Contents:

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Description of Hydraulic Brake

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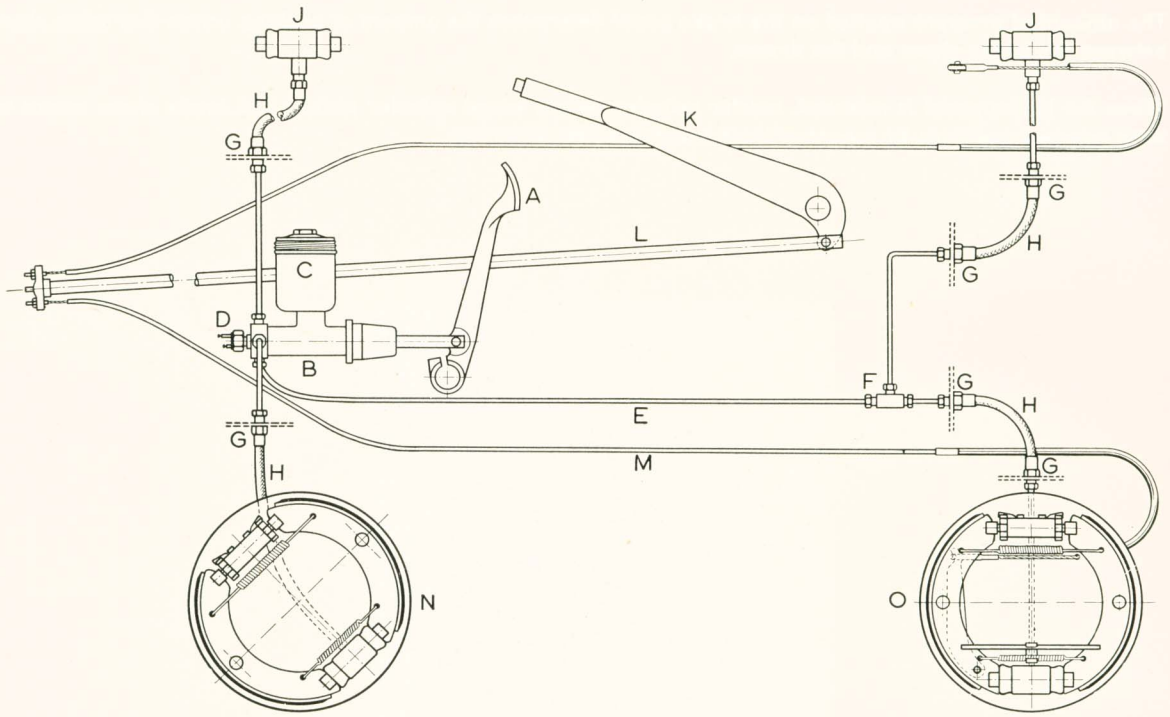

Diagrammatic view of complete hydraulic brake system

A - Brake pedal
B - Master cylinder
C - Fluid reservoir
D - Stop light switch
E - Hydraulic line
F - Three-way connection
G - Brake hose bracket
H - Brake hose
J - Wheel cylinder
K - Hand brake lever
L - Brake push bar
M - Cable conduit tube
N - Front wheel brake
O - Rear wheel brake

The brake system consists of:

Master cylinder, in which the hydraulic pressure is generated;

Fluid reservoir, maintaining the constant volume of the brake fluid;

Wheel cylinder, forcing the brake shoes against the drum;

Hydraulic lines, connecting master cylinder to wheel cylinders, hoses being used at moving parts.

The master cylinder is provided with one piston and each wheel cylinder with two pistons. Rubber boots prevent leakage.

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Operation

When the brake pedal is depressed, the piston is forced into the master cylinder, generating high pressure. This pressure is transmitted with equal and undiminished force to the four wheel cylinders.

The fluid pressure forces the two pistons in each wheel cylinder outward, expanding the brake shoes against the drums.

The amount of pressure applied on the brake pedal determines the amount of braking action that takes place between the brake shoes and the drums.

When the brake pedal is released, master cylinder piston, wheel cylinder pistons and brake shoes return to their released positions by means of their respective return springs.

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(From August 1955)

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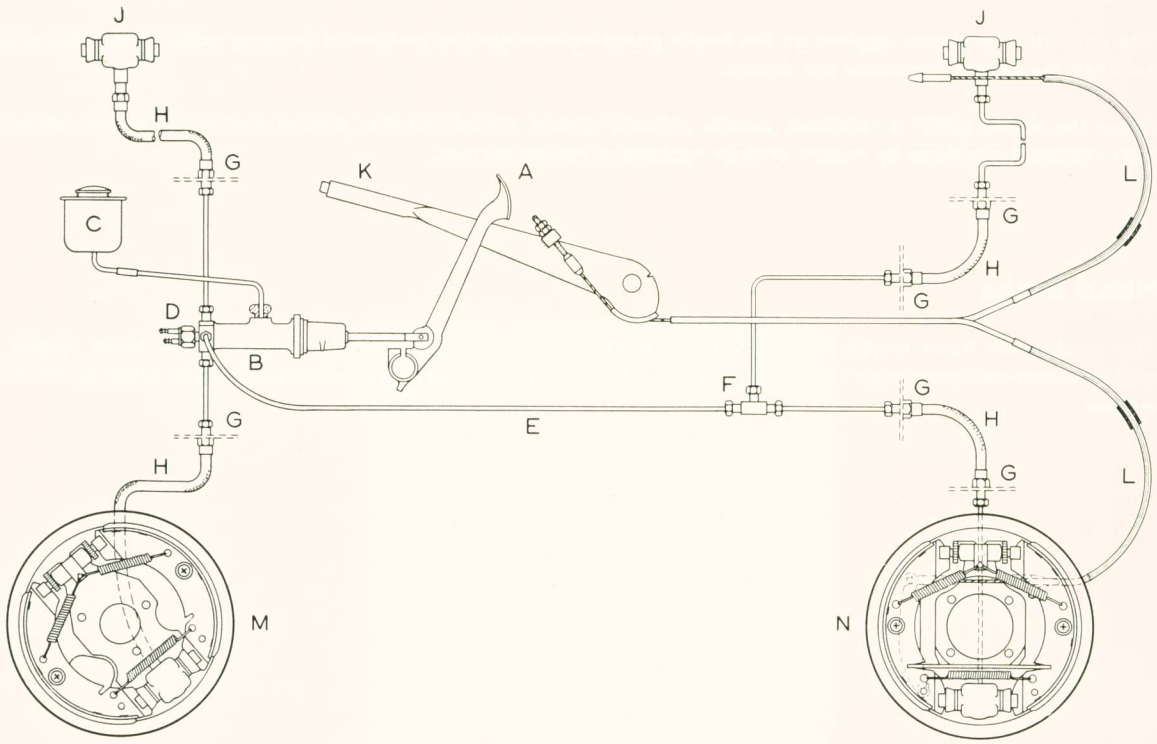

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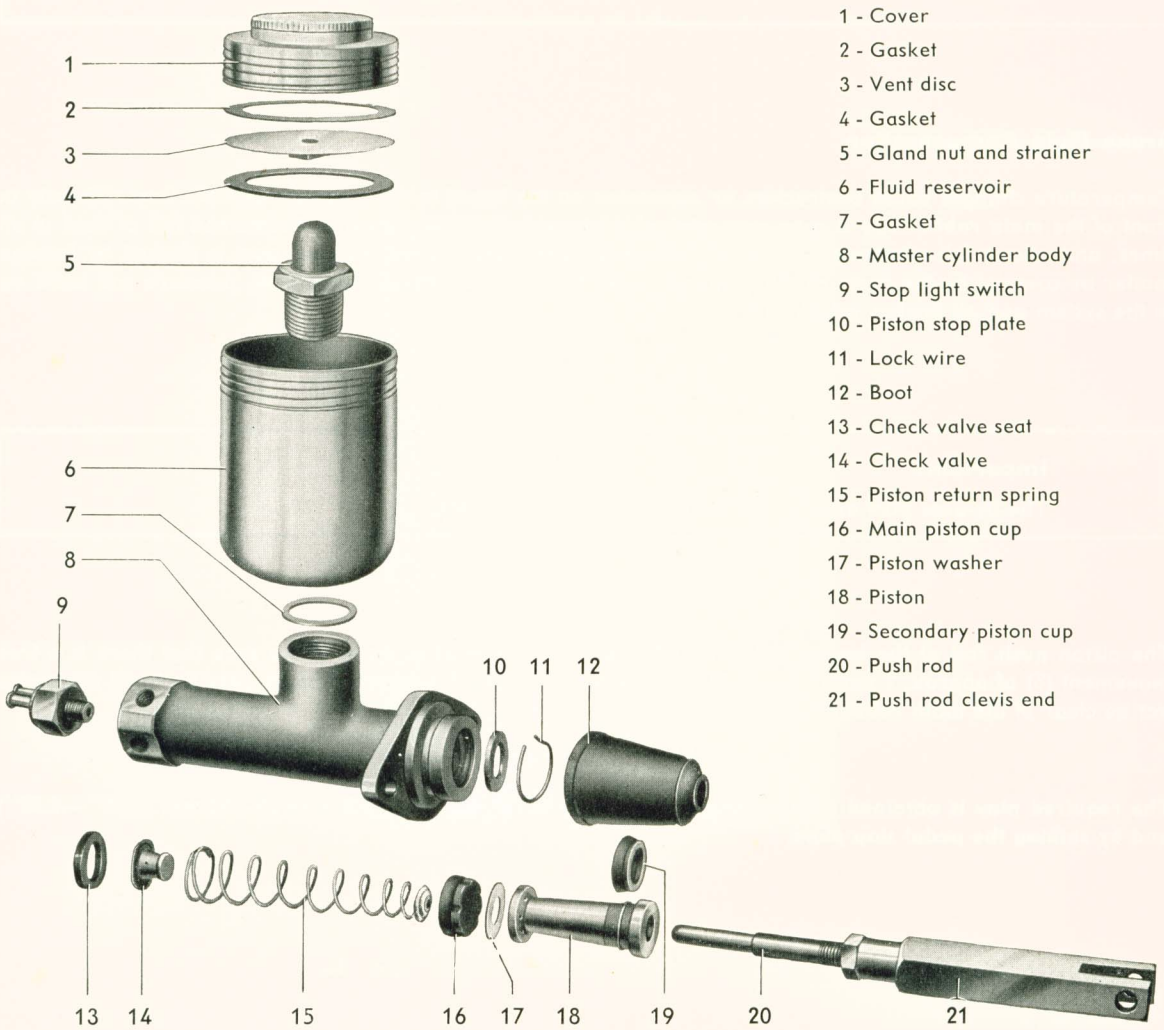
Hand Brake

The mechanical hand brake is operated by pulling up the horizontally placed hand brake lever, which is of the ratchet-and-pawl type. Both cables are anchored direct to the lever and are guided in tubes to the rear wheels.

The push rod links the piston in the master cylinder to the brake pedal. When depressing the brake pedal, the piston forces the hydraulic fluid through the brake lines into the wheel cylinders.



1 - Cover
2 - Gasket
3 - Vent disc
4 - Gasket
5 - Gland nut and strainer
6 - Fluid reservoir
7 - Gasket
8 - Master cylinder body
9 - Stop light switch
10 - Piston stop plate
11 - Lock wire
12 - Boot
13 - Check valve seat
14 - Check valve
15 - Piston return spring
16 - Main piston cup
17 - Piston washer
18 - Piston
19 - Secondary piston cup
20 - Push rod
21 - Push rod clevis end

Fluid Reservoir

Make sure the vent hole in the cover is clear of obstruction to prevent a vacuum or pressure from forming in the fluid reservoir (be careful when painting!).

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When filling the reservoir, it should be made sure that the cover is absolutely clean so as to avoid getting any dirt into the hydraulic system. The reservoir should be sufficiently filled, that is, up to 15—20 mm (0.6″—0.8″) below the upper edge.

Important!

Never use mineral oil, but only VW Genuine Brake Fluid or Lockheed Brake Fluid.
Never allow the brake fluid to come into contact with painted parts.

Brake Fluid Compensation

Temperature changes cause contraction or expansion on the liquid in the cylinders and the lines. Directly in front of the main rubber cup is a by-pass port which insures that the system is maintained full of fluid at all times, and allows full compensation for expansion or contraction. If the by-pass port is choked by foreign matter or covered by the main rubber cup, as a result of incorrect pedal adjustment, pressure will build up in the system and all brakes will drag.

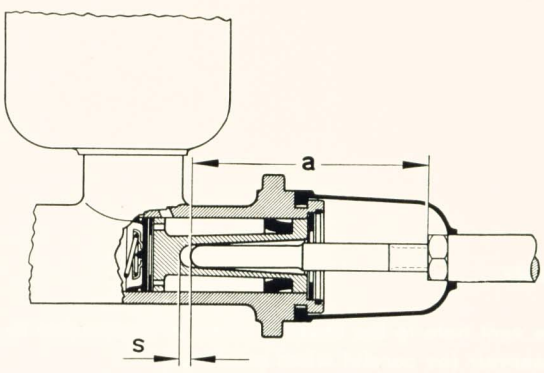
Important!

The by-pass port must be free when the system is at rest.

The piston push rod at the brake pedal must be carefully adjusted so as to make sure that there is a free movement (S) of approx. 1 mm (0.04″) between the push rod and the piston. The by-pass port will otherwise not be clear of the main rubber cup.

The required play is obtained by adjusting the piston push rod to the length a = 53—52 mm (2.09″—2.05″) and by shifting the pedal stop plate.

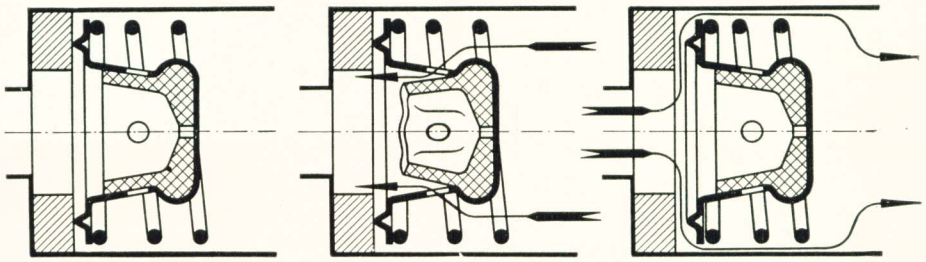
S = 1 mm (0.04″)
a = 53—52 mm (2.09″—2.05″)



Check Valve

The check valve consists of a perforated metal body to which is attached a rubber valve seat. Inside the valve body is a small rubber cup which seals the perforations. The function of the valve is to prevent fluid from returning to the master cylinder during bleeding, thus ensuring a charge of fresh fluid being delivered at each stroke of the foot pedal. During normal operation, the action of the valve is as follows: —

When depressing the brake pedal, the piston forces fluid through the perforations in the valve bodies, causing the internal cup to collapse and create a free passage. When releasing the pedal, the action of the brake shoe return springs causes the fluid delivered to the wheel cylinders to be returned to its original position in the system, and the returning fluid lifts the complete valve assembly to allow free passage, until the pressure it exerts is overcome by the piston return spring, when the valve closes.



Released position | Braking position | Return position

Piston Cups

Additional fluid is drawn into the pressure chamber of the cylinder from the annular space formed by the piston skirt through the small holes in the piston head, via the main cup, as a result of the vacuum created by the rapid return of the piston after each brake application. This prevents air to be drawn into the system. As the system comes to rest, due to the action of the brake shoe return springs, the excess fluid passes to the fluid reservoir via the by-pass port.

The outer end of the annular space around the piston is sealed by the secondary cup. The co-ordinated function of by-pass port, check valve, and main cup allows the system to compensate for any changes and prevents any ingress of air.

Assembled master or wheel cylinders should, if possible, be no longer stored than three months. If circumstances necessitate the cylinders to be stored over a longer period, they should be inspected regularly.

Important! Note when replacing a master cylinder: —

Master cylinder up to Chassis No. 167,889 22.2 mm diam.
Master cylinder from Chassis No. 167,890 19.05 mm diam.

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Master Cylinder Removal and Installation

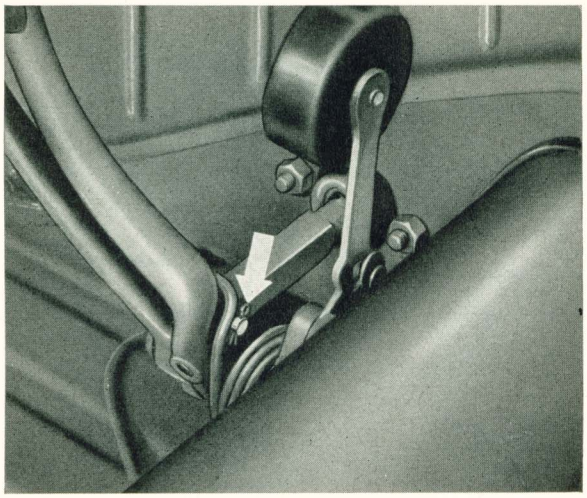
The master cylinder is to be removed for cleaning and inspecting its components.

Removal

1 - Disconnect stop light cable.

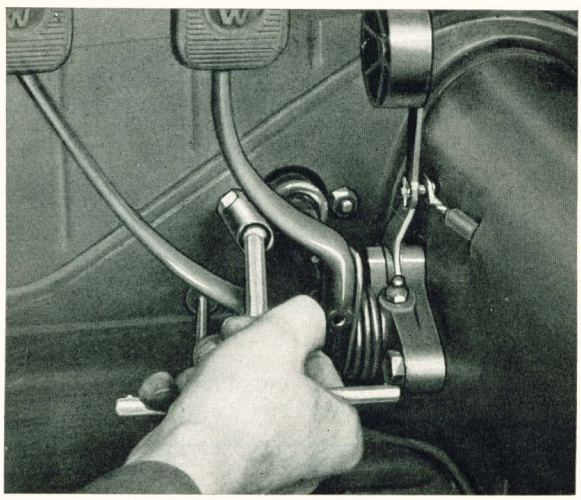
2 - Disconnect brake lines and plug them up.

3 - Remove bolt that attaches piston push rod to brake pedal and loosen brake pedal stop.



4 - Remove piston push rod.

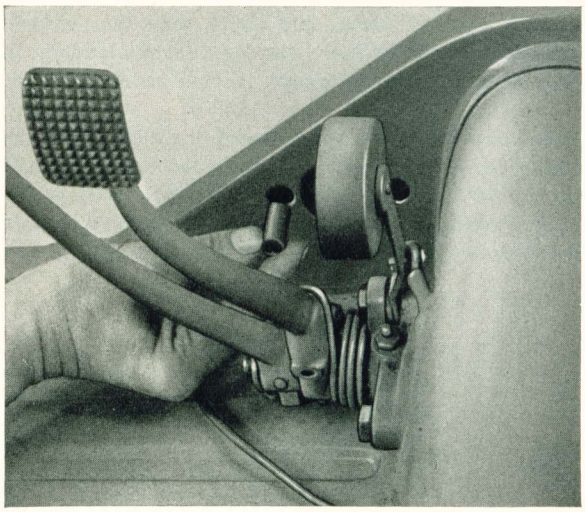
5 - Remove the two master cylinder mounting bolts and nuts and withdraw master cylinder toward the front.



Installation

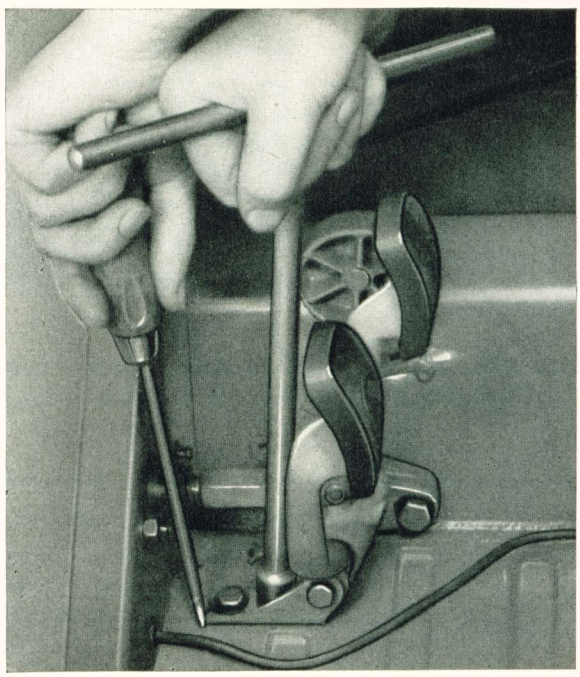
This is a reversal of the preceding operations, but attention should be paid to the following points:

1 - Place distance sleeves in frame end plate.



2 - Check length of piston push rod (53—52 mm/ 2.09″—2.05″ from convex end to nut face).

3 - Adjust brake pedal free play by shifting the stop plate until there is a clearance of 1 mm (0.04″) between push rod and piston.

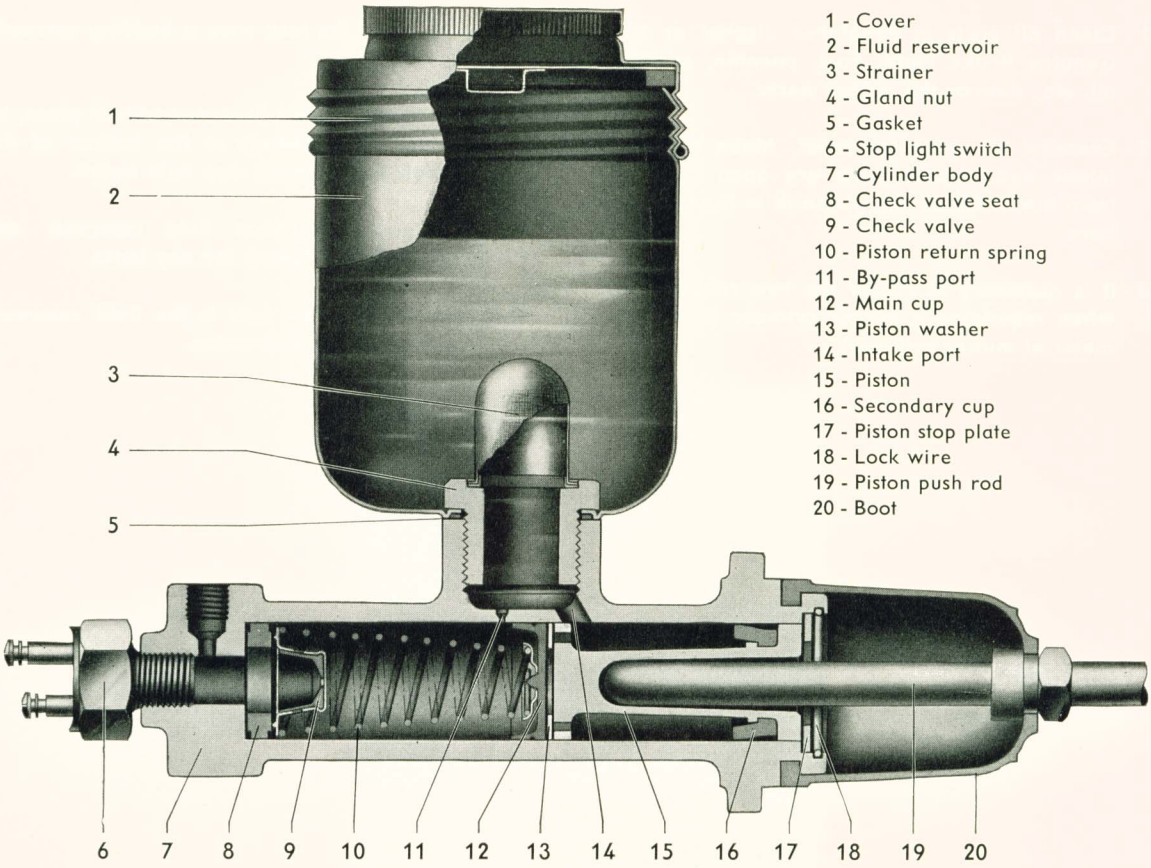


4 - Top up brake fluid.

5 - Bleed the system.

6 - Check operation of stop light.

Reconditioning Master Cylinder



1 - Cover
2 - Fluid reservoir
3 - Strainer
4 - Gland nut
5 - Gasket
6 - Stop light switch
7 - Cylinder body
8 - Check valve seat
9 - Check valve
10 - Piston return spring
11 - By-pass port
12 - Main cup
13 - Piston washer
14 - Intake port
15 - Piston
16 - Secondary cup
17 - Piston stop plate
18 - Lock wire
19 - Piston push rod
20 - Boot

Master Cylinder (Sectional view)

Disassembly

1 - Empty the fluid reservoir, remove and disassemble it.

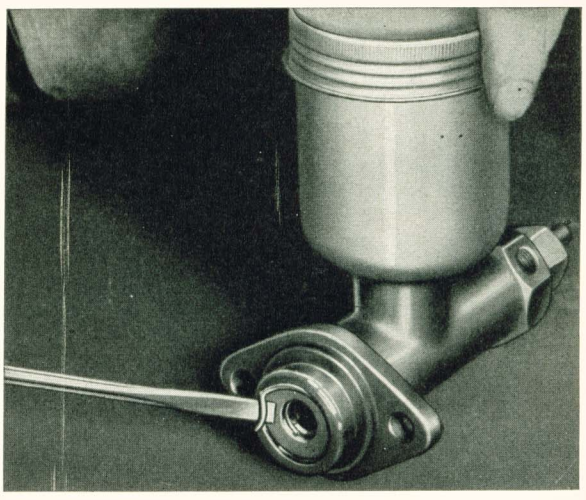
2 - Remove the rubber boot.

3 - Remove the lock wire.

4 - Take off piston stop plate and piston.

5 - Remove piston washer, main cup, return spring, check valve, and seat.

6 - Screw off stop light switch.



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Assembly

Assembly is effected by reversing the preceding operations, but the following points should be observed:

1 - Clean all parts in denatured alcohol or VW Genuine Brake Fluid. Fuel, paraffin, mineral oil, etc., destroy the rubber parts.

2 - Examine all parts for wear. Make sure the intake and by-pass ports are open and free from burrs. Check the piston fit in the cylinder bore.

3 - It is necessary to renew the two rubber cups when rebuilding a master cylinder (Note diameter of master cylinder).

4 - Install check valve seat, check valve, return spring and return spring seat.

5 - Install piston with VW Genuine Brake Cylinder Paste.

6 - See to it that the lock wire is bedding correctly in its recess.

7 - When tightening the fluid reservoir in place, be sure the mark (bead) at the bottom of the reservoir points to the stop light switch.

8 - Place gasket between fluid reservoir and master cylinder. Check for any leaks.

9 - Make sure the vent hole in the fluid reservoir cover is clear of obstruction.

Description

The wheel cylinders transmit the pressure generated in the master cylinder to the brake shoes.

The wheel cylinder is attached to the brake back plate. The cast cylinder body contains a return spring, two cup fillers, two cups, and two pistons. The return spring and the fillers press the cups against the cylinder wall. When depressing the brake pedal, the fluid displaced by the master cylinder forces the cups and pistons outward, expanding the brake shoes against the drum via the two push rods.

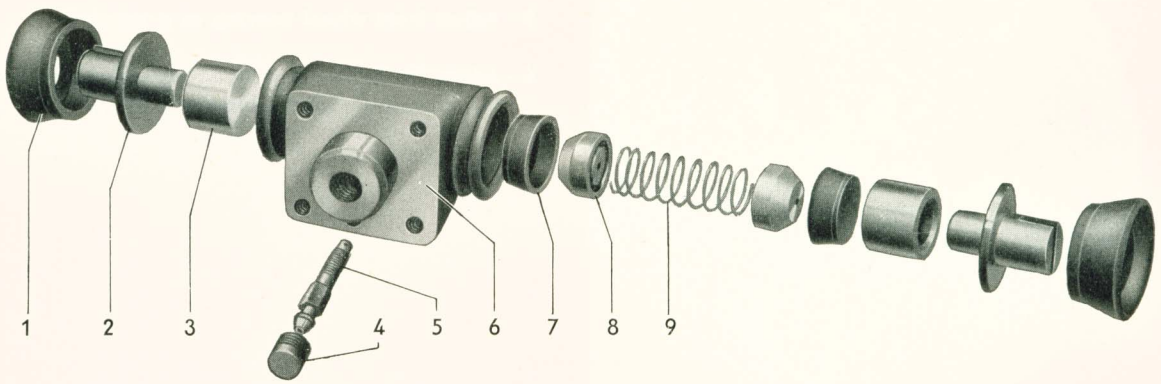
The open ends of the cylinder are fitted with rubber boots to prevent ingress of dirt.

With the brake system at rest, the wheel cylinder is practically filled up, that is, there is no space for the fluid. This insures a perfect bleeding.

Between the pistons is an opening for the bleeder valve, which is turned to the open position when bleeding the system.

Important! Note when replacing a wheel cylinder: —

Wheel cylinder, front	19.05 mm (0.75″) diam.
Wheel cylinder, rear, up to Chassis No. 167,889	19.05 mm (0.75″) diam.
Wheel cylinder, rear, from Chassis No. 167,890	15.87 mm (0.62″) diam.
Wheel cylinder, rear, from Chassis No. 397,023	17.46 mm (0.69″) diam.



1 - Boot
2 - Push rod
3 - Piston
4 - Dust cap
5 - Bleeder valve
6 - Cylinder body
7 - Cup
8 - Cup filler
9 - Return spring

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Front Wheel Cylinder Removal and Installation

Removal

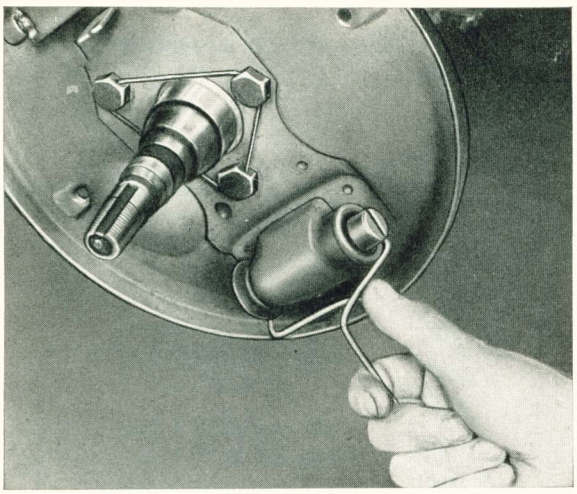
1 - Remove front wheel and brake drum.

2 - Disconnect the hose and plug it up by means of a piece of wood.

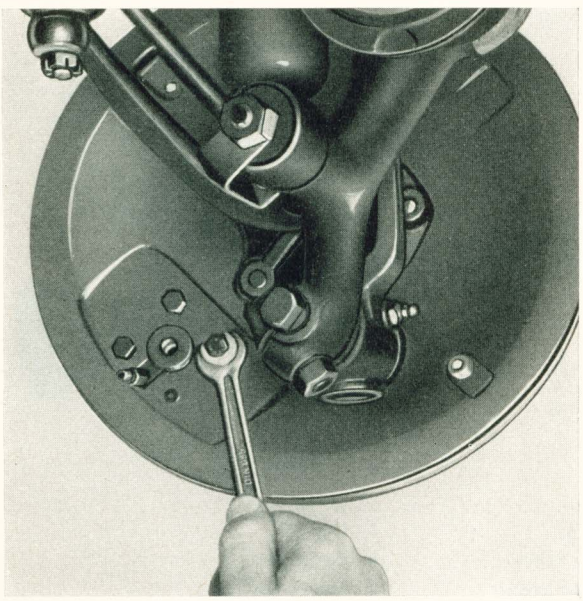
3 - Remove shoe hold-down spring seats, springs, and pins.

4 - Unhook brake shoe return springs.

5 - Remove brake shoes and place the wheel cylinder clamp in position as shown below.



6 - Remove the four wheel cylinder attaching screws and take off wheel cylinder.

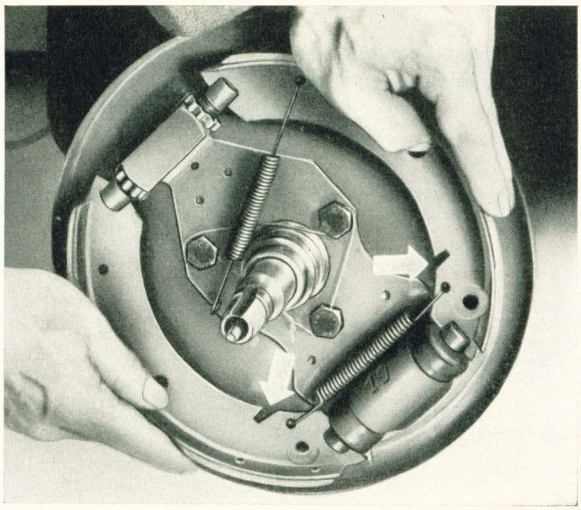


Installation

This is a reversal of the preceding operations, but the following points should be noted:

1 - Install wheel cylinder. When renewing the wheel cylinder, attention should be paid to the size.

2 - Correctly install brake shoes: the slots in the webs must be towards the wheel cylinder.



3 - Before installing the brake drum, make sure the oil seal is in perfect condition.

4 - Clean brake drum hub and ball bearing and apply Universal Grease VW — A 052.

5 - Adjust front wheel bearing as prescribed.

6 - Adjust the brakes and bleed the system. Do not forget to re-install the bleeder valve.

Rear Wheel Cylinder Removal and Installation

Removal

1 - Remove rear wheel, brake drum, and oil deflector.

2 - Disconnect brake line and plug it up by means of a piece of wood.

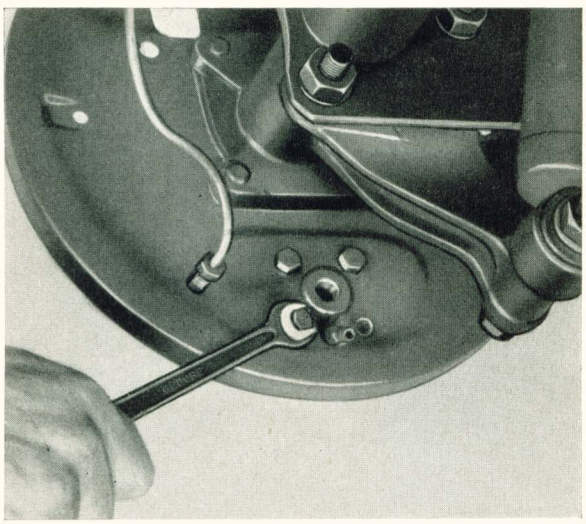
3 - Remove shoe hold-down seats, springs, and pins.

4 - Unhook brake shoe return springs.

5 - Remove brake shoes, brake shoe levers, operating link, and clip. Disconnect brake cable.

6 - Install the wheel cylinder clamp in position.

7 - Remove the four wheel cylinder attaching screws and take off wheel cylinder.



Installation

Reverse the removal procedure and observe the following points:

1 - Install wheel zylinder. When renewing the wheel cylinder, attention should be paid to the size.

2 - Correctly install brake shoes, brake shoe levers, operating link, and clip. The slots in the brake shoe webs must be toward the wheel cylinder. Connect brake cable.

3 - When re-installing brake drum, note proper position of oil deflector.

4 - Tighten rear axle shaft nut to a torque of between 28 and 31 mkg (203 and 224 ft. lbs.).

5 - Bleed the system. Adjust foot and hand brakes. Do not forget to re-install the bleeder valve dust cap.

Reconditioning Wheel Cylinder

Disassembly

1 - Remove wheel cylinder.

2 - Remove both boots.

3 - Take off push bars, pistons, cups, cup fillers, and return spring.

4 - Screw off bleeder valve.

Assembly

This is a reversal of the preceding operations, but the following points should be observed:

1 - Clean all parts only in denatured alcohol or brake fluid.

2 - Examine all parts for signs of wear. Check the piston fit in the cylinder bore.

3 - Renew both cups (note diameter of wheel cylinder).

4 - Install piston with VW Genuine Brake Cylinder Paste.

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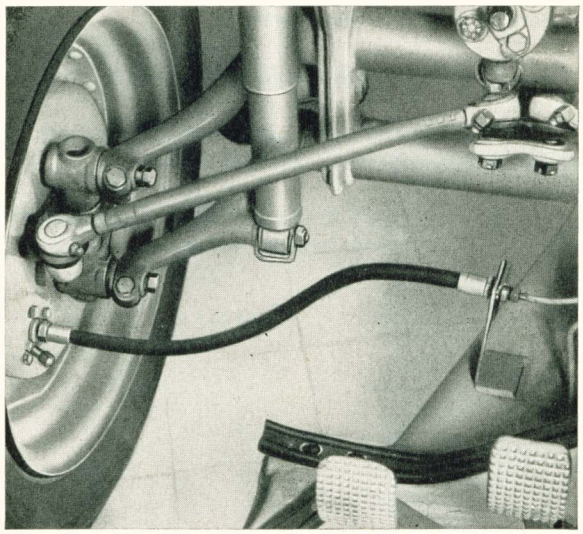
Brake Hoses

General

Brake hoses connect the wheel cylinders to the brake lines which are clipped to the frame.

When installing a brake hose, care should be taken to see that there are no sharp bends at the connection. The brake hoses must not be strained



in any steering position nor under springing action of the wheels. The hose should not be allowed to chafe at the chassis or body with the car in motion. It is important to keep the hoses free from contact with paint, fuel, paraffin, or mineral oil.

To prevent the front brake hoses from bending down too far, they should be installed as specified below:

After the brake hose is attached to the brake wheel cylinder, twist the free end of the hose 90° — or max. 180°. The twisting should be done in a way which makes the tube bend toward the **front** of the car.

The instructions should be followed whenever installing brake hoses of the De Luxe and Convertible. However, prior to installing the hoses, raise the car so that the weight is taken off the front wheels.

The nature and amount of damage done to brake hoses indicates in every case some kind of force. The cause lies usually in carelessness during installation.

In order to avoid such damage and to maintain braking efficiency the hints given above should be observed during installation.

Furthermore, care should be taken that grease does not come into contact with the brake hoses when lubricating the front axle.

Important!
Brake hoses must never be in contact with oil or grease for longer periods.

Important!
The hydraulic system must be bled whenever a fluid line has been disconnected. Top up brake fluid as necessary, using VW Genuine Brake Fluid or Lockheed Brake Fluid.

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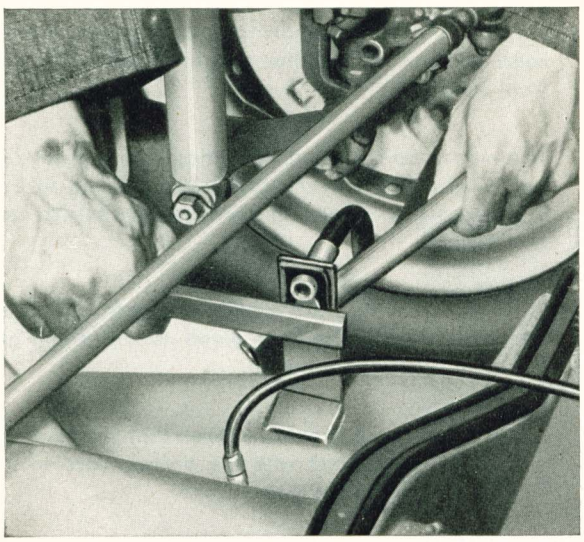
Renewing Brake Hose

Removal

1 - Remove wheel.

2 - Loosen union nut at hose bracket and remove the hose retainer.



3 - Withdraw brake hose from bracket.

4 - Disconnect brake hose from wheel cylinder.

Installation

Install the brake hose in the reverse order, observing the following points:

1 - The brake hose should not be twisted.

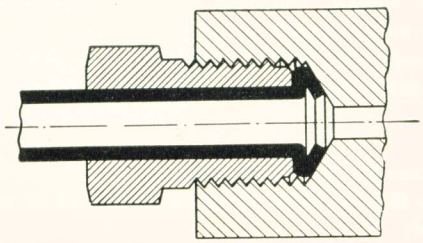
2 - Check for proper position of brake hose by turning steering from lock to lock.

3 - Bleed the system. Do not forget to re-install the dust cap on the bleeder valve.

Tubes

General

The rest of the brake lines consists of steel tubes of 5 x 0.75 mm. No trouble should arise provided the tubing is at all times tightly clipped to the chassis to prevent vibration. The tubes are tested to withstand pressure far in excess of that developed in braking.



Tube Connections

The tube ends are double flared for added protection against splitting and leakage. They are forced against the beveled faces in the couplings when tightening the coupling nuts, insuring strong and tight joints.

Moisten the flared ends with a few drops of brake fluid prior to tightening the nuts.

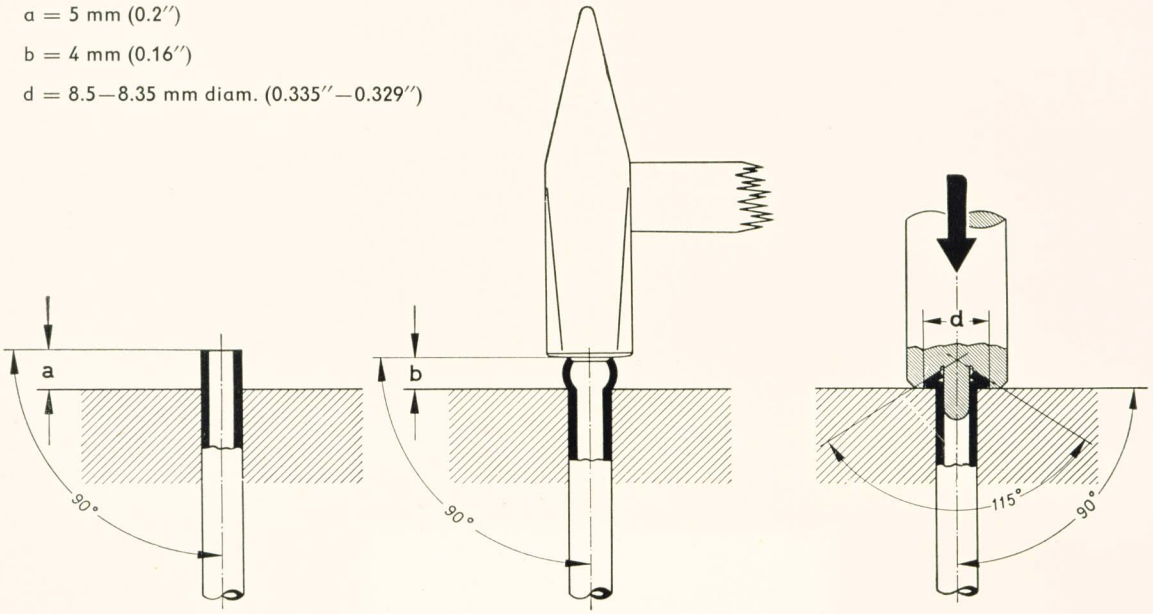
Flaring the tubes requires special tools. Before flaring a tube, square off the ends with a tube cutter and remove any sharp edges. Blow out any metal chips in the tube with compressed air.

Important!
When checking the brake system for leaks at routine services, all brake lines should be inspected for signs of corrosion or other damage.

a = 5 mm (0.2″)

b = 4 mm (0.16″)

d = 8.5—8.35 mm diam. (0.335″—0.329″)



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General

The front and rear wheel brake assemblies are shown in the following illustrations. The rear wheel brake differs from the front wheel brake only by a brake lever at the secondary (trailing) shoe and an operating link between the two shoes.

The brake shoes are self-centralising and are freely resting in the slots of the piston push rods and the adjusting screws, thereby reducing the tendency of the brake to drag to a minimum.

The two shoe hold-down springs assure a constant contact of the shoes with the bosses on the back plate. When letting the pedal return to the "off" position, the brake shoes are pulled to the released position by two return springs.

The brake shoes are adjustable by screws and nuts at the anchor block.

Note:

From Chassis No. 1—1040548 the brake hose running along the spinal member is additionally protected by a coating of sealing compound (Part No. D 9). When repairs are being carried out this coating should be renewed if necessary. The compound is ready for use and can be applied either by brush or spraying gun. Dilute with benzine if necessary.

Date introduced: 1st December 1955.

From Chassis No. 1436722 the copper-plated brake hoses are additionally galvanized. Thus sufficient protection is provided even after years of service and under unfavorable operating conditions.

Date introduced: 8th February 1957.

In the course of routine maintenance the brake system on older vehicles should be checked regularly for leaks and general condition. Workshop should, therefore, inform their customers of any apparent damage to insure safety in operation.

In case of repair the brake hoses can either be additionally coated with sealing compound or replaced by the latest galvanized ones.

The hole for adjusting the brake has been elongated and displaced by 5 mm (.2″).

The brake linings can now be checked without dismantling the brake drum. If the linings on inspection during routine maintenance are found excessively worn, i. e., down to about 2.5 mm (.1″), they should be replaced.

Date introduced: 7th March 1956
From Chassis No.: 1125652

Wheel Brakes

Front wheel Brake

1 - Brake back plate

2 - Secondary (trailing) brake shoe

3 - Primary (leading) brake shoe

4 - Hold-down spring and spring seal

5 - Wheel cylinder

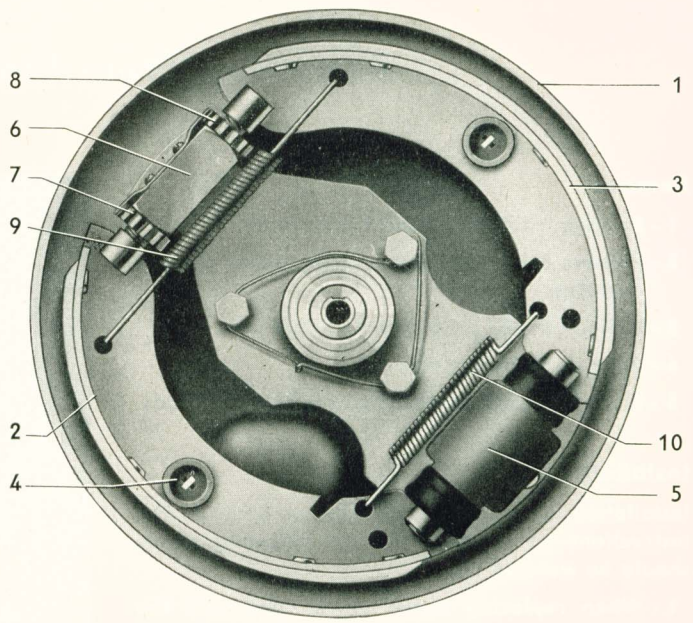
6 - Anchor block

7 - Adjusting nut

8 - Adjusting nut

9 - Return spring

10 - Return spring



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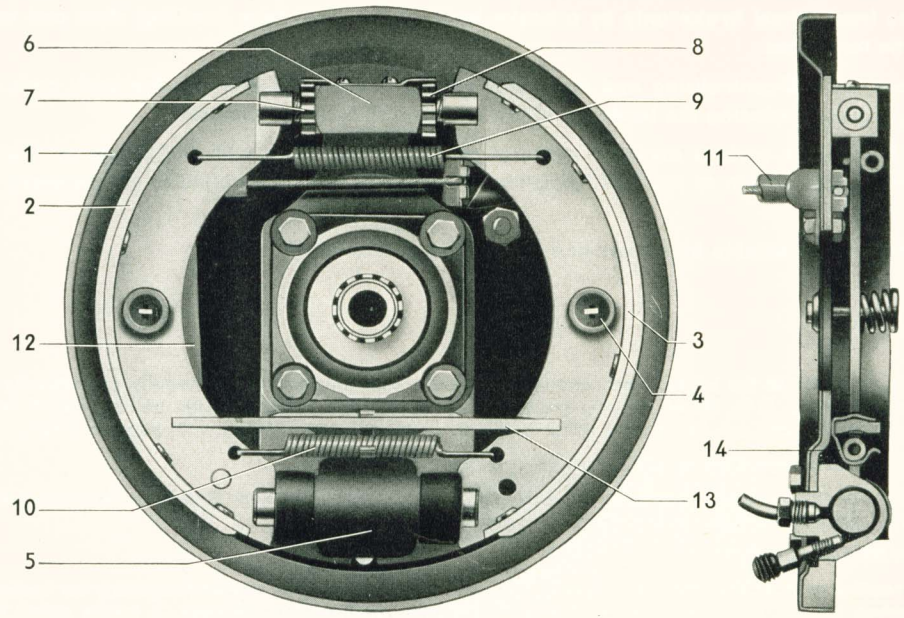
Rear wheel Brake

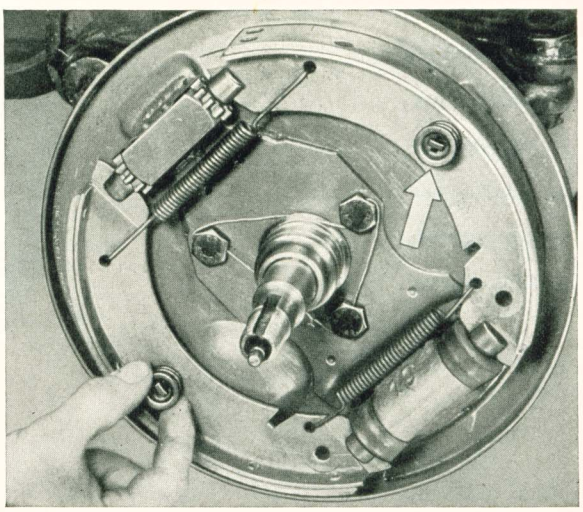


1 - Brake back plate
2 - Secondary (trailing) brake shoe
3 - Primary (leading) brake shoe
4 - Hold-down spring and spring seat
5 - Wheel cylinder
6 - Anchor block
7 - Adjusting nut
8 - Adjusting nut
9 - Return spring
10 - Return spring
11 - Brake cable conduit tube
12 - Brake shoe lever
13 - Operating link
14 - Clip

Renewing Front Brake Shoes

Removal

1 - Remove front wheel and brake drum.
2 - Remove shoe hold-down spring seats, springs and pins.
3 - Unhook brake shoe return springs.
4 - Take off brakes shoes.
5 - Place wheel cylinder clamp over both push rods.



Installation

Installation takes place in the reverse order to the instructions on removal, but the following points should be watched closely:

1 - When replacing brake shoes, take care the linings are of the same type to insure an equal braking.

2 - Correctly install brake shoes; the slots in the brake shoe webs must be toward the wheel cylinder.

3 - Connect return springs so that they do not make contact with other components of the wheel brake.

4 - Before installing the brake drum, make sure the oil seal is in perfect condition.

5 - Clean brake drum hub and ball bearing and apply Universal Grease VW — A 052.

6 - Adjust front wheel bearing as prescribed.

7 - Adjust the brakes and bleed the system. Do not forget to re-install the bleeder valve dust cap.

Renewing Rear Brake Shoes

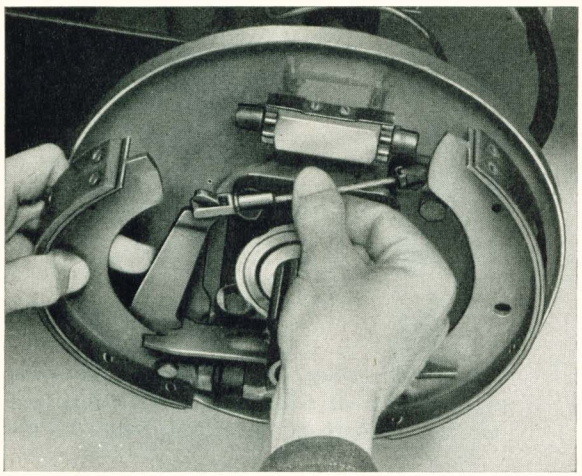
Removal

1 - Remove rear wheel, brake drum, and oil deflector.

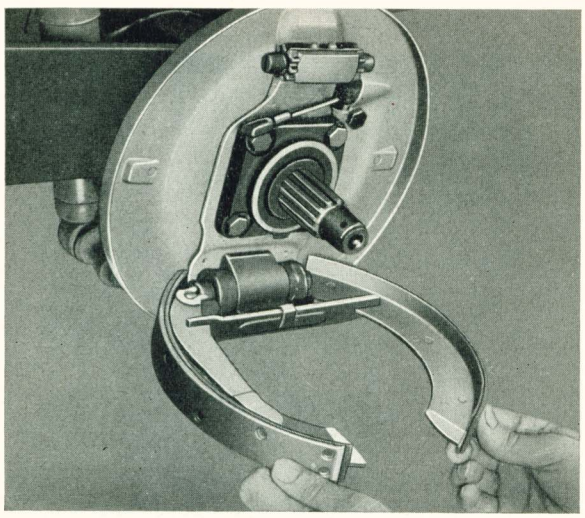
2 - Remove shoe hold-down spring seats, springs, and pins.

3 - Unhook upper brake shoe return spring.

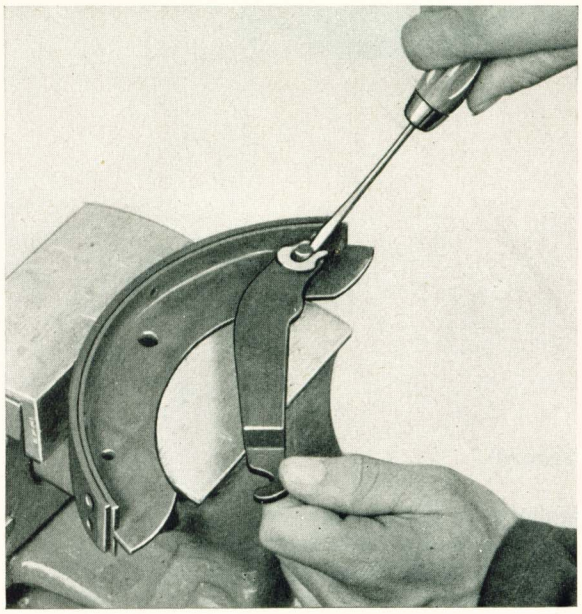
4 - Disconnect brake cable.



5 - Remove brake shoes, return spring, brake shoe levers, operating link, and clip.



6 - Detach brake lever from brake shoe by removing the circlip from the anchor pin.



7 - Place the wheel cylinder clamp in position.

Installation

Installation is a reversal of the removal procedure, but the following points should be observed.

1 - When replacing brake shoes, take care the linings are of the same type to insure an equal braking.

2 - Correctly install brake shoes, return spring, brake shoes levers, operating link, and clip. The slots in the brake shoe webs must be toward the wheel cylinder. Connect brake cable.

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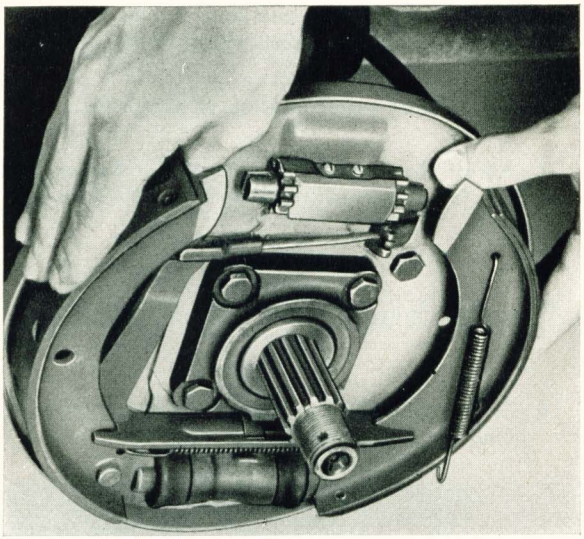


3 - Connect return springs so that they do not make contact with other components of the wheel brake.

4 - When re-installing brake drum, note proper position of oil deflector.

5 - Tighten rear axle shaft nut to between 28 and 32 mkg (202 and 224 ft. lbs.).

6 - Bleed the system. Adjust foot and hand brakes. Do not forget to re-install the bleeder valve dust cap.

Lining Replacement

General

Brake shoe lining replacement should be made only in axle sets (both front wheels or both rear wheels) to insure an equal braking effect. It is also of great importance to use the same type of brake lining to maintain an efficient braking. Oil-soaked brake linings should be replaced. It is of no use to wash the linings in fuel or another grease solvent, as the oil in the lining will again appear on the surface by the heat development when braking.

Relining Brake Shoes

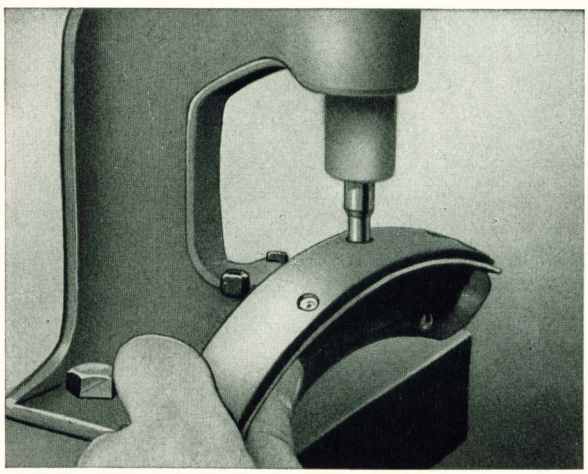
1 - Remove brake shoes.

2 - Carefully remove the lining rivets to avoid damage and distortion to the brake shoe.

3 - Clean and inspect the brake shoe. Remove any burr from rivet holes.

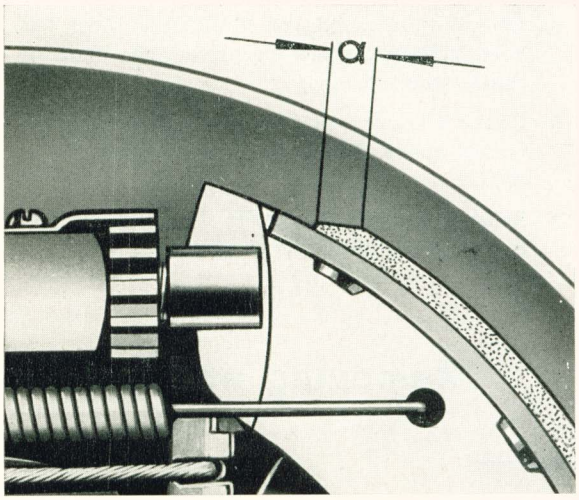
4 - The center rivets should be set first, then work towards both ends of the lining. It is very important that a snug fit exists between the lining and the shoe, as otherwise brake noises and premature failure of the brakes would be the result.

Only rivets which insure a close fit between the rivet shank and the drilled hole in the lining and shoe should be used.



5 - Both ends of the lining should be chamfered (5 mm/0.2″). Round off sharp edges of contact surface.

Important! — Only use rivets supplied by the VW Factory. Never use aluminium rivets.



a = approx. 5 mm/0.2″

Removing and Installing Front Brake Back Plate

Removal

1 - Remove front wheel.

2 - Remove cotter pin securing speedometer drive cable.
Remove grease cap.

3 - Withdraw brake drum.

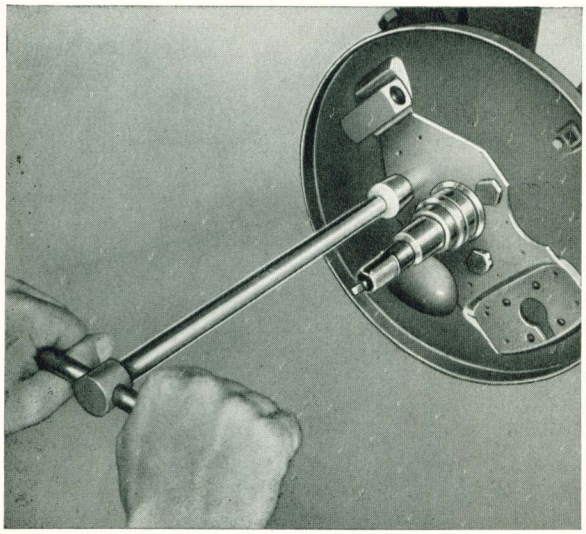
4 - Disconnect brake hose and plug it up by means of a piece of wood.

5 - Remove brake shoes.

6 - Remove wheel cylinder.

7 - Take off adjusting screws and nuts.

8 - Take off the leaf spring on the anchor block after having removed the two attaching screws.



9 - Remove the three back plate mounting bolts.

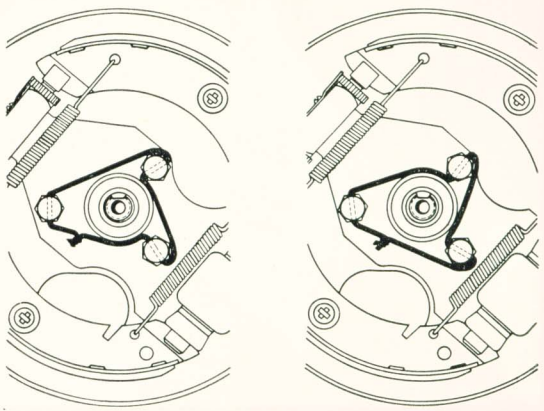
10 - Take off back plate.

Installation

The installation of the back plate takes place in the reverse order to the instructions on removal, but the following points should be watched closely:

1 - Thoroughly clean contact surfaces between back plate and stub axle (steering knuckle).

2 - Tighten back plate mounting bolt to the following torque:
Bolts of quality specification 8 G
4 to 4.5 mkg (29 to 32 ft. lbs.).
Secure the bolts so as to insure that they do not work loose.



Securing Bolts

Wrong Correct

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3 - After the leaf spring on the anchor block has been installed, check its pretension. Bend or renew weak springs.

4 - Check if the adjusting screws and nuts can be turned easily. Apply Universal Grease VW — A 052.

5 - Before installing the brake drum, make sure the oil seal is in perfect condition.

6 - Clean brake drum hub and ball bearing and apply Universal Grease VW — A 052.

7 - Adjust front wheel bearing as prescribed.

8 - Adjust the brakes and bleed the system. Do not forget to re-install the bleeder valve dust cap.

Removing and Installing Rear Brake Back Plate

Removal

1 - Remove brake wheel.

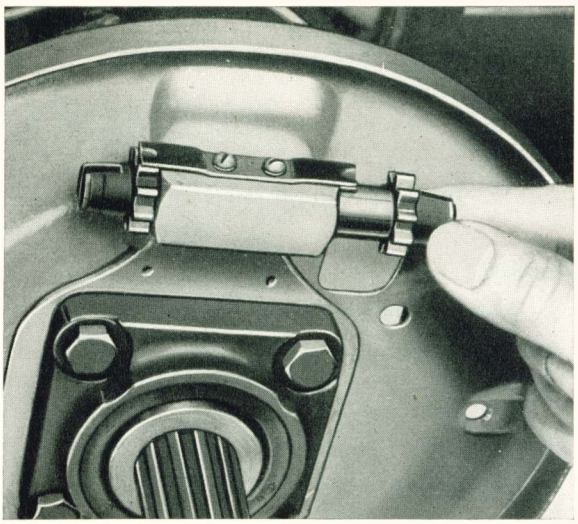
2 - Withdraw brake drum.

3 - Disconnect brake line and plug it up by means of a piece of wood.

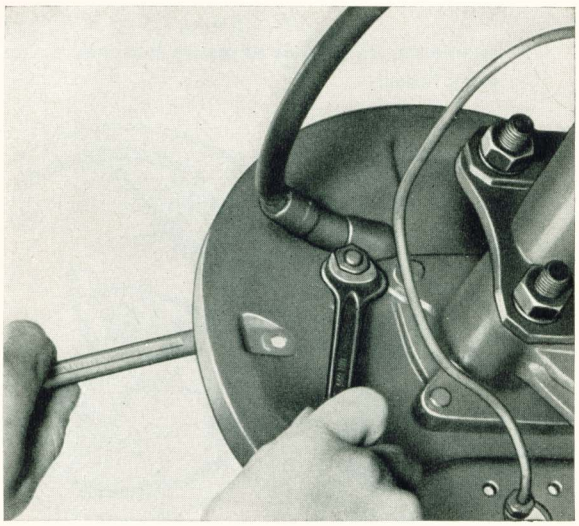
4 - Remove brake shoes, brake lever, operating link, and clip. Unhook brake cable.

5 - Remove wheel cylinder.

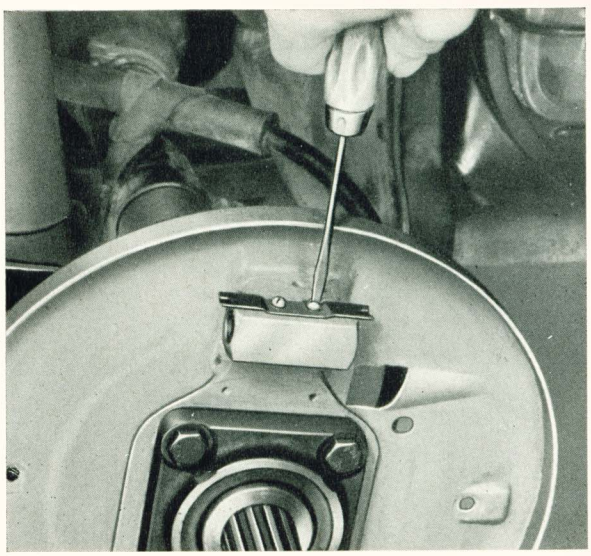
6 - Remove brake cable retainer from back plate.



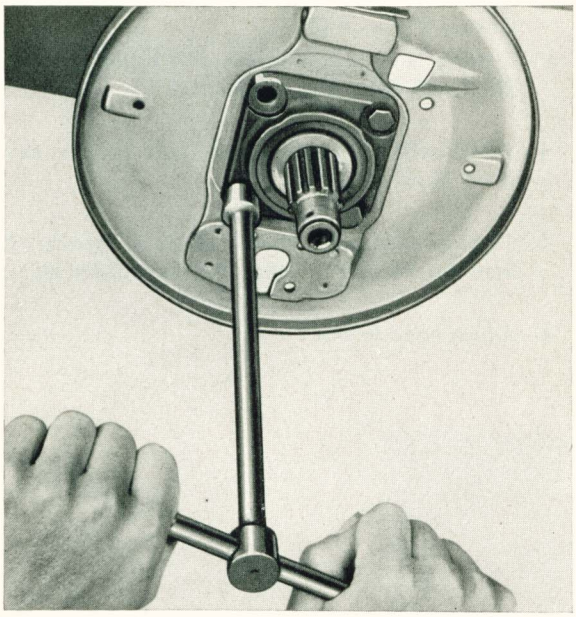
8 - Take off the leaf spring on the anchor block after having removed the two attaching screws.



7 - Take off adjusting screws and nuts.



9 - Remove the four bolts of the bearing housing cover and take off back plate.



Installation

Installation is a reversal of the removal procedure, but the following points should be observed:

1 - Thoroughly clean contact surfaces of back plate.

2 - Before replacing the bearing housing cover, check condition of oil seal and see to it that it is correctly bedding in its recess. Renew the two gaskets for bearing housing cover and spacer. The oil drop nose of the cover must point downward. Tighten back plate mounting bolts to the following torque:

Bolts of the quality specification 8 G
4 to 4.5 mkg (29 to 32 ft. lbs.).

3 - After the leaf spring on the anchor block has been installed, check its pretension. Bend or renew weak springs.

4 - Check if the adjusting screws and nuts can be turned easily. Apply Universal Grease VW — A 052.

5 - Correctly install brake shoes; the slots in the webs must be toward the wheel cylinder.

6 - When re-installing brake drum, note proper position of oil deflector.

7 - Tighten rear axle shaft nut to a torque of between 28 and 31 mkg (202 to 224 ft. lbs.).

8 - Bleed the system. Adjust foot and hand brakes. Do not forget to re-install the bleeder valve dust cap.

Removing and Installing Hand Brake Cable

General

The hand brake is mechanically operated, acting on the rear wheels. The movement of the hand brake lever is transmitted to the brake levers of the two rear wheel brakes via a brake push bar and two cables.

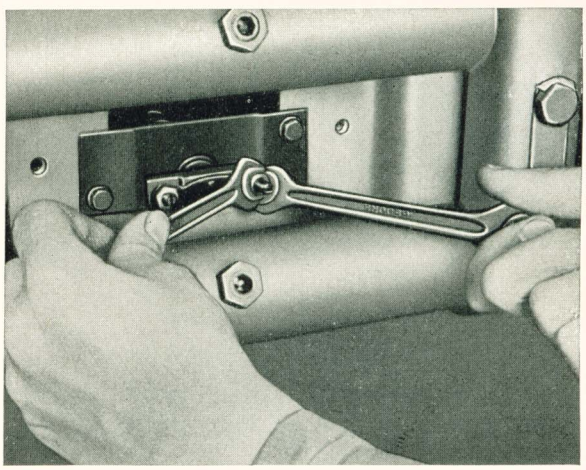
Removal

1 - Loosen rear axle shaft nut and wheel mounting bolts.

2 - Lift the car and support it on trestles.

3 - Take off the wheel and withdraw brake drum and oil deflector.

4 - Remove frame head cover. Remove locknut and adjusting nut at front end of brake cable.



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5 - Remove shoe hold-down spring seats, springs, and pins.

6 - Unhook upper brake shoe return spring.

7 - Unhook brake cable from brake lever.

8 - Remove brake cable retainer from back plate.

9 - Withdraw brake cable and conduit tube from back plate.

Installation

1 - Clean brake cable and conduit tube.

2 - When renewing the cable, attention should be paid to the length of the new cable.

3 - Fill brake cable conduit tubes with Universal Grease VW — A 052.
If there is a grease nipple, the tubes may be filled with the cables in situation.

4 - When refitting brake drum, note proper position of oil deflector.

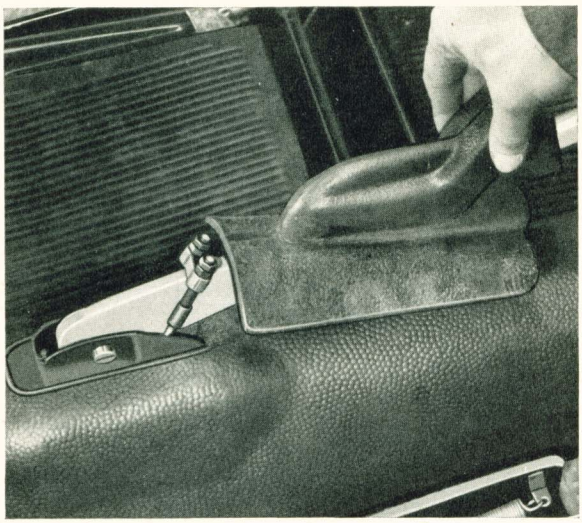
5 - Tighten rear axle shaft nut to a torque of between 28 and 31 mkg (202 and 224 ft. lbs.).

6 - Adjust hand brake.

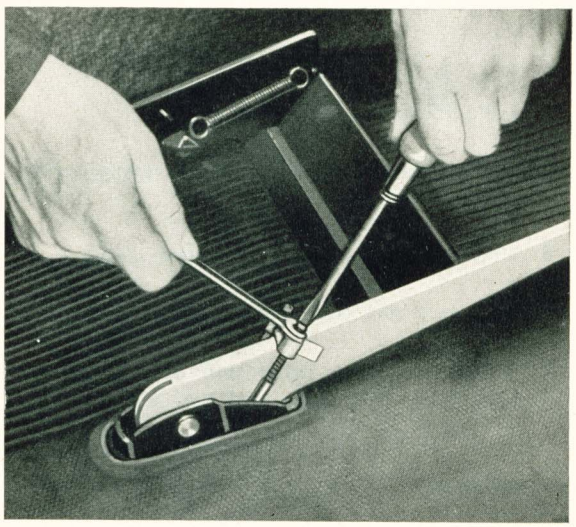
Hand Brake Lever Removal and Installation

Removal

1 - Pull off hand brake lever rubber boot. To do this, lift the frame tunnel rubber matting.



2 - Remove brake cable lock nuts and adjusting nuts.



3 - Remove one circlip from the hand brake lever pin, and push out the pin.

4 - Force hand brake lever rearward without pressing down the release button, until hand brake lever and ratchet can be lifted off.

Installation

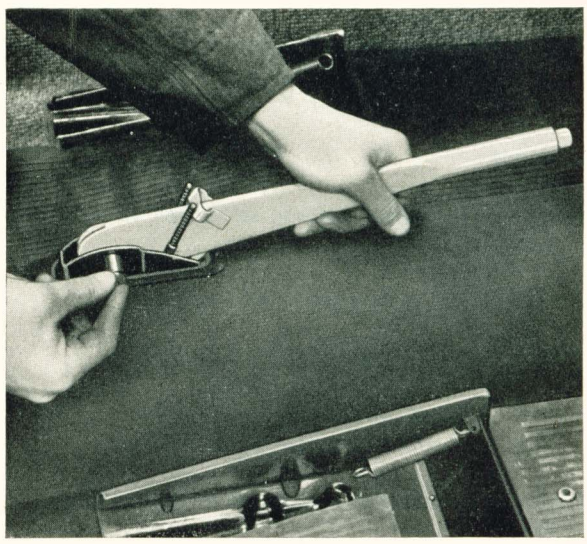
This is a reversal of the above, but it is essential to observe the following points:

1 - Prior to installation, disassemble the hand brake lever (pawl rod, release button, pawl rod spring, and ratchet) and clean and grease the components. When installing, be sure the pawl rod nose is correctly positioned in the pawl rod end (A).

2 - Install the ratchet so that the notches engage with those of the pawl and the holes for the pin are in line (B).

3 - Insert hand brake lever into the opening, and place the threaded end pieces of the cables alongside the lever. Force the hand brake lever rearward until the slot in the ratchet can be made to engage with the edge of the frame tunnel opening (C).

4 - Insert hand brake lever pin and install the circlip.



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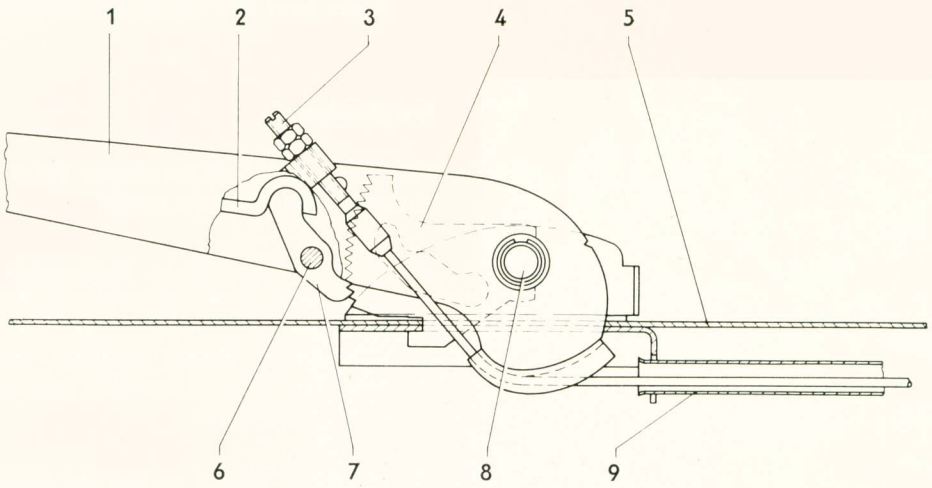
5 - Insert the threaded end pieces of the cables into the cable anchors at the hand brake lever, and screw on the nuts.

6 - Adjust hand brake. Tighten brake cable lock nuts.

7 - Install hand brake lever rubber boot and glue frame tunnel matting in position.



1 - Hand brake lever
2 - Pawl rod
3 - Brake cable
4 - Ratchet
5 - Frame
6 - Pawl pin
7 - Pawl
8 - Hand brake lever pin
9 - Cable conduit tube

Hand Brake Cable Removal and Installation

The hand brake cables are anchored direct to the hand brake lever. The cables are guided in conduit tubes to the rear wheels.

Removal

1 - Loosen rear axle shaft nut and wheel mounting bolts.

2 - Lift the car and support it on trestles.

3 - Remove rear wheel and brake drum.

4 - Pull off hand brake lever rubber boot. To do this, lift the frame tunnel rubber matting.

5 - Remove brake cable anchor nuts at hand brake lever.

6 - Take off hand brake lever.

7 - Remove brake shoe hold-down spring seats, springs, and pins.

8 - Unhook upper brake shoe return spring.

9 - Remove brake cable retainer from back plate.

10 - Withdraw brake cable and flexible conduit tube from back plate and pull out the cable.

Installation

This is a reversal of the removal procedure, but the following points should be observed:

1 - Clean brake cable and conduit tube and fill conduit tube with Universal Grease VW—A 052.

2 - Insert the hand brake cable into the conduit tube. The threaded end piece must stick out of the frame tunnel opening.

3 - Tighten rear axle shaft nut to a torque of between 28 and 31 mkg (202 and 224 ft. lbs.) and secure it with a cotter pin.

4 - Adjust hand brake.

Adjusting Hand Brake

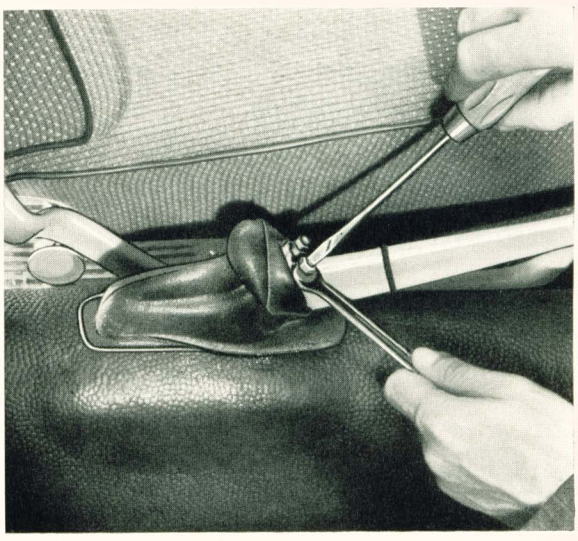
1 - Raise the car.

2 - Slide off the rubber ring, and fold back the hand brake lever rubber boot until the brake cable adjusting nuts are free.

3 - Back off lock nuts and tighten adjusting nuts to a degree which will still allow the rear wheels to turn freely when the hand brake lever is in the released position.

4 - Pull up hand brake lever by two notches, and make sure both rear wheels have the same braking effect. At the fourth notch it should be impossible to turn the wheels by hand.

5 - Securely tighten lock nuts and fasten hand brake lever rubber boot.



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(From August 1957)

VW Passenger Cars except Standard Model, from Chassis No. 1604758

In connection with the alterations to the frame and pedal cluster the openings for the brake cables in both arms of the frame fork have been placed 50 mm (1.96″) towards the front.

The brake back plates remain the same, but have been turned by 180°. The brake cylinders with bleeder screws are now at the top, and the openings for the brake cables as well as the adjusting screws for the brake shoes are at the bottom. Both brake cables now enter the brake back plates from the front. This made it possible to shorten the conduit tubes for the hand brake cables as well as the hydraulic lines.

With the standard model the brake and the position of the brake back plates have remained unchanged.

Installation of a new frame in place of one of previous design in the **De Luxe, Convertible** and **Karmann-Ghia Coupé** is only possible if, besides the new pedal cluster, the new brake cables (Part No. 113609721 E) and the new hydraulic lines (Part No. 113611781 A) are installed. The two brake back plates of the rear wheels must be turned by 180° without interchanging them. Torsion bars of previous design may also be used in future.

When installing a new frame together with a pedal cluster of previous design on the **Standard model,** the protruding end of the conduit tube for the accelerator cable must be bent into correct position.

(From October 1957)

VW Passenger Cars except Standard Model

The following alterations have resulted in a more favourable distribution of the breaking power:

	Karmann-Ghia Coupé	Convertible	De Luxe Sedan
From Chassis No.:	1665213	1665425	1673351

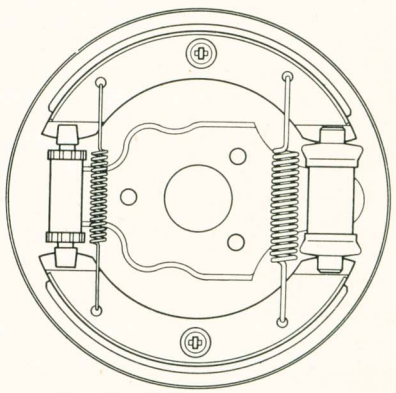
Front wheel brake

1 - The inner diameter of the brake wheel cylinders (Part No. 113611057 A) is 22.2 mm (.874″) (previously: 19 mm/.748″).

2 - The width of the brake shoes (Part No. 113609237 C) is 40 mm (1.560″) (previously: 30 mm/1.170″). In the adjusting screws they are no longer mounted at a slant but straight. The brake shoes are mounted horizontally on the brake back plate (previously: at a slant).

3 - Instead of three return springs for the brake shoes only two (Part No. 113609301 B/309 B) are installed.

4 - The brake back plates (Part No. 113609139 A) are of different shape.



5 - The brake drums (Part No. 113405615 A) are wider and have been provided with a reinforcing rib on their circumference. On the inside and outside the drum overlaps the edge of the brake back plate, thus eliminating ingress of dirt and water.

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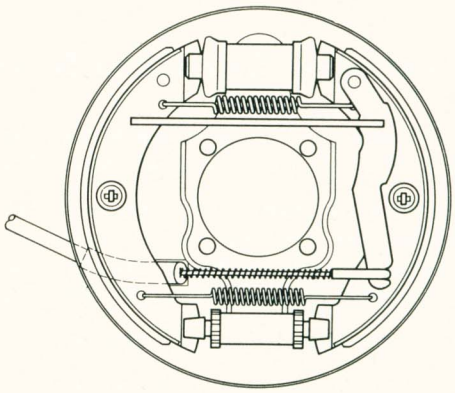
Rear wheel brake



1 - The inner diameter of the brake wheel cylinders (Part No. 113611055B) is 19 mm/.741'' (previously: 17.5 mm/.683'').

2 - The brake shoes (Part No. 113609537A) remain 30 mm (1.170'') wide and are still mounted vertically. In the adjusting screws they are mounted straight (previously: at a slant).

3 - Instead of three return springs two springs (Part No. 113609605A/309B) are installed.

4 - The brake back plates (Part No. 113609439B/440B) are of different shape.

5 - The rear wheel bearing seat has been altered: The bearing flange (Part No. 111501163B/164B) is turned out deeper. The cover (Part No. 111501311B) is without a collar and machined to fit onto the reinforcement sheet on the brake back plate.

6 - The brake drums (Part No. 113501615A) are wider and have been provided with a reinforcing rib on their circumference. On the inside and outside the drum overlaps the edge of the brake back plate, thus eliminating ingress of dirt and water.

Handbrake

1 - The handbrake cable is provided with a tension spring (Part No. complete: 113609721E). From the front it is put through underneath the spring plate and connected to the brake shoe lever (Part No. 113609613A/614A) which is mounted at the top of the rear brake shoe. The cable can only be used as replacement for brake cable 113609721D in cars from Chassis No. 1600440 (1 August 57) onwards.

2 - Since 27 June 57, and from Chassis No. 1584415, a galvanized brake shoe lever bolt (Part No. 211609601A) is installed.

Track, front
New: 1305 mm (50.895'') (previously: 1290 mm/50.310'')

Angle of wheels at full lock
New: 28°/34° (previously: 26°/32°)

Note:
Single components of the new brake — with the exception of the handbrake cable — cannot be exchanged for components of older design and vice versa.

Filling and Bleeding

General

The hydraulic system must be topped up and bled whenever a fluid line has been disconnected. Air in the braking system seriously impairs braking efficiency resulting in soft, spongy pedal action. Air is eliminated by adding brake fluid and bleeding the system.

Brake Fluid

Only VW Genuine Brake Fluid should be used for the hydraulic system of the Volkswagen. It ensures a correct and reliable function of the brakes under all climatic conditions. The VW Genuine Brake Fluid is composed of ingredients which will not derange nor deform the structure or surface of the brake components. Should there be any difficulty to obtain such brake fluid, Lockheed Brake Fluid may be used in lieu of it.

Brake Cylinder Lubricant

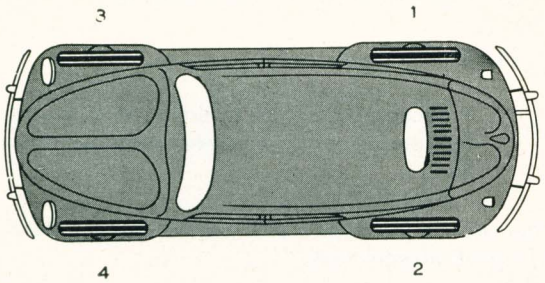
The sealing components of the hydraulic system must not be lubricated with mineral oil or grease. The VW Genuine Brake Cylinder Paste has been introduced to obtain a porper lubrication of the pistons and cylinders. This lubricant does not affect the sealing components of the system and greatly improves the sliding action of the pistons and cups.

Disassemble the cylinder and carefully clean them in denatured alcohol.

When completely dry, the pistons and the cylinder wall should be coated with the brake cylinder paste. Whenever a cylinder has been disassembled, the brake cylinder paste should be applied to the aforementioned parts.

Bleeding the Brake

a - The bleeding can best be carried out by two men. Proceed as follows:



1 - Remove bleeder valve dust cap of one of the wheel cylinders.

2 - Attach one end of the bleeder drain hose to the valve.

3 - Allow the free end of the hose to be submerged in a clean glass container partially filled with hydraulic fluid. The end of the drain hose should, if possible, be above the level of the bleeder valve.

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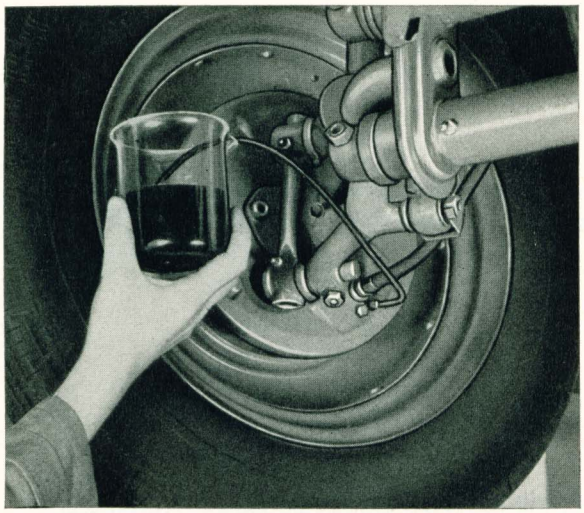


4 - Slacken the bleeder valve about one turn, using a 7 mm wrench.

5 - Depress the brake pedal quickly, allowing it to return without assistance, and continue to pump in this manner until the fluid runs out of the bleeder hose in a continuous stream, without air bubbles.

It is extremely important that the master cylinder reservoir be full of fluid and that it be refilled before being completely exhausted.

6 - The brake pedal should be kept in the fully depressed position, until the bleeder valve is closed.

7 - Tighten bleeder valve and replace dust cap.

8 - Repeat the operation on each of the remaining wheel cylinders. If necessary, top up brake fluid in master cylinder after the complete system has been bled.

b - A combined filling and bleeding operation, which may be carried out by one man, be described below:

This operation requires a fill-bleeder tank, manufactured by some firms.

Before starting to bleed, make sure the fill-bleeder tank is sufficiently filled with brake fluid. Then fill the tank with compressed air until the dial indicates 4 to 5 atm. (57 to 71 lbs./sq. in.).

1 - Completely depress brake pedal and fix it in this position.

2 - Remove bleeder valve dust caps of all four wheel cylinders.

3 - Attach free end of tank hose to bleeder valve of left-hand front wheel and slacken bleeder valve about one turn, using a 7 mm wrench.

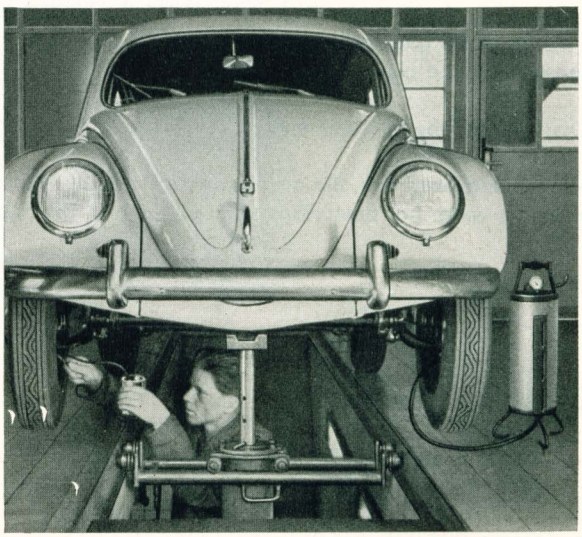
4 - Attach one end ot the bleeder drain hose to the bleeder valve of the right-hand rear wheel cylinder and allow the free end of the hose to be submerged in a clean glass container partially filled with hydraulic fluid. Slacken bleeder valve about one turn, using a 7 mm wrench.

5 - Open the shut-off valve in the tank hose and allow the fluid to be bled into the glass container until bubbles cease to appear in the container and the fluid stream is solid.

6 - Tighten bleeder valves.

7 - Close the shut-off valve in the tank hose.

8 - Repeat the operation on the left-hand rear wheel and right-hand front wheel as outlined under 4 to 7.



9 - Replace all bleeder valve dust caps.

10 - Release brake pedal.

11 - If necessary, top up brake fluid in master cylinder after the complete system has been bled.

Also refer to manufacturer's instructions for operation of fill-bleeder tank.

It is not recommended to reuse the brake fluid in the glass container. It may be contaminated or dirty. Foreign matter in the brake fluid seriously impairs braking efficiency. If reusing the fluid, it should be filtered thoroughly through blotting-paper.

Flushing the system

To fluhs the system, only use brake fluid, never fuel or mineral oil. Even the use of alcohol is not recommended, as the flushing agent cannot be completely removed. When refilling the system, the remaining alcohol will mix with the brake fluid leading to vapour locks at higher temperatures of the system.

Adjusting Wheel Brake

General

Brakes require periodic adjustment to assure their proper operation. Too much free travel of the brake pedal is an indication that the clearance between brake shoes and brake drums has become too great and that the brakes need adjustment. This adjustment will usually compensate for such wear that will take place until relining of the shoes is required.

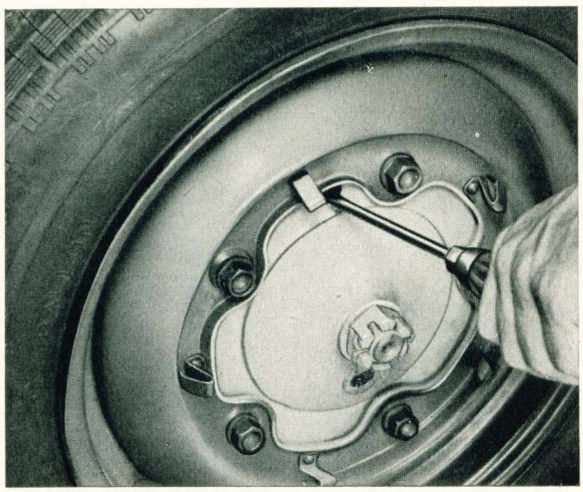
Before carrying out any adjustments of the brakes, check the front wheel bearing play.

Adjustment

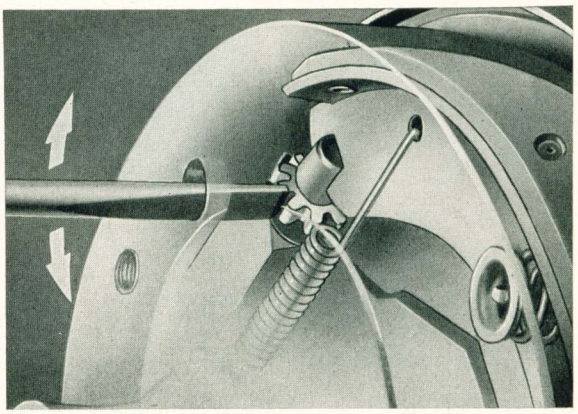
1 - Raise the car and release hand brake.

2 - Prior to adjusting, completely depress the brake pedal several times, to allow the brake shoes to centralize in the drums.

3 - Turn forward the wheel to be adjusted until the hole in the brake drum is in line with one of the adjusting nuts.



4 - Insert a screwdriver through the hole and turn the adjusting nut, using screwdriver as a lever, until a light drag is noted when wheel is turned by hand. Back off adjusting nut 3 to 4 teeth to allow the wheel to turn freely.



5 - Repeat the procedure on the other adjusting nut. Note the opposite turning direction of the two nuts.

6 - Repeat the above operations on the other wheels.

7 - Road-test the car.

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Adjusting Hand Brake

Adjustment

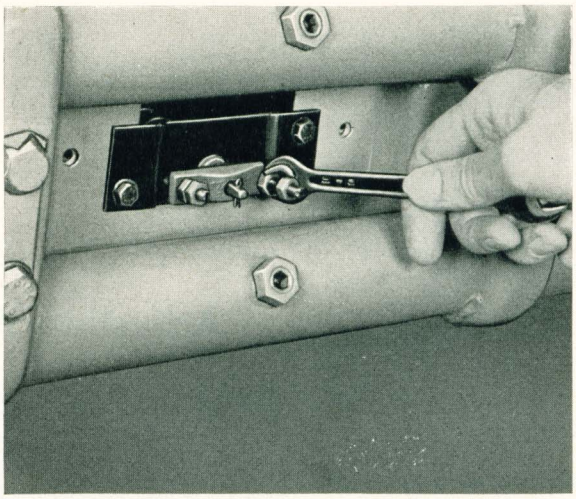
1 - Raise the car.

2 - Remove frame head cover.

3 - Back off locknuts at front end of brake cables and tighten adjusting nuts to a degree which will still allow the rear wheels to turn freely when the hand brake is released.

4 - Pull up hand brake lever by two notches and make sure both rear wheels have the same braking effect. At the fourth notch it should be impossible to turn the wheel by hand.

5 - Securely tighten locknuts.



Brake Trouble Checking

Symptom	Cause	Remedy
Pedal goes to floorboard.	Normal lining wear.	Adjust shoes.
Spongy response at brake pedal.	a - Air in the system. b - Lack of fluid in master cylinder reservoir.	a - Bleed the system. b - Top up fluid level.
Pedal goes to floorboard without brake action, even though the system has been bled and adjusted.	a - Check valve in master cylinder inoperative. b - Check valve seat dirty.	a - Renew the check valve. b - Clean or renew check valve seat.
Brake action is obtained only by pumping pedal several times.	a - Air in the system. b - Weak piston return spring.	a - Bleed the system. b - Renew piston return spring.
Brake action decreases and pedal goes to floorboard, even though the brakes have been adjusted.	a - Fluid leak in the system. b - Damaged or unserviceable cups in master or wheel cylinder.	a - Locate point of leakage and repair. b - Replace faulty cups.
Brakes drag.	a - By-pass port in master cylinder clogged. b - Too less a clearance between piston push rod and master cylinder piston. c - Shoe return springs broken or weak. d - Improper brake fluid.	a - Clean the master cylinder. b - Adjust brake pedal play. c - Replace springs and adjust shoes. d - Drain the fluid, remove all rubber parts, and flush the system with proper brake fluid. Install new rubber parts, including check valve and seat.

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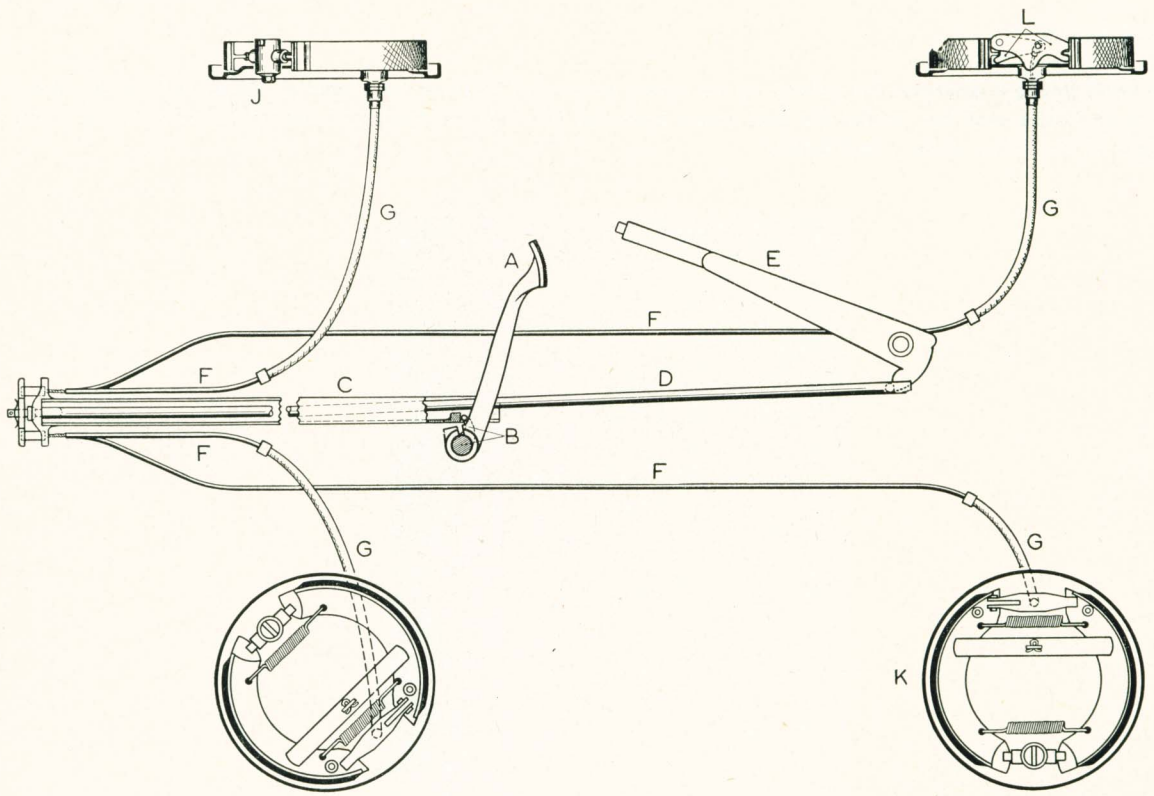
Symptom	Cause	Remedy
Excessive pressure on pedal, poor stop.	a - Oil on brake shoe lining. b - Improper brake shoe lining.	a - Replace lining. Locate point of leakage and clean wheel brake. b - Replace lining, use genuine spare parts.
Brakes tie up while driving.	a - By-pass port in master cylinder not free (possibly caused by a deformed cup). b - Improper brake fluid. c - Incorrect position of brake pedal stop plate.	a - Clean by-pass port by means of a piece of suitable wire. Remove any burr. Replace cup. b - Drain the fluid, flush the system and refill with proper brake fluid. c - Check position of brake pedal and adjust the pedal play so as to ensure that the by-pass port is not closed by the piston cup.
Brakes uneven.	a - Brake drum eccentric. b - Tires not properly inflated or worn. c - Oil on brake shoe lining.	a - Replace brake drum or remachine it. b - Check tire pressure and replace worn tires. c - Replace lining. Only replace in axle sets (both front wheels or both rear wheels).
Brakes chatter and tend to tie up.	a - Brake shoe lining not chamfered at ends. b - Brake shoe lining worn, rivets make contact with the drum. c - Brake drum eccentric.	a - Genuine VW lining is correctly chamfered. b - Replace lining or reset the rivets. c - Replace brake drum or remachine it.
Brakes noisy.	a - Improper brake shoe lining. Lining not chamfered at ends. b - Lining loose on shoe. c - Brakes dirty.	a - Reline the shoes. Use Genuine VW Spare Parts. b - Reline the shoes. c - Clean wheel brakes.

General

The foot and hand brakes operate through mechanical linkage to all four wheels. The force applied at the brake pedal or hand lever is transmitted to the wheels by four cables, which pass through conduit tubes in the tubular backbone of the frame. Between the trame and the wheels, the cables are well protected from dirt, splash water and stones by flexible metal tubes, which in turn are covered by protective hoses. The brake shoes are forced against the drums by one expanding device at each wheel.

One adjusting device at each brake back plate compensates for such wear that will take place until relining of the shoes is required.



Diagrammatic view of mechanical brake

A - Brake pedal
B - Brake pedal shaft
C - Foot brake push bar
D - Hand brake push bar
E - Hand brake lever
F - Brake cable conduit tube
G - Flexible metal tube
H - Front wheel brake
J - Adjusting device
K - Rear wheel brake
L - Brake shoe expanding device

The brake system consists of:

a - Brake pedal with pedal shaft and foot brake push bar.

b - Hand brake lever with ratchet and hand brake push bar.

c - Four brake cables.

d - Brake back plate with adjusting and expanding device and brake shoes.

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Operation

Foot brake

Pressing down on the brake pedal pulls against cables attached to the head of the brake push bar at the one end and to the brake shoe expanding devices at the other. The nose at the brake pedal shaft pushes the foot brake bar toward the front which actuates the cables to operate the expanding evices, forcing the shoes against the drums. When releasing the brake pedal, the brake shoes return to their original position by springs.

Hand brake

The hand brake is operated by pulling up the lever, which can be fixed by a ratchet. When pulling the lever, the hand brake push bar forces the foot brake push bar towards the front and the cables actuate the wheel brakes as described under "foot brake".

Removing and Installing Foot Brake Push Bar and Hand Brake Push Bar

Removal

1 - Lift the front end of the car, release hand brake and remove spare wheel.

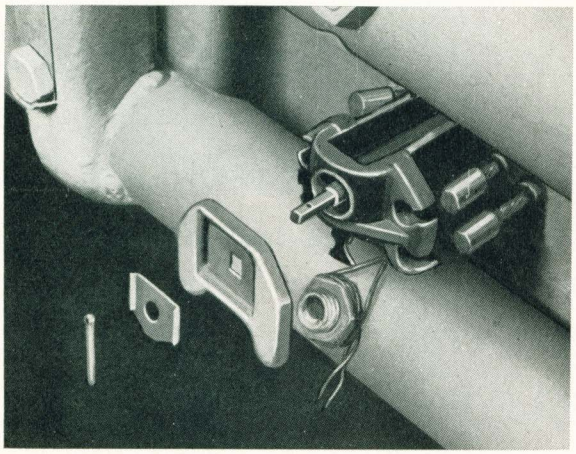
2 - Remove front shock absorbers.

3 - Remove frame head cover.

4 - Disconnect cable at stop light switch and remove stop light switch.

5 - Remove cotter pin, plate, and cover at brake cable junction head.

6 - Unhook brake cables.



7 - Unhook return spring of foot brake push bar by means of a piece of wire and attach it to the lock nut of the torsion bar center anchor as shown above.

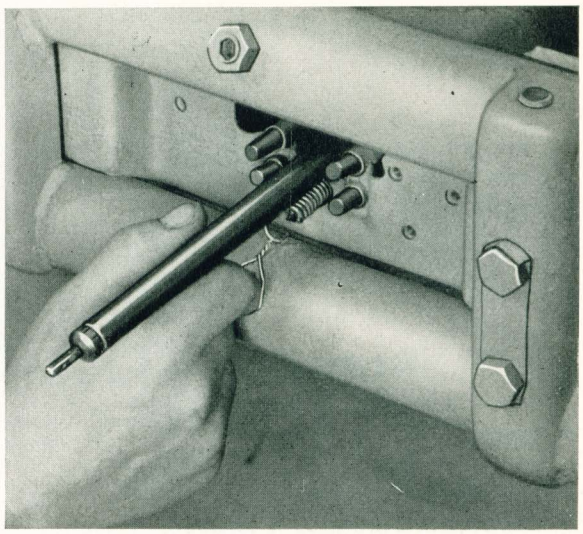
8 - Withdraw foot brake push bar and hand brake push bar through the provided holes in the body.

Installation

This is a reversal of the removal procedure, but the following points should be observed:

1 - Grease adjusting screw of hand brake push bar and check if it can be easily turned.

2 - Insert the hand brake push bar in the opening of the frame head and push the slotted end along the right-hand side (seen in driving direction) of the frame tunnel until the ball of the hand brake lever engages in the slot of the push bar. When the push bar can no longer be turned, this is an indication thet the ball is properly engaged.



3 - Check foot brake push bar for wear and twist and replace it if necessary.

4 - Grease foot brake push bar with Universal Grease VW — A 052. When fitting the foot brake push bar, take care the nose of the brake pedal shaft engages in the slot and the hand brake push bar engages in the hole of the foot brake push bar. The correct assembly can best be controlled by a second mechanic moving the foot pedal and the hand brake lever.

5 - Connect push bar return spring.

6 - Adjust correct play of 1 mm (0.04″) between hand brake push bar and foot brake push bar by turning the adjusting screw.

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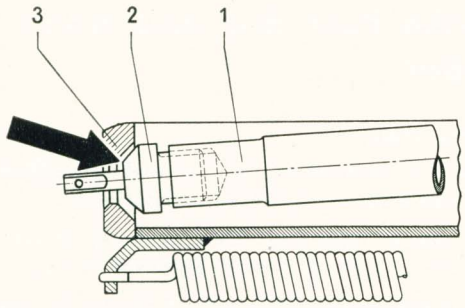


1 - Hand brake push bar
2 - Adjusting nut
3 - Foot brake push bar

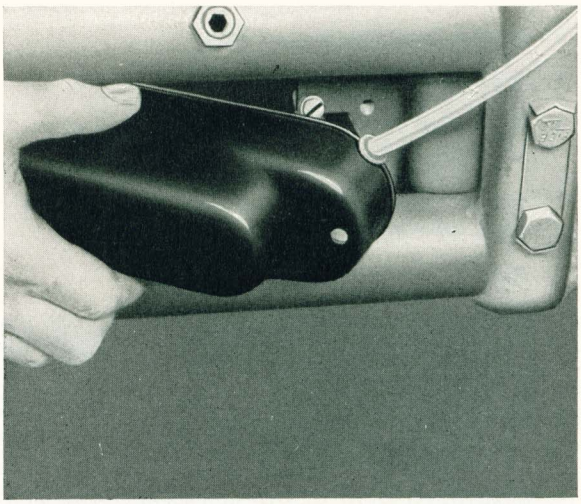
Note. — There should be a free play of half a notch at the hand brake lever to ensure that the cables are free of tension with the lever in the released position.

7 - Attach brake cables to the junction head of the foot brake push bar, taking care the conduit hoses occupy a correct position.

8 - Secure brake cables by means of cover, plate, and cotter pin.

9 - Install stop light switch and check its setting.

10 - See to it that the rubber grommet for the stop light switch cable is properly seated in the frame head cover.



11 - Check brakes and adjust if necessary.

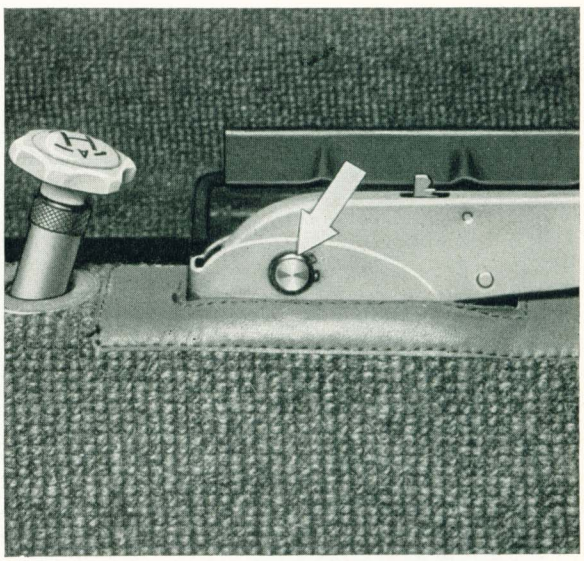
Removing and Installing Hand Brake Lever

Removal

1 - Withdraw both push bars about 10 cm (4″) towards the front.

2 - With the De Luxe Model, take off the hand brake lever boot by lifting the carpet.

3 - Remove one circlip from the hand brake lever pin.



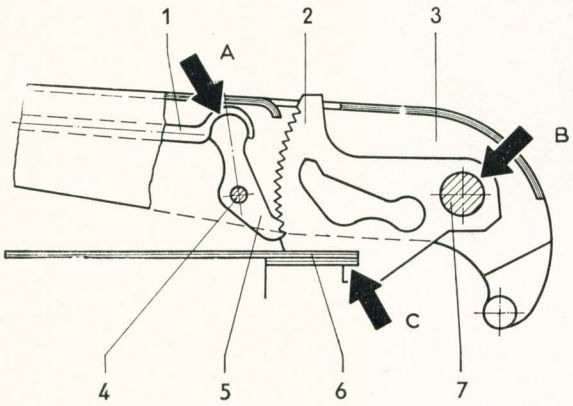
4 - Press down the release button on the pawl rod and remove hand brake lever pin.

5 - Keep the release button in the depressed position and lift the hand brake lever and ratchet towards the rear.

Installation

Replacement is a reversal of the above, but it is essential to observe the following points:

1 - Prior to the installation, disassemble the hand brake lever (pawl rod and release button, pawl rod spring and ratchet), clean and grease the components and reassemble the lever. Note correct position of pawl nose in the pawl rod end (A).

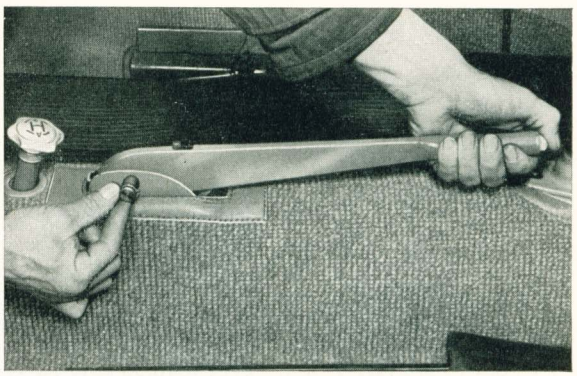


1 - Pawl rod
2 - Ratchet
3 - Hand brake lever
4 - Pawl pin
5 - Pawl
6 - Frame
7 - Hand brake lever pin

2 - Install the ratchet so that the notches engage with those of the pawl and the holes for the pin are in line (B).

3 - When installing the hand brake lever, the slot in the ratchet must grip over the metal of the frame (C).

4 - Press down the release button until the hand brake lever pin is installed.



5 - Check and, if necessary, adjust the prescribed play between hand brake push bar and foot brake push bar (approx. 1 mm = 0.04″).

6 - Install stop light switch and check its adjustment.

7 - See to it that rubber grommet for the stop light switch cable is correctly seated in the frame head cover.

8 - Check brakes and adjust if necessary.

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General

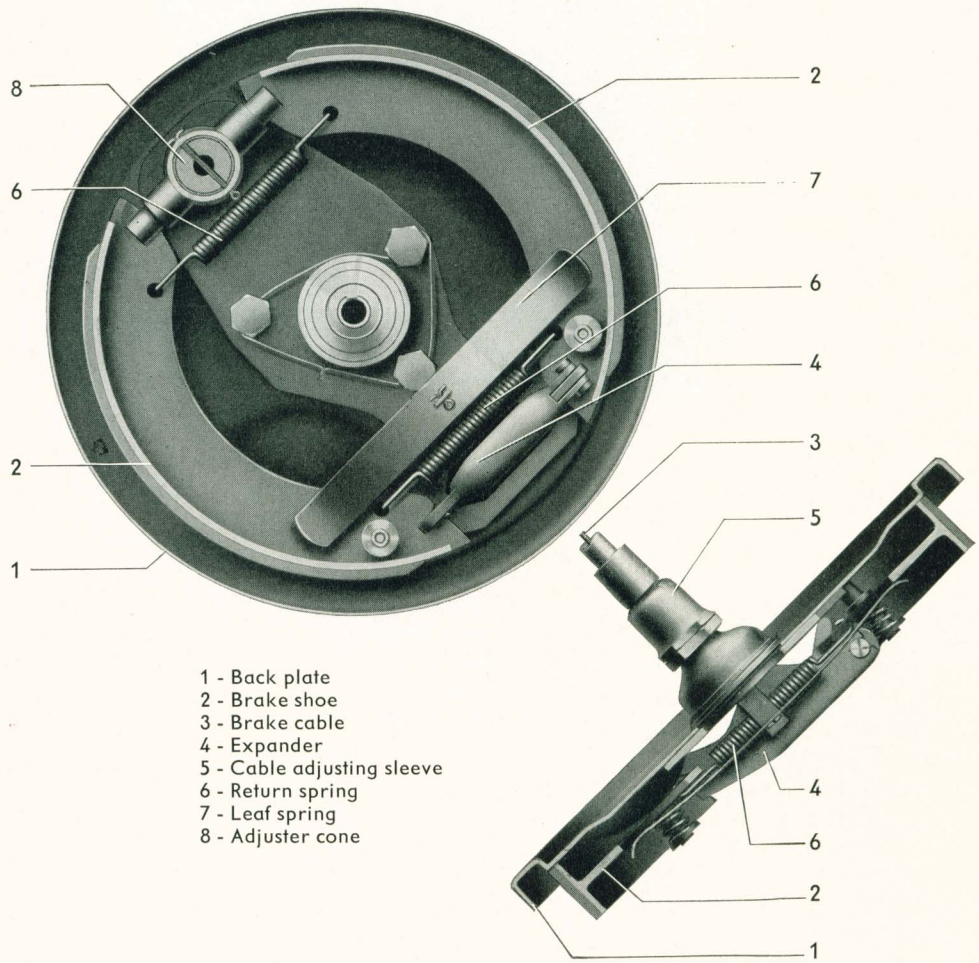
The front and rear wheel brake assemblies are illustrated by the following pictures. The rear wheel brake differs from the front wheel brake by the position of the shoes and the brake shoe adjusting and expanding device at the back plate.

The brake shoes are held in position by spring-loaded pins and returned to the released position by two return springs. A leaf spring maintains the contact between the shoes and the back plate.

The adjusting screw allosw a correct adjustment of the shoes in conjunction with the adjuster cone.

Wheel Brake

Front wheel brake



1 - Back plate
2 - Brake shoe
3 - Brake cable
4 - Expander
5 - Cable adjusting sleeve
6 - Return spring
7 - Leaf spring
8 - Adjuster cone

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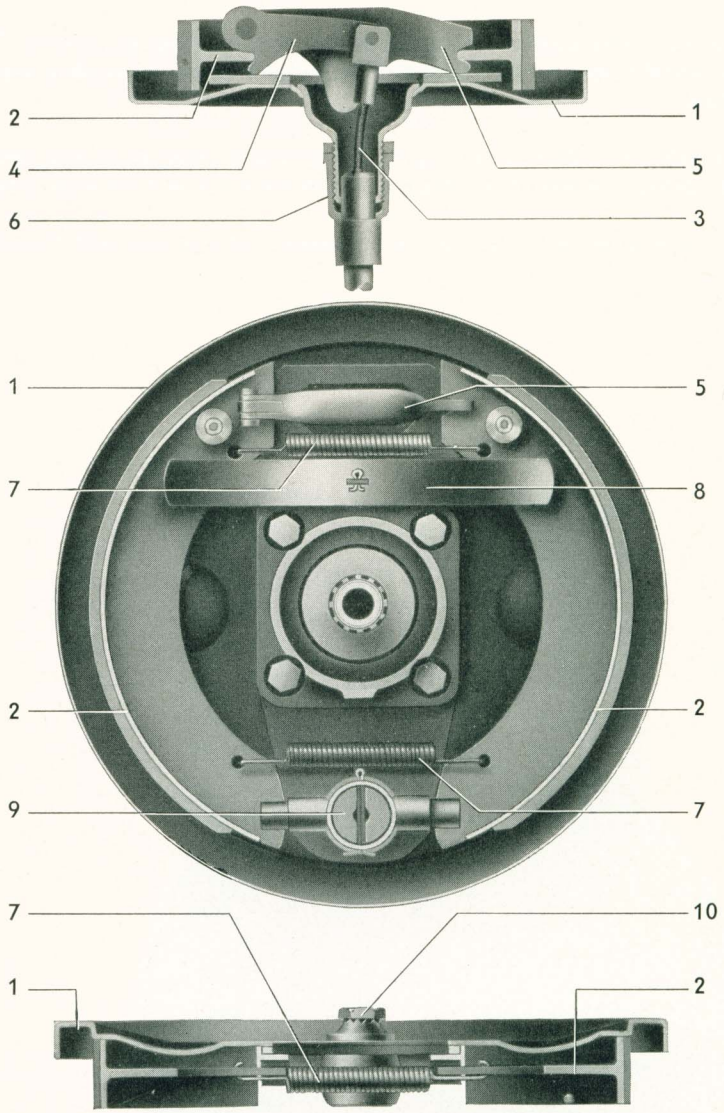
Rear wheel brake



1 - Back plate
2 - Brake shoe
3 - Brake cable
4 - Brake shoe lever
5 - Expander
6 - Cable adjusting sleeve
7 - Return spring
8 - Leaf spring
9 - Adjuster cone
10 - Adjusting screw

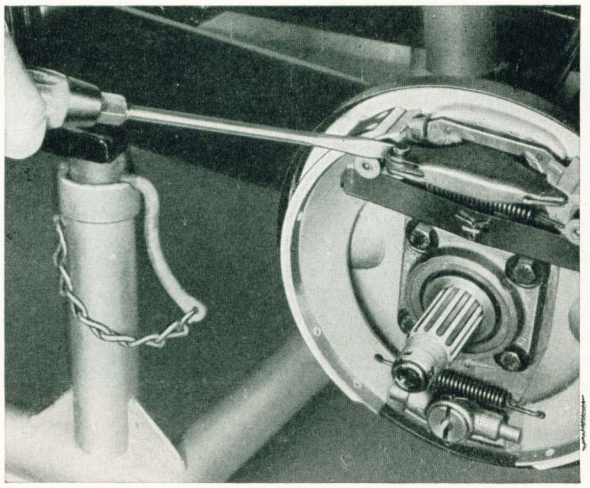
Removing and Installing Operating Lever and Expander

Removal

1 - Raise the car.

2 - Remove wheel and brake drum.

3 - Lever off expander and operating link by means of a screwdriver.



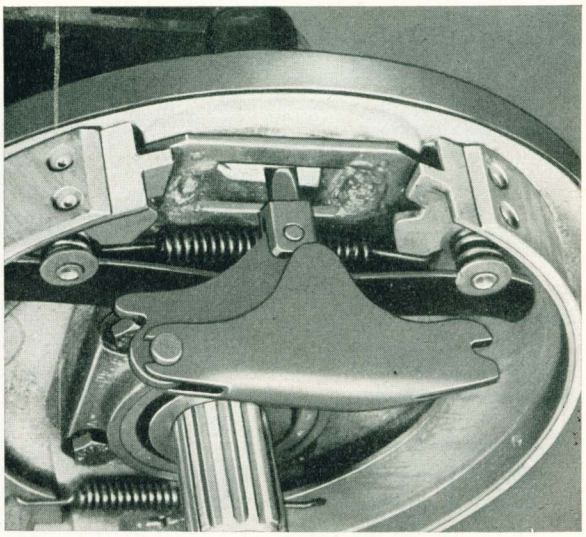
4 - Remove pin for expander and operating link and pin for brake cable and operating lever.

Installation

Installation is a reversal of the preceding operations, but the following points should be observed:

1 - Lightly grease all moving joints at expander and operating link with Universal Grease VW — A 052.

2 - Install operating link and expander, making sure the pin is toward the front at the rear wheel brakes and toward the rear at the front wheel brakes.



3 - Adjust brakes.

Removing and Installing Brake Cables

Removal (Front wheels)

1 - Lift car and support it on trestles.

2 - Remove hup cap and grease cup. At lefthand wheel hub: first remove cotter pin securing speedometer cable.

3 - Turn up lock plate and remove hub nut. Pull off brake drum, using Special Tool VW 202 in conjunction with VW 202c, 202d and 202i.

4 - Lever off operating link and expander by means of a screwdriver.

5 - Remove pin that connects brake cable to operating link and withdraw cable from back plate through the adjusting sleeve.

6 - Remove frame head cover, cotter pin, plate, and cover at brake cable junction head.

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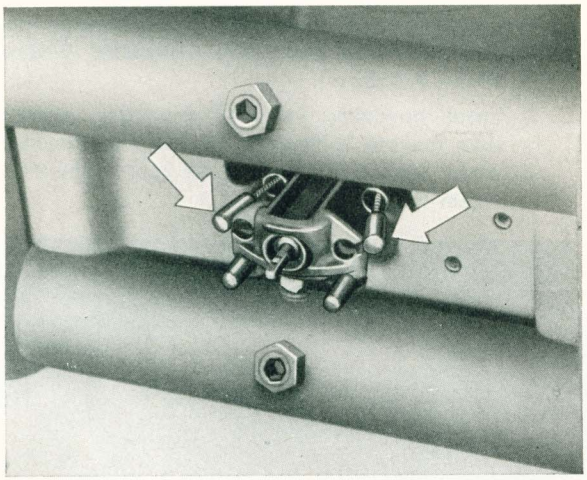
7 - Disconnect cable at stop light switch and remove stop light switch.

8 - Unhook brake cable for front wheel. Pull up the hand brake lever and withdraw cable from the conduit tube toward the rear.



Installation

Reverse the removal procedure, while observing the following points:

1 - Check brake cable for damage and grease it with Universal Grease VW — A 052. If necessary, apply a rust solvent to ensure a free movement of the cable.

2 - See to it that the brake shoes and return springs are correctly positioned.

3 - Adjust front wheel bearings as described in the section "Front Axle".

4 - Check setting of stop light switch. If necessary, reset as outlined in the section "Electrical System".

5 - Adjust brakes.

Removal (Rear wheels)

1 - Lift car and support it on trestles.

2 - Remove hup cap and cotter pin at rear axle shaft nut.

3 - Remove rear axle shaft nut and take off wheel, brake drum, and oil deflector.

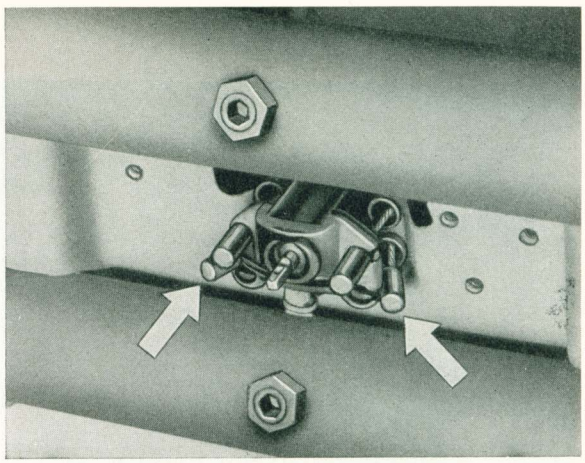
4 - Lever off operating link and expander by means of a screwdriver.

5 - Remove pin that connects brake cable to operating link and withdraw cable from back plate through the adjusting sleeve.

6 - Remove frame head cover, cotter pin, plate, and cover at brake cable junction head.

7 - Disconnect cable at stop light switch and remove stop light switch.

8 - Unhook brake cable for rear wheel. Pull up the hand brake lever and withdraw cable from the conduit tube toward the rear.



Installation

This is accomplished by reversing the above procedure, but attention should be paid to the following points:

1 - Check brake cable for damage and grease it with Universal Grease VW — A 052. If necessary, apply a rust solvent to ensure a free movement of the cable.

2 - See to it that the brake shoes and return springs are correctly positioned.

3 - When installing the brake drum, make sure the oil deflector occupies its proper position.

4 - Tighten rear axle shaft nut to a torque of between 28 and 31 mkg (202 and 224 ft. lbs.).

5 - Check setting of stop light switch. If necessary, reset as outlined in the section "Electrical System".

6 - Adjust brakes.

Removing and Installing Brake Shoes

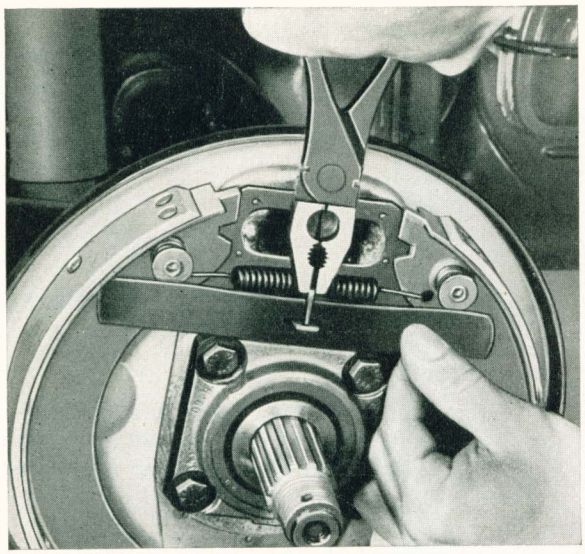
Removal

1 - Raise the car.

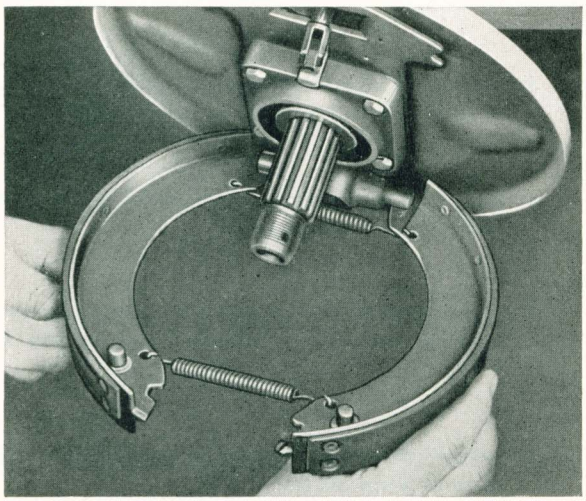
2 - Remove wheel and brake drum.

3 - Remove expander and operating link.

4 - Remove cotter pin and take off leaf spring for brake shoes.



5 - Swing down the shoes and withdraw them from the locating pins.



6 - Remove brake shoe locating pins.

Installation

Installation is a reversal of the above procedure, but the following points should be observed:

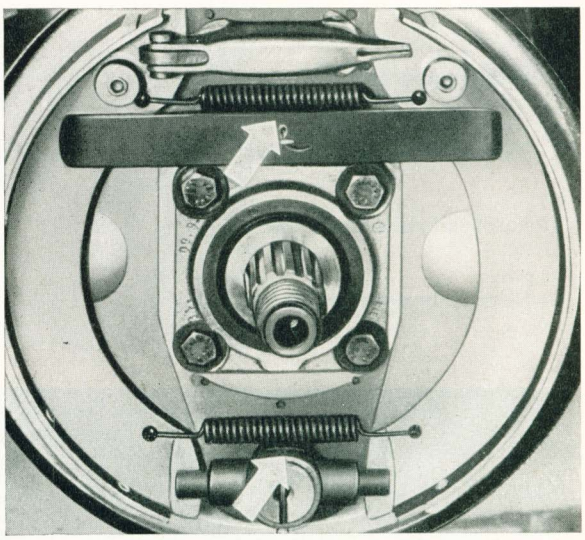
1 - Inspect condition of adjuster cone, cotter pin and adjusting screw; replace as necessary. Lubricate adjuster cone and adjusting screw with Universal Grease VW — A 052.

2 - Grease locating pins and install them with the oblique ends toward the adjuster cone.

3 - When exchanging brake shoes, take care that the brake shoe linings are of the same type on both wheels of the axle to maintain an efficient braking.

4 - Install brake shoes, the spring-loaded retaining pins must bed in the recesses provided in the reinforcement plate.

5 - Hook return springs in position as shown below so that they do not make contact with another part.



6 - Slightly grease contact points of leaf spring.

7 - Install operating link and expander, making sure the pin is toward the front at the rear wheel brakes and toward the rear at the front wheel brakes. Grease the joints of the operating link and expander.

8 - With the front wheels, clean brake drum hub and ball bearings and refill with Universal Grease VW — A 052.

9 - Adjust brakes.

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Lining Replacement

See section **"Hydraulic Brake"**, page 5-4

Removing and Installing Front Brake Back Plate

Removal

1 - Raise the car.

2 - Remove front wheel.

3 - Left front wheel: remove cotter pin securing speedometer cable.

Remove grease cup.

4 - Remove brake drum.

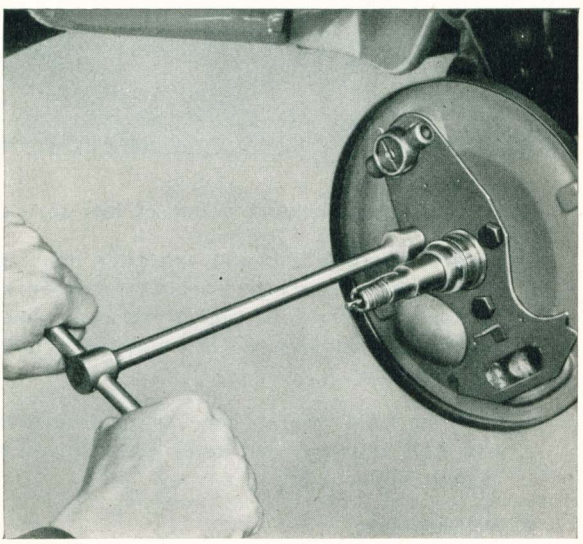
5 - Remove expander and operating link.

6 - Withdraw brake cable from back plate.

7 - Remove cotter pin and brake shoe leaf spring.

8 - Remove brake shoes and return springs.

9 - Remove brake shoe locating pins.



10 - Remove the three back plate mounting bolts.

11 - Take off back plate.

Installation

This is a reversal of the preceding operations, but the following points should be observed:

1 - Grease cable adjusting sleeve and lock nut as well as adjusting screw and cone at brake back plate. If necessary, renew adjuster cone cotter pin.

2 - Tighten back plate mounting bolts to the following torques:

Bolts of quality specification 8 G
to 4—4.5 mkg (29—32 ft. lbs.).

3 - Secure the bolts by means of a piece of wire so as to insure that they do not work loose.

4 - Before installing brake drum, make sure the oil seal is in perfect condition.

5 - Clean grease cup, brake drum hub and ball bearing and apply Universal Grease VW — A 052.

6 - Adjust front wheel bearing as prescribed in the section "Front Axle".

7 - Adjust the brakes.

Removing and Installing Rear Brake Back Plates

Removal

1 - Raise the car.

2 - Remove rear wheel.

3 - Remove brake drum.

4 - Remove expander and operating link.

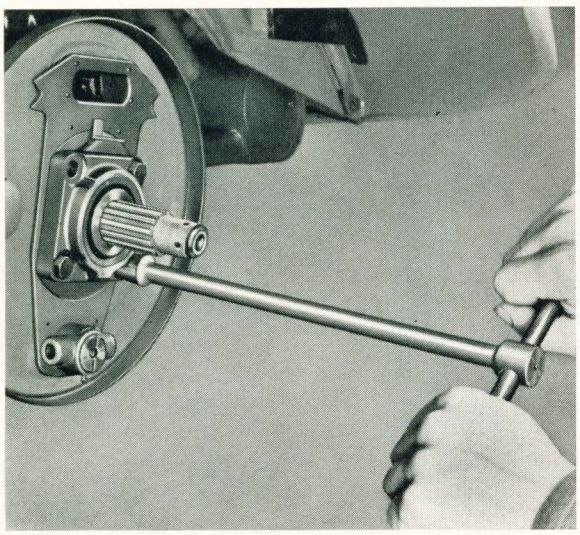
5 - Withdraw brake cable from back plate.

6 - Remove cotter pin and brake shoe leaf spring.

7 - Remove brake shoes and return springs.

8 - Take off locating pins.

9 - Remove the four screws at rear axle shaft bearing housing and take off housing cover.



10 - Remove brake back plate.

Installation

This is a reversal of the above operations, but it is important to observe the following points:

1 - Grease cable adjusting sleeve and lock nut as well as adjusting screw and cone. Make sure that these parts freely move. If necessary, renew cotter pin for adjusting cone.

2 - Prior to refitting the bearing housing cover, check if the oil seal rests squarely in the cover and if it is in a perfect condition. Renew damaged gaskets. The oil drip nose of the cover must point downward.

Tighten the four bolts to the following torques:

Bolts of quality specification 8 G
to 4—4.5 mkg (29—32 ft. lbs.).

3 - When installing brake drum, note correct position of oil deflector.

4 - Tighten rear axle shaft nut to a torque of 28—31 mkg (202—224 ft. lbs.) and secure it with a cotter pin.

5 - Adjust the brakes.

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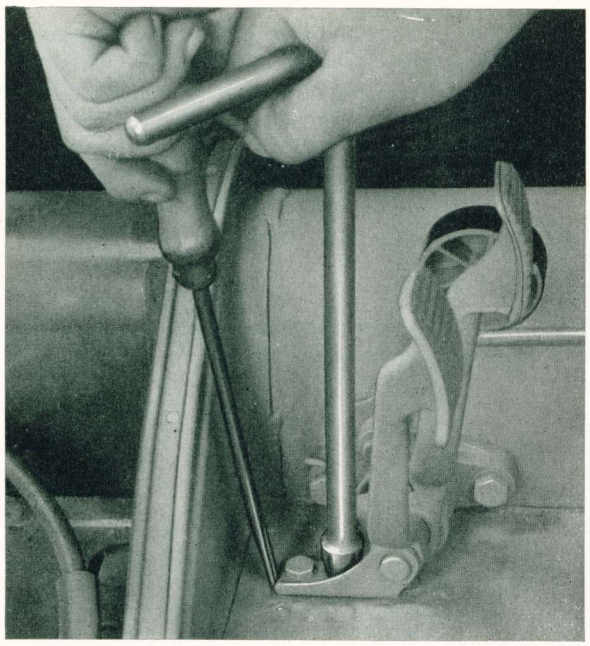
Basic Adjustment

1 - Lift the car and release hand brake.

2 - Check clearance between hand brake push bar and foot brake push bar (approx. 1 mm/0.04″) at hand brake lever. If necessary, adjust hand brake push bar.

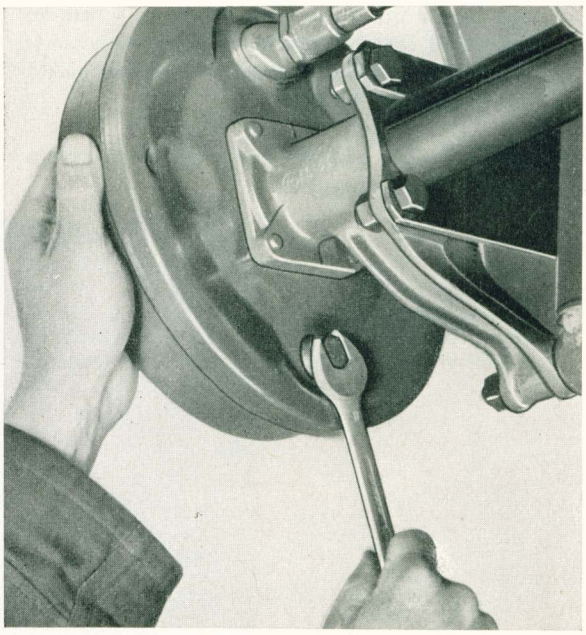
3 - Eliminate free movement of brake pedal by correcting the position of the stop plate.



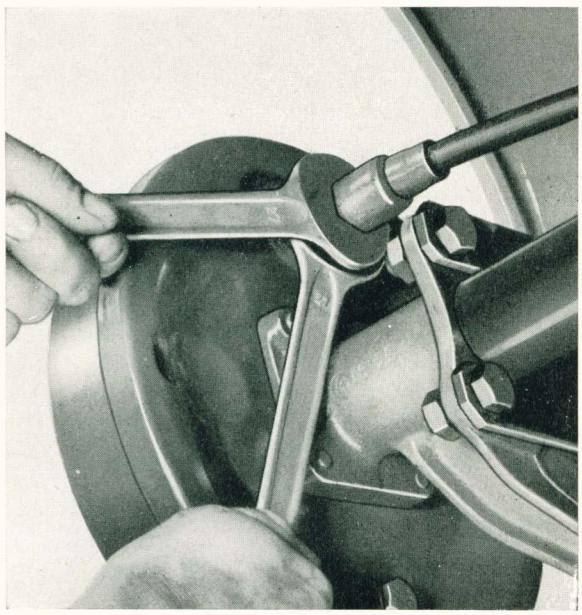
4 - Release adjusting sleeve lock nut at the back plate.

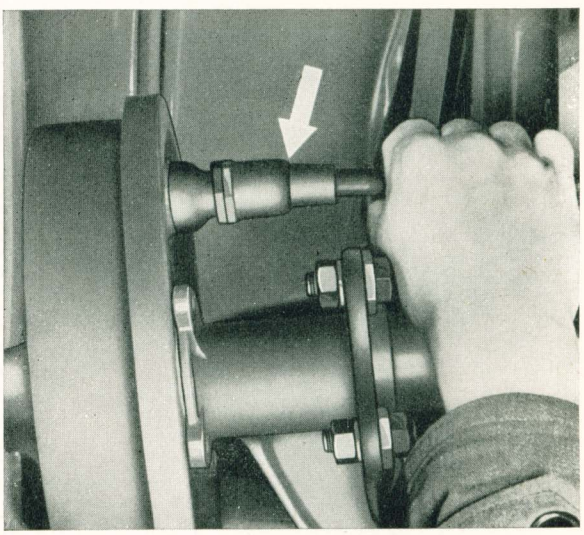
5 - Turn adjusting sleeve and lock nut clockwise, that is, toward the brake back plate.

6 - Tighten brake shoe adjusting screw until the brake drum no longer can be turned by hand. If the wheel has just been installed, turn adjusting screw until a heavy drag is felt.



7 - Turn adjusting sleeve until there is very little clearance between the end piece of the cable hose and the adjusting sleeve.





8 - Tighten adjusting sleeve locknut.

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9 - Loosen the brake shoe adjusting screw until the brake drum can just be turned freely. A light tap against the screw will place the brake shoes and the adjuster cone in the correct position.

10 - Repeat operation 4 to 9 on the other wheels.

11 - Pull up the hand brake by three notches and check equal braking effect on all four wheels. In case there is a difference in the braking effect among the four wheels, release the hand brake and loosen the brake shoe adjusting screw on the wheel with the highest braking resistance. At the fourth notch it should be impossible to turn the wheels by hand.

12 - Lower the car and make a road test to assure proper brake operation.

Note. —

If, after a long period of service, the cable can no longer be correctly adjusted due to an excessive lengthening, a distance piece should be installed.

Re-Adjustment

1 - Lift the car and release hand brake.

2 - Tighten brake shoe adjusting screws of all four wheels until the brake drums can still be turned freely.

3 - Pull up the hand brake by three notches and check equal braking effect on all four wheels. In case there is a difference in the braking effect among the four wheels, release the hand brake and loosen the brake shoe adjusting screw on the wheel with the highest braking resistance. At the fourth notch is should be impossible to turn the wheels by hand.

4 - Lower the car and make a road test to assure proper brake operation.

Treatment of Mechanical Brake When Cold Season Begins

General

In winter, the brakes are especially exposed to splashing water that is apt to freeze in the brake drums and conduit tubes. At the beginning of the cold season, the conduit tubes of the brake cables should, therefore, be thoroughly lubricated with anti-freeze lubrication grease. Do not use just any lubricant, but only the anti-freeze, water-repellent Grease VW — A 052.

Operations

Brake Cables

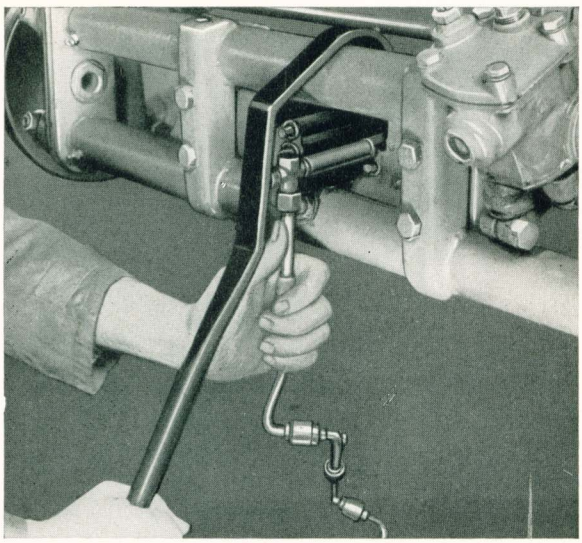
1 - Remove frame head cover.

2 - Remove cover plate on brake cable junction head.

3 - Unhook brake cables.

4 - Withdraw foot brake push bar.

5 - Completely fill the conduit tubes with grease without removing the cables.



Note. —

The firm Tecalemit has designed a Conduit Tube Filler 200120 consisting of a conjunction piece and an operating lever.

6 - Fill brake cable hoses with grease. Remove the end of each hose from the adjusting sleeve for a check.

The assembly is a reversal of the above operations.

Wheel Brakes

1 - Remove brake drums and check them for wear and scores.

2 - Clean brake back plate and control linkage.

3 - Check brake linings. In case of excessive wear, remove linings on all four wheels.

4 - Grease all moving joints.

5 - Reinstall brake drum.

6 - Adjust brakes.

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Installing Distance Piece for Lengthened Brake Cables

If it is found that the lengthening of a brake cable can be no longer compensated by turning the adjusting sleeve, a distance piece is to be installed between the brake hose end piece and the adjusting sleeve.

Operations

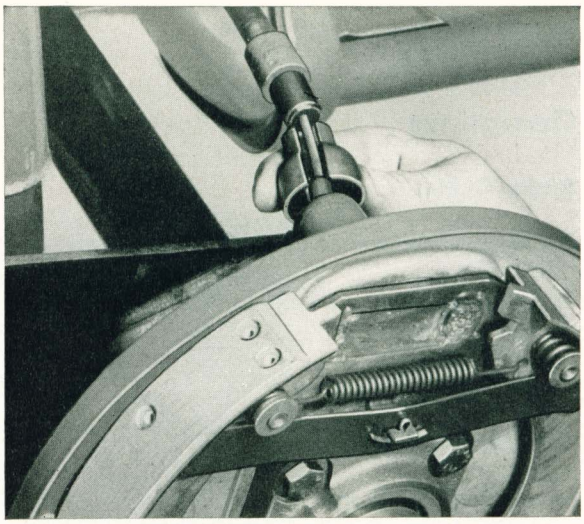
1 - Remove brake drum.

2 - Remove expander and operating link.

3 - Withdraw brake hose from adjusting sleeve.

4 - Install distance piece.

Assembly is accomplished by reversing the above operations.



General

Drop-center rim type wheels are used on the Volkswagen.

The rim size is: 4 J x 15
The tire size is: 5.60 — 15

Proper wheel and tire maintenance is essential to economical and safe automobile operation.

The maintenance includes:

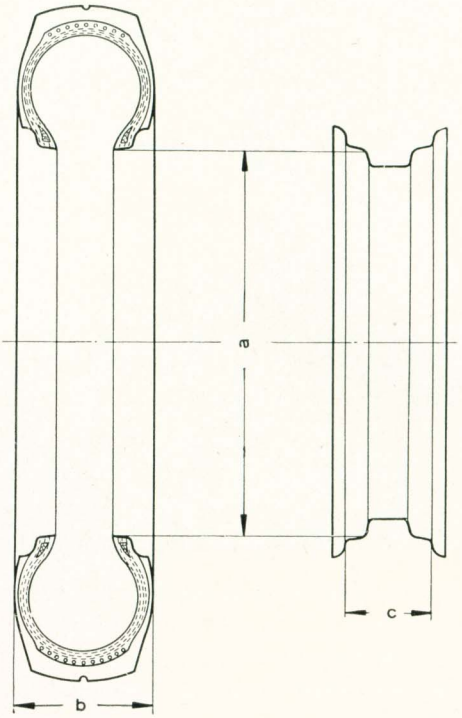
1 - Properly tightened wheel mounting bolts.

2 - Maintaining correct tire pressures.

3 - Inspecting tires for damage and signs of wear.

4 - Periodical tire rotation (criss-crossing).

5 - Wheel balancing.



a = 15″ b = 5.60″ c = 4 J

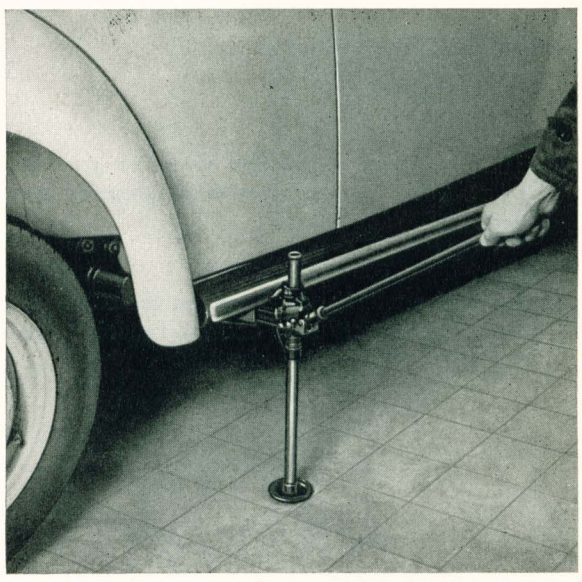
Wheel Removal and Installation

Removal

1 - Set the hand brake.

2 - Insert jack into the square tube below the sill panel. The jack should stand on solid ground.

3 - Remove the hub cap by means of the cap removing tool VW 370 (drawing for local manufacture) or a similar tool.



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4 - Loosen wheel bolts by means of the hex. socket wrench.

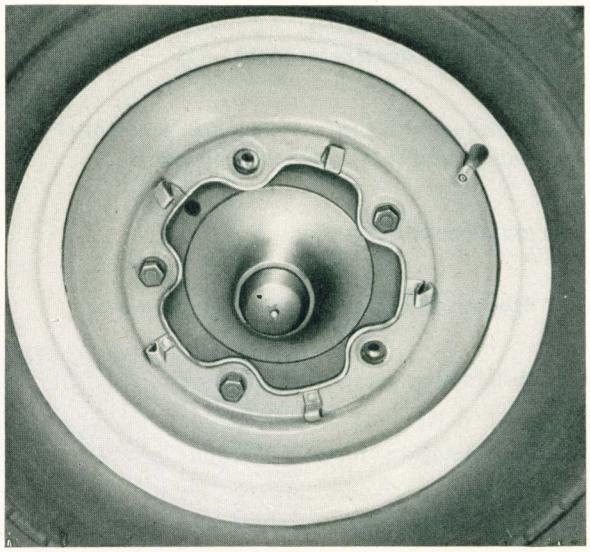
5 - Jack up the car.

6 - Remove wheel mounting bolts and take off wheel.

Installation

Installation takes place in the reverse order to the instructions on removal, but the following points should be watched closely:

1 - Screw in the wheel mounting bolts until the countersunk heads rest centrically in the corresponding recesses.



2 - Lower the car.

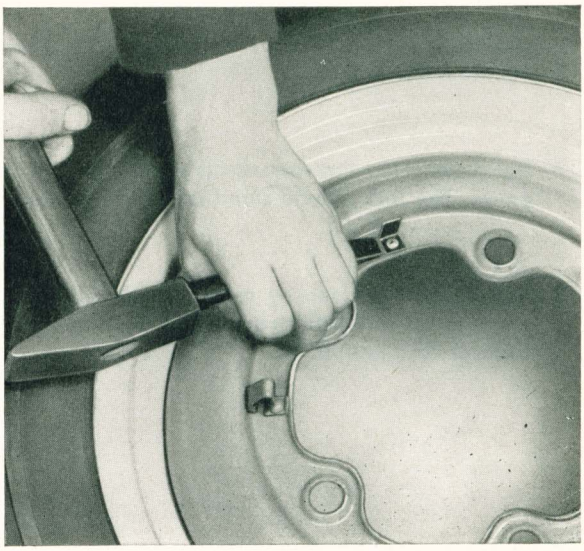
3 - Tighten all bolts diametrically opposite in turn to a torque of between 9 and 11 mkg (65 and 80 ft. lbs.). Oversize bolts M 14 are to be tightened to between 11 and 13 mkg (80 and 94 ft. lbs.).

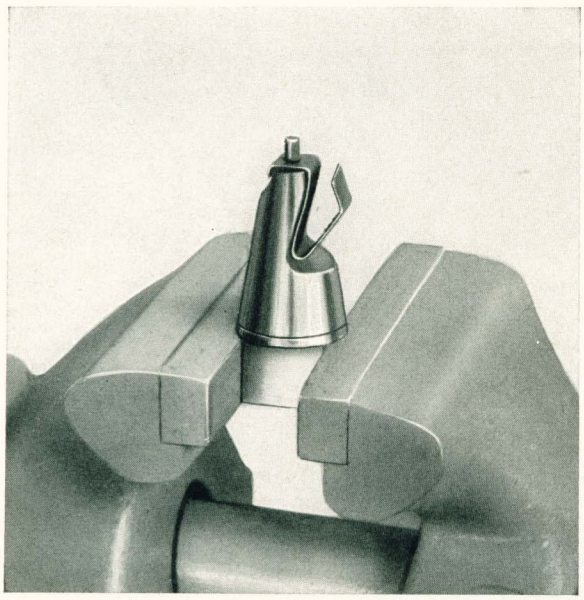
Replacing Broken Hup Cap Retaining Springs

1 - Remove wheel.

2 - Remove broken spring and rivet, using a flat chisel. Drive out the remaining piece of the rivet.

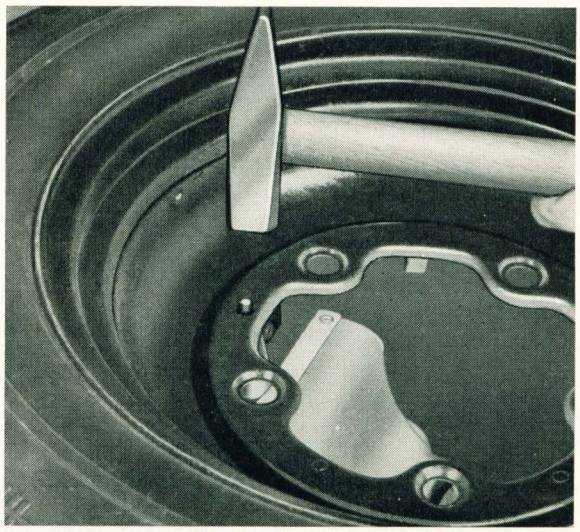
3 - Clamp the dolly in a vise and position a button-head rivet (4.5 x 7 mm) and the retaining clip as shown in the next illustration.





4 - Place wheel horizontally (outside down) over the dolly so that rivet enters the corresponding hole in the wheel.

5 - Set the retaining spring in place.



6 - Paint retaining spring and rivet on both sides.

7 - Position the wheel and tighten the mounting bolts.

Damaged Wheels

Slightly damaged rims, especially rim flanges, can be repaired without difficulty. If more severe damage is present, e. g. after accidence, the serviceability of the wheels should depend on the result of a test for run-out (maximum permissible lateral and radial run-out being 1.5 mm/0.06''). In any case, the wheel assembly must be balanced both statically and dynamically on an accredited wheel balancer after a repair has been carried out. Distorted wheels should be discarded.

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General

The condition of the tires has an essential bearing on economical and safe automobile operation. If a wheel and tire assembly is out of balance, the car will be hard to steer, riding will be rough, and tire wear will be rapid.

Maximum tire mileage can be gained by periodical care and maintenance under normal operating conditions. It should also be made clear to the owner that neglect or indifference is costly and that the small amount of time spent in giving attention to the tires is well repaid.

Undue tire wear may be attributable to incorrect tire pressures, unreasonable driving habits, and bad road conditions.

The tires should not be exposed to intense sunshine, fuel, and oil.

Following are the tire specifications:

Tire size:	5.60—15
Dimensions:	
Outer diameter	653 mm (25.7″)
Width	145 mm (5.7″)
Statically effective radius	304 mm (11.9″)
Dynamically effective radius	307 mm (12″)

Tire Pressures

1 to 2 occupants

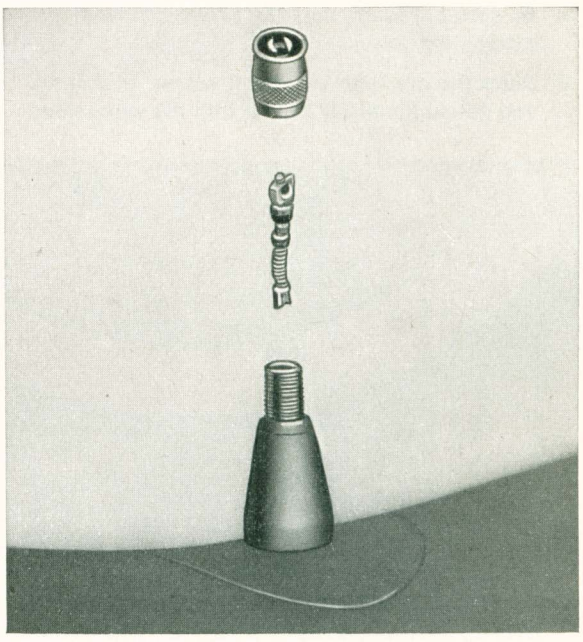
front: 1.1 atm. (16 lbs./sq. in.)
rear: 1.4 atm. (20 lbs./sq. in.)

3 to 4 occupants

front: 1.2 atm. (17 lbs./sq.in.)
rear: 1.6 atm. (28 lbs./sq.in.)

Tire Removal and Replacement

The tire should be removed from the wheel rim carefully in order to avoid damage. Damaged beads and an incorrect position of the tire in the rim are frequently responsible for premature wear and rear. Particular attention should be paid to the proper seating of the tire in the rim.



Removal

1 - Screw off valve cap and valve core.

2 - Lay the wheel on the floor outside up and break loose the tire bead from wheel rim flange.

3 - Force the bead into the rim well at the point opposite to the valve stem and pry the tire bead over the rim flange by means of tire irons, starting at the valve stem.

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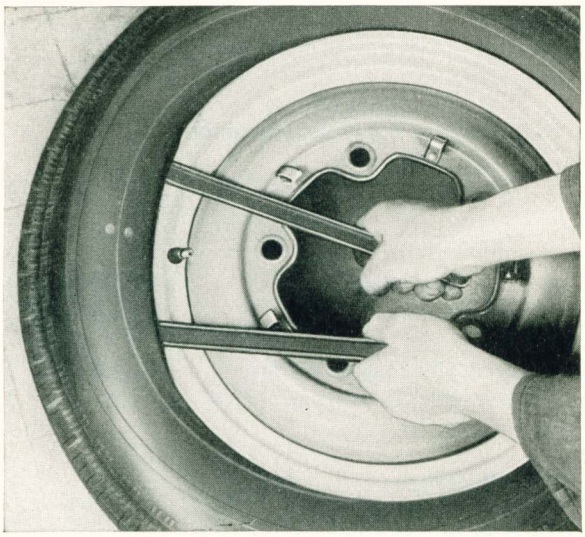


4 - Remove the tire tube.

5 - Examine valve and tube for leaks and mark the points of leaks. Check tube for signs of excessive friction. The tire casing should be carefully checked for cracks, cuts and bruises inside and out. Flints and stones that are embedded in the tire should be removed and the holes filled with suitable compound. Also remove all traces of grease and oil.

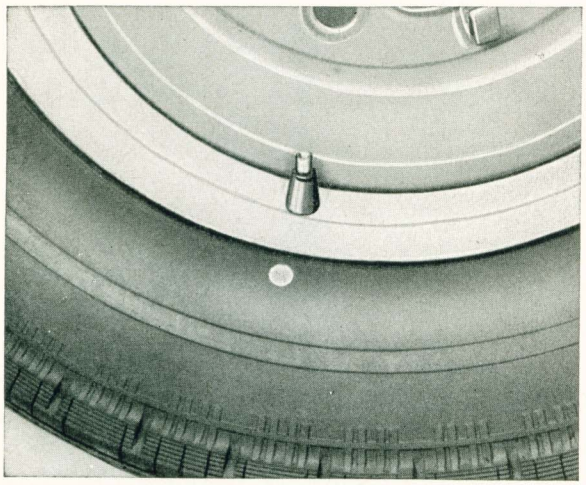
Tire Replacement

Installation of the tire is accomplished by reversing the removal procedure, but the following points should be observed:

1 - Lightly coat the inside of the tire case with talc powder.

2 - Be sure not to damage the tire beads when replacing the tire.

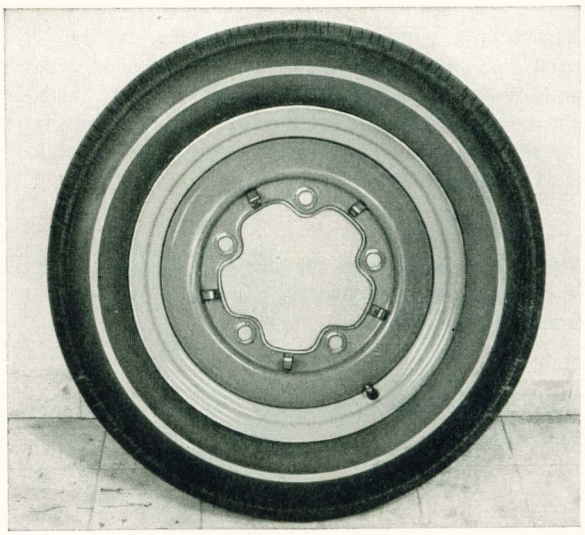
3 - Place the dry tube into the tire case so that the red dot on the tire is in line with the valve stem.



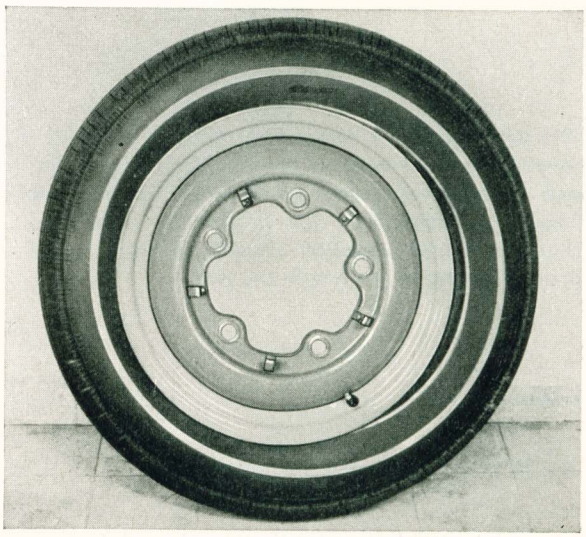
If the tires are marked by two dots, the valve stem must be located between them.

4 - Inflate the tube slightly to shape it to the tire.

5 - Before inflating the tube, be sure that the beads are out of the well and properly seated against the flange to avoid pinching the tube.



correct installation



wrong installation

6 - Do not forget to reinstall the valve cap.

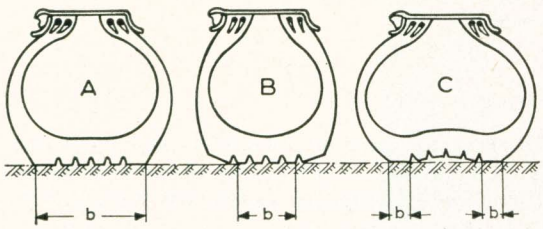
7 - Inflate the tube to the specified pressure.

Tire Inspection

The tires should be frequently checked for correct inflation and undue signs of wear as well as for cracks, grease, cuts, and bruises. Flints and stones that are embedded in the tire should be removed.

Tire inflation

Correct inflation is one of the most important factors for long tire life and perfect riding qualities of the VW Passenger Car. Tires in ordinary use should be checked at least once each week with an accredited tire gauge. An intermingling of the oxygen with the tire tube accounts for a slight drop in the pressure after some time of operation.



A = Proper inflation
B = Overinflation
C = Underinflation
b = Road contact

Tire pressure should be checked only when tires are cold, that is before operation. Tire pressures vary with temperature, the pressure increases when tires are hot. The tires and tubes are constructed with allowances for pressure buildup by expansion resulting from operation at high speeds and hot pavement.

Note: —

Care should be taken when using a simple tire gauge for a prolonged period. After a certain time of use, such tire gauges are subject to variations. Although the readings obtained often depart only slightly from the real pressure in the tube, the detrimental over or underinflation may lead to abnormal tire wear. Therefore, it is absolutely necessary to regularly check the tire gauge for accurateness.

The tightness of the valve cores can easily be checked by moistening a finger and placing it on the valve opening. Renew leaky valve cores.

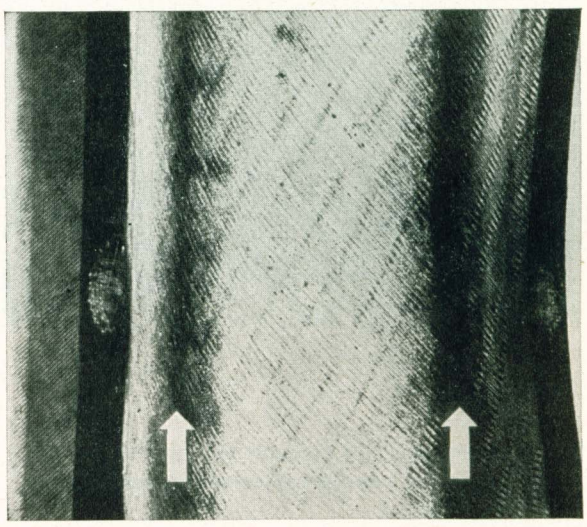
Abnormal tire wear

Following are the causes for abnormal tire wear:

- Underinflation or overinflation
- Poor driving habits
- Overloading the vehicle
- Bad road conditions
- Improper wheel adjustments

Underinflation

An underinflated tire will be subjected to excessive flexing of the side walls and resultant heat. Underinflation can be determined by wear at the sides of the tread. Two black stripes will first form inside



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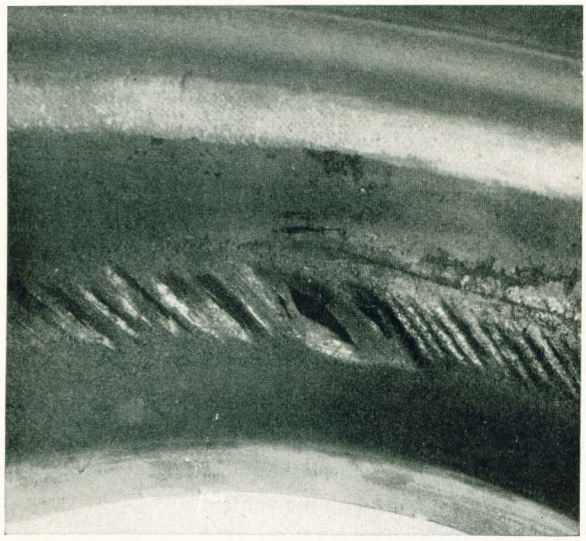
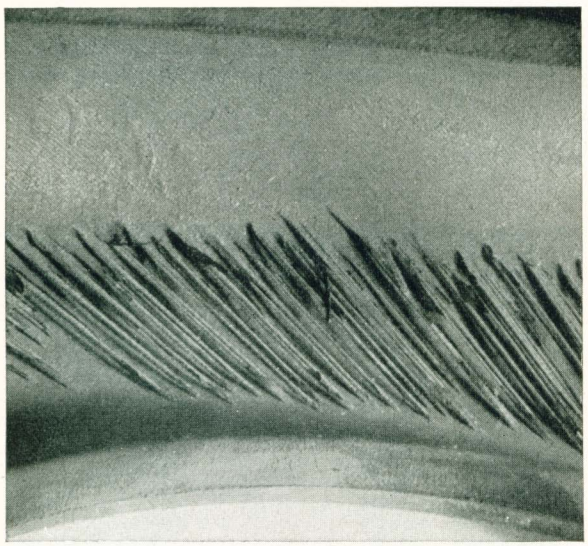
the tire casing, leading to damage of the fabric structure. If the tires are further operated with



insufficient air pressure, the plies in the side walls will separate so that the tires are ruined.



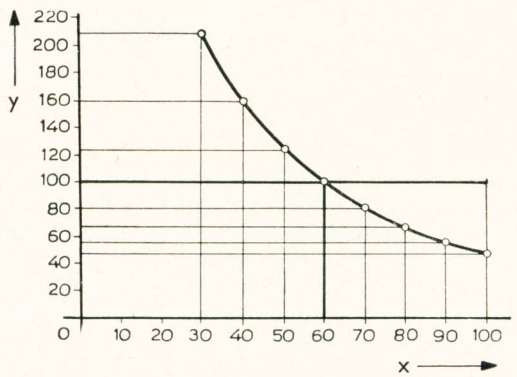
The underinflated tire contacts the road along the sides, where the tread is subjected to greater wear than the center.

Overinflation

Overinflated tires cannot absorb road shocks and abnormal wear will occur at the center of the tread, making the tires susceptible to bruises and breaks.

Driving habit

The average speed of automotive vehicles has gone up considerably in the course of the past decade. The tire wear increases rapidly with the speed. The chart indicates how much more rapidly tires wear at high than at low speed.



Influence of speed on tire life

x = Speed (km)

y = Relative tire life

The average value for tire life is indicated at the speed of 60 km p. h. = 100 per cent on the chart.

High-speed operation causes much more rapid tire wear because of the high temperature and greater amount of scuffing and rapid flexing to which the tires are subjected. Fast acceleration, sudden severe brake application, turning corners and rounding curves too fast or sharply will additionally contribute to increased and uneven tire wear.

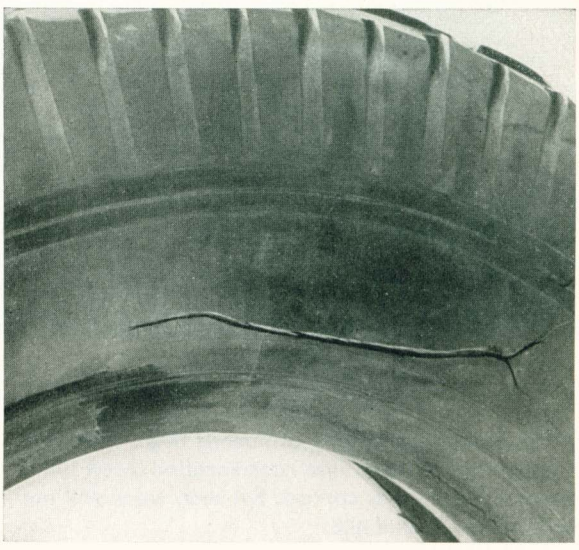
The reasons for increased tire wear when applying the brakes are clear, but it should be borne in mind that unequally or improperly adjusted brakes or differences in the quality of the brake shoe linings may lead to abnormal wear of some tires. Eccentric brake drums may also be the cause for unequal tire wear.

Overloading the car

Tires interpose a cushion between the road and the car wheels. The compressibility of the air in the tube allows the tires to absorb shocks resulting from irregularities in the road. It is the interrelation of air pressure, air volume and load that determines the correct tire size. Each tire size has to cope with a certain continuous load at a given inflation pressure. A temporary overloading is common in the operation of a motor vehicle; a fact which has been taken into account in designing the tires. Continuous overloading, however, has a detrimental effect on the tire structure.

This wear results in a saw-tooth effect with one end of each tread block worn more than the other.

With the tire continuously overloaded, the fabric structure inside the tire will crack. After some time of operation, the cracks appear outside in the tire walls.



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Road Surface

The tire life largely depends on the condition of the surface. To contribute to safe driving, antiskid material is now used to cover the roads. This provides frictional contact between the wheels and the road so that good traction is secured. This will make the tires subject to increased wear.

On steeply cambered roads (high crowned roads), the tires have to resist a side force which the driver attempts to compensate by applying a certain force on the steering wheel toward the center of the road so that the tires drag at an angle to the direction of vehicle movement.

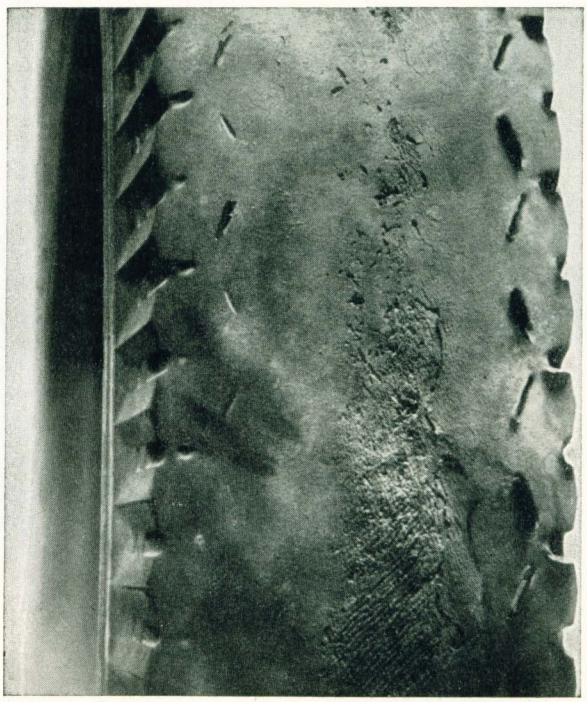
Even a slight departure from the correct toe-in adjustment is very detrimental to the tire life under such conditions. If the toe-in is excessive, the tire toward the nearer curbstone wears more rapidly. If the toe-in adjustment is too low, the wheel toward the center of the road wears faster. This wear is usually distinguished by side wear and feather edges of rubber that appear on one side of the tread design.

A faster wear on steeply cambered (high crowned) roads must be taken into consideration, even if the toe-in adjustment is correct, but such wear will not be confined to one tire.

Misaligned Wheels

There are also several types of wear which can be attributed to wheel misalignment. In each case of abnormal tire wear, it is strongly recommended to check the adjustments of front axle and steering. When only the rear tires are concerned, the spring plate adjustment and the efficiency of the shock absorbers should be checked.

Misaligned wheels cause part of the tread rubber to be scraped off; this is indicated by feather edging of the tread and side wear.



Uneven tire wear is also generally due to mechanical troubles.

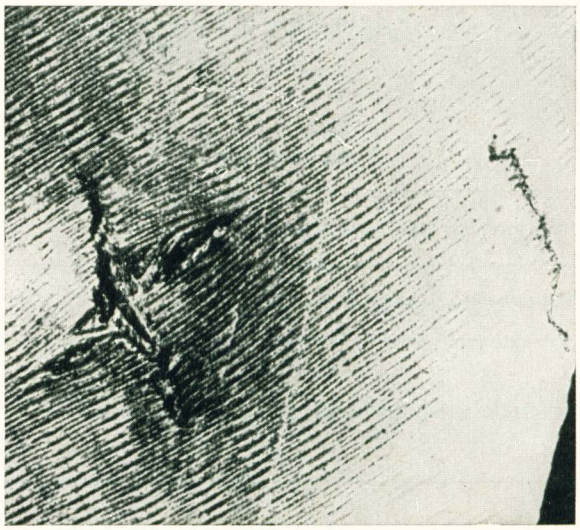
A chassis that has been involved in an accident should in all cases be checked for proper alignment to assure a perfect track of the wheels.

Grease, Foreign Matter, and Cuts

Grease or oil soaked dirt should be removed from the tire tread and the spots cleaned by means of fuel. Never use paraffin.

Foreign matter embedded in the tire should be removed as soon as possible. Small damage to the tread material is of minor importance. More severe damage to the tread material or even to the tire casing should be eliminated by vulcanizing to avoid the tire becoming completely ruined by ingress of moisture.

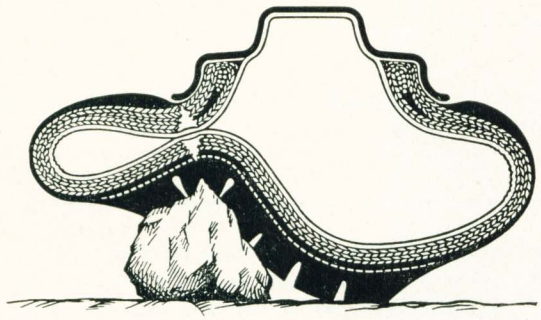
After the flints, nails, etc., have been removed from the tire, it is good practice to fill up the holes with suitable compound.



Double thrust break

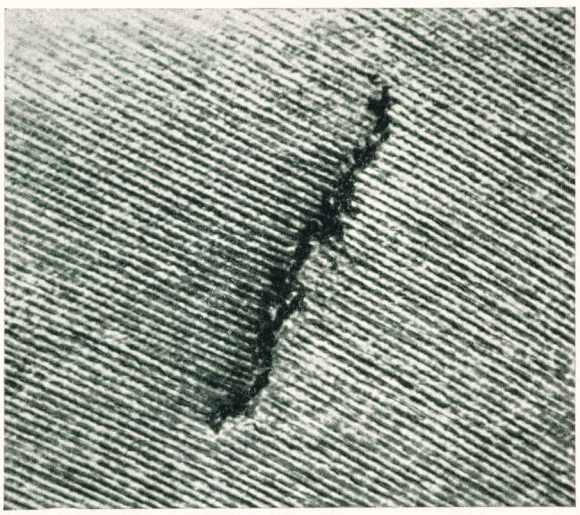
Cracks and Breaks

Sudden and violent shocks resulting from stones or gutters, etc., may cause cracks or breaks in the fabric structure of the tire casing. The illustration below indicates how such damage occurs.

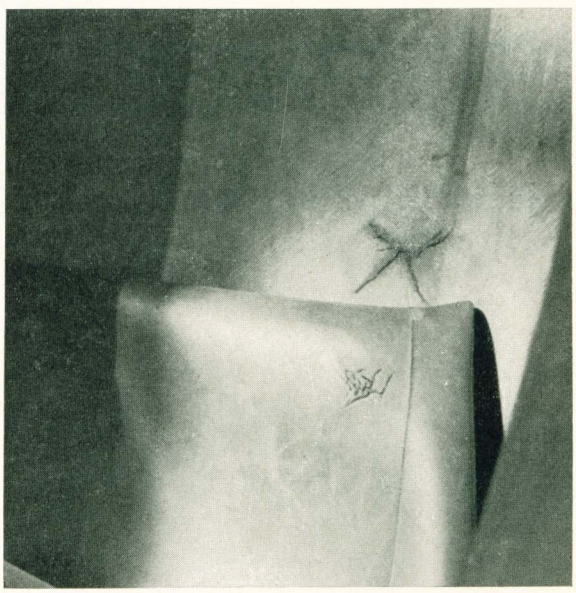


The damage so caused may be of various natures.

This kind of damage is generally difficult to locate outside. It is, therefore, absolutely necessary to carry out a thorough inspection at the inside of the tire when removing the tube for repair. Cracks or breaks in the tire casing cause excessive friction between the tire and the tube at the point of damage,



Single diagonal break



resulting in damage to the tube. It is often the case that only some of the plies are broken and that the damage expands when the trouble had not been located within a reasonable time.

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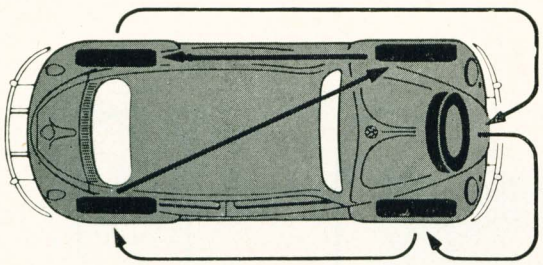
Service Diagnosis of Abnormal Tire Wear

Type of Wear	Cause
Wear at the sides of the tread.	Underinflation.
Wear at the center of the tread.	Overinflation.
Spotty or irregular wear (gouges and waves).	Wheel assembly static and dynamic unbalance. Lateral wheel run-out. Excessive play in wheel bearings or at king pin.
Lightly worn spots at the center of the tread (cups).	Wheel and tire static unbalance. Radial wheel run-out.
Flat spots at the center of the tread.	Violent brake application. Brake drum out of round. Check brakes!
Heel and toe wear (saw-tooth effect with one end of each tread block worn more than the other) leading to cracks in the fabric structure which become visible outside in the long run.	Typical for overloading. Check inside of tire casing for cracks.
(a) Side wear. (b) Feather edge of rubber on one side of the tread blocks. (c) Rounding and roughening of the tread at the outside shoulder of the tire.	(a) Incorrect camber. Continual driving on steeply cambered (high-crowned) roads. (b) Wheels toe-in or toe-out excessively. If the rear wheels are concerned, check adjustment of spring plate and effect of shock absorbers. (c) Caused by high speed driving on curves, called cornering wear.

Tire Rotation

To equalize wear of all tires it is recommended to rotate the wheels periodically at intervals of some thousand miles. The spare wheel should be included in the rotation in order to obtain additional tire mileage. The tires should be rotated as shown below.

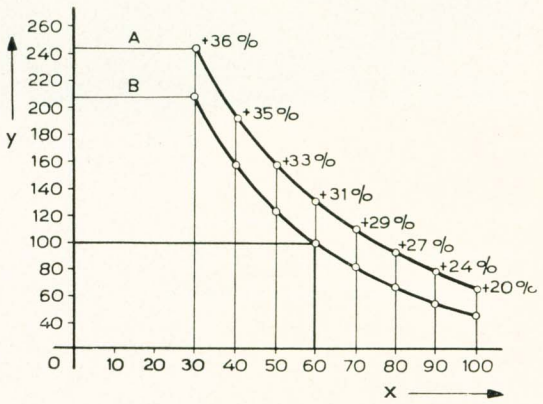


Not only is there a difference in the amount and type of wear between front and rear position, but also between the left and right side of the car, as the turning direction of the wheel is reversed by the above rotation.

As a precautionary measure, you should employ the better tires on the front axle, if already unevenly worn.

New Tires

It is good practice to renew the tires in autumn as tire wear is generally higher in summer than in the cold season. At the same time it should be taken into consideration that the treads of the new tires provide good traction during the cold season when bad road condition such as snow, ice and thaw prevail.



Seasonal influence on tire life (outer temperature)

A = Winter B = Summer

x = Speed of car (km)

y = Relative tire life

Wheel and Tire Balancing

The wheel and tire assembly balance must be maintained to insure good riding qualities and best steering performance of the car. A statically unbalanced condition of a wheel and tire assembly is indicated by an up and down hopping or pounding action. The wheel wobbles or shimmies if it is dynamically out of balance. The faster a car the more important is a perfect wheel and tire balancing.

Wheel balance is the first item to check after the tire has been repaired, retreaded or recapped. Should it not be possible to have repaired tires balanced both statically and dynamically, the car owner should be advised to use such wheels on the rear axle only and to drive at moderate speed. Any unbalanced condition may be destructive and dangerous, reducing not only the life of tires, but also the life of other vital parts of the car.

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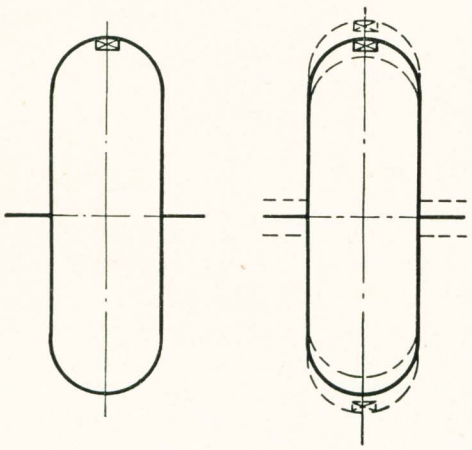
A B

Influence of unbalance on tire wear

A = Balanced wheel and tire after 14,200 km

B = Unbalanced wheel and tire after 11,500 km

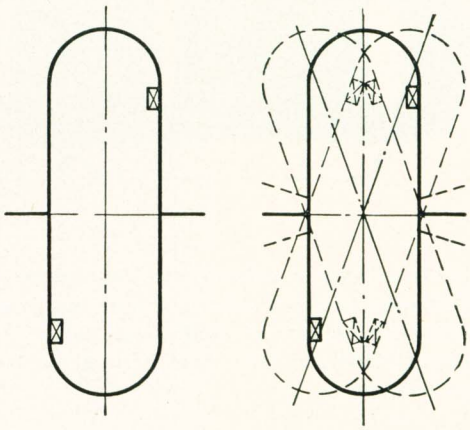
Wheel balance is the equal distribution of the weight of the wheel, tire and tube, brake drum and hub around the axis of rotation. The complete wheel assembly should be balanced both statically and dynamically.



A wheel assembly may be considered in static balance when it will remain static in any position to which it is revolved on its axis.

A wheel which is not statically balanced causes the tire to bounce at each revolution. The effect of the static unbalance increases with the speed of the car.

Perfect static balance does not assure that the wheel assembly is in complete balance. A dynamically out-of-balance wheel does not have even weight distribution in a plane vertical to the wheel axle.

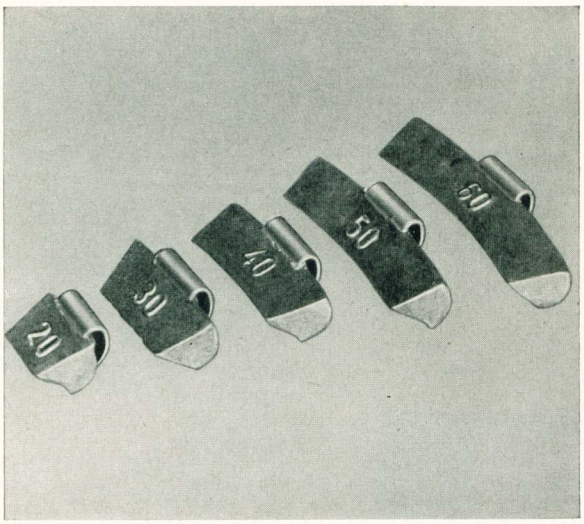


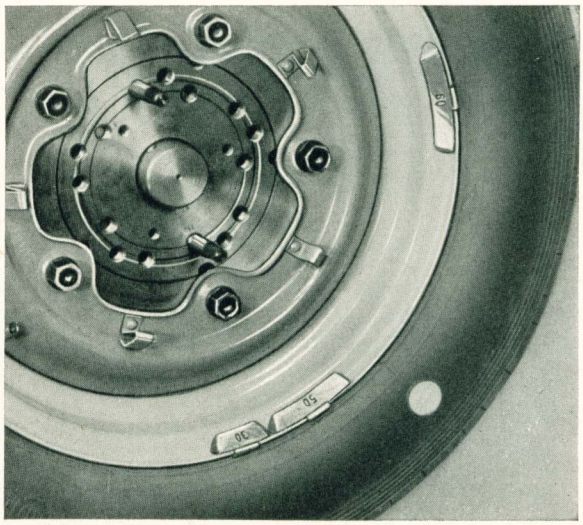
Dynamic unbalance causes the wheels to vibrate rapidly from side to side in their effort to revolve in a straight vertical plane. The greater the speed the more pronounced the condition becomes and steering ability is affected accordingly. This produces excessive wear of the tires, wheel bearings, king pins and steering connections. Prior to balancing the wheel and tire assembly, the wheel rim should be checked for lateral and radial run-out (maximum permissible: 1.5 mm/0.06″).

Static balancing can be carried out on a locally-made balancing fixture. Dynamic balancing requires special equipment to determine the value and location of weights in order to correct the condition without disturbing the static balance. Several types of wheel balancer are in use, all operating in a similar manner. The wheel balancer should be used as instructed by the manufacturer.

Some types of wheel balancer have been tried at the VW Service Department to which reference should be made when further information is required.

The weights used to correct the balance are of lead and are available in various sizes.





Note. —

Tires are factory balanced to compensate for the weight of the valve stem in the tube, and alignment of the dot, or two dots, on the tire and the valve stem will assure this balance.

Static Balancing

1 - Attach the wheel to the wheel balancer, using the five wheel mounting bolts. The wheel assembly should be in a clean condition.

2 - Move the wheel assembly and allow it to turn until it stops. The heaviest part comes to rest at the bottom. Mark the rim flange at the point diametrically opposite to the heavy point by means of a piece of chalk.

3 - Attach a suitable weight to the rim at the point marked with chalk.

4 - The wheel assembly may be considered in static balance when it does not rotate from any position in which it is stopped.

5 - Clamp the weight securely in place.

Dynamic Balancing

The wheel assembly must be balanced statically before testing and balancing to obtain proper dynamic balance. Static balancing eliminates up-and-down movement of the wheels (wheel tramp), while dynamic balancing is to counteract the tendency of the wheel to wobble due to a heavy spot on one side of the wheel when it is rotated.

1 - Attach the wheel to the wheel balancer, using the five wheel mounting bolts. The wheel assembly should be in a clean condition.

2 - Let the wheel spin at high speed.

3 - Determine the sizes of the weights.

4 - Determine the points on both sides of the rim at which the weights must be attached. Attach the weights.

5 - Recheck tha static balance.

An unbalance up to 30 grams (1 oz.) has no bearing on the operation of the wheel.

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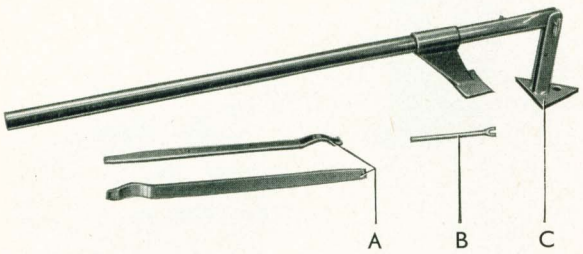
Installed on: Karmann-Ghia Coupé from Chassis No. 1 239 921
VW Convertible from Chassis No. 1 245 207
VW Sedan from Chassis No. 1 248 028

General

Tubeless tires can be changed by simple means. Required are two long tire irons with carefully rounded off edges, a valve installing tool and a bead breaker to break loose the tire bead from its seat in the rim.

Details can be obtained from the Technical Service Department of the Volkswagenwerk.

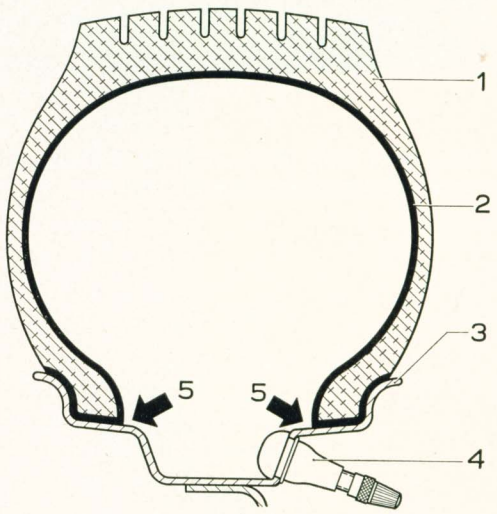
Whenever working on tubeless tires it is of paramount importance to make sure that the air retaining and sealing lining does not suffer damage.



A - Tire Irons
B - Valve Installing Tool VW 639
C - Bead Breaker VW 640

Note:

Full details about the tools VW 639 and VW 640 will soon be given in the 4th supplement to the manual "Local Manufacture of Workshop Equipment".



1 - Tubeless tire
2 - Air retaining and sealing lining
3 - Rim flange
4 - Valve
5 - Rim sealing surface

Apart from these tolls, there are a number of tire tool sets from various manufacturers that have been tested for their suitability for the Volkswagen.

The following instructions should be heeded in changing tubeless tires.

Tubeless Tires on New Type Wheels 4 J x 15

(Part No. 111 601 025 c)

The new type wheels 4 J x 15 have a rectangular recess at the hole for the valve. Stamped between two wheel fixing holes is a "T" for further identification.

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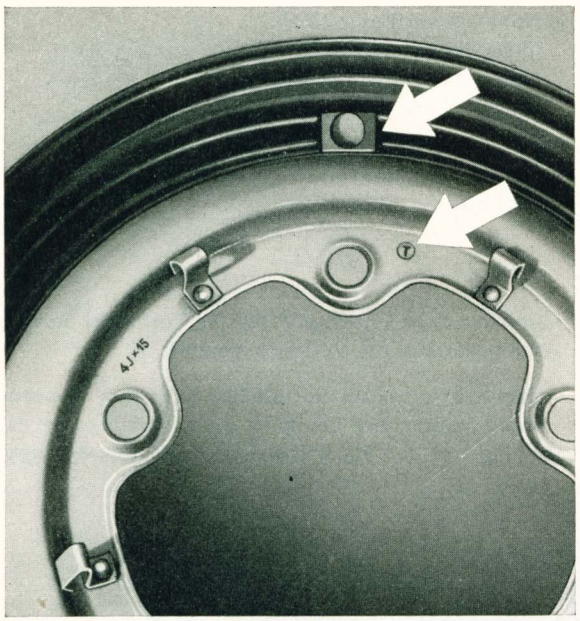
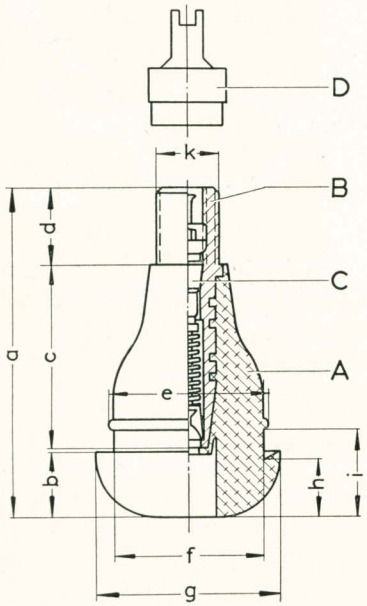


A rubber base valve (Part No. N 201011) is used as standard equipment for tubeless tires.



A - Rubber base
B - Valve stem
C - Valve core
D - Valve cap

a = 43.0 mm (1.69″)	f = 19.5 mm ⌀ (0.77″)
b = 8.5 mm (0.33″)	g = 23.5 mm ⌀ (0.93″)
c = 24.0 mm (0.94″)	h = 7.5 mm (0.29″)
d = 10.0 mm (0.39″)	i = 11.5 mm (0.45″)
e = 20.5 mm ⌀ (0.81″)	k = Valve thread 8

Dismounting Tire

1 - Screw off valve cap and valve core.

2 - Break the tire bead loose from its seat in the rim. This is best accomplished with the Bead Breaker VW 640.

3 - Using tire irons, pry the bead over the edge of the rim.

Caution!

To guard against damaging the sealing lining on the bead, only use long tire irons having carefully rounded off edges.

4 - Check the air-retaining and sealing lining inside the tire for damage and bruises. Inspect the exterior of the tire for embedded flints and stones, cuts, grease, and for signs of wear.

5 - Check valve rubber base for cracks and breakage.

Mounting the Tire

Mounting tubeless tires is, in general, accomplished by reversing the dismounting procedure.

1 - Check the rim for damage. Never mount tubeless tires on rims having damaged, distorted or deeply scratched shoulders or flanges.

2 - Remove any dirt from rim shoulders and flanges, use a wire brush, if necessary.

3 - Pull the rubber base valve (Part No. N 202011) into position, using the Valve Installing Tool VW 639.

4 - Mount tire on the rim with the red dot on the sidewall of the tire located at the valve. Be careful not to damage the tire beads.

5 - Remove the valve core.

6 - Allow the full rush of air to overinflate the tire to 3 kg/cm² (42.67 lbs./sq. in.). This initial rush of air will push the tire beads against the rim flange and provide a quick seal.

Note:

If the sidewalls of the tubeless tires are pressed together because of improper storing, a bead expander (a spring steel band placed round the circumference of the uninflated tire) should be applied to spring the beads against the rim flange for proper sealing.

Tubeless tires should always be stored in an upright position.

7 - Screw in the valve core and deflate the tire to the correct pressure.

Caution!

The tire pressures prescribed for the conventional tubes and tires on VW Passenger Cars also apply to tubeless tires.

8 - Check air seal of tire and valve by immersing in a water tank.

Caution!

All tubeless tires are uniformly inflated to 1.6 kg/cm² (23 lbs./sq. in.) at the factory. Be sure they are brought to the specified pressures before delivery of the car.

Note:

Occasional complaints about tubeless tires would suggest that little attention is paid to the installation procedure. In order to insure safe operating conditions it is of great importance to observe the hints given.

Proper tire fit and tight seal are assured only if the following points are heeded:

a - Rim must be free from dirt and rust.

b - Rim must be airtight.

c - Rim shoulder and flange must not be damaged.

d - Tire air retaining and sealing lining must not be damaged.

e - Valve must be properly fitted in rim hole. Rubber base must not be damaged (breaks, cracks).

f - Overinflate tire to 4 kg/cm² (57 lbs./sq. in.) with the full rush of compressed air with valve core removed.

g - Check inflated tire and valve for leaks in water bath.

For installation of tubeless tires use tools recommended in the Workshop Manual.

If, at regular tire checks, excessive loss of pressure is apparent (more than 20—25% of the specified pressures) check for leaks in tire, rim and valve.

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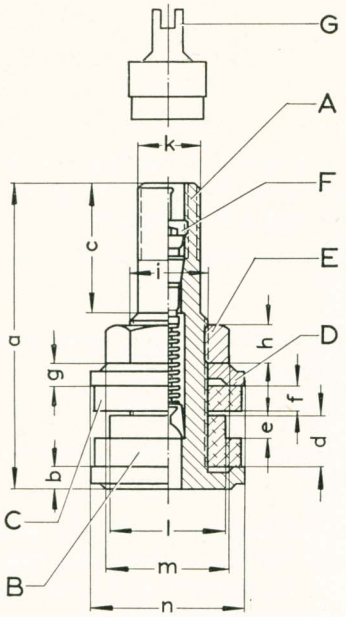
Mounting Tubeless Tires on 15" Wheels of the Earlier Version

(Part No. 111 601 021 c)

Mounting tubeless tires on old type 15" wheels is possible by using a valve of the Part No. N 201021.



A - Valve stem
B - Inner seal
C - Outer seal
D - Thrust washer
E - Nut
F - Valve core
G - Valve cap

a = 40.0 mm (1.57")	h = 5.0 mm (0.20")
b = 3.5 mm (0.14")	i = Valve thread 10
c = 17.0 mm (0.67")	k = Valve thread 8
d = 7.0 mm (0.28")	l = 15.0 mm ø (0.59")
e = 3.0 mm (0.12")	m = 14.0 mm (0.55") across flats
f = 4.0 mm (0.16")	
g = 3.0 mm (0.12")	n = 20.0 mm ø (0.79")

Mounting the tire is accomplished by following the procedure given on the previous page, but the following points should be noted:

1 - Remove dirt, rust, and paint sags from rim. Using the wire brush, clean rim shoulder and flange.

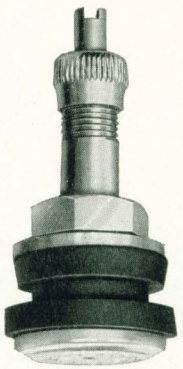
Never mount tubeless tires on rims having damaged, distorted or deeply scratched shoulders or flanges.

2 - According to the type of the rim, a further check should be carried out as follows:

a - Welded rim: Carefully smooth down the welded joint.

b - Riveted rim: Check rivets for looseness and porosity. If necessary, leaks should be remedied by peening over the rivet head with a hammer. Rims with leaky rivets are unsuitable for tubeless tires.

3 - The valve of the Part No. N 201021 should be used whenever mounting tubeless tires on earlier type wheels.



The now standard rubber base valves do not insure a perfect seal in earlier type rims.

4 - Insert the valve with inner seal in the rim and slide the outer seal and thrust washer onto the valve stem so that the larger face of the washer contacts the seal.

5 - Tighten the nut.

6 - As to the further procedure refer to "Mounting the Tire" from point 4- onwards.

Bearing of Weather Conditions on Tire Life

Among the factors which determine the tire mileage are also the weather conditions.

Heat is the worst enemy of the tire. Under the influence of high outside temperatures, the operating temperature of the tire increases rapidly — especially during a long non-stop ride — so that the structure of the tire is liable to change. Such alteration in the structure of the tire causes abnormal wear if the tire is continually subjected to an excessively high thermal load.

Therefore, it is recommended to pay attention to the heat development of the tires on long trips at high speed when high outside temperature prevails. It pays off to stop from time to time and let the tires cool down in the shade. Tire pressures vary with temperature and the pressure increases when tires are hot. That is why the pressure should be checked only when tires are cold, that is before operation.

Tire wear is less when the road surface is wet, as the water acts as a lubricant, reducing the frictional contact.

Anti-Skid Qualities of Tires

General

A wet or ice-covered road surface reduces the frictional contact between the wheels and the road, but this condition will also reduce the traction of the car. The tendency of the car to skid is influenced by

a - Road surface materials
b - Weather and season
c - Tire tread

Road Surface Materials

Concrete roads, granite paving stones, or asphalt containing basalt chippings combat the tendency of the car to skid in wet weather. Unfluted asphalt roads are especially slippery and dangerous. Care should also be taken when driving on wet basalt or wood block pavements. Basalt can be recognized by its dark-blue colour.

Weather and Season

Drizzle, fog or sleet increase the tendency of the car to skid. Wet leaves, soil dropped by agricultural vehicles as well as snow and ice render roads dangerous. Continuous rain, however, will wash off the greasy film from the surface.

Tire Tread

The tire tread design is of great importance to the steering stability of the car under bad road and weather conditions. Where the tread has worn smooth, it is sometimes possible to retread the tire in order to restore the traction and anti-skid properties.

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New Marking

Since October 1952, all VW Passenger Cars were fitted with standard tires 5.60—15 with inner tubes but as of the middle of July 1956 we have been using exclusively tubeless tires of the same size. On the outer side wall these tires are marked "Tubeless" or "Schlauchlos".

To permit easier identification of the two tire types, all standard tires 5.60—15 with inner tubes have been given a new marking. As of February 1958, they will be marked with a green dot instead of the red dot that used to indicate the thinnest spot of the outer tire where the valve is supposed to be during mounting. All tubeless tires continue to carry the red dot.

Consequently, tires marked with green dots must always be mounted with inner tubes.

During a transition period, standard tires 5.60—15 with inner tubes marked with either red or green dots will be stored together with the tubeless tires marked with red dots and we should, therefore, like to advise you to watch for the lettering "Tubeless" or "Schlauchlos" to prevent mix-ups.

Tire Pressure

Tubeless tires keep the pressure much longer than tires with inner tubes and customers as well as workshops are beginning to see the advantage. Here and there, the opinion seems to prevail that the tire pressure no longer requires the same degree of observation and attention as was essential previously. This opinion is mistaken and quite dangerous.

The tubeless tire reacts to insufficient pressure just as unfavorably as a tire with inner tube. It will become excessively hot, diminishing road holding qualities and even causing the car to skid.

In the case of tires with inner tubes, a certain loss in pressure had come to be taken for granted and the pressure was checked and corrected regularly. With tubeless tires, a noticeable loss in tire pressure, is, however, an indication that something is wrong with either the wheel, the tire, or the valve. If, after a loss in tire pressure has been noticed repeatedly, no leaks can be detected in the outer cover (including the bead), the following causes may come into consideration:

a - leaky rim (replace rim).

b - leaky valve (replace valve or valve core).

c - foreign matter or unevenness between the tire and its seat in the rim (clean or straighten the tire bead and the tire seat in the rim).

d - inadequate tire seat in the rim in the case of exceptional border-line tolerances (replace disc wheel and outer tire).

In the last-mentioned instance (d), disc wheel and tire should not be used again until we have had an opportunity to examine them with a view to determining the cause of the pressure loss. However, this applies only to the domestic market. On principle, it may be said that to merely adjust the pressure and to then let the customer continue to operate the vehicle as it is, would not be an acceptable practice.

1 - VW Special Service Tools

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2 - VW Workshop Equipment for Local Manufacture

VW 636 Hub Cap Removal Tool

3 - Normal Hand Tools

Screwdriver, 6 mm
Combination pliers
Pipe wrench
Cold chisel
Pin punch, 4 mm
Mechanic's hammer, 300 grams
Flat file, 180 mm in length
Half-round file, 180 mm in length
Flat scraper
Socket wrench, 17 mm
Socket wrench, 19 mm
Open-end wrench, 7 mm
Open-end wrench, 10 mm
Box wrench, 17 mm
Box wrench, 19 mm
Wire brush
Tire tool
Oil-can
Can for derusting fluid
Grease container
Scratch awl
Tire gauge, 0—6 kg/cm² (85 lbs./sq. in.)
Caliper square, 300 mm in length, measuring 1/50 mm
Tap M 10
Tap M 10 x 1.0
Tap M 12 x 1.5
Die stock, size 2
Die M 10
Die M 10 x 1.0
Die M 12 x 1.5
Tap wrench, size 1, adjustable
Tap wrench, size 2, adjustable
Torque wrench, 0—12 mkg
Drill, 8.5 mm
Drill, 10.0 mm
Drill, 10.5 mm
Drill, 12.0 mm
Inspection lamp with cable and plug
Electric drill

4 - Supplementary Workshop Equipment

Brake cable conduit tube grease injector
Hub cap retaining spring rivet tools
Wheel balancer
Fill-bleeder tank