CHAPTER VI

The Braking System

General Description—Possible Variations—Adjustments—Adjustment of Hand Brake—Adjustment of Servo—Lubrication—Bleeding the Hydraulic System—Hydraulic Master Cylinder.

General Description.

The Bentley four-wheel braking system is of the Servo assisted type, and comprises a mechanically driven servo motor of the dry disc-brake type, which is equally effective for either forward or backward movement of the car. Further, even should the servo be out of action, the rod operated rear brakes are still directly coupled to the pedal.

Pressure on the pedal applies the rear brakes direct in the usual manner, and also engages the servo, but the front brakes which are of the hydraulically operated type are actuated entirely by the servo acting through the medium of a balance lever and hydraulic master cylinder.

The servo effect is distributed between the front and rear brakes, being added therefore to the direct pedal effect in the case of the rear brakes. With the leverages provided, this results in about 55 per cent. of the total braking being imposed on the front wheels, which allows for the fact that greater weight is thrown upon the front wheels during braking.

The proportioning of the servo pull to the front and rear brakes respectively is effected by a balancing lever. A separate equaliser is provided for the two rear brakes, which, with the hydraulic operation of the front brakes, ensures even braking on either side of the car.

The hand brake lever operates the rear brakes only and uses the same linkage as the foot pedal.

A diagrammatic representation of the whole system is shown in Fig. **15**.

A pull rod (**1**, Fig. **15**), operated by the pedal, is coupled to a lever (**2**), on the servo motor shaft, the motor itself (**3**) being mounted on the off-side of the gearbox, and driven at approximately one-tenth of the propeller shaft speed.

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The lever (**2**) has inclined cams formed on the face of its boss, these cams engaging through the medium of steel balls, similar cams formed on the boss of another lever (**4**). From the latter a rod (**5**) directly actuates the rear brakes through the medium of the levers (**6**) and (**7**), which are pivoted on a bracket bolted to the "X" member of the frame, and finally, through the rear equaliser (**8**) mounted on a bracket suspended from the axle.

The output from the servo is taken by one of the two rods (**9**), according to whether the car is moving forwards or backwards, to the lever (**10**). This lever carries, in turn, a balance lever (**11**), the lower end of which is connected by the rod (**12**) to the rear brake lever (**7**), thus augmenting the direct pedal effort, while its upper end is coupled to the master cylinder (**13**), which actuates the front brakes.

The dashboard hand brake (**14**), is mounted under the facia board, convenient to the driver's right hand. The ratchet release is so arranged that should it be inadvertently knocked or pressed, the brakes will not be released. In order to release the brakes, the trigger must be fully depressed and held in this position. The hand brake is then pulled, as if applying the brakes, and this action frees the ratchet permitting the brakes to be released, provided that the trigger is still held. This device is particularly useful in preventing accidental release of the brakes when the car is parked.

To obtain this action, the trigger is not directly connected to the ratchet pawl, but compresses a spring. This spring, in turn, operates the pawl, but is only strong enough to move it out of engagement when the load has been removed by pulling on the hand brake.

The hand brake is connected by an enclosed cable (**15**), to a horizontal lever (**16**), mounted on the "X" section of the frame which provides the required leverage, and is in turn coupled to the rear brakes, through the lever (**7**) and (**17**) and the rear equaliser. The same rear brake-shoes are used, therefore, as for the pedal operation, and the application and release of the hand brake can be lightened accordingly by simultaneous application of the foot brake.

Possible Variations.

As already mentioned, the leverages are so proportioned that the total braking effort is distributed in a predetermined ratio between the front and rear brakes.

This distribution will be upset if the servo brakes are allowed to become badly out of adjustment, or if the servo, for any reason, fails to give its correct output. A less likely cause would be oil or grease on the brake linings.

The need for adjustment of the rear brakes will be indicated by excessive travel of the hand brake lever, whereas the front brakes, which are operated by the servo motor only, will not affect the hand brake or pedal travel.

It is unlikely, however, that the front brakes will wear more rapidly than the rear brakes, so, provided that they are adjusted whenever adjustment of the rear brakes is required, no trouble in this respect need be expected.

Low or inconsistent output from the servo would be indicated by heavy or non-progressive brake pedal action, together with insufficient front braking, in which case the servo would have to be dismantled to ascertain the cause of the trouble. As this is a delicate operation, it is recommended that Messrs. Bentley Motors (1931) Ltd., or one of their "Special Retailers" be entrusted with this work.

A light pedal action, accompanied by defective front braking, resulting in the rear wheels locking, would indicate a fault in the front braking system. An excess of front braking would indicate a fault in the rear brakes.

In the unlikely event of oil reaching either of the rear brakes, the self-seal bearing on the rear axle half shaft will be at fault. Grease catchers are provided for the front hubs, and provided that the recommended grease be used and the quantity limited to 1½ ozs., in each hub, this should not be able to reach the brake linings.

Adjustments.

A separate adjustment is provided on each brake carrier plate to compensate for wear of the brake shoe linings, and is the only adjustment provided on the whole system.

It is important to note that in no circumstances should adjustments be attempted at any other point, for instance, by altering the lengths of the brake rods. These are all carefully determined during erection of the chassis, with a view to synchronisation of the front and rear safety stops, which ensure that in the event of failure of any part of the system, at least one pair of brakes will remain available.

The method of adjustment is the same for both front and rear brakes, with the exception that a hand wheel is provided on the rear brake adjusters, while a ¼" B.S.F. open-ended spanner must be used on the squared end of the front brake adjusters. The rear adjusters (**2**, Fig. **17**) are located forward of the axle tubes, and the front adjusters (**1**, Fig. **16**) directly below the steering pivot pins.

For each complete turn of the adjusters, four "clicks" will be felt, and between each "click" the brake shoes are expanded towards the drum, approximately .014", and then moved back .010", giving an incremental adjustment of .004", and a running clearance of .010".

To adjust the brakes, rotate the adjusters in a clockwise direction until considerable resistance is felt. This resistance must be equal for all four brakes, and should the last "click" on any one adjuster require noticeably greater force to obtain, the adjuster should be turned back to the previous "click". This will give the correct brake adjustment.

It is not necessary to jack up the car to adjust the brakes, as the adjusters are so designed to give the correct shoe clearances automatically.

If, after long service, the brake linings require renewal, this will be apparent by the adjusters coming to the end of their travel, and will have a solid feel quite distinct from the resistance felt when the brake shoes are correctly adjusted.

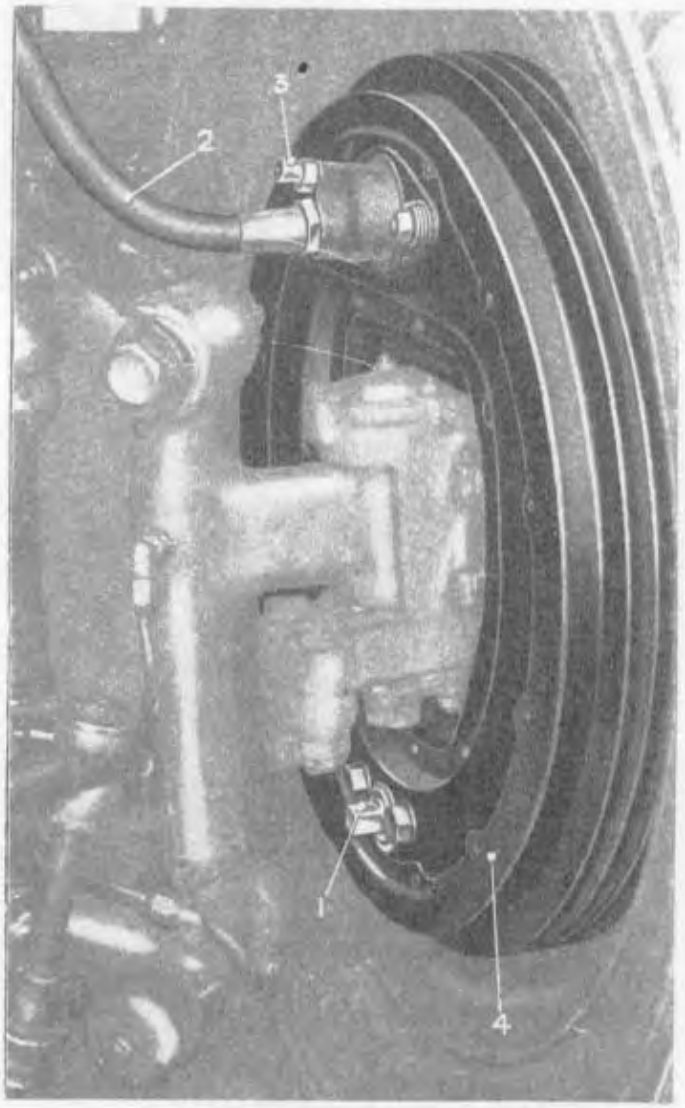

Fig. 16.—FRONT BRAKE ADJUSTMENT.

1. Adjuster screw.
2. Hydraulic pipe.
3. Bleeder connection.
4. Brake drum.

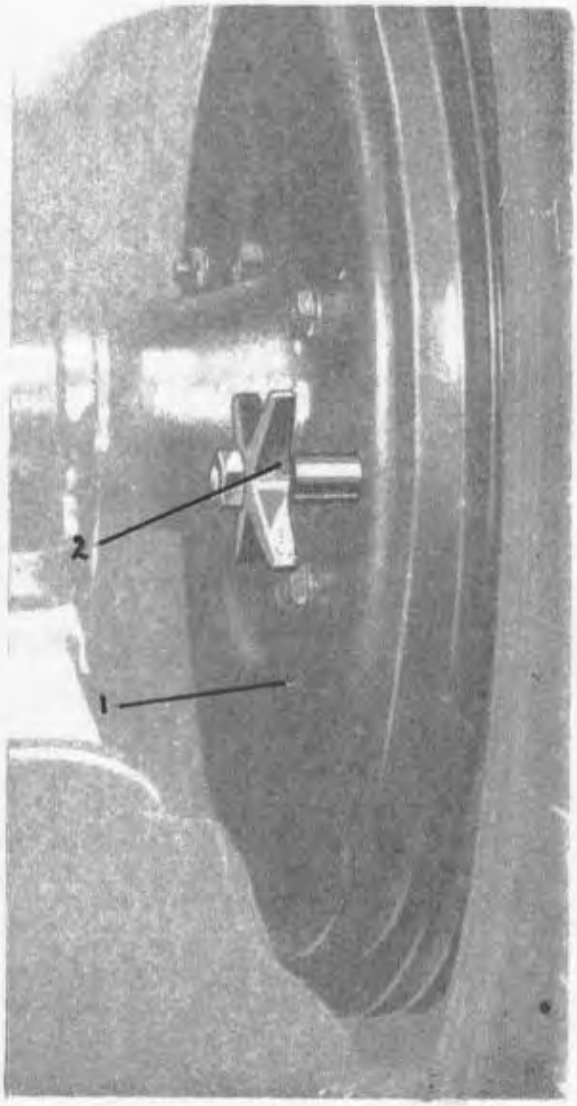

Fig. 17.—REAR BRAKE ADJUSTMENT.

1. Brake drum.
2. Adjuster screw.

Adjustment of Hand Brake.

Adjustment of the rear brakes takes up both the pedal and hand brake clearance in the same operation. No other adjustment is required.

Adjustment of the Servo.

The servo is of the dry disc-brake type, and is shown in Fig. **15**. An adjustment is provided for the initial setting and wear of the friction surfaces, but once correctly set, should require no further attention for a considerable period, as very little wear occurs. As the operation is of a delicate nature it is advised that this adjustment should be effected by Messrs. Bentley Motors (1931) Ltd., or one of their "Special Retailers".

Lubrication.

The need for hand lubrication of various parts of the mechanism has been reduced to a minimum, by the use of self-lubricating bearing bushes at the fulcrum of practically all levers.

The only points that require attention are the jaws and pins of the pull rods and intermediate levers (**6**, **7** and **17**, Fig. **15**). Oil should be applied to these points every 5,000 miles, as directed on page 31. The ball bearing cams which actuate the servo (as described earlier in this chapter) are filled with lubricant upon initial build, and require no attention between overhauls of the chassis.

Bleeding the Hydraulic System.

Bleeding, that is to say expelling air from the system, should only be necessary when completely recharging the system with fluid following the removal of a component or the disconnection of a pipe joint. Under normal conditions air does not enter the system as a result of brake application.

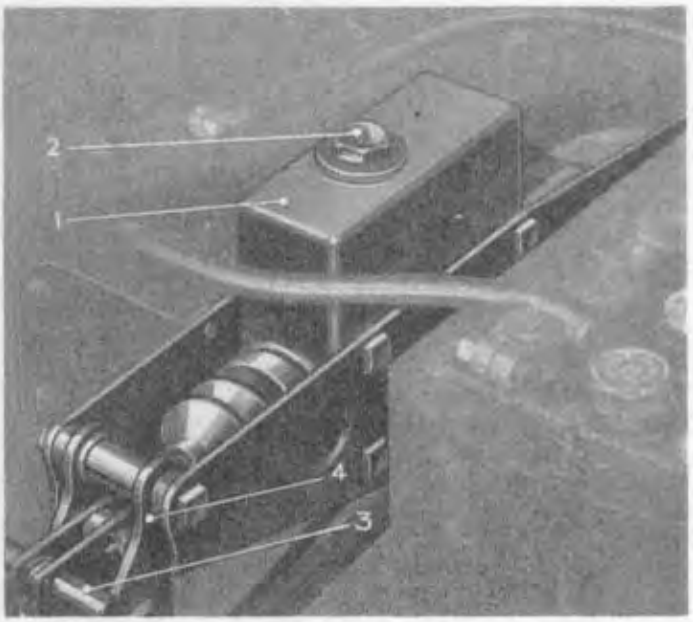

Fig. 18.—THE HYDRAULIC MASTER CYLINDER AND RESERVOIR.

1. Master cylinder and reservoir.
2. Filler plug.
3. Extended pin.
4. Support bracket.

To bleed the system, proceed as follows:—

1. Attach a clean rubber drain tube to one front brake bleeder screw (**3**, Fig. **16**), and immerse the other end in a clean glass jar in which there is sufficient hydraulic brake fluid to submerge the end of the tube.
2. Release the bleeder screw (**3**) half to one turn.
3. Remove the filler plug (**2**, Fig. **18**) and fill the reservoir integral with the master cylinder, with the recommended fluid. (See page 28.)
4. Push the joint forward until the extended pin (**3**) abuts against the master cylinder support brackets (**4**).
5. Release, pause slightly, and repeat until the reservoir is nearly empty, but taking care not to empty it completely.
6. Tighten the bleeder screw and transfer drain tube to the other front brake.
7. Refill the reservoir and bleed this brake in a similar manner.
8. Finally, refill the reservoir and replace the filler plug.

Hydraulic Master Cylinder.

The fluid level in the master cylinder should be examined every 10,000 miles, as directed on page 33, and topped up if necessary so as to maintain the level at one inch below the filler cap.

A rapid fall in the fluid level indicates a leak at some point in the system, and must be traced and rectified.