MORRIS

G40 to G45

SERVICE INFORMATION

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MORRIS ARCHIVE

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Date of issue: June, 1935

The Smith Electric Petrol Gauge

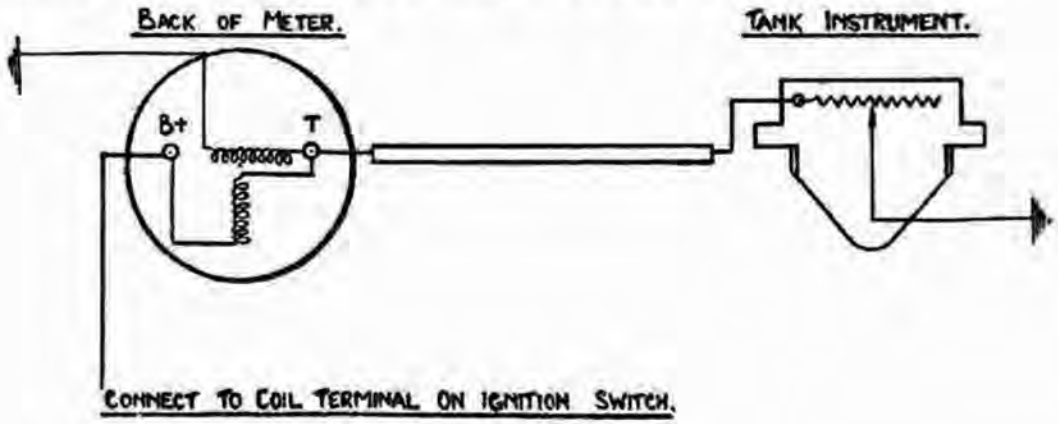
(TYPE G.33)

THE gauge has been developed with a view to meeting the demand for a petrol gauge reading direct on the instrument board and free from the disadvantages attendant on gauges which depend on air pressure and metal tubing for their operation. The instrument itself is divided into two parts:—

1. The dashboard meter. 2. The tank attachment.

Dashboard Meter. This consists of a neat circular case with a pointer and suitably calibrated dial and containing two coils wound on special low hysterisis iron formers. These coils are placed so as to exert a magnetic force on a soft iron armature carried by the same spindle to which is attached the indicating pointer. The magnetic effect of the coils (known as the control coil and deflecting coil respectively) causes the pointer to be deflected in accordance with the amount of petrol in the tank. The control and deflecting coils are connected in series between B+ and earth, and connection for tank attachment is taken from between the two coils, so that the pressure in both of the coils is controlled by position of the float. The instrument is thus practically independent of fluctuations in battery voltage.

Tank Attachment. This consists of a float carried on an arm, which is attached to a contact arm travelling over a resistance. By means of this device, varying pressures are applied to the coils in the dashboard meter, thus causing the pointer in the meter to deflect in accordance with the height of the petrol in the tank.



LOCALISATION OF FAULTS

Symptom.	*Cause.*	*Remedy.*
No reading.	(1) Meter supply disconnected.	Re-connect.
No reading.	(2) Tank attachment cable disconnected or broken.	Re-connect.
No reading.	(3) Tank attachment not "earthed."	Clean body of tank attachment and fixing ring.
Meter reads full.	(1) Case of meter not "earthed."	Make connection with case or fixing stud to "earth."
Meter reads full.	(2) Faulty meter.	Return for repair.
Meter reads full.	(3) Tank attachment cable "earthed."	Replace cable.
Meter reads full.	(4) Terminal on tank attachment "earthed."	Return for repair.

To Test Meter: (*a*) Connect a voltmeter between the positive battery and terminal B+, and the negative battery to case of meter. A reading on the voltmeter should be obtained; (*b*) Connect a voltmeter between the positive battery and terminal B+, and the negative battery to terminal T. A reading on the voltmeter should be obtained.

To Test Tank Unit. Connect a voltmeter between positive battery and terminal on tank unit and the negative battery terminal to the flange. The voltmeter should give a reading which will increase slightly as the float arm is lifted.

The above tests should be carried out with a battery of the same voltage as that fitted to the car.

Care should be taken to connect a voltmeter in the circuits indicated, an ammeter should not be used.

IMPORTANT

1. On no account should the float arm be bent other than as supplied. The float arm provides both top and bottom stops which prevent the contact arm over-travelling the resistance.

2. Please give the following details in all communications dealing with apparatus: Make, year and model of car. Code numbers of meter (on dial) and tank attachment (on top plate).

All units which are returned for repair should be sent direct to the Service Department of the manufactur Messrs. S. Smith & Sons (Motor Accessories) Ltd., Cricklewood Works, London, N.W.2.

Revised: 1st *April*, 1940

FLYWHEEL STARTER RINGS

STARTER rings, when assembled to flywheels on all Morris models, are specially heat-treated during manufacture, and consequently it is strongly recommended that all flywheels requiring new rings should be returned to the Factory for reconditioning.

Reconditioned flywheels are kept in stock for the models shown in the table hereunder, and can be forwarded by return on receipt of an order which quotes the chassis symbol and number of the car concerned.

Such replacement flywheels will be invoiced at full cost for record purposes, and providing the originals are found suitable for reconditioning when returned, the debit will be adjusted accordingly.

Flywheels to be reconditioned should be sent carriage paid together with a letter of advice, addressed to :—

Morris Motors Limited,
Service (Technical) Dept.,
Cowley, OXFORD.

On certain models, where the starter ring teeth are integral with the flywheel, it is possible for the flywheel to be machined to take a toughened starter ring.

Model.	*Clutch Type.*	*Retail Price.* £ s. d.
1935, Series I, II and "E" Eight h.p.	Dry	9 0
Series II and III Ten h.p.	Wet	16 6
Series "M" Ten h.p.	Dry	16 6
Series II Twelve h.p.	Wet	1 0 0
10-cwt. Van	Wet	1 0 0
Series III Twelve h.p.	Dry	1 0 0
Series II and III Fourteen h.p.	Wet	1 0 0
Series II Sixteen and Eighteen h.p.	Wet	1 0 0
Series II Twenty-one h.p.	Wet	1 0 0
Series II and III Twenty-five h.p.	Wet	1 0 0

Whilst every endeavour will be made to maintain these prices, we reserve the right to make any alteration without notice.

Revised : 1*st July*, 1946

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Model.	*Clutch Type.*	*Retail Price.* £	*s.*	*d.*
1935, Series I, II and "E" Eight h.p.	Dry		10	0
Series II and III Ten h.p.	Wet		18	0
Series "M" Ten h.p.	Dry	1	2	6
Series II Twelve h.p.	Wet	1	2	6
10-cwt. Van	Wet	1	5	0
Series III Twelve h.p.	Dry	1	2	6
Series II and III Fourteen h.p.	Wet	1	2	6
Series II Sixteen and Eighteen h.p.	Wet	1	2	6
Series II Twenty-one h.p.	Wet	1	2	6
Series II and III Twenty-five h.p.	Wet	1	2	6

Whilst every endeavour will be made to maintain these prices, we reserve the right to make any alteration without notice.

Revised 15th January, 1946

Reconditioning Borg & Beck Clutch Driven Plate Assemblies

A SCHEME for the reconditioning of Borg & Beck clutch driven plate assemblies is now in operation. Owing to the shortage of materials it is essential that plates should be reconditioned whenever possible.

General

1. Worn clutch plates should be forwarded carriage paid, carefully labelled, bearing sender's name and address with covering order and directed to our Service Department.

2. We will examine the worn plates upon receipt and
   (i) If they are recoverable will supply reconditioned plates, invoicing at cost of repair.
   (ii) If they are scrap will supply new plates invoicing at usual rates (subject to Certificate of Need procedure, if necessary).

3. Our decision as to whether a plate is recoverable or not is final, and we cannot enter into correspondence or undertake to return plates we consider to be scrap.

4. Reconditioning will fall into two categories :—
   (*a*) Refacing both sides and fitting new hub damper springs.
   (*b*) Refacing both sides and fitting new hub.

5. A plate which requires refacing, plus new damper springs, plus new hub, is not economical to repair and cannot be accepted under the scheme. Further, we do not undertake to deal with plates requiring refacing only.

6. Users of the scheme can co-operate in avoiding needless returns by carefully examining all plates before dispatch, to ascertain that they do fall into categories (*a*) or (*b*). Additionally, the general condition of plates should be summed up, and those which are obviously irrecoverable should be scrapped forthwith. For instance, excessive wear at the sides of the " windows " against which the ends of the damper springs butt, is a reason for rejection.

7. The retail repair prices quoted below will be subject to the same terms and conditions as applicable to our other reconditioning schemes generally.

8. **Reconditioning Prices, either 4 (*a*) or (*b*) :**

Part No.	*Model.*	*s.*	*d.*
SA1524	All 8 h.p. cars and vans, 1935 and onwards	12	0
SA2258/2	Series " M " Ten...	13	6
SA1958/1 SA1958/2	Series III Twelve and Series " Y " van	15	0
SA1958/3	14 h.p. Ambulance	15	6

Whilst every endeavour will be made to maintain the above prices, we reserve the right to make any alteration without notice.

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7. The retail repair prices quoted below will be subject to the same terms and conditions as applicable to our other reconditioning schemes generally.

8. **Reconditioning Prices, either 4 (*a*) or (*b*) :** 3/3/48

Part No.	*Model.*	*s. d.*	
SA1524	All 8 h.p. cars and vans, 1935 and onwards	~~12 9~~	14·6
SA2258/2	Series " M " Ten...	~~13 6~~	16·6
SA1958/1 SA1958/2	Series III Twelve and Series " Y " van	~~15 9~~	18·6
SA1958/3	14 h.p. Ambulance	~~15 6~~	1·0·0

Whilst every endeavour will be made to maintain the above prices, we reserve the right to make any alteration without notice.

~~SA 3113/1~~
SA 3113/1 SE/E & SZ/Vans 2nd type 14·6

Date of issue: November, 1945

Hints on Care and Maintenance of Dunlop Synthetic Tyres

THE following instructions have been issued by Messrs. Dunlop Rubber Company Limited, Fort Dunlop, Erdington, Birmingham, in connection with their synthetic tyres. Should you have any query concerning these instructions will you please refer it to Messrs. Dunlop Rubber Company :—

Synthetic tyres can be identified by a red medallion on covers and a red or blue disc on tubes, close to the valve.

Synthetic tyres are more susceptible to failure from abuse than natural rubber tyres and therefore require more careful treatment in service and more regular maintenance if reasonably good performance is expected.

Inflated tyre pressures should be maintained at a minimum of :—

Type	*Tyre Size*	*Front*	*Rear*
Eight	450×17	24 lbs. per sq. in.	27 lbs. per sq. in.
Ten	500×16	26 „ „ „ „	26 „ „ „ „
10-cwt. Van	500×18	24 „ „ „ „	36 „ „ „ „
5-cwt. Van	400×17	24 „ „ „ „	27 „ „ „ „

Tyre pressures should be checked at least weekly.

Avoid high speed, which is more detrimental to synthetic tyres than natural rubber tyres.

Synthetic tyres generate heat more quickly and have less resistance to cuts and tears than natural rubber tyres, especially when the rubber is hot, and for this reason synthetic tyres require frequent inspection for cuts and tears in order that repairs can be made before serious damage is done to the casing.

Special care in fitting synthetic tubes is essential to obtain maximum life and avoid premature failure. Recommendations when fitting on well base rims are as follows :—

(1) Dust the inside of the cover evenly with french chalk.

(2) Inflate the tube until it begins to round out ; then insert in the cover.

(3) Apply a frothy solution of soap and water generously around the entire base of the tube, extending upwards between the tyre beads and the tube itself for at least 2 in. on both sides. Also apply the solution to the bottom and outside of the tyre beads. Do not allow solution to run into crown of tyre. Solution must be strong enough to feel slippery when the fingers are wetted with solution and rubbed together.

(4) Mount the tyre on the rim immediately whilst the soap solution is still wet.

(5) Before inflating, **be sure** the tyre beads are clear of the well of the rim all the way round.

(6) Inflate slowly until beads are fully seated.

(7) Remove valve core to **deflate tube completely.** Do not disturb the beads of the cover.

(8) Re-inflate to correct working pressure.

This procedure must be followed whenever a tube is refitted.

The object of double inflation is to permit any stretched portions of the tube to readjust themselves in the cover and relieve any strains in the tube.

In an emergency, french chalk may be used as a substitute for soap solution, provided it is evenly and generously applied. This practice, however, is not recommended.

REPAIRING TUBES. Have punctures or injuries vulcanised. Ordinary patches should be used only for emergencies.

Date of issue: June, 1946

The Repair of "Synobel" Finish

OWING to the introduction of "Synobel" finish on certain Morris models it is advisable that everyone concerned should be familiar with the correct methods to adopt when dealing with cases where repair to the surface is required.

In order to assist in the identification of vehicles finished in "Synobel," all cars finished with this material will be painted with a yellow letter "S" on a wing valance, and underneath the bonnet.

In actual fact "Synobel" finish is as easy to repair as the cellulose finish previously employed, provided the correct procedure is used, and this can readily be understood when it is realised that this new finish contains a large proportion of cellulose in its composition and that this allows a repair patch to "knit" into the original film, and not just adhere on top, as is the case with enamels of the Synthetic group.

Two methods of application can be used for repair work as follows, and in each case care must be taken to protect any rubber or other perishable materials in the region of the repair, from the heat of the lamp, by the use of wet asbestos, as shown in Fig. 1.

Fig. 1.

Left.—A typical deep scratch, penetrating to the bare metal, which requires facing-out and building up with cellulose primer-filler. Note how adjacent portions of the car which are liable to be damaged by the drying lamp are protected by damp asbestos sheet and asbestos putty.

Fig. 2.

Right.—Drying-off the filler with a 250-watt infra-red lamp located from 6 to 8 inches from the repaired surface. This drying operation should be carried out for at least 5 minutes.

Method No. 1.—The Reflux Process

The use of a De Vilbiss "C-H" type spray gun, fitted with a No. 90 nozzle and an air restrictor adaptor to cut the pressure down to about 25 lb. per square inch, is recommended.

If the scratch is a deep one, reaching down to the bare metal as in Fig. 1, it should first be faced out by the use of No. 400 "Wet-or-dry" Paper, and then built up with Cellulose Primer Filler, the drying-out of which should be accelerated by the application of the rays of an infra-red lamp fitted with a 250-watt bulb located at a distance of from 6 in. to 8 in. from the damaged part, for a period of five minutes. (See Fig. 2.)

After allowing the repair to cool off, face the filler with No. 400 "Wet-or-dry" Paper until a level surfa ained. This surface should be cleaned off thoroughly with a petrol-damped rag.

[conti

Date of issue: June, 1946

The Repair of "Synobel" Finish—*continued*

Mix a sufficient quantity of the "Synobel" finish with an equal quantity of the special "Synobel" thinners and apply two coats of this mixture with the spray gun, taking care to localise the spray on to the damaged portion of the panel only. (See Fig. 3.)

Using thinners only in the gun, now spray lightly the area of the patch and just around the patch. The object of this is to assist the patch to knit into the original film and also to dissolve any dry spray.

Fig. 3.
Right.—Application of the "Synobel" finish with the spray gun, using a No. 90 nozzle with air restrictor adaptor.

Fig. 4.
Left.—When the "Synobel" film has been sufficiently hardened off by the application of the infra-red lamp the surface should be faced carefully with No. 500 "Wet-or-dry" paper.

Allow a few minutes for the solvents to evaporate and then apply the infra-red lamp again for two to three minutes in order to harden off the film. When the film has hardened sufficiently it should be faced lightly with No. 500 "Wet-or-dry" Paper. (See Fig. 4.)

Again apply the infra-red lamp for a few minutes (Fig. 5), until the dulled surface refluxes and regains the high lustre which is characteristic of "Synobel" finish.

Fig. 6 shows the operator repairing the fine line which has been obliterated during the patching process.

Method No. 2

If the scratch is through to the bare metal it should first be faced out by the use of No. 400 "Wet-or-dry" Paper
l then built up with Primer Filler as in the case of Method No. 1, accelerating the drying-out of the filler witl
p of the infra-red lamp for some five minutes.

[conti

Date of issue: June, 1946

The Repair of " Synobel " Finish—*continued*

After allowing the repair to cool off, face the filler with No. 400 " Wet-or-dry " Paper until a level surface is obtained. This surface should be cleaned off thoroughly with a petrol-damped rag.

Now spray two coats of " Synobel " finish on the damaged part and follow this up immediately with a coat of special " Synobel " thinners.

After allowing the solvents to flash-off for a short period (five minutes), focus the infra-red lamp on to the repair at a distance of 6 in. and stove the patch for five minutes. Remove the lamp and allow the patch to cool off, then flat the surface with a fine abrasive compound and finally polish off with a liquid polish to obtain the required lustre.

If the scratches are superficial only they can be removed by the use of a fine grade abrasive, using a liquid polish to restore the lustre.

It will be observed that method No. 2 employs precisely the same technique as that used for dealing with the usual cellulose finishes.

Fig. 5.
Right.—Refluxing the surface by the use of the infra-red lamp after facing ensures the brilliant surface finish which is a characteristic of this process.

Fig. 6.
Left.—If the repair has taken place in the region of the car lining, the obliterated line should be restored carefully.

Date of issue : May, 1947

Borg and Beck Clutches

Borg and Beck clutches are standard equipment on all post-war Morris models.

Types

6¾ in. (diameter of clutch pressure plate), fitted to the Eight Series "E" and the 5-cwt. Van Series "Z."
7¼ in. (diameter of clutch pressure plate), fitted to the Ten Series "M."
8 in. (diameter of clutch pressure plate), fitted to the 10-cwt. Van Series "Y."

Description

These clutches are of the normal dry single-plate type, and consist of a flexible steel driven disc to the outer diameter of which is fixed the annular friction facings. This disc is attached to a splined hub by a spring mounting, which provides a torsional cushion. Behind the disc is a substantial pressure plate, and a series of compression coil springs, circumferentially disposed between the pressure plate and the pressed steel cover-plate to provide the actuating pressure. Toggle fingers, which protrude through the cover-plate, engage the flange of the clutch withdrawal mechanism, and withdraw the pressure plate for clutch release. The thrust bearing is a special carbon graphite ring in an annular carrier.

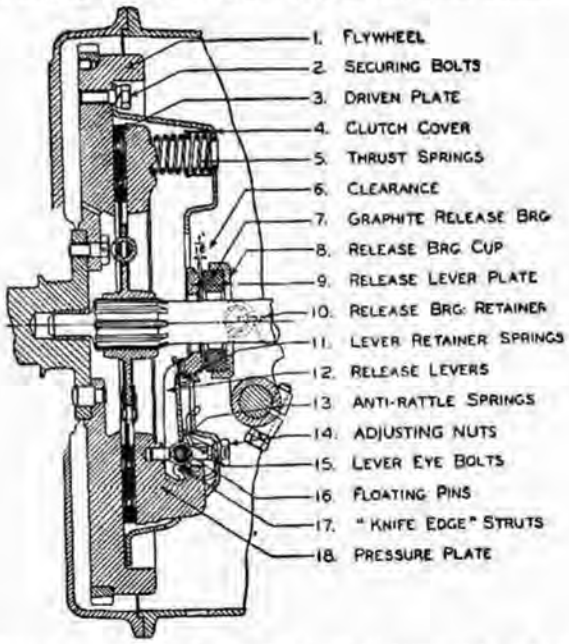

Fig. 1.
The component parts of the Borg and Beck clutch and their relation to each other can clearly be seen from this sectional drawing of the complete clutch assembly.

The general construction of the clutch can be followed by reference to Fig. 1 and the following description. The graphite release bearing (7) is mounted in a cup attached to the throw-out fork, and a release plate (9) is attached to the inner ends of the release levers (12) by means of retainer springs (11). Release is accomplished by moving the release bearing forward into contact with the release plate (9) and applying pressure to the release levers. Each release lever (12) is pivoted on a floating pin (16) which remains stationary in the lever and rolls across a short flat portion of the enlarged hole in the eyebolts (15) (see Figs. 1 and 6). The outer ends of the eyebolts extend through holes in the clutch cover and are fitted with adjusting nuts (14) by which each lever is located in its correct position. The outer or shorter ends of the release levers engage the pressure plate lugs, by means of struts (17), which provide knife-edge contact between the outer ends of the levers and the pressure plate lugs, so eliminating friction at this point. Thus the pressure plate (18) is pulled away from the driven plate (3), compressing the several small thrust coil springs (5) which are assembled between the pressure plate (18) and the clutch cover (4).

When the foot pressure is removed from the clutch pedal the clutch springs force the pressure plate forward against the driven plate, gradually and smoothly applying the power of the engine to the rear wheels.

As the clutch facings wear, the pressure plate moves closer to the flywheel face and the outer or shorter ends of the release levers follow. This causes the inner or longer ends of the levers to travel farther towards the gearbox and decreases the clearance between the release lever plate and the release bearing. The effect on the clutch pedal is to decrease the clearance or free travel; in other words, it reduces the distance the clutch pedal moves forward away from the back stop before the release bearing comes in contact with the release lever plate. *Some free movement must always be maintained here* to prevent the clutch pedal riding against the underside of the toeboard and causing the clutch to slip. This essential free movement is restored by adjusting the clutch pedal.

Clutch Pedal Adjustment

Insufficient pedal travel will cause clutch slip, which becomes aggravated as additional wear takes place on the facings. Excessive pedal movement causes coil binding of the springs and imposes an undue load on the bearing and on the crankshaft, causing excessive and rapid bearing wear.

The required pedal travel is the sum of two movements :

(*a*) The *free movement or travel* necessary to take up the clearance between the release bearing and the release lever plate, provided to ensure that the clutch is fully engaged when the foot is removed from the pedal.

(*b*) The *effective movement or travel* necessary to release the clutch, i.e. the amount of effective pedal movement necessary to move the release lever plate the distance required to free the clutch completely.

The pedal travel should be limited by the front and back stops for the clutch pedal to the correct amount indicated be is essential that these clearances be adhered to to allow the clutch to be completely freed and, at the same time, pre ssibility of damage to the clutch bearing due to over travel.

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If any difficulty is experienced in freeing the clutch when the correct release movement is provided, on no account should efforts be made to improve matters by attempting to increase the effective pedal travel. The actual cause of the trouble *must* be ascertained and rectified.

In the case of the Morris Ten Series " M " the pedal free travel should be 1 in. measured at the pedal pad, and the clearance between the stop on the clutch withdrawal lever and the stop on the flywheel housing should not be more than $\frac{1}{8}$ in. (See Fig. 2.)

In the case of the Morris Eight Series " E " the free pedal movement measured at the pedal pad should be $\frac{3}{4}$ in., and the clearance between the stop on the clutch withdrawal lever and that on the flywheel housing should not be more than $\frac{21}{32}$ in. when the pedal is held forward lightly so that the carbon release bearing is in contact with the release lever plate. (See Fig. 3.)

Press the pedal down and note the distance the release bearing travels after it comes in contact with the release lever plate. To obtain a clean release, the release lever plate should be pushed towards the flywheel $\frac{1}{4}$ in. for the Eight (Series "E") and 5 cwt. Van (Series "Z"), $\frac{5}{16}$ in. for the Ten (Series " M") and $\frac{3}{8}$ in. for the 10 cwt. Van (Series "Y").

Fig. 2.

Right.—The Morris Ten (Series " M ") Clutch Setting. The lower arrows indicate the nuts by means of which the clutch pedal position is adjusted. The set screw indicated by the upper arrow is the pedal stop and should not be interfered with, except when considerable wear has taken place. When checking the stop screw clearance the carbon block should be kept in contact with the thrust ring by pulling lightly on the lower end of the clutch pedal as shown.

Fig. 3.

Left.—The Morris Eight (Series " E ") Clutch Setting. The clutch pedal adjustment on the Morris Eight consists of a screwed eyebolt with two locating lock nuts.

When the release lever plate has travelled this amount and no more, the pedal should be in contact with the forward pedal stop on the flywheel housing so that no further travel is possible. If such is not the case the stop must be adjusted so that this condition is obtained, since over-travel of the release bearing leads to close coiling of the thrust springs and brings undue stress on the internal parts of the clutch, and the graphite release bearing, in particular, which will wear rapidly under these conditions.

No other adjustment is necessary. *Do not* turn the adjusting nuts (14) because that will throw the pressure plate out of position and cause the clutch to chatter.

Servicing Clutch—Removal and Dismantling

To remove the clutch from the flywheel, after removing the gearbox, it is necessary to remove the securing bolts (2) (Fig. 1). Loosen each securing bolt a turn at a time until the spring pressure is relieved (this should be done carefully to prevent springing or distortion of the flanged edge of the cover). The bolts can then be removed and the complete clutch lifted off th all parts except the driven plate (3) (Fig. 1) remaining assembled to the cover.

If it is found necessary to replace parts of the cover assembly it can be dismantled, reassembled and adjusted with the aid of an arbor press or drill press as follows :—

1. Place the cover on the bed of the press as shown in Fig. 4, with blocks under the pressure plate so arranged that the cover is left free to move down. Place a block or bar across the top of the cover resting on the spring bosses.

2. Compress the cover with the spindle of the press and, holding it under compression, remove the adjusting nuts (14) (Fig. 1), and then slowly release the pressure to prevent the springs from flying out.

3. The cover can then be lifted off and all parts will be available for inspection. To remove release levers, grasp the lever and eye bolt between the thumb and fingers as shown in Fig. 6, so that inner end of lever and threaded end of eye bolt

Fig. 4.
Above.—The correct procedure to adopt when dismantling the clutch cover assembly. Note the two wood blocks supporting the pressure plate on the bed of the press. These must not project beyond the pressure plate to ensure that they do not foul the cover plate when this is depressed by the press.

Fig. 5.
Below.—On reassembling the cover plate assembly the pressure plate should be placed on the wood blocks used for dismantling and the springs should be placed in position on their seating blocks as shown.

are as near together as possible, keeping the eye bolt pin seated in its socket in the lever. The strut (17) can then be lifted over the ridge on the end of the lever as shown, making it possible to lift the eye bolt off the pressure plate. It is advisable to replace any parts which show signs of wear.

To Reassemble Clutch

1. Lay the pressure plate (18) (Fig. 1) on the block in the press and place the springs on it in a vertical position, seating them on the small bosses on the pressure plate as shown in Fig. 5.

2. Assemble the release lever, eye bolt and eye bolt pin, holding the threaded end of eye bolt and inner end of lever as close together as possible (see Fig. 6). With the other hand, insert the strut in the slots of the pressure plate lug sufficiently to allow the plain end of the eye bolt to be inserted in the hole provided in the pressure plate. The short end of the release lever will then be under the hook of the pressure plate and will enable the strut to be moved upward in the slots in the pressure plate lug and over the ridge on the short end of the lever and drop into the groove formed in the lever.

3. The cover can then be laid on top of the assembled parts as shown in Fig. 5, taking care that the anti-rattle springs (13) are in the position shown in Fig. 1, and that the tops of the thrust coil springs are directly under the seats in the cover. Also make sure, if using the original parts, that the figures stamped on adjusting nuts, eye bolts, pressure plate lugs and cover are assembled in their correct relative positions. *This is most important to ensure that correct adjustment and correct balance shall be retained.*

4. The bar can then be laid across the cover and the assembly slowly compressed, making sure that the eye bolts and pressure plate lugs are guided through the proper holes in the cover. Care must also be taken that the springs remain in their seats.

5. Holding the clutch under compression, the adjusting nuts can then be screwed down on the eye bolts until the split pins can be inserted and set in the correct position. Before removing the clutch unit from the press it is advisable to release the clutch several times so that all moving parts can settle into their working positions. This can be done by applying pressure from the spindle of the press to the inner ends of the release levers.

6. The release lever plate (9) should then be assembled to the release levers, taking care that the projecting portions properly engage in the slots in the release lever ends. Finally, the small retaining springs (11) should be fitted as indicated in Fig. 1.

Note : If new parts have been fitted to the clutch which may affect adjustment, then final setting of the release levers should be made by using the special service gauge (see Fig. 8).

Caution : When placing the driven plate in the flywheel be sure that the chamfered end of the hub of the driven plate is toward the outside. Line up the pilot bearings and driven plate with a dummy clutch shaft before tigh the clutch cover holding screws. Tighten the securing bolts (2) before pulling out the dummy shaft.

To Adjust Levers

Satisfactory operation of this type of clutch is absolutely dependent on accurate adjustment of the release levers (7) (Fig. 7), so that the pressure plate face (13) is parallel to the flywheel face (1). This cannot be accomplished by setting the levers parallel to the face of the release bearing after the clutch has been assembled to the flywheel (1), because of variation in the thickness of the driven plate. The only accurate method is to adjust the release levers (7) while the pressure plate (13) is held parallel to the flywheel (1), by using the Borg and Beck lever adjustment gauge (3) shown separately in Fig. 8.

Place this gauge (3) in the flywheel (1) in the position normally occupied by the driven plate and mount the cover assembly on the flywheel, turning the holding screws (2) only a turn or two at a time when pulling against the spring pressure (5), otherwise the cover (4) may be distorted. Before the cover is tightened down be sure the gauge (3) is centred. The clutch is equipped with the release lever plate attached to the levers: this release lever plate must be off when setting the levers.

Fig. 6.
Above.—The correct method of removing and assembling the clutch release levers can be followed from this illustration.

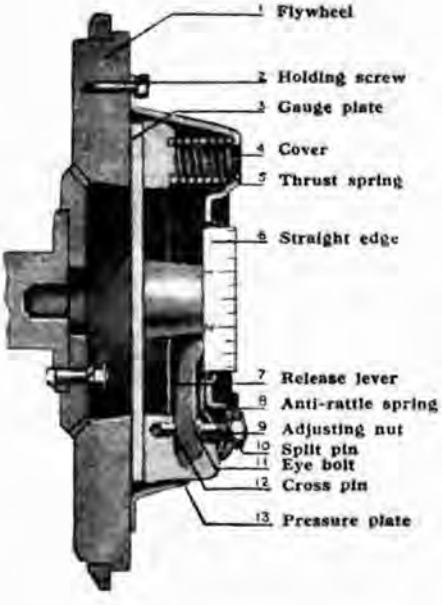

Fig. 7.
Left.—The method of using the special gauge plate and a short rule for setting the release levers.

Fig. 8.
Below.—The special Borg and Beck gauge plate necessary for setting the release levers.

After the cover assembly has been mounted, a short straight-edge or scale (6) (approximately 3 in. long) can then be laid across the centre boss and the bearing surface of one lever (7). Then turn the adjusting nut (9) until these are exactly the same height. (See Fig. 7.) The other levers can then be set in turn by the same method. If carefully done, this setting will be within .005 in. After adjustment is completed, loosen the holding screws (2) a turn or two at a time until the spring pressure (5) is relieved, which will allow the clutch assembly and gauge plate (3) to be removed. A $\frac{1}{16}$ in. diameter hole should then be drilled through each adjusting nut (9) and eye bolt (11) and a corresponding size split pin (10) inserted. When carrying out this operation take care not to upset the adjustment previously made. On the latest clutches a slotted eye-bolt is used and the nuts are peened into the slot.

Note: In the case of the 6½ in. clutch fitted to the Morris Eight and 5-cwt. van the locking method is by tab washer and locking is carried out by turning up the tab on the lock washer instead of inserting a split pin.

Spring Pressure

A tolerance of not more than 10 to 15 lb. pressure is allowable on the compression load of the operating springs when at their assembled height, and all clutch springs are tested for this before assembly.

Lubrication of the splines of the driven plate is provided at assembly only when C.S.881 graphite grease or zinc-based "Kenol" is used.

The clutch operation springs are not affected by high clutch temperatures, as the pressure plate absorbs heat rapidly; the springs have only line contact, and a draught is continuously passing under them when the car is running.

Tolerances

Wear on the working faces of the driven plate is about .001 in. per 1,000 miles under normal running conditions. The accuracy of alignment of the face of the driven plate must be within .015 in.

When Servicing Clutches

After removal from the engine, and before stripping down, mark the parts in such a manner that they can be reassembled in the *same relative position* to each other to ensure that correct balance is maintained; this applies particularly to the cover, pressure plate, and release levers. Failure to follow these instructions may result in excessive vibration at high revolutions. When pressure plate is fitted, it is essential that the complete cover and pressure plate assembly be accurately balanced, for which it is not a practical proposition to fit new pressure plates unless balancing facilities are available.

Driven Plates

It is most important that the clutch facings are *not* touched with greasy hands, or any oil or grease allowed to come in contact with them.

It is essential to instal a complete driven plate assembly when renewal of the friction surfaces is required. Obviously, if the facings have worn to such an extent as to warrant replacement, then slight wear will have taken place on the splines, and also on the torque reaction springs and their seatings. The question of balance and concentricity is also involved. Under no circumstances is it satisfactory to repair or rectify faults in clutch driven plate centres, and we do not countenance this as manufacturers.

Condition of Clutch Facings in Service

It is natural to assume that a rough surface will give a higher frictional value against slipping than a polished one, but this is not necessarily correct. A roughened surface consists of small hills and dales, the " high spots " of which only make contact. As the amount of useful friction for the purpose of taking up the drive is dependent upon the area in actual contact, it is obvious that a perfectly smooth face is required to transmit the maximum amount of power for a given surface area.

Since non-metallic facings of the moulded asbestos type have been introduced in service, *a polished surface is common*, but it must not be confused with a *glazed* surface, which is sometimes encountered due to conditions to be discussed subsequently.

The ideally smooth or polished condition will therefore provide proper surface contact, but a glazed surface entirely alters the frictional value of the facing and will result in excessive clutch slip. These two conditions might be simply illustrated by the comparison between a piece of smoothly finished wood and one with a varnished surface. In the former the contact is made directly by the original material, whereas in the latter instance a film of dried varnish is interposed between the contact surfaces and actual contact is made by the varnish.

A. After the clutch has been in use for some little time, under satisfactory conditions, the surface of the facings assume a high polish, through which the grain of the material can be seen clearly. This polished facing is of light colour when in perfect condition.

B. Should oil in small quantities gain access to the clutch and find its way on to the facings, it will be burnt off as a result of the heat generated by the slipping which occurs under normal starting conditions. The burning of this small quantity of lubricant has the effect of gradually darkening the facings, but, provided the polish of the facing remains such that the grain of the material can be clearly distinguished, it has little effect on clutch performance.

C. Should increased quantities of oil obtain access to the facing, then one or two conditions or a combination of these may arise, depending upon the nature of the oil.

1. The oil may burn off and leave a carbon deposit on the surface of the facings which assume a high glaze and causes further slip. This is a very definite, though very thin, deposit, and in general it hides the grain of the material.
2. The oil may partially burn and leave a resinous deposit on the facings. This has a tendency to produce a fierce clutch, and may also cause excessive " spinning " due to the tendency of the face of the linings to adhere to the surface of the flywheel or pressure plate.
3. There may be a combination of (1) and (2) conditions, which produces a tendency to judder on clutch engagement.

D. Still greater quantities of oil produce a dark and soaked appearance of the facings, and the result will be further slip, accompanied by fierceness or juddering on engagement, according to the severity of the conditions.

If the conditions under (C) or (D) are experienced the clutch driven plate should be replaced by a new one. The cause of the presence of the oil must be traced and removed. It is, of course, necessary for the clutch and flywheel to be thoroughly cleaned out before reassembly.

Release Bearing

Where the graphite release bearing ring is badly worn in service, a complete replacement assembly should be fitted, returning the old assembly for salvage of the metal cup. These graphite rings are shrunk into their metal cups by heating the metal cup to a cherry red, then forcing the graphite ring into position. This is a specialised job, but can be carried out provided the necessary care is exercised. Immediately the ring is forced into position, the whole should be quenched in oil. Alignment of the thrust pad in relation to its face, and the trunnions, should be within .005 in. *In almost every case of rapid wear on the splines of the clutch driven plate, misalignment is responsible.*

Looseness of the driven plate on the splined shaft results in noticeable backlash in the clutch. Misalignment also puts undue stress on the driven member, and may result in the hub breaking loose from the plate, with consequent total failure of the clutch. It may also be responsible for a fierce chattering or dragging of the clutch, which makes gear changing difficult.

In cases of persistent difficulty it is advisable to check the flywheel for truth with a dial indicator to determine any possible misalignment. The dial reading should not vary more than .003 in. anywhere on the flywheel face.