

Figure 34—REAR AXLE SECTION.

SECTION 13. REAR AXLE

113. General

The Rear Axle Assembly, (Fig. 34) is of the hypoid, semi-floating type with shim adjustment for all bearings and for the meshing of the driving gear and pinion. The Axle Shafts are splined at the inner ends to engage splines in the differential side gears. The outer ends of the shafts are provided with tapers and keys for attaching the rear wheel hubs. The wheels are each supported on a taper roller bearing pressed on to the axle shaft and the side thrust from the wheels is transferred from one shaft to the other by a thrust block straddling the differential pinion mate shaft. A cover on the rear of the gear carrier housing permits inspection and flushing of the differential assembly without dismantling the axle. The axle gear ratio is stamped on a plate attached to the assembly by one of the rear cover screws. The axle serial number is stamped on the top of the gear carrier casting on the width of the metal forming the facing for the rear cover.

114. Lubrication

For the lubrication of the hypoid driving gears it is necessary to use an S.C.L. type of E.P. (extreme pressure) *hypoid* lubricant conforming to the S.A.E. 90 specification.

Always use one of the following lubricants:—

Anglo-American Oil Co., Ltd.	Essoleum	EXPER
		Compound 90.
Price's Lubricants, Ltd.	.....	Energol Hypoid 90
Shell-Mex & B.P. Ltd.	.....	Spirax E.P. 90
Vacuum Oil Co., Ltd.	.....	Mobilube GX.
C. C. Wakefield & Co., Ltd.	.....	Castrol Hypoy.
Duckham's	.....	Adecol Hypoid 90

Do not at any time mix various brands of hypoid lubricants. Should there be any doubt concerning the brand of lubricant previously used, drain and flush the axle with a flushing oil or light engine oil before filling with the new lubricant. Do not use paraffin for flushing. Check the level of the lubricant every 1,500 miles. The axle should be drained and re-filled to the bottom level of the filler plug hole every 10,000 miles

Lubricant capacity 2 pints
 Refill capacity $1\frac{3}{4}$ pints

The wheel bearings are each lubricated by a grease nipple located in the axle tube housing adjacent to the brake back plate. Where, on the top side of the housing, a vent hole is provided, the greasing operation should be continued until grease appears at this hole indicating that the chamber is full. Do not overfill. The bearings should be lubricated with a good bearing grease every 5,000 miles.

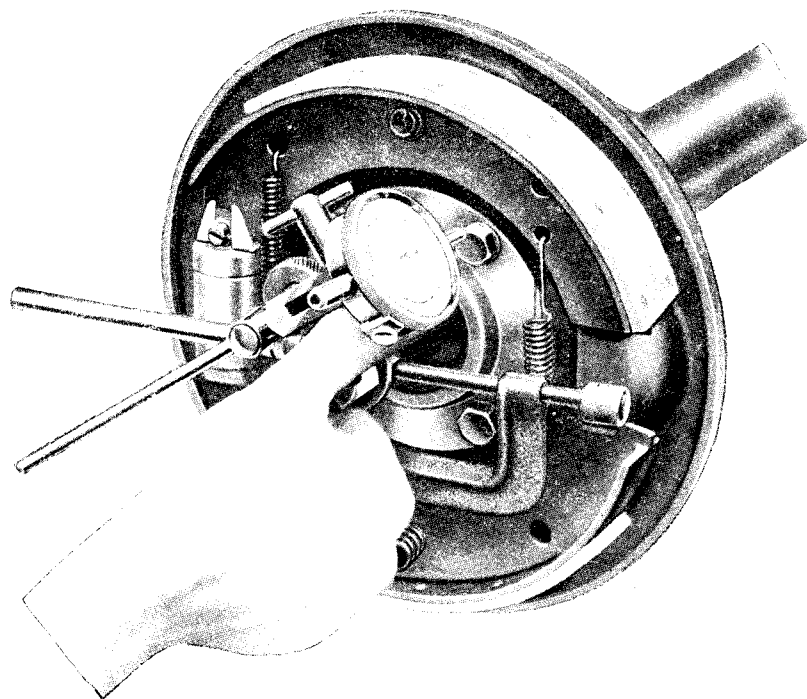


FIGURE 35. AXLE SHAFT END MOVEMENT.

115. Axle Shafts Removal and Replacement

To remove the axle shaft, remove the road wheel and the axle shaft nut and washer. Withdraw the rear hub with a Britool drawer No. 1092, and before dismantling further, check the axle shaft end play with a dial indicator as shown in Fig. 35.

The recommended tolerance ranges from .003" to .006" (.75-1.5 mm.) and the end play is controlled by shims located between the brake back plate and the axle tube flange. Shims are available in thicknesses of .003", .005", .010" and .030". Remove the brake back plate retaining bolts, the outer oil seal assembly, the wheel bearing retaining plate (if fitted) and the brake back plate, taking care of the wheel bearing adjusting shims. The axle shaft with its taper roller bearing may now be withdrawn with a puller and the axle shaft oil seal which is pressed inside the axle tube can be examined. Withdraw the oil seal and replace if necessary.

To replace the axle shaft: After lubricating the wheel bearing with a good bearing grease, instal the axle shaft with the taper roller bearing cone and then the bearing cup. Add or subtract adjusting shims to obtain the correct axle shaft end play of .003" to .006" which will be just perceptible by hand (adding shims increases end play, subtracting shims decreases end play).

Remove or instal approximately an equal number of shims at each end of the axle so as to retain the axle shafts in a central position. Examine the hub oil seal and replace, if necessary. Fit the brake back plate and centralise the hub oil seal. When re-installing, fit new paper gaskets on either side of the bearing retaining plate, or if a retaining plate is not fitted, between the brake back plate and the oil seal assembly to prevent oil leaking into the brake drum.

**116. Differential.
Removal and Dismantling**

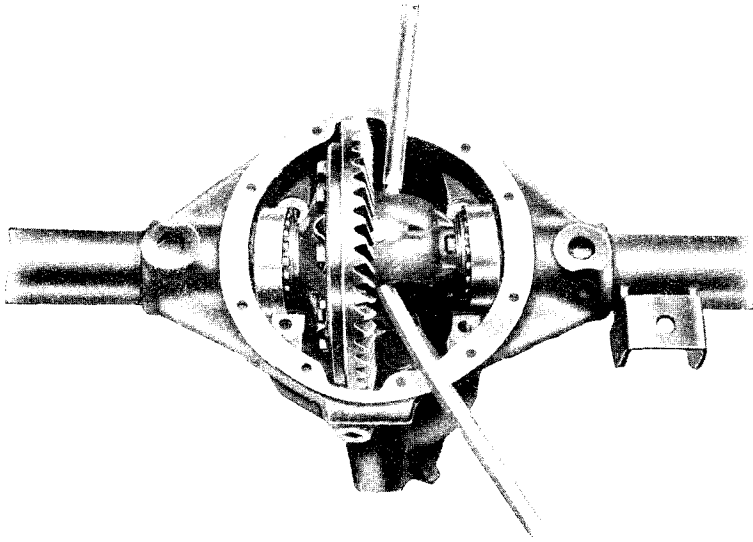
Drain the lubricant from the gear carrier housing and remove the gear carrier rear cover, flushing out the unit thoroughly so that the parts can be carefully inspected. Remove both axle shafts as detailed in the foregoing chapter. Remove the four bolts which hold the differential bearing cap, and using two pry bars, one on each side of the differential case opening, pry out the differential assembly, (Fig. 36). The differential bearing caps and the gear carrier gasket surface are marked during production and when re-assembling the bearing caps be sure that the position of the numerals correspond, (Fig. 37).

Remove the universal joint companion flange with a puller and press the pinion out of the forward bearing. The pinion having been freed from its front bearing can now be removed from the axle housing.

Note. Keep all shims intact.

Use only the recommended brands of hypoid oil in the rear axle.

Should there be any doubt about the type of oil in the axle, drain, flush and refill. Do not "top up."



36. REMOVING DIFFERENTIAL.

Drive the front bearing cup and oil seal assembly out of the housing and if a damaged rear bearing cup is to be replaced, or if the pinion setting is to be changed, the rear bearing cup must be driven from the housing, care being taken of the shims which are fitted between the bearing cup and the housing abutment face. Remove the ring gear from the differential case by bending down the locking tabs and removing the mounting screws. Drive out the pinion mate shaft locking pin, which is secured in place by peening the case, and remove the pinion mate shaft. Take out the axle shaft spacer, and by rotating the gears by hand until the pinions are opposite the openings in the differential case, remove the differential gears and the thrust washers which are fitted behind them. If the ring gear

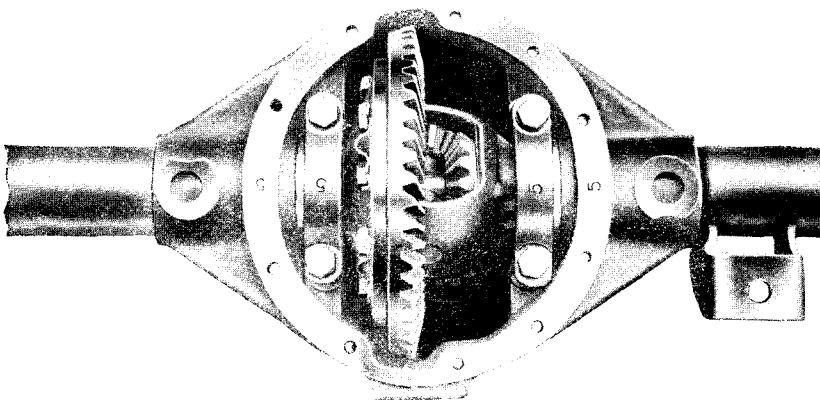


Figure 37. RESETTING BEARING CUPS.

setting is to be altered, it will be necessary to remove the differential bearing with a drawer to gain access to the shims located between the bearing and the abutment face on the differential case.

117. Assembly

Reassemble the internal parts of the differential and install the pinion mate shaft lock pin. Using a punch,peen some of the metal of the differential case over the end of the lock pin to prevent it working loose. The ring gear and differential case contacting surfaces should be cleaned and examined for burrs before the ring gear is fitted. When re-installing the ring gear on the differential case align the attaching bolt holes in the ring gear with those in the case and tap the ring gear on the case with a lead hammer. Insert the ring gear set screws with new locking

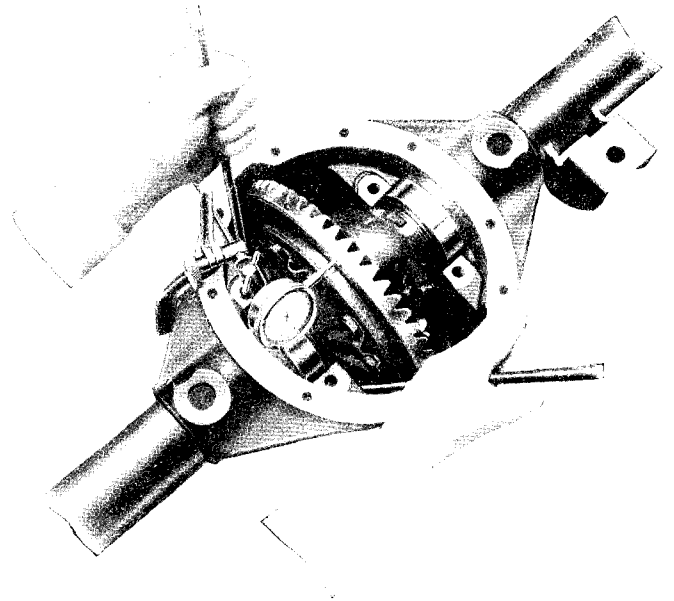


Figure 38. DIFFERENTIAL SETTING.

straps and tighten them uniformly. Then bend the locking tabs around the screw heads to prevent their working loose.

Install the differential bearings without shims on the differential case, making sure that the bearing cones and cups and the housings are perfectly clean. Place the differential assembly with the bearing cups in their housing in the gear carrier. Install a dial indicator in the gear carrier with the button against the ring gear back face and, inserting two screw drivers between the housing and the bearing cup, move the differential assembly to one side of the case as shown in Fig. 38.

GROUP II.

Then after setting the indicator at zero move the assembly to the other side and record the indicator reading. This reading plus .008" preload denotes the total thickness of shims to be used in the installation of the differential bearings. Remove the differential assembly from the gear carrier and, if it has been removed, reinstall the pinion front bearing cup. Also reinstall the original pinion adjusting shims and the pinion rear bearing cup. Using an arbor press and a length of tube, press the rear bearing cone on the pinion, the tube contacting the inner race only and not the roller retainer.

118. Ring Gear and Pinion Adjustment

The rear axle pinion should be adjusted properly before further rear axle assembly is attempted. The ground end of the pinion is marked with the correct pinion setting (Fig. 39). This marking may be zero (0), a minus (-) or a plus (+). When properly adjusted a pinion marked zero (0) will be at the zero cone setting distance from the centre line of the gear; a pinion marked plus two (+2) should be adjusted to the nominal cone setting distance, plus .002", and a pinion marked minus two (-2) to cone setting distance minus .002" (See Fig. 40).

The Zero Cone Setting Distance is 2.125" (53.974) mm.

Thus for a pinion marked minus two (-2) the distance from the centre of the ring gear to the face of the pinion should be 2.123", and for a pinion marked plus 3 (+3) the cone setting distance for this type would be 2.128".

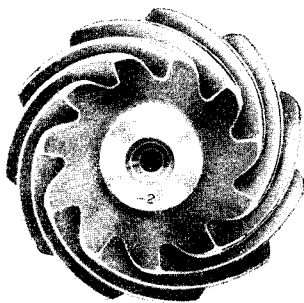


Figure 39. PINION MARKING.

Place the pinion with the rear bearing cone in the gear carrier and adjust the pinion to the correct setting distance by means of shims between the rear bearing cup and the housing. The pinion adjusting shims are available in thicknesses of .003", .005" and .010". Install the pinion bearing spacer and the original bearing adjusting shims on the pinion. Then install the pinion front bearing cone, companion flange, washer and nut. The pinion oil slinger and oil seal should not be installed until the pinion bearing adjusting procedure has been completed.

Tighten the companion flange nut and test the pinion bearing adjustment. The pinion should have no end play and should afford a slight drag

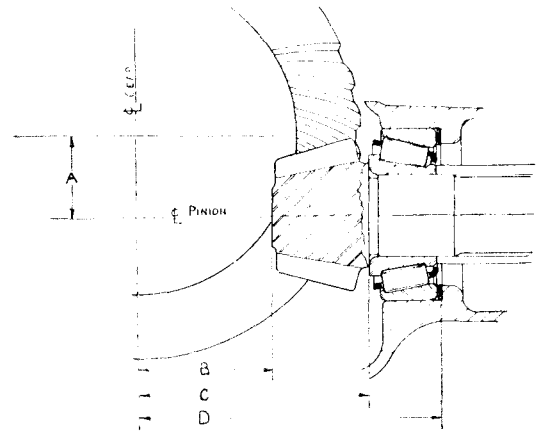


Figure 40. PINION SETTING DIAGRAM

or resistance to turning. Add or remove shims to obtain the proper adjustment.

Being sure that the bearing cones and cups and the housings are perfectly clean, again place the differential assembly with the bearing cups in the housing. Install a dial indicator on the housing with the button against the ring gear back face and inserting two screwdrivers between the housing and the bearing cup, move the differential case and ring gear away from the pinion until the opposite bearing cup is seated against the housing. Then, after setting the indicator at zero, move the differential assembly towards the pinion until the ring gear contacts the pinion deep in mesh. The indicator reading now obtained (clearance between ring gear and pinion) minus .005" denotes the thickness of shims to be placed between the differential case and the bearing cone on the ring gear side of the differential. The quantity of shims inserted on the ring gear side, of the differential case should then be subtracted from the total indicator reading (see assembly). Insert a thickness of shims equal to this amount plus .008" for preload on the opposite side of the differential.

To simplify the differential and ring gear adjustment procedure we give the following example. Assume the total indicator reading to be .080". This figure plus .008" for the recommended preload equals .088" which denotes the total thickness of shims to be used. Assuming the clearance between the ring gear and the pinion to be .042", subtract .005" (the approximate backlash) from this .042" clearance. The .037" difference denotes the thickness of shims to be placed between the differential case and the bearing cone on the ring gear side of the differential. Then subtract the thickness of shims inserted on the ring gear side of the differential case from .088" and the .051" difference denotes the thickness of shims to be inserted on the opposite side of the case.

GROUP II.

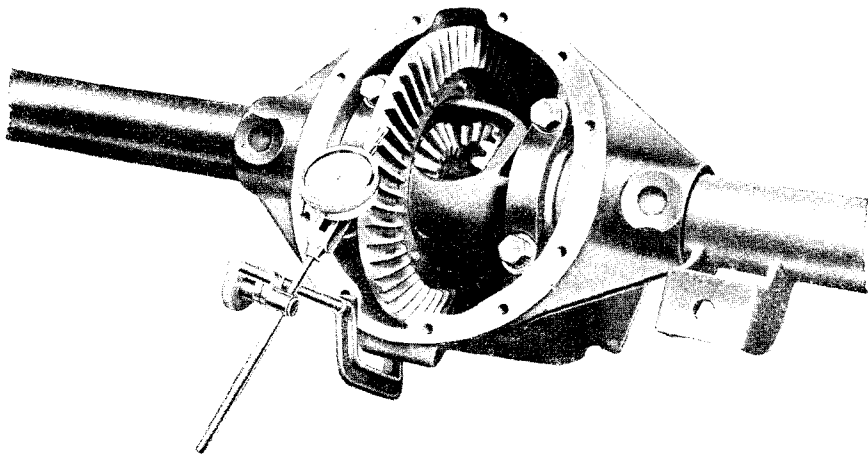


Figure 41. CHECKING BACKLASH, CROWN WHEEL AND PINION.

To facilitate installation of the differential assembly, cock the bearing cups and tap them lightly into position with a lead hammer. When reinstalling the bearing caps be sure the position of the numerals marked on the gear carrier housing face and the caps correspond (see Fig. 37).

Mount a dial indicator on the gear carrier with the button against one of the ring gear teeth as nearly in line with the tooth travel as possible. Move the ring gear by hand to check the backlash which should be between .003" and .006" (Fig. 41). If the backlash is not in accordance with specifications transfer the necessary number of shims from one side of the differential case to the other to obtain the desired setting (Fig. 42). Backlash will be changed approximately two-thirds of the thickness of shims transferred.

After setting the backlash to the required figure, use a small brush to paint eight or ten of the ring gear teeth with a mixture of ground red lead and engine oil.

Move the painted ring gear teeth over the pinion until a good impression of the tooth contact is obtained.

The result impressions should be similar to the first example given in Fig. 43.

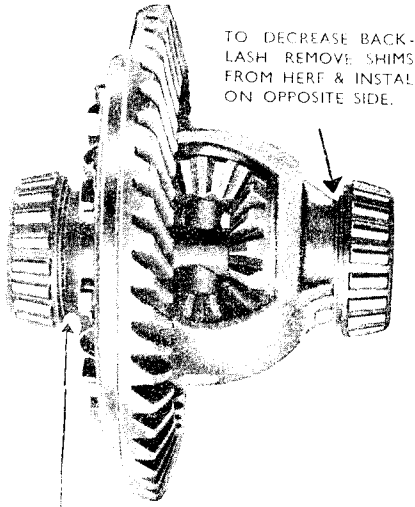


Figure 42. SHIM ADJUSTMENT, DIFFERENTIAL.

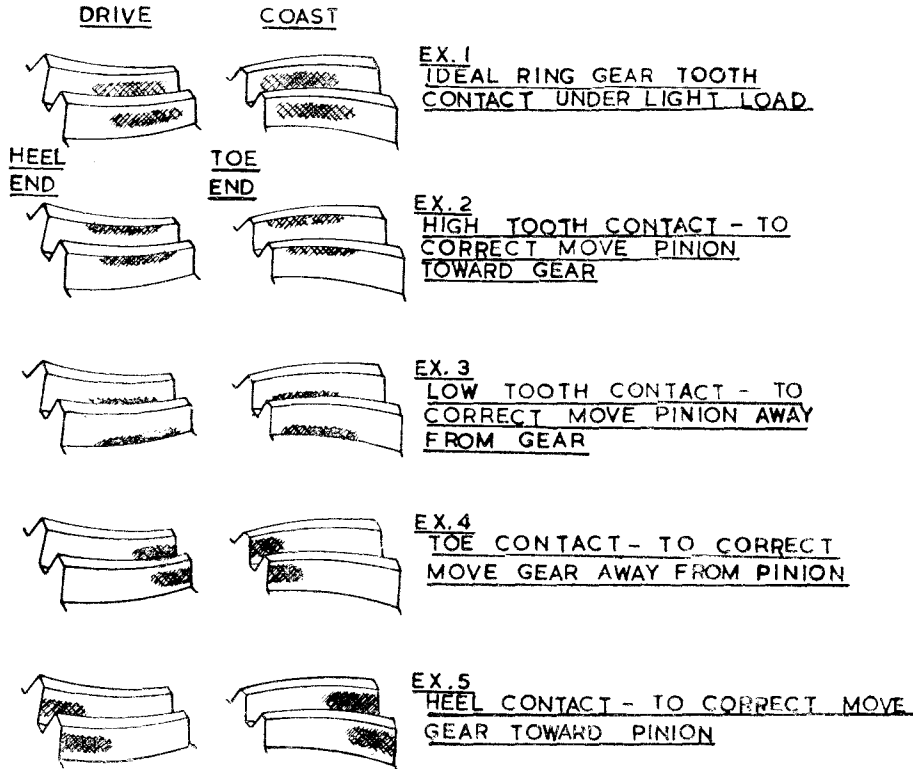


Figure 43.—TOOTH CONTACT DIAGRAM.

If the tooth contact is high on the gear teeth, as shown in the second example, the pinion should be moved towards the gear by adding shims between the rear bearing cup and the housing, and adding the same thickness of shims

GROUP II.

between the pinion bearing spacer and the forward bearing cone.

If the tooth contact is low on the gear, as in Example 3, the pinion should be moved away from the gear by removing shims from between the rear bearing cup and the housing and removing the same thickness of shims from between the pinion bearing spacer and the forward bearing cone.

If the tooth contact is decidedly towards the toe or small end of the tooth as in Example 4 Fig. 43, the gear should be moved away from the pinion by removing shims from the ring gear side of the differential case and adding the same thickness of shims to the opposite side.

If the tooth contact is on the heel or large end of the teeth, as shown in Example 5, Fig. 43, the gear should be moved towards the pinion by removing shims from the side of the differential case opposite to the ring gear and adding the same thickness of shims on the ring gear side.

It must be remembered that in making adjustments to correct a heel or toe contact that the backlash limits of from .003" to .006" must be maintained. A reduction of the backlash within the above limits may correct an extreme heel contact while an increase of backlash may correct

an extreme toe contact. Moving the ring gear .005" will change the backlash approximately .0035" while moving the pinion .005" will change the backlash about .001". Ordinarily it will not be desirable to move the pinion when making a backlash correction as the movement of the ring gear has a much greater effect upon the backlash.

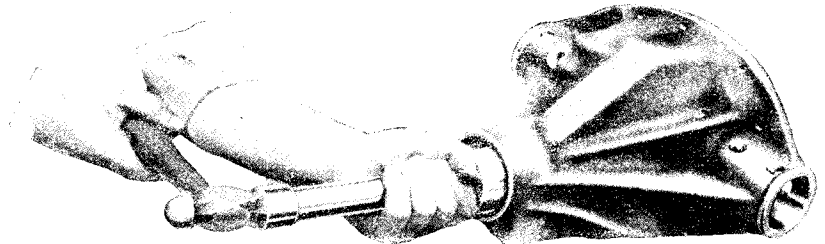


Figure 44.—PINION ASSEMBLY.

Moving the gear out, changes the bearing towards the heel and slightly raises the bearing. Moving the pinion out raises the bearing on the face of the tooth and slightly towards the heel.

After removing the companion flange instal the oil slinger, oil seal gasket and the oil seal (Fig. 44.) Replace the companion flange and tighten; instal both axle shafts, bearings and cups. Then instal the rear cover using a new gasket and fill the housing with the correct amount of approved hypoid lubricant.

SECTION 14.

BRAKES

119. Bleeding the Hydraulic System

This operation should be necessary only when part of the system has been disconnected, or when the level of the supply tank has been allowed to fall too low, allowing air to enter the fluid circuit.

It is emphasised that Girling crimson brake fluid should be used when bleeding or when replenishing the fluid in the reservoir. This special fluid is unaffected by high temperatures, is immune from freezing, and has no harmful effect on the rubber seals. Use of any other type of fluid may result in serious trouble.

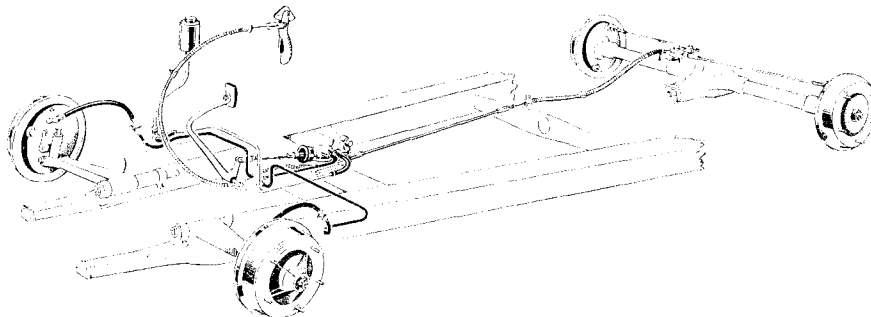


Figure 45.—BRAKE LAYOUT.

Slack back front brake shoe adjusters to zero

Fill up supply tank with fluid, taking great care to prevent entry of dirt.

Working on one brake assembly at a time, remove the rubber cap from the bleeder nipple of the hydraulic cylinder and fit a rubber bleeder tube in its place, allowing the tube to hang into a clean receptacle, preferably a glass jar or bottle. Pour sufficient Girling crimson brake fluid into the container to cover the end of the bleeder tube. Unscrew the nipple about three quarters of a turn, and operate the brake pedal up and down a few times, allowing two or three seconds between each stroke. One or two strokes will cause the fluid to start flowing, but pumping must be continued until the fluid appears entirely free from air bubbles. It is important that the reservoir is frequently replenished during this operation, if it should be allowed to become empty more air will be drawn into the system.