

1080

**SERVICE OPERATION'S  
MANUAL**

**JOHN DEERE  
2 CYLINDER TRACTORS**

**1936-1953**

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Sixth Edition

**MOTOR'S  
TRUCK AND TRACTOR  
REPAIR MANUAL**

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## MAJOR SPECIFICATIONS

Year	Tractor Model	Engine Make	Engine Model	No. Cyls. & Valve Location	Bore & Stroke	Piston Displ. Cu. In.	Engine Oil Capacity, Quarts	Cooling System Capacity, Gallons	Transmission and Differential Capacity, Quarts
1953	40	Own	....	2-In Head	4 x 4	101	5	3½	2½ <sup>ⓐ</sup>
1953	40-S	Own	....	2-In Head	4 x 4	101	5	3½	6½ <sup>ⓐ</sup>
1953	50	Own	....	2-In Head	4 11/16 x 5½	190	7	5¾	22
1953	60	Own	....	2-In Head	5½ x 6¾	321	8	8¾	28
1936-46	A Series	Own	....	2-In Head	5½ x 6¾	321	9½	8¾	ⓑ
1947-53	A Series	Own	....	2-In Head	5½ x 6¾	321	11	8½	28
1936-46	B Series	Own	....	2-In Head	4½ x 5½	175	7½	6	18
1947-52	B Series	Own	....	2-In Head	4 11/16 x 5½	190	7	7	18
1936-53	D	Own	....	2-In Head	6¾ x 7	501	13	14	ⓑ
1936-53	G Series	Own	....	2-In Head	6¾ x 7	413	11	12½	ⓑ
1936-46	H Series	Own	....	2-In Head	3 9/16 x 5	100	4	5½	12
1941-45	L	Hercules	NXB	2-In Block	3¾ x 4	66	3	2½	1¾
1941-46	LA	Own	....	2-In Block	3½ x 4	77	3	2½	1¾
1947-52	M	Own	....	2-In Head	4 x 4	101	5	3½	6½ <sup>ⓐ</sup>
1949-52	MT	Own	....	2-In Head	4 x 4	101	5	3½	7½ <sup>ⓐ</sup>

- ⓐ Before Serial No. 584000, 32 qts.; after 584000, 28 qts.
- ⓑ Before Serial No. 109944, 20 qts.; after 109944, 28 qts.
- ⓒ Before Serial No. 12068, 36 qts.; after 12068, 32 qts.
- ⓓ For each final drive, 1½ qts.
- ⓔ For each final drive, 2 qts.
- ⓕ For each final drive, 1¾ qt.

## TUNE UP DATA

Tractor Model	Firing Order	Spark Plug Gap, Inch	Breaker Gap, Inch		Ignition Timing Mark Location	Ignition Mark		Governed Speeds, No Load	
			Battery Ignition	Magneto Ignition		Retarded Timing	Full Advance Timing	Engine R.P.M.	Belt Pulley R.P.M.
50	1-2	.030	None	.015	Flywheel	(A)	(B)	1370	1370
60	1-2	.030	.022	None	Flywheel	(A)	(B)	1115	1115
A Series	1-2	.030	None	.015	Flywheel	L.H. Impulse	None	1075	1075
B Series	1-2	.030	None	.015	Flywheel	L.H. Impulse	None	1370	1370
D	1-2	.030	None	.015	Flywheel	L.H. Impulse	None	975	975
G Series	1-2	.030	None	.015	Flywheel	L.H. Impulse	None	1080	1080
H	1-2	.030	None	.015	Flywheel	L.H. Impulse	None	1540	770
L, LA	1-2	.025	.020	.015	Flywheel	DC	Spark	....	....
M, MT	1-2	.025	.020	.015	Flywheel	DC	Spark	1825	1746

(A) "5°ATDC" mark on gasoline-burning engines; "TDC" mark on all-fuel burning engines.

(B) "20°BTDC" mark on gasoline-burning engines; "25°BTDC" mark on all fuel-burning engines.

**VALVE DATA**

Tractor Model	Valve Seat Angle, Degrees		Valve Clearance H—Hot C—Cold		Valve Stem Clearance		Average Valve Spring Pressure, Lbs. @ Length Inches	Valve Guide Inside Diameter
	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust		
40	30	45	.012C	.012C	.002-.0045	.002-.0045	42 @ 2	.3745-.3760
40-S	30	45	.012C	.012C	.002-.0045	.002-.0045	42 @ 2	.3745-.3760
50	30	45	.020C	.020C	.0005-.001	.0005-.001	37 @ 2 <sup>13</sup> / <sub>16</sub>	.439-.440
60	30	45	.020C	.020C	.0005-.001	.0005-.001	40 @ 2 <sup>3</sup> / <sub>4</sub>	.501-.502
A	Ⓜ	Ⓜ	.020C	.020C	.0005-.001	.0005-.001	40 @ 2 <sup>3</sup> / <sub>4</sub>	Ⓜ
B	Ⓜ	Ⓜ	.020C	.020C	.0005-.001	.0005-.001	Ⓜ	.439-.440
D	30	30	.030C	.030C	.0005-.001	.0005-.001	Ⓜ	.626-.628
G	Ⓜ	Ⓜ	.020C	.020C	.0005-.001	.0005-.001	62 @ 3 <sup>3</sup> / <sub>8</sub>	.5635-.5650
H	30	45	.015C	.015C	.0005-.001	.0005-.001	65 @ 2 <sup>5</sup> / <sub>8</sub>	.3760-.3775
L	30	30	.006H	.008H	.001-.0015	.001-.0015	42 @ 1 <sup>3</sup> / <sub>16</sub>	.....
LA	30	30	.006H	.008H	.0015-.002	.0015-.002	42 @ 1 <sup>3</sup> / <sub>16</sub>	.....
M	30	45	.012C	.012C	.002-.0045	.002-.0045	42 @ 2	.3745-.3760
MT	30	45	.012C	.012C	.002-.0045	.002-.0045	42 @ 2	.3745-.3760

- ⓂFrom serial numbers 410000 to 487999, 45 degrees on intake and exhaust; from 488000 up, 30 degrees on intake and 45 degrees on exhaust.
- ⓂFrom serial numbers 1000 to 96000, 45 degrees on intake and exhaust; from 96000 up, 30 degrees on intake and 45 degrees on exhaust.
- ⓂFrom serial numbers 1000 to 13000, 45 degrees on intake and exhaust; from 13000 up, 30 degrees on intake and 45 degrees on exhaust.
- ⓂFrom serial numbers 1000 to 95999, 31 @ 2<sup>13</sup>/<sub>16</sub>; from 96000 up, 37 @ 2<sup>13</sup>/<sub>16</sub>.
- ⓂFrom serial numbers 30400 to 109993, 68 @ 3; from 109994 up, 65 @ 3<sup>3</sup>/<sub>8</sub>.
- ⓂTo serial number 583999, .4385-.4400; after 584000, .501-.502.

**PISTONS, RINGS AND BEARINGS**

Tractor Model	Pistons Removed From	Piston Clearance, Inch	Ring End Gap, Inch (Minimum)		Crankpin Diameter, Inches	Rod Bearing Clearance, Inch	Main Bearing Journal Diameter, Inches	Main Bearing Clearance, Inch	Crankshaft End Play, Inch
			Compression	Oil					
40	Above	.004-.006	.010	Ⓜ	2.498-2.499	.001-.0035	2.397-2.398	.001-.0035	.003-.007
40-S	Above	.004-.006	.010	Ⓜ	2.498-2.499	.001-.0035	2.397-2.398	.001-.0035	.003-.007
50	Ⓜ	.004-.007	.025	.020	2.7485-2.750	.0025	Ⓜ	.0045	.005-.010
60	Ⓜ	.005-.008	.040	.028	2.9985-3.000	.0025	Ⓜ	.005	.005-.010
A	Ⓜ	.005-.008	.040	.028	2.9985-3.000	.003	2.749-2.750	.003	.005-.010
B	Ⓜ	.004-.007	.025	.020	2.9985-3.000	.003	2.749-2.750	.003	.005-.010
D	Ⓜ	Ⓜ	.030	Ⓜ	Ⓜ	.003	2.998-3.000	.003	.005-.010
H	Ⓜ	.003-.0055	.015	.015	Ⓜ	.003	2.061-2.062	.003	.005-.010
G	Ⓜ	.006-.009	.039	.030	2.3735-2.375	.003	2.998-3.000	.003	.005-.010
L	Above	.003-.0035	.015	.015	1.748	.001-.0015	1.998	.002-.0025	.002-.004
LA	Above	.003-.0055	.015	.015	.....	.001-.003	.....	.001-.0035	.003-.007
M	Above	.003	.010	Ⓜ	2.249-2.250	.001-.0035	2.397-2.398	.001-.0035	.003-.007
MT	Above	.003	.010	Ⓜ	2.249-2.250	.001-.0035	2.397-2.398	.001-.0035	.003-.007

- ⓂFrom serial numbers 1000 to 200999, 2.248-2.250; from 201000 up, 2.2495-2.2505.
- ⓂFrom serial numbers 30400 to 53387, .017; from 53388 up, .039.
- ⓂEngine is horizontal. Remove from front.
- ⓂFrom serial numbers 30400 to 53387, .004-.008; from 53388 up, .006-.010.
- ⓂFrom serial numbers 1000 to 95999, 2.4985-2.500; from 96000 up, 2.7485-2.750.
- ⓂFrom serial numbers 30400 to 103107, 2.998-3.000; from 103108 up, 3.4985-3.500.
- ⓂFrom serial numbers 1000 to 21499, 2.061-2.062; from 21500 up, 2.061-2.064.
- ⓂOil ring is installed in the lower drilled groove of the piston; clearance, .010".
- ⓂRight hand: 2.6235-2.6245"; left hand: 2.2485-2.2495".
- ⓂRight hand: 2.9990-3.000"; left hand: 2.749-2.750".

## DELCO-REMY GENERATOR SPECIFICATIONS

Generator Number Note ①	Brush Spring Tension, Ounces		Direction of Rotation Note ②	Field Current at 6 Volts (Amperes)	Maximum Cold Output Note ③			Maximum Hot Output Note ④		
	Main	Third			Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
1101356	16	17	CL	3.5-4.5	13	7.8	1800	8.5	7.2	1800
1101371	16	17	CL	3.5-4.5	13	7.8	1800	8.5	7.2	1800
1101377	16	17	CL	3.5-4.5	13	7.8	1800	8.5	7.2	1800
1101385	16	17	CL	3.5-4.5	13	7.8	1800	8.5	7.2	1800
1101390	23	17	CL	2.6-2.9	17	7.1	2000	13	7.1	2000
1101720	16	17	CL	3.3-4.0⑤	10	14.8	1500	7	14.2	1600
1101755	16	17	CL	1.48-1.56⑥	10	14.9	2200	8	14.5	2400
1101756	16	17	CL	1.48-1.56⑥	10	14.9	2200	8	14.5	2400
1101777	16	17	CL	1.48-1.56⑥	10	14.2	2000	8	14.2	2200
1101784	16	16	CL	1.6-1.69⑥	10	14.2	2000	8	14.2	2200
1101852	16	17	CL	2.0-2.3	12	7.65	3000	9.5	7.4	3000

①Generator number stamped on plate riveted to housing.

②CL: Clockwise as viewed from the drive end.

③Do not run generator for any length of time in excess of the figures given, as to do so may result in burnt armature and field.

④Generators having thermostats should not be adjusted to the specified maximum hot output unless the thermostat points are open

⑤Field current at 12 volts.

## DELCO-REMY STARTING MOTOR SPECIFICATIONS

Starting Motor Number Note ①	Brush Spring Tension, Ounces	No Load Test			Lock Test		
		Amperes	Volts	R.P.M.	Amperes	Volts	Torque, Lbs. Ft.
760	36-40	70	5.65	3000	500	3.0	19
794	36-40	65	12.0	4500	725	4.8	44
1107036	24-28	65	5.0	5000	525	3.37	12
1107064	24-28	65	5.0	5000	525	3.37	12
1107424②	24-28	65	5.0	6000	570	3.15	15
1107445②	24-28	65	5.0	6000	570	3.15	15
1107942	24-28	60	5.0	6000	600	3.0	16
1108908	36-40	70	5.65	3000	500	3.0	19
1108914	36-40	70	5.65	3000	500	3.0	19
1108919	36-40	80	11.2	4500	670	5.35	32
1108950	36-40	60	11.5	7000	675	3.98	30
1109158	36-40	65	11.4	6000	725	5.0	44
1109600	24-28	60	5.7	5000	400	3.34	8

①Starting Motor number stamped on plate riveted to housing.

②Free speed of 5000 R.P.M. for Bendix type motors.

## ENGINE REMOVAL

**SERIES 50, 60, A, B, D, G, H**—Engines in these tractors cannot be removed as a unit as they are an integral part of the main frame.

**SERIES L, M**—The tractor must be split in order to remove the engine from these tractors. To do this, proceed as follows:

1. Take off hood and grille.
2. Disconnect fuel lines, carburetor controls, electric wiring, etc.
3. Detach vertical shaft from steering gear worm shaft.
4. If equipped with Touch-o-matic power

lift, disconnect oil lines between instrument panel and rock shaft.

5. Block rear of tractor under center frame.
6. Support engine in a hoist.
7. Remove flywheel cover and unfasten engine from center frame.
8. Remove radiator, front support and front suspension as a unit.
9. Slide engine forward and lift it out.

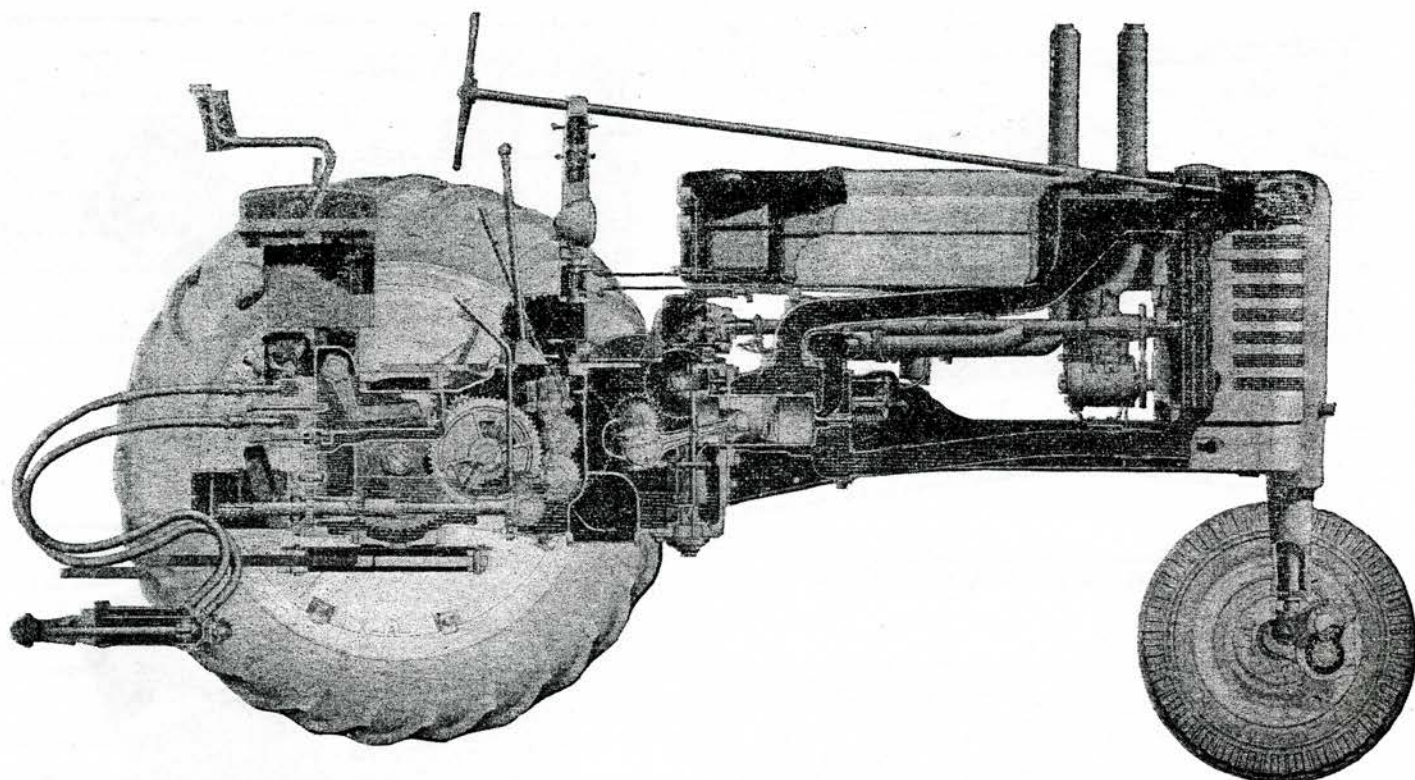
## CYLINDER HEAD

**GENERAL**—Before installing a cylinder head, be sure that the metal around the head studs has not been pulled up to any noticeable extent. If this condition is evi-

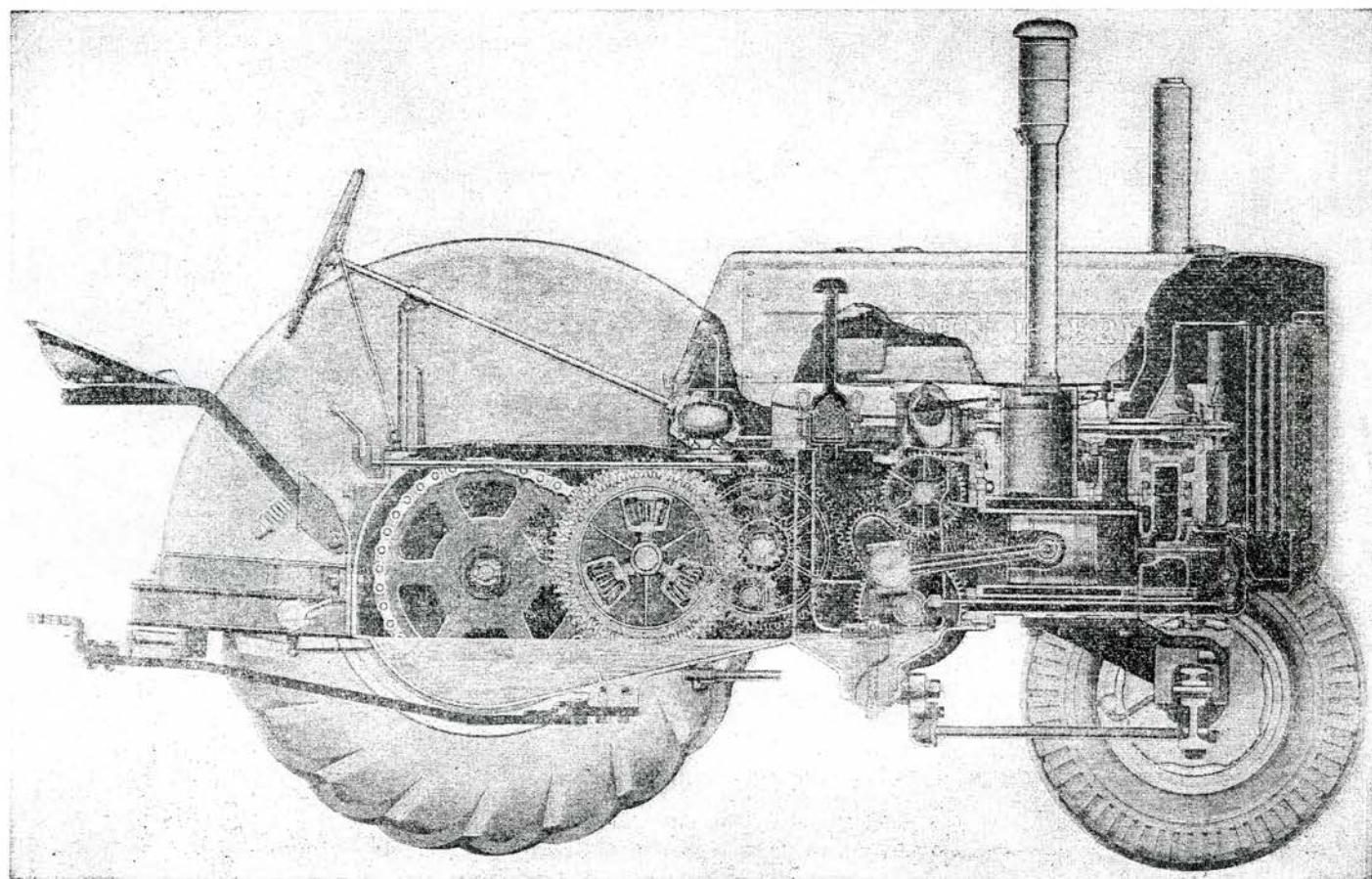
dent, remove the stud and file the block smooth. The greatest allowable variation between block and head is .010". This can be measured on the head or top of the block with a straight-edge and thickness gauge.

Tighten all cylinder head nuts gradually and evenly, going over them several times until all are uniformly tight. Start at the center and work from side to side and outward to the ends. After the engine has been warmed up, a final tightening should be made.

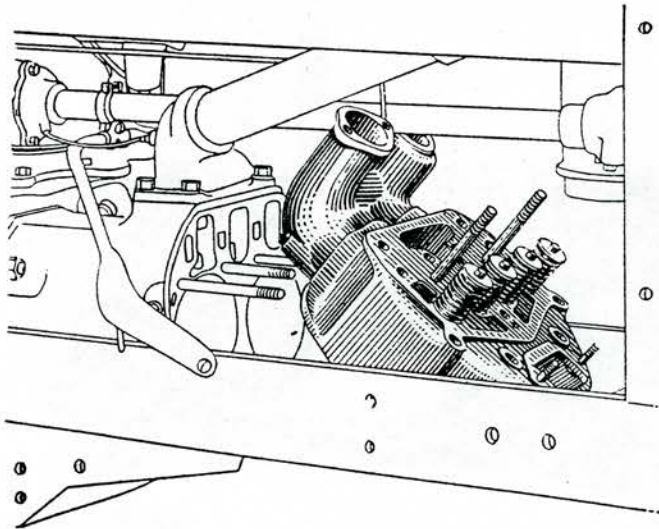
When using a torque wrench, tighten nuts to 125 pounds on Series A; 96 pounds on Series B and H; 205 pounds on Series D and G; and 105 pounds on Series M.



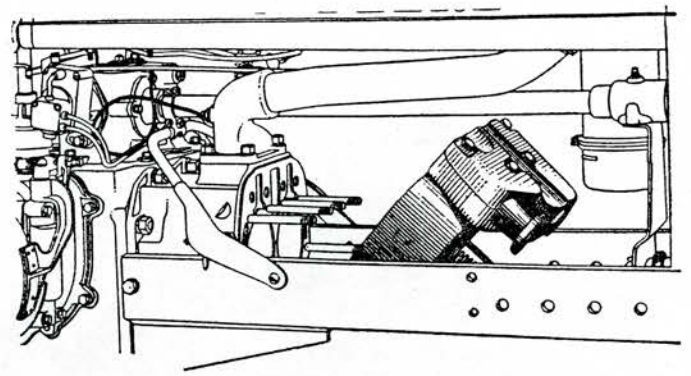
Sectional view of Model A tractor



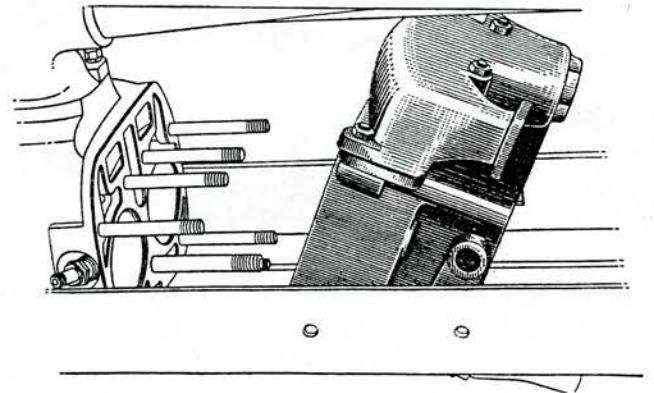
Sectional view of Model D tractor



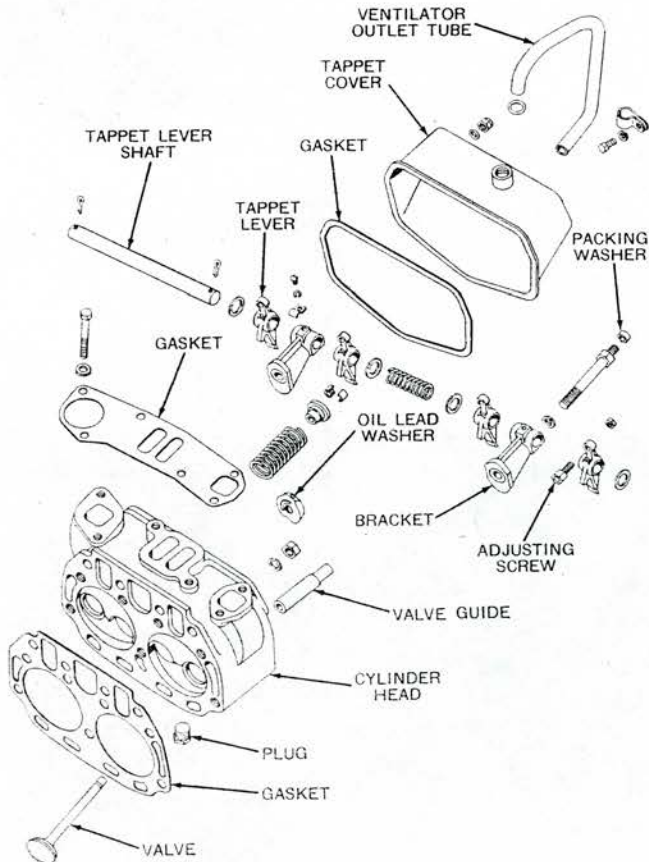
**Fig. 1 Removing cylinder head. Models A, AN, ANH, AW, AWH, BI, BO, BR**



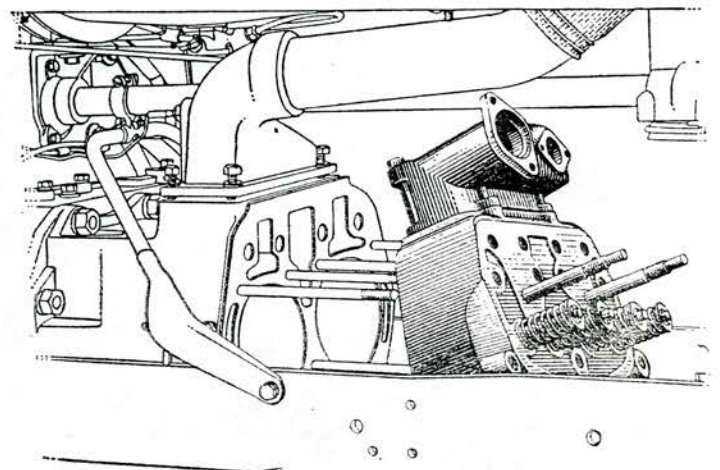
**Fig. 2 Removing cylinder head. Models B, BN, BNH, BW, BWH**



**Fig. 3 Removing cylinder head. Series H**



**Fig. 1A Exploded view of Model 60 gasoline cylinder head, valves, tappet lever assembly and cover. Model 50 is similar**



**Fig. 4 Removing cylinder head. Model G**

The  $\frac{3}{4}$ " stud with the oil lead hole on Series H should be tightened to 180 pounds.

Always remember that the clearance between valve stems and rocker arms are changed each time the head is tightened down. Therefore, always check and ad-

just the clearance after such an operation. Of course, this does not apply to Series L tractors with the valves in the block.

Always use a new head gasket and be sure it is positioned so that the water passages in the gasket line up with the passages in the cylinder block, otherwise

water circulation will be impeded and cause overheating.

**MODELS 50, 60**—To remove the cylinder head and related parts, Fig. 1A, proceed as follows:

1. Disconnect battery, drain cooling system

- and remove tool box.
2. Remove generator, exhaust pipe, ventilator tube and tappet lever cover.
3. Disconnect choke, throttle rod, and fuel line at carburetor.
4. Remove air intake elbow, carburetor and upper water pipe.
5. Disconnect tappet lever oil line.
6. Slide packing washer from each tappet lever assembly attaching stud and remove tappet lever assembly and push rods.
7. Loosen manifold from cylinder head, remove cylinder head nuts and slide head forward off studs.
8. Allow head to rest on frame. Then remove the manifold to permit removing the head from either side.

**NOTE**—When disassembling an All-Fuel engine, remove the carburetor and tappet assembly in the same manner. The cylinder head must be removed with the manifold attached because it is fastened to the head with studs and nuts.

Reverse the order of the foregoing procedure to install the head and tighten the nuts with a torque wrench to 150 lbs. ft.

**MODELS AO, AR**—To remove the head, take off the hood, radiator, carburetor, carburetor air inlet, exhaust pipe, rocker arms, push rods, lower water pipe and cylinder head attaching nuts. Slide the head forward off the studs and lift it out.

**MODELS A, AN, ANH, AW, AWH, BI, BO, BR**—To remove the head, take off the carburetor, carburetor inlet elbow, exhaust pipe, rocker arms, push rods, lower water pipe and cylinder head attaching nuts. Pull off the cylinder head by tipping the bottom of the head forward, Fig. 1.

**MODELS B, BN, BNH, BW, BWH**—To remove the head, take off the carburetor, carburetor inlet elbow, exhaust pipe, rocker arms, push rods, fan shaft support-to-housing screws, lower water pipe and cylinder head attaching nuts. Pull off the head by tipping the top of the head forward, Fig. 2.

**MODEL D**—To remove the head, take off the hood, radiator and fan. Unfasten the head from the block and lift it off.

**SERIES H**—To remove the head, take off the carburetor, carburetor inlet elbow, exhaust pipe, rocker arms, push rods, lower water pipe and the nuts attaching the head to the block. Remove the head by tipping the top of it forward, Fig. 3.

**MODEL G**—To remove the head, take off the carburetor, carburetor inlet elbow, exhaust pipe, rocker arms, push rods, lower water pipe and nuts attaching head to block. Pull the head forward, then tip the top of it back and lift out, Fig. 4.

**SERIES L**—To remove the head, take off

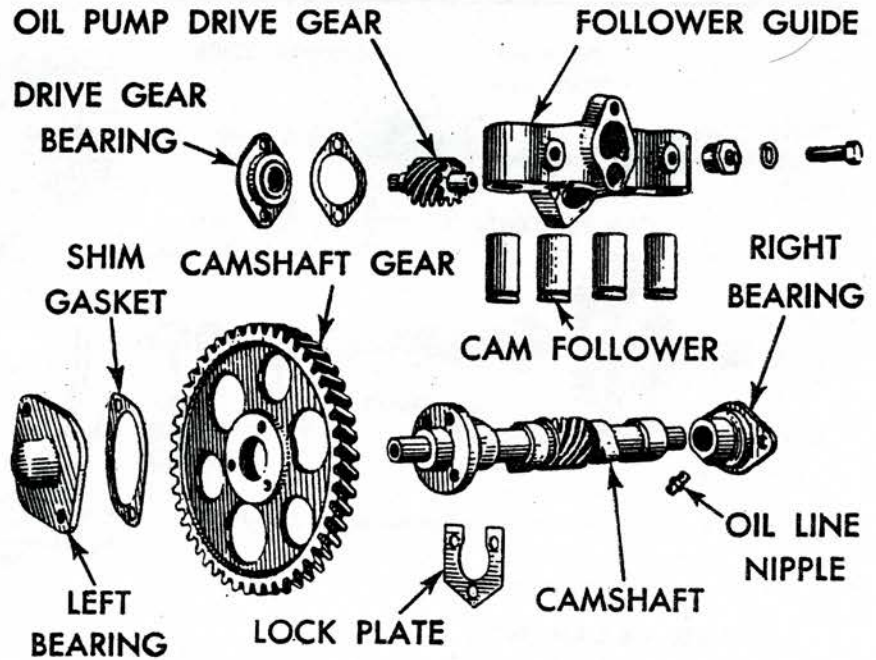


Fig. 5 Camshaft and related parts. Series B

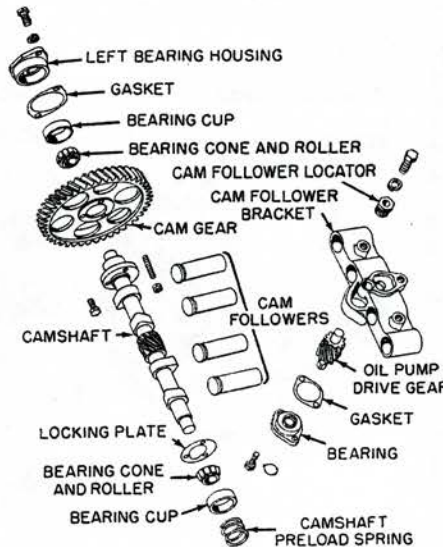


Fig. 5A Exploded view of Model 60 camshaft and related parts. Model 50 is similar

the engine hose, unfasten the head and lift it off.

**SERIES M**—To remove the head, take off the hood, carburetor and manifolds. Disconnect heat indicator from head, and rocker arm oil line. Remove rocker arms and push rods. Unfasten head from block and lift it off.

**TAPPET LEVERS**

**ALL SERIES** (Except L)—Before dismantling a tappet lever assembly, look for identifying marks which will indicate their position. If no marks are provided they

should be numbered so assembly may be made correctly.

When disassembled and cleaned, measure the shaft at the bearing points. Do this with a micrometer and if the shaft is found to be worn, out-of-round or tapered, it should be discarded.

Check each tappet lever for wear at its bearing point on the shaft. This can be done by slipping a thickness gauge between the shaft and inside diameter of the arm. If a gauge in excess of .006" can be inserted, it is recommended that the tappet lever be renewed.

Any tappet lever that shows excessive wear at the end that contacts the valve stem should be replaced. Small pits or rough spots may be polished or ground smooth.

**PUSH ROD SLEEVES**

**SERIES A, B**—Whenever the cylinder head is removed for the purpose of servicing valves, rocker arms, etc., always inspect the push rod sleeves for corrosion or other damage. If a condition of this nature is found, the sleeves may be removed by inserting a special driver through the rear of the head and driving the sleeves out through the front. Note that the rear end of the sleeves are about .002" smaller in diameter than is the front end and this smaller end goes toward the crankcase. White lead or sealing compound should be used on the end of the sleeves to make installation easier and to provide a water-tight fit.

**NOTE**—If no other work is required, sleeves may be removed without removing the cylinder head from the tractor. After removing rocker arms and push rods, pull

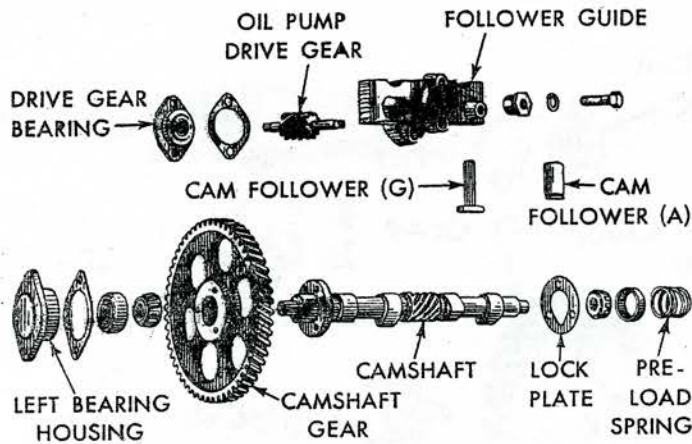


Fig. 6 Camshaft and related parts. Series A and G

out the sleeves with a suitable puller.

## VALVE CLEARANCE

**ALL MODELS**—Rotate the flywheel until No. 1 piston is at the end of the compression stroke when the "TDC" mark on the flywheel aligns with the notches in the timing hole.

Adjust the tappets to the clearance given in the **Valve Data** chart with the engine cold and when at operating temperature. When measuring the clearance with a feeler gauge, make sure that the tappet levers are not worn to the extent that a false reading is obtained.

After adjusting the clearance on No. 1 valves, rotate the flywheel one-half turn and adjust No. 2 valves in the same manner.

Be sure to make the final adjustment with engine at operating temperature.

## VALVE SPRINGS

**ALL SERIES**—Whenever valve springs are removed they should be examined for cocking and broken or set coils. If they appear to be in good condition (not rusted, etched or distorted) their strength should be measured in a spring tension gauge. Any spring that checks weaker than 10% of the figure given in the valve chart should be discarded.

If a spring tension gauge is not available, at least check the free length of all springs by standing them up against a new spring. Springs that have shrunk from use will be shorter than the new spring; such springs should be scrapped.

## VALVES

**ALL SERIES**—To be sure each valve is installed in the same port from which it was taken, a board with numbered holes should be used to hold the valves as they are removed. This will avoid the possibility of an intake valve being installed in an exhaust port, and vice versa.

When removed, clean all carbon and traces of gum or shellac from each valve.

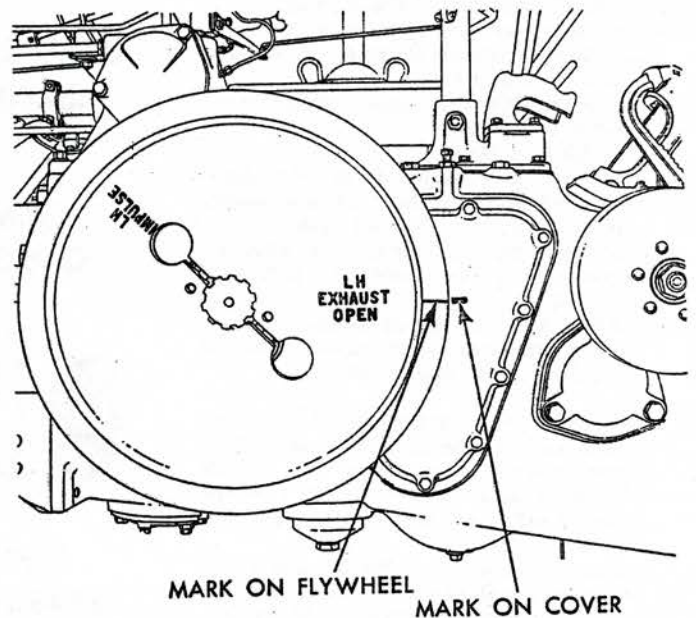


Fig. 10 Valve timing. Models A, AN, ANH, AW, AWH, B, BN, BNH, BW, BWH, C

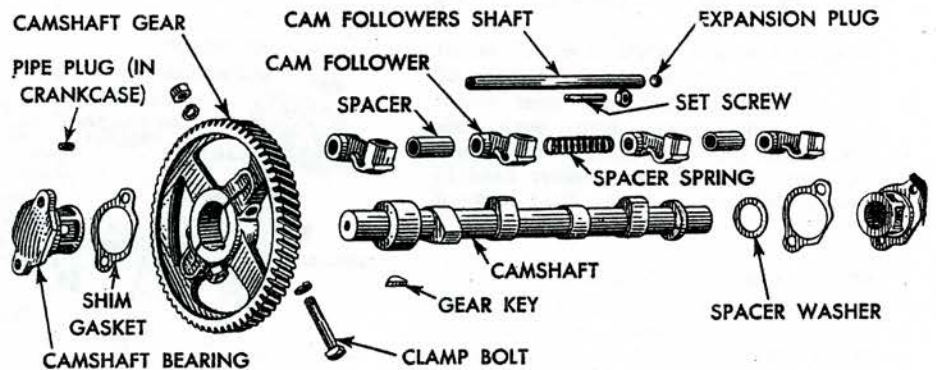


Fig. 7 Camshaft and related parts. Model D

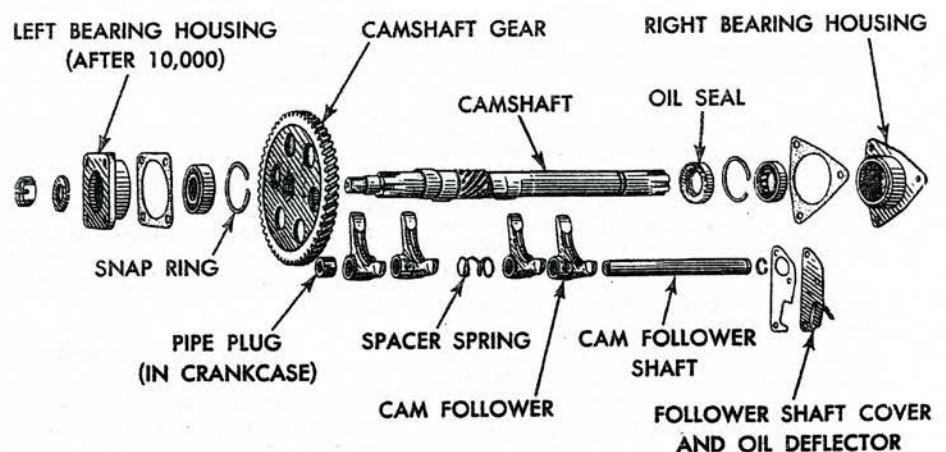


Fig. 8 Camshaft and related parts. Series H



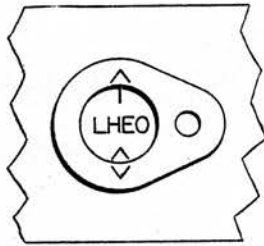


Fig. 8A Checking valve timing. Models 50, 60

Then inspect for worn, cracked or burned heads, and cocked or worn stems. Such valves should be scrapped.

When refacing valves, reject any that grind down thin around the outer edges. Likewise, any valve that produces an uneven face with a thin edge at the wide portion of the ground face should be discarded.

Be sure the end of the stems are smooth and free from rough spots. When necessary to reface stems, grind off just enough to eliminate the roughness.

**VALVE GUIDES**

**ALL SERIES**—When doing a valve job, clean out the valve guides and examine them for being worn, broken, cracked or burned. If a suitable plug gauge is not available, valve guide clearance may be checked by using the stem of a new valve and rocking it from side to side. If the clearance seems excessive, new guides should be installed.

After the old guides have been pressed out and the new ones installed, use a reamer of the correct size to remove any distortion caused by the guide being pressed in place. Ream only just enough to round out the hole and to provide the clearance specified in the chart.

After the reaming operation, use a rifle barrel brush soaked in cleaning solvent to clean out the guides and blow dry with compressed air.

**VALVE LIFTERS**

**SERIES 50, 60, A, B, G**—Figs. 5 and 6. Barrel type lifters are employed in Series A, B, 50, 60 engines, whereas lifters of the mushroom type are used in Model G.

In order to remove the lifters the camshaft must first be taken out. Then, after removing the oil pump cover, disengage the oil pump from the coupling. Unfasten the lifter guide from the crankcase and remove the guide and lifters.

**MODEL D**—Fig. 7. It is not necessary to take out the camshaft in order to remove the tappet levers. The procedure is to take off the radiator, rocker arm cover and push rods. Then, after removing the crankcase cover, remove the set screw and expansion plug from the tappet lever

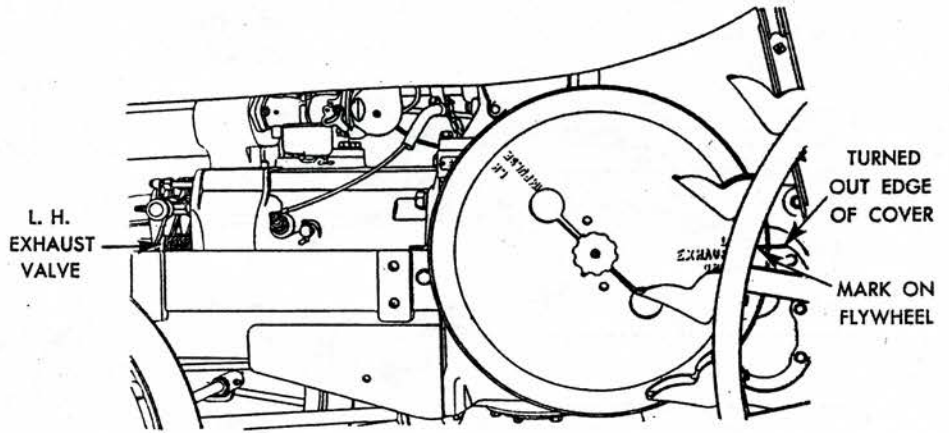


Fig. 9 Valve timing. Models AO, AR

shaft. Unscrew the pipe plug from the crankcase. Push out the tappet lever shaft, lifting the tappet levers (valve lifters) out through the crankcase opening as the shaft is being withdrawn.

**SERIES H**—Fig. 8. To remove the tappet levers (valve lifters), take off air cleaner, carburetor, exhaust pipe, fan shaft, rocker arms, crankcase cover and belt pulley assembly. Take off reduction gear cover and remove reduction gear. Unfasten tappet lever shaft cover, pull out tappet lever shaft and lift tappet levers through crankcase opening.

**SERIES L, M**—To remove valve lifters from these engines, it is first necessary to take out the camshaft. How this is accomplished is outlined further on.

**VALVE TIMING**

**MODELS 50, 60**—With tappet clearance set at .020", turn engine over until left-hand exhaust valve just starts to open which is indicated when the tappet lever has moved just enough to take up the .020" clearance. At this point the "LHEO" (left-hand exhaust opens) mark on the flywheel, Fig. 8A, is aligned within 13/16" of the notch in the timing hole. If this is not the case, check the timing of the camshaft gear with the crankshaft gear as stated under **Camshaft & Bearings**.

**MODELS AO, AR**—To check valve timing, first adjust the tappets to the proper clearance. Then turn the top of the flywheel forward (counter-clockwise) until the exhaust valve of the left-hand cylinder (viewed from the driver's seat) just starts to open. At this point, the flywheel timing mark (L. H. EXH. OPEN) should be in line with or within 1/2" of the turned-out edge at the top of the sliding gear shaft cover, Fig. 9.

If not within this limit, raise the governor case and remove the left camshaft bearing. Then mesh the camshaft gear with the crankshaft gear so the left-hand exhaust valve starts to open when the

timing marks are lined up.

Reassemble the parts removed and retime the magneto as per magneto timing instructions.

**MODELS A, AN, ANH, AWH, B, BN, BNH, BW, BWH, G**—Valve timing is checked in the same manner as outlined above except that the flywheel mark, Fig. 10, should be in line with the timing mark on the transmission cover.

**MODELS BO, BR & H SERIES**—Valve timing is checked in the same manner as outlined above for AO and AR models except that the flywheel mark, Fig. 11, should be in line with the timing mark on the transmission cover.

If the timing marks are not in line within 1/2", remove the crankcase cover, disconnect oil lines at governor case and right-hand camshaft bearing. Raise the governor case, remove the left-hand camshaft bearing, belt pulley and clutch, first reduction gear cover and right-hand camshaft bearing. Then change the mesh of the camshaft gear with the crankshaft gear to obtain correct valve timing.

Reassemble parts removed and retime magneto as per magneto instructions.

**MODEL D**—Valve timing is checked in the same manner as outlined above. But if the timing marks are not within 1/8" of lining up with each other, loosen the bearings on both ends of the camshaft and remove the left bearing. Press down on the left end of the camshaft to separate the camshaft gear from the crankshaft gear. Then mesh the gears correctly so the timing marks line up.

Reassemble parts removed and retime magneto as per magneto instructions.

**SERIES L & M**—Valve timing is correct when the mark on the camshaft gear is meshed with the mark on the crankshaft gear.

With valve clearance adjusted to the proper clearance, crank the engine until No. 1 cylinder intake valve just starts to

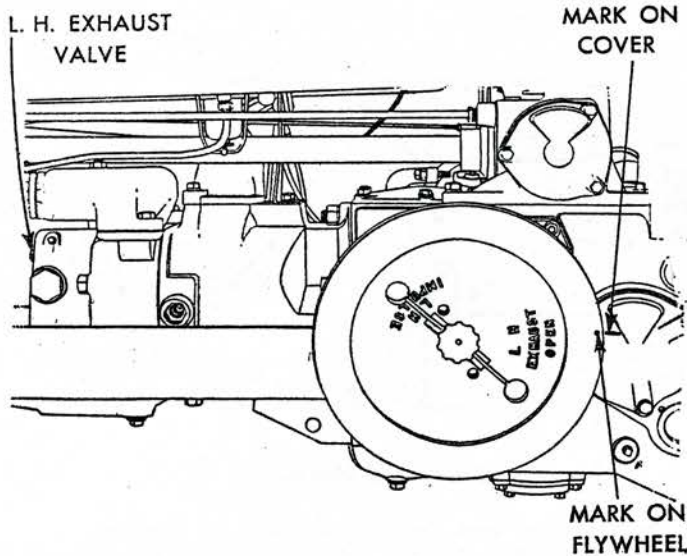


Fig. 11 Valve timing. Models BO, BR and H series

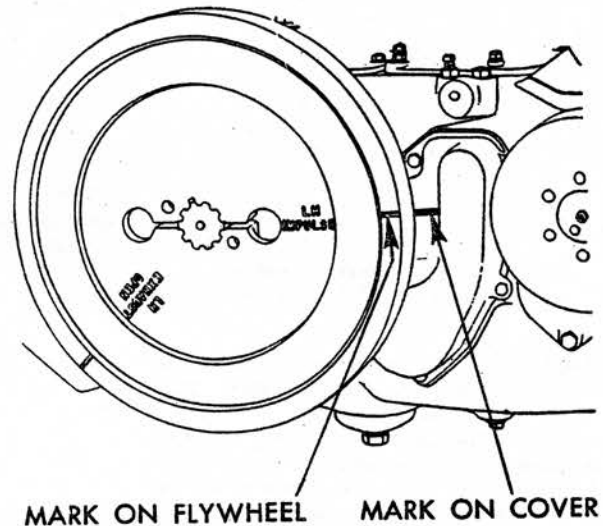


Fig. 12 Governor and magneto timing. Typical of all A, B, D, G, H series

open. At this point the "D/C" mark on the flywheel should line up within approximately  $\frac{1}{4}$ " with the line on the side of the inspection opening. If these marks do not line up, the timing gear cover and camshaft gear will have to be removed and the timing gear marks meshed.

## TIMING GEAR COVER

**SERIES L & M**—To remove the cover, take off the radiator and front suspension. Remove fan, generator and governor. Pull off crankshaft pulley. If equipped with an hydraulic lift pump, remove it also. Unfasten the gear cover from the engine and lift it off.

## CAMSHAFT & BEARINGS

**MODEL 60**—The camshaft is carried in and located by two Timken roller bearings lubricated by oil thrown up inside the crankcase. The bearings are pre-loaded by a spring, Fig. 5A, located at the right end.

When necessary to remove the camshaft, drain the engine oil. Then remove successively the oil pump cover and idler gear, belt pulley and clutch and first reduction gear cover. Remove the tool box and tappet lever cover with ventilator outlet tube. Take off the tappet lever assembly and pull the tappet rods forward free of the cam followers. Take off the cover and flywheel. Remove crankcase cover and left-hand bearing housing.

Use a suitable puller to pull the left bearing from the camshaft. Remove the cam gear attaching parts. Then move the camshaft to the right through the opening enough to remove the gear. Take the camshaft out through the crankcase opening.

Remove the cam follower bracket attaching screws and take off the cam fol-

lower bracket together with the cam followers and oil pump drive gear, being careful not to drop the cam followers into the crankcase.

**NOTE**—Reassemble the parts removed, being sure to mesh the "V" mark on the camshaft gear with the "O" mark on the crankshaft gear for correct valve timing.

**SERIES A & G**—Fig. 6. The camshaft is mounted on two taper roller bearings and end play is controlled automatically by a thrust spring located under the gear cover on the right-hand side of the tractor.

When necessary to remove the camshaft, take off the governor, belt pulley assembly, right-hand brake and reduction gear cover. Remove the rocker arm cover and loosen the tappet adjusting screws to relieve pressure on the camshaft; loosen the valve lifter bracket for the same reason.

Use a suitable puller to remove the left-hand camshaft bearing. Unfasten the camshaft gear from the shaft and withdraw the camshaft.

**NOTE**—Reassemble parts removed, being sure to mesh the camshaft gear with the crankshaft gear in accordance with the instructions outlined under "Valve Timing." When this is done, mesh the governor gear with the camshaft gear so that the "L.H. IMPULSE" mark on the flywheel, Fig. 12, is in line with the mark on the transmission cover.

**SERIES B**—Fig. 5. The camshaft is mounted on two bearings and end play is controlled by gaskets under the left-hand camshaft bearing. Add or remove gaskets as required to obtain  $\frac{1}{64}$  to  $\frac{1}{32}$ " end play.

The camshaft is removed in the same manner as outlined for Series A, although

it may be necessary in some cases to take out the crankshaft to obtain more working space.

**NOTE**—Reassemble parts removed, being sure to mesh the camshaft gear with the crankshaft gear in accordance with the instructions outlined under "Valve Timing." When this is done, mesh the governor gear with the camshaft gear so that the "L.H. IMPULSE" mark on the flywheel, Fig. 12, is in line with the mark on the transmission cover.

**MODEL D**—Fig. 7. The camshaft is mounted on two bearings and end play is controlled by gaskets under the left-hand camshaft bearing. Add or remove gaskets as required to obtain  $\frac{1}{64}$  to  $\frac{1}{32}$ " end play.

To remove the camshaft, take off the flywheel and rocker arm cover. Loosen the tappet adjusting screws to relieve pressure on the camshaft. Loosen the right-hand camshaft bearing and remove the left bearing. Loosen the camshaft gear bolts and drive the gear to the right until the key can be removed. Then push the camshaft to the left through the gear and take shaft out through the left bearing hole.

When replacing the camshaft, be sure to put the flat steel washer between the end of the camshaft and the right-hand bearing. When the left-hand bearing is installed, and both bearings are drawn up tight, the end play should be  $\frac{1}{64}$  to  $\frac{1}{32}$ ". To reduce end play, remove gaskets from under the left bearing.

**NOTE**—Be sure to mesh the camshaft gear with the crankshaft gear in accordance with the instructions outlined under "Valve Timing." When this is done, mesh the governor gear with the camshaft gear so that the "L.H. IMPULSE" mark on the

flywheel, Fig. 12, is in line with the mark on the transmission cover.

**SERIES H**—Fig. 8. The camshaft is mounted on ball and roller bearings and no adjustment for end play is required.

To remove the camshaft, take off the fan, governor and rocker arm cover. Loosen the tappet adjusting screws to relieve pressure on the camshaft. Remove the belt pulley assembly, reduction gear cover, both bearing housings and the left camshaft bearing. Unfasten the camshaft gear and withdraw the camshaft.

Install the camshaft gear on the camshaft so that the V marks on both parts are matched. Note that the left bearing housing is eccentric with the hole in the crankcase and is so constructed to control backlash between the camshaft and crankshaft gears. Therefore, if excessive backlash is present, it may be reduced by installing the housing on the studs  $\frac{1}{4}$  turn to the right of the original position.

**NOTE**—Be sure to mesh the camshaft gear with the crankshaft gear according to the instructions given under "Valve Timing." When this is done, mesh the governor gear with the camshaft gear so that the "L.H. IMPULSE" mark on the flywheel, Fig. 12, is in line with the mark on the transmission cover.

**SERIES L**—The camshaft is mounted on babbitted bearings and is removed in a manner similar to that outlined for Model M below.

End play is controlled by a thrust screw mounted in the timing gear cover and is accessible from the outside. To adjust end play, loosen the lock nut and turn the adjusting screw in until it bottoms, then back off  $\frac{1}{16}$  turn. Hold the thrust screw in this position and securely tighten the lock nut.

End play in the idler gear is adjusted in the same manner.

**SERIES M**—Fig. 13. The camshaft is mounted on two bushings and end play is controlled by a thrust plate and spacer washer behind the camshaft gear.

To remove the camshaft, first take off the timing gear cover as outlined previously. Then remove the rocker arms, push rods, oil pan, and oil pump. Hold the valve lifters up with wire or other suitable means. Unfasten the thrust plate from the cylinder block and pull the camshaft and gear from the engine.

The camshaft gear may be removed by taking off the hydraulic pump drive coupling. Then, after releasing the snap ring from the front of the camshaft, press off the gear.

**NOTE**—When necessary to install new bearings, the engine must be taken out of the tractor and the flywheel removed in order to get at the expansion plug located in the rear of the cylinder block.

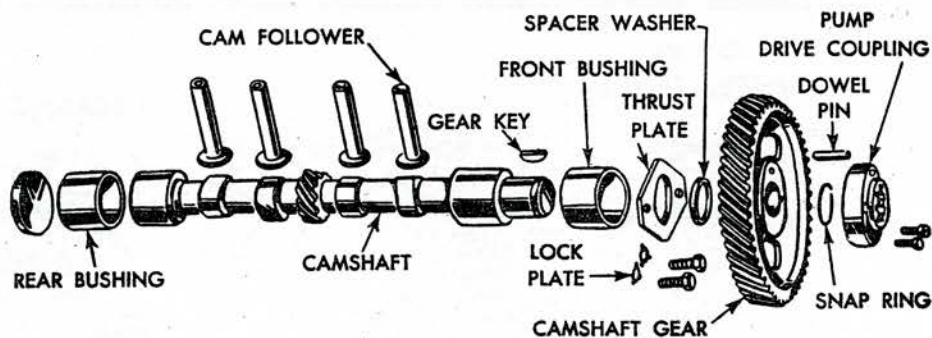


Fig. 13 Camshaft and related parts. Series M

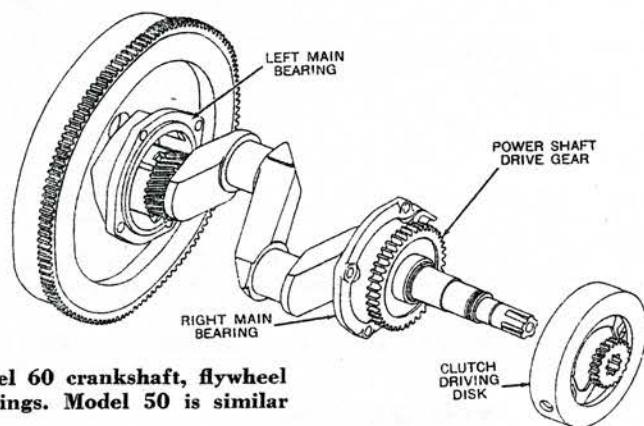


Fig. 13A Model 60 crankshaft, flywheel and main bearings. Model 50 is similar

John Deere supplies a special driver to install bearings and if this tool or its equivalent is used, the bearings need not be reamed. Be sure to line up the oil holes in the bearings with the oil feed holes in the block to assure adequate lubrication.

## PISTONS

**ALL SERIES**—On Models 50, 60 and Series A, B, D, G and H the pistons and rods are removed from the front of the engine after taking off the cylinder head and crankcase cover. On Series L and M, pistons and rods are removed from above.

When fitting pistons, each one should be fitted to a particular bore. To fit a piston, select a thickness gauge about 12" long, the thickness to be about .001" under the recommended piston clearance.

Insert the piston in the bore with rings removed. Locate the thickness gauge 90° from the piston pin hole, between the thrust face of the piston and the cylinder wall. If the piston can be pushed into the bore with a slight drag, its fit is satisfactory. If not, select a piston which will produce this result.

**NOTE**—John Deere pistons for Models 50, 60 and Series A, B, D, G and H must be installed with the word "Top" toward the top of the tractor. The word "Top" is stamped on the open end of the piston flange.

## PISTON RINGS

**ALL SERIES**—When selecting rings, always use standard size rings in cylinders that are standard at the bottom of the ring travel area. Rings may have ample clearance near the combustion area of the cylinder but at the bottom of the piston stroke the ends may jam, causing the rings to buckle and distort.

New rings should be fitted with end gaps within specifications at the crank end of the ring travel area. When fitting rings on new pistons, be sure the rings are free in the grooves so they will just fall from side to side when installed on the piston.

Before installing new rings, the ridge at the combustion end of each cylinder should be carefully cut away with a ridge reamer. Cutting ring ridges eliminates the danger of breaking ring lands during subsequent operation.

Be sure the ring grooves are clean and free from carbon. And dip the piston in oil before installing and stagger the ring gaps around the piston.

## PISTON PINS

**ALL SERIES**—Floating type pins are retained by snap rings which fit in grooves in the piston bosses. When properly fitted, the pin should enter the piston and connecting rod bushing with a light push

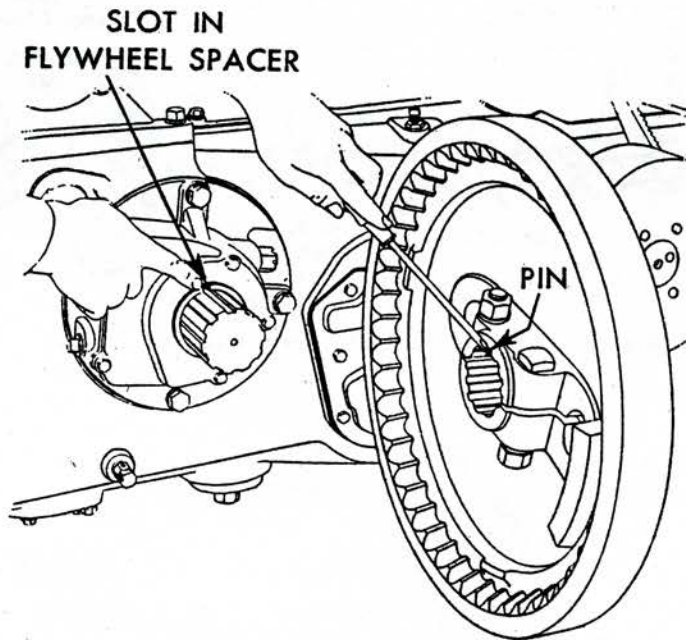


Fig. 14 Install flywheel with pin fitting in slot. Typical of all A, B, D, G, H series

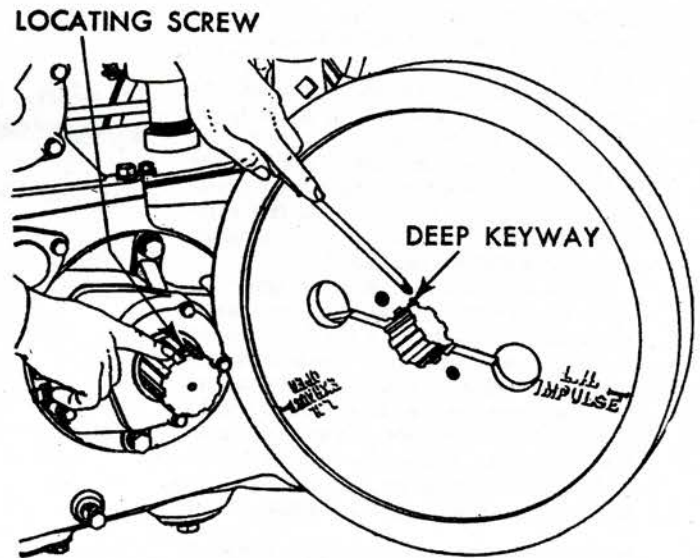


Fig. 15 Locating flywheel with key over locating screw. Typical of all A, B, D, G, H series

with all parts at normal room temperature.

## ROD BEARINGS

**MODELS 50, 60**—Connecting rod bearings are replaceable steel-backed, babbitt-lined non-adjustable precision inserts. Connecting rods are punch-marked for identification at the top of the bearing journal on both halves of the connecting rod.

Connecting rod bearing cap nuts should be torque tightened to 100 lbs. ft.

**SERIES A, B, D, G, H**—Connecting rod bearings are fitted with laminated shims. When necessary to adjust bearings, remove the bearing cap, take out the laminated shim and peel off one layer from the top shim and, if necessary, one from the bottom shim. Continue in this alternating fashion until the bearing fits snugly but not tight enough to bind.

The top of the left-hand connecting rod and cap are both stamped with either the number "1" or with one punchmark. The right-hand connecting rod and cap are both stamped on the top with either the number "2" or with two punchmarks.

When installing connecting rod caps, make certain that they are centrally located on the crankshaft. Screw the nuts up lightly and then tap the cap up and down, while at the same time, gradually and uniformly tightening the nuts. Be sure to install and spread the cotter pins properly.

**SERIES L**—Connecting rods have centrifugally spun bearings with shims provided for adjustment. When necessary to adjust bearings, remove the cap and take out

one shim from each side of the cap. Then replace the cap, making certain that the two raised projections, one on the rod and one on the cap, are on the same side. Also, make sure the cap is centrally located on the crankshaft by screwing the nuts up lightly and then tapping the cap back and forth, while at the same time gradually and uniformly tightening the nuts.

Bearings should be adjusted so that there is .002" clearance between bearing and crankshaft for an oil film.

**SERIES M**—These bearings are of the precision insert type, requiring no reaming or scraping, nor are shims provided for adjustment. When installing bearings of this type, be sure the backs of the bearing shells as well as the bearing seats in the rods are smooth and clean.

When necessary to install new bearings, simply remove the bearing cap, take out the old bearing and slip in the new one.

## MAIN BEARINGS

**MODELS 50, 60**—The crankshaft, Fig. 13A, is mounted cross-wise in a one-piece case, and is carried in two main bearing housings with aluminum alloy bearing inserts. The right main bearing housing contains two single oil seals installed back to back to prevent mixing transmission oil in the first reduction gear cover with engine oil. An oil seal and oil slinger control the oil flow at the left main bearing, directing it back to the crankcase.

The flywheel is splined to the left end of the crankshaft and locked in place with two clamping bolts and a lock nut. A timing mark appears on the flywheel to aid

in ignition timing with the crankshaft.

The clutch driving disc is splined to the right end of the crankshaft, held by one cap screw. A power shaft drive gear is keyed on the right side of the crankshaft just outside the main bearing.

End play of the crankshaft is controlled by the position of the flywheel at the left bearing. Plastic thrust washers are used on both sides of the bearing.

When installing the crankshaft be sure to align the "O" mark on the crankshaft gear with the "V" mark on the camshaft gear. And when installing the flywheel, be sure to align the marks on the flywheel and crankshaft.

**SERIES A, B, D, G**—Main bearings are fitted with laminated shims for adjustment purposes. When necessary to reduce bearing-to-crankshaft clearance, remove the belt pulley, first reduction gear cover, flywheel, left-handed main bearing cover and flywheel spacer. Remove the bearing capscrews and peel off one layer of the top shim and, if necessary, one layer from the bottom shim. Continue in this alternating fashion until the bearing fits snugly but not tight enough to bind when the cap is tightened in place. Be sure to place the laminated shim between the steel shims.

The left-hand bearing cover should be centered to allow clearance for the flywheel spacer.

When installing the flywheel, make sure that the small pin on the inside of the flywheel hub, Fig. 14, fits in the slot of the flywheel spacer in the left-hand main bearing.

To insure proper balance and correct

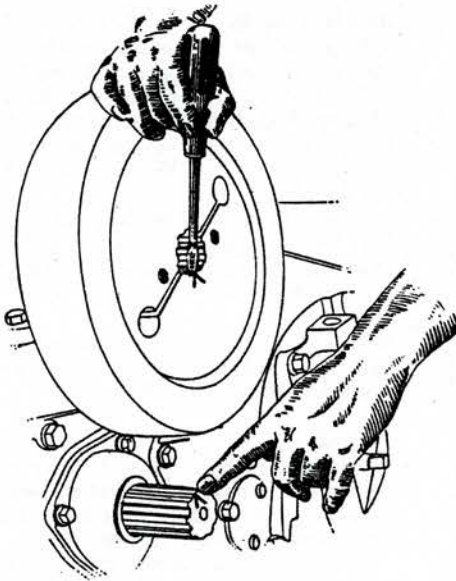


Fig. 16 "V" marks on flywheel and crankshaft should mesh. Series H

location of the flywheel, be sure that the extra deep keyway in the flywheel hub, Fig. 15, fits over the small screw near the end of the crankshaft.

When replacing the clutch drive disc in the belt pulley, make sure that the rivet in the disc fits over the flat spot at the end of one of the splines.

**SERIES H**—Main bearings are not adjustable. When replacement is necessary be sure to center the left bearing cover to allow clearance for the flywheel spacer.

When putting on the flywheel, see that the small pin on the inside of the flywheel hub fits in the slot of the spacer in the left main bearing (see Fig. 14).

To insure proper balance and correct location of the flywheel, match the "V" marks on the flywheel and crankshaft together, Fig. 16.

**SERIES L & M**—These bearings are of the precision insert type and no shims are provided for adjustment. When worn, bearings may be replaced without removing the crankshaft simply by removing the bearing cap and taking out the upper and lower halves.

When installing new bearings, be sure the backs of the bearings as well as the bearing seats are smooth and clean. A piece of dirt or carbon behind the bearing will cause a raised spot on the babbitt side. Excess heat will develop at this point due to poor heat dissipation and this area of the bearing will burn out.

**CRANKSHAFT END THRUST**

**MODELS 50, 60**—End play of the crankshaft is controlled by the position of the flywheel at the left bearing. Plastic thrust

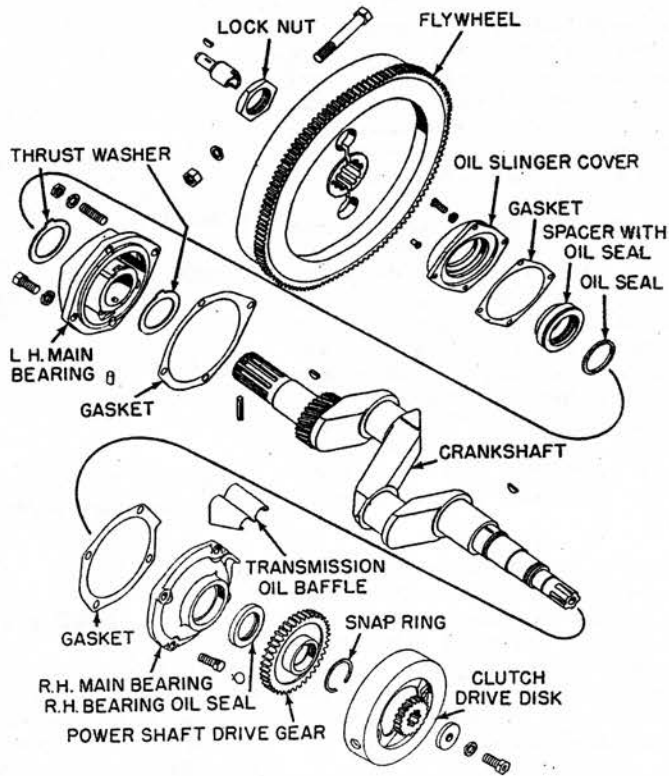


Fig. 16A Exploded view of Model 60 crankshaft and related parts. Model 50 is similar

washers are used on both sides of the bearing.

To adjust the end play, attach a dial indicator to the main case with the indicator button against the inner face of the flywheel. Move the crankshaft back and forth and observe the dial indicator. The correct end play is .005-.010". Tap the flywheel on or off the crankshaft until this end play is established. Then tighten the clamp bolts evenly and securely.

**SERIES A, B, D, G**—The crankshaft should have .005-.010" end play. If end play is excessive, place the flywheel further on the crankshaft, being sure it does not bind when the flywheel hub bolts are tightened. If all end play is removed from the crankshaft, it may result in damage to the left-hand main bearing.

**SERIES H**—Crankshaft should have .005-.010" end play. If end play is excessive, loosen the flywheel bolt nuts and insert a screwdriver in the groove near the end of the crankshaft through the slot in the flywheel and pry toward the tractor. If all end play is removed from the crankshaft, it may result in damage to the left-hand main bearing.

**SERIES L & M**—End play in the crankshaft is controlled by the flanges on the rear main bearing. If end play is excessive, install a new bearing. If, after installing new bearings, not enough end play is present, the bearing flanges may

be dressed down to produce the desired result.

**CRANKCASE COVER**

**MODELS 50, 60 and SERIES A, B, D, G, H**—To remove the crankcase cover, take off the starter if the tractor is equipped with one. Then remove the capscrews retaining the cover to the block and take it off.

**OIL PAN**

**SERIES L & M**—To remove the oil pan, take off the flywheel lower pan, remove the retaining capscrews and take off the pan.

**OIL PRESSURE**

**MODELS 50, 60 and SERIES A, B, D, G**—The correct oil pressure when the engine is hot and idling should be between "M" and "H" on the gauge.

To adjust oil pressure, remove the crankcase cover and loosen the lock nut on top of the oil filter head (see note below for some B models). The adjusting screw can then be turned to raise or lower the oil pressure. Turning the screw out reduces pressure and turning it in increases pressure. At no time should the pressure drop below "L" on the gauge.

If the gasket between the oil pump body and cover is renewed, the new gasket must not be thicker than the old one (.020") or the pump will not maintain pressure.

**NOTE**—On BI, BO and BR models from serial 325000 to 327459, the oil pressure adjusting screw is located on the front side of the governor case. To adjust, remove the screw cap nut, loosen the lock nut and turn the adjusting screw out to reduce pressure, and vice versa.

**SERIES H**—The correct oil pressure when the engine is hot and idling should be between "M" and "H" on the gauge.

To adjust oil pressure, remove the pipe plug in the transmission case below the belt pulley. Insert a screwdriver and turn the slotted screw out to reduce pressure and in to increase pressure.

If the gasket between the pump cover and pump body is renewed, the new gasket must not be thicker than the old one (.020") or the pump will not maintain pressure.

**SERIES L & M**—The oil pressure relief valve is built into the pump. Oil pressure may be adjusted by adding or removing a washer between the relief valve spring and cap nut. Adding a washer increases pressure, and vice versa. Usually three such washers will provide the necessary oil pressure of 30 pounds.

## MAIN BEARING OIL SEAL

**MODELS 50, 60**—As shown in Fig. 16A, the right main bearing housing contains two single oil seals installed back to back to prevent mixing transmission oil with engine oil in the first reduction gear cover. An oil seal and oil slinger control the oil flow at the left main bearing, directing it back to the crankcase.

**SERIES A, B, D, G, H**—The main bearing oil seal is located in the spacer between the left-hand main bearing and flywheel. To remove the seal, take off the flywheel and main bearing cover. Mark the spacer and crankshaft so that the spacer may be reinstalled in the original position with relation to the crankshaft. Remove the spacer, pick out the old seal and install the new one. Reassemble parts removed, being sure the seal is not damaged as it is passed over the splines. See Figs. 14, 15 and 16 regarding flywheel installation.

## CRANKSHAFT OIL SEAL

**SERIES L & M**—It is necessary to split the tractor in order to renew the crankshaft rear oil seal. How this is accomplished is outlined under "Engine Removal."

With tractor split and flywheel removed, unfasten the seal plate from the engine. Press out the old seal and install the new one with its lip facing front of engine.

Before installing the seal, however, soak it in engine oil to make it soft and pliable. And when placing the seal plate over the crankshaft use care to see that the seal is not cut or otherwise damaged.

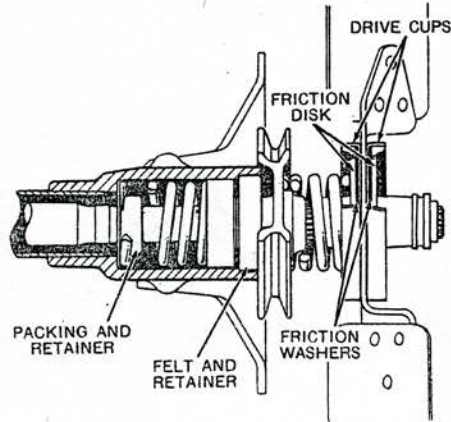


Fig. 16B Cutaway view of Model 60 fan assembly. Model 50 is similar

## RADIATOR

**MODELS 50, 60 and SERIES A, B, G, H**—To remove the radiator, take off the steering shaft, hood, shutter grilles, fan shroud and air cleaner. Disconnect water hose. Remove radiator-to-frame attaching bolts and lift off radiator.

**SERIES D**—To remove the radiator, take off the hood and grille. Unfasten the top tank from the water pipe and the bottom tank from the cylinder head. Detach the radiator and lift it off.

When installing, fasten the lower tank to the cylinder head loosely. Then securely tighten the top tank and finally the bottom tank. This procedure will prevent misalignment of the radiator flanges.

**SERIES L & M**—The radiator, front support and front suspension can be removed as a unit, after which detach the radiator from the front support.

An alternate method is to remove the hood and grille. Then take out the set screw and separate the steering shaft from the stub shaft. The radiator may then be detached and lifted out through the left side of the tractor.

## FAN

**MODELS 50, 60**—The fan shaft, Fig. 16B, is driven directly by the governor through a bevel gear and pinion. Adjustments can be made to compensate for gear wear by adding or removing shims under the fan shaft rear bearing housing and the governor case left-hand bearing housing.

The fan is not attached directly to the fan shaft or drive pulley. A clutch-type coupling, Fig. 16B, is utilized to reduce shock to the bevel gears due to rapid changes in engine speed.

The front fan shaft bearing housing is packed with high temperature grease. The rear fan bearing is lubricated by engine oil.

**SERIES A, B, G, H**—The fan is driven through a rubber bushing located in the fan hub which requires no adjustment.

To remove the fan from the shaft, take off the radiator, push the fan toward the governor and remove the two halves of the lock washer. The fan will then slide off the shaft.

When replacing the fan, see that the long part of the hub is toward the rear, otherwise the lock washer halves cannot be installed.

**NOTE**—The fan shaft is mounted on self-adjusting ball bearings. To adjust the fan drive gears, see "Governor".

**MODEL D**—The fan friction clutch is provided to permit a small amount of slippage when the engine is first started. This slippage reduces the shock on gears and parts, and therefore, reduces wear.

The fan should not slip after the engine is once started. The fan friction clutch should be adjusted so that the spring is compressed to not less than one inch in length. The fan should not slip easily when the engine is not running. It should require at least a 12-pound pull on the outer end of the fan blade to slip it.

In cases where the fan seems to be properly adjusted and fan slippage continues, examine the fan friction facings and, if worn, they should be replaced. Also examine the fan drive discs; the friction surface of both should be perfectly flat.

**SERIES L & M**—The fan is driven by a V-belt and is mounted in a slot to permit vertical adjustment so that the belt may be maintained at the proper tension to insure proper fan speed. Tension should be applied to the belt so that the belt can be deflected about  $\frac{3}{4}$ "

The fan bearing is lubricated from a reservoir which should be filled with the proper lubricant.

## SINGLE-BARREL CARBURETORS

**ALL MODELS (Except 50, 60)**—Three adjustments are provided on most carburetors used on John Deere tractors, namely (1) idling speed, (2) idle mixture, (3) main jet or power setting. The carburetor used on Series L tractors has a fixed main jet and, therefore, is not adjustable. See Figs. 17, 18, 19, 20.

**IDLE SPEED & MIXTURE**—Adjustment for idling speed and mixture can best be made together and with the engine warm. Adjust the idle speed screw so that the engine will idle fast enough to prevent stalling. Then turn the idle needle in or out until the engine runs smoothly. Readjust the idle speed screw if necessary.

In warm weather, the idle needle will have to be turned out the number of

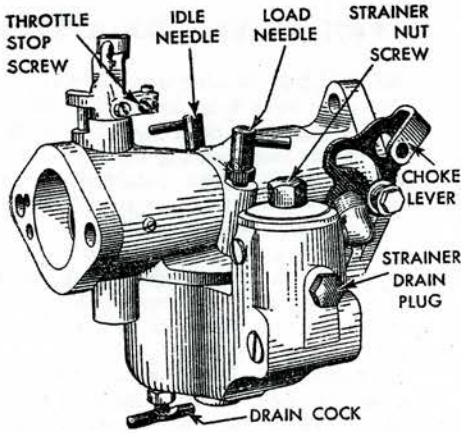


Fig. 17 Carburetor. Models AO, AR, D

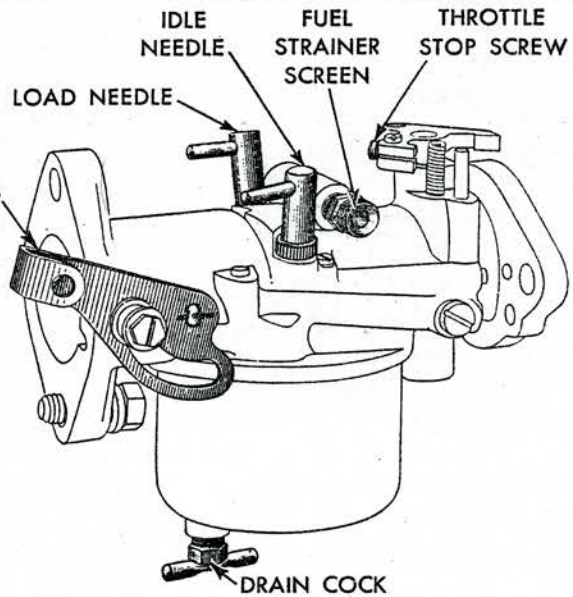


Fig. 19 Carburetor. Series H

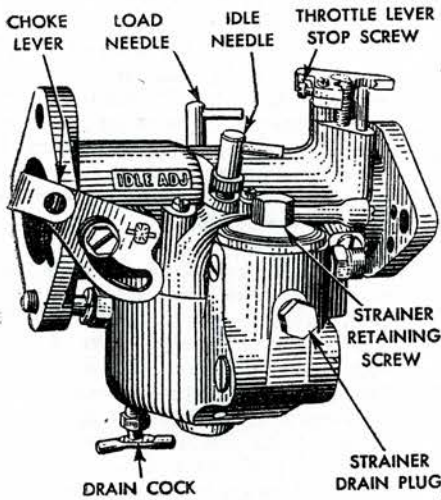


Fig. 18 Carburetor. Models A, AN, ANH, AW, AWH, and all Series B and G

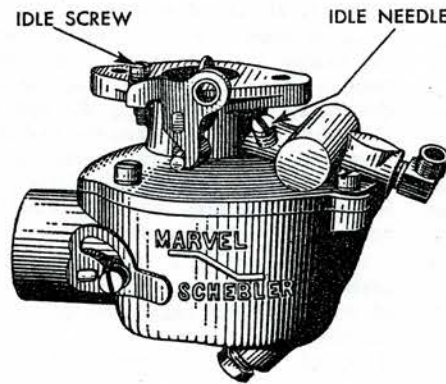


Fig. 20 Carburetor. Series L

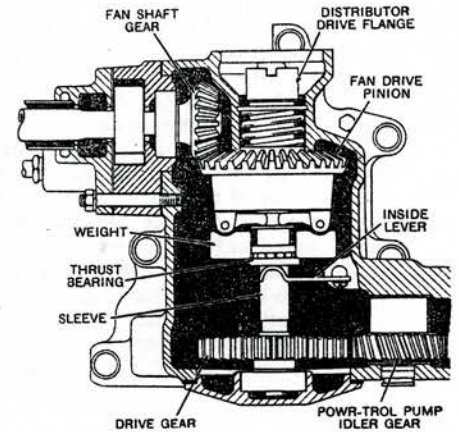


Fig. 20A Cutaway view of Model 60 governor. Model 50 is similar

turns given below for kerosene or distillate and slightly less for gasoline:

1½-1¾	.....A, B, G
1¾-2½	.....D
1-1¼	.....H
1¾-2¼	.....L, LA
2-2½	.....LI
1½-1¾	.....M

**POWER SETTING**—This adjustment should be made when the engine is warm and working under load (belt load preferred). Close the load needle to the point where the engine loses power or backfires. Then unscrew the load needle gradually until full power is developed.

In warm weather this should have the load needle approximately the number of turns open as listed below on kerosene or distillate fuel and slightly less on gasoline. More opening may be required for cold weather or for very heavy load. The load

needle should be closed as far as possible for best fuel economy.

The load needle should be open approximately ¾ to 1 turn on all models except M; on Model M, 1¼ to 1¾.

**FLOAT SETTING**—On all models except Series L, should it be necessary to replace either the float or float valve, be sure that the float is in horizontal position when the valve is seated. The top of the float should be ⅜" from the top of the bowl. To adjust, bend the float lever.

On Series L, the carburetor float should be set parallel to the underside of the carburetor body when the fuel inlet valve is closed.

**DUAL-BARREL CARBURETORS**

**MODELS 50, 60**—Gasoline engines on these models are equipped with a double-barrel carburetor having two separate venturi. A single bowl, float and needle valve

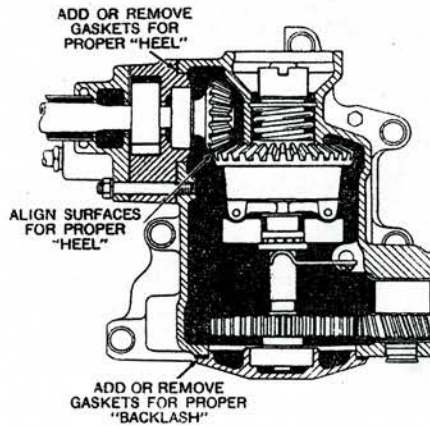
assembly are used, Fig. 20C.

One metering screw adjustment is provided. Normal setting is 1½ to 2½ turns open. However, the carburetor is equipped with limiting main jets and construction is such that under some conditions it is possible to operate the engine at full load with the metering adjusting screw entirely closed while on the other hand it may be opened as much as 5 turns without abnormally high fuel consumption.

Two idle adjustment needles are provided, one for each venturi.

To adjust the carburetor, adjust the throttle linkage so that with the carburetor throttle lever in the wide open position and the governor lever in wide open position, the throttle control rod is short approximately one-half the width of the attaching hole in the carburetor lever.

To adjust the slow idle speed, set the speed control lever in the closed position. Adjust throttle stop screw to give 600 rpm



**Fig. 20B** Location of gaskets used for adjusting fan drive pinion and fan shaft on Model 60. Model 50 is similar

engine speed. Adjust the speed control rod at the ball joint so that the governor speed change spring just touches the stop on the governor arm.

Short out No. 1 cylinder and adjust the idle needle on No. 2 to give maximum rpm. Short out No. 2 cylinder and adjust idle needle on No. 1 cylinder to give maximum rpm. After maximum rpm on both cylinders is known, turn in the idle screw on the cylinder having the higher rpm until it is the same as that of the slower cylinder. Reset the carburetor throttle stop to 600 rpm engine speed and check the governor speed change spring to be sure that it just touches the stop on the governor arm.

To adjust the fast idle, limit the travel of the speed control lever by adjusting the cap screw on the speed control arm to give 1375 rpm on Model 50 or 1115 rpm on Model 60.

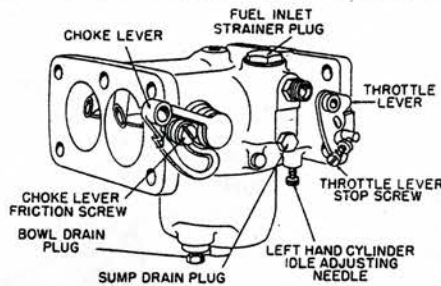
## GOVERNOR ADJUSTMENTS

**MODELS 50, 60**—The governor is a gear-driven, centrifugal, fly-weight type having two weights suspended on a weight carrier fixed to the governor pinion, Fig. 20A.

To adjust the governor-to-carburetor linkage, the throttle linkage is adjusted so that with both carburetor and throttle lever in the wide-open position, the rod is short approximately  $\frac{1}{2}$  the width of the attaching hole in the carburetor lever.

**SERIES A, B, G, H**—Fig. 21. If adjustment of the governor is found necessary after checking the engine speed with a speed indicator, set the speed change screw in the lower bracket on the steering post so that the engine will idle at the speed indicated in the **Tune Up Data** table with the speed control lever against its stop. Turning the screw in increases the speed; turning it out reduces the speed.

The front screw should be adjusted to prevent bending of throttle rod when speed control lever is pulled back to shut off the engine. The threads on the end of



**Fig. 20C** Dual barrel carburetor. Models 50, 60

the throttle rod are provided so that the length of the rod may be changed to get full throttle opening. Engine speed should not be changed by changing the length of this rod.

Keep the control linkage from governor to carburetor clean. Governor bearings are self-adjusting. Lubrication of the governor is automatic and starts and stops with the engine.

**MODEL D**—If adjustment of the governor is found necessary after checking the engine speed with a speed indicator, remove the cotter key from the speed change spring sleeve, Fig. 22, and move the sleeve one hole toward the carburetor. This will increase engine speed approximately 30 to 50 revolutions. If the engine is running too fast, move the sleeve one hole away from the carburetor.

The governor idler gear has a bronze bushing which is replaceable in the event of wear. When reassembling the gear, see that the chamfered end of the bushing is turned toward the right-hand side.

The hardened thrust washer sets over the spindle between the inside end of the hub and the transmission case. This washer is notched and held in place by the same pin that holds the governor idler gear spindle in place. When placing the spindle in the case, see that the locating pin is in place, the oil catch basin turned up and the spindle oil groove clean.

**SERIES L**—The governor is of the variable speed type, automatically lubricated from the engine. The maximum engine speed is determined by the stop screw adjustment of the short governor lever located at the lower right-hand corner of the governor case. The length of the long link (center to center) between governor and carburetor for best operation is approximately  $\frac{1}{16}$ " less than the center to center distance of the connecting holes in the carburetor throttle shaft arm and governor control arm when the throttle is fully opened and governor arm is in the most forward position.

**SERIES M**—The governor is adjusted by turning the stop screw on the fan bracket in or out as required to bring the engine to the required speed.

## FAN DRIVE ADJUSTMENT

**MODELS 50, 60**—If a new fan drive pinion and gear have been installed in the governor, Fig. 20A, or if the shim pack between the rear bearing housing and governor case has been disturbed, it will be necessary to adjust the gear and pinion for backlash and heel, Fig. 20B.

Clamp the governor case in a vise and install the fan shaft assembly on the governor case, using new adjusting gaskets (two thick and two thin). Be sure fan shaft is fastened securely.

To adjust the heel, Fig. 20B, run a finger over the two mating surfaces of the gear and pinion. If they are uneven, add or remove adjusting gaskets located between the governor case and rear fan bearing housing. **Be sure the fan shaft is perpendicular to the governor shaft when checking heel.**

To adjust backlash, attach a dial indicator to the governor case with the plunger set on one tooth of the bevel gear. Measure the amount of backlash and if it is less or greater than .004-.007", remove or add adjusting gaskets between left-hand end of governor case and bearing housing. **Never remove adjusting gaskets from between rear fan bearing housing and governor case to quiet the gears.**

**SERIES A, B, D, G, H**—To adjust the fan drive pinion for mesh with the fan drive gear, add or remove gaskets at either of the points indicated in Figs. 21 and 22, which are the rear fan shaft bearing housing and left-hand governor bearing housing. Take off the magneto before removing the left-hand governor bearing housing. There should be approximately .004-.007" backlash between the gear teeth which will provide quiet operation without binding.

## WATER PUMP

**MODELS 50, 60**—The water pump is bolted to the radiator bottom tank and is driven by the generator belt. The pump shaft is mounted on prelubricated ball bearings, Fig. 22B. A bellows-type seal and carbon sealing washer prevent leakage around the shaft. If seal or washer becomes worn or damaged, water will be present at the drain hole in the bottom of the housing.

**REMOVAL**—Disconnect battery, remove wires from voltage regulator and remove generator with its bracket. Loosen the lower water hose and slide it back on the pipe toward the cylinder head.

Take off the air cleaner cup to get it out of the way. Loosen two screws which hold fan housing to front fan support and remove two cap screws from lower part of fan support. **Do not disturb quantity of washers located under support.** After removing the three pump retaining cap screws, the pump may be taken off.

**DISASSEMBLY**—Use a puller or press



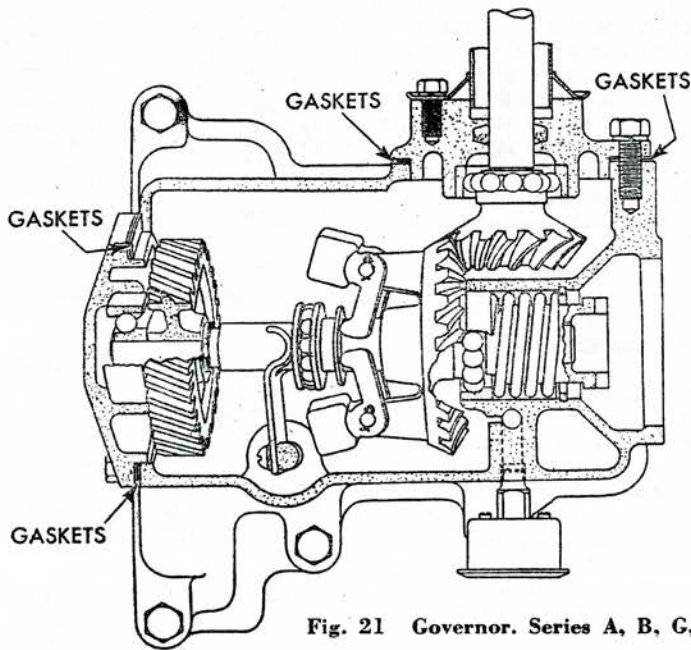


Fig. 21 Governor. Series A, B, G, H

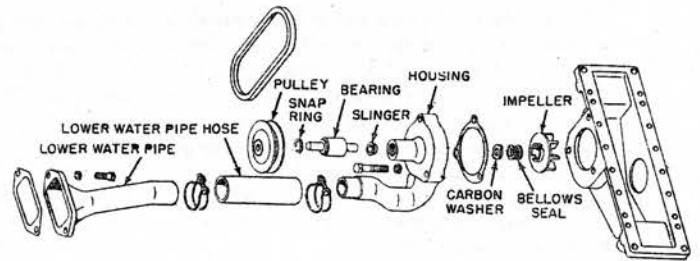


Fig. 22B Exploded view of Model 60 water pump. Models 50, A, B, G are similar

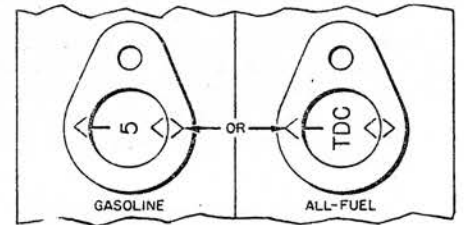


Fig. 22A Ignition timing mark aligned on flywheel. Models 50, 60

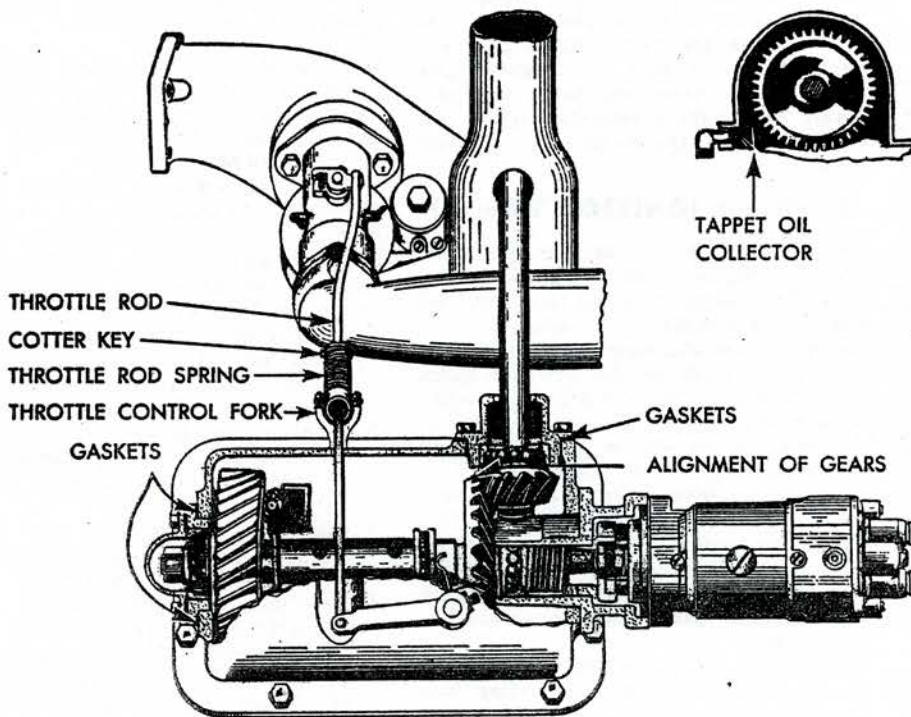


Fig. 22 Governor. Model D

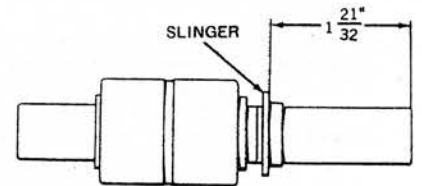


Fig. 22C Location of slinger on Model 60 water pump shaft. Model 50 is similar

to remove the drive pulley. Remove the snap ring from the housing and press the shaft and bearing assembly out of the impeller, seal, washer and housing.

If the small brass slinger, Fig. 22C, is removed from the shaft, press the new slinger on the shaft to the dimension shown in Fig. 22C.

**ASSEMBLY**—Install shaft and bearing assembly into housing and install snap ring. Install right-hand attaching cap screw

(nearest outlet pipe) and press pulley on shaft. Be sure to support shaft on underneath side when pressing on pulley. Press pulley flush with end of shaft.

Assemble bellows seal and carbon thrust washer in that order in impeller. Be sure lugs on washer line up with slots in impeller. Place impeller on flat surface and press housing and shaft assembly onto impeller until highest vane on impeller is flush with mounting surface on housing. If any of the vanes protrude beyond sur-

face of housing they will strike against lower radiator casting when pump is installed.

**INSTALLATION**—Reverse the order of removal to install the pump, being sure the original quantity of spacer washers are placed under the fan support.

**MAGNETO SERVICE**

**SERIES A, B, D, G, H, L**—If no spark is produced at the spark plugs the magneto may be tested on the tractor as follows: Remove the spark plug wires from the distributor cap. Then arrange a piece of stiff wire at each terminal on the cap so that the end of each one is bent in such a manner as to form a spark gap 1/8" from a good ground (magneto frame).

With the ignition switch turned on, crank the engine slowly and see whether or not a spark occurs at one of the gaps each time the impulse coupling trips. Sparks of equal intensity at both gaps indicates a properly functioning magneto.

If no sparks are produced, examine the contact points for proper gap and general condition. If the fault lies elsewhere, check the ignition circuit for loose connections or grounds.

If the proper equipment is not available to test the condenser or coil, these units may be checked by substituting new parts to see if the old ones are at fault.

If the above tests fail to uncover the cause of the failure to produce sparks, the magneto must be removed for overhaul in a shop having the special tools and testing equipment necessary to perform the work properly.

If engine operation is rough or irregular, check the ignition timing as outlined further on. Should the ignition timing check OK, examine the distributor cap for evidences of carbon streaks, burned spots or cracks. Carbon streaks may be removed with a soft rubber eraser, but if the distributor cap is cracked or the burnt spots cannot adequately be removed, a new distributor cap must be installed.

## MAGNETO TIMING

### SERIES A, B, D, G, H—

1. Disconnect spark plug cable from right-hand spark plug and ground it to the tractor.
2. Remove left spark plug cable and hold it about  $\frac{1}{8}$ " away from engine.
3. Turn top of flywheel slowly forward (counter-clockwise) until impulse trips and sparks occurs at end of left-hand spark plug cable. This should occur at end of compression stroke of left-hand cylinder and with mark "L. H. IMPULSE" on flywheel in line with mark on cover as shown in Fig. 12.
4. If impulse trips before flywheel reaches position described, slightly loosen cap screw and nut that hold magneto to governor case and rotate top of magneto toward rear of tractor.
5. Turn flywheel backward  $\frac{1}{4}$  turn and try impulse timing again as described above. If timing is correct, tighten cap screw and nut. If satisfactory timing cannot be secured, locate flywheel in position shown in Fig. 12, disconnect spark plug cables and remove magneto.
6. Bend a short piece of wire and attach to upper terminal of magneto so that end of wire is within  $\frac{1}{8}$ " of some metal part of the magneto frame.
7. Hold the magneto solidly in the same position as it would be when mounted on the tractor.
8. Grip the driving lugs on impulse coupling firmly with pliers.
9. Turn the impulse slowly in a counter-clockwise direction and stop the instant the impulse trips and spark occurs between end of wire and magneto frame. A spark will occur here once to every two times the impulse trips.

**SERIES L—**To check magneto timing, loosen the timing hole cover screw from flywheel housing and swing cover from over timing hole. Remove the spark plug from the front cylinder and attach the outside spark plug wire to the spark plug

and lay the plug on the engine. Then rotate the crankshaft and note if the spark is released on the spark plug at the moment the "D. C." mark on the flywheel is even with the lower edge of the timing hole. If the spark is released just before the mark reaches this position, loosen the attaching stud nuts and rotate the top of the magneto outward from the engine until the spark is released at this moment. If the spark is released after the "D. C." mark has disappeared, rotate the top of the magneto in toward the engine. When timing is correct, tighten magneto firmly in position.

If the magneto has been removed from the tractor, install and time it as follows: Swing the cover from over the timing hole in the flywheel housing. Turn crankshaft until "SPARK" mark on flywheel is visible in inspection hole and lines up with mark on center edge of timing hole. Remove the distributor cover from the rear of the magneto. Turn the magneto gear counter-clockwise until the rotor is pointing toward the outside of the magneto as it would be when mounted in place. Hold the rotor in this position and engage the magneto gear in the engine. Since two helical gears are being engaged, it will be necessary to turn the magneto and rotor as the gears are being engaged. Clamp the magneto securely, replace the cover and time the magneto as outlined above.

## BATTERY IGNITION TIMING

**MODELS 50, 60—**To time the distributor with the engine, remove the spark plug from the flywheel side and turn over the engine until the piston is coming up on its compression stroke. Continue turning until the "TDC" mark on the flywheel aligns with the notch in the timing hole of the flywheel cover, Fig. 22A. With the engine in this position the slot in the coupling of the drive flange will be horizontal.

Remove distributor cap and turn distributor arm to a vertical position. This places the coupling lugs of the distributor in a horizontal position to align with the slot on the drive flange and in position for the upper spark plug cable to fire No. 1 cylinder.

Mount the distributor and gasket on the governor case, making sure driving lugs engage slots on distributor drive flange. After tightening two mounting screws firmly with fingers, connect coil to distributor lead. Rotate distributor approximately one inch toward front of tractor. Install cap on distributor and insert a wire suitable for observing spark in upper spark plug wire terminal cover and bend to within  $\frac{1}{8}$ " of a metallic part of the tractor.

**FOR GASOLINE ENGINES—**Turn the flywheel in running direction from the "TDC" position until the "5" mark, Fig. 22A, is in line with the notch in the timing hole. Tap the top of the distributor toward the rear of the tractor until a spark is produced between the wire and metallic part

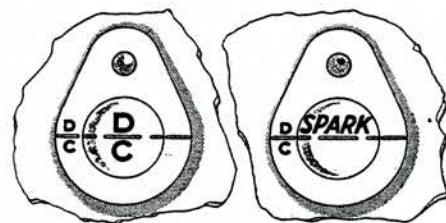


Fig. 23 Ignition timing marks on flywheel. Series M

of tractor. Firmly tighten the distributor hold-down cap screws.

When using a timing light, adjust the distributor so that the 20-degree mark on the outside diameter of the flywheel is in line with the notches in the timing hole when the engine is operating at fast idle (1115 rpm). Tighten the distributor in this position.

**FOR ALL-FUEL ENGINES—**Ignition timing is the same as above except that the initial or basic timing is with the "TDC" mark as shown in Fig. 22A. With a timing light, adjust the distributor to the 25-degree mark on the flywheel.

**SERIES M—**Two methods of timing the ignition are given below, the first to be followed if the oil pump has been removed; the second should be used only when the oil pump has not been removed.

The oil pump has an off-center slot in the drive shaft end. This slot drives the distributor, which has an offset driving lug on the lower end. To time the ignition when the oil pump has been removed, proceed as follows:

1. Remove cover from timing hole in flywheel housing on distributor side of tractor.
2. Remove spark plug from front cylinder.
3. Crank engine slowly until front piston is coming up on its compression stroke, as indicated by air pressure coming out of spark plug hole.
4. Continue cranking slowly until "D C" mark on flywheel lines up with marks on side of timing hole, Fig. 23.
5. Hold oil pump in the position it is to be installed in the cylinder block (drive gear upward) with narrow side of off-center slotted gear end toward outside of cylinder block and with slot parallel with side of block.
6. Turn oil pump drive gear  $\frac{1}{8}$  turn clockwise (looking toward slotted end). Insert oil pump into cylinder block, locking it in position with pointed set screw. Tighten cap nut firmly.
7. Crank engine until compression stroke of No. 1 cylinder is again determined. Continue to crank until the "SPARK" mark on flywheel lines up with marks on timing hole, Fig. 23.
8. Insert distributor into block with terminal for primary lead wire extending away from the engine. Be sure the driving lug on the distributor coupling is engaged its full distance in slot in

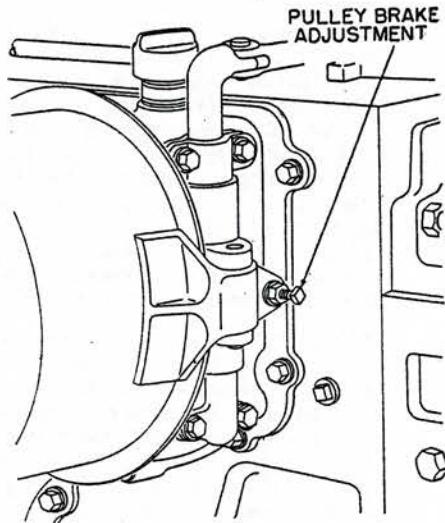


Fig. 23A Pulley brake adjustment on Model 60. Model 50 is similar

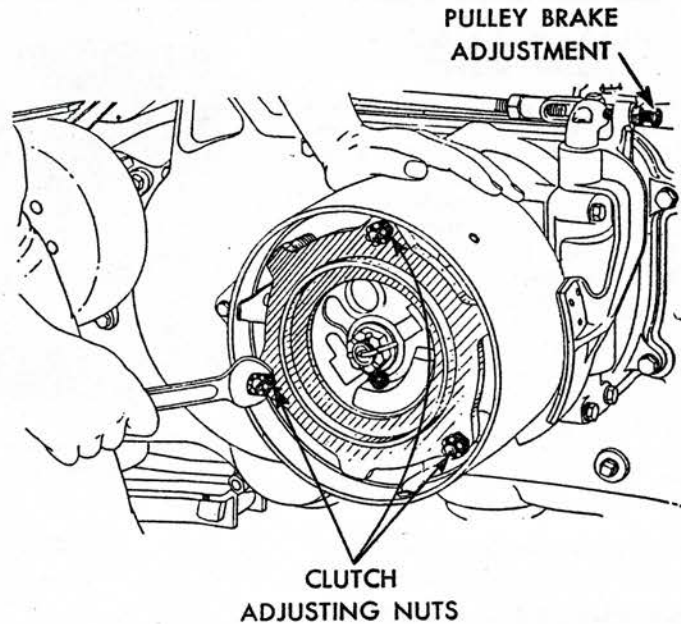


Fig. 24 Clutch and pulley brake adjustments. Series A, B, D, G, H. Typical of Models 50, 60

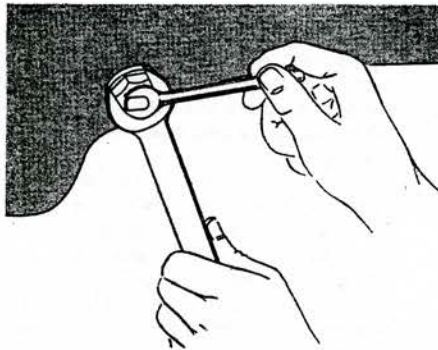


Fig. 25 Clutch pedal adjustment. Series M

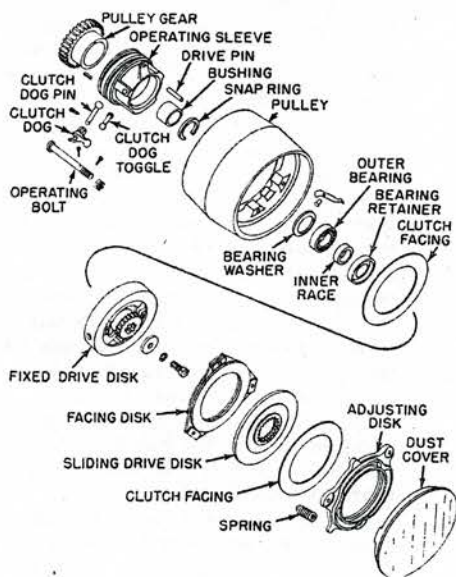


Fig. 25A Exploded view of pulley and clutch. Models 50, 60

- oil pump drive gear.
9. Twist distributor cam counter-clockwise as far as possible and hold cam in this position while adjusting breaker point opening.
  10. With distributor cam held in advanced position, rotate distributor body until breaker points are beginning to open.
  11. Tighten distributor body clamps and install rotor, cap and wires. To set the ignition timing when the oil pump has not been removed crank the engine to bring No. 1 piston up on its compression stroke and stop when the "SPARK" mark on the flywheel, Fig. 23, lines up with the marks on the timing hole. Hold the distributor rotor against its normal rotation and turn the distributor body until the breaker points just begin to open and tighten the distributor clamp bolts.

**GENERATOR**

Delco-Remy generators are used on these tractors, the specifications for which are given in the chart. For general service data, however, see the "Generator" chapter in the truck section of this manual.

**STARTING MOTOR**

Delco-Remy starting motors are used on these tractors, the specifications for which are given in the chart. For general service data, see the "Starting Motors" chapter in the truck section of this manual.

**CLUTCH ADJUSTMENT**

**MODELS 50, 60**—To adjust the clutch,

first set the clutch lever in the engaged position. Then remove the pulley cover and tighten each of the three nuts a little at a time to an equal tension. This can be determined by the effort required to turn the nuts, Fig. 24. Now try the clutch lever. It should go into engaged or operating position with a snap requiring some pressure.

**SERIES A, B, D, G, H**—The clutch is properly adjusted when the three adjusting nuts are drawn up to exactly the same tension, Fig. 24. The tension is determined by the effort required to turn the nuts. The bolts may project unequal distances beyond the nuts when the tension is equal with clutch engaged.

To tighten the clutch, set the clutch lever in engaged position, remove the pulley cover and tighten each nut one slot to the right. Repeat if the clutch is not tight enough.

**SERIES L**—The only adjustment on the clutch is to see that the clearance between the clutch pedal and the foot rest be maintained at 1/2". In other words, the pedal arm should move 1/2" from the foot rest before beginning to disengage the clutch. Adjust by changing the length of the clutch throwout rod.

**SERIES M**—The only adjustment on the clutch is to see that the free travel of the clutch pedal is maintained at 1 1/2", measured at the top of the pedal.

To adjust for free pedal travel, loosen the jam nut on the adjusting stud of the adjusting cam, Fig. 25. Turn the stud counter-clockwise to decrease free travel and clockwise to increase it. Be sure to tighten jam nut when adjustment is completed.

## PULLEY BRAKE ADJUSTMENT

**MODELS 50, 60**—The pulley brake should be adjusted so that when the clutch operating lever is moved slightly from the rear of the released position, pulley is free to turn. This adjustment is made with the clutch lever in the position where the clutch is ready to engage and the pulley brake tight against the pulley. With the clutch lever and pulley brake in this position, turn the adjusting set screw until there is approximately  $\frac{1}{8}$ " clearance between the end of the screw and the operating pin, Fig. 23A.

**SERIES A, B, D, G, H**—To adjust the pulley brake, turn the set screw, Fig. 24, until the brake holds the pulley from turning when the clutch lever is held clear back.

When pulley brake lining becomes worn, replace with new lining, using brass rivets.

## BELT PULLEY & CLUTCH

**MODELS 50, 60**—All clutch parts are contained in the pulley. Fig. 25A shows an exploded view of the assembly.

**CLUTCH FACINGS, REPLACE**—Remove the dust cover and three slotted nuts. Pull out the adjusting disc, outer facing, sliding drive disc and facing disc assembly. Remove the cap screw and large flat washer from the end of the crankshaft. Replace the cap screw in the end of the crankshaft and remove the fixed drive disc with a puller. Remove the inner clutch facing.

If the clutch facings are worn or badly glazed, replace them and install all remaining parts in the sequence shown in Fig. 25A. Be sure the "V" marks on the drive disc and end of crankshaft are lined up. Draw the cap screw up securely. And adjust the clutch as outlined above.

**CLUTCH REMOVAL**—After removing all the parts mentioned above, take out the yoke pin which joins the clutch operating rod to the clutch fork shaft. Remove the clutch fork and bearing assembly. The clutch and pulley assembly can now be pulled off the tractor, although it may be necessary to move the rear wheel to gain clearance.

**DISASSEMBLY**—Using a punch, drive out the bearing retainer, bearing and washer. Remove the operating bolts, pins, dogs and toggles.

**INSPECTION**—Facings in good condition are quite rigid. If they bend appreciably, facings are in poor condition and should be replaced.

If the condition of the springs is in doubt, test them for strength on a spring tester. When compressed  $1\frac{3}{8}$ ", springs should exert a pressure of 45-55 lbs.

Measure the inside diameter of the pulley bushing. The inside diameter of a new bushing is 2.252-2.254". Diameter of bushing journal on crankcase is 2.245-2.247". If clearance is excessive, replace the worn part. Press the new bushing in until it seats

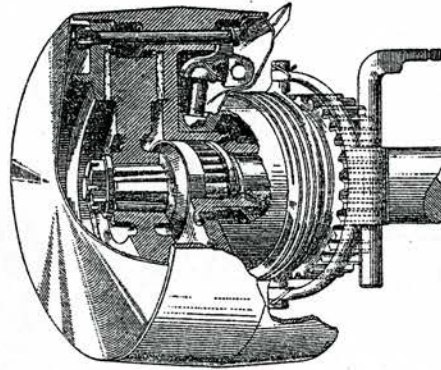


Fig. 26 Belt pulley and clutch. Typical of all A, B, D, G, H

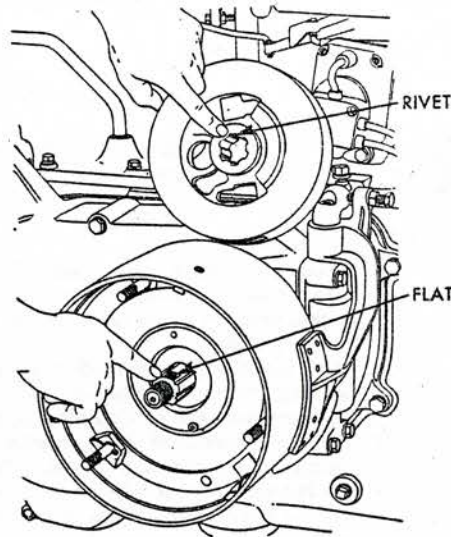


Fig. 27 Install clutch disc with rivet in hub lined up with flat spot on crankshaft splines. Series A, B, G

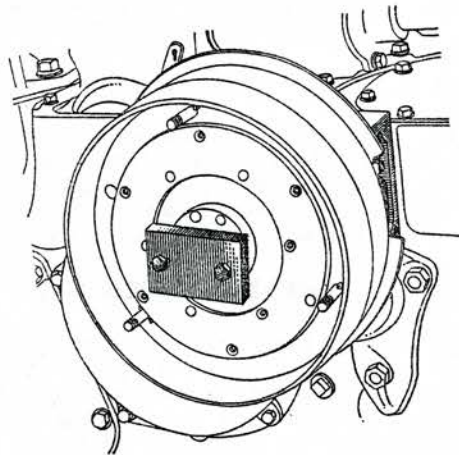


Fig. 28 Using plate to pull clutch driving disc from H series tractors after serial No. H-9999

against the snap ring. This bushing is pre-sized and needs no honing unless it is distorted during installation. If necessary, hone it to an inside diameter of 2.252-2.254".

If the pulley gear is worn or damaged, use a puller to remove it. While the gear is off, examine the operating sleeve. If no longer serviceable, take out the snap ring and remove the sleeve.

If the bearing inner race on crankshaft is broken or damaged, remove it with a puller. Then drive in the new race.

**ASSEMBLY**—Assemble the parts in the sequence shown in Fig. 25A. And when installing the pulley on the tractor, use a screw driver to move the operating sleeve as far as possible towards the pulley gear.

When installing the fixed drive disc, be sure the "V" marks on the drive disc and end of crankshaft are lined up.

Complete the installation and adjust the clutch and pulley brake as outlined previously. The final check of the clutch adjustment should be made while the engine is running.

**SERIES A, B, G**—Fig. 26. To remove the belt pulley, disengage the clutch lever and use a screwdriver to pry off the pulley cover. Remove the nuts from the clutch adjusting bolts and take off the clutch adjusting disc.

To remove the driving disc, use two machine bolts and nuts of the proper size as a jack. Insert the nuts and threaded ends of the bolts through the openings provided in the driving disc. Revolve the pulley so that the ends of the bolts do not rest on the riveted head of the clutch cone drive pin. Rest the nuts against the inner face of the driving disc and screw the bolts against the belt pulley until the driving disc loosens.

Disconnect and remove the clutch operating unit, consisting of clutch collar, fork, fork shaft and fork bearing.

When pulley is off, examine bronze pilot bushing for wear and replace if necessary. When installing a new bushing, remove all rough edges and burrs from both pulley and bushing and start the new bushing from the back or gear side of pulley.

If the clutch fork and shaft are to be taken apart, they should first be marked to show the relative position of the splines. If they are not so marked they may be reassembled by keeping the bent arm at the top of the shaft approximately at right angles to the fork. Always be sure the capscrews attaching the clutch collar to the fork are securely wired.

In replacing the clutch driving disc, be sure the rivet in the hub lines up with the flat spot at the end of one of the crankshaft splines, Fig. 27.

To replace clutch facings, remove the nuts on the adjusting bolts and take off the outer adjusting disc. Remove the driving disc (see above). Place clutch facings in turned recesses provided and reassemble. Adjust all three nuts to uniform tension with clutch engaged.



**SERIES M**—The belt pulley unit used on these tractors contains the pulley gears when assembled, which makes it impossible to measure backlash at the gears. In order to measure the backlash, mount a dial indicator in such a manner that its measuring stem contacts the drive shaft splines. Correct backlash should be .0015-.003" and is adjusted by varying the number of shims behind the pulley shaft inner bearing cup.

## 50, 60 TRANSMISSION

Fig. 29A illustrates an exploded view of Model 60 transmission and the following material deals with this unit specifically. However, due to its similarity with the Model 50 unit, it may be used as a guide when servicing the latter.

**DESCRIPTION**—The transmission gears are carried on two shafts: a sliding gear shaft and a countershaft. The sliding gear shaft is the topmost shaft in the transmission case directly below the shifting mechanism. It is driven by the drive gear and shaft, which receives engine power from the first reduction gear shaft. The countershaft is located underneath the sliding gear shaft.

**REMOVAL**—Drain the transmission and first reduction gear cover. Remove the entire shifting mechanism. Remove the upper right-hand implement attaching stud and the right-hand brake assembly. Remove the clutch, pulley and first reduction gear cover.

To remove the sliding gear shaft, take off the sheet metal oil retainer and snap ring in the main case at left end of shaft. Notice that the snap ring is installed with its ends spanning the oil passage in the main case. The sliding gear shaft may now be removed from the left side of the main case.

To remove the drive gear and shaft, pull the first reduction gear and power shaft idler gear (if tractor is equipped with engine-driven power shaft). Then remove bearing cover and snap ring, and lift shaft out through transmission cover opening.

To remove the countershaft, take off the right-hand bearing housing, remove the nut from the left end of the shaft, pull the fourth speed pinion with a suitable puller, and drive the shaft out to the right.

**INSPECTION**—Examine all parts for excessive wear or damage. The countershaft idler gear is mounted on two straight roller bearings. If these bearings are defective and must be replaced, it is first necessary to pull the Timken taper bearing cone and roller assembly from the right end of the countershaft. Be careful when removing the bearing not to break or otherwise damage the hardened steel thrust washer between the idler gear and bearing cone.

**INSTALLATION**—Referring to Fig. 29A, slide the countershaft into the transmission case from the right side of the tractor, in-

stalling all parts as the shaft goes into place. Install all gears on this shaft with the rounded edge of the teeth to the right except the fourth and sixth speed pinion. The rounded teeth on this pinion face to the left.

Install the right-hand bearing housing with shims and gaskets. Check the countershaft for end play by mounting a dial indicator so that its button contacts the end of the shaft. End play should be .001-.004" and adjustment is made by adding or removing steel shims or paper gaskets between the right-hand bearing housing and transmission case.

To install the drive gear and shaft, set these parts in place and install the snap ring and bearing cover. When installing the bearing cover, be sure to center it around the oil collar on the shaft.

To install the sliding gear shaft, push the shaft into the bore from the left-hand side of the main case. As the shaft goes into place, install all gears and related parts on it, referring to Fig. 29A. Install the snap ring in the case, being sure that its ends span the oil passage in the main case.

Install the sheet metal oil retainer at left end of sliding gear shaft with flat spot on retainer adjacent to oil passage in main case.

Install complete shifting mechanism, being sure the shifter shaft lock plate on right side of case is tightly positioned against flats on shifter shafts while tightening cap screws.

Install power shaft idler gear (if so equipped), first reduction gear and cover, pulley, clutch, right-hand brake and upper implement attaching stud.

## A & G TRANSMISSION

To disassemble, see Figs. 30 and 31 and proceed as follows:

Take off transmission cover, flywheel, and sliding gear shaft cover from left side of transmission case. Remove shifter shafts, being sure to catch detent plunger parts as the shafts are being withdrawn.

To remove sliding gear shaft, remove nut (and gear on 6-speed units), oil retainer and snap ring from left end of shaft. Start shaft out of case and bump drive pinion against the right-hand bearing to force bearing from shaft. Pull shaft through gears and out of case, lifting gears out through top.

To remove the sliding gear shaft drive gear, take off right brake and reduction gear cover. Pull reduction gear and bearing from shaft. Then remove drive gear, shaft and bearing from inside of case.

To remove countershaft, unscrew nuts from right bearing housing. (On 6-speed transmissions, remove sliding gear from left end of countershaft.) Pull shaft through right side of case, lifting out gears and spacers as shaft is being withdrawn.

**ASSEMBLY NOTES**—Reverse the order of the above procedure to assemble the

transmission but observe the following:

When assembling the countershaft, first tighten the nut securely on the left end of the shaft. Then use the proper number of shims and gaskets between the right bearing housing and case to provide a free-turning shaft without end play.

When assembling the sliding gear shaft drive gear, see that the spacer is installed between the reduction gear and outer bearing.

Be sure to adjust the position of the shifter shaft by means of the adjusting screw so that the sliding gears mesh evenly with the countershaft gears.

## MODEL B TRANSMISSION

To disassemble, see Fig. 32 and proceed as follows:

Take off transmission cover, flywheel, and sliding gear shaft cover from left side of transmission case.

To remove shifter shafts on tractors from serial 1000 to 201000, merely loosen the shafts and withdraw the shafts from the case, being sure to catch the detent plunger parts as the shafts are being withdrawn.

To remove shifter shafts on tractors after serial 201000, take off the belt pulley and clutch, and the cover from the reduction gear. Pull gear from left end of sliding gear shaft. Then, after unfastening shifter shafts, withdraw them through left side of case.

To remove the sliding gear shaft, remove nut (and gear on 6-speed units), oil retainer and snap ring from left end of shaft. Start shaft out of case and bump drive pinion against right-hand bearing to force bearing from shaft. Pull shaft through gears and out of case, lifting gears out through top.

To remove the sliding gear shaft drive gear, take off the right brake and reduction gear cover. Pull reduction gear and bearing from shaft. Then remove drive gear, shaft and bearing from inside of case.

To remove countershaft from tractors with serial 1000 to 201000, first remove right bearing housing. Then loosen left differential bearing quill from case. Push countershaft through right side of case, raise left end of shaft, force differential to rear and lift countershaft through top of transmission.

To remove countershaft on tractors after serial 201000, unscrew nuts from right bearing housing. (On 6-speed transmissions, remove sliding gear from left end of countershaft.) Pull shaft through right side of case, lifting out gears and spacers as shaft is being withdrawn.

**ASSEMBLY NOTES**—Reverse the order of the above procedure to assemble the transmission and take the same precautions given in the "Assembly Notes" for Series A and G transmissions above.

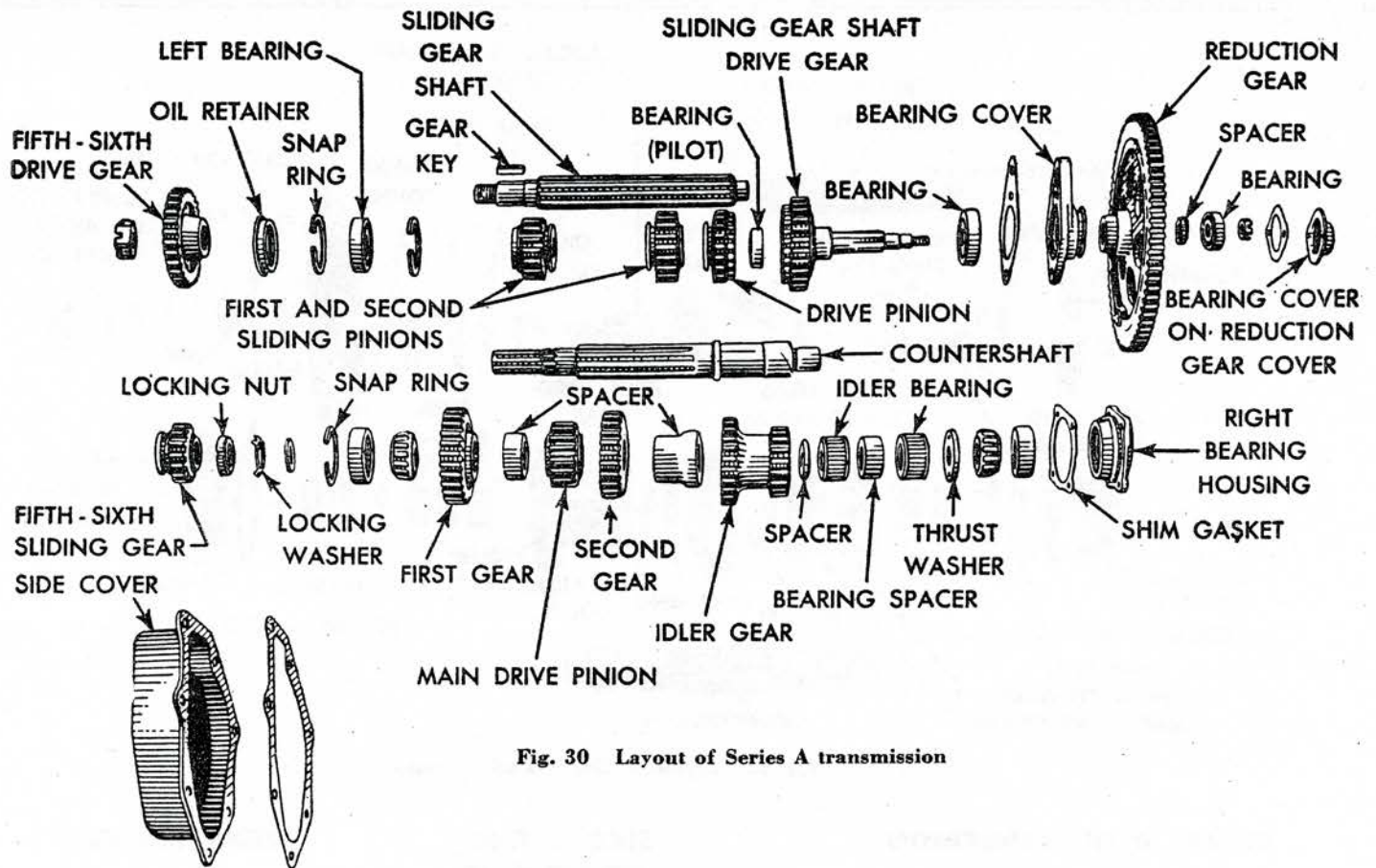


Fig. 30 Layout of Series A transmission

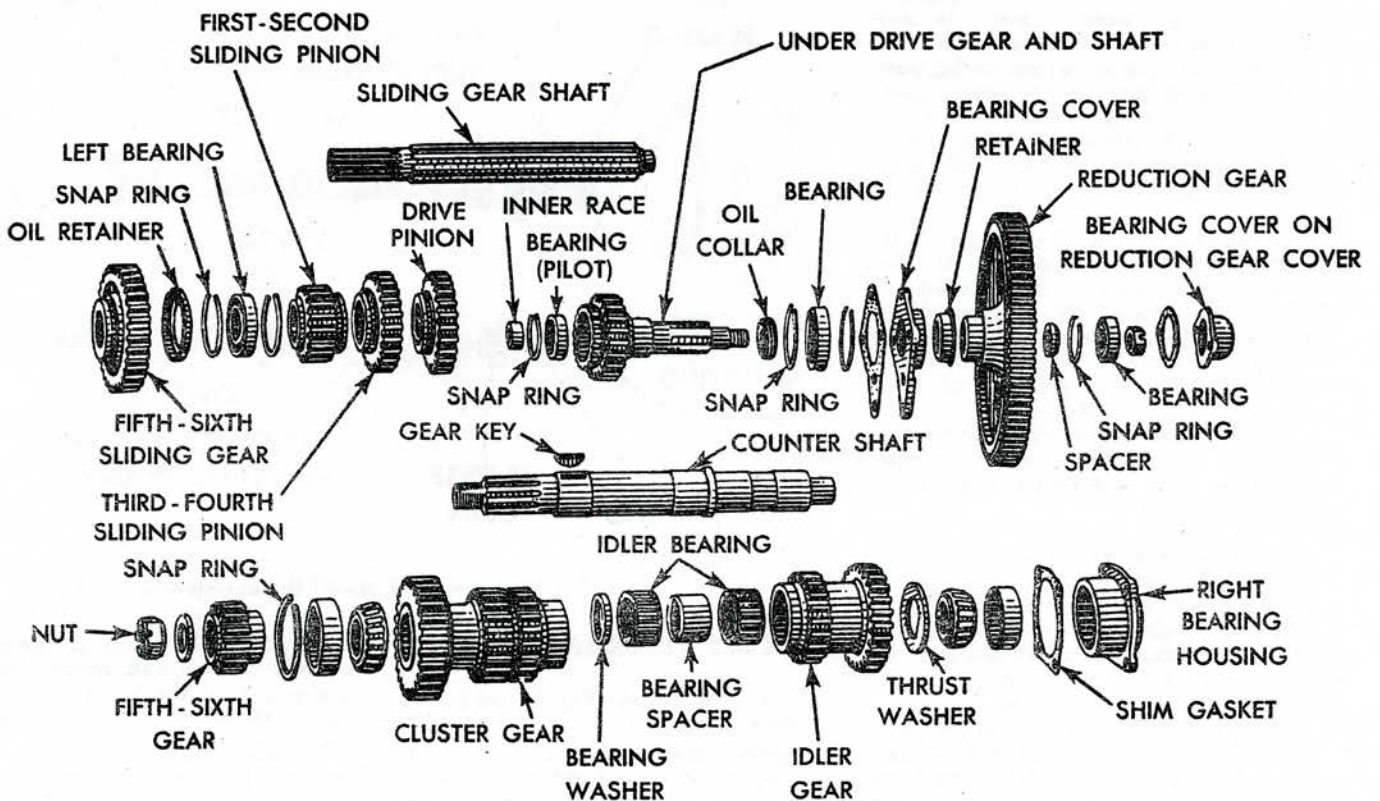


Fig. 31 Layout of Model G transmission

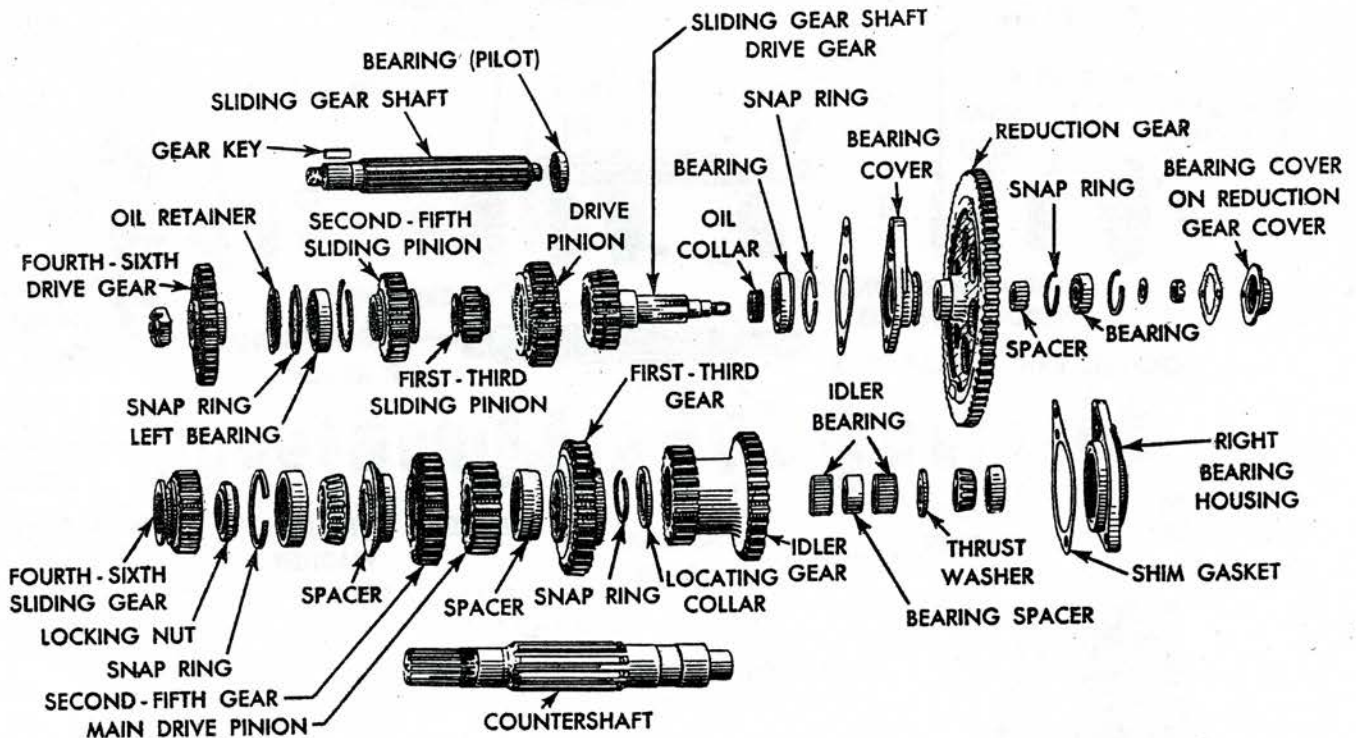


Fig. 32 Layout of Series B transmission

## MODEL D TRANSMISSION

To disassemble, see Fig. 33 and proceed as follows: Take off the transmission cover and right fender. Loosen the shift quadrant and clamp bolt on shift lever arm. Slide shift lever to rear, noting position of related parts as they are removed to assure correct assembly.

Take off belt pulley and clutch and reduction gear cover. Loosen shift shaft screws and remove shift shaft and mechanism.

To remove sliding gear shaft, loosen bearing quill from transmission case. Release snap ring from left end of shaft and release left bearing by bumping it off with the adjacent gear. Pull shaft out through right side of case. The reduction gear may then be pressed off the shaft and bearing quill removed.

Take the reverse gear shaft out through the right side of the transmission case, lifting the gear and thrust washers out through the top.

**ASSEMBLY NOTES**—Reverse the above procedure to assemble, being sure the reverse gear thrust washers are in place.

When assembling the shifter shaft, adjust it by means of the adjusting screw so that the transmission gears mesh evenly with the differential gears.

When installing the reduction gear cover, replace the belt pulley and position the cover so that the clutch operating sleeve slides freely on the pulley. When the cover is located properly, tighten the reduction gear cover securely.

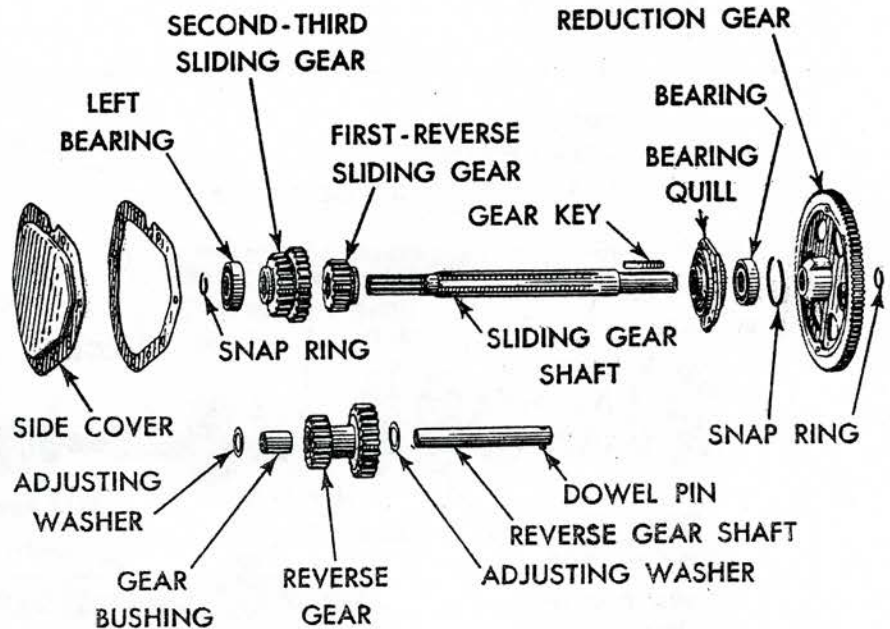


Fig. 33 Layout of Model D transmission

## SERIES H TRANSMISSION

To disassemble, see Fig. 34 and proceed as follows:

Remove transmission cover, flywheel and shifter shaft and shifters. Take off belt pulley and clutch, reduction gear cover and gear. Remove sliding gear shaft bearing housing from right side of case

and pull out the shaft. If equipped with a power take-off unit, remove the bearing and gear from the left end of the sliding gear shaft before removing the shaft.

To remove the countershaft, take out the rear axle and differential as outlined further on. Then remove the countershaft lock plate holding the right end of the shaft to the case. Pull the countershaft



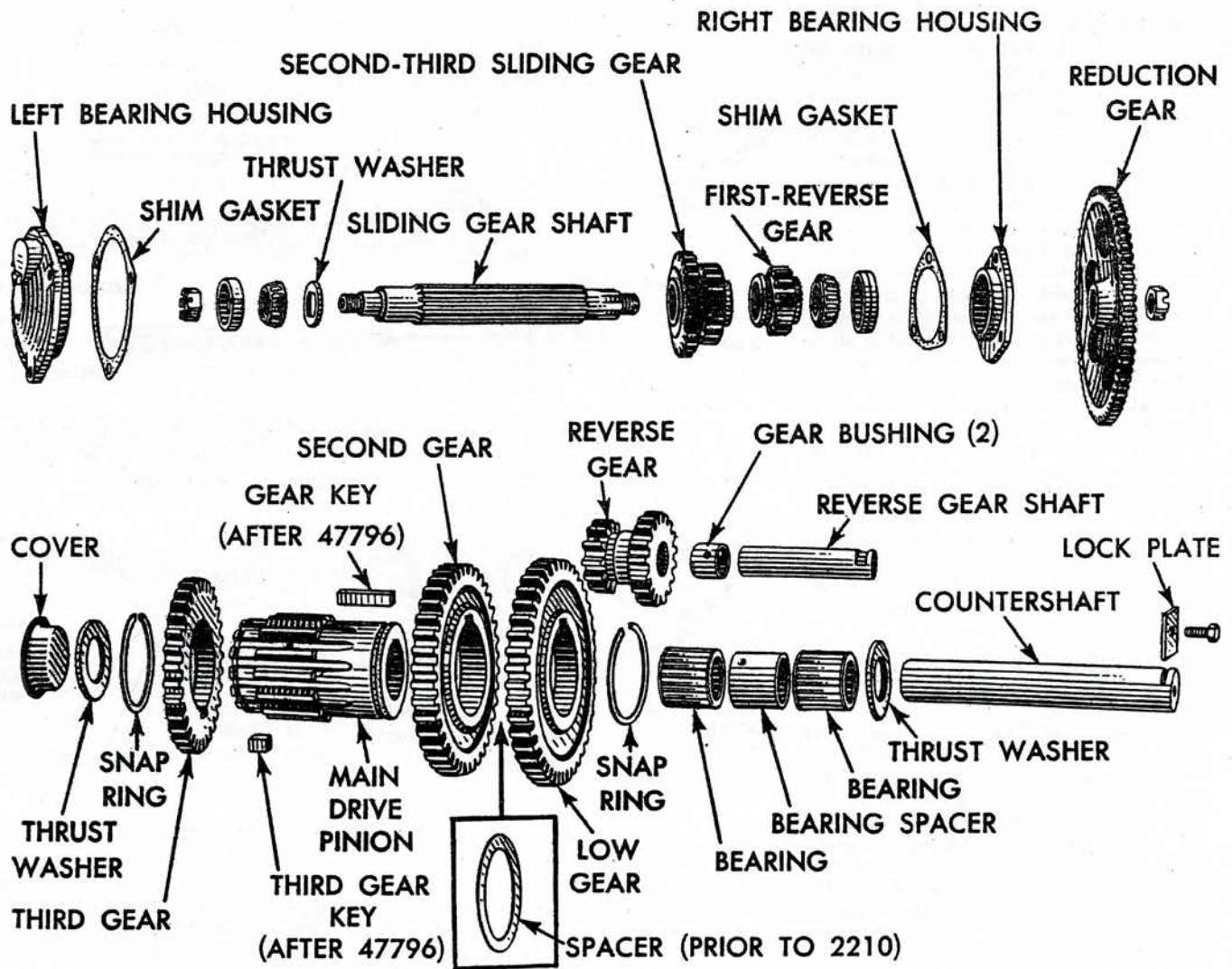


Fig. 34 Layout of Series H transmission

through the right side of the case and remove the gears, washers and spacers through the rear opening.

Pull reverse shaft through right side of case and lift out gear. If new bushings are installed in the reverse gear, they should be reamed just enough to provide a free-running fit on the shaft.

**ASSEMBLY NOTES**—Reverse the order of the above procedure to assemble, being sure to observe the following:

When assembling the countershaft, see that there is no end play between the gears and main drive pinion. To do this, install snap rings of the proper thickness to retain the gears solidly on the shaft. Be sure that a thrust washer is placed at both ends of the countershaft gears.

The reduction gear cover must be located so that the clutch operating sleeve slides freely on the belt pulley before tightening the cover.

The sliding gear shaft should be assembled to provide a free-running fit without end play. This is accomplished by using

the proper number of shims and gaskets under the right bearing housing. Shims and gaskets are also used under the left bearing housing to control the mesh of the bevel gear and power take-off gear (when so equipped).

When assembling the shifter shaft, adjust it by means of the adjusting screw so that the sliding gears will mesh evenly with the countershaft gears.

**SERIES M TRANSMISSION**

To disassemble, see Fig. 35 and proceed as follows: After taking off the transmission cover, support both halves of the tractor and unfasten the transmission case from the center frame. Slide the front half of the tractor forward not more than two inches. Separate the propeller shaft from the transmission input shaft by driving out the pin. Then move the center frame away from the transmission.

To remove the output shaft, first remove the differential and final drives. Then take off the output shaft front bearing

cover, unscrew the nut from the shaft and pull the shaft far enough to the rear to permit taking off the front bearing cone and shims. Pass the shaft out through the rear opening in the case and lift the gears out through the top.

To remove the input shaft, take the front bearing quill from the case. Then slide the shaft forward and lift it out through the top opening by its rear end.

To remove the power take-off shaft, take off the front bearing cover and shims. Bump the shaft forward to release the front bearing cup, and remove the rear bearing by bumping it off with the cluster gear. Pass the shaft through the gears and front of case and lift out gears and related parts.

**ASSEMBLY NOTES**—Reverse the order of the above procedure to assemble, being sure to observe the following:

When assembling the power take-off shaft, install the spacer washer between the cluster gear and rear bearing cone with its beveled edge to the rear. The

shaft should be set up with a .003" bearing preload. To accomplish this, install the proper amount of shims to provide a free-turning shaft without end play; then remove .003" shim.

When assembling the input shaft, see that the spacers and spacer washer are installed with chamfered edge facing rear. The cupped side (concave) of the spring washer goes next to the spacer washer. The chamfered teeth of both the third and fourth speed gears should face each other. When assembled, the input shaft should have .002-.004" end play which is adjusted by installing the proper thickness of shims between the case and front bearing quill. When installing the oil seal in the quill, see that its lip is toward the inside of the transmission.

When assembling the output shaft, see that the chamfered side of the bearing spacer faces the shoulder on the shaft. The shaft should be set up with a .005" bearing preload. To obtain this preload, install sufficient shims to provide a free-turning shaft without end play; then removing .005" shim will establish correct preload.

## TRANSMISSION DRIVEN POWER SHAFT

**MODELS 50, 60**—The front of the power shaft, Fig. 35A, is splined to a bevel gear located in the bottom of the transmission case. The bevel gear is driven by a drive shaft and bevel pinion, the shaft of which lies parallel to the transmission countershaft. A sliding gear on the drive shaft and bevel pinion can be engaged with the countershaft idler gear by a shifter mechanism. The power shaft receives its power from the countershaft idler gear.

The power shaft extends from the bevel gear out through the final drive and basic housings. It is supported at the rear by a ball bearing. An oil seal at the rear prevents oil leakage.

**REMOVAL**—Remove shifting mechanism, sliding gear shaft and countershaft as outlined under **Transmission**. Remove cotter pin from shifter lever and pull lever part way out of transmission case. Knock shifter arm down far enough to permit removal of snap ring and Woodruff key. Remove shifter arm and spring from shifter lever.

Screw shifter shaft out of transmission case. Reach down into case and pull gear shifter from shaft, catching the ball and spring as they spring out when shaft leaves gear shifter.

To remove the drive shaft and pinion, remove the bearing cover and drive the shaft to the right until the bearing is out of the case. Pull the bearing from the end of the shaft. Then remove the shaft and pinion through the transmission cover opening.

To remove the power shaft bevel gear, pull it and the thrust washer out of the boss toward the front of the case.

To remove the bearing and oil seal, re-

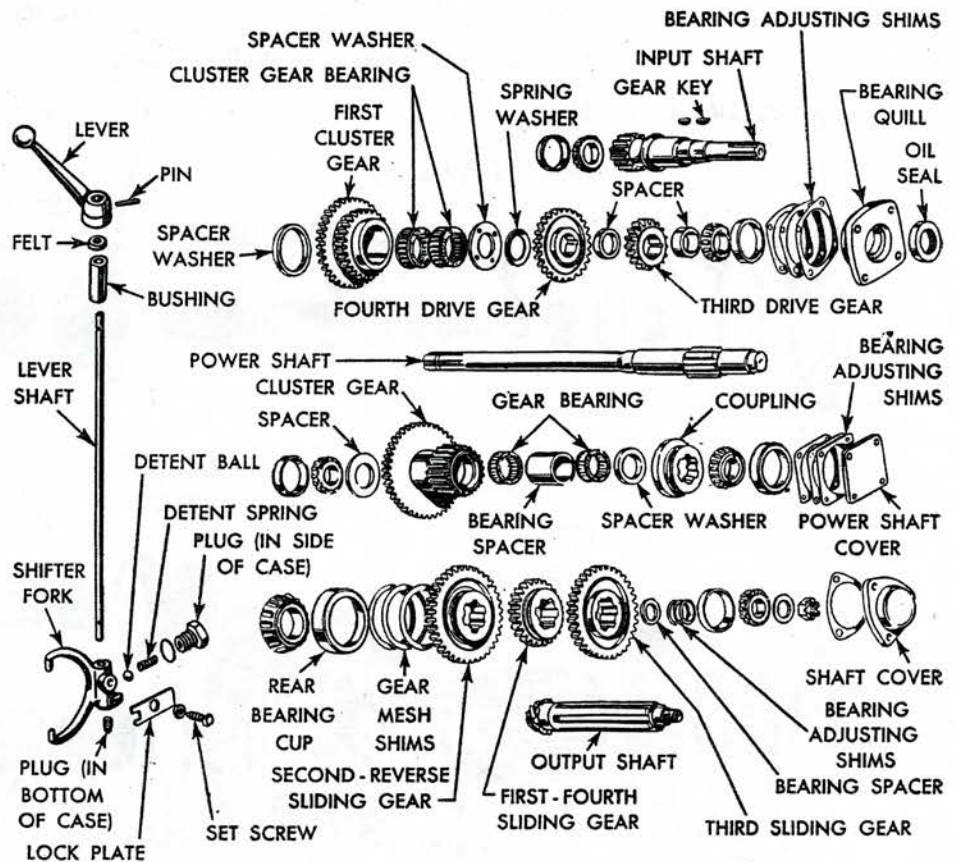


Fig. 35 Layout of Series M transmission

move the cap screws which fasten the bearing housing to the basic housing at the rear of the tractor. Pull the power shaft with bearing housing to the rear far enough to permit removal of the internal snap ring from the front side of the bearing housing. Remove the bearing housing with oil seal from end of power shaft. Bearing and oil seal can now be removed.

If the power shaft is to be removed, it is first necessary to remove the seat, batteries and basic housing in order to reach the snap ring on front end of shaft.

**INSPECTION & REPAIR**—Replace all parts which are worn or damaged.

The diameter of new drive shaft bushing and bevel gear bushing in case bosses is 1.378-1.380". Diameter of bearing surfaces on new drive shaft or bevel gear is 1.372-1.373". If clearances between either bushing or shaft is excessive, replace the worn part.

Thickness of new thrust washer is .102-.106". Replace washer if wear is excessive, with the smooth side toward the gear.

**INSTALLATION**—Referring to Fig. 35B, press the bearing on the power shaft and secure it in place with snap rings. Install a new oil seal in the bearing housing with lip pointing toward the transmission. Slide the bearing housing on the power shaft, protecting oil seal by wrapping a thin piece of shim stock around the splines on the shaft. Install snap ring in bearing housing.

Install the power shaft and bearing housing assembly in the basic housing. Install the snap ring on the inner end of the power shaft. The complete assembly can now be mounted on the tractor.

Replace the bevel gear and thrust washer in boss in bottom of case, being sure the wide section of the washer fits in machined recess in boss.

Slip the sliding gear on the drive shaft and bevel pinion and install the assembly through the transmission cover opening. Drive the bearing on the end of the shaft until it seats against the shaft shoulder.

Install the bearing cover and shim gaskets and test drive shaft and bevel pinion for backlash. Backlash should be .006-.010" and can be adjusted by adding or removing gasket shims from under the bearing cover as required to obtain the desired result.

Place the gear shifter in a vise and set the spring and ball in place. Use a short piece of round, cold-rolled steel that is the same diameter as the shifter shaft for a pilot. Compress the spring and insert the pilot into the gear shifter until it covers better than one half of the ball, thus holding the spring and ball in the gear shifter.

Install the shifter shaft part way in bore of transmission case. Position gear shifter on end of shifter shaft, with long hub end toward the case. Holding the gear shifter and pilot snugly against shifter shaft, rap end of shifter shaft smartly with a hammer,

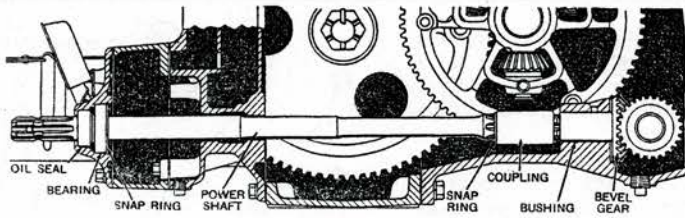


Fig 35A Cutaway view of Model 60 transmission-driven power shaft. Model 50 is similar

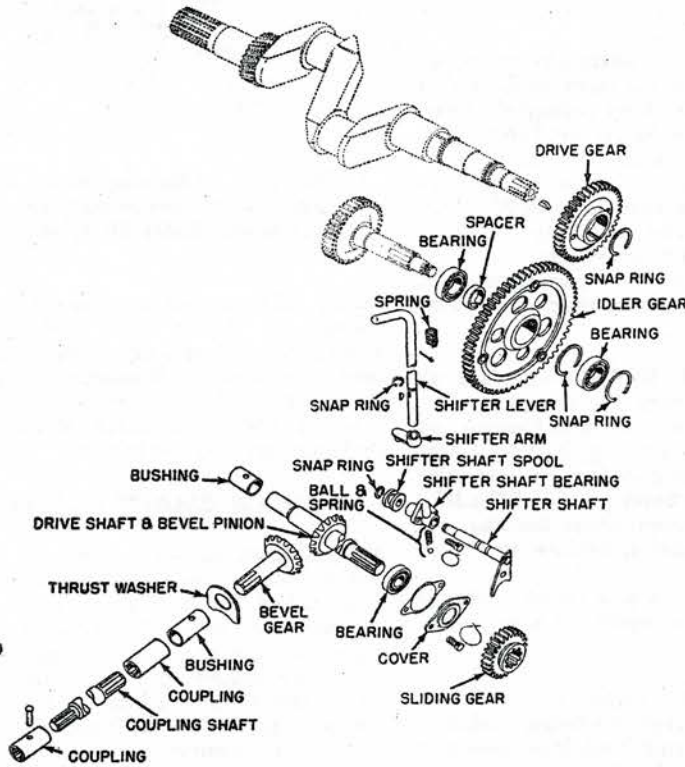


Fig. 35C Exploded view of Model 60 engine-driven power shaft driving and shifting mechanism. Model 50 is similar

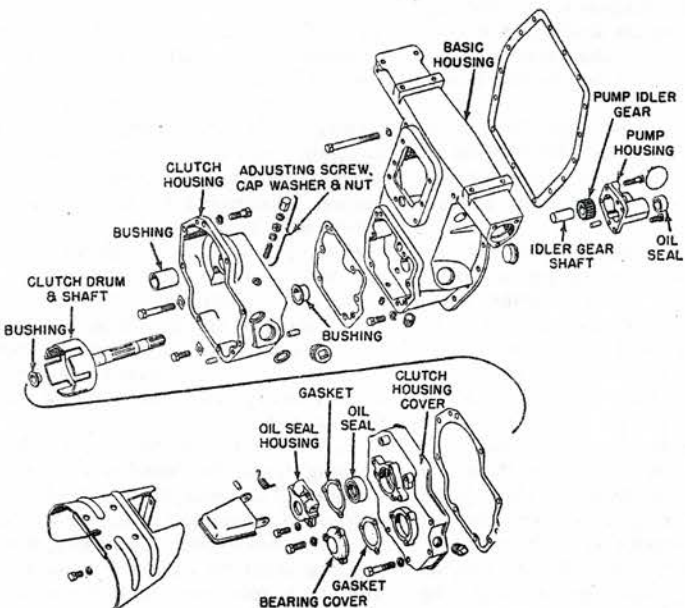


Fig. 35E Exploded view of Model 60 engine-driven power shaft clutch housing and cover. Model 50 is similar

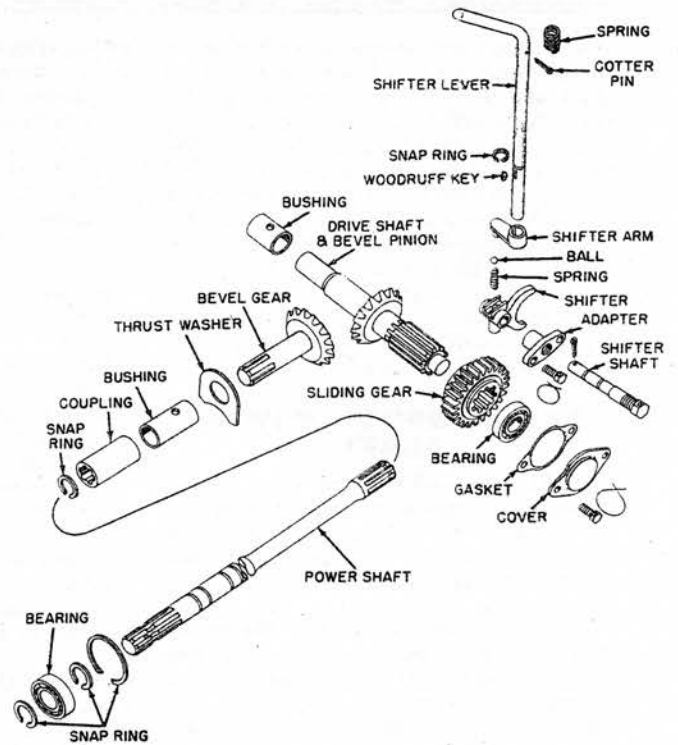


Fig. 35B Exploded view of Model 60 transmission-driven power shaft. Model 50 is similar

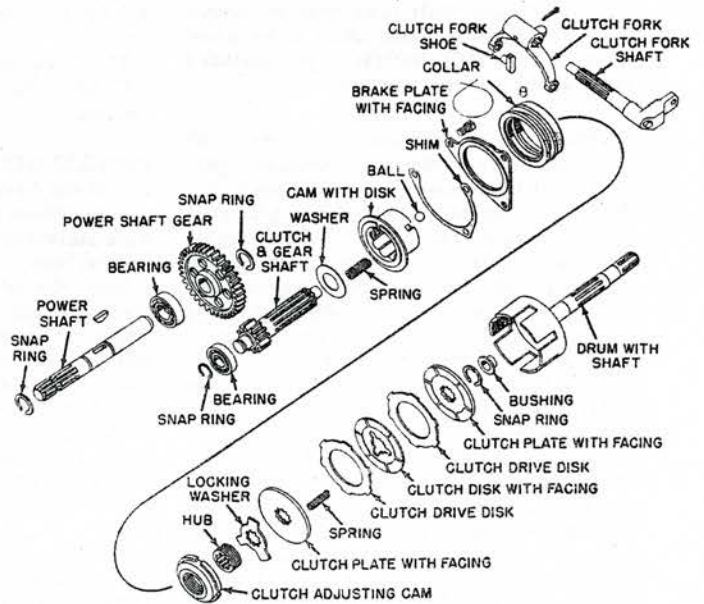


Fig. 35D Exploded view of Model 60 engine-driven power shaft and clutch. Model 50 is similar

which will drive the shaft through the gear shifter and drive the pilot out at the same time.

Screw the shifter shaft into transmission case and install a new cotter key through end of shaft.

Lower the shifter lever through hole in top of case. Slide spring on lever from bottom. Install snap ring on shifter lever, positioning snap ring approximately 1/2"

above snap ring groove in shifter lever. Install Woodruff key. Place shifter arm on shaft and move it up against snap ring (over Woodruff key).

Slide spring up against underside of case and insert cotter pin into hole in shifter lever below the spring. With the spring compressed, engage bottom of shifter arm with corresponding groove in gear shifter and tap shifter arm and snap ring down until snap ring engages snap ring groove in shifter lever.

Install countershaft, sliding gear shaft and shifting mechanism.

## ENGINE DRIVEN POWER SHAFT

**MODELS 50, 60**—The power shaft drive is through a gear train on the right-hand side of the main case. The power shaft drive gear is mounted on the right end of the crankshaft just outside of the right-hand main bearing.

The drive gear meshes with the power shaft idler gear which is carried on two ball bearings mounted on the transmission sliding gear drive gear and shaft. The sliding gear in turn drives the power shaft sliding gear which is mounted on the power shaft drive shaft.

By means of a shift lever the power shaft sliding gear can be moved in or out of mesh with the power shaft idler gear to permit disconnecting the power shaft drive when desired. Fig. 35C illustrates an exploded view of the entire assembly.

**REMOVAL**—To remove the power shaft idler gear, drain the first reduction gear cover and transmission. Remove the upper implement attaching stud on the right front side of the rear axle housing. Remove right-hand brake assembly, main clutch, pulley and first reduction gear cover. Remove the nut on the end of the sliding gear drive shaft and pull off the first reduction gear. Idler gear can now be removed.

To remove the sliding gear and shifter shaft, it is necessary to take off the snap ring on the inner end of the shaft. There are two ways of doing this. If the power shaft drive shaft is not to be removed, the easiest way to reach the snap ring is through the rear of the tractor as described below. However, if the drive shaft and pinion, or the bevel gear in the bottom of the transmission case are to be removed, it is necessary to remove the transmission. In this case it is best to delay removal of the sliding gear and shifter shaft until the transmission is out of the way.

If the first method mentioned above is to be followed, remove the seat, batteries and basic lift housing. Shift the shifter shaft to the left as far as possible, reach in between the final drive gears and remove the snap ring on the end of the shaft. Now shift the shifter shaft to the right. While holding shaft in this position, shift back to the left, pushing the spool from the shaft. Remove the shifter shaft bearing retainer screws and lift the shifter shaft

with bearings and sliding gear from tractor.

To remove the power shaft drive shaft and pinion, it is first necessary to remove the transmission shifter shafts, sliding gear shaft and countershaft.

If the power shaft shifter shaft and sliding gear have not already been removed, reach down through the transmission opening and remove the snap ring from the inner end of the shaft. Slide the spool off the shaft, remove shifter shaft bearing, and lift shifter with shifter shaft bearing from tractor.

Remove the drive shaft bearing cover. Drive the shaft to the right until bearing comes out of case. After pulling the bearing, the shaft may be removed to the left up through the transmission case.

To remove the shifter lever, drive the shifter arm off the lever. Remove Woodruff key, snap ring, cotter pin and spring. Lever may now be pulled out of case.

Remove the power shaft bevel gear and thrust washer by pulling them out of boss to front of case.

**INSPECTION & REPAIR**—Replace all parts which are worn or damaged.

Diameter of new drive shaft bushing and new bevel gear bushing is 1.378-1.380". Diameter of bearing surface on new drive shaft and on new bevel gear is 1.372-1.373". If clearance between either bushing and its shaft is excessive, replace the worn parts.

The thickness of a new thrust washer is .102-.106". Replace washer if wear is excessive.

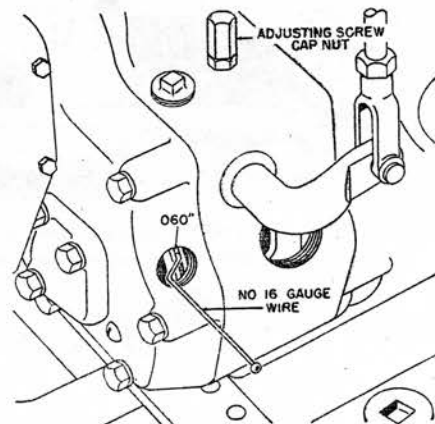
**INSTALLATION**—Referring to Fig. 35C, Install the bevel gear and thrust washer in boss in bottom of main case. Make sure that wide section of washer fits in machined recess in boss.

Slide the power shaft and pinion into place through the transmission opening. Drive the bearing on the shaft until it seats against the shoulder on the shaft. Shielded side of bearing should be to the inside, toward the case.

Install bearing cover with shims and check pinion and gear for .006-.010" backlash. If necessary, make adjustment by adding or removing shims under the bearing cover.

To install the sliding gear and shifter shaft, place the ball and spring in shifter shaft bearing and push shifter shaft through bearing. Install assembly in case, set sliding gear in place and secure shifter shaft bearing to case. Install spool and snap ring on inner end of shifter shaft.

To install the shifter lever, lower it through the hole in the top of the case. Slide the spring on the lever from the bottom. Install snap ring on shift lever, positioning snap ring approximately  $\frac{1}{2}$ " above snap ring groove in shift lever. Install Woodruff key. Place shifter arm on shaft and move it up against snap ring (over Woodruff key). Slide spring up against underside of case and insert cotter pin into hole in shifter lever below the



**Fig. 35F Adjusting Model 60 engine-driven power shaft clutch in tractor. Model 50 is similar**

spring. With spring compressed, engage bottom of shifter with corresponding groove in spool and tap shifter arm and snap ring down until snap ring engages the groove in shifter lever.

Install the countershaft, sliding gear shaft and shifting mechanism.

## POWER SHAFT CLUTCH

**MODELS 50, 60**—The rear end of the engine-driven power shaft coupling shaft is splined to the drum shaft of a multiple disc wet-type clutch. The drum rotates the clutch driving plates. The clutch driven plates are splined to a shaft and pinion which meshes with a gear on the end of the power shaft. The clutch is spring-loaded and locks in or out of engagement. A built-in oil pump provides circulation of oil through the clutch unit and between the clutch plates.

**REMOVAL**—Drain oil and engage clutch. Remove power shaft master safety shield. Back off the clutch fork adjusting screw on top of clutch housing. Remove cap screws which secure clutch cover to clutch housing. Push down on operating lever to separate cover from housing. Disconnect linkage at clutch fork shaft. The housing cover with power shaft and clutch (with the exception of clutch drum and shaft) can now be removed.

To remove the basic housing, take off seat, batteries and platform. Drain Pow-Trol system and detach its oil lines. To facilitate handling, remove the Pow-Trol valve housing. The basic housing may now be removed.

To remove the oil pump, take the pump housing from the front side of the basic housing. The gear teeth which are machined on the clutch drum shaft form the oil pump drive gear. Therefore, the pump housing must be removed from the basic housing before the clutch drum and shaft can be removed.

After removing the oil pump housing, the drum and shaft can be pulled from the

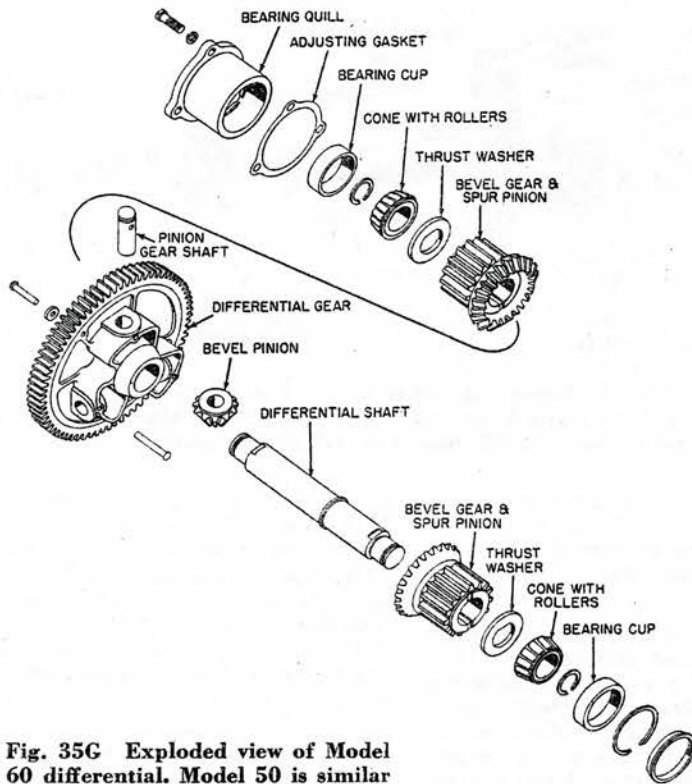


Fig. 35C Exploded view of Model 60 differential. Model 50 is similar

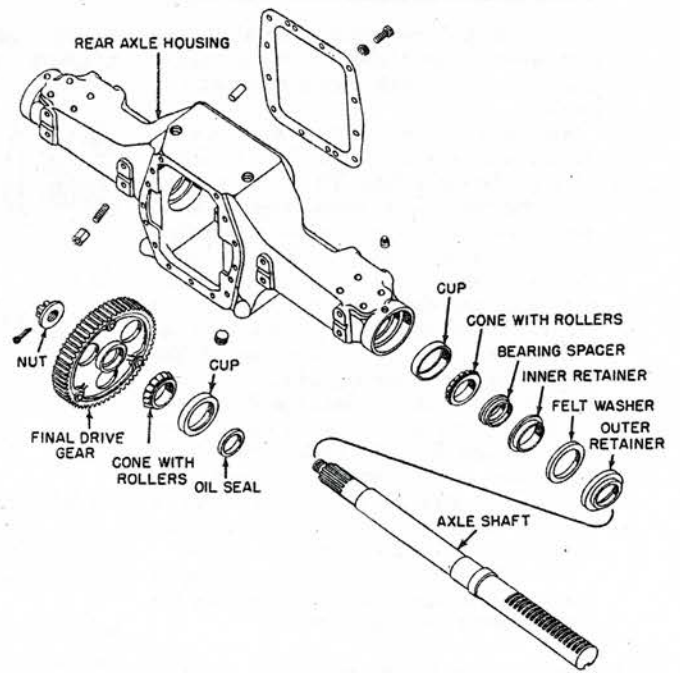


Fig. 35H Exploded view of Model 60 final drive. Model 50 is similar

basic housing. Removal of the clutch drum and shaft will be easier if the clutch fork is first removed.

To remove the clutch fork and fork shaft, take out the cotter pin and pull the shaft from the fork and housing.

**DISASSEMBLY**—Support the clutch and cover assembly in a vise, clamping on the power shaft. With two large screw drivers disengage the clutch. Remove the clutch plate retaining snap ring. Remove clutch plates and discs, release springs, cam locking washer, adjusting cam, balls and clutch collar. Remove brake plate, unscrewing retaining cap screws evenly to avoid distorting the plate. Remove cam with disc, springs and washer. If there are shims between the brake plate and housing note their number and replace the same quantity when clutch is assembled.

To remove the clutch shaft, remove bearing cover from rear of clutch housing cover. Remove snap ring from end of clutch shaft. Clutch shaft and pinion may now be driven or pressed out of bearing.

To remove the power shaft, take off the oil seal housing and remove the bearing retaining snap ring from the power shaft. Drive or press the power shaft and gear out of bearing. To remove the gear from the shaft, remove retaining snap ring and press shaft out of gear.

**INSPECTION & REPAIR**—Examine all parts for evidence of wear and check with specifications given below:

Test springs for strength. When com-

pressed to  $1\frac{3}{8}$ " , clutch pressure springs should exert 83-93 lbs. pressure. When compressed to  $1\frac{3}{16}$ " , clutch return springs should exert 12 $\frac{1}{4}$ -15 lbs. pressure.

Note the condition of the replaceable bronze pilot bushing in the clutch drum. Inside diameter of new bushing is .8102" minimum. Diameter of bearing surface on new clutch and gear shaft is .8082-.8092".

Check the condition of the replaceable steel-backed bronze bushing in the clutch housing which serves as front bearing for power shaft. Inside diameter of new bushing is 1.370-1.372". Diameter of bearing surface on new shaft is 1.367-1.368".

Check bronze bushing in basic housing which is the rear bearing for the clutch drum shaft. Inside diameter of new bushing is 1.3745-1.3755". Diameter of bearing surface on clutch drum shaft is 1.366-1.368". The pump housing serves as the front bearing for clutch drum shaft.

The front end of the clutch drum shaft is supported by the oil pump housing. Inside diameter of new housing bore is 1.370-1.372". Outside diameter of clutch drum shaft is 1.366-1.368".

Replace bushings or shafts if clearance is excessive.

Be sure clutch cork facings are in good condition and that plates and discs are not warped. Maximum allowable out-of-flat is .008". New drive discs are .090" thick.

Inspect oil seals in oil pump housing and in oil seal housing which fits around power shaft. Replace seals if they show signs of leaking.

If the oil pump is not operating satisfactorily, check all parts for damage or

wear and replace if necessary.

**ASSEMBLY**—Referring to Figs. 35C and 35D, assemble as follows:

Press the clutch shaft through bearing in cover and install snap ring on end of shaft. Install bearing cover.

Press power shaft with bearing and gear into cover and secure with snap ring.

Install oil seal in its housing with felt side of seal pressed into housing. Coat sea with pressure gun grease before placing it over shaft. Install oil seal housing on power shaft, using a thin piece of shim stock over splines to protect oil seal from damage.

To assemble the clutch, install cam with disc, springs and washer which acts as a seat for pressure springs. Install brake plate, being sure to replace any shims that were present between it and housing. These shims are a means of adjusting spring pressure. When clutch is assembled a pressure of 700 lbs. should be required to compress springs. If the spring pressure is questionable, load the cam with 700 lbs. pressure and insert as many shims which will freely go between brake plate and housing.

Install plate cap screws and locks. Turn cap screws down evenly, a little at a time, to prevent bending or breaking the plate.

Install clutch collar, balls and adjusting cam with hub. Then install locking washer.

Install clutch plates and release springs in the following order: Start with thick driven plate, cork face up, followed by a steel disc. Next install a cork-faced driven disc, alternating in this order until the last

plate, a thick driven plate, is installed cork face down. Be sure openings for springs in plates line up. Install snap ring on end of shaft.

Although the clutch can be adjusted after installation on the tractor, it is easier to adjust before installing. To do so, turn the adjusting cam in a clockwise direction until, when clutch is engaged, the disc on the cam has moved away from the brake plate .060". Use two large screw drivers to engage and disengage the clutch. After the clutch is properly adjusted, release it and bend locking washer tang down into one of the notches in the adjusting cam.

With clutch plates disengaged, use the clutch drum to align them. A spare drum may be used for this work if the clutch drum was not previously removed. The plates may also be aligned by using a straight edge along the tangs of the plates. After plates are aligned, engage clutch.

Complete the assembly and installation of the basic housing and clutch cover in the reverse order of their removal.

**CLUTCH ADJUSTMENT**—The method of adjusting the clutch while off the tractor is described above. To make the adjustment when installed in the tractor, proceed as follows, referring to Fig. 35F.

Remove inspection hole plug. Engage clutch and check distance clutch cam disc has moved back from brake plate. Correct clearance is .060". A No. 16-gauge wire (.0625") can be used to check the clearance as shown.

If the clutch is out of adjustment, disengage the clutch and remove oil filler plug. Look through filler opening and note position of bent-over tang on cam locking washer. If tang is not adjacent to filler opening, engage clutch, shift power shaft drive out of mesh and turn clutch by the power shaft until tang is adjacent to filler opening.

Release clutch and bend tang out of notch in adjusting cam. Turn cam counter-clockwise (viewed from rear of tractor) until, with clutch engaged, cam flange is .060" from brake plate. Release clutch and bend locking tang into one of adjusting cam notches.

Remove clutch fork adjusting screw cap nut, engage clutch and turn adjusting screw in until it touches fork. Then back it off one turn. Secure in place with lock nut and replace cap nut.

## 50 & 60 DIFFERENTIAL

The differential, Fig. 35G, is of the conventional type having a spider and ring gear, three bevel pinions and two spur pinions which mesh with the final drive gears. The differential ring gear is driven by a pinion on the transmission counter-shaft.

The differential shaft is mounted on tapered roller bearings. The left-hand bearing is housed by a quill secured to the outside of the main case. The right-hand bear-

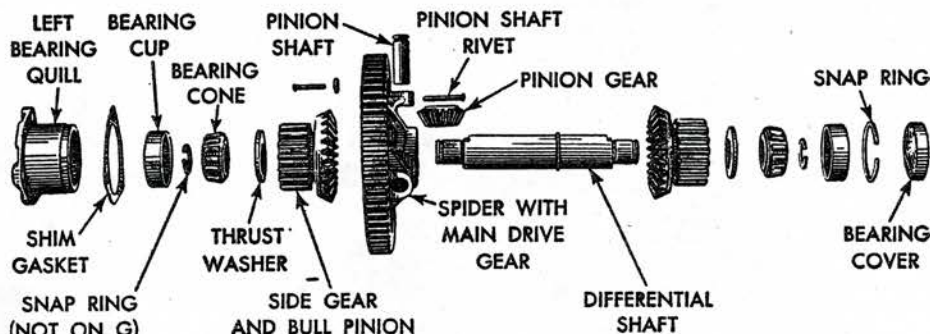


Fig. 36 Layout of differential parts on Series A, B, G. Series G uses no snap rings. Series B after serial No. 201000 uses two differential pinions

ing is located in a bore in the main case.

End play adjustment is made by adding or removing shims between the left-hand bearing quill and main case.

**REMOVAL**—The final drive assembly can be removed without removing the basic power lift assembly as outlined below but the handling problem will be greatly simplified if the lift is removed. Moreover, by first removing the lift, the differential and final drives can be inspected and any defects noted before removal.

To remove the basic power lift assembly, disconnect and remove batteries and seat. Remove platform and Power-Trol oil lines. Remove brakes. Drain transmission and rear axle housing. Take off the entire basic power lift housing together with power shaft clutch if the tractor is so equipped.

To remove the final drive housing, support the transmission case, remove cap screws which retain final drive housing to transmission case and roll final drive assembly away from transmission case. To avoid bending or breaking the mounting dowel pins, be careful to see that the final drive housing comes squarely away from the transmission case.

To remove the differential, take off the left-hand differential bearing quill. The differential assembly may now be removed, right-hand end first.

**DISASSEMBLY**—Use a suitable puller to remove the bearings, after which the differential bevel gear and spur pinions can be removed. To remove the differential bevel pinions, remove rivets and pull shafts out of pinions and differential spider.

**INSPECTION & REPAIR**—If bearing cups are damaged, remove them and install new cups. Examine the thrust washers for galling or excessive wear. Thickness of new thrust washers is .225-.230". Measure old washers and replace if worn.

Examine pinion bores and wearing surfaces on shaft for galling due to seizure or wear. Measure inside diameter of bores and outside diameter of shaft. The bore diameter of a new pinion is 2.238-2.240". Diam-

eter of wearing surfaces on a new shaft is 2.234-2.235". If shaft must be replaced, press the old one out and the new one in.

Examine the bevel pinion bores and wearing surfaces for galling due to seizure. Note condition of shafts. Bore of a new pinion is 1.114-1.116". Diameter of new shaft is 1.1085-1.1100". If clearance is excessive, replace worn parts.

If either the spider or ring gear is worn or damaged, replace the entire assembly. Neither part is available individually or replacement.

**ASSEMBLY**—Referring to Fig. 35G, install the bevel gear and spur pinions on shaft and follow with thrust washers. Place unit in press and install bearing cones with rollers. The press arbor must be of suitable diameter so that the outside diameter does not bear against the roller assembly. Press bearings on shaft until they contact shoulder of shaft. Install new snap rings.

**INSTALLATION & ADJUSTMENT**—Install the differential in the main case. Insert adjusting gaskets on left-hand quill and install it in main case, drawing it up tight with cap screws.

Using a dial indicator mounted so that the contact plunger contacts the side of a ring gear tooth, measure end play of shaft by using pry bars on either side. If end play is not between .001" and .004", remove bearing quill and add or deduct gaskets or shims until adjustment is correct. Do not rotate gear while taking dial readings.

Install the final drive housing, lift assembly and brakes. Be sure teeth of final drive gears are in mesh with spur pinions before drawing axle housing up to main case.

## A, B, G DIFFERENTIAL

The differential, Fig. 36, is carried on tapered roller bearings at each end of the differential shaft. To adjust bearings, remove the differential bearing from the left-hand quill and take out one or more shims, Fig. 37. One paper shim should be on each side of steel shim to prevent oil from leaking out of the transmission. Re-

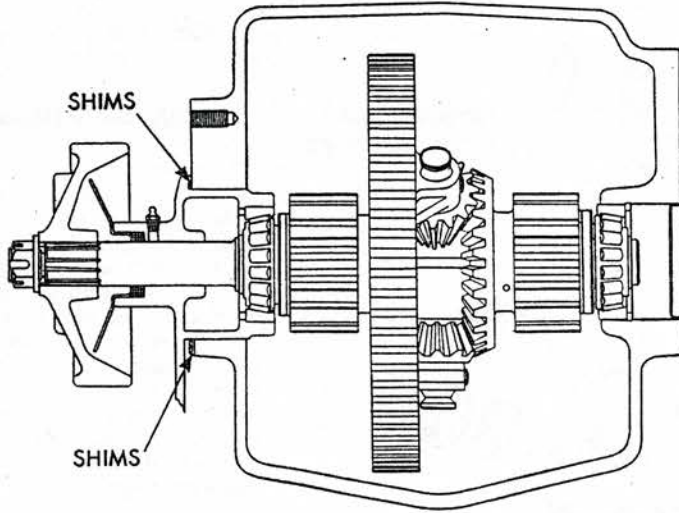


Fig. 37 Differential bearing adjustment. Series A, B, G

place the quill and draw the capscrews up uniformly and tightly. There should be no end play in the differential shaft and the differential should rotate freely without binding.

**DISASSEMBLE**—After removing the rear axle housing, take off the left differential bearing quill. On Series B after serial 201000, it will be necessary to

move the belt pulley unit and reduction gear cover and slide the right bearing quill out about an inch.

On all models, continue by sliding the differential to the left. Then lift its right end and take the assembly out through the rear.

Release the snap rings (not used on G series) and use a puller to remove bearings, gears and washers. After driving

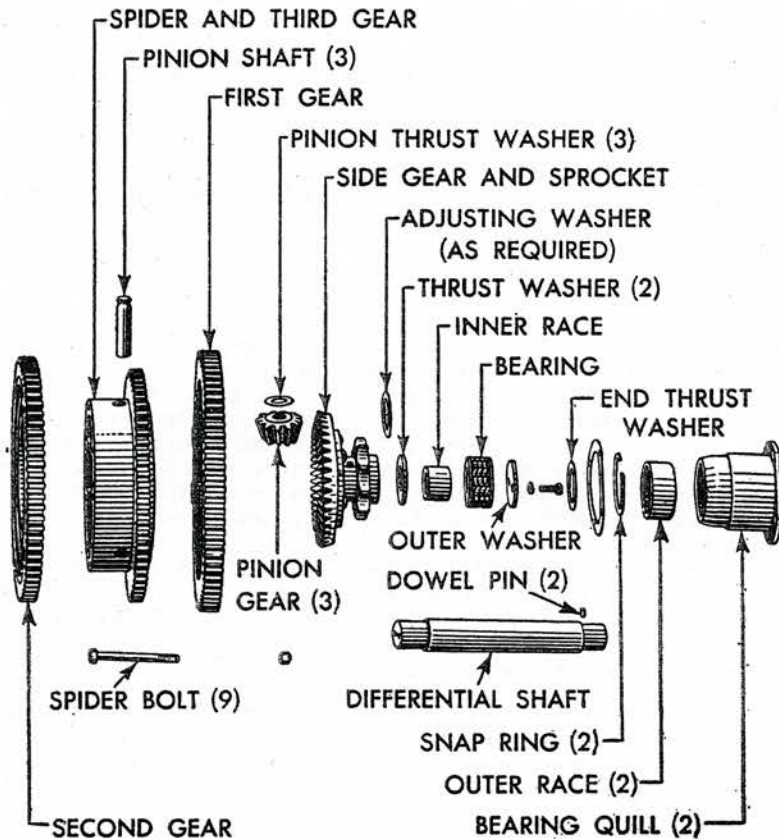


Fig. 38 Differential. Model D

out retaining rivets, remove pinion shafts and pinions.

**ASSEMBLE**—Reverse the above procedure to assemble, being sure to observe the following:

On A and B series, install the proper thickness snap rings so that the bearing cones fit solidly against the shoulders on the shaft. And on all models, adjust the differential bearings as outlined above.

**MODEL D DIFFERENTIAL**

The differential, Fig. 38, is carried on two straight roller bearings and lubrication of them is automatic. The differential should be adjusted so that there is 1/64" to 1/16" end play in the shaft. Adjustment is made by placing steel washers in either bearing quill.

**DISASSEMBLE**—Remove the axle housings. Support the differential unit in a hoist. Remove left quill, bearing and thrust washer. Take off right bearing quill. Shift differential to the left and raise it

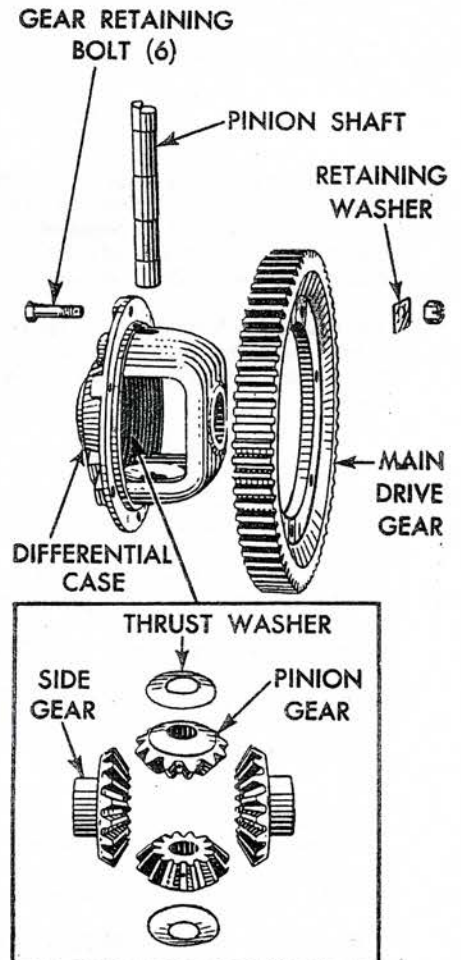


Fig. 39 Differential. Series H

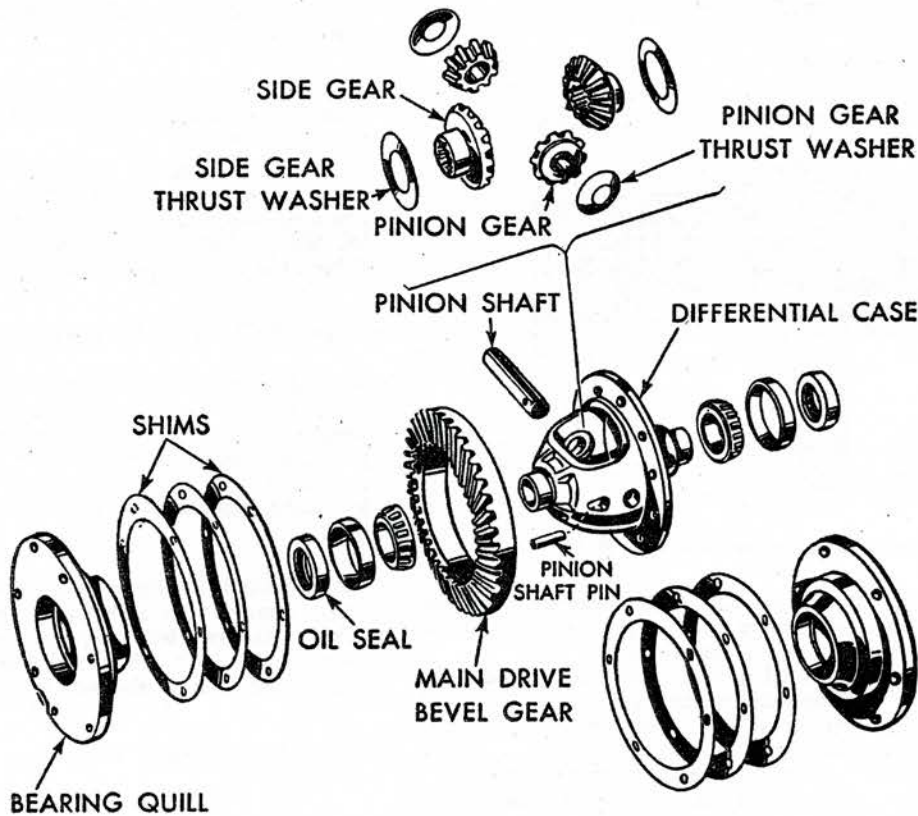


Fig. 40 Differential. Series M

with the hoist, at the same time moving it toward the rear. Continue to raise and move the differential as required to guide the left end of the shaft through the notch in the left side of the case.

**ASSEMBLE**—Reverse the above procedure to assemble and adjust for end play in the differential shaft as outlined above.

## SERIES H

The differential, Fig. 39, is carried on the ends of the rear axle shafts which are mounted on taper roller bearings. The differential is adjusted by means of steel shims on either end of the assembly.

**DISASSEMBLE**—Remove axle housings and rear cover. Take out differential. Unfasten ring gear from differential case. Pull out differential pinion shaft and remove side gears, pinions and thrust washers.

**ASSEMBLE**—When reassembling axle housings to case, install sufficient shims between bevel gear and bearing spacer to provide 1/32" and play in the differential.

## SERIES M DIFFERENTIAL

Fig. 40. To disassemble, remove successively the final drives, belt pulley, rear cover plate, brakes and differential bear-

ing quills. Then take the differential out through the rear cover opening. Unfasten the ring gear from the differential case. Remove the differential pinion shaft and slip out the side gears, pinions and thrust washers.

Gear mesh is established by installing the proper amount of shims between the transmission case and output shaft rear bearing cup, and between transmission case and differential bearing quills.

A special pinion gauge (John Deere No. AM-452-T) should be used to locate the drive pinion properly. Install the gauge in the differential case and measure the clearance with a feeler gauge between the gauge and the head of the pinion. The gauge measurement when added to the clearance indicated by the feeler gauge should equal the dimension etched on the pinion head. If an adjustment is required, place the proper amount of shims between the transmission case and output shaft rear bearing cup. When the bevel pinion is set up properly, adjust the output shaft bearings to a preload of .005" as previously explained in the transmission section.

Install the proper amount of shims between the transmission case and bearing quills to provide a free-turning assembly without end play. Then remove .003" shim to set up a preload at this point.

When bearings have been properly adjusted, adjust gear backlash to .006-.008" by transferring shims from one bearing quill to the other. Moving shims from

the right quill to the left quill increases backlash, and vice versa.

## 50, 60 FINAL DRIVE

The spur gear-type final drive assembly, Fig. 35H, consists of a rear axle housing which encloses the two axle shafts and their driving mechanisms. The inner end of the axle shafts are splined to the final drive gears, which are driven by the bevel gear and spur pinions in the differential. An oil seal at the inner end of each axle keeps transmission oil out of the rear axle housing. A felt at the outer end of each axle prevents grease leakage and eliminates entrance of dust and dirt into outer axle bearings. Both axles are mounted on taper roller bearings.

**REPLACING FELT WASHER ONLY**—Remove rear wheel on side where leakage is evident. Using a chisel and hammer, drive the outer felt retainer from end of rear axle housing. Remove retainer and felt from axle.

Install new felt and new felt retainer. Using a brass drift and hammer, drive retainer into position until it is seated against bottom of recess in housing.

**CHECKING FOR BEARING WEAR**—Support tractor with a jack and slide wheel out to end of axle. Place wooden blocks of suitable length and a steel plate under the axle. Raise and lower the jack, checking the amount of movement between axle housing and axle. If movement is excessive, take up play by tightening the slotted nut on inner end of axle (see Fig. 41). Normal end play in axles is .001-.004".

**REMOVING FINAL DRIVE**—Drain transmission and rear axle housing. Remove seat, batteries, and platform. Disconnect Powr-Trol oil lines and wire to rear lamp.

Remove entire basic power lift housing. For normal maintenance no further removal will be necessary. If rear axle housing is to be removed take off both brake assemblies. Place a support under the transmission, remove axle housing attaching cap screws and roll assembly away from tractor, being careful not to bend or break the mounting dowel pins.

**DISASSEMBLY**—Remove rear wheels, and the cotter pins from the inner ends of both axles. Back off both slotted nuts until they are about 1/4" apart. Place a steel wedge between the slotted nuts and drive against the wedge until slotted nuts contact final drive gears. Continue backing off slotted nuts and driving steel wedge until the axles are free of the inner bearing cones. Then remove slotted nuts, final drive gears, inner bearing cones and rollers and axle assemblies from rear of axle housing.

If one axle does not break free of inner bearing, remove slotted nut and place a



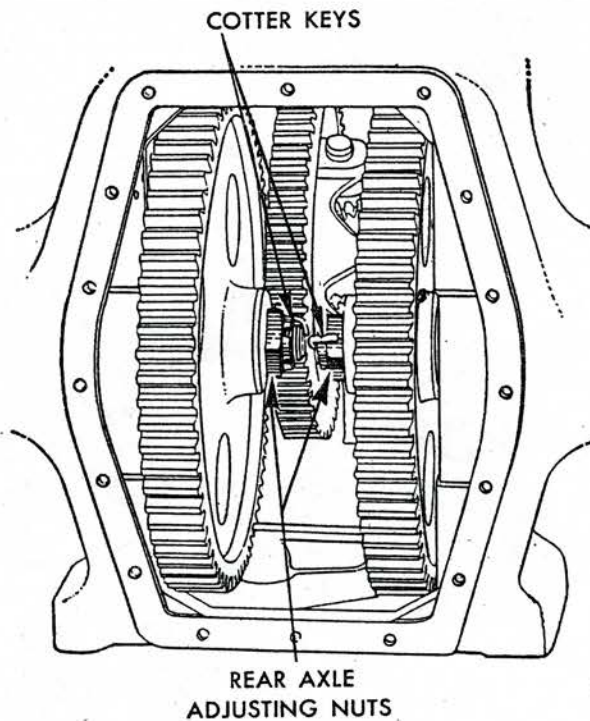


Fig. 41 Adjusting rear axle bearings. Series A, B, G and models 50, 60

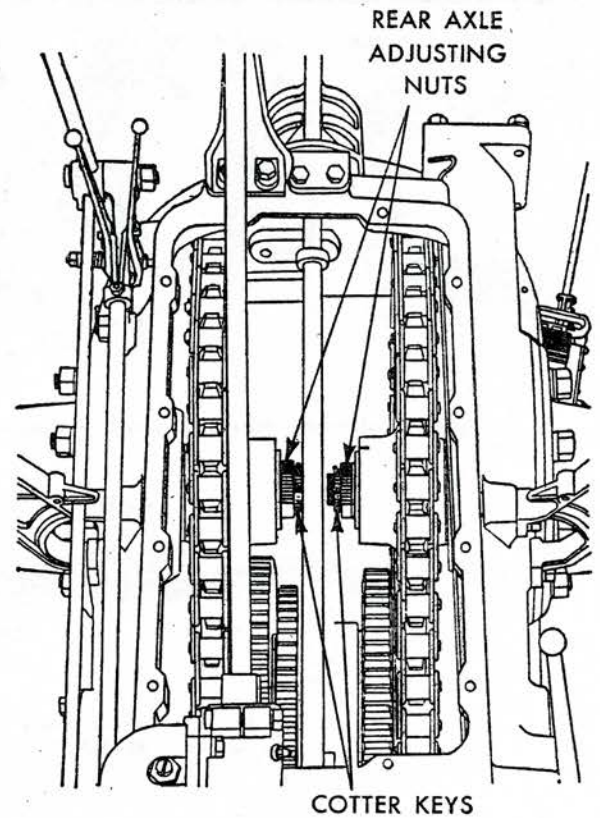


Fig. 42 Adjusting rear axle bearings. Model D

bar against the inner end of axle. Then drive on the bar to remove the axle.

**INSPECTION & REPAIR**—If bearings and seals are worn or damaged, remove and replace the unserviceable parts.

Remove outer felt and its retainer by hand. A good indication of a worn inner oil seal is the presence of transmission oil in axle housing between the inner seal and outer bearing.

If either spider or ring gear is no longer serviceable, replace the entire assembly as neither part is available individually for replacement.

**ASSEMBLY**—Referring to Fig. 35H, pack the outer cone and roller assemblies with wheel bearing grease. Install axles with outer bearing cones and rollers. Install inner bearing cones and rollers and final drive gears with spiders. Flat face of spider must be next to inner bearing. Install slotted nuts and draw them up. Strike outer end of each axle with a soft hammer to make sure bearings are well seated.

**END PLAY ADJUSTMENT**—Clamp a dial indicator on outer portion of axle at a point where button of indicator will contact end of rear axle housing. Using a bar, shift final drive gear back and forth and measure end play. Tighten nut until there is .001-.004" end play, then go on to the nearest slot which will permit installation of cotter pin. Repeat procedure on other axle.

Install a new felt and new outer felt

retainer in end of rear axle housing, using a brass drift hammer. Continue to drive against outer retainer until it is seated against bottom of recess in housing.

**INSTALLATION**—If the rear axle housing was removed, install it on the tractor, using a new gasket and making sure the differential spur gears and bevel pinions mesh with the final drive gears before drawing up the attaching cap screws.

Install both brake assemblies, basic power lift, rear lamp wire and Powr-Trol lines. Replace platform, batteries and seat.

### A, B, G FINAL DRIVE

**REAR AXLE BEARINGS**—Rear axles are carried on taper roller bearings which should be checked and adjusted as follows: Raise the wheels to relieve bearings of all load. Remove the platform and axle housing cover. Pull cotter pin from axle shaft, Fig. 41, turn the adjusting nut with a 15 to 20 inch wrench and insert the cotter pin. When properly adjusted, the wheels should turn freely without end play.

**AXLE SHAFTS**—To remove an axle, shaft, raise the rear of the tractor and take off the rear axle cover. Loosen the adjusting nut on the inner end of the axle shaft. Drive a tapered wedge between the ends of the axle shafts to loosen the inner

bearing cone from the shaft. When loosened, unscrew the nut from the axle and pull out the shaft.

**AXLE HOUSING**—To remove the rear axle housing assembly, raise and block the rear of the tractor securely. Remove the rear cover and brakes. Unfasten the axle housing from the transmission case and move the housing away from the tractor.

### MODEL D FINAL DRIVE

**REAR AXLE BEARINGS**—Rear axles are carried on taper roller bearings which should be checked and kept adjusted as follows: Raise the wheels to relieve the bearings of all load. Remove the rear transmission case cover. Pull the cotter pin from the rear axle shaft, turn the adjusting nut tight with a 15 to 20 inch wrench and insert the cotter pin, Fig. 42. Wheels should turn freely but without end play.

The felt washer at the outer rear axle bearing should be replaced when necessary to prevent the entrance of dirt and oil leaking out.

**DRIVE CHAINS**—Drive chains should be adjusted only when the original adjustment has been disturbed, or in cases where it is positively known that adjustments should be made.

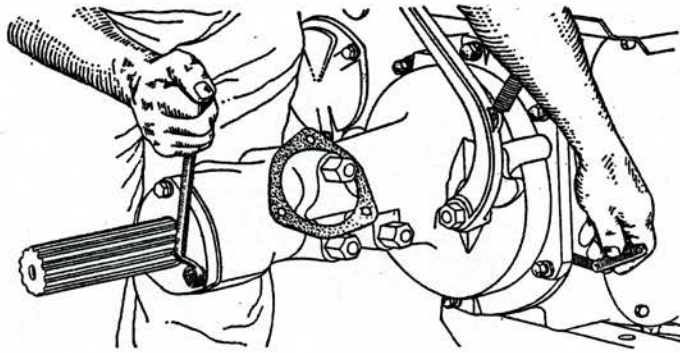


Fig. 44 Adjusting rear axle bearings. Series H

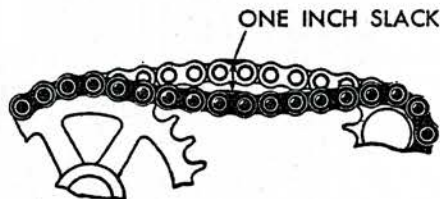


Fig. 43 Final drive chain adjustment. Model D

To adjust drive chains, raise rear of tractor, placing jack under drawbar. Remove rear transmission case cover and turn wheel over several times to find the point where chain is tightest. Then loosen the nuts around the rear axle quill, turn top of quill forward in direction of arrow on case. With all slack on top, chain should be tight enough so it can be raised and lowered one inch at center, Fig. 43.

After chain is adjusted and quill bolts tightened, turn each wheel over several times to make sure chain is not too tight, otherwise there will be excessive wear on chain and bearings.

After chain is adjusted and quill bolts tightened, turn each wheel over several times to make sure chain is not too tight, otherwise there will be excessive wear on chain and bearings.

### AXLE SHAFT & HOUSING (QUILL)—

To remove an axle shaft or housing, jack up and block the rear of the tractor securely. Take off the wheel, fender and housing cover. Unscrew nut from inner end of axle shaft. Unfasten axle housing from transmission case and pull out housing. The axle shaft may then be bumped out of the housing.

Reassemble parts removed and adjust chain as directed above.

### SERIES H FINAL DRIVE

**REAR AXLE BEARINGS**—To adjust bearings on these tractors, proceed as follows:

1. Jack up rear of tractor and remove drive wheel, dust shield, outer bearing cover and felt washer.

2. Loosen all except top capscrew holding rear axle housing to case until only a very slight tension is exerted by the lock washers.
3. Replace the outer bearing cover and shims, draw up capscrews evenly until outer bearing is tight.
4. If rear axle housing pulls away from transmission case at the bottom, add one .005" shim at a time until housing does not pull away from case. (NOTE—Bottom capscrew in rear axle housing must be drawn up snug, then loosened each time bearing cover is removed.)
5. Replace outer bearing felt and dust shield, and tighten all capscrews.

**NOTE**—If rear axle bearing shims become damaged, the approximate number required to correctly adjust the bearings can be determined by using a feeler gauge between rear axle quill and main case, Fig. 44, after rear axle outer bearing cover capscrews are drawn up tight. Recheck as directed in item 4 above.

If at any time either rear axle is removed from the housing, the axle outer bearing should be washed and repacked with wheel bearing grease.

**REAR AXLE HOUSING**—To remove a rear axle housing, jack up and securely block the rear of the tractor. Unfasten the axle housing from the transmission case and withdraw the assembly.

**AXLE SHAFT**—To remove an axle shaft, take out the housing as outlined above.

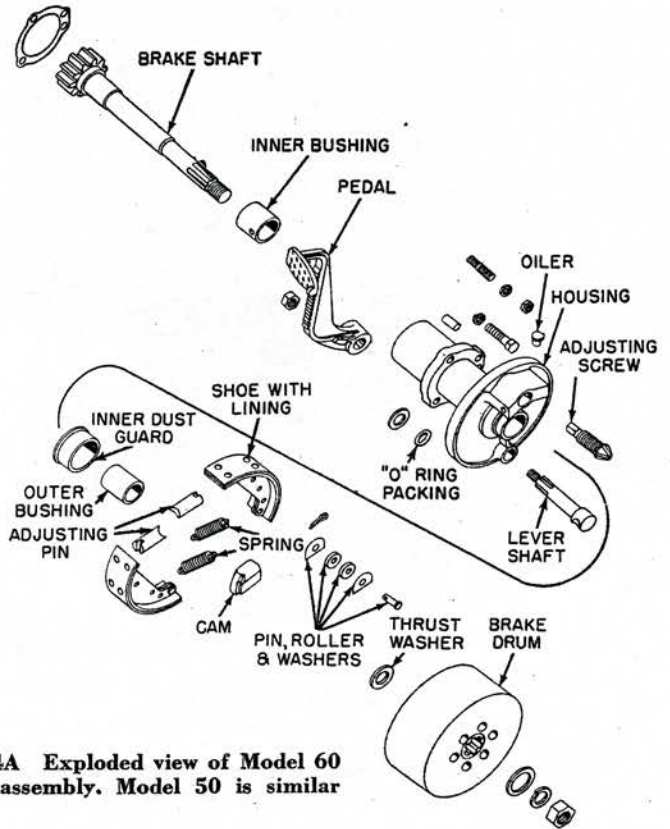


Fig. 44A Exploded view of Model 60 brake assembly. Model 50 is similar

Pull the brake drum from the shaft. Take off the outer bearing cover and pull the shaft from the housing.

### SERIES L FINAL DRIVE

The final drive assemblies are attached to the banjo housing and can be removed as one unit.

The only adjustments necessary are the adjustments of the taper roller bearings on the rear axle flanged shaft and final drive pinion shafts. The adjustments of the bearings on the flanged shaft can be made without removing the final drive assembly by removing shims from under the bearing quill located on the inside of the assembly directly opposite the wheel hub.

The final drive must be removed from the tractor to adjust the bearings on the final drive pinion. Flanged shaft and final drive pinion shaft should rotate easily after bearings are adjusted.

### SERIES M FINAL DRIVE

**FINAL DRIVE UNIT**—To remove the final drive unit, raise rear of tractor and take off the rear wheels, drawbar, fender and brake unit. Remove the final drive-to-transmission capscrew and slide the final drive unit out.

**REAR AXLE BEARINGS**—Rear axle bearings are adjusted by placing the proper amount of shims between the bearing cover and housing to eliminate all end

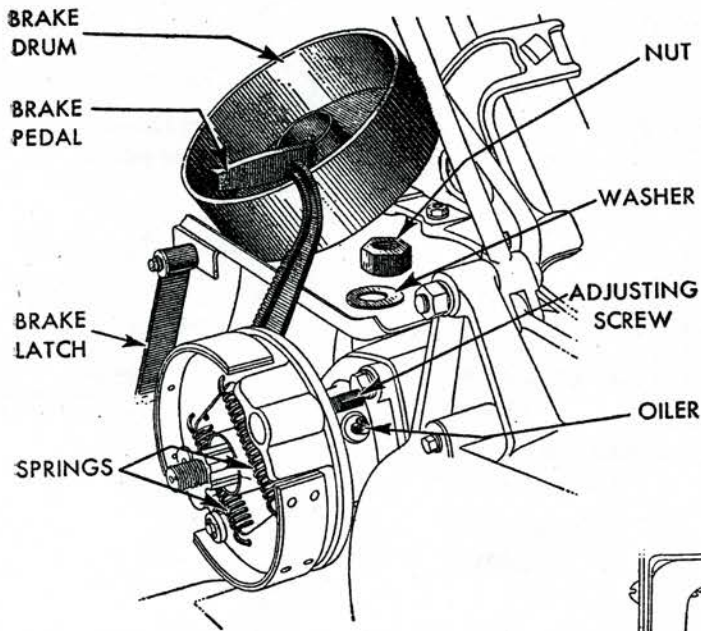


Fig. 45 Differential brake. Series A, B, G

play, yet allowing the shaft to turn freely. Then set up a preload on the bearing by removing a .004" shim.

**REAR AXLE SHAFT**—To remove an axle shaft, jack up and block the rear of the tractor securely. Take off the wheel. Remove pan from bottom of housing. Remove outer bearing quill. Take off inner bearing cover and shims. Remove cap-screw from inner end of axle shaft. Drive axle out of inner bearing and bull gear.

Reassemble parts removed and adjust bearings as directed above.

**MODELS 50, 60 BRAKES**

Individual brakes permit the operator to make sharp turns by applying one brake. This is possible because the application of one brake retards the speed of the rear wheel on the inner side of the turn, and through action of the differential, speeds up the outer wheel.

**ADJUSTMENT**—To compensate for brake lining wear, a tapered adjusting screw, Fig. 44A, and two adjusting pins are provided. As the brake linings wear, the adjusting screw can be turned farther in, causing adjusting pins to move farther up on the tapered adjusting screw, pushing the brake shoes closer to the drum.

**REMOVAL**—Remove upper implement attaching stud from side of rear axle housing from which the brake is to be removed. Take off the right-hand brake by removing three cap screws. Remove left-hand

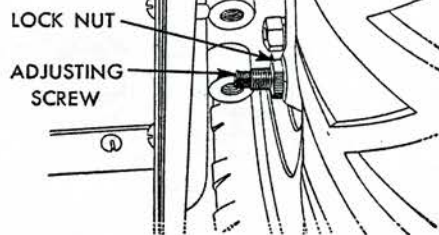


Fig. 46 Rear wheel brake adjustment. Model D

brake by removing two cap screws and one nut.

It is not necessary to remove the entire brake assembly to replace brake linings, springs or adjustment parts.

**DISASSEMBLE**—To remove the brake drum turn adjusting screw out of housing as far as possible. Remove nut from end of shaft and drive against shaft to free the drum.

Place a screw driver between shoe and housing. Lift shoe free of adjusting pin. Spring tension will then be released and shoes can be removed.

**ASSEMBLE**—Referring to Fig. 44A, install brake cam and adjusting pins. Be sure tapered end of adjusting screw is as far back in housing as possible to facilitate assembly of shoes.

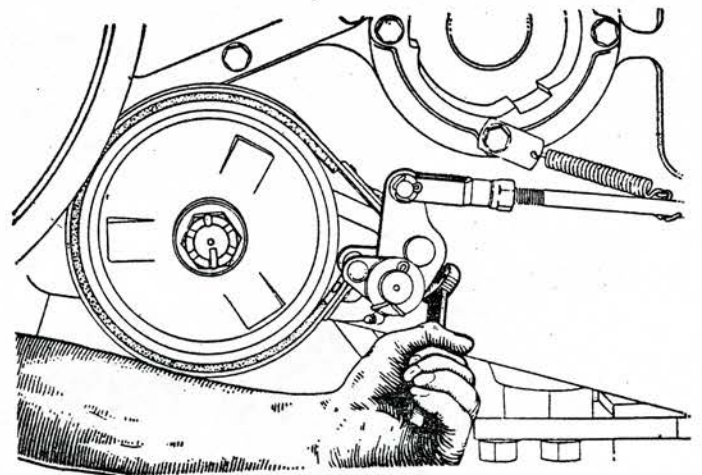


Fig. 48 Adjusting service brake. Model D

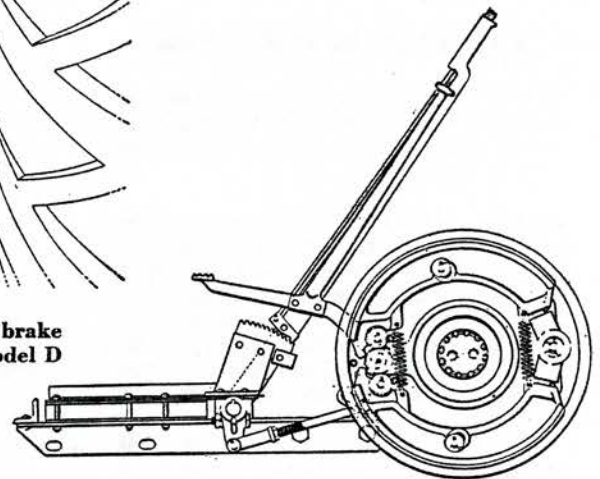


Fig. 47 Wheel brake details. Model D

Hook springs on both shoe assemblies and place one shoe in operating position. Then pull on other shoe until it is in operating position.

Install thrust washer and drum on end of shaft and secure in place with washer and nut. Test brake shaft for .004-.044" end play. If not within these limits, remove nut and drum and add or deduct thrust washers until end play is satisfactory.

**INSTALLATION**—Install new gaskets and both brakes. Fill oiler on each brake assembly with SAE 30 oil. Install upper implement attaching studs on rear axle housing.

**ADJUSTMENT**—Tighten adjusting screw down snug and back off five notches. This should permit 2 3/4 to 3 3/4" pedal travel before brake lining contacts drum.

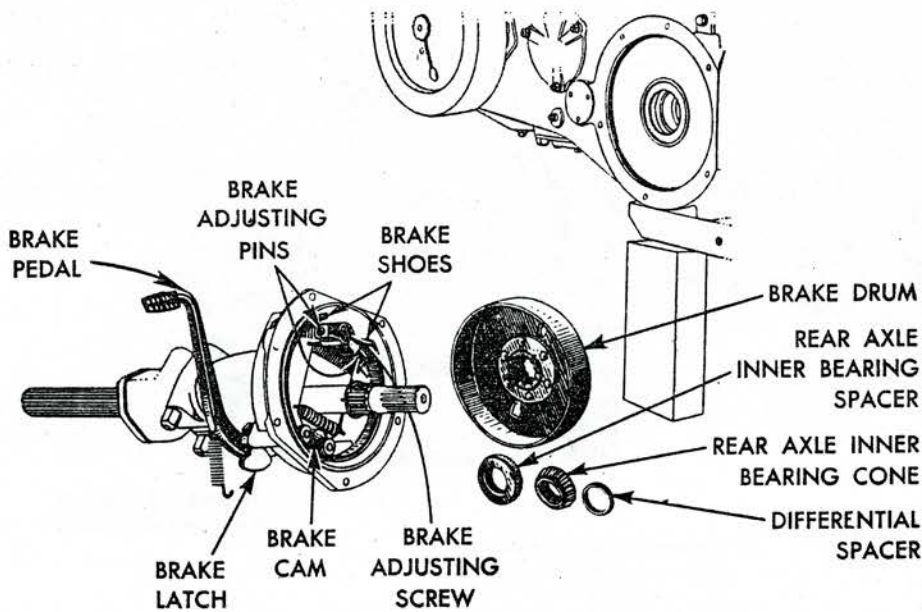


Fig. 49 Brake details. Series H

## SERIES A, B, G BRAKES

**ADJUSTMENT**—To tighten brakes, use a 6-inch wrench and turn the adjusting screw, Fig. 45, down snug and back off four or five notches.

**BRAKE REMOVAL**—To remove the brakes, take off fenders. Unscrew cap-screws holding brake housing to main case and remove entire brake assembly. Remove cotter pin and nut from gear end of brake shaft. Gear may be removed by bumping threaded end against hard wood block. Pull brake drum and shaft from housing.

Before replacing brake drum, see that brake shoe ends are located properly in cams and on plungers. Make sure both springs are hooked up.

## MODEL D BRAKES

**REAR WHEEL BRAKES**—To adjust brakes, pull hand lever back to the fifth notch. Loosen lock nuts on adjusting screws, Fig. 46, turn square head screws in until both brakes are tight and tighten lock nuts.

If, when brakes are applied, one brake holds more than the other, slightly loosen the adjustment on the tight brake.

**BRAKE SHOES**—To remove brake shoes, completely loosen the brake adjusting screw. Remove rear wheel. Remove cotter pin and washer from retaining pin protruding through each brake shoe.

Before replacing the rear wheel, see that brake shoe ends are located properly on cam and plungers, and that washers are placed on retaining pins. Make sure both brake shoe springs are hooked up.

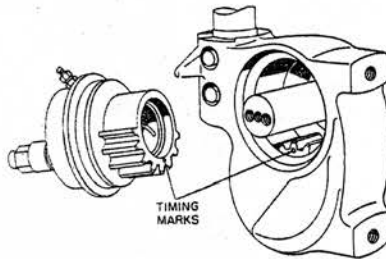


Fig. 49D Roll-O-Matic timing marks on gears should line up when gears are assembled. Models 50, 60

**NOTE**—Whenever the drive chains require adjustment, it is necessary to loosen the three cap-screws attaching the brake brace to the transmission case before rear axle quill can be turned. Turning the quill to adjust the chain will make it necessary to adjust the brake operating rod. To adjust the brake operating rod, remove pin from brake rod yoke and push hand lever against forward stop, Fig. 47. Adjust yoke on rod so that yoke pin hole aligns with pin hole in brake cross shaft lever when pin in forward end of brake rod is against forward end of slot in pedal.

**SERVICE BRAKE**—To adjust the service brake, tighten the nut on the end of the brake band, Fig. 48, as much as possible without causing a drag on the brake drum.

## SERIES H BRAKES

**ADJUSTMENT**—To tighten brakes, use a 6-inch wrench and tighten the adjusting screw down snug. Back off five notches, which should permit about three inches of pedal travel before brake contacts drum.

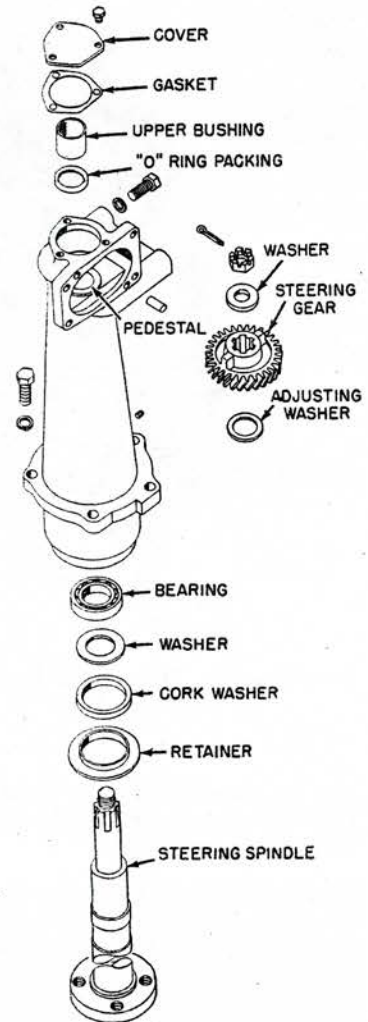


Fig. 49B Exploded view of Model 60 convertible front end pedestal. Model 50 is similar

**BRAKE SHOE**—To remove brakes, remove six cap-screws holding rear axle housing to case. Brake drum can be removed by placing the heads of two bolts through the square openings in drum, sliding the bolts in the slots provided and then pulling drum off by putting a clamp bar over the end of the rear axle shaft and tightening nuts on bolts, Fig. 49.

Reassemble parts removed. But when replacing the axle housing to the case, it is important to provide sufficient shims between the bevel gear and bearing spacer to allow 1/32" end play in the differential assembly.

## SERIES L BRAKES

**ADJUSTMENT**—These brakes are properly adjusted when the ratchet plate locks in the fourth to sixth notch. The pedal should return to the foot rest when released. Adjustments are provided at each brake band next to the housing to adjust for wear of brake lining. Adjust at the

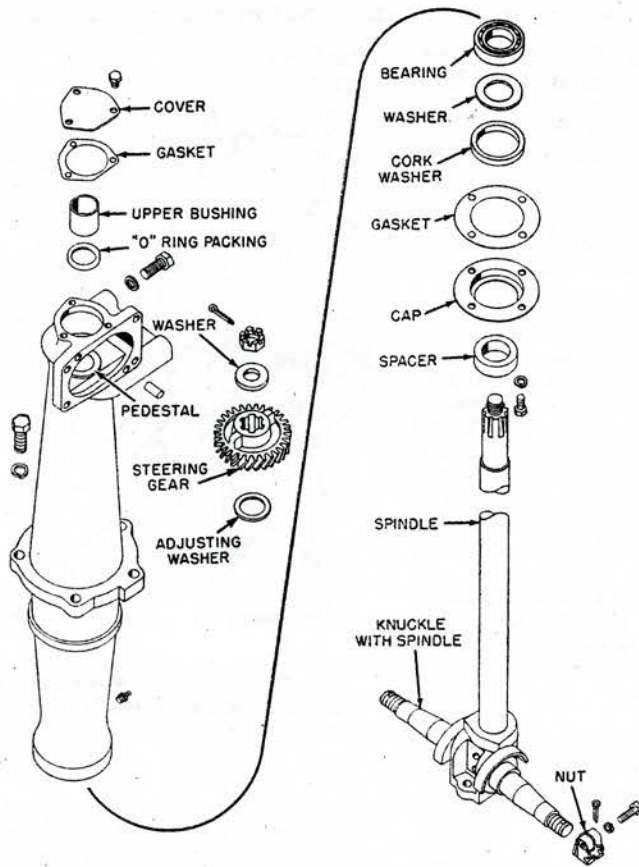


Fig. 49A Exploded view of Model 60 standard one-piece front end pedestal. Model 50 is similar

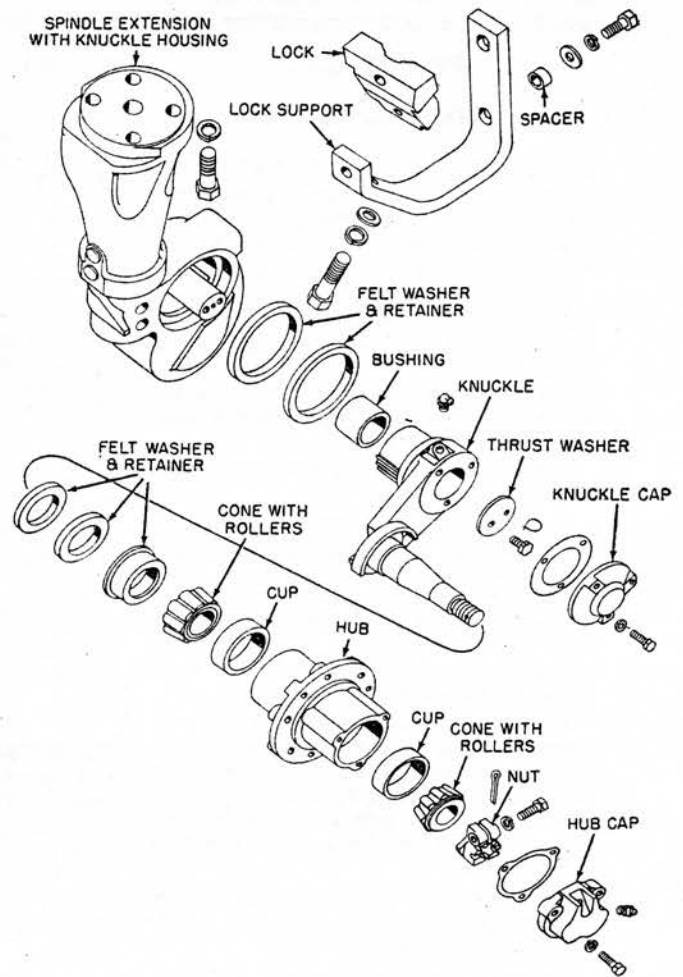


Fig. 49C Exploded view of Model 60 front end Roll-O-Matic assembly as applied to convertible pedestal. Model 50 is similar

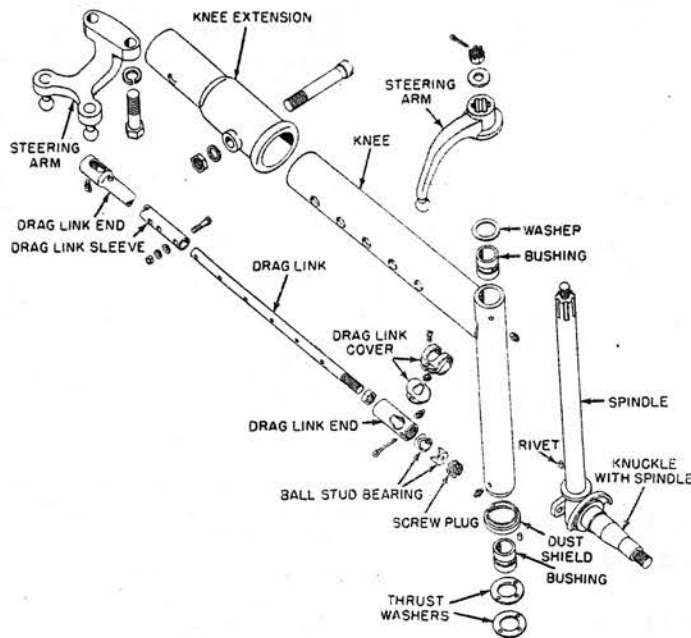


Fig. 49E Exploded view of knee assembly on tractors with wide tread front end. Models 50, 60

pedals so that the brakes are equalized when both pedals are depressed the same amount.

**NOTE**—The final drive assembly must be removed from the tractor to reline the brake bands.

**SERIES M BRAKES**

**ADJUSTMENT**—Loosen the lock nut on the brake rods and screw the rod into the yoke until all play is removed from the foot pedal. Then shorten the rod enough to provide about 3/4" free play in the pedal. When adjustment is made, be sure the lock nut holds yoke firmly in position.

**BRAKE REMOVAL**—Remove the final drive assembly, unfasten the brake assembly from the transmission case, and remove the brake unit.

If new parts are installed, adjust the brake by placing the proper amount of shims on each capscrew (between power plate and differential quill) to obtain .010-.012" clearance between friction disc and quill. This clearance must be present all around the disc.

## FRONT END

### MODELS 50, 60

**STEERING SHAFT & PEDESTAL**—Although the following removal procedure is for the standard one-piece pedestal, it is equally applicable to the two-piece convertible pedestal, Figs. 49A and 49B.

To remove the steering shaft and worm, remove grille, pedestal cover, shaft and worm bearing housing. Remove steering wheel, key and steering shaft from tractor. Loosen packing nut. Then twist and pull the steering shaft and worm out of housing toward front of tractor.

Remove worm housing from upper right side of pedestal.

To remove spindle from standard one-piece pedestal, remove cotter pin and nut from spindle. Jack up tractor so front wheels are off floor. Screw knocker tool on top of spindle and drive spindle free from gear. Remove gear. Then lift front end of tractor high enough to allow removal of spindle from pedestal.

To remove spindle from convertible two-piece pedestal, support front of tractor. Unbolt and remove lower pedestal extension with front wheel assembly. After removing nut from spindle, screw knocker tool on top of spindle and drive spindle free of gear.

To remove the lower bearing, remove bearing spacer and cap. Then use a suitable puller to remove bearing.

**INSTALLATION**—Referring to Figs. 49A and 49B, install the parts in the reverse order of their removal and adjust as follows:

**STEERING SPINDLE END PLAY**—Raise front end of tractor from floor. Attach a dial indicator to top of pedestal with indicator plunger seated on end of spindle. Lower tractor until all weight is on wheels. Spindle end play should be .004-.040". If not within these limits, remove spindle nut and gear and add or deduct adjusting washers as necessary. Washers are .036" thick.

**SHAFT & WORM END PLAY**—When properly adjusted, steering worm has .001-.004" end play. Attach dial indicator to steering shaft near rear shaft support. Set button of indicator against rear shaft support.

Hold steering wheel to keep it from turning. Move front wheels back and forth without permitting steering wheel to turn and note end play on dial indicator. If adjustment is incorrect, remove bearing housing and add or deduct shims as required.

**BACKLASH ADJUSTMENT**—Test for backlash by moving steering wheel back and forth without permitting front wheel to turn. Backlash should be ½ to 1" at

outer edge of steering wheel. If incorrect, drive dowel pins into pedestal and separate worm housing from pedestal. Then add or deduct shims as required for proper adjustment and drive dowel pins back in place. Tighten cap screws.

### ROLL-O-MATIC

The Roll-O-Matic housing contains two constant mesh sector gears which are an integral part of the knuckle and wheel spindle assemblies. The gears are so synchronized that any up and down motion of one spindle is immediately transferred in the opposite direction to the other spindle through the knuckles and sector gears. Thus, the pressure on both front tires is always equal regardless of the irregularity of the ground over which the tractor is traveling.

A lock is available to prevent Roll-O-Matic action if the operator so desires. The wheel spindles are identical in size to those on tractors with conventional front ends.

**REMOVAL**—If the entire Roll-O-Matic and spindle assembly is to be removed from a tractor equipped with one-piece pedestal, follow the procedure outlined previously.

If the Roll-O-Matic is to be removed from a tractor with convertible two-piece pedestal, unbolt it from the bottom of the spindle.

**DISASSEMBLY**—Remove knuckle caps and gaskets, cap screws and thrust washers. Pull knuckles and gears from housing and remove felt washers.

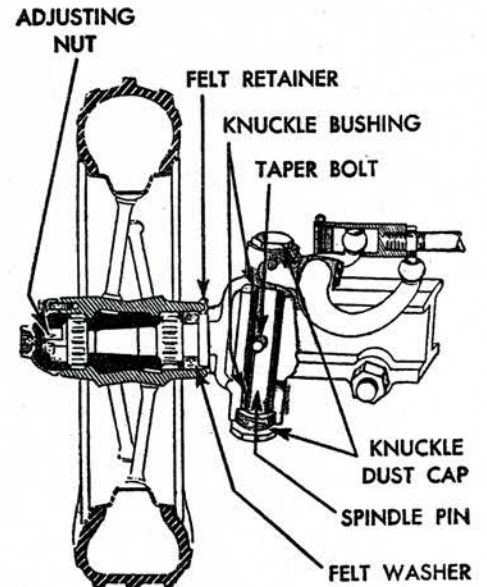
If knuckle bushings are worn so that they require replacement, press in the new bushings with the blind end of the oil groove away from the gap between the bushings. The gap between bushings must be ⅛ to ⅜" wide to allow grease to enter the grooves in the bushings.

**ASSEMBLY**—Referring to Fig. 49C, install new felt washers, soaked in light engine oil. Install one knuckle on shaft in housing so that wheel spindle extends behind vertical steering spindle. Install thrust washer and attaching cap screws. With timing marks lined up, Fig. 49D, install second knuckle assembly. Install thrust washer and cap screws. Wire heads of cap screws together. Install both gaskets and caps.

### WIDE ADJUSTABLE-TREAD FRONT AXLE

#### MODELS 50, 60

The front axle on tractors with adjustable tread provides tread widths of 56 to 80 inches in 4-inch steps. This is accom-



**Fig. 50 Front suspension details. Typical of Series A, B, D, G, H with wide spread front wheels**

plished by means of telescoping axles.

A pivot bracket is bolted to the frame and the front axle housing pivots in the bracket, permitting it to pivot from side to side to follow the contour of the ground. A steering arm is bolted to the bottom of the vertical steering spindle. Telescoping drag links attached to the steering arm transmit steering motion to outer steering arms which are splined to the front wheel spindle and knuckle assemblies.

**REMOVAL**—Remove drag links. Set tractor brakes and remove cap screws holding steering arm with balls to steering spindle. Remove cap screws which secure pivot bracket to frame.

Place a jack under forward end of tractor frame and raise it high enough to allow dowel pins in pivot bracket to clear frame. Be sure to support front axle to keep it from falling backwards. Then roll assembly away from tractor.

**DISASSEMBLY**—After taking off the wheels, remove the special cap screw from rear of pivot bracket and pull bracket clear of front axle housing. Remove lock bolts and pull knee assemblies from housing.

Remove nut and washer from knee spindle. Install a knocker tool and drive on the knocker to break the steering arm free. Then pull the knuckle and spindle assembly from the knee.

**ASSEMBLY**—Referring to Fig. 49E, install dust shield on knee. Place thrust washers on spindle and install spindle with knuckle assembly in knee. Be sure dowel pin engages thrust washers. Install washer.

Install steering arm on spindle so that centerline through the arm is in a plane

90 degrees to a plane of a centerline through wheel spindle. Install washer and nut and draw nut up tight and check spindle for proper end play. Maximum allowable end play is .036". If adjustment is incorrect, remove all parts and add or deduct thrust washers as required. Washers are .167-.172" thick.

Install knee assemblies in housing and secure them in place at the desired tread setting with lock bolts.

Install pivot bracket on housing and secure in place with special cap screw through rear pivot pin.

Install wheels. Then move the entire assembly in position to be installed on the tractor in the reverse order of its removal and adjust toe-in.

**TOE-IN ADJUSTMENT**—Turn the steering wheel until the front wheels are pointing straight ahead. Measure the distance from tire to tire at axle height, at front of tires and at rear of tires.

The front measurement should be  $\frac{1}{8}$  to  $\frac{3}{8}$ " less than the rear measurement. If adjustment is required, disconnect drag links and screw drag link ends in or out until adjustment is correct. Both wheels must have equal toe-in.

## FRONT END

**MODELS AO, AR, AW, AWH, BO, BR, BW, BWH, D, GW, HWH**

**TIE ROD**—The tie rod on the front axle is adjustable. Front wheels should have from  $\frac{1}{2}$  to  $\frac{3}{4}$ " toe-in.

**WHEEL BEARINGS**—Fig. 50. To adjust front wheel bearings, raise each wheel from the ground to relieve all load from the bearings. Remove hub cap and cotter pin. Turn adjusting nut up tight and then back it off until the wheel revolves freely but without end play. Lock the adjustment.

The bearing cups can be removed from the wheels by driving them out with a long punch. Slots are provided back of the cups to facilitate this job.

If the inner wheel bearing is removed, a new felt retainer must be installed when assembling. The new retainer should be pressed in place and staked into the groove in the wheel bore in three or four places.

**KNUCKLE BUSHINGS**—Fig. 50. To replace knuckle bushings, jack up one side of the tractor and remove the wheel and tie rod. When working on the right side of the tractor, remove the front end of the drag link.

Remove two knuckle dust caps and drive out the taper bolt. The spindle pin can then be removed and new bushings installed.

## FRONT END

**MODELS A, B, G, GM, H**

**WHEEL BEARINGS**—Fig. 51. To adjust

bearings, raise the front wheels to relieve all load from the bearings. Remove hub cap, cotter pin and loosen clamp screw. Turn adjusting nut tight and then back off until the wheel rotates freely without end play. Lock the adjustment.

The bearing cups can be removed from the wheels by driving them out with a long punch. Slots are provided back of the cups to facilitate the job.

If the inner bearing is removed, a new felt retainer must be used when reassembling. Press the retainer in and stake it in the wheel bore in three or four places with a blunt tool.

**STEERING SHAFT**—To remove the steering shaft (wormshaft), Fig. 51, remove the steering wheel and pedestal housing cover. Remove steering shaft bearing housing and gasket shims. Pull shaft from front of pedestal.

Reassemble parts removed and install the proper amount of gasket shims between the pedestal and bearing housing to provide a free-turning shaft but without end play.

**VERTICAL SPINDLE**—To remove vertical spindle, take off front wheels, steering shaft and pedestal. On A and G models, remove lower bearing cap. Unscrew nut holding spindle to sector gear. Drive spindle down through sector gear and take it out through lower end of pedestal.

Reassemble parts removed, being sure

to install sector gear on spindle splines so that middle teeth of gear mesh with worm when front wheels are facing straight ahead.

**PEDESTAL**—To remove the pedestal, take out the steering shaft as directed above. Remove grilles, shield and screen. Take off radiator on G models. Remove front wheels. Unfasten and remove pedestal from frame.

## FRONT END

**MODELS AN, ANH, BN, BNH, GN, HN, HNH**

**WHEEL BEARINGS**—To adjust bearings, back off the front bearing lock plate screw, Fig. 52. Tighten the adjusting nut until wheel rotates freely but without end play. Lock the adjustment in the notch closest to this position.

**STEERING SHAFT**—Fig. 52. To remove the steering shaft (wormshaft), remove the steering wheel and pedestal housing cover. Remove steering shaft bearing housing and gasket shims. Pull shaft from front of pedestal.

Reassemble parts removed and install the proper amount of gasket shims between the pedestal and bearing housing to provide a free-turning shaft but without end play.

**VERTICAL SPINDLE**—To remove the spindle, take off the front wheel and steering shaft as directed above. Remove nut holding spindle to sector gear. Drive spindle down through gear and out through the lower end of the pedestal.

Reassemble parts removed, being sure to install the sector gear on the spindle splines so that the middle teeth of the gear mesh with the worm when the front wheel is facing straight ahead.

**PEDESTAL**—To remove the pedestal, take out the steering shaft as outlined above. Remove grilles, shield, screen and front wheel. Unfasten and remove pedestal from frame.

## FRONT END

**SERIES L**

The front wheels are mounted on taper roller bearings. A large felt seal on the inner end of the hub prevents dirt from mixing with the lubricant in the front wheel bearings.

To adjust front wheel bearings, remove the hub cap and cotter pin. Turn the adjusting nut until the wheel begins to drag when rotated. Then loosen the nut one or two notches until the wheel rotates freely but without end play.

When a new felt seal is installed, the bearings should be adjusted so that the wheel drags slightly. As the new felt is used, it will loosen up so the wheel will rotate freely.

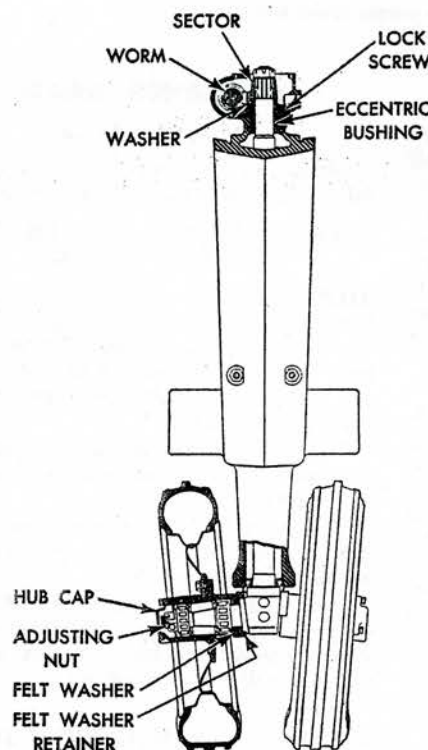


Fig. 51 Front suspension and steering gear. Typical of Series A, B, G, H with dual front wheels

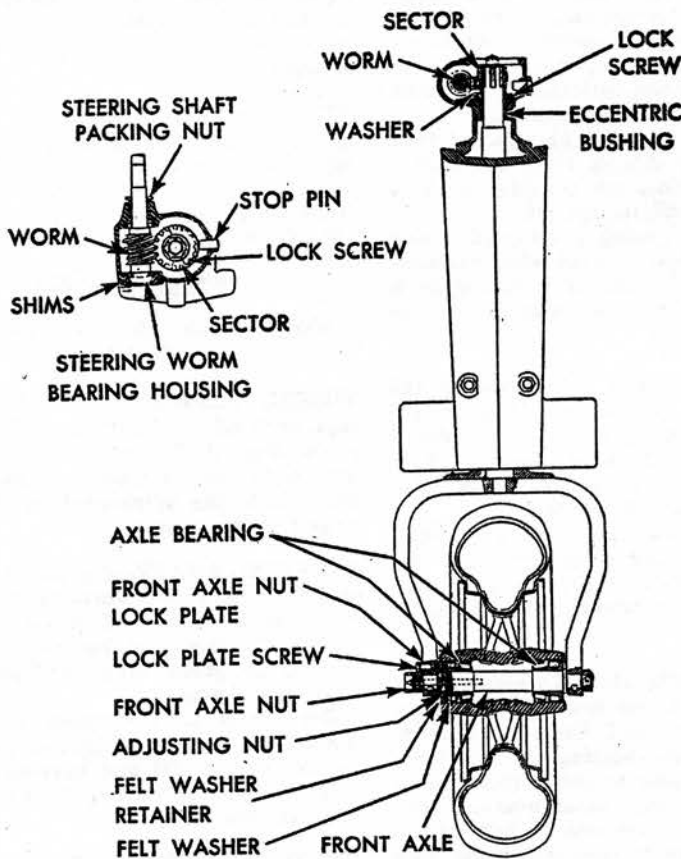


Fig. 52 Front suspension and steering gear. Typical of Series A, B, G, H with single front wheel

## FRONT END

### MODEL M

**STEERING KNUCKLES**—Fig. 53. To remove a steering knuckle, first take off the wheel and wheel bearings. Drive the lock pin out of the steering arm and take the knuckle out of the axle spindle tube.

**PIVOT PIN**—Fig. 53. To remove the pivot pin, detach the vertical steering shaft from the center steering arm. Release the snap ring from the front end of the pivot shaft and drive the shaft out rearward. After removing the front axle, bushings will be accessible for servicing.

**VERTICAL STEERING SHAFT**—Fig. 54. To remove the vertical steering shaft, take off grilles and steering gear housing cover. Disconnect vertical steering shaft from center steering arm and push the shaft through the steering gear housing.

When assembling, be sure to connect the vertical steering shaft to the center steering arm with the steering gear in its mid-position and front wheels in straight-ahead position.

## FRONT END

### MODEL MT

Front suspension service on this model with its dual center wheels is quite similar to that described for Models A, B, G and H.

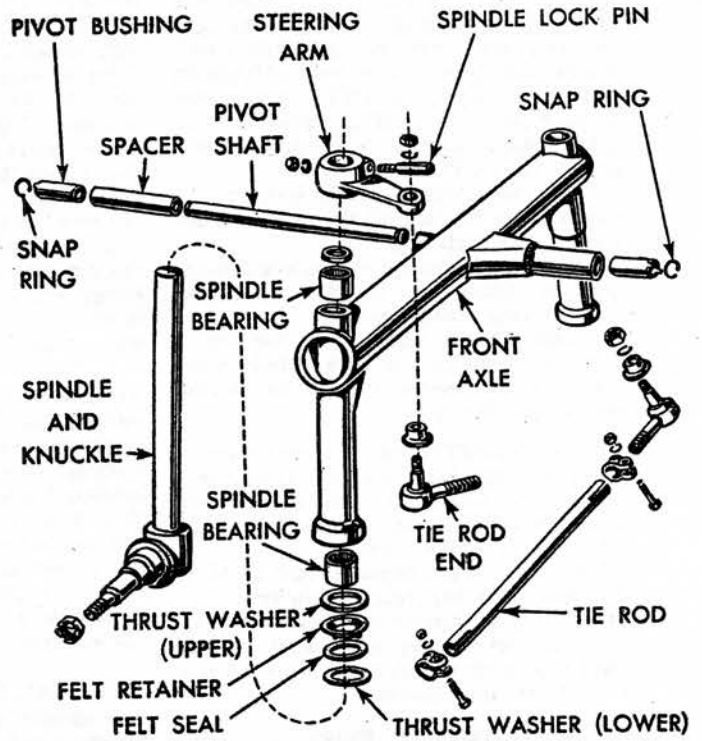


Fig. 53 Front suspension. Model M

## STEERING GEAR

### MODELS 50, 60

Service on the steering gear is covered for these models under **Front Suspension**.

### SERIES A, B, D, G, H, WITH WIDE SPREAD WHEELS

**ADJUSTMENTS**—Fig. 55. To take up lost motion in the steering gear, loosen the lock nut on the adjusting screw in the gear housing and tighten the screw. Do not adjust too tight, and be sure to tighten the lock nut.

To take up worm end play, tighten the steering column nut down snug, then back off  $\frac{1}{8}$  turn.

To reduce backlash between worm and gear, remove shims from between the worm and gear housings.

Lost motion in the drag link and tie rod may be eliminated by tightening the adjusting screw plugs up tight, then backing off to the first cotter pin hole.

### SERIES A, B, D, G, H, WITH SINGLE & DUAL WHEELS

**ADJUSTMENTS**—Figs. 51 and 52. To take up excess play in the steering mechanism, first jack up the front of the

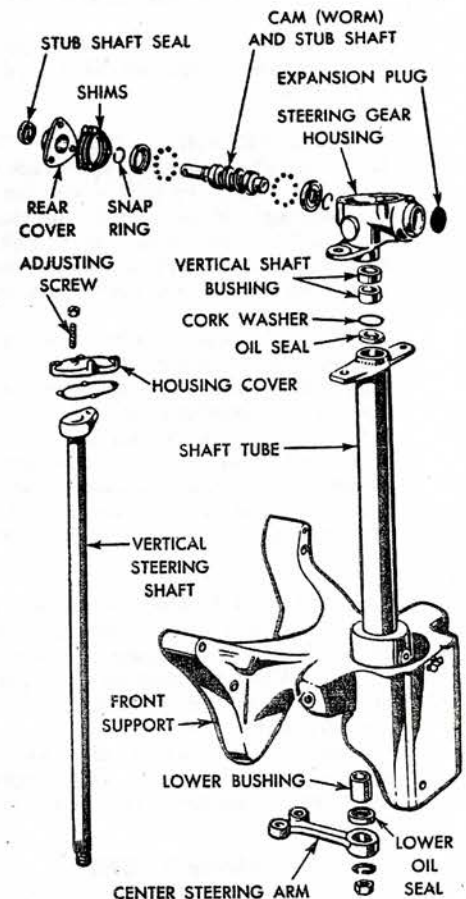


Fig. 54 Front support and steering gear. Model M



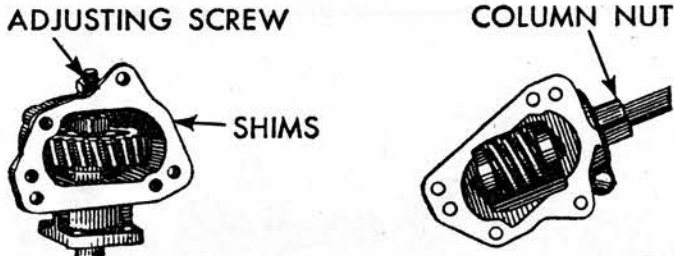


Fig. 55 Steering gear adjustments. Series A, B, D, G, H with wide spread front wheels

tractor, remove the cover over the top of the pedestal and steering gear housing cover. Drain the oil from the steering gear housing.

Adjust the steering worm bearings by taking off the worm bearing housing and removing shims as required until the steering shaft rotates freely without end play. When reassembling steering worm bearing housing, hold bearing in place by packing with hard grease.

Adjust end play in the vertical spindle by adding washers under the flange of the eccentric bushing until end play is reduced to 1/32" or less, and spindle rotates freely. To add washers, remove nut, steering sector and eccentric bushings, insert washers in place and reassemble parts in proper order. When reassembling, be sure wheels are straight ahead, with double knuckle offset to rear of vertical spindle on all dual wheel tractors. On single wheel tractors, reassemble so that offset of yoke on vertical shaft is to the rear. The steering sector should be assembled on the splines to give equal turning in both directions.

Adjust mesh between worm and sector by means of eccentric bushing. Remove eccentric bushing lock screw and turn bushing one or more notches to secure minimum backlash. Turn steering wheel throughout its complete range to be sure there is no bind in any position. Tighten lock screw firmly.

When adjustments have been completed, add lubricant and replace covers.

**SERIES L**

If the tractor turns hard or there is play in the steering mechanism, jack up the front axle and turn the steering wheel to determine the cause of the trouble.

If steering wheel turns freely, check front wheel toe-in, which should be 1/4". Loosen the clamps on the ends of the tie rod and turn the rod as required to adjust toe-in.

If steering wheel turns hard, disconnect the drag link from the steering gear and again turn the steering wheel. If the steering wheel still turns hard, the trouble is in the steering gear. The steering gear is of the automotive type and is fully adjustable to relieve tightness or to take up any play which has developed.

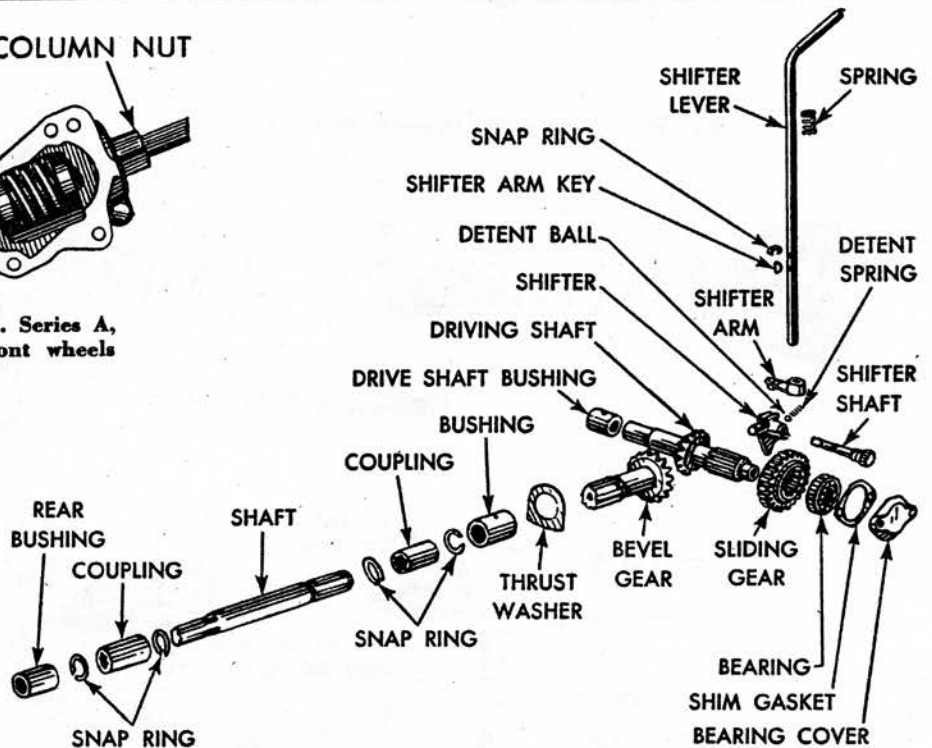


Fig. 56 Layout of P.T.O. drive. Series A, B

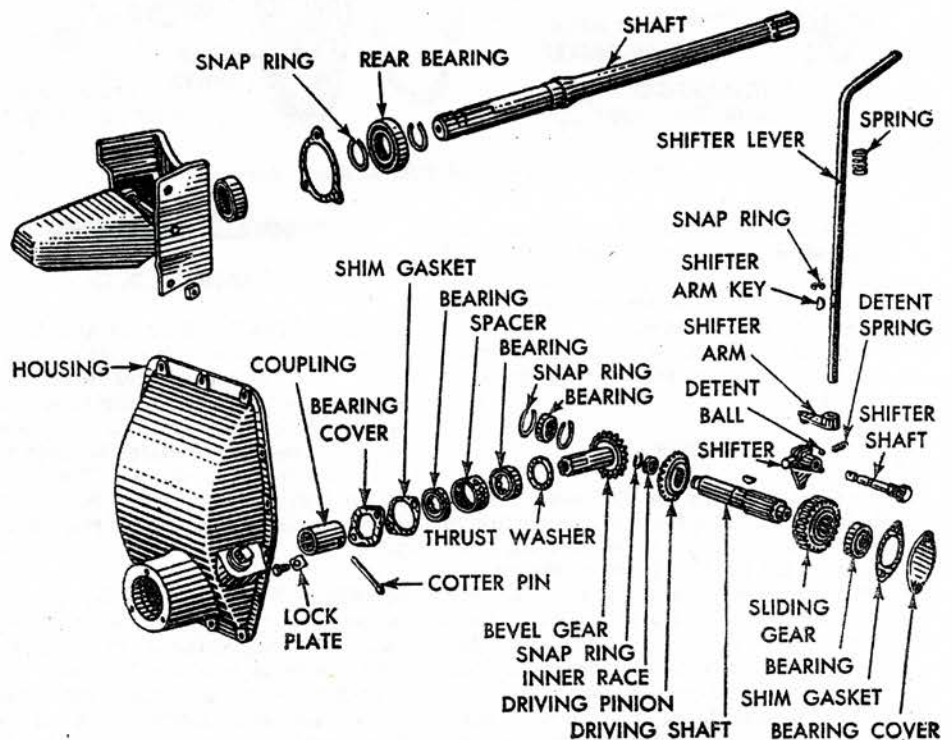
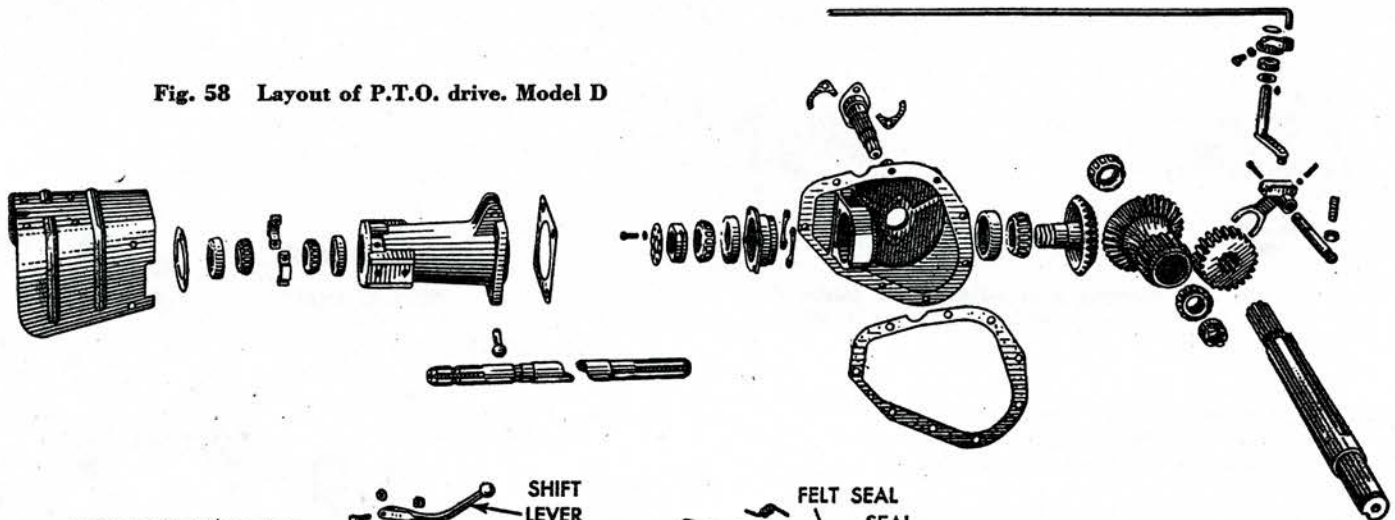


Fig. 57 Layout of P.T.O. drive. Model G

Fig. 58 Layout of P.T.O. drive. Model D



MODEL D

**DISASSEMBLE** — Fig. 58. Unfasten rear bearing quill from transmission case and pull out driven shaft and quill. Detach power shaft housing from transmission case and remove entire power unit. Remove shifter and slide spur drive gear off shaft.

Remove nut from bevel drive gear spindle and capscrews attaching spindle to housing. Pull out spindle and remove bevel drive gear. Remove bevel driven gear adjusting nut and remove gear and adjusting nut.

**ASSEMBLY** — Reverse above procedure to assemble, being sure to observe the following: All bearings are adjusted by shims and should be so installed as to provide free rotation of affected parts with no end play in bearings.

Bevel gear backlash and mesh are controlled by shims between outer end of idler gear spindle and housing, and by shims between bevel driven gear cage and housing. With gears properly meshed, backlash should be .005-.010".

SERIES H

**DISASSEMBLE**—Fig. 59. Take off power shaft rear bearing housing and pull out driven shaft, bearings and gear. Remove sliding gear shaft left bearing housing and take off driving gear and related parts.

**ASSEMBLY** — Bevel gear backlash and mesh are controlled by shims between rear bearing housing and rear cover, and by gaskets and shims between sliding gear shaft bearing housings and transmission case.

In making the adjustment, first set up the sliding gear shaft bearings to provide a free-turning assembly without end play. Then if the drive gear is to be meshed deeper into the driven gear, remove shims from the left bearing housing and add

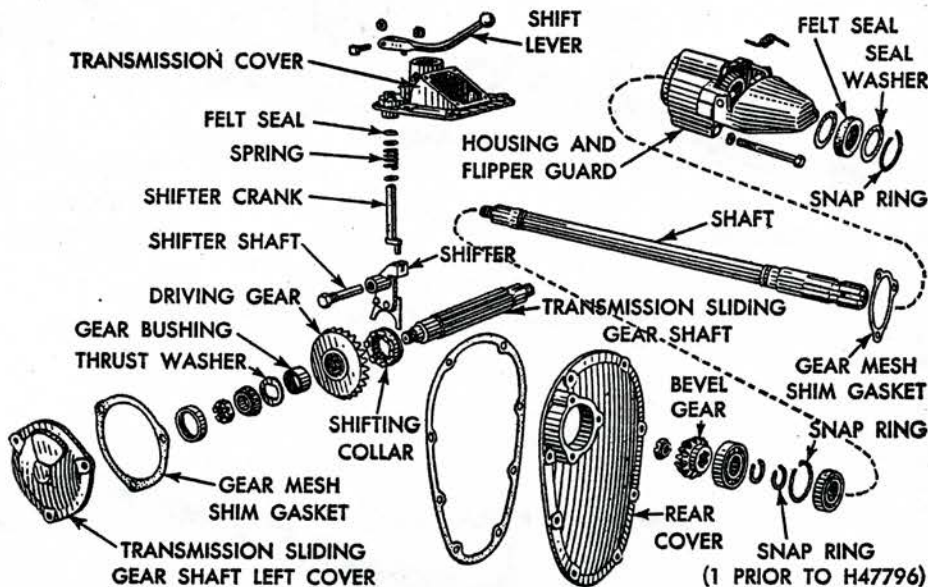


Fig. 59 Layout of P.T.O. drive. Series H

If this is properly adjusted, turn the front wheels by hand. If tightness or end play is determined in the front steering arms and spindles, make sure all lubricant points are well supplied.

Drag link ends are adjustable for wear; remove cotter pin and turn plugs in to tighten.

MODEL M

To eliminate play in the cam (worm) shaft, jack up the front of the tractor to remove all load from the steering gear. Take off the hood and grilles. Remove set screw from steering shaft and slide this shaft away from the worm. Then remove shims from between the rear cover and steering gear housing to provide a free-turning shaft without end play.

To eliminate play in the cam shaft bearings, turn the steering gear to its mid-position, turn the adjusting screw in the housing cover until all play is removed from the vertical shaft but without setting up a bind.

## POWER TAKE-OFF

### SERIES A, B, G

**DISASSEMBLY** — Figs. 56 and 57. Remove transmission cover and countershaft. Detach shifter arm from shifter lever. Unfasten right bearing cover. Shift driving shaft and bearing to right of case and pull bearing off shaft. Remove shaft and gears from top of case. The P. T. O. driven shaft may be pulled out of transmission case after taking off rear cover or power lift.

**ASSEMBLY** — Reverse above procedure to assemble, being sure to adjust bevel gear mesh to provide a free-turning assembly without excessive backlash.

Gasket shims between right bearing cover and case control mesh of bevel drive gear. On series A and B, bevel driven gear mesh is controlled by position of thrust washer. On model G, this adjustment is controlled by thickness of gasket shim.

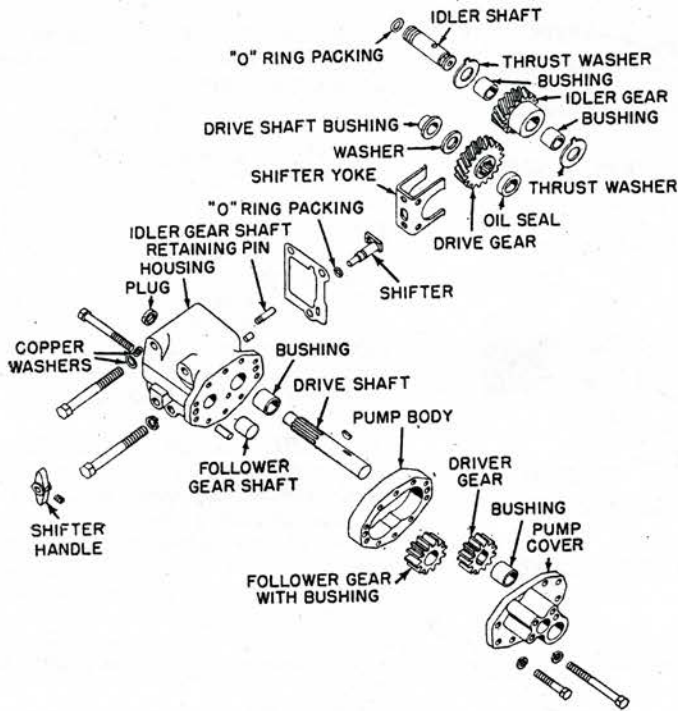


Fig. 59A Exploded view of Powr-Trol pump. Models 50, 60

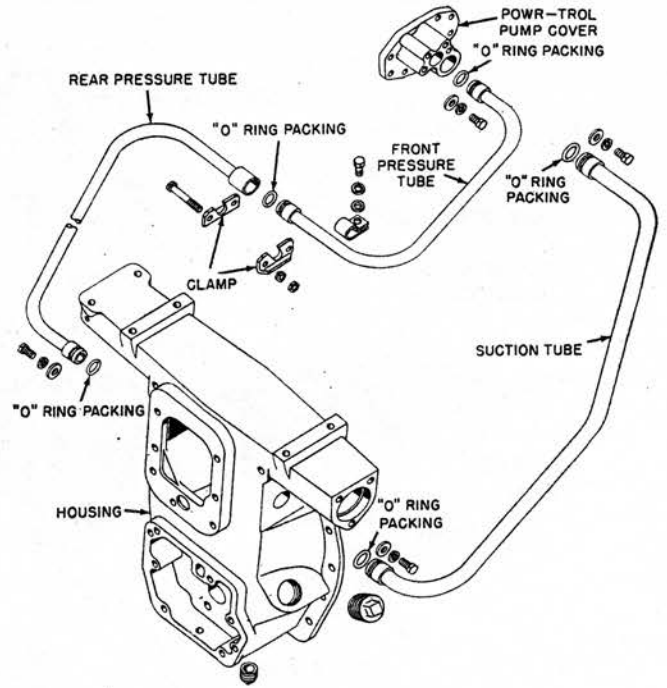


Fig. 59B Exploded view of Powr-Trol oil tubes and rockshaft housing. Models 50, 60

those removed to the right bearing housing. If it is desired to have a shallower mesh, transfer shims from the right bearing housing to the left bearing housing. Transferring shims in this manner will maintain the adjustment of the sliding gear shaft bearings.

**POWR-TROL PUMP**

**MODELS 50, 60**

The Powr-Trol pump, Fig. 59A, is a positive-displacement, gear-type pump, mounted on the governor case and driven by an idler gear which meshes with the cam gear.

With engine stopped, the pump is engaged by turning the shifter handle

counter-clockwise, and vice-versa. It may be necessary to turn the engine over by means of the starter (with ignition off) to engage the gears. **Never attempt to engage the pump with the engine running.**

Turning the shifter handle moves the drive gear into mesh with the idler gear.

**REMOVAL**—Drain the oil from the Powr-Trol system and disconnect oil lines at pump housing. Remove the three mounting cap screws and lift the pump from the governor case. Be careful not to lose the idler gear shaft retaining pin, Fig. 59A, which may fall out when the pump is removed.

The idler gear is located in the governor housing. The above-mentioned pin is located in the oil passage which leads to the

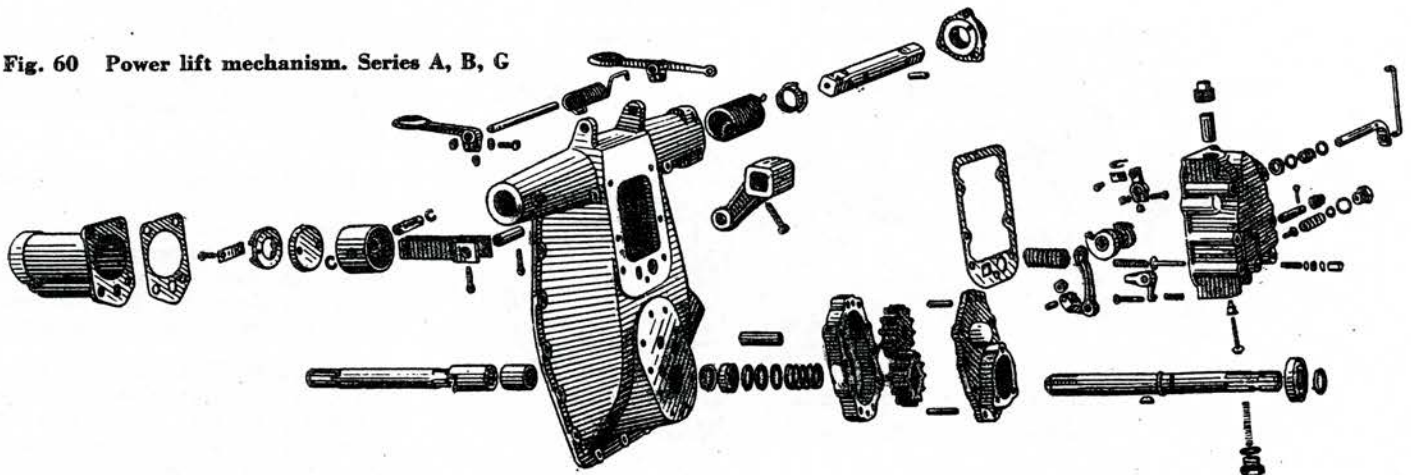
idler gear shaft and acts as a retainer for the shaft. After the pin is removed, the shaft can be pulled to the left from the idler gear and governor housing.

**DISASSEMBLY**—Remove cap screws which secure pump cover to pump housing. Pull driver gear and shaft and follower gear out of body. Drive gear will come out of housing at the same time.

Take out the two special cap screws from left side of housing and remove shifter yoke. To remove the shifter, loosen the set screw in the shifter handle, take off the handle and pull shifter from housing.

**INSPECTION & REPAIR**—Look for evidence of wear or damage to the gears.

Fig. 60 Power lift mechanism. Series A, B, C



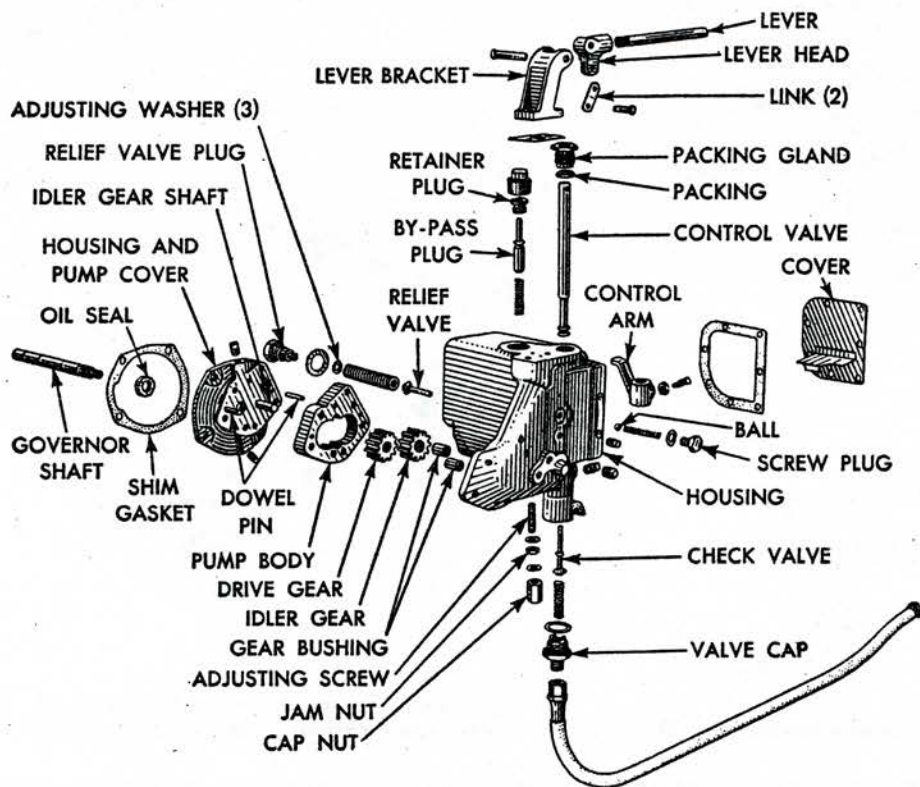


Fig. 61 Power lift mechanism. Series H

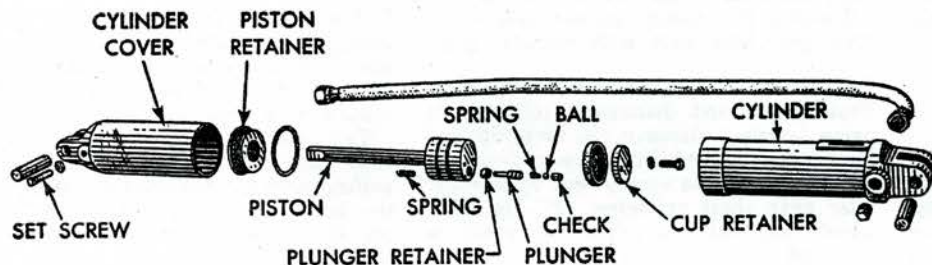


Fig. 62 Power lift cylinder. Series H

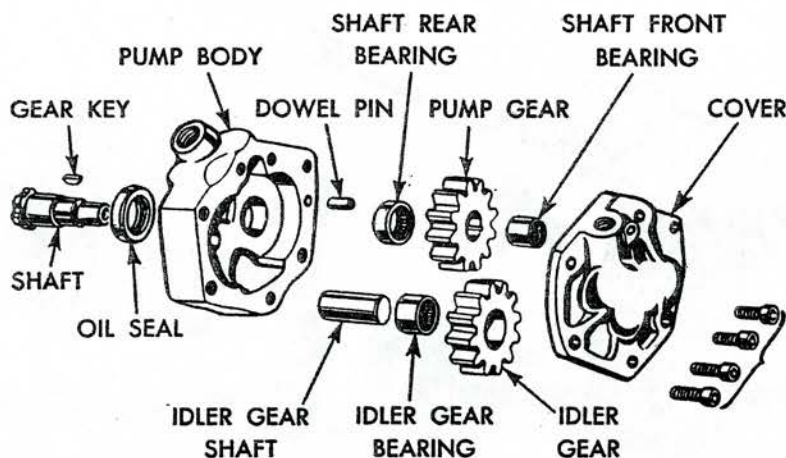


Fig. 63 Power lift pump. Model M

If condition of gears and related parts is in doubt, install new parts. Inspect all bushings and shafts for wear or damage and replace any parts that are in doubt.

Copper washers are used under the special cap screws which enter the left side of the pump body, and under the upper cap screws which hold the pump to the governor housing. If pump has been leaking, make sure the washers are present and in good condition.

Replace all oil seals and "O" rings if they show signs of wear. The oil seal adjacent to the drive gear must be installed with the lip toward the left as viewed from rear of pump housing.

**ASSEMBLY & INSTALLATION**—Assemble the pump in the reverse order of its disassembly and install it on the tractor.

After attaching the oil tubes to the pump, fill the system at the Powr-Trol housing with fresh oil of the proper viscosity for the prevailing temperature. Approximately 6 quarts are required to fill the system. If a remote cylinder is used, approximately one additional quart will be required.

Engage the pump, start the engine and operate the Powr-Trol lever a few times to fill the pump, oil tubes and valve housing. Check the oil level at the test cock and refill the system until oil runs out of the cock.

## POWR-TROL ROCKSHAFT & VALVE HOUSING

MODELS 50, 60

### REMOVING VALVE HOUSING ONLY

—Drain oil from Powr-Trol system. Remove cap screws and one nut securing valve housing to rockshaft housing. Take off valve housing, being careful not to lose the throttle valve and spring from front side of housing.

### REMOVING ROCKSHAFT HOUSING

—Drain both the Powr-Trol system and rear axle housing. Disconnect batteries, and wires to rear lamp. Remove seat, batteries, platform and oil tubes. Place a sling around ends of rockshaft housing and take up slack with a hoist. Remove all cap screws securing housing to rear axle housing. Then lift the housing away with the hoist.

### INSTALLING ROCKSHAFT HOUSING

—Shellac a new gasket to the housing mounting surface. Using a sling and hoist, raise housing into position and secure it to the rear axle housing with cap screws. Install oil tubes, Fig. 59B, platform, batteries and seat. Connect rear lamp wires.

### INSTALLING VALVE HOUSING

—Shellac a new gasket to the valve housing mounting surface. Make sure throttle valve and spring are properly installed in front of valve housing and lift housing into place. Secure it to rockshaft housing with

cap screws and nuts. Use copper gasket under upper right-hand cap screw.

**LUBRICATION**—Fill Powr-Trol system with oil as described previously, and fill transmission and rear axle housing with the correct grade and quantity of gear oil.

**POWER LIFT**

**SERIES A, B, G**

Fig. 60 is a layout of the power lift unit on Model G tractors. The construction of the unit employed on Series A and B is similar.

If the power lift fails to hold the implement in the raised position, it indicates leakage in the system. The most likely cause of the leakage is a defective piston cup, although it may be due to poorly seating valves. The gasket between the cylinder and housing, if defective, is also a condition to be investigated.

To install a new piston cup, drain the oil from the housing and remove the valve housing from the rear of the lift. Remove the capscrews attaching the crank arm to the rock shafts and pull the rock shafts part way out. Remove the pins from the crank arm and connecting rod and pull out the piston and connecting rod. Soak the new leather seal in oil, install it on the piston and reassemble in the reverse order.

If necessary, grind in the valves with fine grinding compound.

**SERIES H**

Figs. 61 and 62. To remove the assembly, take off the magneto, disconnect the oil line and drain the oil. Unfasten the unit from the governor case and remove it from the tractor.

To install a new piston cup, loosen the set screw on the cylinder cover, remove the nut and withdraw the piston. Soak the new leather seal in oil and install it on the piston. Before assembling, clean the plunger and its retainer to be sure that no foreign matter remains to cause leakage.

The check valve at the lower end of the pump housing may be ground in with fine grinding compound, if necessary.

**SERIES M**

**PUMP UNIT**—Fig. 63. To remove the pump, take off the hood and grille. Disconnect oil lines at pump. Unfasten and remove pump from timing gear cover.

To disassemble, remove cover. Press drive shaft out of gear and body. If necessary to remove needle bearing from cover, it must be collapsed. Bearings in body and idler gear may be pressed out.

Do not use sealing compound between body and cover when assembling but be sure mating surfaces are clean and smooth. Install the oil seal with its lip facing the gears.

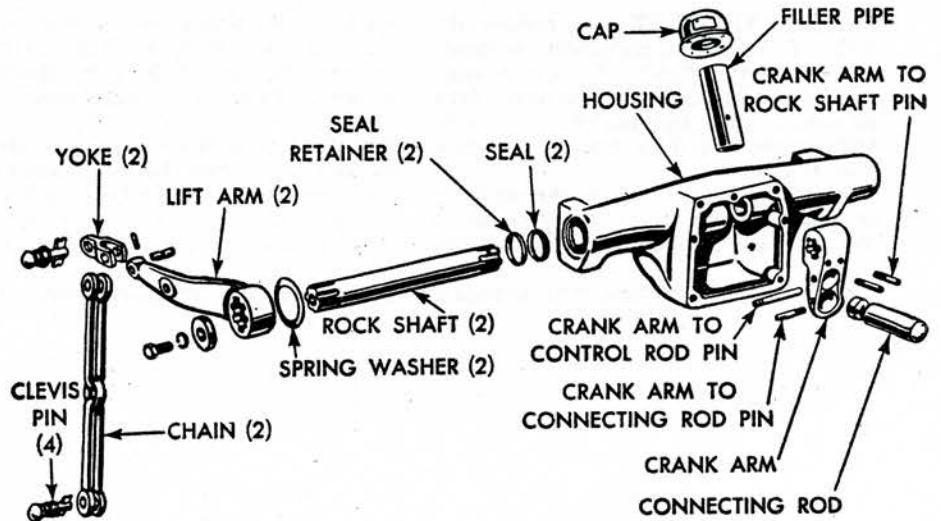


Fig. 64 Power lift rock shaft details. Series M

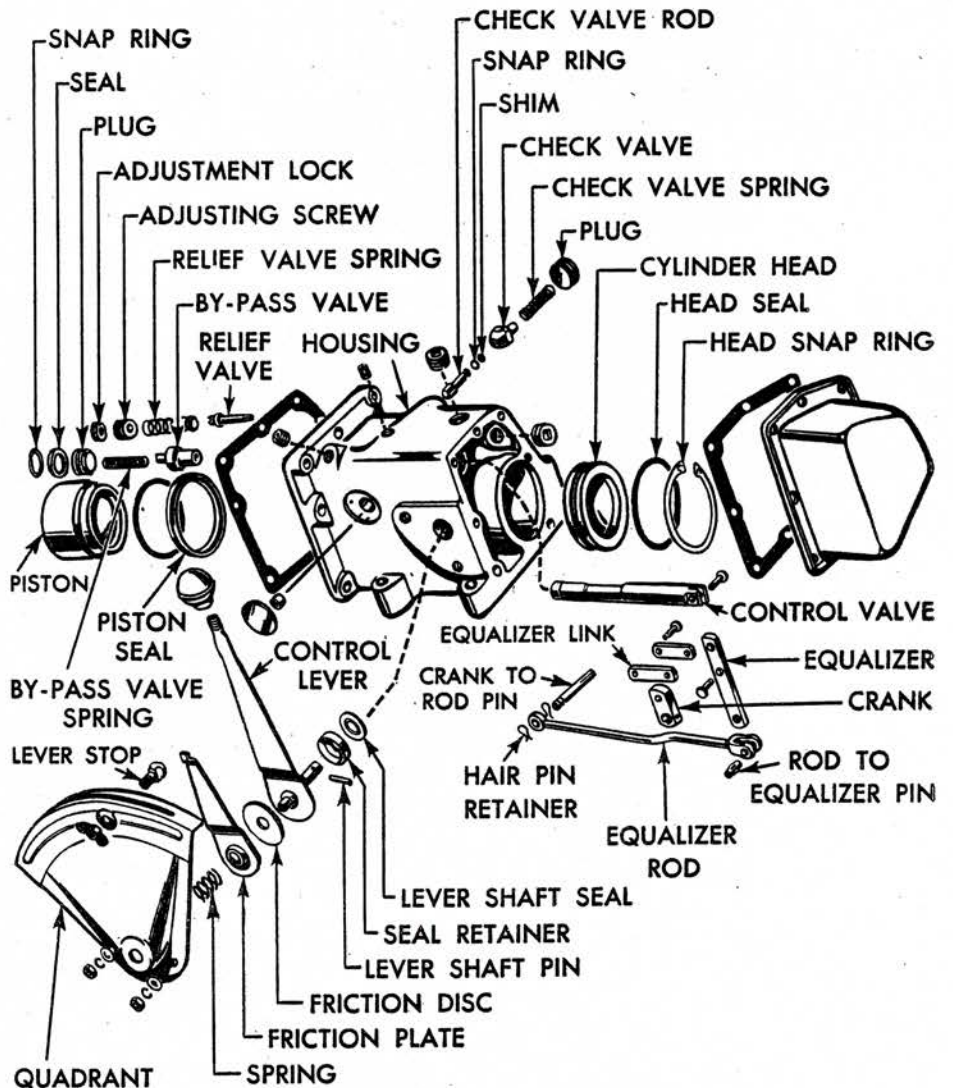


Fig. 65 Power lift valve housing details. Series M

**ROCK SHAFT UNIT**—To remove the rock shaft assembly, disconnect the draw-bar lift chains. Drain oil from housing and disconnect and remove oil lines. Take off control knob and quadrant. Unfasten and remove unit from transmission case, Figs. 64 and 65.

Install the unit and adjust the quadrant as follows: Move control lever as far to the rear as possible and operate the

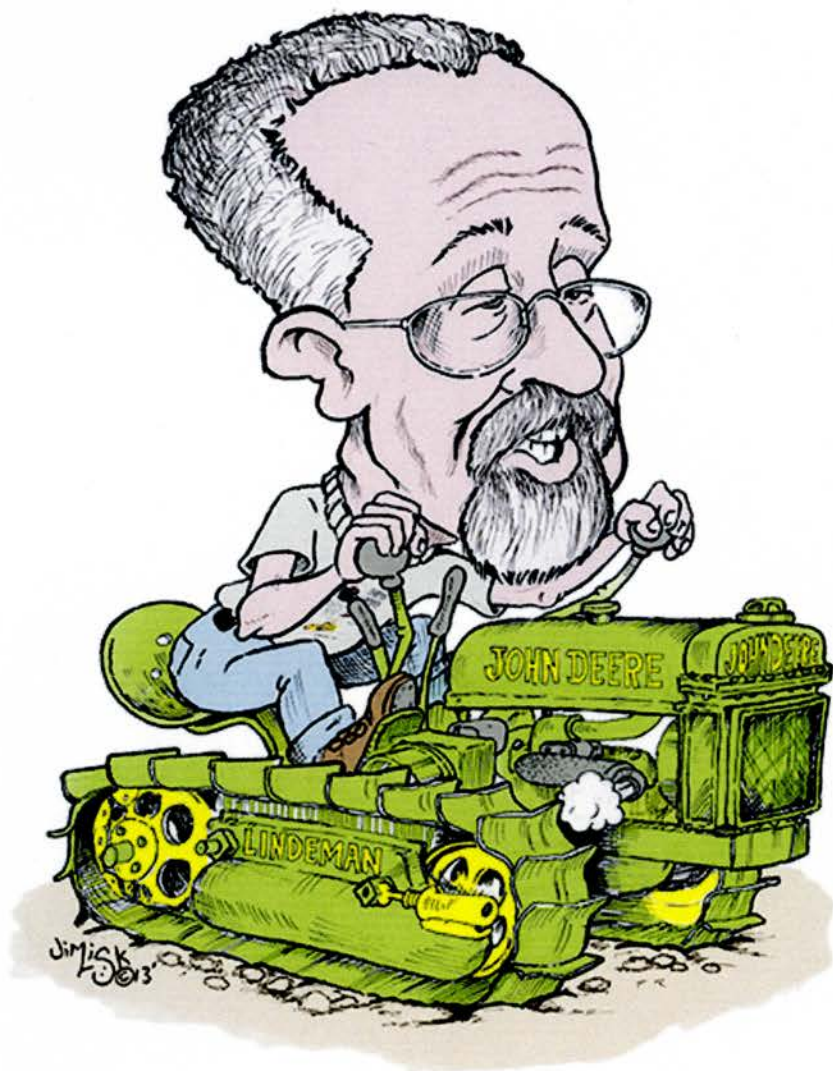
engine. Then rotate the quadrant on the studs so there is  $\frac{1}{8}$  to  $\frac{3}{16}$ " clearance between the right lift arm and the shield on the right side of the seat frame.

**VALVE HOUSING**—Fig. 65. Take off the unit as directed above. Separate rock shaft housing from valve housing. Remove pipe plug and with a compressed air line, apply pressure through the plug hole to

blow out the piston. If necessary, press cylinder head out of housing.

If the head was leaking and is removed, install a new sealing ring in the cylinder head groove. Use a new leather washer and rubber ring on the piston and reassemble parts removed. When installed on the tractor, adjust quadrant as directed above.

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Ted E. Adams  
Lindeman Archives  
903 So. 25th Ave.  
Yakima, WA 98902  
509-248-0100  
[www.LindemanArchives.com](http://www.LindemanArchives.com)