CLARK

Industrial Truck Division

OVERHAUL INSTRUCTIONS

CLARKLIFT C500

ALL LP GAS POWERED
ALL GASOLINE POWERED
10,000 LB. THRU 12,000 LB.
RATED CAPACITY

BOOK NO. OH-430, 1st REV

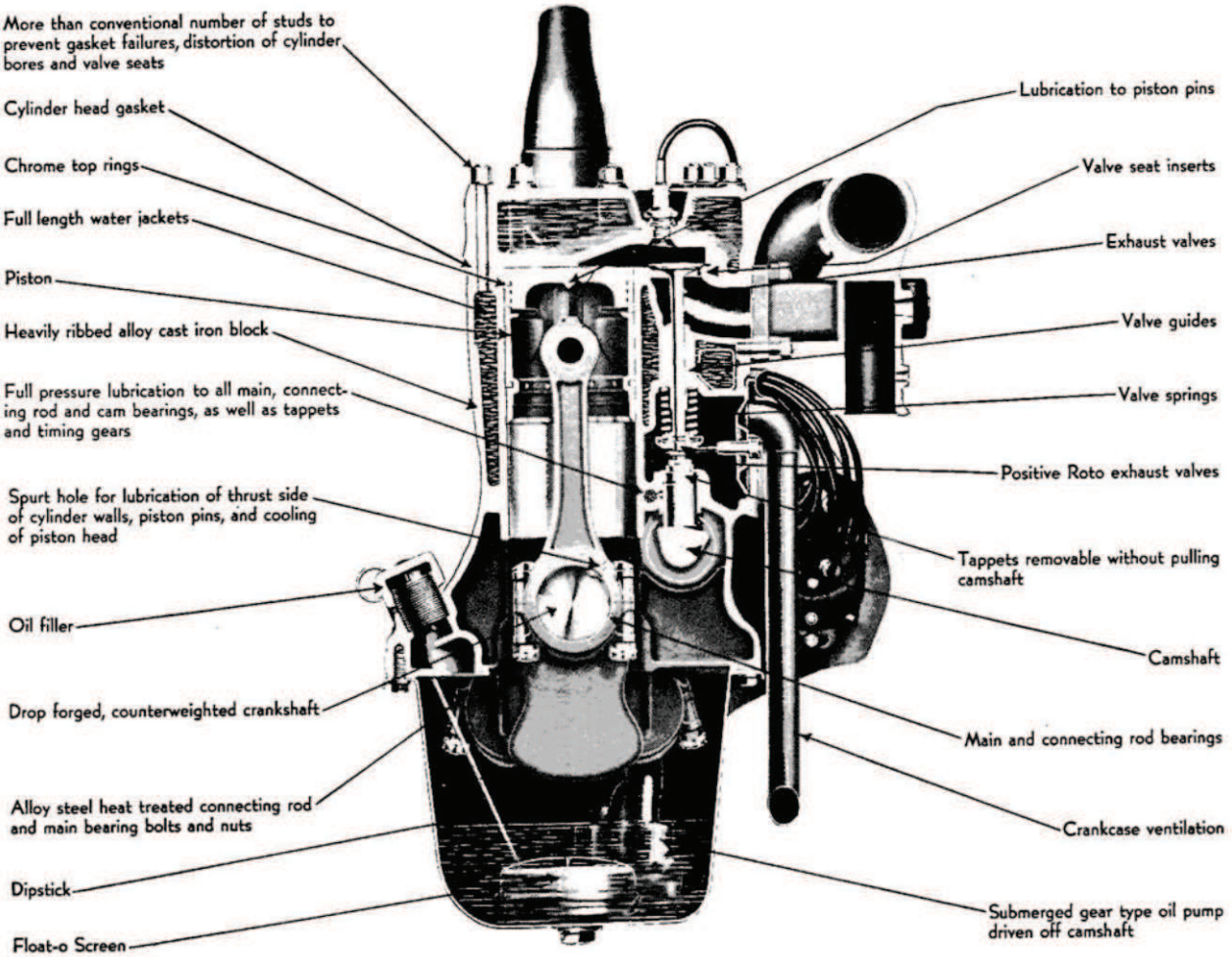


Figure 1 — Cross Section of a Typical Continental "L" Head Engine

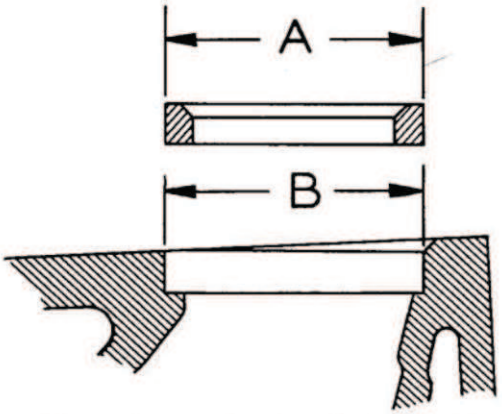


Figure 23 — Insert and counterbore

When OVERSIZE inserts are used, dimensions of the insert and counterbore increase proportionately (.010, .020 — depending on the oversize).

New insert installation should have a press fit. Chill insert in container with dry ice for 20 minutes before assembling.

Insert may then be installed in the counterbore using a piloted driver, tapping in place with very light hammer blows, without the possibility of shearing the side walls. This assures it being seated firmly on the bottom of the counterbore.

Figure 24 — Installing valve seat insert with an arbor press

3. Grind the intake and exhaust valve seats in the block in accordance with instructions in the limits and clearance chart and before removing the arbor, indicate the seat. Total indicator reading of the run-out must not be more than .002". Use a pilot having a solid stem with a long taper, as all valve seats must be ground concentric and square with either new or worn valve stem guide holes.

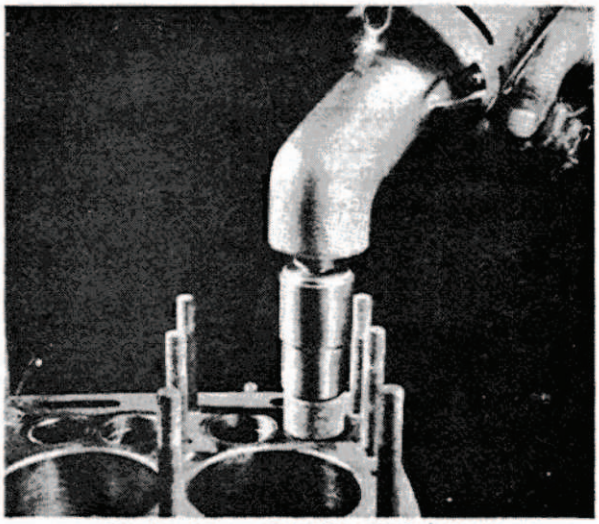


Figure 25 — Grinding Valve Seat

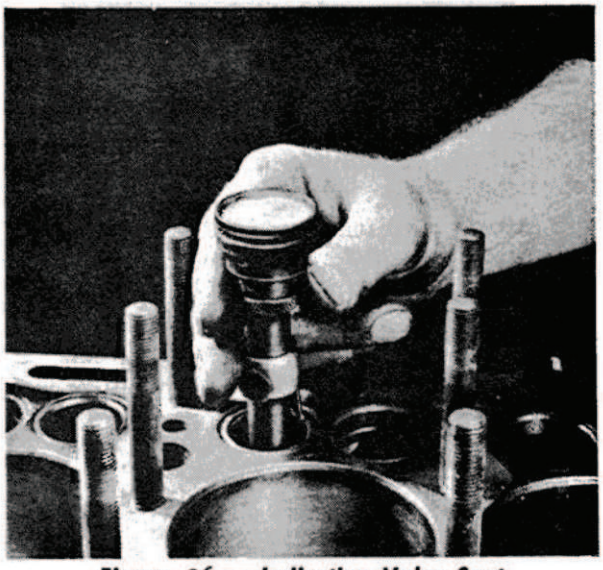


Figure 26 — Indicating Valve Seat

VALVES

1. Inspect valves for condition and replace any that are "necked", cracked or burned, also any on which valve stems are bent or worn more than .002 over the maximum allowable limits. Reface or replace all valves.

TIMING GEARS

1. Timing gears and timing gear fits must be checked carefully while the engine is being overhauled. To check the fit, use a screw driver to force the mating teeth as far apart as possible and check this clearance with a feeler gauge. If this clearance is .002" or greater, or if the gear teeth are badly scuffed and worn, the gear must be replaced. Timing gears must be replaced in pairs.

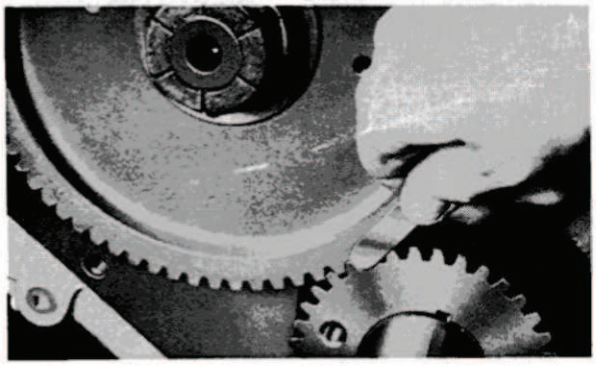


Figure 57 — Checking Timing Gear Backlash

Gears marked same as the original as far as sizes are concerned should be used as replacements.

2. Examine the camshaft thrust plate carefully for scoring and wear and if any indication of either shows, a new thrust plate should be assembled without question.

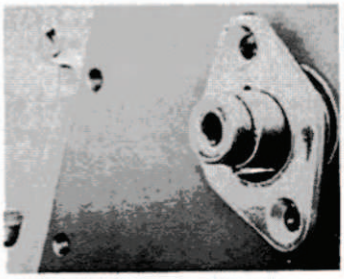


Figure 58 — Camshaft Thrust Plate

3. Assemble the cam gear to the camshaft by driving or pressing it on, at the same time **holding the camshaft forward with a suitable bar through the fuel pump opening in the block so there is no possibility of the camshaft bumping the expansion plug at the rear end and forcing it out of position, thus causing an oil leak.**

Check camshaft end play as shown in illustration. Refer to limits and clearance section for the correct dimension.

CAUTION: NEVER USE THE CAMSHAFT NUT TO PULL THE GEAR ONTO THE CAMSHAFT. This will break the threaded end off cast iron camshafts and damage threads on steel camshafts.

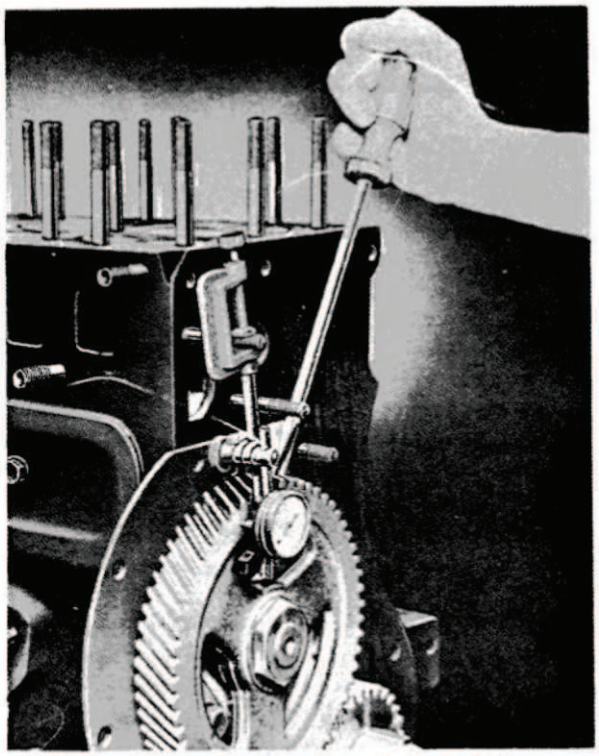


Figure 59 — Checking Camshaft End Play

4. Inspect crankshaft thrust washers for wear and scoring. Replace if necessary before reassembling gear.

5. Drive the crank gear on the shaft making sure that the marked teeth on the cam gear straddle the marked tooth on the crank gear, which assures you of the crankshaft and camshaft being in time.

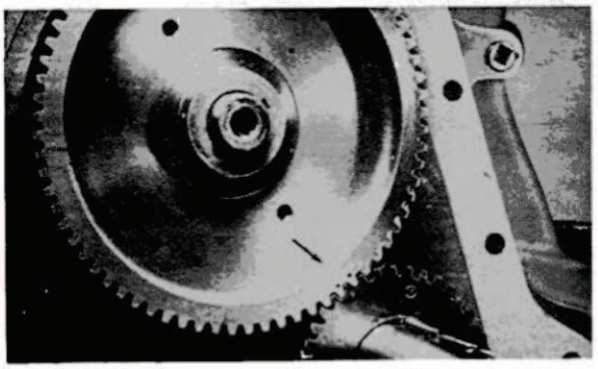


Figure 60 — Timing Gears Assembled According to Timing Marks

6. Check for clearance with the above gears assembled in place, since it may be possible that it is not within specifications. Repeat the operation previously outlined. Using a screwdriver pry the teeth as far apart as possible and check the clearance with a feeler gauge. If a .0015" feeler will not enter the gap the clearance is not excessive.

FLYWHEEL AND FLYWHEEL HOUSING

The flywheel is machined and balanced so that the clutch face and locating counterbore will run true with its axis.

To be sure that the crankshaft flange has not been sprung or otherwise damaged or that the counterbore in the flywheel, which locates it on the crankshaft, is not damaged, mount an indicator on the flywheel housing and check the flywheel for runout. Caution: When checking runout remove spark plugs to allow engine to be turned over freely.

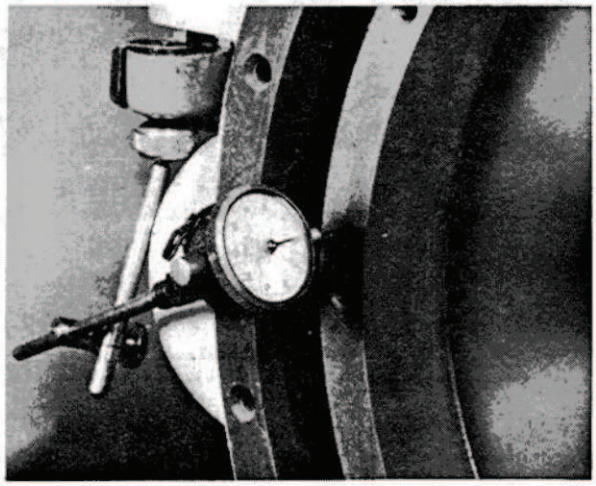


Figure 79 — Checking Flywheel Run-Out

The indicator should be set up so that it contacts the clutch face or the vertical surface of the clutch counterbore, then turn the flywheel at least one full revolution at the same time holding against the crankshaft to offset the possibility of end play.

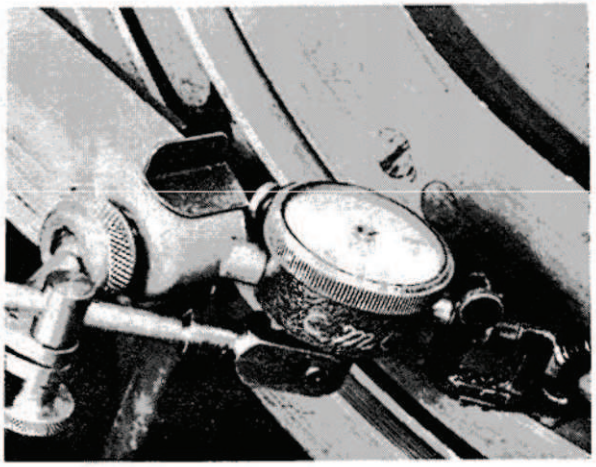


Figure 80 — Checking Flywheel Counterbore

Excessive runout of the flywheel, in either position, is probably caused by dirt in or damage to counterbore locating the flywheel on the crankshaft flange.

Re-locate the indicator to check the inside diameter of the counterbore. In both cases the maximum indicator reading must not be more than .008.

When assembled, mount the indicator on the flywheel so that it contacts the housing face and turn the crankshaft, at the same time holding against it to counteract end play. The maximum indicator reading must not exceed .008.

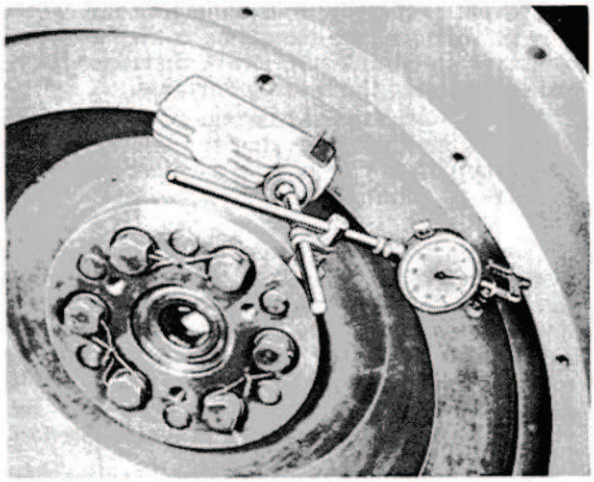


Figure 81 — Checking Flywheel Housing Face

Re-locate the indicator to contact the housing bore and check this in the same manner. The same runout limits prevail.

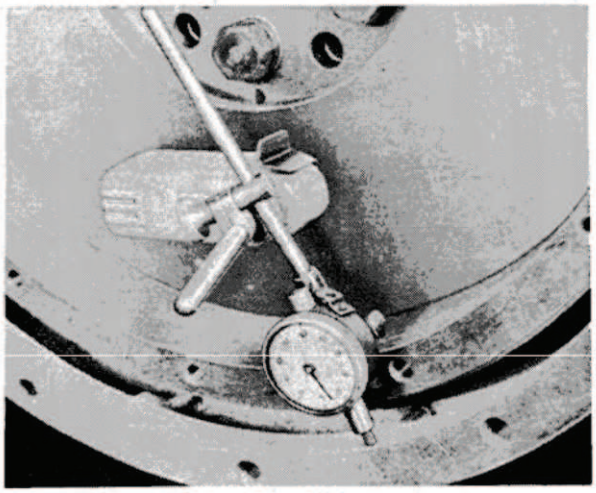


Figure 82 — Checking Housing Bore

If more than one engine is being rebuilt at a time, the housing should be identified with its original cylinder block and should be reassembled to that block in the rebuilding process.

FOUR CYLINDER INDUSTRIAL L-HEAD ENGINES*

MODEL	N-56	N-62	Y-69	Y-91	Y-112	F-124	F-135	F-140	F-162	F-163
No. of cylinders	4	4	4	4	4	4	4	4	4	4
Bore and Stroke	2¼ x 3½	2⅜ x 3½	2½ x 3½	2⅞ x 3½	3⅜₁₆ x 3½	3 x 4⅜	3⅛ x 4⅜	3⅜₁₆ x 4⅜	3⅜₁₆ x 4⅜	3⅜₁₆ x 4⅜
Displacement Cu. In.	56	62	69	91	112	124	135	140	162	162
Compression Ratio	6.12	6.46	6.66	6.46	6.07	6.28	7.2:1	6.00	6.01	7.4:1
Max. Oil Pressure**	20-30	20-30	30-40	30-40	30-40	20-30	20-30	20-30	20-30	20-30
Min. Oil Pressure (Idling)	7	7	7	7	7	7	7	7	7	7
Firing Order	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Main Brg. Frt.	2 x 1⅞₃₂	2 x 1⅞₃₂	1¾ x 1⅞₃₂	1¾ x 1⅞₃₂	1¾ x 1⅞₃₂	2¼ x 1⅛	2⅜ x 1⅛	2¼ x 1⅛	2¼ x 1⅛	2⅜ x 1⅛
Main Brg. Center			1¾ x 1⅞₁₆	1¾ x 1⅞₁₆	1¾ x 1⅞₁₆	2¼ x 1⅜	2⅜ x 1²³⁄₃₂	2¼ x 1⅝	2¼ x 1⅝	2⅜ x 1²³⁄₃₂
Main Brg. Rear	2 x 1⅞₃₂	2 x 1⅞₃₂	1¾ x 1⅞₁₆	1¾ x 1⅞₁₆	1¾ x 1⅞₁₆	2¼ x 1⅜	2⅜ x 1⅝	2¼ x 1⅝	2¼ x 1⅜	2⅜ x 1⅝
Conn. Rod Brg.										
Dia. and Length	1½ x ¾	1½ x ¾	1½ x 1	1½ x 1	1½ x 1	1¹⁵⁄₁₆ x 1⅛	2⅛₆ x 1⅛	1¹⁵⁄₁₆ x 1⅛	1¹⁵⁄₁₆ x 1⅛	2⅛₆ x 1⅛
Oil Capacity										
Crankcase	3½	3½	3½	3½	3½	4	4	4	4	4
Filter	½	½	½	½	½	½	½	½	½	½
Total	4	4	4	4	4	4½	4½	4½	4½	4½
Valve Clearance										
Intake	.015	.012	.012	.012	.012	.014	.012	.014	.014	.012
Exhaust	.015	.012	.012	.020	.020	.016 ◇	.020	.016 ◇	.016 ◇	.020
Water Capacity	(Given in quarts — add approximately 1 quart for hoses)									
Engine	2	2	3¾	3¾	3¾	5	5	5	5	5
Engine and Radiator	11	11	14	15	15	14	14	14	15	15
Weight (Bare Engine)	180	210	290	290	290	415	415	415	415	415

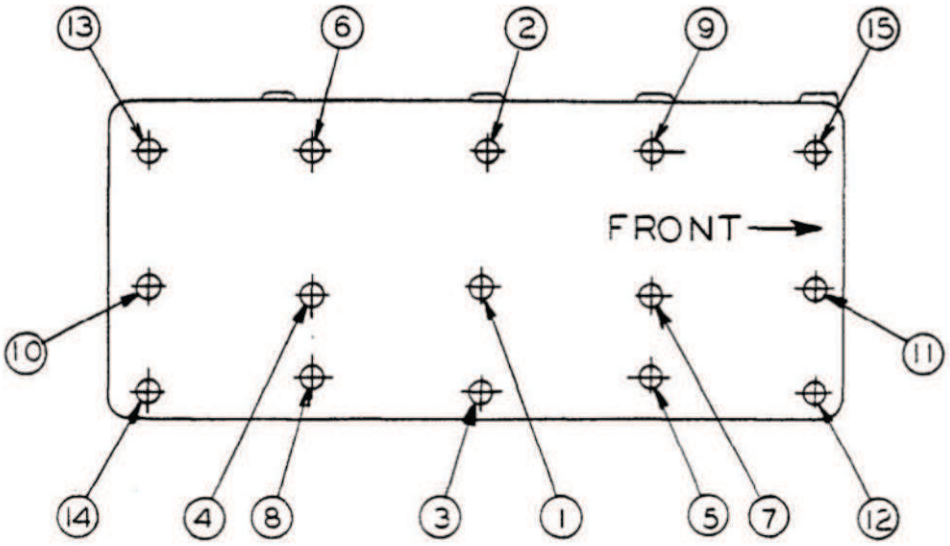
*Dimensions and data shown are for Standard Industrial Engines.

**Note: Other oil pressures are available, based on customer specifications.

◇Static or cold setting .017

CYLINDER HEAD TORQUE SEQUENCE

Y400



TORQUING PROCEDURE

1. HAND TORQUE COLD TO 48 LB. FT.
2. HAND TORQUE WARM AFTER ENGINE REACHES OPERATING TEMP. TO 42 LB. FT.

NOTE - POWER-WRENCH TORQUE LIMIT MUST BE HELD AT LEAST 10 LB. FT. BELOW HAND TORQUE SPEC. THEN HAND TORQUE TO SPEC.

LIMITS AND CLEARANCE DATA

ENGINE MODEL	F.135**** F.163****	F.227*** F.245**		
CAMSHAFT				
Brg Journal Dia. #1	1.8725/1.8715	1.8725/1.8715		
#2	1.7465/1.7455	1.8095/1.8085		
#3	1.2475/1.2465	1.7465/1.7457		
#4	NONE	1.2475/1.2465		
*Wear Limits - Min. Dia.	(.001 UNDER MINIMUM NEW SHAFT DIAMETER)			
Bushing - Inside Dia. #1	1.8755/1.8745	1.8755/1.8745		
#2	1.7502/1.7495	1.8125/1.8115		
#3	1.2505/1.2495	1.7502/1.7495		
#4	NONE	1.2505/1.2495		
Bushing - Clearance Limits	.004/.002	.004/.002		
End Play	.009/.005	.009/.005		
CONNECTING RODS				
Bushing Hole Dia.	.914/.913	.914/.913		
Bearing Hole Dia.	2.1870/2.1865	2.1870/2.1865		
Bearing Thickness	.0616/.0613	.0616/.0613		
*Wear Limits - Min. Thk.	.0608	.0608		
Dia. - Crank Pin	2.0627/2.0619	2.0627/2.0619		
*Wear Limits - Min. Dia.	2.0609	2.0609		
Clearance Limits	.0006/.0022	.0006/.0022		
Desired Clearance	.0015	.0015		
*Wear Limits - Max. Cl.	.0032	.0032		
Side Play	.010/.006	.010/.006		
Desired Side Play	.006	.006		
MAIN BEARINGS				
Dia. of Brg. Bore in Block	2.5622/2.5615	2.5622/2.6515		
Bearing Thickness	.0925/.0928	.0925/.0928		
*Wear Limits - Min. Thk.	.0920	.0920		
Dia. of Main Brg. Journal	2.3752/2.3744	2.3752/2.3744		
*Wear Limits - Min. Dia.	2.3734	2.3734		
Clearance Limits	.0007/.0028	.0007/.0028		
Desired Clearance	.0015	.0015		
C/S End Play	.002/.006	.002/.006		
PISTON PIN	SEE NOTE 7	SEE NOTE 4		
Length	2.878/2.868	2.878/2.868		
Diameter	.8593/.8591	.8593/.8591		
*Wear Limits - Min. Dia.	.8588	.8588		
Desired Fit	Light Push	Light Push		
Bushing Hole Dia. - Fin.	.8597/.8595	.8597/.8595		
*Wear Limits - Max. Dia.	.8607	.8607		
Pin Cl. in Bushing	.0006/.0002	.0006/.0002		
Desired Pin Fit	.0004	.0004		

NOTE 4 - F244 and F245 Piston Pin Length 2.878/2.868

NOTE 7 - F135 Piston Pin Length 2.961/2.676

**F245
Rear Flange Bearing
Thickness..... .0926 - .09290
*Wear Limits Min. Thk. .0921
Clearance Limits..... .0005 - .0026
Desired Clearance.... .0015

***F227
Camshaft Bearing Journal Dia. #3 1.7465 - 1.7455
Rear Flange Bearing
Thickness..... .0926 - .09290
*Wear Limits, Min. Thickness... .0921
Clearance Limits..... .0005 - .0026
Desired Clearance..... .0015

*****F135 and F163...Center Flange Brg. Thickness... .0926 - .09290
*Wear Limits, Min. Thk. .0921, Clearance Limits .0005 - .0026 Desired Clearance .0015

STEP 3. Remove air valve spring, and the air valve and diaphragm assembly.

N O T E

The cup portion of the air valve contains a cone shaped gas metering valve.

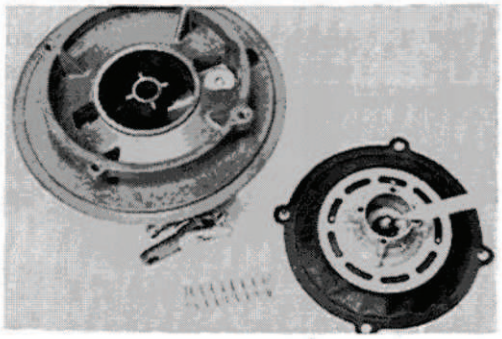


Fig. A1665

STEP 4. Turn carburetor upside down. Scratch a locating mark before removing throttle body and gasket from housing.

N O T E

Do not disassemble throttle body. Levers are pinned to the shaft which rotates in sealed oilite bushings.

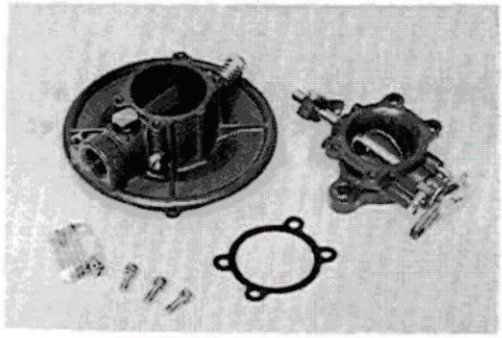


Fig. A1666

STEP 5. Remove idle mixture screw and spring, and the vacuum hose fitting from housing. It is unnecessary to remove housing plugs as passages are not used.

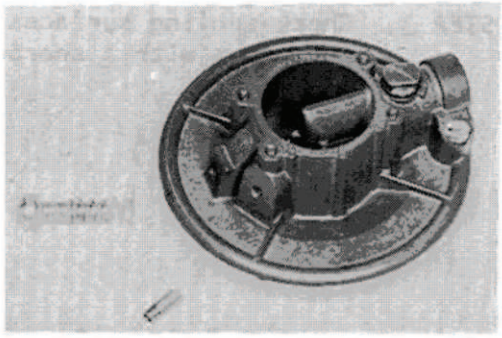


Fig. A1667

CLEANING AND INSPECTION:

Pick up a repair kit and throttle body gasket from your parts department. Discard old parts which will be replaced.

REPAIR KIT INCLUDES:

1. Air valve and diaphragm assembly complete.

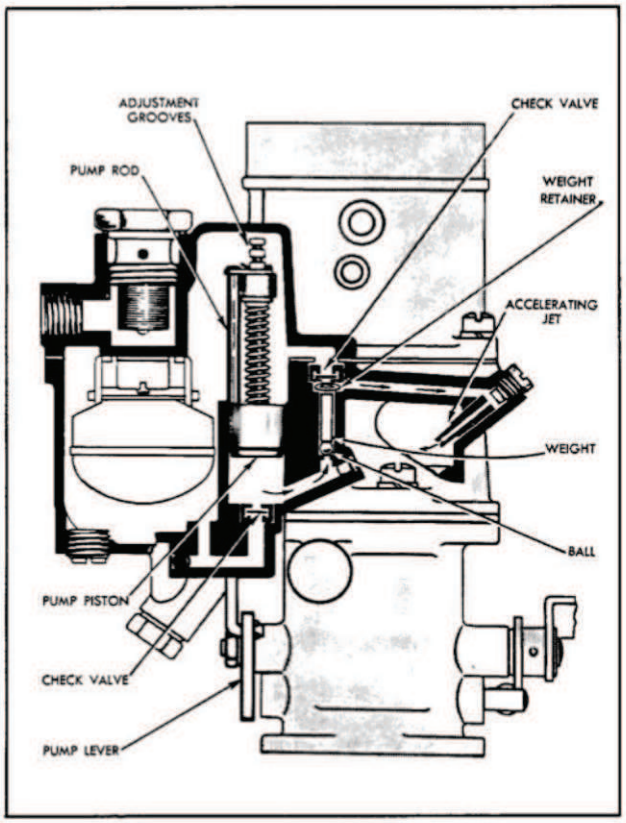


Plate 3350. Accelerating Pump System

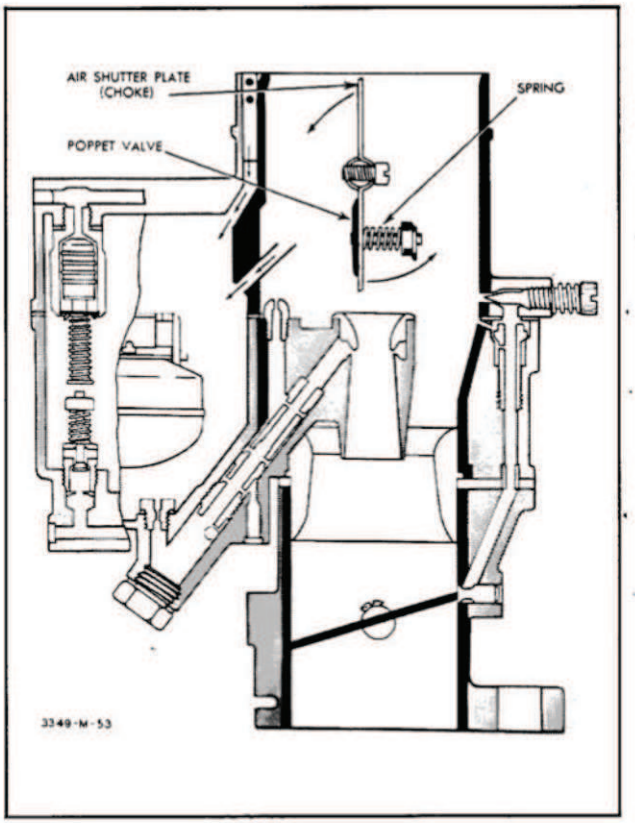


Plate 3349. Choke System

adjusting the stroke of the pump assembly. Such adjustment is made possible by three adjustment grooves located on the upper end of the pump rod. The pump is assembled with a hair pin cotter at this point. When the cotterpin is placed in the bottom groove, it allows a full stroke of the pump piston in the pump cylinder. When the cotterpin is placed in the center groove it allows a three-quarter stroke; and when placed in the top groove, a half stroke of the pump. The full stroke pump gives the larger volume of gasoline.

A spring is used between the pump piston and the pump rod to offset any pressure built up on the down stroke of the piston. The pump piston contacts the fuel in an enclosed cylinder and since fuel is a liquid and non-compressable, some relief of the back pressure against the pump piston and pump rod must be provided; otherwise, a bent pump rod, linkage, or lever would result.

The check valve, located in the bottom of the pump cylinder, supplies the fuel to the accelerating system. Any pressure from the pump piston will cause the small disc to seat in the valve and prevent fuel flowing back to the fuel bowl. The refill check which is made up of a ball, a weight, and a retainer washer, is to facilitate instant filling of the pump well when the throttle is closed and the piston is raised in the pump cylinder. The final check valve is to provide a break in the accelerating channel to admit air after the pump charge is dissipated. This avoids syphoning action through the accelerating system.

The accelerating jet meters fuel directly into the main air stream of the carburetor. The calibration in the accelerating jet controls the rate of flow and not the amount of fuel delivered.

CHOKE SYSTEM

The choke system consists of a choke shaft, choke lever, and a choke plate in the intake of the carburetor.

A choke is required for starting cold engines. Gasoline, the same as all fluids, has a definite boiling or vaporization point. The manifold on a cold engine will vaporize only a small fraction of the total quantity of gasoline in the normal input volume in standard fuel-air ratio. It is necessary, therefore, to introduce a large volume of gasoline so that a sufficient amount of the so-called light ends will vaporize to create a combustible mixture in the cylinders. The choke plate when closed creates an extremely high suction on all

2 SPEED FORWARD AND REVERSE HYDRATORK TRANSMISSION (MODELS H-200 THROUGH H-211)

Whenever the Hydratork transmission is disassembled, the following steps must be carefully followed to insure proper operation of the transmission upon reassembly.

Location of model and part numbers.

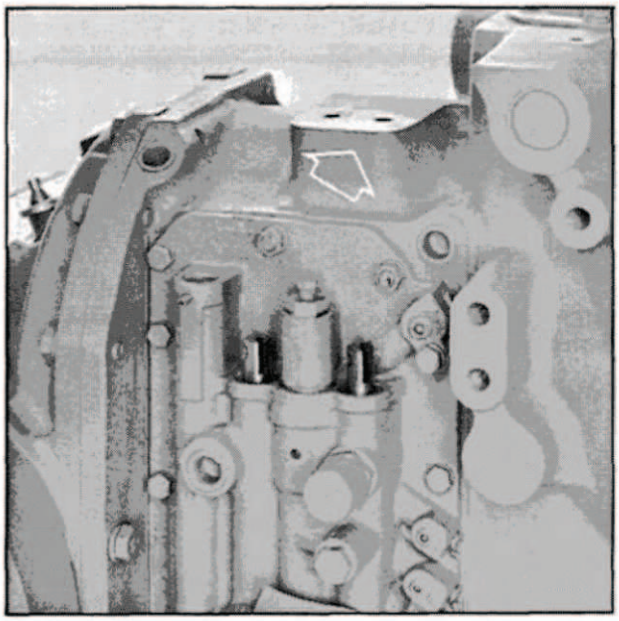
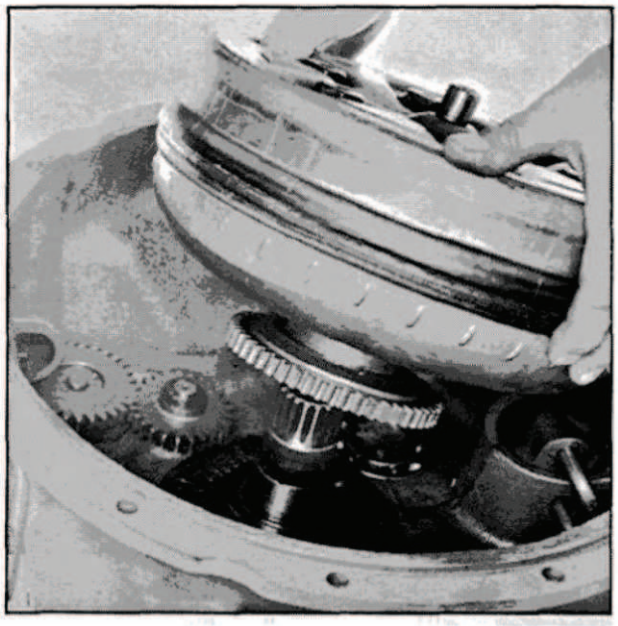


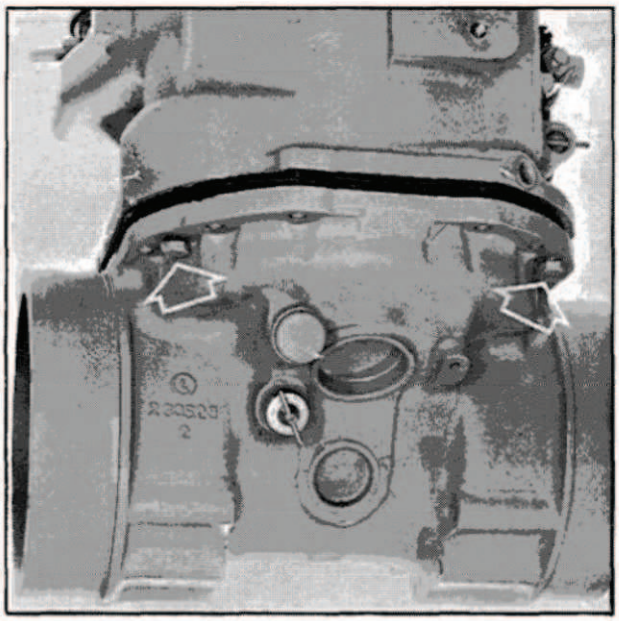
Plate 10220

STEP 1. Remove the torque converter.



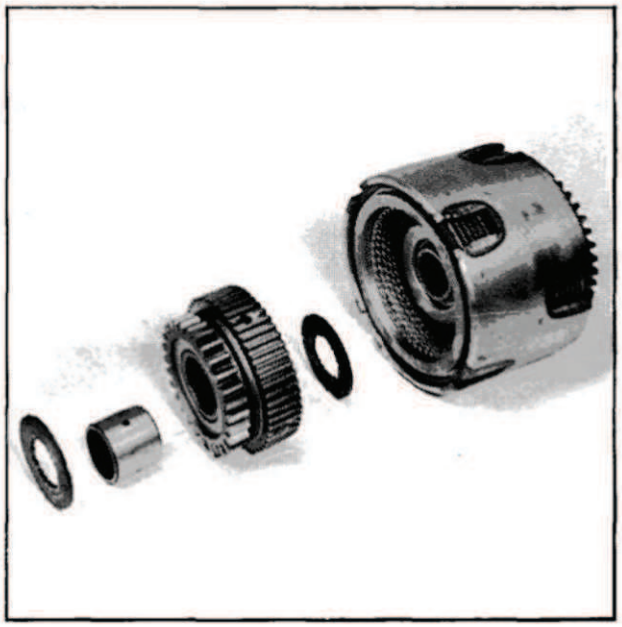
Step 1. Plate 10221

STEP 2. Remove all fasteners from axle adaptor to transmission, and separate adaptor from transmission by use of jackscrews and remove axle adaptor assembly.

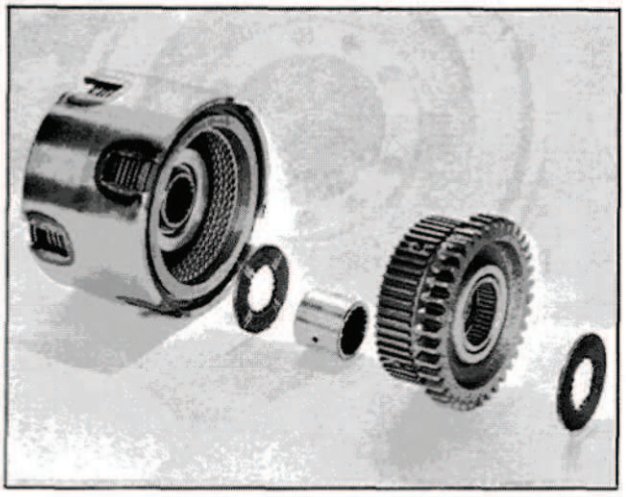


Step 2. Plate 10222

STEP 23. Remove the thrust washers, small gear and inner bearing race from the clutch pack.



Step 23. Plate 8038

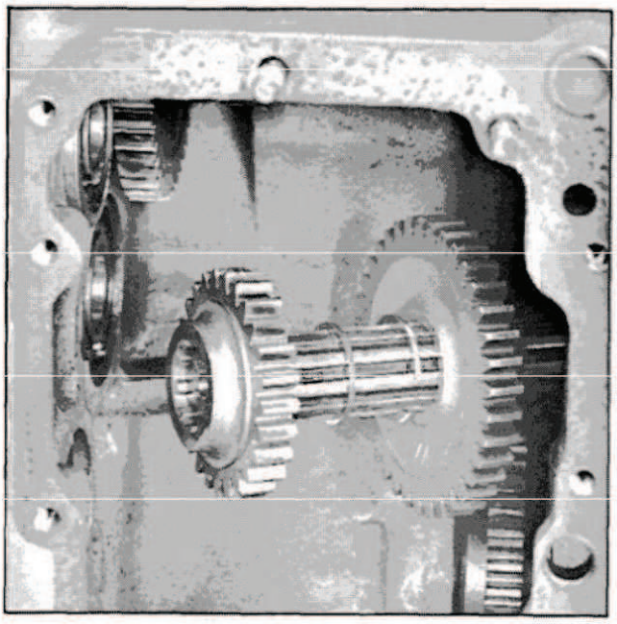


Step 23. Plate 10337

STEP 24. Remove the thrust washers, large gear and inner bearing race from the clutch pack.

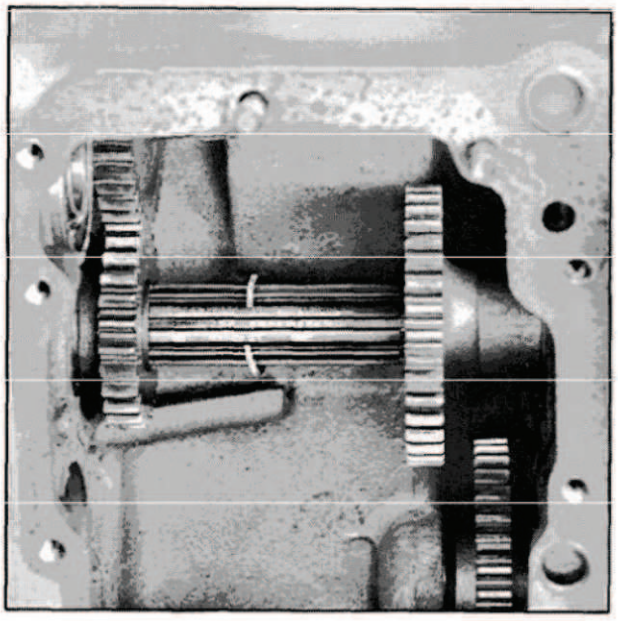
STEP 4. Insert the intermediate shaft from the converter end of the transmission with bearing installed on shaft.

STEP 5. Install on the shaft, the shaft spacer, (making sure the beveled end of spacer is toward the bearing) large intermediate gear, (hub of gear toward converter end) large gear lock ring small gear locking ring. Small intermediate gear, (hub of gear toward axle adaptor end).



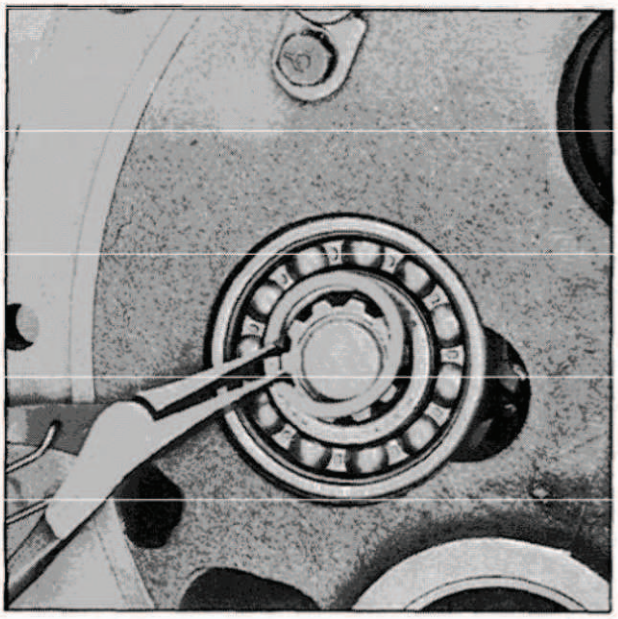
Step 4 - 5. Plate 10241

STEP 6. After the shaft has been installed into the intermediate bearing install the large gear retainer ring into position.



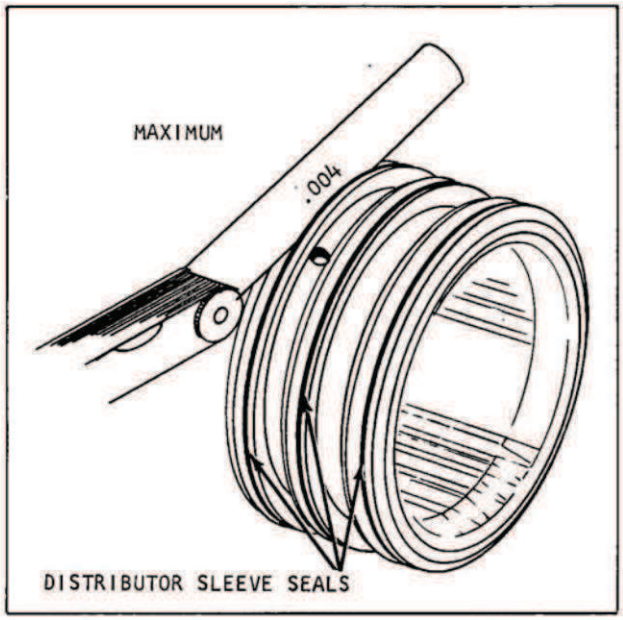
Step 6. Plate 10240

STEP 7. Install the intermediate shaft retainer on the axle adaptor end of the transmission.



Step 7. Plate 10098

STEP 28. Check the oil distributor sleeve seals with a flat type feeler gauge as illustrated. All three seals must not have more than a MAXIMUM of .004 side clearance.

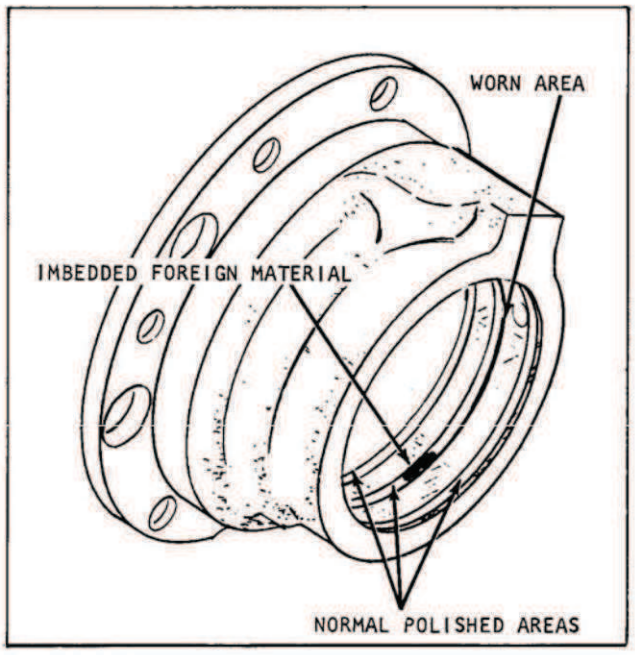


Step 28. Plate 10334

STEP 29. Carefully inspect the oil distributor for ring wear and imbedded foreign material.

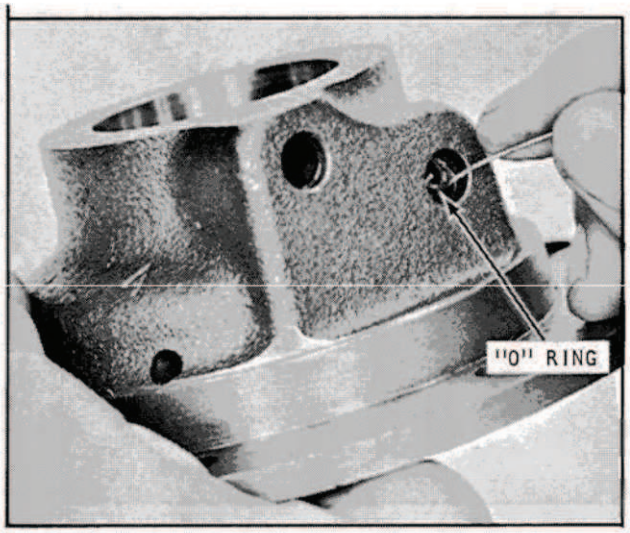
Normal ring wear will show up as a polished surface free of ridges, rough spots, and grooves.

Ridges, rough spots and grooves will require replacement of the distributor and sealing rings.



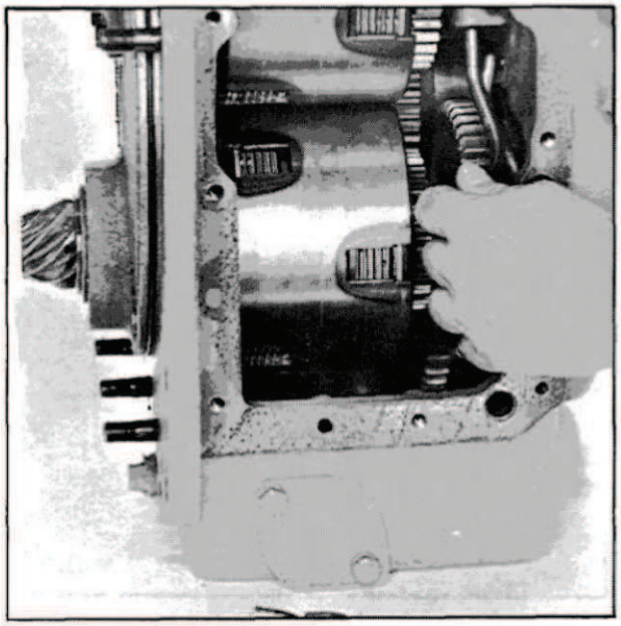
Step 29. Plate 10335

STEP 30. Replace the old "O" ring seals in the oil distributor. Make sure seals are well seated in the grooves.



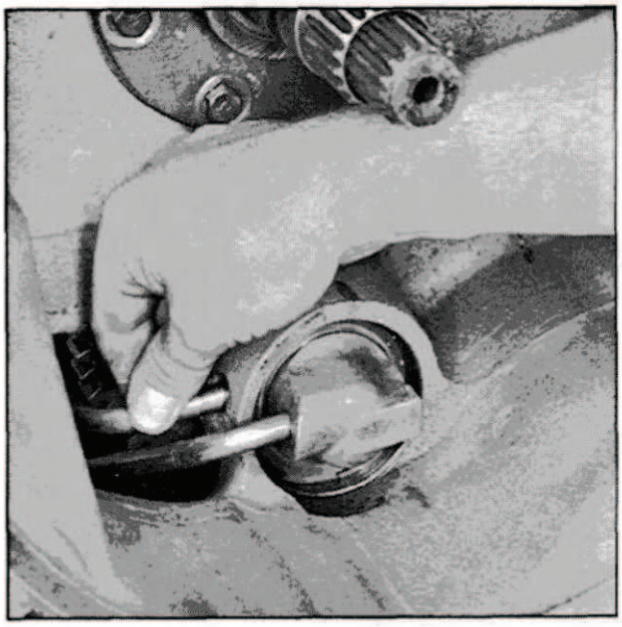
Step 30. Plate 10376

STEP 57. Install forward and reverse oil tubes into oil distributor. Be careful not to damage the seals in the distributor when installing tubes.



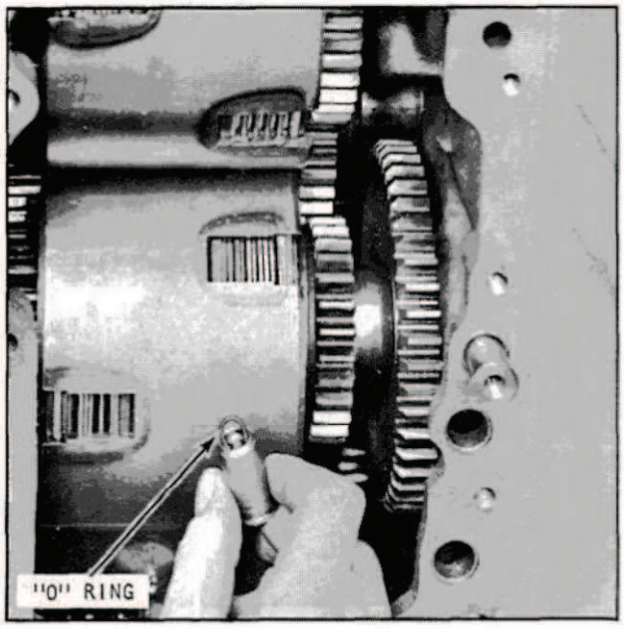
Step 57. Plate 10228

STEP 58. Install high and iow oil tubes into the oil distributor being careful not to damage the oil seals.



Step 58. Plate 10227

STEP 59. Install new seals into the oil tube sleeves and install on oil tubes being careful not to damage seals.



Step 59. Plate 10372

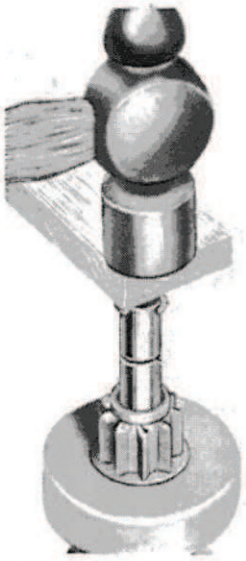


Figure 8—Forcing snap ring over shaft.

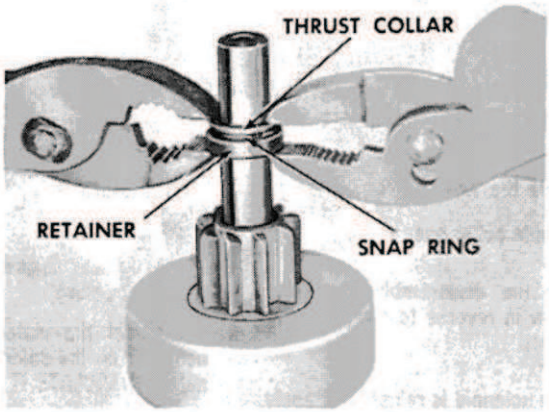


Figure 9—Forcing retainer over snap ring.

pile between the battery and "M" terminal as shown in dashed red lines instead of across the battery as shown in solid red lines. If not needed, connect a jumper directly from the battery to the "M" terminal as shown in dashed red lines. CAUTION: To prevent overheating, do not leave the pull-in winding energized more than 15 seconds. The current draw will decrease as the winding temperature increases.

The purpose of the "R" terminal is to short out the ignition resistor during cranking, and thereby provide higher ignition coil output. (Fig. 7)

REASSEMBLY

1. Place the clutch assembly on the armature shaft. To facilitate replacing the snap ring and retainer onto the armature:
   a. Place the retainer on the armature shaft with the cupped surface facing the snap ring groove.
   b. Place the snap ring on the end of the shaft. With a piece of wood on top of it, force the ring over the shaft with a light hammer blow (Fig. 8), then slide the ring down into the groove.
   c. To force the retainer over the snap ring, place a suitable washer over

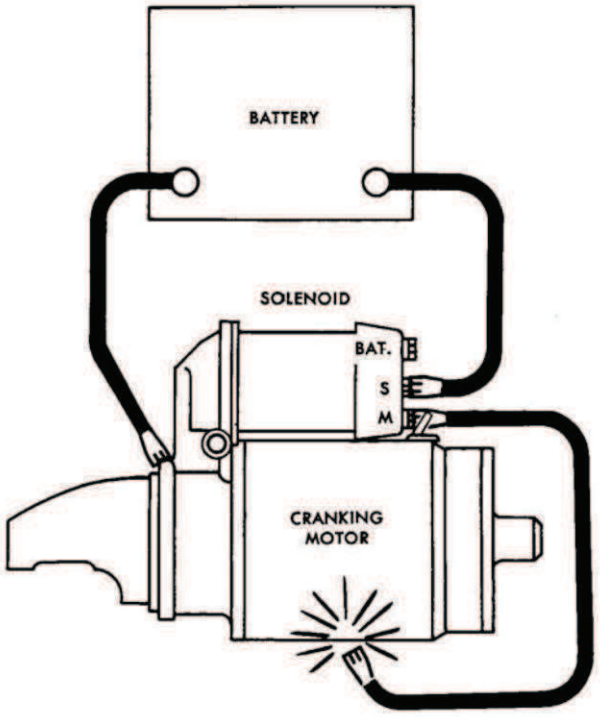


Figure 10—Circuit for checking pinion clearance.

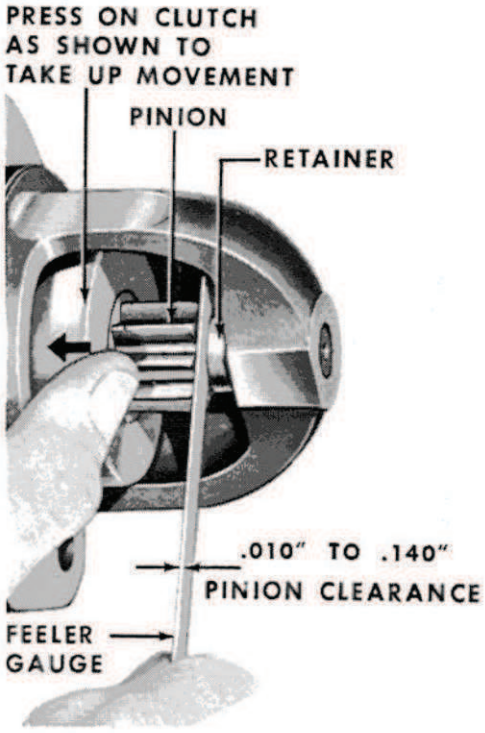


Figure 11—Checking pinion clearance.

If the inserts inside the cap are excessively burned, the cap should be replaced. However, the vertical face of the insert will show some evidence of burning through normal operation. The inserts should also be checked for evidence of mechanical interference with the rotor tip.

The carbon brush and the spring in the center of the cap should be checked to ascertain that the brush moves freely in the cap and that the spring is not burned or corroded. Be sure that the graphite tip is intact on the brush. The brush and spring should be replaced if needed.

3. The rotor should be visually inspected for cracks, evidence of burning on the top of the metal strip or evidence of mechanical interference with the cap. If any of the above conditions are found, the rotor should be replaced. Some burning is normal on the end of the metal strip. This should never be filed.

4. Contacts may be inspected with the distributor on the engine to determine if replacement is needed. A small dental type mirror is helpful in making this check. Some pitting of one contact with a corresponding buildup on the opposite contact is normal after the contacts have been in service. If the contacts show a frosty gray color and the pitting is not severe, they should not be disturbed. Never attempt to file or clean used contacts. However, if the contacts are burned black or blue black or if pitting is excessive, the distributor should be removed from the engine for replacement of the contacts and further checking.

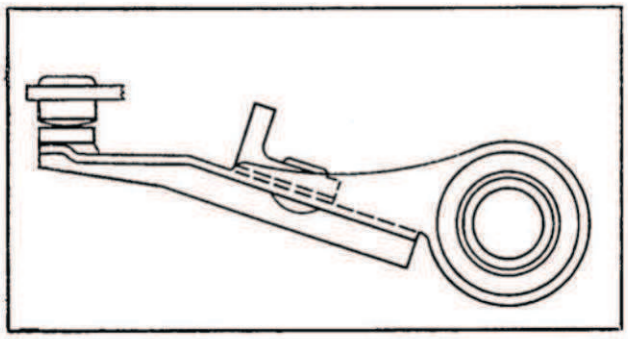


Fig. 16989
Contact Point Alignment

When removing the distributor from the engine the position of the distributor base in relation to the engine block should be marked and the position of the rotor noted to simplify reinstallation.

While it is possible in most cases to install contacts with distributor on engine, this practice is not recommended. Removal of distributor is a simple operation and not only makes the unit more accessible for service but also provides an opportunity to clean other parts and check them for wear, distortion and malfunction.

5. The condenser should be removed and checked on a reliable condenser tester for series resistance, leakage and capacity. If proper readings are not obtained the condenser should be replaced.

6. The cam should be wiped clean and inspected for excessive wear or scoring and breaker plate should be wiped clean and checked for binding and distortion before reinstalling contacts and condensers.

7. When installing new contacts be sure the contact surfaces are properly aligned (Fig. 16989).

Auto. Curve No.	Zero Advance RPM	Intermediate Advance Adv.°	RPM	Adv.°	RPM	Adv.°	RPM	Full Advance Adv.°	RPM
1555	400	1	470	6	820	8	1450	9	1750
1556	375	1	430	6	720	10	1300	11.5	1800
1557	400	1	480	6	970	9	1700	11.5	2300
1558	450	1	560	3	790	7	1800	9	2300
1559	350	1	450	2.5	600	4	1200	6	2000
1562	275	1	290	5	360	8	410	10	440
1567	400	1	420	7	550	12	1800	13.5	2200
1568	400	1	460	6	790	10	1570	11.5	2200
1569	400	1	465	6.5	820	10	2000	11.5	2500
1572	400	1	470	5	750	8	1900	9	2200
1573	400	1	465	7	850	13	1950	14	2200
1578	350	1	375	6	490	11	600	12	625
1579	200	1	250	8	790	13	1050	15	1200
1581	400	1	470	8	950	11	1700	13	2200
1585	400	1	450	6	700	8	1430	9	1800
1587	425	1	450	9	630	14	1080	16.25	2000
1588	400	1	490	4	750	7	2000	8	2400
1591	500	1	545	4.5	700	7	1140	8.5	1400
1592	425	1	460	8	690	14	1600	16.5	2300
1593	1200	1	1285	3	1460	6	1720	7.5	1850
1594	420	1	460	7	720	12	1770	13.5	2300
1600	370	1	435	8	890	13	1700	16	2200
1602	420	1	490	8	970	11	1550	14	2200
1604	400	1	470	7	900	12	1255	14	1400
1605	275	1	330	9	770	12	1630	14	2200
1606	525	1	545	10	740	14	1370	15	1550
1608	400	1	435	5.5	600	8	1600	9.5	2200
1609	400	1	425	9	600	14	1700	15.5	2250
1612	500	1	540	6	720	12.0	945	13.5	1000
1615	425	1	450	10	625	12	1000	15	2300
1617	425	1	450	10.5	725	12	1280	14	2000
1618	400	1	440	8	725	10	1450	11.5	2000
1622	300	1	330	4	500	10	1260	13.5	1700
1623	400	1	460	4	650	10	1400	13	2100
1631	450	1	470	12	700	16	1900	18	2500
1632	450	1	475	12.5	750	16	1850	18	2500
1635	400	1	430	10	700	14	1300	16	1750
1638	335	1	350	13	625	16	1300	20	2200
1639	450	1	480	7	640	10	725	13	1800
1642	400	1	450	6	700	9	1650	11.5	2400
1664	400	1	430	8.5	650	14.5	1700	19	2350
1671	575	1	590	7	700	12.5	800	15	2400
1672	575	1	600	10	800	12	1900	13	2400
1676	200	1	225	6	350	12	920	14	1200
1677	200	1	260	7	670	12	1000	15	1200

DISASSEMBLY: (Refer to Fig. 12-225 on Page 2)

1. Thoroughly clean the outside of the generator assembly with clean dry compressed air and place the assembly on a clean flat work surface. Scribe a line across both end frames (12.230 and 12.205) for use on re-assembling the generator.

Fig. 18214

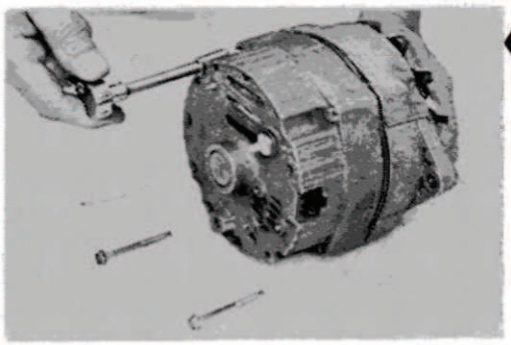


Fig. 18218

2. Loosen and remove four (4) end frame thru bolts (12.285).

3. Use screw-driver at stator slot to pry two end frames apart.

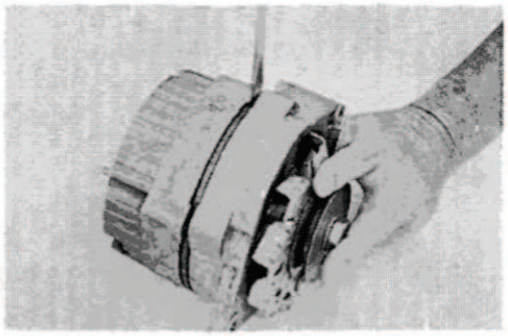


Fig. 18236

4. Place a piece of pressure sensitive tape over the slip ring end frame bearing (12.228) to prevent entry of dirt or other foreign material.

C A U T I O N

MAKE SURE YOU USE ONLY THE PRESSURE SENSITIVE TYPE TAPE - NOT FRICTION TAPE, AS IT MAY LEAVE GUMMY DEPOSITES ON THE BEARING.

Fig. 18222

5. Place a piece of pressure sensitive tape around the slip ring end of the rotor shaft to prevent scratching or marring the bearing surface.

C A U T I O N

MAKE SURE YOU USE ONLY THE PRESSURE SENSITIVE TYPE TAPE - NOT FRICTION TAPE AS IT MAY LEAVE GUMMY DEPOSITS ON THE SHAFT BEARING SURFACE.

Fig. 18212

If the voltage is uncontrolled with speed and increases above 15.5 volts on a 12-volt system, or 31 volts on a 24-volt system, check for grounded brush lead clip as covered in Trouble Shooting Section under the heading, "Overcharge energizer".

Step 3. If not grounded, replace the regulator and check field winging.

N O T E

The energizer or battery must be fully charged when making this check.

Step 4. If voltage is below 15.5 volts on a 12-volt system, or 31 volts on a 24-volt system, connect the carbon pile (as shown in Fig. 12344).

Step 5. Operate the generator at moderate speed as required and adjust the carbon pile as required to obtain maximum current output.

Step 6. If output is within 10 percent of rated output, as stamped on generator frame, generator is good.

Step 7. If output is not within 10 percent of rated output, keep energizer or battery loaded with carbon pile and ground the generator field (as shown in Fig. 12348*).

Step 8. Operate the generator at moderate speed as required and adjust the carbon pile as required to obtain maximum current output.

Step 9. If output is within 10 percent of the rated output as stamped on generator frame, replace regulator.

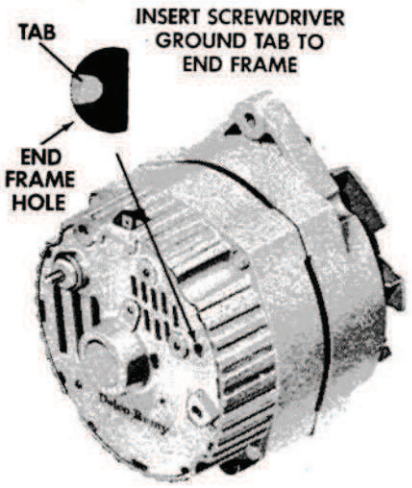


Fig. 12348

Step 10. If output is not within 10 percent of rated output, check the field winding, diode trio, rectifier bridge and stator as previously covered.

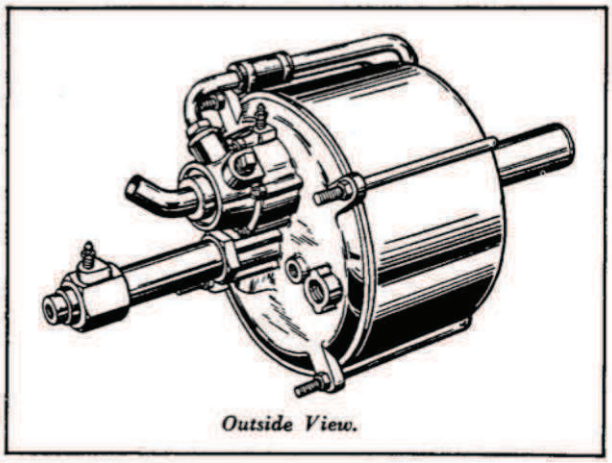
*C A U T I O N

TAB IS WITHIN 3/4 INCH OR 19 mm OF CASTING SURFACE. DO NOT FORCE SCREW DRIVER DEEPER THAN 1 INCH OR 25.4 mm INTO END FRAME.

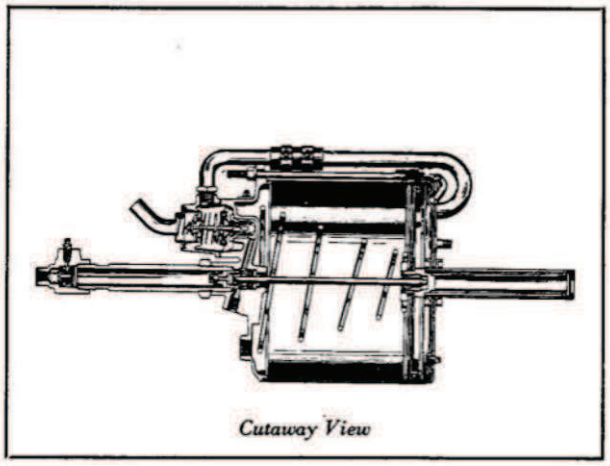
MODEL "C" GUIDED PISTON TYPE HYDROVACS

DESCRIPTION

The guided piston type of Hydrovac differs from the other Model "C" single piston Hydrovac in that a separate guide rod guides the vacuum piston throughout its stroke. A self-aligning push rod replaces the rigidly mounted type of push rod used on all other single piston Model "C" Hydrovacs. Illustrated below are two views of the guided piston type of Hydrovac, showing the external as well as internal construction.



Outside View.



Cutaway View

BENCH OVERHAUL

The following service instructions cover the disassembly and reassembly of the guided piston type Hydrovac. Use care in the handling of hydraulic system parts to prevent their coming into contact with mineral oil or greases. DO NOT HANDLE HYDRAULIC CUPS AND SEALS WITH GREASY HANDS.

DISASSEMBLY

The step by step disassembly of the guided piston type Hydrovac has been omitted because of the similarity in the disassembly of the guided piston type and the single piston type Hydrovacs. For your guidance in the disassembly of the guided piston type, refer to the disassembly operations for the single piston type, pages 2 and 3.

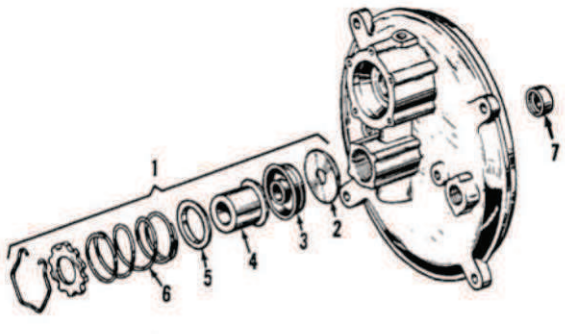
CLEANING AND INSPECTION

Thoroughly clean all metal parts in a parts cleaner such as; Bendix Metalclene. After cleaning, wash all hydraulic system parts in clean alcohol before assembly. Inspect all parts for excessive wear or damage, replace worn or damaged parts. If vacuum cylinder bore is corroded or rusted, polish with fine emery cloth or steel wool. Replace when badly pitted or scored.

Inspect control valve poppets and seat. If poppets are damaged but seat is not damaged, use poppet replacement kit. When seat is damaged replace control valve body. Always use a Hydrovac Repair Kit when overhauling a Hydrovac.

ASSEMBLY

1 Press push-rod leather seal into end plate with lip of leather seal toward hydraulic cylinder side of end plate. Assemble push-rod hydraulic seal parts (1) as illustrated: stop washer (2) with chamfered side as shown; seal cup (3) with lip of cup as shown; seal retainer (4) with shoulder end next to cup; expander washer (5), with beveled side next to cup. Place stop washer against retainer spring (6) and assemble snap ring in groove.



1 *Assembly of Stationary Seal Parts.*

GROUP 23

SECTION 11

DISC TYPE WHEEL BRAKES -- EARLY AND LATE DESIGN

TROUBLE SHOOTING MANUAL STEERING GEAR

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
Steering wanders	1. Lack of lubrication in linkage and king pins.	1. Lubricate. Free up any components which are frozen and will not take lubrication.
	2. Steering gear requires readjustment of preloads.	2. Adjust steering gear preloads to SPECIFICATIONS.
	3. Tires badly worn or improperly inflated.	3. Install new tires or inflate properly.
	4. Steering components worn and loose, or out of adjustment.	4. Replace or adjust loose or worn parts, as necessary.
	5. Steering system out of alignment.	5. Align steering completely and inspect spring components for wear or damage.
Snapping or chucking in steering column or wheel	1. Steering gear incorrectly adjusted.	1. Adjust steering gear to SPECIFICATIONS.
	2. Steering gear loose at frame.	2. Tighten mounting bracket.
	3. Worn steering linkage components.	3. Adjust, repair or replace.
Steering pulls to left or right	1. One solid tire worn or damaged, or one pneumatic tire improperly inflated; steering will pull to low side.	1. Replace, repair or inflate tires properly, on drive axle as well as steer axle.
	2. Left or right drive unit damaged or malfunctioning.	2. Examine and check both motors and drive units.
	3. Malfunction in SCR control panel or contactor panel.	3. Inspect and test both drive motor circuits.

After making sure there is some lash between the ball nut and sector teeth, assemble and tighten the side cover bolts 20 to 25 lb. ft. or 28 to 34 N·m torque.

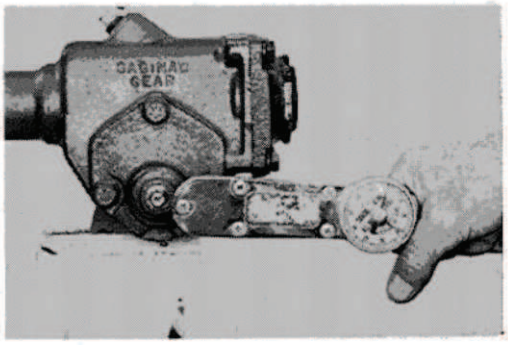


Fig. 18476

With lash adjuster backed off, turn the adjuster plug clockwise until all end play has been removed, then tighten the lock nut.

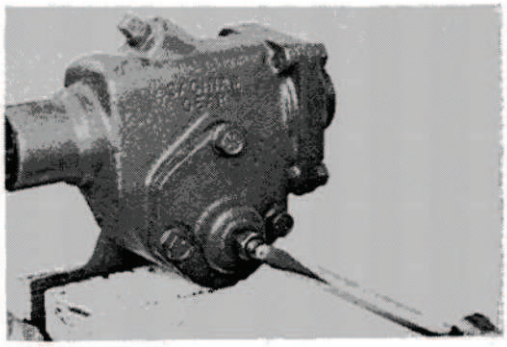


Fig. 18493

Measure amount of torque required to keep shaft in motion. Adjust bearing cup and adjuster plug until proper preload of 16 lb. in. or 71 N is obtained. Torque cup and adjuster plug lock nut 50 to 100 lb. ft. or 68 to 135 N·m.

Recheck worm thrust bearing preload adjustment after locknut is tightened. Readjust if necessary.

Return steering gear to center position. Turn lash adjuster screw clockwise to remove all lash between ball nut and sector teeth. Tighten lock nut.

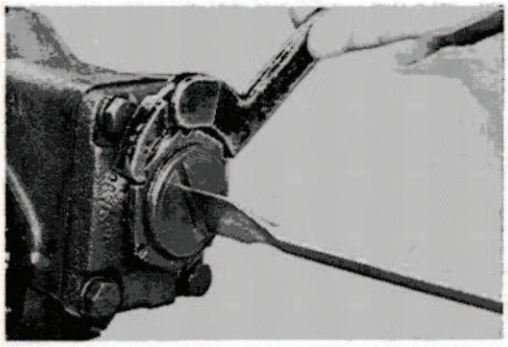


Fig. 18498

Using a 12-point socket on splined end of shaft and a pound inch torque wrench, observe highest reading while gear is turned through center position. Adjust lash adjuster to obtain preload adjustment of 10 lb. in. or 44 N, in excess of worm thrust bearing preload, but not to exceed 30 lb. in. or 133 N.

Tighten lash locknut 20 to 25 lb. ft. or 28 to 34 N·m torque.

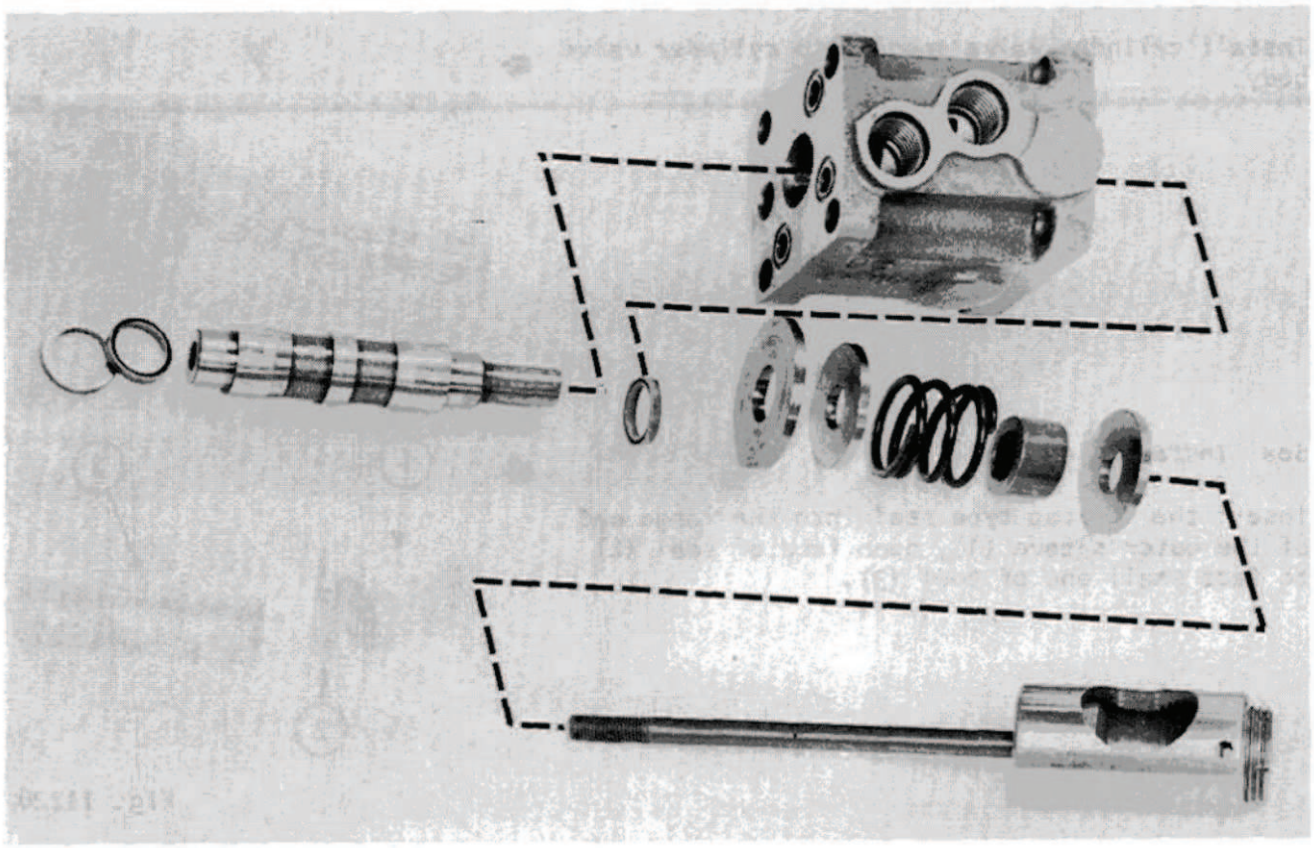


Fig. 18176
Disassembled View of Cylinder Valve Spool Assembly

Clean all parts in a Stoddard type cleaning solvent. Assembly must be free of all dirt and foreign material.

Carefully inspect parts to insure serviceability. Special attention must be given to the valve spool and spool area of the valve body. The parts must be free of nicks, scratches and high spots or any conditions that will hamper the operation of the valve.

Use only new seals and "O" rings.

Install new seal on check valve. Install check valve ball into check valve orifice of control valve body. Install check valve into control valve body.

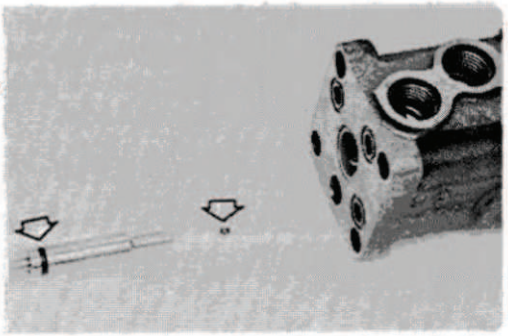


Fig. 18162

DESCRIPTION AND PRINCIPLES:

These gear type pumps consist of two intermeshing hardened and precision ground gear assemblies which are lapped and enclosed in a three section housing assembly consisting of a die cast aluminum front cover, an intermediate (center) section made of high yield extruded aluminum and a back cover assembly. Passages within this housing connect the intermeshing gears with the pump inlet and outlet ports.

Each gear assembly is press fitted on a separate precision ground and lapped shaft. Retaining rings are installed in grooves in these shafts to insure that gears will not move axially along the shaft.

The drive shaft is keyed to the gear to provide positive drive and extends thru the front cover to permit coupling the pump to an external driving means.

A double lip shaft seal is provided in the front cover to prevent external leakage of fluid and the seal lip in contact with the fluid is spring loaded. Vent passages within the housing and driven shaft transmit pump inlet pressures to the shaft seal area to insure lowest possible pressures at the seal to extend seal service life.

A phenolic shield, a paper composition gasket and a molded rubber seal form compartments behind a steel backed bronze wear plate. These compartments are vented to either pump inlet or discharge pressures. Discharge pressure within these compartments axially loads and deflects the wear plate toward the gear faces to take up gear end clearances. This increases pump efficiency by reducing internal leakage.

Pump rotation is dependent on proper orientation of the heat shield, the gasket and the seal in the front cover with respect to the pump center section and back cover. Opposite pump rotation may be achieved by rotating the heat shield, the gasket, the seal, the wear plate, the center section and the back cover 180 degrees.

Pumping action is achieved by connecting the pump inlet port to an oil supply, the outlet port to a discharge line and rotating the pump drive shaft in a direction which causes the gear teeth to rotate away from the pump inlet port. Rotation causes the volume at the gear mesh to increase on the inlet side and decrease on the pressure side. This creates a suction at the pump inlet port to allow filling of the gear tooth spaces by the pressure acting on the fluid in the inlet line.

29.000

N O T E

Always thoroughly clean unit to be disassembled with a non-corrosive stoddard type cleaning solvent which will not effect rubber components.

C A U T I O N

CLEAN WORKING AREAS ARE AN ABSOLUTE MUST WHEN DISASSEMBLING, REPAIRING OR REASSEMBLING HYDRAULIC COMPONENTS OF ANY TYPE.

BREAK-IN:

1. Install pump and connect to sump, after putting in some clean oil in pump.

2. Run pump at 1800 RPM (if possible) or with available electric motor speed between 1000-2500 RPM.

3. Put a load on pump in 500 PSI steps (to a maximum pressure of 250 PSI over the application pressure in SPECIFICATIONS). Cycle three (3) seconds "on" load and two (2) seconds "off", a minimum of five times at each pressure level.

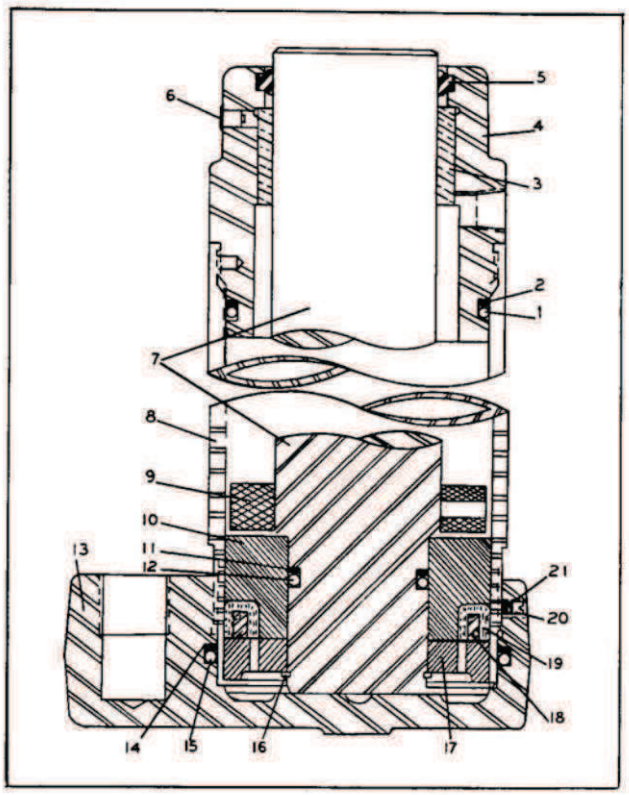


Fig. 5970. Lift Cylinder (Hi-Lo)

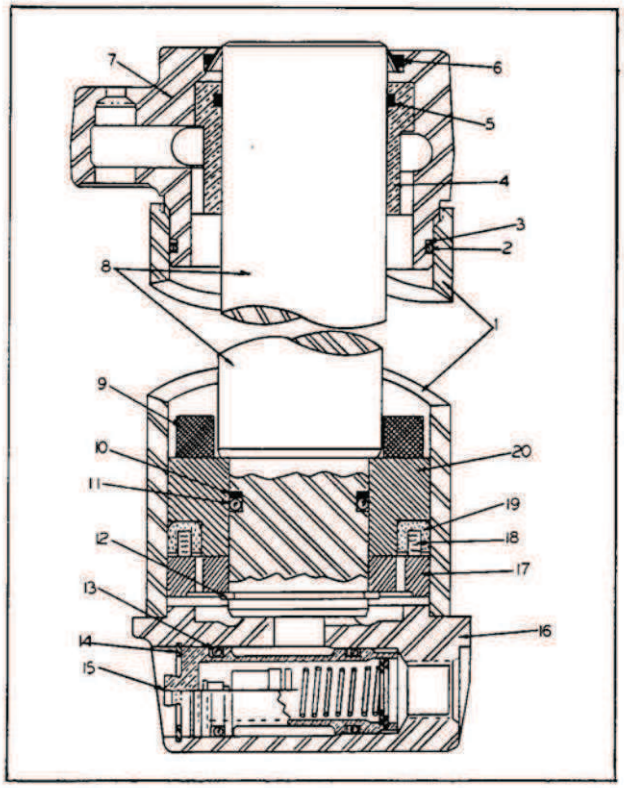


Fig. 5971. Lift Cylinder (Hi-Lo)

(1) Cap O-ring
(2) Cap Back-up Ring
(3) Bronze Bushing (Need not be removed except in case of replacement for wear or damage)
(4) Cylinder Cap
(5) Piston Rod Wiper
(6) Cylinder Grease Fitting (Grease at time of assembly with Grease Clark Specifications MS-9)
(7) Piston Rod
(8) Cylinder Tube
(9) Spacer (when used)
(10) Piston
(11) Back-up Ring, Piston Rod
(12) O-ring, Piston Rod
(13) Cylinder Base
(14) Back-up Ring, Cylinder Base
(15) O-ring, Cylinder Base
(16) Snap Ring, Piston Rod
(17) Piston Follower
(18) Filler Ring
(19) U-cup
(20) Setscrew, Cylinder Base
(21) Plug, Cylinder Base Setscrew

(1) Cylinder Tube
(2) O-ring, Cylinder Cap
(3) Back-up Ring, Cylinder Cap
(4) Bronze Bushing (need not be removed except in case of replacement for wear or damage)
(5) O-ring "inner", Cylinder Cap
(6) Seal Guard Kit
(7) Cylinder Cap
(8) Piston Rod
(9) Spacer (when used)
(10) Back-up Ring, Piston Rod
(11) O-ring, Piston Rod
(12) Snap Ring, Piston Rod
(13) O-ring, Flow Regulator Assy
(14) Snap Ring, Flow Regulator Assy
(15) Flow Regulator Assy
(16) Cylinder Base (welded assy)
(17) Piston Follower
(18) Filler Ring
(19) U-cup
(20) Piston

34.400

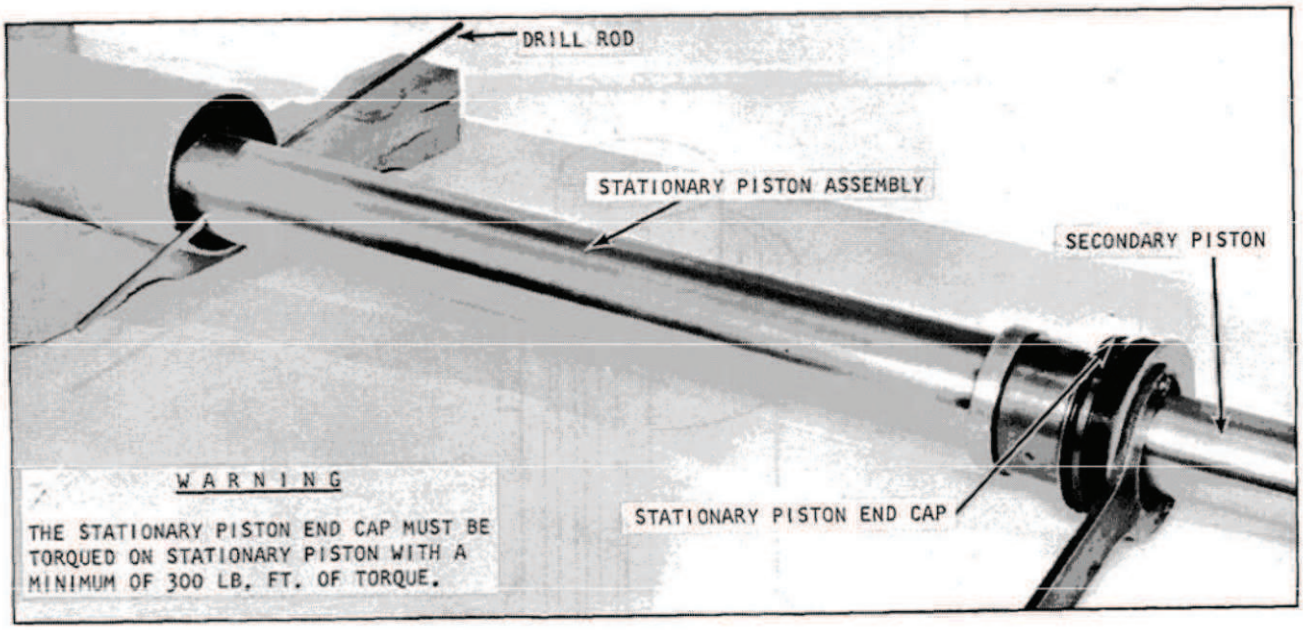


Fig. 9547 Stationary Piston End Cap

STEP 5. Remove stationary piston cap from stationary piston by pulling secondary piston out until drill rod will go through oil flow hole in stationary piston and use spanner wrench as shown.

34.400

1	CYLINDER ASSEMBLY, LIFT	34.400
2	WIPER, LIFT CYLINDER INNER PISTON ROD	34.479
3	NUT, LIFT CYLINDER INNER ROD GLAND	34.496
4	PACKING, LIFT CYLINDER INNER ROD	34.477
5	NUT, SECONDARY PISTON ROD GLAND	34.527
6	WIPER, SECONDARY PISTON ROD	34.528
7	ADAPTOR, INNER ROD MALE PACKING	34.495
8	SPRING, INNER PISTON ROD PACKING*	34.511
9	RING - BACKUP, GLAND CAP SEAL OUTER	34.514
10	SEAL, GLAND CAP (OUTER)	34.497
11	SEAT, INNER PISTON ROD PACKING SPRING*	34.476
12	PACKING, SECONDARY PISTON ROD	34.529
13	ADAPTOR, SECONDARY ROD MALE PACKING	34.530
14	SPRING, SECONDARY ROD PACKING *	34.531
15	SEAT, SECONDARY ROD PACKING SPRING*	34.532
16	SPACER, PRIMARY PISTON ROD	34.492
17	SPACER, INNER PISTON ROD	34.466
18	SPACER, SECONDARY PISTON ROD	34.525
19	CAP, LIFT CYLINDER GLAND	34.478
20	FASTENER, LIFT CYLINDER STATIONARY TUBE	34.513
21	ROD, LIFT CYLINDER PISTON INNER	34.475
22	ROD, LIFT CYLINDER SECONDARY PISTON	34.526
23	TUBE, LIFT CYLINDER STATIONARY	34.515
24	ROD, LIFT CYLINDER PRIMARY PISTON	34.491
25	CYLINDER WELDED ASSEMBLY, LIFT	34.401
26	BLEEDER, LIFT CYLINDER	34.493
27	ADAPTOR, PRIMARY ROD PACKING MALE	34.499
28	PACKING, LIFT CYLINDER PRIMARY ROD	34.498
29	NUT, LIFT CYLINDER PRIMARY ROD GLAND	34.501
30	BEARING, STATIONARY TUBE *	34.521
31	SPRING, STATIONARY TUBE PACKING *	34.520
32	WIPER, PRIMARY PISTON ROD	34.502
33	ADAPTOR, STATIONARY TUBE PACKING MALE	34.519
34	RING, SHEAVE CARRIER LOCATING	34.512
35	PACKING, STATIONARY TUBE	34.518
36	NUT, STATIONARY TUBE PACKING GLAND	34.516
37	WIPER, STATIONARY TUBE GLAND	34.517
38	VALVE ASSEMBLY, LIFT CYL FLOW CONTROL	34.444
39	RING-RETAINING, CYLINDER FLOW VALVE	34.489
40	CAP, CYLINDER SECONDARY ROD END	34.533
41	PELLET, SECONDARY ROD END CAP LOCKING	34.534
42	SEAL, CYLINDER FLOW VALVE	34.456
43	SEAL, CYLINDER FLOW VALVE (SPRING END)	34.488
44	FITTING, LIFT CYLINDER PORT	31.035
45	FITTING, LINE TO LIFT CYLINDER	31.034
46	PELLET, GLAND CAP THREAD LOCKING	34.523
47	FASTENER, LIFT CYLINDER GLAND CAP	34.522
48	BEARING, SECONDARY ROD END CAP	34.536
49	BEARING, INNER PISTON ROD	34.537
50	WEAR RING, LIFT CYL PRIMARY ROD	34.490

34.400

*Notes, Fig. 19364 Callouts

Brass Rings (items 11, 15 & 30) no longer furnished with holes for springs; new design is solid.

Springs (items 8, 14 & 31) no longer furnished.

STEP 5. Install primary piston assembly end, using spanner wrench and drill rod as shown.

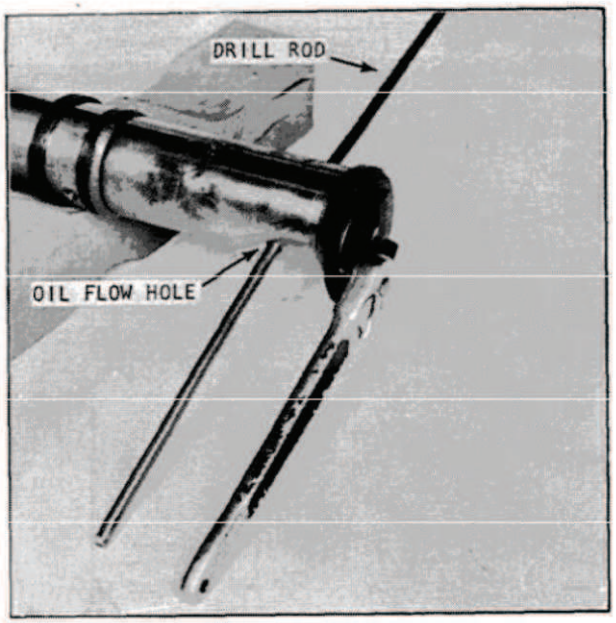


Fig. 9551 Secondary Piston End Cap

34.400