# REAR AXLE

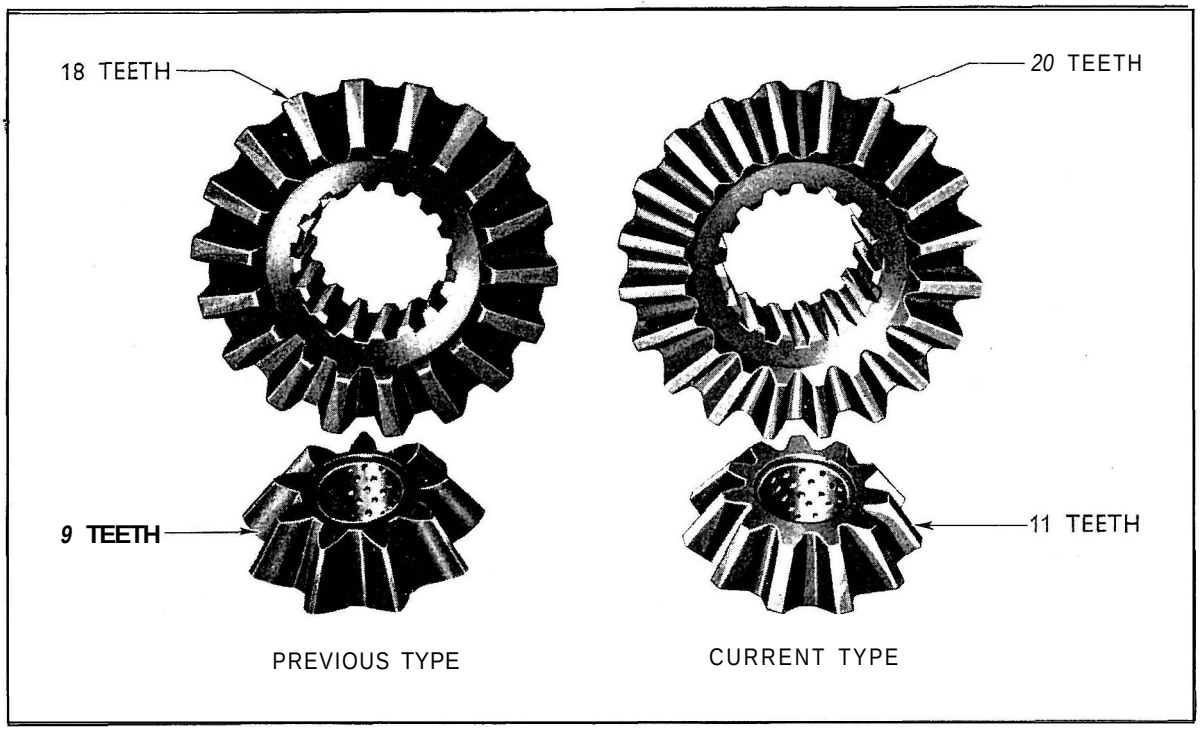


Fig. 1

**Differential Side Gears and Pinions**

## DIFFERENTIAL ASSEMBLY

Various changes have been made to the components of the differential assembly since the inception of the Fordson Major in 1952. Servicing of early assemblies is simplified however by the fact that only the strengthened and redesigned parts as fitted to the Fordson Power Major are supplied in service.

The parts that were redesigned—the differential side gears and pinions—have more teeth than the previous parts (differential side gear—20 as against 18, and the pinion—l l as against 9, as shown in Figure 1). The side gear thrust washer was also changed from brass to bronze to give greater resistance to wear consistent with the heavier loading.

Only the latest type of pinions, side gears and thrust washers should be used on the Power Major, but where dealers have stocks of previous parts they may be used on tractors prior to the Power Major.

Where the latest type parts are used as replacements for previous type parts they must be used in sets, i.e., the new pinions and side gears must not be mixed with the previous type.

## CROWN WHEEL AND DIFFERENTIAL CASE

To obviate the necessity of replacing the complete crown wheel and differential case assembly when only one of the parts requires renewal, a separate differential case assembly, and crown wheel and pinion assembly were made available in service in August 1956 and they are suitable for use on all Fordson Major and Power Major Tractors.

Special retaining bolts, spacers and self-locking nuts are also available to replace the twelve rivets which have to be removed when separating the differential case from the crawn wheel (see Fig. 2).

### To Remove the Crown Wheel and Differential Assembly

1. Drain the rear axle oil by removing the drain plug in the underside of the housing.

2. Support the rear of the tractor on jacks or lifting tackle, and remove the left-hand rear wheel.

3. Disconnect the 4de and rear lamp wires and remove the left-hand mudguard and footplate as an assembly.

4. Disconnect the brake cable from the left-hand brake operating lever.

5. Remove the locking wire and six bolts securing the left-hand bull pinion and brake extension housing assembly to the rear axle housing, and remove the bull pinion and brake extension housing assembly.

The two lower bolts retain the brake cable conduit support.

6. Remove the split pins and clevis pins and disconnect the hydraulic lifting rods from the lift arms.

7. Remove the driver's seat assembly (four bolts, flat washers and spring washers).

8. Unscrew the retaining bolts securing the hydraulic ram cylinder housing to the rear axle housing and remove the ram cylinder housing.

9. Remove the vertical feed pipe from the top of the hydraulic pump.

10. Unscrew the three retaining bolts and lockwashers securing the hydraulic pump to the pedestal, and remove the pump.

11. Remove the split pin and castellated nut (left-hand thread) securing the left-hand large reduction gear to the axle shaft, using the special wrench (Tool No. T.4065) as shown in Fig. 3.

12. Lift the lips of the left-hand rear axle shaft oil seal retainer from the outer end of the rear axle shaft housing, and partially withdraw the left-hand axle shaft from the housing so that the large reduction gear may be removed.

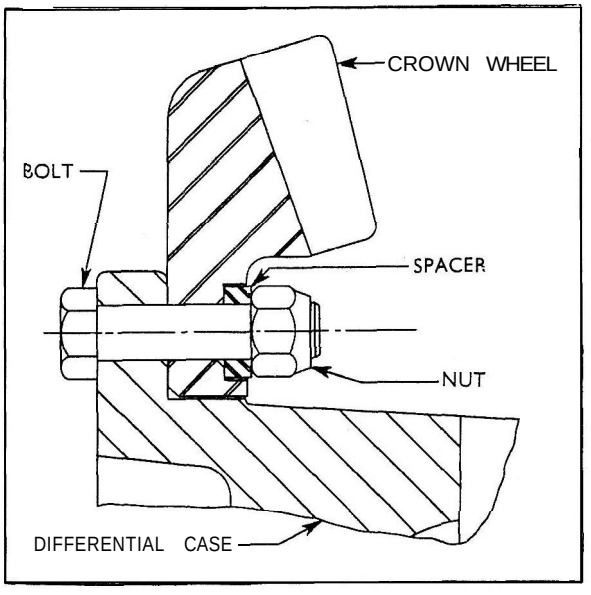


Fig. 2

**Crown Wheel and Differential Case Bolts**

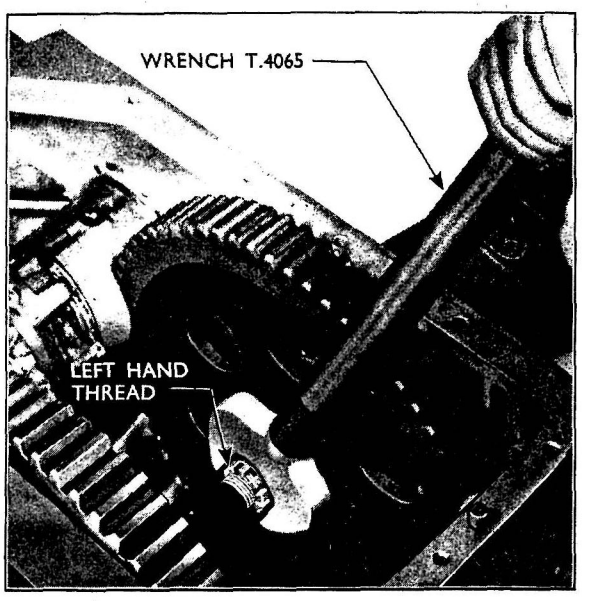


**Fig. 3**
**Removing the Large Reduction Gear**

13. Unscrew the three bolts securing the oil deflector assembly and remove the oil deflector assembly. (See Fig. 6.)

14. Withdraw the left-hand bull pinion housing from the axle housing. If necessary, removal of the bull pinion housing may be facilitated by use of two bolts inserted in the tapped holes provided.

Note the thickness of shims fitted between the rear axle and bull pinion housing as the same thickness must be replaced on reassembly.

15. Remove the crown wheel and differential assembly from the rear axle housing.

### To Dismantle the Crown Wheel and Differential Assembly

1. Ensure that the two halves of the differential case have mating marks and remove the eight wired bolts.

2. Lift off the top half of the differential case and remove the differential spider, gears, pinions and thrust washers. (See Fig. 4.)

### To Remove the Crown Wheel from the Differential Case

1. With the crown wheel and differential case assembly securely held, centre punch the upset end of each of the twelve retaining rivets, i.e., on the gear side of the crown wheel.

2. Drill pilot holes into each of the twelve rivets with a drill of approximately $\frac{1}{8}$ in. (3.2 mm.) diameter, using the centre punch marks as a guide.

3. Using a drill of $\frac{1}{2}$ in. (12.7 mm.) diameter, drill along the pilot holes until the hardened face of the crown wheel is reached.

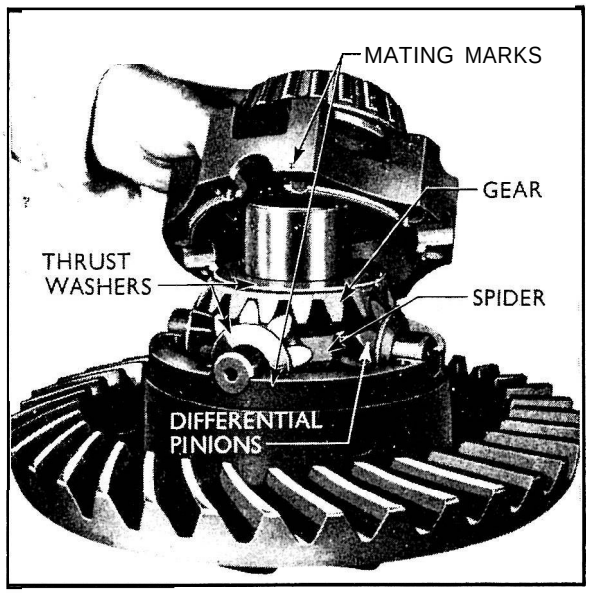


Fig. 4

**Assembling the Crown Wheel and Differential**

Note.—Drilling the rivets completely out may enlarge the holes.

4. Drift out the remainder of the rivet using a drift of approximately $\frac{3}{8}$ in. (9.5 mm.) diameter.

**To Reassemble the Crown Wheel to the Differential Case**

1. Thoroughly clean and inspect the part which is to be used again, taking care to ensure that the mating face is free from burrs.

2. Assemble the crown wheel to differential case with the spacers, bolts and nuts as shown 'in Fig. 2.

3. Tighten down the nuts evenly to a torque of 40 to 45 lbs. ft. (5.53 to 6.22 kg.m.).

To **Reassemble the Crown Wheel and Differential Assembly**

1. Position the larger part of the differential case on the bench with the crown wheel gear teeth facing upwards.

2. Fit a washer to the differential gear (only use bronze type thrust washers on the Power Major bronze or brass may be used on the Major), and place in position in the differential case.

3. Fit a pinion and thrust-washer on each arm of the spider and locate it in position in the differential case.

4. Fit a thrust washer to the remaining differential gear and place it in position on the pinions so that the gear is in mesh with the pinions.

5. Re-locate the top part of the differential case with the mating marks in line, replace the eight retaining bolts, and tighten to a torque of 65/75 lbs. ft. (8.98/10.37 kg.m.). Wire the heads of the bolts securely.

To **Replace the Crown Wheel and Differential Assembly**

1. Relocate the crown wheel and differential assembly in the rear axle housing with the teeth on the crown wheel in mesh with those on the drive pinion.

2. Fit the locating studs (Tool No. PT 4063) to the rear axle housing and refit the left-hand bull pinion housing, together with the same thickness of shims as were removed, and secure with two bolts.

3. Using feeler gauges, check the backlash between the crown wheel and drive pinion, which should be .004 in.—.018 in. (.102—.457 mm.).

The bscklash can be adjusted by moving the shims that are interposed between the bull pinion and rear axle housing, from one side of the axle housing to the other. It must be remembered, however, that at all times the total shim thickness must be .016 in. (.407 mm.), to ensure correct pre-load on the differential bearings.

If the backlash is not within the limits stated it will be necessary to remove the right-hand bull pinion housing (adopt a similar procedure to that detailed for the left-hand bull pinion housing), and adjust the thickness of shims under the housing flanges, i.e., if the backlash exceeds .018 in. (.457 mm.) removing shims from the left-hand side and fitting them under the right-hand side will decrease the backlash.

If the backlash is less than .004 in. (.102 mm.), moving shims from the right-hand to the left-hand side bull pinion housing will increase the backlash.

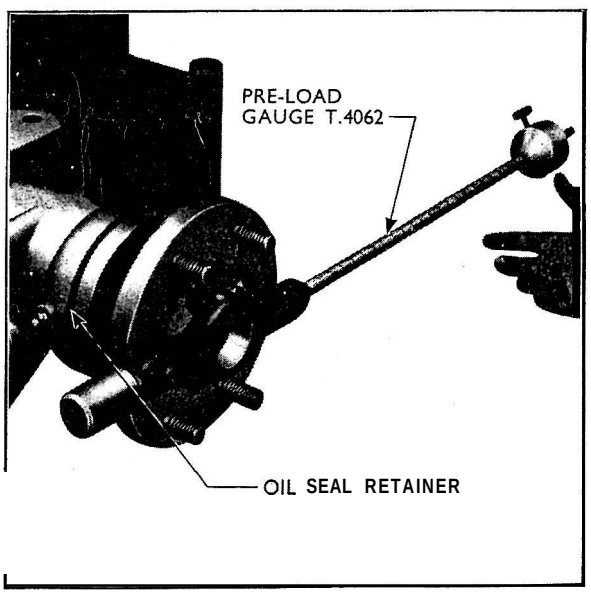


Fig. 5
**Checking Axle Shaft Pre-Load**

If the backlash is adjusted by the transference of shims, it will also be necessary to check the clearance between the crown wheel and the thrust pad, which should be .004 to .014 in. (.102 mm. to .356 mm.). The clearance may be adjusted by adding or removing gaskets between the thrust pad and rear axle housing to increase or decrease the clearance as required.

4. Position the large reduction gear in the rear axle housing and reposition the left-hand axle shaft, until the axle shaft splines enter those in the large reduction gear.

5. Secure the shaft to the gear with the castellated nut, using the special wrench (Tool No. T.4065) and then pre-load the axle shaft bearings to 40-45 in. lbs. (.460-.518 kg.m.), using the pre-load gauge (Tool No. T.4062) as shown in Fig. 5. Securely split pin the castellated nut.

6. Stake the axle shaft oil seal retainer to the axle shaft housing.

7. Replace the left-hand bull pinion and brake extension housing assembly and secure with six bolts. Wire the bolt heads securely. The lower two bolts also secure the brake cable conduit support.

8. Refit the oil deflector assembly to the bull pinion housing and secure with three bolts and spring washers. Check for .004 in. (.102 mm.) clearance between the oil deflector plate and the periphery of the crown wheel, adjust, if necessary, by moving the plate in the elongated holes. (See Fig. 6.)

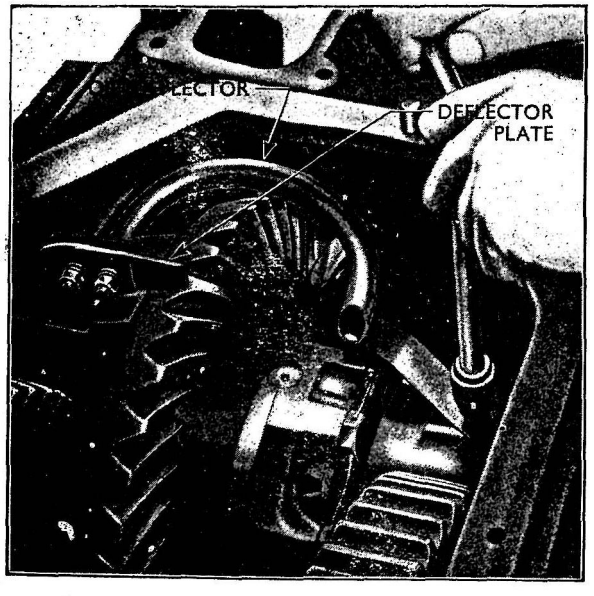


Fig 6
**Oil Deflector Plate**

9. Reconnect the brake cable to the left-hand brake operating lever, replace the clevis pin and split pin securely.

10. Replace the hydraulic pump and secure in position with three bolts and lockwashers.

11. Replace the vertical feed pipe in the port in the hydraulic pump, ensuring that new rubber "O" rings are fitted to the upper and lower grooves in the pipe.

12. Refill the axle housing with approximately 9 Imperial Gallons (10.8 U.S. Gallons, 41 litres) of the correct grade of oil, up to the "high" mark on the dipstick.

13. Relocate the hydraulic ram cylinder on the rear axle housing and replace the retaining bolts.

14. Reconnect the hydraulic lifting rods to the lift arms, replace the clevis pins and secure with split pins.

15. Replace the driver's seat assembly and secure in position with four bolts, spring washers and flat washers.

16. Replace the left-hand mudguard and foot plate as an assembly. Reconnect the side and rear lamp wires.

17. Replace the left-hand rear wheel and remove the lifting tackle or jacks.

## REAR AXLE SHAFTS AND HOUSINGS

To provide additional strength when extremely heavy auxiliary equipment is mounted on the tractor a modified axle shaft was introduced as a production option effective with approximate tractor number 1406540. At the same time the axle shaft housing flange thickness was increased from approximately .6 in. (15.2 mm.) to .8 in. (20.3 mm.). The modified shaft is machined slightly smaller than standard at the grease retainer location and gives a larger blending radius into the axle shaft flange, thus relieving stresses set-up at this point.

To compensate for the reduction in diameter a bearing abutment sleeve was also introduced, together with a new grease retainer and felt.

The strengthened axle shaft may be used as a replacement for the previous type without changing the axle housings, if it is so desired. It should, however, be remembered that the new abutment sleeve and grease retainer assembly must also be fitted.

The strengthened rear axle housing may also be interchanged with the previous type.

## LUBRICATION

Extensive testing has proved that a lighter grade of oil than previously specified may be used on all Fordson Major and Power Major Tractors produced since 1952.

For service the specification is as follows:—

| *Temperature Range* | *S.A.E. Viscosity Number* | |
|---|---|---|
| Above 20°F (—7°C) | 30 H.D. | or 20W/30 H.D. |
| Below 20°F (—7°C) | 20 H.D. | |

## DIFFERENTIAL CASE BUSHES

Effective with approximate tractor number 1367376 the two parts of the differential case assembly were fitted with bushes at the side gear location.

To assist the installation of these bushes in service, it is recommended that a driver be made locally to the dimensions shown in Figure 7.

This driver will ensure that the bush is installed to the correct depth, i.e., with the inner edge of the bush flush with the bottom of the chamfer on the inside of the housing.

The bush is pre-sized and no reaming is necessary after assembly, but care must be taken not to close it in during fitting and so prevent the gear rotating freely.

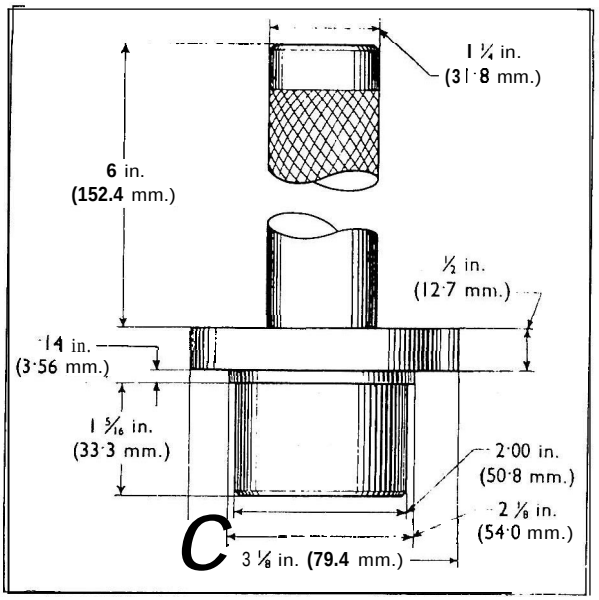


Fig. 7
**Differential Case Bush Driver**

# REAR TRANSMISSION

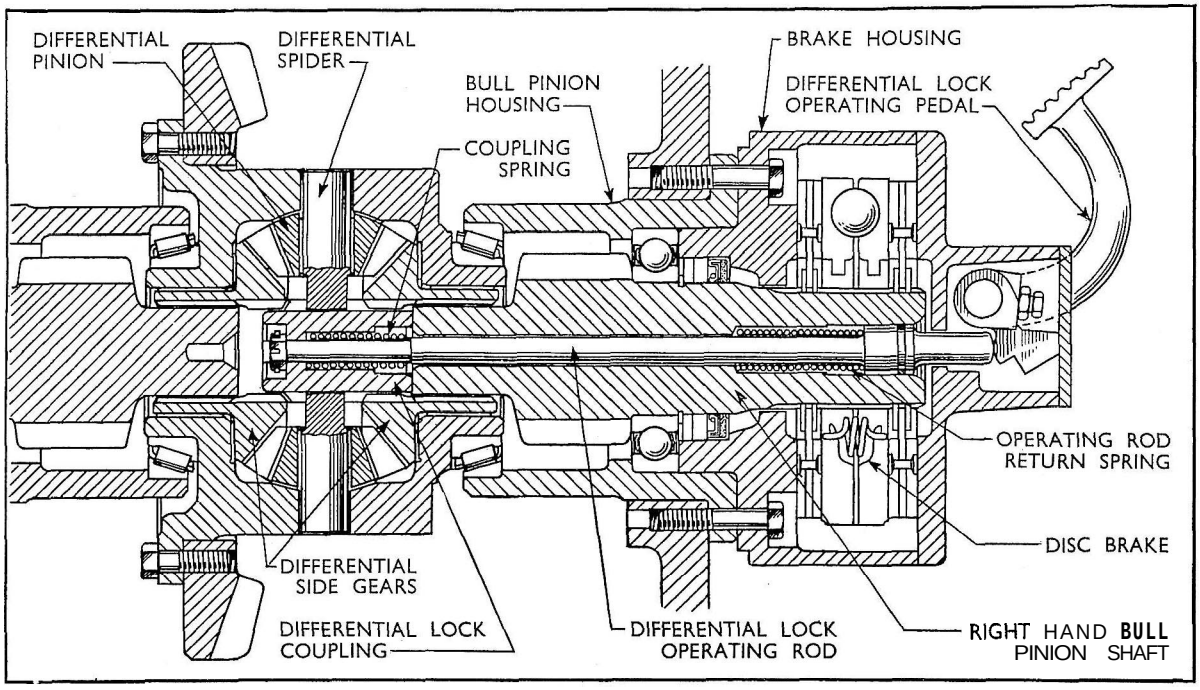


Fig. 8
**Differential Lock**

Although the basic gear train function is unchanged, considerable redesigning of the rear transmission differential has taken place to enable a locking device to be incorporated (see Fig. 9) and the opportunity has been taken to generally strengthen the differential components. At the same time the bull pinion extension housings have been discontinued as the disc brakes fitted to the Super Major are mounted directly onto the side of the transmission housing.

### Transmission Housing

A new rear transmission housing, incorporating a modified top flange to locate the hydraulic lift inlet and exhaust pipes, is used on the Super Major. The overall dimensions and mounting points have, however, been retained and the new housing can, therefore, be used on previous Major tractors.

### Differential Lock

Where conditions occur whereby one rear wheel encounters a soft patch, without a differential lock this wheel will have a tendency to spin, nearly all the drive being taken to this wheel and relatively little to the other wheel, with the result that the tractor is either considerably slowed down or comes to a complete halt.

The differential lock fitted to the Super Major overcomes this disability and enables additional traction to be obtained from the wheel which is on firm ground, thus enabling the tractor to pull through the soft patch.

The differential locking arrangement is illustrated in Fig. 8, and consists of an externally splined sliding coupling locating in the internal splines of the right-hand differential side gear. The coupling is of sufficient length to enable engagement to be also made with the internal splines of the left-hand differential side gear when it is moved axially by a foot pedal mounted on the right-hand disc brake cover.

A spring loaded plunger, passing through the central bore of a new type right-hand bull pinion shaft, connects the sliding coupling with a cam which, in turn, is connected to the foot pedal.

In operation, depression of the foot pedal rotates the cam and moves the plunger and sliding coupling to the left, thus locking the left- and right-hand differential side gears together. The differential gears and pinions are then unable to rotate independently and the drive is thereby equally distributed to both rear wheels.

If the splines of the coupling and left-hand side gear are not completely aligned when the foot pedal is depressed, engagement will not take place immediately, but the operating plunger will continue to move to the left thus compressing the coupling spring (Fig. 8). This spring remains in compression until the splines on the relative parts are aligned, when it will automatically move the coupling into engagement with the left-hand side gear.

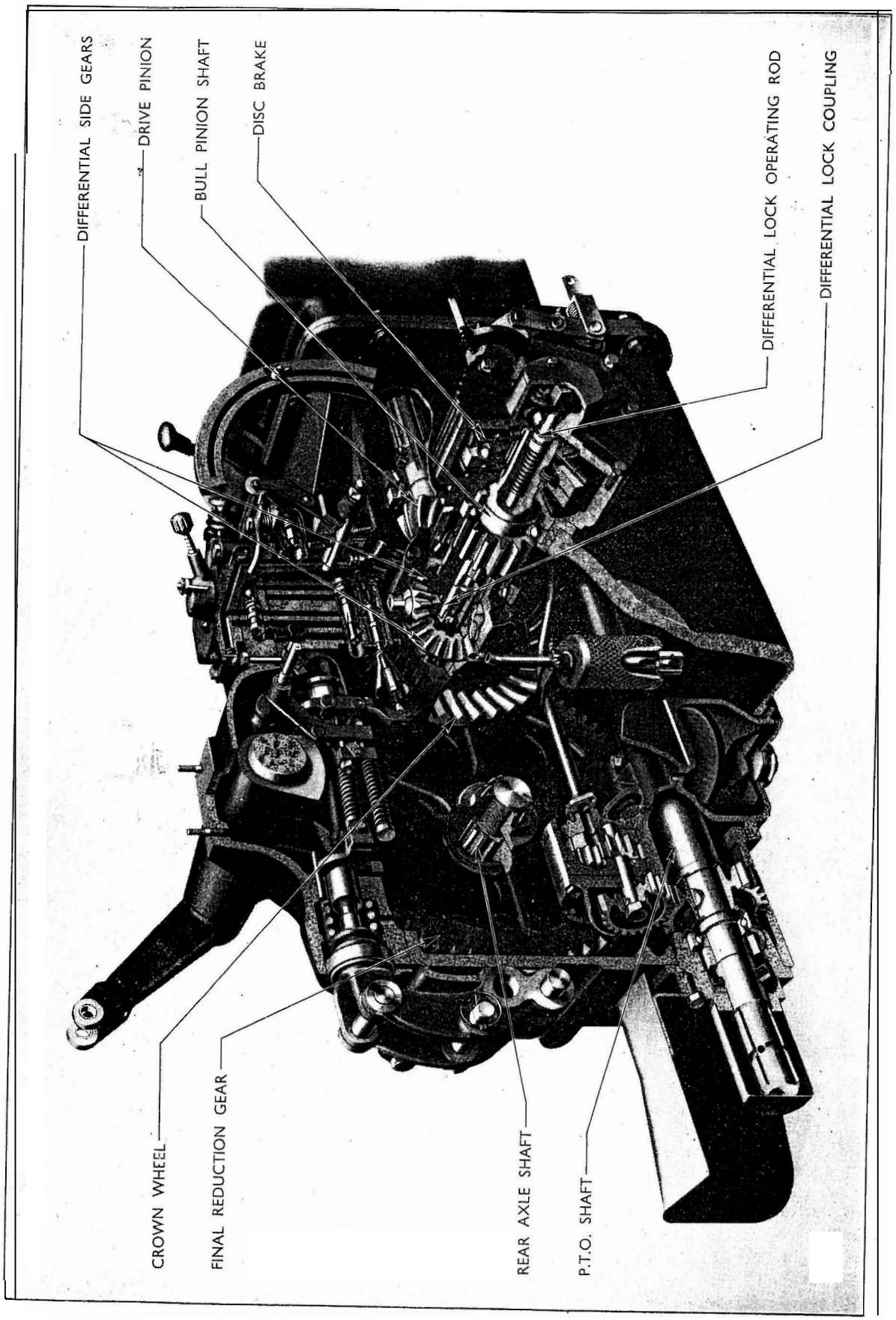


**Fig. 9 Sectioned View of Rear Transmission**

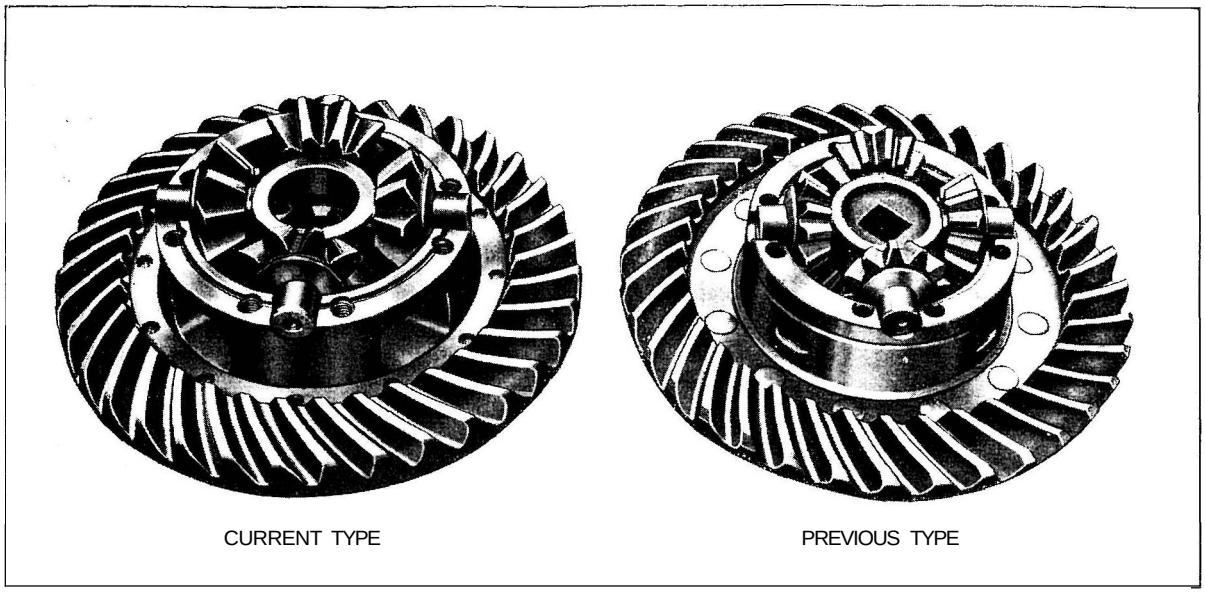


Fig. 10
**Crown Wheel and Differential Assembly with Right-hand Casing Removed**

### Differential Assembly

Quite apart from the locking device a completely new differential assembly (Fig. 10) is used on the Super Major, none of the parts being interchangeable with those used on previous Major tractors. Generally speaking, every component is larger than its counterpart on the previous Major and, in addition, the number of teeth on the side gears has been changed from 20 to 16, and those on the pinions from 11 to 9.

To compensate for the increased overall width of the differential casing the supporting taper roller bearings have been decreased in width but increased in diameter, necessitating new bull pinion housings to accept the new bearing cups.

### Crown Wheel

The new crown wheel (larger internal bore to suit the Super Major differential case, but with the same number of gear teeth as previously used) is secured to the left-hand differential casing by twelve self-locking bolts—as against the previous rivetted method of retention. The larger diameter differential casing flange has also necessitated a modified crown wheel thrust pad.

### Bull Pinions and Final Reduction Gears

The introduction of disc brakes, still operating on the bull pinion shafts but fitting directly onto the transmission housing, has obviated the necessity of fitting brake extension housings and, in consequence, the bull pinion shafts are shorter than those previously used, also the right-hand shaft is hollow to accept the differential lock operating rod.

Each bull pinion shaft is now supported at its centre by a bearing within the bull pinion housing and at its inner end by the differential side gear.

Changes in tooth form of the large reduction gears mean that the Super Major parts are not interchangeable with those previously used.

### Lubrication

To provide improved lubrication of the drive pinion bearings, a new scraper and trough assembly (see Fig. 11) collects oil from the periphery of the crownwheel and directs it into the drilled passage in the front wall of the transmission housing, where it is fed into the space between the drive pinion taper roller bearings.

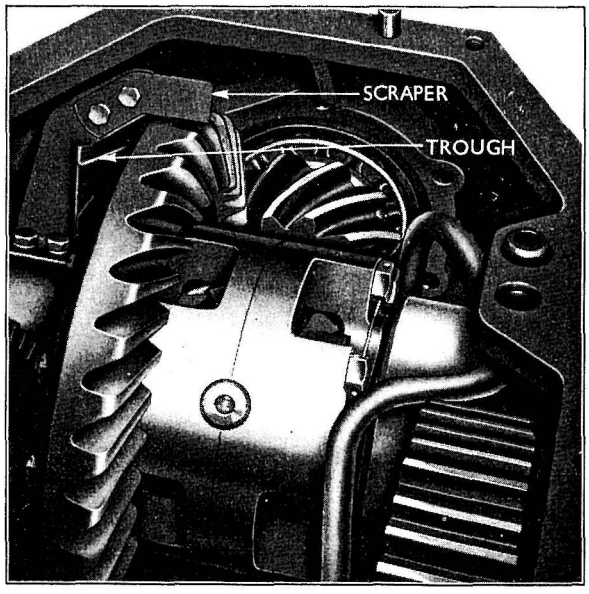


Fig. 11
**Oil Scraper and Trough**

The new scraper assembly locates in the same position as, the scraper, box and oil pipe previously used to feed oil to the differential. The latter assembly is not required on the Super Major as the larger '' windows '' incorporated in the new differential casings permit oil, forced from between the crown wheel and pinion teeth, to be fed directly into the differential components.

## REPAIR PROCEDURE

### To Remove the Left-Hand Bull Pinion Shaft

1. Disconnect the battery and the wiring, to the left-hand side and tail lamp.

2. Disconnect the clutch pedal return spring. Remove the four bolts securing the platform to the platform bracket and brake housing, the bolt securing the fender to the platform bracket, and the two fender mounting bolts. Remove the fender and platform as an assembly.

*3.* Remove the left-hand brake cover, disconnect the brake actuating linkage and remove the brake discs and actuating plates assembly from the brake housing.

4. Remove the six self-locking bolts securing the brake housing to the rear transmission housing, and withdraw the brake housing taking care not to disturb the bull pinion housing and shims during this operation.

*5.* Remove the oil baffle frorn the bull pinion shaft bearing, and withdraw the bull pinion shaft from the bull pinion housing, once again taking care not to disturb the bull pinion housing and shims.

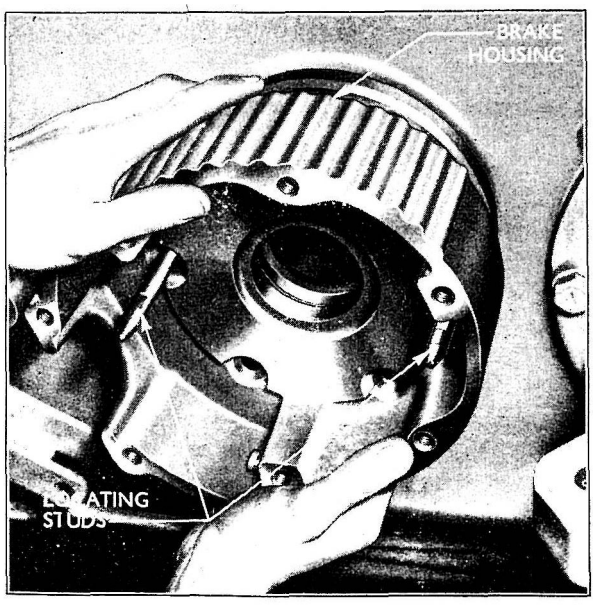


Fig. 12
Replacing Brake Housing

### To Replace the Left-Hand **Bull** Pinion Shaft

**1.** Insert the bull pinion shaft and bearing into the bull pinion housing, ensuring that the bearing contacts the shoulder within the bull pinion housing.

2. Replace the bull pinion shaft oil baffle.

*3.* Fit the two bull pinion housing locating studs (Tool No. PT.4063) and replace the brake housing (see Fig. 12), tightening the six self-locking bolts to a torque of 55-65 lb./ft. (7.61-8.99 kg.m.).

4. Replace the brake inner friction disc, actuating plates assembly, outer friction disc and brake housing cover then re-connect the brake actuating linkage.

*5.* Replace the platform and fender assembly and the clutch pedal return spring.

6. Reconnect the wiring to the tail and side lamp and re-connect the battery.

7. Adjust the brakes as described in the Super Major Supplement Section 8.

### To Renew the Left-Hand **Bull** Pinion Shaft Bearing

1. Remove the left-hand bull pinion shaft as previously described.

**2.** Remove the bearing retaining circlip, and drive the bearing from the shaft using a suitable drift located between the teeth of the bull pinion.

*3.* Fit a new bearing to the bull pinion shaft and secure the bearing in position by means of a new circlip.

4. Replace the bull pinion shaft as described above.

### To Remove the Right-Hand **Bull** Pinion Shaft and Differential Lock Assembly

1. Disconnect the battery and the wiring to the right-hand side and tail lamp.

2. Remove the four bolts securing the platform to the platform bracket and brake housing, remove the bolt securing the fender to the platform bracket and the two bolts securing the fender to the rear axle housing. Remove the fender and, platform as an assembly.

3. Remove the brake cover and differential lock operating pedal assembly, disconnect the brake actuating linkage and remove the brake discs and the actuating plates assembly from the brake housing.

4. Remove the six brake housing retaining bolts and withdraw the brake housing, taking care not to disturb the bull pinion housing and shims during this operation. Remove the oil baffle from the bull pinion shaft bearing.

5. Withdraw the bull pinion shaft and differential lock assembly once again taking care not to disturb the bull pinion housing.

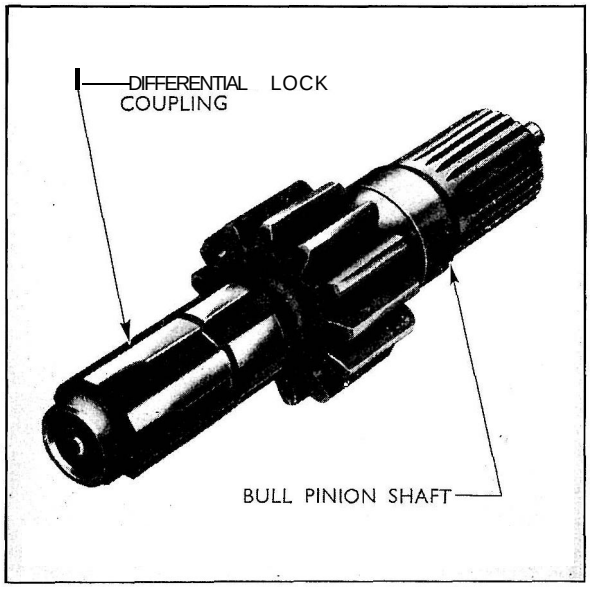


Fig. 13
**Differential Lock Coupling Spline Alignment**

### To Replace the Right-Hand Bull Pinion Shaft and Differential Lock Assembly

1. Align the splines of the differential lock coupling with the splines on the inner end of the bull pinion shaft as illustrated in Fig. 13. Insert the bull pinion shaft and differential lock assembly into the bull pinion housing so that the differential lock coupling and the end of the bull pinion shaft engage with the right-hand differential 'side-gear.
2. Replace the bull pinion shaft bearing oil baffle.
3. Fit the two bull pinion housing locating studs (Tool No. PT4063) and replace the brake housing, tightening the six self-locking bolts to a torque of 55-65 lb./ft. (7.61-8.99 kg.m.).
4. Replace the brake discs, actuating plates assembly and brake housing cover and reconnect the brake actuating linkage and differential lock operating pedal assembly.
5. Replace the fender and platform assembly, reconnect the wiring to the side and tail lamp and reconnect the battery.
6. Adjust the brake as described in the Super Major Supplement Section 8.

### To Dismantle the Right-Hand Bull Pinion Shaft and Differential Lock Assembly

1. Remove the bull pinion shaft and differential lock assembly as described on page 10.
2. Remove the split pin and castellated nut from the inner end of the differential lock operating rod and remove the differential lock coupling, coupling spring and thrust washer.
3. Withdraw the operating rod and return spring from the bull pinion shaft.
4. Remove the bull pinion shaft bearing retaining circlip and drive the bearing from the shaft by means of a suitable drift.

### To Reassemble the Right-Hand Bull Pinion Shaft and Differential Lock Assembly

The illustration, Fig. 14, shows an exploded view of the bull pinion shaft and differential lock assembly.

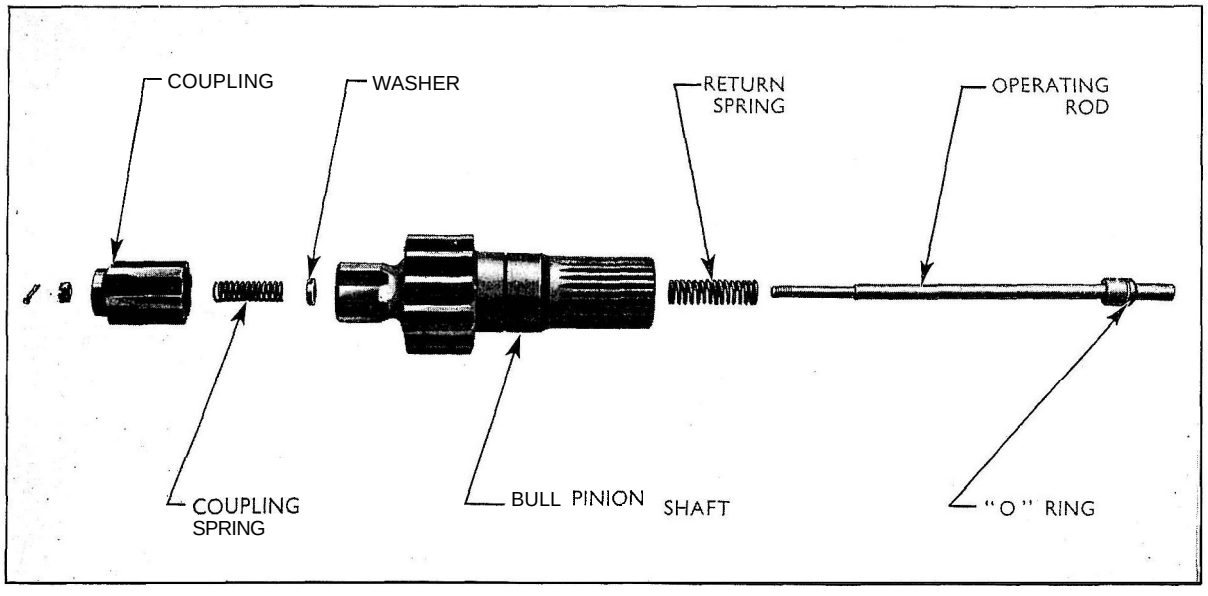


Fig. 14
**Bull Pinion Shaft and Differential Lock Assembly**

1. Replace the bull pinion shaft bearing and fit a new bearing retaining circlip.
2. Fit a new "O" ring to the outer end of the operating rod and insert the return spring and operating rod into the bull pinion shaft.
3. Replace the thrust washer, coupling spring and coupling on the inner end of the operating rod.
4. Replace the castellated nut to retain the coupling and, by means of this nut, adjust the protrusion of the differential lock operating rod from the outer end of the bull pinion shaft to 1.30-1.32 in. (33.02-33.53 mm.) as illustrated in Fig. 15.
5. Fit a new split pin to lock the castellated nut at the end of the operating rod, ensuring that the split pin does not project beyond the end of the coupling.
6. Replace the bull pinion shaft and differential lock assembly as described on page 10.

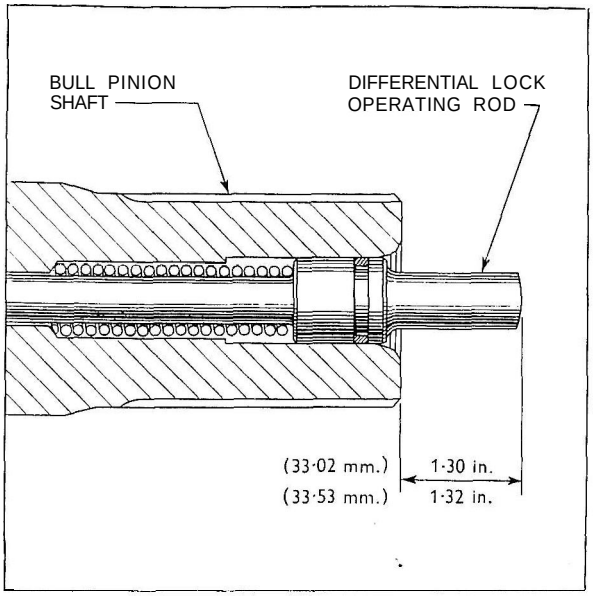


Fig. 15
**Differential Lock Operating Rod Adjustment**

### To Overhaul the Differential Lock Operating Pedal

1. Remove the brake housing cover and differential lock operating pedal assembly.
2. Remove the two bolts securing the operating lever cover plate and remove the cover plate.
3. Drive the pin from the cross shaft retaining collar and remove the collar.
4. Slacken the locking nut and remove the grub screw from the operating pedal. Withdraw the operating pedal and cross shaft, and remove the lever.
5. Drive out the pin securing the pedal to the cross shaft and remove the pedal from the cross shaft.
6. Inspect the cross shaft bearing bushes and fit new bushes if necessary.
7. Fit the pedal to the cross shaft ensuring that the pedal is fitted to the correct end of the shaft. This may be checked by noting the position of the dimple in which the grub screw locates.
8. Insert the cross shaft into the front bearing and position the operating lever so that the shaft may be passed through the lever and lever bearing.
9. Replace the grub screw and lock nut to secure the lever to the cross shaft.
10. Replace the locking collar and fit a new pin to secure the collar to the shaft,
11. Replace the operating lever cover plate.
12. Replace the brake housing cover and differential lock operating pedal assembly to the brake housing, and secure by means of the seven bolts and spring washers.

### To Remove a Rear Axle Shaft

1. Disconnect the battery and wiring to the tail lamp.
2. Remove the rear transmission housing top cover plate and seat, or if hydraulic power lift is fitted, remove the hydraulic lift top cover and lifting rods.
3. Jack up the rear of the tractor and remove the appropriate rear wheel.
4. Lift the edge of the rear axle shaft oil seal retainer at the three points where it is peened over into the groove in the rear axle shaft housing.
5. Remove the split pin and castellated nut securing the final reduction gear to the rear axle shaft, support the final reduction gear and withdraw the rear axle shaft from the axle shaft housing.

### To Replace a Rear Axle Shaft

1. Support the final reduction gear with its bearing cone located in the bearing cup at the inner end of rhe rear axle shaft housing and insert the axle shaft complete with bearing, oil seal and oil seal retainer into the axle housing. Engage the splines on the rear axle shaft with the splines in the final reduction gear.
2. Replace the final reduction gear retaining nut (left hand thread), initially tightening the nut until there is no end-float on the shaft.

   To adjust the rear axle shaft bearing preload it is necessary to remove the bull pinion shaft as described on page 10. Locate the preload gauge (Tool No. **T.4062)** on two of the wheel retaining bolts and by means of the final reduction gear retaining nut, adjust the bearing preload to 45 lb. in. **(6.23 Kg.m.)**.

3. Replace the split pin to secure the final reduction gear retaining nut and " stake " the oil seal retainer, at diametrically opposite points, into the retaining groove in the axle shaft housing.
4. Replace the wheel and remove the jack.
5. Fit a new gasket to the top face of the rear transmission housing and replace the rear transmission housing top cover or hydraulic lift top cover and lifting rods if fitted.
6. Replace the seat, connect the wiring to the tail lamp and reconnect the battery.

### To Renew a Rear Axle Shaft Outer Bearing Cone or Oil Seal

1. Remove the rear axle shaft as described on page 12.
2. Insert the " U " shaped portion of the bearing remover (Tool No. T.4061), behind the bearing cone; it will be necessary to distort the oil seal retainer in order to position the tool correctly. Withdraw the bearing from the shaft, taking care that the side rods of the tool are not allowed to twist during this operation.
3. Remove the oil seal and retainer from the shaft.
4. Fit a new oil seal and felt to a new oil seal retainer and locate the retainer on the shaft.
5. Draw the new bearing cone onto the shaft using Tool No. T.4059.
6. Replace the rear axle shaft and adjust the bearing preload as described on page 12.

### To Remove the Final Reduction Gear

1. If H.P.L. is fitted, drain the oil from the rear transmission housing and remove the hydraulic lift top cover and hydraulic pump as described in the Super Major Supplement Section 6.
2. Remove the rear axle shaft as described on page 12.
3. Lift the final reduction gear from its location in the rear transmission housing.

### To Replace the Final Reduction Gear

1. Support the final reduction gear within the rear transmission housing with the bearing cone located in the bearing cup in the rear axle shaft housing.
2. Replace the rear axle shaft as described on page 12.
3. Replace the hydraulic pump, if fitted, before replacing the hydraulic lift top cover.

### To Remove a Rear Axle Shaft Housing

1. Drain the oil from the rear transmission housing or lower the oil level until it is below the rear axle shaft housing.
2. Remove the rear axle shaft as described on page 12.
3. Disconnect the check chain from the check chain bracket and remove the fender.
4. Remove the rear axle housing retaining bolts and withdraw the axle housing from the rear transmission housing.

### To Replace the Rear Axle Shaft Housing

1. Fit the two rear axle housing locating studs (Tool No. CT.6076), to the rear transmission housing, fit a new gasket and replace the rear axle shaft housing.
2. Replace the rear axle shaft and adjust the bearing preload as described on page 12.
3. Replace the fender and connect the check chain to the check chain bracket.
4. Fill the rear transmission housing to the correct level with the appropriate grade of oil.

### To Renew the Rear Axle Shaft Housing Bearing Cups and Final Reduction Gear Bearing Cone

1. Remove the rear axle shaft and rear axle shaft housing as described on page 12.
2. Locate the split adaptors T.4060-la behind the final reduction gear bearing cup and withdraw the bearing cup using main tool No. T.4060.
3. Remove the axle shaft bearing cup using split adaptors T.4060-lb and main tool T.4060.
4. Fit new rear axle shaft and final reduction gear bearing cups using tool No. T.4055. The bearing cups may be fitted simultaneously using this tool.
5. Remove the final reduction gear from the rear transmission housing.

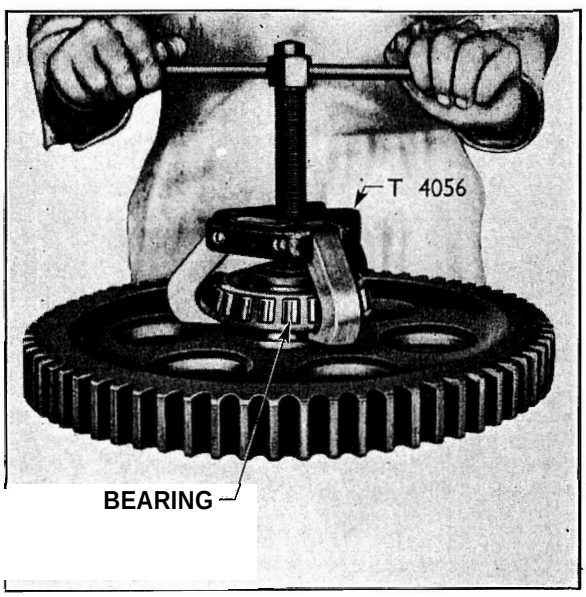


Fig. 16
**Removing Final Reduction Gear Bearing**

6. Remove the bearing cone from the final reduction gear using the three clawed bearing remover (Tool No. T.4056), as illustrated in Fig. 16. Before removing the bearing ensure that the claws of the tool are correctly located behind the bearing in order to avoid damage to the tool.

7. Fit a new bearing cone to the final reduction gear using the bearing replacer adaptor T.4057 with the 550 handle.

8. Replace the final reduction gear within the rear transmission housing.

9. Replace the rear axle housing and rear axle shaft as described on page 12.

### To Remove the Crown Wheel and Differential Assembly

1. Remove the left-hand bull pinion shaft, right-hand bull pinion shaft and differential lock assembly and the left-hand final reduction gear.

2. Remove the oil scraper and trough from the left-hand bull pinion housing.

3. Remove the three bolts which retain the crown wheel thrust pad and withdraw the thrust pad.

4. Remove the hydraulic oil feed pipe, return pipe and filter, if fitted, as described in the Super Major Supplement Section 6.

5. Support the crown wheel and differential assembly and withdraw the left-hand bull pinion housing and shims.

6. Lift the crown wheel and differential assembly from the rear transmission housing.

### To Replace the Crown Wheel and Differential Assembly

1. Fit the two bull pinion housing locating studs (Tool No. PT.4063) to the left-hand side of the rear transmission housing.

2. Fit the bull pinion housing shims over the locating studs. Enter the inner end of the bull pinion housing into the rear transmission housing.

3. Support the crown wheel and differential assembly with the right-hand differential case bearing cone located in the bearing cup in the right-hand bull pinion housing and slide the left-hand bull pinion housing into position to engage the left-hand differential bearing cup with the bearing cone.

4. Securely bolt the left-hand and right-hand bull pinion housings to the rear transmission housing and check the backlash between the crown wheel and drive pinion by means of a feeler gauge inserted between the teeth. The specified backlash is .004-.018 in. (.102—.457 mm).

5. If necessary, adjust the position of the crown wheel and differential assembly to bring the backlash within the specified limits. Adjustment of the backlash is achieved by repositioning the shims behind the flanges of both bull pinion housings. Note that the total thickness of shims should at all times be .016 in. (.406 mm) in order to maintain the correct preload on the differential case bearings.

6. Replace the crown wheel thrust pad and check that the clearance between the thrust pad and the crown wheel is within the specified limits of .004-.014 in. (.102—.356 mm). Adjustment of this clearance is effected by varying the number of gaskets behind the flange of the thrust pad.

7. Replace the oil scraper and trough and adjust the clearance between the scraper and the crown wheel to .004 in. (.102 mm).

### To Dismantle the Crown Wheel and Differential Assembly

1. Remove the crown wheel and differential assembly as previously described.

2. Inspect the differential casing to ensure that both halves of the casing have mating marks adjacent to the joint face. If no mating marks are present, the casing should be marked before commencing to dismantle.

3. Remove the eight wire locked bolts which secure the right-hand half of the casing to the left-hand half.

4. Lift off the right-hand half of the casing and remove the right-hand side-gear and thrust washer.

5. Remove the differential spider complete with the four pinions and thrust washers. Remove the pinions and thrust washers from the spider.

6. Remove the side gear and thrust washer from the left-hand differential casing.

7. If necessary drive the bearing cones from the differential casings by means of a punch located in the holes behind the bearings.

Note that if the bearing cones are renewed, the bearing cups within the bull pinion housings should also be renewed.

8. If necessary, remove the twelve self-locking bolts securing the left-hand differential casing to the crown wheel and withdraw the casing from the crown wheel.

9. Inspect the differential case bushes for wear or damage and, if necessary, renew the bushes as described on page 15.

### To Reassemble the Crown Wheel and Differential Assembly

1. Replace both differential case bearing cones ensuring that they locate against the shoulder on the differential casings.

2. Refit the left-hand differential case to the crown wheel and secure by means of the twelve self-locking bolts, tightening the bolts to a torque of 45-55 lb./ft. (6.2-7.6 kg.m.).

3. Replace the left-hand thrust washer and differential side-gear ensuring that the thrust washer is correctly located in its recess in the casing.

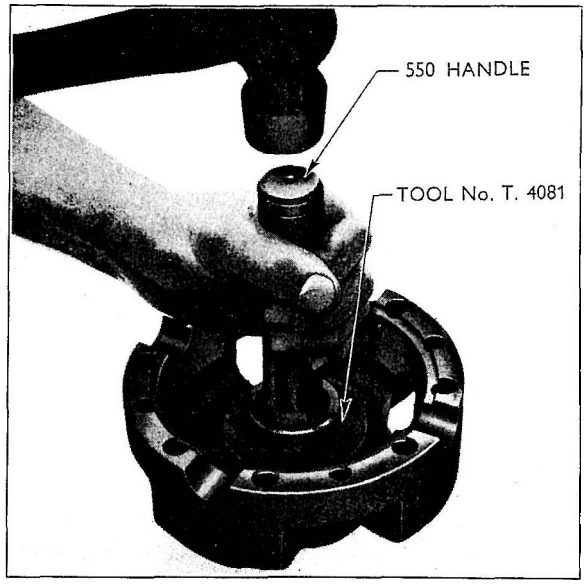


Fig. 17
**Replacing Differential Case Bush**

4. Fit the four pinions and thrust washers to the spider and replace the assembly in the left-hand differential casing.

5. Replace the right-hand side-gear and thrust washer in the right-hand differential case.

6. Locate the right-hand differential casing and side-gear on the left-hand casing with the mating marks correctly aligned.

7. Check that both side-gear thrust washers are located correctly. Replace, tighten and wire lock the eight bolts securing the two halves of the differential casing.

8. Replace the crown wheel and differential assembly as described on page 14.

### To Renew the Differential Case Bushes

1. Remove and dismantle the crown wheel and differential assembly as previously described. Note that it is not necessary to separate the crown wheel and left-hand differential case.

2. Drive the damaged or worn bushes from the two halves of the differential case taking care not to damage the surface of the bore of the differential casing which houses the bushes.

3, Drive the new bush into the differential casing using Tool No. T.4081 with the 550 handle as illustrated in Fig. 17. The bush should be driven into position from the inside of the differential casing until the large diameter shoulder of the tool contacts the machined thrust washer face of the casing.

4. Re-assemble and replace the crown wheel and differential assembly.

### To Overhaul the Drive Pinion and Bearings Assembly

1. Separate the engine and front transmission from the rear transmission housing as described in Section **3.**

2. Remove the crown wheel and differential assembly as described on page 14.

**3.** Before removing the pinion assembly, straighten the tabs of the locking washer and slacken the drive pinion locking nut, and adjusting nut using adjusting nut wrenches (Tool No. T.4067).

4. Remove the six drive pinion housing retaining bolts and withdraw the drive pinion and bearings assembly from the rear transmission housing. It may be necessary to drive the assembly from the rear transmission housing; this can be accomplished by using a drift located on the drive pinion housing. Under no circumstances should the drive pinion and bearings assembly be driven from its location by striking the drive pinion as this could result in damage to the rear bearing.

5. Remove the nuts, thrust washer and lock washer then withdraw the drive pinion and rear bearing cone from the drive pinion housing. The front bearing cone will then be released.

6. Withdraw the front and rear bearing cups from the drive pinion housing using Tool No. T.4060 and adaptors T.4060-2.

7. Remove the rear bearing cone from the drive pinion using main Tool No. T.7000 with the clawed ring adaptor T.7000-22.

8. Renew any parts which may be worn or damaged. Note that if it is necessary to fit a new drive pinion it

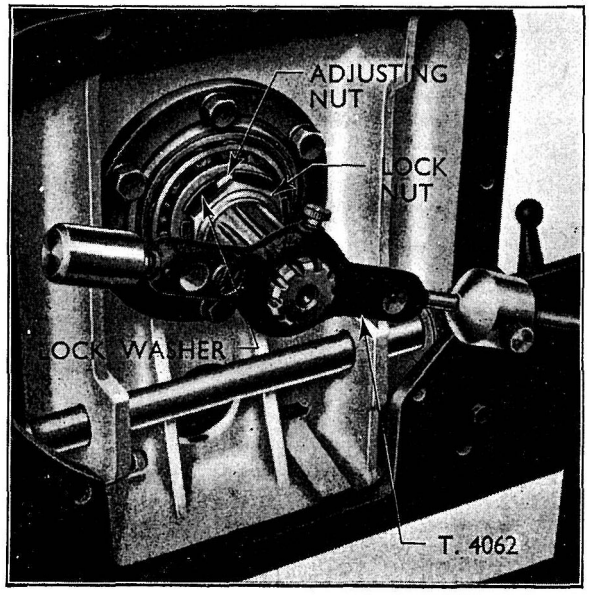


Fig. 18
**Checking Drive Pinion Bearing Pre-load**

will also be necessary to fit a new crown wheel as these parts are manufactured as a matched assembly.

Bearing cups and cones should also be renewed as an assembly.

9. Replace the drive pinion rear bearing cone using tool number T.7000 with the adaptor ring T.7000-22.

10. Fit both the front and rear drive pinion bearing cups to the drive pinion housing using Tool No. T.4060 and adaptors T.4060-2.

11. Insert the drive pinion into the pinion housing and replace the front bearing cone and thrust washer.

12. Replace the drive pinion bearing adjusting nut and position the nut so that the pinion is just free to rotate in its bearings. Fit a new locking washer and replace the locking nut, but do not tighten the locking nut.

13. Fit the drive pinion and bearings assembly to the rear transmission housing using guide studs CT.6076 and replace the six bolts securing the assembly to the housing.

14. Check the drive pinion bearing preload (see Fig. 18) and adjust to 12-16 lb./in. (1.66-2.07 kg.m.) using Tool Nos. T.4067, T.4064 and T.4065.

The drive pinion is held by the splined wrench Tool No. T.4064 whilst adjusting the preload by means of the drive pinion lock nut wrenches T.4067.

After setting the bearing preload, tighten the locking nut and again check the preload. Lock the two nuts by means of the locking washer tabs.

15. Replace the crown wheel and check the backlash between the crown wheel and pinion. Adjust the backlash if necessary as described on page 14.

16. Replace the bull pinion shaft, brake assembly, platform and rear transmission housing cover plate, adjust the brakes and fill the rear transmission housing to the correct level with the appropriate grade of oil.