and washer, withdraw cover (cover carries reverse idler).

Both mainshaft and layshaft can then be withdrawn.

Gear slide off mainshaft in following order:-

Top gear dogs and 2nd speed pinion, 1st speed pinion (pressed on).

Reverse pinion is part of the shaft.

Primary pinion is removed by tapping back from front end.

To remove selectors remove N/S selector fork first complete with shaft tapping out from front end.

Remove central locking plate and steel ball located between selectors.

Note position of distance sleeves on selector shafts.

O/S selector need not be removed, but IF REQUIRING SEPARATE ATTENTION can be withdrawn by tapping shaft out from front end.

WHEN RE-ASSEMBLING:—Locking washer and plug must be removed from top of selector and ball held down against spring while shaft is driven through. Locating plate at front end of shafts must be positioned and shaft tapped home. Selector ball is best held down by inserting suitable screwdriver from front of box through selector shaft housing, as selector shaft is pressed home, screwdriver is withdrawn.

TOOLS.
One pair pliers.
One screwdriver.
One ¾in. spanner.
One ¼in. spanner.
Time—2 hours.

INSTRUCTIONS FOR FITTING CORK TYPE CLUTCH TO 10/25 H.P. ROVER.

Replace clutch plate by new type cork plate, verifying that the dog slides freely along the splined shaft.

Replace felt washer retaining plate in declutching plate by a new dished washer.

Replace clutch springs by 75 lb. set, and adjust all four evenly.

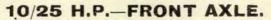
If the hole in the base of the clutch case is not screwed it must be tapped out 3/8 in. Gas thread, and have a drain plug fitted.

The screws holding the inspection cover on the top of the clutch case are to be withdrawn, and studs fitted in their places. Inspection cover to be held down on cork washer by wing nuts and spring washers.

A pint of engine oil should be poured into the clutch case through the inspection cover opening.

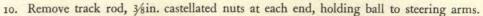
Should the clutch become "fierce" at any time, add a little more oil as necessary.

Time required— hours.



REMOVE AND DISMANTLE.

- 1. Jack up car, supporting under chassis and remove road wheels, undo five 3/8in. domed nuts on each, using special wheel brace.
- 2. Disconnect drag link from steering drop arm, 3/32 in. split pin and 3/8 in. castellated nut.
- 3. Remove drag link from steering drop arm, 3/2 in. split pin and 3/8 in. castellated nut.
- Drop axle off springs, removing four 5/4 in. nuts, bolts and locking plates from each spring.
- Remove hubs, ½sin. split pin, ½sin. nut and plain washer (nearside left hand thread.) Withdraw hubs with bearings, distance piece, oil retaining cup and felt washer.
- 6. Remove brake shoes, releasing two return springs from each.
- Remove brake anchor plates, four 5/16 in. castellated nuts and bolts. Brake operating gear comes away with plates.
- 8. Remove brake operating cam from plates, take out two screws in back of plate holding cam bush, it will then come away complete.
- 9. Dismantle universal joint of brake cam, remove brake cam return spring from end of shaft; remove brake lever, %sin. nut, bolt and spring washer, tap lever off key, remove %zin. split pin in shaft, slide off collar, spring and outer and inner universal joint cover. This type of universal joint is dismantled by rotating each component in turn through 90 degrees in order to bring the flats machined in the ball opposite the throats of the forks.



- 11. Remove stub axles, two 3/16 in. taper pins, nuts and plain washers, tap out cotter, withdraw swivel pins, using special extractor. Stub axle then comes away.
- 12. Dismantle ball joints, 3/2 in. split pins and socket plug. Tap housing off ball, remove socket and spring.

NOTE.—The housing at steering drop arm end of drag link has longer slot for allowing greater angle of travel.

To assemble—reverse operations, taking care that brakes are re-adjusted correctly. Time—1 1/2 hours.

TOOLS REQUIRED.

One pair of pliers.

One screwdriver.

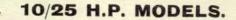
One %in. open ended spanner.

One % in. open ended spanner.

One 3/8in. open ended spanner.

One 11/16in. open ended spanner.

One hammer.



DISMANTLING STEERING.

NOTE.—Steering complete cannot be removed from car with engine in position on models up to 63400.

Remove pedal floor board.

Remove steering wheel 1/2 in. bolt, washer and horn switch.

Remove cap slacking off 1/2 in. pinch bolt and nut.

Remove %in. nut, spring and clamp holding lower ends of control rods.

Remove 14 in. pinch bolt and nut holding outer column to steering box.

Draw off outer column.

Remove drop arm, %in. nut and split pin.

Remove washer.

Remove %6in. clamp bolt and nut.

Tap off drop arm and remove washer.

Remove four 4in. bolts and spring washers.

Remove adjustable cap and bush.

NOTE.—Worn wheel is brought further into mesh by turning cap in clockwise direction.

Withdraw bush and worm wheel.

Remove bottom bearing cover releasing four locking plates and removing four 1/4 in nuts.

Slack off %in. bolt and nut holding box to chassis.

Tilt box upwards.

Tap column down from top end and withdraw.

Worm is pressed on to column and pegged.

Bearing is held to worm shaft by 11/16 in. castellated nut and washer.

To assemble—reverse operation.

TOOLS.

One pair pliers. One screwdriver.

One ¼in. spanner.

One 5/16in. spanner.

One 7/6 in. spanner.

One 1/2 in. spanner.

One %in. spanner.

One 11/16in. spanner.

Time-1 and 1/2 hours.

10/15 H.P. ALL MODELS.

TO DISMANTLE PROP. SHAFT CENTRE BEARING.

1. Jack up car under rear springs, just in front of rear axle.

2. Remove wing nuts from rear brake rods.

3. Remove floor boards—four turn plates and several wood screws.

4. Disconnect hand brake return spring.

5. Remove two 5/16 in. bolts and nuts from ball joint housing.

6. Remove six 3/16 in. bolts and nuts and spring washers from ball housing flange.

. Unscrew ball using tommy bar.

8. Remove 3/2 in. split pin from front end of prop. shaft, securing prop. shaft to universal joint.

 Slide rear axle backwards on road springs as far as possible, this will withdraw front end of prop. shaft and allow same to drop to floor.

10. Remove eight %16in. bolts, nuts and spring washers from centre flanges of torque tube, centre bearing can then be removed.

NOTE.—Centre bearing is assembled as follows:— Nose of bearing plate inserted in front end of torque tube, Steel plate between same and rear member of torque tube.

Time-5 hours.

TOOLS.

%in. spanner.
%in. socket or box spanner.
One pair pliers.
Two jacks.
One tommy bar.

ALL 10/25 H.P. MODELS

TO CURE EXCESSIVE OIL CONSUMPTION OF REAR AXLE WHEN THERE IS NO EVIDENCE OF LEAKAGE.

Drill two 1/8in. holes on torque tube as follows :-

One hole in top of torque tube, immediately behind thread at front end.

One hole in top of tube just behind centre bearing flange.

Time required—15 minutes to 2 hours according to type of body fitted.

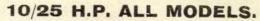
10/25 h.p., ALL MODELS.

TO REMOVE REAR AXLE.

- t. Drain rear axle. Remove drain plug in axle case.
- 2. Jack up car. Fix strong jacks under large bolts which secure road springs to chassis.
- 3. Remove rear road wheels, five 1/16in. nuts and washers to each wheel.
- 4. Remove wing nuts from rear brake rods.
- 5. Disconnect shock absorbers by removing nuts from "U" bolts around axle tubes.
- 6. Remove ten 3/8in. bolts and nuts and spring washers which secure rear flange of torque tube to axle casing—using 5/16in. spanner.
- 7. Slide rear axle back and drop clear of road springs.

To re-fit—Reverse operations.

Time-2 hours.



DISMANTLING REAR AXLE.

- 1. Remove split pins and nuts from end of axle shafts, two 11/6 in. nuts.
- 2. Remove hubs, using "Rover" extractor.
- 3 Remove brake shoes—four springs.
- 4. Remove two C nuts securing bearings to axle sleeves.
- 5. Remove two hub bearings and oil retaining washers by prizing same off axle sleeves.
- 6. Remove wormshaft thrust cap-four 5/16in. nuts and spring washers.
- 7. Remove wormshaft by tapping with lead hammer.
- 8. Remove one 11/16 in. nut from wormshaft—R.H. thread.
- 9. Remove thrust race and bearing from wormshaft.
- 10. Remove roller bearing from front end of wormshaft, taking care of distance washer. NOTE.—Outer ring of this bearing will stay in housing and is a push fit.
- 11. Remove nine 1/4 in. nuts and spring washers from axle case and separate case with lead hammer.
- 12. Remove three 1/4 in. nuts and spring washers from N/S case.
- 13. Tap out diff. assembly using lead hammer on end of axle shaft. NOTE.—Position of thrust washer—inside axle case.
- 14. Strip diff. assembly as follows:—
 Remove split pins and nuts from two ¼in. bolts, also from four 56in. bolts. Using socket or box spanners. Tap diff. cages apart using lead hammer. Take particular note of position of diff. components.
- 15. NOTE ON DIFF. ASSEMBLY. Fit large ends of four diff. pins in holes in nearside diff. cage. Fit one distance collar on each of two diametrically opposite pins. Fit one diff. pinion to ditto. Next

fit one diff. pinion to each remaining pin and then one distance collar. Offer up worm wheel and O/S diff. cage and check pinions for being quite free. If O.K. fit bolts, etc.,

Remove axle shaft pinions as follows:—
 Press pinion along shaft. Remove split collars. Draw off pinions.

17. Remove woodruff keys from axle shafts.

Remove diff. cages and oil throwers—small grub screw.
 NOTE.—L.H. thread oil thrower is fitted to O/S shaft.

 Remove split rings which secure locking nuts on diff. cages and remove bearings and baffle plates.

To assemble—reverse operations. Time to strip and re-build—5 hours.

TOOLS required.
One pair pliers.

One screwdriver.

One 1/4 in. spanner.

One %isin. spanner.

One 3/8in. spanner.

One 11/16 in. spanner.

One 1/4 in. socket or box spanner.

One 5/16 in. socket or box spanner.

One C spanner.
One lead hammer.

One hub extractor.

10/25 H.P., ALL MODELS.

TO FIT UNDERSIZE SPRING ROLLERS.

- Jack up rear of car and place jacks or blocks under large bolts securing rear springs to frame.
- 2. Remove two bolts through rollers, split pins and 3/8in. nuts.
- 3. Dress sides of springs to suit new undersize rollers.
- 4. Re-assemble, reversing operations.

 NOTE.—Special pen steel washers are supplied to eliminate any end play between spring rollers and jaws on rear axle tube.

Time-2 hours.

TOOLS REQUIRED. Two jacks. Pliers. 3/sin. spanner. 12in. file.

10/25, H.P. BRAKE ADJUSTMENT. All Models,

The same methods are again used to adjust the brakes on the 10/25 h.p. models, but it will be found more difficult to cut out the tendency to lock rear wheels.

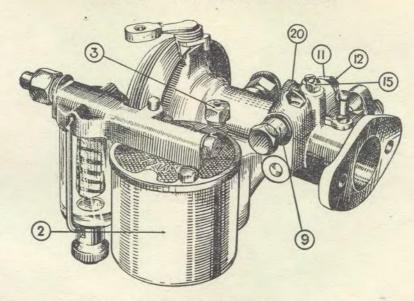
Take the car on the road with the front wheels adjusted two half turns ahead as on previous models. If rear wheels lock, slacken off rear adjustment half a turn at a time, until all four wheels act equally.

Time required—20 minutes.

10/25 H.P.

"AMAL" CARBURETTERS.

10/25 H.P. "AMAL" CARBURETTERS.



The "Amal" Carburetter as viewed from above. The numbered portions are referred to in letterpress.

CARBURATION

The carburetter is the "AMAL 26 HHR," which, by special design of the choke tube, pilot system and petrol passages enables the mixture strength to be maintained correctly at any position of the throttle and engine speed, and flat spots are quite unknown.

The choke tube is of "venturi" formation, which means that a smaller size can be used without loss of power or speed, and this, in turn, enables a smaller main jet to be used with the attendant advantages of certain acceleration, better fuel consumption and a

longer period of running without decarbonisation being necessary.

The carburetter is most accessible, as all the jets can be removed by means of an ordinary spanner without disturbing any other part; in fact, the main jet can be removed while the engine is running on the pilot system, and any of the pilot system jets can be removed while the engine is running on the main jet.

An economising device is incorporated which gives three different mixture strengths, namely, rich, normal and weak, and is connected by means of a rod to a hand control on

the facia board, which is conveniently placed for use by the driver.

Fuel, before entering the float chamber, has to pass through the large filter gauze (1) and into the float chamber (2) being adequately cleansed before entering the carburetter.

The fuel for the main jet system has to pass through the main jet (3) being metered

through the small orifice (4) at the side of the jet.

The main jet contains besides the fuel metering orifice an air passage down its centre with two side outlets (5) also near its base. This air not only aids atomisation, but chiefly serves another purpose—that of compensation. When the engine's speed increases under light loads this admission of air enables an increased amount of air to flow, owing to its density being lighter than that of the fuel, and this automatically compensates the tendency for a greater fuel flow. A reverse state of affairs occurs under opposite conditions.

It will be seen that a preliminary mixing of air and fuel takes place in the main jet well (6) and this mixture then passes to the groove (7) round the choke tube.

Owing to the special design of the choke tube the air passing through it to the engine has a high velocity, and as the fuel emulsion issues from the choke tube groove into the air stream from every side through the small diffuser tubes (8), it becomes very intimately mixed with the main body of air. The mixture, therefore, enters the induction system of the engine in a condition which enables it to form a perfectly explosive gas as soon as it comes into contact with the warm engine,

SLOW-RUNNING

With regard to the "slow running" system, all the fuel is drawn through the pilot jet (9) from the float chamber (2) and will be found on the right-hand side of the

carburetter body.

The fuel, after being metered by this jet (9) issues into a small chamber (10) and at the end of this chamber is located the by-pass sleeve (11) with its air jet (12). Through this by-pass sleeve (11) a predetermined amount of air is also allowed to flow into the pilot chamber along the centre air passage (13). It will thus be understood that in this small space (10) a mixture of fuel and air is formed.

An outlet (14) from this chamber communicates with the main bore of the carburetter on the engine side of the throttle valve (18) and into which the idling jet (15) is located for the purpose of controlling the quantity of fuel and air mixture, by means of the calibrated orifice (19) that is required for correctly running the engine at idling speeds.

With regard to the by-pass sleeve (11) and air jet (12), these are used as a means of correcting the mixture during the period of changing-over the running from the idling to the main jet systems, and for overcoming any type of flat spot-rich or weak-that may occur at this point, and is accomplished in this way. At the side of the by-pass sleeve (11) there is a small calibrated passage (16) which is in communication with the second outlet (17) in the main bore of the carburetter, but on the atmospheric side of the throttle valve (18) when this is in the "closed" position.

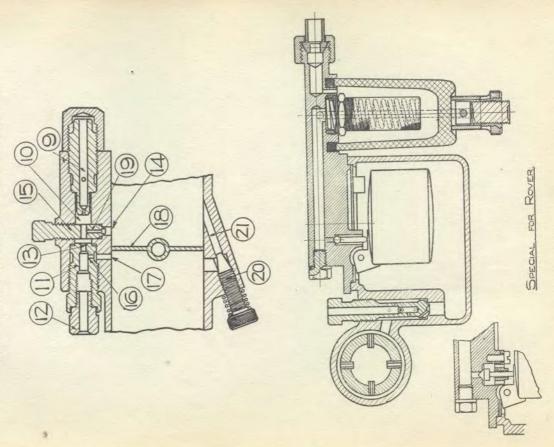
The other end of this calibrated passage (16) in the by-pass sleeve (11) is in communication with the air passage (13) which is drilled down its centre, and through which the air flows into the pilot chamber.

It will be seen that when the engine is idling with the throttle valve (18) closed, air is drawn not only through the by-pass air jet but also through the second outlet (17). Opening the throttle valve uncovers this second outlet (17) and it is immediately put into communication with the suction of the engine. This has the effect of not only preventing the flow of atmospheric air through this hole to the pilot chamber, but of causing a reversal of flow through this passage, and by this means correcting the mixture strength which otherwise would have fluctuated had there been no bridging device of this nature. In other words, this by-pass arrangement has the effect of bridging any gap that may occur during the transition period from idling to main jet running.

For controlling the quality of the idling mixture to a more minute degree, an air adjusting screw (20) is provided, and is at the left-hand side of the carburetter.

This screw is located in an air passage (21) that runs from the atmospheric side of the throttle valve to the engine side of same, and by turning it in a clockwise direction is made to restrict the amount of air passing and so enrich the idling mixture, or vice versa.

At the same time, once the correct idling jet (15) has been arrived at, this air adjusting screw (20) is used as a means for determining the rate at which the engine runs for "slow running."



THE "AMAL" CARBURETTER IN SECTION

FLOAT CHAMBER. It will be seen that on removing the float chamber cover (24) the float (22), needle (23) and filter (1) are withdrawn, leaving the float chamber (2) clear, this, obviously, being a big advantage from an accessibility point of view.

When replacing the float chamber cover, etc., care should be taken to slide the float between the four lugs (which are used for holding screws for the cover).

The petrol level is correctly set and remains constant to the cover, and should not be altered under any circumstances.

ADJUSTMENTS

MAIN JET. The jet as fitted to the carburetter should be correct for your engine. If it is necessary to alter this, it will be noted that, owing to the construction of the carburetter, the jet is in a very accessible position, and is readily removed by unscrewing.

A final testing of the main jet size should always be done on the road, when the smallest jet should be fitted consistent with the engine developing its best power and acceleration. All jets are carefully calibrated and marked with their sizes.

IDLING ADJUSTMENT. To slow down the rate at which the engine runs, the air adjusting screw (20) should be turned in a clockwise direction, and, of course, the converse is necessary should the speed of the engine be required to be increased.

BY-PASS SYSTEM. This is for the purpose of eliminating the annoying "flat spot" so frequently experienced when opening up the throttle. To cut out any flat spot the the tuning is extremely simple, as it is only necessary to fit the requisite sized air jet without getting any hesitation from the engine when opening up.

CENERAL INSTRUCTIONS

BEST METHOD FOR STARTING. To obtain an easy start from cold it is necessary to give the engine a rich mixture for the purpose of saturating the induction system, and this is achieved in the following manner.

The throttle valve should be set about 1/4-open, and the strangler valve should be fully closed. After a few revolutions the engine should start, when the strangler should

be returned to its fully open position.

Flooding is unnecessary.

It should be noted that the throttle valve must be opened in order that the full suction of the engine may work on the main jet.

If the throttle valve is left closed, the engine can only suck on the pilot jet, which will not give sufficient fuel for the rich mixture necessary for starting from cold.

When the engine is warm it may generally be started with the throttle valve in the slow running position, without the aid of the strangler.

DIFFICULT STARTING WHEN HOT can only be caused by a too liberal supply of fuel, and is generally due to either the over-use of the strangler or the float chamber flooding.

To retain the best performance from the "AMAL" carburetter, cleanliness is essential, and we advise that the float chamber and all jets, together with the by-pass sleeve, should be periodically examined and cleaned, to ensure freedom from trouble due to the presence of water and other foreign matter. By adopting this course irritating delays on the road are eliminated.

"AMAL" CARBURETTERS

The same instructions apply to our 1931 type of Amal Carburetter as given in this book for the 1930 type, with the exception that the jets are numbered differently, and the extra air is controlled at the carburetter instead of at the facia board.

Standard jets fitted in our 10/25 h.p. Amal Carburetter up to 1930:-

Main Jet, 95.

Pilot Jet, 25.

Idle Discharge Jet, 30.

Air Bleed Jet, 7.

Choke Tube, 71.

Standard jets fitted in our 1931 10/25 h.p. Amal Carburetter:-

Main Jet, 100A.

Pilot Jet, 25.

Idle discharge Jet, 65.

Air Bleed Jet, & 7.

Choke Tube, 71.

10/25 H.P., ALL MODELS.

No. 1.

POWER UNIT.
Engine will not start.
Check items AA, AB, AC, AD, AE, AK, AL.
No. 2.
Engine starts and stops again.
Check items AA, AB, AL.

No. 3.

ENGINE SLUGGISH OR LACKS POWER. Check power against standard performance. Item AF.
ENGINE MISFIRES.
Check items AC, AD, AE, AG, AL.
ENGINE HAS NO COMPRESSION.
Check items AD, AH, AL.

No. 4.

CLATTERING NOISE FROM ENGINE. Check item AM. Tapping noise from engine. Check items AD, AH, AJ. Rattling noise from engine. Check item AW. Knock and, or, dull thud in Engine. Check item AN.

No. 5.

Engine overheats. Check items AQ, AD, AH, AJ.

No. 6.

Petrol consumption. Check item AO.

No. 7.

OIL PRESSURE DROPS. Check items AQ, AR, AV, AN.

No. 8.

POPPING BACK IN CARBURETTER. Check items AB, AL, AC, AD, AS. No. 9. CLUTCH SLIPPING. Check item AX.

No. 10.

CLUTCH STIFF TO OPERATE. Check item AP.

No. 11.

GEARBOX. Gear jumps out. Check item AY.

No. 12.

BACK AXLE. Snatch when taking up drive, or noisy axle. Check item AT.

No. 13.

STEERING.
Excessive backlash.
Check item AU.
Steering Stiff.
Check item AZ.
Steering wanders.
Check item AU.

No. 14. BRAKES. See Operation No. 86.

No. 15.

ELECTRICAL EQUIPMENT. See Operation No. 91.

10/25 H.P., ALL MODELS.

AA Check petrol supply.

Flood carburetter to see if petrol reaches float chamber.

If there is no petrol check supply tank, note if tap is in correct position.

AB Check for air leak at carburetter, joint between carburetter flange and cylinder head. Windscreen wiper tubing.

AC Check sparking plugs using Neon plug tester.

Set gaps to .020in.

Clean plugs if necessary taking care not to damage insulation on central electrode.

AD Check tappet clearance, .oo4in. engine cold. .oo6in. engine hot.

Set as in Operation No. 75.

AE Check ignition.

Examine contact breaker in distributor for free movement of breaker arm.

Set spark gap to .012in.

See instructions under Item F (Operation No. 69), except that when testing coil as under Item F, Section 2, master lead must be detached from distributor head instead of coil.

See also Electrical Instructions, Operation No. 91.

AF Check for standard performance.

Maximum speed, 50 m.p.h. on models prior to 63401. Maximum speed, 55 m.p.h. on models after 63400.

Acceleration.

Acceleration 10, m.p.h. to 30 m.p.h. in top gear, 15 seconds. For method of checking see Instruction L (Operation No. 69).

AG Check for broken valve spring.

Replace spring as per Operation No. 79.

AH State of carbon deposit and valve seats.

To check for seating of valves.

Check tappet clearances, as per Operation No. 75.

Turn engine over slowly with starting handle, thereby checking compression on each cylinder, using gauge. A definite resistance must be felt on each individual cylinder.

To check for carbon deposit take car on road with engine hot.

Run car in second gear at 10 m.p.h. When engine is pinking, half retard ignition. If pinking stops engine is O.K. as regards carbon deposit.

AJ Fit of pistons and rings.

Check for compression as per Instructions AH above.

AK Set slow running by means of thumb screw on the carburetter throttle stop. If this has no effect clean pilot jet. See Operation No. 87.

AL Check for choked jets in carburetter. See Operation No. 87.

AM Noisy timing chains.

Replace if worn.

To fit see Operations Nos. 76 and 77.

AN Fit of engine bearings.

If slack, engine overhaul required.

Proceed as in Operations Nos. 73 and 74.

Slack bearings can best be heard when the engine is hot and the oil, therefore, thin. Engine should be allowed to tick over in neutral, and the accelerator pedal sharply depressed. Bearing knocks can then be heard.

AO Check petrol consumption.

Use test tank.

Petrol consumption must be checked at an average speed of 30 m.p.h.

AMAL Standard, 32 m.p.g.

Main jet, No. 95. Pilot jet, No. 30.

See Operation No. 87.

AP Trunnion bearings and withdrawal bearings dry.

Three grease nipples are provided on the above, one on each side of the clutch housing facing rear of car, lubricating ends of declutching shaft. One protruding through top front of gearbox casing, lubricating bearing.

Grease these points thoroughly.

AQ Check oil level.

AS Check ignition timing.

Remove No. 1 sparking plug-%6in. box spanner.

Turn engine by hand till No. 1 piston is coming up on compression stroke (both valves shut).

Watch flywheel through cover aperture.

Bring mark on flywheel (SF.ADV) in line with mark on housing.

With ignition fully advanced points should be just breaking, rotor being under No. I terminal on distributor (front terminal).

AT Examine back axle.

See Customer's Complaint No. 25.

AU Check ball joints.

Tighten up where necessary.

Bring worm wheel further into mesh if necessary—see Operation No. 82B. Adjust wheel bearings or replace bearings if necessary, see Operation No. 82.

AV Examine oil pipe.

Old pattern Y joint is most likely point for leakage.

AW Examine magneto drive (if fitted). Fit new type four point coupling.

AX Clutch slipping. Ill-usage.

Replace clutch cork plate.

See Operation No. 81A.

AY 2nd gear jumps out.

Worn gear pinions.

Replace as necessary.

See Operation No. 81.

AZ Steering stiff.

Lubricate all points thoroughly. If this does not cure trouble worm wheel may be too far in mesh. Adjust as per Operation No. 82B.

CAR TESTING. All Models.

Engine knocks may be due to many causes and practical experience is necessary for their location.

- WORN MAIN BEARINGS chatter and set up heavy vibration through the clutch
 pedal or steering wheel when engine is pulling hard, or in rapid acceleration with
 car stationery; the same symptoms appear if the vibration damper is solid, so ascertain
 that this is O.K.
- 2. END PLAY IN MAIN BEARINGS. This sets up an intermittent irregular dull thud, and will answer to the engagement and disengagement of the clutch.
- 3. WORN BIG ENDS produce a hollow knock with the engine running lightly and can be located by shorting each plug.
- WORN GUDGEON PINS produce a light knock with engine running lightly on over-run, and will appear to come from top of engine, cannot be definitely cut out by shorting plugs.
- PISTON SLAP sets up a metallic sound and appears to come from cylinder block, can be definitely cut out by shorting the plugs. It is more pronounced when the engine is cold, and will show up on rapid acceleration.
- 6. FLATS ON ROLLERS are detected by inability to make valve gear quiet with standard tappet clearances.
- 7. TO CHECK CARBURATION when car is stationary, allow engine to tick over, then suddenly depress accelerator pedal to its full extent, the engine should then

- accelerate quickly and smoothly, bad carburation will be indicated by the engine spluttering, misfiring, firing in the silencer or gathering speed in a jerky fashion. When car is pulling on full throttle and increases speed by easing foot on accelerator pedal, it is an indication that the main jet is too large. If car increases speed by partially choking carburetter it indicates that the main jet is too small.
- 8. SLIPPING CLUTCH is sometimes hard to detect, but a sure indication is given when the car is travelling at about 40 m.p.h. and encounters a slight incline, releasing the accelerator allows the car to surge forward at an increased speed momentarily. Alternative check in shop. Pull hand brake hard on, engage top gear, and let in clutch gradually, at the same time "revving" up engine. If engine continues to run with clutch right "home" change clutch.
- FIERCE CLUTCH is indicated by the clutch taking up the drive suddenly, however carefully the clutch is operated.
- 10. SPINNING CLUTCH is indicated by inability to engage gears, when car is stationary, without a grating noise.
- II. NOISY CONSTANT MESH sets up a slight grating noise in gear box, and can be cut out by disengaging the clutch. If it is accompanied by a pronounced rattle it will indicate a noisy reverse idler.
- NOISY GEARS. Each gear should be tried under load, both pulling and over-run, worn or damaged gears will set up a harsh grinding noise.
- 13. PLAY IN TRANSMISSION can be located by driving car in top gear at about 12 m.p.h. and by depressing and releasing the accelerator pedal, any excessive play will then be noticed, and will set up a pronounced clicking or bumping noise.

- 14. NOISY REAR AXLE will set up a singing noise, both pulling and on over-run. If the diff. cages are worn there will be a loud clonk when taking up the drive from stationary. An indication that the centre bearing or washer is worn is excessive oil in rear axle and, or, on brake shoes.
- 15. WHEEL WOBBLE sets up a fierce vibration at front of car accompanied by a rapid semi rotary movement of the steering wheel.
- STEERING WANDER can be checked by driving car on level road and any sign
 of car leaving its course indicates wandering.
- EXCESSIVE BACK LASH IN STEERING can be checked by feeling lost motion on the steering wheel when car is stationary.
- 18. TO CHECK BRAKES the car should be driven in centre of road and the brake pedal applied, at the same time steering wheel must be held lightly. Car should then pull up squarely and within a reasonable distance according to speed. Any signs of car pulling to one side or wheels locking, will indicate bad compensation, oil on brake shoes, or worn brake shoes.
- 19. SHOCK ABSORBERS being too slack cause the road wheels to pound on uneven surfaces, if shocks are too tight all road shocks will be transmitted through the body.

ELECTRICAL EQUIPMENT.

1931 METEOR, LIGHT 20 and 2-LITRE MODELS.

In a number of cases where trouble has occurred in the Electrical System of Two-Litre and 20 H. P. Models (1931) the cause has been traced to the cable connecting switch unit to ammeter. This has either proved to be too small or the insulation has been damaged.

In no case must a smaller size cable than 40/36 be used and care must be taken that the insulation is undamaged.

ELECTRICAL EQUIPMENT.

IGNITION SYSTEM.

The ignition system fitted is a 12 volt coil ignition system. It consists of two separate units—the distributor, which is driven by the camshaft, and the coil.

The distributor consists of a housing in which revolves a lobed cam. This cam operates the contact breaker which controls the current in the primary circuit of the coil. On the housing is mounted a moulded distributor containing a central terminal fed by H.T. current from the coil and round this are arranged the terminals connected with the respective sparking plugs. These terminals are supplied with H.T. current through a rotor mounted on the end of the distributor spindle. H.T. current is supplied to the revolving segment of the rotor through a small carbon brush carried on the central terminal.

The distributor also carries the condenser which is connected directly across the points of the contact breaker.

In order to vary the point of ignition, the distributor head is made so that it can be revolved round its own axis through a small angle and is connected through suitable linkage to the ignition control on the steering column.

The coil consists of a laminated core of special alloy iron carrying the primary and secondary windings and mounted inside a casing which prevents access of dirt or water. On the outside of the box is mounted the ballast resistance which consists of a length of iron wire carried on a porcelain bobbin and arranged in the primary circuit. The object of the ballast resistance is to reduce the current consumption when the engine is idling or when the engine is stopped and the coil left switched on.

The system is very simple and very little attention is required. At the same time, if the best results are to be obtained, attention must be given to the following points.

WARNING LIGHT. On the facia board is a red warning light which glows whenever the ignition is drawing current from the battery instead of being supplied by the dynamo, as it should always be whenever the engine is running at more than idling speed.

SPARKING PLUGS. Check every five thousand miles and adjust if necessary. The gap for a 6-cyl. engine is 10 thou. The advice frequently given with coil ignition to run with a wide gap is really only applicable to engines having a low compression ratio and not designed to speed up to a high rate of revolution as are those of British manufacture.

LIGHTING AND STARTING SYSTEM.

DYNAMO. Check every five thousand miles. The dynamo does not require a great deal of attention but there are a few things which must be inspected to ensure trouble free running. These parts are readily accessible when the dust cover is removed from the commutator end bracket.

BRUSHES. Brushes must work freely in their holders. Check by gently pulling the flex lead attached to the brush. The brush must move without any trace of sticking or sluggishness. It must also return to its original position when the lead is let go. The brushes must be clean and bed down over all the surface in contact with the commutator. The springs must be inspected to see that they have not lost their tension, especially when the brushes are worn down. When ordering replacement brushes, always state what type machine they are for and always state whether main or control brushes are required. Do not fit brushes or springs of other grades than those supplied with the machine.

COMMUTATOR. Keep the surface of the commutator free from oil and brush dust. Neglect of this precaution will result in the commutator becoming blackened, cause

sparking at the brushes and will shorten the life of the machine. Clean the commutator by inserting a fine duster held by means of a suitably shaped piece of wood against the commutator and allow the engine to run at tick over. If the commutator has been long neglected, clean with fine glass paper. This should not be necessary if the machine has been properly looked after. The grooves must be examined and any deposits of copper or carbon dust cleaned out with a thin saw blade or similar article.

LUBRICATION. As the bearings are packed with grease before leaving the works, very little attention is needed. A few drops of oil may, however, be added through the lubricator on the end plate of the dynamo every 1,000 miles. This should be done cautiously as far more trouble has been caused with dynamos by excessive oiling than too

little.

OILY DYNAMO. In case of oil getting in the dynamo replace the leather washer at

back of chain wheel on dynamo.

STARTING MOTOR. The armature spindle of this machine is fitted with a pinion which, on rotation, runs into engagement with a ring gear on the engine flywheel. Immediately the engine begins to fire, the pinion is automatically thrown out of mesh. If for any reason the pinion wheel on the motor does not engage with the flywheel when the starting motor revolves, examine the screwed sleeve on the armature spindle to see that it is free from dirt or burrs. If necessary wash with petrol. As in the case of the dynamo the commutator surface must be kept free from dirt or oil.

STARTING SWITCH. The switch is extremely simple in construction, and as there

are no working parts to get out of order the contacts are permanently enclosed.

The switch should be operated firmly and quickly, both in switching on and releasing. The current carried by the switch is very heavy and hesitating use of the switch will inevitably lead to trouble through burning of the contacts.

LAMPS.

HEAD LAMPS. 'In order to get the best result it is essential that the filament should be approximately at the focus of the reflector. It is therefore arranged that the bulb holder can be adjusted. To focus—slacken the clamping clip on the bulb holder at the back of the reflector. Move the bulb backwards or forwards until the position giving the best road illumination is obtained and tighten up the clamping clip. The best way of focussing and setting the lamp is to take the car on a straight level road, find the best position for the bulb and then move the lamp on its adjustable mounting until the best road illumination is obtained.

SIDE LAMPS. Side lamps are fitted with an adjustable mounting, the adjustments of position being similar to that of the head lamp.

CLEANING. The reflectors are finished with a transparent and colourless covering, which enables accidental finger marks to be removed with a chamois leather or a soft cloth without affecting the surface of the reflector. On no account use metal polish on reflectors, or the protective covering will be destroyed.

REPLACEMENT OF BULBS. When the replacement of bulbs is necessary use the bulbs supplied by Messrs. Lucas Ltd. (the filaments are arranged to be in focus and give the best results with the reflectors).

STANDARD BULBS.

METEOR, LIGHT-TWENTY and 2-LITRE.

LAMPS.			BULB TYPE.		Volts.		WATTS.
Head Lamp	***	***	BAS. No. 4S.	***	12		36
Side, Tail and Dash			BAS. No. 10S.		12		6
Ignition Warning Light			MES.		16-18		3

10/25 H.P.

LAMPS.			BULB TYPE.	Volts.	WATTS.
Head Lamps	***	***	 BAS. No. 3S.	 12	 24
Side and Tail			 BAS. No. 10S.	 12	 6

LOCATION OF FAULTS IN ELECTRICAL SYSTEM.

Although every precaution is taken to eliminate all possible causes of trouble, failure may occasionally develop through lack of attention to the equipment, or damage to wiring etc. The most probable faults are tabulated in the accompanying text, according to the various symptoms that may be displayed. Sometimes the source of trouble may be by no means obvious, and a considerable amount of deduction may have to be used from the symptoms before the source of the trouble is located.

For instance, the starter may not respond to the switch. A hasty inference would be that the starting motor is at fault. However, as the starter is dependant on the battery it may be that the battery is exhausted. This in turn may be due to the fact that the dynamo is failing to charge and the final cause of the trouble may be a loose terminal at the battery or elsewhere in the charging circuit.

Should the intensity of the lights vary or should they fail entirely it is probably due to the battery terminal being allowed to corrode and the consequent breaking down of a connection. If the cause of the trouble is not located at the battery, the distributor box should be examined to see that all terminals are tight. Examine the starter switch connections, as the feed for the lights, ignition, etc., is tapped off by a lead taken from the positive side of the starter switch.

If one particular lamp does not light look for a broken filament, a loose adaptor or a broken cable from the lamp to the switch. See that the lamp is earthing properly.

When the car is stationary and the lamps light when switched on but gradually goout, the battery is probably exhausted due to excessive use of the starter or lights, or dynamo not charging. If it is found that the battery is exhausted, remove it from the car and have it charged from an independent source of supply.

Do not use bulbs having a higher consumption than those recommended, as they may have the effect of putting a drain on the battery greater than the dynamo output is designed to replace. Any non-standard accessories fitted should be placed on the fuse terminal marked + in the distribution box.

BATTERY. Usual indication of battery trouble:-

Lights poor-starter will not work.

Test each cell separately with a hydrometer. This test should be taken after the carhas had a run to make sure that the electrolite is thoroughly mixed.

In a fully charged battery the specific gravity of the acid solution should be 1.285 to

1.300 when the temperature of the solution is 60 deg. F.

In a half charged condition it should be about 1.215 s.p.g., and when fully discharged to the limiting voltage, 1.150 s.p.g. The reading of the six cells should be approximately the same. If only one or more cells differ appreciably from the others, examine for leaks, or the plates may be short circuited.

A battery should be frequently topped up with distilled water, say, every fortnight, and acid should only be added when the original acid has been spilled. Level should be brought up to about 3/8 in. above plates. If acid has been spilled it should be replaced by diluted sulphuric acid solution of 1.285 s.p.g.

CUT OUT. This instrument is sealed at the factory and should not be broken open or otherwise the guarantee becomes void. If any trouble with cut out is experienced it should be exchanged and returned to the makers.

FUSE. The fuse is provided to protect the accessories which are connected to the terminal marked + in distribution box. In the event of any of these accessories not functioning, examine the fuse to see if it is blown. Before replacing it examine the wiring for evidence of faulty wiring, short circuits, etc.

TROUBLE TRACING CHART ELECTRICAL EQIPMENT.

Starting motor will not work.

1. Battery run down.

2. Starter switch connection faulty.

3. Broken or bad connection anywhere in starter circuit.

4. Brush and commutator trouble in starter.

5. Seized centre or end bush in starter. All 6-cyl. models.

ONE LAMP FAILS TO LICHT.

1. Broken filament.

2. Faulty contact in holder.

3. Faulty wiring connection.

4. Bad earth.

ALL LAMPS FAIL TO LIGHT.

Battery run down. Broken connection in lighting circuit.

LICHT DIM, UNSTEADY, AND INCREASE IN BRILLIANCE WHEN ENGINE IS REVVED UP.

- 1. Defective battery or battery earth.
- 2. Defective battery connections.
- 3. Defective charging line connections.

BATTERY WILL NOT HOLD CHARGE.

- 1. Sulphated plates.
- 2. Partial short circuit.
- 3. Acid level too low.
- 4. Leak in starter switch.
- 5. Battery leaking.

IGNITION FAULTS.

- 1. Bad connection in switch.
- 2. Battery run down.
- 3. Battery connections loose or broken.
- 4. Short circuit in low tension wire or defective connections.
- 5. Contact breaker points need adjusting or cleaning.
- 6. Defective coil.
- 7. Defective condenser or condenser connections.
- 8. Short in H.T. cables.
- 9. Timing slipped at distributor or controls.
- 10. Burned out ballast resistance.
- 11. Timing late through partial seizure of distributor spindle.

COIL.

If the engine will not fire check the low tension circuit as follows:-

Switch on the ignition and turn the engine by hand till the contact breaker points are closed. Pull the breaker points open quickly with the fingers. A spark should occur between the points at the moment of breaking, indicating that a current is flowing through the primary circuit. If no spark is seen, examine the battery and see that all terminals on coil and distributor are tight. If the lamps light, the fault will not be in the battery.

Test the coil independently of the distributor. Remove the H.T. cable from the centre of distributor and hold it about a 1/4 in. away from some metal portion of engine or frame and turn the engine. The spark should be strong and regular if the coil is functioning correctly.

COIL FAULTS.

SHORT IN PRIMARY. Switch on ignition and see that contact breaker points are closed. Note reading on ammeter. With engine stopped this should be approx. 4 amps. discharge. If the reading is greatly in excess of this there is a short in the primary.

BREAKDOWN IN PRIMARY, or burnt out ballast resistance. Will show no reading on ammeter.

BREAKDOWN IN SECONDARY. No high tension spark.

MISFIRING AND BAD STARTING.

Examine the H.T. cables and plugs. If necessary adjust plug gaps to correct setting, 10 thou. Sooty or oily plugs should be dismantled and cleaned.

Remove distributor moulding and see that the electrodes and contacts are clean and that there is no sign of tracking between contacts.

See that contact breaker gap is correct, 12 thou. Clean up if necessary and see that points line up properly with each other.

BALLAST RESISTANCE.

This is provided in series with the primary to limit the amount of current flowing through the windings when the engine is idling or stopped, and is provided to safeguard the coil if the engine should be stopped and the ignition left switched on. With the engine stopped it heats up rapidly and has the property of increasing its resistance as it gets hotter, thus limiting the current flowing through the coil primary.

In case of emergency, should the ballast coil be broken or burned out, remove the low tension wire to the other terminal at the other end of the ballast coil, or short circuit the ballast coil with a piece of wire. Always replace a burned out ballast coil at the first opportunity. Before finally condemning a coil, make certain that the condenser is alright.

CONDENSER.

Signs of a faulty condenser:

Weak, irregular, and yellow H.T. spark.

Burned contact points. The points are usually yellow too.

To test condenser, remove same from distributor. Apply "mains" voltage (about 200) to each end of the condenser, using a lamp in series with one lead—(to prevent main fuses blowing should the condenser be defective). The lamp should not light, if it does, the condenser is faulty. With M.L. keep points apart with a match.

If the condenser is sound it should be possible to get a spark when the condenser terminals are short circuited after the high voltage test.

ICNITION WARNING LIGHT.

When the engine is stopped the ignition key should always be turned to off position to prevent the battery being discharged by current flowing through the coil windings. To ensure that this does not happen the warning lamp is provided.

WARNING LAMP DOES NOT LICHT.

This will not affect the running of the car in any way.

1. Switch on ignition and press bulb further down in socket. If it lights, cut out a thick paper ring and place over bulb. Replace red glass and holder. If lamp will not light when pushed down examine filament and wires at back of bulb holder.

RED LICHT DOES NOT CO OUT.

This is important, investigate at once, because it indicates that there is trouble in the charging circuit and that for some reason or other the engine is running on the battery, and not on the dynamo.

When first starting up the engine, the only place that current for the coil can be drawn from is the battery, and it will be noticed that the warning light goes out at the same moment that the cut out comes in. When the dynamo is charging the battery, it is also feeding the ignition.

NOTE.—2-Litre, Light Six, 10/25 h.p.:—The voltage of the warning light bulb is 16.18.

Meteor:—2 volts; a resistance is incorporated in series with the bulb. Both are screw in type bulbs.

ELECTRICAL EQUIPMENT.

STARTER WILL NOT WORK. Unless a clue is given by a customer that he heard an obvious cause of mechanical breakdown, it is never safe to assume at once that there is anything wrong with the starter at all. If the starter fails to give any indication of life when the switch is closed a complete check should be made of the outside circuit first. Actual failure of the starter itself is a very rare occurrence and one may eventually be led back as far as the dynamo.

Check dynamo for charging (full charge approximately 8 amps.).

Check battery.

Check battery connections, see that they are tight and clean.

Check earth connection to frame.

Check positive cable to switch.

Check switch and its connections.

Check cable from switch to starter.

To check switch, short circuit the two terminals, if starting motor works, trouble is in switch. Change switch.

If no fault can be found in the outside circuit, trouble lies in starter.

Time to check as above—15 minutes.

BOOSTER OR OVERCHARGE PREVENTOR.

The battery booster is a magnetically operated switch which automatically regulates the dynamo output according to the condition of the battery.

When the battery is nearly fully charged it acts so as to weaken the dynamo field, thus lowering the charging rate. When the battery is in a low state it causes the dynamo to give full charging rate.

It will be seen that it makes a charging switch unnecessary and prevents the excessive overcharging of a battery through long runs with the dynamo giving its full output.

Its function is to make charging purely automatic. The booster is sealed under the same cover as the cut out and if the seal is broken the guarantee becomes void.

In a car fitted with a booster the following points will be noticed:-

After use of the starter first thing in the morning it will most likely be found that the ammeter shows a charging rate of approximately 8 amps. After a time it will be noticed that the rate has fallen to about 4 amps. This merely indicates that the battery has recovered its charge and that the booster is doing its job.

CHARGING RATE NEVER EXCEEDS APPROXIMATELY 4 AMPS.

CHECK BOOSTER.

To do this, switch on side lamps and rev. up engine. Watch ammeter and if charg-

ing rate goes up booster is not working. Change box.

If an exchange box is not immediately available, a temporary expedient is to wire the positive and field terminals on the dynamo together. This will have the effect of putting the dynamo permanently on full charge, a reversion to standard should be made at the first opportunity.

The reason for switching on the side lamp and revving up engine is as follows:-

The lighting switch is so arranged that as soon as any lights are switched on the dynamo is automatically put on full charge irrespective of what the booster may be doing.

BATTERY CAPACITY METER.

The battery meter is provided to give the driver an indication of the state of the battery.

The marking on the scales gives the position of the needle when the battery is $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or fully charged.

NOTE.—The meter is not a precision instrument and its readings are only approximate.

As the meter does not give any indication of what the dynamo output actually is, it sometimes becomes necessary to find out what a dynamo is doing. Check with an independent ammeter in the following way:—

Take lid off junction box and remove wire from terminal in box marked A. This puts the battery meter out of circuit. Take an independent ammeter with two leads attached. Attach one lead to A terminal in junction box, and the other lead to terminal marked B. Rev. up engine and an exact reading of the dynamo output will be obtained.

This method, in conjunction with the test for faulty booster (page 231), can be used on cars where a booster and capacity meter are both fitted. This method obviously checks dynamo and booster at the same time.

MA/2 MODELS.

The following alterations have been made to all "MA" Models, 1931 Two-Litre, commencing from MA.9565.
All MA Models after 9565 differ from the previous specification in the following points:-

(1). REAR AXLE. The top gear ratio has been altered from 4.7 to 1 to 5.3 to 1 as on MeteorCars.

(2). CLUTCH. This has been altered from cork to fabric as on

1931 Meteor Models.

(3). GEARBOX. This has been altered to the 1931 Meteor type and can be readily recognised by the fact that the box itself is made of cast iron instead of aluminium. Castrol "D" is used in the Gearbox, as the Engine does not circulate oil through both Units as formerly.

(4). FAN ASSEMBLY. This is also altered to 1931 Meteor type.

(5). DYNAMO. This is now located on the offside of crankcase and is driven by the Fan Belt as on 1931 Meteor Models.

The following operations in the 1931 Service Book that formerly applied to "G2" and "GM/1" Models only, now apply to "MA/2" Models, 9565 onwards:-

Operations Nos. 5. 10. 12. 18. 19. 27. 28. 30. 31A. 33.

The "MA/2" Model can readily be recognised, even when the Car no. is not known, by the fact that the dynamo is located on the offside of the crankcase.