CLARK EQUIPMENT

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

OPERATORS MANUAL

FOR

CF 20-25

1st REVISION

0-147

CLARK EQUIPMENT COMPANY

PUBLISHED BY

TECHNICAL SERVICE DEPARTMENT,
BATTLE CREEK, MICHIGAN, U.S.A.

SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

Powered industrial trucks may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, personnel and procedures should be provided.

Maintenance and inspection of all powered industrial trucks should be performed in conformance with the recommendation in this manual and the following practices.

1. A scheduled preventive maintenance, lubrication, and inspection system should be followed.

2. Only qualified and authorized personnel should be permitted to maintain, repair, adjust, and inspect industrial trucks.

3. Before Leaving The Truck:

   A. Stop truck.

   B. Fully lower the load engaging means.

   C. Place directional controls in neutral.

   D. Apply the parking brake.

   E. Stop the engine or turn off power.

   F. Lock the control or ignition circuit.

   G. Block the wheels if truck is on a ramp, or being worked on.

4. Before Working On Truck:

   A. Raise wheels free of floor or disconnect power source.

   B. Use chocks or other positive truck positioning devices.

   C. Block load engaging means, innermast(s), or chassis before working under them.

   Before working on engine fuel system of gasoline powered trucks with gravity feed fuel systems, be sure fuel shutoff valve is closed.

   Before working on engine fuel system of LP gas powered trucks, close LP gas cylinder valve and run engine until fuel in system is depleted and engine stops running.

   Operation to check performance of the truck or attachments should be conducted in an authorized, safe clearance area.

5. Before Starting To Operate The Truck:

   A. Be in operating position.

   B. Depress clutch (or brake pedal on automatic transmission and electric trucks).

   C. Place directional controls in neutral.

   D. Start engine or turn on power.

   E. Before operating truck, check functioning of lift and tilt systems, directional and speed controls, steering, warning devices, brakes, and any attachment. (If used)

   F. Release parking brake.

- continued -

SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

6. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level, or for leakage, of fuel, electrolyte or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.

7. Properly ventilate work area, vent exhaust fumes and keep shop clean and floor dry.

8. Handle LP gas cylinders with care. Do not drop, dent, or damage in any way.

9. Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, guards and safety devices should be inspected regularly and maintained in a safe operating condition.

10. All parts of lift and tilt mechanisms and frame members should be carefully and regularly inspected and maintained in a safe operating condition.

11. Special trucks or devices designed and approved for hazardous area operation should receive special attention to ensure that maintenance preserves the original, approved safe operating features.

12. Fuel systems should be checked for leaks and condition of parts. Extra special consideration should be given in the case of a leak in the fuel system. Action should be taken to prevent the use of the truck until the leak has been corrected.

13. All hydraulic systems should be regularly inspected and maintained in conformance with good practice. Tilt cylinders, valves, and other similar parts should be checked to assure that "drift" has not developed to the extent that it would create a hazard.

14. Capacity, operation and maintenance instructions plates, tags, or decals should be maintained in legible condition.

15. Batteries, motors, controllers, limit switches, protective devices, electrical conductors and connections should be inspected and maintained in conformance with good practice. Special attention should be paid to the condition of electrical insulation.

16. Industrial trucks should be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

17. Modifications and additions which affect capacity and safe truck operation should not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance instruction plates, tags or decals should be changed accordingly.

18. Care should be taken to assure that all replacement parts are interchangeable with the original parts and of a quality equal to that provided in the original equipment.

INDUSTRIAL TRUCK DIVISION

PLEASE NOTE

INSTRUCTIONS ON USE OF MANUAL

This Operator's Manual is published as a service reference guide and includes Specifications, Operating Instructions, Lubrication and Preventive Maintenance Instructions, and Trouble Shooting Guide.

The TABLE OF CONTENTS for this manual is printed on green paper and is placed at the front for easy reference. A separate INDEX (also printed on green paper) is placed in front of the Lubrication and Preventive Maintenance Section.

Lubrication and Preventive Maintenance Instructions are listed under the TIME INTERVALS that they should be performed.

The TIME INTERVAL is part of the page number and code number.

Example: 8H 002-0; 8H is the TIME INTERVAL (8 operating hours), 002 is the PAGE NUMBER, and -0 is a CODE NUMBER that you as a customer should disregard. The dash number or code number is for the benefit of the publisher only.

The INDEX is set up under the TIME INTERVALS that the Lubrication and Preventive Maintenance should be performed.

Example: (8 Hours)	Time Interval (H=Hours)	&	Page Number (000-)
Hydraulic Sump Tank, level check...	8H		503
Brake Pedal Free Travel, check.....	8H		303

The above states to check the sump tank fluid level every 8 operating hours and refer to page 503 for fluid recommendations etc. Also, to check brake pedal free travel at this interval and turn to page 303 for instructions.

Turn to the eight (8) hour section (8H) and then to the page listed — 503 or 303 etc. The instructions covered therein will pertain only to the checks or adjustments that should be performed at this TIME INTERVAL.

If, for instance, the Brake Pedal Free Travel is incorrect, you would then refer to the INDEX for "Brake Pedal Free Travel, adjust" which would be listed in the TIME INTERVALS following the 8 hour section.

Example: (100 Hours)	Time Interval (H=Hours)	&	Page Number (000-)
Brake Pedal Free Travel, adjust....	100H		302

Turn to the one hundred hour section (100H) and then to

INSTRUCTIONS ON USE OF MANUAL

page 302. Complete instructions as to the importance of pedal free travel, the method to check and adjust for correct free travel with illustrations are included therein.

NOTE

YOU WILL NOTE THAT AT THE BEGINNING OF EVERY SECTION A LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION IS SHOWN GIVING THE LOCATION OF THE COMPONENTS TO BE SERVICED.

It is impossible to cover all types of machine operations in one manual. Operating conditions should determine the lubrication and maintenance intervals. Common sense and a close observance can best determine the frequency with which you should service your machine.

The care you give your machine will greatly determine the satisfaction and service life that you will obtain from it. A difinite maintenance program should be set up and followed. Haphazard maintenance will only lead to faulty performance and short life.

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LUBRICATION AND PREVENTIVE MAINTENANCE

TROUBLE SHOOTING GUIDE

INDUSTRIAL TRUCK DIVISION

ILLUSTRATION OF MACHINE

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS

DISTRIBUTOR (All FOUR and SIX Cylinder Engines)

N O T E

Distributors are equipped with either Standard or Heavy Duty Points. Heavy Duty Points are thicker (have more contact material) than Standard Points.

Heavy Duty Points - All FOUR Cylinder Engines
Set Dwell Angle at.....31° - 34°

Heavy Duty Points - All SIX Cylinder Engines
Set Dwell Angle at.....22° - 26°

Heavy Duty Points

When connecting leads, terminals must be back to back (flat sides together). Push into slot between insulator and spring. (DO NOT push lever spring.) Then push other terminal in place between first terminal and insulator. See following illustration.

WHEN CONNECTING LEADS, THE TERMINALS MUST BE BACK TO BACK (flat sides together).....

- FOUR (4) CYLINDER ENGINES, ONLY -

Point Opening (in.)	Dwell Angle (deg.)	Centrifugal Advance							
		START		INTERMEDIATE		INTERMEDIATE		MAXIMUM	
		Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.
.022*	31-34	600	1-5	800	6-10	1600	11-15	2200	15-19
.021**	31-34	600	1-5	800	6-10	1600	11-15	2200	15-19

- SIX (6) CYLINDER ENGINES, ONLY -

Point Opening (in.)	Dwell Angle (deg.)	Centrifugal Advance							
		START		INTERMEDIATE		INTERMEDIATE		MAXIMUM	
		Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.
.020*	28-32	600	1-5	800	6-10	1600	11-15	2200	15-19
.021**	22-26	600	1-5	800	6-10	1600	11-15	2200	15-19

N O T E

Time engine with timing light and tachometer at 400 engine RPM or below to the above specifications. The initial advance RPM range is 430 - 580. Distributor advance at 600 engine RPM should be 1° to 5°. Distributor rotation (as viewed from cap end) is counterclockwise.

When checking Distributor on a test stand, the above specifications are 1/2 that shown.

*..... Four (4) or Six (6) Cylinder Engine STANDARD Points.
**..... Four (4) or Six (6) Cylinder Engine HEAVY DUTY Points.

INDUSTRIAL TRUCK DIVISION

ADJUST TAPPETS TO THE STATIC COLD SETTINGS LISTED IN THE FOLLOWING CHART:

Engine Model	Intake	Exhaust	NOTE
Y-69	.014"	.014"	Static Cold Settings.
Y-91	.014"	.014"	Static Cold Settings.
Y-112	.014"	.014"	Static Cold Settings.
F-124	.016"	.018"	Static Cold Settings.
F-140	.016"	.018"	Static Cold Settings.
F-162	.016"	.018"	Static Cold Settings.
F-244	.016"	.018"	Static Cold Settings.
F-186	.016"	.018"	Static Cold Settings.
F-209	.016"	.018"	Static Cold Settings.
F-226	.016"	.018"	Static Cold Settings.
F-135	.012"	.020"	Static Cold Settings.
F-163	.012"	.020"	Static Cold Settings.
F-227	.012"	.020"	Static Cold Settings.
F-245	.012"	.020"	Static Cold Settings.
NOTE: Engine Nameplate Tappet Settings is for Hot Idle only.			

FOR -- VEHICLES EQUIPPED WITH CONTINENTAL ENGINES.

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR CF20 & 25

GENERAL

Type of vehicle ..... Fork Lift Truck

	CF20	CF25	
Overall length with forks	99½	102¼	inches
Overall length without forks	67½	70¼	inches
Overall width	32	34	inches
Overall height with 130 MFH upright	83		inches

Single Drive
- Tread drive tires (Std.& HiLo Upr.) ..... CF20 26 inches
- Tread drive tires (T.S. Upr.) 29 1/8 inches
- Tread drive tires (Std.& HiLo Upr.) ..... CF25 28 inches
- Tread drive tires (T.S. Upr.) 30 1/8 inches
- Tread steer tires (CF20 & CF25) ..... 24 3/4 inches

Basic aisle for right angle stacking .....
.....(add length of load)CF20 73 1/8 inches
.....(add length of load)CF25 75 7/8 inches

Turning radius, outside ..... CF20 61 inches
..... CF25 63 1/2 inches

Turning radius, inside (CF20 & CF25) 1 1/2 inches

Ground clearance - under counterweight..3 inches

Ground clearance - under rear axle.. 2.65 inches

Ground clearance - under front axle 3.375 inches

Ground clearance - under upright ..... 3 inches

Ground clearance between axles..... 3.87 inches

Grade clearance 36 1/2%

Draw bar pull (Loaded) (CF20) 1900 (CF25) 2075 lbs.
..... at 12 inch coupler height

Draw bar pull (Empty) (CF20) 1300 (CF25) 1000 lbs.
..... at 12 inch coupler height

Travel speeds:		CF20	CF25	
Loaded:	1st	5.47	5.14	MPH
	2nd	10.89	10.23	MPH
Empty:	1st	5.47	5.23	MPH
	2nd	10.89	10.39	MPH

Gradeability:
- Loaded..... CF20 30.5% CF25 25.8%
- Empty CF20 22.5% CF25 17.1%
- ..... @ .9 coefficient of friction

Lifting & Lowering Speeds:

Lift	STANDARD	HI-LO	TRIPLE STAGE
Loaded	83	62	59 FPM
Empty	94	70	67 FPM
Lower.....			
Loaded	65	65	65 FPM
Empty	80	80	80 FPM

ENGINE

Model..... Y112

Type ..... Internal Combustion

Number of cylinders 4

Bore 3 3/16

Stroke 3 1/2

Displacement ..... 112 cu. in.

Governed Speed (No Load)..... 2350 R.P.M.

Net Brake H.P. at Governed R.P.M. 16.3

Bare Engine H.P. at Governed R.P.M. .....
..... 32 @ 2200

Maximum torque ..... 88 lb. ft.

Governor Setting (Loaded)..... 2,200 R.P.M.

Firing Order 1-3-4-2

Crankcase Capacity:
- With Filter ..... 4 1/2 quarts
- Without Filter ..... 4 quarts

Lubrication System.....Pressure lubricated by submerged gear-type pump.

FUEL TANK CAPACITY ..... 5.4 gallons

COOLING SYSTEM CAPACITY ..... 9 quarts

FAN BELT DEFLECTION .....
..... 3/4" long span

CLUTCH

Outside diameter ..... 10 inches

Clutch Pedal Free Travel .....
..... approx. 5/8 to 1 inch

Clutch throwout bearing.... Lubricated thru use of a grease cup.

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS

(CONTINUED)

TRANSMISSION

Speeds ..... 2 Forward 2 Reverse

Capacity ..... 3 1/2 pints

STEER AXLE

Axle Alignment:

Toe-In ..... 0 degrees
Camber Angle ..... 1 degree
Caster ..... 0 degrees

Left-hand Turning radius angle,

Left wheel..... 80 degrees
Right wheel..... 55 degrees

Right-hand Turning radius angle,

Left wheel ..... 55 degrees
Right wheel ..... 80 degrees

DRIVE AXLE

Differential Capacity .....
..... (Refer to Transmission Capacity)

Drive Wheel Bearings ..... 1 oz. approx.
(each bearing)

WHEELS AND TIRES (Non-directional)

Size...Front... 16 1/4 x 6 x 11 1/4 cushion
(CF25 Triple Stage Upright Only)..
..... 16 1/4 x 7 x 11 1/4 cushion

Size...Rear..... 13 x 4 1/2 x 8 cushion

SPLIT RIM WHEELS

Drive Wheel ..... 150 ft. lbs. (Dry Thread)

Steer Wheel ..... 75 ft. lbs. (Dry Thread)

Steering Gear Pitman Arm Lock Nut Torque.....
..... 100-125 foot pounds

Steering Gear Mounting Bolts and Clamp Bolt
Torque..... 90 foot pounds

HYDRAULIC SYSTEM

Sump Tank Capacity ..... 3.1 gallons

Sump Tank Breather (Cleanable)... Hemp Hair

Sump Tank Strainer (Cleanable).... 100 mesh

Sump Tank Filter Attaching Bolts Torque....
..... 40 to 50 inch lbs.

Hydraulic Pumps
Main Pump:

Type ..... Vane

Capacity .....
6 G.P.M. at 1450 engine R.P.M. 100 PSI

Hydraulic Valve

Pressure Relief Valve Setting 2000 PSI

BRAKE SYSTEM

Type ..... Hydraulic

Brake Pedal Free Travel

(as measured from top pedal position -to-
where pedal meets resistance from master
cylinder) ..... 3/16 to 1/2

(as measured from bottom of floor board
-to- top of brake lever arm)... 3/16 to 1/2

DISTRIBUTOR

Rotation (viewed from drive end).....
..... Clockwise

Point Opening ..... .022

Start Advance
R.P.M. (Dist.) 300
Degree (Dist.) 5-2.5

Maximum Advance
R.P.M. (Dist.) 1100
Degree (Dist.) 7.5-9.5

Cam Angle Range ..... 31° to 34°

Spring Tension (ounces) .....
..... 520 oz. per. in.

SPARK PLUGS

Gap

Standard ..... .025

Resistor ..... .035

STARTER RELAY

Point Opening ..... .020-.030

Opening Voltage ..... .6 Min.

(CONTINUED)

CIRCUIT BREAKER .....
..... @ 125° F. Regulator Ambient Temp.

Armature Air Gap..... .020

Contact Point Gap ..... .020 ± 10% Min.

Contacts Close ..... 11.8 to 13.5 Volts

VOLTAGE REGULATOR.....
..... @ 125° F. Regulator Ambient Temp.

Armature Air Gap ..... .075 ± 10%

Operating Voltages.....13.5 to 14.4 amps

CURRENT REGULATOR .....
..... @ 125° F. Regulator Ambient Temp.

Armature Air Gap ..... .075 ± 10%

Operating Amperage..... 31-35.5

BATTERY (Negative Ground) .....
..... (Volts) 12

Number of Cells 6

Number of Plates 66

20 Hour Rate A.H. 45
150 Amps., 0 Deg. F.

Total Min. 3.3

5 Sec. Volt. 8.4

Group ..... S.A.E.

Model 3EM45-D

STARTING MOTOR

Brush Tension (oz.) 35

Lock Test

Draw Current (Amps) 435

Volts 5.8

Torque (Ft. Lbs.) 10.5

No Load Test

Draw Current (Amps)..... 49 to 76

Volts 10.6

Speed (R.P.M.).... 6200 Min. 9400 Max.

Teeth in Pinion 9

No Teeth in Ring Gear 142

Starter to Crankshaft Ratio..... 15.77 to 1

Starting Medium ..... Solenoid

GENERATOR

Volts 12

Brush Spring Tension ..... 24 to 28 oz.

Type ..... Third Brush Control

Rated Output ..... 25 Amps

Output Test @ 80° F.

14 Volts, 25 Amps @ 1970 R.P.M.

Charging Starts Cold 25 Amps.....
750 R.P.M. (Gen.)

Charging Starts Hot 25 Amps.....
2200 R.P.M. (Gen.)

Dimensional Specifications

CLARKLIFT®

CF 20/25

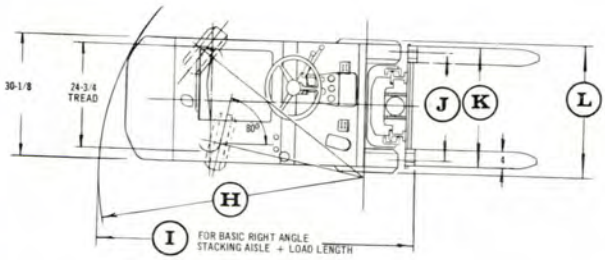
UPRIGHT DIMENSION TABLE

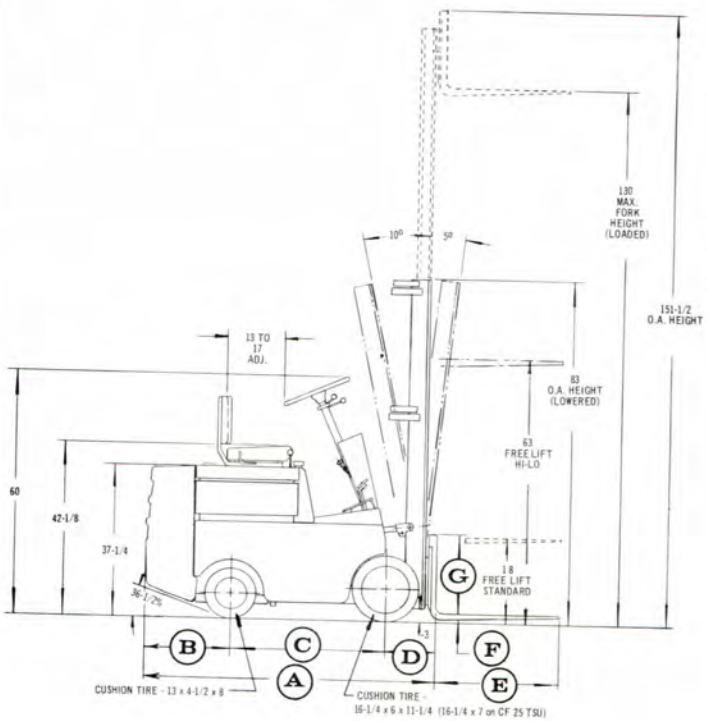
MFH			FREE LIFT		
STD HI-LO	TSU	OAHL	STD	HI-LO	TSU
70	—	53	18	—	—
76	—	56	18	—	—
82	—	59	18	—	—
88	—	62	18	—	—
94	135	65	18	45	12½
100	144	68	18	48	12½
*106	*153	71	18	51	12½
112	162	74	18	54	12½
118	*171	77	18	57	12½
124	180	80	18	60	12½
*130	189	83	18	63	12½
136	198	86	18	66	12½
142	207	89	18	69	12½
148	216	93	18	73	12½
*154	225	96	18	76	12½
160	—	99	18	79	12½
166	—	103	18	83	12½
172	—	106	18	86	12½
*178	—	109	18	89	12½

Intermediate heights available in increments of 3" MFH.

For overall height raised — add 21" to MFH.

* Indicates preferred standard sizes.





CLARKLIFT CF 20/25 DIMENSION TABLE

DIMENSION	CF 20	CF 25
A	67-1/2"	70-1/4"
B	17-3/8"	19-7/8"
C	38"	38"
D	12-1/4"	12-1/2"
E	32"	32"
F	1-1/4"	1-1/2"
G	20"	19-3/4"
H	61"	63-1/2"
I	73-1/8"	75-1/8"
J STD	26"	28"
J TSU	29-1/8"	30-1/8"
K	30"	30"
L STD	32"	34"
L TSU	35-1/8"	37-1/8"

L.P.Gas and Gasoline ENGINE
TORQUE SPECIFICATIONS

Engines have many studs, bolts, and cap screws of special material and sizes and it is very important that care be exercised to torque all studs and bolts correctly.

The torque specifications, **foot pounds**, listed below MUST be followed in order to have the engine conform to the original specifications.

Size - Diameter	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"
Cylinder Heads	------	35-40	70-85	100-110	130-140	145-155
Manifolds	15-20	25-30	40-50	50-60	50-60	60-70
Gear Covers, Water Pumps, Front and Rear End Plates	15-20	25-30	50-55	80-90	------	------
Oil Pans	12-16	12-16	------	------	------	------

INDUSTRIAL TRUCK DIVISION

NEW MACHINE 50 HOUR SERVICE AND INSPECTION

Air Cleaner, Service	8H 403
Battery Test and Level Check	100H 603
Brake Master Cylinder Level Check	100H 303
Brake Pedal, Adjust	100H 302
Clutch Pedal, Adjust	100H 653
Cooling System, Inspect	100H 103
Cylinder Head, Tighten	1000H 003
Engine Crankcase, Drain and Refill	100H 003
Engine Oil Filter, Change	100H 003
Fan Belt, Adjust	100H 203
Fuel Pump Strainer, Clean or Replace	500H 002
Hand Brake, Adjust	1000H 1103
Hydraulic Oil Strainer, clean	500H 103
Intake and Exhaust Manifold, Tighten	500H 403
Lift Chains, Adjust	100H 403
Lubricate Machine	100H 703
Nuts, Bolts and Capscrews, Tighten	500H 403
Pressure Check Main Hydraulic System	1000H 1503
Steering Gear Level Check	100H 603
Transmission and Axle Adaptor Level Check	100H 002

N O T E

PERFORM THIS SERVICE AND INSPECTION AFTER THE FIRST 50 HOURS OF OPERATION ON NEW MACHINES.

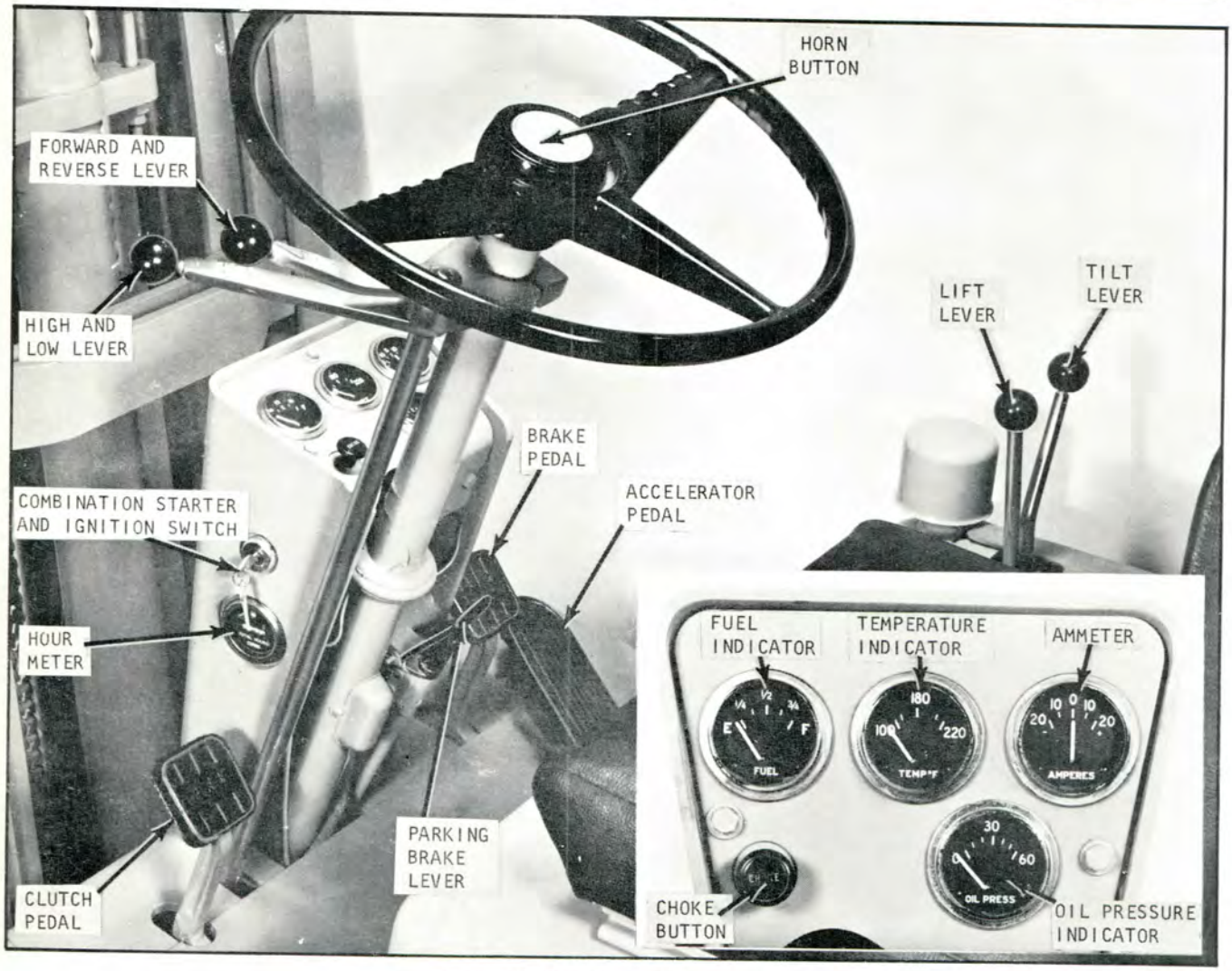


Plate 7448. Overall Controls

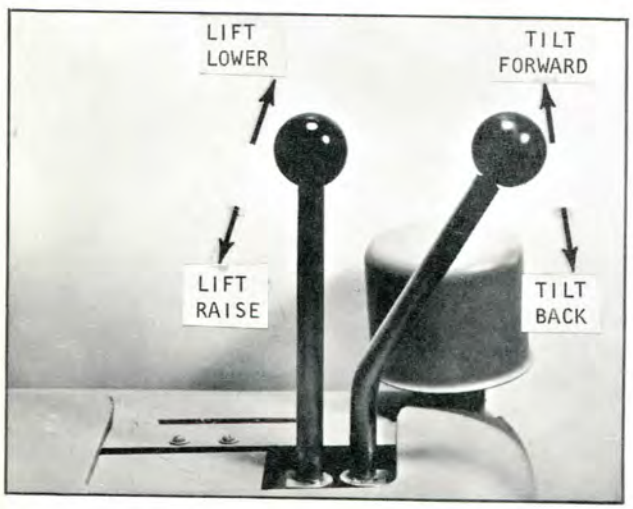


Plate 7449. Hydraulic Control Levers

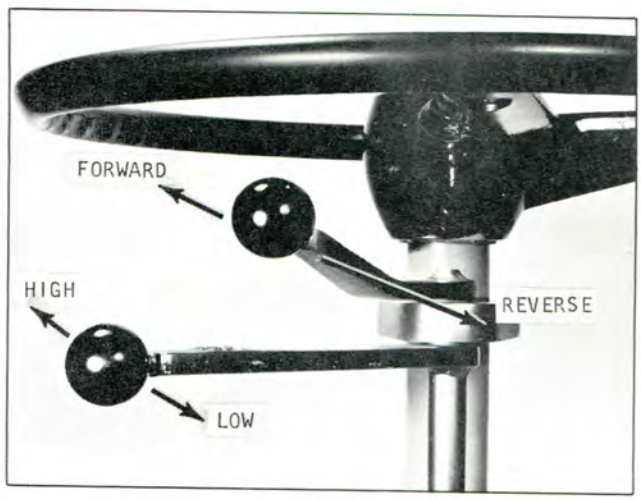


Plate 7450. Directional Control Levers

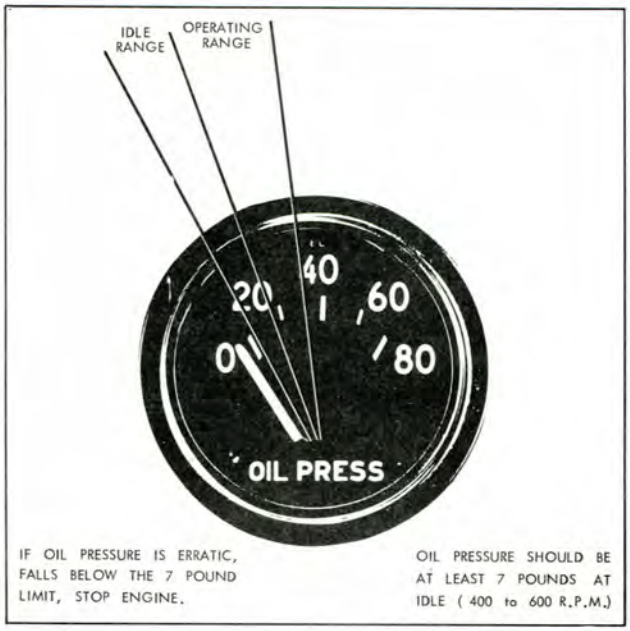


Plate 6288. Oil Pressure Indicator

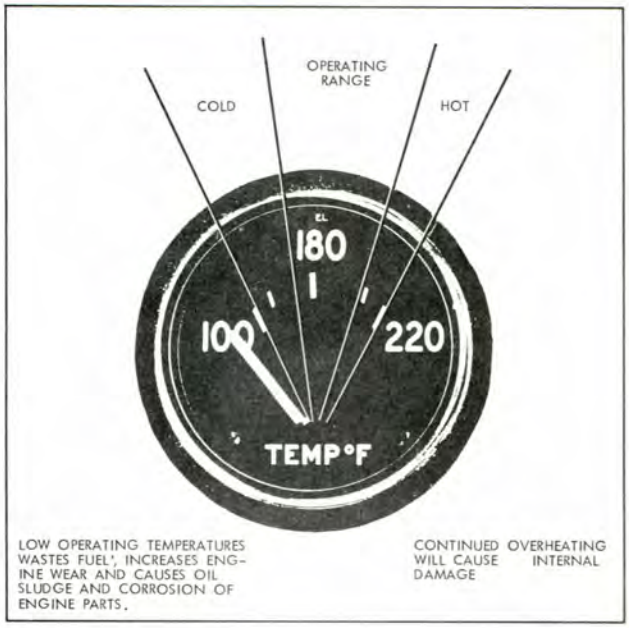


Plate 6287. Engine Coolant Temperature Indicator

a. Oil Pressure Indicator. Oil pressure should be at least 7 pounds at idle (400 to 600 R.P.M.)

CAUTION

IF THE OIL PRESSURE IS ERRATIC OR FALLS BELOW THE ABOVE LIMIT, STOP THE ENGINE IMMEDIATELY AND FIND THE CAUSE OF THE TROUBLE. REFER TO TROUBLE SHOOTING SECTION FOR THIS INFORMATION.

CAUTION

ON NEW MACHINES, AFTER STARTING THE ENGINE RUN IT AT IDLE FOR FIVE MINUTES, THEN STOP ENGINE AND RECHECK OIL LEVEL IN CRANKCASE - BRING OIL LEVEL TO HIGH MARK, IF NECESSARY.

NOTE

BEFORE PLACING MACHINE IN OPERATION RUN ENGINE A FEW MINUTES TO WARM OIL, ESPECIALLY IN COLD OPERATION CONDITIONS.
LOW OPERATING TEMPERATURES WASTES FUEL AND INCREASES ENGINE WEAR.

NOTE

THE COOLANT TEMPERATURE SHOULD REGISTER 185° TO 205° F. AFTER THE FIRST TEN OR FIFTEEN MINUTES OF OPERATION.

CAUTION

DO NOT IDLE THE ENGINE FOR LONG PERIODS, AS IT IS NOT ONLY DETRIMENTAL TO THE ENGINE BUT ALSO INCREASES THE OPERATING COSTS AS YOU ARE USING FUEL WITHOUT BENEFIT.

Plate 6418. Ignition Switch

STARTING

Place all transmission control levers in neutral position. Pull out on choke button and turn ignition switch key. The starter is engaged when the key is turned to start position.

CAUTION

DO NOT ENGAGE THE STARTER LONGER THAN 15 SECONDS WITHOUT A MINUTE OR SO INTERVAL BETWEEN TRIALS.

If the engine becomes overchoked or flooded; push choke button in, depress accelerator pedal fully and engage starter. If all necessary equipment is in correct working order, the engine will start.

After engine has started, make certain that the oil pressure indicator registers adequate pressure. If an abnormal reading is indicated, stop engine and correct the difficulty.

NOTE

RUN ENGINE A FEW MINUTES TO WARM OIL, BEFORE PUTTING MACHINE TO WORK ESPECIALLY IN COLD OPERATING CONDITIONS.

TO OPERATE MACHINE

1. Place transmission levers in neutral position and start engine.

2. Release hand brake and depress clutch pedal. Position shift levers for desired speed and direction.

3. Release clutch pedal slowly and at the same time accelerate as required.

4. Travel with the forks only high enough to clear any floor obstructions.

CAUTION

DO NOT ALLOW FOOT TO REST ON CLUTCH PEDAL WHILE DRIVING FROM POINT TO POINT. RIDING THE CLUTCH PEDAL WILL CAUSE SLIPPAGE OF THE DRIVEN DISC RESULTING IN UNNECESSARY WEAR OR DAMAGE TO THE CLUTCH COMPONENTS.

TO STOP MACHINE

Remove foot from accelerator pedal and depress clutch and brake pedal. If machine is to be parked, place transmission control levers in neutral position, apply hand brake and shut off engine.

CAUTION

IF THE ENGINE HAS BEEN OPERATING AT OR NEAR FULL LOAD, IT SHOULD BE ALLOWED TO RUN AT FAST IDLE (600 to 800 R.P.M.) FOR ONE OR TWO MINUTES AFTER LOAD IS REMOVED BEFORE BEING STOPPED. THIS ALLOWS INTERNAL ENGINE TEMPERATURES TO EQUALIZE.

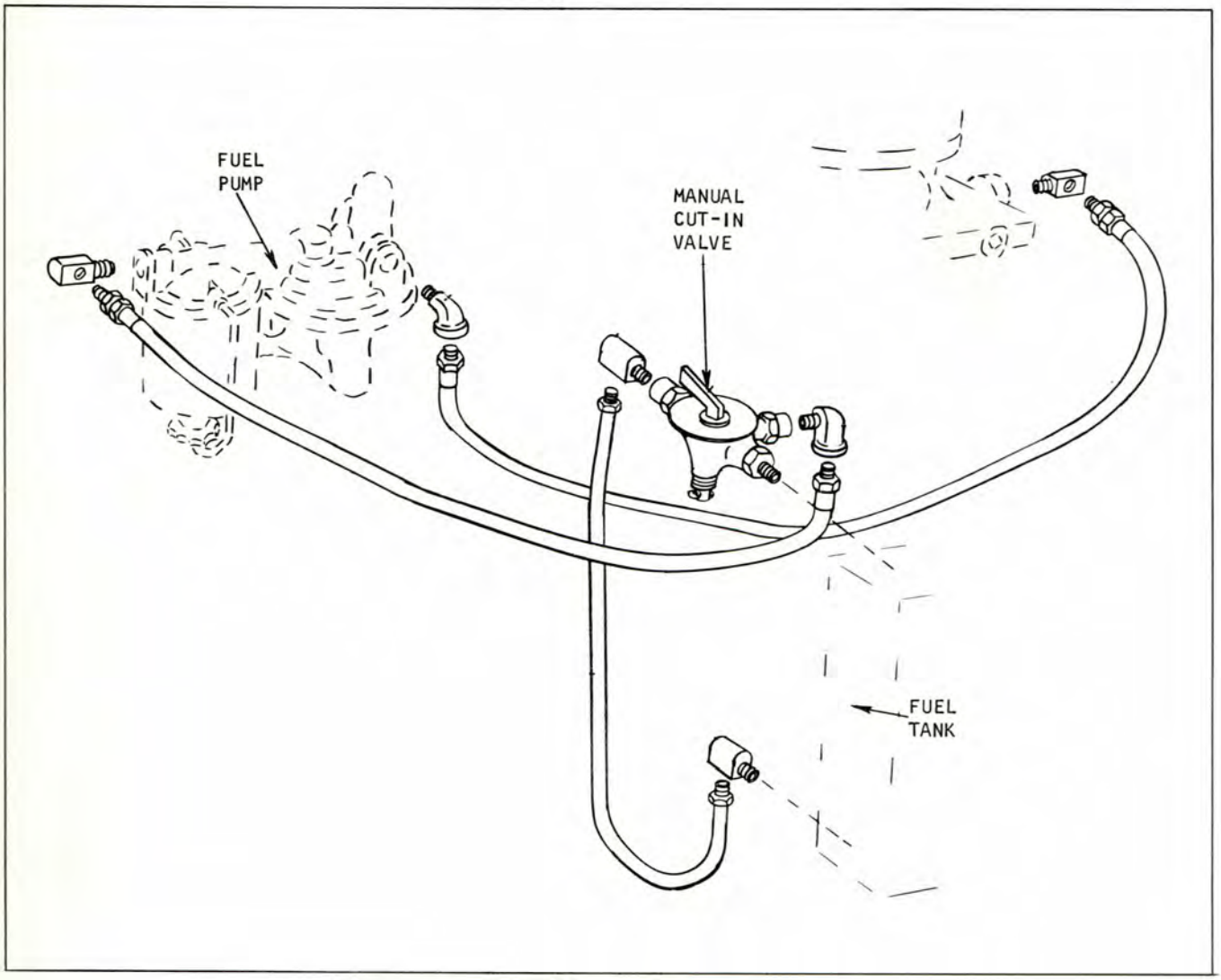


Plate 7236. Manual Cut-in Valve

The auxiliary fuel reserve manual cut-in valve located at the fuel tank may be turned to the auxiliary position in the event that the main fuel tank supply becomes exhausted. The reserve fuel supply of approximately 1/2 gallon will in most cases be adequate to allow the machine to be driven to its refueling location. After the fuel supply has been replenished the manual cut-in lever should be turned to the normal position.

(ON MACHINES SO EQUIPPED)

To Move A Load.

The forks should be adjusted sidewise on the fork bars to obtain firm support and maximum balance of the load. Raise or lower the forks to the proper level and engage the load by driving forward. Tilt the upright backward sufficiently to adequately cradle the load, and raise load sufficiently to clear obstructions, accelerating engine slightly at the same time. Back away from stack.

The operator should have clear vision ahead when moving in a forward direction. When this is not possible, the operator should drive in reverse and turn in his seat to obtain clear vision backward.

When the load is to be deposited, enter the area squarely, especially when placing one load on top of another, in order that all piles will be square and secure. Place load directly over desired area and slowly lower into position. Disengage forks from the load by using necessary lift-tilt and then back away.

Loads will vary in size, shape, method of packaging, stacking procedures, etc. The best way to handle a load will depend on these factors. If in doubt, consult with your supervisor.

I M P O R T A N T

EVERY 8 OPERATING HOURS (OR EVERY SHIFT) ELEVATE UPRIGHT TO THE UPPER LIMIT. THIS WILL PROVIDE LUBRICATION TO THE TOP PORTION OF THE LIFT CYLINDER. CHECK FOR NORMAL SEQUENCE OF OPERATION.

OPERATING SAFETY RULES AND PRACTICES.

1. Operators of powered industrial trucks should be physically qualified. An examination should be made on an annual basis and include such things as field of vision, hearing, depth perception and reaction timing.

2. Only trained and authorized operators should be permitted to operate a powered industrial truck. Methods should be devised to train operators in the safe operation of powered industrial trucks. It is recommended that badges or other visual indication of the operator's authorization should be displayed at all times during work period.

GENERAL.

1. Safeguard the pedestrians at all times. Do not drive a truck up to anyone standing in front of a bench or other fixed object.

2. Do not allow anyone to stand or pass under the elevated portion of any truck, whether loaded or empty.

3. Unauthorized personnel should not be permitted to ride on powered industrial trucks. A safe place to ride should be provided where riding of trucks is authorized.

4. Do not put arms or legs between the uprights of the mast or outside the running lines of the truck.

5. When leaving a powered industrial truck unattended, load engaging means should be fully lowered, controls should be neutralized, power shut off, brakes set, key or connector plug removed. Block wheels if truck is parked on an incline.

6. Maintain a safe distance from the edge of ramps or platforms and do not, while on any elevated dock or platform, push freight cars. Do not use trucks for opening or closing freight doors.

7. Have brakes set and wheel blocks in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading. Fixed jacks may be necessary to support a semi-trailer during loading or unloading when the trailer is not coupled to a tractor. Check the flooring of trucks, trailers, and railroad cars for breaks and weakness before driving onto them.

8. Be sure of sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.

9. Use an Overhead Guard and Load Backrest Extension unless conditions prevent their use.

W A R N I N G

AN OVERHEAD GUARD IS INTENDED TO OFFER PROTECTION FROM THE IMPACT OF SMALL PACKAGES, BOXES, BAGGED MATERIAL, ETC., REPRESENTATIVE OF THE JOB APPLICATION, BUT NOT TO WITHSTAND THE IMPACT OF A FALLING CAPACITY LOAD.

10. Use only approved industrial trucks in hazardous locations.

INDUSTRIAL TRUCK DIVISION

FUEL HANDLING AND STORAGE SAFETY

Liquefied Petroleum Gas Fuel (LPG Powered Trucks)

1. The storage and handling of liquefied petroleum gas (LP-Gas) should be in accordance with the Standard for Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58, USA Standard Z106.1-1965).

2. Trucks using LP-Gas should be refueled only at locations designated for that purpose. Safe outdoor locations are preferable to indoor. Trucks should be refueled as provided in the Standard for the Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58, USA Standard Z106.1-1965.)

3. Reasonable care should be exercised in handling of LP-Gas containers to avoid damage. Do not drop, throw, roll, or drag LP-Gas containers or any associated parts of the containers or fuel systems.

4. Do not over-fill LP-Gas containers.

5. Engine should be stopped and operator off the truck during refueling.

6. Trained and designated personnel should recharge or exchange LP-Gas containers.

7. Personnel engaged in recharging of LP-Gas containers should wear protective clothing such as face shield, long sleeves, and gauntlet gloves.

8. Never use a match or flame to check for leaks, use a soap solution.

9. LP-Gas powered trucks should not be refueled nor stored near underground entrances, elevator shafts nor any other place where LP-Gas could collect in a pocket causing a potentially dangerous condition.

10. Trucks equipped with permanently mounted LP-Gas containers should be refueled outdoors.

11. Exchange of removable LP-Gas containers preferably should be done outdoors, but may be done indoors. Means should be provided in the fuel system to minimize the escape of fuel when the containers are exchanged. This should be accomplished by either of the following methods:

A. Using an automatic quick closing coupling (a type closing in both directions when uncoupled) in the fuel line, or.....

B. Closing the valve at the LP-Gas container and allowing the engine to run until the fuel in the line is consumed.

12. When installing removable LP-Gas containers they should be so located on the truck that the safety pressure relief valve opening is always in contact with the vapor space (top) of the cylinder. This is accomplished by an indexing pin which, when the tank is properly installed, positions the container.

13. All reserve LP-Gas containers should be stored and transported with the service valve closed. Safety relief valves should have direct communication with the vapor space of the container at all times.

14. The careless handling of LP-Gas containers can result in a serious accident. Extreme care should be exercised when transporting containers so that they are not accidentally dropped or physically damaged. When it is necessary to move more than one container at one time, a proper carrying device should be provided.

15. Physical damage such as dents, scrapes, or gouges, may materially weaken the structure of the LP-Gas container and render it unsafe for use. All LP-Gas containers should be examined before recharging and again before reuse, for the following defects or damage:

A. Dents, scrapes, and gouges of the pressure vessel.

B. Damage to the various valves and liquid level gage.

C. Debris in the relief valve.

D. Indications of leakage at valves or threaded connections.

E. Deterioration damage or loss of flexible seals in the fill or servicing connections.

All defective or damaged LP-Gas containers should be removed from service.

16. Smoking should be prohibited in the refueling area.

17. Whenever vehicles using LP-Gas as a fuel are parked overnight or stored for protracted periods of time indoors, with the fuel container in place, the service valve on the fuel container should be closed.

When checking or adjusting L.P. Gas equipment be sure to:

1. Properly ventilate work area.

2. Eliminate ignition sources (sparks, pilot lights etc.).

3. Prohibit smoking.

4. Have fire fighting equipment present.

5. Check all equipment, lines, connections with soapy water. NEVER USE A MATCH OR FLAME WHEN CHECKING FOR LEAKS.

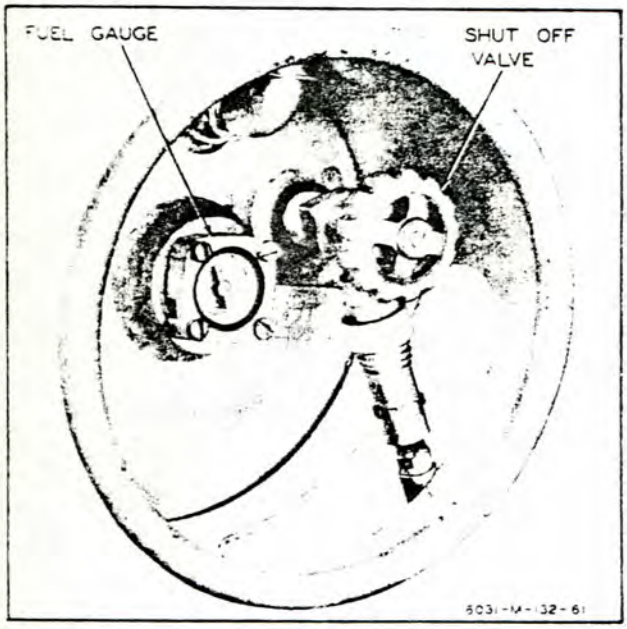


Plate 6031. Typical L.P. Gas Container

6. Check cylinder (container) for security of mounting.

7. Inspect hoses, grommets or whatever means is used to protect hoses from damage where they run through sheet metal etc. Replace any component that is unfit for further service.

8. Check all equipment for security of mounting.

9. Check the Solenoid Lock-Off Valve to be sure it is working. Upon turning off the ignition switch there should be an audible click indicating the valve has actuated shutting off the fuel flow at the valve. The valve should not open again until the ignition switch is turned on and the engine cranked. Cranking the engine provides oil pressure to the engine oil pressure sending unit which actuates completing an electrical circuit to the solenoid lock-off valve. The valve then opens allowing the L.P. Gas to pass through.

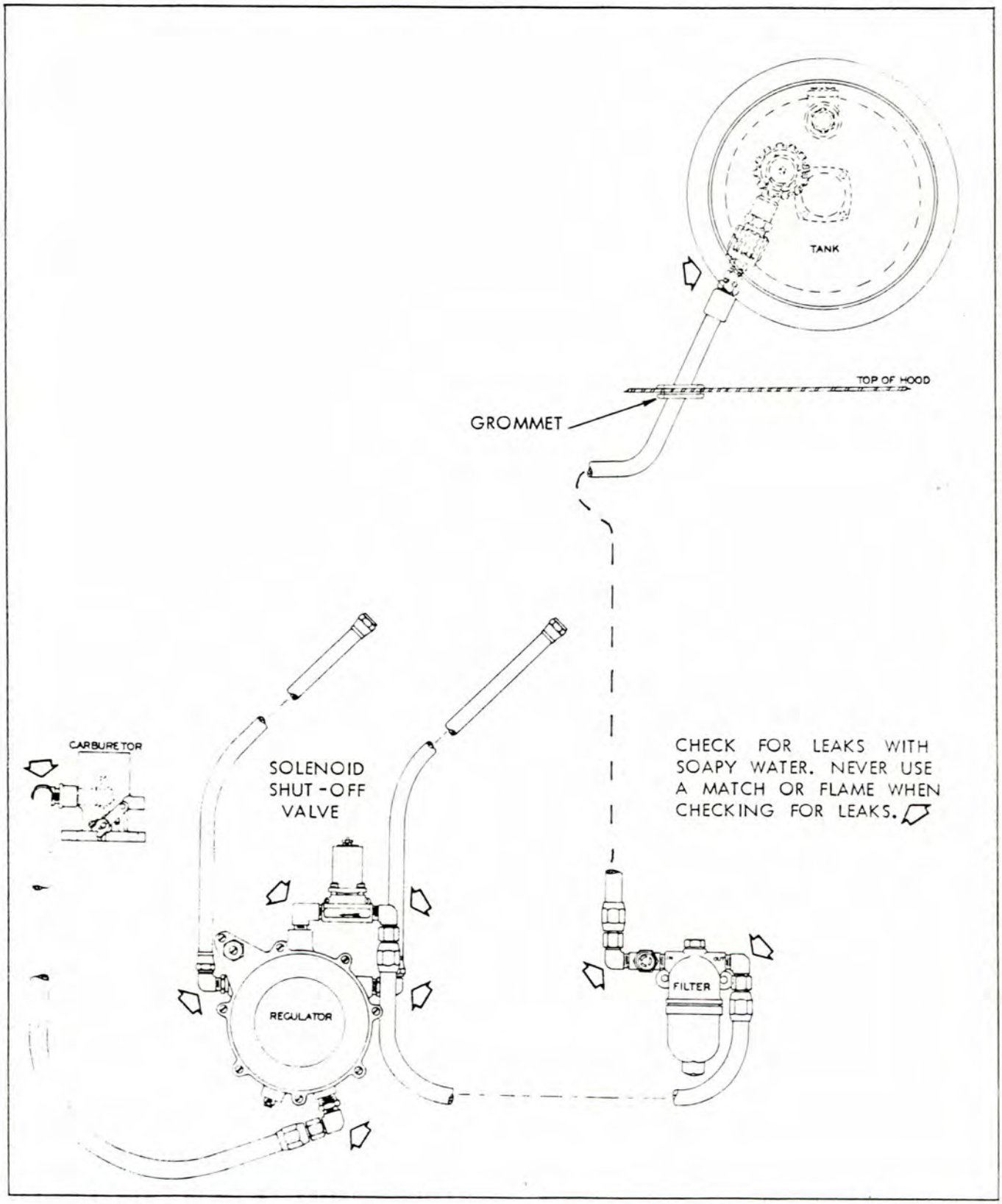


Plate 7405. Typical L.P. GAS Installation

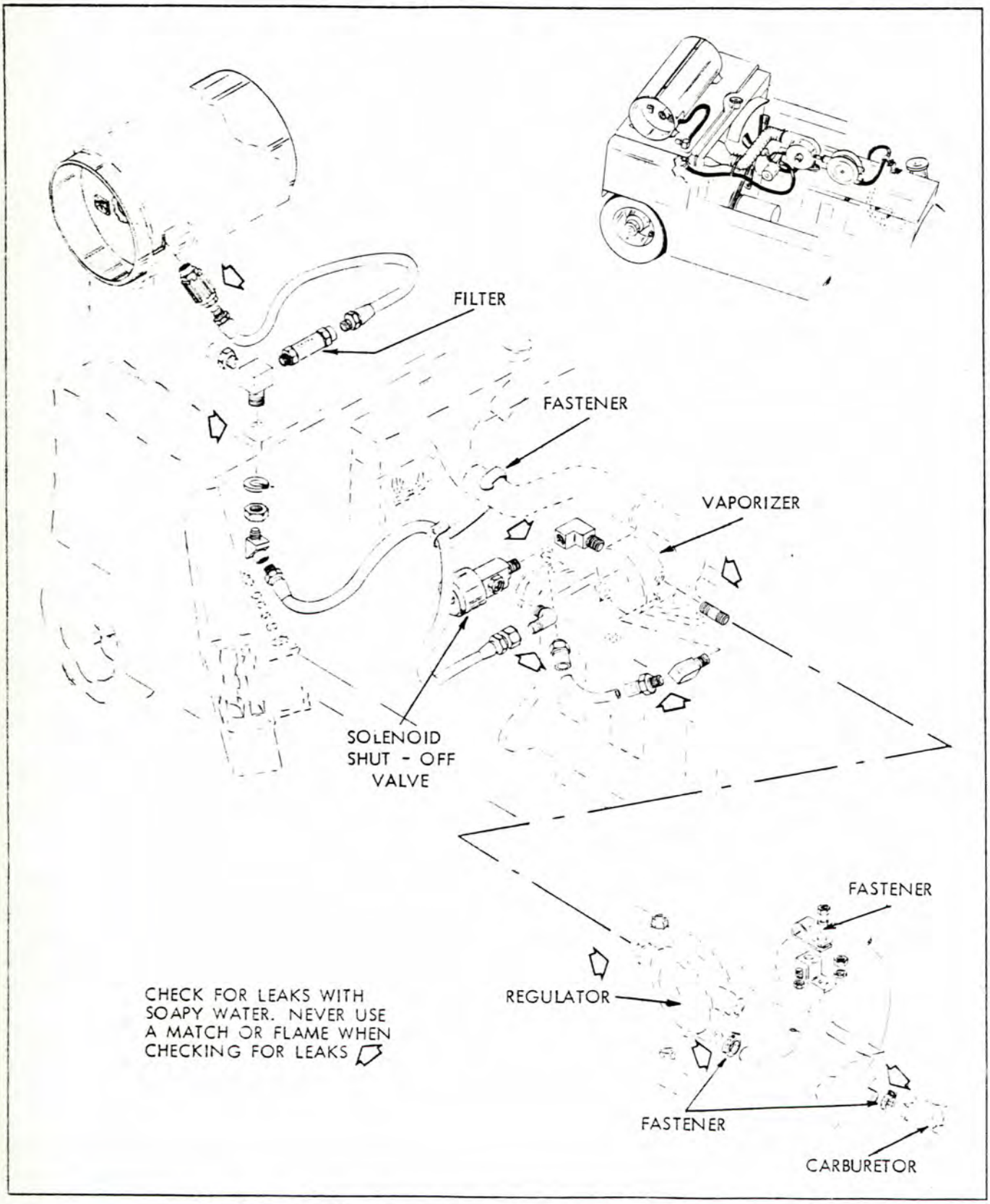


Plate 7406. Typical L.P. GAS Installation

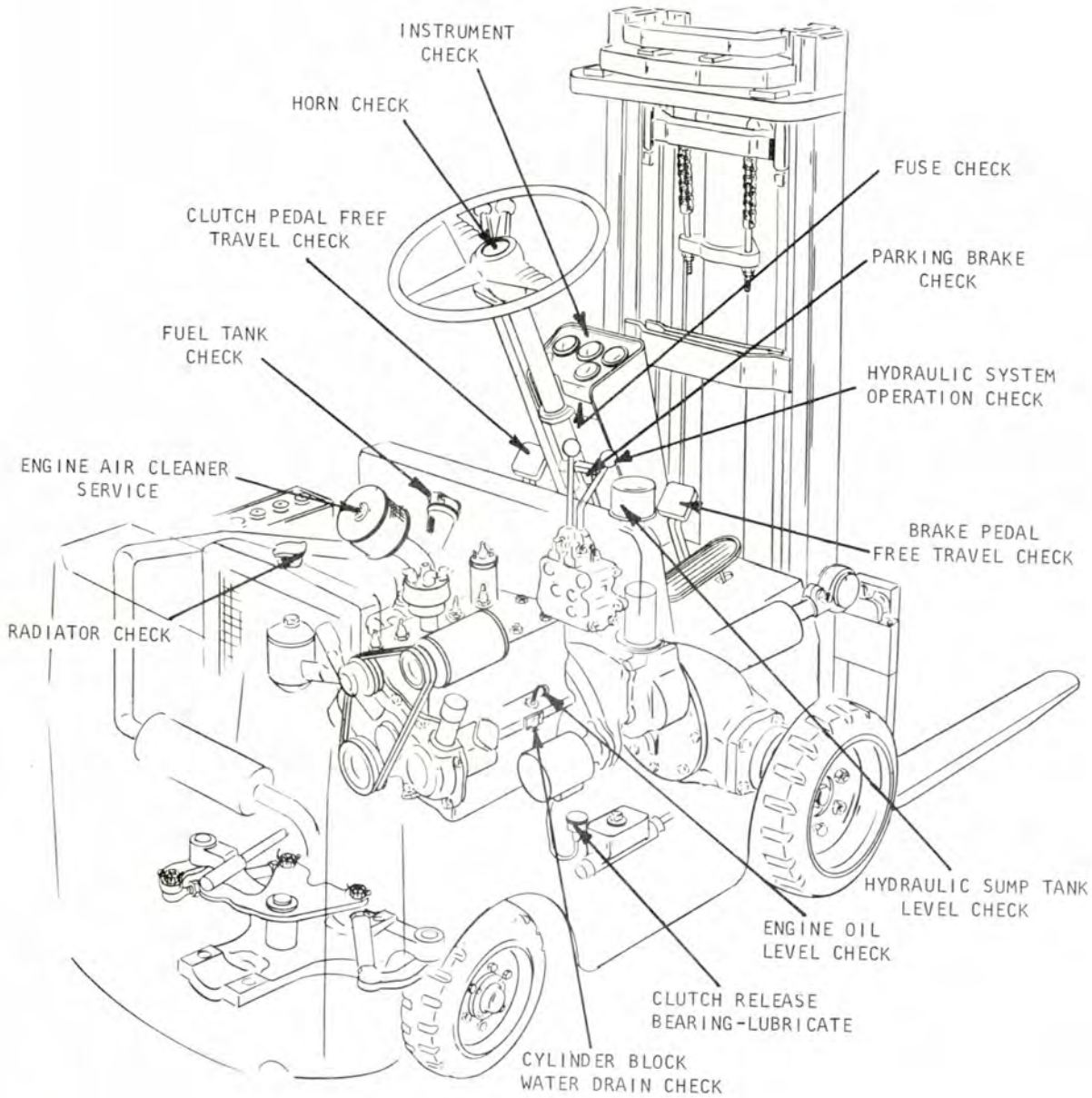
INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE INDEX

N O T E

WHEN PERFORMING THE 100, 500 OR 1000 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE, ALWAYS INCLUDE THE PREVIOUS LUBRICATION AND PREVENTIVE MAINTENANCE SCHEDULES.

8 HOURS



N O T E

AFTER EACH 8 HOURS OF OPERATION, PERFORM THE ABOVE PREVENTIVE MAINTENANCE SERVICES.

Plate 7465. Lubrication and Preventive Maintenance Illustration

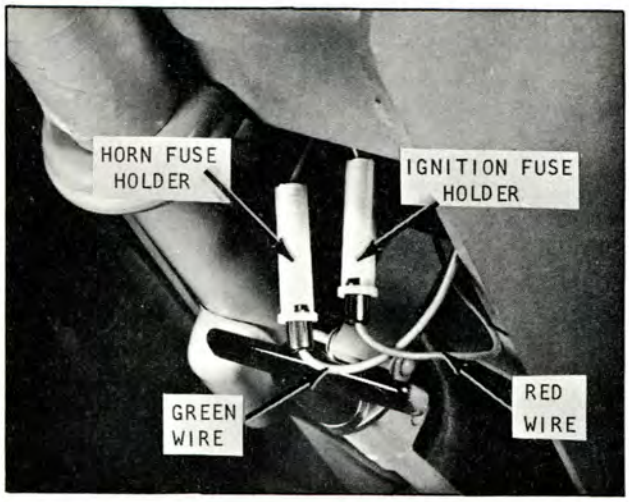


Plate 7452. Horn and Ignition Fuse

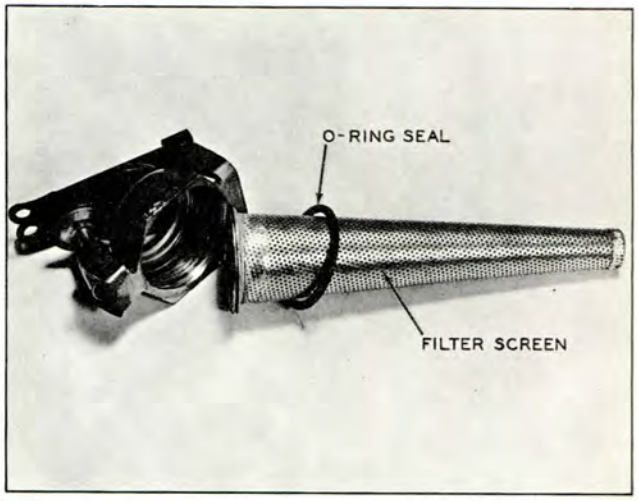


Plate 6627. Fuel Tank Filler Cap and Screen

HORN

Check to be sure the horn is working properly.

FUSES

Check the electrical circuit fuses. The fuse holders are located beneath the dash. A red wire leads to the ignition fuse holder and a green wire leads to the horn fuse holder.

FUEL TANK

Check fuel supply and fill if necessary. Use a good grade of fuel.

Before filling full tank, make certain the filler cap screen is in place and not damaged (on machines so equipped).

W A R N I N G

DO NOT FILL THE TANK WITH THE FILLER CAP SCREEN REMOVED.

ENGINE CRANKCASE

Before attempting to start the engine, first make sure that it has sufficient oil. The oil filler pipe is located on the right side of the machine. The oil level stick is of the dipstick or bayonet type and is also located on the right side of the machine. Fill the crankcase reservoir through the filler pipe to the proper level as indicated on the dipstick.

C A U T I O N

NEVER PERMIT THE OIL LEVEL TO FALL BELOW THE "ADD" MARK ON THE DIPSTICK.

DO NOT OVERFILL THE CRANKCASE, AS TOO MUCH OIL WILL BRING THE LEVEL HIGH ENOUGH FOR THE CONNECTING RODS TO DIP, THUS CAUSING EXCESSIVE QUANTITIES OF OIL TO BE THROWN TO THE CYLINDER WALLS RESULTING IN OIL CONSUMPTION, SMOKING, EXCESSIVE CARBON DEPOSITS AND FOULED SPARK PLUGS.

N O T E

ON L.P. GAS MACHINES, USE A NON-DETERGENT OIL DURING BREAK-IN PERIODS.

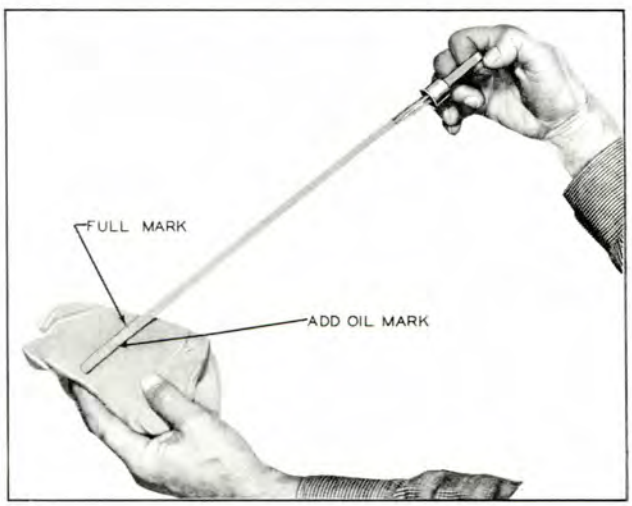


Plate 3145. Crankcase Oil Check

Crankcase Capacity — Refer to Specifications

Service "MS" Oils

S.A.E.	10W	0° to 32° F.
S.A.E.	20W	32° to 75° F.
S.A.E.	30	above 75° F.
or use	10W....	30 MULTI-GRADE OIL.

Plate 6629. Engine Crankcase Fill

ENGINE COOLING

Make sure that the radiator drain cock and the water drain in the cylinder block are closed Plate 7469. Check radiator coolant level and fill to within 1 inch of the top with clean water; or if operation is in cold weather, use a suitable anti-freeze solution.

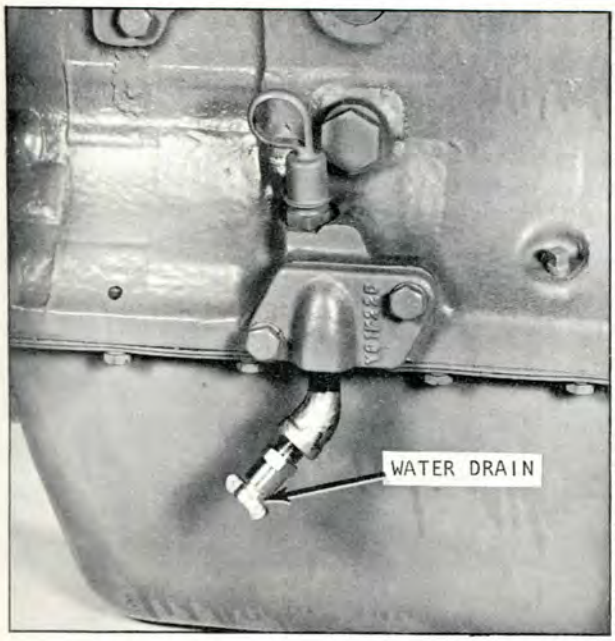


Plate 7469. Cylinder Block Water Drain

It is recommended that a soluble oil in the proportion of 1 ounce per gallon of water be added to the Cooling System.

C A U T I O N

NEVER POUR COLD WATER OR COLD ANTI-FREEZE INTO THE RADIATOR OF AN OVERHEATED ENGINE. ALLOW THE ENGINE TO COOL AND AVOID THE DANGER OF CRACKING THE CYLINDER HEAD OR BLOCK. KEEP ENGINE RUNNING WHILE ADDING WATER OR ANTI-FREEZE.

C A U T I O N

WHEN PERMANENT ANTI-FREEZE OF THE ETHYLENE GLYCOL TYPE IS USED, THE COOLANT SOLUTION MUST CONTAIN AT LEAST 40% WATER.

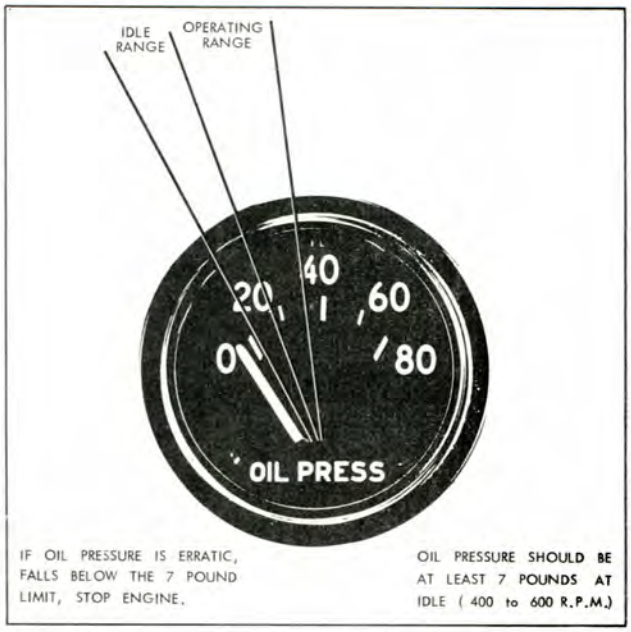


Plate 6288. Oil Pressure Indicator

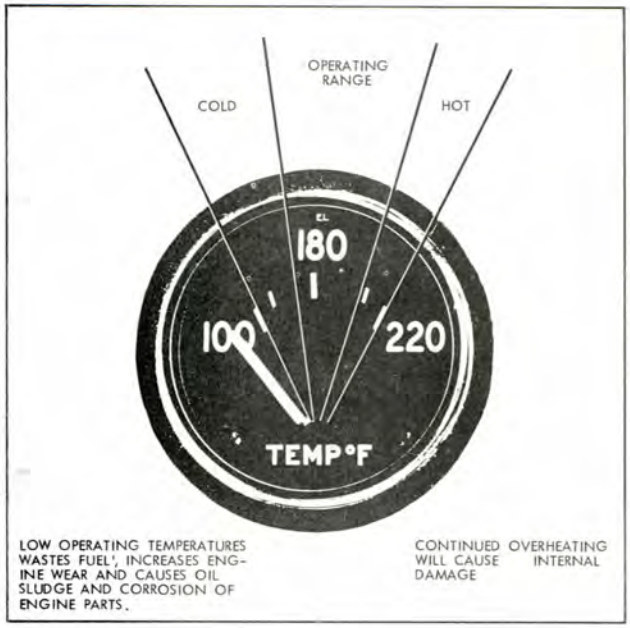


Plate 6287. Temperature Indicator

INSTRUMENT INDICATORS

a. Oil Pressure Indicator. Oil pressure should be at least 7 pounds at idle (400 to 600 R.P.M.) CAUTION: IF THE OIL PRESSURE IS ERRATIC OR FALLS BELOW THE ABOVE LIMIT, STOP THE ENGINE IMMEDIATELY AND FIND THE CAUSE OF THE TROUBLE. REFER TO TROUBLE SHOOTING SECTION FOR THIS INFORMATION.

C A U T I O N

ON NEW MACHINES, AFTER STARTING ENGINE -- RUN IT AT IDLE FOR 5 MINUTES, THEN STOP ENGINE AND RECHECK OIL LEVEL IN CRANKCASE - BRING OIL LEVEL TO HIGH MARK, IF NECESSARY.

b. Temperature Indicator. The water temperature should register 185° to 205° F. after the first ten or fifteen minutes of operation.

c. Ammeter. The ammeter is connected in the generator (or alternator if used) and battery circuit in such a manner as to indicate rate of charge or discharge. If the generator (or alternator) is functioning properly the ammeter should show a small amount of charge at engine idle. As engine R.P.M. increases the rate of charge also increases. When the battery becomes fully charged the circuit is regulated to reduce the rate of charge, and cause the ammeter needle to return to near neutral position, showing only a small amount of charge.

N O T E

BEFORE PLACING MACHINE IN OPERATION RUN ENGINE A FEW MINUTES TO WARM OIL ESPECIALLY IN COLD OPERATING CONDITIONS.

LOW OPERATING TEMPERATURES WASTES FUEL AND INCREASES ENGINE WEAR.

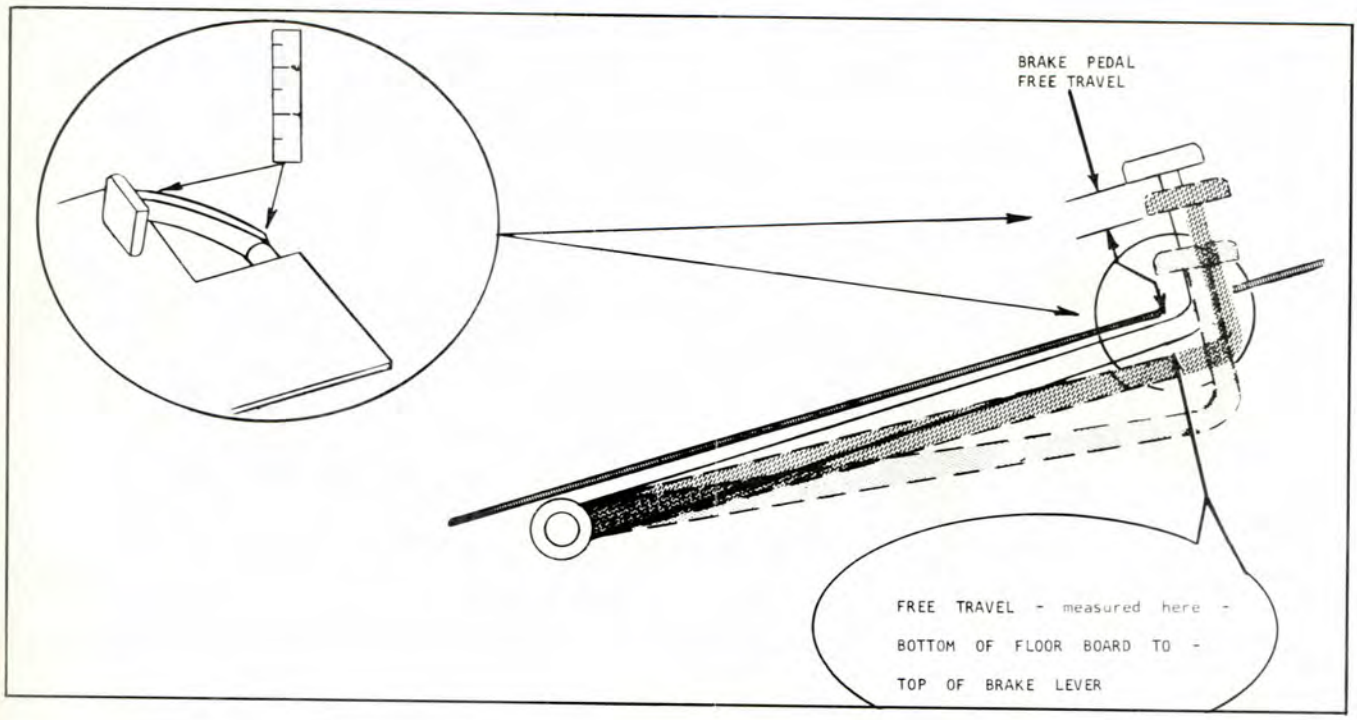


Plate 7042. Brake Pedal Free Travel

BRAKE PEDAL

1. Depress brake pedal by hand. When pedal meets resistance from the master cylinder, the distance traveled should be 3/16" to 5/16". If free travel is incorrect an adjustment should be made at the master cylinder linkage adjuster.

2. Depress foot pedal and hold for at least 10 seconds. Pedal must be solid, must not be spongy or drift under foot pressure.

PARKING BRAKE

The parking brake linkage should be adjusted so that the brake handle will have 2 inches of upward free travel, before resistance is noticed and the brake becomes applied.

The parking brake must be capable of holding the truck, with full rated load, on a 15% grade. This should be tested while occupying the driver's seat with the parking brake applied and truck out of gear.

If brake operation is not satisfactory, report to designated person in authority.

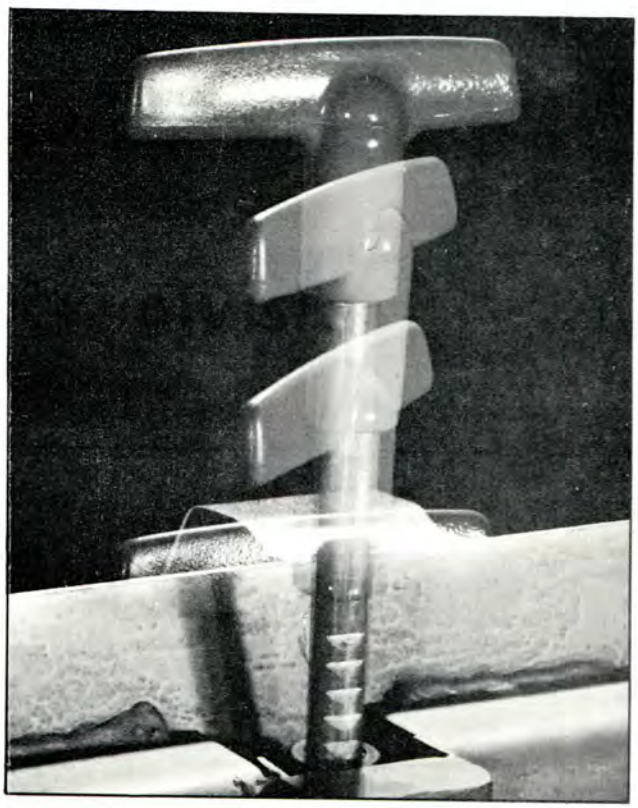


Plate 7482. Parking Brake

ENGINE AIR CLEANER (DRY TYPE)

Operating conditions determine the air cleaner service periods. The air cleaner should be checked every 8 operating hours and cleaned. This may be necessary more often under dusty operating conditions.

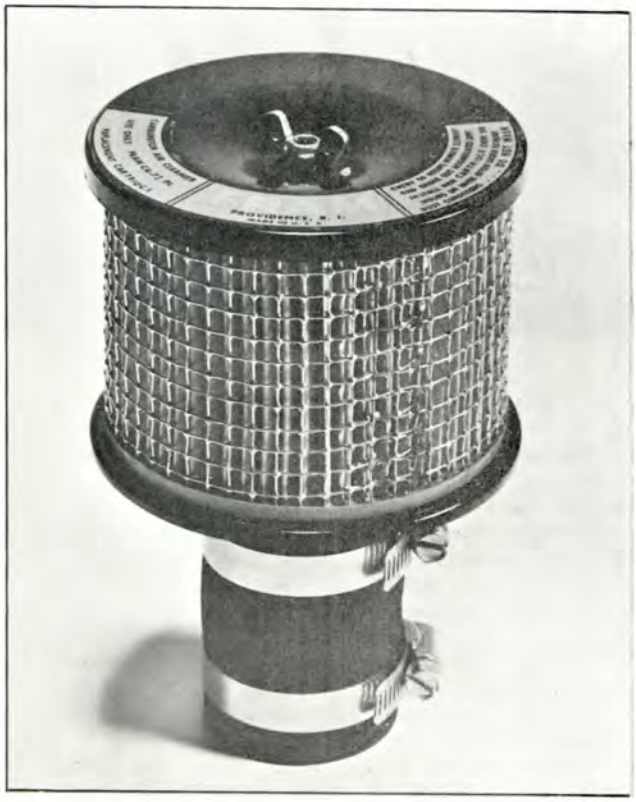


Plate 7453. Typical Air Cleaner

Proper servicing means cleaning unit thoroughly and maintaining air-tight connections between the air cleaner and intake manifold so that all air entering the engine is filtered.

1. Remove air cleaner cartridge (2) and tap cartridge on a hard flat surface until all loose dirt is removed.

2. After cleaning by the above procedure, clean unit with filtered, moisture free, compressed air. Direct air stream from the inside, (thru cartridge) outward at the same time rotating cartridge by hand.

N O T E

IF FILTER CARTRIDGE CANNOT BE PROPERLY CLEANED, REPLACEMENT IS NECESSARY.

Check all hose connections to be sure they are tight thus preventing any air and dirt from entering at these points. Periodcally remove hoses and check interior for any signs of dirt or dust. If found, this indicates that more frequent cleaning intervals are necessary as the hose interior should be free of all dirt and dust.

Plate 6980. Air Cleaner Components

N O T E

DEPENDING ON THE TYPE OF OPERATING THE MACHINE IS SUBJECTED TO WILL DETERMINE THE FREQUENCY OF AIR CLEANER MAINTENANCE. HAPHAZARD MAINTENANCE WILL LEAD TO SHORT ENGINE LIFE. AIR CLEANER MAINTENANCE MAY SEEM TRIVIAL, BUT IT CAN MEAN LONGER ENGINE LIFE, LESS ENGINE UPKEEP AND BETTER ECONOMY PROVIDED PROPER MAINTENANCE IS EXERCISED. CLOSE OBSERVANCE AND COMMON SENSE CAN BEST DETERMINE THE FREQUENCY OF AIR CLEANER MAINTENANCE.

Plate 7454. Sump Tank Breather

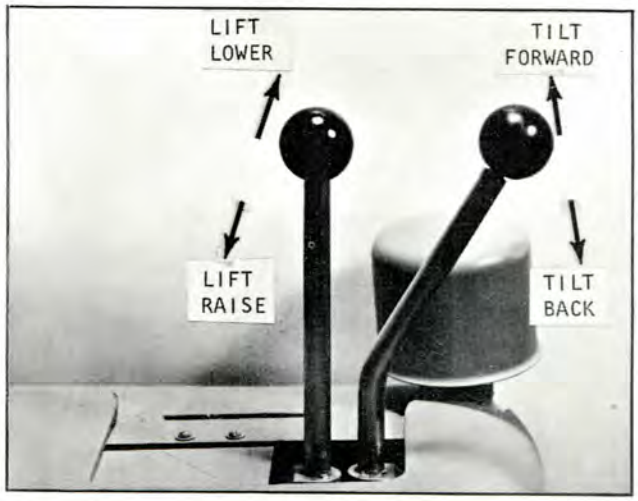


Plate 7449. Lift and Tilt Levers

HYDRAULIC SUMP TANK

Check hydraulic sump tank fluid level in the following manner:

1. Lower upright.

2. Shut engine off.

3. Remove sump breather. Fluid level should be up to bottom of filler pipe.

If necessary, fill sump tank using MS 68 Hydraulic Oil. Start engine and operate valve control levers allowing any air in the lines to escape, then recheck sump tank fluid level before putting machine into operation.

HYDRAULIC CONTROL LEVERS

I M P O R T A N T

EVERY 8 OPERATING HOURS (OR EVERY SHIFT)

ELEVATE UPRIGHT TO THE UPPER LIMIT. THIS WILL PROVIDE LUBRICATION TO THE TOP PORTION OF THE LIFT CYLINDER.

Check lift and tilt operation. The lift and tilt cylinders should actuate when lift or tilt levers are moved either way from neutral position.

When load is elevated and control lever returned to neutral position, load should remain in elevated position with no noticeable downward drift. If load drifts downward excessively, this may indicate lift cylinder U-Cup or seal damage -- report to designated person in authority.

With tilt lever in neutral position, upright should remain steady with no noticeable backward or forward drift. If upright drifts excessively either way, this may indicate tilt cylinder seal or U-Cup damage -- report to designated person in authority.

C A U T I O N

NEVER ALLOW LOADED OR UNLOADED LIFT CARRIAGE TO REMAIN IN AN ELEVATED POSITION FOR ANY PROLONGED PERIODS. LIFT CARRIAGE SHOULD BE LOWERED WHEN NOT IN USE.

DO NOT HOLD CONTROL LEVERS IN EXTREME POSITIONS AFTER A LOAD HAS REACHED ITS LIMITS. TO DO SO WILL RESULT IN HIGH OIL PRESSURE THAT MAY RESULT IN HEATING OF THE HYDRAULIC OIL.

TIRE AND RIM MAINTENANCE

1. Inspect tires regularly - remove all sharp objects picked up by treads before they have a chance to cut further into the rubber and cause chipping or possible separation of the rubber from the base metal.

2. Avoid overloading and do not allow vehicle to stand under heavy loads for prolonged periods as this will cause a "flat" spot on the tires.

3. Check steering axle alignment regularly to protect against fast, irregular tread wear and separation.

4. If rubber tires come in contact with oils, grease, and gasoline they should be wiped off without delay.

5. Regular lubrication of all wheel bearings will assure free-rolling and elimination of tire drag when stopping or starting.

Plate 7398. Clutch Release Bearing Grease Cup

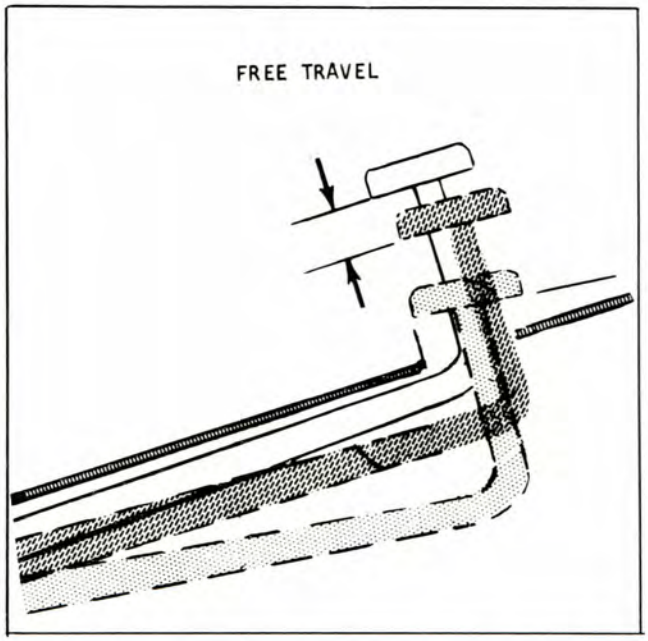


Plate 7048. Clutch Pedal Free Travel Check

CLUTCH RELEASE BEARING LUBRICATION:

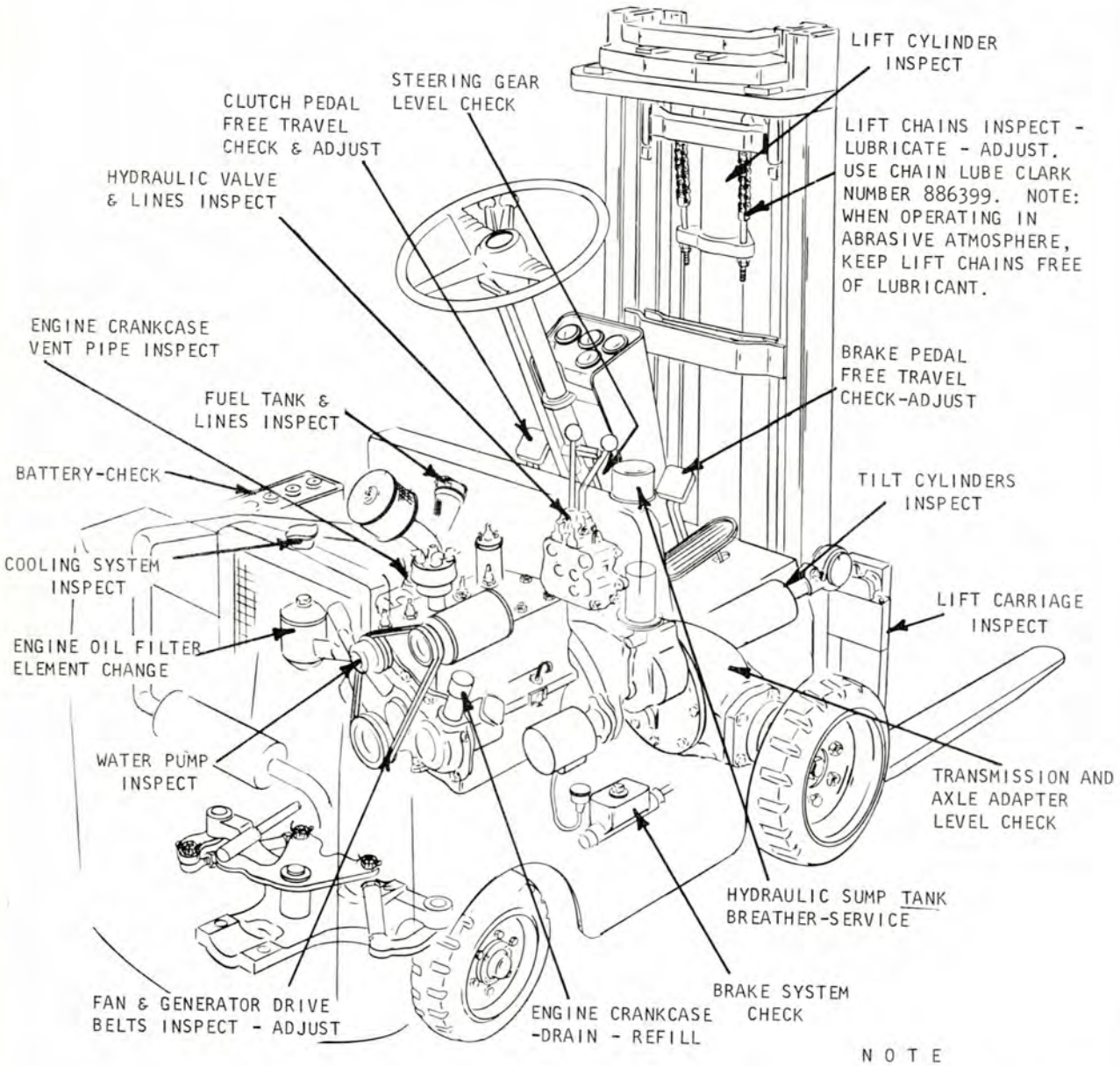
Rotate cup one complete turn every 8 operating hours.

Keep grease cup filled with Clutch Release Bearing high temperature grease. Use Shell 5A, Texaco 1199 or equivalent.

CLUTCH PEDAL FREE TRAVEL. Depress clutch pedal from the top position to a point where it meets resistance. This free travel should be approximately 5/8 to 1" inches from top pedal position.

100 HOURS

LUBRICATE MACHINE



N O T E

IN ADDITION TO THE ABOVE, PERFORM THE 8 HOUR PREVENTIVE MAINTENANCE SERVICES.

Plate 7466. Lubrication and Preventive Maintenance Illustration.

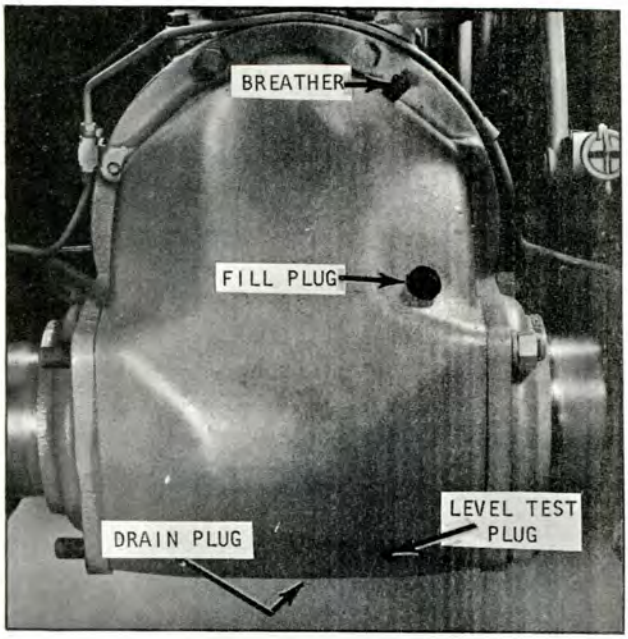


Plate 7455. Axle Adapter

TRANSMISSION AND AXLE ADAPTER

The transmission and axle adapter have a common lubrication system. Verify fluid level after removing level test plug located on the front side of the axle adapter. If lubricant is not to the height of this plug, remove the filler plug and add a sufficient quanity of straight mineral lube of S.A.E. 90 grade to bring level to the height of the level plug opening. Replace plugs and operate the machine in forward or reverse for 2 or 3 minutes to distribute lubricant throughout the system. Stop engine and again check level at the test plug. ADD or DRAIN lubricant as required.

C A U T I O N

DO NOT OVERFILL AS THE EXCESS QUANITY WILL SERVE NO USEFUL PURPOSE. IF THE OIL LEVEL IS TOO HIGH, IT WILL CAUSE EXCESSIVE OIL CHURNING AND ATTENDANTLY HIGH OIL TEMPERATURE AND POSSIBLE LEAKAGE.

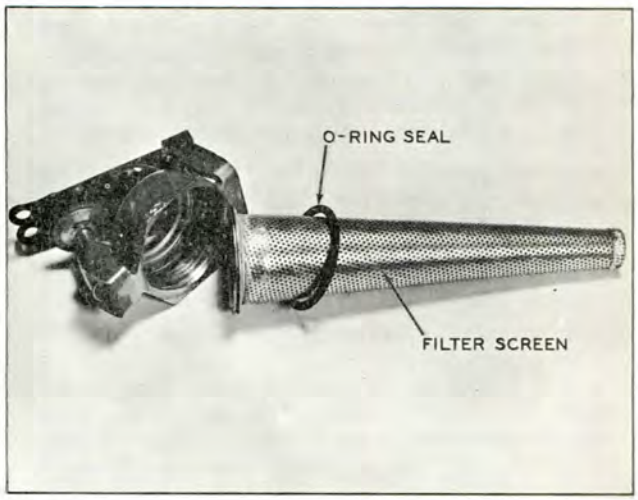


Plate 6627. Fuel Tank Filler Cap and Screen

AXLE ADAPTER BREATHER

Check breather to be sure it is free of any obstruction. Remove and clean in a Stoddard type cleaning solvent if necessary. Dry with compressed air before replacing breather on axle adapter.

FUEL LINES

Make certain that fuel line connections are secure. Check fuel lines for obstruction and leaks. Check screen in fuel filler cap to make certain that it is properly installed.

ENGINE CRANKCASE

Every 100 operating hours, drain and refill. (Drain at operating temperatures). Refill, then run engine a few minutes and add oil as necessary to bring oil level to full mark indicated on the dipstick.

Crankcase Capacity — Refer to Specifications

Service "MS" Oils

S.A.E.	10W	0° to 32° F.
S.A.E.	20W	32° to 75° F.
S.A.E.	30	above 75° F.
or use	10W....30 MULTI-GRADE OIL.	

ENGINE CRANKCASE VENTILATION PIPE

Check crankcase ventilation pipe for damage or obstructions. The pipe must be open to provide proper ventilation. Clean, repair or replace as required.

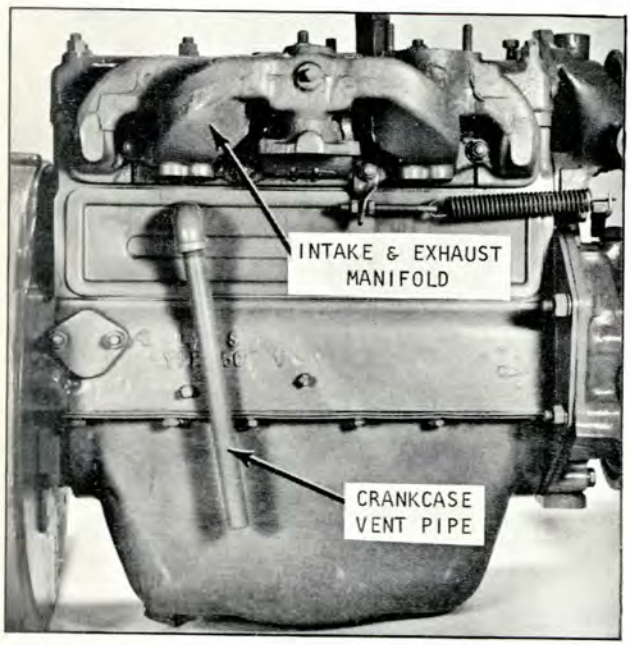


Plate 7470. Crankcase Vent Pipe

ENGINE OIL FILTER

The oil filter element is of the replaceable type. The element should be changed whenever the crankcase is drained. To remove the element, remove oil filter cover screw and gasket, oil filter cover, cover spring and cover gasket. Lift out oil filter element. Install new element after draining and thoroughly cleaning filter case. Install new gaskets and replace cover spring, oil filter cover and secure with oil filter cover screw.

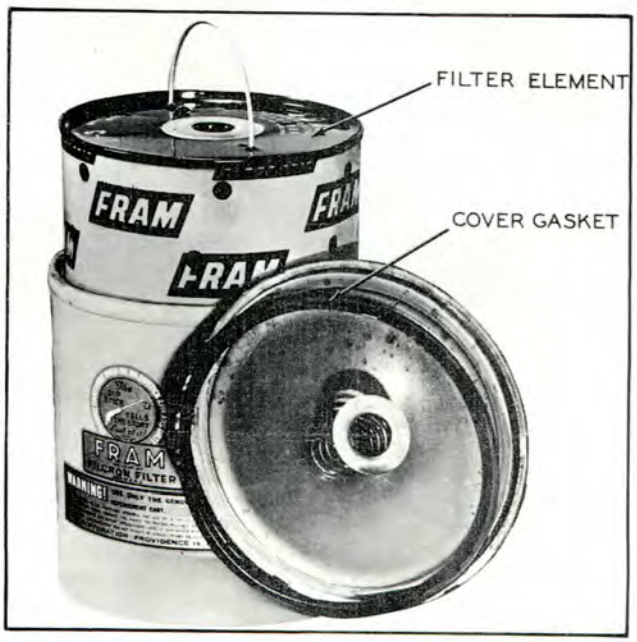


Plate 6642. Engine Oil Filter

C A U T I O N

START ENGINE, RUN AT IDLE FOR A FEW MINUTES, CHECK COVER AND COVER SCREW FOR LEAKS.

Plate 6458. Radiator Pressure Cap

W A R N I N G

USE EXTREME CARE IN REMOVING THE RADIATOR PRESSURE CAP. IN PRESSURE SYSTEMS, THE SUDDEN RELEASE OF PRESSURE CAN CAUSE A STEAM FLASH AND THE FLASH, OR THE LOOSENED CAP CAN CAUSE SERIOUS PERSONAL INJURY. LOOSEN CAP SLOWLY AND ALLOW STEAM TO ESCAPE. THIS MACHINE IS EQUIPPED WITH A 7 LB PRESSURE CAP.

COOLING SYSTEM

Check radiator, hoses and water pump for leaks.

Add proper amount of water or anti-freeze solution to cooling system. If anti-freeze is not available and machine is to be at rest for an appreciable length of time, drain system when temperature is likely to be 32° F, or lower. If water is added to radiator containing anti-freeze solution, always test solution in radiator with a hydrometer to determine the degree of protection. For proper amount of anti-freeze solution required to protect the cooling system, refer to instructions on anti-freeze container.

N O T E

COOLING SYSTEM CAPACITY - REFER TO SPECIFICATIONS.

Accumulated foreign material should be blown from radiator fins with compressed air. Direct air stream through radiator fins towards engine to make this process effective.

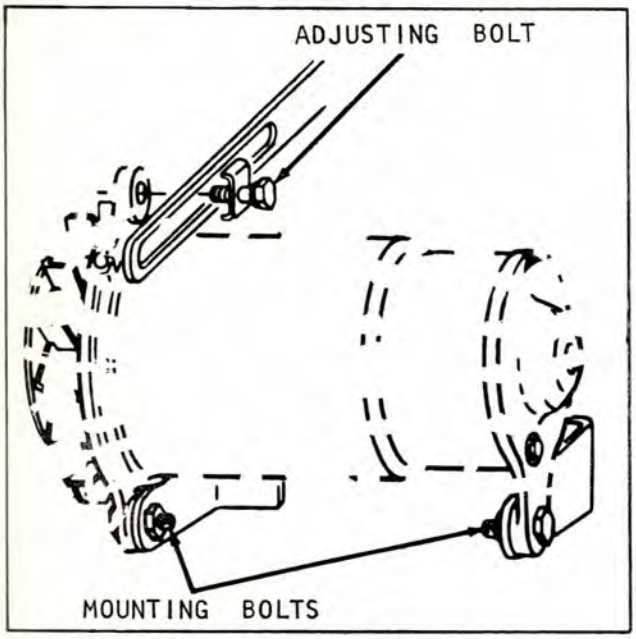


Plate 6631. Generator Drive Belt Adjustment

FAN AND GENERATOR DRIVE BELTS

The drive belts should have finger pressure deflection of 3/4 to 1 inch midway on long span. If belts require adjustment, use following procedure.

1. Loosen generator brace adjusting bolt and two lower mounting bolts, see Plate 6631.

2. Move generator toward cylinder block to loosen Generator Drive Belts and away from cylinder block to tighten belts. Tighten bolts when correct finger deflection is obtained.

C A U T I O N

EXERCISE CAUTION WHEN ADJUSTING BELTS. BELTS ADJUSTED TOO TIGHT WILL VERY LIKELY CAUSE BEARING DAMAGE. CONVERSELY, BELTS ADJUSTED TOO LOOSE WILL RESULT IN BELT WEAR AND HIGH ENGINE TEMPERATURE DUE TO BELT SLIPPAGE.

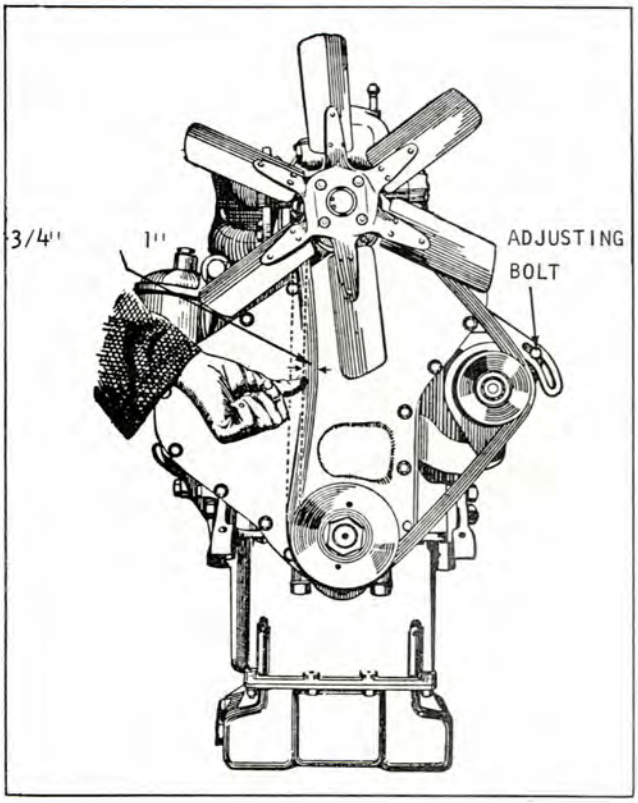


Plate 6632. Belt Deflection Check

N O T E

UPON REPLACEMENT OF DRIVE BELTS, IT WILL BE NECESSARY TO USE A MATCHED SET OF BELTS.

BRAKE PEDAL FREE TRAVEL

Using a rule, measure pedal free travel at either of the two places shown below.

Depress brake pedal by hand. When pedal meets resistance from the master cylinder, the distance traveled should be 3/16 to 1/2" — if free travel is incorrect, adjust as follows:

1. Loosen lock nut, see Plate 6633.

2. Rotate adjuster to obtain specified pedal free travel.

3. Tighten lock nut to hold adjustment.

ACTUATION STROKE

The Automatic Brake Adjustors will maintain pedal stroke, with little variation, until such time as the brake linings require replacement.

If the system has been properly bled and brake pedal travels beyond this point---------- this indicates a malfunction in the brake system. Check the complete system and repair or replace the faulty components.

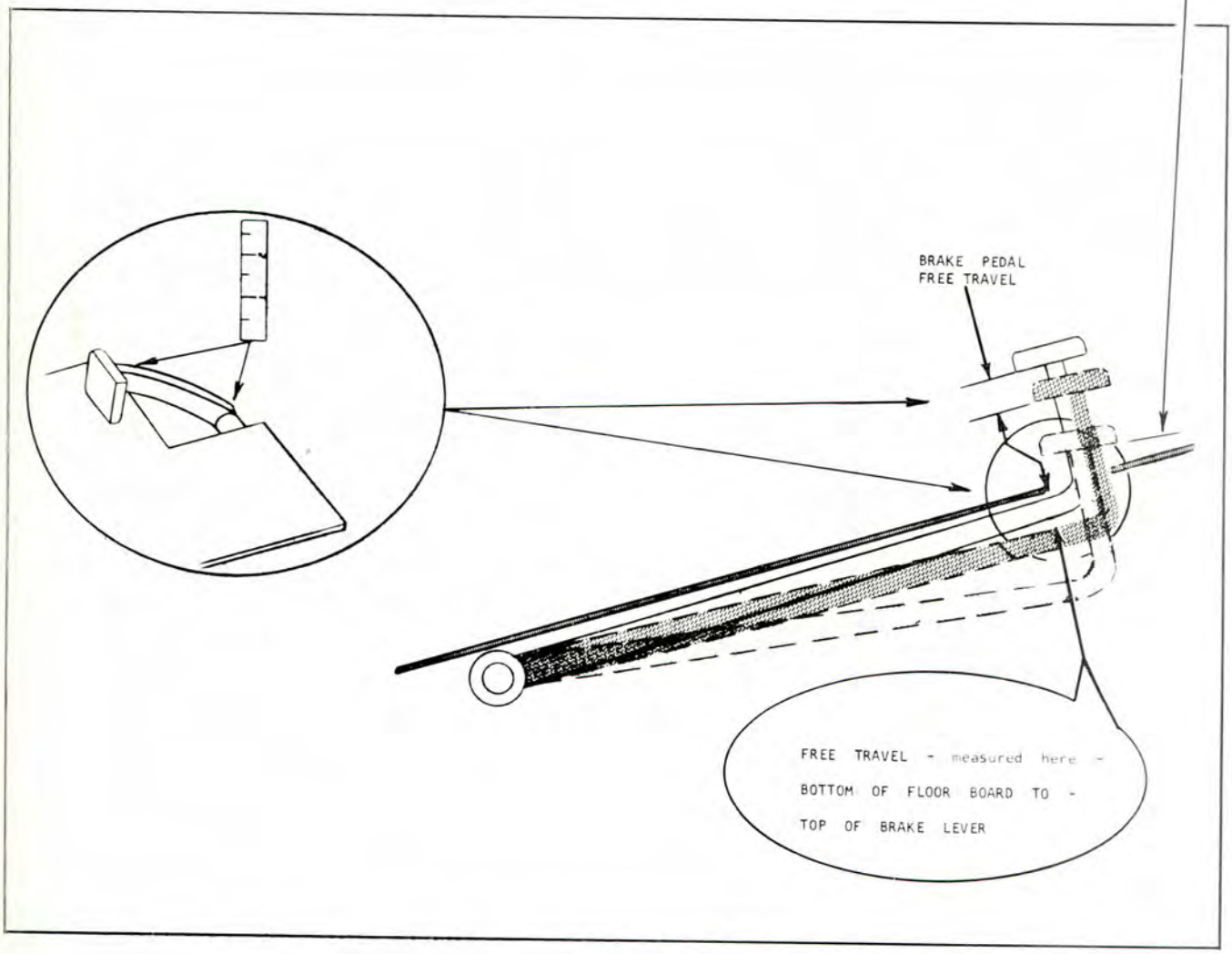


Plate 7042. Brake Pedal Check and Adjustment

BRAKE SYSTEM

Check brake fluid level in the master cylinder. Brake fluid should be within 1/4 inch of the top. Fill with S.A.E. 70 R3 Heavy Duty Hydraulic Brake Fluid, CLARK part #1800200.

Master Cylinder Filler Cap Vent Hole:
Check cap vent hole for obstruction. Vent hole must be open at all times. Clean if necessary. See Plate 6633.

A correctly adjusted brake pedal is important so that the internal ports in the master cylinder are not blocked by the cylinder piston. The following lists two important reasons for proper brake pedal free travel.

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WARNING

CORRECT BRAKE PEDAL FREE TRAVEL IS IMPORTANT FOR SAFE OPERATING BRAKES.

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Inadequate pedal free travel will block the internal ports so that upon releasing the brake pedal fluid will be trapped in the lines and hold the brake linings in contact with the brake drums. Resulting in lining wear and excessive fuel consumption.

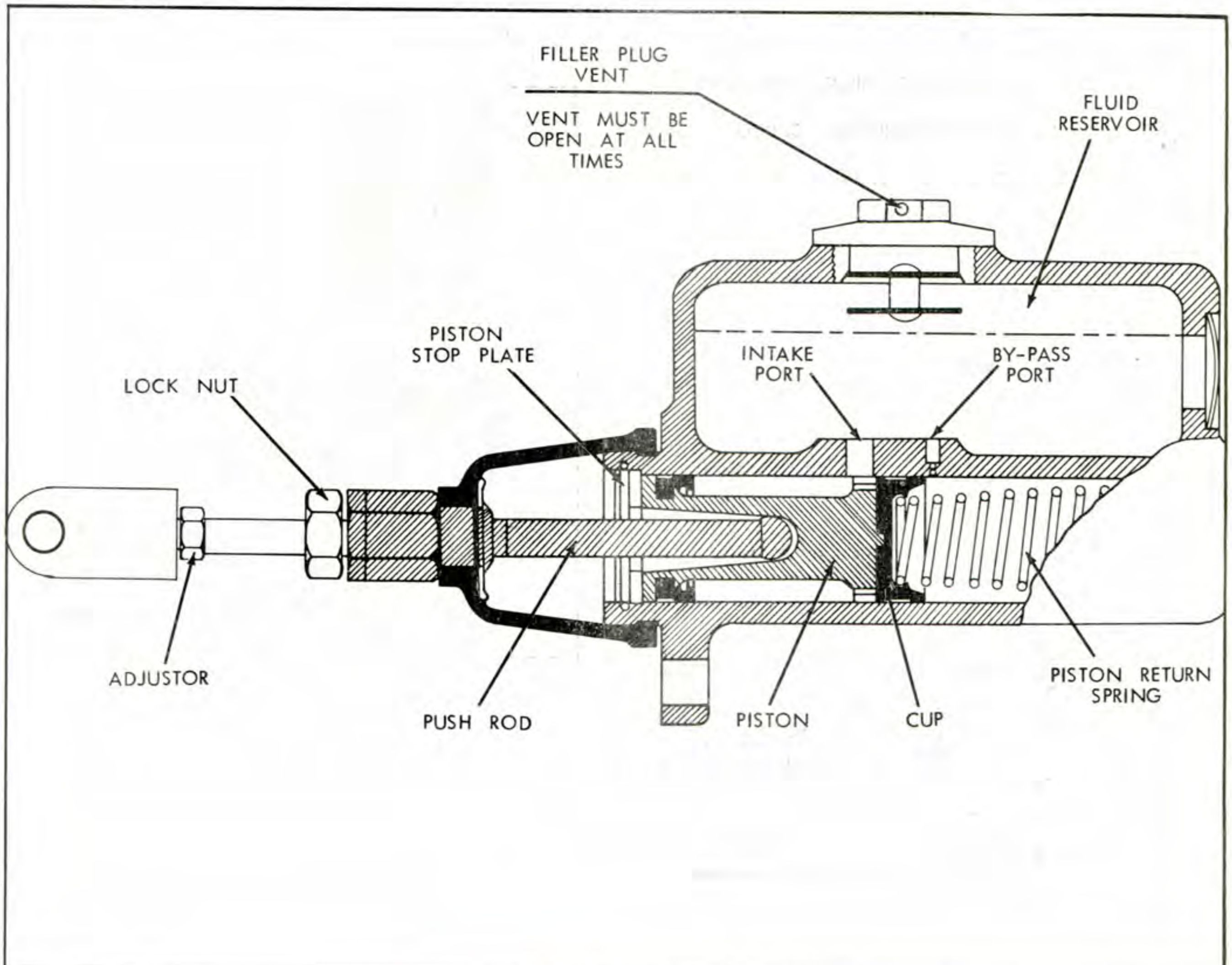

Plate 6633. Brake Pedal Adjustment

LIFT AND TILT CYLINDERS

Check for drift, leakage at packings, damage and security of mountings (Anchor Pivot Pins, Flanges and Mounting Rings).

LIFT CHAINS

The lift chains are mounted to the chain anchors on the lift carriage and at the chain anchor rods near the lift cylinder piston head.

If it becomes necessary to adjust the lift chains place a capacity load on forks (or device if used) and adjust chains so center line of lower carriage roller is at least 1/2" above the bottom end of the innerslide channel. It is important that the chain adjustment be made with a capacity load. In this manner you will allow for chain stretch.

W A R N I N G

KEEP CLEAR OF LOAD DURING ADJUSTMENT TO AVOID INJURY IF ANY MALFUNCTION SHOULD OCCUR AND CAUSE LOAD TO FALL.

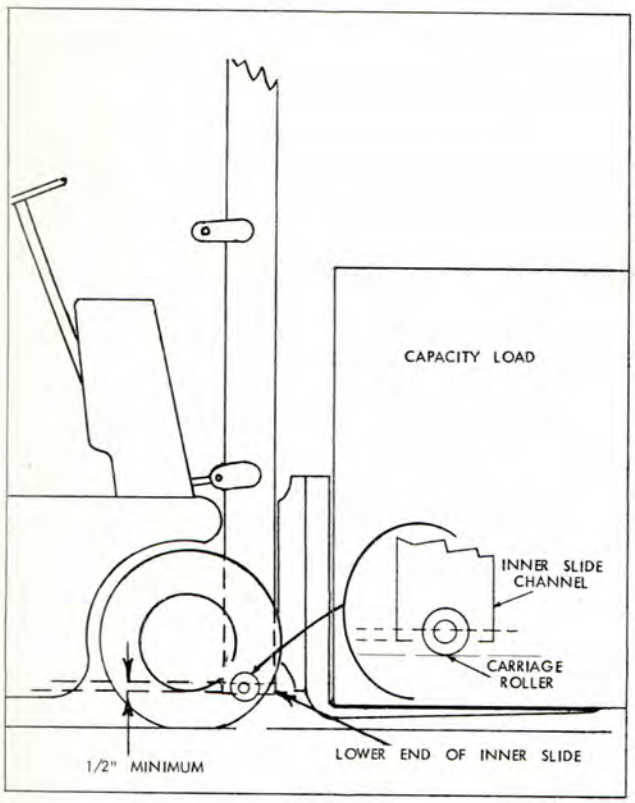

Plate 6884. Lift Chain Adjustment (Place Maximum Load On Forks)

LUBRICATE MACHINE

C A U T I O N

WHEN LUBRICATING THE TRUCK, MAKE A VISUAL INSPECTION OF ALL HYDRAULIC LINES, FITTINGS AND ALL ELECTRICAL WIRING. LUBRICATE ALL MISCELLANEOUS LINKAGE WITH S.A.E. NUMBER 20 OIL.

HYDRAULIC CONTROL VALVE AND LINES

Inspect for damage, leakage and security of mounting.

LIFT BRACKET

Inspect for damage, bent forks etc.

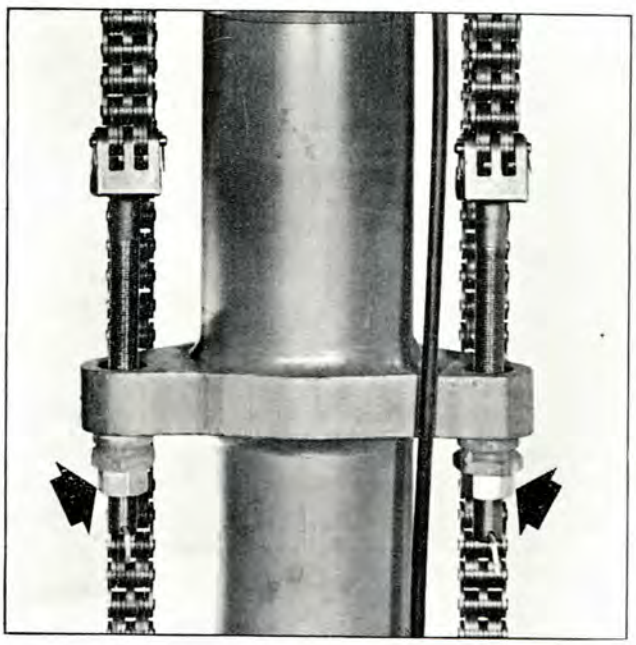

Plate 6634. Lift Chain Adjustment (Chain Anchor Rods)

Plate 7454. Hydraulic Sump Tank Breather

HYDRAULIC SUMP TANK BREATHER

Check breather to be sure it is not dirty or clogged with foreign matter.

Rinse breather in a Stoddard type cleaning solvent each time the machine is lubricated. Re-oil breather with S.A.E. number 20 after washing.

BATTERY INSPECTION

Remove all caps and check fluid level. Keep the fluid in each battery cell above the plates or up to the level ring in the bottom of the filler well. Use only pure distilled water. If the machine is exposed to freezing temperatures, operate the engine for a period of time to make sure the added water mixes thoroughly with the battery electrolyte solution. Otherwise, the water may freeze and damage the battery.

```
x x x x x x x x x x x x x x x x x x x x x x x x x x x
x                                                     x
x                    W A R N I N G                    x
x                                                     x
x  NEVER ALLOW FLAME OR SPARKS NEAR THE               x
x                                                     x
x  BATTERY FILLER HOLES BECAUSE EXPLOSIVE             x
x                                                     x
x  HYDROGEN GAS MAY BE PRESENT.                       x
x                                                     x
x x x x x x x x x x x x x x x x x x x x x x x x x x x
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Take hydrometer reading of electrolyte to determine state of charge. Charge battery if reading is below 1.225 at 24 deg. C (75 deg. F), or below 1.265, if machine is exposed to freezing temperatures. If machine is operating in tropical areas in which freezing weather is not encountered, the full charge specific gravity reading may be lowered from 1.375 to 1.225 by diluting the electrolyte with distilled water.

N O T E

Add distilled water before charging. Do not add distilled water immediately after a charge.

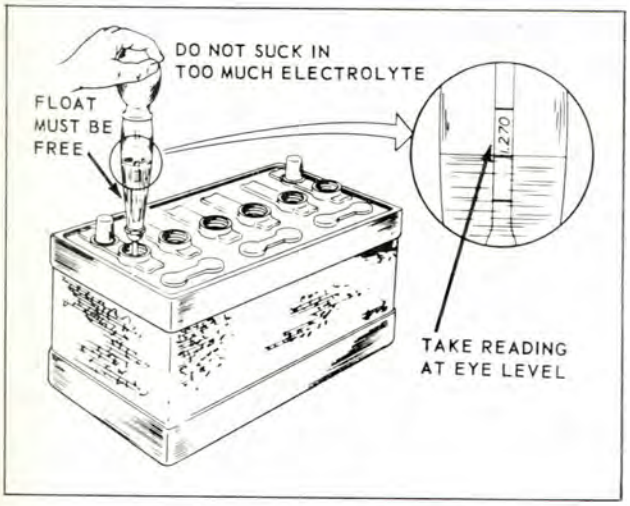


Plate 6271. Checking Specific Gravity of Battery

Make sure that all connections are tight at battery, starter, generator/alternator voltage regulator, distributor and spark plugs. Corrosion can be removed from the battery cables and terminals with a solution of baking soda or ammonia and water. After cleaning, flush the top of the battery with clean water, and coat the parts with grease to retard further corrosion.

BATTERY TEST PROCEDURE

A defective battery or a discharged battery may be found by performing the following "Light Load Test".

1. Place an electrical load on the battery by cranking the engine for three seconds. If it starts, turn the ignition off immediately.

2. Place a 10 ampere load across the battery terminals for one minute. This will condition the battery so an accurate voltage comparison test can be made between cells. (Connecting two headlights turned on low beam will equal the 10 ampere load - this method may be used in place of the load placed across the terminals.)

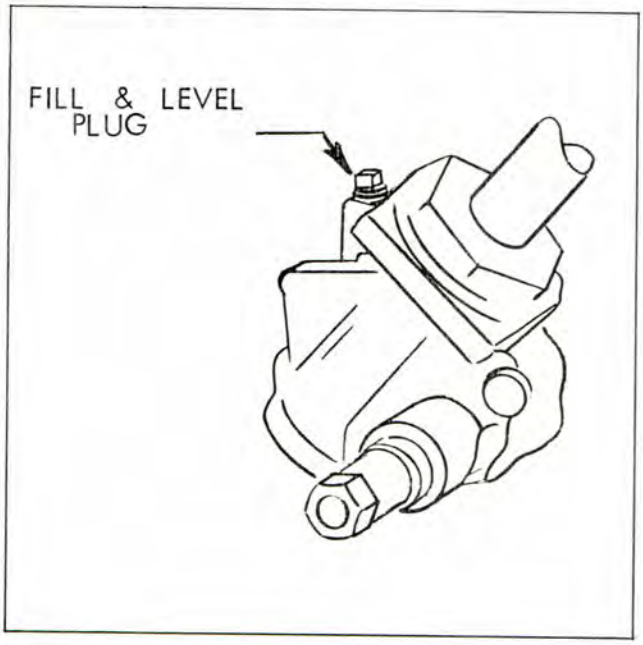


Plate 6429. Typical Steering Gear

STEERING GEAR

The steering gear is prepacked with grease at the factory and should not require lubrication until disassembled for repair. However, it is recommended that periodically the gear be checked for proper lubricant level, and filled if necessary with NLGI #1 (amolith grease EP #1 or its equivalent).

3. After one minute, and with the 10 ampere load still on the battery, check the individual cells with an expanded scale voltmeter.

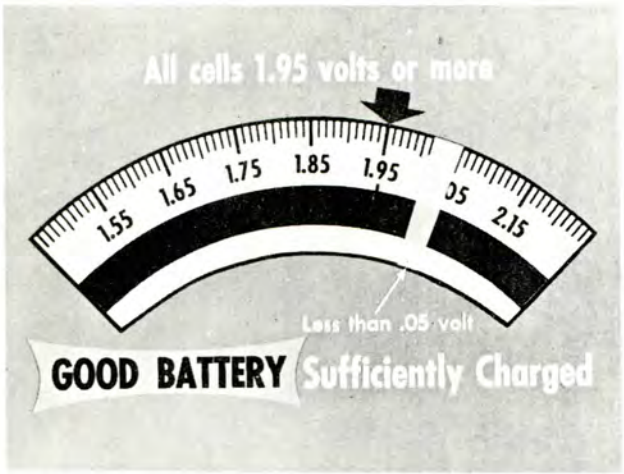


Plate 8306.

4. Place the positive voltmeter prod on the positive side of the cell and the other prod on the negative side. A good battery, sufficiently charged will read 1.95 volts or more on each cell with a difference of less than .05 volt between highest and lowest cell.

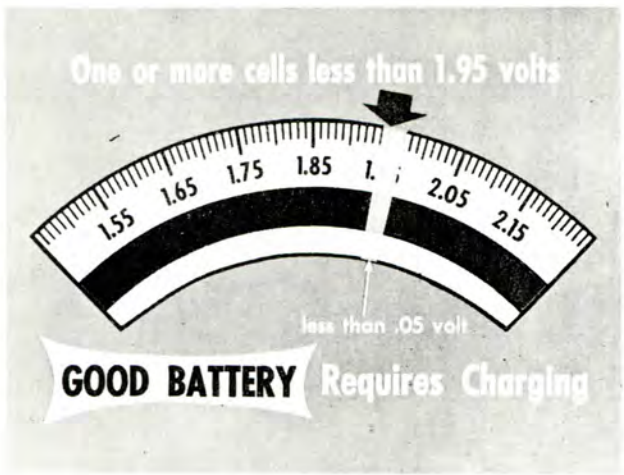


Plate 8307.

5. If cells read both above and below 1.95 volts and the difference between highest and lowest cell is less than .05 volt, battery is good but requires charging.

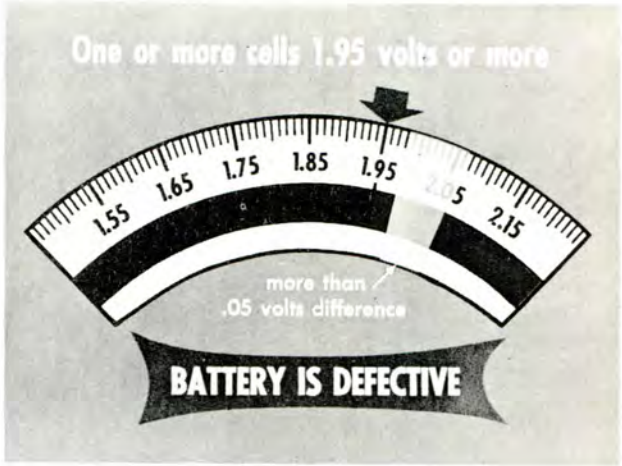


Plate 8308.

6. If any cell reads 1.95 volts or more and there is a difference of .05 volt or more between the highest and lowest cell, the battery is defective.

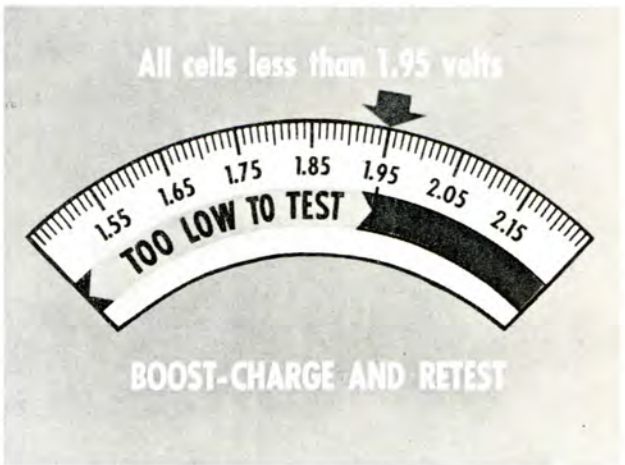


Plate 8309.

7. If all cells read less than 1.95 volts, battery is too low to test accurately. Boost-charge and repeat light load test.

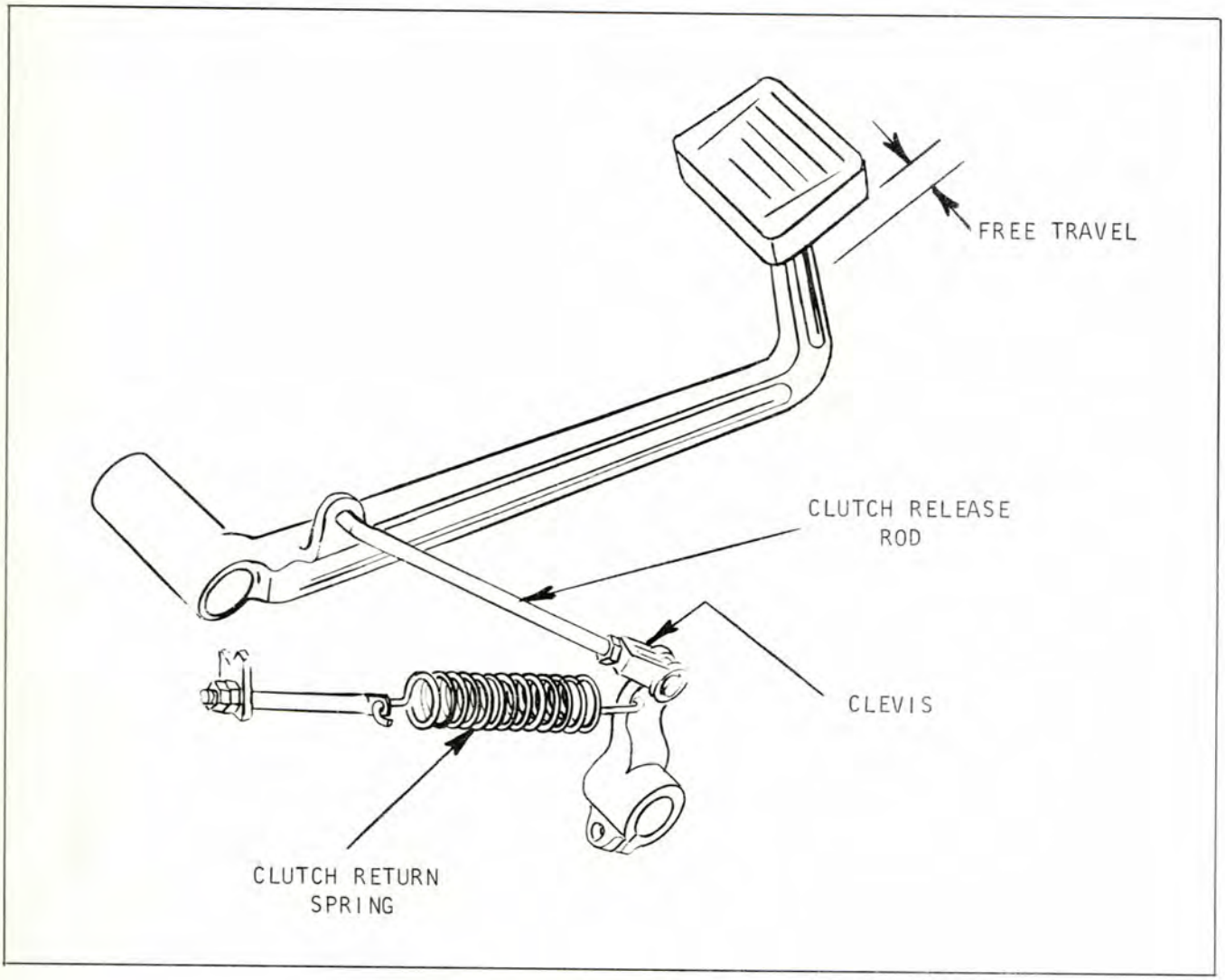
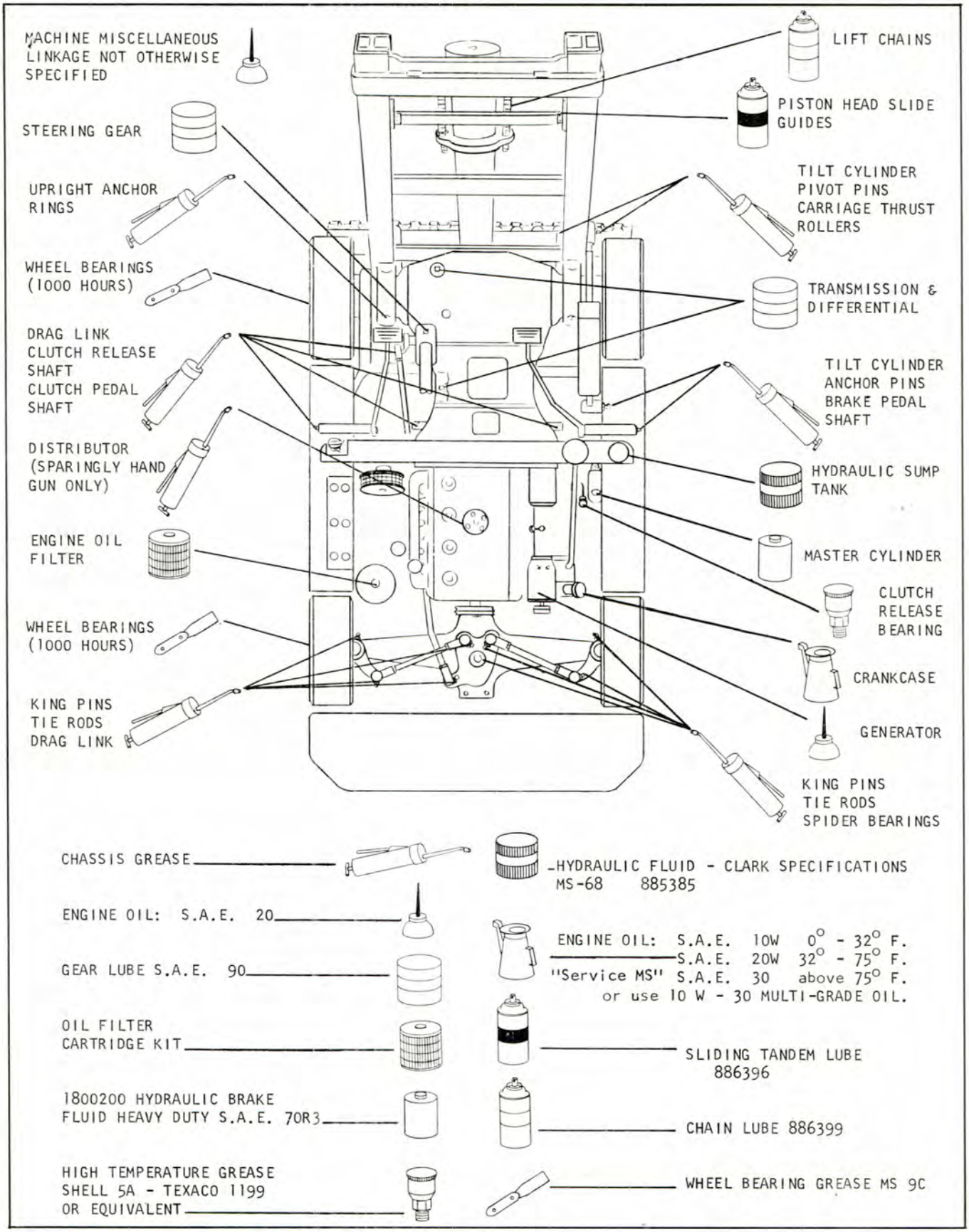


Plate 7481. Clutch Pedal Adjustment

The clutch pedal adjustment is necessary to compensate for clutch facing wear and provide clearance between the release bearing and pressure plate fingers. The adjustment is made beneath the floor plates.

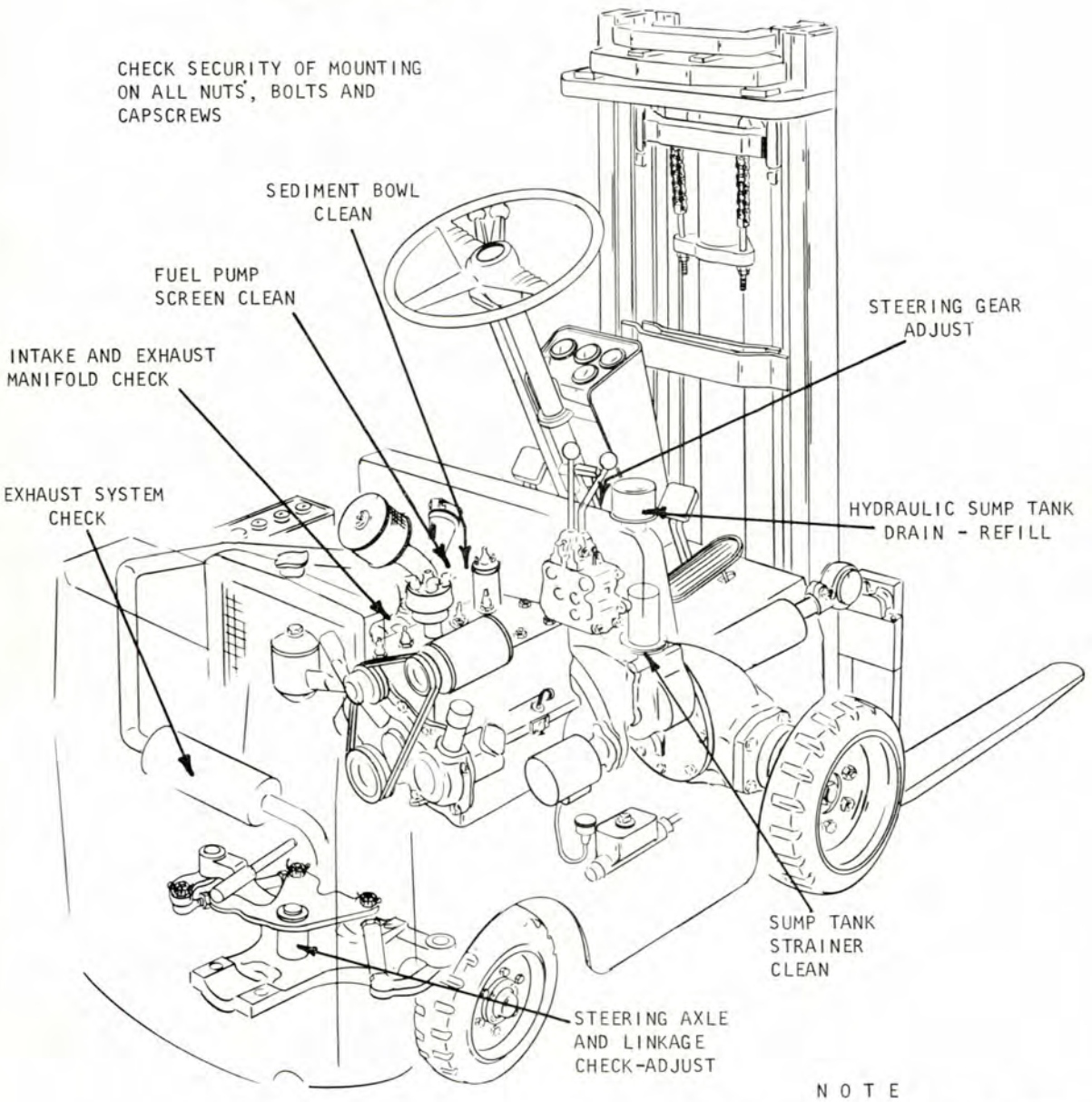
1. Adjust the clevis on the clutch release rod until the pedal has 5/8" to 1" free travel. Test the amount of free travel by depressing pedal by hand rather than the foot since this is a sensitive adjustment. The specified clearance is the distance from the top pedal position (with floor plate installed) to a point where resistance is noticed from the release bearing making contact with the pressure plate release fingers. See Plate 7481.

2. After correct free travel is obtained adjust the clutch return spring (see Plate 7481) to a length of 6 1/8 inches. This measurement is the length between the hooks on each end of the spring.


MACHINE MISCELLANEOUS LINKAGE NOT OTHERWISE SPECIFIED
STEERING GEAR
UPRIGHT ANCHOR RINGS
WHEEL BEARINGS (1000 HOURS)
DRAG LINK
CLUTCH RELEASE SHAFT
CLUTCH PEDAL SHAFT
DISTRIBUTOR (SPARINGLY HAND GUN ONLY)
ENGINE OIL FILTER
WHEEL BEARINGS (1000 HOURS)
KING PINS
TIE RODS
DRAG LINK
LIFT CHAINS
PISTON HEAD SLIDE GUIDES
TILT CYLINDER PIVOT PINS
CARRIAGE THRUST ROLLERS
TRANSMISSION & DIFFERENTIAL
TILT CYLINDER ANCHOR PINS
BRAKE PEDAL SHAFT
HYDRAULIC SUMP TANK
MASTER CYLINDER
CLUTCH RELEASE BEARING
CRANKCASE
GENERATOR
KING PINS
TIE RODS
SPIDER BEARINGS
CHASSIS GREASE
ENGINE OIL: S.A.E. 20
GEAR LUBE S.A.E. 90
OIL FILTER CARTRIDGE KIT
1800200 HYDRAULIC BRAKE FLUID HEAVY DUTY S.A.E. 70R3
HIGH TEMPERATURE GREASE SHELL 5A - TEXACO 1199 OR EQUIVALENT
HYDRAULIC FLUID - CLARK SPECIFICATIONS MS-68 885385
ENGINE OIL: S.A.E. 10W 0° - 32° F.
S.A.E. 20W 32° - 75° F.
"Service MS" S.A.E. 30 above 75° F.
or use 10 W - 30 MULTI-GRADE OIL.
SLIDING TANDEM LUBE 886396
CHAIN LUBE 886399
WHEEL BEARING GREASE MS 9C

500 HOURS

STEAM CLEAN MACHINE



N O T E

IN ADDITION TO THE ABOVE, PERFORM THE 8 HOUR AND 100 HOUR PREVENTIVE MAINTENANCE SERVICES.

Plate 7467. Lubrication and Preventive Maintenance Illustration

FUEL PUMP STRAINER

The fuel filter and sediment bowl should be cleaned every 500 operating hours. Remove and clean sediment bowl. If fuel strainer is dirty, install a new strainer assembly and gasket. Do not reuse old gasket.

FUEL PUMP

To determine if the fuel pump is defective, remove the fuel tank supply line at the pump and blow out line with compressed air to remove any possible obstructions. Reconnect fuel tank line and disconnect pump to carburetor line. Install a fuel pressure gauge, by placing a "T" in the line, and run engine at 1800 R.P.M. with all lines connected. Fuel pump pressure should be between 1 1/2 and 2 1/4 pounds. If the fuel pump pressure is not within this range the pump should be removed for repair or replacement.

C A U T I O N

TO AVOID CREATING A FIRE HAZARD CARE SHOULD BE TAKEN SO THAT GASOLINE IS NOT SPILLED DURING THESE OPERATIONS.

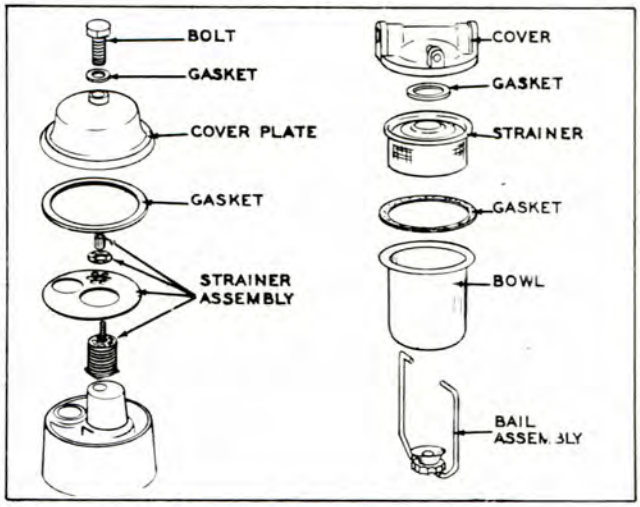


Plate 6638. Fuel Pump & Sediment Bowl

HYDRAULIC SUMP TANK AND SUMP OIL STRAINER

C A U T I O N

THE HYDRAULIC SYSTEM MUST BE KEPT CLEAN. IT MAY BE NECESSARY TO DRAIN, CLEAN AND REFILL SUMP TANK MORE OFTEN UNDER ADVERSE CONDITIONS. THIS IS BEST DETERMINED BY CHECKING CONDITION OF THE HYDRAULID FLUID FOR EVIDENCE OF DIRT, SLUDGE OR ANY FOREIGN MATTER AT PERIODIC INTERVALS.

1. Lower upright and shut engine off.

2. Remove the pump pressure line at the hydraulic valve.

3. Place the unattached end of the hose in a large container and run engine at idle speed until the oil has been pumped from the sump tank. See Plate 3720.

C A U T I O N

DO NOT OPERATE ENGINE AFTER THE OIL HAS BEEN PUMPED FROM THE SUMP TANK AS THE HYDRAULIC PUMP WILL NOT BE LUBRICATED AND DAMAGE WILL RESULT.

4. Reinstall the pump pressure line to the hydraulic valve.

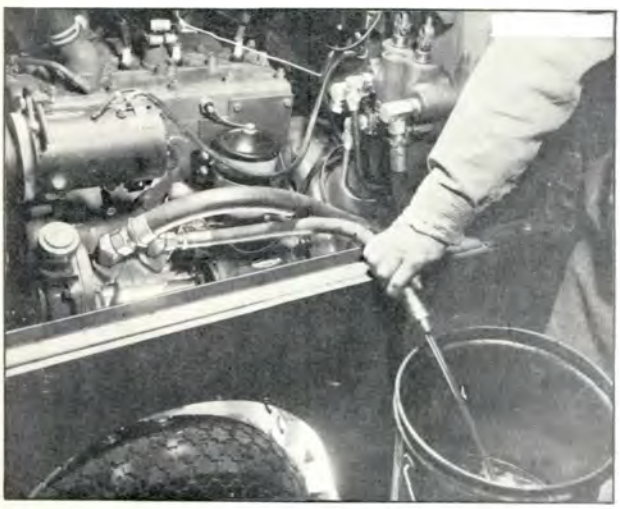


Plate 3720. Removing Hydraulic Sump Oil

SUMP TANK STRAINER

1. Remove suction line from bottom of sump strainer housing.

2. Remove strainer retaining bolts and pull strainer and housing out of sump tank.

3. Remove any remaining gasket material from mounting flange.

4. Rinse sump strainer in a Stoddard type cleaning solvent and dry with filtered compressed air.

5. Flush sump tank with 2 quarts of clean hydraulic oil. Be sure sump tank is absolutely clean. It is recommended that a new felt washer and gasket be used when installing the cleaned strainer.

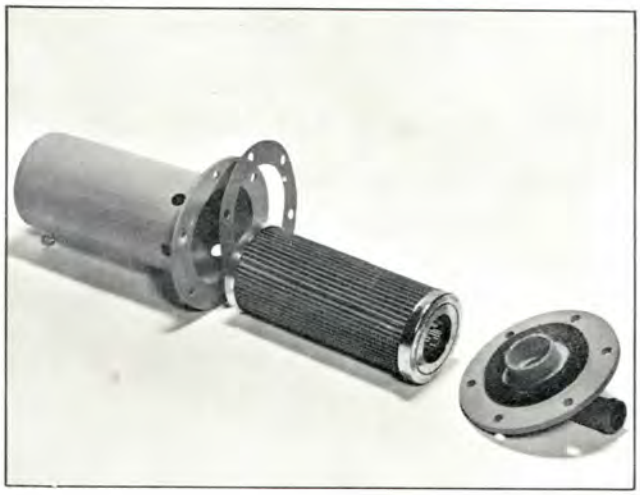


Plate 7456. Sump Tank Strainer

6. Install sump housing retainer bolts, hose and connections.

7. Fill sump tank with MS68 hydraulic fluid until level reaches the bottom of the fill pipe.

C A U T I O N

START ENGINE AND OPERATE HYDRAULIC CONTROL LEVERS SEVERAL TIMES, CHECK OIL STRAINER FOR LEAKS, RECHECK OIL LEVEL AND FILL TO BOTTOM OF FILL PIPE IF NECESSARY.

STEERING GEAR

Steering gear adjustments must be made in the following manner (see Plates 6636 and 6637).

Always check worm bearing thrust adjustment, and adjust if necessary, before making sector gear lash adjustment.

Before making above adjustments, the following preliminary operations are necessary.

1. Disconnect steering drag link from pitman arm. Note relative position of drag link parts when disconnecting link so the parts may be re-assembled correctly.

2. Check lubricant level in steering gear housing. If low, add enough lubricant to bring level up to filler plug hole. (Use NLGI #1 Amolith grease EP #1 or its equivalent).

3. Tighten steering gear housing to frame side member bolts, see Plate 6636.

4. Determine straight-ahead position of steering mechanism by turning steering wheel to extreme right.

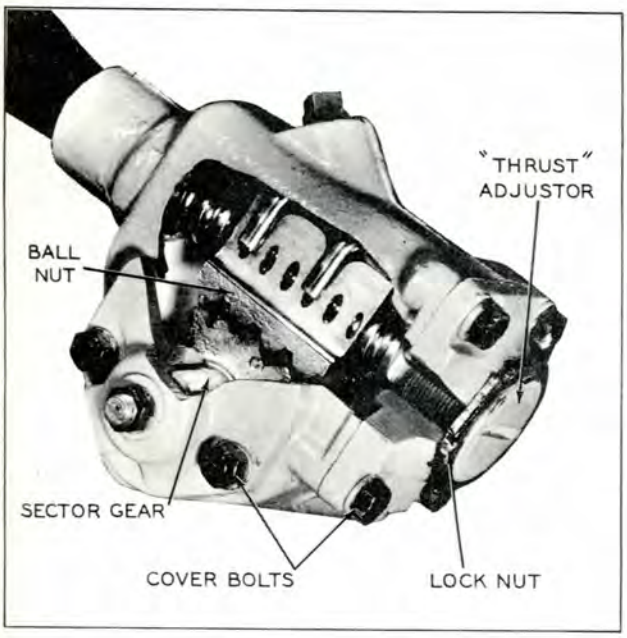


Plate 6636. Steering Gear Thrust Adjustment (Worm Bearings)

CAUTION

APPROACH EXTREME ENDS CAUTIOUSLY; WORM BALL NUT MUST NOT STRIKE ENDS WITH ANY DEGREE OF FORCE.

Then turn to extreme left, counting the exact number of turns from right to left end. Turn wheel back one-half number of wheel turns. Mark wheel with respect to steering column so center position may readily be found during adjustment procedures.

Worm Bearing THRUST Adjustment: Refer to Plate 6636 and proceed as follows:

1. Check tightness of cover bolts, see Plate 6636. Loosen lock nut and turn lash adjuster screw (Plate 6637) counterclockwise a few turns to provide clearance between sector gear and worm ball nut.

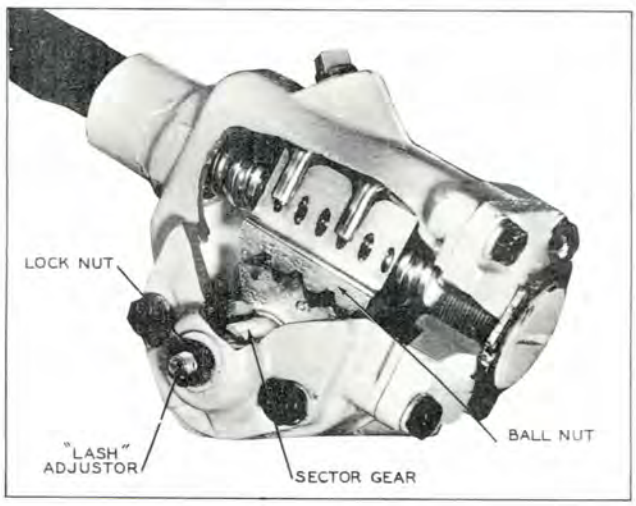


Plate 6637. Steering Gear Lash Adjustment (Sector Gear)

2. Turn steering wheel GENTLY to one extreme end. Turn wheel back one full turn. With spring scale on spoke of wheel, measure pull required to KEEP WHEEL MOVING. Pull on scale should be made at right angles to wheel spoke. If pull is within 1 1/2 to 2 pounds, proceed to lash adjustment in the following paragraphs. If pull is not within 1 1/2 to 2 pounds, adjust worm bearings. The pitman shaft adjustment must be made if worm bearing check is accomplished, or if the worm bearings are adjusted.

3. If it is necessary to adjust the worm bearings, loosen lock nut and then turn worm bearing adjuster nut clockwise until all end play is removed, see Plate 6636. Using

spring scale, as directed in Step 2, check pull and readjust as necessary; then tighten lock nut securely.

Sector Gear Lash Adjustment: Refer to Plate 6637 and proceed as follows:

1. Steering Gear Mechanism must be in straight ahead position as previously explained.

2. Turn lash adjuster screw clockwise to remove all lash between gear teeth. Tighten adjuster screw lock nut. Position spring scale on steering wheel so pull may be made at right angles to wheel spoke.

3. Measure pull while wheel is TURNED THROUGH CENTER POSITION. Readjust if reading is not within 2 1/2 to 3 pounds.

4. Tighten adjuster screw lock nut, check pull again.

5. After adjustments are made, install drag link on pitman arm.

N O T E

If steering linkage adjustment is necessary do not install drag link to pitman arm.

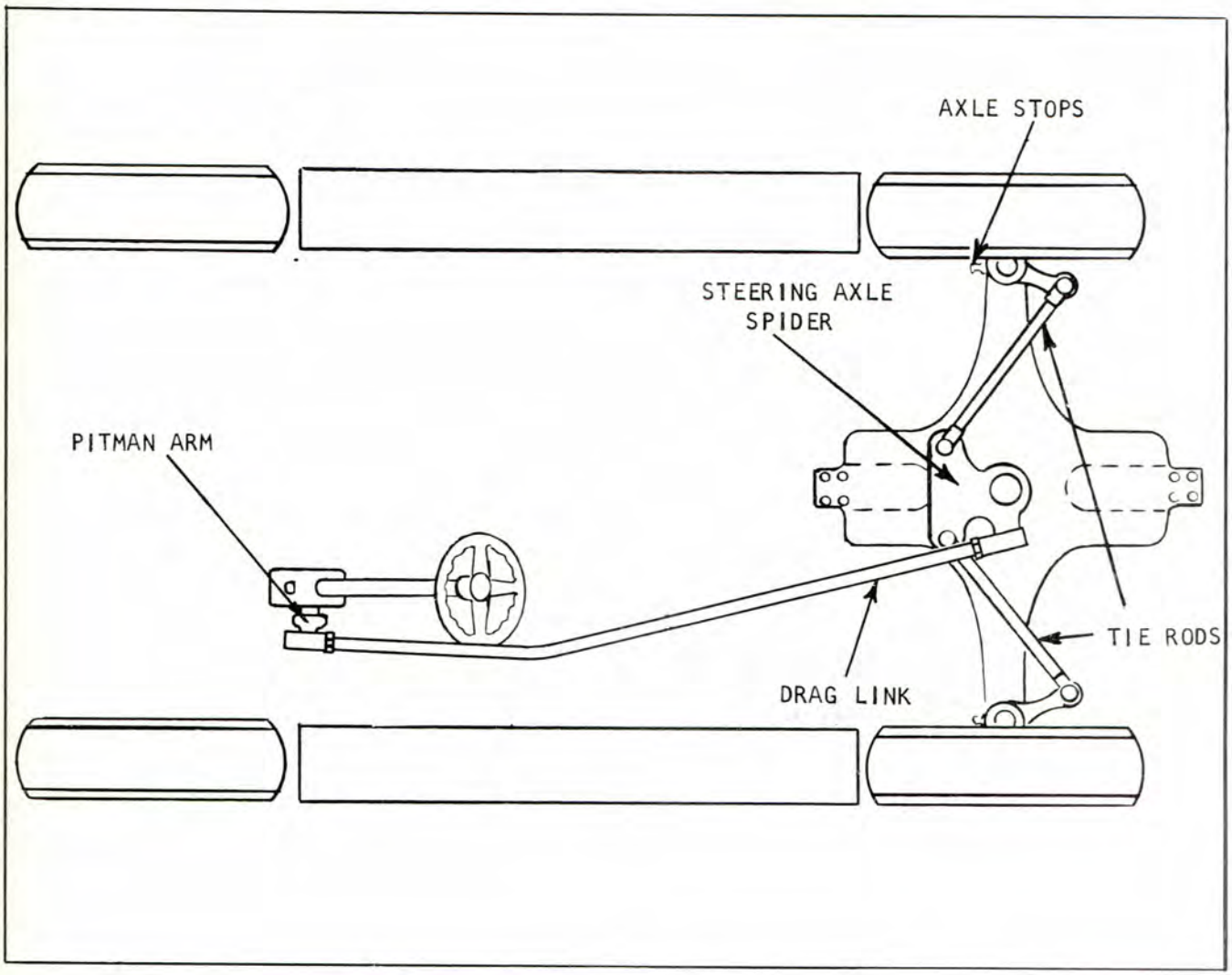


Plate 7419. Steering Linkage

STEERING AXLE AND LINKAGE ADJUSTMENTS

1. Raise the steering wheels far enough to clear the floor and place heavy blocking under the machine frame so it cannot accidentally become lowered during adjustments.

2. The steering wheels should track square with the drive wheels with no toe-in or toe-out. If adjustment is necessary loosen the lock nuts at the tie rod ends and turn each tie rod in a manner so they will be the same length when the correct adjustment is obtained. Tighten tie rod lock nuts to secure this adjustment.

3. Disconnect the drag link socket from the steering pitman arm noting the relative position of the socket parts so they may be re-installed correctly after checking wheels for correct turning geometry.

4. Check wheels for correct turning geometry by turning the wheels all the way for a left turn - this should allow the left wheel to attain an angle of 80 degrees to the frame. If an adjustment is necessary, the axle stop on the left side should be turned in or out whichever is necessary to acheive the correct angle. Repeat this procedure in a right turn with the opposite wheel and adjust the right axle stop as required.

5. Turn Steering wheels to straight ahead position.

6. Determine center position of steering gear. (Refer to Steering Gear adjustments for correct procedure).

7. Adjust drag link socket so that the grease fitting lines up with the centerline of the pitman arm ball stud and secure with lock nut and cotter pin.

8. Turn the handwheel until wheels are in straight ahead position. Remove handwheel and replace on steering column with the center spoke aligned minus or plus 10 degrees with the center line of the machine, the center spoke pointing back.

N O T E

CHECK STEERING GEAR SUPPORT BOLTS FOR SECURITY OF MOUNTING. TIGHTEN MOUNTING BOLTS AND CLAMP BOLTS TO 90 FOOT POUNDS TORQUE.

9. Remove blocking from under frame and lower machine to the floor.

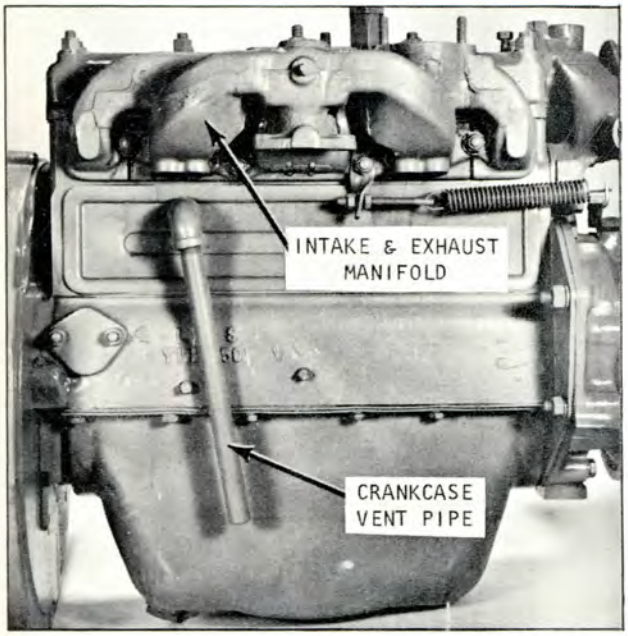


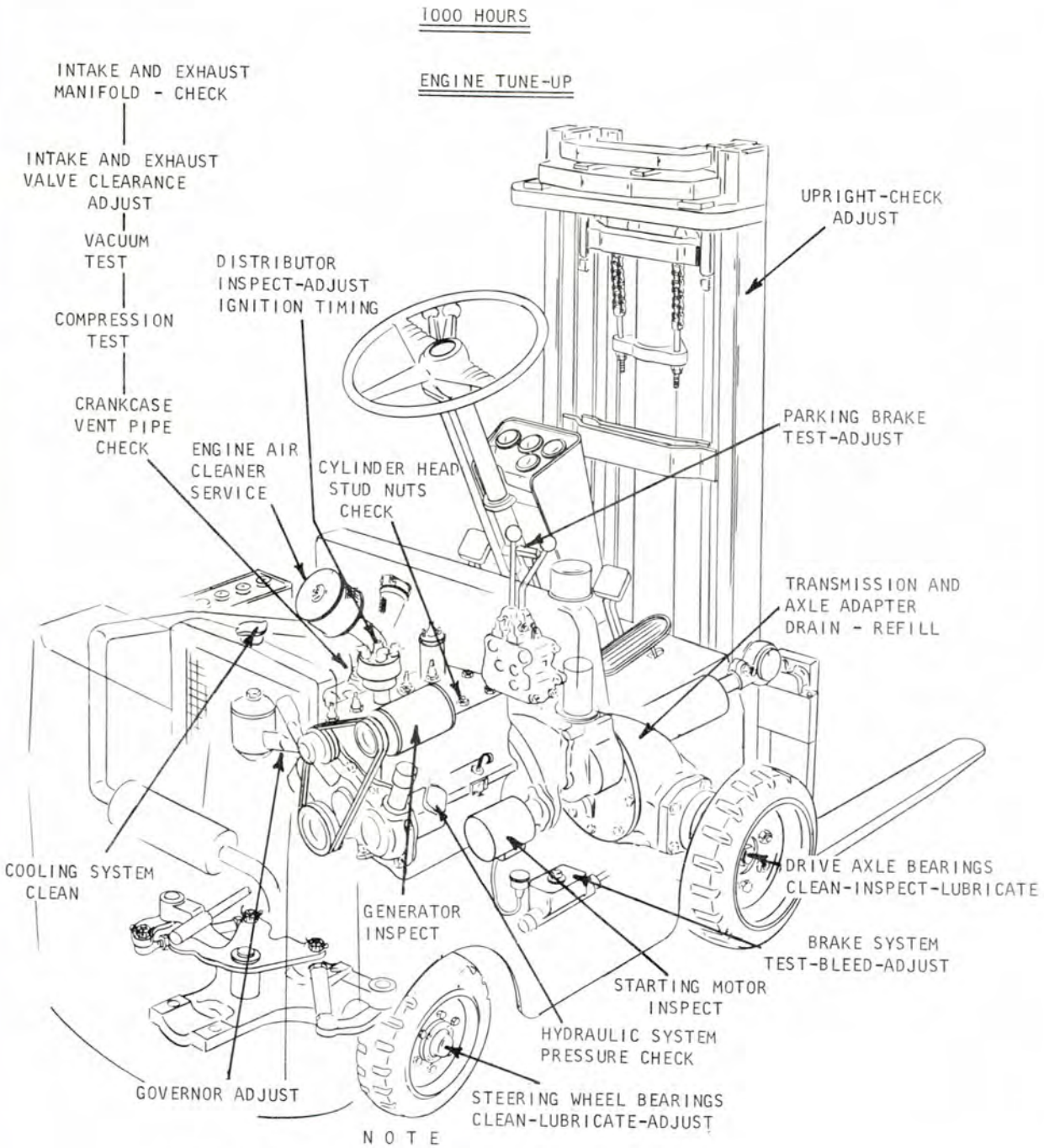
Plate 7470. Intake and Exhaust Manifolds

INTAKE AND EXHAUST MANIFOLDS

1. Inspect gaskets for leaks and inspect security of manifold nuts.

2. Inspect exhaust pipe and muffler for damage, leakage and security of mountings.

NUTS, BOLTS AND CAP SCREWS. Check security of mounting, tighten as required.



N O T E

IN ADDITION TO THE ABOVE, PERFORM THE 8 HOUR 100 HOUR AND 500 HOUR PREVENTIVE MAINTENANCE SERVICES.

Plate 7468. Lubrication and Preventive Maintenance Illustration

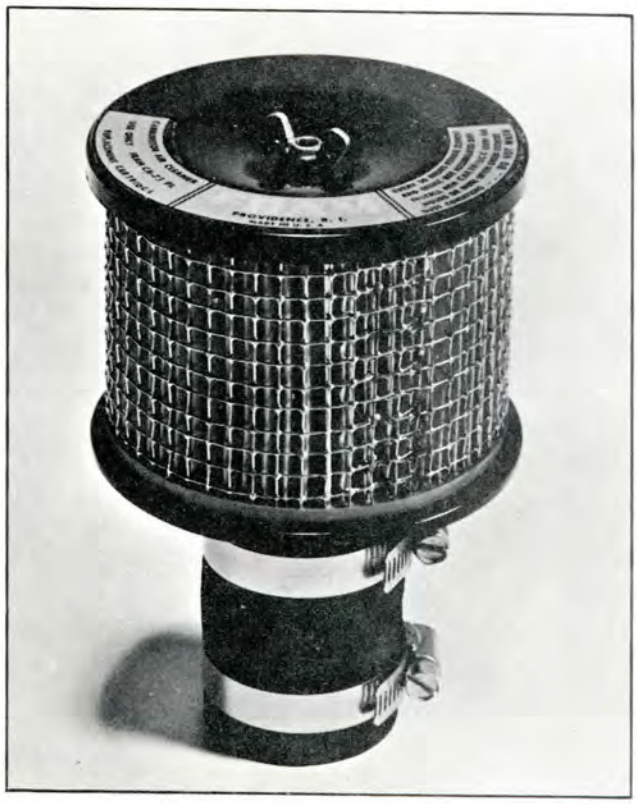


Plate 7453. Typical Air Cleaner

ENGINE TUNE-UP

Engine tune-up is the orderly and systematic process of checking the engine and accessory equipment to maintain or restore satisfactory engine performance. Engine tune-up must be accomplished semi-annually and more frequently if engine performance indicates the need for these services. Perform engine tune-up as follows:

1. AIR CLEANER. Be sure air cleaner has received proper service. Air cleaner must be installed before making engine tune-up.

2. FUEL PUMP. Be sure the fuel pump bowl and strainer has been properly serviced and the fuel pump is operating satisfactorily.

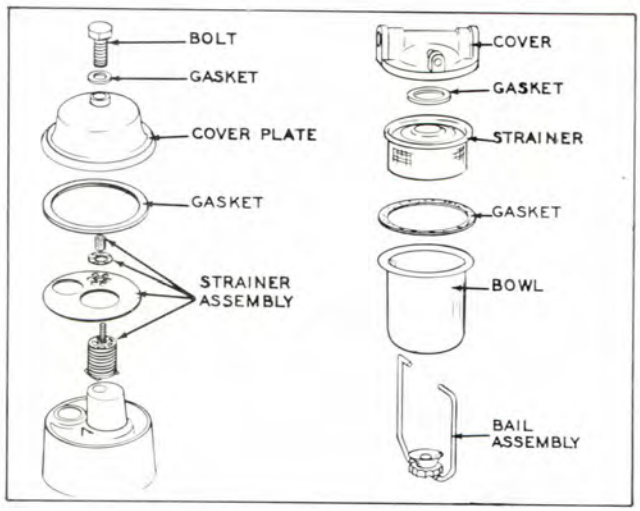


Plate 6638. Fuel Pump Strainer & Sediment Bowl

3. CYLINDER HEAD STUD NUTS. Check all stud nuts for correct torque, refer to specifications. Check cylinder head gasket for leaks.

C A U T I O N

THE SEQUENCE SHOWN ON PLATE 6281 MUST BE FOLLOWED. ALL CYLINDER HEAD CAP SCREWS OR NUTS MUST BE TIGHTENED EVENLY AND TORQUED IN ACCORDANCE WITH LIMITS LISTED IN SPECIFICATIONS.

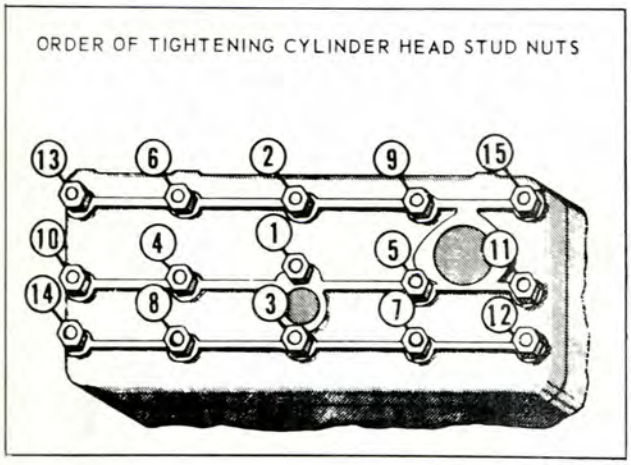


Plate 6281. Cylinder Head Stud Nut Tightening Sequence

4. INTAKE AND EXHAUST MANIFOLDS. Inspect for gasket leaks and security of mounting.

5. CRANKCASE VENTILATION. The crankcase vent pipe allows clean air to pass through the crankcase to help carry off corrosive gases (which are the by-products of combustion) that leak by the pistons and valve stems.

Check crankcase ventilation pipe for damage or obstructions. The pipe must be open to provide proper ventilation. Clean, repair, or replace as required, see Plate 7470.

6. INTAKE AND EXHAUST VALVE CLEARANCE ADJUSTMENTS. (PREFERRED METHOD).

a. Remove valve chamber cover mounting screws, and the valve chamber cover gasket.

b. With engine running at idling speed and at normal operating temperature, adjust intake valves as follows:

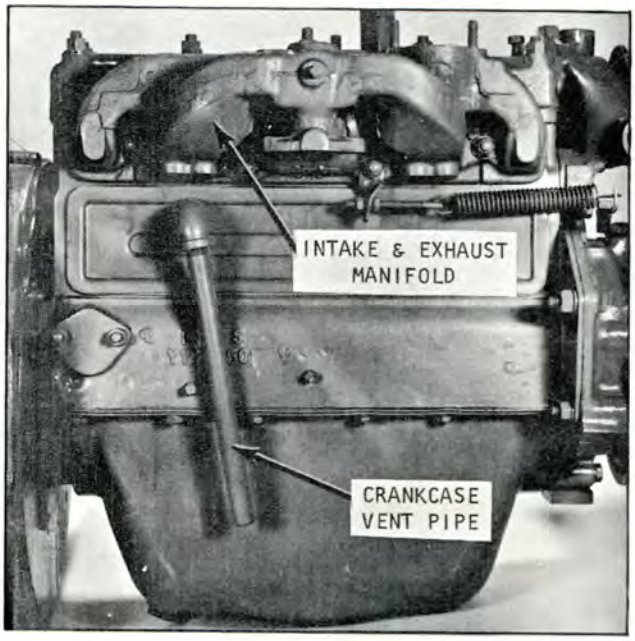


Plate 7470. Crankcase Vent Pipe

c. Check for proper 0.012 inch clearance by alternately passing a 0.011 inch and a 0.013 inch flat feeler gauge between head of adjusting screw and valve stem, see Plate 3223 on following page.

d. If a 0.011 inch feeler gauge moves freely back and forth in gap when valve is not being lifted and a 0.013 inch feeler gauge binds, at all times, clearance requires no adjustment.

e. If a 0.011 inch feeler gauge is gripped at all times, the clearance is insufficient.

f. Hold valve lifter with an open end wrench while using a second wrench to turn adjusting screw 1/4 to 1/2 turn clockwise. Repeat clearance check and adjustment, until proper clearance is obtained. The adjustable type valve lifters have self-locking adjusting screws that require no lock nuts.

g. If 0.013 inch feeler moves freely when valve is not being lifted, the clearance is too great. Hold valve lifter with an open end wrench while using a second wrench to turn valve lifter adjusting screw counterclockwise 1/4 to 1/2 turn. Repeat clearance check and adjustment until proper clearance is obtained.

h. Repeat clearance check and adjustment on remaining intake valves.

i. With engine running at slow idle and at normal operating temperature, adjust exhaust valves as follows:

j. Check for proper 0.012 inch clearance by alternately passing a 0.011 inch and a 0.013 inch flat feeler gauge between head of adjusting screw and valve stem, see Plate 3223.

k. If a 0.011 inch feeler gauge is gripped at all times, the clearance is insufficient. If a 0.013 inch feeler gauge moves freely when valve is not being lifted, the clearance is too great.

m. Turn adjusting screw in the direction necessary so that a 0.011 inch feeler gauge moves freely back and forth in gap and a 0.013 inch feeler is gripped at all times.

n. After adjustment is complete on all exhaust valves, install valve chamber cover using new cover gasket and replace cover retainment screws.

N O T E

DO NOT REUSE OLD GASKETS. THEY DO NOT AFFORD A POSITIVE SEAL.

o. Check valve chamber cover gasket for leaks.

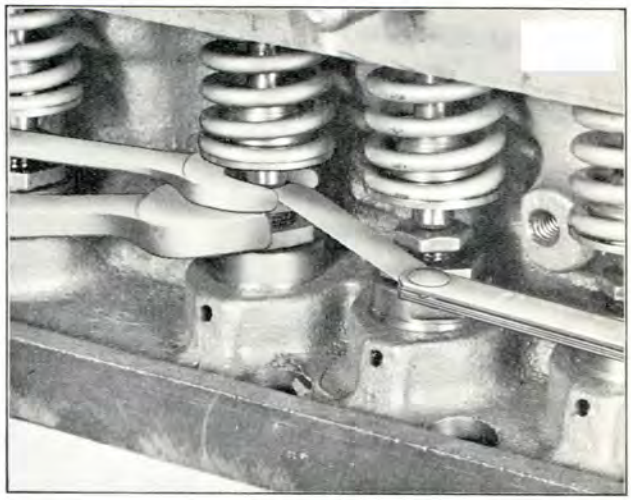


Plate 3223. Adjusting Valve Clearance

6A. COLD SETTING. (ALTERNATE METHOD) To adjust valve clearance when engine is at room temperature and not running, proceed in the following manner:

a. Remove distributor cap.

b. Crank engine until distributor rotor points to No. 1 cylinder position with the breaker points open. In this position the No. 1 piston is at the top of its compression stroke with both lifters on the base circle of the cam and both valves can be adjusted.

c. Adjust the valve clearance to 0.014 inch on the intake and 0.014 inch on the exhaust. The exhaust (E) and intake (I) valve arrangement on the four cylinder engine is: E-I-I-E-E-I-I-E.

d. The other valves may be adjusted by setting the engine with the distributor rotor pointing to the rest of the cylinder positions in the sequence of the firing order which is: 1-3-4-2.

7. COMPRESSION TEST

a. Test battery for full charge (specific gravity 1.280 temperature of 24°C (75° F). If battery is not fully charged, replace with fully charged battery.

b. Start engine and allow it to warm up until normal operating temperature is reached.

c. Turn off ignition.

d. Remove spark plug cables from spark plugs and remove spark plugs from cylinder head. Examine spark plugs for carbon deposits, defective insulation and general serviceability. All carbon or lead deposits must be removed from the insulation shell and electrodes. This can be done on a sand blast cleaner. Carbon deposits should be removed from the plug threads with a stiff brush. After cleaning, inspect plugs carefully for cracked or broken insulator, badly pitted electrodes or other signs of failure.

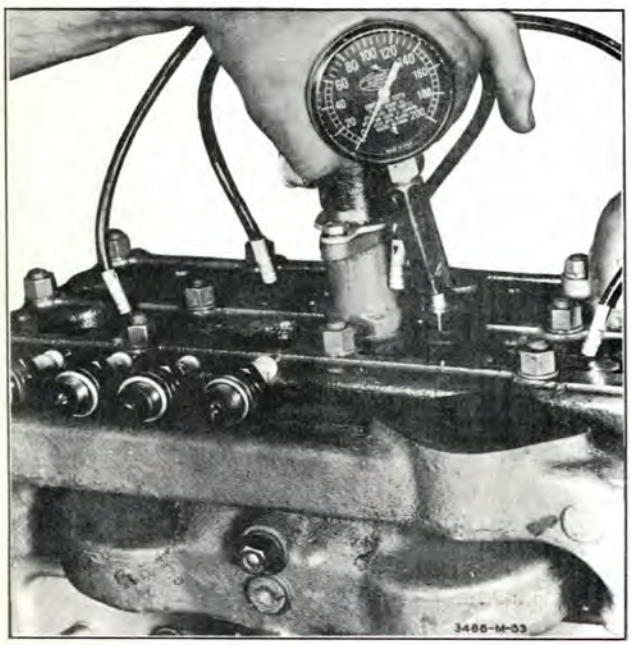


Plate 3486. Compression Test

e. With all plugs removed, install compression gauge in front spark plug port. Operate starting motor until maximum reading on gauge is obtained, see Plate 3486. Record gauge reading. Repeat this operation on each remaining cylinder.

f. If readings are reasonably high (110 to 120) pounds and the readings do not vary more than about 10 pounds between cylinders, compression may be considered normal. Excessively low readings or readings that vary more than 10 pounds between cylinders indicate internal trouble to be corrected after further examination and testing.

g. Set the spark plug gap as specified, by bending side electrode only. The gap should be checked with a wire feeler gauge rather than a flat type gauge as it is better suited for this purpose.

h. Spark Plug Specifications:

Standard Type	-	.025" Gap
Resistor Type	-	.035" Gap

i. Replace spark plugs using new gaskets. Always replace spark plug gasket whenever a spark plug is removed from the engine. Before installing plugs, be sure that the spark plug seat in the cylinder head is clean and free from obstructions. The spark plug should be screwed into cylinder head (using a socket of proper size) sufficiently tight to fully compress the gasket. This is most important as a large percentage of troubles due to overheated spark plugs are caused by plugs being too loose in the cylinder head. Conversely, excessive tightening may change the gap between the electrodes or crack the insulator.

Plate 3278. Check Spark Plug Gap

8. DISTRIBUTOR

Inspection: Remove distributor cap (without removing wires). Wipe cap with a clean cloth. Examine rotor and cap for chips, cracks, corroded terminals, carbon runners (paths which will allow high-tension leakage to ground) or if the vertical faces of the inserts are burned -- install a new cap and rotor, as this is due to the rotor being too short.

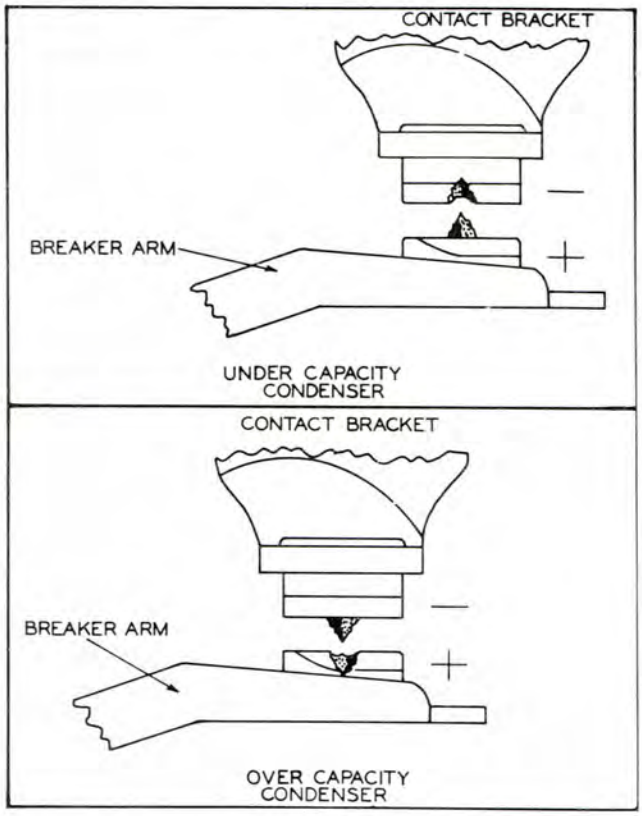


Plate 5933. Breaker Points

Check the centrifugal advance mechanism for "freeness" by turning the breaker cam in the direction of rotation and then releasing it. The advance springs should return the cam to its original position without sticking.

Inspect breaker points. If points are pitted, burned or worn to an unserviceable condition, install a new set of points.

The normal color of contact points should be a light gray. If the contact point surfaces are black, it is usually caused by oil vapor, or grease from the cam. If they are blue, the cause is usually excessive heating due to improper alignment, high resistance or open condenser circuit.

Badly pitted points may be caused by a defective or improper condenser capacity.

If the condenser capacity is too high, the crater (depression) will form in the positive contact. If the condenser capacity is too low, the crater will form in the negative contact, see Plate 5933.

For a temporary repair, dress the contact points with a few EVEN strokes using a clean fine-cut contact file. DO NOT ATTEMPT TO REMOVE ALL ROUGHNESS OR DRESS THE POINT SURFACES DOWN SMOOTH. See Plate 7475.

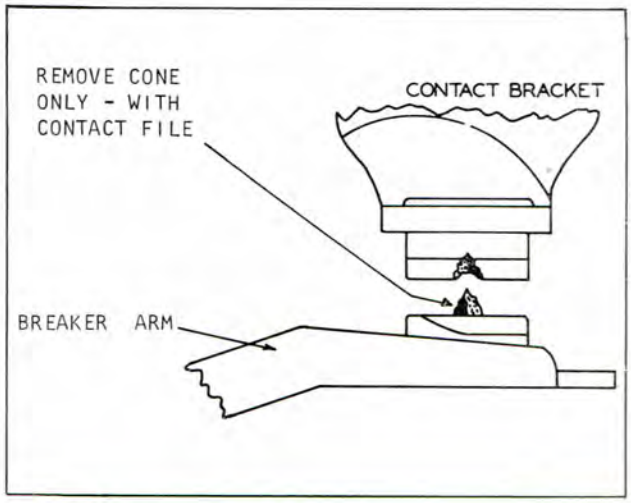
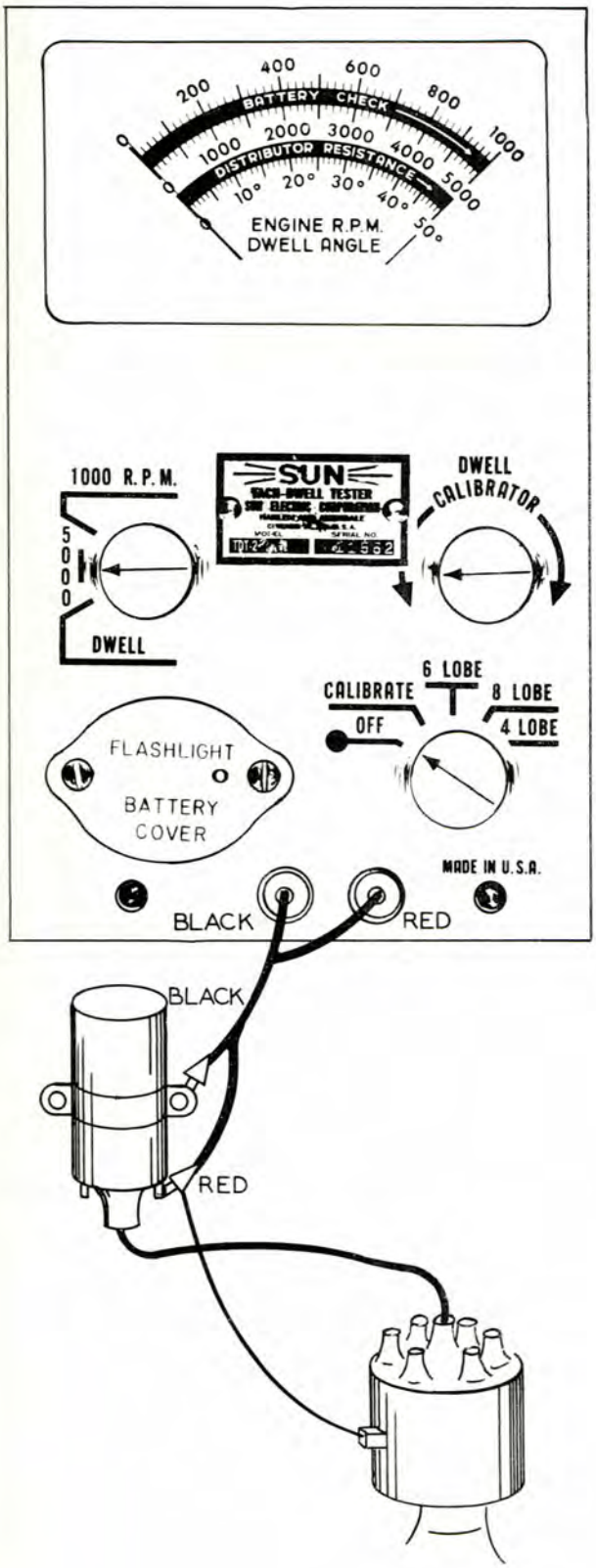


Plate 7475. File Contact Points

C A U T I O N

NEVER USE EMERY CLOTH OR SANDPAPER TO CLEAN POINTS AS PARTICLES WILL EMBED IN THE POINTS AND CAUSE ARCING AND RAPID BURNING.



MEASURING ENGINE SPEED

1. Connect the test leads as shown.
2. Turn switch to the LOBE position corresponding to the number of cylinders.
3. Turn the other switch to the 1000 rpm position for all idle and low speed testing. Use the 5000 rpm position for all speeds over 1000 rpm.

DISTRIBUTOR RESISTANCE TEST

1. With test leads disconnected, turn switches to DWELL and CALIBRATE positions and adjust dwell calibrator until meter reads on the SET LINE.
2. Connect test leads as shown.
3. Turn ignition switch ON with engine stopped. If distributor resistance is not excessive, meter will read in the black bar marked DISTRIBUTOR RESISTANCE.

   If meter does read within black bar, readjust dwell calibrator until meter again reads on the SET LINE before making the following tests.

   If meter does not read within black bar, excessive resistance is indicated. To locate excessive resistance, trace the primary circuit through the distributor with the red test lead until point of high resistance is located. Excessive resistance must be eliminated and the dwell calibrator adjusted until the meter again reads on the SET LINE before proceeding with the following tests.

DWELL AND DWELL VARIATION TESTS

1. Turn switch to the proper LOBE position.
2. Operate engine at idle speed and note reading on dwell scale of meter. Refer to specifications for proper dwell.
3. Turn tachometer switch to the 5000 rpm position and increase speed to 1500 rpm.
4. Turn switch back to the DWELL position and again note dwell reading. Slowly reduce speed to idle while watching meter. Dwell should not change more than 3 degrees in either case.

Plate 6887 Tach Dwell Meter

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS

DISTRIBUTOR (All FOUR and SIX Cylinder Engines)

N O T E

Distributors are equipped with either Standard or Heavy Duty Points. Heavy Duty Points are thicker (have more contact material) than Standard Points.

Heavy Duty Points - All FOUR Cylinder Engines
Set Dwell Angle at.....31° - 34°

Heavy Duty Points - All SIX Cylinder Engines
Set Dwell Angle at.....22° - 26°

Heavy Duty Points

When connecting leads, terminals must be back to back (flat sides together). Push into slot between insulator and spring. (DO NOT push lever spring.) Then push other terminal in place between first terminal and insulator. See following illustration.

WHEN CONNECTING LEADS, THE TERMINALS MUST BE BACK TO BACK (flat sides together).....

- FOUR (4) CYLINDER ENGINES, ONLY -

Point Opening (in.)	Dwell Angle (deg.)	Centrifugal Advance							
		START		INTERMEDIATE		INTERMEDIATE		MAXIMUM	
		Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.
.022*	31-34	600	1-5	800	6-10	1600	11-15	2200	15-19
.021**	31-34	600	1-5	800	6-10	1600	11-15	2200	15-19

- SIX (6) CYLINDER ENGINES, ONLY -

Point Opening (in.)	Dwell Angle (deg.)	Centrifugal Advance							
		START		INTERMEDIATE		INTERMEDIATE		MAXIMUM	
		Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.
.020*	28-32	600	1-5	800	6-10	1600	11-15	2200	15-19
.021**	22-26	600	1-5	800	6-10	1600	11-15	2200	15-19

N O T E

Time engine with timing light and tachometer at 400 engine RPM or below to the above specifications. The initial advance RPM range is 430 - 580. Distributor advance at 600 engine RPM should be 1° to 5°. Distributor rotation (as viewed from cap end) is counterclockwise.

When checking Distributor on a test stand, the above specifications are 1/2 that shown.

*..... Four (4) or Six (6) Cylinder Engine STANDARD Points.
**..... Four (4) or Six (6) Cylinder Engine HEAVY DUTY Points.

INDUSTRIAL TRUCK DIVISION

ADJUST TAPPETS TO THE STATIC COLD SETTINGS LISTED IN THE FOLLOWING CHART:

Engine Model	Intake	Exhaust	NOTE
Y-69	.014"	.014"	Static Cold Settings.
Y-91	.014"	.014"	Static Cold Settings.
Y-112	.014"	.014"	Static Cold Settings.
F-124	.016"	.018"	Static Cold Settings.
F-140	.016"	.018"	Static Cold Settings.
F-162	.016"	.018"	Static Cold Settings.
F-244	.016"	.018"	Static Cold Settings.
F-186	.016"	.018"	Static Cold Settings.
F-209	.016"	.018"	Static Cold Settings.
F-226	.016"	.018"	Static Cold Settings.
F-135	.012"	.020"	Static Cold Settings.
F-163	.012"	.020"	Static Cold Settings.
F-227	.012"	.020"	Static Cold Settings.
F-245	.012"	.020"	Static Cold Settings.
NOTE: Engine Nameplate Tappet Settings is for Hot Idle only.			

FOR -- VEHICLES EQUIPPED WITH CONTINENTAL ENGINES.

Contact Point Adjustment: The point opening of new points can be checked with a wire feeler gauge, but the use of a feeler gauge on older, rough points is not recommended, since accurate gauging cannot be done on such points. The gauge measures between high spots on the points instead of the true point opening. Point opening of used points can be checked with a Dwell Angle Meter. A meter of this type indicates the cam or contact angle. This angle is the number of degrees that the breaker cam rotates from the time the points close until they open again. The cam angle increases as the point opening decreases and it is reduced as the point opening is increased. Manufactures of this type equipment furnish complete instructions as to their use.

N O T E

REFER TO SPECIFICATIONS FOR DWELL ANGLE AND CONTACT POINT OPENING.

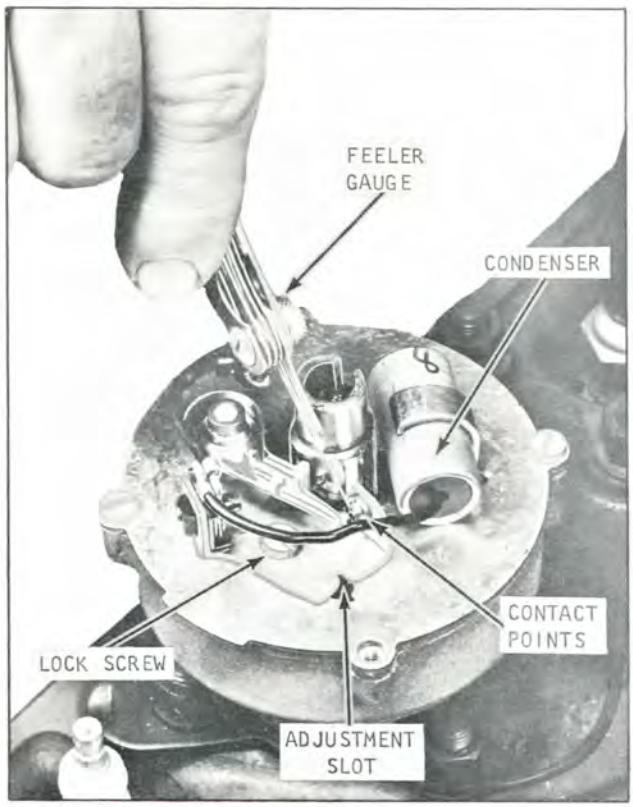


Plate 7457. Contact Point Adjustment

To check point opening with a feeler gauge, insert a wire feeler gauge of proper size between the contact points. MAKE CERTAIN THAT THE BUMPER BLOCK ON THE MOVABLE CONTACT IS AT THE HIGH POINT ON THE CAM. If adjustment is necessary, loosen the lock screw, and insert a screw driver of the proper size in the adjustment slot and move the stationary arm until the correct clearance is obtained. Tighten locking screw and recheck point gap. See Plate 7457.

9. IGNITION TIMING

If the engine is out of time, the following procedure should be followed:

a. Remove No. 1 spark plug which is the one nearest the radiator.

b. Press thumb over hold left vacant by removal of the spark plug.

c. With thumb pressed over hole, Plate 7476, turn engine over slowly with the starter until air is being forced up around the thumb.

d. Stop turning engine over at this point for it means that No. 1 piston is on the compression stroke and it is approaching top dead center.

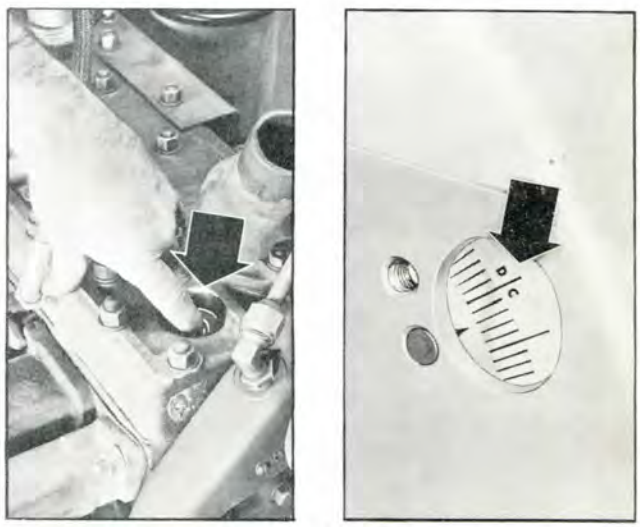


Plate 7476. Ignition Timing

e. Flash a light into the timing hole and continue to turn engine over slowly until the 2° after top D.C. marking on flywheel appears in timing hole, Plate 7476.

f. The pointer (Plate 7476) should be centered on 2° after top D.C. marking.

g. With breaker points set at proper gap, loosen distributor clamp plate screw and rotate distributor body until the contact points just start to open. This may be more accurately checked by means of a test lamp connected between the distributor primary lead and a ground. When points are closed the light will be "ON" and as soon as the points break the light will go "OFF". Tighten clamp plate screws before starting engine.

10. VACUUM TEST

Before making vacuum test, make certain cylinder head is securely tightened and that cylinder head gasket is not leaking. Air cleaner must be installed and must be clean to perform vacuum test. Manifold stud nuts must be tight and there must not be any leakage at gasket.

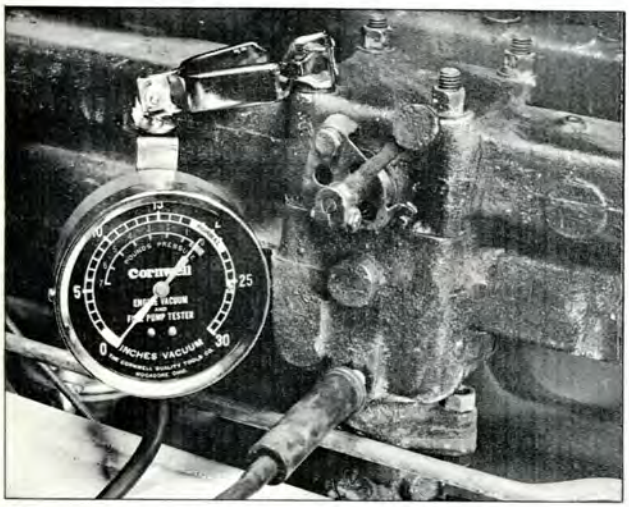


Plate 6643. Vacuum Test

(a) Remove plug at intake manifold and install vacuum gauge, see Plate 6443. Using the tachometer, set the engine idle speed at 450 to 500 RPM.

Idle Speed Adjustment: A stop screw controls action of the throttle valve. Turn screw clockwise for faster idle speed, or counterclockwise for slower idle speed. This adjustment should be made with a tachometer. Idling speed should be set for 450 to 500 revolutions per minute. Reset idle mixture screw if necessary, after throttle adjustment has been made, see Plate 6889.

(b) Check the vacuum gauge. A steady reading from 18" to 22" of mercury is a normal reading, indicating that valve and spark timing, valve seating, and piston ring sealing are all satisfactory.

(c) A steady but below normal reading indicates a condition common to all cylinders such as a leak at the carburetor gasket, late ignition or valve timing, or uniform piston ring and bore wear.

(d) A slowly fluctuating or drifting reading indicates that the fuel idle mixture is incorrect. Look for the cause in the fuel system.

Plate 6889. Idle Speed Adjustment

(e) A rhythmic pulsating reading is caused by a condition affecting one or more cylinders, but not all, and indicates leaky valve, gasket blow-by, restricted intake port, or an electrical miss.

(f) An intermittent pulsating reading is caused by an occasional malfunction, such as a sticking valve (all valves may be erratic in operation if the valve springs are weak), electrical miss caused by insufficient distributor point tension or low coil voltage coupled with inconsistent spark plug gaps or fouled plugs, or dirt in the fuel system finding its way into passages of critical size or valve seats in the carburetor.

(g) A normal reading that quickly falls off (with engine running at approx. 1860 RPM) indicates exhaust back pressure caused by a restriction in the exhaust system.

(h) Make indicated corrections to bring vacuum to 18" to 22" of mercury normal reading.

Idle Fuel Adjustment: The carburetor is controlled by the idle adjustment screw that regulates the fuel-air mixture, see Plate 6889. Turning the screw clockwise, towards the seat, cuts off air increasing the suction on the idle jet and making the mixture richer. Turning the idle adjusting screw counterclockwise, or away from seat, allows more air to be mixed with the fuel making a leaner mixture for idling.

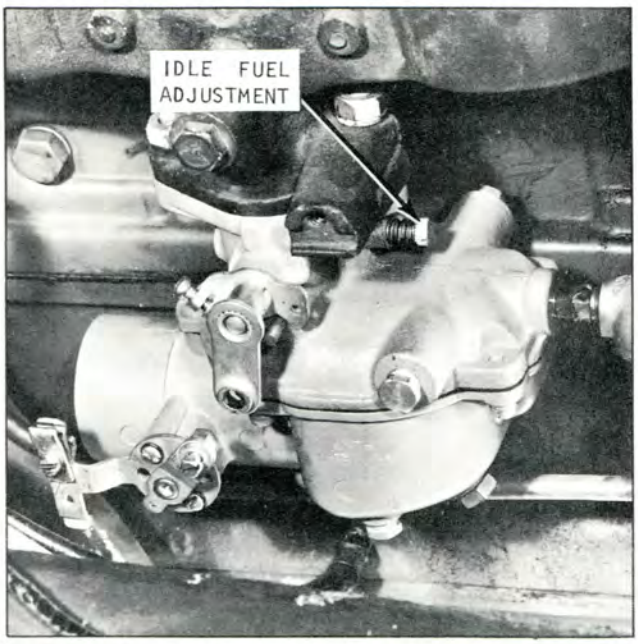


Plate 6888. Idle Fuel Adjustment

Turn the screw until highest vacuum reading is obtained. If vacuum gauge needle cannot be held steady after these adjustments have been made, report condition to designated person in authority.

If a gauge is not used, set the screw to a range at which engine idles its smoothest.

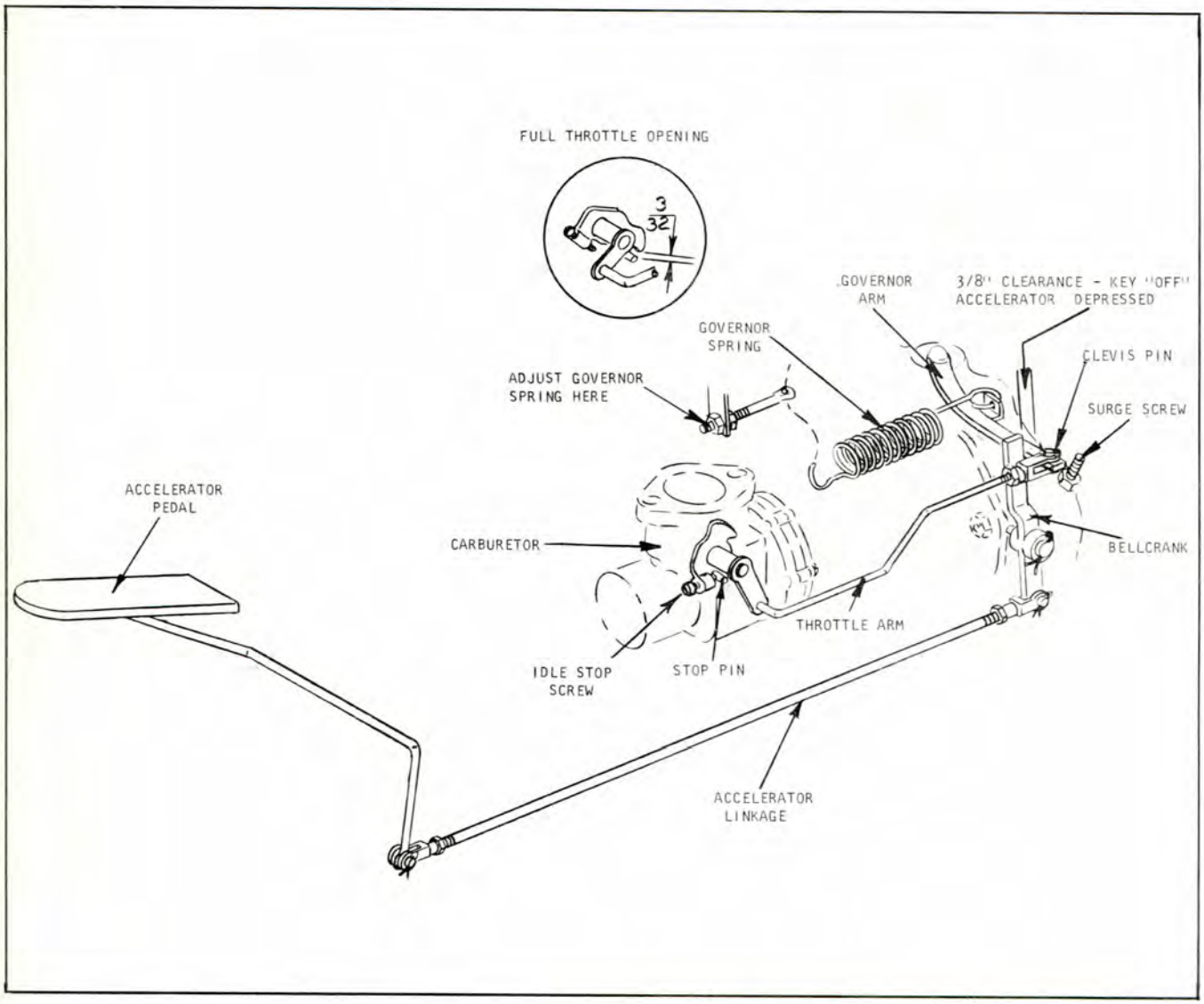


Plate 7480. Governor Adjustment

11. Governor Adjustment

With timing set at 2 degrees after top dead center and the carburetor properly adjusted to idle at 500 R.P.M., proceed with the following:

A. Loosen governor surge screw jam nut and back surge screw out several turns.

B. With switch key "off" depress accelerator pedal to the floor plate. The bellcrank should have at least 3/8 inch clearance between it and the governor arm with accelerator depressed. See Plate 7480. Adjust the accelerator linkage clevis at the bellcrank to obtain this clearance.

C. With switch key "off" again depress accelerator pedal. This will allow the governor arm to move forward. There should be at least 3/32 inch clearance between the full throttle opening stop and the stop pin on the carburetor. If adjustment is necessary remove the clevis pin from the governor arm and adjust throttle arm clevis until the specified clearance (3/32 inch between stop and stop pin) is obtained. See Plate 7480. Reinstall the clevis pin making sure it is in the outer hole of the governor arm.

D. Push the governor arm rearward until the idle stop screw contacts stop pin on the carburetor. Rotate the governor surge screw inwards until screw comes

in contact with the governor shaft lever. (When holding the governor arm rearward). Do not rotate screw so far that the idle stop screw moves away from stop pin. When correct surge screw adjustment is obtained, tighten jam nut.

E. With the use of an electric tachometer, start engine (warm up to normal temperature) and check for no-load 2350 R.P.M. If top R.P.M. is too high decrease tension on the governor spring. If top R.P.M. is too low increase tension on the spring.

STARTING MOTOR

1. Remove end plate (or Brush Cover) from starter. Use a wire hook to lift a brush spring and remove brush from holder. Compare brush size with that of a new brush. If brush is worn beyond half the original size, or if brushes are jammed, chipped, or broken they must be replaced.

CAUTION

NEVER ALLOW SPRING TO SNAP DOWN ON BRUSHES.

Plate 6449 Checking Brush Spring Tension

2. Check for Brush Spring Tension, refer to Specifications. Refer to the following procedures for checking spring tension.

Measuring Brush Spring Tension - Reaction Type Brushes. Hook the scale under the brush spring near the end and push or pull on a line parallel to the sides of the brush. To assist in telling the exact instant that the pressure is relieved, a small strip of paper can be placed under the brush. Pull slightly on the paper and the paper will slip out at the correct instant for reading the spring scale.

Measuring Spring Tension - Swinging Type Brushes: Hook the spring scale under the brush screw tight against the brush and push or pull on a line parallel to the sides of the brush. Take the reading just as the brush leaves the commutator. Pulling slightly on a strip of paper which has been placed under the brush will indicate when the brush leaves the commutator and the correct instant for reading the spring scale.

3. If commutator is glazed or dirty, clean with a strip of No. 00 sandpaper. Blow out all dirt and grit with compressed air.

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

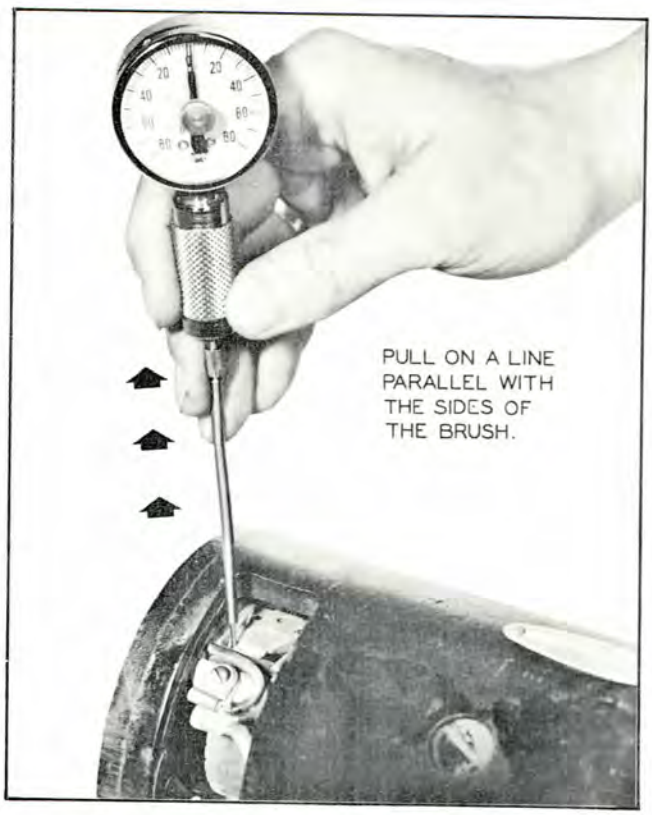


Plate 6450. Checking Brush Spring Tension

Condition Test: Use one of the two following methods to determine whether the starting motor should be removed from the engine for inspection, service or replacement.

1. First Method: Operate the starting motor by disconnecting the battery cable from the solenoid switch and holding the cable terminal firmly against the starting motor terminal, using a battery known to be fully charged and in good condition. To do this it will be necessary to remove the solenoid switch.

2. If the motor reacts correctly, and the drive mechanism engages and disengages each time the starting motor is operated, the starting motor is in good condition.

3. If motor does not react properly, it must be removed for inspection or replacement.

4. Second Method: Using a voltmeter and a battery (fully charged) that is in good condition, connect positive lead of test voltmeter to positive terminal of battery and negative lead of voltmeter to negative (grounded) terminal of battery. Record voltmeter reading. Now pull high-tension wire from ignition coil so engine will not start when starter is engaged. Connect positive lead of test voltmeter to ground and negative lead of test voltmeter to starter switch terminal. Turn ignition switch to start position and note voltmeter reading. Compare this reading with the previously recorded reading. If the voltage drop is more than 4 volts, or if the second reading is below 8 volts, the starting motor should be removed from the engine for further testing and repair, or replacement.

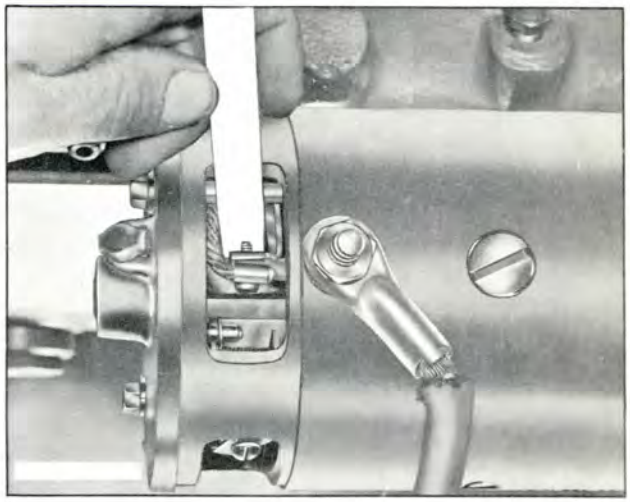


Plate 3436. Seating Brushes

NOTE

BLOW OUT ABRASIVE PARTICLES AFTER SEATING BRUSHES.

GENERATOR

1. Remove end plate (or Brush Cover) from generator. Use a wire hook to lift a brush spring and remove brush from holder. Compare brush size with that of a new brush. If brush is worn beyond half the original size, or if brushes are jammed, chipped, or broken they must be replaced.

CAUTION

NEVER ALLOW SPRING TO SNAP DOWN ON BRUSHES.

New brushes can be seated with a brush seating stone. When held against the revolving commutator, the abrasive material carries under the brushes, seating them in a few seconds. Blow out abrasive particles after seating brushes. See Plate 3436.

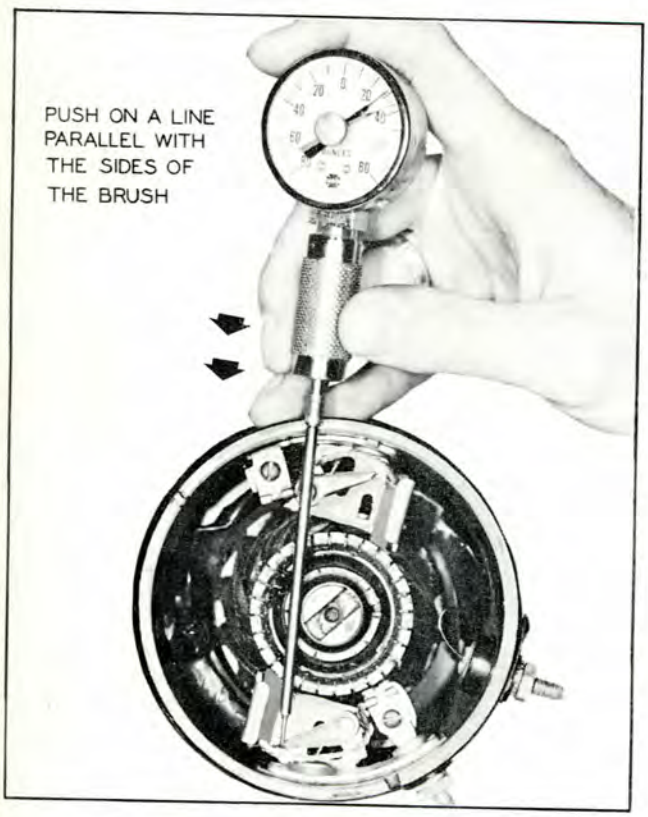


Plate 6451. Checking Brush Spring Tension

Using a spring scale, check for proper brush spring tension. Refer to Specifications. Refer to the following procedures for checking spring tension.

Measuring Brush Spring Tension - Reaction Type Brushes. Hook the scale under the brush spring near the end and push or pull on a line parallel to the sides of the brush. To assist in telling the exact instant that the pressure is relieved, a small strip of paper can be placed under the brush. Pull slightly on the paper and the paper will slip out at the correct instant for reading the spring scale.

Measuring Spring Tension - Swinging Type Brushes: Hook the spring scale under the brush screw tight against the brush and push or pull on a line parallel to the sides of the brush. Take the reading just as the brush leaves the commutator. Pulling slightly on a strip of paper which has been placed under the brush will indicate when the brush leaves the commutator and the correct instant for reading the spring scale.

3. If commutator is glazed or dirty, clean with a strip of No. 00 sandpaper. Blow out all dirt and grit with compressed air.

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

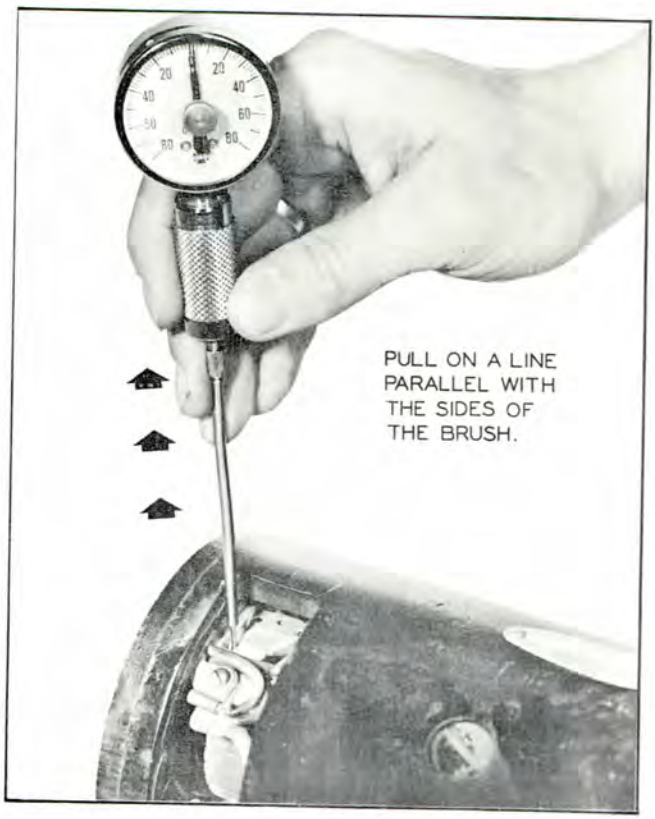


Plate 6450. Checking Brush Spring Tension

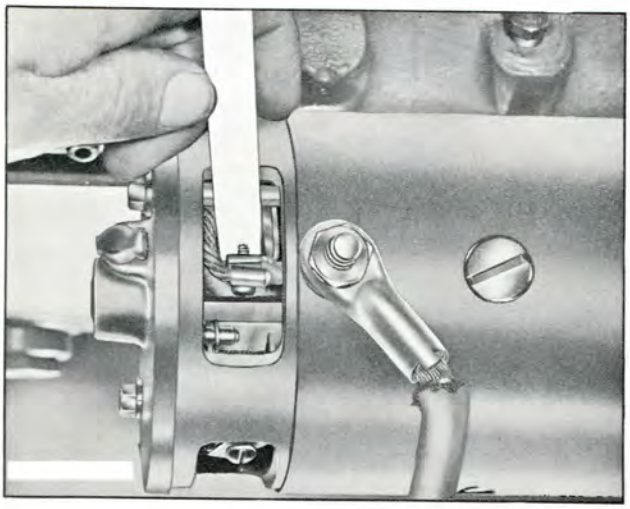


Plate 3436. Seating Brushes

NOTE

BLOW OUT ABRASIVE PARTICLES AFTER SEATING BRUSHES.

REGULATOR

Inspect regulator leads for frayed or worn condition. Check to make certain that leads are tight and securely mounted.

WIRING

Check all wires for loose or corroded connections and for fraying. Replace defective wires.

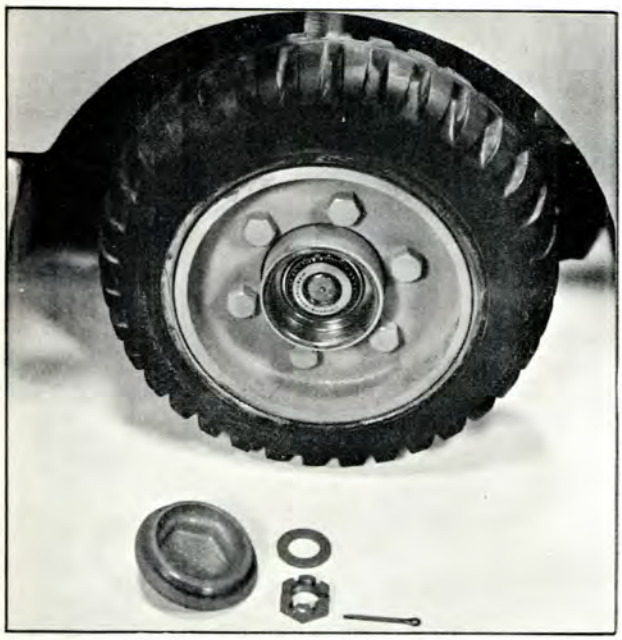


Plate 7458. Typical Wheel Bearings

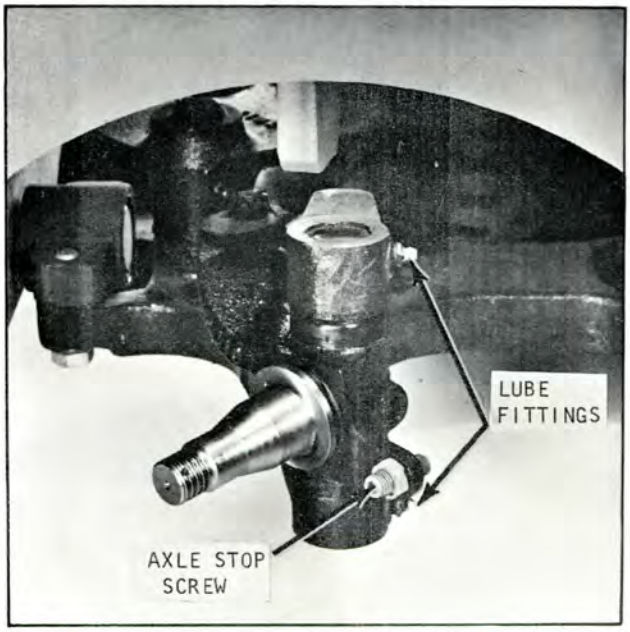


Plate 7459. Typical Spindle

STEERING WHEEL BEARINGS

Adjustment

1. Raise rear of machine so that tires clear floor.

WARNING

AFTER RAISING MACHINE AND BEFORE DOING ANY MAINTENANCE OR MAINTENANCE CHECKS, MAKE SURE SUPPORTS OF ADEQUATE STRENGTH ARE PLACED SECURELY UNDER THE MACHINE (IN A POSITION SO AS NOT TO CAUSE TEETERING) TO PREVENT THE POSSIBILITY OF ACCIDENTAL LOWERING OR FALLING OF THE MACHINE AND CAUSING INJURY TO PERSONNEL.

2. Inspect adjustment of bearings by gripping top and bottom of tire, chuck the tire in and out to determine looseness or wobble. Now grip front and rear side of tire, chuck tire in and out to determine looseness or wobble.

NOTE

Before making wheel bearing adjustments, be sure play (looseness or wobble) is in the wheel bearings and not in the king pins. If wheel bearings need adjusting, clean and repack bearings before making adjustments. Refer to lubrication paragraph.

3. If looseness or wobble is in the wheel bearings, remove hub cap and spindle cotter pin. Tighten nut with a 12" wrench and at the same time rotate the wheel in one direction and then in the other until there is a slight bind to be sure all bearing surfaces are in contact. Then back off the nut 1/6 to 1/4 turn allowing the wheel to rotate freely. Secure nut at this position with a new cotter pin and replace hub cap.

Lubrication

1. Remove wheels after 1000 hours or every six months of operation. Clean bearings and repack with medium bodied high temperature wheel bearing grease, Clark Specification MS9C.

2. Install wheels and adjust wheel bearings as previously described.

CLEAN AND REPACK DRIVE WHEEL BEARINGS

Every 1000 operating hours, remove and repack the drive wheel bearings.

1. Tilt upright back. Place solid blocks under each upright rail. Tilt upright forward, until vertical to floor. This should allow the drive wheels to clear the floor. Remove drive wheels.

Plate 7477. Axle Hub

W A R N I N G

ON PNEUMATIC TIRE MACHINES, DEFLATE TIRES BEFORE REMOVING WHEELS.

2. Remove axle cotter pin, nut and washer. Pull hub from axle.

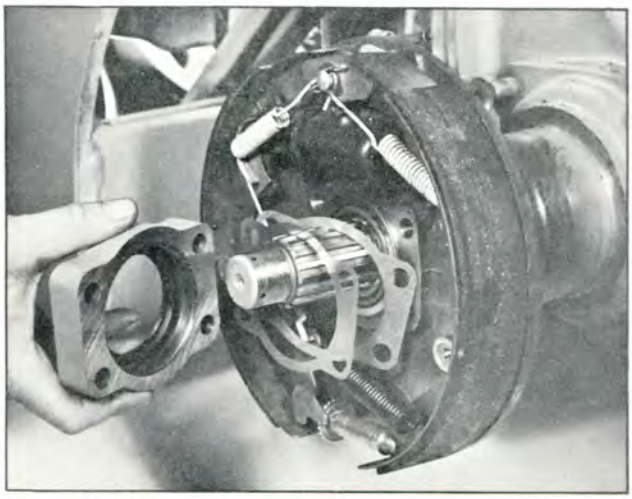


Plate 7478. Seal Retainer and Shims

3. Remove the lockwire and capscrews used to secure the seal retainer. Pull retainer and shims from the axle shaft; noting, the number of shims used. (At reassembly the correct shims must be used so that bearings will be adjusted properly).

4. Pull the axle shaft from its housing see Plate 7479.

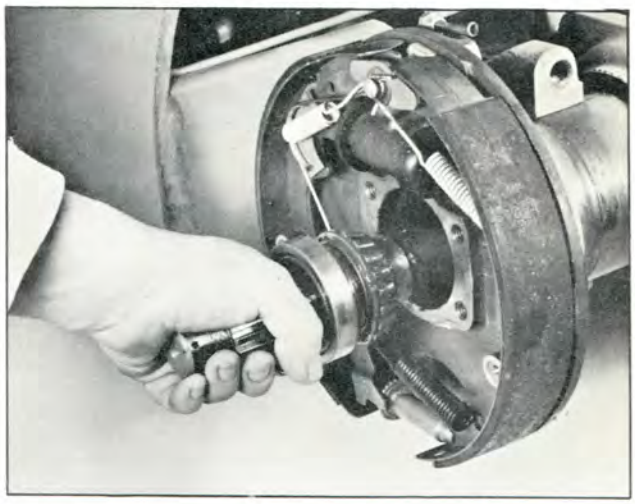


Plate 7479. Removing Axle Shaft

5. Clean the bearings and shaft in a Stoddard type cleaning solvent. After bearings are clean, blow them dry with compressed air. Direct air stream across bearings to prevent spinning. Slowly rotate bearings by hand to facilitate drying. Inspect bearings and races carefully to determine if they are in good condition and suitable for further service.

6. Repack bearing cones with Clark specification MS9C Wheel Bearing Grease. (Approximately 1 oz. each bearing).

7. If there is any doubt about the serviceability of the bearing seals it is more economical to install new ones to prevent a premature overhaul to replace these parts at a future time. Care should be taken when installing the axle shaft to prevent damage to the inner seal, located in the axle housing.

8. Reassemble all parts in the reverse order of disassembly.

N O T E

CHECK CONDITION OF BRAKE LININGS (SEE FOLLOWING PAGE.)

BRAKE LININGS

Observe the condition of the brake linings. If linings are worn to a point where they will not be serviceable until the next wheel bearing inspection and lubrication period, it is advisable to replace the linings at this time. If linings are glazed or oil soaked they should be replaced.

BRAKE BLEEDING PROCEDURE

Proper operation of the hydraulic brake system requires a solid column of fluid without air bubbles at all points in the pressure system. Under certain conditions it becomes necessary to bleed fluid from the system in order to expel air bubbles which have become mixed with the fluid. The necessity of bleeding is indicated by a soft or spongy pedal, or at any time a brake line is removed (or broken) the system must be bled.

Step 1. Tilt upright back. Place solid heavy blocks under each upright rail. Tilt upright forward until vertical to the floor. This should allow the drive wheels to clear the floor. Remove drive wheels.

N O T E

MACHINES EQUIPPED WITH PNEUMATIC TIRES,

DEFLATE TIRES BEFORE REMOVING DRIVE WHEELS

FROM MACHINE.

Step 2. Check the brake pedal free travel (Refer to Specifications). Clean dirt from around the filler cap of the master cylinder reservoir. Brake fluid should be within 1/4" of the top. With filler cap off the master cylinder, depress and release brake pedal. A small displacement of fluid should be noticed in the cylinder reservoir. If this happens, the brake pedal (upon being released) is returning the master cylinder piston to its normal position to open a master cylinder port. This port must be open. If fluid does not return to the reservoir (when releasing brake pedal), this indicates improper pedal free travel and a pedal adjustment is required.

Step 3. To properly bleed the system it is recommended that a pressure bleeder filled with about two quarts of SAE 70R3 heavy duty brake fluid be connected to the master cylinder reservoir. Pressure bleeder should then be pressurized to approximately 30 P.S.I.

Step 4. Loosen line connection at highest position on "T" block point "A" (Plate 6883) and allow fluid and air to escape. Tighten fitting at this point when escaping fluid is free of air bubbles.

Step 5. Install a bleeder hose on one of the wheel cylinder bleeder screws and submerge the unattached end of the hose in a clean transparent jar containing several inches of brake fluid. NOTE: DURING BLEEDING OF THE WHEEL CYLINDERS THE JAR SHOULD BE ELEVATED TO A POSITION HIGHER THAN THE BLEEDER SCREWS MAKING SURE THAT THE END OF THE HOSE REMAINS SUBMERGED IN THE FLUID AT ALL TIMES. Loosen bleeder screw "B" (Plate 6883) enough to allow fluid and air to escape. Tighten bleeder screw at this point when escaping fluid is free of air bubbles.

Step 6. Install bleeder hose on the remaining bleeder screw and proceed as in step five. After all bleeding has been completed close the pressure bleeder shut-off cock and loosen hose connection at master cylinder to allow pressure to escape. Replace master cylinder cap.

Step 7. Replace drive wheels. (Inflate tires if they are of the pneumatic type).

Step 8. Tilt upright back and remove blocking from under each upright rail.

If a pressure bleeder is unavailable the system may be bled manually by following steps four thru eight. It must be remembered that the brake pedal should be depressed slowly and held to the floorboard until the line connections or bleeder screws are securely tightened. This prevents the possibility of air being drawn into the system during the bleeding operation. Check master cylinder reservoir level periodically during manual bleeding and fill to within 1/4 inch of the top as required.

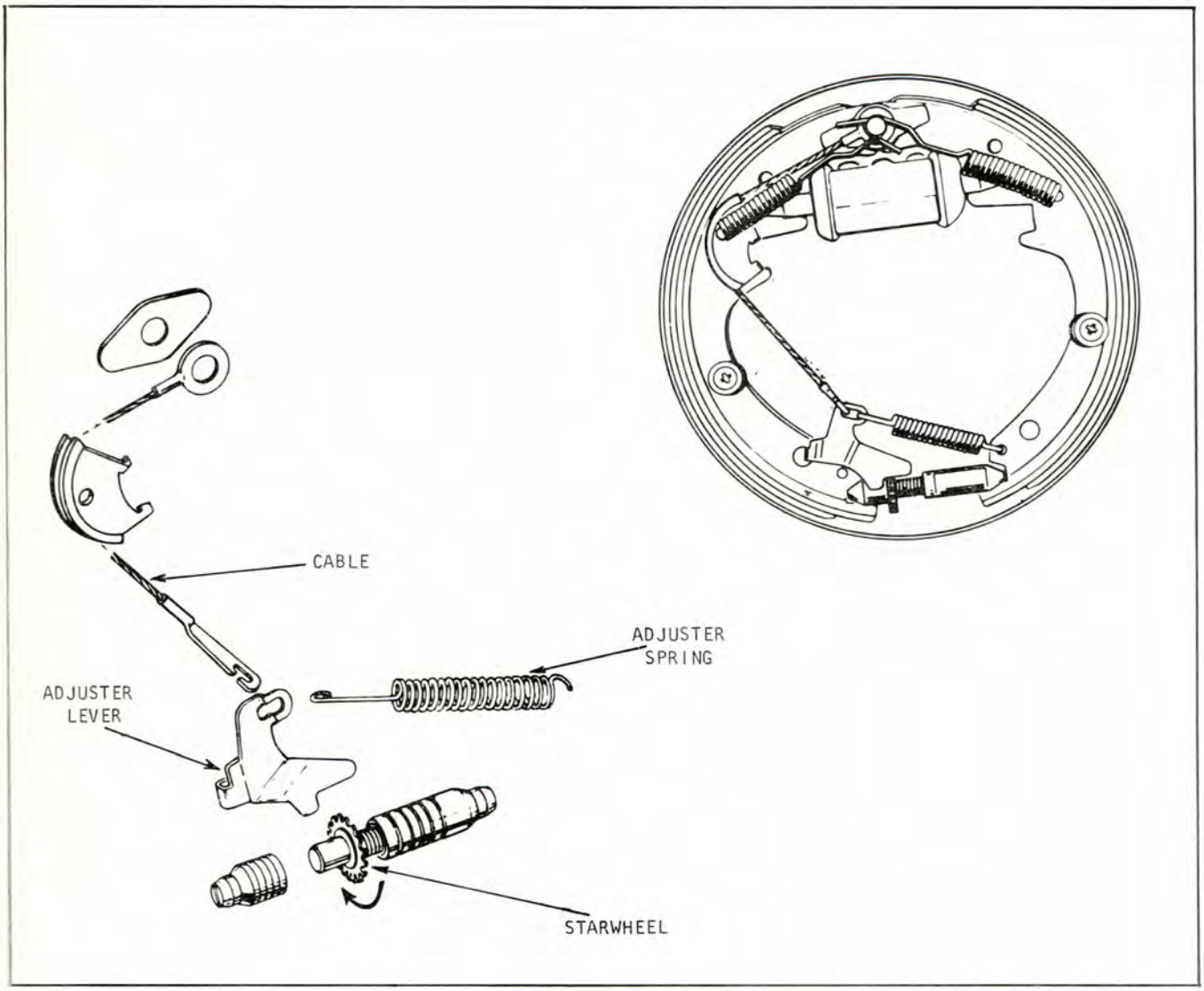


Plate 7471. Automatic Brake Adjuster

AUTOMATIC BRAKE ADJUSTERS

When brakes are applied with the machine moving in the direction which permits the operating shoe to leave its anchor, the shoe movement causes a cable to pull on an adjuster lever in contact with the star wheel. When lining wear increase to the point that the lever rises above a particular tooth on the star wheel, it falls into engagement with the tooth. As the operating shoe returns to its anchor (upon release of brakes) an adjuster spring pulls the lever downward, advancing the star wheel one notch (tooth) to expand the shoes. Subsequent braking simply causes the adjuster lever to ride against the next tooth until lining wear again increases enough for the lever to slip over the tooth and repeat the process.

N O T E

CHECK BRAKE LININGS FOR WEAR EACH TIME THE AXLE ENDS ARE REPACKED. REFER TO PAGE 1000H 805 FOR PROCEDURES AND ILLUSTRATIONS.

PARKING BRAKE ADJUSTMENT

The mechanical "V" block type parking brake operates on the transmission drive shaft brake drum. The only adjustment necessary during the useful life of the brake lining, is a periodic adjustment of the linkage.

To adjust the linkage, remove the floor plates, and adjust the clevis on the linkage, so that the brake handle has 2 inches of upward travel, before resistance is noticed and the brake becomes applied.

The parking brake must be capable of holding the truck, with full rated load, on a 15% grade. This should be tested with the drivers seat occupied, parking brake applied and the truck out of gear. If brake operation is not satisfactory report to designated individual in authority.

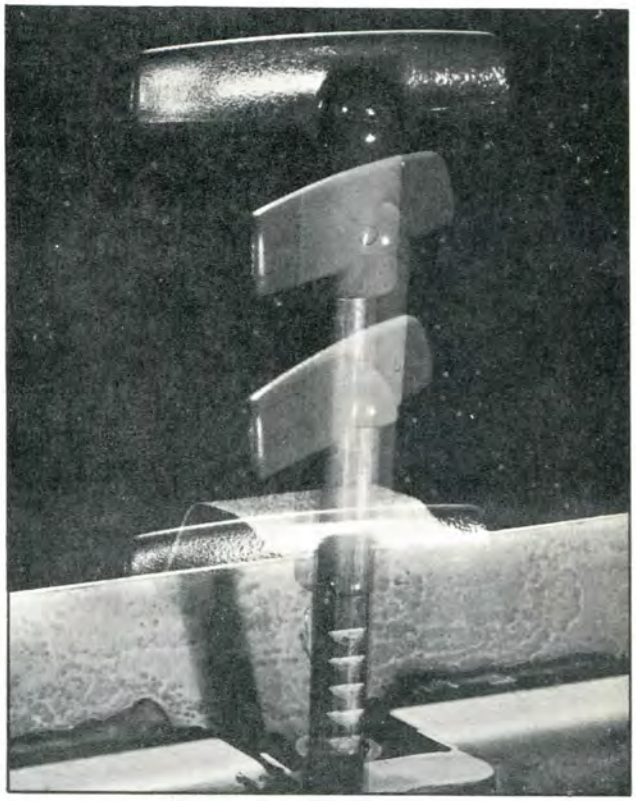


Plate 7482. Parking Brake

COOLING SYSTEM

Radiator Pressure Caps:

WARNING

USE EXTREME CARE IN REMOVING THE RADIATOR PRESSURE CAP. IN PRESSURE SYSTEMS, THE SUDDEN RELEASE OF PRESSURE CAN CAUSE A STEAM FLASH AND THE FLASH, OR THE LOOSENED CAP CAN CAUSE SERIOUS PERSONAL INJURY. LOOSEN CAP SLOWLY AND ALLOW STEAM TO ESCAPE.

1. Inspect pressure cap gasket and radiator filler neck to be sure they are providing a proper seal. If the rubber face of the valve is defective, a new cap should be installed.

Plate 6458. Radiator Pressure Cap

2. Inspect pressure cap for freedom of operation.

Pressure caps employ a spring loaded, rubber-faced valve which presses against a seat in the radiator top tank. Pressure caps employ either a vacuum valve held against its seat under spring pressure, or a weighted vacuum valve which hangs open until forced closed by a surge of vapor or coolant. Check to be sure components are free to operate.

NOTE

IF A NEW CAP IS REQUIRED, ALWAYS INSTALL A CAP OF THE SAME TYPE AND PRESSURE RATING. PRESSURE RATING 7 LB.

3. Inspect for dented or clogged overflow pipe. To remove clogged material, run a flexible wire through pipe until obstruction is removed.

When a pressure cap opens the sudden surge of vapor or liquid must pass thru the overflow pipe. If the pipe is dented or clogged, the pressure developed by the obstruction may cause damage to radiator or hoses.

Inspect and Clean Cooling System:

Check hose connections for coolant leaks as well as air leakage. Air leakage around hose connections allows oxygen into the system which is a major factor in corrosion.

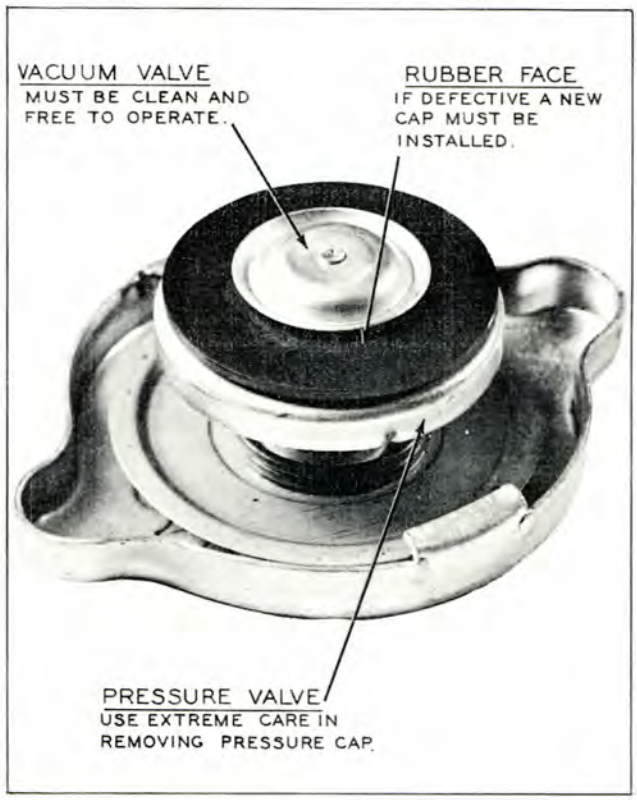


Plate 6459. Pressure Cap Gasket, Valve and Valve Gasket

NOTE

EXHAUST GAS LEAKAGE BETWEEN CYLINDER HEAD AND GASKET ALSO RESULTS IN CORROSION. IF EXHAUST GAS DISCHARGES INTO COOLANT, THE COOLANT AND THE GAS COMBINE TO FORM A VARIETY OF ACIDS. IT IS THEREFORE IMPORTANT THAT CYLINDER HEAD STUD NUTS BE DRAWN DOWN TO SPECIFICATIONS AS INSTRUCTED IN "ENGINE TUNE-UP".

Using a washing soda solution, flush cooling system in the following manner:

1. Drain system.

2. Replace half of volume with fresh water. Refer to Specifications for capacity.

3. Boil other half of volume and add washing soda until no more will dissolve.

4. Add hot soda solution to cooling system (fill up).

5. Operate engine normally for 24 hours.

6. Drain, flush, refill with clean water to which a soluable oil has been added in a proportion of 1 ounce per gallon of water.

Maintaining the cooling system efficiency is important, as engine temperatures must be brought up to and maintained within satisfactory range for efficient operation; however, must be kept from overheating, in order to prevent damage to valves, pistons and bearings. Continued overheating may cause internal damage, while continuously low operating temperature wastes fuel, increases engine wear and causes oil sludge and corrosion of engine parts.

Overcooling may be caused by operating conditions such as excessive idling, low speeds and light loads during cold weather. Overheating may be caused by faulty thermostat, clogged radiator or an improperly adjusted fan belt.

C A U T I O N

NEVER POUR COLD WATER OR COLD ANTI-FREEZE INTO THE RADIATOR OF AN OVERHEATED ENGINE. ALLOW THE ENGINE TO COOL AND AVOID THE DANGER OF CRACKING THE CYLINDER HEAD OR BLOCK. KEEP ENGINE RUNNING WHILE ADDING WATER.

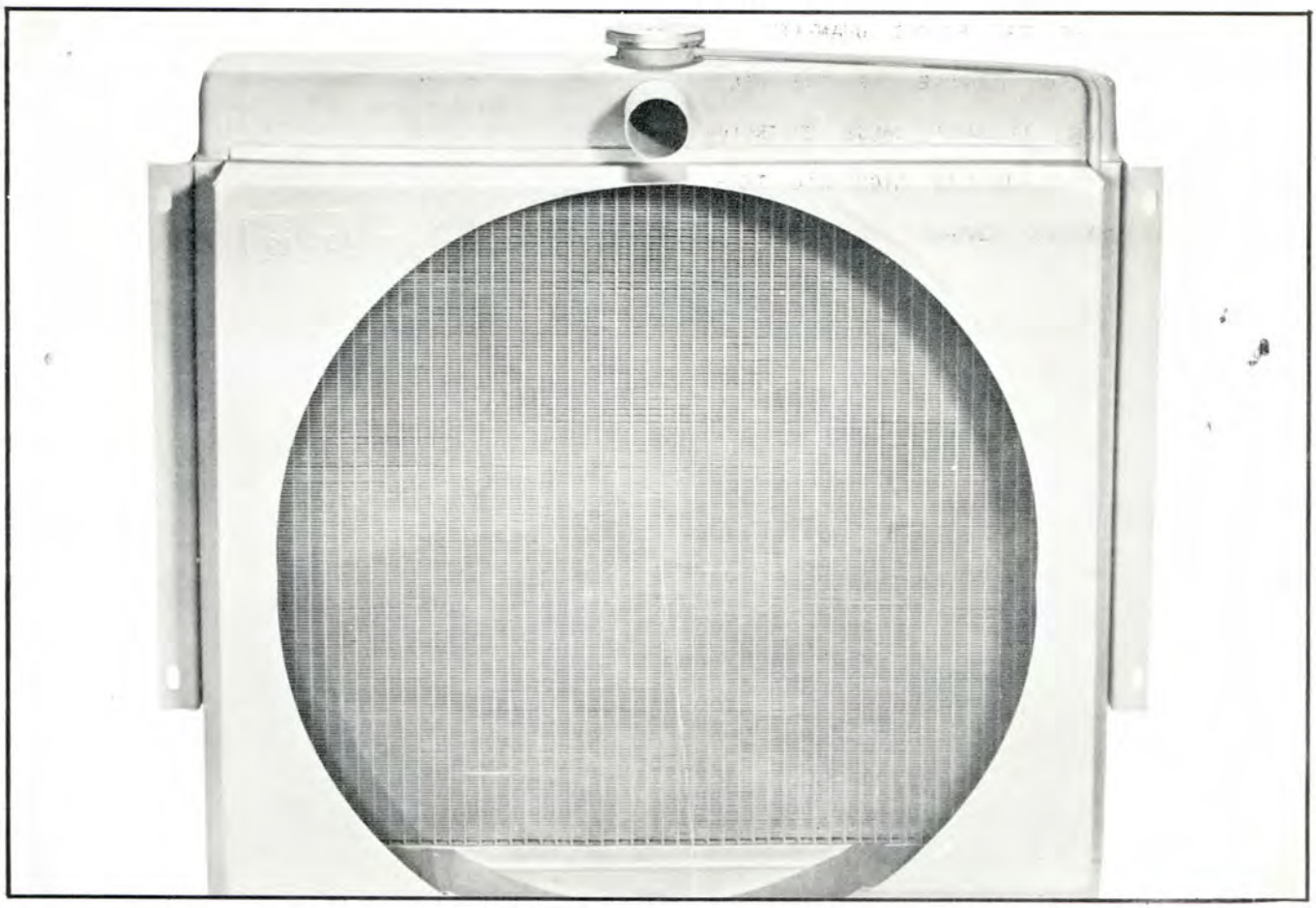


Plate 6461 Typical Radiator

TRANSMISSION AND AXLE ADAPTER DRAIN AND REFILL

The transmission and axle adapter have a common lubrication system and should be drained at operating temperatures, after each 1000 hours of operation.

It is necessary to remove both the axle adapter drain plug and the transmission drain plug, to facilitate complete draining.

After the transmission and axle adapter have completely drained, replace drain plugs and fill thru the axle adapter fill plug, until the lubricant reaches the height of the level test plug. See Plate 7455. Use a straight mineral gear lubricant of a S.A.E. number 90 grade. Replace plugs and operate the machine in forward or reverse for a short time to distribute the lubricant throughout the system. Stop engine and again check level of lubricant at the test plug. Add or drain lubricant as required.

C A U T I O N

DO NOT OVERFILL AS THE EXCESS QUANTITY WILL SERVE NO USEFUL PURPOSE. IF THE OIL LEVEL IS TOO HIGH, IT WILL CAUSE EXCESSIVE OIL CHURNING AND ATTENDANTLY HIGH OIL TEMPERATURE AND POSSIBLE LEAKAGE.

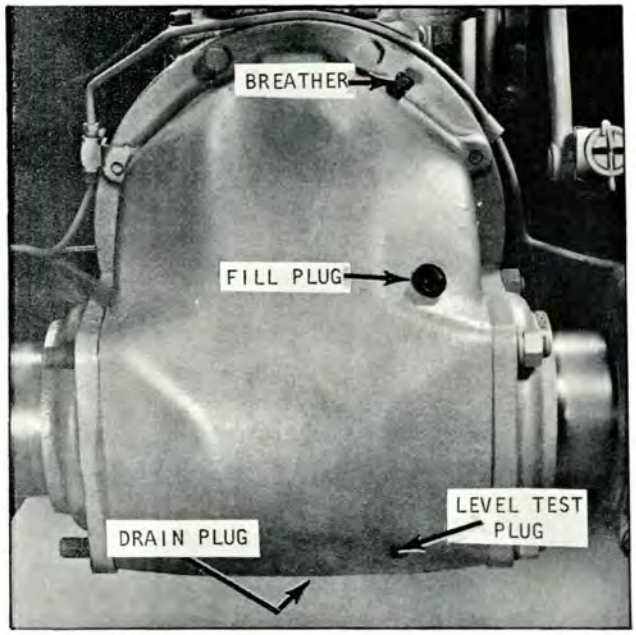


Plate 7455. Axle Adapter

AXLE ADAPTER BREATHER

Check breather to be sure it is free of any obstruction. If breather is dirty remove and clean in a Stoddard type cleaning solvent. Dry breather with compressed air before replacing on axle adapter.

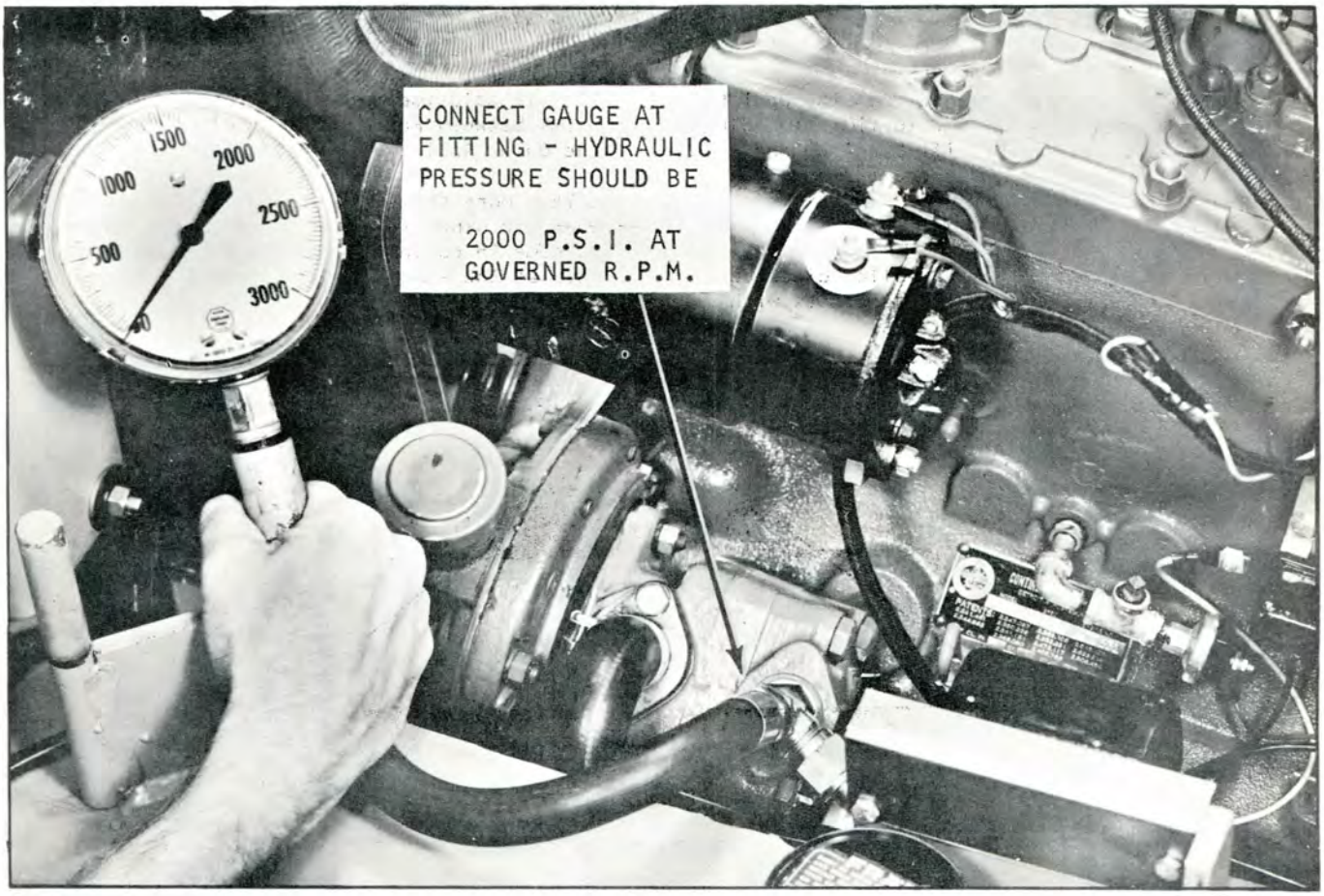


Plate 6662. Main Hydraulic System Pressure Check

Provide a means for connection of a hydraulic pressure gauge at the pressure outlet of the hydraulic pump. One method is to place a "T" in the pressure line leading to the valve as shown in Plate 6662.

C A U T I O N

WITH GAUGE CONNECTED IN THE PRESSURE LINE THERE MUST BE A COMPLETED CIRCUIT TO THE VALVE TO ALLOW THE PRESSURE RELIEF VALVE TO OPERATE.

System pressure should be checked with engine operating at governed 2350 R.P.M. Move lift lever to "raise" position. When lift cylinder reaches maximum height, check gauge reading. Pressure should be reasonably close to the factory preset pressure of 2000 P.S.I.

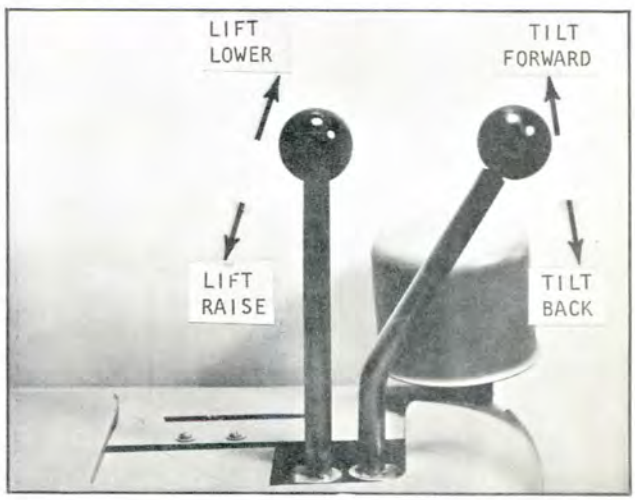


Plate 7449. Hydraulic Control Levers

LIFT CARRIAGE AND UPRIGHT
ROLLER ADJUSTMENTS

To maintain top performance from the upright it may be necessary, from time to time, to adjust the rollers located on the Lift Carriage and Upright Assembly. These adjustments may be accomplished as follows:

Before checking for proper roller clearance, check to be sure the Inner Slide contacts with both Fabreeka (Stop) Pads at the same time when lowering the Inner Slide.

If adjustment is required, add or remove shims between Fabreeka (Stop) Pads located on the Outer Rail Tie Bar Assembly.

NOTE: More shims may be required on one side than the other in order to allow the Inner Slide to come in contact with both Fabreeka (Stop) Pads at the same time when lowering the Inner Slide.

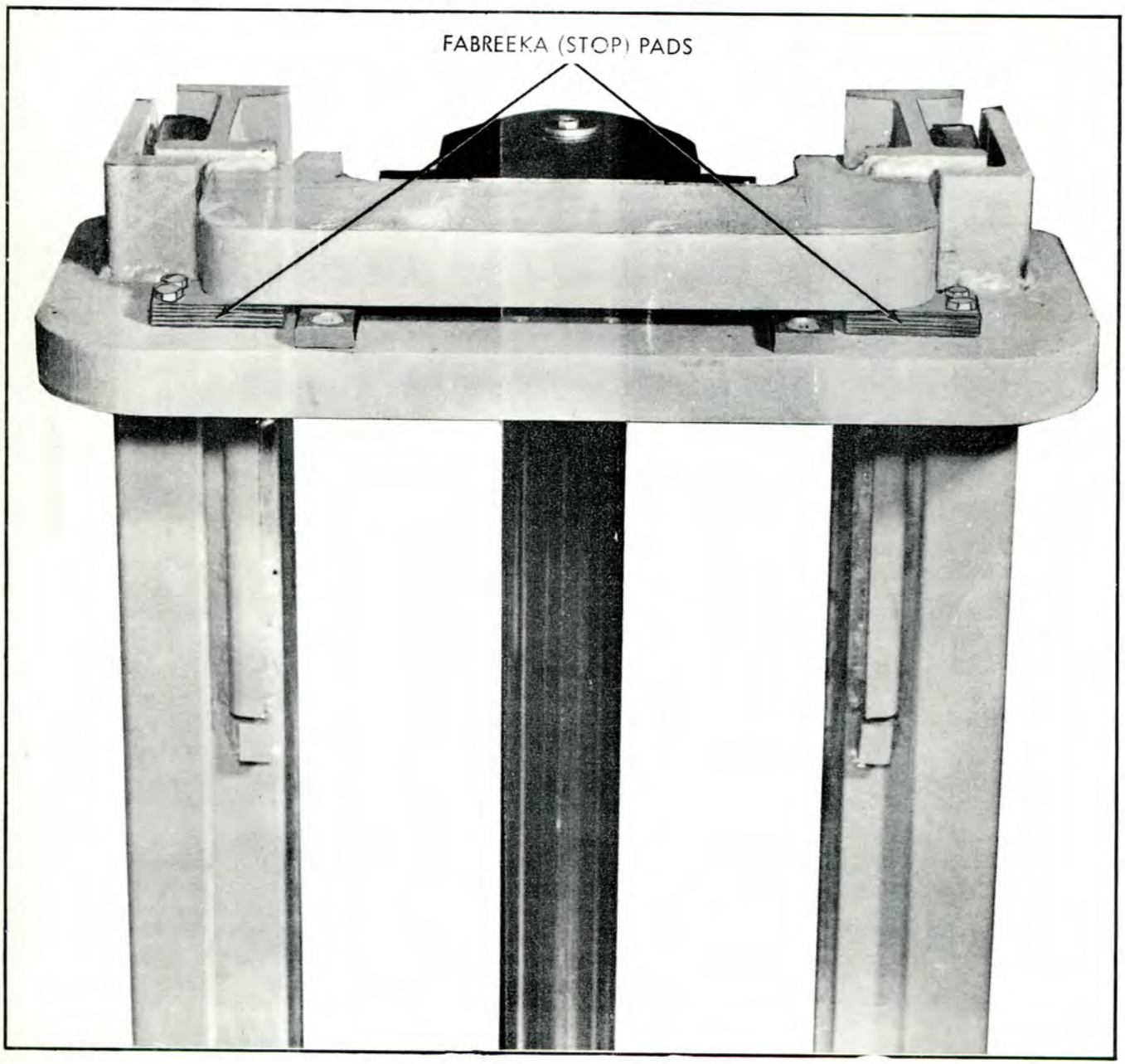
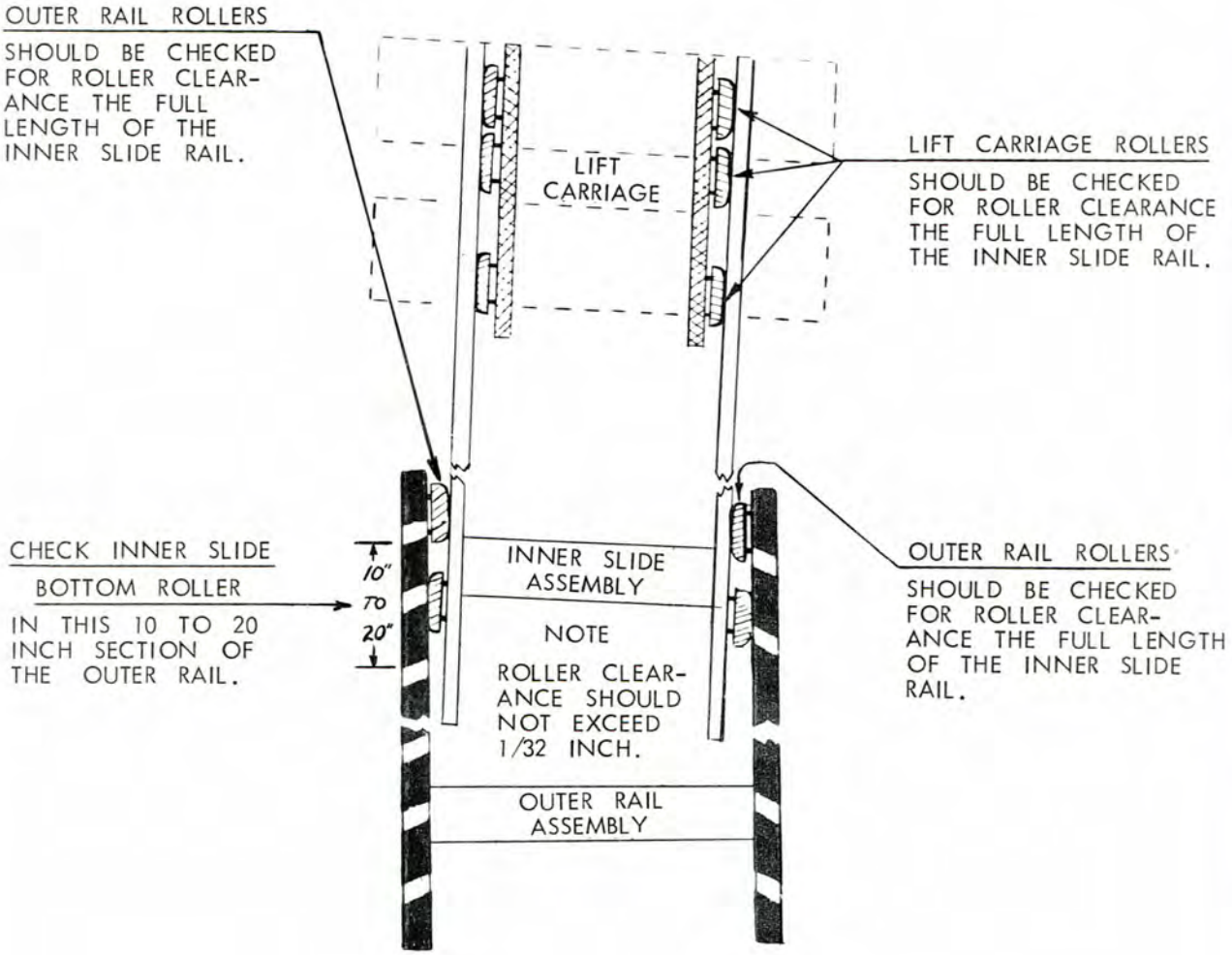


Plate 6619. Inner Slide Must Contact Both Fabreeka (Stop) Pads At The Same Time When Lowering Inner Slide



NOTE

IF UPRIGHT RAILS ARE COCKED IN POSITION AS SHOWN, AND IF CLEARANCE IS CHECKED ON THIS SIDE, CLEARANCE IS MEASURED BETWEEN THE UPPER EDGE OF THE ROLLER RIM AND CORRESPONDING RAIL.

NOTE

IF UPRIGHT RAILS ARE COCKED IN POSITION AS SHOWN, AND IF CLEARANCE IS CHECKED ON THIS SIDE, CLEARANCE IS MEASURED BETWEEN THE LOWER EDGE OF THE ROLLER RIM AND CORRESPONDING RAIL.

Plate 6891. Roller Adjustments

UPRIGHT ROLLER ADJUSTMENTS.

NOTE

THE UPRIGHT OUTER RAIL ASSEMBLY IS MANUFACTURED WITH A SLIGHT TAPER, THE BOTTOM BEING 1/16 INCH WIDER THAN THE TOP. EXTEND THE UPRIGHT TO THE UPPER LIMIT. CHECK TO BE SURE THERE IS NO BIND. LOWER UPRIGHT. IF THERE IS A BIND, THE INNER SLIDE WILL HESITATE OR REMAIN AT THE UPPER LIMIT. AS THE LIFT CYLINDER BEGINS TO RETRACT, THE INNER SLIDE WILL BREAK FREE AND THEN LOWER. THIS INDICATES IMPROPER ADJUSTMENT, OR THIS MAY INDICATE A DAMAGED ROLLER WHICH WILL NOT ROTATE. RAISE AND LOWER CARRIAGE AND CHECK TO BE SURE ALL ROLLERS ROTATE FREELY.

1. Because of the 1/16 inch taper in the Outer Rail Assembly, the rollers may bind when upright is extended if roller adjustment is made with the upright lowered; therefore, the upright must be extended to the upper limit (with no backward or forward tilt) before making any adjustments.

2. Insert pry bar between bottom end of either right or left Inner Slide (Rail), and Outer Rail, refer to Plate 6891.

3. Move Inner Slide sideways to remove all clearance at opposite rail.

4. When checking clearance on the side that pry bar was installed, there must be some clearance between the Outer Rail and the bottom roller at the lower edge of the Roller Rim. THIS CLEARANCE SHOULD NOT EXCEED 1/32 INCH. If clearance is checked on opposite side, clearance should be checked between Outer Rail and bottom roller at the upper edge of Roller Rim, refer to Plate 6891 and 6325.

NOTE

THE BOTTOM ROLLERS OF THE INNER SLIDE, MUST BE CHECKED FOR CLEARANCE IN A 10 TO 20 INCH SECTION STARTING AT TOP OF OUTER RAIL ASSEMBLY, SEE Plate 6572.

5. Check clearance between Outer Rail Upper Rollers and Inner Slide. ROLLER CLEARANCE SHOULD BE CHECKED THE FULL LENGTH OF THE INNER SLIDE ASSEMBLY. Refer to Step 4 for Roller Clearance Specifications.

6. If adjustment is required, proceed as follows:

7. Disassemble upright.

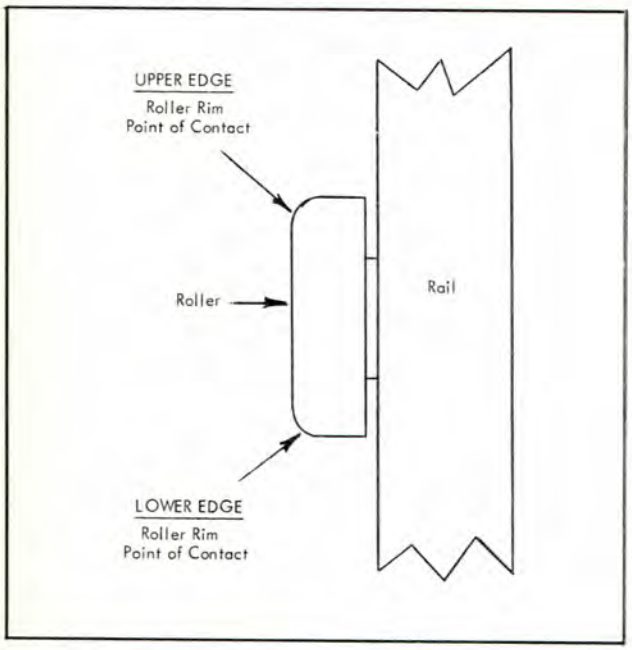


Plate 6325. Upright Roller

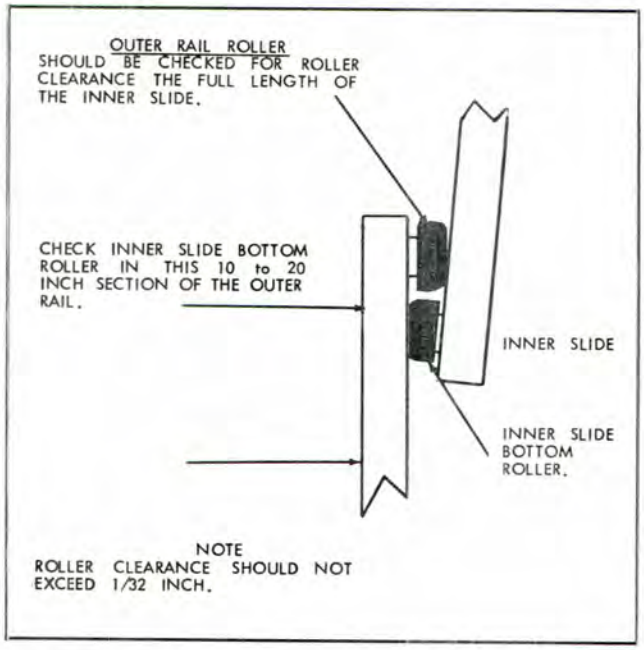


Plate 6572. Outer Rail Roller Clearance Check

8. Remove rollers from shafts and add or remove shims to acquire the clearance previously stated.

N O T E

THE ROLLER SHAFTS ARE WELDED TO THE RAIL ASSEMBLIES. TO REMOVE ROLLERS, MERELY PULL ROLLERS FREE OF ROLLER SHAFTS.

9. Reassembly upright.

10. Follow Steps 1 thru 5 and recheck clearance.

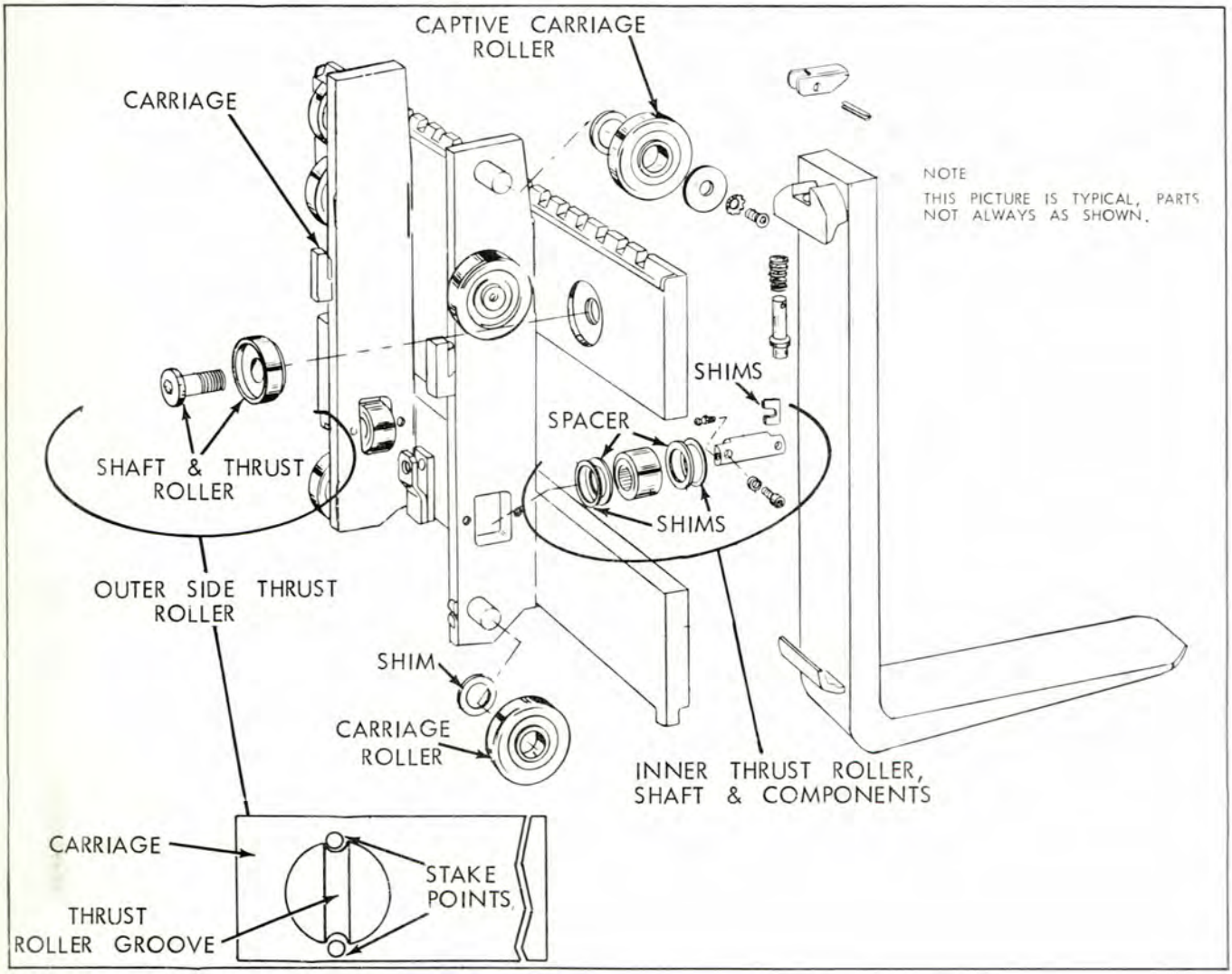


Plate 7000. Lift Carriage

LIFT CARRIAGE ROLLER ADJUSTMENTS

CARRIAGE MUST BE ADJUSTED SO IT IS HORIZONTAL AND CENTERED IN THE UPRIGHT FRAME. ROLLER CLEARANCE SHOULD BE CHECKED THE FULL LENGTH OF THE RAILS. ROLLERS SHOULD HAVE CLEARANCE OF NOT MORE THAN 1/32 INCH AT EACH SIDE.

Carriage Rollers are adjusted with shims placed on roller shaft between roller and carriage frame.

N O T E

CARRIAGE ROLLERS SHAFTS ARE WELDED TO CARRIAGE FRAME. TO REMOVE ROLLERS MERELY PULL ROLLER FREE OF SHAFT.

If adjustment is necessary refer to Steps 4 and 8.

Outer Side Thrust Rollers

The Outer Side Thrust Rollers do not require adjustment. These should be replaced in the event of wear or damage. The maximum clearance is 1/16 inch at each side.

Tighten the Outer Side Thrust Roller Shafts to 150 pound feet torque. The end of these shafts have a machined groove. Stake with a punch at each end of groove as shown in Plate 7000 This will secure shaft to lift carriage.

Inner Side Thrust Rollers

1. Check the clearance between the Inner Side Thrust Rollers and Inner Rails. Maximum allowable clearance is 1/32 inch

or 1/64 inch at each side. Rollers must be free to rotate without binding. See Plate 7000.

If adjustment is required, proceed as follows:

2. Elevate carriage and place a suitable support under the carriage. Plate 8623.

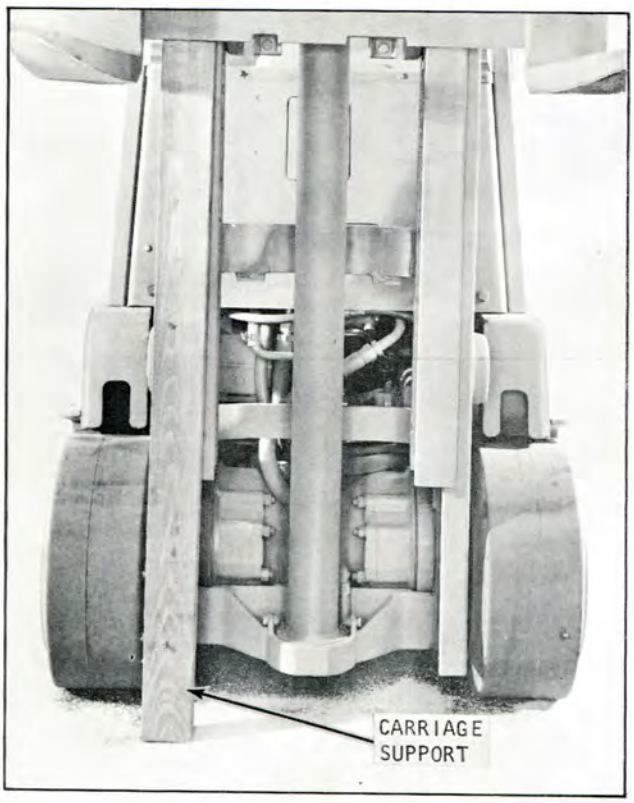


Plate 8623. Carriage Support

3. Remove carriage lift chain pins & replace with similar sized bolts. Plate 8599.

4. Remove carriage support, lower carriage to bottom, and tilt upright a little forward of vertical till carriage rests on the floor.

5. Remove bolts, raise channel, and back away from carriage. Plate 8922.

6. Add or remove shims as required to obtain correct clearance. Plate 8923.

7. Reinstall carriage by reversing steps 2-5.

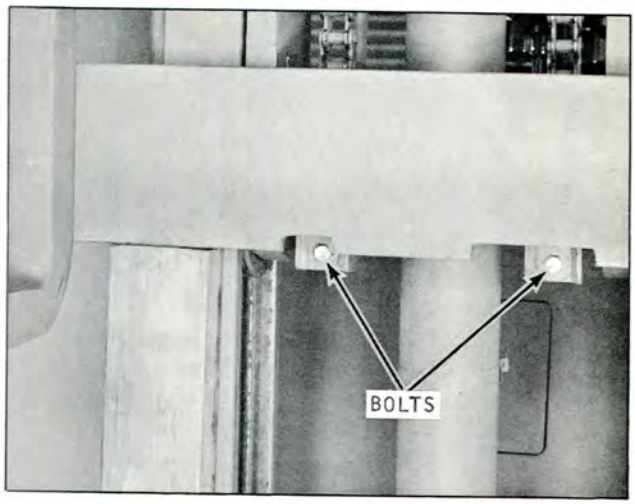


Plate 8599. Carriage Pin Replacement

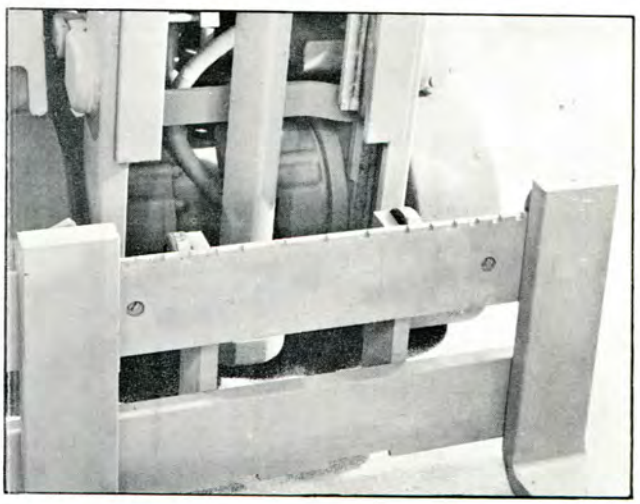


Plate 8922. Carriage Removed

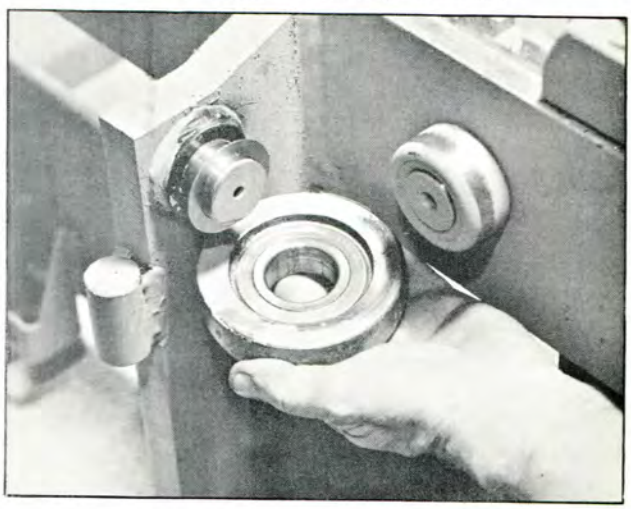


Plate 8923. Shim Adjustment

Plate 6323. Upright Roller

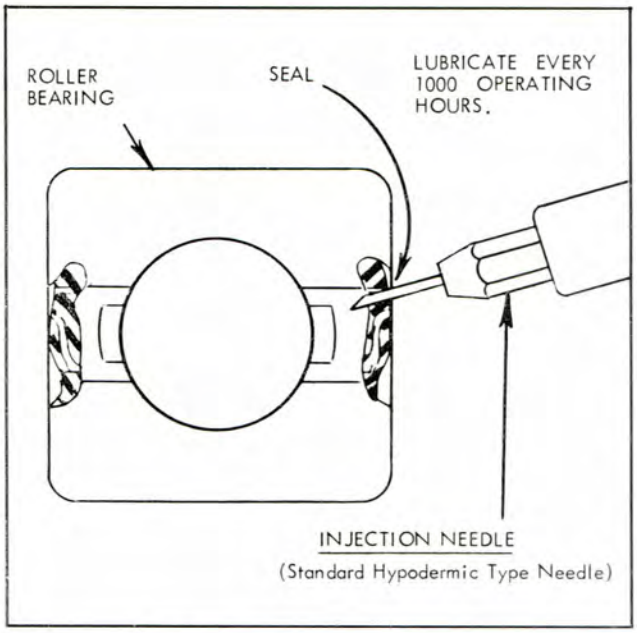


Plate 6328. Roller Bearing Lubrication

UPRIGHT AND CARRIAGE ROLLER LUBRICATION

The manufacturer does not recommend removing a bearing seal for periodic lubrication.

Bearings are generally provided with four openings (on the bearings front face, between the waffle pattern) for lubrication with an Injection Needle.

This needle is a standard hypodermic type needle and can be purchased in drug stores, refer to Plate 6328.

A good light petroleum base oil should be used.

INDUSTRIAL TRUCK DIVISION

TROUBLE SHOOTING GUIDE

ENGINE

TROUBLE	PROBABLE CAUSE	REMEDY
Starting motor will not crank engine.	Battery discharged	Recharge or replace battery.
	Battery cable terminals loose or corroded. Ignition Fuse blown.	Remove and clean, reinstall and tighten cables. Replace fuse.
	Starting motor drive gear jammed in flywheel teeth.	Loosen starting motor and free-up gear.
	Improper oil.	Change oil to proper grade.
	Battery cable terminal broken.	Replace cable.
	Poor starting switch contacts.	Replace switch.
	Faulty Neutral Starting Switch.	Refer to Starting Motor.
Starting motor operates, but fails to crank engine when switch is engaged.	Starting motor gear does not engage flywheel.	Remove starting motor, and clean drive mechanism.
	Starting motor or drive gear defective.	Replace starting motor.
Engine will not start. No spark. Ammeter shows no discharge (Zero reading) with ignition switch "on".	Ignition switch partly "on".	Turn switch "on" fully.
	Ignition switch defective.	Replace switch.
	Ignition primary wires or starting motor cables broken or connections loose.	Repair, or replace and tighten.
	Ignition coil primary winding open.	Replace coil.
	Distributor points dirty.	Clean and adjust points.
	Distributor points not closing.	Adjust or replace points.
	Loose or corroded ground, or battery cable connections.	Remove and clean, reinstall and tighten cables.
Engine will not start. Ammeter showing abnormal discharge with ignition switch "on".	Defective condenser.	Replace condenser.
	Short-circuited or burned distributor cap or rotor.	Replace parts.
	Short-circuited wire between ammeter and ignition switch.	Repair or replace wire.
	Short-circuited primary winding in ignition coil.	Replace coil.
	Distributor points not opening.	Clean or replace, and adjust points.
Weak spark.	Distributor points pitted or burned.	Clean or replace, and adjust points.
	Distributor condenser weak.	Replace condenser.
	Ignition coil weak.	Replace coil.

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine will not start.		
Weak spark (continued)	Primary wire connections loose.	Tighten.
	High-tension, spark plug wires, or distributor cap wet.	Dry thoroughly.
	High-tension, spark plug wires, or distributor cap damaged.	Replace defective parts.
	Distributor cap or rotor burned or broken.	Replace defective parts.
	Spark plug gap incorrect.	Reset gaps.
	Short-circuited secondary circuit in coil.	Replace coil.
Good spark.	Fuel tank empty.	Refill tank.
	Dirt or water in carburetor, or float stuck.	Drain and clean carburetor.
	Carburetor and engine flooded by excessive use of choke.	Depress accelerator pedal fully, crank engine with starting motor, when engine starts, reset throttle and leave choke control "in".
	Fuel does not reach carburetor.	Inspect for damaged or leaky lines or air leak into line between tank and fuel pump.
	Dirt in fuel lines or tank.	Disconnect lines, drain tank, and blow out lines.
	Fuel line pinched.	Repair or replace line.
	Ignition wires incorrectly installed in distributor cap.	Install wires correctly.
	Ignition timing incorrect.	Reset timing.
	Fuel Strainer Clogged.	Remove and clean strainer.
	Fuel pump does not pump.	Clean screen, replace pump if defective.
	Lack of engine compression.	Report to designated individual in authority.
Backfiring.	Ignition out of time.	Reset timing.
	Spark plug wires incorrectly installed distributor cap or at spark plugs.	Install wires correctly.
	Distributor cap cracked or shorted.	Replace cap.
	Valve holding open.	Report to designated individual in authority.

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine operates, but backfires and spits.	Improper ignition timing.	Reset timing.
	Spark plug wires incorrectly installed in distributor cap.	Install wires correctly.
	Dirt or water in carburetor.	Drain and clean carburetor.
	Carburetor improperly adjusted.	Clean and adjust carburetor.
	Carburetor float level low.	Report to designated individual in authority.
	Valve sticking or not seating properly, burned or pitted.	Report to designated individual in authority.
	Excessive carbon in cylinders.	Remove carbon from cylinders.
	Valve springs weak.	Report to designated individual in authority.
	Heat control valve not operating.	Free-up, and adjust valve.
	Fuel pump pressure low.	Clean screen; replace pump, if defective.
	Fuel strainer clogged.	Remove and clean strainer.
	Partly clogged or pinched fuel lines.	Clean and repair lines.
	Intake manifold leak.	Inspect gaskets and tighten manifold stud nuts.
	Distributor cap cracked or shorted.	Replace cap.
Engine stalls on idle.	Carburetor throttle valve closes too far, or idle mixture incorrect.	Adjust carburetor.
	Carburetor choke valve remains closed.	Free-up and lubricate valve.
	Dirt or water in idler passages of Carburetor.	Clean or replace carburetor.
	Air leak at intake manifold.	Inspect gaskets and tighten manifold stud nuts.
	Heat control valve defective.	Free-up and adjust valve.
	Spark plugs defective, gaps incorrect.	Clean or replace spark plugs, set gap clearance.
	Ignition timing early.	Reset timing.
	Low compression.	Report to designated individual in authority.
	Water leak in cylinder head or head gaskets.	Replace gasket; report cylinder head leak to designated individual in authority.

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine misfires on one or more cylinders.	Dirty spark plugs.	Clean, adjust, or replace plugs.
	Spark plug gap incorrect.	Reset gap.
	Cracked spark plug porcelain.	Replace spark plug.
	Spark plug wires grounded.	Replace wires.
	Spark plug wires incorrectly installed in cap or at spark plugs.	Install wires correctly.
	Distributor cap or rotor burned or broken.	Replace defective parts.
	Valve tappet holding valve open.	Report to designated individual in authority.
	Low engine compression.	Report to designated individual in authority.
	Leaky cylinder head gasket.	Replace gasket.
	Cracked cylinder block, broken valve tappet or tappet screw.	Report to designated individual in authority.
Engine does not idle properly.	Ignition timing.	Reset timing.
	Dirty spark plugs, or gaps too close.	Clean and adjust spark plugs.
Engine misses at high speeds.	Ignition coil or condenser weak.	Replace defective parts.
	Distributor points sticking, dirty or improperly adjusted.	Clean, adjust, or replace points.
	Distributor rotor or cap cracked or burned.	Replace defective parts.
	Leaky cylinder head gaskets.	Replace gaskets.
	Uneven cylinder compression.	Report to designated individual in authority.
	High-tension or spark plug wires leaky, cracked insulation.	Replace defective parts.
	Carburetor choke not adjusted.	Adjust choke.
	Carburetor accelerating pump system defective, dirt in metering jets or float level incorrect.	Report to designated individual in authority.
	Fuel pump defective, causing lack of fuel.	Clean screen, replace defective pump.
	Air cleaner dirty.	Clean complete air cleaner and refill oil cup.
	Heat control valve defective.	Free-up and adjust

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine misses at high speeds. (continued)	Valves sticking, weak or broken valve springs.	Report to designated individual in authority.
	Fuel strainer clogged.	Remove and clean strainer.
	Weak distributor bracket arm spring	Replace point set.
	Excessive play in distributor shaft bearing.	Replace distributor.
	Spark plugs defective, dirty or gap incorrectly set.	Clean, adjust or replace spark plugs.
Engine pings (Spark Knock).	Ignition timing early.	Reset timing.
	Distributor automatic spark advance stuck in advance position, or spring broken.	Replace distributor.
	Excessive carbon deposit in cylinders.	Remove cylinder head and clean.
	Incorrect fuel.	Drain, use correct fuel.
Engine lacks power.	Ignition timing late.	Reset timing.
	Incorrect fuel.	Use correct fuel.
	Leaky cylinder head gasket.	Replace gasket.
	Excessive carbon formation.	Remove cylinder head, and clean cylinder head, piston heads, cylinder block, and valves.
	Engine runs cold.	Test thermostat; in cold weather, cover radiator.
	Insufficient oil, or improper grade oil.	Lubricate in accordance with lubrication section.
	Oil system failure.	Report to designated individual in authority.
	Air Cleaner dirty.	Clean complete air cleaner, change oil in cup.
	Spark plug gaps too wide.	Reset gaps.
	Choke valve partially closed, or throttle does not open fully.	Adjust valve or throttle.
	Manifold heat control inoperative.	Free-up and adjust control.
	Exhaust pipe, muffler or tail pipe obstructed.	Service or replace obstructed parts.
	Low compression, broken valve springs, sticking valves.	Report to designated individual in authority.

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine lacks power. (Continued)	Improper tappet adjustment.	Adjust tappets.
	Lack of fuel.	Clean filter, inspect fuel pump, inspect carburetor for water or dirt and clean if necessary.
Engine overheats.	Cooling system deficient. Water low, air flow through radiator core restricted.	Clean radiator core from engine side with compressed air or water, or fill radiator to proper level.
	Clogged radiator core (Clogged internally).	Clean by flushing radiator.
	Cylinder head gasket leaking.	Tighten cylinder head stud nuts and/or replace gasket.
	Radiator or water pump leaking.	Repair or replace defective parts.
	Damaged or deteriorated hose or fan belt.	Replace defective parts.
	Loose fan belt.	Adjust fan belt tension.
	Cylinder block or head leaking.	Report to designated individual in authority.
	Ignition timing incorrect.	Reset timing.
	Damaged muffler, bent or clogged exhaust pipe.	Service or replace defective parts.
	Excessive carbon in cylinders.	Remove cylinder head, and clean cylinder head, piston heads cylinder block, and valves.
	Insufficient oil, or improper grade.	Refer to Lubrication Instructions.
	Air Cleaner restricted.	Clean complete change oil in cup.
	Inoperative thermostat.	Replace thermostat and gasket.
	Water pump impeller broken.	Replace pump.
	Poor compression.	Report to designated individual in authority.
	Valve timing incorrect.	Reset timing.
High fuel consumption.	High engine speeds (Excessive driving in lower gear range).	Correct driving practice.
	Air cleaner clogged.	Clean complete air cleaner and change oil in cup.
	Carburetor float level too high, accelerating pump not properly adjusted.	Report to designated individual in authority.
	Fuel line leaks.	Correct leaks, replace lines.

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
High fuel consumption. (Continued)	Overheated engine.	See "Engine overheats".
	Carburetor parts worn or broken.	Replace fuel carburetor.
	Fuel pump pressure too high, or leaky diaphragm.	Replace fuel pump.
	Engine running cold.	Inspect thermostat, cover radiator in winter.
	Ignition incorrectly timed.	Reset timing.
	Spark advance stuck.	Replace distributor.
	Leaking fuel pump bowl gasket.	Replace gasket.
	Low compression.	Report to designated individual in authority.
	Carburetor controls sticking.	Free-up and lubricate controls.
	Engine idles too fast.	Adjust carburetor throttle stop screw.
	Spark plugs dirty.	Clean or replace spark plugs.
	Weak coil or condenser	Replace coil or condenser.
	Clogged muffler, or bent exhaust pipe.	Service or replace defective parts.
	Loose engine mounts, permitting engine to shake and raise fuel level in carburetor.	Tighten; if damaged, replace defective mounts.
High oil consumption.	High engine speeds, or excessive driving in low gear range.	Correct driving practice.
	Oil leaks.	Replace leaking gaskets.
	Improper grade oil, or diluted oil.	Use new oil of proper grade.
	Overheating of engine causing thinning of oil.	See "Engine overheats".
	Oil filter clogged.	Clean filter case thoroughly and replace element.
	Defective piston or rings, excessive side clearance of intake valves in guides, cylinder bores worn (scored, out-of-round, tapered); excessive bearing clearance, misaligned connecting rods.	Report to designated individual in authority.

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Low oil pressure.	Insufficient oil supply.	Fill crankcase to prescribed level.
	Improper grade of oil, or diluted oil foaming at high speeds.	Change oil, inspect crankcase ventilator, inspect for water in oil.
	Oil too heavy (funneling in cold weather).	Change to proper grade oil. (Refer to Lubrication Instructions.
	Oil pump screen clogged.	Remove oil pan and clean pump screen.
	Oil leaks.	Report to designated individual in authority.
	Faulty oil pump, pressure regulator valve stuck or improperly adjusted, or spring broken.	Report to designated individual in authority.
Defective valves.	Incorrect tappet adjustment.	Adjust tappets.
	Other valve troubles.	Report to designated individual in authority.
Abnormal engine noises.	Loose fan, fan pulley or belt, heat control valve.	Tighten or correct conditions as required.
	Leaking intake or exhaust manifold or gaskets, cylinder head gasket, or spark plugs.	Tighten loose components or replace defective gaskets.
	Overheated engine, clogged exhaust system.	Remove obstruction from exhaust system. Inspect for further serviceability.
	Other abnormal engine noises.	Report to designated individual in authority.
Poor compression.	Incorrect tappet adjustment.	Adjust tappets.
	Leaking, sticking, or burned valves; sticking tappets; valve spring weak or broken; valve stems and guides worn; piston ring grooves worn or rings worn, broken, or stuck; cylinder bores scored or worn.	Report to designated individual in authority.

FUEL SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Fuel does not reach carburetor.	No fuel in fuel tank.	Fill fuel tank.
	Fuel pump inoperative.	Replace pump.
	Fuel line air leak between tank and fuel pump.	Repair or replace line.
	Fuel line clogged.	Disconnect and blow out lines.
	Fuel tank cap vent clogged.	Clean vent.
Fuel reaches carburetor, but does not reach cylinders.	Choke does not close.	Free-up and lubricate, inspect for proper operation.
	Fuel passage in carburetor clogged.	Clean or replace carburetor.
	Carburetor float valve stuck closed.	Report to designated individual in authority.
High fuel consumption.	Lubricant in power train too heavy.	Use correct lubricant.
	Incorrect adjustment of carburetor.	Adjust carburetor.
	Vehicle overloaded.	Reduce loads to specified maximum capacity.
	Tires improperly inflated.	Inflate tires properly.
	Tight brakes.	Adjust brakes.
Low fuel pressure.	Air leak in fuel lines.	Tighten connections, repair lines if damaged.
	Fuel pump defective, diaphragm broken; valves leaking, linkage worn.	Replace fuel pump.
	Fuel lines clogged.	Clean or replace lines.
Engine idles too fast.	Improper carburetor throttle stop adjustment.	Adjust throttle stop screw.
	Carburetor control sticking.	Free-up and lubricate control.
	Control return spring weak.	Replace spring.
Fuel gauge does not register.	Loose wire connection at instrument panel or tank unit .	Tighten connections.
	Instrument panel unit or tank unit inoperative.	Replace unit.

CLUTCH

TROUBLE	PROBABLE CAUSE	REMEDY
Clutch slips.	Improper pedal adjustment.	Adjust pedal free travel.
	Release linkage binding.	Free-up and lubricate linkage.
	Clutch facings burned or worn, torn loose from plate, or oil soaked.	Report to designated individual in authority.
	Weak pressure spring.	Report to designated individual in authority.
	Sticking pressure plate.	Report to designated individual in authority.
	Weak or broken retractor springs.	Replace. Report to designated individual in authority.
	Damaged pilot or clutch release bearing.	Replace. Report to designated individual in authority.
Clutch grabs or chatters.	Control linkage binding.	Free-up and lubricate linkage.
	Loose engine mounting.	Tighten engine mounts.
	Facings burned, worn, or loose on driven plate; driven plate crimped, flattened out, worn, or binding on splined shaft.	Report to designated individual in authority.
	Pressure plate or clutch adaptor face scored or rough; pressure plate broken.	Report to designated individual in authority.
	Excessive looseness in power train.	Report to designated individual in authority.
	Oil on facings, or excessively worn disc surfaces.	Report to designated individual in authority.
	Sticking pressure plate.	Report to designated individual in authority.
Clutch drags.	Excess pedal free play.	Adjust pedal free play.
	Driven plate warped, facings torn or loose.	Report to designated individual in authority.
	Pressure plate warped or binds, improper clutch lever adjustment.	Report to designated individual in authority.
Clutch rattles.	Clutch pedal return spring broken or disconnected.	Replace or connect spring.

CLUTCH (Continued)

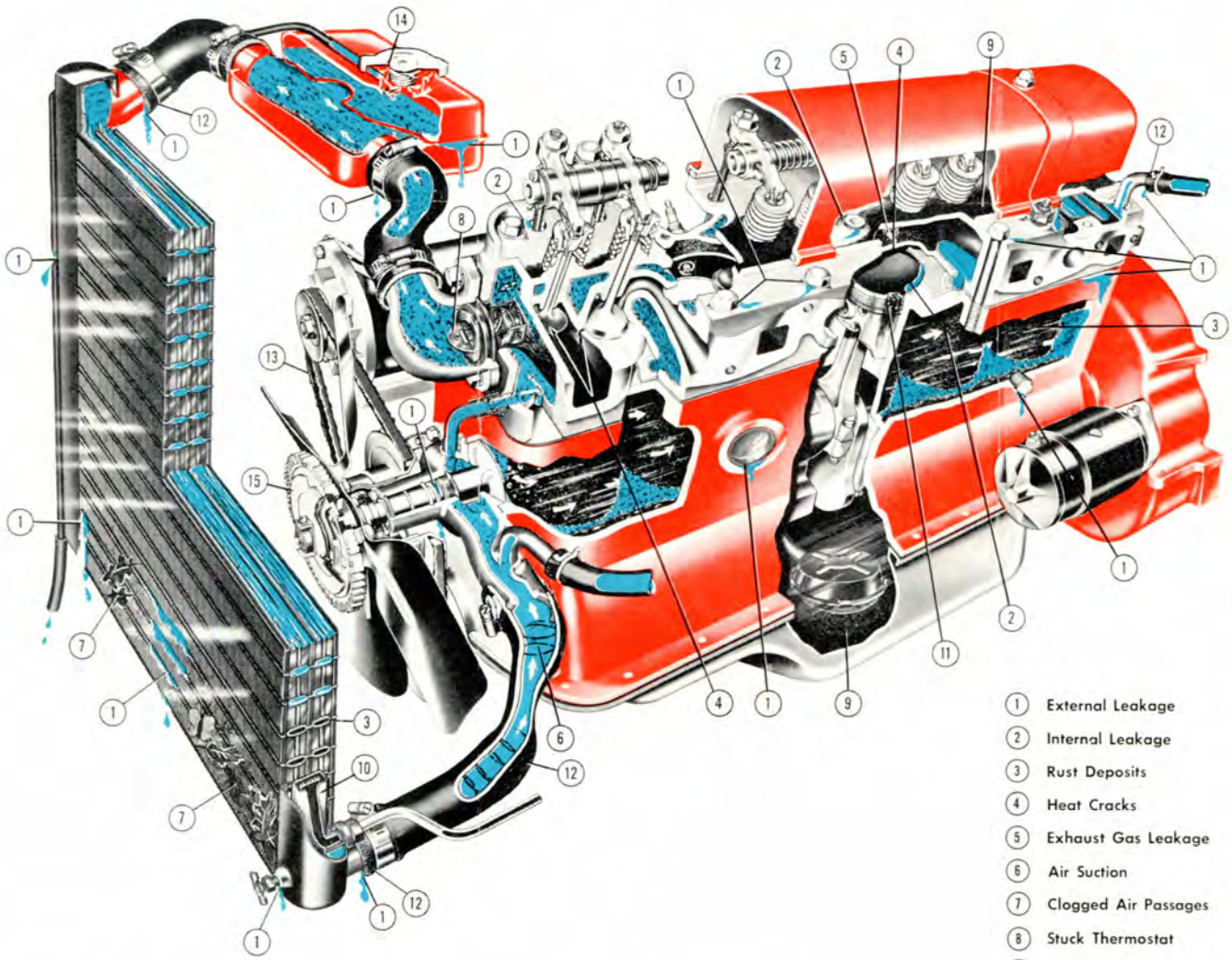
TROUBLE	PROBABLE CAUSE	REMEDY
Clutch rattles. (Continued)	Release fork loose on ball stud.	Adjust clutch pedal free travel to one inch.
	Worn pressure plate, or broken return springs at driving lugs; worn driven plate hub on splined shaft, worn release bearings, pilot bushing worn.	Report to designated individual in authority.

COOLING SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Overheating.	Unusual operating conditions of high temperature.	Inspect. (Refer to "Engine overheats".)
Loss of cooling solution.	Loose hose connections. Damaged or deteriorated hose. Leaking radiator.	Tighten hose connections. Replace hoses. Repair or replace radiator.
Engine operates too cool.	Thermostat sticking. Low air temperature.	Replace thermostat and gasket. Cover radiator.
Noises.	Frayed or loose fan belt. Water pump defective.	Replace or adjust belt. Replace pump.

THE ENGINE COOLING SYSTEM

Trouble spots resulting from service neglect



1. External Leakage
2. Internal Leakage
3. Rust Deposits
4. Heat Cracks
5. Exhaust Gas Leakage
6. Air Suction
7. Clogged Air Passages
8. Stuck Thermostat
9. Sludge Formation in Oil
10. Transmission Oil Cooler
11. Heat Damage
12. Hose Failure
13. Worn Fan Belt
14. Pressure Cap Leakage
15. Temperature Control Fan Drive

The cooling system depicted here does not represent that of any particular make of car. It incorporates features used by many different manufacturers.

Cooling System Care Pays!

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IGNITION SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Ignition system troubles.	Weak spark.	Refer to "Engine will not start".
	Timing incorrect.	Retime ignition.
	Moisture on distributor wires, coil, or spark plugs.	Clean and dry thoroughly.
	Ignition switch inoperative.	Replace switch.
	Primary or secondary wiring loose, broken, or grounded.	Service.
	Coil defective.	Refer to "Ignition coil troubles", below.
	Distributor defective.	Refer to "Distributor troubles", below.
	Spark plug defective.	Refer to spark plug troubles below.
Ignition coil.	Connections loose; dirty or broken external wire, wet.	Clean and tighten, or repair, dry thoroughly.
	Coil defective.	Replace coil.
Distributor troubles.	Distributor breaker points dirty or pitted, point gaps incorrect.	Clean, adjust or replace breaker points.
	Distributor breaker point arm spring weak.	Replace breaker point arm.
	Distributor breaker points sticking.	Free-up breaker points.
	Distributor automatic advance defective.	Lubricate and free-up. If seized, replace distributor.
	Distributor cap or rotor shorted, cracked or broken.	Replace defective parts.
	Distributor rotor does not turn.	Report to designated individual in authority.
	Condenser defective.	Replace condenser.
Spark plug troubles.	Cracked, broken, leaking, or improper type.	Replace spark plug.
	Spark plug wires incorrectly installed on plugs or in distributor cap.	Install wires correctly.
	Spark plugs dirty; gap incorrect.	Clean, set gaps, or replace plugs.
	Spark plug porcelain cracked or broken.	Replace plug.

STARTING MOTOR

TROUBLE	PROBABLE CAUSE	REMEDY
Starting motor cranks engine slowly.	Engine oil too heavy.	Change to proper grade oil.
	Battery charge low.	Recharge or replace battery.
	Battery cell shorted.	Replace battery.
	Battery connections corroded, broken, or loose.	Clean and tighten, or replace cables.
	Dirty commutator.	Clean commutator.
	Insufficient brush surface contact.	Free-up or replace brush.
	Defective starting motor.	Replace starting motor.
	Starting switch defective.	Replace switch.
Starting motor does not crank engine.	Engine oil too heavy.	Change to proper grade oil.
	Starting motor, Solenoid, or cables defective; loose connections.	Replace or tighten loose connections.
	Starting motor pinion gear jammed in flywheel drive gear.	Remove starting motor and reinstall. Replace defective driving gear.
	Dirty drive mechanism.	Clean and lubricate drive mechanism.
	Faulty Relay Switch.	Replace Relay Switch.
	Ignition Fuse Blown.	Replace Fuse.
	Faulty Ignition Switch.	Replace Switch.
	Faulty Neutral Starting Switch.	Replace Switch. NOTE: The INDEX of this manual will list an ADJUSTABLE Neutral Starting Switch if your machine is so equipped.

GENERATOR TROUBLES

TROUBLE	PROBABLE CAUSE	REMEDY
No output.	Regulator defective.	Replace regulator.
Low or fluctuating output.	Loose fan belt.	Adjust belt.
	Insufficient brush surface contact.	Free-up or replace brush.
	Weak brush springs.	Replace spring.
	Worn commutator.	Report to designated individual in authority.
	Broken or loose connections.	Repair, tighten or replace.
	Dirty commutator.	Clean commutator.
	Regulator defective.	Replace regulator.
	Loose or dirty connections in charging circuit.	Clean and tighten connections.
Excessive output.	Short circuit between field coil and armature leads.	Replace generator.
	Regulator defective.	Replace regulator.
Noisy.	Loose pulley or generator mounting.	Tighten.
	Defective bearings, or armature rubbing on field poles.	Replace generator.
	Improperly seated brushes.	Seat brushes.
Generator regulator troubles.	Loose connections or mountings.	Clean and tighten.
	Defective regulator.	Replace regulator.

BATTERY, LIGHTS AND HORN

TROUBLE	PROBABLE CAUSE	REMEDY
Battery discharged.	Battery solution level low.	Add distilled water to bring level above plates; inspect for cracked case.
	Short in battery cell.	Replace battery.
	Generator not charging.	Inspect generator, fan belt, and regulator.
	Loose or dirty connections; broken cables.	Clean and tighten connections; replace cables.
	Excessive use of starting motor.	Tune up engine; charge battery.
	Idle battery, or excessive use of lights with engine at idle.	Recharge or replace battery. Use lights sparingly.
	Short circuits.	Replace defective wiring.
Battery (other troubles)	Overheated battery.	Inspect for short circuit or excessive generator charge.
	Case bulged (or out of shape).	Inspect for overcharging and overtightening of hold-down screws.
Light switch.	Loose or dirty connections; broken wire.	Clean and tighten; replace broken wire.
	Defective switch.	Replace switch.
Wiring.	Loose or dirty connections; broken wire or terminal.	Clean, tighten, repair or replace. Wire or terminal.
Lights do not light.	Switch not fully "on".	Turn switch "on" fully.
	Loose or dirty connections; broken wire.	Clean and tighten; replace or repair wire or terminal.
	Wiring circuit short-circuited, or open.	Correct short circuit or replace defective parts.
	Light burned out.	Replace light.
Lights dim.	Loose or dirty connection.	Clean and tighten connections.
	Wiring short-circuited.	Correct short circuit or replace defective parts.
	Defective switch.	Replace switch.

BATTERY, LIGHTS AND HORN (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Horn troubles.	Loose or dirty wiring connections.	Clean and tighten connections.
Horn sounds continuously.	Short-circuit in wiring between horn and horn button.	Replace wire.
Improper tone.	Loose or dirty wiring connections.	Clean and tighten connections.
	Cover or bracket screws loose.	Tighten.
	Points adjusted improperly.	Adjust points.
Horn will not operate.	Horn Fuse Blown.	Replace Fuse.
	Open Circuit.	Trace, repair or replace as required.
	Faulty Horn Relay.	Replace relay.

TRANSMISSION

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive noise.	Incorrect driving practice.	Correct practice.
	Insufficient lubricant.	Add lubricant.
	Gears or bearings broken or worn; shift fork bent, gears worn on splines.	Replace transmission.
	Overheated transmission.	Inspect lubricant grade and supply.
Hard shifting.	Clutch fails to release.	Adjust clutch pedal free travel.
	Clutch driven plate binds, or pressure plate is defective.	Report to designated individual in authority.
	Gearshift binding in housing.	Lubricate and free-up.
	Shift rods binding in case.	Report to designated individual in authority.
	Transmission loose on bell housing.	Tighten transmission mounting bolts.
	Clutch shaft pilot bearing binding, or shift housing damaged.	Report to designated individual in authority.
Slips out of gear.	Weak or broken rail spring.	Report to designated individual in authority.
	Transmission gears or bearing worn.	Replace transmission.
	Shifting fork bent, causing partial gear engagement.	Report to designated individual in authority.
	Transmission loose on bell housing.	Tighten transmission mounting bolts.
	Damaged bell housing.	Report to designated individual in authority.
	Damaged mainshaft pilot bearing.	Report to designated individual in authority.
Loss of lubricant.	Worn or damaged seals or gaskets.	Report to designated individual in authority.

DRIVE AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Continuous Axle Noise.	Badly worn parts.	Replace worn parts with new.
	Unevenly worn tires.	Replace tires.
	Improperly adjusted wheel bearing.	Adjust correctly.
	Lack of lubricant.	Add sufficient lubricant of correct grade.
Axle Noise on Drive or on Coast Only.	Differential pinion gear and ring gear out of adjustment or worn excessively.	Adjust, repair or replace entire unit if conditions warrants.
Excessive Backlash in Axle Driving.	Loose axle shaft drive flange cap screws.	Tighten cap screws.
	Flange loose on axle shaft.	Reweld flange to shaft.
	Worn splines on axle shaft at differential end.	Replace drive flange and shaft assembly.
	Differential drive pinion gear and ring gear out of adjustment or worn excessively.	Adjust or replace as condition warrants.
Complete Failure to Function.	Broken axle shaft.	Replace axle shaft.
	Broken teeth on ring gear or pinion gear.	Replace ring gear and pinion and other parts of differential necessary. Adjust ring gear and pinion gear correctly.

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Damaged axle.	Replace axle.
	Lubrication leaks.	Replace oil seals. (Refer to Lubrication Section). Report to designated individual in authority.
	Incorrect caster or camber.	Report to designated individual in authority.
	Uneven tire wear.	Inflate tires properly. Check wheel alignment.

STEERING

TROUBLE	PROBABLE CAUSE	REMEDY
Steering difficult.	Lack of lubrication	Lubricate.
	Tight steering system connections.	Lubricate and adjust linkage.
	Tight steering gear; misaligned wheels.	Report to designated individual in authority.
	Bent steering connecting linkage or arm.	Straighten or replace linkage.
	Misaligned steering gear mounting.	Adjust mounting.
Wander or weaving.	Improper toe in camber or caster (axle twisted).	Report to designated individual in authority.
	Steering system connections or king pin bearings not properly lubricated.	Lubricate.
	Loose wheel bearings.	Adjust wheel bearings.
	Steering gear worn or maladjusted.	Report to designated individual in authority.
	Steering gear mountings loose.	Tighten mounting bolts.
Low speed shimmy or wobble.	Loose steering connections.	Adjust and tighten linkage.
	Steering gear worn, or adjustment too loose.	Report to designated individual in authority.
	Loose wheel bearings.	Adjust wheel bearings.
Vehicle pulls to one side.	Odd size, or new and old tires on opposite wheels.	Match tires.
	Tight wheel bearings.	Adjust. Lubricate wheel bearings.
	Bent steering arm or connection.	Straighten or replace bent linkage.

BRAKES

TROUBLE	PROBABLE CAUSE	REMEDY
Brakes drag.	Improper pedal adjustment.	Adjust brake pedal free travel.
	Brake pedal return spring broken or weak.	Replace spring.
	Brakes improperly adjusted.	Adjust brakes.
	Brake shoe anchor pin tight in shoe.	Free-up pin and lubricate lightly.
	Brake shoe return spring broken or weak.	Replace spring.
	Loose or damaged wheel bearings.	Adjust or replace wheel bearings.
	Insufficient brake shoe clearance, or improper brake anchor pin adjustment.	Adjust brakes.
	Brake backing plate loose.	Tighten plate.
	Grease on linings.	Correct grease leakage; clean or install new shoes and lining assemblies.
	Dirt imbedded in lining.	Clean lining with wire brush.
	Drums scored or rough.	Replace drum and brake shoe and lining assemblies.
Severe brake action on light pedal pressure.	Brake shoes improperly adjusted.	Adjust brakes.
	Grease on linings.	Correct grease leakage; clean or install new shoes and lining assemblies.
	Loose brake shoe anchor.	Adjust and tighten.
Brake locked.	Brake pedal lacks free travel.	Adjust pedal free travel.
	Brakes frozen to drums (cold weather).	Break loose by driving vehicle.
Brake noisy or chatters.	Brake lining worn.	Replace shoe and lining assemblies.
	Grease on linings.	Correct leakage; clean or replace shoe and lining assemblies.
	Dirt embedded in linings.	Clean lining with wire brush.
	Improper or loose linings.	Replace shoe and lining assemblies.
	Brake shoe or drum distorted.	Straighten or replace.

BRAKES (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive pedal travel.	Lining worn.	Adjust or replace shoe and lining assemblies.
	Brake improperly adjusted.	Adjust brake.
	Scored brake drums.	Repair or replace drums.
Excessive pedal pressure.	Grease on linings; worn or glazed lining.	Correct grease leakage; clean up and replace shoe and lining assemblies.
	Warped brake shoes, or defective brake linings.	Replace shoe and lining assemblies.
	Shoes improperly adjusted.	Adjust brakes.
	Brake drum scored or distorted.	Repair or replace drums.
	Shoes improperly adjusted.	Adjust brakes.
	Insufficient fluid in master cylinder.	Fill master cylinder to within 1/4 inch of the top.
Wheel troubles.	Wheel wobbles; bent.	Inspect mounting on hub, spindles, and drive axle; replace defective wheel or mounting.
	Wheel loose on hub.	Tighten.
	Wheel out of balance.	Balance wheel.
	Wheel bearings run hot.	Adjust, lubricate wheel bearings.

INDUSTRIAL TRUCK DIVISION

TROUBLE SHOOTING GUIDE

HYDRAULIC SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Pump not delivering oil.	Wrong direction of rotation.	Must be reversed immediately to prevent seizure and breakage of parts due to lack of oil.
	Tank oil level low.	Add recommended oil.
	Oil intake pipe or suction filter plugged.	Replace filter cartridge, clean strainer if so equipped.
	Air leak in suction line.	Will prevent priming, or cause noise and irregular action of control circuit.
	Oil viscosity too heavy to pick up prime.	Thinner oil should be used, per recommendations for given perature and service.
	Broken pump shaft or gear.	Report to designated individual in authority.
Pump not developing pressure.	Pump not delivering oil for any of the above reasons.	Check oil circulation by watching oil in tank.
	Relief valve setting not high enough.	Refer to relief valve instructions.
	Relief valve sticking open.	Dirt under pressure adjustment valve. Refer relief valve instructions.
	Leak in hydraulic control system (cylinders or valves).	Find leak and correct.
	Partially clogged intake line, intake filter or restricted intake pipe.	Pump must receive intake oil freely or cavitation will take place.
Pump making noise.	Small air leak at pump intake piping joints.	Test by pouring oil on joints while listening for change in operation. Tighten as required.
	Air leak at pump shaft packing.	Repair or replace.
	Tank air vent plugged.	Must be open thru breather opening or air filter.
	Too high oil viscosity.	Use recommended oils.
	Shaft packing worn.	Replace shaft packing per preceding instructions.
	Oil filter dirty.	Replace filter element.
Forks do not lift to maximum height.	Hydraulic Oil level low.	Fill sump tank.

HYDRAULIC SYSTEM CONTINUED

TROUBLE	PROBABLE CAUSE	REMEDY
Lift or tilt action fails.	Loss of oil pressure.	Report to designated individual in authority.
Oil leak at top of lift cylinder assembly.	Worn or damaged lift piston seal.	Replace seal.
	Scored cylinder wall.	Replace cylinder.
	Plugged vent line.	Clean out vent line. Replace if collapsed.
Oil leak around piston rod at tilt cylinder.	Worn seal.	Replace seal.
	Scored piston rod.	Replace rod and eliminate cause of scoring which may be caused by misalignment, worn bearing or foreign matter.
With load centered on lift forks load is lifted unevenly.	Lift chains out of adjustment.	Adjust chains.