SECTION E

THE CLUTCH
(1½ and 2½ LITRE)

Description of the Clutch Assembly.

GENERAL DESCRIPTION

The clutch is of the single-plate dry-disc type, no adjustment for wear being provided in the clutch itself. Individual adjustment is provided for locating each lever during initial assembly. The adjusting nuts are locked in place and should never be disturbed unless the clutch is dismantled for the replacement of parts.

The general construction can be followed by reference to Fig. E.1 and the following description :—

The driven plate assembly

This consists of a splined hub and flexible steel driven plate (3), to the outer diameter of which are fixed the annular friction facings. This plate is attached to the splined hub by a spring mounting which provides a torsional cushion.

The release bearing assembly

This comprises the graphite release bearing (7) mounted in a cup attached to the operating fork, and a release plate (10) is attached to the inner ends of the release levers (12) by means of the retainer springs (11). Release is accomplished by moving the release bearing forward into contact with the release plate and thus applying pressure to the release levers.

Cover assembly

Each release lever 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). The outer ends of the eyebolts extend through holes in the clutch cover and are fitted with adjusting nuts (14) by means of 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, eliminating friction at this point. Thus the pressure plate (18) is pulled away from the driven plate (3), compressing the six 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 to the rear wheels.

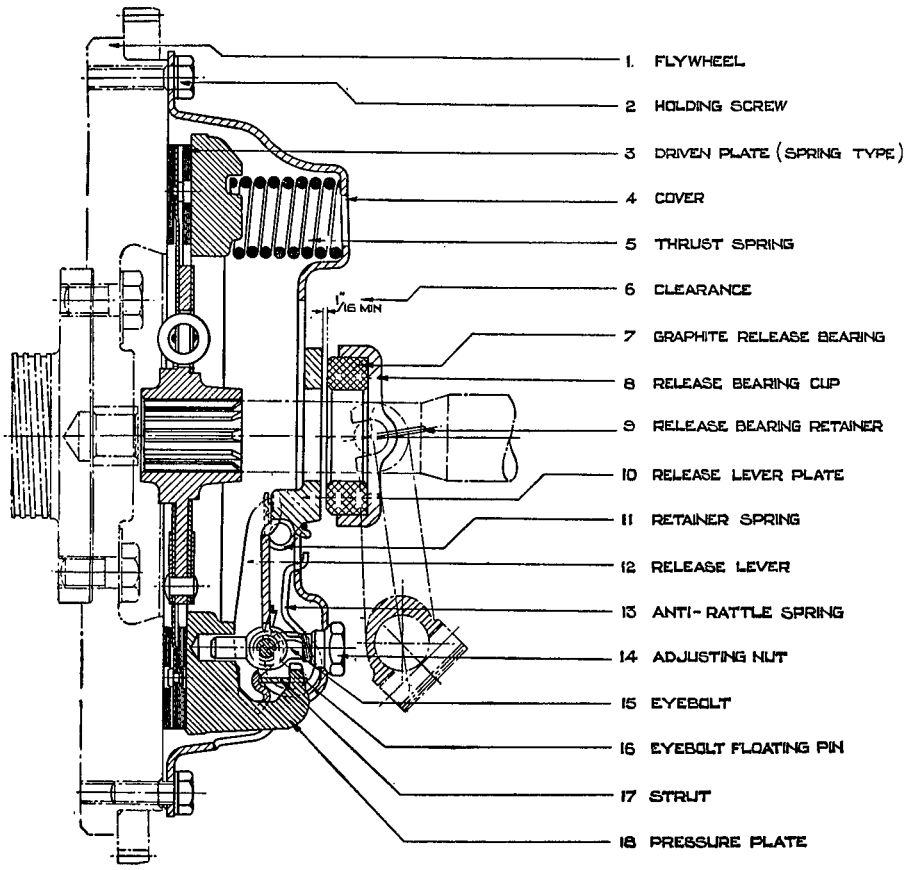


Fig. E.1.
Section of the clutch.

Section E.1

RUNNING ADJUSTMENTS

The only adjustment necessary throughout the life of the driven plate friction facings is to restore the free movement of the clutch pedal periodically. As the driven plate facings wear, the free movement of the clutch pedal will gradually decrease ; when it is reduced to ½ in. (12·7 mm.), measured at the pedal pad, adjustment must be made to restore the correct amount of free movement, i.e. ¾ in. (19 mm.). To correct this clearance, proceed as follows :—

There are two points to check.

1. At the screwed rod shown in Fig. E.2. In this case the locknut is slackened back and the ¾ in. (19 mm.) clearance is set at this point.
2. At the clutch stop shown in Fig. E.3. This is set so that after the clutch is completely withdrawn there is a further movement of ½ in. (12·7 mm.) at the pedal.

Note.—*Over-travel of the release bearing leads to solid coiling of the thrust springs, and this brings undue stress on the internal parts of the clutch and to the graphite release bearing in particular, which will wear extremely rapidly under these conditions.*

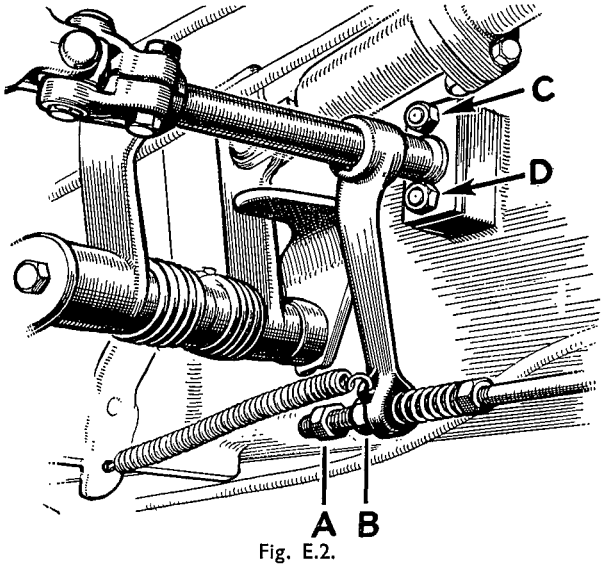


Fig. E.2.
A and B are the adjuster nuts. Do not tighten C and D completely, otherwise binding will occur at this point.

Section E.2

REMOVAL OF THE CLUTCH

Remove the gearbox as in Section F.1.

Loosen each of the hexagon bolts securing the clutch to the flywheel by slackening them a turn at a time until the spring pressure is released (this should be done carefully to avoid distortion of the clutch cover flange).

The clutch cover can now be disengaged from the flywheel dowels and the whole assembly lifted from the flywheel, all parts except the driven plate remaining assembled to the cover.

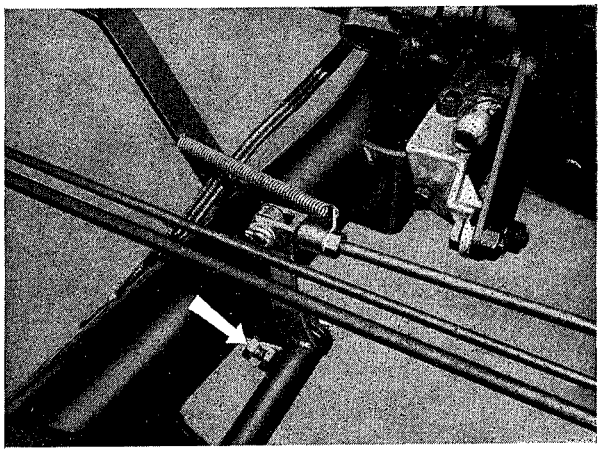


Fig. E.3.
This is the clutch stop.

Section E.3

DISMANTLING THE CLUTCH

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

Apply pressure to the cover with the spindle of the press and, holding it under compression, remove the three adjusting nuts. The pressure from the press may now be released gradually until the clutch springs are fully extended.

While stripping down the cover-plate assembly, the parts should be marked so that they may be reassembled in the same relative position to each other, to ensure that the correct balance is maintained. When a new pressure plate is fitted it is essential that the complete cover and pressure plate assembly be accurately balanced, for which reason it is not a practical proposition to fit new pressure plates unless balancing facilities are available.

The cover can then be lifted off, and all parts will be available for inspection.

To remove the release levers, grasp the lever and eyebolt between the thumb and fingers as shown in Fig. E.6, so that the inner end of the lever and the threaded end of the eyebolt are as near together as possible, keeping the eyebolt pin seated in its socket on the lever. The strut can then be lifted over the ridge on the end of the lever as shown, making it possible to lift the eyebolt off the pressure plate. It is advisable to renew any parts which show signs of wear.

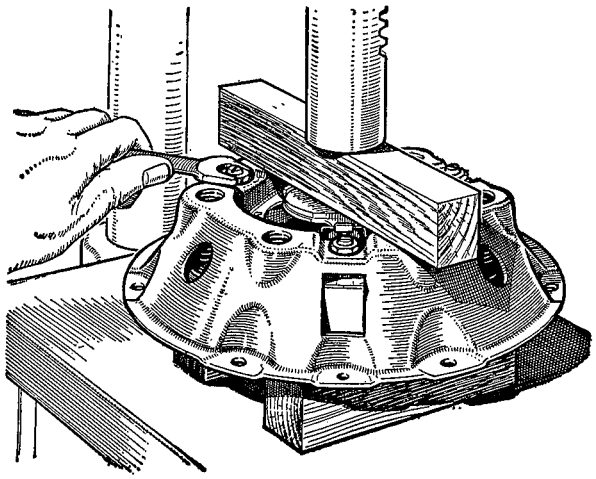


Fig. E.4.
The correct procedure to adopt when dismantling the clutch cover assembly. Note the two wood blocks supporting the pressure plate on the bed of the press. These must not project beyond the pressure plate, to ensure that they do not foul the cover-plate when this is depressed by the press. A 1½ litre clutch is illustrated.

Section E.4

ASSEMBLING THE CLUTCH

Lay the pressure plate on the wood block on the bed of the press and place the springs on it in a vertical position, seating them on their small locating bosses as shown in Fig. E.5. Thoroughly clean all parts and renew any which show appreciable wear.

Assemble the release levers, eyebolts and eyebolt pins, holding the threaded end of the eyebolt and the inner end of the lever as close together as possible. With the other hand insert the strut in the slots of the pressure plate lug just sufficiently to allow the plain end of the eyebolt to be inserted in the hole in the pressure plate. Move the strut upwards into the slots in the pressure plate lugs, over the ridge on the short end of the lever, and drop it into the grooves formed in the lever.

Lay the cover over the parts, taking care that the anti-rattle springs are in position and that the springs are directly under the seats in the cover. Also make

sure, if using the original parts, that the eyebolts, eyebolt nuts, pressure plate lugs and cover are fitted in their correct relative positions, as marked when dismantling, to ensure correct balance being maintained.

Place a block of wood across the cover and compress the springs, taking great care to guide the eyebolts and the pressure plate lugs through the correct holes in the cover. Make sure also that the thrust springs remain correctly in their seats.

Replace the eyebolt nuts onto the eyebolts, and release the pressure compressing the cover assembly.

Note.—*The final setting of the release levers should be made, using the special gauge plate, Part No. CG.10516 for the 1½ litre and CG.13422 for the 2½ litre (as described in Section* E.5).

The release lever plate (10) (Fig. E.1) 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.

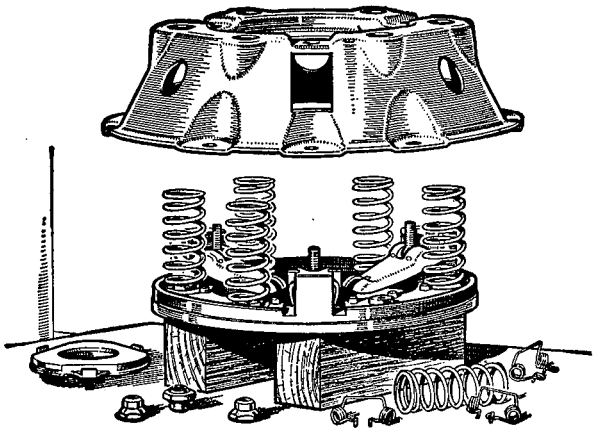


Fig. E.5.
When reassembling the clutch the pressure plate should be supported on the wood blocks used for dismantling and the levers assembled on their shoulder studs. The thrust springs should be placed in position on their seatings, making sure that they remain correctly located when the clutch cover is placed in position. Make sure also that the lever anti-rattle springs are properly located. There are 6 springs in the 1½ litre clutch and 12 in the 2½ litre clutch.

Section E.5

ADJUSTING THE RELEASE LEVERS

Satisfactory operation of the clutch is dependent upon accurate adjustment of the release levers, so that the pressure plate face is maintained parallel to the flywheel face. This cannot be accomplished by setting the levers parallel to the face of the release bearings after the clutch has been assembled to the flywheel, because of the variations in the thickness of the driven plate. The only accurate method is to adjust the release levers while the pressure plate is held parallel to the flywheel by using the Borg & Beck lever adjustment gauge (Special Tool, Part No. CG.10516 for the 1½ litre and CG.13422 for the 2½ litre) (see Fig. E.7).

Place this gauge in the flywheel in the position normally occupied by the driven plate, and mount the cover assembly on the flywheel in the same position as before dismantling. Tighten the holding screws a turn or two at a time when pulling against the spring pressure, otherwise the cover may be distorted.

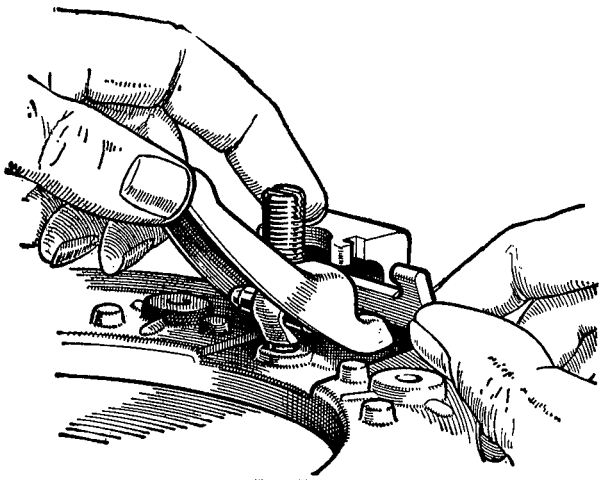


Fig. E.6.
To assemble the levers hold the threaded end of the eyebolt (15) and lever (12) close together as shown and with the other hand insert the struts in the slots of the pressure plate lugs sufficiently to permit the plain end of the eyebolt to be inserted in the hole in the pressure plate (18).

Before the cover is tightened down be sure that the gauge plate is properly centred, and the three flat machined lugs are directly under the levers. The clutch is equipped with a release lever plate attached to the levers which should be removed before the levers are adjusted.

After the cover assembly has been mounted, a short straight-edge should then be laid across the centre boss of the special gauge plate and the bearing surface of one lever, and the nut adjusted until the lever just makes contact with the straight-edge. The other levers can then be set in turn by the same method. If carefully done, this setting will be within the permissible tolerance of ·005 in. (·12 mm.).

The adjusting nut is then locked in position by punching the protruding flange of the nut into the slot of the eyebolt, thereby definitely locking it in position. When carrying out this operation take care not to upset the adjustments previously made.

After adjustment is completed, loosen the holding screws a turn or two at a time until the spring pressure is released, which will allow the clutch assembly and the gauge plate to be removed.

Section E.6

REPLACEMENT OF THE CLUTCH

Check the adjustment of the release levers, and if necessary adjust them as in Section E.5.

Replace the release lever plate, taking care that the projecting portions properly engage the slots in the release lever ends. Finally, the small lever-retaining springs should be fitted.

Assemble the driven plate and clutch assembly to the flywheel, taking care to place the chamfered end of the driven plate hub towards the gearbox, i.e. the rear of the car.

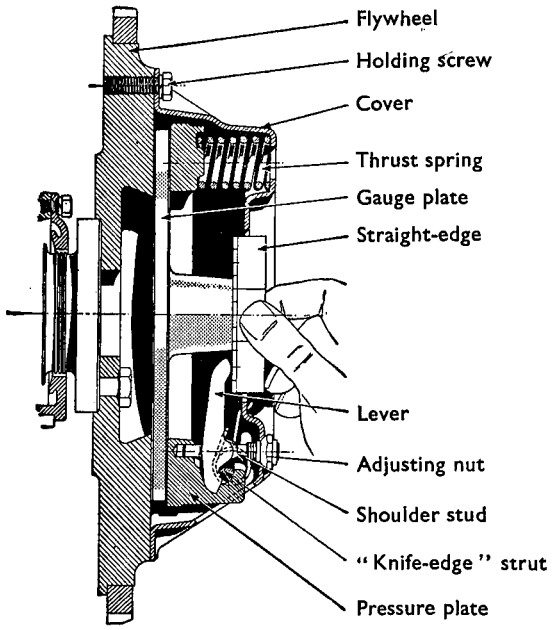


Fig. E.7.
Setting the release levers by means of the special Borg & Beck gauge plate and a short straight-edge.

Line up the driven plate and pilot bearings with a dummy shaft before tightening the cover holding screws. Tighten the screws fully before removing the dummy clutch shaft.

Note.—*The weight of the gearbox must be supported during its replacement, in order to prevent strain and distortion of the driven plate assembly.*

After the gearbox and floorboards have been assembled the foot pedal should be adjusted until there is approximately ¾ in. (19 mm.) free movement of the pedal pad. The clutch stop on the clutch relay shaft should then be set so that, after the clutch is completely withdrawn, there is a further movement of ½ in. (12·7 mm.) at the pedal.

Section E.7

SERVICING THE CLUTCH

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 into contact with the release lever plate. Some free movement must always be maintained here to prevent the clutch pedal riding against the back stop and thus causing the clutch to slip. This essential free movement is restored by adjusting the clutch pedal position.

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. It therefore follows that the required pedal travel is the sum of the two movements :—

1. *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.
2. *The effective movement*, or travel necessary to release the clutch, i.e. the amount of effective pedal movement necessary to move the release plate the distance required to free the clutch completely.

The pedal travel should be limited by the clutch pedal stop on the relay shaft to the correct amount indicated. It is essential that these clearances be adhered to, to allow the clutch to be completely freed, and at the same time prevent the possibility of damage to the clutch bearing, due to over-travel.

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.

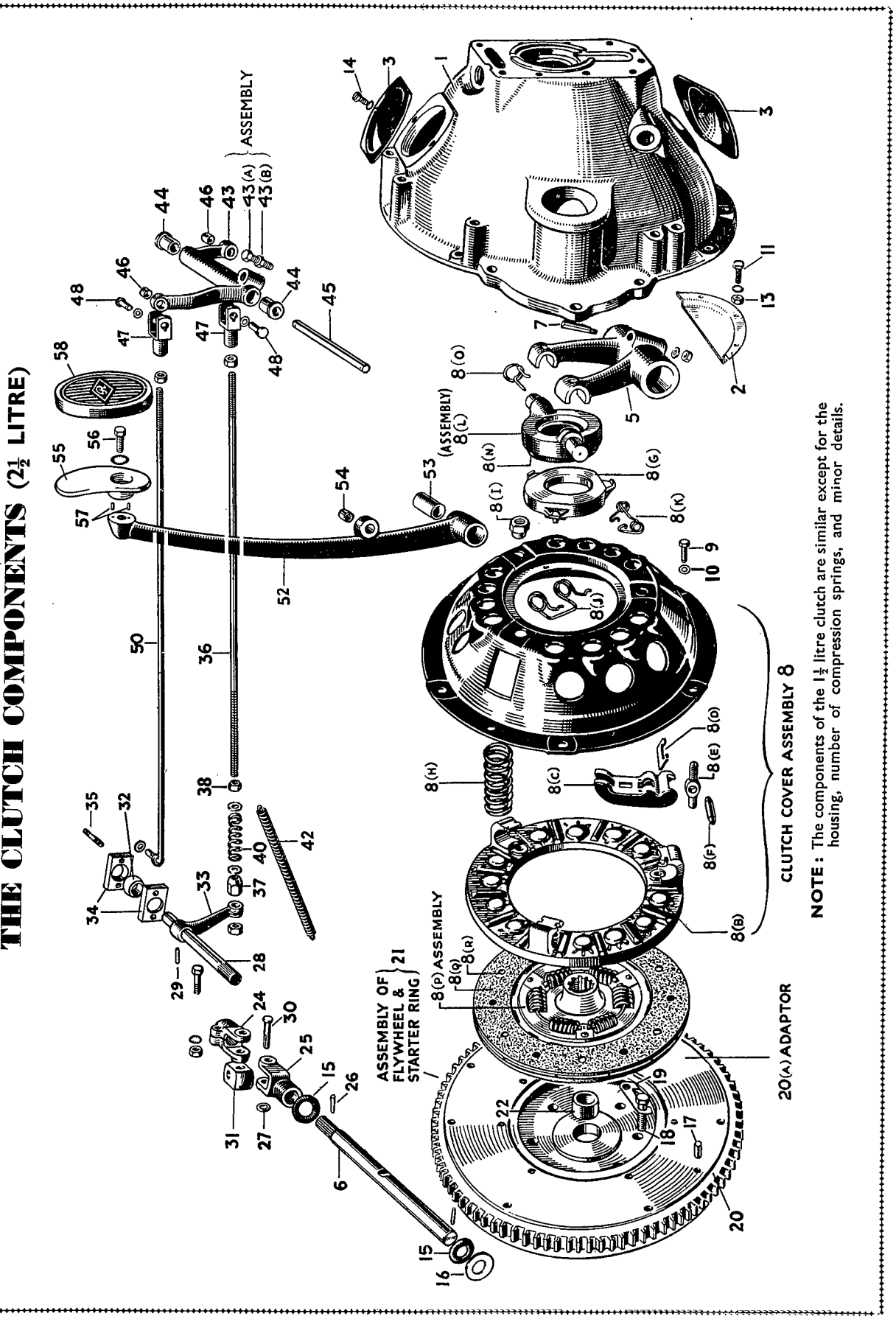
The free pedal movement, measured at the pedal pad, should be ¾ in. (19 mm.).

To obtain a clean release, the release lever plate should move a distance of $\frac{5}{16}$ in. (8 mm.) towards the flywheel.

Spring pressure

A tolerance of not more than 10 to 15 lb. (4·5 to 6·8 kg.) pressure is allowable on the compression

THE CLUTCH COMPONENTS (2½ LITRE)



NOTE : The components of the 1½ litre clutch are similar except for the housing, number of compression springs, and minor details.

KEY TO CLUTCH COMPONENTS (2½ AND 1½ LITRE)

No.	Description
1.	Housing—bell.
2.	Shield—bell housing.
3.	Cover—bell housing.
5.	Fork—clutch operating.
6.	Shaft—clutch operating.
7.	Cotter and nut—clutch operating fork.
8.	Clutch (complete).
9.	Bolt—flywheel to clutch.
10.	Washer—flywheel to clutch bolt.
11.	Bolt—bell housing shield.
13.	Nut—bell housing shield bolt.
14.	Set screw—bell housing cover.
15.	Rubber ring—clutch operating shaft.
16.	Washer—clutch operating shaft.
17.	Dowel—flywheel to clutch.
18.	Bolt—flywheel.
19.	Lock strap—flywheel bolt.
20.	Flywheel starter ring.
20A.	Flywheel starter plate only.
21.	Flywheel with starter ring.
22.	Bush—flywheel.
24.	Joint—clutch operating shaft.
25.	Joint—clutch operating shaft.
26.	Taper pin—clutch operating shaft.
27.	Bush—clutch operating shaft joint.
28.	Extension—clutch operating shaft.
29.	Pin—clutch operating shaft (Mills).
30.	Pin—clutch operating shaft joint.
31.	Toggle—clutch operating shaft.
32.	Bush—clutch operating rod.
33.	Lever—clutch operating.
34.	Bearing block—clutch operating shaft.
35.	Stud—clutch operating shaft bearing block.
36.	Rod—clutch operating (short).
37.	Nut—clutch operating rod adjusting.
38.	Nut—clutch operating rod.
40.	Spring—clutch operating rod (short).
42.	Spring—clutch pedal return.
43.	Lever—clutch compensating.
44.	Bush—compensating lever (long).
45.	Shaft—compensating lever.
46.	Bush—compensating lever (short).
47.	Fork—clutch operating rod.
48.	Pin—clutch operating rod fork.
50.	Rod—clutch operating (long).
52.	Pedal—clutch.
53.	Bush—clutch pedal (large).
54.	Bush—clutch pedal (small).
55.	Pad—clutch pedal (aluminium).
56.	Bolt—clutch pedal pad.
57.	Dowel—clutch pedal pad.
58.	Pad—clutch pedal (rubber).

load of the operating springs when at their assembled height, and all clutch springs are tested for this before assembly.

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 continually passing under them when the engine is running.

Tolerances

Wear on the working faces of the driven plate is about ·001 in. (·02 mm.) per 1,000 miles (1600 km.) under normal running conditions. The accuracy of the alignment of the face of the driven plate must be within ·015 in. (·38 mm.).

Driven plates

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

Lubrication of the splines of the driven plate is provided at assembly only, when CS881 graphite grease or zinc-based " Kenol " is used.

It is essential to install a complete driven plate assembly when renewal of the friction surfaces is required. 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.

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, only the " high spots " of which 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, the polished surface is common, but it must not be confused with the 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 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 dry varnish is interposed between the contact surfaces, and actual contact is made by the varnish.

If the clutch has been in use for some little time under satisfactory conditions, the surface of the facings assumes 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.

Should oil in small quantities gain access to the clutch and find its way onto the facings, it will be burnt off as a result of the heat generated by the slipping occurring 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 distinguished clearly it has little effect on clutch performance.

Should increased quantities of oil obtain access to the facing, then one of 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, producing 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 conditions (1) and (2) which produces a tendency to " judder " on clutch engagement.

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."

If the conditions enumerated above 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 cleaned out thoroughly before reassembly.

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 inserted into their metal cup by heating the metal cup to a cherry red, then forcing the graphite ring into position. 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. (·12 mm.).

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. The dial reading should not vary more than ·005 in. (·12 mm.) anywhere on the flywheel face.

Section E.8

SETTING OF CLUTCH OPERATING ARM

The clutch cross-shaft is articulated with a universal joint outside the bell housing. The outer end of the shaft is supported in a spherical, oil-impregnated bearing held to the chassis side by a split housing.

The universal jaw on the shaft is serrated and clamped in position so that it is possible to set this at the correct angle which is from 5° to 7½° from the vertical.

The clutch cross-shaft can be disconnected by removing the universal joint pin.