

# SERVICE MANUAL

CARS AND VANS

PV 444—445

Part 6

Front axle and steering gear

*Export Service Department*

AKTIEBOLAGET

**VOLVO**

GÖTEBORG . SWEDEN

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# FRONT AXLE

## DESCRIPTION

The PV 444-445 is fitted with an independent front wheel suspension. The front axle is built up of a sturdy box-sectioned cross member, which is bolted to the front side sills of the unit body on the PV 444 and to the frame side members on the PV 445. The front wheel suspension is attached to the front axle member ends, and the engine front suspension rests on its centre part. See fig. 1.

The coil spring is retained between an upper spring seat in the front cross member (6) and a lower spring seat attached to the lower control arm (8). The inner end of the lower control arm is attached to the cross member through a

pivot; the other end of the control arm is attached to the lower end of the steering knuckle support (1) also through a pivot. The upper end of the steering knuckle support is attached through a pivot to the upper control arm (2). The upper pivot bushing is eccentric for camber adjustment. The king pin (18 fig. 2) attached to the steering knuckle support carries the steering knuckle (6 fig. 2). A ball bearing (39 fig. 2) takes up the thrust.

The PV 444 is fitted with stabilizers attached to the unit body (the frame on the PV 445) and the lower control arm.

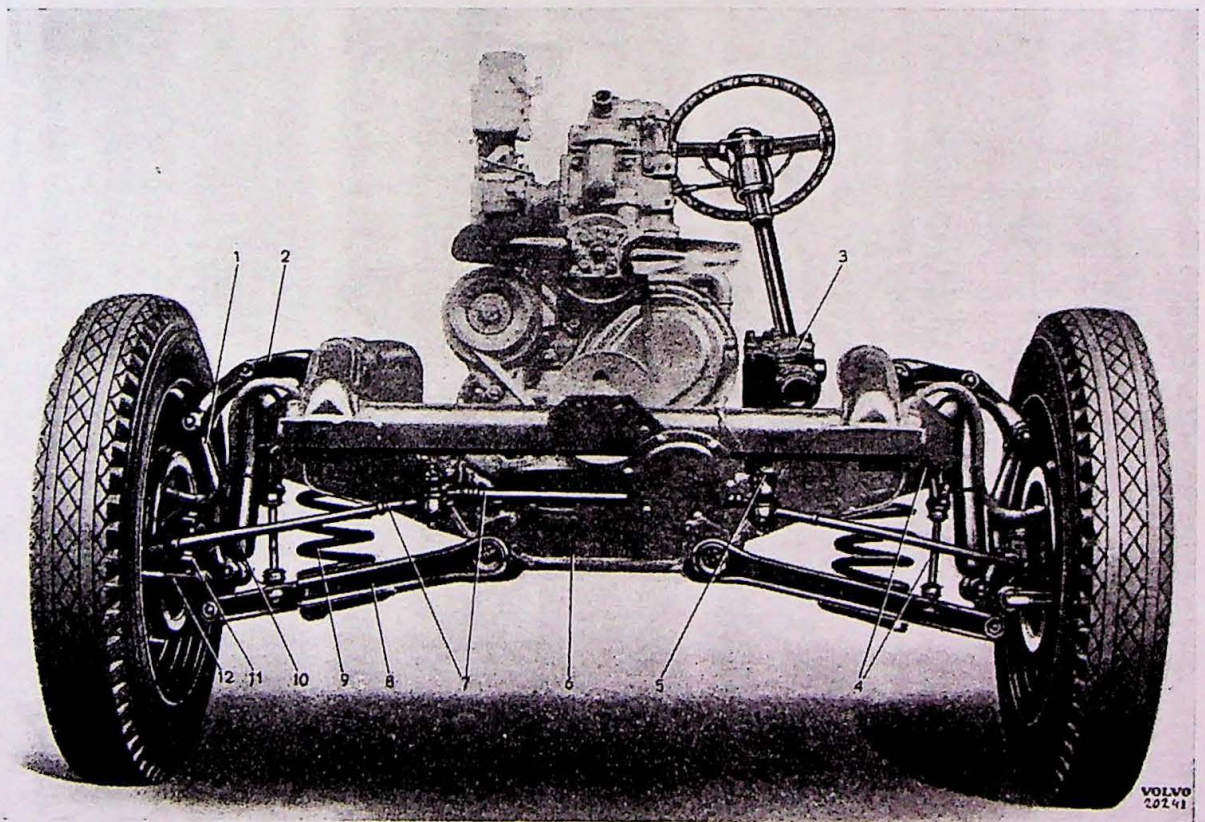


Fig. 1.

- |                                  |                             |
|----------------------------------|-----------------------------|
| 1. Steering knuckle support      | 7. Steering rod and tie rod |
| 2. Upper control arm             | 8. Lower control arm        |
| 3. Steering gear housing         | 9. Spring                   |
| 4. Stabilizer                    | 10. Shock absorber          |
| 5. Pitman arm                    | 11. Steering knuckle        |
| 6. Front suspension cross member | 12. Steering knuckle arm    |

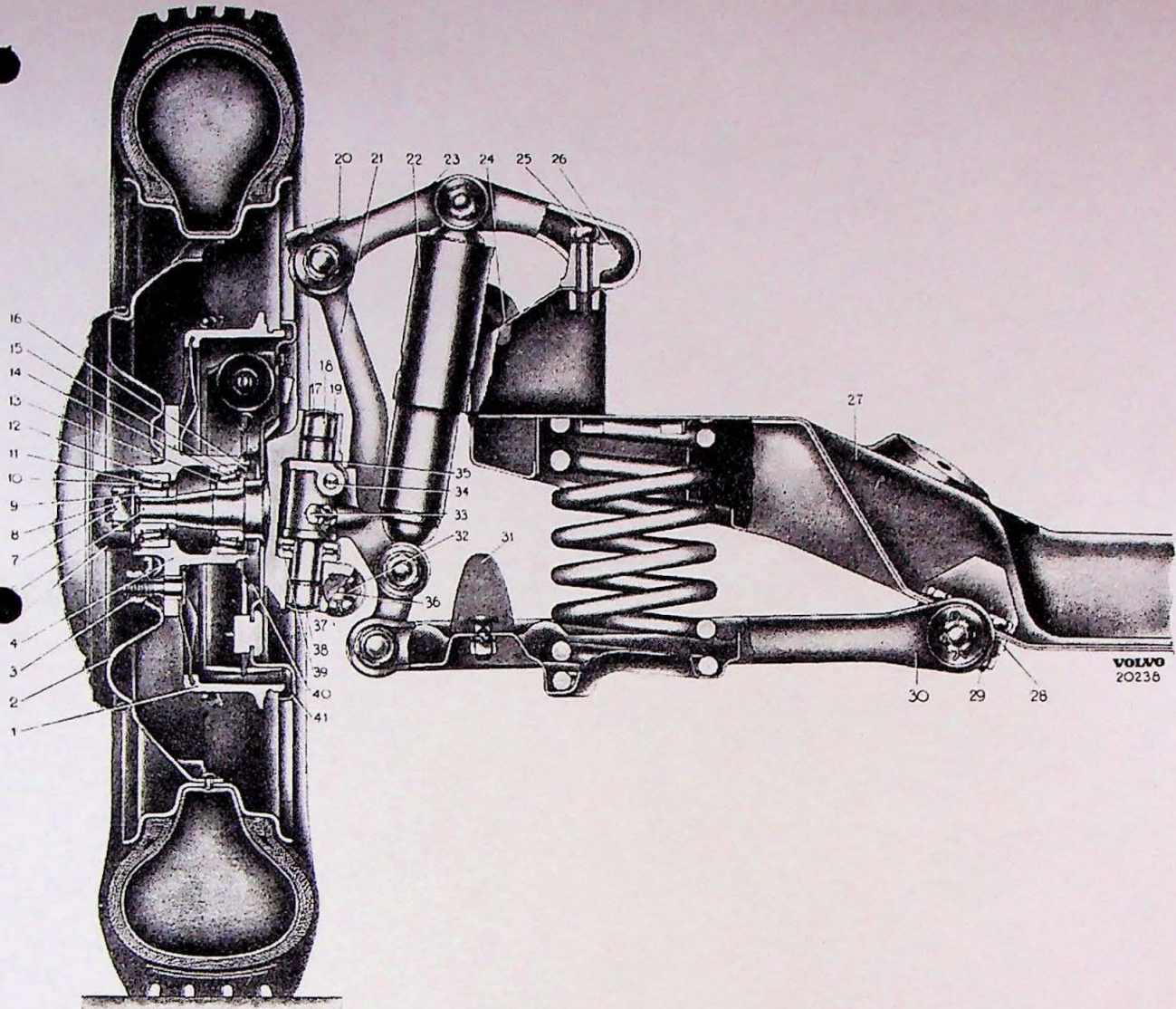
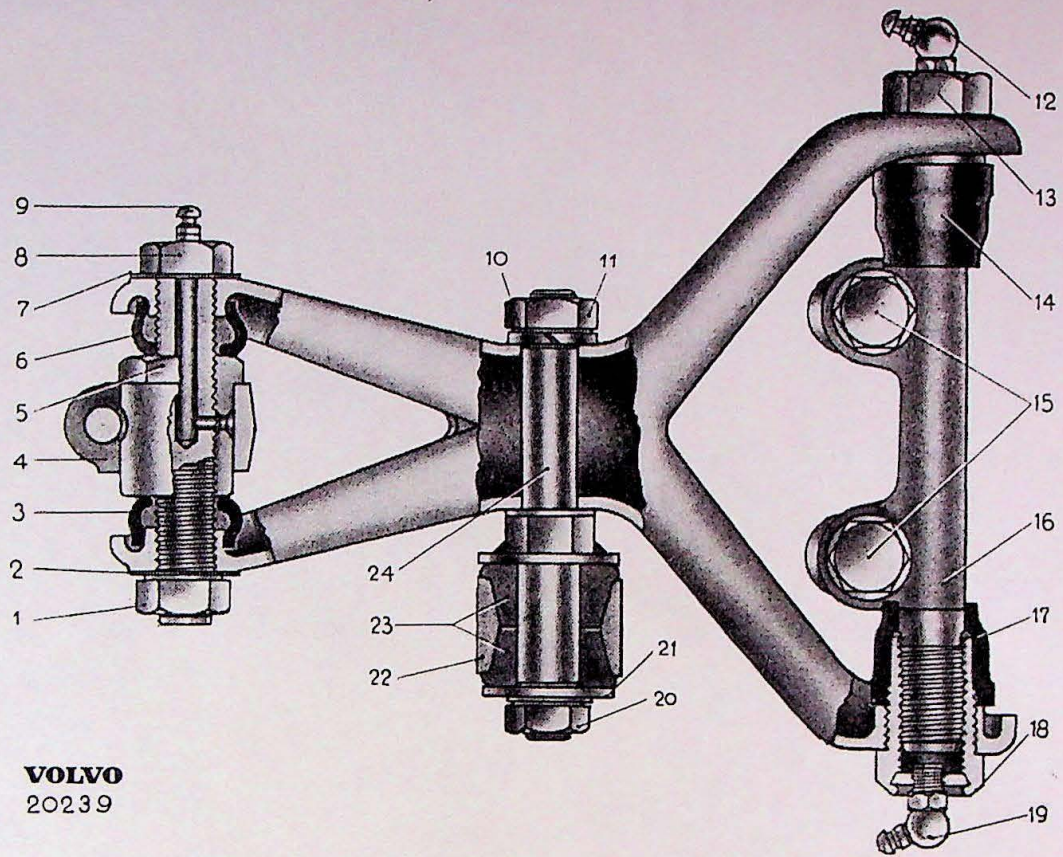
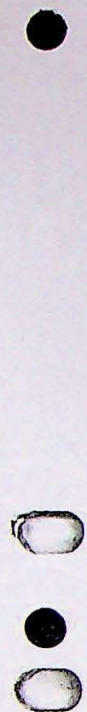


Fig. 2.

- |                              |                                   |                          |
|------------------------------|-----------------------------------|--------------------------|
| 1. Brake drum                | 15. Inner bearing outer ring      | 29. Bolt                 |
| 2. Wheel                     | 16. Oil seal                      | 30. Lower control arm    |
| 3. Wheel nut                 | 17. King pin seal washer          | 31. Upper rubber bumper  |
| 4. Hub                       | 18. King pin                      | 32. Nut                  |
| 5. Grease cap                | 19. King pin bushing              | 33. Stop screw           |
| 6. Steering knuckle          | 20. Clamp screw                   | 34. King pin stop key    |
| 7. Cotter pin                | 21. Steering knuckle support      | 35. Adjuster shim        |
| 8. Castellated nut           | 22. Shock absorber                | 36. Steering knuckle arm |
| 9. Outer bearing inner ring  | 23. Upper control arm             | 37. King pin bushing     |
| 10. Washer                   | 24. Upper rubber bumper           | 38. Seal washer          |
| 11. Roller bearing           | 25. Bolt                          | 39. Roller bearing       |
| 12. Outer bearing outer ring | 26. Upper control arm pivot shaft | 40. Splash apron         |
| 13. Inner bearing inner ring | 27. Front suspension cross member | 41. Brake backing plate  |
| 14. Roller bearing           | 28. Lower control arm pivot shaft |                          |

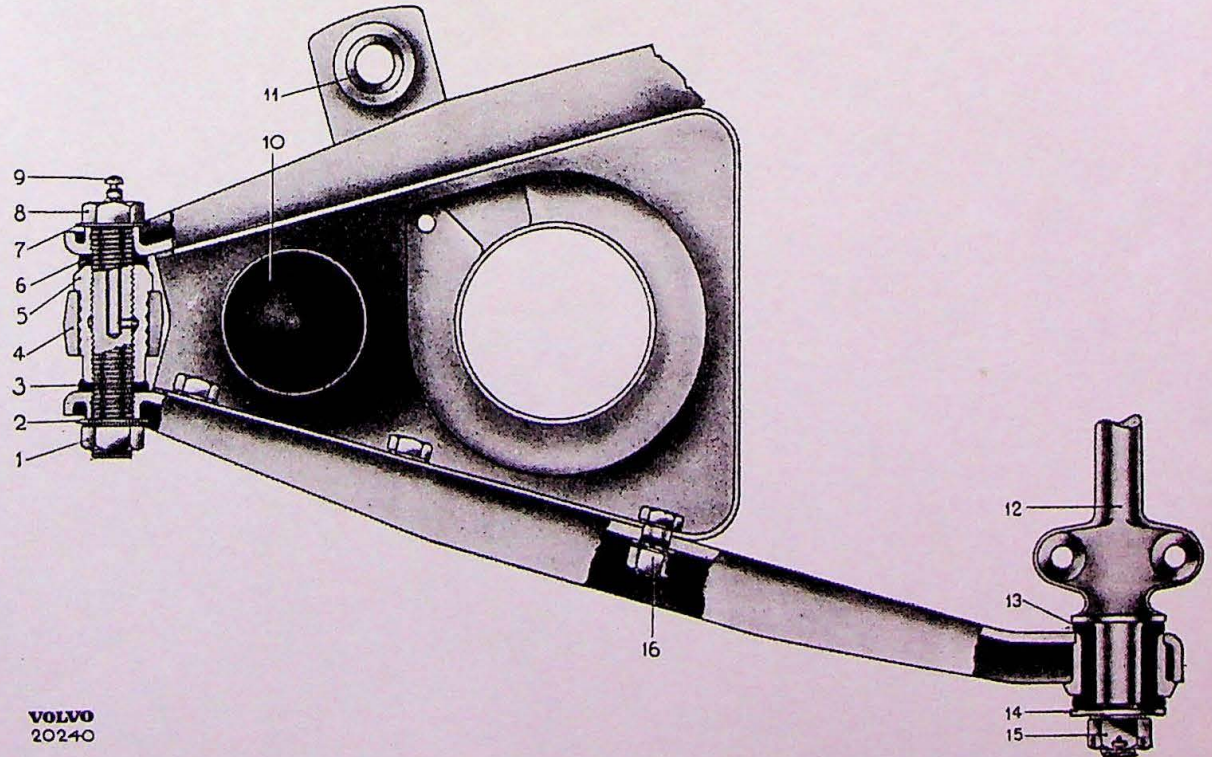
- |                             |                        |                    |
|-----------------------------|------------------------|--------------------|
| 1. Nut                      | 7. Shake proof washer  | 12. Pivot shaft    |
| 2. Shake proof washer       | 8. Bolt                | 13. Rubber bushing |
| 3. Rubber seal              | 9. Lubricator          | 14. Washer         |
| 4. Steering knuckle support | 10. Rubber bumper      | 15. Nut            |
| 5. Bushing                  | 11. Stabilizer bracket | 16. Bolt           |
| 6. Rubber seal              |                        |                    |



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*Fig. 3. Upper control arm.*

- |                             |                       |                 |                    |
|-----------------------------|-----------------------|-----------------|--------------------|
| 1. Nut                      | 7. Shake proof washer | 13. Bushing     | 19. Lubricator     |
| 2. Shake proof washer       | 8. Bolt               | 14. Rubber seal | 20. Nut            |
| 3. Rubber seal              | 9. Lubricator         | 15. Bolt        | 21. Washer         |
| 4. Steering knuckle support | 10. Spring washer     | 16. Pivot shaft | 22. Shock absorber |
| 5. Eccentric bushing        | 11. Nut               | 17. Rubber seal | 23. Rubber bushing |
| 6. Rubber seal              | 12. Lubricator        | 18. Bushing     | 24. Bolt           |



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*Fig. 4. Lower control arm.*  
(Explanatory text on page 2).

# REPAIR INSTRUCTIONS

## Dissassembly of complete front wheel suspension unit.

1. Remove hub caps and loosen wheel nuts.
2. Jack up car front end and place trestles under the body (the frame on the PV 445) behind the front axle cross member.
3. Remove wheel nuts and lift off wheels.
4. Disconnect stabilizer from the lower control arms.
5. Pull off the Pitman arm. Use tool SVO 1410 (see fig. 5).

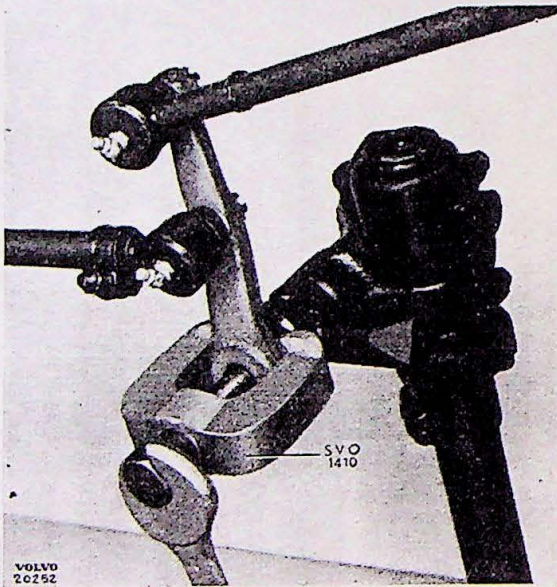


Fig. 5.

6. Put a wooden block under the brake pedal. Disconnect the front wheel brake lines at the master cylinder. Plug the connections to prevent dirt to penetrate into the brake lines.
7. Screw off nuts at the front engine suspension. Remove the front engine guard plate. Place a wooden block (1 fig. 6) (62×6×6 cm) above the sills but below the fan hub (3). Insert the wooden block from below. Two extra blocks (2) (size 4×6×6 cm) should be placed between the wooden block mentioned above and the side members on the PV 445. A small overhead crane can of course also be used to support the engine.

8. Remove the eight bolts attaching the front axle cross members to the body (the frame on the PV 445).
9. Lower jack slowly (loosen one of the upper control arm pivot shafts if necessary). Remove the front wheel suspension unit from the body, when the brake backing plates reach the floor.

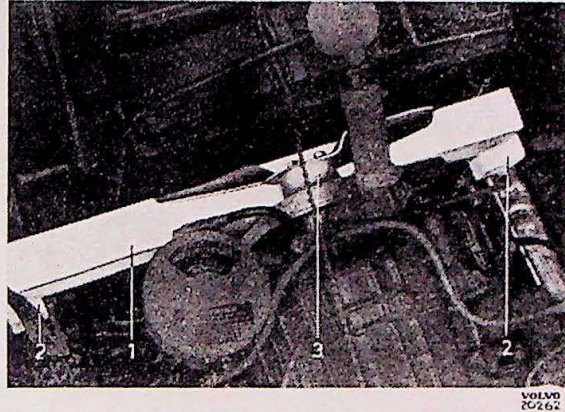


Fig. 6.

## Assembly of complete front wheel suspension unit.

1. Lift up the front wheel suspension unit on an hydraulic jack and move it under the car.
2. Insert two guide pins into the car body (the frame on the PV 445). Raise the front axle cross member into position and fit and tighten bolts.
3. Remove the wooden block and attach the engine to the front engine suspension. Connect brake lines.
4. Fit Pitman arm (see instructions under "Steering gear").
5. Install stabilizer.
6. Bleed front wheel brake system. See part 7.
7. Mount wheels and lower car. Tighten wheel nuts and fit hub caps.
8. See "Wheel alignment" page 16 for checking and adjustment.

## Exchange and adjustment of front wheel bearings.

When adjusting front wheel bearings first remove the wheel hub for inspection of roller bearing races and rollers.

Draw off front wheel hub by means of tool SVO 4011 (fig. 7) (PV 444 C: SVO 1791) after having removed hub, grease cap and castellated nut from the steering knuckle. Remove the grease cap by tapping on its sides with a rubber headed hammer.

Exchange badly worn or scratched roller bearing races and rollers.

Exchange of bearings should be carried out by pressing out the outer bearing outer ring (12 fig. 2) by means of tool SVO 4002 and steel driver (PV 444 C: SVO 1800 and 1801) and the inner bearing ring (15) by means of SVO 4003 (PV 444 C: SVO 1799 and 1801). Remove the

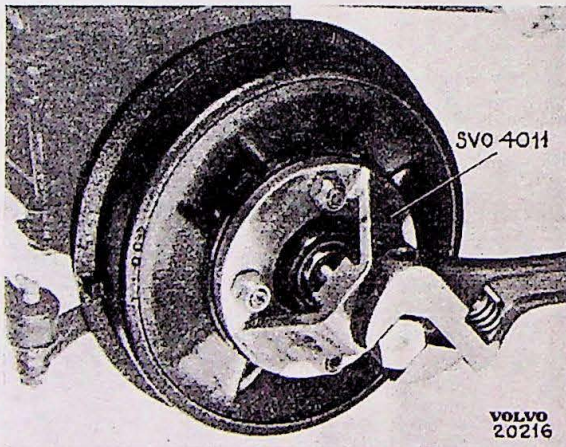


Fig. 7.

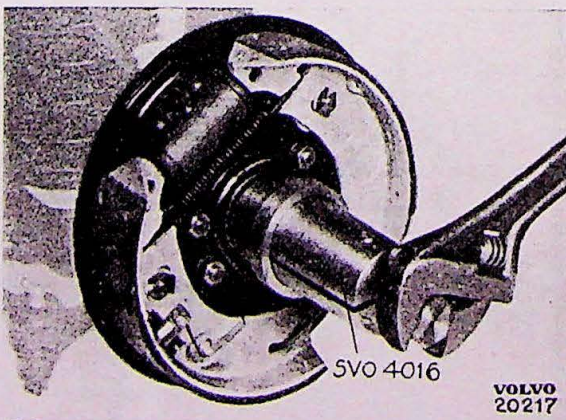


Fig. 8.

inner bearing inner ring (13) by means of SVO 4016 (Fig. 8) (PV 444 C: SVO 1794).

Make sure when installing roller bearing races that they are pressed in evenly and so far that they contact their shoulders in the hub.

When installing the outer bearing ring in the front hub use driver SVO 4000 (PV 444 C: SVO 1797 and 1801) and for the inner bearing ring SVO 4001 (PV 444 C: SVO 1798 and 1801).

Install the inner bearing rollers (14) and inner ring (13) in the hub after having fitted the outer rings. Press then the oil seal (16) into position by means of driver SVO 4114 (PV 444 C: SVO 1798 and 1801). Lubricate the bearing properly with heatresisting short fibre wheel bearing grease.

Adjust the front wheel bearings by tightening the castellated nut by a torque wrench up to 6,9 kgm (50 lb.ft.). Back then off about a third of a complete revolution. Rotate the wheel, which should run easily without any play. Back off the nut further if necessary and fit the cotter pin (7 fig.2).

## Exchange of king pin and bushings.

Do not mix up the clearance of the king pin bushings with the clearance of the control arm bushings.

The last mentioned clearance should lie within 0,3—0,6 mm (.012—.024").

The king pin bushing clearance should not exceed 0,3 mm (.012").

### Removal.

1. Loosen wheel nuts.
2. Raise front end of car until the wheels are lifted up from the floor and place trestles under lower control arms. Remove wheel.
3. Remove grease cap (5 fig. 2) and loosen castellated nut (8) and draw off front hub. Use puller SVO 4011 fig. 7 (use SVO 1791 for PV 444 C).
4. Unscrew the four bolts attaching brake backing plate (41) and splash apron (40) to steering knuckle (6). Lift up splash apron and tie it up with a string to prevent damage to the brake hose.

5. Disconnect steering rod (1) from steering knuckle arm. Use a crow bar and tap with a hammer if necessary. See fig. 9.

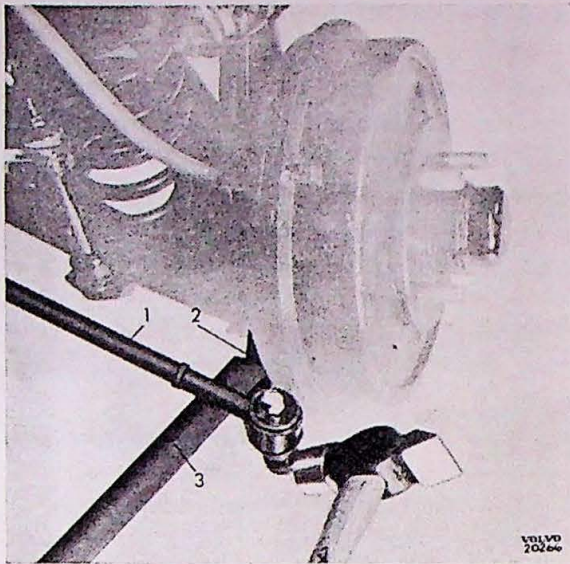


Fig. 9.

6. Remove king pin stop key forwards by means of driver SVO 4115 and remove seal washer (38). Use tool SVO 4008 (fig. 10) and SVO 1808 for PV 444 C.
7. Drive out king pin downwards. Use driver SVO 4004 with extension SVO 4004 A (fig. 11).
8. Remove king pin by means of SVO 1808 on

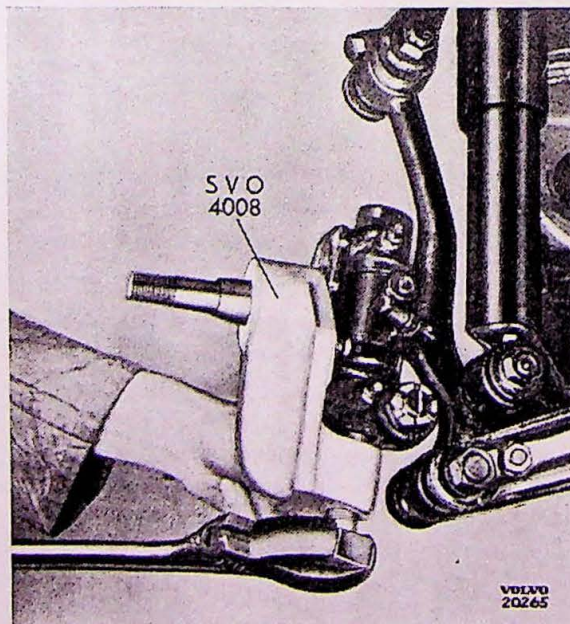


Fig. 10

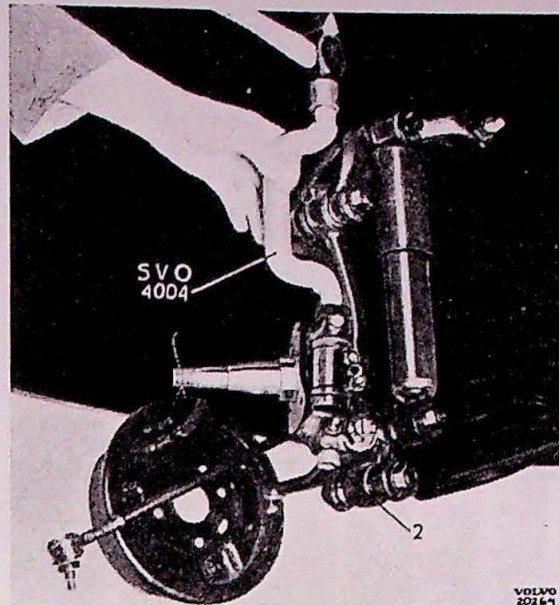


Fig. 11.

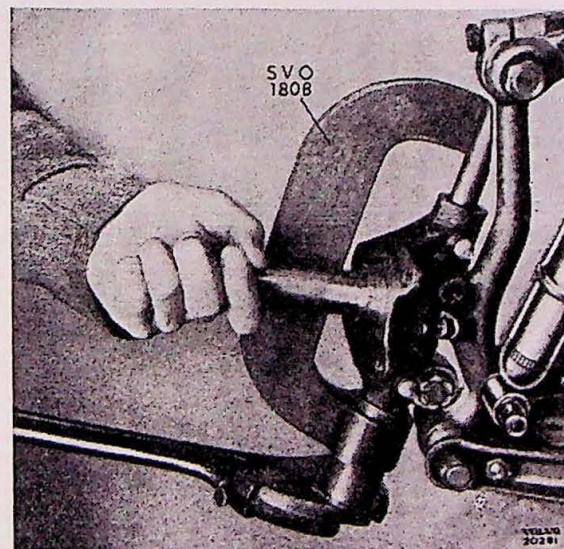


Fig. 12.

PV 444 C. Mount the tool in accordance with fig. 12 and press the upper seal washer down as far that it can be picked off after having removed the tool. Re-mount tool and press out king pin.

9. Remove lubricators, after which bushings (19 and 37) can be pressed out. Use driver SVO 1442.

#### Installation.

Use a complete king pin set consisting of the following integral parts: 1 king pin, 2 bushings, 1 roller bearing, 2 seal washers and shims of 0,10 and 0,35 mm thickness. Press the new bush-

ings into position after having cleaned the steering knuckle carefully. Use driver 1412. Press in the bushings evenly and make sure that the oil grooves come into position.

Ream the bushing with reamer SVO 1171 A (fig. 13) and check that the king pin can be

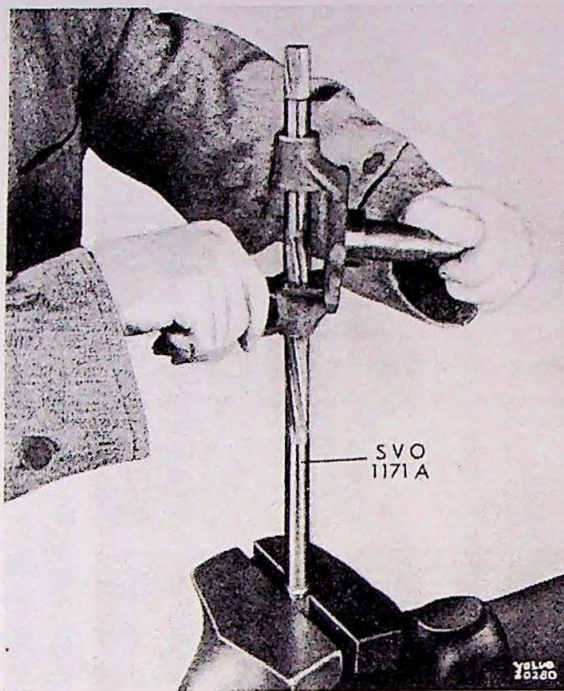


Fig. 13.

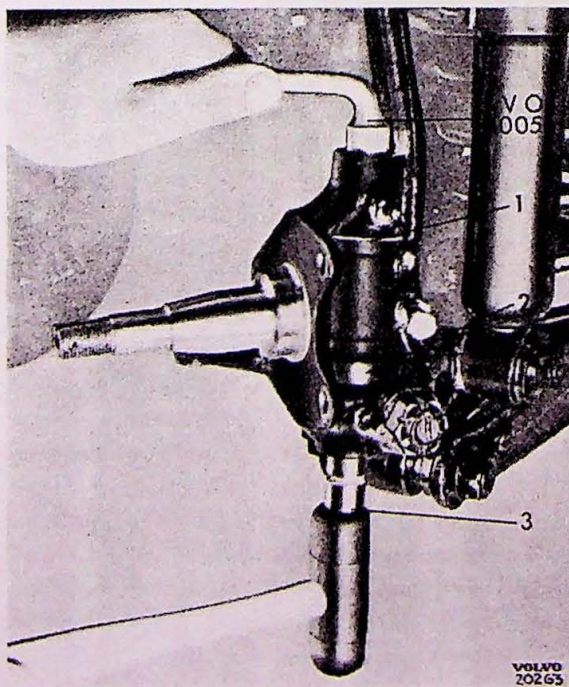


Fig. 14.

pushed into position by light hand pressure. Fit the lubricators and press in some chassis lubricant and dope the bushings with same.

Install king pin and roller bearing and insert the centering driver into the upper bushing (fig. 14). Adjust the clearance with the shims integral with the set. Drive then the king pin into position. Use first a rubber headed hammer (see fig. 14) and then driver SVO 4004. Make sure that the king pin can be turned round easily. Fit king pin stop key and seal washer. The easiest way to fit the seal washers is to install them with their convex surface turned out and then knock them in with a ball-peen hammer. Connect steering rod to steering knuckle arm. Mount hub and wheel. See "Exchange and adjustment of front wheel bearing" page 5 for adjustment of front wheel. Check wheel alignment.

### Overhaul of control arm mechanism.

Damaged control arms or steering knuckle supports must absolutely not be straightened. Old parts, which turn out to differ from the new ones are to be exchanged.

Exchange of eccentric bushings should be proceeded in accordance with point 1—5 below.

Note that the clearance should be 0,3—0,6 mm (.012—.024"). Max. permissible clearance 0,8 mm (.032").

#### Removal of upper control arm.

1. Loosen wheel nuts.
2. Raise front end of car until the wheels are lifted up from the floor and place a trestle under the lower control arm.
3. Remove wheel nuts and lift off wheel.
4. Disconnect the shock absorber anchorage at the upper control arm bolt (24 fig. 3).
5. Screw off nut (1) and remove bolt (8).
6. Remove bolts (15) attaching pivot shaft to front suspension cross member and lift out control arm.
7. Remove pivot shaft from control arm by screwing out lubricators (12 and 19) and threaded bushings (13 and 18) at pivot shaft ends.

#### Installation of pivot shaft in upper control arm.

1. Fit rubber seals (5 and 10, fig 15) at pivot shaft ends (9).

2. Insert pivot shaft into control arm (2) and mount same on fixture SVO 1412.
3. Push retainer (4) over pivot shaft (9) and lock it with wing nut (3).

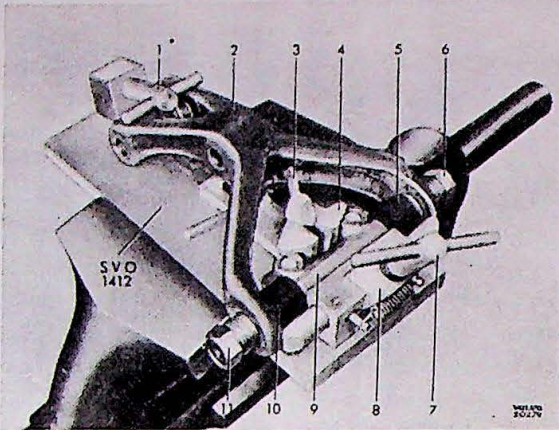


Fig. 15.

4. Screw in bushings (6 and 11) about three threads on pivot shaft.
5. Lock control shaft with locking device (1).
6. Stretch control arm by tightening the screw (7) of the stretching device (8) until the dowels of same contact the control arm. Then turn the screw  $1\frac{1}{4}$ — $1\frac{3}{4}$  complete revolution.
7. Screw home both bushings (6 and 11) at the same time.
8. Fit rubber seals (5 and 10) and lubricators.
9. Remove control arm from fixture and make sure that it is movable on pivot shaft.

#### Installation of upper control arm.

1. Place control arm into position and fit bolts (15 fig. 3) attaching pivot shaft to front suspension cross member.
2. Install a new bushing and clamp screw (20 fig. 2) in steering knuckle support if bushing (5) has been exchanged. Install bushing with its hexagon facing forwards.
3. Fit new rubber seals (3 and 6), bolt (8) (hexagon facing forwards) and nut (1). Do not forget shake proof washers 2 and 7. Check the clearance, which should be within 0,3—0,7 mm (.012"—.032").
4. Lubricate king pin and bushings properly.
5. Mount shock absorbers and wheels. Lower car. Tighten wheel nuts.
6. Check wheel alignment. See "Wheel alignment" page 16 for particulars.

#### Removal and installation of lower control arm.

Remove the lower control arm after having blocked up the front end of car in the usual way, by removing the wheel, disconnecting the stabilizer at its anchorage (11 fig. 4) in the control arm, and placing a jack under its inner anchorage in accordance with fig. 16. Loosen screws (29 fig. 2) attaching the pivot shaft (28) to the cross member, lower the jack and remove the spring. Disconnect the control arm from the steering knuckle support.

Exchange of pivot shaft (16 fig. 3) or rubber bushing (13 fig. 3) can be carried out after having removed the control arm by removing the two inner screws (16 fig. 4) attaching the control arms to each other, and loosening the outer one a little. It is then possible to turn the parts from each other and the pivot shaft will come loose.

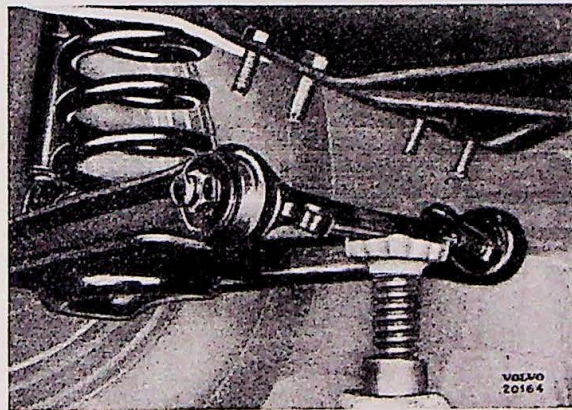


Fig. 16.

When exchanging the lower bushing (5 fig. 4) of the steering knuckle support and bolt (8 fig. 4) remove only the wheel, after which a jack should be placed straight below the spring. Remove nut (1), bolt (8) and screw out bushing.

Be careful, when assembling, not to forget rubber seals (3 and 6) and washers (2 and 7) at the outer anchorage. Make sure that the spring comes into position, i.e. the end with the straight wire should be turned down.

The lower control arm should be attached to the front suspension cross member by means of castellated nuts and cotter pins.

# STEERING GEAR

## DESCRIPTION

The PV 444-445 is fitted with a cam and lever steering gear. The steering gear housing is attached to the body (the frame of the PV 445) by means of screws.

The movement is transferred from the Pitman arm (5 fig. 17) to the wheels via tie rod (10),

steering rods (3 and 15) and steering idler arms (18).

This steering gear gives the car a turning circle of 10 m (32<sup>3</sup>/<sub>4</sub> ft.). The number of steering wheel turns lock to lock is 3<sup>1</sup>/<sub>4</sub>. See fig. 17—19 for particulars in design.

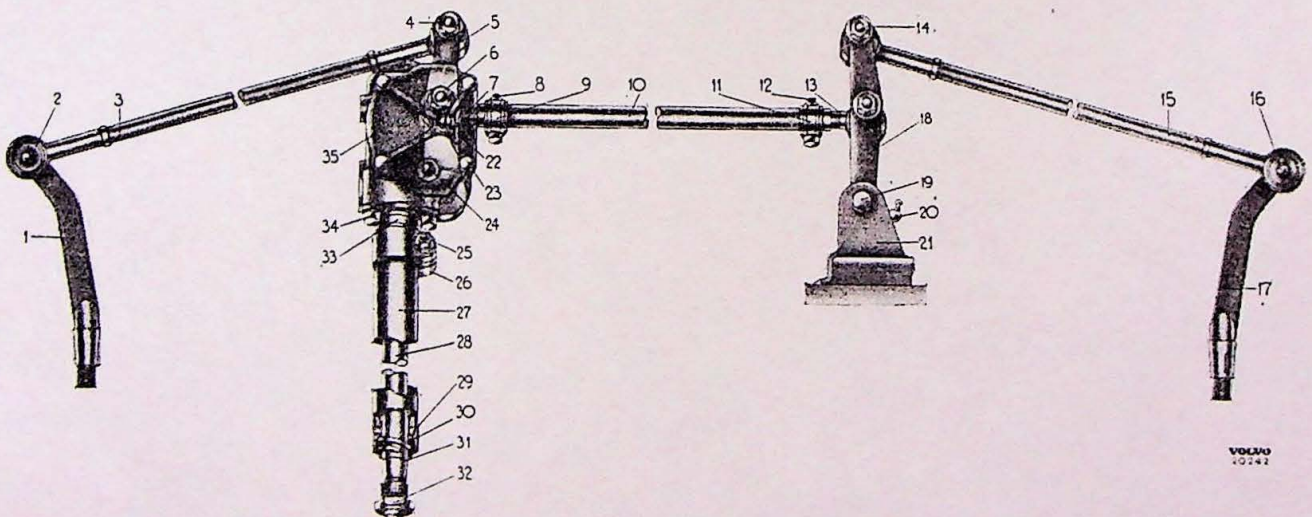


Fig. 17.

- |  |  |                                 |
|--|--|---------------------------------|
| 1. Steering knuckle arm                        | 13. Tie rod end assy                             | 25. Bolt                        |
| 2. Lubricator                                  | 14. Nut  | 26. Clamp                       |
| 3. Left steering rod complete with ball joints | 15. Right steering rod complete with ball joints | 27. Jacket tube                 |
| 4. Nut   | 16. Lubricator                                   | 28. Lever shaft                 |
| 5. Pitman arm                                  | 17. Steering knuckle arm                         | 29. Ball bearing                |
| 6. Nut   | 18. Steering idler arm                           | 30. Lock ring                   |
| 7. Tie rod end assy                            | 19. Bolt   | 31. Spring                      |
| 8. Bolt  | 20. Lubricator                                   | 32. Nut                         |
| 9. Clamp                                       | 21. Bracket                                      | 33. Upper cover                 |
| 10. Tie rod                                    | 22. Adjuster screw                               | 34. Screw                       |
| 11. Clamp                                      | 23. Lock nut                                     | 35. Steering gear housing cover |
| 12. Bolt                                       | 24. Oil filler plug                              |                                 |

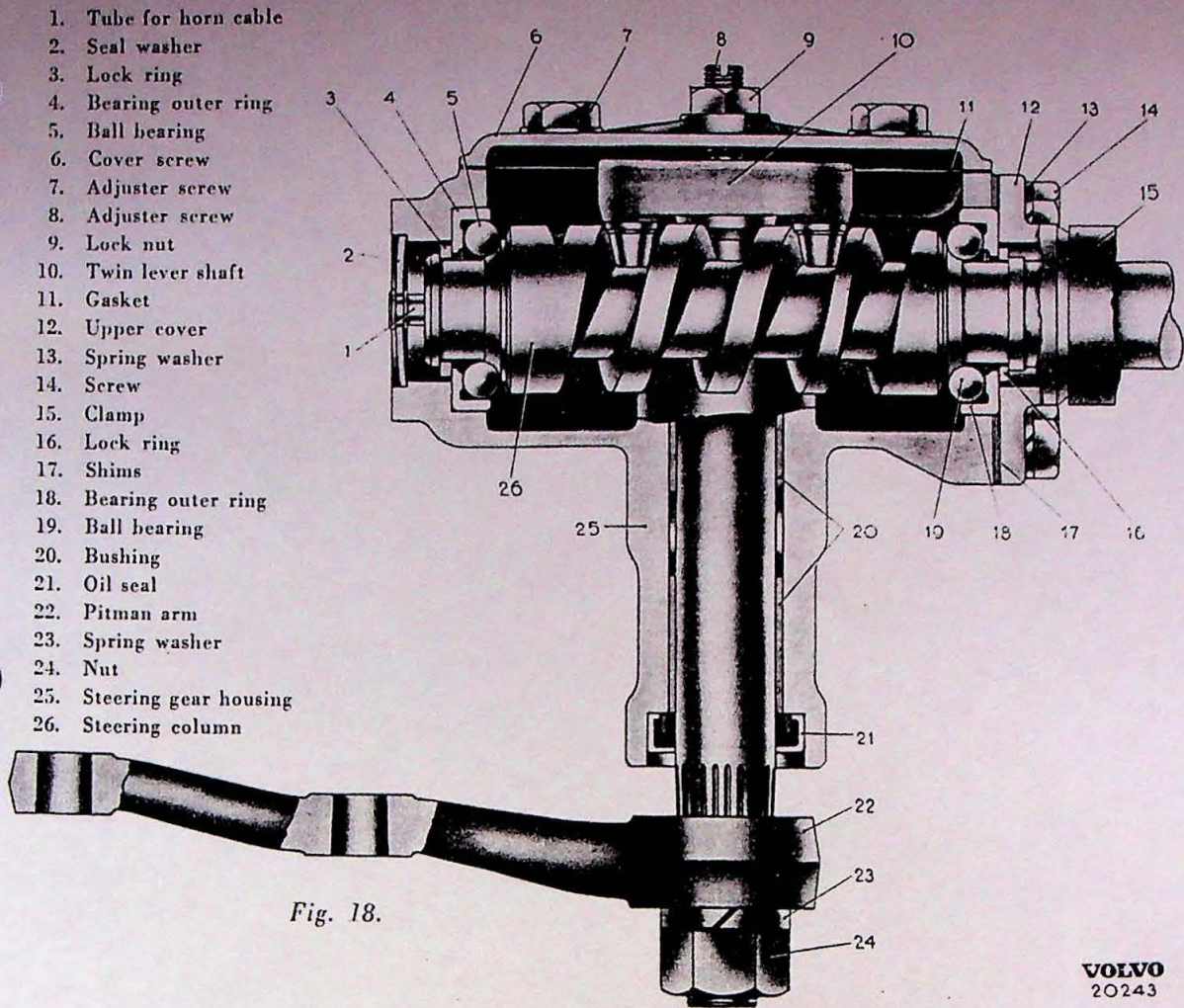


Fig. 18.

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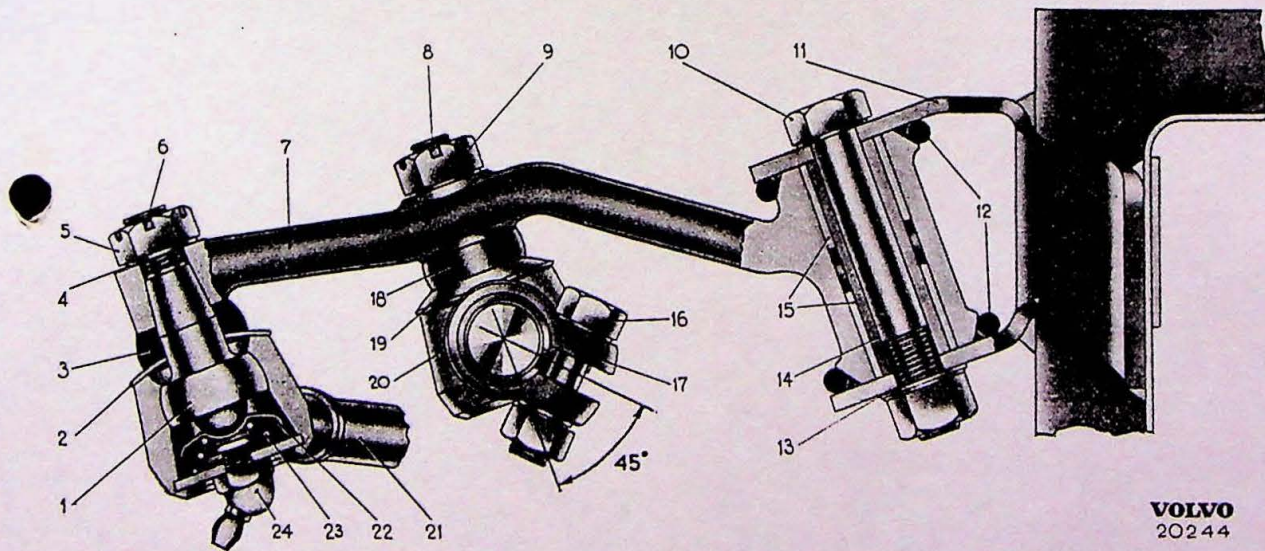


Fig. 19.

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- |                         |                          |   |
|-------------------------|--------------------------|---|
| 1. Ball stud            | 9. Nut                   | 17. Clamp                                 |
| 2. Washer               | 10. Bolt                 | 18. Dust shield (rubber)                  |
| 3. Dust shield (rubber) | 11. Bracket              | 19. Washer                                |
| 4. Washer               | 12. Dust shield (rubber) | 20. Tie rod end assy                      |
| 5. Nut                  | 13. Washer               | 21. Steering rod complete with ball joint |
| 6. Cotter pin           | 14. Spacer               | 22. Thrust washer                         |
| 7. Steering idler arm   | 15. Bushing              | 23. Spring                                |
| 8. Cotter pin           | 16. Bolt                 | 24. Lubricator                            |

# REPAIR INSTRUCTIONS

## Exchange of steering wheel.

Removal and installation (jacket tube not fitted with direction indicator switch housing).

1. Remove fuse for horn.
2. Remove horn ring. Push it down and turn it a quarter of a complete turn anti-clockwise.
3. Loosen steering wheel nut.
4. Draw off steering wheel. Use puller SVO 1185 B and spacer SVO 1453 and clamp SVO 1454. See fig. 20.

Install in the reverse order and make sure that the steering wheel spokes are horizontal when the front wheels are parallel with the car's centre line.

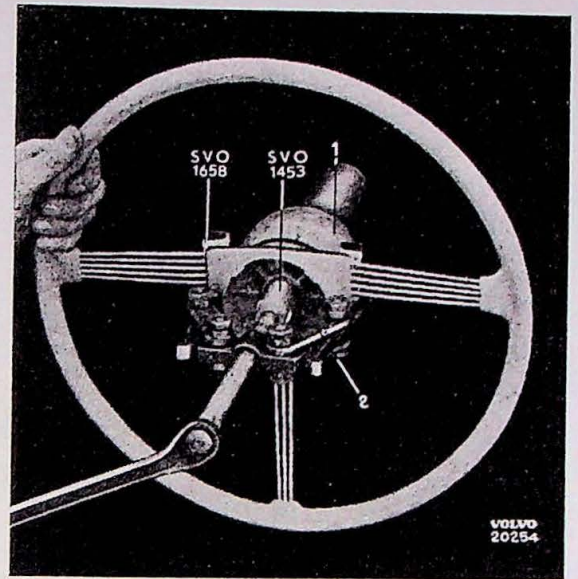


Fig. 21.

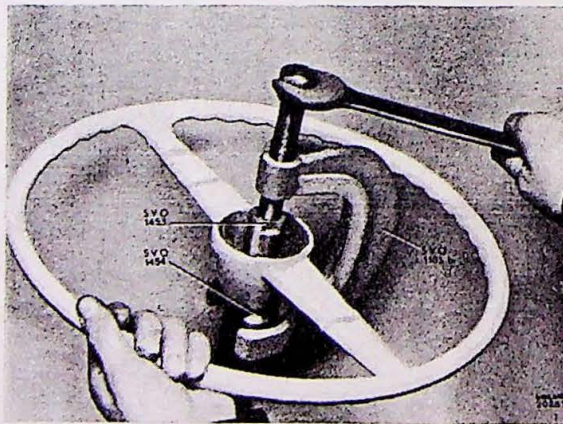


Fig. 20.

Removal (jacket tube fitted with direction indicator switch housing).

1. Remove fuse for horn.
2. Remove horn ring. Loosen screw on the left side of steering wheel hub and lift up horn ring.
3. Loosen steering wheel nut.
4. Pull off steering wheel. Note: Indicator switch lever is to lie in neutral position to prevent damage to internal parts. Use

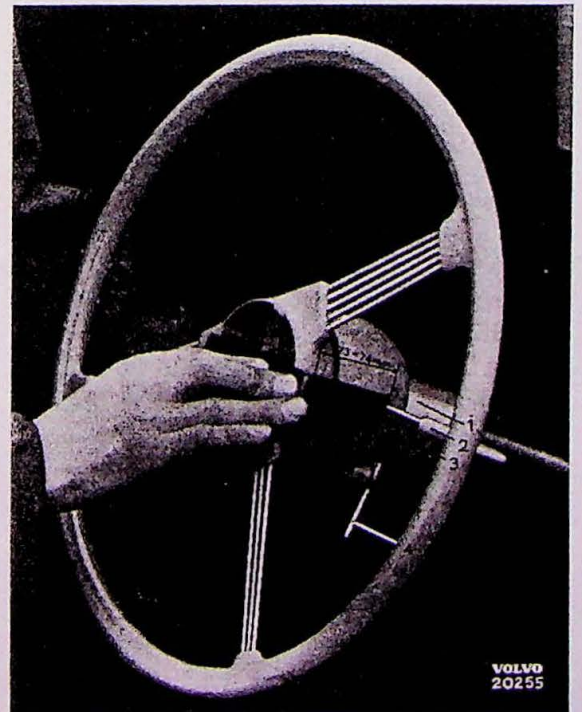


Fig. 22.

# WHEEL ALIGNMENT

## Preliminary checks.

Make the following checks and correct existing defects before adjusting the wheel alignment.

1. Check tyre pressure of all wheels.
2. Check tyre wear of front wheels. Exchange same for rear wheels or spare wheel, if one tyre should be more worn than the other.
3. Check that wheel warping and out-of-roundness do not exceed 2,5 mm. Mark rim with chalk, where it has its maximum warping.
4. Check front wheel bearings, king pin, bushings and shock absorbers.
5. Make sure that the control arms are correct and that the upper control arm bushing clearance does not exceed 0,8 mm (normal clearance 0,3—0,6 mm). Check that the control arm is properly attached to the front suspension cross member.
6. Check that the springs are correct and have not grown slack.
7. Check clearance and setting of steering gear housing. With the steering gear set in middle position the front wheels should be parallel with the centre line of car.

8. Check steering rods, steering arms, steering idler arm and tie rod.

9. Make sure that the car is fitted with normal equipment. (Lubricating oil, water, gasoline and tools).

## Checking caster.

Caster refers to the backward tilt of the king pin and provides steering stability.

Follow special instructions given for the tools used when checking wheel alignment.

The wheel alignment can be checked in the following way (HPA method):

Center the front wheels on the turntables and lock the wheels by pushing down the brake pedal. Turn the wheel to a position with the mark for max. warping at front or rear. Jack up the rear wheels until level with the front wheels. It is absolutely necessary that the floor is level in the longitudinal as well as the cross direction. Release locking device (1 fig. 29).

Mount the wheel aligner on the rim in vertical position and attach it with the clamp at the upper support.

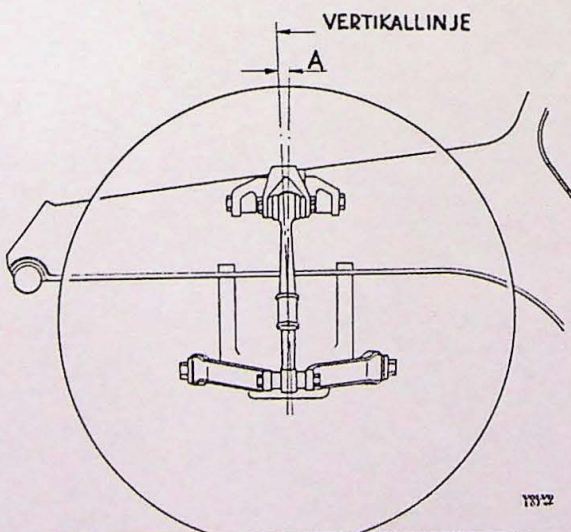


Fig. 28.

Positive caster shown in figure

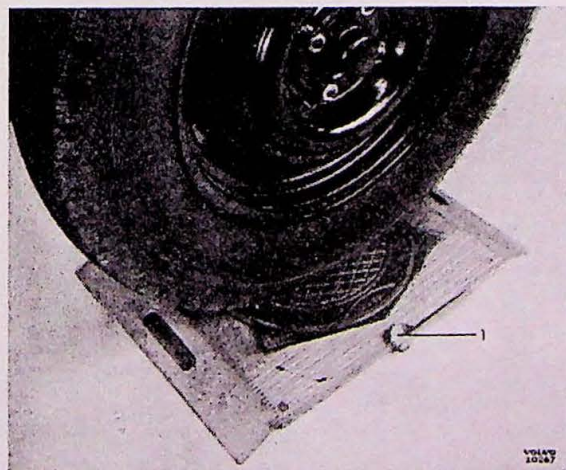


Fig. 29.

When measuring the caster angles the scale should lie at right angles with the wheel.

1. Turn out the wheel 20 degrees by means of the steering wheel. The wheel is turned 20 degrees when one of the turntable edges is parallel with the side lines of the support (fig. 30).
2. Adjust water-level to middle position by means of the right set screw (5 fig. 31). The movable scale zero should be lined up with the indicating line.
3. Turn the wheel 20 degrees inwards (fig. 32).

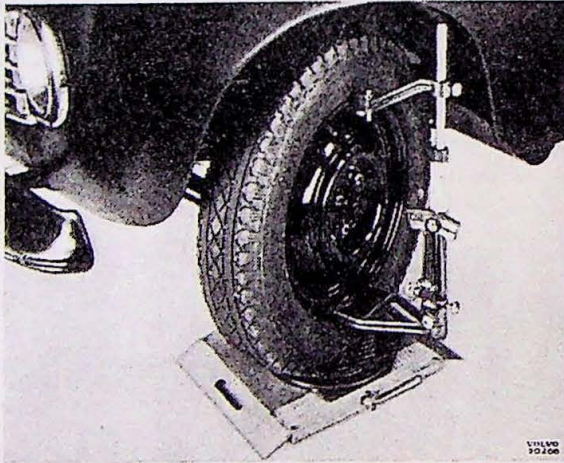


Fig. 30.

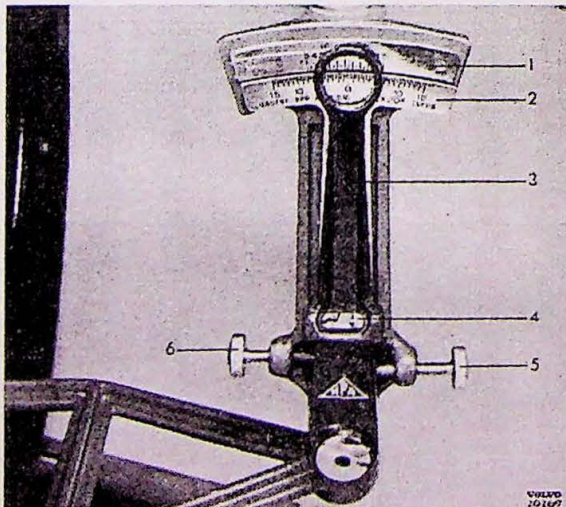


Fig. 31.

1. Fixed scale for camber
2. Movable scale for caster and king pin inclination
3. Movable arm fitted with water-level and indicating line
4. Water-level
5. Arm set screw
6. Movable scale set screw

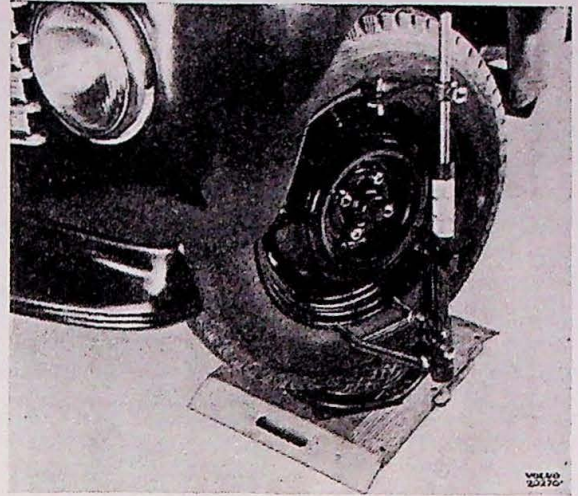


Fig. 32.

4. Adjust water-level to middle position after which the caster angle can be read directly on the lower (movable) scale. The instrument gives negative caster angle, if the angle is read on the part of the scale that is next to the car. The caster should be as follows:

PV 444 and PV 445 . . . . .  $-3/4^\circ$  to  $+1/4^\circ$

The caster angles can be adjusted by loosening the clamp bolt (1 fig. 33) and turning the eccentric bushing (5 fig. 3). Use wrench SVO 1411. A complete turn alters the angle  $1/2$  degree.

*Note.* Turn one or more complete turns if the camber is correct to maintain the camber setting.

Lock the eccentric bushing with the clamp bolt when the recommended caster angle is achieved.

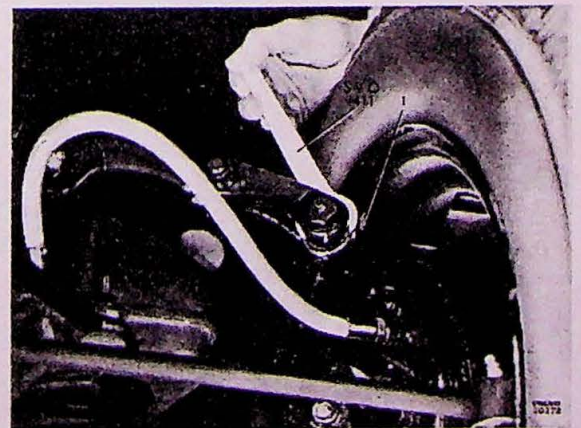


Fig. 33.

## Adjusting camber.

Adjust camber after having checked caster.

The purpose of camber is to decrease the stress on the steering knuckle by moving the load towards the inner part of the steering knuckle. The camber angle is defined as positive when the wheel is tilted out (C fig. 34).

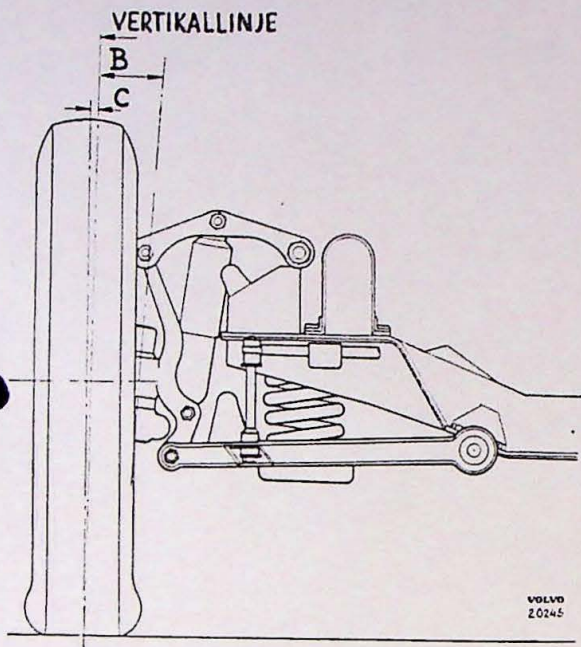


Fig. 34.

Figure showing positive camber.

## Checking camber.

1. Turn wheels straight ahead. Set the scale of the instrument at right angles with the wheel (see fig. 35).
2. Adjust water-level to middle position.
3. Read camber angle on the upper fixed scale. Positive camber angles are read on the right side of zero. The camber on the PV 444-445 should be  $-1/4^{\circ}$  to  $+1/2^{\circ}$ .

Adjust camber by wrench SVO 1411. Loosen clamp bolt (1 fig. 33) until the desired adjustment is achieved. With the eccentric bushing in one of the outer positions one complete revolution of same alters the camber angle 1 degree.

*Note.* Alteration of the camber angle also causes a small alteration of the caster angle. But this is of no real importance.

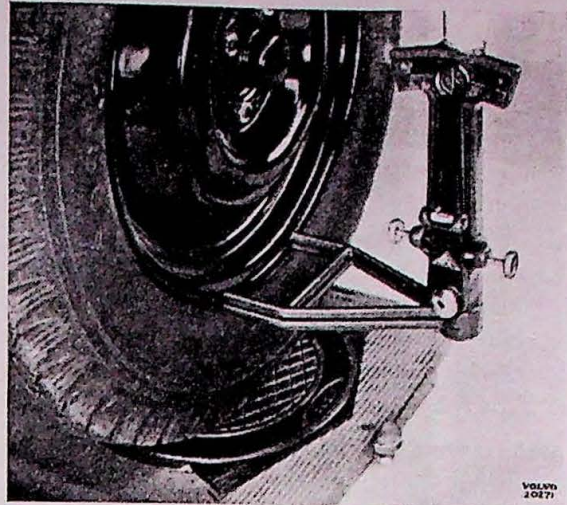


Fig. 35.

Damaged control arms or steering knuckle supports make sometimes camber adjustment impossible. Check the king pin inclination in such cases. See "Checking king pin inclination".

## Checking king pin inclination.

Besides the inclination defined as caster the king pin is tilted inwards defined as king pin inclination (B fig. 34).

Set the scale parallel with the wheel when checking king pin inclination.

1. Turn out wheel 20 degrees by means of steering wheel (fig. 36).
2. Adjust water-level to middle position and set scales to zero.

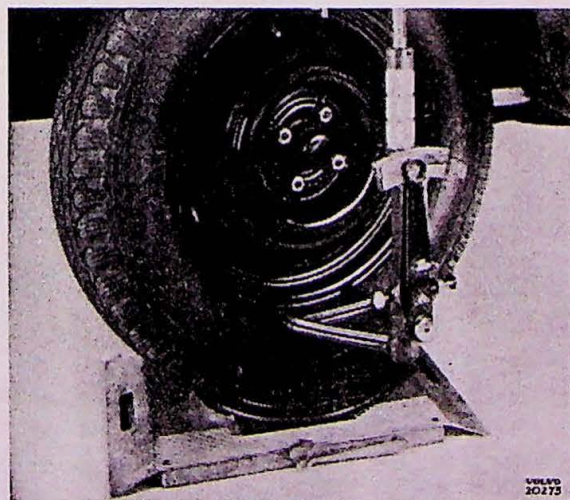


Fig. 36.

3. Turn in wheel 20 degrees by means of steering wheel (fig. 37).
4. Adjust water-level to middle position and the king pin inclination can be read on the lower scale. The king pin inclination on the PV 444-445 should be 5 degrees.

If the inclination does not correspond with the recommended data the probable reason is that control arms or steering knuckle support are damaged. Check also the camber in such cases as a precautionary measure.

The king pin inclination can not be altered and damaged steering system parts must absolutely not be straightened. Damaged parts should always be exchanged for new ones.

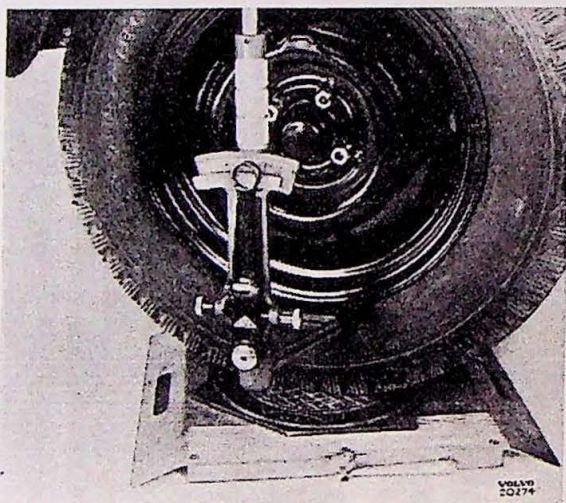


Fig. 37.

#### Checking toe-out.

When driving on corners the inner wheel is to be turned more than the outer one (D and F, fig. 45), because of the fact that the wheels roll in circles of different diameter but with the same centre.

This relation between the wheels is taken into consideration at the design of the car.

Center front wheels on turntables and make sure that they point straight ahead and are locked. The turntable should be set to zero and locked beforehand.

With the outer wheel turned 20 degrees (fig. 38) the inner wheel should be turned 22 degrees  $\pm 1$  degree (fig. 39):

Faults may be caused by damaged tie rods and steering rods or steering arms.

As there are no possibilities to adjust the king pin inclination and straightening of damaged parts is not allowed, they should be exchanged for new ones.

Limit the wheel turning angle to max. 40 degrees out by means of stop screw (33 fig. 2).

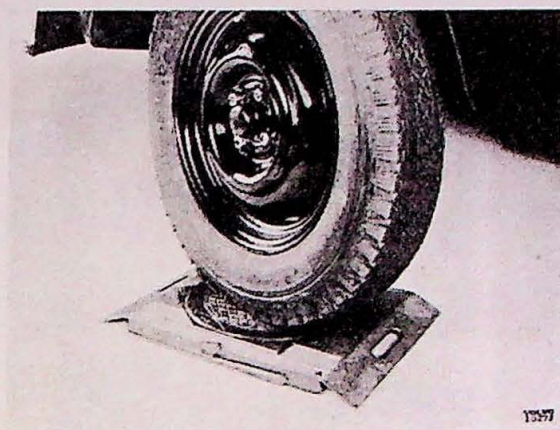


Fig. 38.

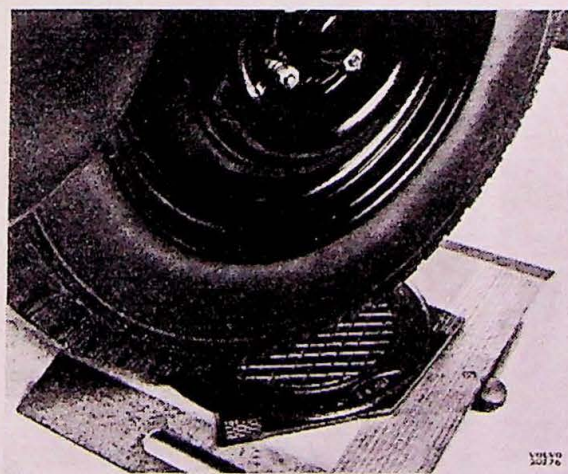


Fig. 39.

#### Toe-in adjustment.

The difference in distance (E and G fig. 45) between the wheels measured at hub height at the rear and front side of the wheels is called toe-in. The purpose of toe-in is to reduce tyre wear.

## Checking toe-in.

1. Make preliminary checks as described on page 16.
2. Raise front end of car until the wheels are lifted from the floor.
3. Spin front wheels and hold a piece of chalk against the centre of the thread and the pointer in accordance with fig. 40 and 41.
4. Lower car. Turn wheels straight ahead and move car about one complete wheel revolution forwards.
5. Set nonius (fig. 42) to zero and pointers to hub height. Locate the instrument behind the wheels with the measuring end pointer against the right wheel marking line and adjust the other pointer against the left wheel marking line (fig. 43).
6. Move the tool carefully to the front side of wheels with the fixed pointer towards the right wheel marking line. Adjust the measuring end pointer against the left wheel marking line and read the toe-in (fig. 44). The PV 444-445 toe-in should be 0—3 mm.

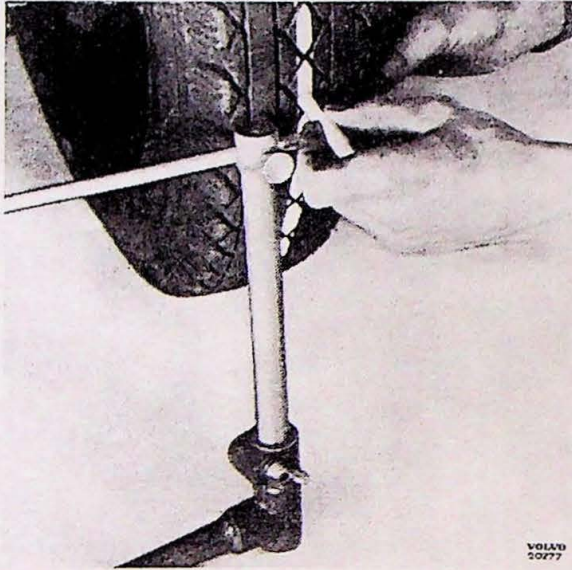


Fig. 40.

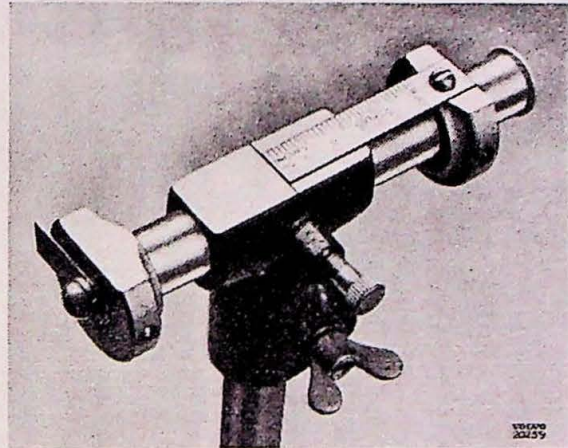


Fig. 42.

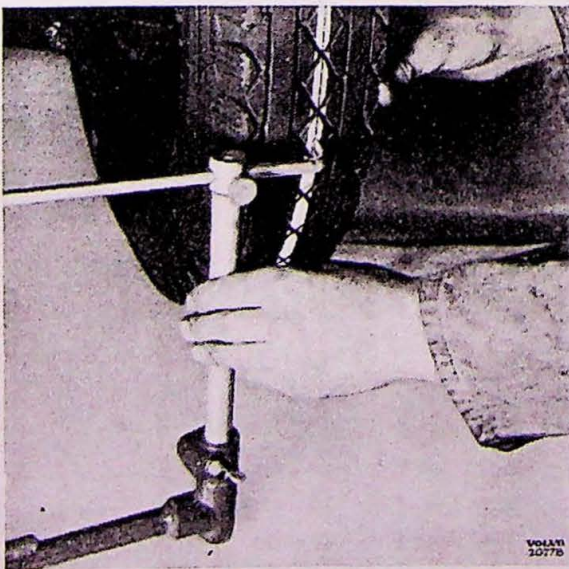


Fig. 41.

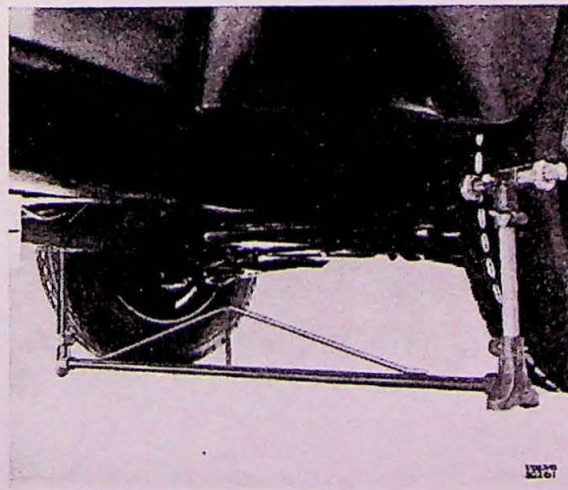


Fig. 43.

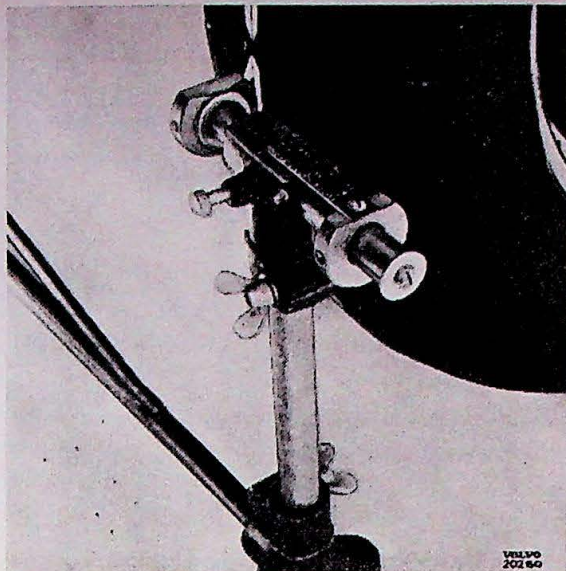


Fig. 44.

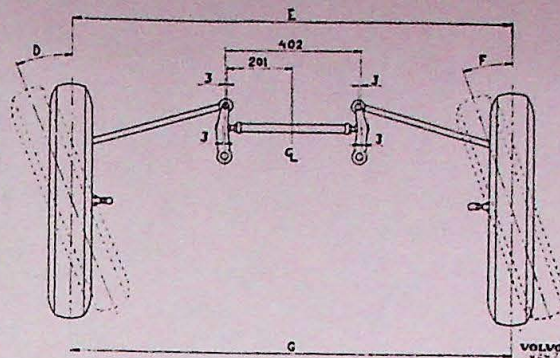


Fig. 45.

### Toe-in adjustment.

Adjust toe-in by means of clamp bolts (8 fig. 17) at the ends of the tie rod (10), after which the tie rod can be turned round in the wanted direction.

Roll the car one complete wheel revolution forwards after the adjustment and adjust once more if necessary.

Tighten clamp bolts in the position indicated by fig. 19.

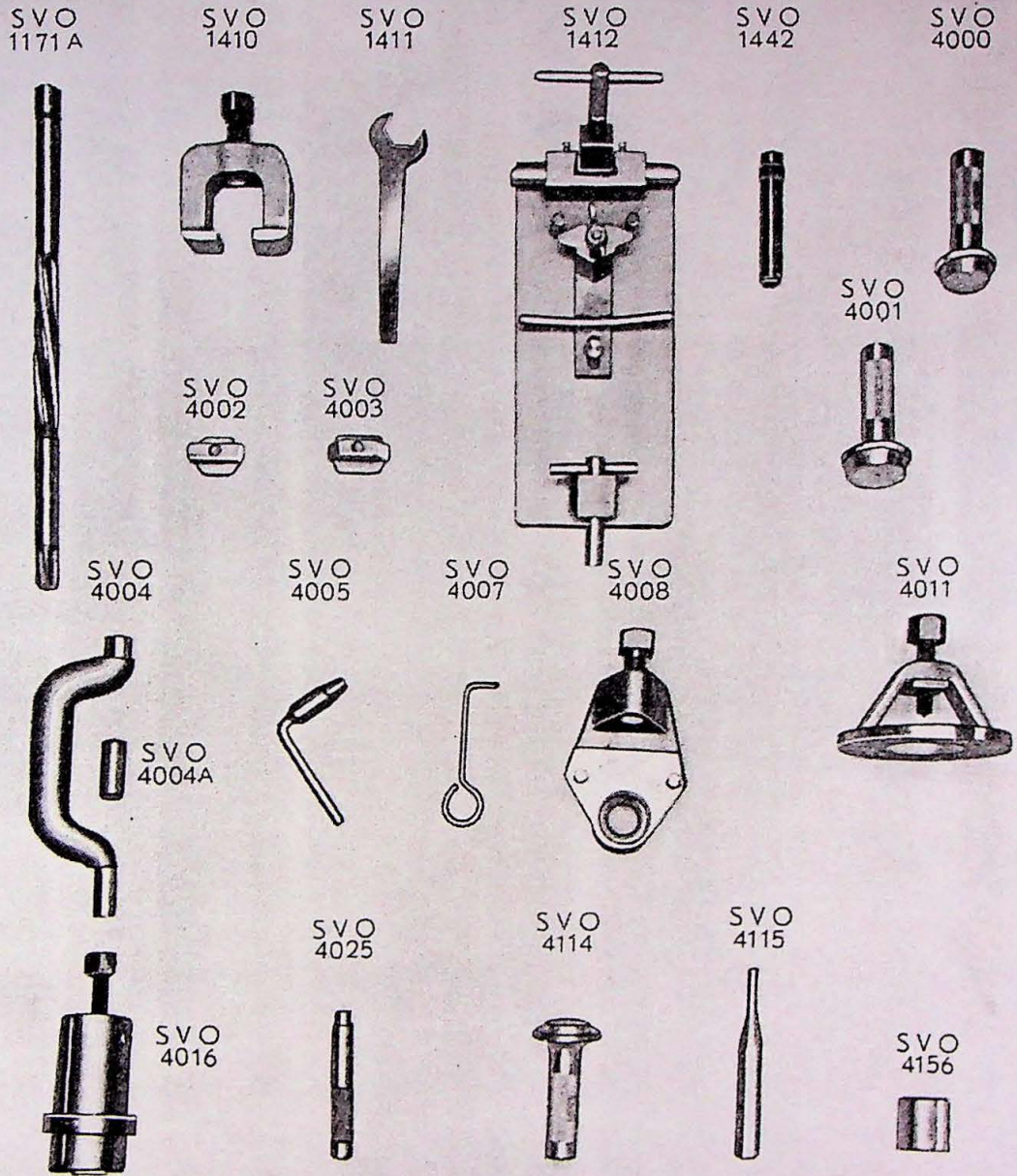
# TRACING FAULTS

CAUSE	REMEDY
<b>Car wanders.</b>	
<p>Incorrect caster Excessive or insufficient play in the steering gear. Steering and tie rod ball joints worn or too tight.  Insufficient toe-in.</p>	<p>Check and adjust caster if necessary. Adjust steering gear.  Check ball joints and exchange worn ones. Lubricate. Check and adjust if necessary. See "Wheel alignment".</p>
<b>Car pulls to one side.</b>	
<p>Low or uneven tyre pressure. Front springs have grown slack or are of different height. Abnormal friction in one wheel bearing.  Front and rear wheels not tracking.  Brake dragging. Bent steering rod or tie rod. Incorrect camber.</p>	<p>Check tyre pressure (see Part 8). Remove and check springs (see Part. 9).  Remove wheel. Check bearings. Exchange damaged bearings and adjust in accordance with instruction on page 5. Measure car body (frame of the PV 445) and straighten it if necessary (see Part 11 and 9). Adjust brake (see Part 7). Exchange damaged parts. Check and adjust if necessary.</p>
<b>Hard steering.</b>	
<p>Abnormal friction in steering knuckles or damaged roller bearing.  Unsuitable or insufficient lubricating oil in steering gear housing. Abnormal friction in steering gear. Steering rod or tie rod ball joints or steering idler arm bushings not lubricated. Excessive caster.</p>	<p>Remove wheels. Investigate and lubricate or exchange bushings, king pin and roller bearings if necessary. Check oil level. See "Specifications" for oil viscosity. Adjust steering gear. See "Steering gear". Lubricate ball joints and bushings.  Check and adjust if necessary. See "Wheel alignment".</p>
<b>Front wheel shimmy</b>	
<p>Wheels out-of-balance. Out-of-round worn brake drums. Damaged steering rod and tie rod. Loose or worn front wheel bearings.</p>	<p>Balance wheels (see Part 8). See Part 8. Exchange damaged parts. Remove wheel and hub. Investigate bearing races. Exchange the whole bearing if any part should be damaged.</p>
<b>Steering shock or kickback.</b>	
<p>Excessive play in steering gear. Unsuitable or insufficient lubricating oil in steering gear housing. Loose front wheel bearings. Excessive play in steering rod and tie rod ball joints. Pitman arm wrongly fitted. Wheels out-of-balance.</p>	<p>Adjust play. See "Steering gear". Check, flush steering gear housing and fill oil in accordance with specification. See under "Front wheel bearings". Exchange ball joints if necessary.  See "Pitman arm adjustment". Remove and balance wheels. See Part 8.</p>

# TOOLS

The following tools should be used when repairing front axle and steering gear.

## Front axle.



**VOLVO**  
20283

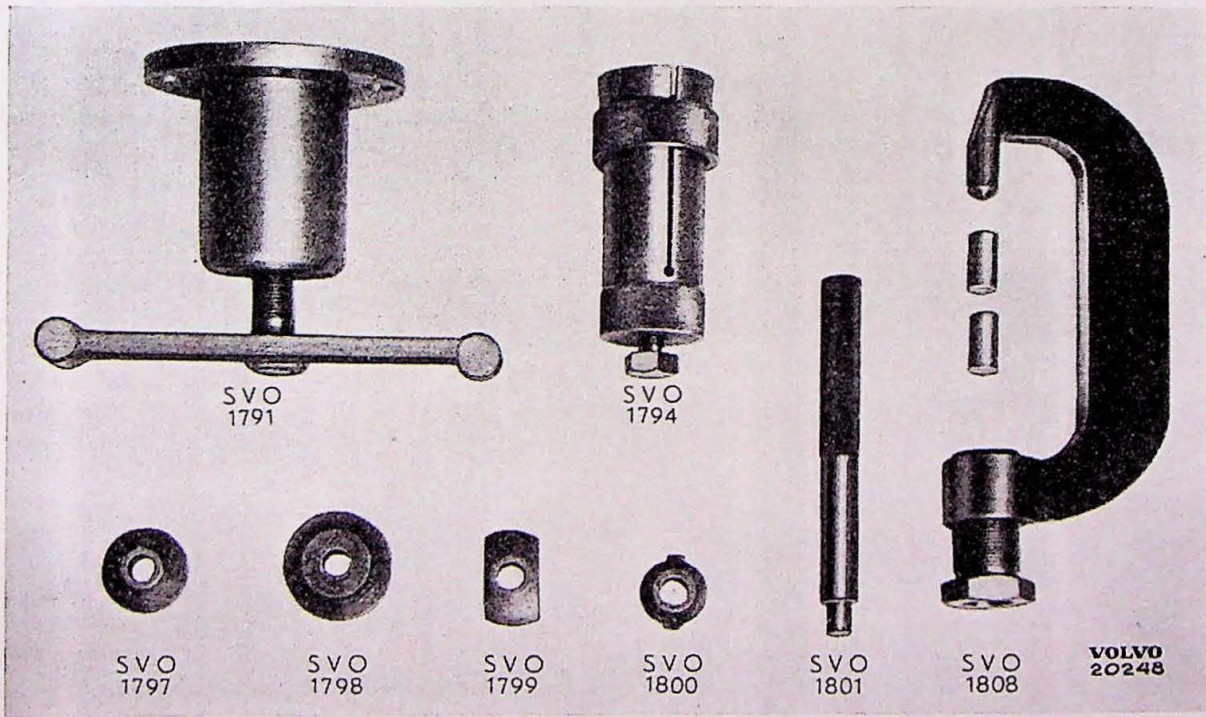
SVO 1171A King pin bushing reamer.  
SVO 1410 Pitman arm puller.  
SVO 1411 Eccentric bushing wrench.

SVO 1412 Upper control arm fixture.  
SVO 1442 Driver for removal and installation  
of king pin bushing.

- |           |   |          |  |
|-----------|---|----------|--|
| SVO 4000  | Driver for installation of bearing outer ring in front hub.         | SVO 4008 | Tool for removal of upper seal washer.                             |
| SVO 4001  | Driver for installation of bearing inner ring in front hub.         | SVO 4011 | Puller for front wheel brake drum.                                 |
| SVO 4002  | Cross piece for removal of bearing outer ring (small) in front hub. | SVO 4016 | Puller for large bearing on steering knuckle.                      |
| SVO 4003  | Cross piece for removal of bearing outer ring (large) in front hub. | SVO 4025 | Driver for removal and installation of steering idler arm bushing. |
| SVO 4004  | Driver for removal of king pin.                                     | SVO 4114 | Driver for fitting of oil seal in front hub.                       |
| SVO 4004A | Extension for ditto.  | SVO 4115 | Driver for removal of king pin stop key.                           |
| SVO 4005  | Centering for king pin.   | SVO 4156 | Spacer for removal of idler arm bushing.                           |
| SVO 4007  | Hook for removal and fitting of rubber ring.                        |          |  |

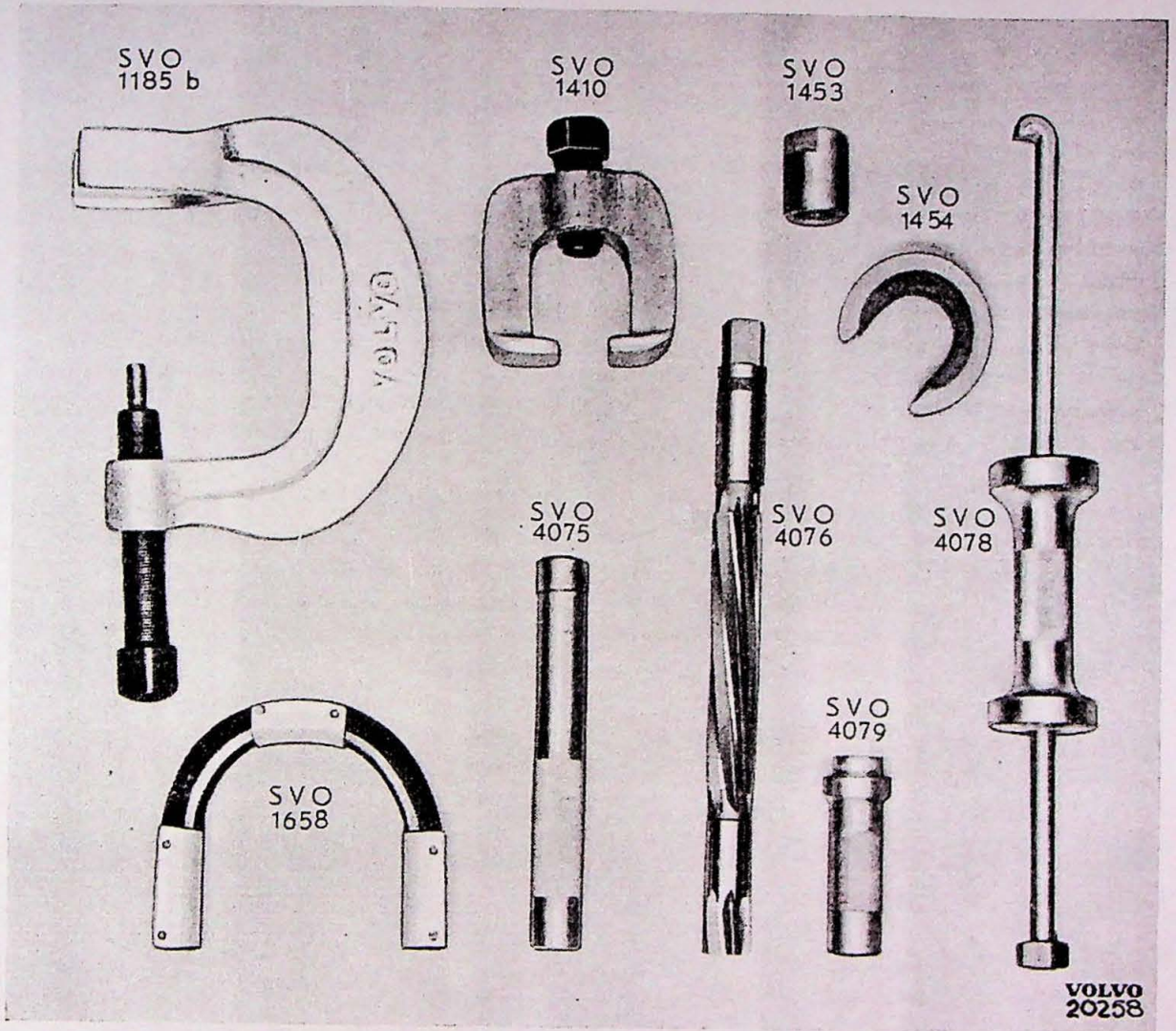
Standard tool: Steel driver for removal of bearing outer rings in front hub.

### Supplementary tools for front axle PV 444 C.



- |          |  |          |   |
|----------|--|----------|---|
| SVO 1791 | Puller for front wheel brake drum.                                       | SVO 1799 | Cross piece for removal of large bearing ring in front hub. |
| SVO 1794 | Puller for large bearing on steering knuckle.                            | SVO 1800 | Cross piece for removal of small bearing ring in front hub. |
| SVO 1797 | Cross piece for fitting of small bearing ring in front hub.              | SVO 1801 | Cross piece handle.   |
| SVO 1798 | Cross piece for fitting of large bearing ring and oil seal in front hub. | SVO 1808 | Tool for removal of upper seal washer and king pin.         |

## Steering gear.



SVO 1185B Steering wheel puller.  
 SVO 1410 Pitman arm puller.  
 SVO 1453 Spacer for steering wheel puller.  
 SVO 1454 Clamp washer for steering wheel puller.  
 SVO 1658 Clamp for removal of late production steering wheel.

SVO 4075 Driver for removal and installation of twin lever shaft bushings.  
 SVO 4076 Reamer for twin lever shaft bushings.  
 SVO 4078 Puller for ball bearing in jacket tube.  
 SVO 4079 Driver for fitting oil seal.

