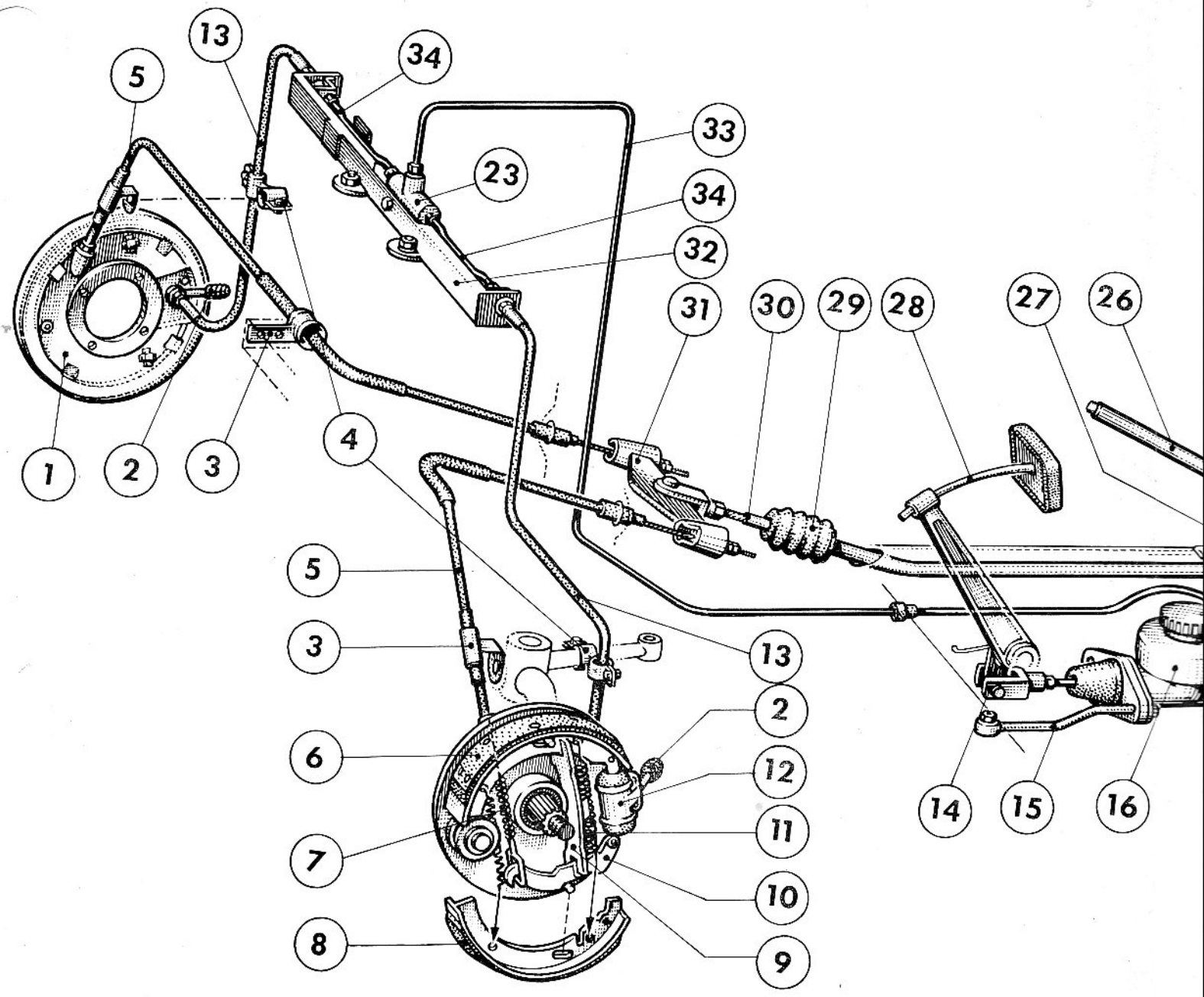
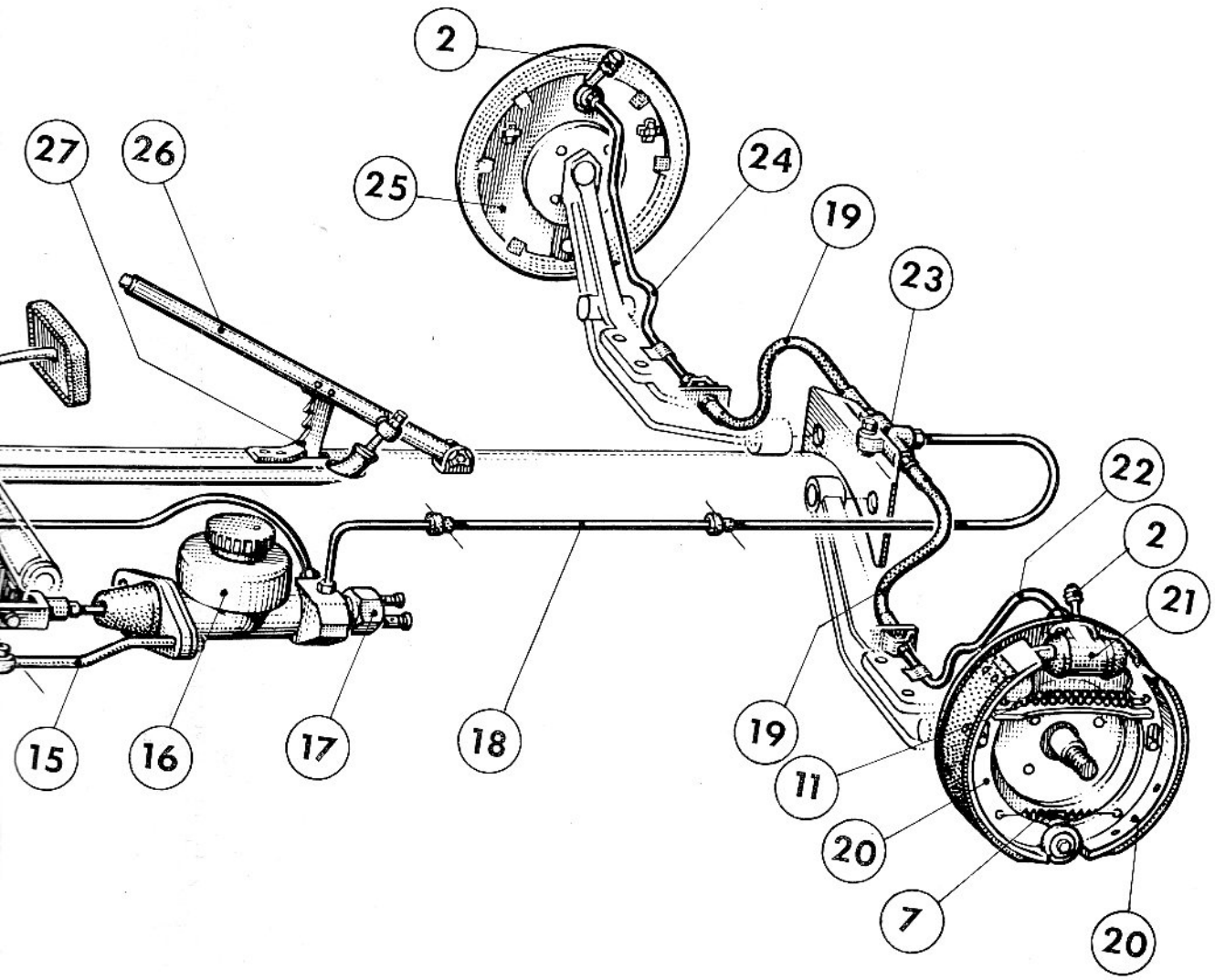
Main Group Br

Brakes, Wheels and Tires

Hydraulic brake system of LLOYD 600



1. Brake carrier plate, R. H.
2. Bleeder valve
3. Guide for brake cable
4. Double clip
5. Brake cable, front
6. Brake shoe, front, L. H., top
7. Return spring on the anchor pin side
8. Brake shoe, front, L. H., bottom
9. Push rod
10. Brake lever, front, L. H. (for hand brake)
11. Return spring on wheel cylinder side
12. Wheel brake cylinder, front
13. Brake hose, front
14. Push rod with fork head
15. Eye screw
16. Master brake cylinder
17. Stop light switch
18. Brake line from master cylinder to distributor, rear
19. Brake hose, rear
20. Brake shoe, rear (with lining)
21. Wheel brake cylinder, aft
22. Brake line, rear, L. H.
23. Distributor
24. Brake line, rear, R. H.



25. Brake carrier plate, rear
26. Hand brake lever
27. Toothed sector and catch
28. Brake pedal
29. Rubber bellow (folded bellow)
30. Hand brake cable
31. Brake equalizer
32. Holder for brake hose
33. Brake line from master cylinder to distributor, front
34. Brake line, front

er to distributor, rear

General

For the safety in rod traffic effectiveness and reliability of the brakes are of special importance.

The function of the brake is to absorb the energy of motion (the so-called "kinetic energy) which is being converted into heat the braking procedure.

The brake action can be judged according to the attainable mean deceleration. The following deceleration values are specified for this purpose in the Road Traffic Regulations:

Mean deceleration for foot brake: 2.5 m/sec.²
Mean deceleration for hand brake: 1.5 m/sec.²

The mean brake deceleration can be computed from the speed at the beginning of braking and from the stopping distance of the car until it has stopped. The mean deceleration may also be computed from the stopping speed (speed at the beginning of braking operation) and braking time.

The stopping distance of the vehicle depends upon:

1. The weight of the vehicle
2. Stopping speed (i. e. speed at beginning of braking)
3. Condition and kind of brake
4. Condition of tires
5. Condition of road surface.

In this case, an equal foot braking effort experted by the driver will be taken as a basis.

The mean deceleration from the stopping speed (speed at beginning of braking operation) and the brake time are calculated on the following formula:

$$b = \frac{V}{3.6 \cdot t} \quad (m/sec.^2)$$

A simple method to determine the mean deceleration from the stopping distance and stopping speed consists in using the following formula:

$$b = \frac{V^2}{26 \cdot s} \quad (m/sec.^2)$$

where:

b = retardation in m/sec.²
V = speed in km/h
s = stopping distance in m
t = braking time in sec.

The stopping distance must be accurately measured and the speed (in km/h) has to be determined with a calibrated speedometer.

The braking trace, however, allows no accurate measuring of the stopping distance to be made. To determine the stopping distance (s) in a precise manner, collar guns must be used, by means of which beginning and end of braking can be marked by a color point.

Another simple method often used in practice to determine the braking deceleration is the measurement with the Siemens Brake Tester available in all Car Retailer Shops.

Put this apparatus on the floor inside the car. The maximum deceleration values may be read direct from the graduated tubes.

The mean deceleration corresponds approximatelly to the 0.8 time the value indicated by the apparatus, i. e. the read-off value has to be multiplied by 0.8 in order to compute the mean deceleration.

The specified brake deceleration should be determined at normal average pedal pressure with full loaded car on level highway and with heated brake drums. Even if the vehicle is being braked from top speed the specified brake deceleration should be obtained. Furthermore, the car shall follow the track during braking operation.

Stopping distances "s" (in m) and brake time "t" (in sec.) on dry level concrete highway i.e. autobahn.

Delay	Speed in km/h																	
	20		30		40		50		60		70		80		90		100	
	s	t	s	t	s	t	s	t	s	t	s	t	s	t	s	t	s	t
1,5	10,2	3,73	23,1	5,6	41	7,46	64,1	9,3	92,3	11,19	125,6	13	164	14,92	207,7	16,8	256,4	18,6
2	7,7	2,8	17,4	4,2	30,8	5,6	48,1	7	69,3	8,4	94,2	9,8	123,2	11,2	156,6	12,6	192,4	14
2,5	6,2	2,24	13,9	3,36	24,8	4,48	38,5	5,6	55,8	6,72	75,4	7,6	99,2	8,96	125,1	10,08	154	11,2
3	5,1	1,86	11,5	2,8	20,4	3,72	32,1	4,7	45,9	5,58	62,8	6,5	81,6	7,44	103,5	8,4	128,4	9,4
3,5	4,4	1,6	9,9	2,4	17,6	3,2	27,5	4	39,6	4,8	53,8	5,6	70,4	6,4	89,1	7,2	110	8
4	3,8	1,4	8,6	2,1	15,2	2,8	24	3,5	34,2	4,2	47,1	4,9	60,8	5,6	77,4	6,3	96	7
4,5	3,4	1,24	7,7	1,86	13,6	2,48	21,4	3,1	30,6	3,72	41,9	4,4	54,4	4,96	69,3	5,58	85,6	6,2
5	3,1	1,12	6,9	1,68	12,4	2,24	19,2	2,8	27,9	3,36	37,7	3,9	49,6	4,48	62,1	5,04	76,8	5,6
5,5	2,8	1,02	6,3	1,53	11,2	2,04	17,4	2,54	25,2	3,06	34,2	3,6	44,8	4,08	56,7	4,59	69,6	5,08
6	2,6	0,93	5,9	1,4	10,4	1,86	16	2,3	23,4	2,79	31,4	3,3	41,6	3,72	53,1	4,2	64	4,6
6,5	2,4	0,86	5,4	1,29	9,6	1,72	14,8	2,15	21,6	2,58	28,9	3	38,4	3,44	48,6	3,87	59,2	4,3
7	2,2	0,8	4,9	1,2	8,8	1,6	13,7	2	19,8	2,4	26,9	2,8	35,2	3,2	44,1	3,6	54,8	4

The "reaction time" has not been taken into consideration in computing the aforementioned values.

In many tests it has been found that the driver of a vehicle requires an average time of just a second to brake his car fully and efficiently. This second, the so-called "reaction time" is composed of:

The driver's recognition and reaction time as well as of the actuation and reaction time of the brakes.

During this time the vehicle continues moving with undiminished speed.

If, for example, a vehicle is being braked at a speed of 70 km/h (19.4 m/sec.), the stopping time (t) will be 3.9 sec. at a deceleration rate of 5 m/sec.² (see Chart Page 1-2) and the length of the stopping distance (s) 37.7 m.

Considering the a/m reaction time, the stopping distance has been extended by the distance covered in a second's time, in this case by 19.4. The actual stopping distance is thus

$$37.7\ \text{m} + 19.4 = \mathbf{57.1\ m.}$$

The deceleration values attainable with Lloyd vehicles lie considerably higher than the legally specified minimum values. Under favourable conditions on dry level concrete highways (e. g. autobahn) we may rely in the case of a braking effected at normal pedal effort (of abt. 30 kg), with a fully loaded car of the LP/LC 600 type driving at a speed of 50 km/h, on a deceleration value of 7.5 m/sec.². Naturally, this optimum deceleration rate depends, as already mentioned in the foregoing, upon the condition and kind of road surface. For this reason, we shall obtain in brake tests carried out on wet asphalt, especially on a road surface covered with slippery ice, considerably lower deceleration values.

Service Hints for Maintenance and Repair Work

All maintenance and repair work on which the traffic safety of a vehicle is dependent, should be done with extreme care. For this kind of work, the following hints should be attended to:

1. Before commencing any work to wheel brake cylinders, master brake cylinders, brake lines and brake hoses they should be thoroughly cleaned, especially their bolted connections in order to avoid getting dirt in the braking system when carrying out repairs. Moreover, care must be taken to have clean hands so as to avoid oil or grease entering the braking system. Dirt will impair the reliability and effectiveness of the brakes.

2. The original ATE brake fluid contains ingredients which act as dissolving agent on paint an varnish coats. Particularly, when bleeding the braking system or unscrewing a brake line and refilling brake fluid, care is to be given that no brake fluid comes in contact with the varnish coat of the vehicle.

   Attention! If brake fluid should be thrown into the eyes, wash out with water!

3. The brake fluid pumped out in bleeding the brake system should never be used, otherwise foreign matters may enter the braking system.

4. If by mistake or ignorance a brake fluid other than the prescribed has been used for refilling, it is necessary to have the entire braking system drained, disassembled and cleaned. Rubber parts of the hydraulic braking system are not resisting to mineral oil and require to be renewed if mineral oil or any other harmful fluid has been refilled. For cleaning, use only spirits or original ATE brake fluid. After cleaning has been finished, let parts dry. In order to ensure a correct conservation of brake cylinder guides and pistons, they should be given a coat of ATE brake cylinder paste before assembling. After refilling, the entire braking system requires, of course, to be bled.

5. The rubber parts of the brakes (collars and protecting caps) are subjected to atmospheric influences while they are being kept stored and become unserviceable after a longer time. Care should be taken to store them in a cool, dry and, if possible, dustfree, room.

   Assembled wheel and master brake cylinders should not be kept stored longer than 6 months, while storage of collars and protecting caps should not exceed 12 months. If preassembled wheel and main brake cylinders should have been kept stored for a time longer than specified above, dismounting, cleaning and reassembling must then be done with due consideration of the remarks given in section (4). All hardened rubber parts should be renewed.

6. The braking system should be checked at regular intervals according to the routine inspection scheme as specified in the Customer's Service Coupon Boocklet. Damaged brake hoses and brake lines should always be renewed. Furthermore, the cause of damage must be eliminated.

7. After a longer time and frequent use of the brakes, the brake fluid becomes contaminated by abrasions of the rubber parts (rubber collars). For this reason, it is recommendable to renew the brake fluid after a 12 months use of the car.

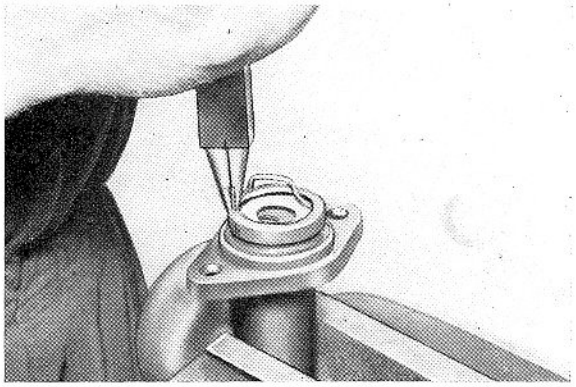
Master brake cylinder disassembly and reassembly

(Master brake cylinder removed from car)

Disassembly

1. Open equalization tank and drain. Remove rubber cap.

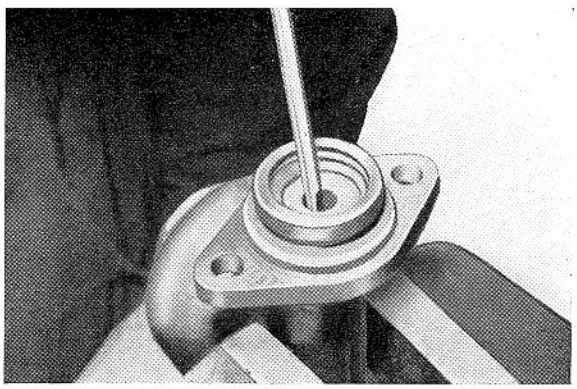
2. Loosen safety spring washer of thrust washer with pointed pliers or screw driver and take out. (Fig. 2 - 3/1).



2 - 3/1

Attention! The spring is put under strong tension and may spring easily away.

3. Take out covering plate, piston with secondary collar, filling disk, primary collar and compression spring with bottom valve. Should the piston fail to get out immediately, use a screw driver, applying it at the seat of the push rod (Fig. 2 - 3/2).



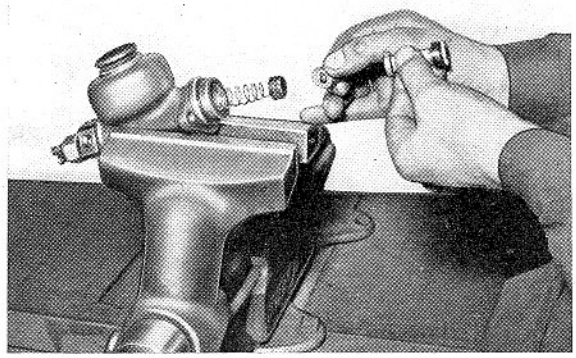
2 - 3/2

4. Clean all parts with spirits or original brake fluid. Gasoline, benzol or other solution may result in destruction of rubber parts.

5. Check master brake cylinder and components. Renew damaged and worn parts. Renew, as a rule, primary and secondary collars.

Reassembly

1. Insert compression spring with bottom valve, primary collar, filling disk and piston with secondary collar (Fig. 2 - 3/3).



2 - 3/3

2. Push with a blunt drift piston inward at the seat of push rod. Insert stop washer and put locking ring in place with pointed pliers.

3. Put rubber cap in place. Be sure the bleeding hole points downward with installed master brake cylinder, otherwise no drainage of condensed water may take place.

4. Refill with brake fluid. Close tank and check function of master brake cylinder.

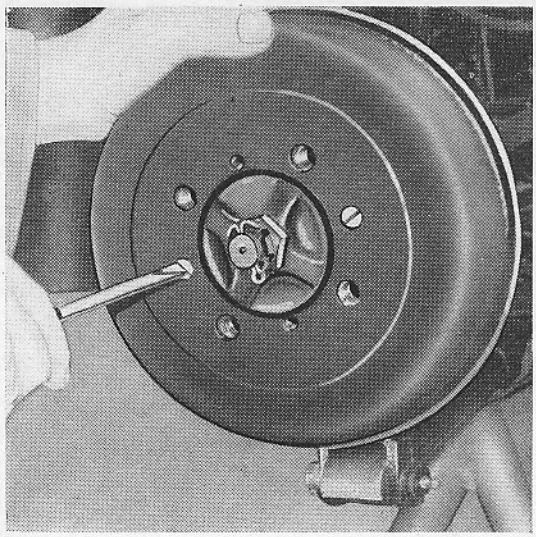
Removal and installation of brake shoes

Removal

1. Take off wheel hub caps. Loosen wheel bolts and jack up car.

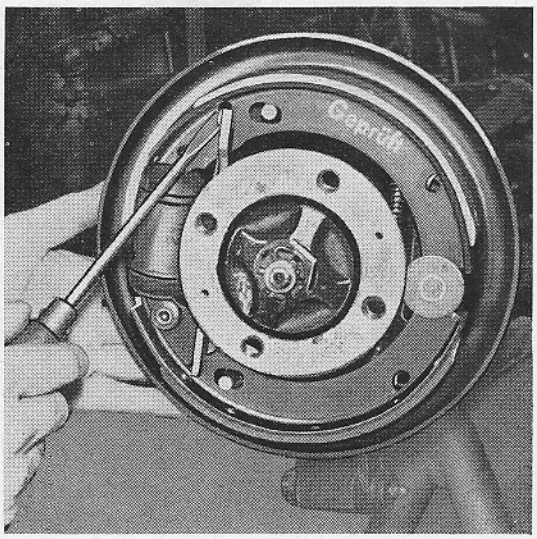
2. Remove wheels. Unscrew countersunk screws on brake drums and remove brake drums (Fig. 4 - 1/1).

   All figures show the operations to be effected in removing the R. H. front wheel.



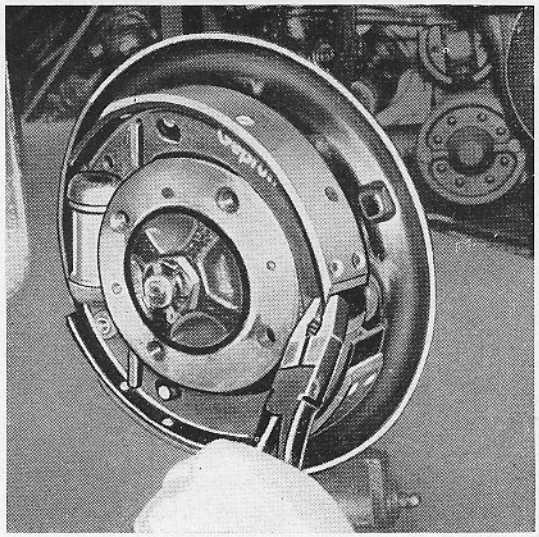
4 - 1/1

3. Disconnect traction spring from the upper brake shoe on the wheel brake cylinder side by means of a screw driver (Fig. 4 - 1/2).



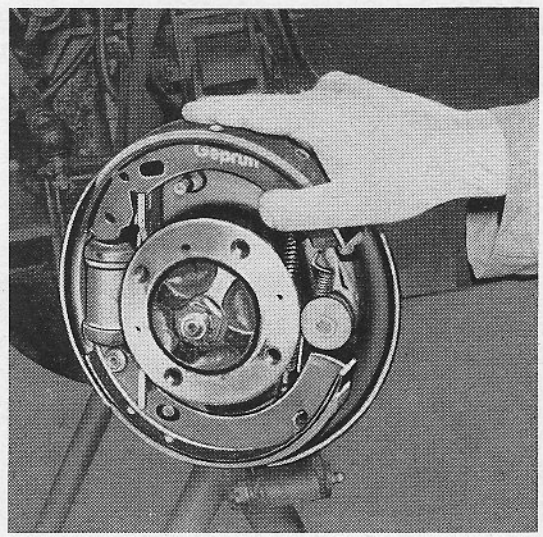
4 - 1/2

4. Lift upper and lower brake shoes from their anchor pins and disconnect return spring (on the bearing side) (Fig. 4 - 1/3).



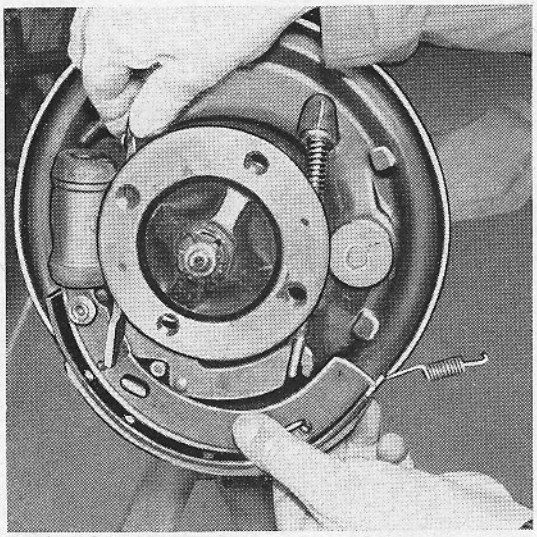
4 - 1/3

5. Remove the upper brake shoe (Fig. 4 - 1/4).



4 - 1/4

6. Take out from below the lower brake shoe including push rod and both traction springs (Fig. 4 - 2/1).



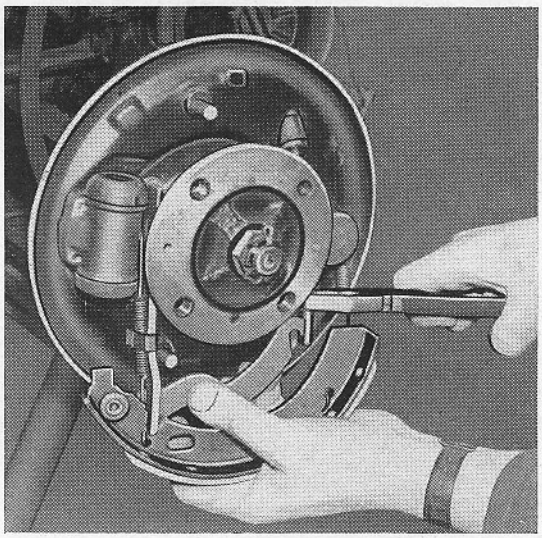
4 - 2/1

7. Disconnect hand brake cable. (See Fig. 4 - 2/2).

Installation

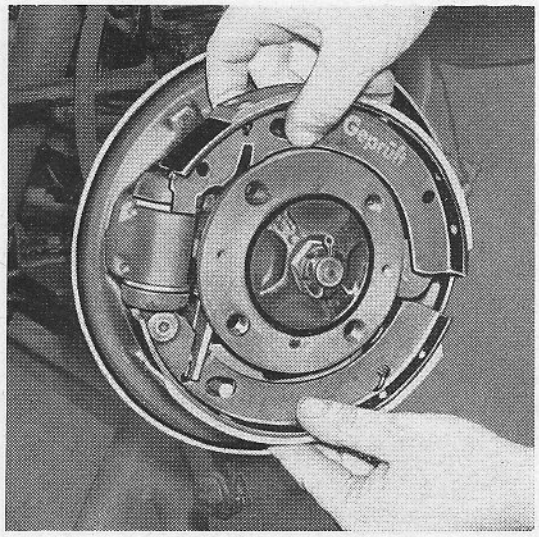
Check brake lining: Worn, damaged or oiled brake linings should be renewed. Washing with gasoline or other solvents is of no use as the oil absorbed by the lining would emerge at the instant the brake lining gets heated during the braking process. As far as renewing of the brake linings is necessary, the brake lining of **either** front respt. rear wheels should be generally renewed in order to guarantee the same braking action on either side. For this reason, use always linings of the same make for both sides.

1. Connect both traction springs to the lower brake shoe. Fasten traction spring on the wheel cylinder side with the clip to the push rod and insert from below the lower brake shoe with the push rod. Connect hand brake cable (Fig. 4 - 2/2).



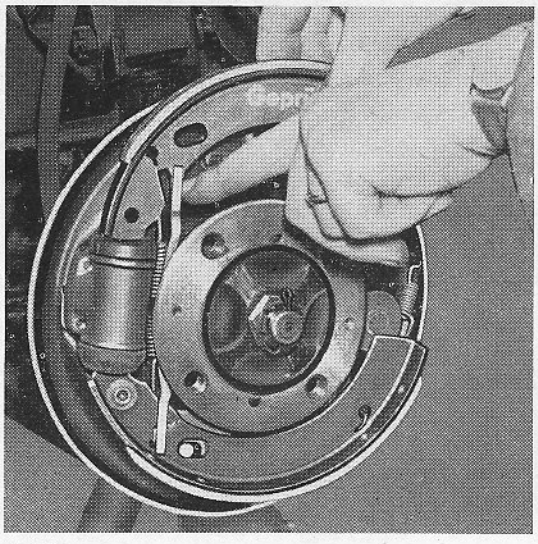
4 - 2/2

2. The traction spring on the wheel cylinder side is to be connected to the upper brake shoe (Fig. 4 - 2/3).



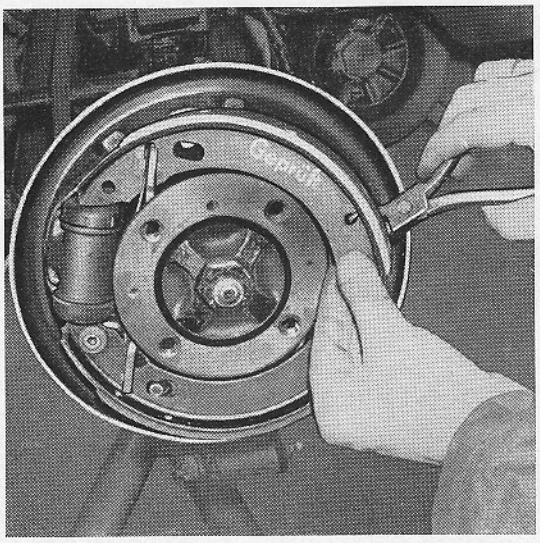
4 - 2/3

3. Put upper brake shoe in place at wheel cylinder piston. Lift brake shoe and place push rod in the proper position (Fig. 4 - 3/1).



4 - 3/1

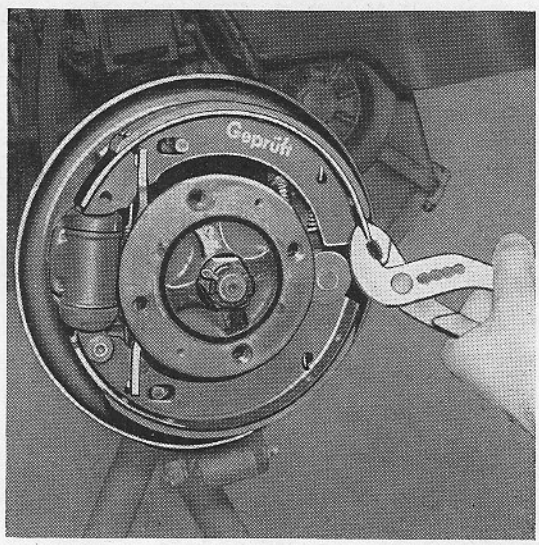
4. Connect short tension spring to the upper brake shoe with pointed pliers (Fig. 4 - 3/2).



4 - 3/2

Connect tension spring in such a manner that their function will not be impaired by other parts of the brake. The center piece of the short tension spring shall be conducted with its offset bend past the inner side of the anchor pin.

5. Insert both brake shoes with Polygrip pliers at the anchor pin and put in the proper functional position. (Fig. 4 - 3/3).



4 - 3/3

6. Check function of brake by actuating foot and hand brake lever.

7. Put brake drum in place and fasten each drum with two countersunk screw M 6 x 10. (See also Fig. 4-1/1).

8. Put wheels in place; screw in wheel bolts; tighten wheel nuts slightly and unjack car.

9. Tighten wheel nuts securely, (torque = 7.2 mkg) and put in place wheel hub caps.

10. Check braking action on a trial run. The deceleration values obtained should conform to the official Regulations.

Installing New Brake Linings
(with brake shoes removed from car)

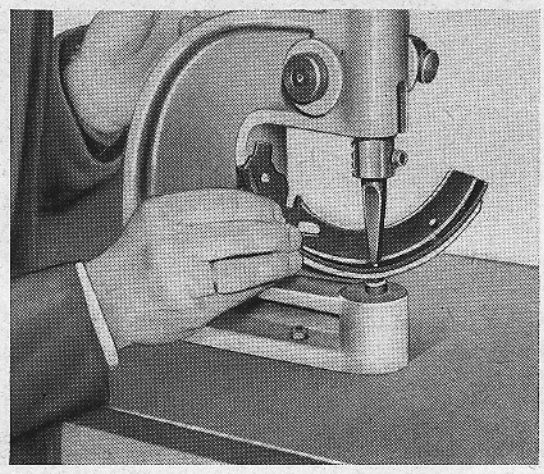
1. Separate with care rivets from brake linings on the inner side with a cross cut chisel and drive out with a drift. In doing so, give care that both shoes will not be damaged.

2. Clean brakes hoes and remove burr from rivet holes.

3. Fasten by riveting new brake lining from the center. (Fig. 4 - 4/1).

In order to achieve an unobjectionable brake action and to avoid squeaking noises, be sure lining bears on the whole surface of brake shoe and does not protrude laterally. Avoid any tension, i.e. insert rivets vertically, if necessary rebore holes in the lining.

4. Break sharp edges in way of cam surface.
If necessary, round off and chamfer lining at either end 5-7 mm.



4 - 4/1

General

The brake system in vehicles, particularly the brake linings, is subjected to a natural wear which is dependet upon the kind and time of applying brakes. For example, the application of brakes in a car driving on mountain passes, and a "keen" manner of driving in conjunction with frequent use of the brakes results in a higher rate of wear than a more careful manner of driving in a open flat country. In both cases the brake lining will wear down so that the distance between brake shoe and brake drum is being increased.

Thanks to the constructional features of the hydraulic brake system the volume of the brake fluid tank enables any change of distance to be compensated, but in the course of time the slack travel of the brake will increase.

When the pedal brake travel increases excessively before the brakes will react, readjustment of the brake shoes by means of the eccentrics on the brake carrier plate will be necessary.

Adjusting Brakes

1. Jack up car at all four wheels and loosen hand brake.

2. Actuate several times brake foot lever for centering brakes shoes inside brake drum.

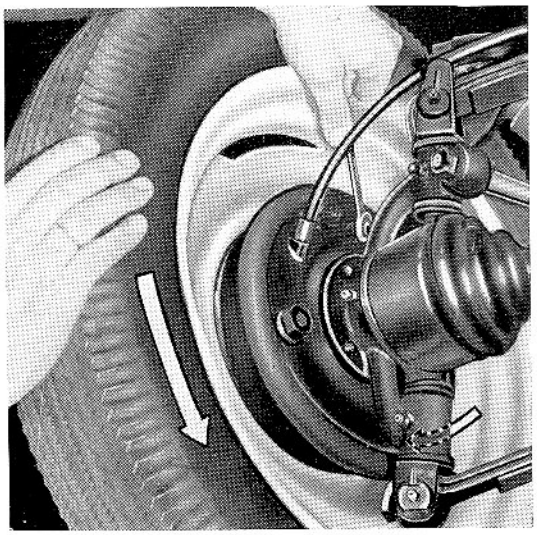
3. Turn each wheel corresponding to the sense of rotation when driving in the ahead direction and in doing so readjust with an open-jaw wrench SW 10 the upper eccentric until the brake shoes bear firmly against the brake drum. Following this procedure, loosen wheel eccentric until brake drum spin just freely (Fig. 5 - 1/1).

   In order to obtain on all readjustment eccentrics a fairly equal adjustment, turn open-jaw wrench in the direction "away from wheel cylinder".

4. Carry through readjusting on the lower wheel eccentric in the same manner (operations on the R. H. front wheel are shown in the figure.

5. Readjust likewise wheel eccentrics on all other wheels as described under item (3).

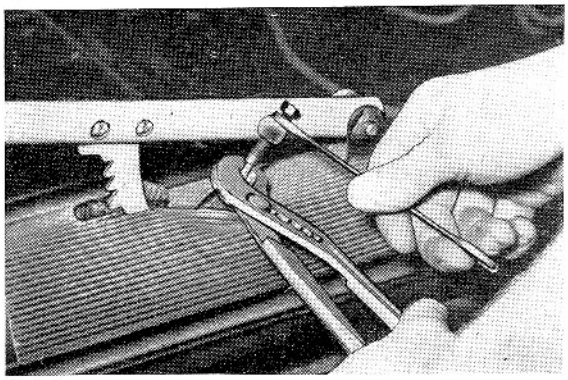
6. Put car on ground and check brakes.
   Give care to proper track keeping of the car at full braking action.



5 - 1/1

Readjusting Hand Brake

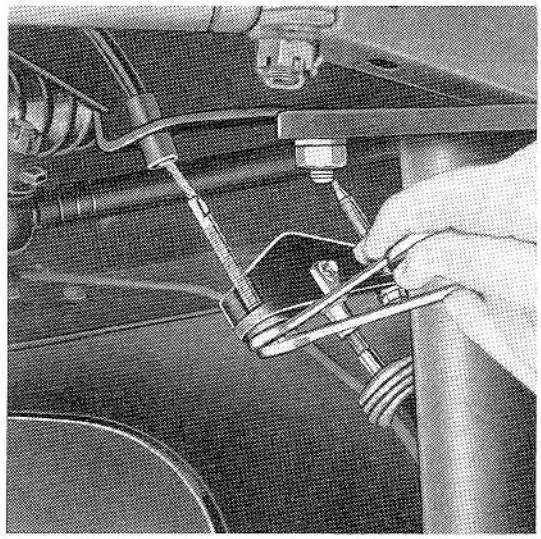
1. Loosen counter nut SW 10 on brake cable ends (hand brake lever). Hold fast brake cable end with pliers below threaded end and readjust adjusting nut until the wheels are kept immobilized, with hand brake lever applied by 3 to 4 teeth (Fig. 5 - 2/1).



5 - 2/1

2. Hold fast adjusting nut and tighten counter nut.

3. As soon as the adjusting nuts on the hand brake lever are tightened up to the end of the threaded end, back off nuts to initial position and unlock and tighten adjusting nuts on the equalizer until the wheels are kept immabilized, with hand brake applied by 3 to 4 teeth. Tighten counter nuts. (Fig. 5 - 2/2).



5 - 2/2

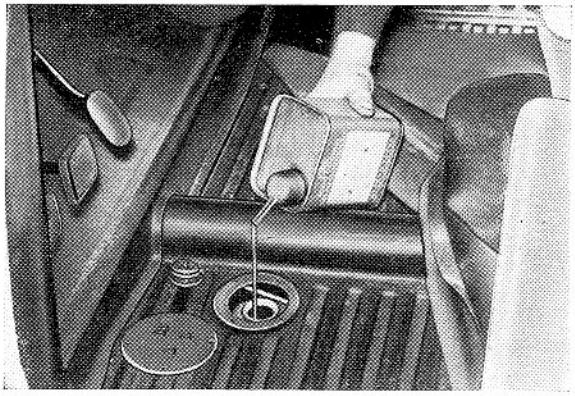
4. Check brake action of hand brake on the front wheels. Both front wheels should be braked uniformly when applying hand brake.

Bleeding Brakes

General

If in the case of repairs to the brake system the master or wheel brake cylinders, brake tubes or brake lines are separated provisionally or are renewed, it is necessary to bleed the brake system. Furthermore, it is necessary to bleed the brake system if brake pedal can be depressed entirely without any resistance being felt, and it has to be depressed or "pumped" repeatedly for one braking. If a car the braking system requires to be held several times it is necessary to localize the trouble and to remedy it. It is possible that wheel or master brake cylinder rubber collars have become untight. Furthermore, air may enter the brake lines and brake tubes at their connections, if one of the lines is leaky or if one of the screw connections has become slack. For testing the braking system fill master brake cylinder with brake fluid, actuate brake pedal and keep it in that position for about 2 minutes, so that a fluid pressure will be created inside the brake system. During this test the connections, brake lines and wheel brake cylinders should be observed so that the trouble will be found in the majority of cases.

1. Open cover in the frame bottom.
   Remoev closing cap from brake fluid tank and fill tank with brake fluid (Fig. 5 - 3/1).



5 - 3/1

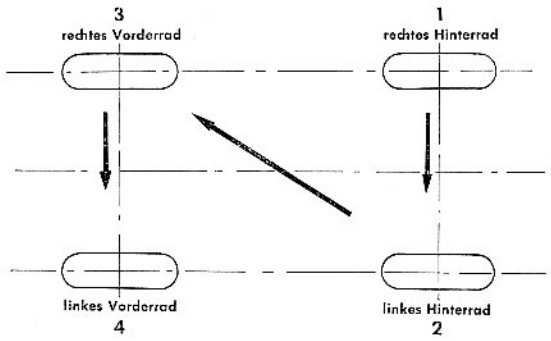
Attention! Use only blue ATE brake fluid. In foreign countries Lockhead brake fluid should be used.

(Mixing of ATE and Lockhead brake fluids is permitted). If other brake fluids are used, the Manufacturer undertakes no guarantee for a reliable function of the brakes. For a safe operation of the brakes refill brake fluid tank always in time so as to avoid air being drawn in.

Do not reuse the brake fluid drained out during bleeding operation, otherwise there is fear of foreign matters entering the brake system.

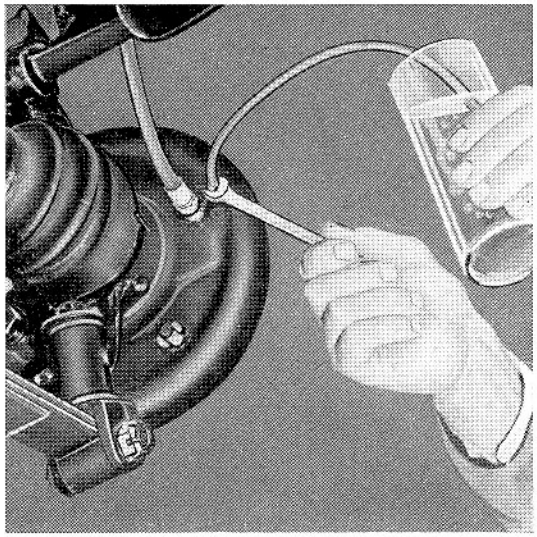
2. Commence bleeding of brakes at the wheel brake lying farthest away from the master brake cylinder.

   For sequence of bleeding operation see: Fig. 5 - 3/2.



5 - 3/2

3. Clean connection fitting; remove rubber boots on bleeder valves. Push bleeding hose over on bleeder valve and dip the other end of bleeder hose into a clean vessel fitted with brake fluid so that you may notice whether air bubbles will flow to the surface during bleeding process (Fig. 5 - 3/3).



5 - 3/3

4. Depress several times brake pedal. Hold it fast in its lower position. Open bleeder screw with a open jaw wrench SW 7 and close again. Repeat this operation until air bubbles cease to flow at the bleeding tube end immersed in the brake fluid.

5. Remove bleeder hose and put in place rubber boot on bleeder valve.

6. Repeat bleeding operation on all other wheels according to the sequence of operations shown in Fig. 5 - 3/2.

7. Refill again with brake fluid. Screw into place filler cap and put in place cover in the frame.

8. Check brake action during a trial run.