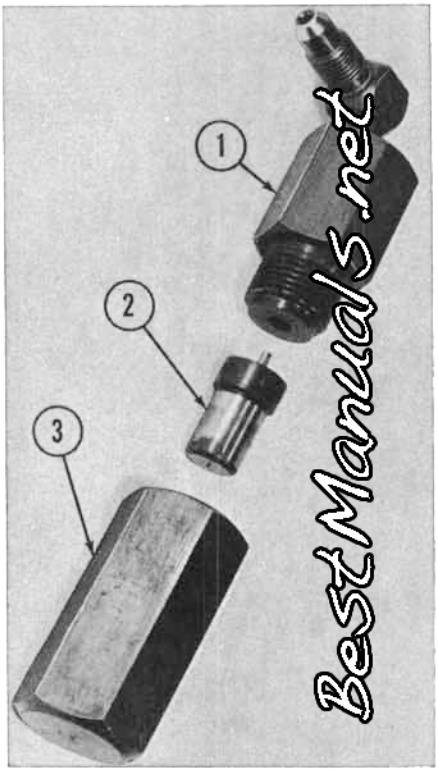


Fig. 79–The special nozzle valve extractor attaches to tester pump and uses hydraulic pressure to remove valve.

return the assembly to the carbon solvent. A special nozzle valve extractor (Fig. 79) is available which uses hydraulic pressure from tester pump to remove valve.

Examine the lapped pressure faces (A, B & D—Fig. 77) of nozzle body and holder for nicks or scratches, and the piston surfaces (C) of nozzle valve and body for scratches, wear or scoring. Clean the fuel gallery (H) with the special hooked scraper tool as shown in Fig. 80, by applying side pressure while the body is rotated. Clean the nozzle valve seat with the brass seat scraper as shown in Fig. 81. Polish the seat with a pointed wooden polishing stick and a small amount of tallow. Use the special scraper to remove any carbon in dome cavity behind the spray holes as shown in Fig. 82, then clean the spray holes with the special cleaning wires held in a pin vise (Fig. 83). Leave only about 1/16-inch of cleaning wire extending through pin vise to resist bending. Start with the smaller size wires then use larger size. Keep wire points sharp while cleaning with the hone furnished in kit. If the 0.011 diameter wires can be inserted in spray holes after nozzle is clean, nozzle assembly should be renewed.

As the parts are cleaned, immerse in clean diesel fuel in a compartmented pan. Insert the nozzle valve into body underneath the fuel level to prevent

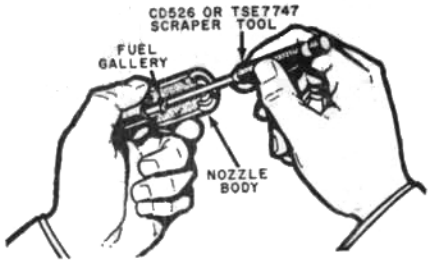


Fig. 80–Use the special scraper tool as shown to remove carbon and varnish from fuel gallery.

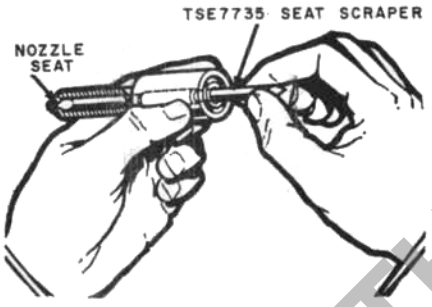


Fig. 81–Use the special brass seat scraper to clean nozzle seat.

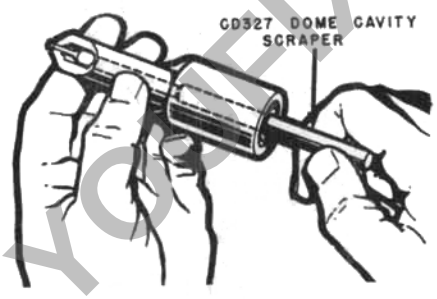


Fig. 82–Remove the carbon from dome cavity with the specially designed tool.

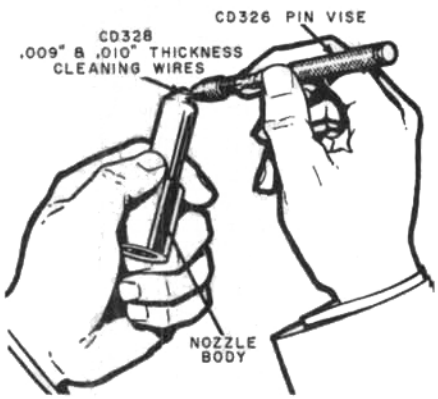


Fig. 83–Using pin vise and cleaning wires to clean early nozzle spray holes.

the inclusion of dust particles between the piston surfaces of nozzle valve and body (C—Fig. 77). If a reverse flushing attachment is available, flush the nozzle assembly after the valve is inserted, then immediately install the nozzle assembly on the holder. Make sure the sealing surfaces (A, B & D) are

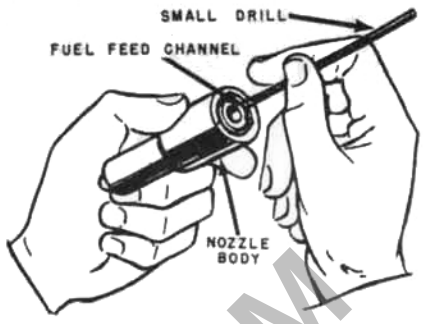


Fig. 84–Clean the fuel gallery with a small drill.

absolutely clean, and that nozzle assembly is properly installed on dowels (E). Tighten the nozzle cap nut to a torque of 50 ft.-lbs. using a twelve-point deep socket. Retest the injector as previously outlined. If injector fails to meet the tests and no leaks because of dust were found upon disassembly, renew the nozzle and any other parts suspected of being faulty.

INJECTOR NOZZLES

All Late Diesel Models

Late tractors use Roosa-Master 9.5 millimeter (pencil) nozzles. Refer to Fig. 85 for an exploded view.

96. TESTING AND LOCATING A FAULTY NOZZLE. If rough or uneven engine operation or misfiring indicates a faulty injector, the defective unit can usually be located as follows:

With engine running at the speed where malfunction is most noticeable (usually slow idle speed), loosen the compression nut on high pressure line for each injector in turn, and listen for a change in engine performance. As in checking spark plugs, the faulty unit is the one which, when its line is loosened, least affects the running of the engine.

If a faulty nozzle is found and considerable time has elapsed since the injectors have been serviced, it is recommended that all nozzles be removed and checked, or that new or reconditioned units be installed. Refer to the appropriate following paragraphs for removal and test procedure.

97. **REMOVE AND REINSTALL.** Wash injector, lines and surrounding area with clean diesel fuel or solvent to remove any dirt accumulation. Unscrew the leak-off tube tee-nut at all injectors, disconnect at injection pump and lift off leak-off tube as an assembly. Disconnect high-pressure lines at injector using two wrenches.

Injector unit can normally be re-

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FRONT SYSTEM

TRICYCLE AXLE

Dual Wheel Tricycle Models

1. Dual front wheels are mounted on a horizontal axle which is retained to the vertical spindle by a nut (N—Fig. 1) or by a snap ring. To adjust the wheel bearings, tighten the spindle nut until a slight drag is obtained when wheel is manually turned, then back the nut off until drag is just removed and install cotter pin.

Single Wheel Tricycle Models

2. A sectional view of single wheel and fork installation used on 630 series is shown in Fig. 2. Single wheel installation used on 530 series is similar except one half of tire flange is integral with hub and other half of rim is detachable. Bearings and axle shaft are identical for both series.

Axle is carrier on tapered roller bearings which can be adjusted to provide a noticeable drag, by shims located between each bearing cone and fork bearing block as shown. Shims are available in thicknesses of 0.003 and 0.005.

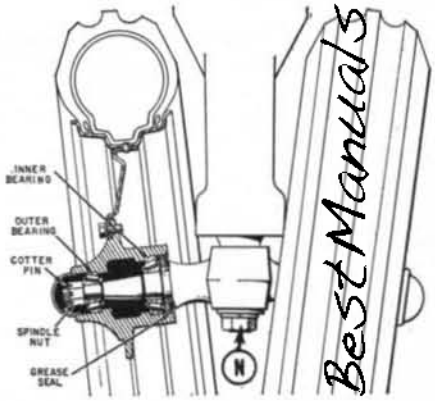


Fig. 1–Dual wheel tricycle installation on 430 and 530 series. Series 630 tractors are similar except horizontal axle is retained to spindle by a snap ring instead of nut (N).

STEERING KNUCKLES

Series 430-530, Non-Adjustable Axle

3. Fig. 3 shows an exploded view of a non-adjustable front axle of the general type used. To remove the steering knuckles, support front of tractor and remove wheel and hub assemblies. Disconnect tie-rod and drag link and remove plugs (17). Remove screws (22) and bump king pins (16) from axle and knuckles. Ream king pin bushings (15), after installation, to provide a clearance of 0.001-0.003 for the king pin. When reassembling, renew thrust bearings (21) if their condition is questionable.

Series 630, Non-Adjustable Front Axle

3A. The heavy-duty, non-adjustable front axle used on 630 Series tractors is shown in Fig. 4. Knuckles (14) are carried in Torrington needle bearings (22). Before removing old bearings note their exact position and install new ones in the same location. Install upper bearing using Case arbor A-8354 or equivalent. Install lower bearing, using Case arbor A-8351 or equivalent. When installing the steering arms, tighten the retaining nut to remove all spindle end play without causing binding.

All Models, Adjustable Axle

4. Refer to Fig. 5 or Fig. 6 for an exploded view of the adjustable axle used. To remove the steering knuckles, support front of tractor, remove steering arm (8) and withdraw knuckle. Bushings (10) are pre-sized to provide a clearance of 0.003-0.007 for the knuckles. Be sure to renew thrust bearings (12) if their condition is questionable. When reassembling, vary the number of 0.010 thick shims (9) to remove all spindle end play without causing any binding.

TIE RODS AND DRAG LINK

All Models So Equipped

5. Tie-rod ends are of the renewable automotive type. Drag link ends on non-adjustable axle types are integral with the drag link. On adjustable axle models, adjust the length of each tie rod an equal amount to provide a toe-in of ⅛-3/16-inch. On utility models, loosen the clamp bolts and turn the tie rod tube either way as required, to obtain the recommended ⅛-3/16-inch toe-in.

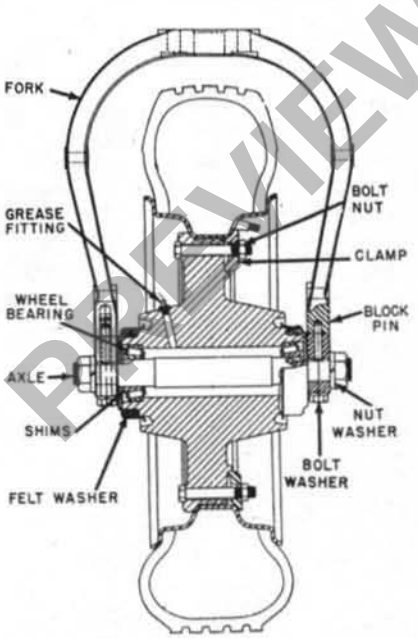


Fig. 2–Sectional view of fork mounted single front wheel used on 630 series. Other models are similar except one half of tire flange is integral with hub and other half is detachable.

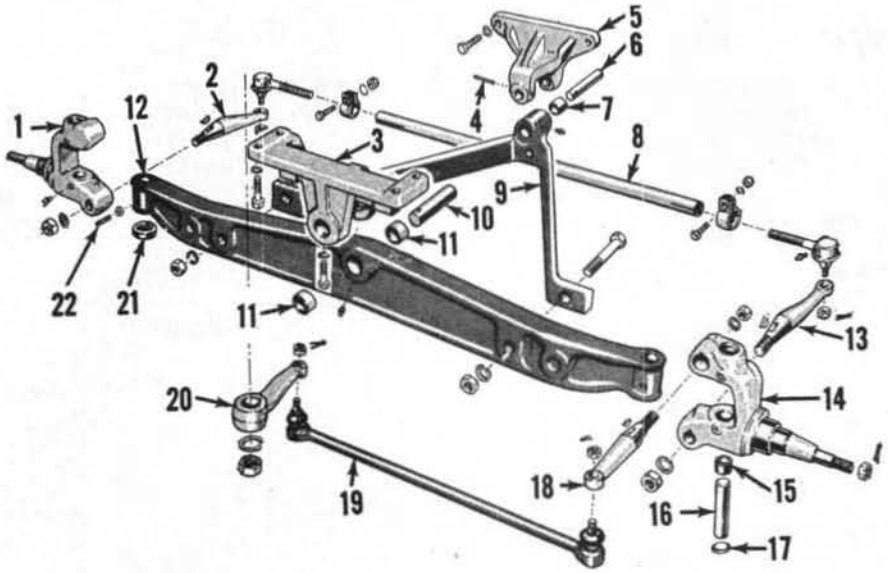


Fig. 3–Exploded view of non-adjustable front axle of the general type used on series 430 and 530.

1. Right knuckle
2. Right tie rod arm
3. Front pivot bracket
4. Roll pin
5. Rear pivot bracket
6. Radius rod pivot pin
7. Bushings
8. Tie rod tube
9. Radius rod
10. Axle pivot pin
11. Bushing
13. Left tie rod arm
14. Left knuckle
15. King pin bushings
16. King pin
17. Plug
18. Drag link arm
19. Drag link
20. Center steering arm
21. Thrust bearing
22. Screw

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gear by rotating steering wheel from full right to full left turning position, then back half-way. Tighten the mesh adjusting screw (41—Fig. 10, 11 or 12) until a slight drag is felt only when turning the steering gear through the mid position. The steering gear should turn freely when off the mid-point.

OVERHAUL

All Models

10. **WORMSHAFT AND HOUSING.** To overhaul the steering gear, drain cooling system and remove hood, grille, air cleaner and radiator. Remove radiator mounting plate and baffle plate from front support. Remove the frame left side rail and the cap screw retaining the steering shaft bracket to the torque tube. Remove roll pin retaining the steering drive shaft universal joint to the wormshaft and bump the joint yoke off the wormshaft. On 630 Series, remove cover from top of housing, extract cotter pin and remove nut (51—Fig. 11). On all models remove the cap screws retaining the wormshaft housing to the front support and remove the housing assembly.

The procedure and need for further disassembly of the wormshaft housing is evident. The inner race for each wormshaft bearing is integral with the shaft. Renew shaft if inner races are pitted or otherwise damaged or if the worm is excessively worn or scored. Outer races and balls are available separately. Renew the seal (26A—Fig. 8 or 9) if wormshaft is renewed or if seal is leaking.

Note: Right hand cams are used on utility and western models. Left hand cams are used on all general purpose models. The two cams can be interchanged in the steering gear but the steering action will be reversed. Cams can be identified by the last two digits of the number stamped on them. For right hand cams, the last two digits are "23." For left hand cams, the last two digits are "22."

When reassembling, vary the number of shims between bearing cover (31) and housing until the wormshaft rotates freely without binding.

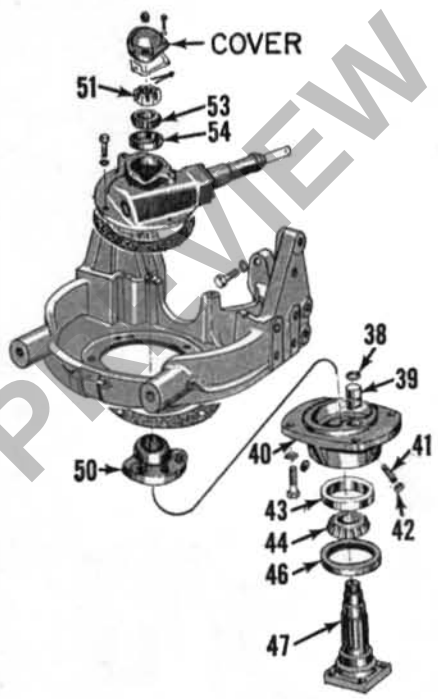


Fig. 11–Vertical spindle and associated parts used on series 630 general purpose tractors. Refer to Fig. 10 for parts identification.

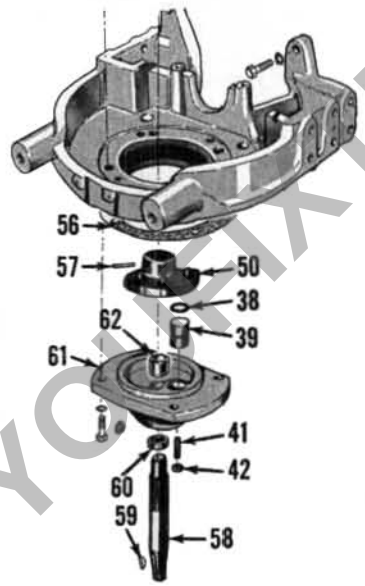


Fig. 12–Steering lever, shaft and support of the type used on series 430 and 530 tractors and utility models of 630 series.

38. "O" ring
39. Adjusting plug
41. Adjusting screw
42. Jam nut
50. Steering lever
56. Gasket
57. Roll pin
58. Lever shaft
59. Woodruff key
60. Oil seal
61. Shaft housing
62. Bushing

Shaft end play not exceeding 0.002 is permissible. Shims are available in thicknesses of 0.002, 0.003 and 0.010.

10A. **LEVER STUD AND STEERING SPINDLE.** To disassemble the lever stud and steering spindle, proceed as outlined in the appropriate following paragraphs. On all models when reassembling, back off the mesh adjusting set screw (41—Fig. 10, 11 or 12) to insure full seating of worm shaft housing. Adjust the stud mesh after assembly, as outlined in paragraph 9A.

11. **AXLE TYPE MODELS EXCEPT** 630 Series. Refer to Fig. 12. Remove the center steering arm and key (59) from the lower end of steering spindle (58) and withdraw spindle and steering lever upward from support (61). If bushing (62) is damaged or worn, renew the bushing and ream after installation to provide a clearance of 0.001-0.003 for the spindle. Install oil seal (60) with lip upward and be sure lower surface of seal is slightly above outer edge of housing to avoid damage from contact with center steering arm. Check clearance of upper end of spindle in wormshaft housing bushing (B—Fig. 8). If clearance is excessive, install new bushing until lower edge is flush with bottom of chamfer in bushing bore. Burnish the bushing after installation to provide 0.0005-0.0025 clearance on upper end of spindle shaft.

Renew steering lever (50—Fig. 12) if any of the studs are worn or damaged. The roll pin hole in replacement steering levers is drilled through one side only. When renewing the lever, align hole in lever with hole in shaft; then, using the holes as a guide, drill straight through other side of lever with a ¼-inch drill. The steering lever and spindle are properly timed when the front lever stud is directly opposite the key seat in lower end of shaft.

11A. TRICYCLE MODELS EXCEPT 630 Series. Refer to Fig. 10. Mark the relative position of the steering lever (50) on the vertical spindle and remove the lever. Remove front wheels and unstake and remove bearing adjusting nut (51). Withdraw the steering spindle. Install oil seals (46 and 55) with lips facing upward. Tighten the bearing adjusting nut (51) to remove all spindle end play without binding. Renew the steering lever (50) if any of the studs are damaged or worn. When renewing the lever, turn the steering spindle until the front wheels are in a straight-ahead position and install the lever with the front stud pointing directly forward from the vertical spindle.

12. ALL 630 GENERAL PURPOSE. Refer to Fig. 11. Mark the relative position of the steering lever (50) on the vertical spindle and remove the lever. Remove center steering arm (axle models), pedestal (dual-wheel tricycle) or wheel fork (single-wheel tricycle) from vertical shaft and withdraw shaft (47). When reassembling, install seal (46) with lip facing upward. Renew lever (50) if any of the studs are worn or damaged. The lever is correctly timed if, with the front wheels in a straight-ahead position, the front stud points directly forward.

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depth in housing bores. Install oil seals (23 and 16) until they bottom in counterbore, with spring-loaded sealing lip toward inside of housing.

Reinstall worm shaft (7) and cover (1), omitting the sealing "O" ring (2) and vary the thickness of shim pack (3) to eliminate all worm shaft end play without binding. Shims are available in thicknesses of 0.003, 0.005 and 0.010. After shim pack thickness has been established, install and lubricate sealing "O" ring (2) on cover (1), reinstall cover and tighten the retaining cap screws to a torque of 30 Ft.-Lbs.

Reinstall spindle (24) and sector gear (20), making sure the single punch-marked spline on spindle is positioned between the two marked splines on sector gear. Reinstall snap ring (19), then install upper housing (8) and secure with the two cap screws.

Install saddle (14), thrust ball (13) and adjusting plug (12), making sure machined flat on ball is to the top. Tighten the adjusting plug to eliminate all end play; engage projection (P) in cover with slot in top of adjusting plug; then back off the plug if necessary, until bolt holes are aligned. Reinstall the steering gear by reversing the removal procedure.

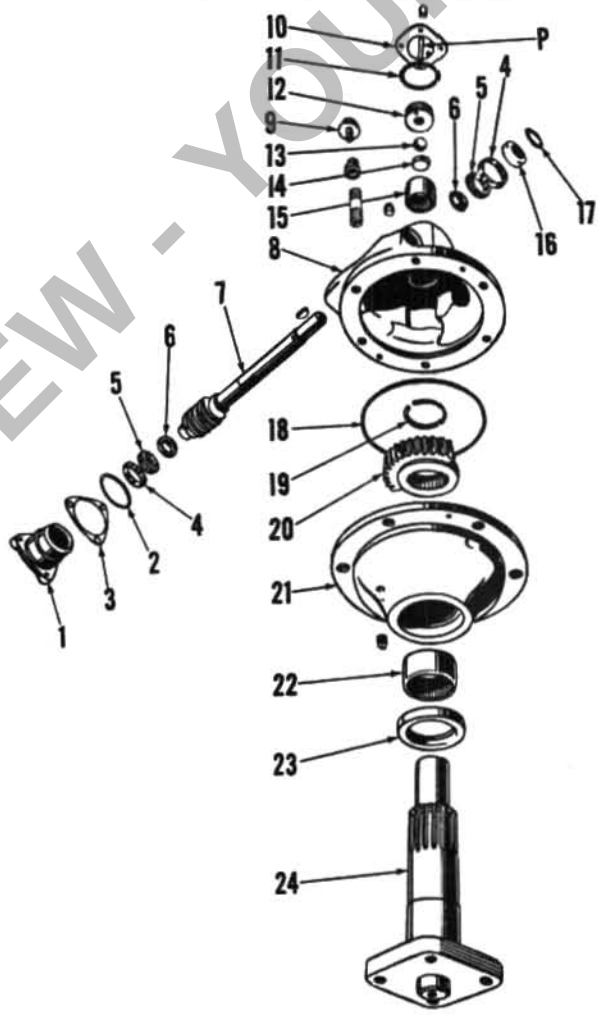


Fig. 15–Exploded view of worm & sector type manual steering gear used on Series 630 tractors so equipped.

1 End-cover
2 "O" ring
3 Shim pack
4 Bearing cup
5 Bearing
6 Bearing cone
7 Worm shaft
8 Housing
9 Breather
10 Top cover
11 "O" ring
12 Adjusting plug
13 Thrust ball
14 Saddle
15 Needle bearing
16 Oil seal
17 Dust seal
18 "O" ring
19 Snap ring
20 Sector gear
21 Lower housing
22 Needle bearing
23 Oil seal
24 Spindle

POWER ASSIST STEERING (For Hydrostatic Steering See Paragraph 29)

The power steering system for utility model tractors is of the linkage booster type powered by an engine mounted, gear driven pump. The power steering system for early general purpose tractors consists of the same engine mounted hydraulic pump, and a Char-Lynn booster motor, located on steering shaft directly below the steering wheel.

Late Series 530 and 630 General Purpose tractors use a rotary vane type torque motor mounted on the center steering spindle immediately below the steering gear unit.

NOTE: The maintenance of absolute cleanliness of all parts is of utmost importance in the operation and servicing of the hydraulic power steering system. Of equal importance is the avoidance of nicks and burrs on any of the working parts.

LUBRICATION AND BLEEDING

All Models

18. The manufacturer specifies that only Automatic Transmission Fluid, Type A, should be used in the power steering system. The fluid level should be maintained ¼ to ½-inch above top of filter element.

To bleed the system, fill the reservoir and run the engine until normal operating temperature is reached. With the engine running at normal speed, cycle the power steering system several times to bleed out any trapped air, then refill the reservoir to the proper level.

TROUBLE SHOOTING

All Models with Power Steering

19. As with any type of hydraulic system, establishing and following a systematic test procedure will go far toward the elimination of the trouble encountered. If the system is operative, before disassembling any of the system components, first check and eliminate any binding or malfunction of the mechanical system or linkage. Remove the reservoir cover, check the condition of the filter, fill the system to the proper level and bleed system as outlined in paragraph 18. Check for, and correct, any external leaks and check the system pressure as outlined in paragraph 20. It is generally good service practice not to remove or disassemble any of the system components which can be thoroughly tested without removal. The accompanying chart lists the more common troubles which may be encountered in the operation of the power steering system. The procedure for correcting most of the troubles is evident; for those not readily remedied, refer to the appropriate following paragraphs.

SYSTEM OPERATING PRESSURE

All Models with Power Steering

20. A pressure test of the hydraulic circuit will disclose whether the pump or some other unit of the system is malfunctioning. To make such a test, proceed as follows:

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three flange bolts and withdraw the control assembly and valve spool from valve housing. Remove the grease fitting from the outer sleeve and dust shield from ball stud. Slide the ball stud forward as far as possible in outer sleeve and drive the lock pin from the stop screw, then unscrew the spool and stop screw from the inner sleeve. The need and procedure for further disassembly is evident. Renew any parts which are worn or damaged and assemble by reversing the disassembly procedure. Be sure all parts are absolutely clean then lubricate during assembly with Automatic Transmission Fluid, Type "A." Turn the stop screw and valve spool bolt assembly into inner sleeve as far as it will go, then back off until nearest hole in stop screw aligns with slot in inner sleeve. Install lock pin. Make sure lock pin is centered in inner sleeve so that a protruding end will not bind or score outer sleeve.

Reassemble the control valve and cylinder assembly by reversing the disassembly procedure, install the unit as outlined in paragraph 24 and bleed the system as in paragraph 18.

BOOSTER STEERING MOTOR

General Purpose Tractors So Equipped

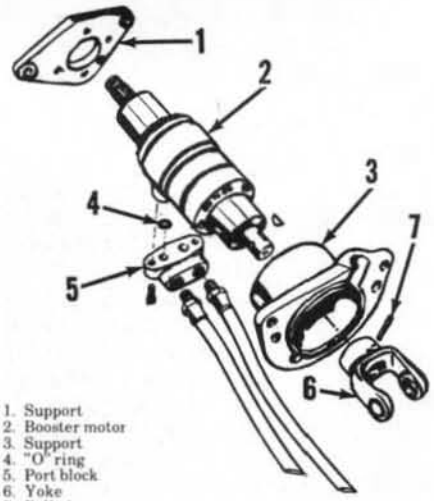
28. The Char-Lynn power steering booster motor (Fig. 22) is mounted on the steering post directly under the steering wheel. Component parts of the booster motor are not serviced. If it becomes inoperative, the complete unit must be renewed.

ROTARY VANE TYPE TORQUE MOTOR

General Purpose Tractors So Equipped

28A. **STEERING VALVE.** The Ross type steering valve is mounted on front end of steering worm shaft, and can be removed after removing grille and axle support front cover. To remove the valve, disconnect fluid lines from valve body and remove valve cap as shown in Fig. 23. Unlock and remove thrust bearing nut and front thrust bearing assembly as shown in Fig. 24, then withdraw valve body and spool, being careful not to lose any of the valve centering springs and plungers. Valve spool (1—Fig. 25) and body (5) are mated parts and must be renewed as an assembly. Check valve (6) in the return port can be removed with a screwdriver and must be renewed as an assembly.

Inspect the brass tube seats (7) in body ports. If seats are damaged, tap seat bore with a suitable bottoming tap and use a cap screw, nut and washer as a puller. The seat may be pressed into position by reinstalling the hydraulic line.



1. Support
2. Booster motor
3. Support
4. "O" ring
5. Port block
6. Yoke
7. Roll pin

Fig. 22–The Char-Lynn power steering booster motor used on some early general purpose tractors can only be serviced as a complete assembly.

When reassembling the valve, make sure the two inactive plungers (4) are separated by an active plunger and spring assembly. Active plungers (2) may be installed either end out, but must be separated by spring (3). Port identification symbols (RT and PR) and identification groove on inside of spool must both be toward threaded end of wormshaft. These locating marks are identified by (L) in Fig. 25.

Thrust bearings (Fig. 24) should both be installed with the larger washer toward valve body. Loosely install nut lock washer and thrust bearing nut. If the special Case adjusting plate (A-8342) is available, install plate using the valve cap retaining screws as shown in Fig. 26. If adjusting plate is not available, secure valve to gear housing using shorter cap screws, with flat washers to protect machined surface of valve. Tighten valve retaining cap screws to a torque of 30 ft.-lbs.; then, using a torque wrench as shown in Fig. 26, tighten shaft nut to 20 ft.-lbs. With shaft nut tight, back nut off exactly 1/6 turn to provide the required 0.010 free movement. Secure the adjustment by bending one tab of nut lock against flat of nut as shown in Fig. 24, reinstall valve cap and tighten retaining cap screws to a torque of 30 ft.-lbs. Complete the assembly by reversing the disassembly procedure.

28B. **GEAR HOUSING & TORQUE MOTOR.** The steering gear housing and torque motor is located in front motor support casting and can be removed as a unit for overhaul. The only adjustment provided, is adjustment of spindle shaft end play. Adjustment procedure is identical to that given for Series 630 tractors in paragraph 15, except air bleed tube must be disconnected. Remove the gear housing and torque motor as outlined in paragraph 28C and overhaul as in paragraph 28D.

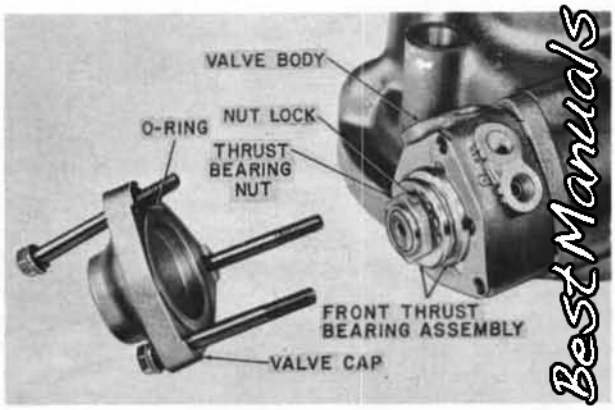


Fig. 23–Torque motor gear cover with valve cap removed, showing details of construction.

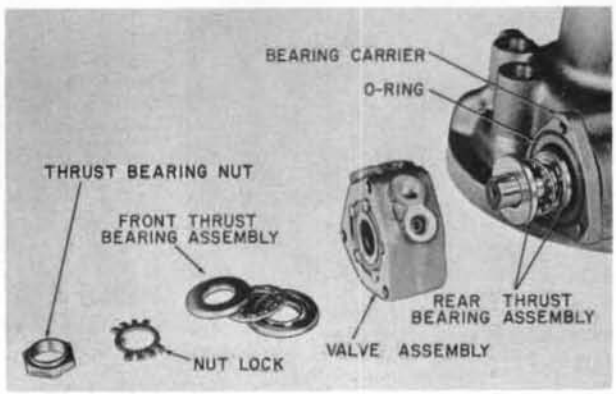


Fig. 24–Valve assembly can be withdrawn after removing thrust bearing nut and bearing.

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	Loss of Power Assistance	Power Assistance In One Direction Only	Unequal Turning Radius	Erratic Steering Control	Fluid Foaming Out of Reservoir
Binding, worn or bent mechanical linkage	★		★	★	
Insufficient fluid in reservoir	★			★	
Low pump pressure	★			★	
Internal leakage in booster motor	★				
Sticking or binding valve spool	★	★		★	
Improperly positioned steering shaft		★	★		
Damaged or restricted hose or tubing	★			★	★
Pump to valve hose lines reversed	★				
Wrong fluid in system				★	★
Improperly adjusted tie rods			★	★	
Faulty steering lever timing			★		
Air in system				★	★
Faulty flow control valve in pump	★			★	
Plugged filter element					★
Internal leak in valve					★
Faulty Cylinder	★			★	

Connect a pressure test gage and a shut-off valve in series with the pump pressure line as shown in Fig. 17. Note that shut-off valve is connected in the circuit between the gage and the control valve. Open the shut-off valve and run the engine at idle speed until oil is warmed. With engine running at idle speed, rotate front wheels to extreme right or extreme left turn position and note gage reading which should be in the range of 1050-1150 psi.

NOTE: To avoid heating the pump and steering fluid excessively, do not hold wheels in test position longer than is necessary to get a satisfactory reading.

If the pressure is higher than specified, the pump relief valve is probably stuck in the closed position, damaged, or blocked. If the pressure is less than specified, turn the wheels to straight ahead position, at which time the pressure should drop to almost zero. Now, slowly close the shut-off valve and retain in closed position only long enough to observe the gage reading. Pump may be seriously damaged if valve is left in closed position for more than 10 seconds. If the gage reading increases to the correct range of 1050-1150 psi with valve closed, the pump and relief valve are in good condition and any trouble is located in the control valve or power cylinder (utility models) or steering motor (general purpose models).

A low reading with the shut-off valve closed, indicates trouble in the pump or relief valve. After checking the relief valve and/or renewing the pump, recheck the pressure by turning the steering wheel, to make sure the control units of the system are in good condition.

RELIEF VALVE

All Models with Power Steering

21. The relief valve is located in the pump body as shown in Fig. 18. If the system pressure test indicates a malfunctioning relief valve, remove the relief valve plug and extract the spring and ball. Thoroughly clean the ball and seat as required. Shim washers can be added behind the spring to increase the relief valve cracking pressure.

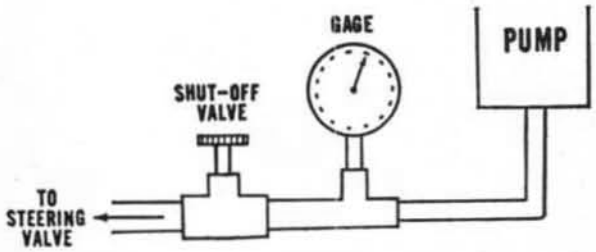


Fig. 17–Approved method of installing pressure gage and shut-off valve in pump pressure line for testing pump and relief valve.

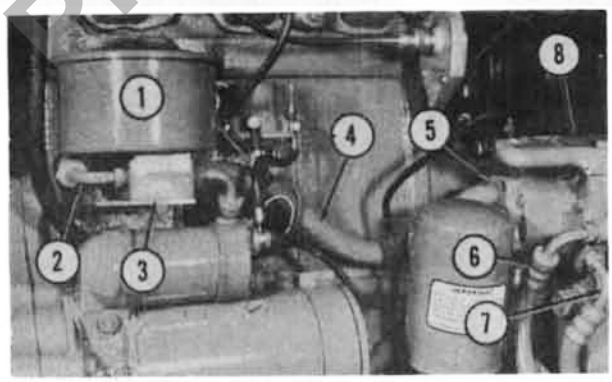


Fig. 16–Power steering pump and reservoir assembly showing component parts.

1. Fluid reservoir
2. Hose connection
3. Mounting bracket
4. Supply hose
5. Pump
6. Relief return hose
7. Pressure hose
8. Generator bracket

POWER STEERING PUMP

All Models with Power Steering

22. **REMOVE AND REINSTALL.** Component parts of the gear driven pump are not supplied. Any failure of the pump is therefore corrected by renewing the complete pump assembly. The power steering pump body also serves as the attaching point for the generator mounting bracket.

To remove the pump (5—Fig. 16), first drain the system and disconnect the supply (4), pressure (7) and return (6) hoses from pump body. NOTE: Although the pump can be removed from the tractor with the engine oil filter in place, accessibility is somewhat improved by first removing the filter. If the service work to be performed includes filter service, remove filter before proceeding with power steering pump removal.

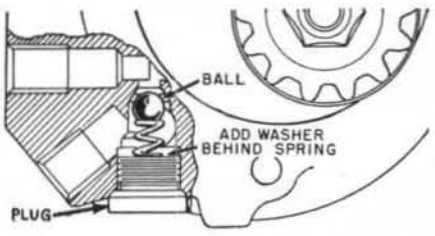


Fig. 18–Cutaway view of pump body showing location and type of relief valve used.

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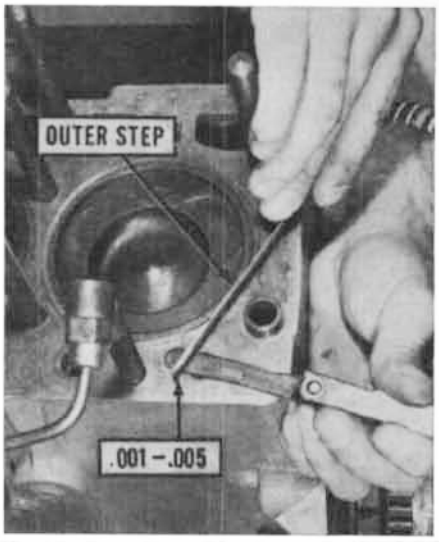


Fig. 58–Cylinder sleeve stand-out on all diesel models and 630 series non-diesel must be measured from the outer step of the two-step sleeve as shown. Correct stand-out is 0.001-0.005.

After making the trial installation, remove the sleeves and install packing rings dry in sleeve grooves. Make certain that packing rings are not twisted, then lubricate the packings and block sealing surface with petroleum jelly or liquid soap, carefully lower sleeve into cylinder block and press into place with hand pressure. Fill the cylinder block water jacket with cold water and check for leaks at the packing rings.

PISTON PINS

All Models

67. The full floating piston pins are retained in the piston bosses by snap rings and are available in standard size only.

On 430-470 non-diesel models, the 0.8591-0.8593 diameter piston pin should have a 0.0003 press fit in piston and 0.0003-0.0007 clearance in rod bushing. On 530-570 non-diesel models, the 0.9991-0.9996 diameter piston pin should have a 0.0001-0.0005 press fit in piston and 0.0001-0.0005 clearance in rod bushing. On 630 non-diesel models, the 0.9991-0.9996 diameter piston pin should have a palm press fit in piston and 0.0002-0.0006 clearance in rod bushing. On all diesel models, the 1.2497-1.2498 diameter piston pin should have a tight press fit in piston and 0.0002-0.0005 clearance in rod bushing. Heating pistons in hot water will facilitate installation of the pins.

CONNECTING RODS AND BEARINGS

All Models

68. Connecting rod bearings are of the precision type, renewable from below after removing oil pan and bearing caps.

When installing new bearing shells, make certain that the projections engage in the milled slots in connecting rod and cap and that correlation numbers are in register and face toward camshaft side of engine. Replacement rods are not marked and rod and cap should be stamped to correspond with cylinder number, on oil squirt hole side, during assembly. Connecting rod bolt heads are relieved on one side as shown in Fig. 59. The relieved portion must be installed to the outside as shown. If the bolt is reversed, the head will strike the lower edge of sleeve on some engines. Tighten connecting rod nuts to a torque of 45-50 ft.-lbs.

Check the connecting rods, bearing inserts and crankpin journals against the values which follow:

Crankpin Diameter

All models	2.0605-2.0615

Rod Side Play

430, 470, 530, 570 non-diesel	0.004-0.006
630 non-diesel, all diesel	0.005-0.011

Bearing Diametral Clearance

430, 470 non-diesel	0.0015-0.002
530, 570 non-diesel	0.0005-0.0025
630 non-diesel	0.001-0.002
All diesel	0.001-0.0035

CRANKSHAFT AND MAIN BEARINGS

All Models

69. The precision type main bearing inserts can be renewed from below after removing oil pan, oil pump and main bearing caps. On 430, 470, 530 and 570 non-diesel engines, the bearing caps should be marked before removal so that they can be reinstalled in their original position. The main bearing caps on 630 non-diesel and all diesel engines have a cast arrow which points to camshaft side of engine. The second and fourth main bearing caps on diesel engines will interchange, but are stamped during manufacture to indicate their relative position. Block and bearing caps are align bored and caps should never be interchanged from one block to another.

On 630 non-diesel and some diesel engines, the rear main bearing inserts are fitted with a second oil groove at rear of bearing. Make sure the oil drain hole in lower insert is aligned with the drain hole in rear main bearing cap during installation.



Fig. 59–Install connecting rod bolt with relieved edge to outside as shown.

Crankshaft end play is controlled by the flanged center main bearing. The recommended end play for all tractors is 0.001-0.006.

To remove the crankshaft, first remove the engine as outlined in paragraph 44, and remove clutch, flywheel and rear oil seal retainer. Remove the timing gear cover on non-diesel models as outlined in paragraph 54, or the timing gear housing on diesel models as in paragraph 55. Remove the oil pan, oil pump, main and rod bearing caps and lift crankshaft from engine. Crankshaft should be renewed or reconditioned if any of the journals are damaged or excessively rough, or measure more than 0.002 out of round or 0.001 taper. Replacement bearing liners are available for non-diesel engines in undersizes of 0.002, 0.020 and 0.040, as well as standard. Replacement liners for diesel engines are available in standard and undersizes of 0.002, 0.010, 0.020 and 0.030.

Check the crankshaft and main bearings against the specifications which follow:

Crankpin diameter

All models	2.0605-2.0615

Main journal diameter

430, 470, 530, 570 non-diesel	2.6230-2.6240
630 non-diesel and all diesels	2.8730-2.8740

Main bearing diametral clearance

430, 470, 530, 570 non-diesel	0.0015-0.002
630 non-diesel and all diesels	0.0008-0.0038
Wear limit	0.006
Main bearing bolt torque	90-100 Ft.-Lbs.
Rod bearing nut torque	45-50 Ft.-Lbs.

Refer to paragraph 70 when installing the crankshaft rear oil seal and to paragraph 73 when installing the oil pump.

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SHOP MANUAL

J. I. CASE

SERIES 430-440-470-530-540-570-630-640

NOTE: For purposes of identification in this manual "Series 430" includes Gasoline and Diesel Models 430, 431, 440 and 441: Series "470" includes Gasoline and Diesel Models: "Series 530" includes Gasoline, LP-Gas and Diesel Models 530, 530C, 531, 531C, 540, 540C, 541 and 541C: Series 570 includes Gasoline and Diesel Models: "Series 630" includes Gasoline and Diesel Models 630, 630C, 631, 631C, 632, 632C, 640, 640C, 641 and 641C.

Tractor serial number is stamped on tractor name plate located on instrument panel of series 430 and 440, and on right side of engine hood on 470, 530, 540, 570, 630 and 640 series.

Engine serial number is stamped on right rear corner of engine block.

All Series available with Case-O-Matic drive are designated by addition of "C" suffix to model number.

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