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Important Instructions for Brake System Repairs

VOLKSWAGEN 1200

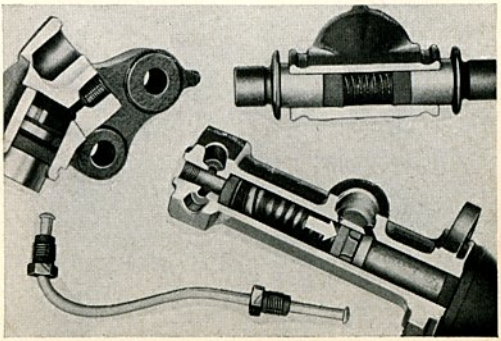
Slide Series № 2

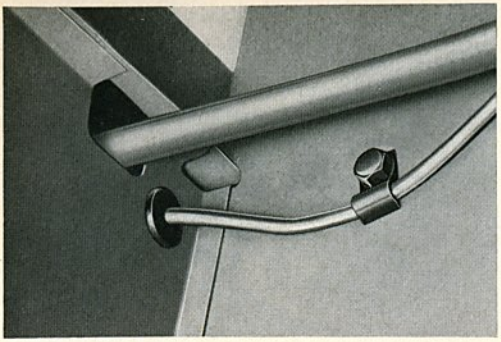
IMPORTANT INSTRUCTIONS FOR BRAKE SYSTEM REPAIRS

VOLKSWAGEN 1200

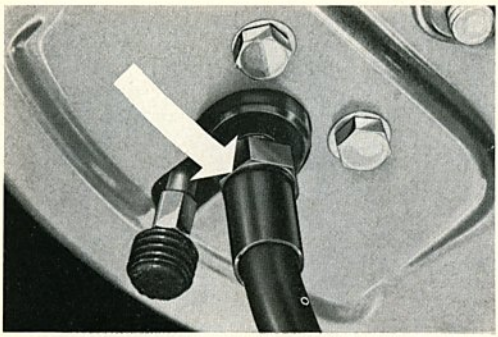
2/10 A properly functioning brake system is of great importance to the road safety of a vehicle. For this reason, the brakes of every Volkswagen are tested before it leaves the factory. The braking effect of each individual wheel is recorded on the four gauges on the brake test stand measuring column which is visible on the right of the picture. As soon as the vehicle leaves the factory, the task of maintaining its roadworthiness by conscientious care is in the hands of the VW specialist.

2/20 In order to locate faults in the brake system and repair them properly it is essential to understand the function of all the parts in the system. Let us look first at the various parts in the hydraulic brake system. The wheel cylinders at the upper right and left of the picture are fitted with a number of pistons and cups depending on whether they have to operate one or two brake shoes. The master cylinder shown below the wheel cylinders is divided in the center by the main cup (arrow). The left hand part of the master cylinder which contains the spring and the check valve is known as the pressure chamber and the right hand part with the piston and the secondary cup is known as the reserve chamber. Near the main cup is the small by-pass drilling to the pressure chamber and in the supply chamber is the slightly larger refill hole.

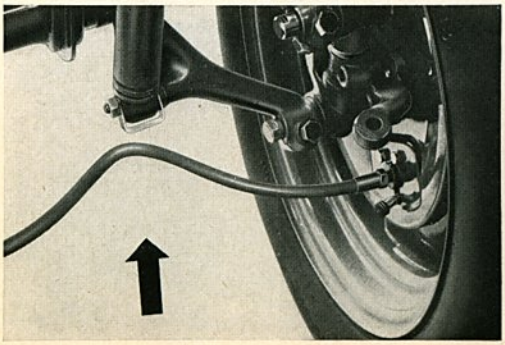




2/250 After accidents which are attributed to brake failure it is usual to examine the repair work carried out by various workshops. It is advisable, therefore, to check the condition of the brake lines during maintenance checks and when carrying out repairs. Even though the brake lines are copper plated and galvanized there is always a danger of corrosion at securing clips, and at holes where the pipes pass through cross members and other points where the pipes contact the chassis and tend to hold moisture.

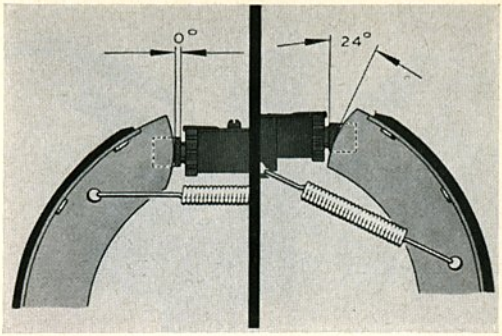


2/260 When tightening brake line and hose unions there is a tendency to use excessive force. A tightening torque of 10—18 ft. lbs is really quite sufficient. If this torque is exceeded there is a danger of breaking the threaded adaptor or damaging the seat for the nipple. The importance of details of this type will be realised if we consider that pressures of up to 1400 psi are reached when the brakes are applied.

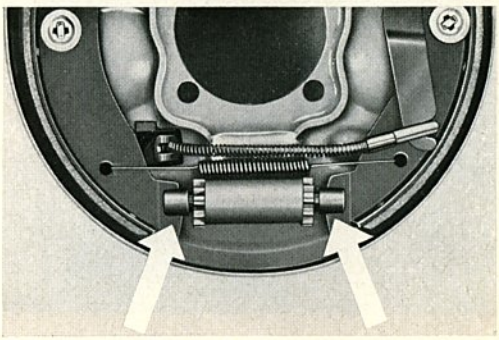


2/270 Make sure that the brake hoses on the passenger car do not hang down and affect the ground clearance. To give the hoses a slight curve to the front as shown here, twist them from about 90° to a maximum of 180° before securing them at the frame end. Great care must be exercised when greasing, spraying or painting the vehicle as the hoses are not paint or oil resistant.

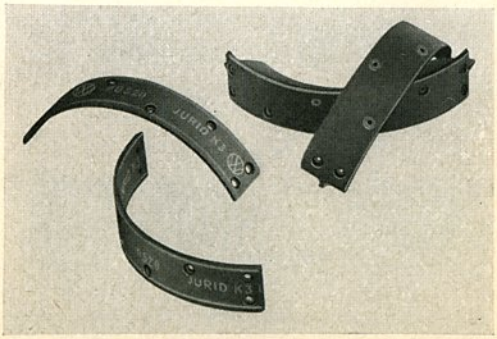
2/280 We shall now leave the hydraulic part of the brake system and proceed to the parts which convert the hydraulic pressure into friction. There are two types of brake shoe which differ at the ends where they fit into the support brackets. The support angles at the adjusting screws, the shape of the shoe, the return springs and the support bracket are different. The individual parts of these two versions are not interchangeable. When fitting a new axle, ensure that these parts are the same on all four wheels.

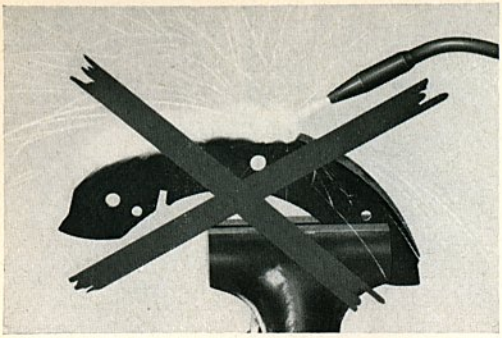


2/290 The brake shoes can move freely in the slots in the piston ends and the adjusting screws and are thus self centering. This more or less eliminates the tendency to brake grabbing. To further the self-centering properties, the sliding surfaces are lubricated with high melting point graphite grease on assembly.

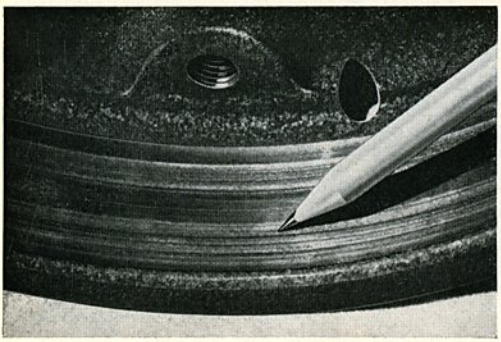


2/300 One essential feature for uniform, effective braking is the coefficient of friction of the brake linings. When fitting new linings, always ensure that at least the two wheels on one axle are fitted with linings which have the same coefficient of friction. Oiled-up linings cannot possibly fulfill this requirement.

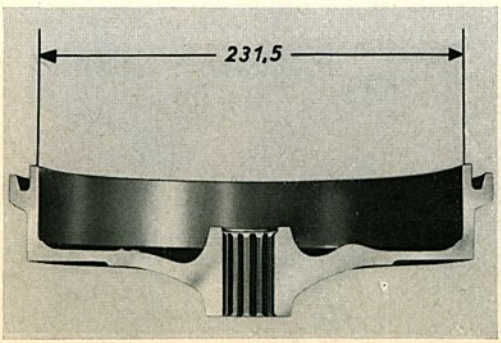




2/310 This is one very poor way of trying to make oily linings fit for use again. Burning off, boiling or washing oiled-up linings is not only useless, it also endangers the safety of the vehicle.

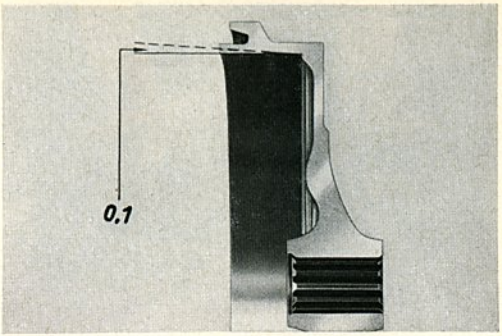


2/320 Before new or newly lined brake shoes are installed, the drums must be checked for grooving and radial and axial run-out. All friction surface damage reduces the efficiency of the brakes and thus minimises the success of the entire repair operation.

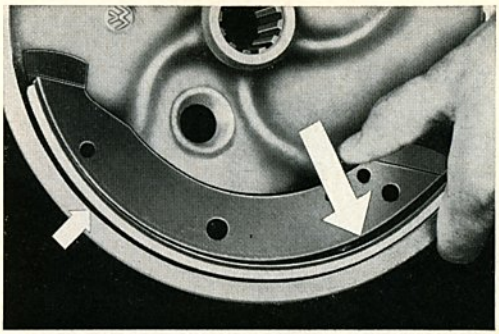


2/330 Brake drums which are grooved or badly worn can be turned out up to a diameter of 231.5 mm. Always ensure that a minimum wall thickness of 4 mm remains.

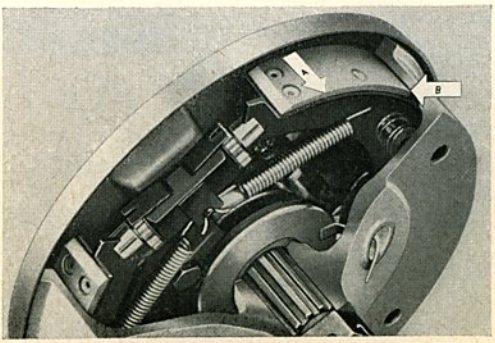
2/340 The difference in diameter at the inner and outer edges of the friction surface which is commonly known as taper, must not exceed 0.1 mm. Excessive taper and radial and axial run-out reduces brake efficiency and causes noises.

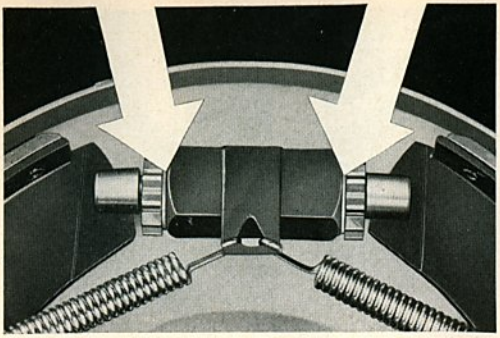


2/350 If one end of a brake shoe with a normal lining is pressed against the friction surface of an oversize drum as shown here, there will be a steadily increasing gap towards the other end between drum wall and lining. This gap is proof that reworked drums should only be used together with oversized linings. This is the only way to ensure that the lining contacts the brake drum over the full area.

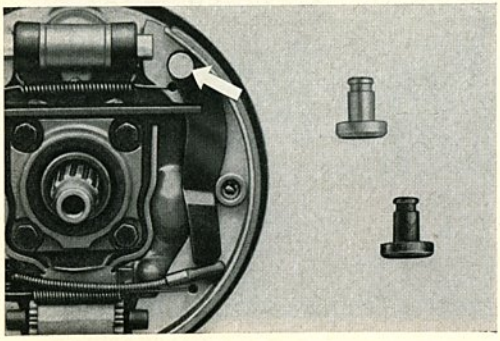


2/360 Excessive taper in the drum and distorted brake shoes or backplates can be the cause of the trouble if the lining only touches at the point shown here by arrow B. As a result, the brake shoe moves in the direction shown by arrow A when the brakes are applied. When the brakes are released the brake shoe moves back, hits the backplate and causes a knocking noise.





2/370 On older vehicles, knocking noises at the wheels can be caused by the fact that the contact faces of the nuts have worn into the anchor block. The edge thus formed on the nut slips on the end face of the anchor block when the brakes are released and causes a knocking noise. This trouble can be eliminated by fitting a washer between the anchor block and the adjusting nut on each side.



2/380 Moisture which occasionally enters the brake drum can cause the pin for the lever of the handbrake linkage to seize. When this happens, the brakes stay on when the handbrake is released. In such cases it is advisable to fit a galvanized pin and not to just free the linkage off.

2/390 To prevent water from entering the brake drum, the slot between backplate and brake cable retainer should be sealed carefully with VW D 9 sealing compound.

2/400 When the repairs to the brake system have been completed, the brakes must be tested. If a modern brake testing stand is available, the braking force at each wheel can be read off from the height of the four columns of liquid. The exercise of the necessary care in all repair and checking operations on the brake system is an indispensable condition for road safety and is one of the most important tasks afor the VW specialist.

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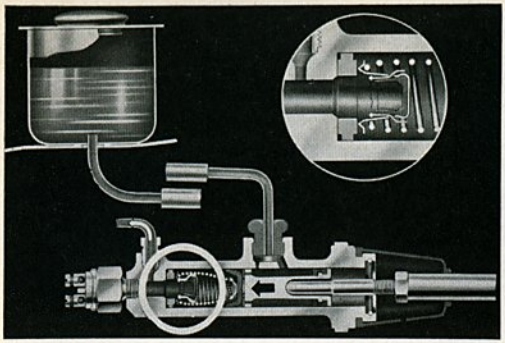
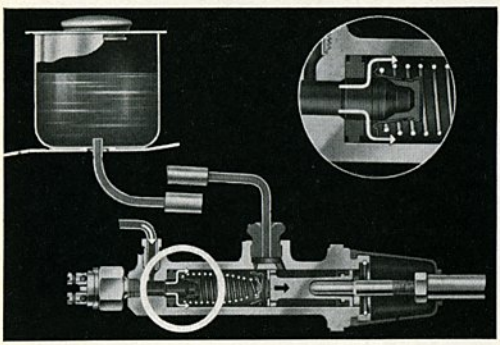
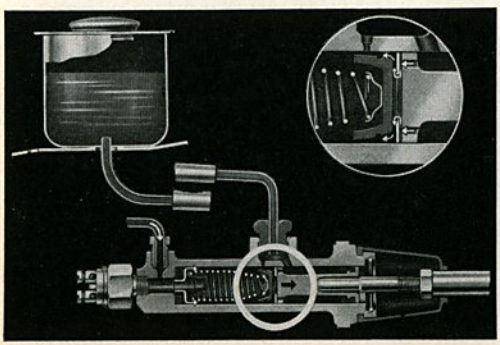


2/30 When the brake pedal is depressed, the piston forces the brake fluid past the check valve along the brake lines to the wheel cylinders. An enlarged view of the check valve on the right shows the rubber cap which opens and closes the system.

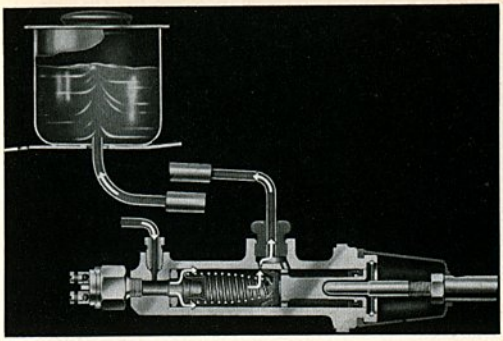


2/40 When the pedal is released, the tension of the brake shoe return springs forces the fluid back to the master cylinder where it lifts the check valve from its seat and passes into the pressure chamber. Whereas the piston returns to its original position very quickly when the pedal is released, the fluid flows comparatively slowly. This can create a vacuum in front of the main cup for a short time.

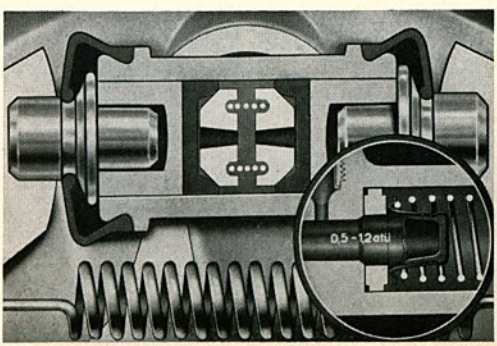


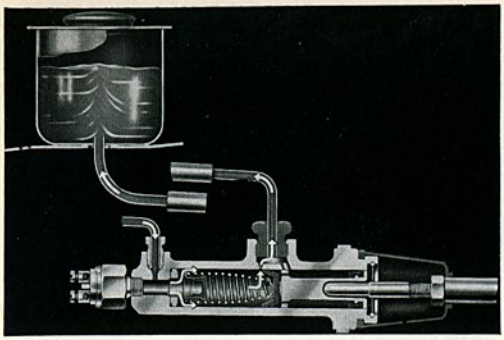
2/50 Such a vacuum would naturally encourage air to enter the pressure chamber of the master cylinder. In order to prevent the ingress of air via the sealing lip of the main cup, the part of the cylinder where the piston is located is also filled with brake fluid. When pressure compensation takes place due to the presence of a vacuum as mentioned above, brake fluid from the reserve chamber passes into the pressure chamber and not air. The brake fluid flows through the holes in the piston, past the washer and the grooves in the main cup. The space round the piston then fills with fluid via the refill hole. This space is sealed by means of the secondary cup.

2/60 Even though the piston has already returned to the rest position, the check valve is still lifted from its seat by the slowly flowing fluid. It is quite possible that the pressure chamber may not be able to hold all the fluid returning from the system. It may be that the vacuum created by the sudden releasing of the brake pedal has caused additional fluid to move from the reserve chamber past the main cap into the pressure chamber. Or it may be that the heat set up by the friction in the wheels has caused the fluid to expand. In this case the fluid compensation necessary between master cylinder and fluid reservoir takes place via the by-pass port. This is why you may still notice movement of the fluid in the reservoir even though the brake pedal has been back at the rest position for some seconds.

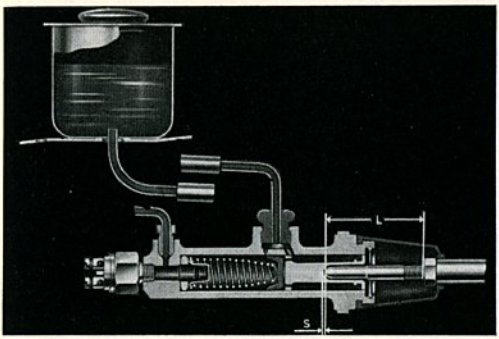


2/70 The fluid can, of course, only flow back to the reservoir as long as the tension of the brake shoe return springs is greater than the pressure of the spring in the check valve. As soon as the return flow pressure of the fluid falls to about 7 to 17 psi, the spring loaded check valve closes. In this manner, a residual pressure of 7—17 psi remains in the brake lines and wheel cylinders. This residual pressure ensures that the brakes work immediately and that the lips of the wheel cylinder cups contact and seal properly on the cylinder walls.

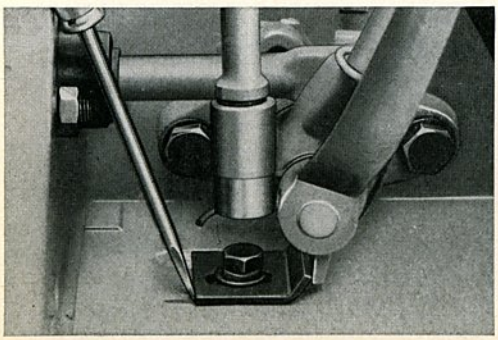




2/80 Excessive heat in the brake drums transfers to the brake fluid which then expands and causes the pressure in the brake lines to rise. To prevent this pressure rise from leading to dragging of the brakes, the check valve releases and allows the pressure to equalize to the reservoir via the by-pass port. This operation shows how important it is to ensure that the by-pass port is not blocked.

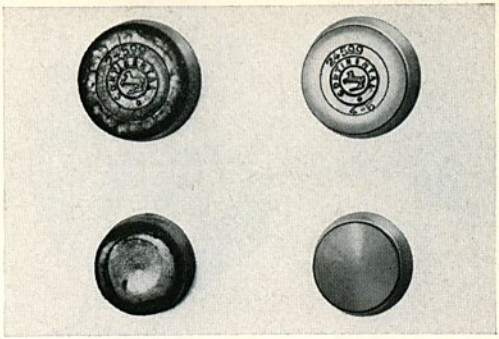


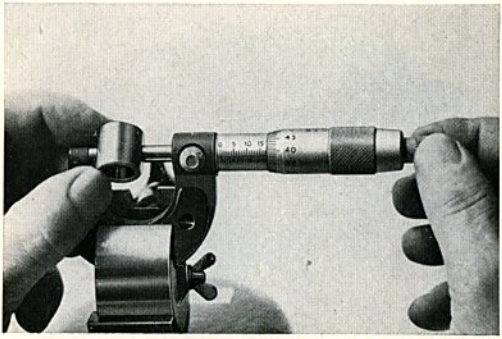
2/90 The by-pass port must not be covered by the main cup when the piston is in the rest position. We must, therefore, always ensure that there is 1 mm play (indicated by measurement S) between the tip of the push rod and the piston. This play is not adjusted by means of the thread on the rod as the length of the rod (measurement L) should always be 52—53 mm on the passenger car and 61—62 mm on the Transporter. If this measurement is incorrect it can cause inadequate braking effort or damage to the check valve.



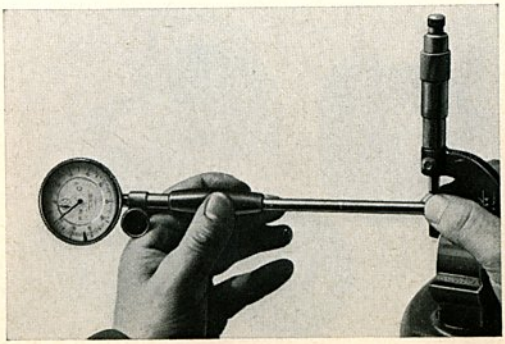
2/100 The proper way to adjust the play between push rod and piston is by means of the elongated hole in the brake pedal stop bracket. To prevent the bracket from moving in service, ensure that there is always a galvanized spring washer on the securing screw.

2/110 When the brake system gives trouble, the causes should not be sought only in the functioning of the hydraulic system and the various adjustments. The master and wheel cylinders are subject to a certain amount of natural wear after being in service for some time, just like all other vehicle parts. The badly worn edges of the two cups on the left can be seen clearly when compared with the cups on the right which are in good condition. The cause of this wear was excessive clearance between piston and cylinder. If these typical signs of wear are observed on the cups, the clearance must be checked carefully.

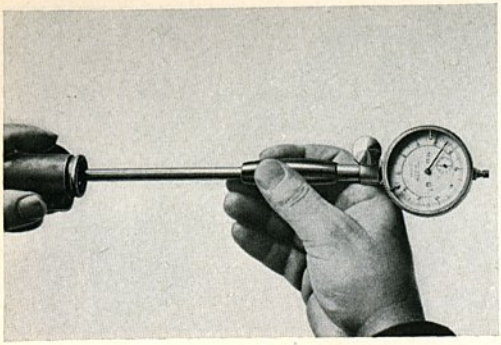




2/120 This is done by first measuring the piston diameter with a micrometer. As the piston may not be quite round, measure it at several places.

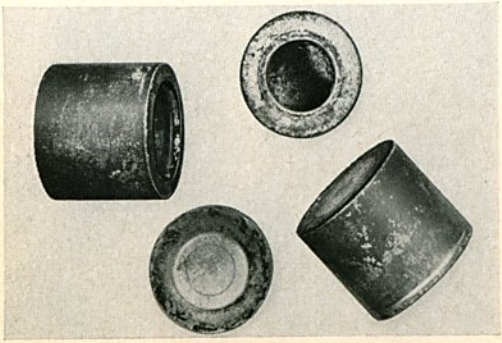


2/130 When the measurement has been taken, set the inside measuring gauge to the micrometer reading without altering the micrometer and then zero the dial indicator.



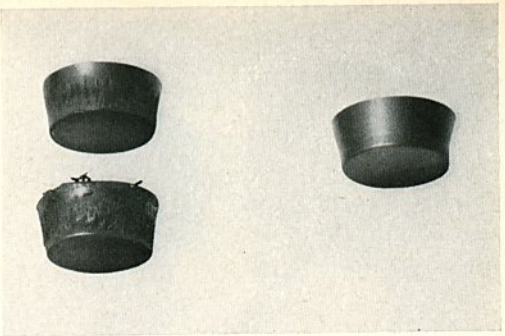
2/140 When the inside measuring gauge is inserted into the cylinder, the clearance can be read off on the dial indicator as the variation from zero. This clearance must not exceed 0.26 mm (.10″). Parts which are getting near to this limit should be replaced to be on the safe side. The presence of burrs on the backplate or on the cylinder contact surface can cause cylinder distortion. For this reason the inside measuring gauge should be turned when taking the reading.

2/150 At the opposite end of the scale are sticking pistons. Even if the damage is not so serious as in this picture, the cylinder, pistons and cups should be replaced without hesitation.

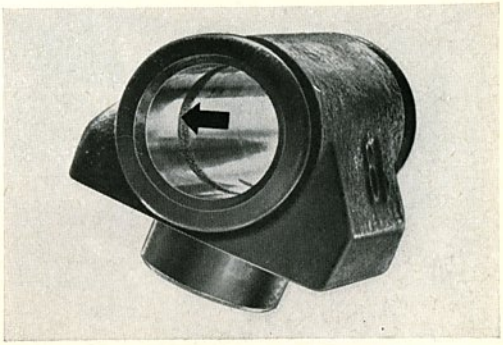


2/160 A glance at these corroded pistons shows what happens if alkaline solutions get into the wheel cylinder when cleaning dirty backplates or spraying axles after removal.

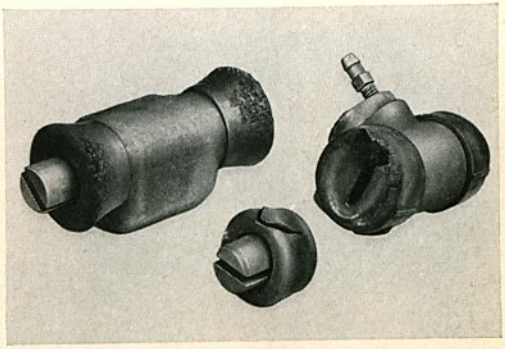
2/170 Here two cups which have been damaged by seizure marks in the cylinder are compared with a good cup. Before these parts are replaced it is advisable to have a good look at the cylinder to which they belong.



2/180 As the pistons should be a suction fit in the cylinder, any cylinder showing signs of rust like this one, is not fit for further use. Reworking with emery cloth or grinding paste is not satisfactory from a technical or safety point of view.



2/190 One of the main causes of such corrosion is damaged protective boots. Apart from the fact that these boots are often loose, aged or torn they can be softened in a very short time by grease escaping from overfilled wheel bearings.

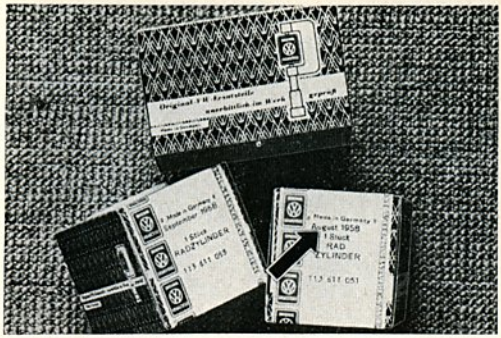


2/200 All the other rubber parts in the hydraulic brake system are equally susceptible to damage from mineral oils. This picture shows a cup which is swollen due to the influence of mineral oil compared with a good cup.

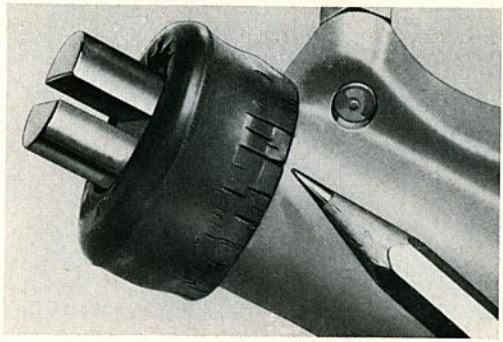
2/210 This is why the rubber parts and other parts of the cylinders should never be washed in gasoline, benzine or kerosene. Apart from brake fluid itself, the only other liquid to be used is methylated spirits. After cleaning with meths, the parts must be dried thoroughly.

2/220 The brake lines should be flushed with brake fluid only. Dirty brake fluid should be replaced by fresh fluid. As only the sealing lips of the cup come into contact with brake fluid in actual operation, pistons and cylinder interiors should be lubricated with brake cylinder paste. This lubricant has no affect on rubber and helps to prevent corrosion.

2/221 New master and wheel cylinders are also lubricated. As the storage period for assembled brake cylinders is limited, the cartons containing these parts are marked at the factory with the date of manufacture. Brake cylinders in cartons on which the date of manufacture is more than 6 months back, must be dismantled, cleaned, checked for corrosion and hardening of the cups and lubricated with brake cylinder paste before they are used.



2/230 The storage time for boots, cups and seat rings which are grouped together under the heading — rubber parts — is twelve months when the parts are loose. The effects of prolonged storage can be seen on this boot. The storage time for brake hoses is limited to 18 months. The rubber parts should, wherever possible, be stored at a uniform temperature and not subjected to direct sunlight.



2/240 This is not a picture of an excavation find dating back to early Roman times, but a very much enlarged view of a rusty brake line. The effects of weathering over a period of several years service can make this brake line just as dangerous as a pipe which is badly chafed, kinked or flattened by stone damage.