SHOP MANUAL

ALLIS-CHALMERS

MODELS D-14, D-15, D-15 SERIES II, D-17, D-17 SERIES III AND D-17 SERIES IV

Model D-14 tractors were available in single wheel tricycle, dual wheel tricycle and adjustable axle versions with non-diesel engines only.

Model D-15 tractors were available in single wheel tricycle, dual wheel tricycle, adjustable or heavy duty non-adjustable front axle versions with either 175 cubic inch diesel or 149 cubic inch non-diesel engines

Model D-15 Series II tractors are available in single wheel tricycle, dual wheel tricycle, adjustable or heavy duty non-adjustable front axle versions with either 175 cubic inch diesel or 160 cubic inch non-diesel engine.

D-17, D-17 Series III and D-17 Series IV tractors are available in single wheel tricycle, adjustable or heavy duty non-adjustable front axle versions with either 262 cubic inch diesel or 226 cubic inch non-diesel engine.

INDEX (By Starting Paragraph)

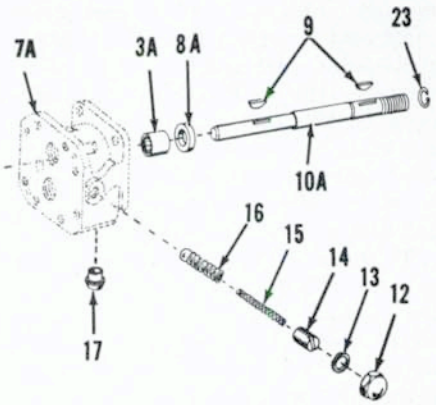

Fig. 20 — After diesel tractor Serial No. D17-38963, a Barnes pump similar to that shown in Fig. 19, except for drive end parts shown above, is used alternately with a Webster pump.

3A. Needle bearing
7A. Pump base
8A. Shaft seal
9. Woodruff keys
10A. Drive shaft
12. Acorn nut
13. Gasket
14. Adjusting screw
15. Inner spring
16. Ball and spring assembly
17. Tubing seat
23. Snap ring

Idler gear on early production pumps is secured to shaft with pin driven into blind hole in gear and shaft. On later production pumps, pin (19) in shaft (21) engages keyway in idler gear (20) and gear can be removed from shaft after removing snap rings (18). Drive gear (5) can be removed from drive shaft after removing snap rings (4).

Gasket (6) was not used on early production pumps, although the 0.0005 thick plastic gasket can be used in reassembly of these earlier units. Install seal (8) with lip to rear.

When renewing needle bearings (3), press on lettered end of bearing cage only. Opposite end of bearing cage is soft and is easily distorted. If no snap rings are used on idler shaft, press idler shaft bearings to just below flush with machined surfaces. If equipped with snap rings, press bearing cages to $\frac{1}{16}$-inch below flush with machined surfaces.

Be sure that machined surfaces of housing and cover are clean and free of nicks or burrs. Place gasket (6) over dowel pins; then, carefully align housing on dowel pins, press housing and body together and install housing retaining screws.

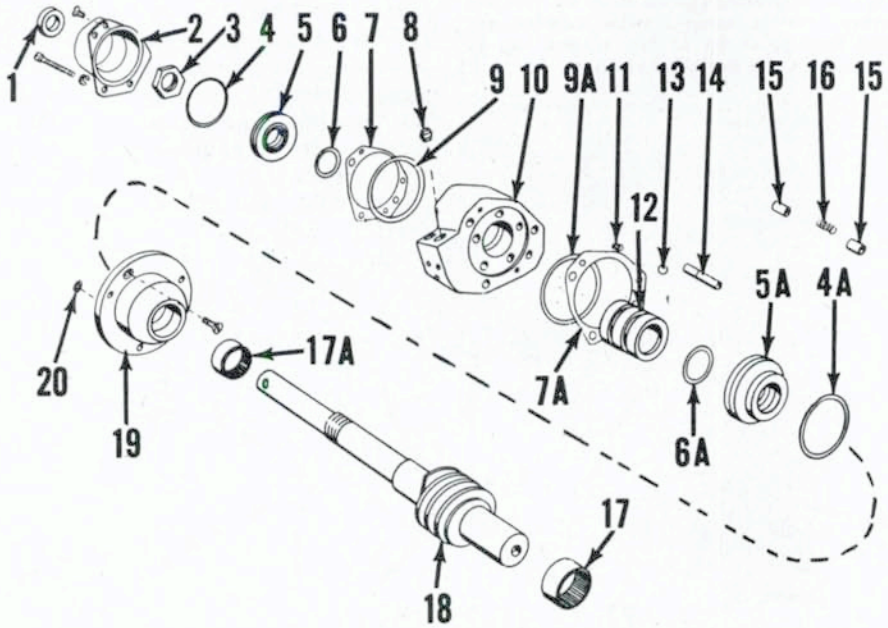

Fig. 21 — Exploded view of power steering control valve unit. Later production unit is shown; early production valves may be overhauled as described in text using later parts shown above.

1. Seal
2. Rear cover
3. Adjusting nut
4. "O" ring
4A. "O" ring
5. Thrust bearing
5A. Thrust bearing
6. "O" ring
6A. "O" ring
7. Shim
7A. Shim
8. Tube seat
9. "O" ring
9A. "O" ring
10. Control valve body
11. Check valve
12. Control valve spool
13. Plug
14. Inactive plunger
15. Active plungers
16. Spring
17. Needle bearing
17A. Needle bearing
18. Wormshaft
19. Front cover
20. "O" ring

D-17 Diesel (After Tractor Serial No. D17-38963)

26. **REMOVE AND REINSTALL.** Loosen the nut retaining the pulley to the pump drive shaft. Disconnect the pressure, by-pass and suction tubes from the pump. Loosen the cap screws retaining pump to pump mounting bracket and remove drive pulley and belt. Remove pump from mounting bracket.

26A. **OVERHAUL.** If equipped with a Barnes power steering pump, refer to Fig. 20 and to paragraph 25A. Follow same general overhaul procedures as outlined for the prior production Barnes pump that was mounted on rear of generator.

If equipped with the optional Webster power steering pump, refer to overhaul procedures as outlined in paragraph 24A for non-diesel power steering pump.

STEERING CONTROL VALVE

27. **REMOVE AND REINSTALL.** To remove the steering control valve and wormshaft unit (Fig. 21), first remove the front support as outlined in paragraph 32. With the front support removed, disconnect the power steering tubes from the control valve; then, unbolt and withdraw the control valve and wormshaft unit.

Reinstall by reversing the removal procedure. Install new gasket (37—Fig. 23) and tighten retaining cap screws to a torque of 24 Ft.-Lbs. After installation is complete and reservoir is filled, bleed the system as outlined in paragraph 20.

27A. **OVERHAUL.** After removing the unit as outlined in paragraph 27, scribe a line across rear cover (2—Fig. 21), body (10) and front cover (19) to aid in reassembly of the unit. Then, proceed as follows:

Unbolt and remove the rear cover (2), unstake and remove the bearing adjusting nut (3) and lift out the thrust bearing (5). Withdraw the body and spool assembly (10 and 12) and thrust bearing (5A). Be careful when removing the body and do not drop or nick any of the component parts. Carefully slide the spool (12) from the valve body and remove the active plungers (15) and centering spring(s) (16).

NOTE: There are five drilled holes through the control valve housing surrounding the valve spool bore. On some early production units, active (centering) plungers and springs were used in three holes; the

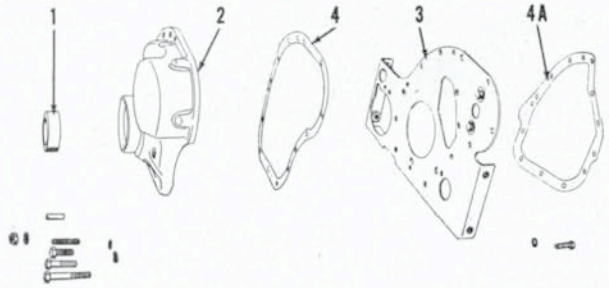

Fig. 42 — Diesel timing gear cover (2) an associated parts.

1. Crankshaft front oil seal
2. Timing gear cover
3. Engine front support plate
4. Gasket
4A. Gasket

D-15 and D-17 Diesel

56. **R&R TIMING GEAR COVER.** To remove the timing gear cover, first perform a front split as outlined in paragraph 13; then, remove the fan belt, power steering pump drive belt if so equipped, and the crankshaft pulley retaining nut and pulley. The timing gear cover can now be unbolted and removed.

The crankshaft front oil seal (1—Fig. 42) should be installed with the lip facing rear. Apply gasket sealer to outside rim of seal before installing same in timing gear cover.

Reinstall cover by reversing the removal procedure taking care to install the four cover to oil pan cap screws and copper washers in the proper places.

NOTE: Copper sealing washers are not used on late production engines. On these engines, be sure to apply gasket sealer to the threads of the cap screws that extend through the engine oil pan.

57. **CRANKSHAFT FRONT OIL SEAL.** The crankshaft front oil seal can be renewed in a conventional manner after first removing the timing gear cover as outlined in paragraph 56. Gasket sealer should be applied to outer rim of seal.

TIMING GEARS

Non-Diesel

58. **TIMING GEAR MARKS AND GEAR BACKLASH.** Timing gears are properly meshed when the scribed lines on the camshaft gear and crankshaft gear are in register as shown in Fig. 43.

Check timing gear backlash while holding all end play from camshaft. Desired backlash is 0.002-0.006. Renew timing gears if backlash exceeds 0.010.

59. **CAMSHAFT GEAR.** The camshaft gear is keyed and press fitted to the camshaft and can be removed with a suitable puller after first removing the timing gear cover as outlined in paragraph 53 or 54.

Before installing, heat gear in hot oil or boiling water for 15 minutes; then, buck-up camshaft with heavy bar while drifting heated gear on shaft. The gear should butt up against front camshaft journal. Make certain that timing marks are aligned as shown in Fig. 43.

NOTE: Some mechanics may prefer to remove the camshaft as outlined in paragraph 65 or 66; then, remove the gear from the shaft and install new gear in a press.

60. **CRANKSHAFT GEAR.** The crankshaft gear is keyed and press fitted to the crankshaft and can be removed by using a suitable puller after first removing the timing gear cover as outlined in paragraph 53 or 54.

Before installing, heat gear; then, buck-up crankshaft with a heavy bar while drifting heated gear on shaft. Make certain that timing marks are aligned as shown in Fig 43.

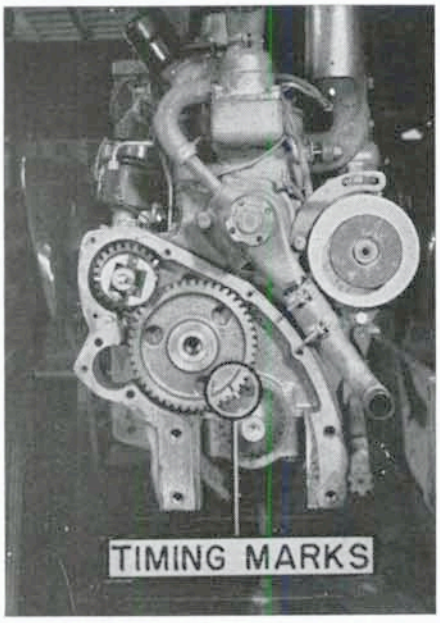

Fig. 43—D-14 and D-15 non-diesel timing marks on camshaft gear and crankshaft gear. The governor and distributor drive gear, also shown, may be meshed in any position; ignition timing being made at distributor. Timing marks for D-17 non-diesel engines are similar.

Diesel

61. **TIMING GEAR MARKS AND GEAR BACKLASH.** Timing gears are properly meshed when the punch marked tooth of the crankshaft gear is in register with the punch marked space between teeth on the camshaft gear and the punch marked space between teeth on the injection pump drive gear is in register with the punch marked tooth on the pump driven gear as shown in Fig. 44.

Desired backlash between camshaft gear and crankshaft gear is 0.001-0.005. Camshaft gear and/or crankshaft gear should be renewed if backlash exceeds 0.008. Gears are available in standard size only. Note: While checking gear backlash, be sure to hold all end play out of camshaft.

62. **CAMSHAFT GEAR.** It is recommended that the camshaft be removed from engine to remove and install

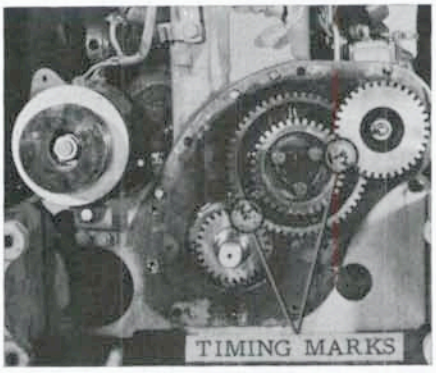

Fig. 44 — Diesel engine timing gears consist of camshaft and crankshaft gears and injection pump drive and driven gears. Timing marks should be aligned as shown.

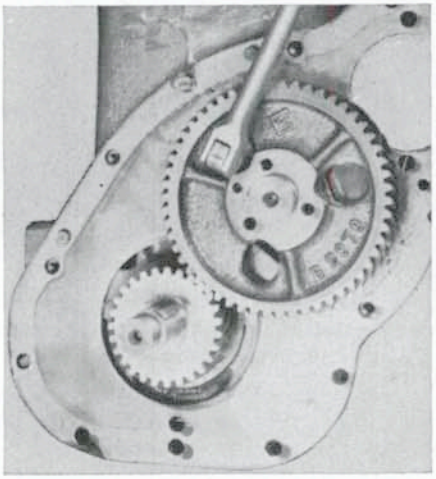

Fig. 45 — Removing the camshaft thrust plate retaining cap screws. (Although a WD45 diesel engine is shown the method is the same for D-15 and D-17 diesel models.)

LP-GAS SYSTEM

The LP-Gas system available is designed and built by Ensign Carburetor Co. Like other LP-Gas systems, this system is designed to operate with the fuel tank not more than 80% filled.

The Ensign model Mg 1 carburetor and model W regulator have three points of mixture adjustment, plus an idle stop screw.

ADJUSTMENTS

100. **STARTING SCREW.** Immediately after the engine is started, bring the throttle to the fully **open** position and with the choke in the fully **closed** position, rotate the starting screw (N—Fig. 61) until the highest engine speed is obtained. A slightly richer adjustment (counter-clockwise until speed drops slightly) may be desirable for a particular fuel or operating condition. Average adjustment is ¼-turn open. Place the controls in operating position by completely opening the choke.

101. **IDLE STOP SCREW.** Idle speed stop screw on the carburetor throttle should be adjusted to provide the correct low idle engine speed.

D-14 .....525-575 rpm
D-15 .....550-575 rpm
D-17 .....375-425 rpm

102. **IDLE MIXTURE SCREW.** With the choke **open**, engine warm and idle stop screw set, adjust idle mixture screw (K—Fig. 64), located on regulator, until best idle is obtained. An average adjustment is approximately 1¼-turns open.

103. **LOAD SCREW (WITH ANALYZER).** It is important that the exhaust gas analyzer operating instruction be followed.

Move the throttle to the fully open position and load engine until speed is kept below any governor action (until throttle remains open); then, set the load screw (D—Fig. 61) to give a reading of 13.4 to 14.0, on a gasoline scale, or 14.0 to 14.7, on a LP-Gas scale. An average adjustment is approximately 1½-turns open.

Recheck idle adjustment as outlined in paragraph 102.

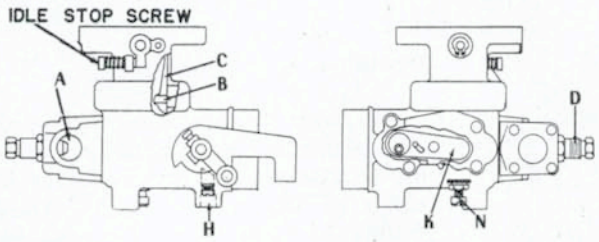

Fig. 61 — The correct low idle engine rpm is obtained by adjusting the idle stop screw shown for Ensign MG 1 carburetor.

A. Gas inlet
B. Nozzles
C. Venturi
D. Load adjusting screw
H. Balance line connection
K. Valve
N. Starting adjustment screw

104. **LOAD SCREW (WITHOUT ANALYZER).** Move the throttle to the fully open position and load engine until speed is kept below any governor action (until throttle remains open); then, find the two load screw settings where the engine speed begins to drop, when going richer and leaner and set the adjusting screw at the mid-point. An average adjustment is approximately 1½-turns open.

Recheck the idle adjustment as outlined in paragraph 102.

105. **LOAD SCREW (WITHOUT LOAD).** The idle adjustment (paragraph 102) must be carefully made before using the following method as it influences the mixture.

With the engine running at high idle rpm, adjust the load screw to obtain the maximum rpm; then, carefully turn the screw in until the rpm begins to fall. Set the screw at the mid-point of these two positions and tighten lock nut. An average adjustment is approximately 1½-turns open.

FILTER

106. The filter (Fig. 63) used in this system is subjected to and should be able to stand high pressures without leakage. When major engine work is being performed, it is advisable to remove the lower part of the filter, thoroughly clean the interior and renew the felt cartridge if same is not in good condition.

NOTE: A partially clogged filter element will cause a pressure drop across the ele-

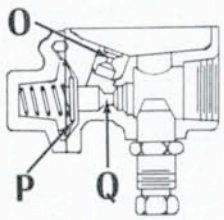

Fig. 62 — A fixed orifice (O) type economizer is built in the carburetor gas inlet casting and is operated by manifold vacuum applied in back of the diaphragm (P) which actuates valve (Q), resulting in slightly leaner mixtures at partial load ranges.

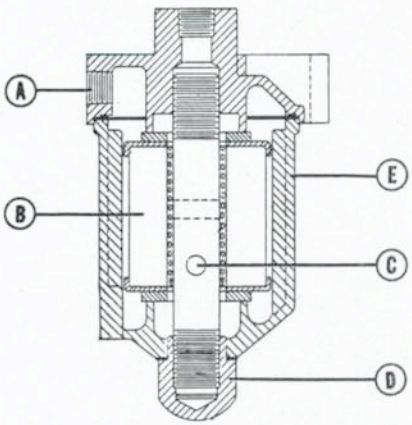

Fig. 63 — Cross sectional view of the LP-Gas filter.

A. Fuel inlet
B. Filter element
C. Fuel outlet
D. Cap nut
E. Filter bowl

COOLING SYSTEM

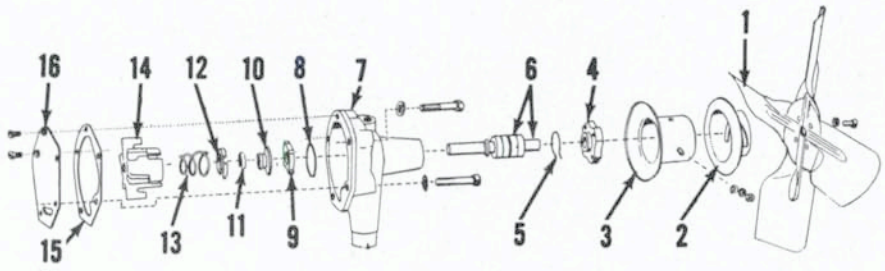

Fig. 86—Exploded view of D-14 and D-15 non-diesel water pump and fan assembly.

1. Fan blade
2. Adjustable pulley flange
3. Fixed pulley flange
4. Fan hub
5. Snap ring
6. Bearing and shaft assembly
7. Pump body
8. Snap ring
9. Carbon thrust washer
10. Shaft seal
11. Clamp ring
12. Spring guide
13. Shaft seal spring
14. Impeller
15. Gasket
16. Cover

RADIATOR

All Models

135. To remove the radiator, proceed as follows: Remove grille and drain cooling system. Then, remove both hood side panels and, on shuttle clutch equipped models, disconnect oil cooler tubes. Remove radiator shell, disconnect radiator hoses and unbolt and remove radiator from front support. Note: Radiator and radiator shell may be removed as a unit if so desired.

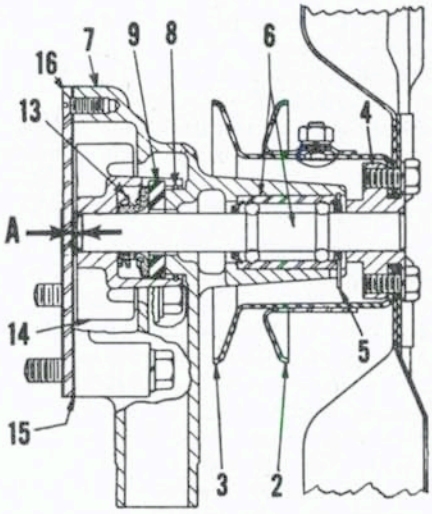

Fig. 87 — Cut-away drawing of water pump showing 1/32-inch clearance (A) between impeller and pump body. See Fig. 86 for legend.

WATER PUMP

D-14 and D-15 Non-Diesel

136. **REMOVE AND REINSTALL.** To remove the water pump, first remove both hoods, generator and fan belt. Disconnect lower radiator and thermostat by-pass hoses from pump. Remove the fan and pulley assembly. Unbolt and remove water pump.

137. **OVERHAUL.** To overhaul the removed water pump, first remove the cover (16—Fig. 86); then, using a suitable puller, remove impeller from rear end of shaft. Carbon thrust washer (9) and seal assembly can be removed from impeller after removing snap ring (8). Shaft and bearing assembly (6) can be pressed out front of body after removing snap ring (5) from behind fan hub (4). Hub can be pressed from shaft.

Surface of pump body contacted by the carbon thrust washer must be smooth and true. When pressing impeller on shaft, use caution not to collapse seal. Press impeller on shaft until rear face of impeller is $\frac{1}{32}$-inch below the cover gasket surface of body as shown at "A" Fig. 87. Fan hub should be pressed on shaft until fan hub is flush with end of shaft.

D-17 Non-Diesel

138. **R&R AND OVERHAUL.** To remove the water pump, first drain cooling system and remove left hood side panel. Loosen fan belt adjustment, then unbolt and remove fan from water pump. Disconnect by-pass hose and lower radiator hose from pump and unbolt and remove pump from engine.

To overhaul pump, refer to Fig. 88 and proceed as follows: Remove the fan pulley (9) using a suitable puller. Remove snap ring (8) and rear cover (2); then press the drive shaft and bearing unit forward out of impeller and pump housing. Seal (5) is available separately or in kit that includes all necessary gaskets and snap ring (8). Renew shaft and bearing assembly (7) if bearing is rough or dry. Renew all other questionable parts and reassemble pump in reverse of disassembly procedure. Press impeller onto shaft until rear face of impeller is 1/64 to 1/32-inch below gasket surface of body. Be sure to use copper washers under heads of the four cap screws that extend into the pump body.

D-15 Diesel and Early D-17 Diesel

Refer to the following for all D-15 diesel models and D-17 diesel models prior to engine Serial No. 119938 (except Serial Nos. 117087 through 117104).

139. **R&R AND OVERHAUL.** To remove the water pump, first remove radiator and radiator shell as a unit as outlined in paragraph 135. Loosen the fan belt adjustment and remove fan blades and fan belt. Disconnect

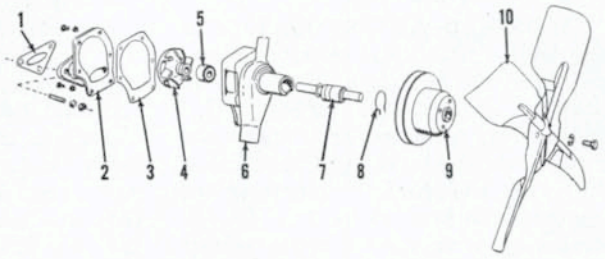

Fig. 88 — Exploded view of the non-diesel D-17 fan and water pump assembly.

1. Gasket
2. Body cover
3. Gasket
4. Impeller
5. Seal
6. Pump body
7. Bearing and shaft
8. Snap ring
9. Fan pulley
10. Fan

either prior to or after reassembling tractor. Engage and disengage clutch using pry-bar against clutch collar (C—Fig. 99) if adjusting clutch prior to reassembly of tractor.

CLUTCH OUTER (HOLLOW) SHAFT

D-14 and D-15 Models

163. **REMOVE AND REINSTALL.** To remove the "Power Director" outer clutch shaft, it is necessary to split the torque tube from the transmission housing as outlined in paragraph 172; then proceed as follows: Remove snap ring (27—Fig. 103), unbolt and remove retainer (28) and oil transfer tube (28A). Outer shaft (25) can be withdrawn as the transfer tube is removed. After snap ring (21—Fig. 104) is removed, thrust washer (20) and drive gear (19) can be removed.

In some cases, outer shaft bushing (26) may need to be honed after installing same in the outer shaft to provide a free fit between bushing and engine clutch shaft.

When reinstalling, reverse the removal procedure.

D-17 Models

164. **REMOVE AND REINSTALL.** To remove the outer clutch shaft, it is necessary to first split the tractor between transmission and torque housing as outlined in paragraph 180; then, proceed as follows: Remove snap rings (43 and 46—Fig. 105), then bend tabs on lockwasher away from nut (45) and remove the nut and lockwasher. Using a tool similar to that shown in Fig. 106, screw tool onto outer shaft (36—Fig. 107) and bump shaft, bearings (40 and 42) and spacer (41) out toward rear.

Bushings (37 and 38) are pressed into the outer shaft. In renewing bushings, press the ½-inch wide front bushing (37) into hollow shaft bore until bushing is $3\frac{21}{32}$ inches from rear end of shaft. Press the 1-inch wide rear bushing (38) into hollow shaft so that bushing is 21/32-inch from rear of shaft. Ream or hone new bushings, if necessary, to provide 0.001-0.003 clearance between bushings and engine clutch shaft.

To reassemble, install snap ring (39) in the front groove in housing. Assemble front bearing cone and cup (40), spacer (41), rear bearing cone and cup (42), lock-tab washer (44) and nut (45) on hollow shaft, but do not tighten nut at this time. Apply grease to bushings in hollow shaft and install the assembly in bore of housing using the same tool that was used in removal. Adjust nut to provide 0.0005-0.0045 end play of shaft in bearings and bend tangs of lock-tab washer over nut. Install as thick a snap ring (43) as possible in the rear groove in bore of housing. Snap rings are available in thicknesses of 0.094 to 0.109 in steps of 0.003. Install snap ring (46).

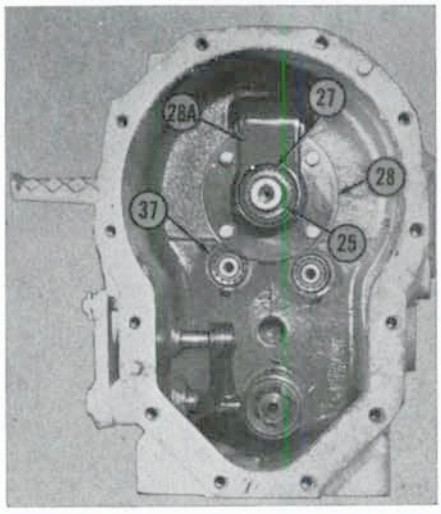

Fig. 103—View of D-14 and D-15 "Power-Director" compartment. After the snap ring (27) and the transfer tube (28A) retaining cap screws are removed; the outer (hollow) "Power Director" clutch shaft (25), oil transfer tube (28A) and retainer (28) can be lifted out.

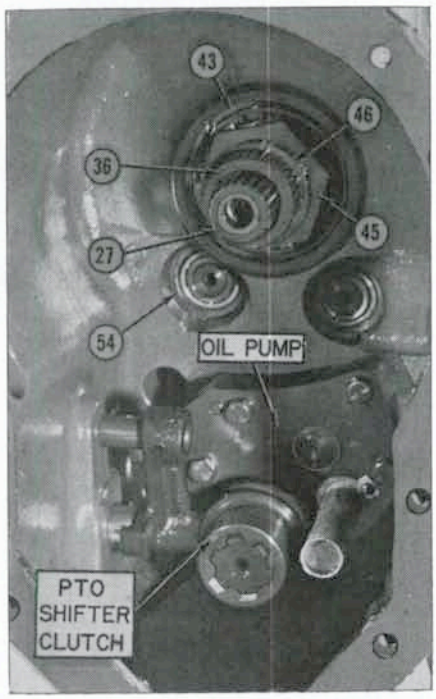

Fig. 105 — View into D-17 "Power-Director" compartment showing the inner clutch shaft (27) and the outer (hollow) shaft (36).

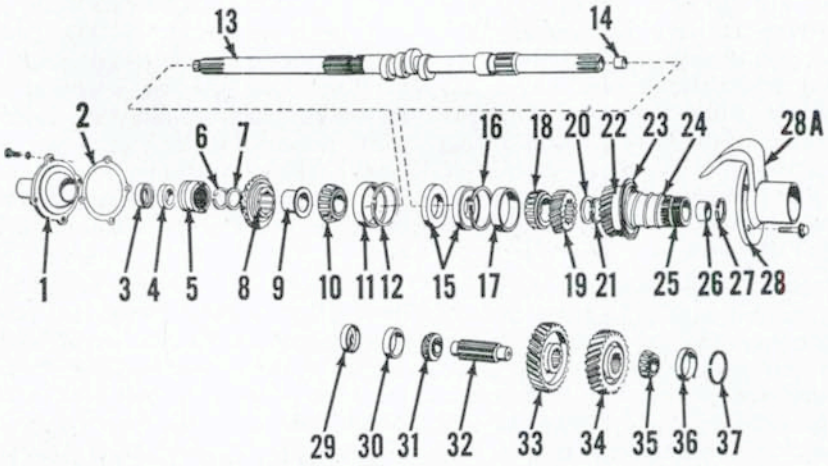

Fig. 104—Exploded view of D-14 and D-15 clutch shaft and associated parts. Lip seals (3 & 4) face toward rear.

1. Retainer
2. Gasket
3. & 4. Oil seal
5. Shifter collar
6. Snap ring
7. Thrust washer
8. Belt pulley pinion
9. Bushing
10. Bearing cone
11. Bearing cup
12. Snap ring
13. Clutch shaft
14. Pilot bushing
15. Oil seals (2)
16. Snap ring
17. Bearing cup
18. Bearing cone
19. Drive gear
20. Thrust washer
21. Snap ring
22. Bearing
23. Snap ring
24. Pump spring
25. Clutch outer shaft
26. Bushing
27. Snap ring
28. Retainer
28A. Oil transfer tube
29. Plug
30. Bearing cup
31. Bearing cone
32. Intermediate shaft
33. Driven gear
34. Intermediate drive gear
35. Bearing cone
36. Bearing cup
37. Snap ring

INTERMEDIATE SHAFT AND GEARS

D-14 and D-15 Models

165. To remove the intermediate gears and shaft, it is first necessary to remove the PTO driven gear as outlined in paragraph 224; then proceed as follows: Remove snap ring (27—Fig. 103), then unbolt and remove retainer (28) and oil transfer tube (28A). Remove the plug (29—Fig. 104), then remove snap ring (37). As the shaft (32) is pressed or bumped

MAIN DRIVE BEVEL GEARS AND DIFFERENTIAL D-14 AND D-15 MODELS

ADJUST BEVEL GEARS

The tooth contact (mesh position) of the main drive bevel pinion and ring gear is controlled by varying the thickness of snap ring (20—Fig. 117). The backlash of the bevel gears is controlled by transferring shims (61—Fig. 126) from one side of the differential housing to the other.

186. **BEARING AND BACKLASH ADJUSTMENT.** Carrier bearings are adjusted by varying the number of shims (61—Fig. 126) located under the carriers (60). Although shim removal can be accomplished without removing the rockshaft housing (bolted to the rear face of the transmission housing), there is no sure way of checking the bearing adjustment or the pinion to ring gear backlash without doing so.

187. To adjust the differential carrier bearings, first remove both final drive assemblies as outlined in paragraph 201, the brake shoes from their brackets and the rockshaft housing from rear face of transmission housing. Vary the number of 0.004 thick shims (61—Fig. 126), located between carriers and housing, to remove all bearing play but permitting differential to turn without binding. Removing shims reduces bearing play. NOTE: When making the bearings adjustment, make certain that there is some backlash between gears at all times.

188. After the bearings are adjusted as outlined in the previous paragraph, the backlash can be adjusted as follows: Transfer shims from under one bearing carrier to the other to provide 0.007-0.012 backlash between teeth of the main drive bevel pinion and ring gear. To increase backlash, remove shim or shims from carrier on ring gear side of housing and install same under carrier on opposite side.

189. **MESH POSITION.** The mesh position of the bevel pinion and ring gear must be adjusted when renewing either bevel pinion and bearings or the ring gear or both. The first step in adjusting the mesh position is to remove all gears, spacers and shims (22 to 36 —Fig. 115) using paragraph 175 as a general guide during this operation. Reinstall the pinion shaft with only bearings (19, 21, 38 & 39) on the shaft; then tighten the retaining nut (40) until the shaft (18) turns freely with no end play. Reinstall the differential assembly and adjust the bearings and backlash referring to paragraphs 187 and 188. Using mechanics (Prussian) blue, check the mesh position of the gears. If there is not a central mesh position, remove the differential, loosen nut (40), and install a different thickness snap ring (20). Then recheck the mesh position. Snap ring (20) is available in thicknesses from 0.060 to 0.072 in graduations of 0.003. A thicker snap ring will move the bevel pinion toward the rear. Refer to paragraph 176 when reinstalling the bevel pinion shaft.

190. **R&R AND OVERHAUL DIFFERENTIAL.** To remove the differential unit from the transmission housing. Remove both final drive units as outlined in paragraph 201, the brake shoes from their brackets, the rockshaft housing from rear face of transmission housing and the differential carrier from each side of transmission

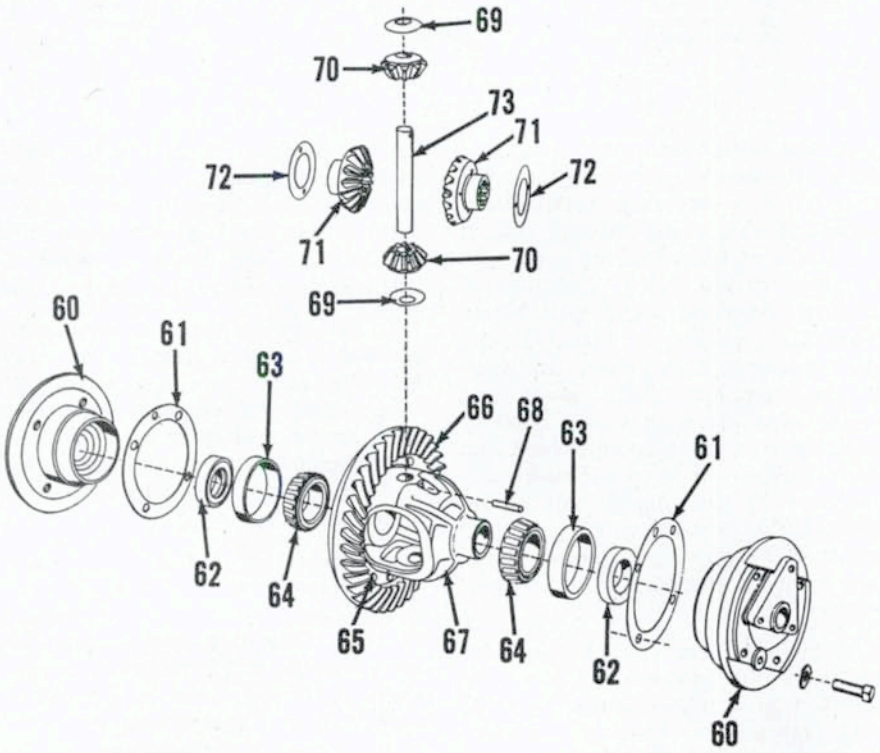

Fig. 126—Exploded view of the D-14 and D-15 differential unit including the bearing carriers (60). The main drive bevel gear backlash adjustment is accomplished by transferring shims (61) from under one bearing carrier (60) to the other as required to obtain the desired backlash of 0.007-0.012.

60. Bearing carriers
61. Shims (0.004)
62. Oil seal
63. Bearing cup
64. Bearing cone
65. Rivet
66. Ring gear
67. Differential case
68. Lock pin
69. Thrust washers
70. Differential pinions
71. Side gears
72. Thrust washers
73. Pinion shaft

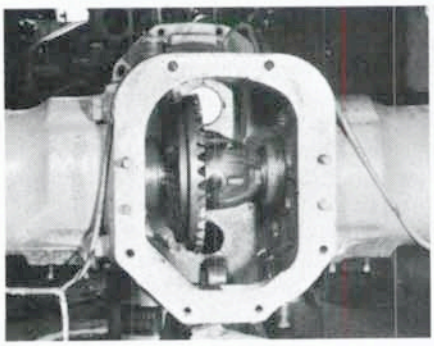

Fig. 127 — View showing the D-14 and D-15 differential unit installed.

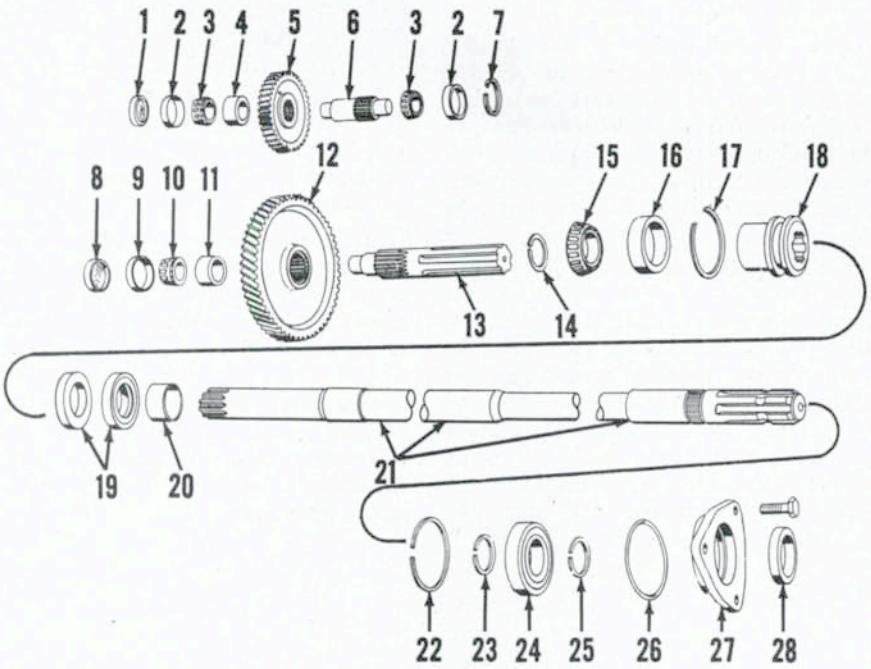

Fig. 144 — Exploded view of the Power Take-Off assembly. Adjustment of bearings (10 and 15) is controlled by the thickness of snap ring (17); the adjustment of bearings (3) is controlled by thickness of snap ring (7).

1. Plug
2. Bearing cup
3. Bearing cone
4. Spacer
5. Idler gear
6. Idler shaft
7. Snap ring
8. Plug
9. Bearing cup
10. Bearing cone
11. Spacer
12. PTO driven gear
13. PTO coupler shaft
14. Snap ring
15. Bearing cone
16. Bearing cup
17. Snap ring
18. Coupler
19. Oil seals (opposed)
20. Bushing
21. PTO shaft
22. Snap ring
23. Snap ring
24. Bearing
25. Snap ring
26. "O" ring
27. Rear bearing retainer
28. Oil seal

To reinstall, proceed as follows: Apply sealer to rim of plug and drive the plug, cupped side to rear, into torque housing until flat side is flush. Drive front bearing cup in tight against shoulder in bore of housing and drive rear bearing cone against snap ring on shaft. Place front bearing cone in cup and position the gear in housing. Insert shaft through rear bearing bore into splines of gear, place spacer between gear and bearing cone, and push shaft on through gear and spacer. Drive the shaft forward until shoulder on shaft contacts front bearing cone. Install rear bearing cup and snap ring. Bump shaft to front and to rear to seat bearing cones and cups; then, check end play of shaft with dial indicator. If end play is not within recommended limits of 0.0005-0.0045, remove snap ring (17) and install new snap ring of proper thickness to bring end play within limits. Snap rings are available in thicknesses of 0.061 to 0.105 in steps of 0.004.

Reassemble tractor by reversing disassembly procedure.

PTO IDLER GEAR

D-14 and D-15 Models

226. To remove the PTO idler gear (5—Fig. 144), first remove the PTO driven gear as outlined in paragraph 224; then proceed as follows: Remove snap ring (SR—Fig. 145), then unbolt and remove the oil transfer tube and retainer. Remove plug (1—Fig. 144) and snap ring (7); then while driving or pressing shaft (6) toward rear, withdraw bearing (3), spacer (4) and gear (5) through opening in bottom.

When reinstalling the idler shaft, press bearings (3) on shaft and bearing cup (2) in bore. Install a snap ring (7) of the proper thickness to maintain the recommended shaft end play of 0.0005-0.0045. This snap ring is available in thicknesses from 0.069 to 0.109 in graduations of 0.004.

D-17 Models

227. To remove the PTO idler gear (5—Fig. 144), first remove the PTO driven gear as outlined in paragraph 225; then, proceed as follows: Remove the snap ring (7) and install slide hammer adapter into threaded hole in rear end of idler shaft. Bump shaft and rear bearing cone and cup out towards rear end of torque housing. Remove gear (5), spacer (4) and front bearing cone (3) out bottom opening of torque housing. If necessary to renew front bearing cup (2), pull cup with slide hammer and bearing cup adapter; or, remove the hydraulic pump, drive plug (1) out to front and drive the cup out to rear.

NOTE: Prior to tractor Serial No. D17-24001, the PTO idler gear and shaft were splined. After this serial number, shaft is cross-drilled and a pin inserted through hole in shaft engages a milled slot in the bore of the gear.

To reinstall, proceed as follows: Apply sealer to outer rim of plug (1) and insert plug in bore from rear with flat side of cup to front. Drive plug forward until flat side is flush with front of casting. Drive front bearing cup in tightly against shoulder in bore. Drive rear bearing cone on shaft and insert gear drive pin in shaft if so equipped. Place front bearing cone in cup and idler gear in housing. Insert shaft through rear bearing bore into gear, mating splines or pin and milled slot. Place spacer between gear and front bearing cone, then bump shaft forward until shoulder on shaft is seated against front bearing cone. Install rear bearing cup and snap ring (7). Bump shaft to front and to rear to be sure bearings are seated; then, check end play of shaft with a dial indicator. If end play is not within the recommended limits of 0.0005-0.0045, remove snap ring (7) and install new snap ring of proper thickness to bring end play within limits. Snap rings are available in thicknesses of 0.069 to 0.109 in steps of 0.004.

NOTE: After tractor Serial No. D17-24001, the PTO idler and driven gears are thicker than gears used in prior production. The later type PTO idler gear and shaft and driven gear may be used as a set to renew the gears and shaft in models prior to tractor Serial No. D17-24001; however, it may be necessary to enlarge the bottom opening in the torque housing by grinding enough material from edge of opening to admit the thicker PTO driven gear.

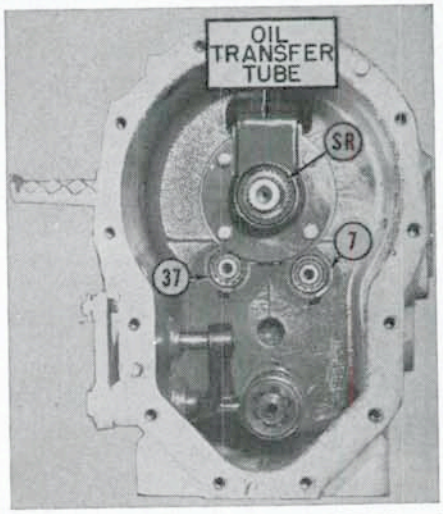

Fig. 145—View into rear end of D-14 and D-15 tube showing the snap ring (7) which must be removed in order to remove the PTO idler gear.

HYDRAULIC POWER LIFT SYSTEMS (GEAR TYPE PUMPS)

258. Gear type hydraulic pumps are available for D-15 and D-17 Series IV (tractor Serial No. D17-75001 and up). The gear type pump is mounted on the right side of the torque housing in place of the belt pulley. On D-15 tractors, the pump is driven by the bevel gear (8—Fig. 142) on the engine clutch shaft. On D-17 Series IV tractors, the pump is driven by the bevel gear on the pump drive shaft (10—Fig. 97). Refer to paragraph 228 for the plunger type pump used on other models.

CHECKS AND ADJUSTMENTS

Series IV D-17 Models

259. **TORSION BAR ADJUSTMENT.** Remove any weight or implement attached to the three point hitch. Loosen lock nut and back the preload adjusting screw (Fig. 172) out until torsion bar tube (3) is free to turn in the support brackets. Then, turn adjusting screw in just far enough to eliminate all free movement of the torsion bar tube and tighten the lock nut while holding the screw in this position.

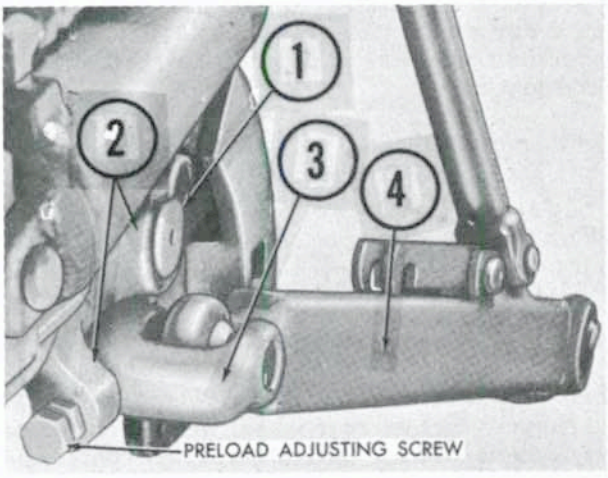

Fig. 172 — View of the torsion bar preload adjusting screw and locknut for Series IV D-17 tractors. Refer to paragraph 259 for adjustment procedure.

1. Torsion bar
2. Left hand torsion bar support
3. Torsion bar tube
4. Left hand draft arm

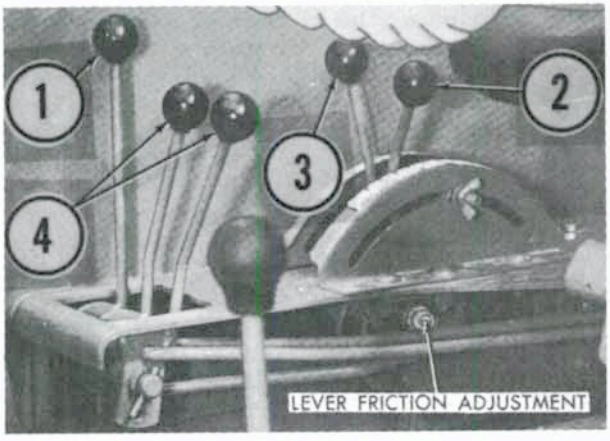

Fig. 173—View of Series IV D-17 hydraulic control levers and control lever friction adjustment nut.

1. Lift arm control lever
2. Position control lever
3. "Traction Booster" control lever
4. Remote ram control levers

260. **"TRACTION BOOSTER" (DRAFT) ADJUSTMENT.** Remove any weight or implement attached to the 3 point hitch and/or drawbar. With the engine running at low idle speed, move the lift arm control lever (1—Fig. 173) to the "Traction Booster" detent position, move the position control lever (2) all the way forward and move "Traction Booster" control lever (3) all the way to the rear. Loosen locknut (L—Fig. 174) and turn the "Traction Booster" link rod into yoke (Y). Attach a 200 lbs weight to the lift arms and back the link rod out of the yoke (Y) until lift arms begin to lower with the attached 200 lbs. Make certain that lift arms move to the fully lowered position with 200 lbs of weight, then tighten locknut (L).

261. **POSITION CONTROL ADJUSTMENT.** With the engine running at low idle speed, move the lift arm control lever (1—Fig. 173) to the "Traction Booster" detent position, move the "Traction Booster" control lever (3) all the way forward, move the position control lever (2) all the way to the rear. Turn the position control adjustment nut (Fig. 175) out until lift arms raise, then with lift arms at top of travel, turn the adjusting nut (Fig. 175) onto rod until pressure is below ½ of scale on the "Traction Booster" gage.

262. **LEVER FRICTION ADJUSTMENT.** With the engine stopped, completely lower the lift arms. Move the "Traction Booster" control lever (3—Fig. 173) and the position control lever (2) to full rearward position. If the levers will not stay in this position, tighten the friction adjusting nut (See Fig. 173).

263. **LOWERING RATE ADJUSTMENT.** The rate of lowering can be adjusted by turning the adjusting screw (56—Fig. 177) in to slow the lowering rate or out to increase the speed of lowering. Normal setting is accomplished by turning needle in until it seats, then backing screw out ¾-turn. The adjusting needle is located at bottom of lift arm valve body, just ahead of the lift arm ram outlet connection. **NOTE:** The high volume