

THE FRONT AXLE

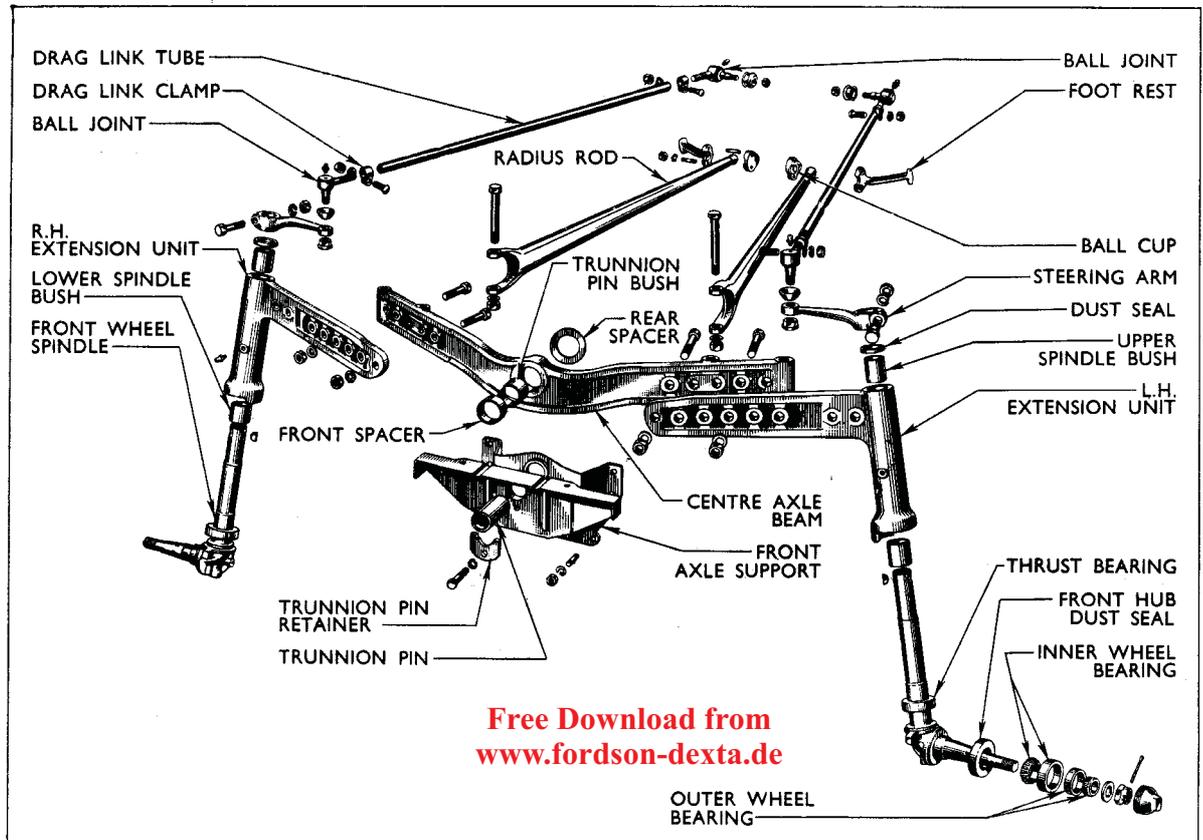


Fig. 1
The Front Axle

The front axle consists of a centre beam, mounted to the front engine support by means of a trunnion pin, and right- and left-hand extension units which carry the wheel spindles. Two radius rods are connected between the centre beam and the gearbox housing to provide rigidity for the front axle.

Front Track Adjustment

With standard 4.00x19 tyres, the front wheels are adjustable from 48 ins. to 76 ins. in 4 in. stages when the extension units are symmetrically positioned. With optional rims and 5.50x16 tyres the smallest possible track setting is 52 ins. otherwise the tyres will rub on the radius rods when on maximum lock. The cast figures on the outer axle beams indicate the track width when both outer axle beams are symmetrically positioned. Figures marked on the top flange of the outer axles (Fig. 2) indicate the track width when they line up with the innermost hole (Hole A) of the centre beam. Similarly, the figures on the bottom flange indicate track width when lined up with the outermost hole (Hole B) of the centre beam.

CAUTION.-At least one open bolt hole must be left between the axle beam to extension fixing bolts. The wheels must not be reversed on the hubs to obtain a greater track since this results in excessive loading on the bearings and mounting bolts. With track settings at, or below, 56 ins. the radius rods should be located in the inner holes (Hole C, Fig. 2) of the centre beam, but when the track is adjusted to over 56 ins. the radius rods must be moved to the outer holes (Hole D) to maintain rigidity.

When the track has been re-set it will be necessary to adjust the toe-in as described below, both drag links being adjusted to ensure equal lock.

TOE-IN

Toe-in of the front wheels is designed to be between 1/4 in. and 1/2 in. and may be regulated by adjusting the drag links. Correct toe-in is set at the factory and marked with four chisel marks, one on each spindle housing lining up with one on each steering arm. If new steering arms are fitted it will be necessary to re-align the wheels and re-mark for future reference.

If only one steering arm is to be changed, set the steering in the straight ahead position, using the marks on the opposite steering arm and axle extension as a guide.

Fit the new arm, connect its corresponding drag link and measure between the front wheels (at both front and rear) at hub height.

Adjust the drag link until the correct toe-in of 1/4 in. to 1/2 in. is obtained. Chisel mark the new arm in line with the existing mark on the axle beam. Should circumstances arise where it is not possible to use the original factory marking (i.e. if the marks become obliterated or if both steering arms or both axle extensions require renewing) it will be necessary to find first the centre of the steering box. Disconnect the drag link and count the number of turn required to move the steering wheel from lock to lock, then turn the wheel back half this number of revolutions.

Assemble the new parts and place the wheels in the straight ahead position, connect the drag links and adjust their lengths to give the specified toe-in. Chisel mark the arms and axle extensions as necessary.

The adjusted length of the drag links differ because of the position of the steering drop arms and, if fitting new drag links or drag link ends, the length of each drag link will have to be adjusted individually. The approximate lengths of the drag links with track at 52 ins. (132cm) are: R.H.- 39.1 ins. (99,3cm) and L.H.- 38.4 ins. (97,5cm). The front and rear drag link ends also differ as shown in Fig.3, and care must be taken to ensure that the links are fitted correctly.

It is most important that the drag link tube to drag link end clamp bolts are always



Fig. 3
Front and Rear Drag Link Ends

positioned so as to lie across the split in the tube.

Trunion Pin and Bush

To Remove

1. Disconnect the two radius rods from the centre beam and the drag links from the steering arms.
2. Jack up the front of the tractor to just support its weight and remove the front axle extension units.
3. Remove the trunion pin clamping bolt and retainer and draw out trunion pin, using Tool No. T.3051. Ensure that the spacers are maintained in their originally assembled order.
4. Slide out the centre beam sideways.
5. Drive out the trunion pin bush using Tool No. T.3052

To Replace

1. Fit a new bush using Tool No.T.3052 and check the fit of the trunion pin in the bush.
2. Slide the centre beam into position and align it with the front axle support.
3. Replace the trunion pin, remembering to fit the large spacer between the front of the centre beam and the axle support. The other spacers are fitted in the position they were in before stripping.
4. Refit the trunion pin retainer and clamping bolt.
5. Replace the axle extension units checking that the fixing bolts are located in the correct holes.

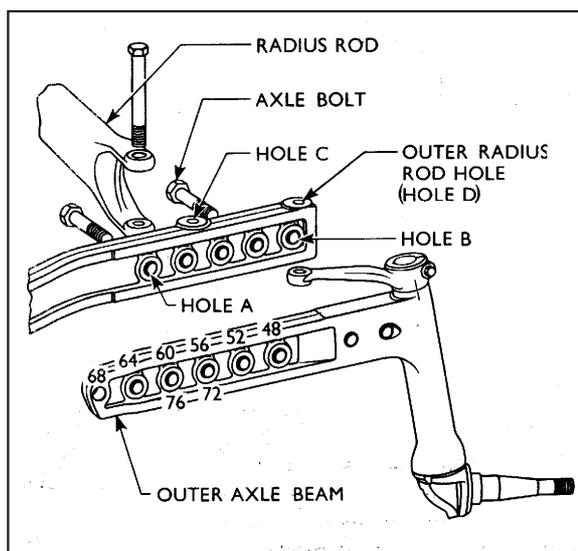


Fig. 2
Track Settings

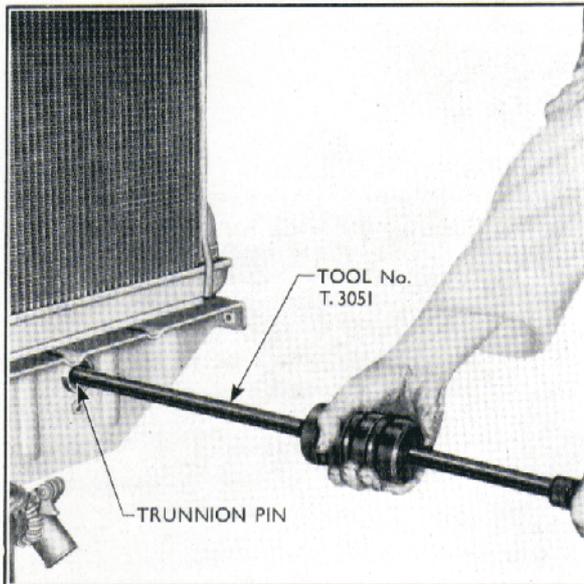


Fig. 4

Trunnion Pin Removal

6. Connect the radius rods to the centre axle beam.
7. Connects the drag links to the steering arms and check that the wheel alignment marks are correctly matched.
8. Remove the jack

Wheel Bearings

To Adjust

The following applies to both left- and right hand wheels.

1. Jack up the front of the tractor, grasp the wheel at the top and bottom and test for excessive play in the bearings. (Do not mistake worn wheel spindles or bushes for end play in the bearings.)
2. Remove the hub cap and extract the split pin from the bearing adjusting nut.
3. Rotate the wheel whilst tightening up the bearing adjusting nut and continue to tighten until a heavy drag can just be felt. Turn back the nut, one castellation at a time so that the wheel rotate freely, but with no end play. Fit a new split pin and reassemble the hub cap filled with clean grease. Finally lower the tractor to the ground.

The bearings should be tested for correct adjustment every 200 working hours and readjusted if necessary. Even if it is not necessary to adjust the bearings the hub cap should be removed and filled with clean grease.

CAUTION. Care should be taken to ensure that no dirt or water is allowed to reach the bearings, or inside the hub cap when the wheels are being readjusted

To Remove

1. Remove the hub cap and jack up the front wheel of the tractor.
2. Extract the split pin from the bearing adjusting nut and remove the nut and keyed washer.

3. Pull the wheel outwards so that the outer bearing can be detached and lift the wheel off the spindle.
4. The inner bearing can now be removed and if the dust excluder needs replacing it can be levered off its seat.
5. If the bearings need replacing press out the inner and outer bearing cup using Adaptors T.1024-4 in Tool No. T.1024.

To Replace

1. Fit the new inner and outer bearing cups using Adaptors T.1024-4 in Tool No. T.1024 and pack the hub with a good quality short fibre grease.
2. Fit a new dust excluder if required (using Tool No. T.3053) and replace the inner bearing on its seat.
3. Lift the assembly onto the spindle and locate the outer bearing and keyed washer.
4. Fit the adjusting nut and adjust the bearings as previously described.
5. Fit the new split pin and reassemble the hub cap filled with clean grease.
6. Remove the jack.

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Spindle Bushes

To Remove

1. Jack up the front of the tractor and remove the wheel.
2. Disconnect the drag link to steering arm connection.
3. Remove the front axle extension.
4. Slacken off the steering arm locking bolt, remove the steering arm, the woodruff key and the dust seal and slide out the wheel spindle (the bottom thrust bearing will come away with the wheel spindle.)

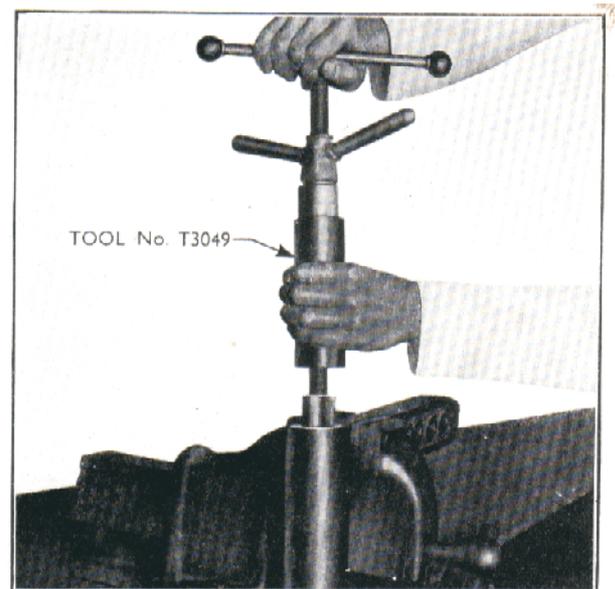


Fig. 5

Removing the Spindle Bushes

THE STEERING GEAR

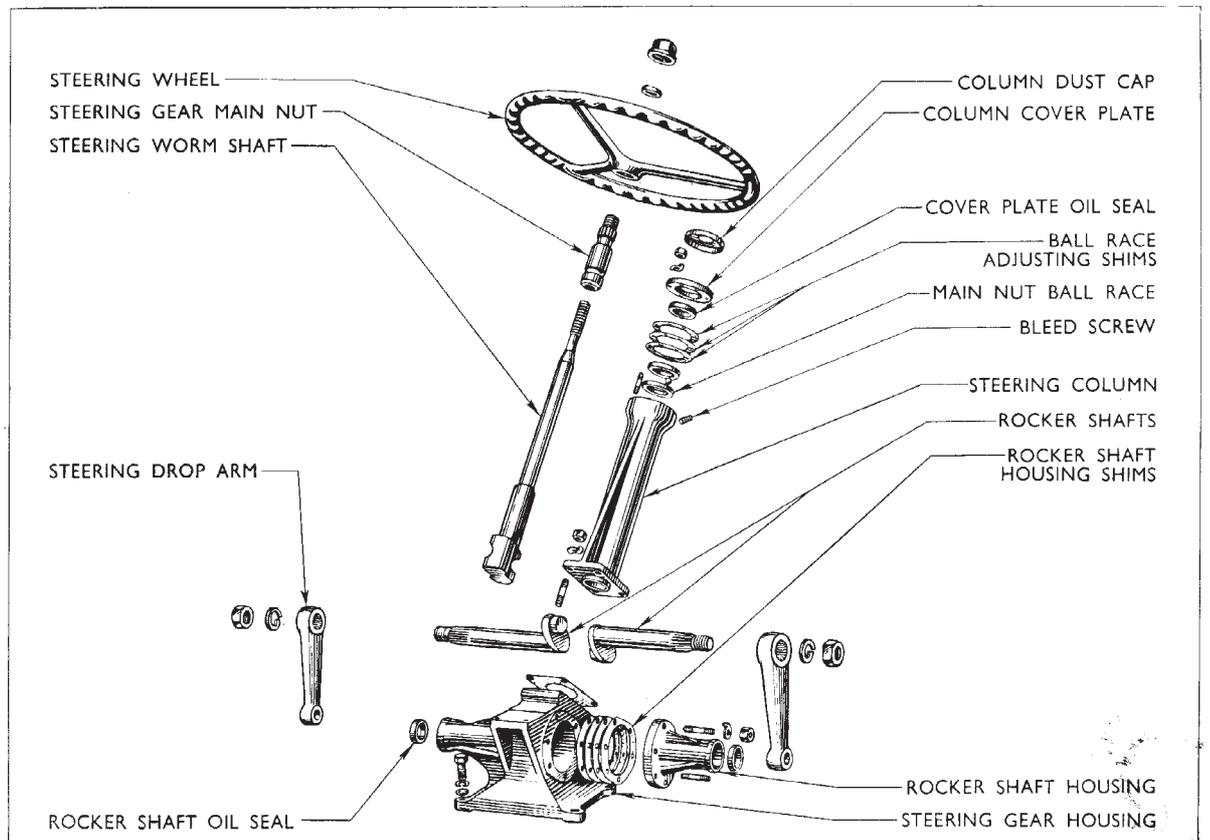


Fig. 7
 The Steering Gear

The steering gear which is mounted on the top of the clutch housing is of the worm and nut type. The worm consists of a "two start" thread machined on the upper end of the steering shaft and the nut rotates in a loose ball race located in the upper end of the steering column, designed to withstand end thrust as well as radial loading.

The steering main nut has an internal "two-start" thread which engages with the worm, and is splined into the hub of the steering wheel, which is retained on the main nut by a cap nut.

The lower end of the steering worm shaft is shaped to accommodate the cranked ends of two rocker shafts which extend to either side of the tractor. The outer ends of the rocker shaft are splined into

separate drop arms and these in turn are connected through individual drag links to each front wheel steering arm.

Steering wheel rotation will therefore cause the main nut to rotate within its bearing and so move the steering worm shaft vertically (up or down depending on the direction of rotation) within the steering column. Such movement of the steering worm shaft rotates the steering rocker shafts (in opposite directions) and transmits movement to the front wheels.

Each front wheel is therefore steered direct from the steering gear by its own drag link, which is adjustable for length, and the necessity for an inter-connecting track rod is eliminated.

The following operations can be carried out without removing the steering gear from the tractor.

Steering Cover Plate Oil Seal

To Remove

1. Unscrew the cap nut retaining the steering wheel to the steering main nut.
2. Lift the steering wheel from the main nut splines followed by the steering column dust cap.
3. Remove the pin securing the throttle lever to the vertical throttle rod and remove the lever.
4. Unscrew the four instrument panel securing screws, lift the panel from its location and move it clear of the top of the steering column. If necessary, the warning light bulb holders can be pulled out of their sockets to improve accessibility.
5. Bend back the locking tabs on the six steering column cover nuts and unscrew the nuts. Lift the cover plate from the studs and the steering main nut taking care not to damage the oil seal.

Note that a number of shims and gaskets are fitted between the cover plate and the column to provide adjustment on the ball race.

When the cover plate is removed a quantity of oil will run out of the column and this should not be allowed to run onto the wiring.

6. Drive the oil seal out of its location in the column cover plate.

To Replace

1. Fit the new seal, pressing it squarely into the plate with the lip facing downwards. Ensure that the seal does not stand proud of the lower face of the

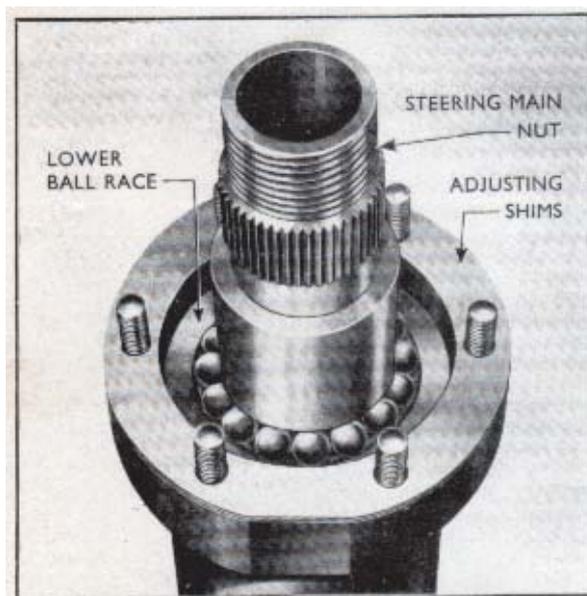


Fig. 8
The Steering Main Nut

plate. Refit the plate to the steering column and retain with six tab washers and nuts. Tighten the nuts to a torque of 12 lbs. ft. (1.65 kg.m.).

2. Refit the warning light bulbs in their appropriate sockets (the purple wire should be connected to the oil pressure warning light on the right-hand side and the yellow and white wire to the generator charging light on the left). Ensure that the small rubber sealing ring is located correctly in the throttle rod support bush in the instrument panel.
3. Refit the instrument panel, locating the throttle rod in its support bush and ensuring that the rubber gasket seats correctly between the panel and the fuel tank. Check that warning lights and temperature gauge are seated correctly in their locations in the plate and install the instrument retaining plate and rubber gasket. Fit and tighten the four long screws to secure the assembly.
4. Replace the column dust cap and fit the steering wheel onto the main nut splines.
5. Add sufficient oil through the centre of the steering main nut to bring the level above the worm shaft. Turn the steering wheel during the replenishing operation to obviate air locks.
6. Examine the rubber sealing washer fitted inside the steering wheel cap nut and renew if it shows signs of damage or deterioration.
7. Replace the steering wheel nut and sealing washer assembly and tighten securely.

Steering Main Nut Bearing

To Adjust

Adjustment of the steering main nut bearing is achieved by varying the number and thickness of the shims between the cover plate and the steering column (see page 9, Operations 7 and 8).

To Renew

The bearing upper race and balls may be renewed after removing the steering column cover plate, but should the lower race require replacing, it will be necessary to remove the steering column and drive out the old race through the top of the column.

This involves removal of the steering gear (complete) as outlined on page 7 (with the exception that the drop arms need not be removed) followed by Operations 2 to 4 of section headed "To Dismantle the Steering Gear" page 8.

To reassemble, follow Operations 6 to 13 of section headed "To Reassemble the Steering Gear," pages 9 and 10 followed by section headed "To Replace the Steering Gear," page 8.

STEERING DROP ARMS

To Remove a Steering Drop Arm

1. Remove the self-locking nuts on the drag link rear ball joints and disconnect the drag links from the drop arms.
2. Remove the nuts and spring washers retaining the drop arms to the steering rocker shafts and, using Tool No. T.3054, pull the drop arms from the rocker shaft splines by tightening the centre screw of the tool. If necessary, strike the end of the screw a sharp blow whilst retaining a tension on the arm to free the drop arm from the rocker shaft splines.

To Replace a Steering Drop Arm

The steering rocker shafts and drop arms are fully interchangeable but care must be taken on assembly that the drop arms are fitted in correct relation to the rocker shafts.

When fitted correctly, with the steering gear in the straight-ahead position (i.e. mid-way between steering locks), the bottom ends of both drop arms should incline rearwards at an angle of approximately 13 degrees to the vertical.

To facilitate assembly, a chisel mark is made on the threaded end face of the rocker shaft and two chisel marks are placed on the outer face of the large boss on the drop arm.

Depending on which side of the steering gear the drop arm is fitted, one of the marks on the drop arm must coincide with the mark on the rocker shaft. (If an attempt is made to assemble either drop arm using the incorrect marking for that particular side of the steering gear, it will be immediately apparent, as the drop arm will not then incline at the specified angle of 13 degrees from the vertical).

1. Ensure that the rubber dust seal behind the drop arm is in good condition, fit the drop arm and retain with the appropriate spring washer and nut.
2. Refit the drag link rear ball joint to the arm and retain with the appropriate self-locking nut.
3. Check that with the steering gear in the straight-ahead position the chisel marks on the axle extensions and on the steering arms line up, thus indicating that the front wheels are also correctly aligned. Adjust the drag links if necessary to obtain the above condition.

STEERING ALIGNMENT

To carry out a complete check of the alignment of the steering gear and linkage and the front wheels :—

1. Set the steering wheel in the straight ahead position, i.e. set midway between locks with the drag links disconnected.

2. Check that the steering drop arms are correctly fitted with the chisel marks lined up as described under "To Replace a Steering Drop Arm."

3. Set the front wheels in the straight ahead position with the specified toe-in of $\frac{1}{4}$ in. to $\frac{1}{2}$ in. The chisel marks on the axle extensions and the steering arms should then be in line.

4. Slacken the clamp bolts on the drag link ends and adjust the length of the drag links to fit exactly between the steering arms and drop arms.

The standard lengths for the drag links (track set at 52 ins.) are :—

- | | |
|----------------------|------------------------------|
| Left-hand drag link | 38.4 ins. (9.75 cm.) approx. |
| Right-hand drag link | 39.1 ins. (9.93 cm.) approx. |

5. Fit the self-locking nuts on the ball joint studs and tighten securely.

STEERING GEAR OVERHAUL

To Remove the Steering Gear

1. Remove the primary air cleaner, vertical exhaust pipe (if fitted) and the bonnet (4 screws, flat washers and nuts).
2. Disconnect the battery leads and remove the battery clamping bracket and battery.
3. Unscrew the four self-tapping screws in each control panel side plate and remove the plates.
4. Drain approximately half a gallon (2.27 litres) of water from the radiator drain tap so as to bring the water level below the temperature gauge bulb unit in the cylinder head water outlet, and remove the bulb from the outlet.
5. Remove the steering wheel, release the instrument panel retaining plate screws, detach the warning light bulb holders and remove the plate as described under : "To Remove the Steering Cover Plate Oil Seal."
6. It will facilitate handling if the fuel tank is drained, but this is not absolutely necessary if care is taken to ensure that the fuel tap is fully closed. Disconnect the main fuel pipe and induction primer pipe from the fuel tap and the injector leak-off pipe from the front of the fuel tank.

7. Unscrew the three bolts securing the fuel tank to the support brackets (two bolts at front, one at rear).

8. Lift the fuel tank complete with instrument panel and temperature gauge unit over the steering column and away from the tractor. Store the tank carefully to avoid damaging the fuel unions.

9. Disconnect the vertical throttle control rod from the horizontal relay rod.

10. Disconnect the drag links and remove the drop arms as previously described.

NOTE.—This is not necessary if the steering box is not to be dismantled.

11. Unscrew the four bolts securing the steering gear to the clutch housing and the single bolt passing through the fuel tank front support bracket into the steering gear housing.

12. Remove the steering gear assembly from the tractor.

To Replace the Steering Gear

1. Install the steering gear on the clutch housing and fit the four securing bolts, spring washers and flat washers. The electric horn, if fitted, should be installed under the front right-hand side bolt.

Refit the single bolt securing the fuel tank front support bracket to the steering gear.

2. Refit the steering drop arms and reconnect the drag links as described under "To Replace a Steering Drop Arm."

3. Use a length of cord to secure the warning light bulb holders to the upper end of the steering column. Locate the vertical throttle rod in its recess in the steering gear housing and reconnect the throttle relay rod.

4. Place the fuel tank on its support brackets passing it carefully over the steering column, throttle rod and wiring. Take particular care not to trap the temperature gauge bulb or tubing when making the assembly.

5. Release the warning light wires from the steering column and feed them through the appropriate holes in the instrument panel. Replace the warning light bulbs and insert in the holders in the instrument panel retaining plate. Install the plate and retaining screws.

6. Fit the three rubber mounting pads between the fuel tank and the brackets, and replace the three mounting bolts and spring washers.

7. Reconnect the main fuel feed pipe and the induction primer pipe to the fuel tap and primer assembly and the injector leak-off pipe to the union on the front of the fuel tank. It will be necessary to bleed the fuel system to exclude air before re-starting the engine.

8. Refit the throttle control lever and the steering wheel as described under, "To Replace the Steering Cover Plate Seal."

9. Replace the battery and battery clamping bracket and reconnect the battery leads. Operate the main control key to ensure that both warning lights are working correctly.

10. Refit the control panel side plates securing each with four self-tapping screws.

11. Refit the temperature gauge bulb unit in the cylinder head outlet and refill the radiator.

12. Replace the bonnet and secure with four screws, flat washers and nuts.

13. Replace the primary air cleaner and vertical exhaust pipe (if fitted).

To Dismantle the Steering Gear

1. Remove the steering gear from the tractor as previously described (the steering wheel and steering drop arms will normally have been removed from the steering gear prior to its removal from the tractor).

2. Remove the steering column cover plate, steering main nut, bearing upper race and balls as described under "To Remove the Steering Cover Plate Oil Seal."

3. Invert the assembly and pour away the oil.

4. Bend back the locking tabs on the four steering column to steering box retaining nuts, unscrew the nuts and remove the steering column.

Examine the balls and races of the bearing and if either shows signs of pitting or excessive wear the complete bearing should be renewed.

If such replacement is necessary drive the lower race out through the top of the steering column using a long rod which should be inserted from the base of the column and located against the bottom face of the ball race.

Drive the new lower race into position to seat against the shoulder at the top of the internal bore of the column.

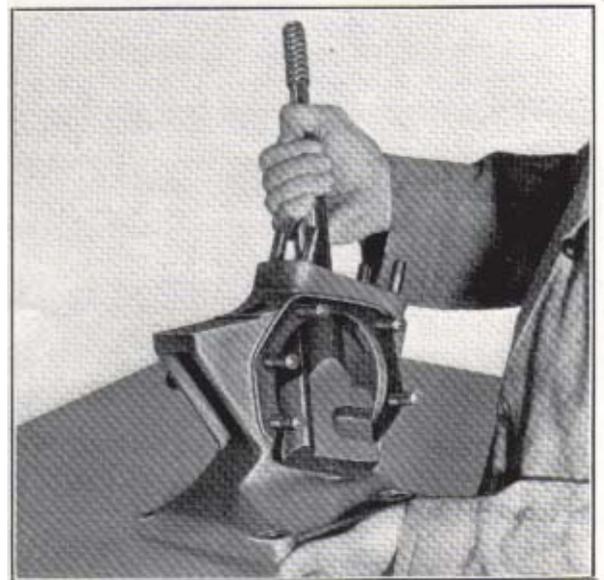


Fig. 9
Removing the Steering Worm Shaft

5. Separate the left-hand rocker shaft housing on the steering box by bending back the tab washers and unscrewing the six nuts. Note that a number of shims are fitted between the housings to provide an adjustment on the rocker shaft engagement with the lower end of the worm shaft.

6. To remove the steering worm shaft from the steering box, remove the lower rear rocker shaft housing stud and withdraw the shaft through the left-hand side of the steering box as shown in Fig. 9.

7. Remove the rocker shafts from their respective housings. The shafts are identical but if they are to be re-used it is recommended that they are reassembled in the same housings from which they were originally removed.

To renew the rocker shaft oil seals lever the old seals out of the housings and drive or press the new seals squarely into position with the lip on the seals facing inwards. Pressure should be applied only to the outer edge of the seals to avoid damaging the lip.

To Reassemble the Steering Gear

1. Examine the rocker shafts for burrs which could damage the oil seals on reassembly.

NOTE.—The rocker shaft housings are serviced complete with bushes, which are ball broached after assembly into the housings.

Coat the rocker shafts liberally with oil and assemble into their respective housings ensuring that they are a good fit.

2. Fit the steering worm shaft into the steering box and replace the stud previously removed to facilitate dismantling.

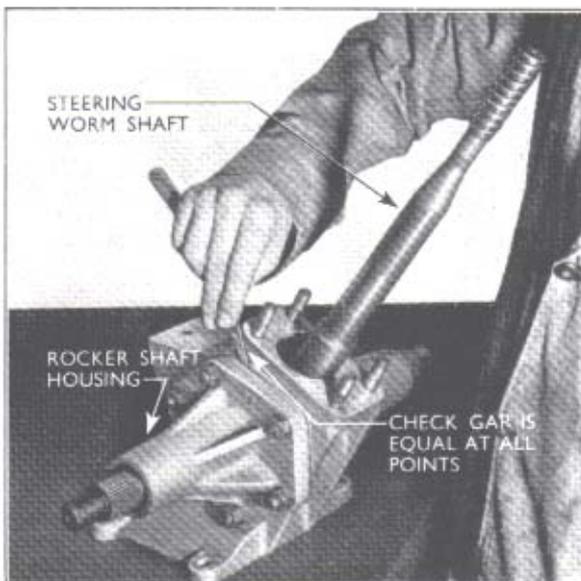


Fig. 10
Rocker Shaft Adjustment

3. Assemble the left-hand rocker shaft housing complete with rocker shaft and ensure that both rocker shafts engage correctly with the worm shaft. Fit the securing nuts finger tight and position the worm shaft centrally between its stops. Using feeler gauges measure the gap between the steering box and the left-hand housing ensuring it is equal at all points (Fig. 10).

4. Remove the left-hand rocker shaft housing, insert a sufficient number of shims and gaskets equal in thickness to the measured gap and replace the housing. Two sizes of steel shims are available of thickness .005 in. (.127 mm.) and .030 in. (.762 mm.). A gasket should also be fitted between the shims and the steering box and rocker shaft housing faces, and to facilitate adjustment two thicknesses of gasket are available i.e. .002 in. (.51 mm.) and .010 in. (.254 mm.). It should be noted that the compressed thickness of the .010 ins. gasket is approximately .007 in. (.178 mm.).

5. Tighten the six housing nuts fully, check that the rocker shafts turn freely without binding in any one position and bend over the tab washers to secure the nuts.

6. Fit the steering main nut in the top of the column, install the fifteen ball bearings, fit the bearing upper race and the cover plate.

7. Fit the six nuts on the cover plate studs and tighten sufficiently to remove all side movement of the main nut whilst still permitting it to turn freely.

Use feeler gauges to measure the gap between the cover and the column, ensuring that this is equal at all points, and select shims and gaskets of the equivalent thickness (see Fig. 11).

The shims available are .004 in. (.102 mm.) and there are two sizes of gaskets .002 in. (.051 mm.) and .010 in. (.254 mm.) which should be fitted between the shims and the housing and cover plate.

Note that the .010 in. (.254 mm.) gasket compresses to a thickness of approximately .007 in. (.178 mm.).

8. Remove the cover plate, insert the selected shims and gaskets and refit the cover plate. Tighten the six retaining nuts and check that the main nut turns freely without side play. If necessary, remove the cover plate to add or remove shims as required to obtain the correct adjustment.

9. When the correct adjustment is obtained bend over the tab washers to lock the retaining nuts.

10. Fill the steering gear housing with oil and fit a new paper gasket on the housing to column joint face.

11. Install the column and main nut assembly on the steering gear housing, turning the main nut clockwise to engage the worm shaft as the column is lowered into position. Tighten the column to housing nuts and bend over the tab washers.



Fig. 11
Steering Main Nut Bearing Adjustment

12. Remove the bleed screw and fill the column with oil, tilting the assembly to position the screw hole to the top.

13. Replace the bleed screw and finally top up the oil level by pouring oil into the centre of the main nut to cover the worm shaft when the steering is in the straight-ahead position (i.e. mid-way between stops).

Turn the main nut as oil is added to obviate any air locks which might possibly stop the oil from passing into the steering gear housing.

14. Rebuild the tractor as described under "To Replace the Steering Gear."

STEERING SPECIFICATIONS

Type	Worm and nut
Gear ratio	13.2 : 1 in straight-ahead position
Steering wheel diameter	18 ins. (44.72 cm.)
Turning circle	17 ft. (5.18 m.) with brakes
Main nut diameter (at oil seal location)	1.496 to 1.497 ins. (38 to 38.02 mm.)
{ Main nut bearing adjustment	By shims between cover plate and column
{ Shim thickness004 in. (.1016 mm.)
{ Gasket sizes002 in. (.0508 mm.) and .010 in. (.254 mm.) compressing to .007 in. (.1778 mm.)
Steering rocker shaft diameter	1.2475 to 1.2485 ins. (31.686 to 31.712 mm.)
{ Rocker shaft adjustment	By shims between housings to eliminate end-float
{ Shim thickness005 and .030 in. (.127 and .762 mm.)
{ Gasket thickness002 in. (.0508 mm.) and .010 in. (.254 mm.) compressing to .007 in. (.1778 mm.)
Grade of lubricant	S.A.E. 90
Capacity	2 1/8 pints

<i>Tightening Torque Figures</i>	<i>lbs. ft.</i>	<i>kg.m.</i>
Steering column cover plate nuts	12	1.65
Steering column to steering box nuts	60	8.30
Rocker cover nuts	60	8.30