

F

Clutch

FACTORY

SERVICE INSTRUCTION LEAFLET

ISSUED BY

BENTLEY MOTORS (1931) LTD.



BM/F1.

SB/GS. 2/SF

Subject : CLUTCH - REPLACEMENT
TIMING MARKS
4 $\frac{1}{2}$ litre BENTLEY

Date of Issue 2nd December, 1946

IMPORTANT

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DOCUMENT ARE
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The ignition and valve timing marks on the 4 $\frac{1}{2}$ litre Bentley are stamped on the Borg and Beck clutch housing. It is therefore necessary whenever a complete new clutch is fitted to ensure that these markings are transferred to the new clutch in the same relative positions. This applies also to the tappet clearance figure required for checking valve timing.

In order to avoid possible confusion, all irrelevant marks should be erased by peening or filing.

ALL COMMUNICATIONS SHOULD BE ADDRESSED TO

BENTLEY MOTORS (1931) LTD., SERVICE STATION, HYTHE ROAD, WILLESDEN, LONDON, N.W.10

SERVICE INSTRUCTION LEAFLET

ISSUED BY

BENTLEY MOTORS (1931) LTD.



BM/F2

SB/GF/1/PVS.

Subject : CLUTCHES:
OVERHAUL, ADJUSTMENT AND GENERAL MAINTENANCE.
 $3\frac{1}{2}$ and $4\frac{1}{4}$ LITRE BENTLEY CHASSIS.

Date
of 14th April, 1950
Issue

All $3\frac{1}{2}$ litre Chassis are fitted with Single Dry Plate clutches of Bentley Motors (1931) Ltd., design and manufacture. An improved design was fitted from Chassis No. B.2.EF inclusive, this clutch was incorporated with a lighter type of flywheel, and is usually referred to as the "Light Type".

All $4\frac{1}{4}$ litre Chassis are fitted with a standard 10" Borg and Beck Single Plate Clutch.

DESCRIPTIVE INFORMATION.

Prior to proceeding with the data covering overhaul and adjustment, the following brief description and diagrammatic sketches illustrating the individual characteristics and construction of each type of clutch are given.

$3\frac{1}{2}$ litre Bentley, Chassis B.1.AE to B.199.DK inclusive.

Fig.1. illustrates the general characteristics of the clutch fitted to all these chassis.

In this design, the clutch plate, which is bolted to the hollow clutch shaft, is located between the friction liners. These are riveted to carrier rings, (A & B), the front ring being secured to the flywheel face, while the back ring constitutes the pressure plate, (B), in the cover assembly.

Four release levers (C) are mounted on the back plate assembly, and are operated through the sliding sleeve, (D), which is actuated by the ball race thrust bearing and trunnion block.

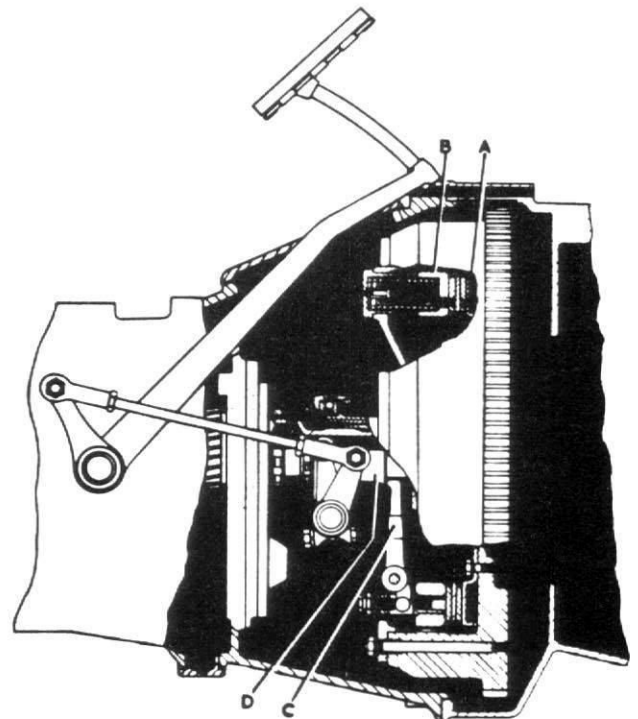
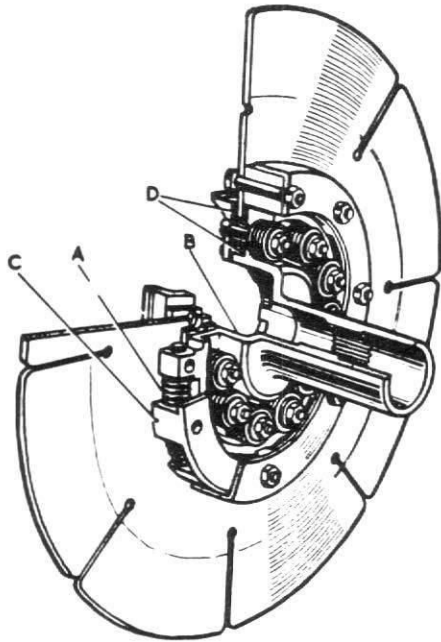


Fig. 1.

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Two types of clutch plate are used on these early $3\frac{1}{2}$ litre chassis, the Spring Drive clutch plate (illustrated in Fig. 2 below) being fitted to all chassis up to B-203-CW, and the Rigid type clutch plate to all remaining $3\frac{1}{2}$ litre chassis.



On the Spring Drive clutch plate the drive is transmitted from the clutch plate to the shaft through the medium of 16 coil springs (A) which are set circumferentially round the hub, being interposed between the driving dogs of the hub itself (B) and those of the driving ring (C) which is bolted to the friction plate.

A damping device is included within this Spring Drive section, whereby the movement of the clutch plate relative to the hub is controlled through the two spring loaded friction discs (D).

Both the Rigid and the Spring Drive type of clutch plates have alternate segments staggered to provide gradual engagement, the staggered segments being bent 0.025" (0.64 m/m) towards the engine to assist full disengagement. All plates have the words "To Engine" etched on this face as an aid to correct assembly.

Fig. 2.

$3\frac{1}{2}$ LITRE BENTLEY, ALL CHASSIS BETWEEN B-2-EF AND B-159-FC INCLUSIVE:

Fig. 3 below illustrates the "Light Type" clutch fitted to all these chassis.

This has a rigid type of clutch plate, lined on both faces with friction fabric, and bolted directly to the hollow driving sleeve. The friction surfaces are provided by the pressure plate (A) and the flywheel ring (B) respectively.

This flywheel ring, which is secured to the flywheel for rotation by three dowels (C), is also spring loaded, six small coil springs (D) being recessed in the flywheel behind the ring. Although this ring is free to move axially on the dowels, the amount of end float is determined by the three special retaining clamps (E).

The four release levers (F) pivot on needle rollers, and are actuated through the sliding sleeve (G) in conjunction with the ball race thrust bearing (H) and trunnion block (J).

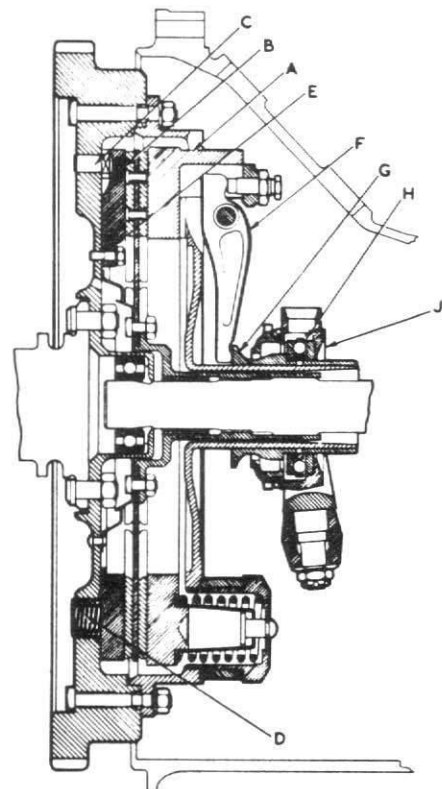


Fig. 3.

BORG & BECK 10" CLUTCH.4½ litre Bentley - All Chassis.

All these chassis are fitted with the standard 10" Borg and Beck clutch illustrated in Fig. 4 below.

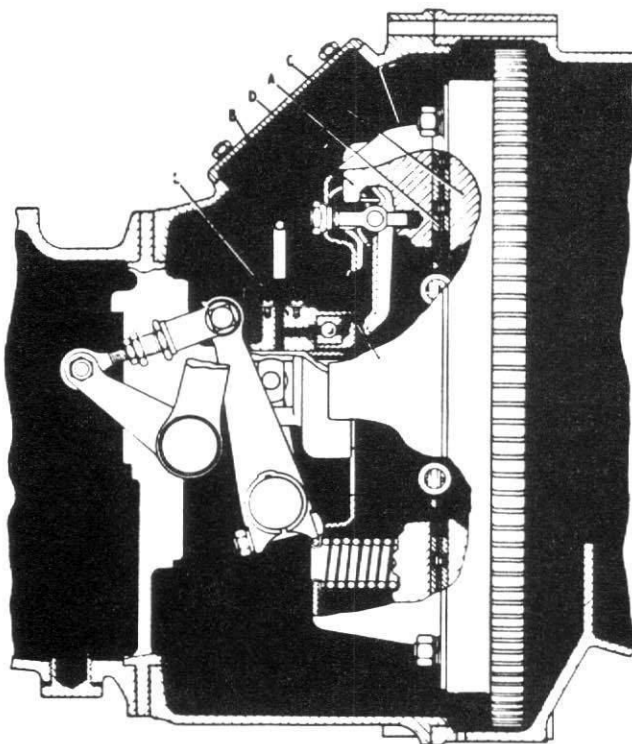


Fig. 4.

In this the driven plate (A), which is lined on both faces with friction fabric, is interposed between the clutch cover assembly (B) and the flywheel face to which this assembly is secured. The driven plate is located in position relative to the friction surfaces provided by the pressure plate (D), and the flywheel face (C), by means of the splined 1st motion shaft of the gear-box. Three release levers are mounted on the clutch cover, and are pivoted on floating pins. The release levers are operated by the sliding trunnion (E), which is actuated by the withdrawal forks.

CLUTCH ADJUSTMENT DURING SERVICE.

Normally the clutches fitted to Bentley chassis require very little attention during service beyond the periodical adjustment to restore the free pedal travel which has been lost due to wear of the friction linings.

NORMAL RUNNING ADJUSTMENT can be effected at the link rod between the clutch pedal and the external operating lever. On some 3½ litre models a limit to this adjustment is determined by the withdrawal sleeve fouling the front face of the gearbox ball race housing. A check must always be made for adequate clearance at this point with the clutch pedal lifted to the floorboard, after adjustment.

On very early models the link rod is pegged and external adjustment should not be attempted.

3½ litre models from B-2-DG and all Chassis fitted with Borg and Beck clutches have a link rod in the form of a turnbuckle with right and left hand thread.

WORKSHOP ADJUSTMENT on 3½ litre type clutches. At the time of overhaul, and/or when the external adjustment is completed, adjustment should be effected at the toggle lever adjusting screws. On models with pegged linkage, the toggles provide the only adjustment.

The adjustment procedure together with the relevant data covering each type of clutch fitted will be found detailed in the following paragraphs.

PERIODICAL ADJUSTMENTBENTLEY TYPE CLUTCHES3½ LITRE CHASSIS.Early Chassis from B-1-AE inclusive, with Pegged Linkage.

Clutch adjustment on above chassis should be effected at the toggle levers, the correct toggle adjustment being obtained with the toes of the levers in light contact with the face of the withdrawal sleeve when this face is exactly 0.685" (17.4 m/m) from the rear face of the clutch cover plate. The best method of adjustment is to slacken off the four adjusting screws several turns, which will allow the withdrawal sleeve to approach the clutch cover face. One lever should then be adjusted by the screw, until the gap between the withdrawal sleeve and clutch cover face is to the exact measurement. This is best determined by means of a small gauge measuring 0.685" (17.4 m/m). With the withdrawal sleeve held against this lever, the remaining levers should be adjusted up to the sleeve. A final check should then be made to ensure that all four levers make equal contact with the sleeve.

With the above adjustment carried out, the clutch pedal should have $\frac{3}{4}$ " (19.05 m/m) free lift to the floorboard (floorboard secured in position), the measurement to be made horizontally from the dashboard to the top of the pedal.

All Chassis to B-203-CW inclusive, with Unpegged Linkage.

Periodical adjustment may be carried out at the external linkage. A check must be made to ensure that the rear face of the withdrawal sleeve is well clear of the front gearbox housing. If this is not the case, toggle adjustment is essential. At overhaul, toggle adjustment is necessary, as described previously, and the external linkage should be restored to the original setting by measurement of the free pedal lift. The dimensions for setting the toggle levers and the free pedal travel are the same as described for the preceding models.

All Chassis from B-2-DG to B-199-DK inclusive.

Periodical adjustment may be carried out at the turnbuckle (external linkage). At overhaul, toggle adjustment is necessary, as described previously, and the turnbuckle restored to the original setting by measurement of the free pedal lift. The dimensions for setting the toggle levers and the free pedal travel are the same as described for the preceding models.

All Chassis from B-2-EF to B-169-FC (Light Type Flywheel and Clutch)

Periodical adjustment may be carried out at the turnbuckle (external linkage), to give $\frac{3}{4}$ " to 1" (19.05 m/m to 25.40 m/m) free lift to the floorboard (floorboard secured in position). The measurement to be made horizontally from the dashboard to the top of the pedal.

At overhaul, toggle adjustment is necessary, and the correct procedure is detailed under "CLUTCH OVERHAUL" in this leaflet.

BORG & BECK TYPE CLUTCHES4½ Litre ChassisAll Chassis - (B-2-GA to B-203-MX inclusive)

The above chassis were fitted with Borg & Beck clutch assemblies of standard type and are provided with turnbuckle adjustment for the regulation of free pedal travel.

The clutch pedal is held up against the floorboard by a tension coil spring, and the free movement is measured in a horizontal direction between the top of the pedal and the dashboard. This movement should be $\frac{3}{4}$ " to 1" (19.05 m/m to 25.40 m/m) when the pedal is lightly depressed to where the withdrawal sleeve makes light contact with the operating levers. The aluminium pedal plate must be secured in position to make this check.

Toggle adjustment is only possible when new parts are fitted, as described later in this leaflet under "CLUTCH OVERHAUL".

LUBRICATION OF THE CLUTCH MECHANISM.

Lubrication of the various joints and bearings of the clutch mechanism, in addition to the hand lubrication of the external linkage joints common to all Bentley chassis, is essential for the mechanical efficiency of clutches.

As, however, the points to be lubricated and the methods of lubrication vary throughout the Bentley range of chassis, the detailed sequence is given in the following paragraphs.

$3\frac{1}{2}$ litre Bentley, All Chassis.

The ball race thrust bearing and the bearings of the clutch withdrawal shaft on these chassis are lubricated through the centralised chassis lubrication system.

The clutch spigot bearing, on the other hand, requires to be hand lubricated every 5,000 miles, the point of lubrication taking the form of a small oil hole in the clutch shaft just behind the clutch trunnion. On models prior to the fitting of the "Light Type" assembly (before B-2-EF), this hole is not accessible without first rotating the clutch withdrawal sleeve, by hand, until a slot in the rear end of the sleeve is brought to the top, the engine should then be turned, by hand, to bring the hole of the shaft into view. The amount of lubricant to be injected at this point should never exceed 4 drops of engine oil from an oil can.

The toggle lever fulcrum pins on all clutches fitted to chassis up to B-199-DK should also be hand lubricated at the same mileage, each pin receiving 3 to 4 drops of engine oil from the oil can (On the later type clutches fitted to the remaining Bentley $3\frac{1}{2}$ litre chassis, these levers pivot on needle rollers which are initially packed with grease, and require no further attention between chassis overhauls).

$4\frac{1}{2}$ litre Bentley, All Chassis.

The withdrawal thrust ball race and its associated moving parts are all lubricated from the centralised chassis lubrication system.

The clutch shaftspigot bearing is initially packed with grease, and requires no further attention between chassis overhauls.

CLUTCH OVERHAUL - ALL MODELS.

A. REMOVAL OF GEARBOX: $3\frac{1}{2}$ LITRE & $4\frac{1}{2}$ LITRE, ALL CHASSIS.

1. Disconnect the exhaust pipe from the manifold, (three $\frac{1}{4}$ " B.S.F. bolts), and remove the conical packing piece.
2. Remove the silencer suspension from the gearbox cross-member.
3. Remove the silencer suspension from the cross-member forward of the petrol tank.
4. Remove the silencer and tail pipe.

5. Disconnect the universal coupling from the rear axle, (six 5/16" B.S.F. bolts).
6. Remove the six 2. BA nuts securing the propellor shaft vibration damper (if fitted) to the front universal, and pull the damper clear of the universal joint.
7. Disconnect the front universal (six 5/16" B.S.F. bolts), and pull the propellor shaft clear.
8. Remove the clevis pins from the two servo connections to the rear brake equaliser shaft, release the locknut on the rear of the rods, and unscrew from the shaft connection.
9. Remove the clutch and brake pedals by withdrawing the pinch bolts.
10. Remove the footbrake operating lever clevis pin, and remove the return spring.
11. Remove the clevis pins on the brake cable connections to the front axle, and undo the leather gaiters on the undertray.
12. Undo the two 1/4" B.S.F. nuts either side, together with the two 1/4" B.S.F. bolts in the centre of the undertray, drop the tray and pull the cable through.
13. Remove the oil pipes from the pedal shaft.
14. Remove the pinch bolt from the pedal shaft bush inside the right hand frame member, and also the two bolts holding this bush to the frame member. Lever this bush inwards along the shaft, and push the shaft away from the gearbox, removing same.
15. Remove the clevis pin securing the handbrake lever coupling rod.
16. Remove the speedometer drive.
17. Remove the control rod and flexible oil pipe from the damper control pump casing.
18. Release the locknuts on each rubber suspension at the rear of the gearbox, and screw in towards the centre. The cap will then come away with the rubber.
19. Support the gearbox on a suitable jack.
20. Remove the two nuts at each end of the gearbox cross member and also the two bolts on the underside at the centre. Remove the member.
21. Remove all the gearbox bellhousing nuts with the exception of the one at the top centre.
22. Remove four long bolts securing the starter pinion and housing, and remove same.
23. Remove the large inspection plate, remove the one remaining nut securing the gearbox bellhousing at the top, tap back the bolts, and remove the gearbox. (A certain amount of manipulation of the jack may be necessary before the gearbox is freed.)

DISMANTLING, RELINING & RE-ASSEMBLY OF THE CLUTCH.

- a) 3 $\frac{1}{2}$ litre Bentley, Chassis B-1-AE to B-199-DK inclusive.
1. Slacken off the clutch spring retaining caps to relieve the spring pressure.
 2. Remove the nuts securing the back plate assembly to the flywheel, and remove the unit complete with the driven plate and driving sleeve.
 3. Remove the setscrew securing the inner friction lining plate to the flywheel face, and remove the plate.
 4. Remove the eight clutch springs and toggle levers, and drop out the pressure plate, having first marked this to ensure identical re-assembly.
 5. Remove the driven plate securing nuts at the hub, and separate this from the driving sleeve. (In the case of the Spring Drive clutch plate, however, the eight 2. B.A. nuts securing the driving ring to the friction plate and the twelve 2. B.A. nuts retaining the damping springs in the centre of the hub must all be first removed before the plate and the driving sleeve can be separated, and, as these nuts have all been burred over, replacement nuts and bolts will be required for re-assembly).
 6. Drill out the existing rivets from the back of the liner plates, and remove the linings.
 7. Clean up the faces on both plates and fit the replacement linings, riveting in position.
 8. Fit the replacement driven plate to the driving sleeve. (The bolt holes on all replacement plates require to be reamed to size prior to fitting, and care should be taken to ensure that the face with the words "To Engine" etched on is to the front, i.e., facing the flywheel when assembled in the clutch.)

NOTE: As a means of assistance, the procedure covering the re-assembly of a replacement Spring Drive type clutch plate will be found detailed hereunder:-

The eight bolt holes in the clutch plate require to be reamed to size (2. B.A.) prior to actual assembly.

- a. Lay the friction plate, "Engine" side facing downwards, on the bench, and position a friction disc over its central hub. Place the driving sleeve, sleeve pointing upwards, on top of this disc, and coincide the twelve bolt holes in the driving sleeve flange with those in the friction disc.
- b. Drop the driving ring into position over the centre flange and after lining up the eight bolt holes with those in the friction plate, insert a driving spring between each alternate set of driving dogs. Temporarily secure the driving ring and friction plate together by pushing two of the squareheaded 2. B.A. bolts through from the "Engine" side of the friction plate, and tightening up the nuts. Do not, however, burr these over

- c. **Turn the assembly over, i.e., with the sleeve pointing downwards, and position the second friction disc over the hub on the "Engine" side of the friction plate.** Line up the twelve bolt holes in this with those already coincided, and insert the twelve tubular bronze distance pieces, pushing these fully home and ensuring that they are flush with the outside surfaces of the friction discs at either end.
 - d. Fit the driven plate over this second friction disc, coincide the bolt holes with those already coincident, and push the twelve 2. B.A. countersunk headed screws through the tubular distance pieces, ensuring that these are fully home. Turn the assembly over again so that the sleeve points upwards, and fit the damping springs over these screws. Each spring should have a plain 2. B.A. washer between the spring and the securing nut, and the nut should be tightened down to its fullest extent, i.e., when the plain washer comes into contact with the end of the distance piece, and can go no further, after which it should be lightly burred over.
 - e. Insert the remaining eight driving springs into position, push the remaining six squareheaded 2. B.A. bolts through in the same manner as previously explained, remove the two nuts already fitted, fit the driving ring cover in position over the driving ring, replace all the nuts, tighten these down and lightly burr over.
9. Refit the front friction liner plate to the flywheel face.
 10. Refit the pressure plate into the back plate assembly, ensuring that the assembly marks on both units coincide and that the plate slides freely on its serrations.
 11. Refit the toggle levers and replace the eight clutch springs, screwing down retaining caps, a few turns in each case.
 12. Slide the driving sleeve, complete with the friction plate, into the back plate assembly, lift the complete unit up to the flywheel, line up the assembly marks and position on the securing studs.
 13. Using a suitable arbor, centralise the friction plate, and then tighten up all the securing nuts round the back plate assembly.
 14. Fully tighten down all the clutch spring retaining caps, and remove the arbor.
 15. The withdrawal sleeve should be extracted from the trunnion (Push fit); if too tight the whole trunnion should be detached from the fork. The sleeve should then be threaded on to the spigot of the cover plate for the purpose of adjusting the toggle levers. These levers should be set to make equal contact with the face of the withdrawal sleeve when it is pressed forward with light finger pressure. The required measurement between the withdrawal sleeve face and the flywheel cover being 0.685" (17.4 m/m). The sleeve (or trunnion) should then be replaced in the fork.
 16. The gearbox should be replaced, as described later.
 17. The free pedal movement should be adjusted, if required, to $\frac{3}{4}$ " (19.05 m/m) and the linkage re-set accordingly.

3¹/₂ litre Bentley. Chassis from B-2-EF to B-169-FC inclusive (Light Type)

1. Relieve the clutch spring pressure by slackening off the retaining caps.
2. Remove the back plate assembly securing nuts, and pull off the unit complete with the driving sleeve and friction plate.
3. Remove the three special clamping pieces retaining the front friction ring to the flywheel face, and pull the ring off the driving dowels, first ensuring that this has been suitably marked for re-assembly. Care should be taken to see that the six small coil springs recessed behind this ring are neither lost nor damaged.
4. Drop out the driving sleeve and friction plate, remove the clutch springs and toggle levers, and remove the pressure plate, first marking this in relation to the back plate assembly for correct re-assembly.
5. Drill out the existing friction liner rivets and remove the linings from the clutch plate. Clean up both faces, and fit the replacement linings.

NOTE: These linings are supplied in sets of eight, already drilled and counterbored, and must, therefore, be fitted accordingly, i.e., one complete set should be fitted to one side of the friction plate before the other set is untied.

6. Inspect the pressure plate friction face, and re-face if necessary.
7. Examine the front friction ring (GB.1643) on the friction face for re-facing, if necessary. It should also be examined for distortion on the opposite (forward face), if excessive - too much to be trued with a light skim - the ring should be replaced.
8. If machining has been carried out to the ring, as described in the preceding paragraph:-
 - a) It should then be checked to ensure that the driving dowels permit the ring to freely contact the flywheel face when offered into position.
 - b) The three special clamping pieces should be re-faced if necessary, on their forward faces to allow a maximum end float of .004" (0.10 m/m) between the ring and the rear flywheel face.
9. The six small coil springs (GB.1650) - free length .859" (21.9 m/m) should be checked for evidence of lost tension due to heat and replaced, if necessary.
10. Refit the friction ring to the flywheel face, ensuring that the six small coil springs have first been replaced and that the assembly marks on both the ring and flywheel are coincident.
11. Replace the three special clamping pieces and re-check that the ring is free on the dowels and that the required end float is correct.
12. Lock the six nuts of the clamping pieces.
13. Refit the pressure plate into the back plate assembly, fit the toggle levers and replace the clutch springs, screwing the retaining caps up a few turns in each case.

14. Slide the driving sleeve complete with the friction plate into the back plate assembly, lift the complete unit up to the flywheel, line up the assembly marks, and position on the studs.
15. Using a suitable arbor, centralise the friction plate, and then tighten all securing nuts.
16. Fully tighten down all the clutch spring retaining caps, and remove the arbor.
17. The withdrawal sleeve should be extracted from the trunnion (push fit); if too tight the whole trunnion should be detached from the fork. The sleeve should then be threaded on to the spigot of the cover plate for the purpose of adjusting the toggle levers. These levers should be set to make equal contact with the face of the withdrawal sleeve when it is pressed forward with light finger pressure.

NOTE: Due to the curvature of the flywheel cover plate, it is impracticable to work from this face to the front face of the withdrawal sleeve in taking a measurement. (Fig. 5 Dimension 'A'), and the toggle levers should be equally in contact with the front face of the withdrawal sleeve when .125" (3.17 m/m) of the clutch cover spigot is exposed. (Fig. 5 Dimension 'B').

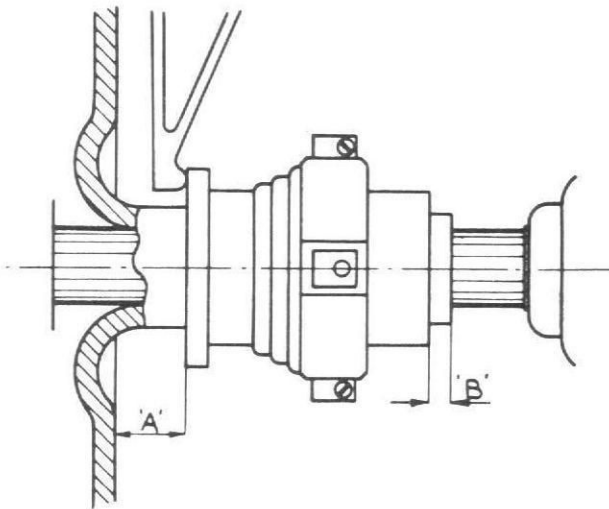


Fig. 5.

After making this adjustment the sleeve (or trunnion) should be replaced in the fork.

18. The gearbox should be replaced as described later.
19. The free pedal movement should be adjusted, if required, to $\frac{3}{4}$ " to 1" (19.05 m/m to 25.4 m/m), and the linkage reset accordingly.

4.1 LITRE BENTLEY, ALL CHASSIS. (BORG & BECK CLUTCH):

1. Remove the clutch unit (six $\frac{3}{8}$ " B.S.F. nuts and spring washers).
2. Inspect the friction surfaces on both the flywheel face and the pressure plate. Should excessive scoring have taken place, the flywheel will require to be removed for machining, whilst the clutch unit should be returned to the London Service Depot for replacement. Should it be

impracticable for the clutch unit to be returned as recommended, the pressure plate can be removed for machining in the following manner, but it is essential that **ALL** parts are suitably marked to ensure identical re-assembly.

DISMANTLING PROCEDURE:

Place the cover assembly on the bed of a press with the pressure plate resting on blocks so arranged that the cover is free to move downwards when pressure is applied. Place a block of wood across the cover, resting it on the spring bosses, and compress the cover by means of the ram. While under compression, remove the split pins, or shear away the peening, according to the type of fixing encountered, from the nuts retaining the release levers, and unscrew the nuts. Slowly release the pressure to prevent the clutch springs from **flying out**, and remove the release levers by holding lever and the eyebolt between the fingers and thumb so that the inner end of the lever and the threaded end of the eyebolt are so close together as possible, keeping the eyebolt pin in position in the lever. Lift the strut at the outer end of the lever over the ridge on the lever, and remove the eyebolt from the pressure plate.

3. Check that the replacement driven plate is free on the clutch shaft splines.
4. Centralise the driven plate by means of a locating arbor, locate the locating pin on the flywheel face, and secure the clutch assembly in position. Remove the arbor.

NOTE: In the event of a replacement clutch unit being fitted, it is essential that the ignition and valve timing marks stamped on the original Borg and Beck clutch housing are transferred to the new clutch in the same relative positions. This also applies to the tappet clearance figure required for checking valve timing.

5. The external adjusting link must be used to obtain the correct free pedal movement as described earlier in this leaflet. (The release levers on all replacement Borg and Beck clutch units are correctly adjusted by the Manufacturers).

IMPORTANT NOTE:

No provision is made in these clutches for subsequent adjustment due to wear or to incorrect assembly, should the unit itself be dismantled, i.e., **ALL** parts not restored to their previous relative positions.

At the time of initial assembly and adjustment the three nuts and eyebolts which control the position of the operating levers are drilled for split pins. Should further adjustment become necessary for any reason, it would be necessary to fit new eyebolts to allow for the subsequent re-drilling.

Subject to the requirements of the preceding paragraph, adjustment of the operating levers may be corrected as follows:-

- (1) The clutch unit should be secured to the flywheel, by the full complement of nuts, with the Borg & Beck Lever Adjustment Gauge centred in the place of the driven plate. The three flat machined lugs should be positioned directly underneath the three operating levers.
- (2) Each lever should then be **adjusted** at the eyebolt nut until the withdrawal bearing surface of the lever is in line with the outer face of the boss on the Gauge plate.

For accurate adjustments the Gauge Plate is essential (Use of the Driven Plate could give misleading results due to varying thickness and compressibility of the cushioning).

Should a Gauge Plate be unavailable, however, reasonable results may be obtained with the following procedure:-

- (1) The clutch unit should be bolted down to a face plate, with the Driven Plate centralised in position (The full number of bolts must be used - 6).
- (2) Using a Dial Indicator Gauge, set each lever to a dimension of 1.820" + or - .0015" (46.23 m/m + or - .04 m/m) between the withdrawal bearing surface of the lever and the surface plate.

Re-Assembly of the Gearbox, 3 $\frac{1}{2}$ litre and 4 $\frac{1}{2}$ litre - ALL CHASSIS.

1. Push the gearbox under the car, and lift up to the clutch housing. Turn from the rear to line up the splines.
2. Replace the bellhousing bolts in the crankcase.
3. Replace the starter motor pinion and housing together with the retaining bolts.
4. Replace the gearbox cross member, and line up the gearbox by means of the jack. Secure the gearbox to the crankcase.
5. Check that the pedal shaft securing bracket is free on the shaft, and replace the shaft from under the chassis, replacing the two securing bolts and the pinch bolt, and reconnect the coil pipe.
6. Refit the two pedals and secure with the pinch bolts, the nuts on these facing each other. Lock the nuts by means of split cotters.
7. Reconnect the brake pedal return spring, replacing the collar and cotter pin.
8. Refit the brake pedal connecting rod to the servo mechanism.
9. Reconnect the speedometer drive.
10. Reconnect the damper control rod, and screw up the adjusting screw until the ball joint is just free to move. Secure with the small pinch bolt.
11. Reconnect the flexible feed pipe to the bottom of the damper control pump casing, and top up the casing with oil if necessary.
12. Adjust the clutch pedal free movement.
13. Thread the front brake cables through the undertray, lift the tray into position under the chassis and secure.
14. Lace the leather gaiters into position on the undertray.
15. Reconnect the front brake cables to the levers on the front axle.
16. Reconnect the two brake rods to the servo and rear brake equaliser shaft respectively. The longer of the two rods should be passed through the hole in the cross-member, and then screwed into the fork on the equaliser shaft, the front end being secured by means of the clevis pin. Pass the shorter rod over the cross-member, and connect the front end to the short lever adjacent to the servo drum, the rear end being screwed in the same manner as the longer rod.
17. Place the exhaust pipe and silencer under the chassis. Lift the tail pipe and pass a small bolt through the bracket, as a means of support. Lift the exhaust pipe up to the manifold, replace the conical packing piece in position, cone upwards, and secure, but do not tighten until

small bolt is located in the holding brackets from the sump to the lug on the silencer.

18. Replace the 5/16" B.S.F. bolt through the suspension bracket from the gearbox cross-member, refit the distance piece, and secure.
19. Replace the 5/16" B.S.F. bolt through the suspension bracket on the cross-member forward of the rear axle, and secure.
20. Refit the propellor shaft at the front end.
21. Refit the propellor shaft vibration damper (if fitted).
22. Reconnect the rear universal to the rear axle.

Sr. - FBA. Ltd.,
Allied Motors, Bombay.
Rv. - Madrid.
Mr. de Boeck. - Nice.

Sg.

C.

H.

Tr.

Cx.

Mr. Evans. - Lillie Hall.

Mr. Crawford. - Lillie Hall.

Br. - N.

Bentley Repair Depot, Glasgow.

Bentley Repair Depot, London.

Mr. Reid, Glasgow.

Instruction School.

D.O., Mr. Walker.

Hs.

Mr. Hancock.

D/BP.

EWT.

Mx.

BY.

EP.

Mr. Robinson. - Holland.

Repair Department.

13th December 1935.

DEPOT SHEET NO. Hd.295.

CLUTCH.

3½ LITRE BENTLEY CHASSIS.

Origin of information:-
BY/TWD6/E.15.11.35.

One or two instances have occurred where the bosses which carry the four adjusting screws on the fly wheel have come loose in service.

This only refers to the type of clutch introduced at the commencement of "E" series, i.e., B.1-EEF.

This is due to there being no provision for locking the two countersunk headed screws which secure the boss to the fly wheel.

The fixing has now been improved by using heat treated nickel steel screws instead of mild steel. They are screwed into place by means of a spanner, there being a square extension on the screw head which is twisted off in the process of tightening up. They are then locked by peening the metal of the screw head into slots which are cut in the bosses. The attached sketch makes this clear.

-contd-

Continued:-

The existing bosses may be modified as shown and new screws are now available and will be forwarded to Depots.

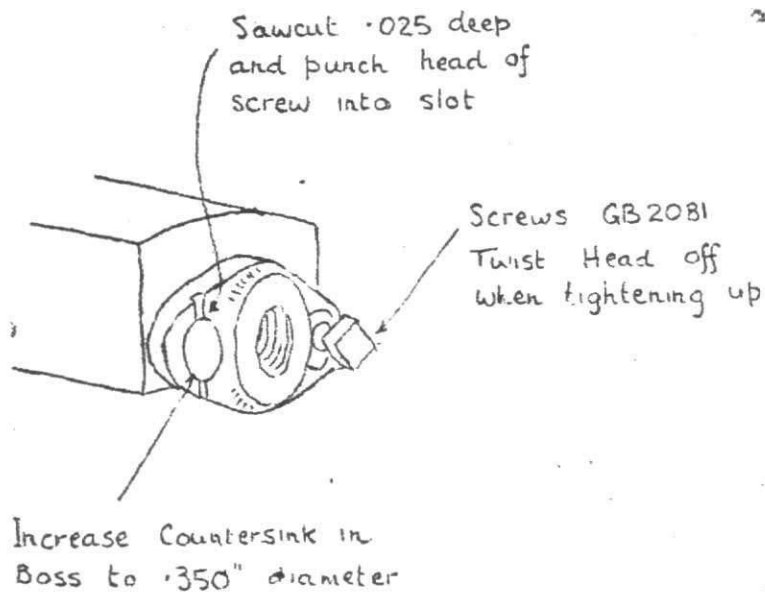
Chassis should be modified as and when they become available at Depots and they should be reported to us after modification, in the usual way.

Cars after chassis No. B.53-FC are already modified.

. Hd.

Hd 295

-3-



MODIFICATION TO CLUTCH ADJUSTING SCREW

BOSSES. 3 1/2 LITRE BENTLEY

518 Hd 295

7
25th August 1936.

DEPOT SHEET NO. Hd. 307.

CLUTCH JAGGERS.
Bentley Chassis.

Origin of information.
Hs/Smth18/KW.13.7.36.

The following should be carefully noted when dealing with complaints of clutch jagers on $4\frac{1}{4}$ litre Bentley or 25/30 H.P. Rolls-Royce cars:-

The two principal causes of jaggering are incorrect setting of the operating fingers and irregularities in the thickness of the driven plate when it is compressed. A contributing cause in some cases is poor finish on the flywheel.

FINGER SETTING. To check this -

1. Mount the clutch on the flywheel in the normal manner but with the driven plate replaced by a metal gauge plate of uniform thickness.
2. Work each of the fingers, say, half a dozen times and tap the eyebolt nuts to ensure that the fingers have settled into their correct working position.
3. Find the highest points of the finger contact pads by blueing them with a flat surface.
4. Find the variation in height of these points by mounting a clock gauge from the crankcase joint face and turning the flywheel, being careful to take up all the end float in crankshaft. If the maximum variations between two of the fingers exceeds .005", the clutch should be changed.

Cont'd.

THICKNESS OF DRIVEN PLATE. Find the thickness of the driven plate when compressed locally at the centre of each crimped segment. If there is an irregularity of more than .005", the plate should be changed.

FLYWHEEL FINISH. On the earlier $4\frac{1}{2}$ litre Bentley and 25/30 H.P. units, the finish of the flywheel friction surface is not dead smooth. An improvement can be made by rubbing lightly with fine emery paper.

Occasionally it may be found that while the clutch is free from shudder, there is a tendency for a rattle in the transmission to occur as the car moves off from rest. This will probably be particularly noticeable in second speed.

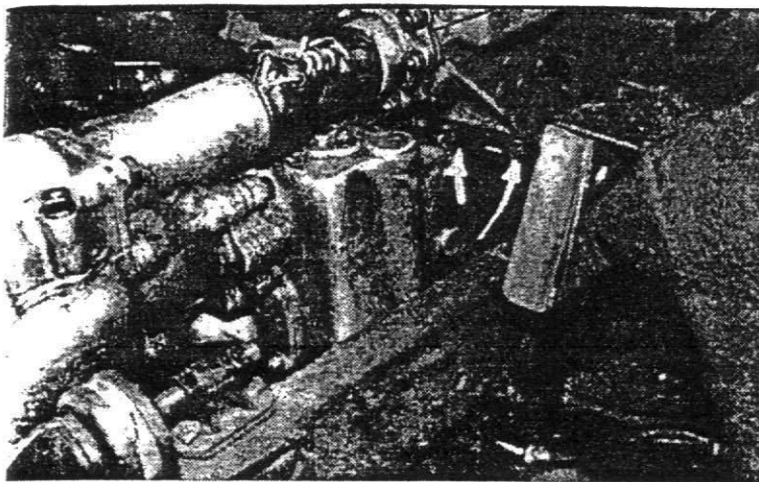
In such cases the propeller shaft damper should be fitted, and in all probability this will eliminate the noise in question. Provision is made for fitting the propeller shaft damper on the 25/30 H.P., and it can also be fitted to the $4\frac{1}{2}$ litre Bentley. The latter is, however, a more expensive job.

Hd.

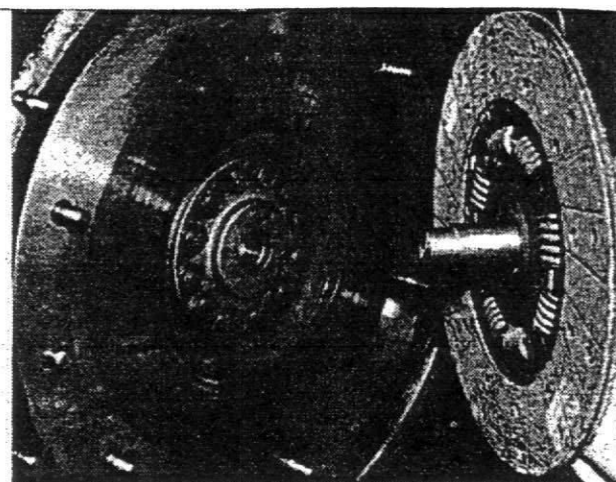
F

Clutch

RREC, RROC & Misc Articles



Arrows show 2 of 4 nuts holding gear lever gate to frame. "Sawed-off" part is body cross member.



Relined clutch plate on 1" diameter of mandrel: .875 dia. end about to be inserted in center of flywheel.

BENTLEY 4 1/4 L. CLUTCH RELINING

Dear Geer Bochs:

Last summer the clutch on our 4 1/4 Bentley (B87LE) got pretty slippery. It gripped well (in fact, even chattered) when the engine was cold, but at normal operating temperature, a pretty light touch on the throttle was necessary to avoid slippage, and dragging VW's from traffic lights became just humiliating. Diagnosis (later verified): oil on the clutch plate.

(N.B. Comments below re gearbox removal probably apply to all 3 1/2 and 4 1/4 litre cars. However, information about the clutch pressure plate and friction disc apply only to the 4 1/4 litre model.)

This winter we got out the Bentley Service Sheets, jacked the car up with the wheels about 7 inches off the floor, and started to disassemble, following the steps beginning on page 5 of BM/F2. When we went to unbolt the vibration damper from the front universal joint and disconnect the universal coupling (steps 6 and 7), we found that there was apparently a solid body cross member in the way. Closer inspection showed that it had bolted joints and so it was taken out.

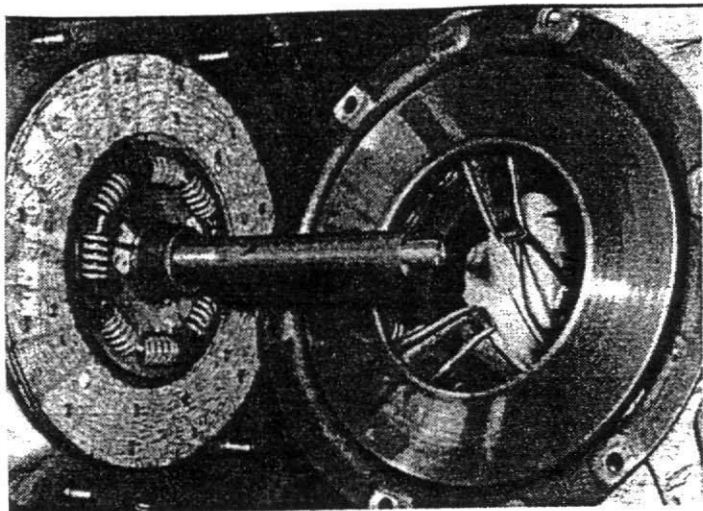
All went according to the book until we got to step 23 (actual removal of the gearbox from the flywheel). It then became apparent that the gear change gate at the bottom of the gear lever was bolted to the frame and would have to be unfastened to permit removal of the gearbox with the gear lever attached. Two steps should be added between steps 19 and 20:

19a. Remove floorboard support bracket adjacent to gear lever gate.

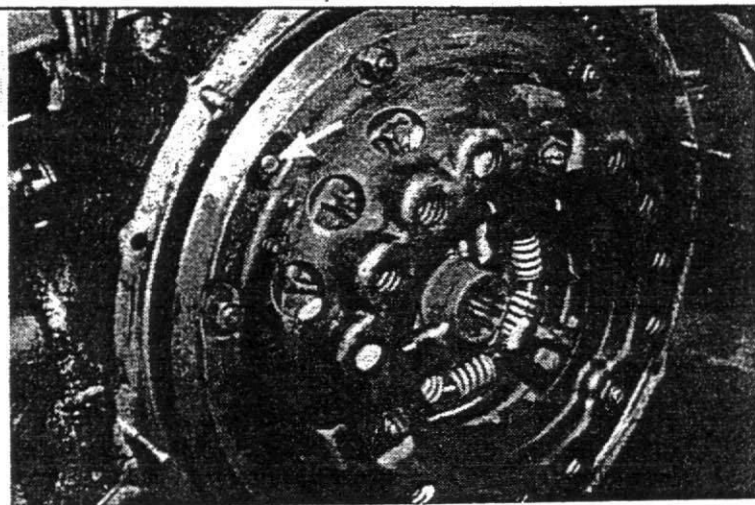
19b. Remove 4 bolts holding gear change lever gate to chassis frame. Two of these bolts pass through stiffener brackets inside the frame channel. Note the small clearance for nuts on these bolts, and the order of removal; it simplifies reassembly.

Step 23 should mention that the front end of the bell-housing has a spigot to fit inside the flywheel housing. It may be necessary to tap the blade of a dull knife between the flanges of the two housings at several places to encourage them to separate. The gearbox has to be moved aft about 1/2 inch to disengage the spigot, and about another 2 inches to withdraw the first motion shaft from the clutch plate (friction disc).

The pressure plate assembly was exposed as the gearbox was lowered to the floor. We used a floor-type hydraulic jack for this. Try to have one available before you begin this job. It's a nearly impossible task without either a garage-type jack or a chain hoist, and from where could you hang the latter? We removed it by undoing the six mounting nuts evenly, one revolution at a time. This avoids possible distortion of the pressure plate assembly flange. As the latter came off, the friction disc came with it. Although there was plenty of lining left, it was pretty well oil-soaked. The one-shot system appeared to have supplied the oil. A short length of brass tube is mounted on the bell housing above a cup on the throw-out bearing. When the one-shot (Bijur) pump is operated, a drop or two of oil is supposed to fall into this cup to lubricate the bearing. In our case, the pipe had been bent slightly so that the oil tended to miss the cup and fall on the rotating parts, from which it was distributed very neatly over the



New clutch plate centered in place with mandrel (or pilot shaft) as pressure plate assembly approaches.



Pressure plate assembly bolted home. Note unsymmetrical locating-dowel hole at upper left.

clutch plate. A slight push on the free end of the pipe re-aimed it properly.

We took the clutch plate (friction disc) to the T. T. Bearing Co. (454 Court St., Rochester, N.Y. 14604), expecting to have to have a new lining cut and punched to fit. A sharp-eyed, experienced salesman thought it looked familiar, however, and from stock produced a pair of liners with properly located rivet holes and only 1/8 inch less in diameter than the original. In 15 minutes we were on our way with a relined plate. Cost: about \$7. Facings were Grey-Rock VL-953-C.

To center the friction disc while refitting it between

the flywheel and the pressure plate assembly, we took a 4-inch length of 1-inch cold rolled round stock and turned about an inch of the length down to .875 inch to fit the center hole in the flywheel. The 1-inch diameter was a good sliding fit inside the splined hole in the friction disc. With the .875 end inserted in the hole in the flywheel, the friction disc was slid on over the 1-inch diameter and the pressure plate assembly was reinstalled, tightening nuts one turn at a time in rotation. This insured that the two holes would be axially aligned for insertion of the gearbox first motion shaft. Happy relining! Roy Bertch and Tournez L'Huile

Oil Leaks in Bentley Clutches

OIL LEAKS ON BENTLEY 4 1/4 L CLUTCH--MORE

Let's add this to the clutch relining article on pp. 900-901.

There are two other areas which will leak oil into the bellhousing, they are the rear seal and the starter-motor. Rolls-Royce had a modification explained on their repair sheets for correcting the starter-motor leak (a hole drilled in the housing near the motor). I would also recommend replacing the rear seal and drilling a 1/4-inch hole in the bottom of the bell housing to drain any oil which works past the seal.

To replace the seal, proceed as follows: Grind the peening off the ends of the 12 flywheel bolts and remove the nuts. Work carefully if you wish to reuse the nuts and bolts. Mark the location of the pin in the flywheel by putting a center punch mark on the bolt nearest to it. This allows the timing marks to be replaced properly. Tap the bolts back with a drift pin, about 1/4

inch. The flywheel is a tight fit and will have to be worked off. Do not use the nut and bolt which hold the crankshaft end plug in place as a bearing point for a puller.

With the flywheel off, you can have the surface machined. On my flywheel the 6 studs are right-hand threaded into the face. Work carefully in order to preserve them if you are using a stud puller. We drilled the pin out and replaced it after machining.

Pull the 12 flywheel bolts out of the way and remove the brass machine screws which hold the two seal halves to the block. Now is the time to replace the bolts if you wish to do so. New nuts, bolts, and seal felts are available from Rolls-Royce as I just received them in July.

With the new seals and the two drain holes in the housing, any possibility of oil reaching the clutch lining is eliminated.

Elliot G. Jacoby, Jr., Pa.