

CHAPTER VIII

Steering, Shock Dampers, Road Springs, Wheels and Tyres

Steering Box and Column—Front Suspension—Warning, Front Suspension Springs—Steering Arms and Joints—Front Stabiliser—Rear Hydraulic Shock Dampers—Rear Road Springs—Wheels—Wheel Discs—Lubrication of Wheel Bearings—Tyres—The Jacking System—Wheel Changing—Fitting and Removing Tyres—Inflation of Tyres—Balancing Road Wheels.

Steering Box and Column.

The steering mechanism is of the cam-and-roller type, and requires no attention beyond inspection of the oil level.

The cover of the box is provided with a filling plug. Every 5,000 miles, as directed on page 30, this plug should be removed, preferably when the box is warm, and the level of the oil inspected. If necessary oil should be poured in until it is on the point of overflowing from the plug orifice.

For correct oils, see page 28.

With the steering wheel in its normal central position, a hole will be found in its boss, adjacent to the upper arm, into which the nozzle of the oil-can should be inserted to reach an oil hole provided in the control carrier. This operation should be included when lubricating the controls every 5,000 miles, as directed on page 30.

Front Suspension.

Each wheel is independently sprung, the suspension consisting of the two upper and two lower radius arms of different lengths set at a leading angle, between which a vertical yoke is carried, and on this the stub axles are pivoted.

The upper radius arms are connected to and operate the special Bentley shock damper, which effectively dampens excessive spring action.

The main helical coil spring is mounted between the forward lower radius arm and a seat formed as an integral part of the chassis frame.

The ball joints and the steering pivot bearings are lubricated from the central chassis system. (See Fig. 4.)

The shock damper consists of two pistons operating in cylinders full of oil. The oil being displaced from one cylinder to the other through drilled passages, the degree of damping being controlled by spring-loaded valves.

Until it is obvious that the effectiveness of the shock damper has become reduced, or undue leakage is apparent, no attention whatever will be necessary for 10,000 miles, when the level of the oil in the shock damper should be inspected, as directed on page 31.

It is of vital importance that only perfectly clean oil of the correct grade should be used, and this should be strained through a fine gauze before using.

Straining is facilitated if the oil be first warmed to about 75° C.

The importance of the above cannot be over-emphasised, as a very small particle of foreign matter in the oil may lodge under one of the valves and impair the effectiveness of the shock damper.

WARNING.

Front Suspension Springs.

No attempt must be made to remove the coil springs of the front suspension.

Special appliances are required because the powerful springs are compressed even when in the rebound position.

Any necessary dismantling or adjustment of the suspension must be effected by Messrs. Bentley Motors (1931) Ltd., or one of their "Special Retailers". (See page 16.)

Steering Arms and Joints.

The steering gear should be examined occasionally to see that all bolts are tight and joints well lubricated.

If any of the nuts are found loose, and only retained by their split pins, the latter should be removed, the nuts screwed up tightly and new split pins fitted.

The ball joints of the cross and side steering tubes are lubricated from the centralised chassis system, as described in Chapter I, and illustrated in Fig. 4.

The bearing pads of all joints are spring-loaded, being self-adjusting for wear. They should not normally require attention except when the car is undergoing a general overhaul.

Front Stabiliser.

In order to reduce the tendency of the car to "roll" on corners, a steel torsion-rod stabiliser is provided at the front end of the chassis.

The stabiliser is carried in rubber bearings, and is coupled to the wheel mountings by links with rubber pads.

No attention is necessary.

Rear Hydraulic Shock Dampers.

Hydraulic shock dampers of Bentley design and manufacture are fitted to the rear axle, one of the dampers being shown in Fig. 23.



Fig. 23.—REAR HYDRAULIC SHOCK DAMPER.

1. Filler plug. 2. "Ride Control" oil pipe.

Unless it is obvious that the effectiveness of the shock damper has become reduced, or undue leakage of oil is apparent, no attention will be necessary for 10,000 miles of running.

After 10,000 miles, it is necessary to inspect the oil level in the shock dampers as directed on page 31.

For this purpose a filling plug (1, Fig. 23) is provided, arranged at such a height in the casing as to control the maximum oil level.

It is of vital importance that only perfectly clean oil of the correct grade should be used. The following precautions must be observed:—

1. Before attempting to remove the plug (1), both the plug and the shock damper casing adjacent to it must be cleaned very carefully with a brush dipped in paraffin, in order to avoid the possibility of dirt entering the hole when the plug is removed.
2. Only a recommended oil must be used (see page 28), and before inserting this, it must be strained through a fine gauze. Straining is greatly facilitated if the oil be first warmed to about 75°C.

The importance of such cleanliness cannot be over-emphasised. A small particle of foreign matter may lodge under a valve and impair the effectiveness of the shock damper.

The plug (1) can then be removed with a box-spanner, and the oil level restored, if necessary, to the bottom of the plug hole, the oil being poured in very slowly to avoid entrapping bubbles of air. It will be found most convenient to add oil by means of small syringe provided in the tool kit. When replacing the plug, care must be taken that its washer is in position.

The shock damper consists of a piston assembly operating in a cylinder which is maintained full of oil, the latter being displaced from one end of the cylinder to the other, past spring-loaded valves.

The loading of these valves, and hence the degree of damping is controllable through the "**Ride Control**" lever, by means of a small pump carried in a casing bolted to the gearbox, which maintains a pressure of oil in a system of piping. This pressure is variable, and is controlled through a relief valve, operated by the aforementioned lever.

The pump is charged with oil from the gearbox. It must be observed that oil is not actually pumped into the dampers, and there should be no wastage of oil from the pump unit or pipe line. Such wastage or leakage will impair the functioning of the control.

As it is of such importance that the shock dampers, and also the pump and pipe line, should be maintained full of oil, evidence of undue leakage should be at once reported to Messrs. Bentley Motors (1931) Ltd., or one of their "Special Retailers". (See page 16.)

Rear Road Springs.

The forward ends of the rear springs are pivoted to the frame by means of steel bushes. The shackle pins at the front and rear ends are of the threaded type, and both bushes and shackle pins are lubricated from the centralised chassis system

The advantage of threaded bearing pins is that they do not develop end-play as the result of wear.

The springs themselves are encased in leather gaiters, and by means of a special arrangement of oil holes and grooves in the leaves, the ends of the three longest leaves of each spring are lubricated by surplus oil from the eye of the master leaf.

Owing to this arrangement, in combination with absorbent material inside the gaiter, the springs are entirely self-lubricating and remain free from squeaks.

Wheels.

All wheels are of heavy gauge pressed steel, with 16" by 5" well-base rims, and are secured with five nuts.

The securing nuts for the "off-side" or R.H. wheels have right-hand threads, and those for the "near-side" or L.H. have left-hand threads.

The nuts must be tightened, with the wheel-brace provided, evenly and securely, and the threads must be kept clean and greased.

If any difficulty is experienced in removing the nuts with the wheel-brace, extra leverage can be applied by using the $\frac{1}{2}$ " spanner, provided in the tool kit, on the squared section of the wheel-brace spanner head.

Wheel Discs.

When fitting the wheel discs, care must be taken to get the valve centered in the hole provided.

The outer nuts, having right-hand threads for both "off-side and near-side" wheels, are necessary only to retain the disc, and should therefore not be overtightened.

The correct tension is attained by giving the nut **one complete turn** with the special spanner provided after the disc has been felt to be in light contact with the rubber stops on the wheel centre.

There should be a small gap, approximately .100", between the edge of the disc and the wheel. Overtightening distorts and brings the disc in contact with the wheel, thus causing creaks and rattles.

Lubrication of Wheel Bearings.

The wheel bearings are correctly packed with ball-bearing grease in the first instance, and should need no attention between general overhauls of the chassis.

Tyres.

The tyres fitted are India Super Silent Rayon, size 6.50" by 16".

When ordering new covers, the above should be specified. With regard to the inner tubes, it is necessary to state the size and mention "well-base".

Tubes for flat base rims should not be used.

The Jacking System.

A portable jack is provided in the tool kit and is operated as shown in Figs. 24 and 25.

The jack is fitted on to a slide arranged on the side frame member near the centre body pillar, and is used either side of the car as required.

To operate, push the jack **right home** on the slide, spin the body of the jack to the ground, insert handle and use as shown in Fig. 25.

It is important, before operating the jack, that the handbrake is pulled well on.

It is convenient to note that the jack may be used in other suitable positions, such as under the rear springs or front jacking pad if required.

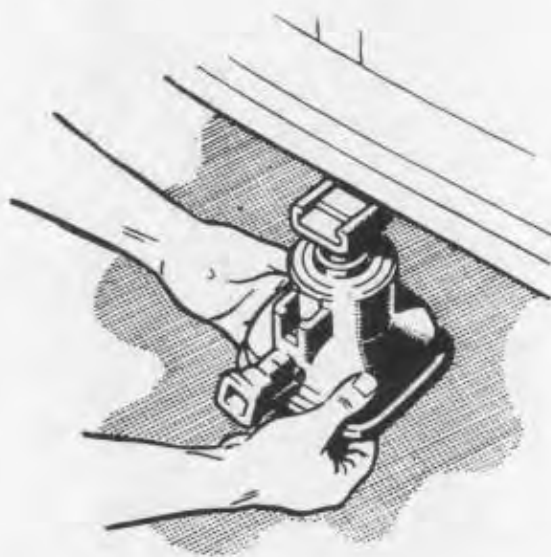


Fig. 24.—FITTING JACK TO SLIDE.



Fig. 25.—OPERATING JACK.

Wheel Changing.

No difficulty should be experienced in wheel changing, the spare wheel can be put on the rear or front hub with very little effort as follows:—

Rear.—Having jacked up the car, applied the hand brake and removed the rear wheel:—

1. Roll the spare wheel under the hub, the top of the wheel being inclined outwards, then with a foot at the bottom of the wheel, lift by the rim on to the hub extension, as shown in Fig. 26.

2. One of the five wheel studs will be found to be nearly on the horizontal halfway line, either to the front or rear. Rotate and tilt the wheel until this stud protrudes through the nearest stud hole.

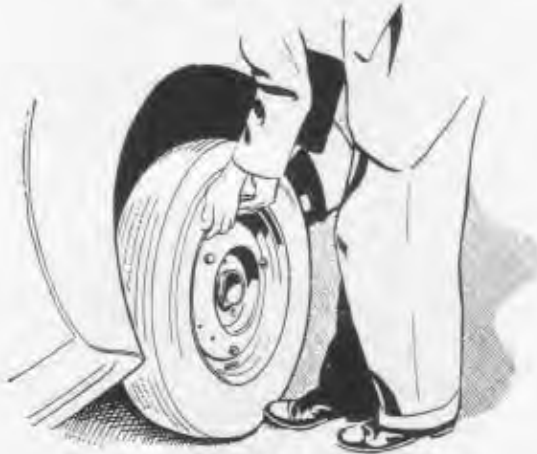


Fig. 26.—MOUNTING REAR WHEEL.



Fig. 27.—POSITIONING REAR WHEEL.

3. Using the one entered stud as a fulcrum, raise the wheel until the other studs enter their respective holes. (See Fig. 27.)

Replace wheel nuts, wheel disc and retaining nut as previously described.

Front.—Position the wheel on the hub extension as described for the rear wheel (1). (See Fig. 26.)

1. Rotate the wheel, which also rotates the hub, until a stud enters at the halfway line. (See Fig. 28.)



Fig. 28.—ROTATING FRONT WHEEL.



Fig. 29.—ENTERED STUD AT TOP.

2. Rotate the wheel until the entered stud is at the top, when it will be found that the other four will go home. (See Fig. 29.)

Replace wheel nuts, wheel disc and retaining nut as previously described.

FITTING AND REMOVING TYRES.

Inextensible steel wires are incorporated in the edges of the tyres. Therefore, do not attempt to stretch the wire edges of the tyre cover over the rim edge.

Force is entirely unnecessary, and may be dangerous, as it merely tends to damage the cover edges and serves no helpful purpose.

Fitting or removing will be quite easy if the wire edges are carefully adjusted into the rim base; if it is not found to be easy, the operation is not being performed correctly.

To Remove the Tyre.

Remove all valve parts, and push both cover edges into the base of the rim at the part diametrically opposite to the valve, then lever the cover edges near the valve over the rim edge.

To Fit Tyre.

Push one edge of the cover over the edge of the rim. It will go quite easily if the part first put on is pushed right down into the wheel base.

A coloured spot on the outer wall indicates its lightest part, and the cover should be fitted so that the coloured spot is at the valve position.

1. Dust evenly with french chalk both the inside of the cover and the outside of the inner tube.
2. Inflate the tube until it begins to round out, then insert into cover.
3. Mount tyre.
4. Before inflating, make sure that the tyre beads are clear of the well of the rim all the way round.
5. Inflate slowly until the beads are fully seated.
6. Remove valve and deflate the tube completely.
7. Refit valve and inflate the tyre to the correct working pressure.

N.B.—This procedure must be followed whenever the tube is refitted.

Inflation of Tyres.

The pressures recommended for the 6.50" by 16" India tyres are:—

Front	...	...	...	25 lbs.	} Cold.
Rear	...	...	...	30 lbs.	

Tyre pressures will increase slightly after continued running at high speeds or in hot weather. It is not considered advisable to reduce pressures under such conditions, as this would tend to cause further heating, due to excessive flexing when the tyre cools.

The pressures being comparatively low, it is important that they should be carefully maintained if maximum tyre life is to be secured. It is, therefore, recommended that the pressure be tested weekly by means of a gauge applied to the valve stem orifice.

Balancing the Road Wheels.

It is most important, in view of the high speeds attainable, that the front road wheels should be properly balanced. Therefore, it is necessary to have all the wheels balanced, and to re-balance a wheel after changing its tyre.

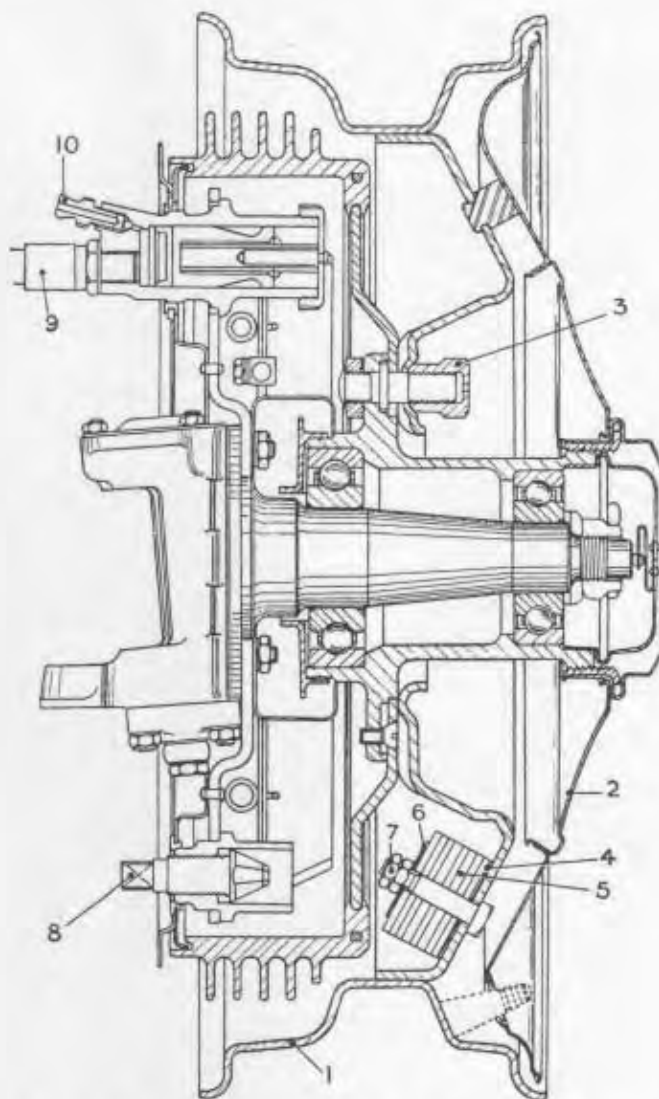


Fig. 30.—SECTION OF FRONT HUB AND WHEEL

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|------------------------|--------------------------|
| 1. Well base rim. | 6. Steel washer |
| 2. Wheel disc. | 7. Locknuts. |
| 3. Wheel securing nut. | 8. Brake adjuster screw. |
| 4. Fibre washer. | 9. Hydraulic fluid pipe. |
| 5. Lead washer. | 10. Bleeder nipple. |

An out-of-balance effect is usually present in the complete wheel and tyre due to:—

- (a) The valve and its patch on the inner tube: and
- (b) unavoidable irregularities in the outer cover, due to movement of the material during vulcanizing.

A coloured spot on the outer wall indicates its lightest part, and the cover should be fitted so that this spot is at the valve position.

To correct such out-of-balance, three bolts are provided, spaced at equal intervals around the wheel centre, as shown in Figs. 30 and 31, and each carries a number of lead washers.

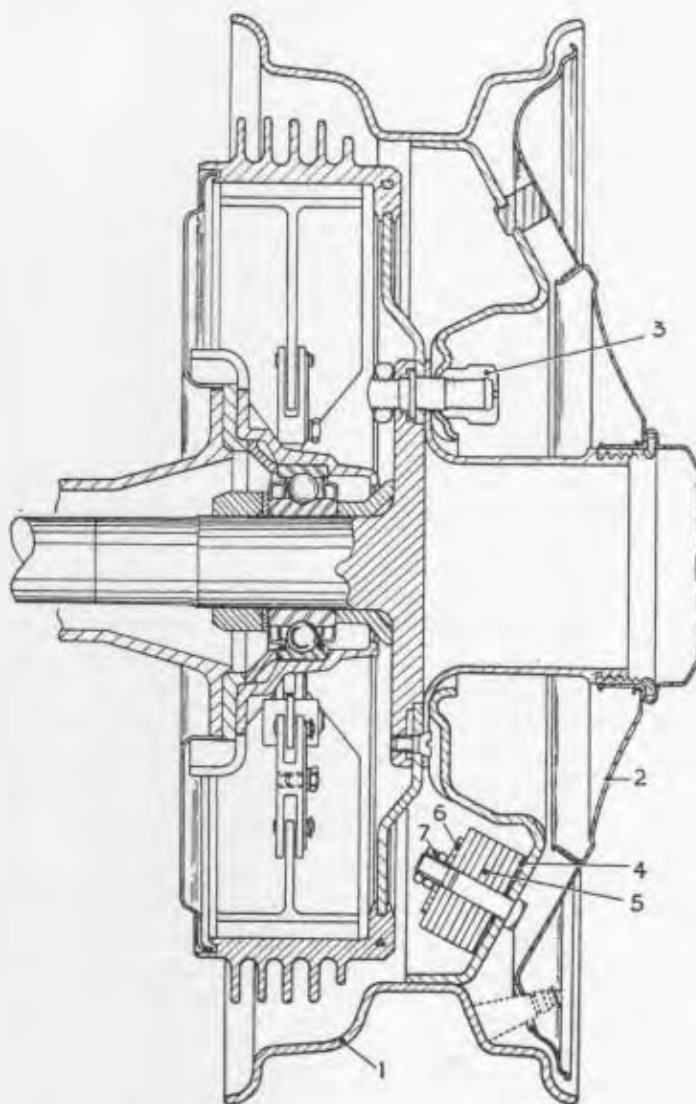


Fig. 31.—SECTION OF REAR HUB AND WHEEL.

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|------------------------|------------------|
| 1. Well base rim. | 5. Lead washer. |
| 2. Wheel disc. | 6. Steel washer. |
| 3. Wheel securing nut. | 7. Locknuts. |
| 4. Fibre washer. | |

The parts are assembled on the bolt in the following order:—

1. Fibre washer (4).
2. Lead washers (5), up to eight in number on any one bolt.
3. Steel washer (6).
4. Locknuts (7), for retaining lead balancing washers.

To balance a wheel, proceed as follows:—

- 1.—Remove the wheel.
 - 2.—Remove all the washers from each bolt.
 - 3.—Reverse the bolts in the wheel, this will allow the operation of balancing to be performed more easily, as the balance washers may then be fitted externally, and re-fit the wheel.
 - 4.—Re-fit the fibre washers, steel washers and lock nuts.
 - 5.—The wheel should then be turned gently and allowed to come to rest. The lowest point of the tyre should then be marked.
 - 6.—The operation should then be repeated, and if the original mark returns to the bottom position, one or more lead washers should be added to the bolt on the opposite side of the wheel.
 - 7.—If the mark on the tyre is adjacent to the bolt, then one lead washer should be fitted on each of the other two bolts. On the other hand, if no bolt should lie on the vertical centre line through the marked point of the tyre, the washers of the two bolts furthest from the mark must be altered; for instance, if the distance of one bolt from the centre line is approximately twice that of the other, two lead washers should be fitted on the bolt nearest to the centre line, and one lead washer on the other bolt.
- This process should be continued until the wheel will remain in any position in which it may be brought to rest, the number of lead washers being kept down to a minimum consistent with good balance of the wheel.
- When all the lead washers are not required, fibre packing washers should be substituted, the lead washers being fitted last, so as to keep the greatest mass as near to the centre line of the tyre as possible.
- 8.—Remove the wheel and reverse the studs so as to return the balance weights to their correct position, on the inside of the wheel.
 - 9.—Re-fit the wheel and check that the balance is still correct, if any out of balance effect is still present, it will be necessary to correct this by the addition of washers as required.