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Front Axle (rigid)

FACTORY

SERVICE INSTRUCTION LEAFLET

ISSUED BY

BENTLEY MOTORS (1931) LTD.



BM/L1

SB/VK.2/JSP.

Subject : OVERHAUL OF STEERING PIVOT PINS
BENTLEY 3½ & 4½ LITRE MODELS

Date
of 1st September, 1953
Issue

IMPORTANT

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OF THIS
DOCUMENT ARE
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GENERAL:

On all 3½ and 4½ Litre models, the axle pivot upper bearing is a Hoffmann roller assembly and the lower bearing consists of a chrome nickel steel bush pressed into the axle pivot, the corresponding portion of the pivot pin forming the inner bearing element.

On A & B series cars, the tapered portion of the pivot pin has a maximum diameter of .700", which dimension was increased to .750" on all subsequent models.

Preliminary Dismantling:

The work on the pivot pins is best done with the front axle removed from the car, rather than carrying out the overhaul in situ.

1. Jack up the front of the car and place a stand under each chassis side member.
2. Remove the front wheels and draw the front hubs as described in Service Instruction Leaflet ~~HM~~/V1. Special tools are required for this.
3. Disconnect the brake cables from the torsion bars by removing the split pins and collars and withdrawing the cotter pins.
4. Disconnect the shock absorbers links from the front axle.
5. Disconnect the actuating rods from the brake levers.
6. Disconnect the forward end of the side steering tube.
7. Remove the cross steering tube complete with the steering levers.
8. Remove the brake shoe carrier plate, the brake shoe pivot bolts and the brake shoe guides. Withdraw the spring eye pins from one brake shoe, withdraw the toggle lever pin connections and remove the brake shoes. Remove the brake back plate.
9. Undo the nuts on the road spring U-bolts, lower the front axle and mount it in a convenient working position.

It will be necessary to disconnect the pipe lines of the chassis lubrication system, stage by stage, but as no difficulty should be encountered in this respect the description of the system is omitted.

Removal and Refitting of Axle Pivots:

1. Undo the securing nuts and remove the top cap.
2. Undo the securing nuts and remove the bottom flange, taking care not to lose the thrust washer.
3. Undo the pivot pin nut and lift out the locking washer and loosen the setscrew in the back of the axle neck.
4. With a suitable drift drive the pivot pin out in the downward direction.
5. From beneath, drive out the top bearing assembly.
6. Pull away the pivot axle, taking care not to lose the dust excluder positioned over the bottom bush. The bush may then be driven out in the downward direction.

For A & B Series cars no oversize pins are supplied, but a repair may be effected by reaming the axle eye 1:200 taper to take the later type pivot pin (GB.1465). This procedure may also be adopted for cars fitted with the original pivot pins, but in these cases it will be necessary to fit the later type top bearing and oil trough. The early type pivot pins are easily recognised as they are threaded .500" B.S.F compared with .5625" B.S.F.

From C Series onwards oversize (+ .002" & + .010") pivot pins are available. In fitting these pins it is necessary to ream the axle eyes with a 1:200 taper reamer to the desired light drive fit. It is essential that the pivot pin goes fully home in the axle eye to nip the dust excluder against the lower face of the axle eye, and that the groove registers with the setscrew in the axle neck.

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B.
E.
Mr. Robinson. - Germany.
Repair Department.

9th January 1935.

DEPOT SHEET NO. Hd.272.

FRONT AXLE CONTROL.

BENTLEY CHASSIS.

It has been found that there is a possibility of the front axle control member being deprived of lubrication, by reason of the fact that in several instances the rear eye bolt has not been provided with an annulus to convey oil from the feed hole in the leg to the hole at the top of the spindle over which the eye bolt is pressed.

Depots should therefore note that all Bentley chassis which become available should have the anchorage bolts dismantled and examined for this particular feature.

It is unnecessary to remove the eye bolt from the spindle as it is pressed on, but it is easy to tell whether there is a proper oil duct by blowing down the oil hole in the leg and noting whether there is a clear passage through the hollow shaft.

In the event of it being found that there is no passage through to the spindle, and examination of the eye bolt reveals that the annulus has actually been cut, check whether there is an oil hole in the spindle to coincide with the annulus, because it is possible for the spindle to have been fitted the wrong way round, causing the oil hole to register with the blind eye bolt at the front.

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30.5.35.

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DEPOT SHEET NO. Hd. 282.

FRONT AXLE PIVOTS - BENTLEY.

Origin of Information:
Hs/RM3/KW25.5.35.

A case has occurred on an Experimental Bentley car, which has done a very large mileage under particularly abnormal and strenuous conditions, of a pivot failing, as shown on the attached Sketch.

We recommend that, as opportunities occur, cars which have done 30,000 miles and over should be examined at this point.

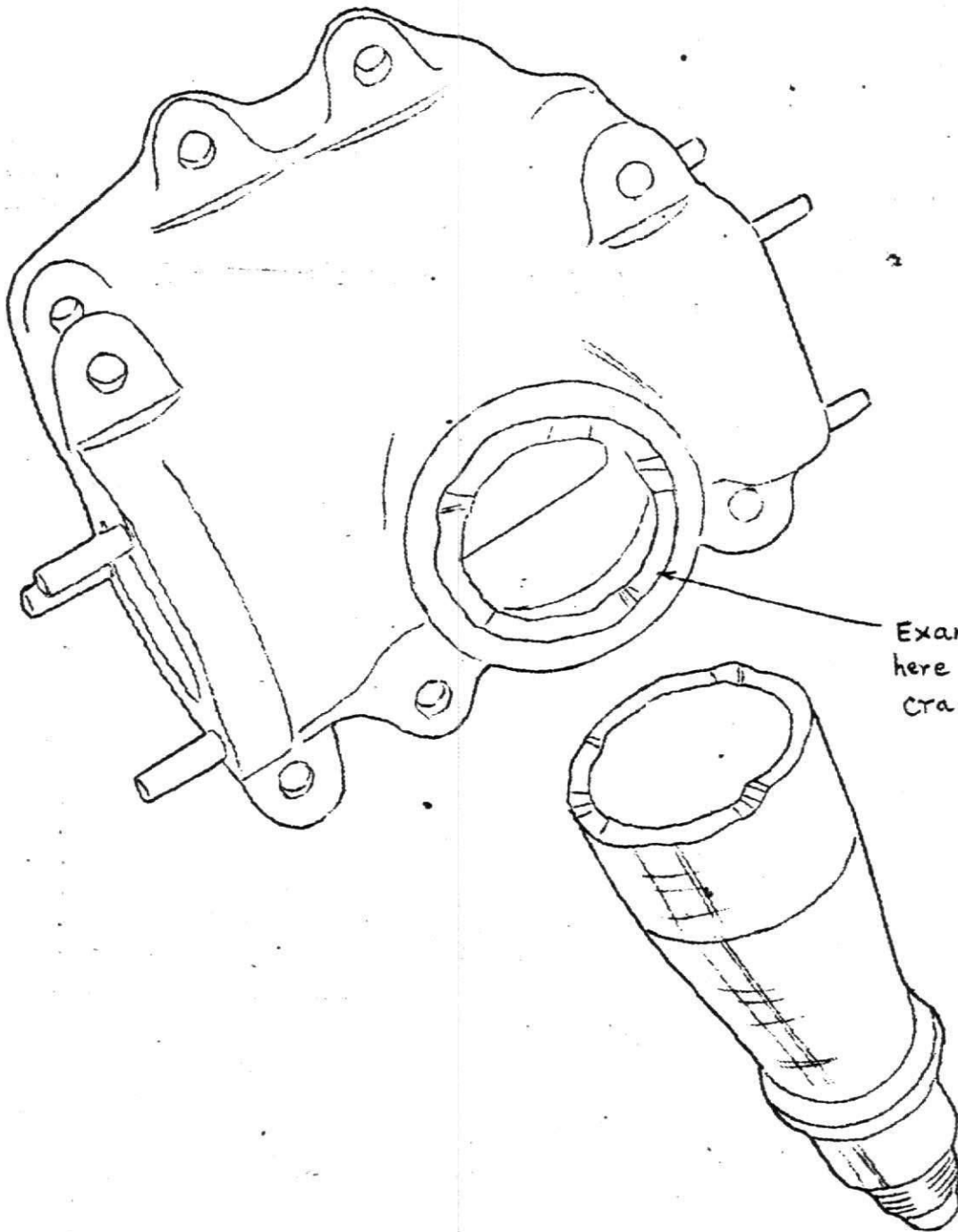
In view of this failure, all pivots fitted to new cars are being strengthened up from the present date onwards.

Hd.

Hd 282

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Examine round
here for sign of
cracks.

Hd. 282

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Mr. Reid, Glasgow.

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Mr. Hancock.

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Repair Department.

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18th July 1935.

DEPOT SHEET NO. Hd.288.

FRONT AXLE PIVOTS.
Bentley Chassis.

Origin of Information:-
BY/Cghll/G.3.7.35.

It has now been decided to change the front axle pivots on all cars in service.

The new pivots have been strengthened by reducing the size of the bore in the stub axle and a larger radius is added to the root of the stub axle where it joins the vertical pivot.

This necessitates the fitting of a distance piece behind the inner ball bearing and the fitting of new ball race covers as shown in the sketch attached.

On A. and B. series chassis the new pivots required are GB.1927/8, whilst on C. series onwards, pivots GB.1882/3 are required.

Supplies of material are now in course of manufacture and will be sent to Depots as quickly as possible.

-contd-

The greatest importance is attached to changing the pivots on earlier cars first, but if later chassis become available at Depots, the opportunity should be taken to change the pivots on these cars.

When the pivots have been changed, the letter "P" should be stamped on the offside brake actuating tunnel on the axle, as shown in the sketch.

All chassis modified should be reported to W. in the usual way.

With regard to the new bearing caps GB.1885/6, which are required, it should be noted that where facilities are available the existing caps may be modified by increasing the 1.9375" diameter bore to 2.046" diameter.

A small supply of new bearing caps will be available as a floating stock. Any of the original bearing caps not modified should be returned to W.

Hd.

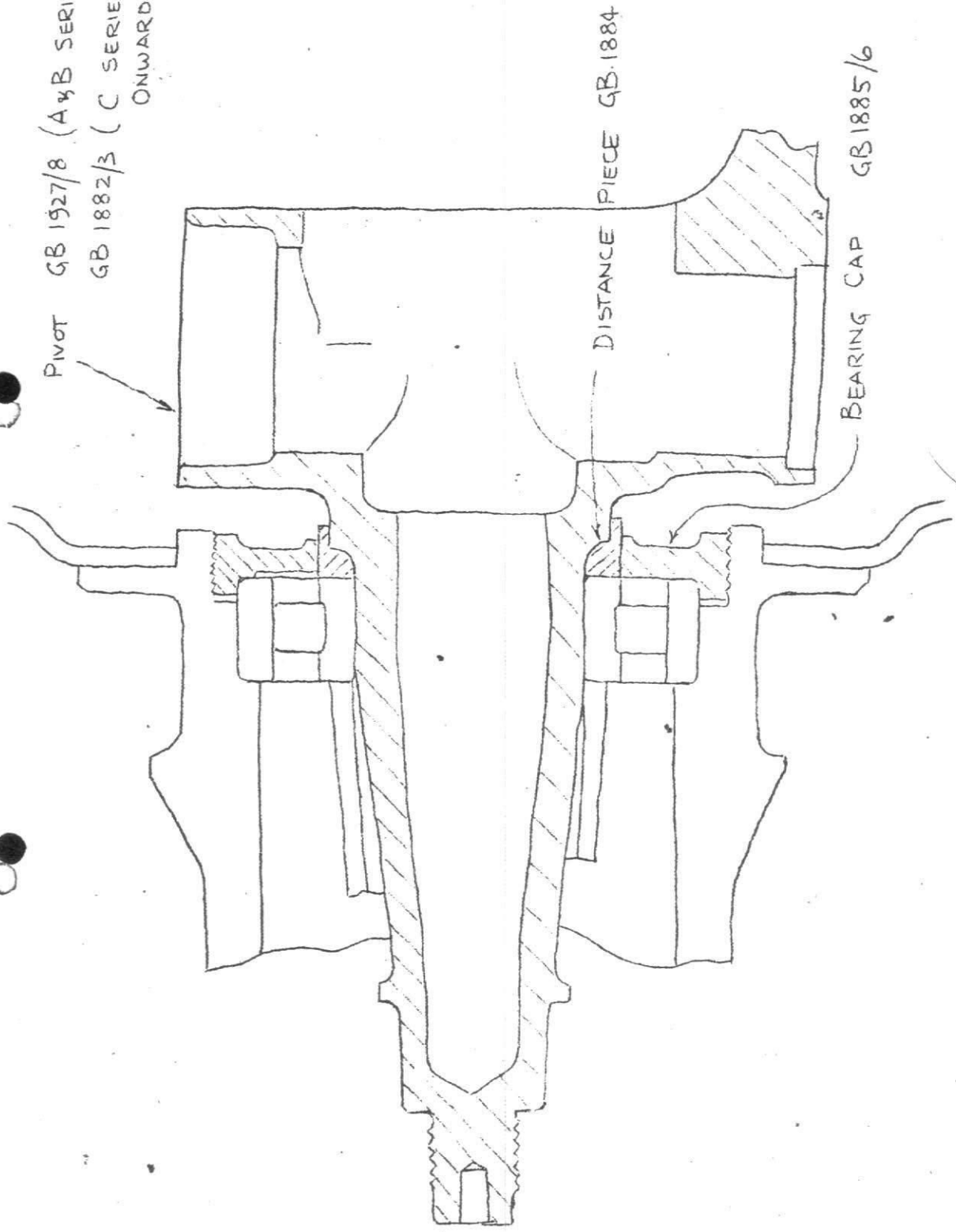
Pivot GB 1927/8 (A & B SERIES)
GB 1882/3 (C SERIES)
ONWARDS

DISTANCE PIECE GB.1884

BEARING CAP GB 1885/6

STRENGTHENED PIVOTS - BENTLEY

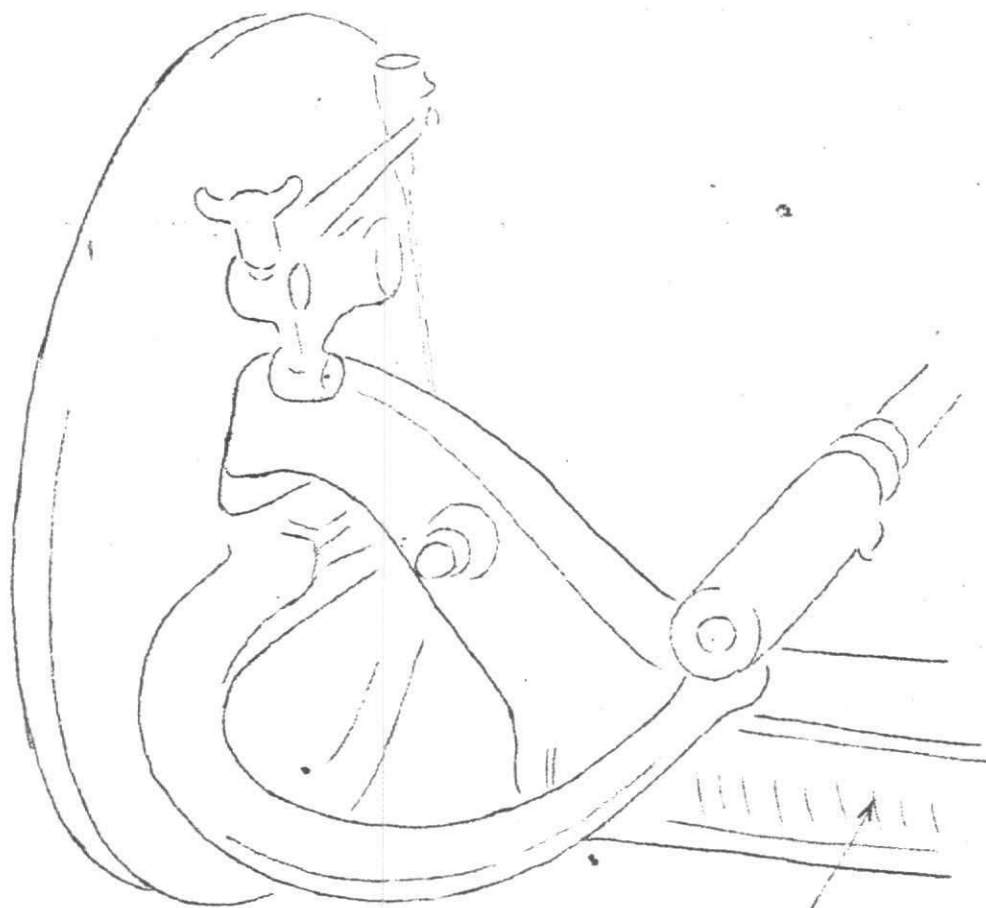
Hd. 288



Hd 288

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STAMP LETTER 'P' HERE

Hd. 288

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10th July 1936.

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DEPOT SHEET NO. Hd.305.

BENTLEY FRONT AXLE CONTROL.

Origin of information:-
Hs/Rml4/KW.30.6.36.

It has been established that if, owing to wear, excessive slack develops in the triangular links which convey the brake torque to the shock absorber arm, front brake jagers are likely to be aggravated.

It should therefore be noted that it should be made a routine job to inspect the axle controls whenever a car comes into a Depot, and the end play should be taken up by adjustment or, if the wear is excessive, new parts should be fitted.

Care should be taken to ensure that the lubrication from the bigur supply is satisfactory.

Further, a ZT.3 type metering valve should be fitted to the anchorage in place of the ZT.2 type now fitted.

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 Rm.
 RHC.
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 Repair Department.

25th June 1937.

DEPOT SHEET NO. Hd.353.

FRONT AXLE CONTROL ANCHORAGE.
 3½ and 4¼ Litre Bentley Chassis.

Origin of information:-
 Hd/SB25/HR.17.6.37.

In order to reduce trouble due to rapid wear of the bronze bushes on the Bentley front axle control anchorage, new cars are now being fitted with hardened steel anchorage spindles and bushes. The design of the rear bush has also been altered so that the threaded adjustment is on its outside diameter instead of being screwed on a separate ¾" diameter spindle.

In order to enable the hardened steel bushes to be used retrospectively for repair work, a special design of bush has been made which will fit the existing triangular bracket without alteration.

The new parts required are:-

FB.2606.	Bush, front end.
R.2642.	Bush, rear end.
R.2643.	Anchorage spindle.

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Continued:-

It is important to note when fitting these parts that a new metering plug, size ZT.3, should be fitted to the anchorage instead of the present ZT.2.

The parts mentioned above will be suitable for repairs on all Bentley cars up to approximately B.33-JY., after which, hardened steel bushes and spindles are used on Production.

A supply of bushes and spindles has been ordered and will be available shortly.

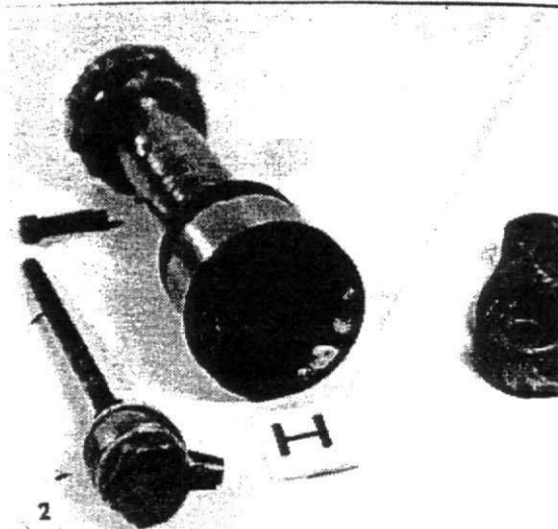
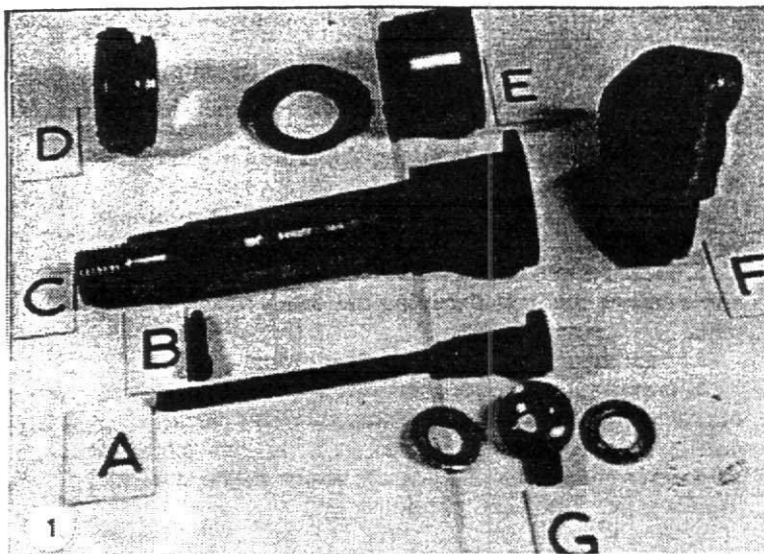
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Derby Bentley Society – technical paper compilation

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Front Axle (rigid)

RREC, RROC & Misc Articles



KINGPIN OVERHAUL "One Shot" Oil Distribution and Flow Control by Wing Cdr. R. E. Kirkby

Parts shown are 1938 4 1/4 Bentley but sufficiently alike R-R for purposes of illustration. A knowledge of how the parts in photo 1 are assembled is needed for full understanding of the lubrication method.

Assembly

Bearings: Roller bearing D is driven into the top yoke of the stub axle assembly from above, and the hardened steel plain bearing E driven into the bottom yoke from below, with the dust cap shown alongside placed on top of E after E has been driven home.

Pivot Pin: Set screw B is located in the eye of the axle, on the inside face near the top, pointing outwards towards the end of the axle. The narrower end section projects inside the bore of the eye. The stub axle is offered up to the axle eye, and swivel pin C driven in from below, with the keyway immediately above the central oil hole aligned with setscrew B. Axle eye and pin C are both tapered 1:200 with the pin a light driving fit. The stub axle assembly on its bearings D and E rotates about pin C which is prevented from turning by the 1:200 taper and by setscrew B in the keyway.

Rusted Bearing E: The bright area on E may be misleading, this is not a working surface kept bright by rotation but a ground finish which has stayed clean since original installation. The thick base section of pin C gives a clear idea of the actual condition of working surfaces--badly worn, scored, and pitted with rust, with the interior of bearing E in the same condition.

Standpipe: After pin C is driven home, standpipe A, with banjo G at its base sandwiched between two aluminium washers, is screwed into bottom flange F and entered into the pin C at H, photo 2, the flange then being bolted to the yoke. The banjo is shown without its associated piping.

Felt Filters: From instruction books most readers will know there is a renewable felt filter located towards either end of the axle. After passing through this filter the oil travels along a drilling in the axle body, and emerges in the axle eye opposite the oil hole in pin C. As the two holes have to be in alignment, the significance of setscrew B engaging the keyway in pin C becomes more obvious.

Length of Standpipe: Photo 4 shows that the standpipe, when in position, reaches a point inside pin C flush with the bottom edge of the oil hole.

Hollow Pivot Pin: Pin C is drilled out end to end 5/16" except for a 7/8" length of 1/2" dia bore shown at H. Inboard of the 1/2" dia section, and by means of a bush approximately 1" long, the 5/16" dia is reduced to 3/16". The 3/16" dia parallel section of standpipe A is a running fit in this 3/16" I.D. bush.

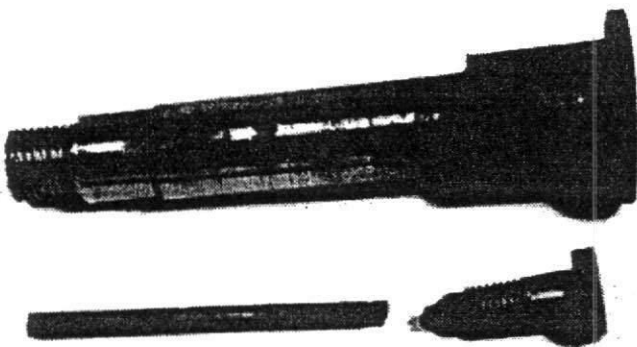
Metered Flow Upwards: In photo 3, J is a 5/16" aluminium washer with central hole about 3/32" dia pushed into the top of pin C to meter oil flowing upwards.

Oil Flow and Metering

Flow Through Pin C: Oil enters pin C from the axle eye as described above. Part flows upwards to the brake cam bush via a pipe attached to the top plate of the stub axle assembly (not illustrated). Bulk flow is downwards through the standpipe and banjo, thence by pipe through the backplate to the two steering ball joints on the right stub axle (single joint on the opposite side). A second pipe on banjo G passes upward to the top plate, and is assumed to duct excess supply not required by the ball joint(s), back to the hollow in pin C as a reservoir.

Metered Supply to Bearing E: The running fit between standpipe A and the 1" long 3/16" dia bush in pin C, allows a metered flow of oil to reach the 1/2" dia hole at H, form a separate reservoir, and feed the lower bearing E through the two 1/16" dia oil holes in the side of pin C towards the base.

Standpipe Fracture: Another fairly well-known fact is that the standpipe can fracture, cause oil to flood internally and ruin the brake linings. Photo 3 at 1 shows a broken standpipe which has failed just inboard of the bottom flange F. "Necking" can be seen on standpipe A at the same place, and its failure was fairly imminent, due to rust and pitting. The rust condition of the standpipe, pin C, and interior of bearing E is assumed to come from grit laden water running down the backplate outer face, into the lower yoke, and running between pin C and bearing E where wear has developed, to collect in cavity H.



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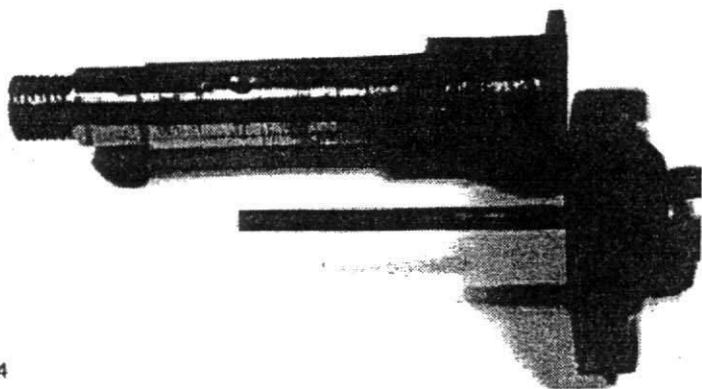
Oil Drain Holes: The brake cam bearing housing is bolted to the backplate on the outside, with a drilling through for oil supply from the top of pin C. There is an external hole in the base of this housing for draining off excess oil. Below the cam, riveted to the inside face of the backplate, there is a small "gutter" to catch any internal drips and duct them outwards through a hole. Both these drain holes need cleaning out periodically.

Blocked Supply Holes: The base of both pivot pins on this Bentley were in very bad condition. Except for a 3/16" dia hole formed by standpipe A, the interior of cavity H was solid with a congealed mixture of oil, grit, and rust. The two 1/16" dia oil holes feeding bearing E were filled with rock hard deposits, and no lubricant had reached these bearings for a long time. Wear was so advanced that in the end all tread on a new tyre was being ripped off the left front wheel in 100 miles.

Blockage with Grease: A previous owner had disliked the "One Shot" system, substituted nipples in certain parts, and pumped in grease. As the narrow passageways to brake cam bearing and bearing E are intended for oil flow, use of grease aggravated the situation and will cause troubles elsewhere if applied similarly through nipples as an alternative to proper attention to the "One Shot" system. An oil filled gun can be used to force feed pipelines where ball valves at supply points are stuck, but that is another long, and different story.

Oil Tight Joint: Bottom flange F has a bronze thrust washer on the inside face. Another feature is that in spite of the oil reservoir forming in H there is no fibre or paper packing or obvious gasket cement between F and the bottom yoke to prevent oil seepage. Unlike the rusty face of pin C around cavity H, the surrounding face of F was clean and rust free after 30 years, and presumably relies on clean, metal to metal faces for an oil tight joint, provided flow into cavity H is restricted and the "One Shot" is not used excessively, this being a known cause of oil contamination of brakes. The writer would appreciate comment from informed sources on these presumptions.

Development of Wear: It seems reasonable to assume the vicious circle started with the 1/16" dia supply holes to bearing E becoming blocked, then with lubrication cut off wear developed rapidly allowing water to penetrate to cavity H more freely. Side play developed in pin C (a good .025" in this instance), the standpipe being moved sideways by the 3/16" bush beyond cavity H, and snapped off at its base where weakened by rust; this happening progressively from road shocks, the standpipe being held rigidly by flange F in relation to the worn moving pin.



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Possible Repairs Needed: When new pivot pins are fitted the need to renew weakened standpipes would be obvious from appearance, but if standpipes alone were being replaced to cure oil leakage it may not be equally obvious that oil supply to bearing E could also have failed. In this case, if pins and bearings are still sound, the only practical remedy is to drift the pins out and put a 1/16" drill through the supply holes. You might ream them free in situ with something like the short end of a suitably ground Allen key--remembering the holes face towards the centre of the axle--but working from below on very hard deposits would be tedious, and the holes difficult to locate.

Removing Pivot Pins: To extract the pivot pins, R-R recommend removing the axle. Except for early P-I's, the pins ought to come out fairly easily and extraction could be tried with axle in position. A bronze or copper drift about 1" dia is needed, with 9/16" dia hole drilled a short way into one end to sit on the threaded end of pin C to prevent the drift slipping.

Replacing Pivot Pins: During assembly it is fairly easy to align the keyway and setscrew B, because these parts come opposite each other before the 1:200 taper on pin and eye starts to bite, and the pin can still be turned. The setscrew must be removed before starting to drift out the pin. The keyway is cut into the pin to the same depth as the threaded part of the shank. Note in photos that there is a solid collar of material between shank and keyway which the end of the setscrew would not clear. Likewise, the setscrew needs to be screwed back flush with the bore of the eye when inserting the pin, otherwise it will foul the edge of the collar adjacent to the threads. Once the collar is well past this point the screw can be advanced to make light contact with the keyway and properly secured after the pin is driven fully home.

Removing Bearings: Lift off dust cap before starting to drive out bearing E. A second dust cap is located under roller bearing D and is a fixture. Be sure to pass your drift beyond this cap before starting to tap out D.

Repairing Standpipes: 3/16" dia Bundy hydraulic tubing is suitable for replacing the old piping. Fix in place with soft solder as before.

Reference: See also F.L. p. 532, article and diagram showing assembled kingpin.