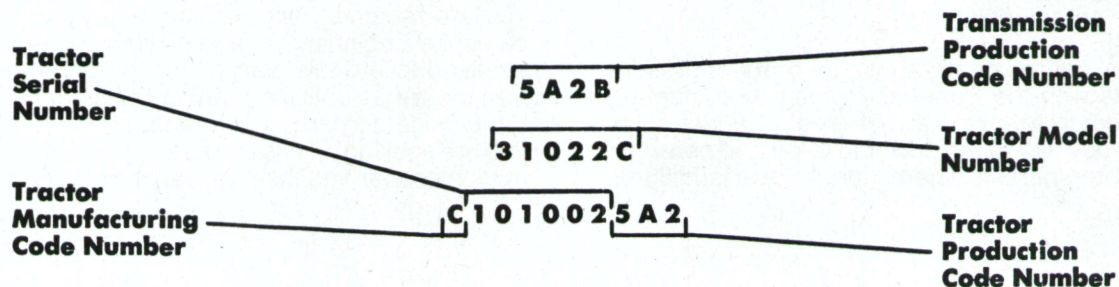


SHOP MANUAL

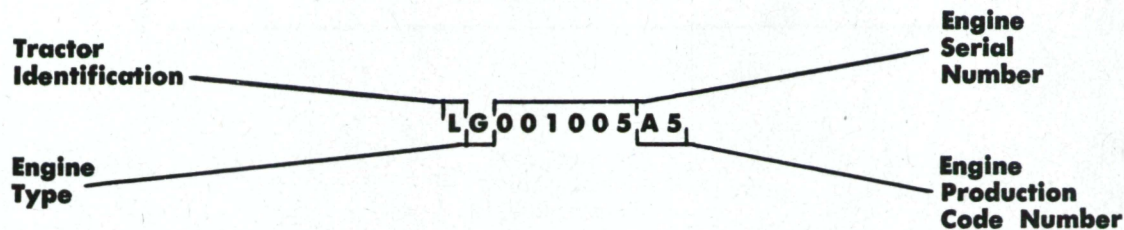
FORD

SERIES 2000-3000-4000
(COVERS MODELS PRIOR TO 1975)

Tractor Serial Number, along with manufacturing and production code numbers and tractor model number, will appear on implement mounting pad at right front corner of transmission (directly behind engine starter). Numbers will be stamped on top of pad, on mounting face of pad, or partially on top of and partially on mounting face of pad. Refer to following explanation of the numbers that will appear at this location:



Engine Serial Number, along with tractor size identification, engine type identification and engine production code number, will appear on either the left or right pan rail of cylinder block casting approximately at mid-length of engine. Refer to following explanation of the numbers that will appear at this location.



Tractor Identification:
Before 7-20-68 **After 7-19-68**
 L-2000 B-2000
 N-3000 C-3000
 P-4000 D-4000

Engine Type:
 D-Diesel Engine
 G-Gasoline Engine
 P-LP-Gas Engine

The following tractor models prior to 1975 are covered in this manual:

- 2100 All Purpose
- 2110 L.C.G. (Low Center Gravity)
- 3100 All Purpose
- 4100 All Purpose
- 4110 L.C.G.
- 4140 S.U.
- 4200 Row Crop

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CONDENSED SERVICE DATA

General	TRACTOR SERIES (Before 7/20/68)			TRACTOR SERIES (After 7/19/68)		
	2000	3000	4000	2000	3000	4000
Engine Make	Own	Own	Own	Own	Own	Own
No. of Cylinders	3	3	3	3	3	3
Bore—Inches, Non-Diesel	4.2	4.2	4.4	4.2	4.2	4.4
Diesel	4.2	4.2	4.4	4.2	4.2	4.4
Stroke—Inches, Non-Diesel	3.8	3.8	4.2	3.8	3.8	4.4
Diesel	3.8	4.2	4.4	3.8	4.2	4.4
Displacement—Cubic Inches,						
Non-Diesel	158	158	192	158	158	201
Diesel	158	175	201	158	175	201
Compression Ratio, Non-Diesel	8.0:1	8.0:1	8.01:1	7.8:1	7.8:1	7.8:1
Diesel	16.5:1	16.5:1	16.5:1	16.5:1	16.5:1	16.5:1

CONDENSED SERVICE DATA (CONT).

Tune-Up	TRACTOR SERIES (Before 7/20/68)			TRACTOR SERIES (After 7/19/68)		
	2000	3000	4000	2000	3000	4000
Compression, Gage Lbs. @ Cranking						
Speed of 200 RPM:						
Non-Diesel (All Spark Plugs Out) ...	115-150	115-150	115-150	105-140	115-150	115-150
Diesel	420-510	420-510	420-510	410-490	420-500	420-500
Max. Allowable Variation @ 200 RPM:						
Non-Diesel	25	25	25	25	25	25
Diesel	50	50	50	50	50	50
Firing Order	1-2-3	1-2-3	1-2-3	1-2-3	1-2-3	1-2-3
Valve Tappet Gap—Intake, Hot	0.015	0.015	0.015	0.015	0.015	0.015
Valve Tappet Gap—Exhaust, Hot	0.018	0.018	0.018	0.018	0.018	0.018
Valve Face Angle—Degrees	44	44	44	44	44	44
Valve Seat Angle—Degrees	45	45	45	45	45	45
Ignition Timing	See Paragraph 180					
Injection Timing	19° BTDC	19° BTDC	19° BTDC	19° BTDC	19° BTDC	19° BTDC
Spark Plug Make	Autolite	Autolite [®]	Autolite	Autolite	Autolite	Autolite
Spark Plug Model	AG-5	AG-5	AG-5	AG-5	AG-5	AG-5
Engine Low Idle RPM	600-650	600-650	600-650	600-700	600-700	600-700
Engine High Idle RPM, Non-Diesel ...	2065-2115	2285-2335	2395-2445	2065-2165	2285-2385	2385-2495
Diesel	2175-2225	2175-2225	2395-2445	2225-2275	2225-2275	2425-2475
Engine Rated RPM, Non-Diesel	1900	2100	2200	1900	2100	2200
Diesel	2000	2000	2100	2000	2000	2200
Battery Terminal Grounded	Negative	Negative	Negative	Negative	Negative	Negative
Sizes-Capacities-Clearances						
Crankshaft Journal Diameter	_____			3.3714-3.3722	_____	
Crankpin Diameter	_____			2.749-2.750	_____	
Camshaft Journal Diameter	_____			2.3895-2.3905	_____	
Piston Pin Diameter	_____			1.4997-1.5000	_____	
Valve Stem Diameter—Intake	_____			0.3711-0.3718	_____	
Valve Stem Diameter—Exhaust	_____			0.3701-0.3708	_____	
Main Bearings Running Clearance	_____			0.0022-0.0045	_____	
Rod Bearings Running Clearance,	_____				_____	
Aluminum Bearings	_____			0.0025-0.0045	_____	
Copper Lead Bearings	_____			0.0017-0.0038	_____	
Camshaft Bearings Running Clearance	_____			0.001-0.003	_____	
Crankshaft End Play	_____			0.004-0.008	_____	
Camshaft End Play	_____			0.001-0.007	_____	
Piston Skirt to Cylinder Clearance	_____			See paragraph 105		
Cooling System, Quarts	13.2	13.8	14.0	13.2	13.8	14.0
Crankcase, Quarts—With Filter	7	8	8	7	7	9
Transmission, Quarts:						
4-Speed	6.5	6.5	....	6.5	6.5	....
6-Speed .....	....	....	....	14.5	13.8	....
8-Speed	17½	17	17	14.5	13.8	13.8
10-Speed (Select-O-Speed)	12	13¼	13¼	12	12	13.3
Final Drive & Hydraulic, Quarts	23½	20½	26¼	24.6	24.6	33.9
Steering Gear Housing, Quarts	0.85	0.85	0.66	0.85	0.85	0.66
Power Steering System, Quarts	2.31	2.31	2.0	2.3	2.3	2.35

FRONT SYSTEM AND STEERING

(MODELS 2100, 2110, 3100, 4110 & 4140 S.U.)

1. Cap Screw
2. Retainer
3. Pivot pin
4. Front support
5. Spacer (inner bushing)
6. Axle center member
7. Bushing

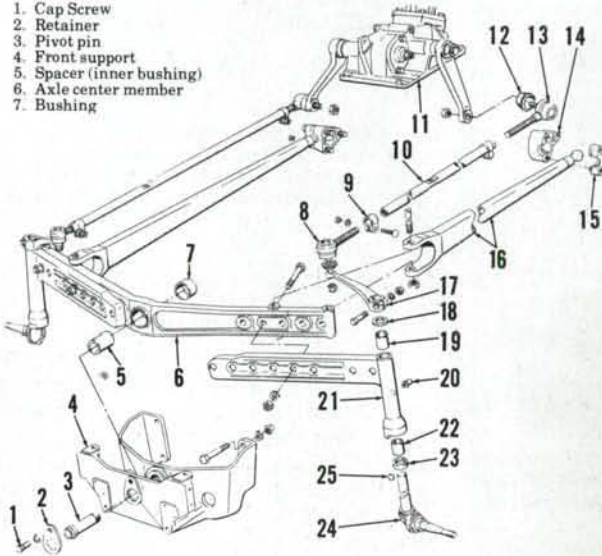


Fig. 1—Exploded view of 2100 and 3100 front axle and related parts used on models prior to production date 8-70. Radius rods on later models attach to axle extensions. Models 2110, 4110 and 4140 are similar. Spacer (5) is available in three lengths; refer to text for selection.

8. Front drag link end
9. Clamp
10. Drag link
11. Steering gear assy.
12. Dust cover
13. Rear drag link end
14. Radius rod ball spacer
15. Radius rod cap
16. Radius rod
17. Steering arm
18. Dust Seal
19. Spindle bushing, upper
20. Grease fitting
21. Axle extension, L.H.
22. Spindle bushing, lower
23. Thrust bearing
24. Spindle
25. Steering arm key

FRONT AXLE ASSEMBLY AND STEERING LINKAGE

Models 2100-2110-3100-4110 4140 S.U.

1. SPINDLE BUSHINGS. To renew the spindle bushings (19 and 22—Fig. 1), proceed as follows: Support front of tractor and disconnect steering arms (17) from wheel spindles (24). Slide spindle out of the axle extension (21). Drive old bushings from front axle extension and install new ones using a piloted drift or bushing driver. New bushings will not require final sizing if

not distorted during installation. Renew thrust bearing (23) if worn or rough. Refer to Fig. 2 for dust seal and thrust bearing installation.

2. AXLE CENTER MEMBER, PIVOT PIN AND BUSHINGS. To remove the axle center member (6—Fig. 1), on models prior to production date 8-70, support front of tractor, unbolt radius rods and axle extensions from axle center member and swing the axle extensions and wheel assemblies away from tractor.

NOTE: On models after production date 7-70, the radius rods are attached to axle extensions instead of the axle center member and generally do not need to be disconnected.

Remove cap screw (1) and retainer (2), then unscrew front axle pivot pin (3). Withdraw axle center member from either side of tractor. Remove spacer (5) when so equipped and press out bushing (7).

The front axle support spacer (5) used on models prior to production date 8-70 is available in three lengths: Red, 2.235-2.240; Green, 2.245-2.250 and Grey, 2.255-2.260. Select a spacer that will provide a close fit between pivot pin bosses of front support.

To reassemble, press new bushing into axle center member. If used, insert previously selected spacer into bushing and be sure spacer is a free fit in bushing.

On all models, insert axle center member into front support, then install

pivot pin and tighten pin to a torque of 300-320 Ft.-Lbs. Install retainer (2) and tighten cap screw (1) to a torque of 75 Ft.-Lbs. If removed, tighten radius rod to axle bolts and axle extension bolts to a torque of 130-160 Ft.-Lbs.

3. FRONT SUPPORT. To remove front support, proceed as follows: Remove engine hood, grille, lower hood to front support bolts and unbolt radiator from front support. Place floor jack under front end of transmission and take weight of tractor from front axle. Remove front axle pivot pin as in paragraph 2. Remove bolts retaining front support casting to engine and lower the front support to floor. When reinstalling, tighten the front support bolts to a torque of 200-240 Ft.-Lbs. for models prior to production date 8-70, or 180-220 Ft.-Lbs. for later models.

4. DRAG LINKS AND TOE-IN.

Drag link ends are non-adjustable automotive type and renewal procedure is evident. Refer to Fig. 1 for manual steering tractors and to Fig. 5 for power steering.

Front wheel toe-in should be $\frac{1}{4}$ to $\frac{1}{2}$ -inch; vary the length of each drag link an equal amount to obtain proper toe-in.

MANUAL STEERING GEAR

Models 2100-2110-3100-4110

5. ADJUSTMENT. To adjust the steering gear, first be sure that gear housing is properly filled, then disconnect both drag links from steering arms and proceed as follows:

6. WORMSHAFT END PLAY. To check wormshaft end play, first loosen the lock nuts (1—Fig. 3) on the sector shaft adjusting screws (8) and back screws out two full turns. The wormshaft should turn freely without perceptible end play. Shims (24) are available in thicknesses of 0.0024 (brass), 0.005 (steel) and 0.010 (steel); also, a 0.005 thick paper gasket is available. Install at least one paper gasket and brass or steel shims as required. Tighten the steering shaft cover retaining cap screws to a torque of 25 Ft.-Lbs. Renew wormshaft bearings as outlined in paragraph 9 if end play is perceptible with paper gasket, but without any metal shims installed.

After checking or adjusting wormshaft end play, readjust sector shaft end play as follows:



Fig. 2—Top view shows proper installation of the dust seal on upper end of spindle before installing steering arm. Lower view shows installation of thrust bearing on spindle before installing spindle in axle extension.

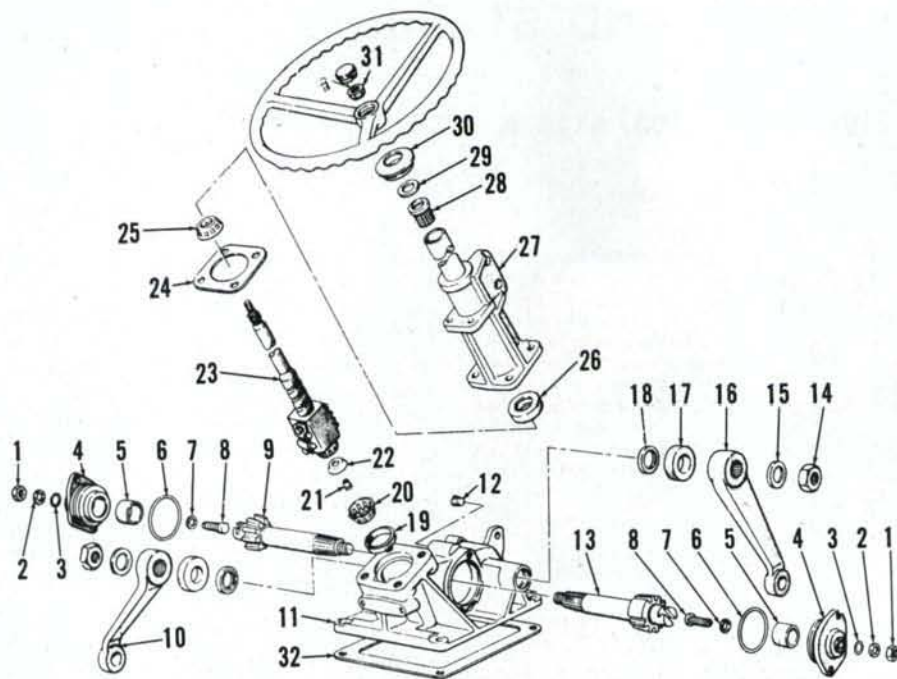


Fig. 3—Exploded view of 2000 and 3000 manual steering gear assembly. Wormshaft (23) end play is adjustable by varying thickness of shims (24); sector shaft end play is adjusted by screws (8). Select a shim (7) that will provide zero to 0.002 clearance between head of adjusting screw (8) and slot in sector shaft (9 or 13).

- | | | | |
|-------------------------|-----------------------------|-----------------------------|--|
| 1. Lock nut | 10. Steering arm, L.H. | 19. Bearing cup | 26. Bearing cup |
| 2. Washer | 11. Housing | 20. Bearing cone & rollers | 27. Steering column |
| 3. Packing | 12. Oil level & filler plug | 21. Bearing retainer eyelet | 28. Bushing |
| 4. Side covers | 13. Sector gear (double) | 22. Bearing retainer | 29. Dust seal |
| 5. Bushing | 14. Nut | 23. Wormshaft assembly | 30. Grommet |
| 6. "O" ring | 15. Washer | 24. Shims | 31. Steering wheel nut |
| 7. Shim | 16. Steering arm, R.H. | 25. Bearing cone & rollers | 32. Gasket (Select-O-Speed transmissions only) |
| 8. Adjusting screw | 17. Felt dust seal | | |
| 9. Sector gear (single) | 18. Oil seal | | |

7. SECTOR SHAFT END PLAY.

Before adjusting sector shaft end play, be sure that wormshaft is properly adjusted as outlined in paragraphs 5 and 6, then proceed as follows:

Turn the steering wheel to mid or straight ahead position. With the lock nuts on both sector shaft adjusting screws loosened and the adjusting screw on forward sector shaft (left side) backed out several turns, turn sector shaft adjusting screw (right side) in until there is no perceptible end play in rear sector shaft (13). Tighten lock nut while holding adjusting screw. Turn adjusting screw on left side of unit (front sector shaft) in until there is no perceptible end play of front sector shaft (9). Hold the adjusting screw and tighten lock nut.

Adjustment of steering gear is correct if a pull of 1 to 2½ lbs. is required at outer edge of steering wheel to turn the steering gear over center position. When adjustment of sector shafts is correct, reconnect the drag links to steering arms.

8. R&R STEERING GEAR ASSEMBLY. To remove the steering gear assembly, proceed as follows: Discon-

nect battery ground cable and remove the steering wheel. Remove the sheet metal covers at each side of steering gear. Remove screws retaining instrument panel, disconnect ground terminal at left side of panel and rotate panel up out of opening in sheet metal. Disconnect wiring from instrument panel and remove the panel assembly. Remove the light switch and choke or diesel fuel shut-off cable. If equipped with Select-O-Speed transmission, refer to paragraphs 245 and 246 for removal of controls. Remove engine hood and the sheet metal surrounding fuel tank. Shut off the fuel supply, disconnect fuel supply line and diesel fuel return line from tank, then remove fuel tank assembly. Thoroughly clean the steering gear and surrounding area. Disconnect drag links from steering arms, then unbolt and remove steering gear assembly from transmission housing. Drain lubricant from steering gear housing if unit is to be disassembled. Note: On models with Select-O-Speed transmission, take care that no dirt or foreign material enters transmission housing while removing steering gear assembly and place a cover over opening in transmission

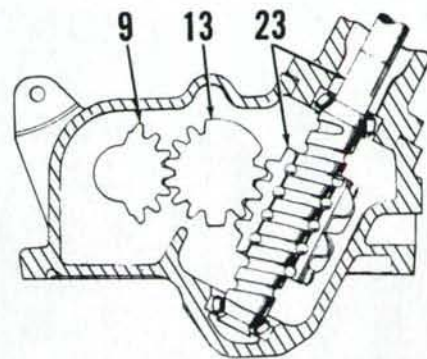


Fig. 4—Cross-sectional view of manual steering gear assembly showing correct installation of sector gears and wormshaft assembly. Refer to Fig. 3 for exploded view and parts identification.

while steering gear is removed.

To reinstall the steering gear assembly, first place a new gasket on opening in transmission housing (Select-O-Speed transmission models only), then reinstall unit by reversing removal procedure. Refill gear housing with SAE 90 E.P. gear lubricant (Ford specification M2C53-A).

9. OVERHAUL. Major overhaul of the steering gear unit necessitates removal of the unit from tractor as outlined in paragraph 8. After removing unit, refer to Fig. 3 and proceed as follows:

Remove steering arm retaining nuts (14) and pull steering arms (10 and 16) from sector shafts (9 and 13). Sector shafts and side covers (4) can be removed as a unit after removing cover retaining screws. To separate shaft and cover, remove lock nut (1) and thread adjusting screw (8) into cover until threads clear. Unbolt steering shaft cover (27) from gear housing (11) and remove cover, shaft and ball nut assembly. Do not disassemble the ball nut and steering shaft assembly (23) as component replacement parts are not available. If steering shaft and/or ball nut are damaged, renew the complete assembly. The need and procedure for further disassembly and/or overhaul is evident from inspection of unit.

The bushings in gear housing for the sector shafts are not serviced separately from housing; install a new housing if bushings are excessively worn. Bushings (5) in side covers (4) are renewable separately from side covers.

Shims (7) on the adjusting screws (8) are available in thicknesses of 0.063, 0.064, 0.066 and 0.069. When reassembling, select a shim that will provide zero to 0.002 clearance between adjusting screw head and slot in sector shaft.

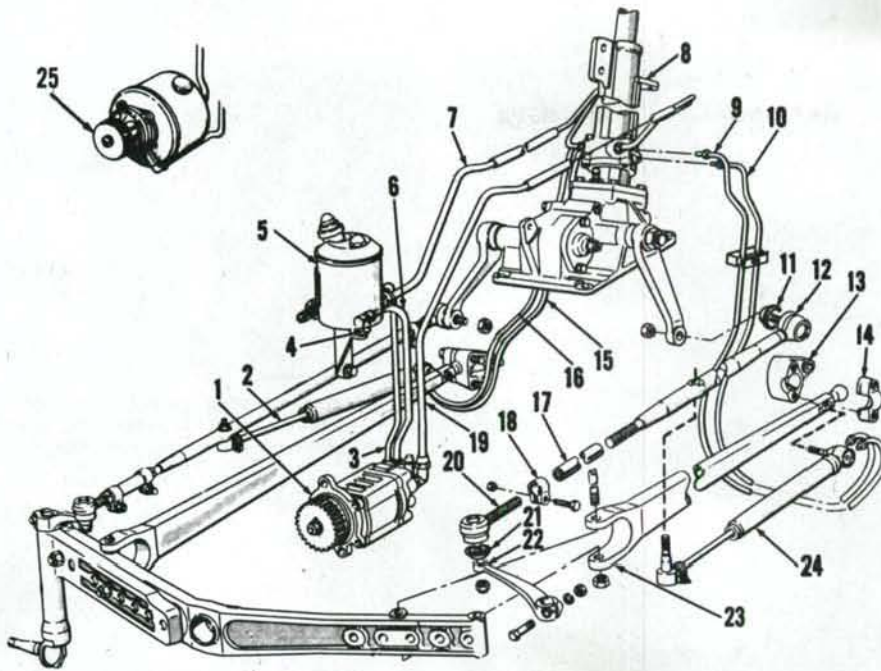


Fig. 5—Drawing of 2000 and 3000 power steering system. For exploded view of steering gear and valve assembly (8), refer to Fig. 12. Exploded view of power steering pump (1) is shown in Fig. 7, late pump (25) in Fig. 10.

- | | | | |
|--------------------------------|--------------------------------|----------------------------|-----------------------------|
| 1. Power steering pump (early) | 6. Tube, pump to reservoir | 12. Drag link assembly | 19. Pressure tube |
| 2. Steering cylinder, R.H. | 7. Return tube | 13. Radius rod ball spacer | 20. Drag link front end |
| 3. Tube, pump to reservoir | 8. Steering gear & valve assy. | 14. Radius rod ball cap | 21. Dust seal |
| 4. Tube clamp | 9. Front inner tube, L.H. | 15. Rear outer tube, R.H. | 22. Steering arm |
| 5. Reservoir | 10. Rear outer tube, L.H. | 16. Front inner tube, R.H. | 23. Radius rod |
| | 11. Dust cover | 17. Drag link tube | 24. Steering cylinder, L.H. |
| | | 18. Clamp | 25. Steering pump (late) |

To reassemble, insert the steering shaft and ball nut unit into gear housing with gear teeth on ball nut forward, then install steering shaft housing (27) with proper number of shims as outlined in paragraph 6. Insert the sector shafts, with their adjusting screws and correct thickness shims, into gear housing so that sector gear teeth and ball nut teeth are timed as shown in Fig. 4. Place new "O" rings (6—Fig. 3) on side covers (4) and pull the side covers into place with sector shaft adjustment screws. Install and tighten the side cover retaining cap screws to a torque of 25 Ft.-Lbs. and adjust the sector shaft end play as outlined in paragraph 7. Install new packing rings (3—Fig. 3) on adjusting screws, install flat washers (2) and tighten the adjusting screw lock nuts (1) while holding adjusting screws in proper position.

Refill gear housing with SAE 90 EP gear lubricant to level with plug (12) opening (approximately 1 3/4 pints). When reinstalling steering arms, tighten the retaining nuts (14) to a torque of 115-125 Ft.-Lbs.

POWER STEERING SYSTEM Models 2100-2110-3100-4110-4140

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

10. FLUID AND BLEEDING. Recommended power steering fluid is Ford M2C41-A oil. Maintain fluid level to full mark on dipstick (1—Fig. 6); reservoir assembly (5—Fig. 5) on early models is located under engine hood directly behind radiator. On late models, reservoir is mounted on pump (25). After each 600 hours of operation, it is recommended that the filter element (8—Fig. 6 or 3—Fig. 10) be renewed, any oil in reservoir be removed with suction gun and that the reservoir be refilled to full mark on dipstick with new, clean oil.

The power steering system is self-bleeding. When unit has been disassembled, refill with new oil to full mark on dipstick, then start engine

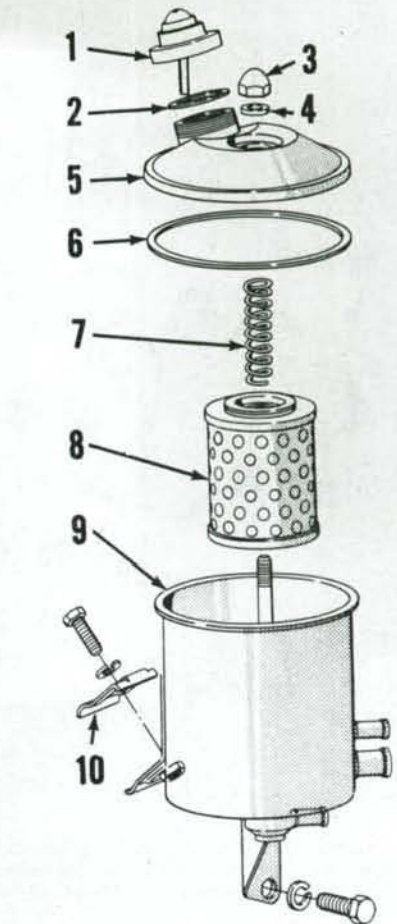


Fig. 6—Exploded view of power steering reservoir and filter assembly used on early models.

- | | |
|-------------------|-------------------|
| 1. Dipstick | 6. Gasket |
| 2. Gasket | 7. Spring |
| 3. Nut | 8. Filter element |
| 4. Sealing washer | 9. Reservoir |
| 5. Cover | 10. Clamp |

and cycle the system several times by turning the steering wheel from lock to lock. Recheck fluid level and add as required. System is fully bled when no more air bubbles appear in reservoir as system is being cycled.

11. CHECKING SYSTEM PRESSURE AND FLOW. The power steering pump assembly incorporates a pressure relief valve and a flow control valve. System relief pressure and flow should be as follows:

	Early Pump	Late Pump
Pressure, psi	650	650
Flow, gpm @ 1000 rpm	3.5	2.74

To check system relief pressure, install a "T" fitting in pressure line (19—Fig. 5) at pump connection and connect a 0-1000 psi gage to fitting. With the engine running at 1000 RPM and the front wheels turned against lock, gage reading should be 600-700 psi.

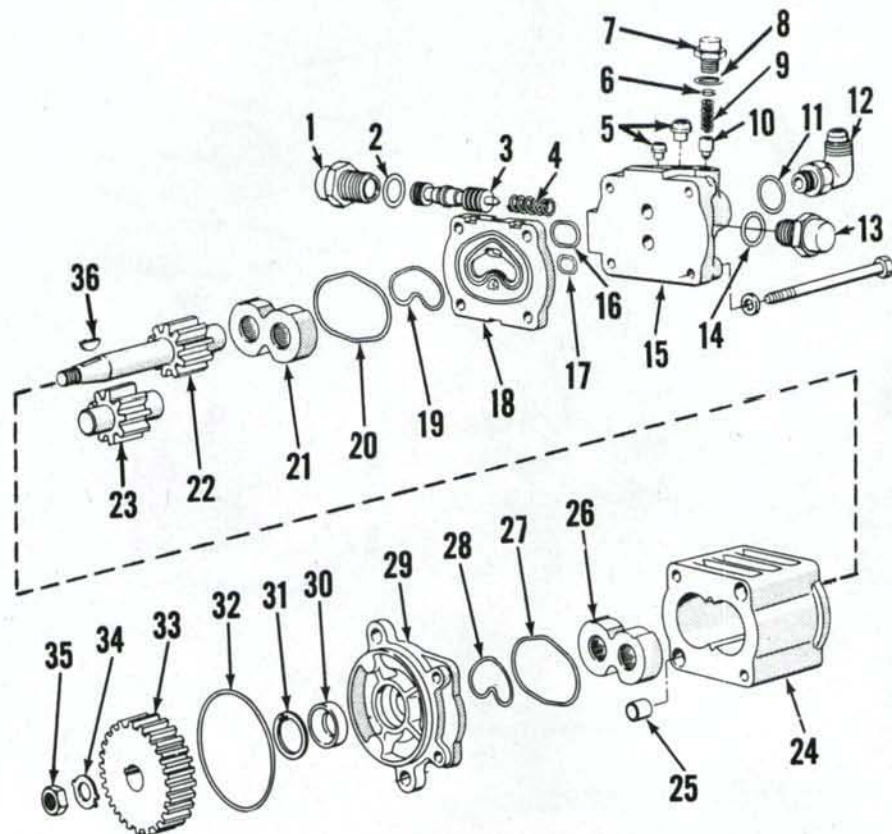


Fig. 7—Exploded view of early power steering pump. Note that flow control valve spring (4) and small tip end of valve (3) is towards side of rear cover (15) containing the relief valve assembly (Items 6 through 10). Refer to Fig. 9 for model 4200 shaft seals.

- | | | | |
|-----------------------|---------------------------|----------------------------|------------------------------|
| 1. Cap plug | 10. Pressure relief valve | 20. Outer seal ring | 30. Seal (except model 4200) |
| 2. "O" ring | 11. Seal ring | 21. Bearing block | 31. Locating ring |
| 3. Flow control valve | 12. Outlet elbow | 22. Drive gear & shaft | 32. "O" ring |
| 4. Spring | 13. Cap plug | 23. Driven gear & shaft | 33. Drive gear |
| 5. Tubing seats | 14. "O" ring | 24. Pump body | 34. Tab washer |
| 6. Shims | 15. Rear cover | 25. Bolt (dowel) rings (2) | 35. Nut |
| 7. Cap plug | 16. "O" ring | 26. Bearing block | 36. Woodruff key |
| 8. "O" ring | 17. "O" ring | 27. Outer seal ring | |
| 9. Spring | 18. Rear plate | 28. Inner seal ring | |
| | 19. Inner seal ring | 29. Front cover | |

CAUTION: When checking system relief pressure, hold the steering wheel against lock for only long enough to observe gage reading; pump may be damaged if steering wheel is held in this position for an excessive length of time.

To adjust the pressure on early models, remove pressure relief valve cap (7—Fig. 7) and add or remove shims (6) as required. If adding shims under the pressure relief valve cap will not increase system pressure, remove and overhaul power steering pump as outlined in paragraph 12.

On late models, pump must be disassembled to adjust opening pressure. Refer to paragraph 12 and Fig. 10. Shims (25) control system pressure and are available in thicknesses of 0.010, 0.015 and 0.060. A change of 0.005 in total shim pack thickness will alter system pressure about 35 psi. Late pump does not contain a flow control valve.

12. R&R AND OVERHAUL PUMP. Thoroughly clean pump, lines and surrounding area. Disconnect lines from pump and allow fluid to drain. Cap all openings to prevent dirt from entering pump or lines, then unbolt and remove pump assembly from engine front plate. When reinstalling pump, use new sealing "O" ring and tighten retaining bolts to a torque of 23-29 Ft.-Lbs. Reconnect lines, fill and bleed system as in paragraph 10.

On early models, refer to exploded view of pump in Fig. 7 and disassemble pump as follows: Scribe an assembly mark across pump covers and body. Straighten tab on washer (34) and remove nut (35). Pull drive gear (33) from pump shaft and remove key (36). Remove the four through-bolts and separate rear cover assembly (15), plate (18), body (24) and front cover (29). Remove bearing blocks (21 and 26) and gears (22 and 23) from pump as a unit. Remove caps (1, 7 and 13) from

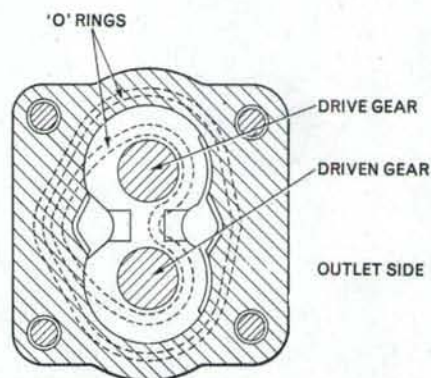


Fig. 8—Drawing showing correct installation of gears and bearing blocks in pump body. View is from rear (flanged) end of pump body.

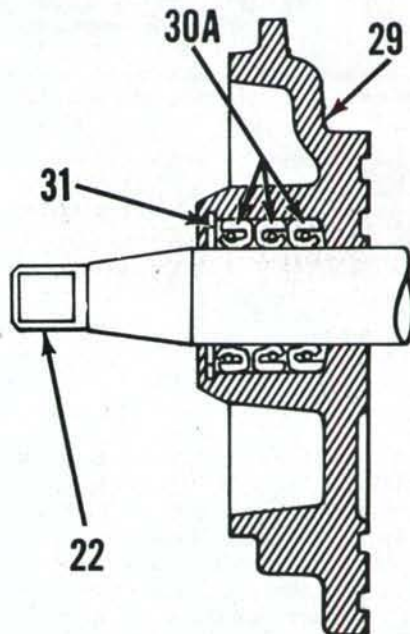
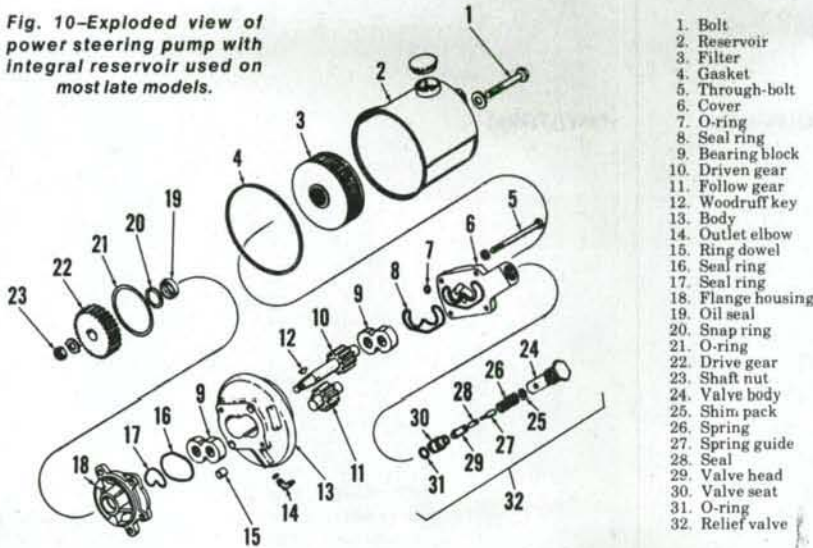


Fig. 9—On model 4200 tractors, power steering pump is fitted with three shaft seals (30A) instead of single seal (30—Fig. 7) used on other models. Lips of two inner seals face inward, outer seal lip is toward retaining snap ring (31). Pump front cover is (29); drive shaft is (22).

rear cover (15) and withdraw flow control valve (3), pressure relief valve (10) and related parts. Remove snap ring (31) and the oil seal (30) from front cover. Clean all parts in a suitable solvent, air dry, then lightly oil all machined surfaces.

Inspect bearing blocks (21 and 26) for signs of seizure or scoring on face of journals. (When disassembling bearing block and gear unit, keep parts in relative position to facilitate reassembly.) Light score marks on faces of bearing blocks can be removed by lapping bearing block on a surface plate using grade "O" emery paper and kerosene.

Fig. 10—Exploded view of power steering pump with integral reservoir used on most late models.



Examine body for wear in gear running track. If track is worn deeper than 0.0025 on inlet side, body must be renewed. Examine pump gears for excessive wear or damage on journals, faces or teeth. Runout across the gear face to tooth edge should not exceed 0.001. If necessary, the gear journals may be lightly polished with grade "O" emery paper to remove wear marks. The gear faces may be polished by sandwiching grade "O" emery paper between gear and face of scrap bearing block, then rotating the gear. New gears are available in matched sets only.

When reassembling pump, install all new seals, "O" rings and sealing rings. On models with three shaft seals (Fig. 9), the two inner seals are installed lips first and outer seal lip out to serve as a dust seal.

Install flow control valve (3), spring (4) and plugs (1 and 13) with new "O" rings (2 and 14). Install pressure relief valve (10), spring (9) and plug (7), being sure that all shims (6) are in plug and using new "O" ring (8). Assemble pump gears to bearing blocks (use Fig. 8 as a guide, if necessary) and insert the unit into pump body. Be sure the two bolt rings (hollow dowels) are in place in pump body, then position the front cover on body. Place the rear plate (18—Fig. 7) at rear of body and install rear cover. Tighten the four cap screws (throughbolts) to a torque of 13-17 Ft.-Lbs. Install the pump drive gear key, drive gear, tab washer and nut. Tighten the nut to a torque of 55-60 Ft.-Lbs. and bend tab of washer against flat on nut.

On models with integral pump and reservoir refer to Fig. 10. Clean pump and surrounding area and disconnect pump pressure and return lines. Remove the two cap screws securing pump to engine front cover and lift off

pump and reservoir as a unit. Drain the reservoir and remove through-bolt (1), reservoir (2) and filter (3).

Relief valve cartridge (32) can now be removed if service is indicated. For access to shims (25), grasp seat (30) lightly in a protected vise and unscrew body (24). Shims (25) are available in thicknesses of 0.010, 0.015 and 0.060. Starting with the removed shim pack, substitute shims thus varying total pack thickness, to adjust opening pressure. Available shims permit thickness adjustment in increments of 0.005 and each 0.005 in shim pack thickness will change opening pressure about 35 psi. If parts are renewed, the correct thickness can only be determined by trial and error, using the removed shim pack as a guide.

To disassemble the pump, bend back tab washer and remove shaft nut (23), drive gear (22) and key (12). Mark or note relative positions of flange housing (18), pump body (13) and cover (6); then remove pump throughbolts (5). Keep parts in their proper relative position when disassembling pump unit. Pump gears (10 & 11) are available in a matched set only. Bearing blocks (9) are available separately but should be renewed in pairs if renewal is because of wear. Bearing blocks should also be renewed with gear set if any shaft or bore wear is evident.

When reassembling the pump, tighten through bolts (5) to a torque of 25 Ft.-Lbs. and drive gear nut (23) to a torque of 30-40 Ft.-Lbs.

13. CONTROL VALVE AND STEERING GEAR ASSEMBLY. The power steering system is of the linkage booster type which utilizes a control valve combined with the steering shaft and gear assembly as an integral unit. Refer to Fig. 12 for an exploded view of the assembly. Adjust-

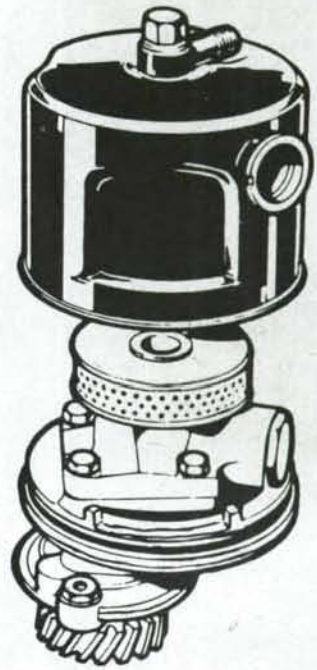


Fig. 11—When installing reservoir, align indent in reservoir with positioning lugs on pump body as shown.

ment and service information for the unit is contained in the following paragraphs 14 through 17.

14. ADJUST STEERING GEAR. The steering wormshaft (21—Fig. 12) is carried in needle roller bearings (20 and 22) which require no adjustment. End thrust of the wormshaft is utilized to operate the control valve spool.

To adjust sector gears, loosen the lock nuts (1) and back both adjusting screws (8) out two full turns. Turn adjusting screw on rear sector shaft (13) in until there is no perceptible backlash of rear sector shaft gears. Tighten the lock nut while holding adjusting screw in this position. With the rear sector shaft adjusted, turn the adjusting screw on front sector shaft (9) in until there is no perceptible backlash of front sector shaft gears, then tighten lock nut while holding adjusting screw in this position.

15. R&R STEERING GEAR AND CONTROL VALVE ASSEMBLY. To remove the steering gear and power steering control valve assembly, proceed as follows:

16. Disconnect battery ground cable and remove the steering wheel. Drain power steering reservoir and disconnect cylinder line at outer side of either cylinder to drain oil from the control valve. Remove the sheet metal covers at each side of steering gear. Remove screws retaining instrument panel, disconnect ground terminal at left side of panel and rotate panel up out of the opening in sheet metal. Disconnect

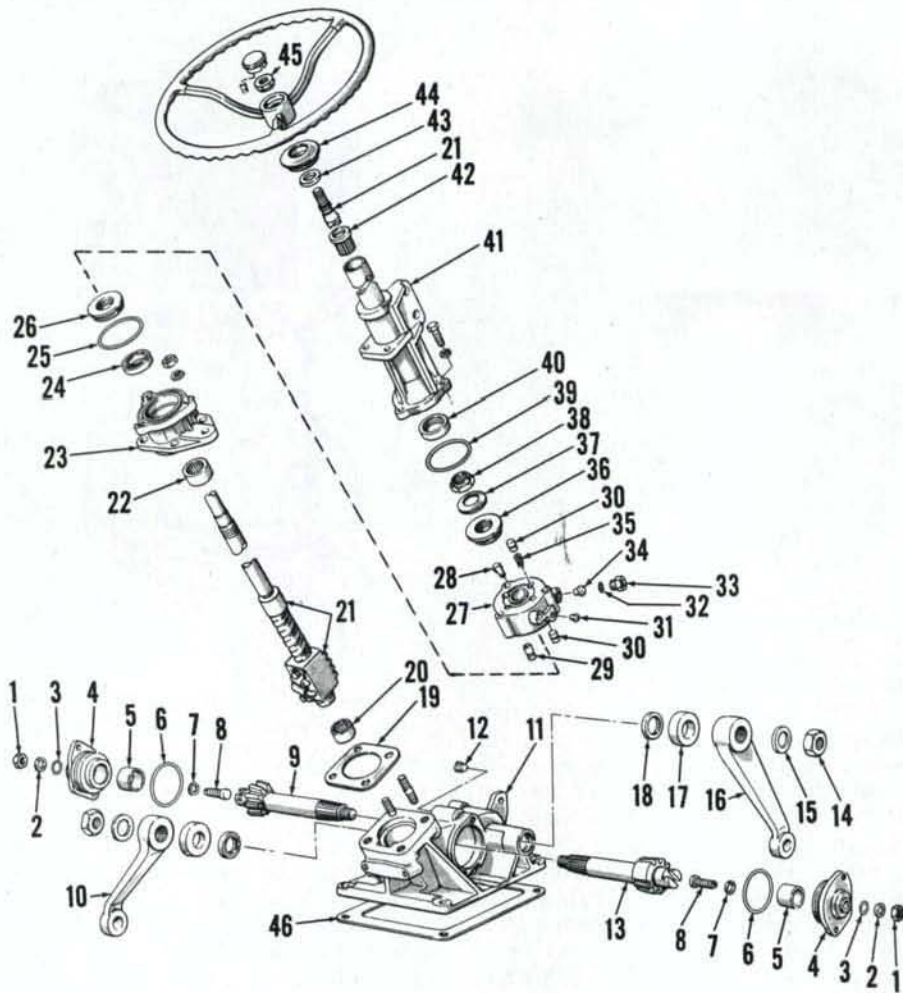


Fig. 12—Exploded view of power steering gear and valve assembly. Turning effort on steering wheel, or reaction of front wheels through steering linkage and gears, causes wormshaft (21) to move up or down, thereby actuating the control valve (27).

- | | | | |
|------------------------|-----------------------------|---------------------------|----------------------------|
| 1. Lock nut | 12. Oil level & filler plug | 24. Oil seal | 36. Thrust bearing assy. |
| 2. Washer | 13. Sector gear, double | 25. "O" ring | 37. Pre-load spring washer |
| 3. Packing | 14. Nut | 26. Thrust bearing assy. | 38. Lock nut |
| 4. Side covers | 15. Washer | 27. Valve assembly | 39. "O" ring |
| 5. Bushing | 16. Steering arm, R.H. | 28. Tube seat | 40. Oil seal |
| 6. "O" ring | 17. Felt dust seal | 29. Reaction plungers (2) | 41. Steering column |
| 7. Shim | 18. Oil seal | 30. Thrust plungers (6) | 42. Upper bushing |
| 8. Adjusting screw | 19. Paper gasket (0.005) | 31. Tube seat | 43. Dust seal |
| 9. Sector gear, single | 20. Needle roller bearing | 32. "O" ring | 44. Grommet |
| 10. Steering arm, L.H. | 21. Wormshaft assembly | 33. Return union | 45. Steering wheel nut |
| 11. Housing | 22. Needle roller bearing | 34. Check valve | |
| | 23. Adapter assembly | 35. Plunger springs (3) | |

wiring from instrument panel and remove the panel assembly. Remove the light switch and choke or diesel shut-off cable. If equipped with Select-O-Speed transmission, refer to paragraphs 245 and 246 for removal of controls. Remove hood and the sheet metal surrounding fuel tank. Shut off the fuel supply valve, disconnect fuel supply line and diesel fuel return line from tank, then remove the fuel tank assembly.

17. Thoroughly clean the steering gear, power steering line connections and surrounding area. Disconnect drag links from steering arms and disconnect power steering lines from control valve. Unbolt and remove the steering gear and control valve assembly from

top of transmission housing. Note: On models with Select-O-Speed transmission, take care that no dirt or other foreign material enters the transmission when removing or reinstalling the steering gear and cover the opening in transmission housing while steering gear unit is removed. Drain lubricating oil from gear housing.

Reinstall steering gear unit by reversing removal procedure. On Select-O-Speed transmission models, place a new gasket over opening in transmission housing before reinstalling steering gear. Refill and bleed the power steering system as outlined in paragraph 10. Refill steering gear with SAE 90 E.P. gear lubricant.

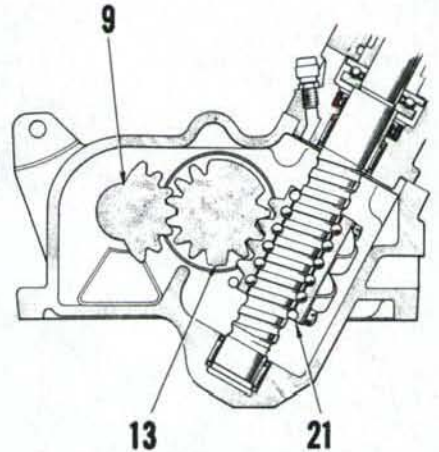


Fig. 13—Cross-sectional view of steering gear assembly showing correct installation (timing) of sector gears and wormshaft; refer to Fig. 12 for exploded view of unit and for parts identification.

18. RENEW CONTROL VALVE UPPER SEAL. If power steering fluid leaks from steering column housing, the control valve upper seal (40—Fig. 12) is leaking and can be renewed as follows:

Follow general procedures outlined in paragraph 16, except that the fuel lines do not need to be disconnected nor does the fuel tank need to be removed. Thoroughly clean the steering gear and control valve assembly. Remove the cap screws retaining steering column (41) to steering gear and remove the steering column. Remove the seal from lower end of steering column with OTC945-2 puller and slide hammer. Drive the bushing (42) from upper end of steering column with a 1-inch diameter dowel.

19. Fabricate a seal guide from an 18 inch length of 3/4-inch thin wall electrical conduit by counterboring the inside diameter to 27/32-inch for a depth of 3 inches. Install new seal in lower end of steering column using a 1 3/8 inch diameter driver. Install seal so that spring and lip will be downward (towards control valve). Place counterbored end of seal guide through seal and install the steering column over steering shaft with new "O" ring in groove in steering column. Install the steering column retaining cap screws to a torque of 25 Ft.-Lbs. and remove the seal guide. Install new bushing in top end of steering column, then reinstall removed parts. Refill and bleed power steering as outlined in paragraph 10.

20. OVERHAUL CONTROL VALVE. With steering gear and control valve assembly removed from tractor as outlined in paragraphs 15

through 17, proceed as follows:

Scribe a line across steering column, valve housing and adapter to facilitate reassembly. Remove return line union (33—Fig. 12) from valve housing, discard "O" ring (32) and unscrew the check valve (34). Remove the cap screws retaining steering column and remove column from steering shaft. Carefully unstack lock nut (38) and temporarily install steering wheel on shaft to hold shaft while unscrewing nut. Remove the steering wheel and nut and position steering gear unit on bench so that steering shaft is in horizontal position. Slide spring washer (37), upper thrust bearing (36), control valve assembly (27) and lower thrust bearing (26) from steering shaft. Note: Take care that control valve spool, plungers (30) and check valves (29) do not drop out of valve housing as it is removed from steering shaft. Unbolt and remove adapter (23) from steering gear housing.

Note which end of the control valve spool has the identification groove (Fig. 15), then slide spool from housing. Remove the six plungers (30—Fig. 12), three springs (35) and the two check valves (29), noting which hole contained the check valves. If any of the brass seats (28 and/or 31) for the pump pressure line and the steering cylinder lines are damaged, remove them from valve housing by threading a tap into the seat, clamping tap in vise and pulling the housing from the seat. Remove seal (40) and bushing (42) from steering column. Remove seal (24) from adapter (23).

Inspect all removed parts for damage or undue wear and renew any not ac-

ceptable for further service. Install new "O" rings (25, 32 & 39), seals (24 and 40) and lock nut (38) when reassembling. To reassemble, proceed as follows:

21. Install new seal (24) in adapter (23) with lip of seal up (towards control valve). Install the adapter over steering shaft and to steering gear housing with a new 0.005 thick paper gasket (19) and tighten the retaining nuts to a torque of 25 Ft.-Lbs. Place new "O" ring (25) in groove in top of adapter. Place the small race, bearing retainer and large race over steering shaft and against shoulder on shaft. Lubricate valve spool and insert in housing with identifying groove in same direction as when removed. Insert the check valves in same bore from which they were removed and with open ends inward. Lubricate and insert the six plungers in the remaining bores with a spring between each set of plungers. Carefully place the assembled valve unit on steering shaft next to thrust bearing with the offset cylinder ports upward as shown in Fig. 16. Place large race of upper thrust bearing on shaft against valve, then install bearing retainer and small race. Place spring washer on shaft against small thrust bearing race with cup side of washer towards the race. Install a new lock nut, tighten the nut so that all end play is removed, then loosen the nut 1/6-turn and stake the nut to locating slot in steering shaft as shown in Fig. 16. Reinstall the steering column as outlined in paragraph 19.

22. OVERHAUL STEERING GEAR. With control valve assembly and

adapter removed from top of steering gear as outlined in paragraph 20, refer to Fig. 12 and proceed as follows:

Remove the nuts (14) and with suitable pullers, remove steering arms (10 and 16). Remove the lock nuts (1) from sector shaft adjusting screws (8) and remove cap screws retaining side covers (4) to steering gear housing. With screwdriver, turn adjusting screws in to push side covers from sector shafts and the steering gear housing. Withdraw the sector shafts (9 and 13) and adjusting screws from housing. Remove steering shaft and ball nut assembly (21). Drive the seals (18) from steering gear housing.

Carefully inspect all parts and renew any that are damaged or show undue wear. Sector shaft bushings in steering gear housing are not serviced separately from housing. Bushings in side covers may be renewed or a new side cover and bushing assembly may be installed if bushings are worn. Steering shaft and ball nut assembly is serviced as a complete unit only. Renew needle bearings (20 and 22) in steering gear housing and adapter if loose or worn; drive or press on lettered (trade mark) end of bearing cage only.

Reassemble unit as follows: Install seals (18) in gear housing with lips of seals to inside. Install new seal (24) in adapter (23) with lip of seal upward (toward control valve). Place steering shaft and ball nut assembly in gear housing with gear teeth on ball nut forward, then install the adapter with a new 0.005 thick paper gasket (19). Note: Take care not to damage seal in adapter when installing the adapter over steering shaft; wrap threads, sharp shoulders, etc., with plastic tape. Tighten the adapter retaining nuts to a torque of 25 Ft.-Lbs. Insert adjusting

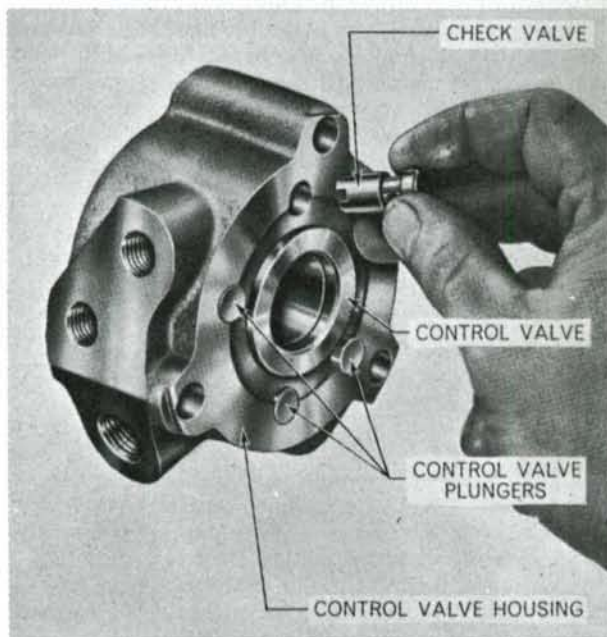


Fig. 14—View showing upper side of control valve and spool assembly; install the three sets of control valve plungers and springs and the two check valves in the bores in housing as shown.



Fig. 15—Insert control valve spool in housing so that identification notch will be towards top end of steering shaft.