CLARK EQUIPMENT

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

OPERATORS MANUAL

C500-Y355D-1-2512 AND ABOVE
C500-H355D-1-2515 AND ABOVE

C500-355D-1-2514 AND ABOVE
C500-HY355D-1-2513 AND ABOVE

Book No. 0-221-1
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CLARK EQUIPMENT COMPANY, INDUSTRIAL TRUCK DIVISION

CUSTOMER SERVICES PUBLICATION DEPARTMENT
BATTLE CREEK, MICHIGAN, U.S.A. 49016

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.

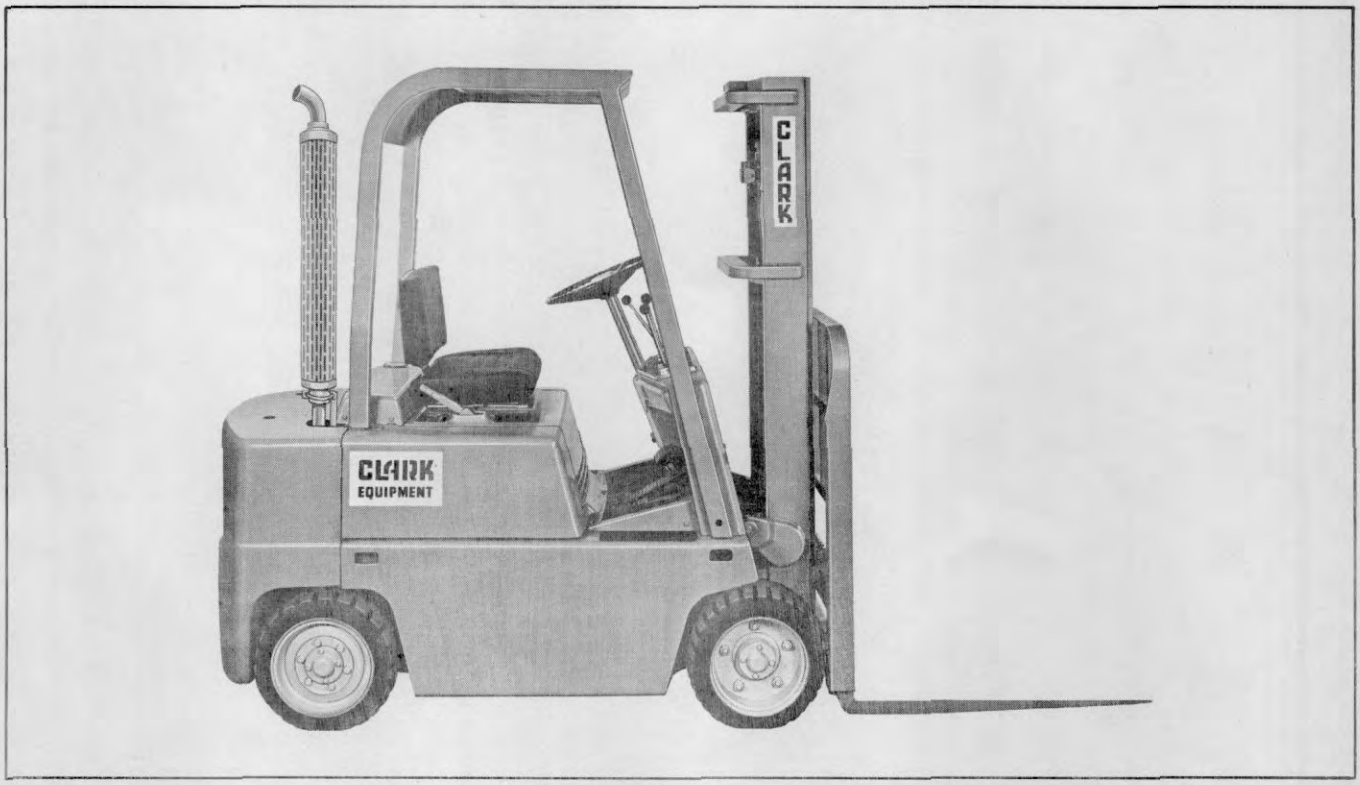
15. Batteries, motors, controllers, limit switches, protective devices, electrical conductors and connections should be inspected and maintained in conformance with good practice. Special attention should be paid to the condition of electrical insulation.

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

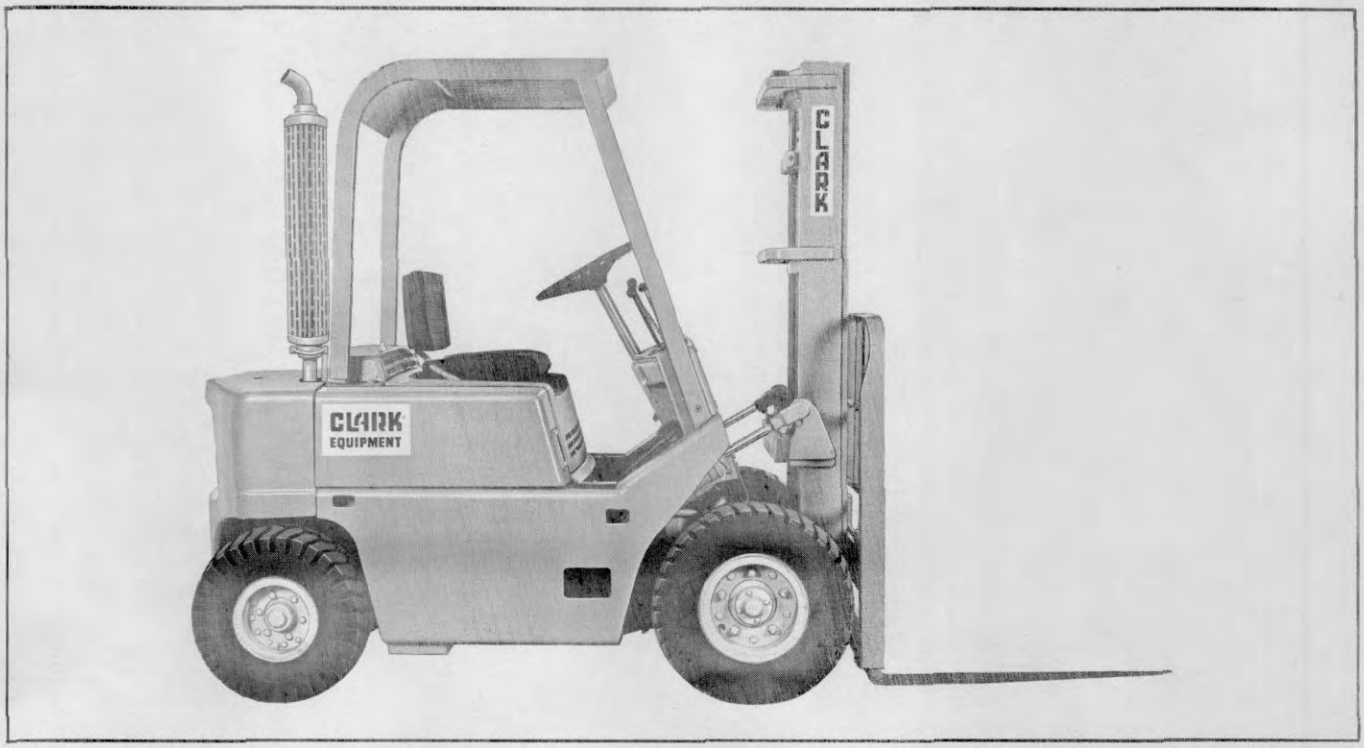
17. Modifications and additions which affect capacity and safe truck operation should not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance instruction plates, tags or decals should be changed accordingly.

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.

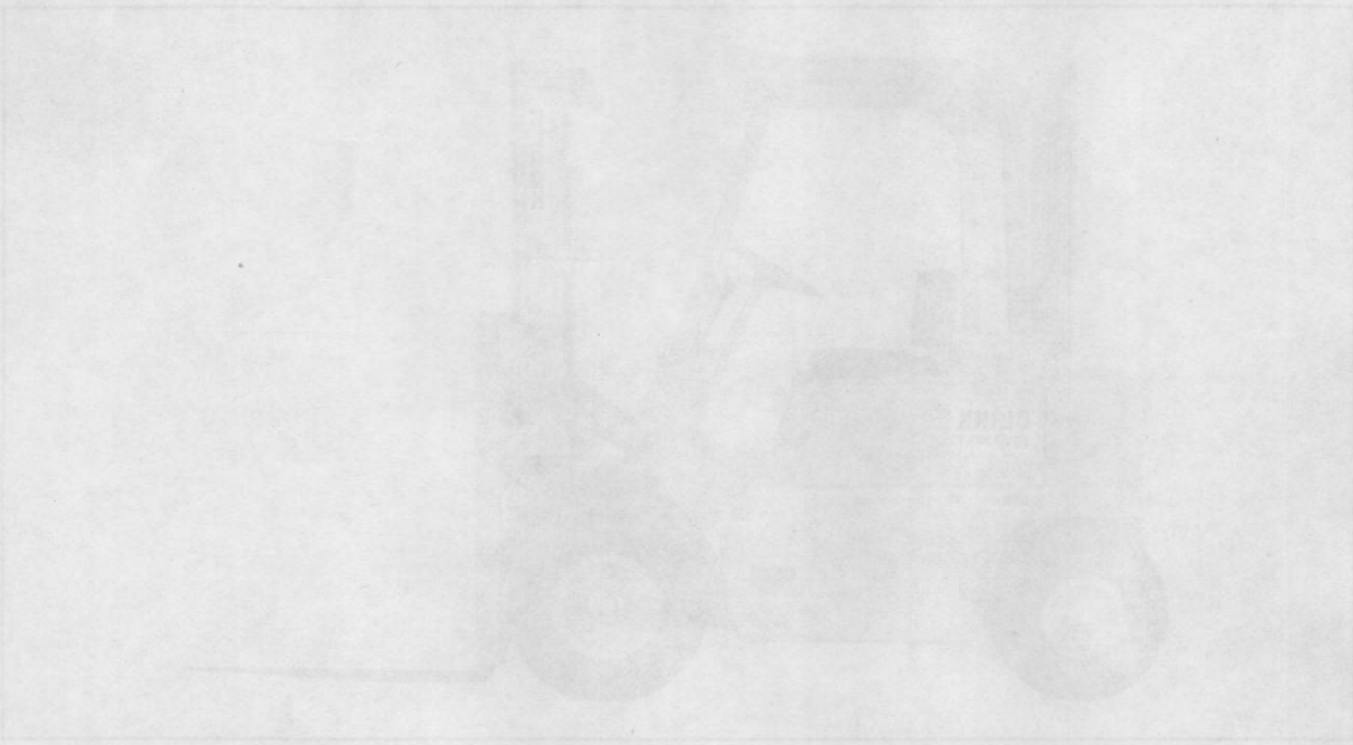
ILLUSTRATION OF MACHINE



C500-(H) 35D, 45D, 55D



C500-(H) Y45D, Y55D



INDUSTRIAL TRUCK DIVISION

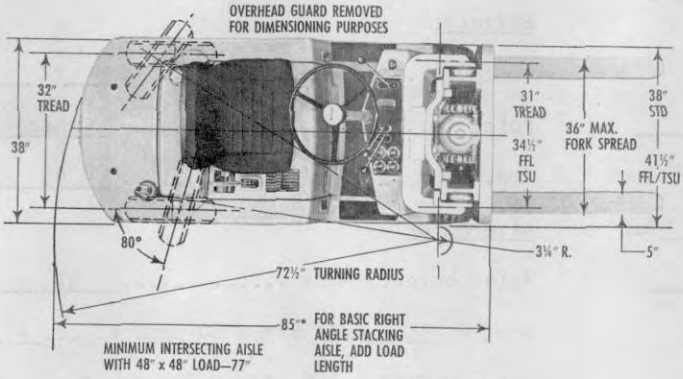
SPECIFICATIONS

DIMENSIONAL SPECIFICATIONS

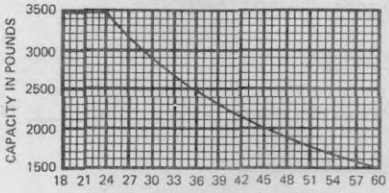
CLARKLIFT® 500

C500-(H) 35D

Rated for 3500 Lbs.
24" Load Center



CAPACITY CHART



Load center in inches from front face of forks —Rated capacities shown above are computed with uprights in vertical position. Lifts above 154" maximum fork height, contact factory. Specific capacities will be shown on truck nameplate.

UPRIGHT DIMENSION TABLE

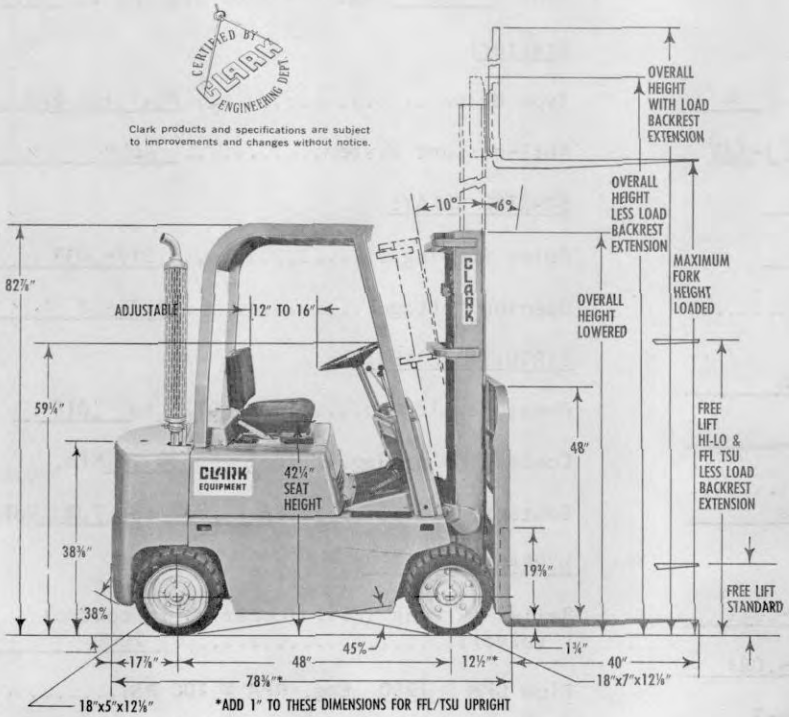
MFH			FREE LIFT	
Std. & Hi-Lo	FFL TSU	Overall Height Lowered	Std.	Hi-Lo & FFL TSU
*106	*153	71	16	50½
112	162	74	16	53½
118	171	77	16	56½
124	180	80	16	59½
*130	*189	83	16	62½
136	—	86	16	65½
—	198	88	—	67½
142	—	89	16	68½
148	—	92	16	71½
—	207	93	—	72½
*154	—	95	16	74½
—	216	98	—	77½
160	—	99	16	78½
166	—	102	16	81½
—	*225	103	—	82½
172	—	106	16	85½
—	234	108	—	87½
*178	—	109	16	88½
184	—	112	16	91½
190	—	116	16	95½
196	—	121	16	100½
202	—	124	16	103½

For overall height fully raised, add 49" to maximum fork height with LBRE; 20⅜" without LBRE.

* Indicates preferred standard sizes. Intermediate Heights Available in Increments of 3" MFH.

CERTIFIED BY CLARK ENGINEERING DEPT.

Clark products and specifications are subject to improvements and changes without notice.



UNDERCLEARANCES

Upright	3⅞"	Frame	4⅞"
Drive Axle	2⅜"	Counterweight	4"
Steer Axle	4⅛"	Grade Clearance	38%

	STD/HI-LO	FFL/TSU
Optional Drive Widths	41½" & 50"	50" & 53½"

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)35D

GENERAL:

MODEL C500-(H) 35D:	130" STD	130" HI-LO	153" FFL/TSU
Service Weight	7,134	7,196	7,537
Weight on Drive Wheels Empty	3,164	3,226	3,567
Weight on Drive Wheels Loaded	9,444	9,506	9,846

INSURANCE CLASSIFICATIONS:

Underwriters' Laboratores, Inc. listed. Type D standard; DS optional.

DRIVE AXLE:

Ratio..... 4.4 to 1

TORQUE CONVERTER:

Diameter..... 11 in.

Torque Multiplication 2.15 to 1

ENGINE:

Model..... CLARK 155D

Type..... DIESEL

Net Brake H.P. at Governed R.P.M. 40

No. Cylinders..... 4

Bore & Stroke - in. .....3-5/8 x 3-3/4

Displacement - cu. in. 155

Bare engine H.P. @ 50 RPM..... 2350

Bare engine torque (ft/lb) @ 120 RPM..... 1400

Governed RPM (No load)..... 2350

Idle RPM..... 600

Normal engine RPM @ conv. stall..... 1330

Valve clearance - hot static:

Intake - in. ..... .009-.011

Exhaust - in. ..... .019-.021

Firing order..... 1-2-4-3

Compression:

Ratio..... 17.5:1

Pressure @ cranking speed..... 390-410

Oil pressure:

Normal oil pressure (PSI) @ 2350 RPM..... 28-30

Minimum oil pressure (PSI) @ 500 RPM..... 8-10
(Eng. Note: 3 PSI Min. allowable.)

ELECTRICAL SYSTEM:

Battery:

Volts..... 12

Polarity..... Neg.

Amp. hour rating (20 hr.)..... 45

Alternator:

Rated output, Amps..... 42

Amps @ 2350 eng. RPM @ 80 deg. F. ... 41.5

Volts @ 2350 eng. RPM @ 80 deg. F. ... 14

Amps @ 600 eng. RPM @ 80 deg. F. ... 23.5

Starter:

Type drive.....Positive Engage

Anti-restart system..... ADLO

STARTER RELAY:

Point Opening..... .017-.033

Opening Voltage..... 3.7-5.2

CIRCUIT BREAKER:

Armature Air Gap..... .012 to .018

Contact Point Gap..... .030 Min.

Contacts Close..... 3.8 to 7.2 Volts

HYDRAULIC SYSTEM:

Relief setting (PSI) (Location in control valve)..... 2000

Flow GPM @ 1200 Eng. RPM @ 100 PSI..... 7

Sump filter (Replaceable):

Micron size..... 25

Capacity (GPM)..... 30

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)35D

By-pass relief (PSI)..... 2-3

Sump Tank Capacity..... 7-1/4 gal.

Sump Tank Breather..... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)..... 1250

Controlled flow (GPM) from 500 to 2350 eng. RPM..... 2

Flow GPM @ 685 eng. RPM 4

Axle alignment:

Toe-in (deg.)..... 0

Camber angle (deg.)..... 1

Caster (deg.)..... 0

Steering wheel turning diameter (inside drive tire):

Model - Cushion Tire Machines..... 6-1/2

COOLING SYSTEM:

Thermostat:

Start to open (deg. F.)..... 180 deg.

Full open (deg. F.)..... 202 deg.

Pressure cap (PSI)..... 7

Fan belt deflection (in.)..... 1/2-3/4

Coolant level below cap seal (in.) 2-3/4

COOLING SYSTEM CAPACITY..... 11 Qts.

WHEELS AND TIRES:

Front (size)..... 18x7x12-1/8

Rear (size)..... 18x5x12-1/8

Single Drive:

Tread (drive tires)..... 31 in.

Tread (steer tires)..... 32 in.

TRANSMISSION PRESSURES (Power Shift):

a. Forward & reverse PSI @ 1300 RPM with 200 deg. F. oil..... 120-135

b. Min. allowable F & R PSI @ 500 RPM with 200 deg. F. oil..... 30

c. Converter PSI @ 1300 RPM..... 60-75

d. High & low PSI @ 1300 RPM to 2200 RPM with 200 deg. F. oil..... 150-165

e. Pump flow GPM @ 1300 RPM & 2200 RPM with 200 deg. F. oil..... 6.7-11.0

TRANSMISSION:

Speeds..... (1-C) 2-CH

Gear Ratio:	(C)	(CH)
First.....	.737:1 to	1.26:1
Second.....	.737:1	
Reverse:		
First.....	.695:1 to	1.20:1
Second.....	.70:1	

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel..... 115-125
2. Drive wheel:
   a. Dual & wide drive axle ends..... 215-225
   b. All others..... 290-300
3. Axle to frame..... 640-700
4. Counterweight bolt..... 225-250
5. Pitman arm locknut..... 120-130
6. Outboard Pitman shaft support bolts..... 75-80
7. Tilt cylinder yoke clamp bolt..... 75-80
8. Cylinder head fasteners..... 92-100

LEFT FOOT BRAKE & INCHING PEDAL:

Cushion Tire:

Free play..... 1/8 in.

Up height..... 6 in.

CLUTCH PEDAL:

Cushion Tire:

Free play..... 9/16 in.

Up height..... 5-7/8 in.

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)35D

RIGHT FOOT BRAKE PEDAL:

Cushion Tire Power Shift Trans:

Free play..... 1/8 in.

Up height..... 4-7/16 in.

Cushion Tire Hydracool Clutch:

Free Play..... 1/8 in.

Up height..... 3-13/16 in.

SPEEDS AND GRADES:

	HYDRATORK C500-35D	HYDRACOOL C500-H35D
Std. Travel speed loaded.....	8.4 mph	8.4 mph
Std. Gradeability @ .9 c.f. - loaded.....	29.4%	26.1%
Optional travel speed loaded.....	11.0 mph	11.0 mph
Optional gradeability @ .9 c.f. - loaded.....	22.8%	19.4%
Gradeability @ .9 c.f. empty.....	24.0%	24.0%
Drawbar pull @ .9 c.f. empty.....	2973 lbs.	2973 lbs

CAPACITIES:

Crankcase.....(w/filter) 5 Qts.

Cooling System..... 11 Qts.

Fuel Tank:

Cushion tire..... 6.8 Gal.

Differential:

Std. Trans. ..... Included w/trans.

Power Shift..... Included w/trans.

Transmission:

Standard..... 11

Power Shift..... 11

Hydraulic Sump..... 7-1/4 Gal.

LIFTING & LOWERING SPEED IN FPM:

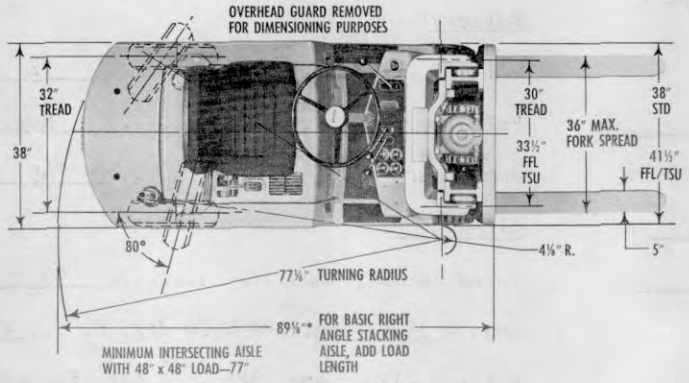
	STANDARD	HI-LO	FFL/TSU
Lifting Speed (fpm)			
Loaded	79	74	76
Empty	89	83	82
Lowering Speed (fpm)			
Loaded	65	65	67
Empty	80	80	80

DIMENSIONAL SPECIFICATIONS

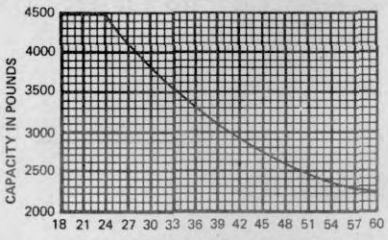
CLARKLIFT® 500

C500-(H) 45D

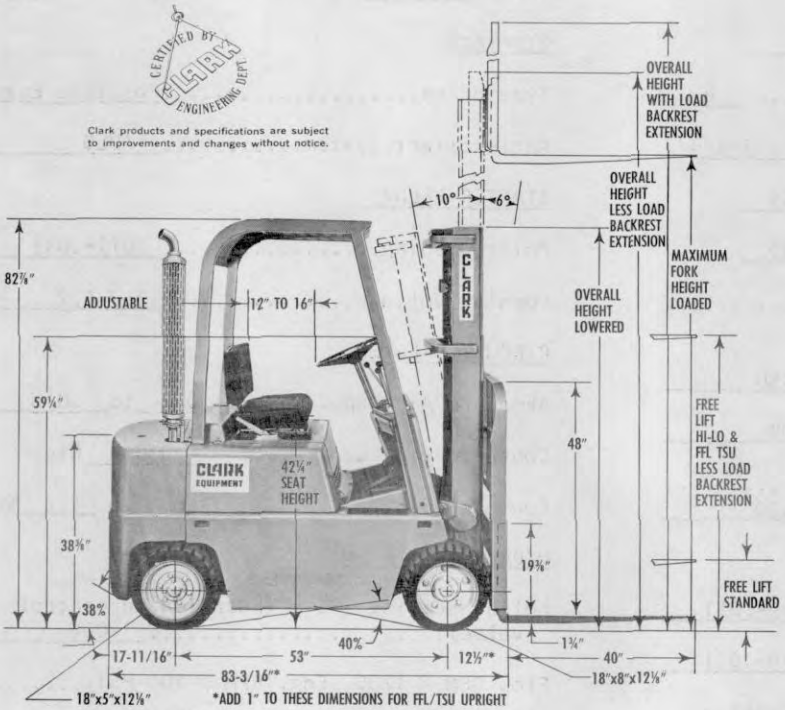
Rated for 4500 Lbs.
24" Load Center



CAPACITY CHART



Load center in inches from front face of forks —Rated capacities shown above are computed with uprights in vertical position. Lifts above 154" maximum fork height, contact factory. Specific capacities will be shown on truck nameplate.



Clark products and specifications are subject to improvements and changes without notice.

UPRIGHT DIMENSION TABLE

MFH		Overall Height Lowered	FREE LIFT	
Std. & Hi-Lo	FFL/TSU		Std.	Hi-Lo & FFL TSU
*106	*153	71	16	50½
112	162	74	16	53½
118	171	77	16	56½
124	180	80	16	59½
*130	*189	83	16	62½
136	—	86	16	65½
—	198	88	—	67½
142	—	89	16	68½
148	—	92	16	71½
—	207	93	—	72½
*154	—	95	16	74½
—	216	98	—	77½
160	—	99	16	78½
166	—	102	16	81½
—	*225	103	—	82½
172	—	106	16	85½
—	234	108	—	87½
*178	—	109	16	88½
184	—	112	16	91½
190	—	116	16	95½
196	—	121	16	100½
202	—	124	16	103½

For overall height fully raised, add 49" to maximum fork height with LBRE; 20⅜" without LBRE.

* Indicates preferred standard sizes. Intermediate Heights Available in Increments of 3" MFH.

UNDERCLEARANCES

Upright	3⅞"	Frame	4⅞
Drive Axle	2⅜"	Counterweight	4"
Steer Axle	4⅛"	Grade Clearance	38%

	STD/HI-LO	FFL/TSU
Optional Drive Widths	41½" & 50"	50" & 53½"

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)45D

GENERAL:

MODEL C500-(H) 45D:	130" STD	130" HI-LO	153" FFL/TSU
Service Weight	7,724	7,786	8,127
Weight on Drive Wheels Empty	3,204	3,266	3,607
Weight on Drive Wheels Loaded	10,809	10,871	11,212

INSURANCE CLASSIFICATIONS:

Underwriters' Laboratores, Inc. listed. Type D standard; DS optional.

DRIVE AXLE:

Ratio..... 4.4 to 1

TORQUE CONVERTER:

Diameter..... 11 in.

Torque Multiplication 2.15 to 1

ENGINE:

Model..... CLARK 155D

Type..... DIESEL

Net Brake H.P. at Governed R.P.M. 40

No. Cylinders..... 4

Bore & Stroke - in. .....3-5/8 x 3-3/4

Displacement - cu. in. 155

Bare engine H.P. @ 50 RPM..... 2350

Bare engine torque (ft/lb) @ 120 RPM..... 1400

Governed RPM (No load)..... 2350

Idle RPM..... 600

Normal engine RPM @ conv. stall..... 1330

Valve clearance - hot static:

Intake - in. ..... .009-.011

Exhaust - in. ..... .019-.021

Firing order..... 1-2-4-3

Compression:

Ratio..... 17.5:1

Pressure @ cranking speed..... 390-410

Oil pressure:

Normal oil pressure (PSI) @ 2350 RPM..... 28-30

Minimum oil pressure (PSI) @ 500 RPM..... 8-10
(Eng. Note: 3 PSI Min. allowable.)

ELECTRICAL SYSTEM:

Battery:

Volts..... 12

Polarity..... Neg.

Amp. hour rating (20 hr.)..... 45

Alternator:

Rated output, Amps..... 42

Amps @ 2350 eng. RPM @ 80 deg. F. ... 41.5

Volts @ 2350 eng. RPM @ 80 deg. F. ... 14

Amps @ 600 eng. RPM @ 80 deg. F. ... 23.5

Starter:

Type drive.....Positive Engage

Anti-restart system..... ADLO

STARTER RELAY:

Point Opening..... .017-.033

Opening Voltage..... 3.7-5.2

CIRCUIT BREAKER:

Armature Air Gap..... .012 to .018

Contact Point Gap..... .030 Min.

Contacts Close..... 3.8 to 7.2 Volts

HYDRAULIC SYSTEM:

Relief setting (PSI) (Location in control valve)..... 2000

Flow GPM @ 1200 Eng. RPM @ 100 PSI..... 7

Sump filter (Replaceable):

Micron size..... 25

Capacity (GPM)..... 30

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)45D

By-pass relief (PSI)..... 2-3

Sump Tank Capacity..... 7-1/4 gal.

Sump Tank Breather..... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)..... 1250

Controlled flow (GPM) from 500 to 2350 eng. RPM..... 2

Flow GPM @ 685 eng. RPM 4

Axle alignment:

Toe-in (deg.)..... 0

Camber angle (deg.)..... 1

Caster (deg.)..... 0

Steering wheel turning diameter (inside drive tire):

Model - Cushion Tire Machines..... 8-1/4

COOLING SYSTEM:

Thermostat:

Start to open (deg. F.)..... 180 deg.

Full open (deg. F.)..... 202 deg.

Pressure cap (PSI)..... 7

Fan belt deflection (in.)..... 1/2-3/4

Coolant level below cap seal (in.) 2-3/4

COOLING SYSTEM CAPACITY..... 11 Qts.

WHEELS AND TIRES:

Front (size)..... 18x8x12-1/8

Rear (size)..... 18x5x12-1/8

Single Drive:

Tread (drive tires)..... 30 in.

Tread (steer tires)..... 32 in.

TRANSMISSION PRESSURES (Power Shift):

a. Forward & reverse PSI @ 1300 RPM with 200 deg. F. oil..... 120-135

b. Min. allowable F & R PSI @ 500 RPM with 200 deg. F. oil..... 30

c. Converter PSI @ 1300 RPM..... 60-75

d. High & low PSI @ 1300 RPM to 2200 RPM with 200 deg. F. oil..... 150-165

e. Pump flow GPM @ 1300 RPM & 2200 RPM with 200 deg. F. oil..... 6.7-11.0

TRANSMISSION:

Speeds..... (1-C) 2-CH

Gear Ratio: (C) (CH)

First..... .737:1 to 1.26:1

Second..... .737:1

Reverse:

First..... .695:1 to 1.20:1

Second..... .70:1

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel..... 115-125
2. Drive wheel:
   a. Dual & wide drive axle ends..... 215-225
   b. All others..... 290-300
3. Axle to frame..... 640-700
4. Counterweight bolt..... 225-250
5. Pitman arm locknut..... 120-130
6. Outboard Pitman shaft support bolts..... 75-80
7. Tilt cylinder yoke clamp bolt..... 75-80
8. Cylinder head fasteners..... 92-100

LEFT FOOT BRAKE & INCHING PEDAL:

Cushion Tire:

Free play..... 1/8 in.

Up height..... 6 in.

CLUTCH PEDAL:

Cushion Tire:

Free play..... 9/16 in.

Up height..... 5-7/8 in.

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)45D

RIGHT FOOT BRAKE PEDAL:

Cushion Tire Power Shift Trans:

Free play..... 1/8 in.

Up height..... 4-7/16 in.

Cushion Tire Hydracool Clutch:

Free Play..... 1/8 in.

Up height..... 3-13/16 in.

SPEEDS AND GRADES:

	HYDRATORK C500-45D	HYDRACOOL C500-H45D
Std. Travel speed loaded.....	8.4 mph	8.4 mph
Std. Gradeability @ .9 c.f. - loaded.....	25.3%	22.4%
Optional travel speed loaded.....	11.0 mph	11.0 mph
Optional gradeability @ .9 c.f. - loaded.....	19.5%	16.9%
Gradeability @ .9 c.f. empty.....	21.5%	21.5%
Drawbar pull @ .9 c.f. empty.....	2973 lbs.	2973 lbs

CAPACITIES:

Crankcase.....(w/filter) 5 Qts.

Cooling System..... 11 Qts.

Fuel Tank:

Cushion tire..... 6.8 Gal.

Differential:

Std. Trans. ..... Included w/trans.

Power Shift..... Included w/trans.

Transmission:

Standard..... 11

Power Shift..... 11

Hydraulic Sump..... 7-1/4 Gal.

LIFTING & LOWERING SPEED IN FPM:

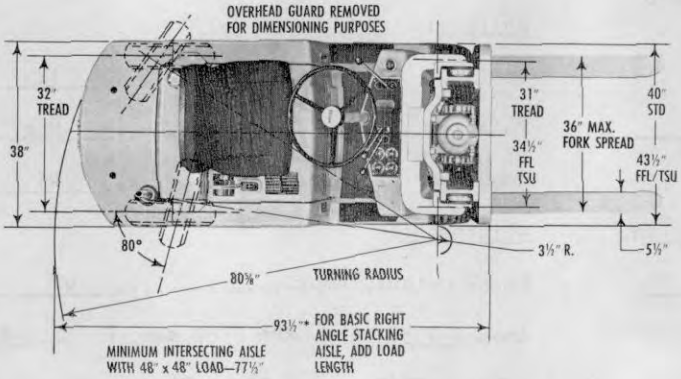
	STANDARD	HI-LO	FFL/TSU
Lifting Speed (fpm)			
Loaded	79	74	76
Empty	89	83	82
Lowering Speed (fpm)			
Loaded	57	57	63
Empty	80	80	80

DIMENSIONAL SPECIFICATIONS

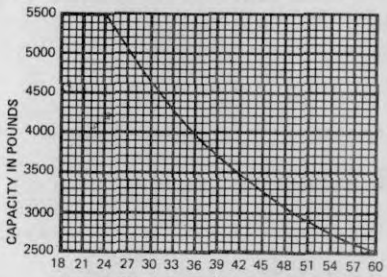
CLARKLIFT® 500

C500-(H) 55D

Rated for 5500 Lbs.
24″ Load Center



CAPACITY CHART



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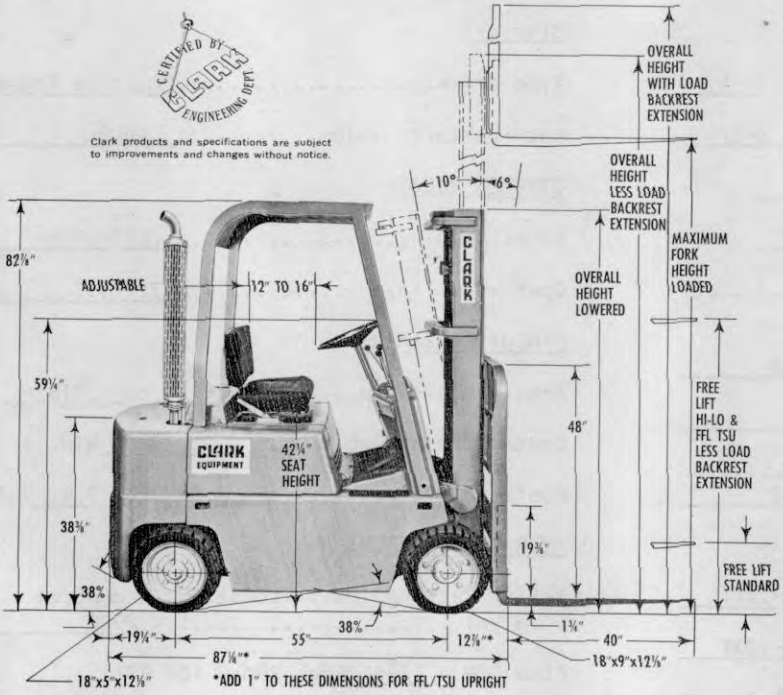
116	169	77	16	56½
122	178	80	16	59½
*128	*187	83	16	62½
134	—	86	16	65½
—	196	88	—	67½
140	—	89	—	68½
146	—	92	16	71½
—	205	93	—	72½
*152	—	95	16	74½
—	214	98	—	77½
158	—	99	16	78½
164	—	102	16	81½
—	*223	103	—	82½
170	—	106	16	85½
—	232	108	—	87½
*176	—	109	16	88½
182	—	112	16	91½
—	241	113	—	92½
188	—	116	16	95½
—	250	118	—	97½
194	—	121	16	100½
200	—	124	16	103½

For overall height fully raised, add 49″ to maximum fork height with LBRE; 20⅜″ without LBRE.

* Indicates preferred standard sizes. Intermediate Height Available in Increments of 3″ MFH.



UNDERCLEARANCES

Upright	3⅜″	Frame	4⅞″
Drive Axle	2⅜″	Counterweight	4″
Steer Axle	4⅛″	Grade Clearance	38⅝

	STD/HI-LO	FFL TSU
Optional Drive Widths	41½″ & 50″	50″ & 53½″

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)55D

GENERAL:

MODEL C500-(H) 55D:	130" STD	130" HI-LO	153" FFL/TSU
Service Weight	8,404	8,466	8,807
Weight on Drive Wheels Empty	3,304	3,366	3,707
Weight on Drive Wheels Loaded	12,404	12,466	12,806

INSURANCE CLASSIFICATIONS:

Underwriters' Laboratores, Inc. listed. Type D standard; DS optional.

DRIVE AXLE:

Ratio..... 4.4 to 1

TORQUE CONVERTER:

Diameter..... 11 in.

Torque Multiplication 2.15 to 1

ENGINE:

Model..... CLARK 155D

Type..... DIESEL

Net Brake H.P. at Governed R.P.M. 40

No. Cylinders..... 4

Bore & Stroke - in. .....3-5/8 x 3-3/4

Displacement - cu. in. 155

Bare engine H.P. @ 50 RPM..... 2350

Bare engine torque (ft/lb) @ 120 RPM..... 1400

Governed RPM (No load)..... 2350

Idle RPM..... 600

Normal engine RPM @ conv. stall..... 1330

Valve clearance - hot static:

Intake - in. ..... .009-.011

Exhaust - in. ..... .019-.021

Firing order..... 1-2-4-3

Compression:

Ratio..... 17.5:1

Pressure @ cranking speed..... 390-410

Oil pressure:

Normal oil pressure (PSI) @ 2350 RPM..... 28-30

Minimum oil pressure (PSI) @ 500 RPM..... 8-10
(Eng. Note: 3 PSI Min. allowable.)

ELECTRICAL SYSTEM:

Battery:

Volts..... 12

Polarity..... Neg.

Amp. hour rating (20 hr.)..... 45

Alternator:

Rated output, Amps..... 42

Amps @ 2350 eng. RPM @ 80 deg. F. ... 41.5

Volts @ 2350 eng. RPM @ 80 deg. F. ... 14

Amps @ 600 eng. RPM @ 80 deg. F. ... 23.5

Starter:

Type drive.....Positive Engage

Anti-restart system..... ADLO

STARTER RELAY:

Point Opening..... .017-.033

Opening Voltage..... 3.7-5.2

CIRCUIT BREAKER:

Armature Air Gap..... .012 to .018

Contact Point Gap..... .030 Min.

Contacts Close..... 3.8 to 7.2 Volts

HYDRAULIC SYSTEM:

Relief setting (PSI) (Location in control valve)..... 2000

Flow GPM @ 1200 Eng. RPM @ 100 PSI..... 7

Sump filter (Replaceable):

Micron size..... 25

Capacity (GPM)..... 30

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)55D

By-pass relief (PSI)..... 2-3

Sump Tank Capacity..... 7-1/4 gal.

Sump Tank Breather..... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)..... 1250

Controlled flow (GPM) from 500 to 2350 eng. RPM..... 2

Flow GPM @ 685 eng. RPM 4

Axle alignment:

Toe-in (deg.)..... 0

Camber angle (deg.)..... 1

Caster (deg.)..... 0

Steering wheel turning diameter (inside drive tire):

Model - Cushion Tire Machines..... 10 (in.)

COOLING SYSTEM:

Thermostat:

Start to open (deg. F.)..... 180 deg.

Full open (deg. F.)..... 202 deg.

Pressure cap (PSI)..... 7

Fan belt deflection (in.)..... 1/2-3/4

Coolant level below cap seal (in.) 2-3/4

COOLING SYSTEM CAPACITY..... 11 Qts.

WHEELS AND TIRES:

Front (size)..... 18x9x12-1/8

Rear (size)..... 18x5x12-1/8

Single Drive:

Tread (drive tires)..... 31 in.

Tread (steer tires)..... 32 in.

TRANSMISSION PRESSURES (Power Shift):

a. Forward & reverse PSI @ 1300 RPM with 200 deg. F. oil..... 120-135

b. Min allowable F & R PSI @ 500 RPM with 200 deg. F. oil..... 30

c. Converter PSI @ 1300 RPM..... 60-75

d. High & low PSI @ 1300 RPM to 2200 RPM with 200 deg. F. oil..... 150-165

e. Pump flow GPM @ 1300 RPM & 2200 RPM with 200 deg. F. oil..... 6.7-11.0

TRANSMISSION:

Speeds..... (1-C) 2-CH

Gear Ratio:	(C)		(CH)
First.....	.737:1	to	1.26:1
Second.....	.737:1		
Reverse:			
First.....	.695:1	to	1.20:1
Second.....	.70:1		

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel..... 115-125
2. Drive wheel:
   a. Dual & wide drive axle ends..... 215-225
   b. All others..... 290-300
3. Axle to frame..... 640-700
4. Counterweight bolt..... 225-250
5. Pitman arm locknut..... 120-130
6. Outboard Pitman shaft support bolts..... 75-80
7. Tilt cylinder yoke clamp bolt..... 75-80
8. Cylinder head fasteners..... 92-100

LEFT FOOT BRAKE & INCHING PEDAL:

Cushion Tire:

Free play..... 1/8 in.

Up height..... 6 in.

CLUTCH PEDAL:

Cushion Tire:

Free play..... 9/16 in.

Up height..... 5-7/8 in.

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)55D

RIGHT FOOT BRAKE PEDAL:

Cushion Tire Power Shift Trans:

Free play..... 1/8 in.

Up height..... 4-7/16 in.

Cushion Tire Hydracool Clutch:

Free Play..... 1/8 in.

Up height..... 3-13/16 in.

SPEEDS AND GRADES:

	HYDRATORK C500-55D	HYDRACOOL C500-H55D
Std. Travel speed loaded.....	8.4 mph	8.4 mph
Std. Gradeability @ .9 c.f. - loaded.....	23.1%	19.6%
Optional travel speed loaded.....	11.0 mph	11.0 mph
Optional gradeability @ .9 c.f. - loaded.....	17.1%	14.7%
Gradeability @ .9 c.f. empty.....	19.9%	19.9%
Drawbar pull @ .9 c.f. empty.....	2973 lbs.	2973 lbs

CAPACITIES:

Crankcase.....(w/filter) 5 Qts.

Cooling System..... 11 Qts.

Fuel Tank:

Cushion tire..... 6.8 Gal.

Differential:

Std. Trans. ..... Included w/trans.

Power Shift..... Included w/trans.

Transmission:

Standard..... 11

Power Shift..... 11

Hydraulic Sump..... 7-1/4 Gal.

LIFTING & LOWERING SPEED IN FPM:

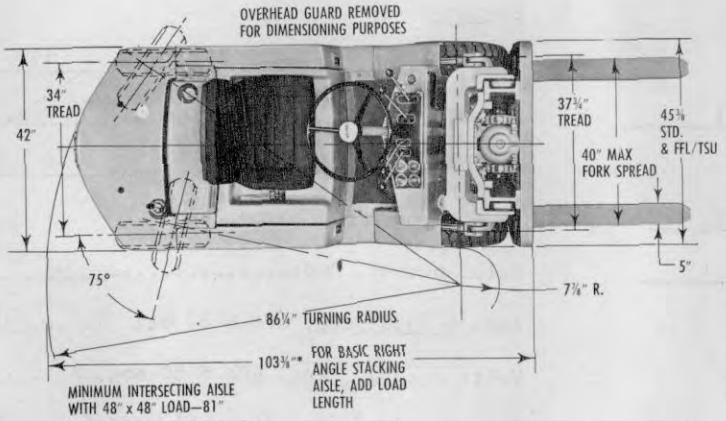
	STANDARD	HI-LO	FFL/TSU
Lifting Speed (fpm)			
Loaded	67	74	76
Empty	76	83	82
Lowering Speed (fpm)			
Loaded	50	52	58
Empty	80	80	80

DIMENSIONAL SPECIFICATIONS

CLARKLIFT® 500

C500-(H) Y45D

Rated for 4500 Lbs.
24" Load Center



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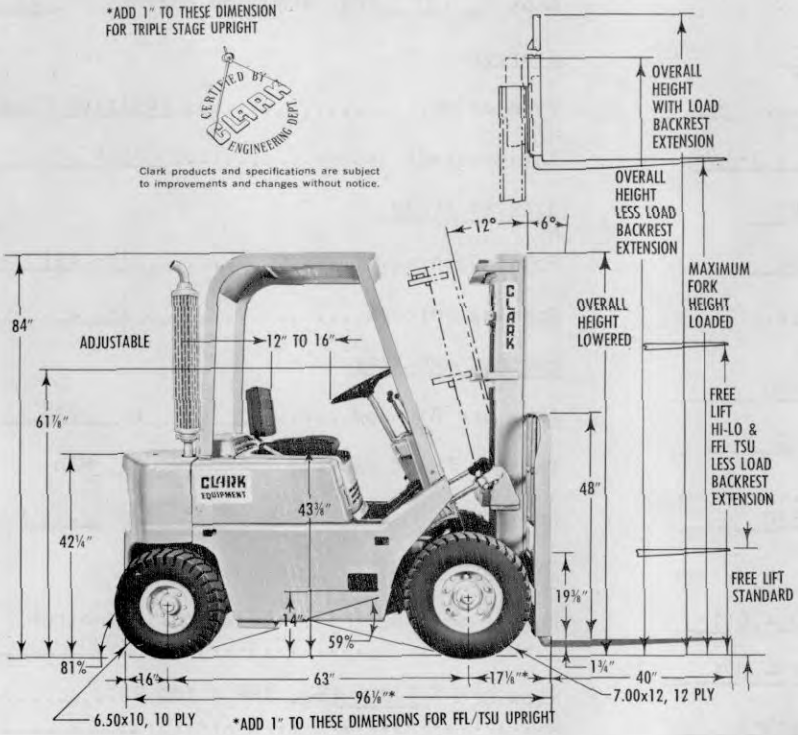
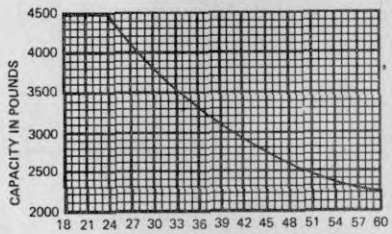


CAPACITY CHART



Load center in inches from front face of forks —Rated capacities shown above are computed with uprights in vertical position. Lifts above 154" maximum fork height, contact factory. Specific capacities will be shown on truck nameplate.

UPRIGHT DIMENSION TABLE

MFH			FREE LIFT		
Std. & Hi-Lo	FFL TSU	Overall Height Lowered	Std.	Hi-Lo	FFL TSU
*104	*151	72¾	16	50⅜	54⅜
110	160	75¾	16	53⅜	57⅜
116	169	78¾	16	56⅜	60⅜
122	178	81¾	16	59⅜	63⅜
*128	*187	84¾	16	62⅜	66⅜
134	—	87¾	16	65⅜	—
—	196	89¾	—	—	71⅜
140	—	90¾	16	68⅜	—
146	—	93¾	16	71⅜	—
—	205	94¾	—	—	76⅜
*152	—	96¾	16	74⅜	—
—	214	99¾	—	—	81⅜
158	—	100¾	16	78¾	—
164	—	103¾	16	81⅝	—
—	*223	104¾	—	—	86⅜
170	—	107¾	16	85⅜	—
—	232	109¾	—	—	91⅜
*176	—	110¾	16	88⅜	—
182	—	113¾	16	91⅜	—
188	—	117¾	16	95⅜	—
194	—	122¼	16	100⅜	—
200	—	125¼	16	103⅜	—

For overall height fully raised, add 49" to maximum fork height with LBRE; 22" without LBRE.

* Indicates preferred standard sizes. Intermediate Heights Available in Increments of 3" MFH.

UNDERCLEARANCES

Upright	5⅛"	Frame	6"
Drive Axle	5⅝"	Counterweight	6⅞"
Steer Axle	6⅜"	Grade Clearance	81%

TIRE OPTIONS

		PLY	OVERALL WIDTH STD/HI-LO	OVERALL WIDTH FFL/TSU
#1	Dual drive/ standard steer 7.00x12	12	60⅛"	63⅞"
#2	Wide profile — Single drive standard steer 27x10.00-12	12	47¾"	47¾"
#3	Wide profile — Dual drive standard steer 27x10.00-12	6	65⅜"	68⅞"

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)Y45D

GENERAL:

MODEL C500-(H) Y45D:	130" STD	130" HI-LO	151" FFL/TSU
Service Weight	8,606	8,668	9,009
Weight on Drive Wheels Empty	4,146	4,208	4,549
Weight on Drive Wheels Loaded	11,581	11,643	11,984

INSURANCE CLASSIFICATIONS:

Underwriters' Laboratores, Inc. listed. Type D standard; DS optional.

DRIVE AXLE:

Ratio..... 4.4 to 1

TORQUE CONVERTER:

Diameter..... 11 in.

Torque Multiplication 2.15 to 1

ENGINE:

Model..... CLARK 155D

Type..... DIESEL

Net Brake H.P. at Governed R.P.M. 40

No. Cylinders..... 4

Bore & Stroke - in. .....3-5/8 x 3-3/4

Displacement - cu. in. 155

Bare engine H.P. @ 50 RPM..... 2350

Bare engine torque (ft/lb) @ 120 RPM..... 1400

Governed RPM (No load)..... 2350

Idle RPM..... 600

Normal engine RPM @ conv. stall..... 1330

Valve clearance - hot static:

Intake - in. 009-.011

Exhaust - in. 019-.021

Firing order..... 1-2-4-3

Compression:

Ratio..... 17.5:1

Pressure @ cranking speed..... 390-410

Oil pressure:

Normal oil pressure (PSI) @ 2350 RPM..... 28-30

Minimum oil pressure (PSI) @ 500 RPM..... 8-10
(Eng. Note: 3 PSI Min. allowable.)

ELECTRICAL SYSTEM:

Battery:

Volts..... 12

Polarity..... Neg.

Amp. hour rating (20 hr.)..... 45

Alternator:

Rated output, Amps..... 42

Amps @ 2350 eng. RPM @ 80 deg. F. ... 41.5

Volts @ 2350 eng. RPM @ 80 deg. F. ... 14

Amps @ 600 eng. RPM @ 80 deg. F. ... 23.5

Starter:

Type drive.....Positive Engage

Anti-restart system..... ADLO

STARTER RELAY:

Point Opening.....017-.033

Opening Voltage..... 3.7-5.2

CIRCUIT BREAKER:

Armature Air Gap..... .012 to .018

Contact Point Gap..... .030 Min.

Contacts Close..... 3.8 to 7.2 Volts

HYDRAULIC SYSTEM:

Relief setting (PSI) (Location in control valve)..... 2000

Flow GPM @ 1200 Eng. RPM @ 100 PSI..... 7

Sump filter (Replaceable):

Micron size..... 25

Capacity (GPM)..... 30

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)Y45D

By-pass relief (PSI)..... 2-3

Sump Tank Capacity..... 8 gal.

Sump Tank Breather..... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)..... 1250

Controlled flow (GPM) from 500 to 2350 eng. RPM..... 2

Flow GPM @ 685 eng. RPM 4

Axle alignment:

Toe-in (deg.)..... 0

Camber angle (deg.)..... 1

Caster (deg.)..... 0

Model - Pneumatic Tire Machines:

15-3/4 (in.).....Dia. (Inside Wheel)

COOLING SYSTEM:

Thermostat:

Start to open (deg. F.)..... 180 deg.

Full open (deg. F.)..... 202 deg.

Pressure cap (PSI)..... 7

Fan belt deflection (in.)..... 1/2-3/4

Coolant level below cap seal (in.) 2-3/4

COOLING SYSTEM CAPACITY..... 11 Qts.

WHEELS AND TIRES:

Front (size)..... 7.00x12-12 Ply

Rear (size)..... 6.50x10-10 Ply

Single Drive:

Tread (drive tires)..... 37-3/4 in.

Tread (steer tires)..... 34 in.

Dual Drive:

Tread (outside front tires)..... 52-13/16 in.

Tread (inside front tires)..... 34-13/16 in.

Tread (rear tires)..... 34 in.

PNEUMATIC TIRE AIR PRESSURE:

Drive (PSI)..... 100

Steer (PSI)..... 100

TRANSMISSION PRESSURES (Power Shift):

a. Forward & reverse PSI @ 1300 RPM with 200 deg. F. oil..... 120-135

b. Min. allowable F & R PSI @ 500 RPM with 200 deg. F. oil..... 30

c. Converter PSI @ 1300 RPM..... 60-75

d. High & low PSI @ 1300 RPM to 2200 RPM with 200 deg. F. oil..... 150-165

e. Pump flow GPM @ 1300 RPM & 2200 RPM with 200 deg. F. oil..... 6.7-11.0

TRANSMISSION:

Speeds..... (2-Y) 3-HY

Gear Ratio:	Y		HY
First.....	1.440:1	to	2.24:1
Second.....	.737:1	to	1.440:1
Third.....	.737:1		
Reverse:			
First.....	1.357:1	to	2.13:1
Second.....	.695:1	to	1.20:1
Third.....	.70:1		

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel..... 115-125
2. Drive wheel:
   a. Dual & wide drive axle ends..... 215-225
   b. All others..... 290-300
3. Axle to frame..... 650-700
4. Counterweight bolt..... 225-250
5. Pitman arm locknut..... 120-130
6. Outboard Pitman shaft support bolts..... 75-80
7. Tilt cylinder yoke clamp bolt..... 75-80
8. Cylinder head fasteners..... 92-100

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)Y45D

LEFT FOOT BRAKE & INCHING PEDAL:

Pneumatic Tire:

Free play..... 1/8 in.

Up height..... Fixed in.

CLUTCH PEDAL:

Pneumatic Tire:

Free play..... 9/16 in.

Up height..... Fixed in.

RIGHT FOOT BRAKE PEDAL:

Pneumatic:

Free play..... 1/8 in.

Up height..... Fixed in.

SPEEDS AND GRADES:

	HYDRATORK C500-Y45D	HYDRACOOL C500-HY45D
Travel speed loaded.....	11.3 mph	11.3 mph
Gradeability @ .9 c.f. loaded.....	29.8%	27.2%
Gradeability @ .9 c.f. empty.....	30.2%	30.2%
Drawbar pull @ .9 c.f. empty.....	3558 lbs.	3558 lbs.

CAPACITIES:

Crankcase.....(w/filter) 5 Qts.

Cooling System..... 11 Qts.

Fuel Tank:

Pneumatic tire..... 10-1/2 Gal.

Differential:

Std. Trans. ..... Included w/trans.

Power Shift..... Included w/trans.

Transmission:

Standard..... 12-1/2

Power Shift..... 11

Hydraulic Sump..... 8 Gal.

LIFTING & LOWERING SPEED IN FPM:

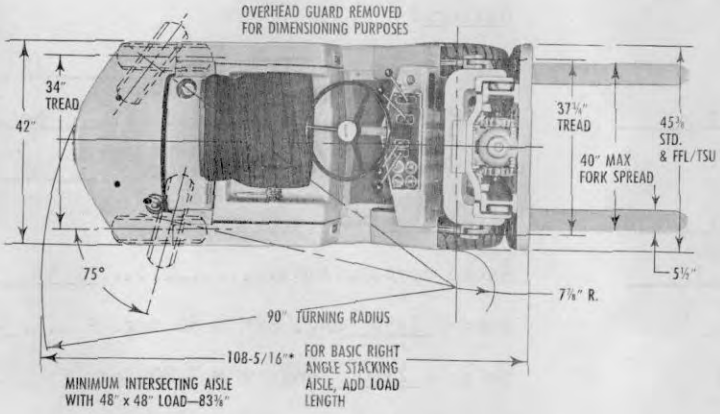
	STANDARD	HI-LO	FFL/TSU
Lifting Speed (fpm)			
Loaded	79	74	73
Empty	89	83	79
Lowering Speed (fpm)			
Loaded	57	57	63
Empty	80	80	80

DIMENSIONAL SPECIFICATIONS

CLARKLIFT® 500

C500-(H) Y55D

Rated for 5500 Lbs.
24" Load Center



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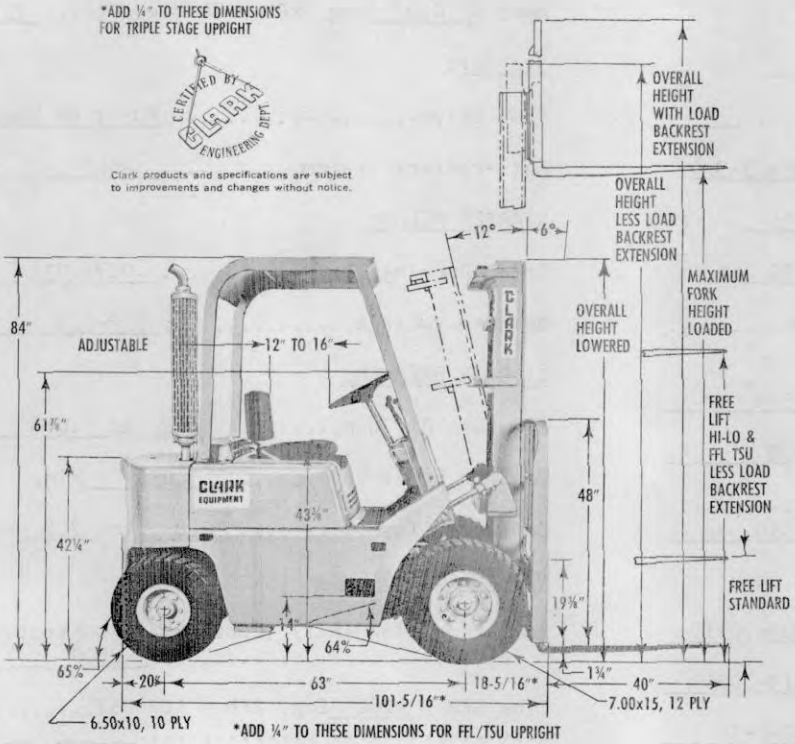
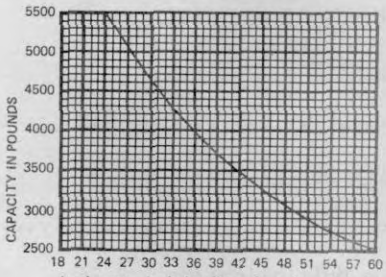


CAPACITY CHART



Load center in inches from front face of forks —Rated capacities shown above are computed with uprights in vertical position. Lifts above 154" maximum fork height, contact factory. Specific capacities will be shown on truck nameplate.

UPRIGHT DIMENSION TABLE

MFH			FREE LIFT		
Std. & Hi-Lo	FFL TSU	Overall Height Lowered	Std.	Hi-Lo	FFL TSU
—	*151	74¾	—	—	51
*104	—	76¾	16	53	—
—	160	77⅞	—	—	54
110	—	79¾	16	56	—
—	169	80¾	—	—	57
116	—	82¾	16	59	—
—	178	83¾	—	—	60
122	—	85¾	16	62	—
*128	*187	88¾	16	65	65
134	—	91¾	16	68	—
—	196	93¾	—	—	70
140	—	94⅞	16	71	—
146	—	97¾	16	74	—
—	205	98¾	—	—	75
*152	—	101¾	16	78	—
—	214	103¾	—	—	78
158	—	104⅞	16	81	—
164	*223	108¾	16	85	85
170	—	111¾	16	88	—
—	232	113¾	—	—	90
*176	—	114¾	16	91	—
182	241	118¾	16	95	95
188	250	123¾	16	100	100
194	—	126¾	16	103	—
200	—	131¾	16	108	—

For overall height fully raised, add 49" to maximum fork height with LBRE; 23½" without LBRE.

* Indicates preferred standard sizes. Intermediate Heights Available in Increments of 3" MFH.

UNDERCLEARANCES

Upright	6"	Frame	6⅛"
Drive Axle	6⅜"	Counterweight	6¾"
Steer Axle	6⅜"	Grade Clearance	65%

TIRE OPTIONS

			PLY	OVERALL WIDTH STD/HI-LO	FFL TSU
#1	Dual drive/ standard steer	7.00x12	12	60⅜"	63⅜"
#2	Wide profile — Dual drive standard steer	27x10.00-12	6	65⅛"	68⅛"

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)Y55D

GENERAL:

MODEL C500-(H) Y55D:	130" STD	130" HI-LO	153" FFL/TSU
Service Weight	9,351	9,413	9,754
Weight on Drive Wheels Empty	3,972	4,034	4,375
Weight on Drive Wheels Loaded	13,142	13,204	13,545

INSURANCE CLASSIFICATIONS:

Underwriters' Laboratores, Inc. listed. Type D standard; DS optional.

DRIVE AXLE:

Ratio..... 4.4 to 1

TORQUE CONVERTER:

Diameter..... 11 in.

Torque Multiplication 2.15 to 1

ENGINE:

Model..... CLARK 155D

Type..... DIESEL

Net Brake H.P. at Governed R.P.M. 40

No. Cylinders..... 4

Bore & Stroke - in. .....3-5/8 x 3-3/4

Displacement - cu. in. 155

Bare engine H.P. @ 50 RPM..... 2350

Bare engine torque (ft/lb) @ 120 RPM..... 1400

Governed RPM (No load)..... 2350

Idle RPM..... 600

Normal engine RPM @ conv. stall..... 1330

Valve clearance - hot static:

Intake - in. ..... .009-.011

Exhaust - in. ..... .019-.021

Firing order..... 1-2-4-3

Compression:

Ratio..... 17.5:1

Pressure @ cranking speed..... 390-410

Oil pressure:

Normal oil pressure (PSI) @ 2350 RPM..... 28-30

Minimum oil pressure (PSI) @ 500 RPM..... 8-10
(Eng. Note: 3 PSI Min. allowable.)

ELECTRICAL SYSTEM:

Battery:

Volts..... 12

Polarity..... Neg.

Amp. hour rating (20 hr.)..... 45

Alternator:

Rated output, Amps..... 42

Amps @ 2350 eng. RPM @ 80 deg. F. ... 41.5

Volts @ 2350 eng. RPM @ 80 deg. F. ... 14

Amps @ 600 eng. RPM @ 80 deg. F. ... 23.5

Starter:

Type drive..... Positive Engage

Anti-restart system..... ADLO

STARTER RELAY:

Point Opening..... .017-.033

Opening Voltage..... 3.7-5.2

CIRCUIT BREAKER:

Armature Air Gap..... .012 to .018

Contact Point Gap..... .030 Min.

Contacts Close..... 3.8 to 7.2 Volts

HYDRAULIC SYSTEM:

Relief setting (PSI) (Location in control valve)..... 2000

Flow GPM @ 1200 Eng. RPM @ 100 PSI..... 7

Sump filter (Replaceable):

Micron size..... 25

Capacity (GPM)..... 30

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)Y55D

By-pass relief (PSI)..... 2-3

Sump Tank Capacity..... 8 gal.

Sump Tank Breather..... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)..... 1250

Controlled flow (GPM) from 500 to 2350 eng. RPM..... 2

Flow GPM @ 685 eng. RPM 4

Axle alignment:

Toe-in (deg.)..... 0

Camber angle (deg.)..... 1

Caster (deg.)..... 0

Model - Pneumatic Tire Machines.

15-3/4 (in.).....Dia. (Inside Wheel)

COOLING SYSTEM:

Thermostat:

Start to open (deg. F.)..... 180 deg.

Full open (deg. F.)..... 202 deg.

Pressure cap (PSI)..... 7

Fan belt deflection (in.)..... 1/2-3/4

Coolant level below cap seal (in.) 2-3/4

COOLING SYSTEM CAPACITY..... 11 Qts.

WHEELS AND TIRES:

Front (size)..... 7.00x12-12 Ply

Rear (size)..... 6.50x10-10 Ply

Single Drive:

Tread (drive tires)..... 37-3/4 in.

Tread (steer tires)..... 34 in.

Dual Drive:

Tread (outside front tires)..... 52-13/16 in.

Tread (inside front tires)..... 34-13/16 in.

Tread (rear tires)..... 34 in.

PNEUMATIC TIRE AIR PRESSURE:

Drive (PSI)..... 100

Steer (PSI)..... 100

TRANSMISSION PRESSURES (Power Shift):

a. Forward & reverse PSI @ 1300 RPM with 200 deg. F. oil..... 120-135

b. Min. allowable F & R PSI @ 500 RPM with 200 deg. F. oil..... 30

c. Converter PSI @ 1300 RPM..... 60-75

d. High & low PSI @ 1300 RPM to 2200 RPM with 200 deg. F. oil..... 150-165

e. Pump flow GPM @ 1300 RPM & 2200 RPM with 200 deg. F. oil..... 6.7-11.0

TRANSMISSION:

Speeds..... (2-Y) 3-HY

Gear Ratio:	Y		HY
First.....	1.440:1	to	2.24:1
Second.....	.737:1	to	1.440:1
Third.....			.737:1
Reverse:			
First.....	1.357:1	to	2.13:1
Second.....	.695:1	to	1.20:1
Third.....			.70:1

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel..... 115-125
2. Drive wheel:
   a. Dual & wide drive axle ends..... 215-225
   b. All others..... 290-300
3. Axle to frame..... 650-700
4. Counterweight bolt..... 225-250
5. Pitman arm locknut..... 120-130
6. Outboard Pitman shaft support bolts..... 75-80
7. Tilt cylinder yoke clamp bolt..... 75-80
8. Cylinder head fasteners..... 92-100

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR C500(H)Y55D

LEFT FOOT BRAKE & INCHING PEDAL:

Pneumatic Tire:

Free play..... 1/8 in.

Up height..... Fixed in.

CLUTCH PEDAL:

Pneumatic Tire:

Free play..... 9/16 in.

Up height..... Fixed in.

RIGHT FOOT BRAKE PEDAL:

Pneumatic:

Free play..... 1/8 in.

Up height..... Fixed in.

SPEEDS AND GRADES:

	HYDRATORK C500-Y55D	HYDRACOOL C500-HY55D
Travel speed loaded.....	12.1 mph	12.1 mph
Gradeability @ .9 c.f. loaded.....	26.1%	25.0%
Gradeability @ .9 c.f. empty.....	26.3%	26.3%
Drawbar pull @ .9 c.f. empty.....	3388 lbs.	3388 lbs.

CAPACITIES:

Crankcase.....(w/filter) 5 Qts.

Cooling System..... 11 Qts.

Fuel Tank:

Pneumatic tire..... 10-1/2 Gal.

Differential:

Std. Trans. ..... Included w/trans.

Power Shift..... Included w/trans.

Transmission:

Standard..... 12-1/2

Power Shift..... 11

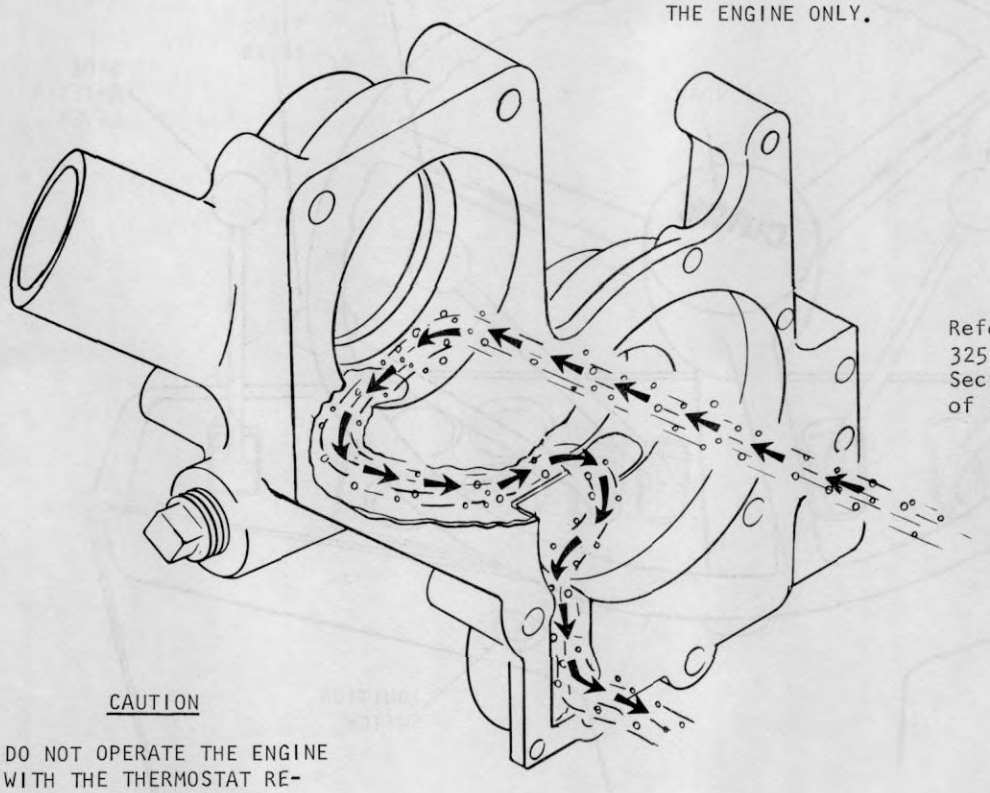
Hydraulic Sump..... 8 Gal.

LIFTING & LOWERING SPEED IN FPM:

	STANDARD	HI-LO	FFL/TSU
Lifting Speed (fpm)			
Loaded	67	74	73
Empty	76	83	79
Lowering Speed (fpm)			
Loaded	50	47	58
Empty	80	80	80

CAUTION

DO NOT REMOVE THERMOSTAT FOR ANY REASON AND RUN ENGINE.....THE ENGINE WILL OVERHEAT CAUSING SERIOUS DAMAGE. AS YOU CAN SEE BELOW...REMOVING THERMOSTAT WILL ALLOW THE WATER TO BY-PASS THE RADIATOR AND CIRCULATE THROUGH THE ENGINE ONLY.



NOTE

Refer to pages TS-322 and 325 in the Trouble Shooting Section located in the back of this manual.

CAUTION

DO NOT OPERATE THE ENGINE WITH THE THERMOSTAT REMOVED.....SEE ABOVE.

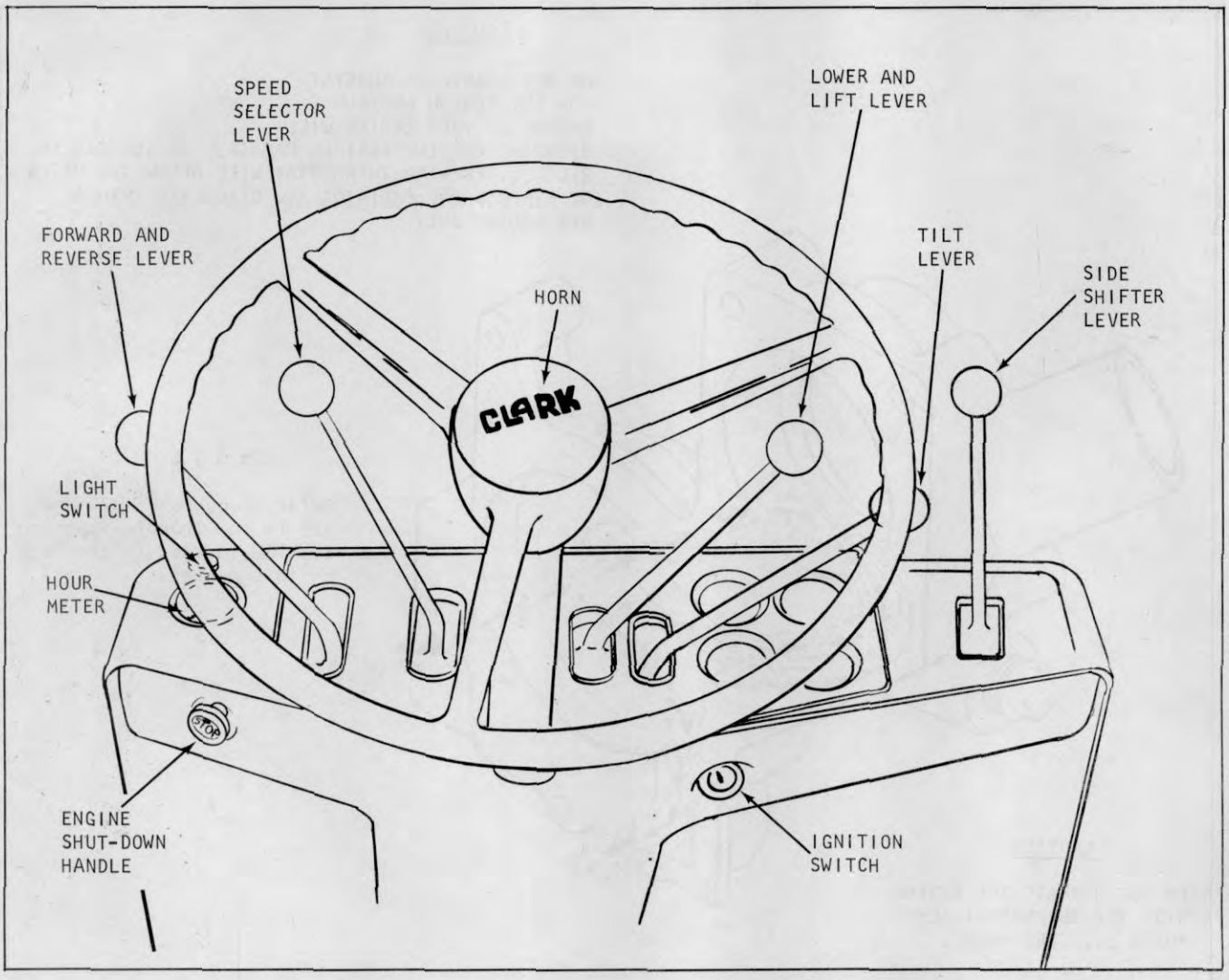


Plate 10173. Typical Overall Controls

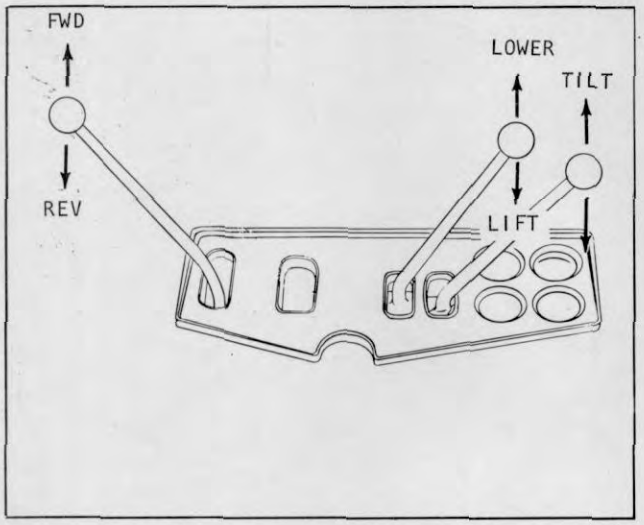


Plate 9610. One Speed Hydratork Transmission

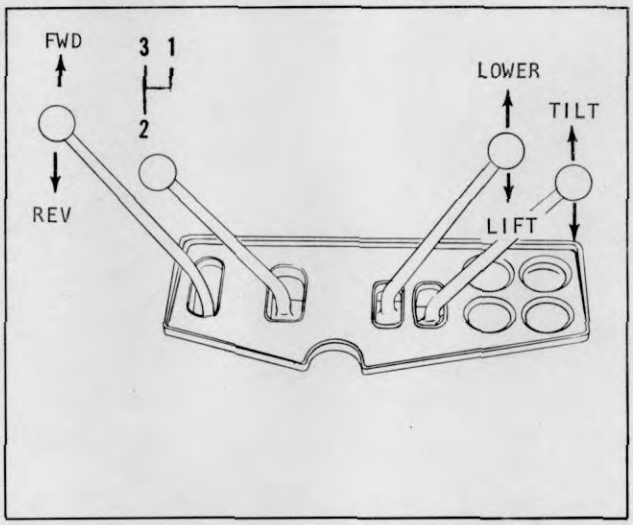


Plate 9611. Three Speed Standard Transmission

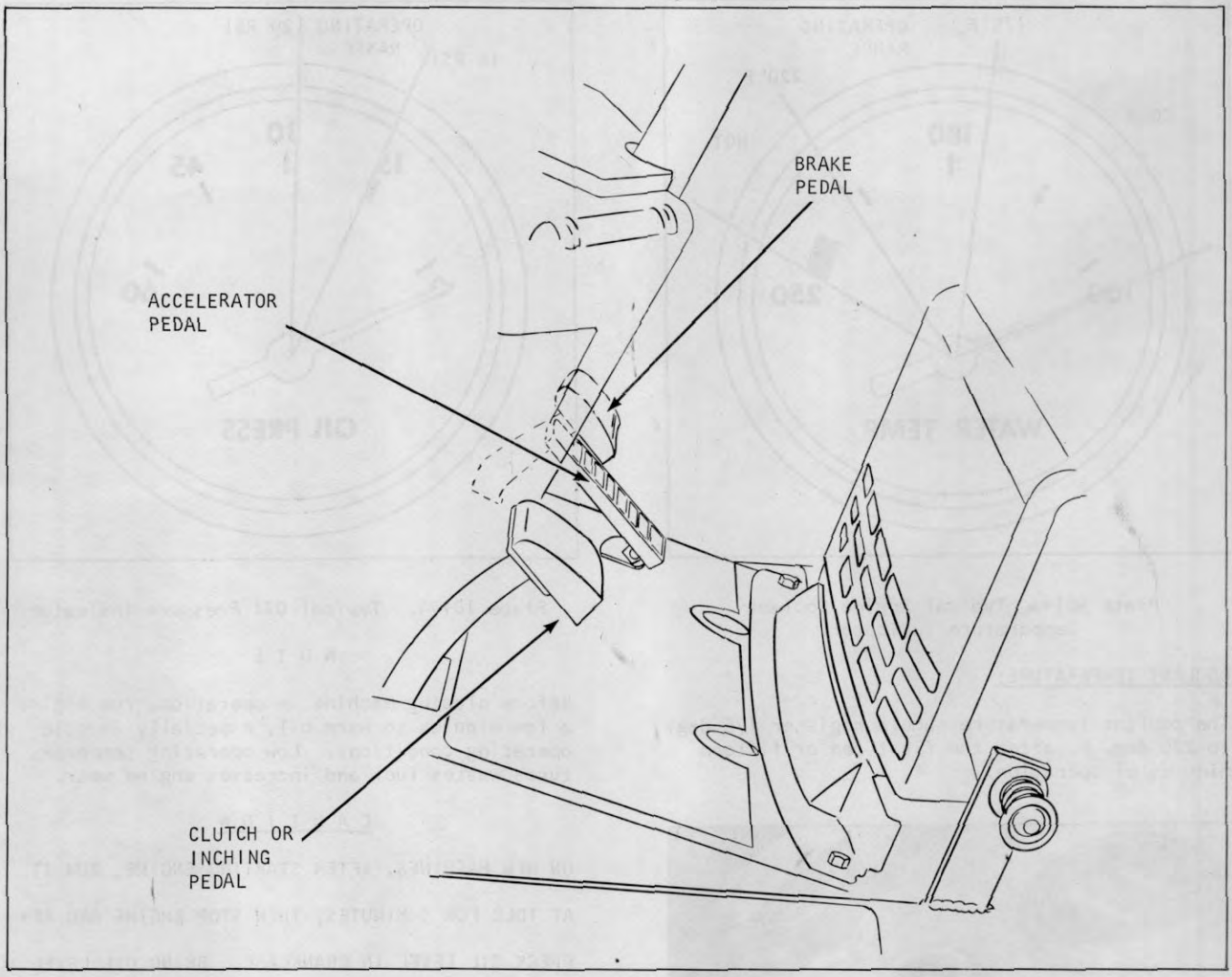


Plate 9613. Typical Lower Controls

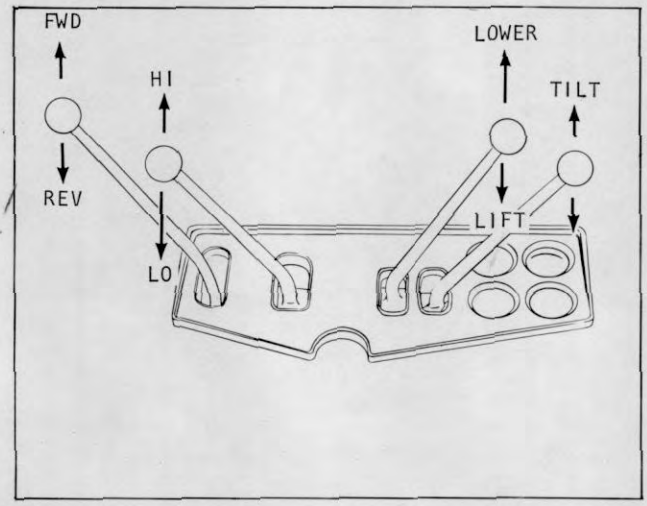


Plate 9612. 2 Speed Hydratork & Standard Trans.

CAUTION

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

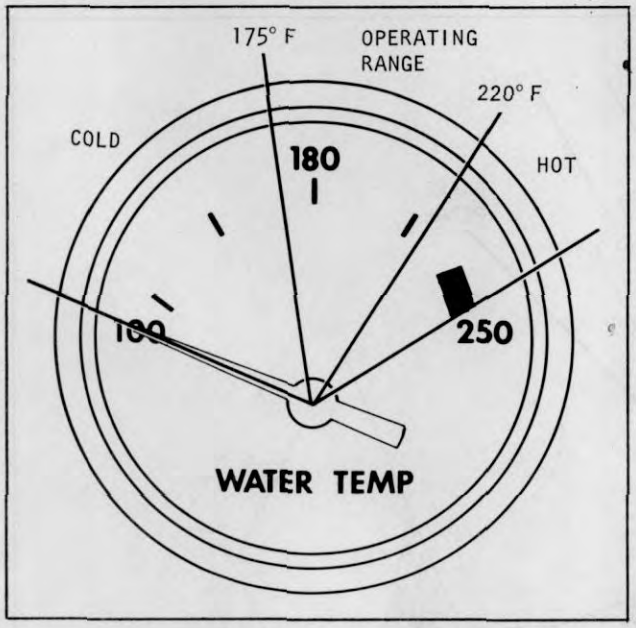


Plate 9614. Typical Engine Coolant Temperature Indicator

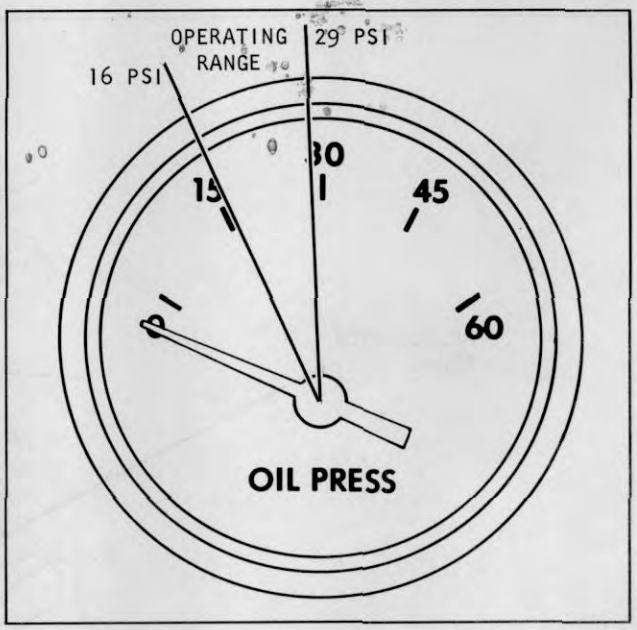


Plate 10174. Typical Oil Pressure Indicator

COOLANT TEMPERATURE:

The coolant temperature should register 175 deg. to 220 deg. F. after the first ten or fifteen minutes of operation.

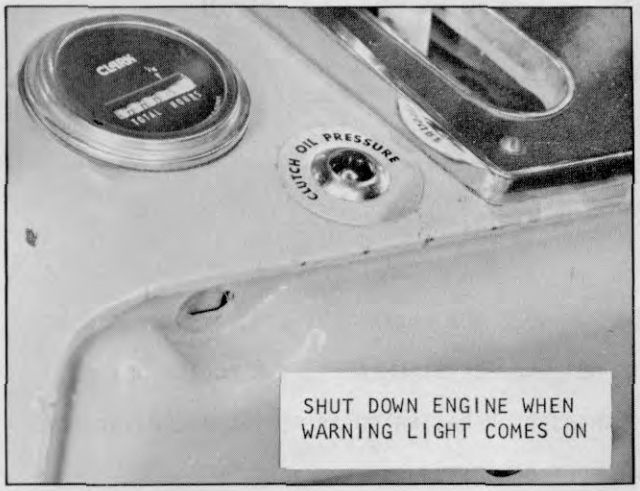


Plate 10175. Typical Instrument Console

C A U T I O N

IF CLUTCH OIL PRESSURE WARNING LIGHT COMES ON, STOP THE ENGINE IMMEDIATELY AND FIND THE CAUSE OF THE TROUBLE. REFER TO TROUBLE SHOOTING.

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.

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 REQUIRED MARK IF NECESSARY.

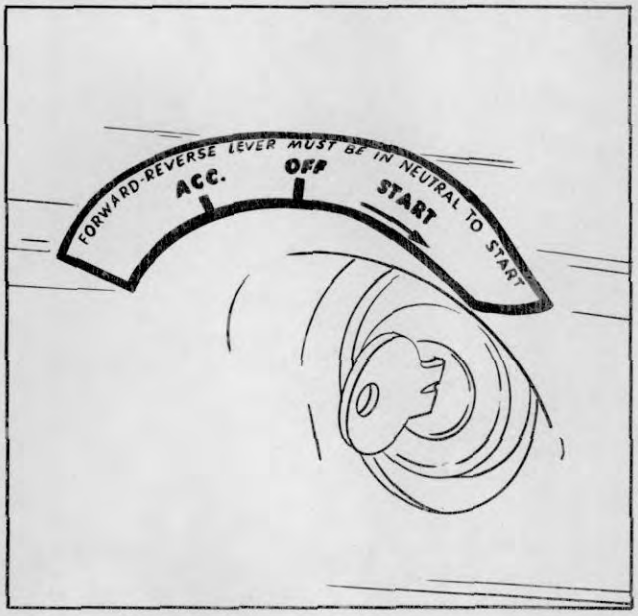


Plate 9617. Typical Ignition Switch

NORMAL STARTING PROCEDURE FOR DIESEL ENGINE:

1. Place transmission control levers in neutral position and set parking brake.

2. Turn ignition switch key to start position ...the starter is engaged when the key is held in this position.

C A U T I O N

DO NOT ENGAGE THE STARTER LONGER THAN 15 SECONDS

AT A TIME AND ALLOW A MINUTE OR SO INTERVAL

BETWEEN TRIALS.

3. If the engine does not start after the first two (2) attempts, then...

a) open left hand engine compartment door.... so you can reach the primer pump handle from the driver's seat.

b) with your left hand, reach down and start pumping the fuel primer. Now...

c) fully depress the accelerator pedal....keep priming...

d) with your right hand, turn ignition key to start position...keep pumping primer until engine starts.

e) continue to pump primer until engine runs without faltering, then...

f) ...close primer pump and lock.

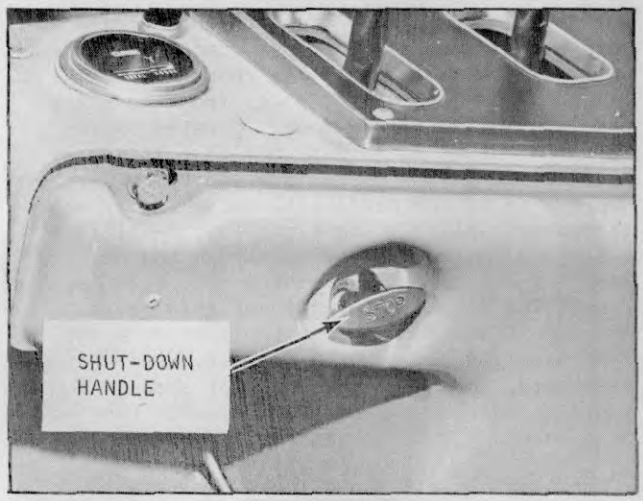


Plate 10178. Typical Shut-Down Handle

4. After engine has started...check instrument panel making certain the oil pressure warning light/s are not lit. If the light/s come on... shut engine down until the cause of the trouble can be located and corrected.

N O T E

Run engine a few minutes to warm oil before putting machine to work...especially in cold operating conditions.

ENGINE SHUT DOWN CONTROL:

To shut the engine down...allow engine to idle a few moments, then pull out on the STOP lever ...until engine stops.

(Pulling on the STOP lever manually places the injection racks in a "no-fuel" position.)

After engine stops...the control should be pushed back to its original position.

TO OPERATE MACHINE:

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

2. Move Hi and Lo range lever or gear selector for desired position on machines so equipped.

3. Now move forward and reverse lever out of neutral and into position for desired direction. Accelerate as required.

4. Inching Operation: To inch the machine into a load, depress the left foot combination inching-brake pedal only far enough to permit gradual disengagement of power from the drive wheels. The master cylinder operated by the left foot pedal is so designed that after the inching mechanism has fully actuated, a further depression of the pedal will cause the brakes to become applied. The right foot pedal is not connected to the inching mechanism and has its separate master cylinder which serves to operate the brakes as on a conventional automobile. After the operator becomes familiar with the foot pedal controls and a definite feel is developed, inching may be accomplished in a smooth manner even when the engine is running at governed R.P.M. for fast lifting.

C A U T I O N

TO PROLONG TRANSMISSION LIFE IT IS BEST TO COME TO A COMPLETE STOP BEFORE SHIFTING TO THE OPPOSITE DIRECTION. ALLOW FOOT TO REST ON BRAKE PEDAL ONLY WHEN INCHING IS DESIRED.

TO STOP MACHINE:

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

C A U T I O N

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.

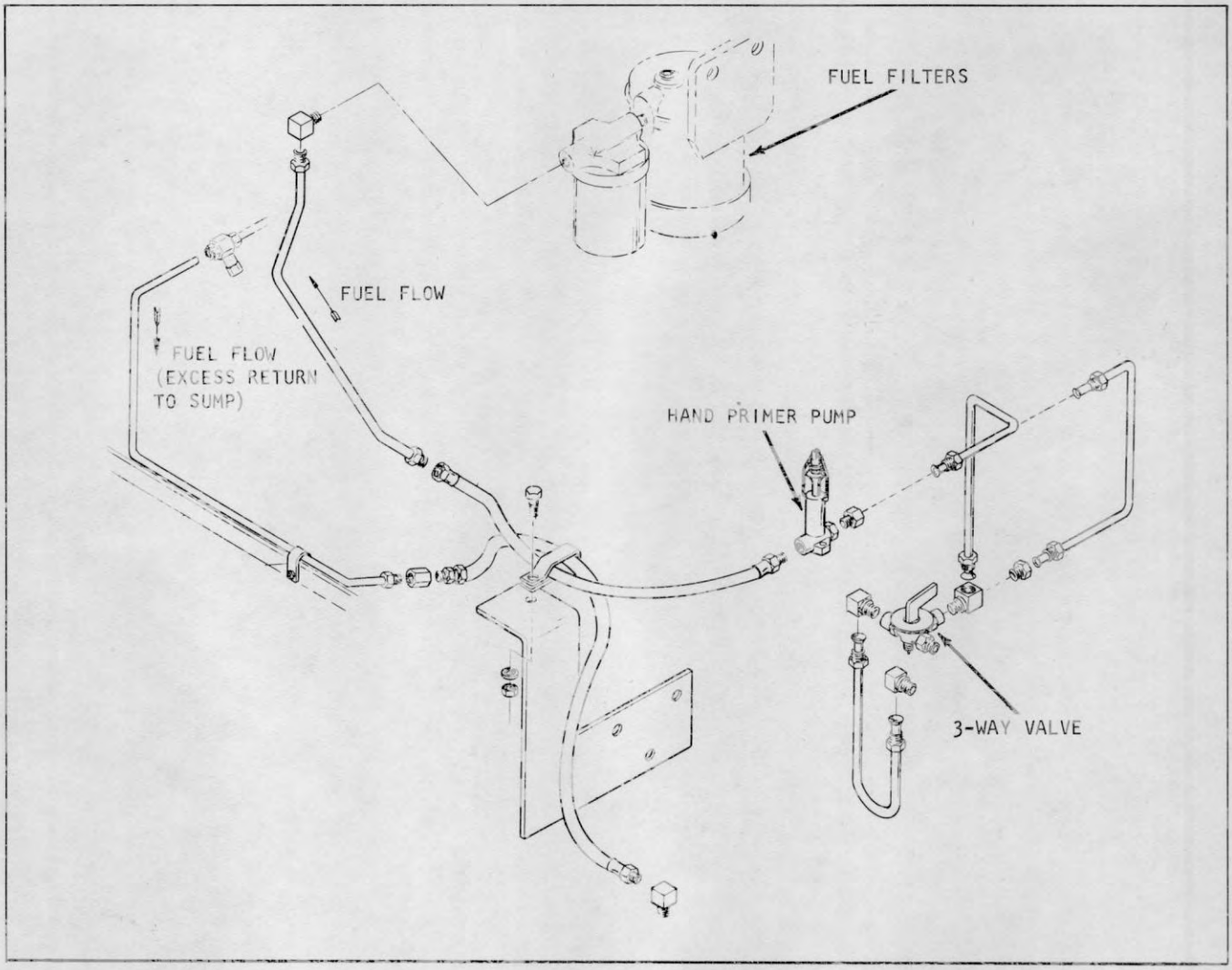
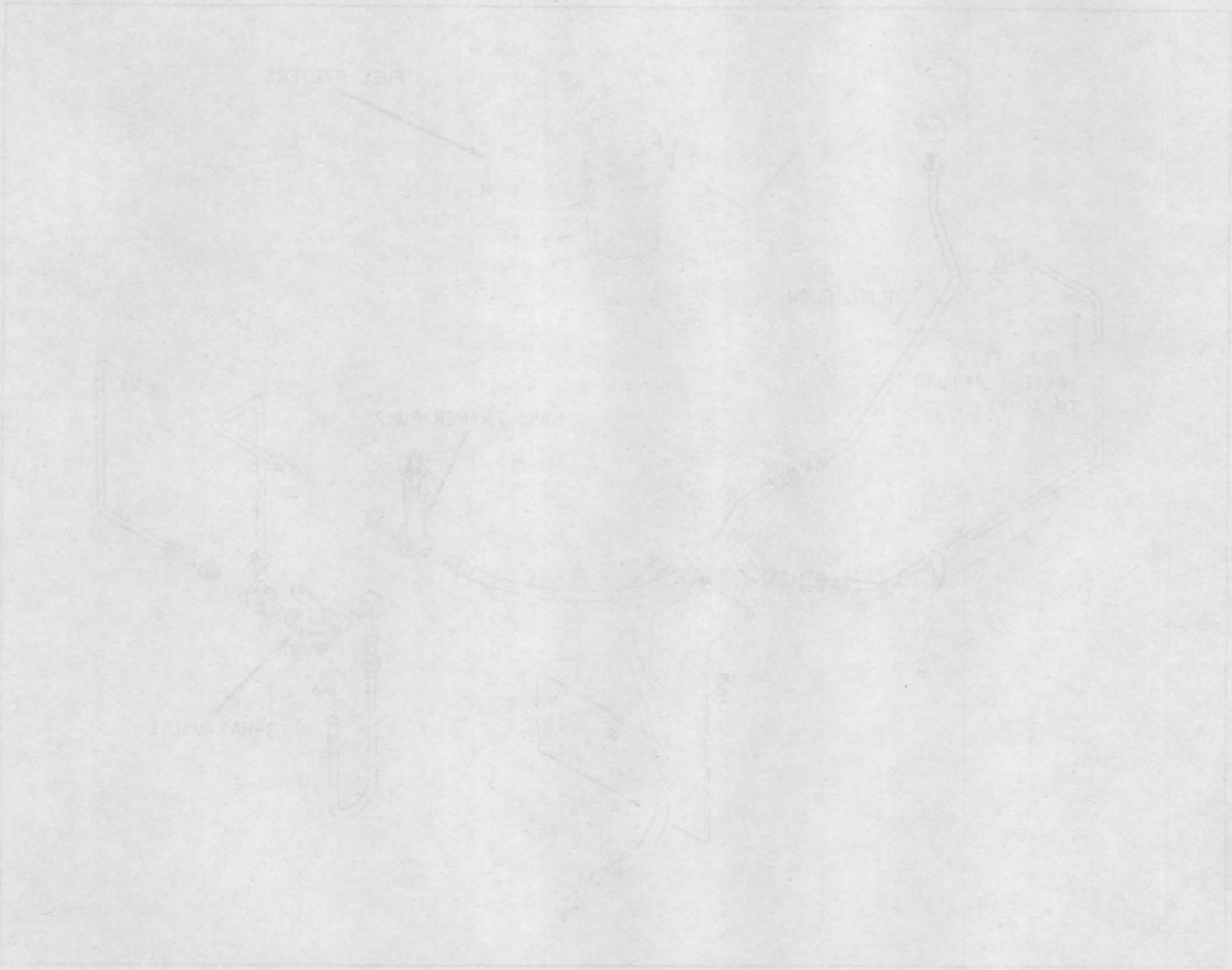


Plate 10197. Typical Fuel Lines

FUEL RESERVE:

The auxiliary fuel reserve manual cut-in valve, located at the front of 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.



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.

```
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  AN OVERHEAD GUARD IS INTENDED TO OFFER             x
x                                                     x
x  PROTECTION FROM THE IMPACT OF SMALL                x
x                                                     x
x  PACKAGES, BOXES, BAGGED MATERIAL, ETC.,            x
x                                                     x
x  REPRESENTATIVE OF THE JOB APPLICATION,             x
x                                                     x
x  BUT NOT TO WITHSTAND THE IMPACT OF A               x
x                                                     x
x  FALLING CAPACITY LOAD.                             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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10. Use only approved industrial trucks in hazardous locations.

11. Elevate personnel only on an approved safety platform firmly secured to the lifting carriage and/or forks.

12. Report all accidents involving personnel, building structures, and equipment.

13. Fire aisles, access to stairways, and fire equipment should be kept clear.

TRAVELING.

1. Observe all traffic regulations including authorized plant speed limits. Under normal traffic conditions, keep to the right. Maintain a safe distance, approximately three truck lengths from the truck ahead, and keep the truck under control at all times. Use of truck on public roads should conform to local traffic regulations.

2. Yield the right of way to ambulances, fire trucks, or other vehicles in emergency situations.

3. Do not pass another truck traveling in the same direction at intersections, blind spots, or at other dangerous locations.

4. Slow down and sound horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view travel with the load trailing.

5. Cross railroad tracks diagonally wherever possible. Do not park closer than 8 feet from center of railroad tracks.

6. Look in the direction of, and keep a clear view of the path of travel.

7. Ascend or descend grades slowly.

When ascending or descending grades in excess of 10%, loaded trucks should be driven with the load upgrade.

Unloaded trucks should be operated on all grades with the load engaging means downgrade.

On all grades the load and load engaging means should be tilted back if applicable, and raised only as far as necessary to clear the road surface.

8. Under all travel conditions the truck should be operated at a speed that will permit it to be brought to a stop in a safe manner.

9. Travel with load engaging means or load low and, where possible, tilted back. Do not elevate the load except during stacking.

10. Make starts, stops, turns or direction reversals in a smooth manner so as not to shift load and/or overturn the truck.

11. Stunt driving and horseplay should not be permitted.

12. Slow down for wet and slippery floors.

13. Before driving over a dockboard or bridgeplate, be sure that it is properly secured. Drive carefully and slowly across the dockboard or bridgeplate and never exceed its rated capacity.

14. Do not run vehicles onto any elevator unless specifically authorized to do so. Approach elevators slowly, and then enter squarely after the elevator car is properly leveled. Once on the elevator, neutralize the controls, shut off power, and set brakes. It is advisable that all personnel leave the elevator before a truck is allowed to enter or leave.

15. Avoid running over loose objects on the roadway surface.

LOADING.

1. Handle only stable or safely arranged loads. When handling off-center loads which cannot be centered, operate with caution.

2. Handle only loads within the rated capacity of the truck.

3. Adjust for long or high (including multiple tiered) loads which may affect capacity.

4. When attachments are used, particular care should be taken in securing, manipulating, positioning, and transporting the load. Operate trucks equipped with attachments as partially loaded trucks when not handling a load.

5. Place load engaging means under the load as far as possible and carefully tilt the mast backward to stabilize the load. Caution should be used in tilting backward with high or segmented loads.

6. Use extreme care when tilting load forward or backward particularly when high tiering. Do not tilt forward with load engaging means elevated except to pick up a load. Do not tilt an elevated load forward except when the load is in a deposit position over a rack or stack. When stacking or tiering use only enough backward tilt to stabilize the load.

OPERATOR CARE OF THE TRUCK.

1. Give special consideration to the proper functioning of tires, horn, lights, battery, controller, lift system (including load engaging means, chains, cable, and limit switches), brakes and steering mechanism. If at any time

OPERATOR CARE OF THE TRUCK (CONT.).

a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the matter should be reported immediately to the designated authority, and the truck should be taken out of service until it has been restored to safe operating condition.

2. Do not make repairs or adjustments unless specifically authorized to do so.

3. Do not fill fuel tanks while engine is running and avoid spillage.

4. Spilliage of oil or fuel should be carefully washed away or completely evaporated and fuel tank cap replaced before restarting engine.

5. Do not operate a truck with a leak in the fuel system until the leak has been corrected.

6. Do not use open flames for checking electrolyte level in storage batteries or gasoline level in fuel tanks.

NOTE

The preceding is reproduced from:

American National Standard ... Safety Standard for Powered Industrial Trucks. B56.1 - 1969

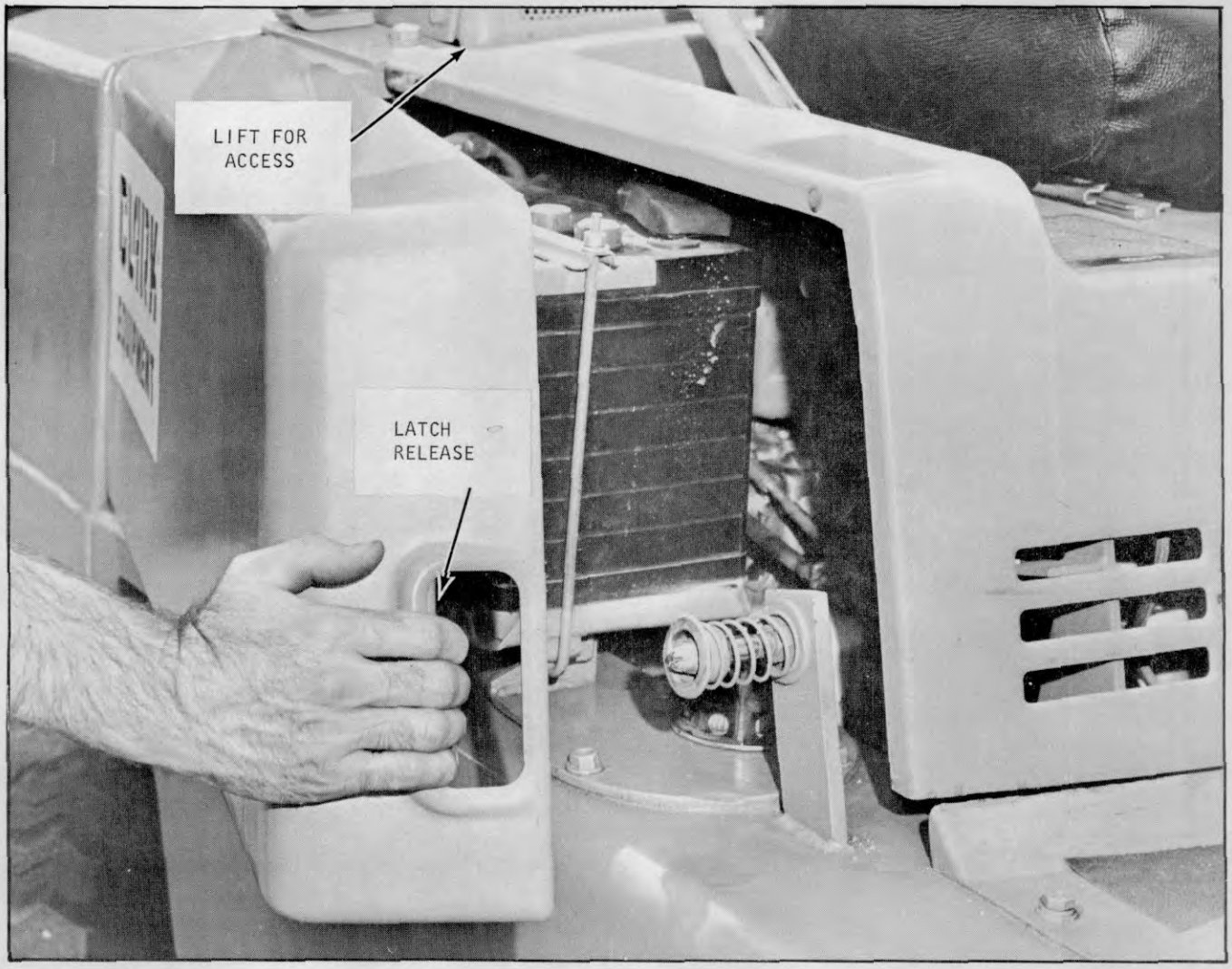


Plate 10176. Typical Side Door Entry

SIDE HOODS:

The side hoods swing open and can be removed to completely expose the engine compartment. The hoods can be opened by placing hand in slot, and pulling outward in the direction of the hood opening. The hood latches are adjustable for clearance and tension.

FUEL HANDLING AND STORAGE SAFETY

(Gasoline Powered Trucks)

Liquid Fuels. (Such as Gasoline and Diesel Fuel).

1. The storage and handling of liquid fuels should be in accordance with the Flammable and Combustible Liquids Code. (NFPA No. 30).

2. Trucks using liquid fuels should be refueled only at locations designated for that purpose. Safe outdoor locations are preferable to those indoors. The Flammable and Combustible Liquids Code (NFPA No. 30), Paragraph 7211, outlines recommendations for arranging safe indoor fueling facilities.

3. Engines should be stopped and operator off the truck during refueling.

4. Liquid fuels not handled in approved dispensing pumps should be transported in safety cans. Safety cans should be inspected regularly for damage to closures and for leaks; faulty cans repaired or replaced. Care should be exercised in handling of safety cans to avoid damage.

5. Reasonable care should be exercised to prevent the spillage of fuel or overfilling either the vehicle fuel tanks or safety cans. Filler cap should be replaced and any spilled fuel disposed of by using a noncombustible adsorbent before the engine is restarted.

6. Smoking should be prohibited in the refueling area.

INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE.....INDEX

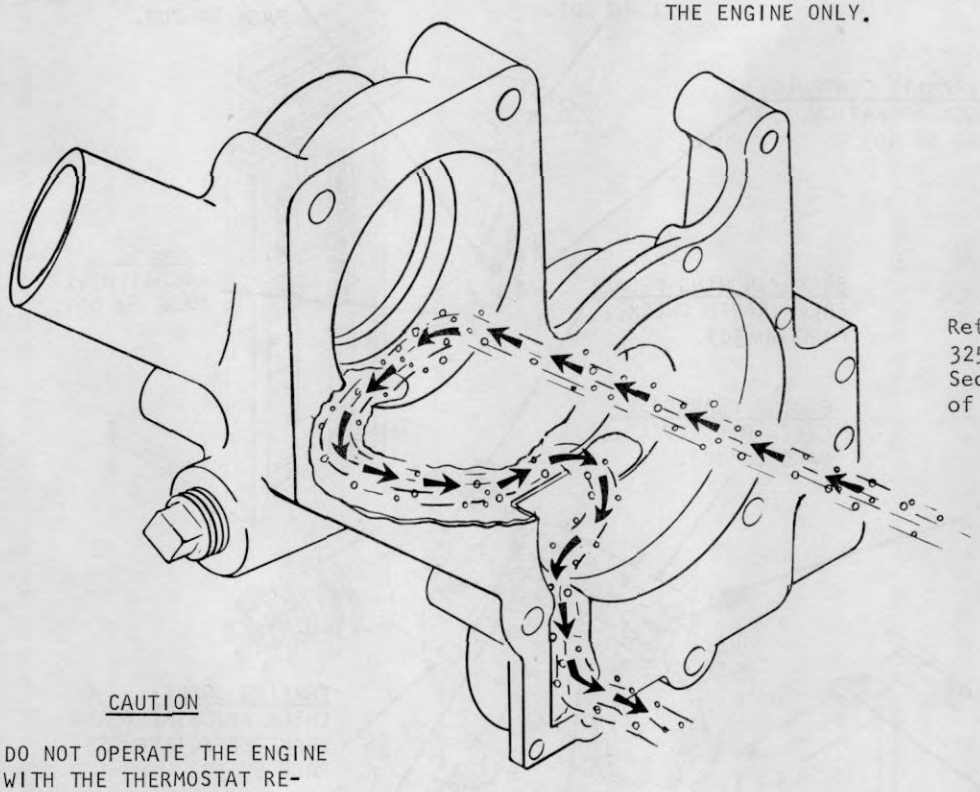
N O T E

Lubrication and Preventive Maintenance Illustrations at the beginning of each Time Interval Section....When performing the 100, 500 or 1000 Hour Lubrication and Preventive Maintenance.... always include the previous schedules.

TROUBLE SECTION - located in rear of manual.

CAUTION

DO NOT REMOVE THERMOSTAT FOR ANY REASON AND RUN ENGINE.....THE ENGINE WILL OVERHEAT CAUSING SERIOUS DAMAGE. AS YOU CAN SEE BELOW...REMOVING THERMOSTAT WILL ALLOW THE WATER TO BY-PASS THE RADIATOR AND CIRCULATE THROUGH THE ENGINE ONLY.



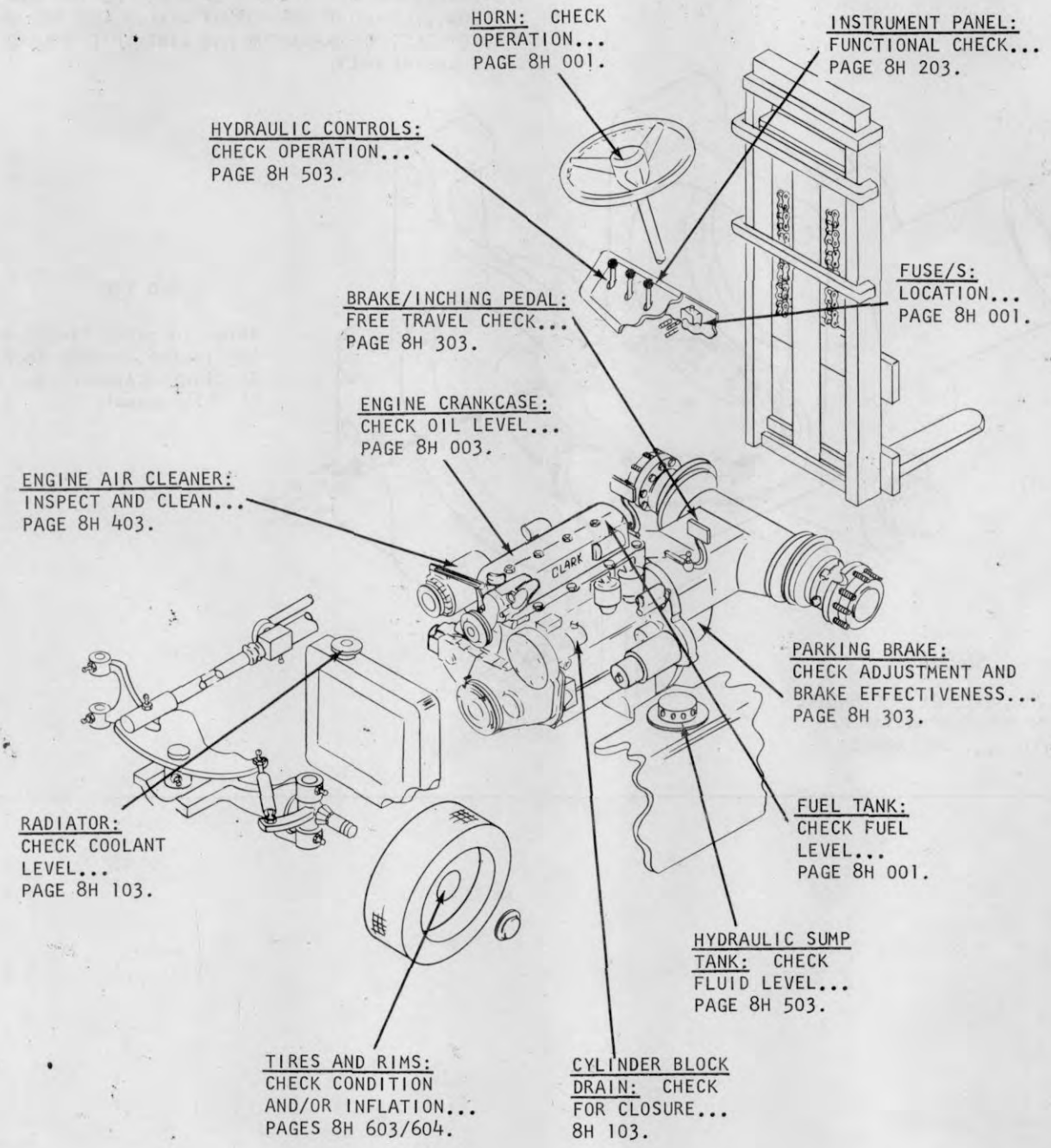
CAUTION

DO NOT OPERATE THE ENGINE WITH THE THERMOSTAT REMOVED.....SEE ABOVE.

NOTE

Refer to pages TS-322 and 325 in the Trouble Shooting Section located in the back of this manual.

8 HOUR LUBRICATION AND
PREVENTIVE MAINTENANCE INDEX



LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION

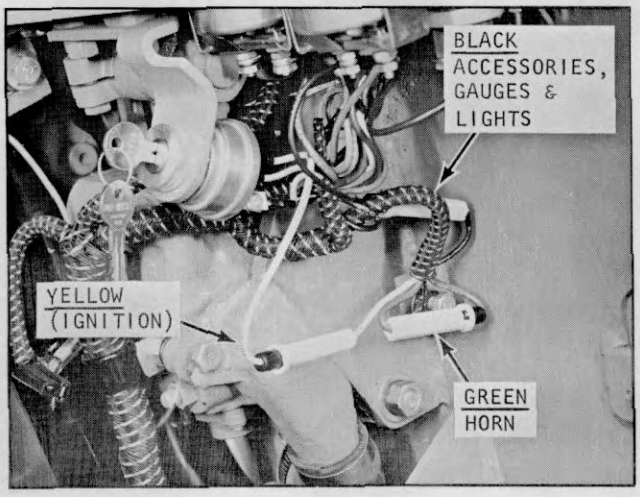


Plate 9752. Typical Electrical System Fuses

HORN:

Check to be sure horn is working properly.

FUEL TANK:

Check fuel sypply and fill if necessary. Use a good grade of diesel fuel; automotive quality diesel fuel.....ASTM #1 or #2, 45-Centane minimum.

Before filling the tank, make certain the filler cap screen is in place and not damaged. (Machines so Equipped.)

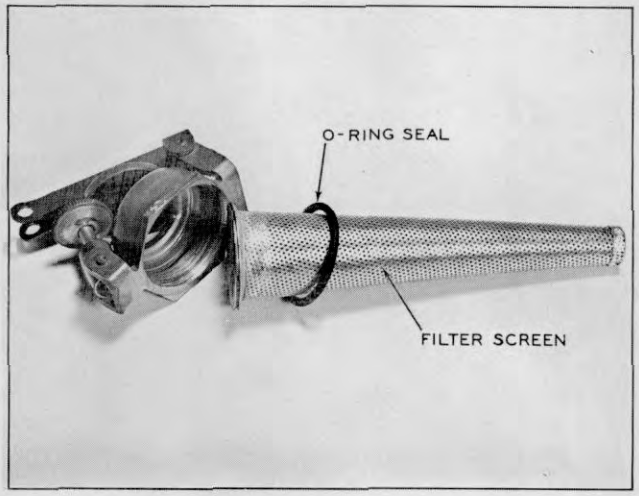


Plate 6627. Diesel Fuel Tank Filler Cap and Screen

TIRE INFLATION: (Pneumatic Tire Models)

Check tires for proper inflation.
Front.....100 lbs.
Rear.....100 lbs.

ENGINE CRANKCASE CHECK:

Every 8 operating hours....check the engine crankcase....USE YOUR DIPSTICK. Fill if necessary with.....

SAE 10W----------0 deg to 32 deg F
SAE 20W----------33 deg to 75 deg F
SAE 30----------Above 75 deg F

The crankcase capacity is 5 quarts with filter change.

SERVICE CONDITIONS:

Oil performance will reflect engine load, temperature, fuel quality, atmospheric dirt, moisture and maintenance. Where oil performance problems arise or are anticipated, the oil supplier should be consulted. When extended drain periods are contemplated, his analysis or that of a reputable laboratory should determine the suitability of oil for further service.

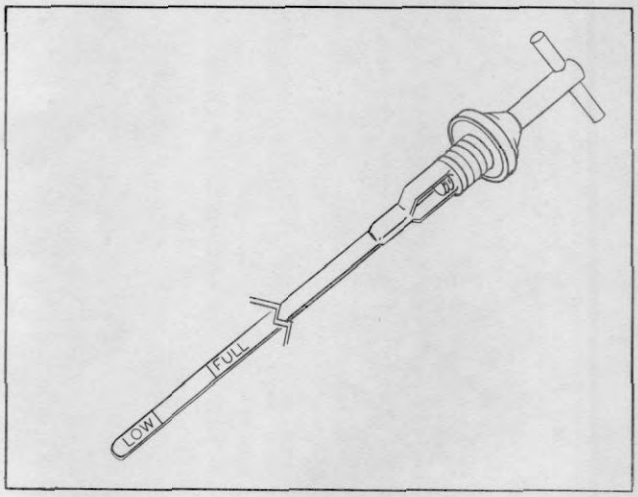


Plate 9758. Typical Crankcase Dipstick

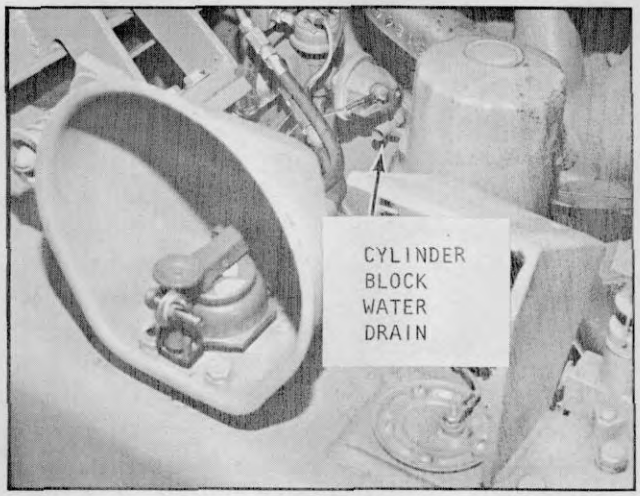


Plate 10177. Typical Cylinder Block Water Drain

ENGINE COOLING:

Make sure that the radiator drain cock and the water drain in the cylinder block are closed.

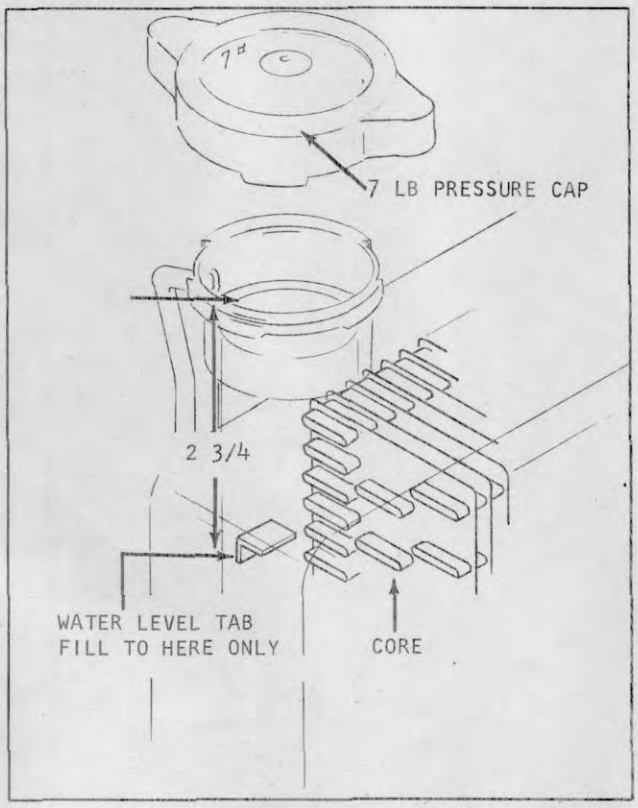


Plate 9738. Typical Water Level Tab

I M P O R T A N T

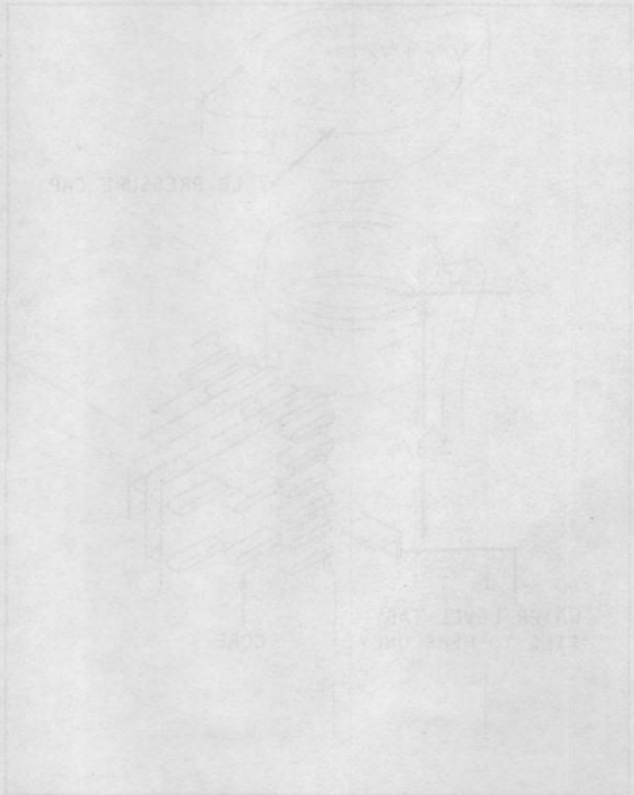
ALWAYS CHECK RADIATOR COOLANT LEVEL WITH THE ENGINE SHUT DOWN. BE SURE COOLANT LEVEL IS 2 3/4" BELOW FILLER NECK, NEVER HIGHER. CHECK RADIATOR COOLANT LEVEL AND FILL TO THE TAB (LOCATED IN THE RADIATOR) WITH CLEAN WATER; OR IF OPERATION IS IN COLD WEATHER, USE A SUITABLE ANTI-FREEZE SOLUTION. IT IS RECOMMENDED 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. WHEN PERMANENT ANTI-FREEZE OF THE ETHYLENE GLYCOL TYPE IS USED, THE COOLANT SOLUTION MUST CONTAIN AT LEAST 40% WATER.

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.



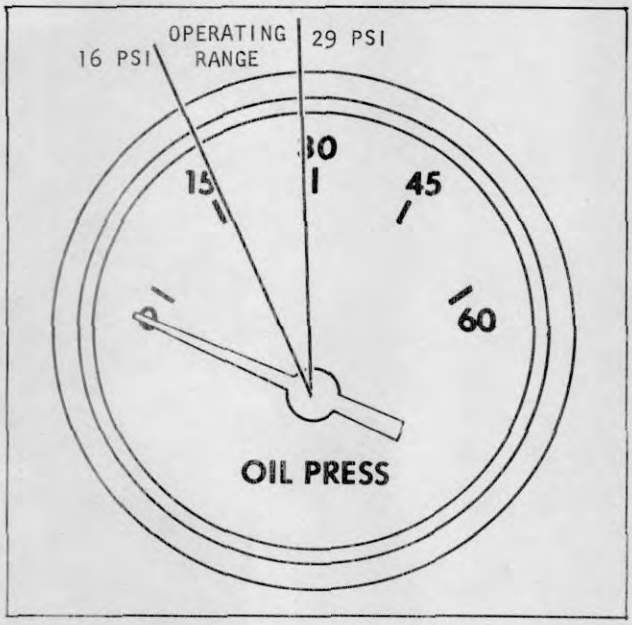


Plate 10174. Typical Oil Pressure Indicator

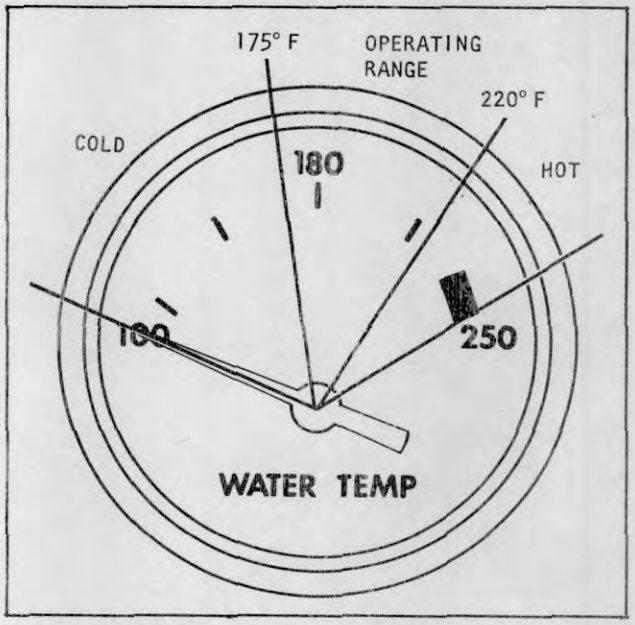


Plate 9614. Typical Temperature Indicator

INSTRUMENT INDICATORS:

1. Oil Pressure Indicator. The oil pressure should be approximately 15 pounds at idle (600 rpm).

C A U T I O N

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. 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.

2. Temperature Indicator. The thermostat installed in this machine begins to open between 160 deg F. and is fully open at 190 deg F. This should occur in a few minutes of engine operation.

3. Ammeter. The ammeter is connected in the alternator and battery circuit in such a manner as to indicate rate of alternator charge or battery discharge with engine at fast idle (approximately 700 rpm).

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.

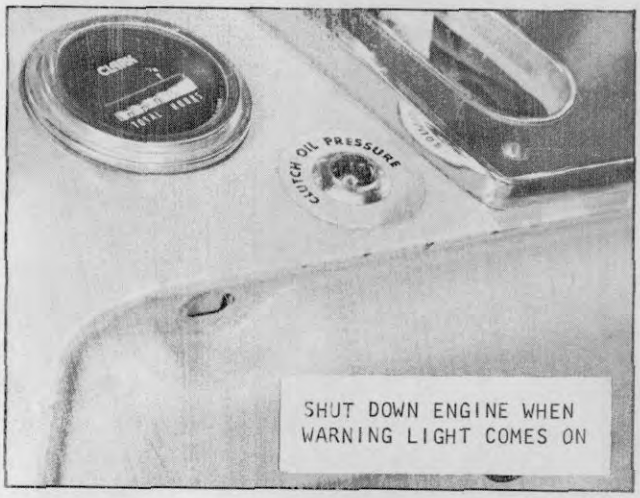


Plate 10175. Typical Instrument Console

C A U T I O N

IF CLUTCH OIL PRESSURE WARNING LIGHT COMES ON, (MACHINES SO EQUIPPED) STOP THE ENGINE IMMEDIATELY AND FIND THE CAUSE OF THE TROUBLE.

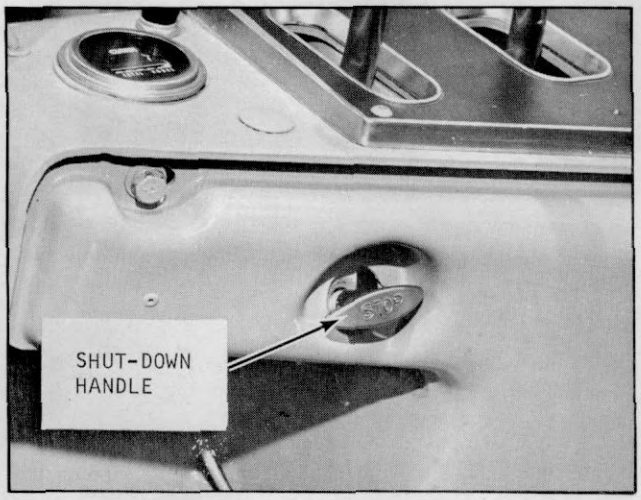


Plate 10178. Typical Shut-down Handle

TO SHUT DOWN ENGINE:

Place directional levers in neutral, set parking brake, turn ignition switch off, and pull out engine shut-down handle.

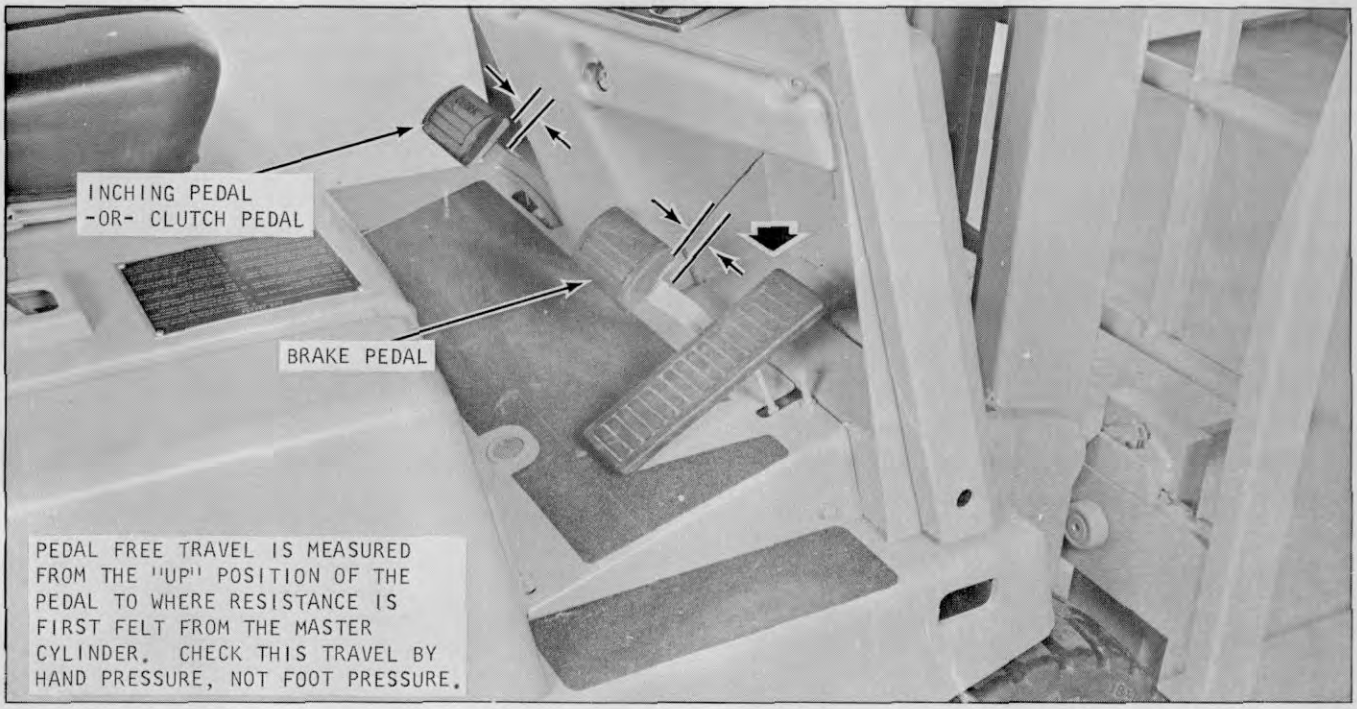


Plate 9763. Brake and Inching Pedal Free Travel Check

BRAKE AND INCHING PEDAL FREE TRAVEL CHECK

Refer to the Index for Linkage Adjustments and Brake Bleeding Procedures.

N O T E

Pedal free travel check should be made with the engine shut down.

1. Depress pedal and hold foot pressure for at least ten seconds. Pedal must be solid, must not be spongy or drift under foot pressure.
2. Now ... depress pedal by hand. When pedal meets resistance from the master cylinder, the distance traveled should be 1/8 of an inch.

PARKING BRAKE

Make certain that the parking brake is working properly. Fully apply hand brake, moving brake lever from full forward to full rear position .... cable tension should be strong enough so that the lever hesitates or remains in a vertical position before continuing on as the lever passes through center position to full rear position.

N O T E

The parking brake must be capable of holding truck with full rated capacity load, on a 15% grade.

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

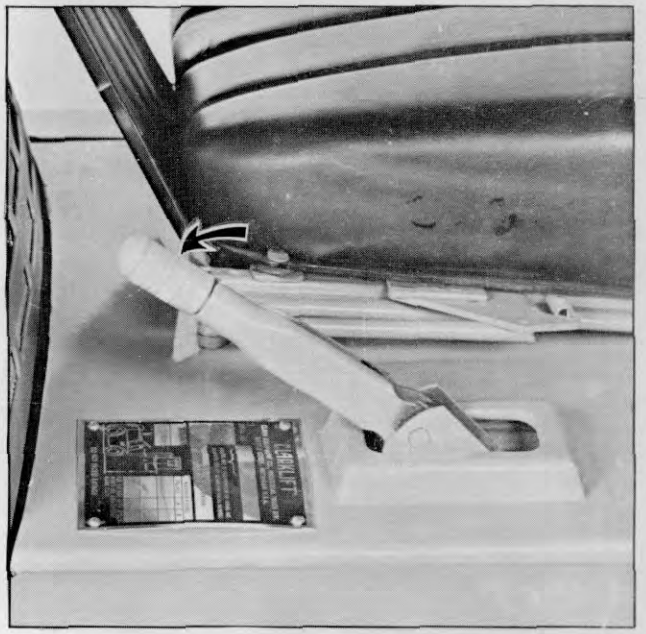
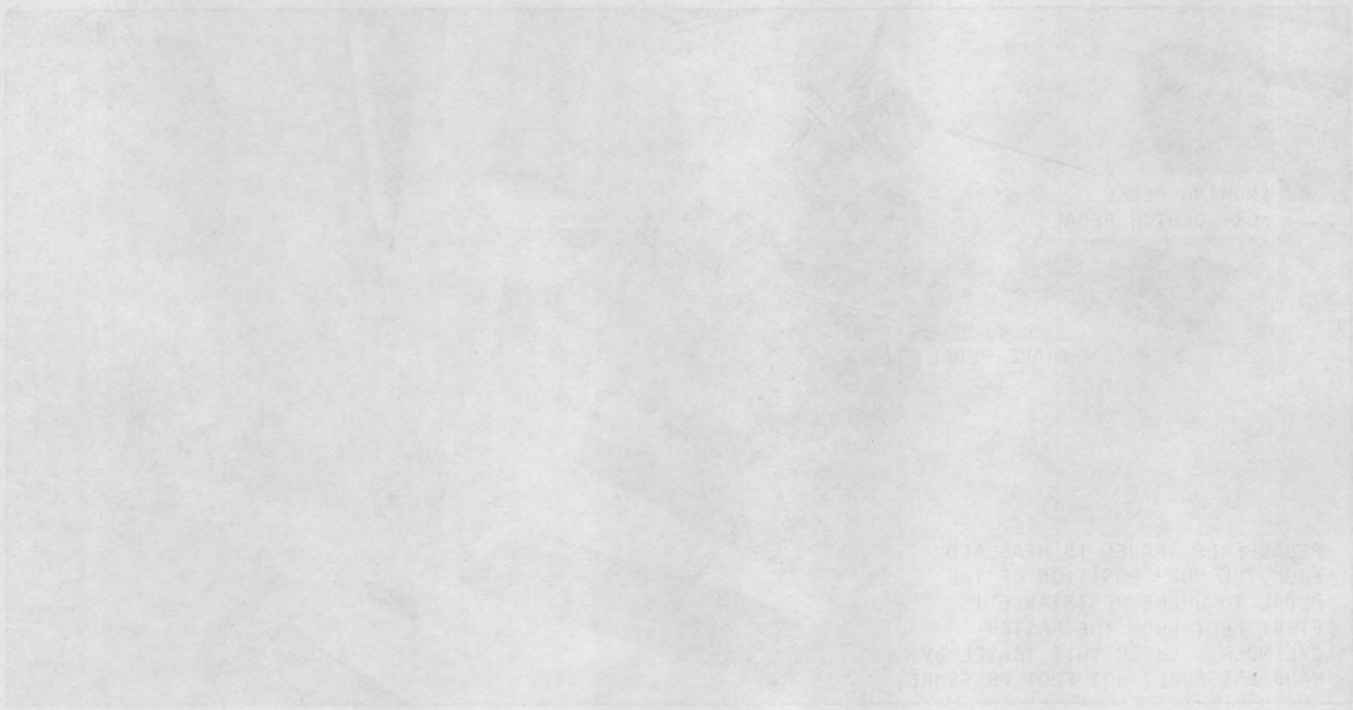


Plate 9781. Typical Parking Brake Lever



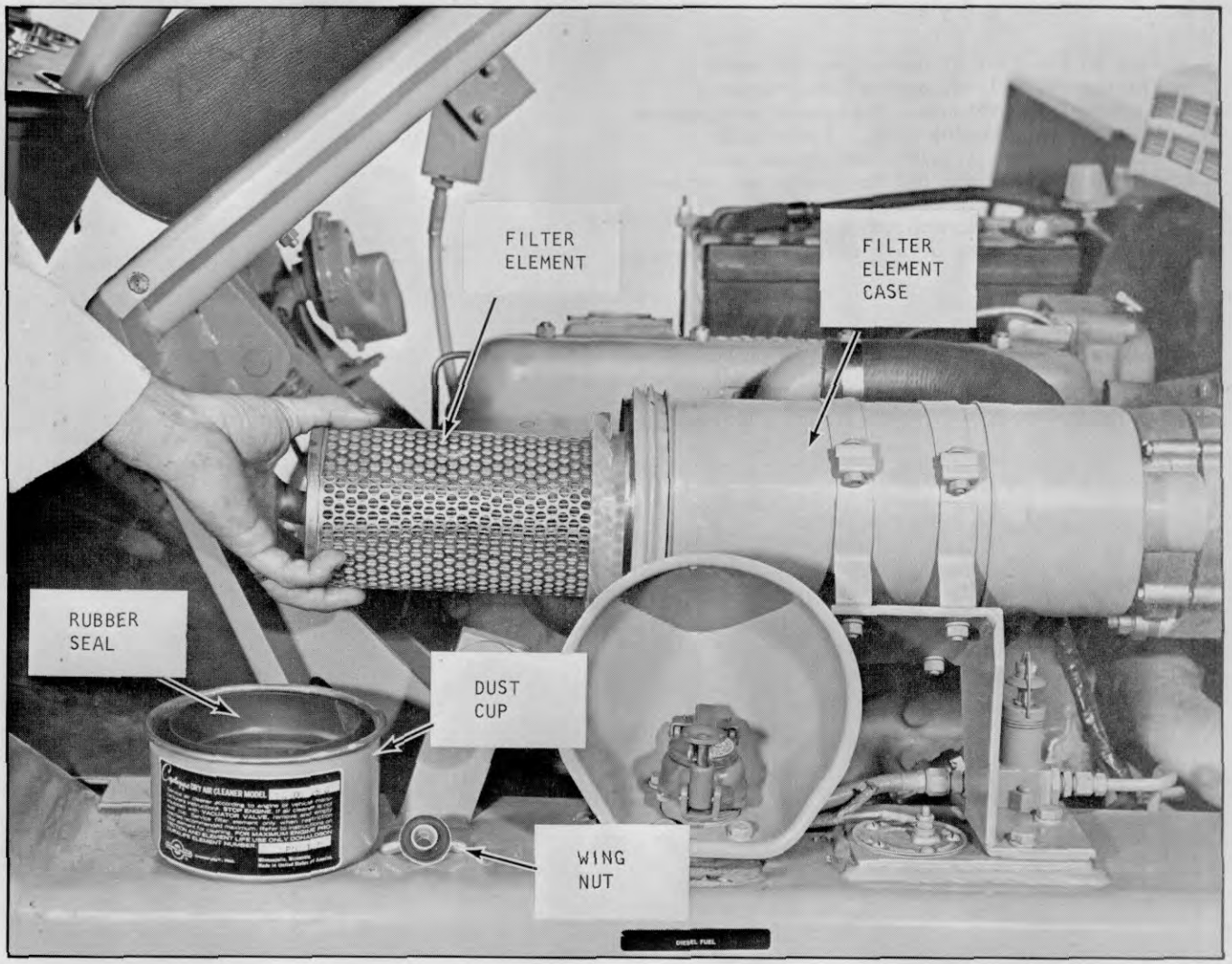


Plate 10179. Typical Air Filter Assembly

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.

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. Turn off wing nut, remove dust cup, pull out rubber seal and empty contents of dust, dirt, etc. (When replacing dust cup, position slot up.)

2. Remove air cleaner element and tap on a hard flat surface until all loose dirt is removed.

N O T E

If filter cartridge cannot be properly cleaned, replacement is necessary.

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

4. Check gasket for damages, replace if necessary.

5. Reassemble in reverse order.

N O T E

Depending on the type of operation 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.

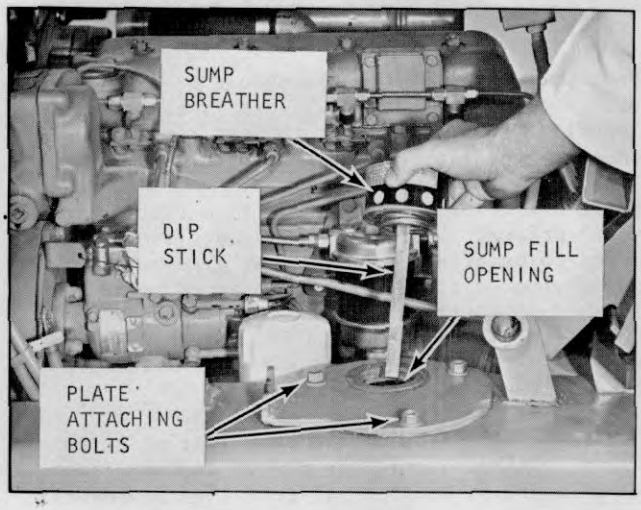


Plate 10180. Typical Hydraulic Filter Cover Plate

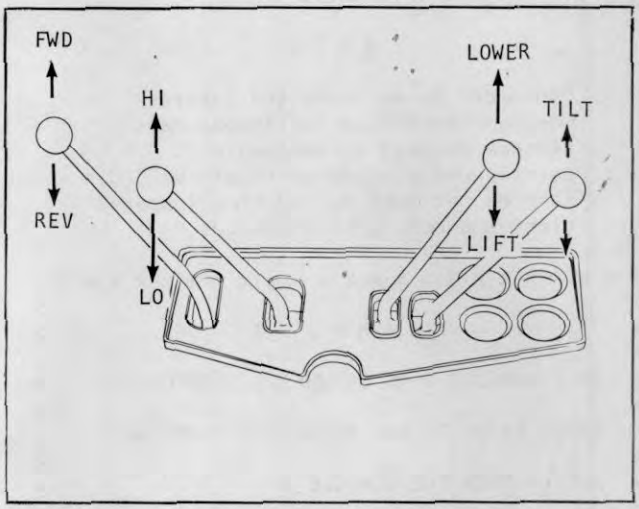


Plate 9612. 2 Speed Hydratork & Standard Transmissions

HYDRAULIC SUMP TANK:

Check hydraulic sump tank fluid level in the following manner:

1. Lower upright.

2. Turn switch key to off position.

3. Remove sump breather. Fluid level will show on the dipstick.

If necessary, fill sump tank using MS 68 Hydraulic fluid. Move valve control levers with hydraulic pump operating to allow any air in the lines to escape, then recheck sump tank fluid level and fill as required before putting machine in 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.

RIM AND WHEEL MAINTENANCE:

N O T E

"In order to maintain and insure maximum service, a continuous maintenance program is advisable... maintenance procedures should be carried out both during tire inspections and during tire changes."

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 PULL DAMAGED RIMS OR WHEELS. DEFLATE x
x x
x TIRES PRIOR TO THE REMOVAL OF RIMS OR x
x x
x WHEELS FROM THE VEHICLE. 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

Check all metal surfaces thoroughly while making tire inspections...watch for...

1. Fatigue cracks in metal.

2. Bent flanges, resulting from road obstructions.

3. Deep rim tool marks.

4. Loose, missing or damaged nuts.

5. Bent or stripped studs.

6. Excessive rust or corrosion.

Mark damaged or hazardous areas with chalk so that part will be removed from service...replace damaged parts.

Insure that replacements are made with the proper sizes and types...refer to your machine serial number when ordering replacement parts. 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.

Check all metal surfaces, as listed above, and check for cracks. These are caused by deep rim tool marks, overloading and overinflating tires and using larger than recommended tire sizes.

Cracks in wheel between stud holes are caused by loose wheel nuts...improper installation procedures and use of incorrect sizes or types of attaching parts. Insufficient mounting torque can cause wheel shimmy, resulting in damage to parts and extreme tire tread wear. Excessive mounting torque can cause studs to break and disc to crack in the stud hole area.

Thoroughly clean wheels...remove rust, dirt and other foreign materials from all surfaces. Hand or electric wire brushes, and blasting or chemical baths may be used.

Bead seat areas of the rim should be free of rust and rubber deposits. This is especially important for drop-center tubless rims...because of the air-sealing element.

Paint rim by brush or spray with a fast-drying metal primer. Surfaces should be clean and dry prior to painting. Insure that bare metal areas on outside or tire side of rim are covered. This is especially important on drop-center tubless rims, because warm and somethimes moist air is in constant contact with the metal surface on the tire side of the rim.

Lubricate tire side of rim base just prior to mounting tire...avoid the use of any lubricant which contains water or solvent that is injurious to rubber...a combination lubricant and rust-preventive compound is preferable. This protective measure is of particular importance with drop-center tubless rims as the air in the tire is contained by the tire-side rim surface.

N O T E

Rim Distributors can supply the proper compound that serves as a lubricant and rust preventive.

TIRE MAINTENANCE:

Inspect for proper inflation. Refer to Specifications for correct tire pressure.

Inspect tires and wheels regularly for cuts, breaks, alignment, security of wheel clamp bolts (on machine using split rims), and lug nuts or bolts.

Even with the best of maintenance practices, cuts will still be a source of tire trouble. The correct procedure for handling and repairing tires should be given careful attention. Close inspection of all tires should be made at the time of inflation check, and all tires having cuts that penetrate into the cord body should be taken off for proper repair.

Failure to make regular inspections and repairs, when needed, will result in further deterioration of the cord body and eventually a blowout. Small rocks and dirt will get into shallow cuts in the tread and if neglected will gradually be pounded through the cord body.

One simple method to forestall this action is to clean out the cut with an awl or similar tool to remove any stones or other matter which may be lodged in the cut. Use a sharp, narrow-bladed knife and cut away the rubber around the cut to form a cone-shaped cavity extending to the bottom of the injury. The sides of the cavity should be slanted enough to prevent stones from

TIRE MAINTENANCE (CONTINUED):

wedging into it. Tires with cuts treated in this manner may be continued in service without danger of further growth of these injuries. If a tire has at least one deep cut that requires a repair, then all smaller cuts may be quickly and economically repaired and vulcanized by the steam kettle method.

WARNING

IT IS NOT RECOMMENDED THAT TIRES WITH BREAKS BE USED AGAIN.

If uneven tire wear is evident, wheel alignment should be checked.

TIRE INFLATION:

Before inflating tires, make certain all wheel nuts are tightened to proper torque (see Specifications).

WARNING

IN ALL CASES, WHEN REMOVING TIRES WITH SPLIT RIMS FROM THE MACHINE FOR REPAIR OR PERIODIC ROTATION, COMPLETELY DEFLATE TIRES. THIS IS ACCOMPLISHED BY REMOVING THE VALVE CORE.

WARNING

IN ALL CASES, WHEN REMOVING TIRES EQUIPPED WITH THE LOCK RING TYPE RIM FROM THE MACHINE FOR REPAIR OR PERIODIC ROTATION, COMPLETELY DEFLATE TIRES. THIS IS ACCOMPLISHED BY REMOVING THE VALVE CORE.

WARNING

WHEN REPAIRING TIRES USED ON MACHINES THAT EMPLOY THE LOCK RING TYPE RIM, USE CAUTION WHEN INFLATING TIRE, PROCEED AS FOLLOWS:

1. After positioning lock ring on rim, turn wheel and rim assembly over so that lock ring is on side toward ground.

2. Inflate tire to 5 to 10 pounds.

3. Turn rim over and tap lock ring carefully with a mallet to be sure it is properly seated.

4. If you have access to a steel cage...use it, (see next page)...otherwise turn rim and wheel over once again so that lock ring is on the bottom and inflate tire to proper pressure.

WARNING

IF LOCK RING IS NOT LOCATED PROPERLY, IT IS POSSIBLE FOR IT TO POP OFF RIM WITH GREAT FORCE WHEN TIRE IS INFLATED AND COULD RESULT IN SERIOUS INJURY TO ANYONE STRUCK BY IT.

On machines using split rims, make periodic checks for noises in the wheel, as it is possible for damage to occur to the wheel bolts if they are not securely tightened when tires are changed. If the wheel bolts are loose or have been sheared off as a result of being loose, a grinding or scraping noise will be present when wheels are turned. Should this condition exist, it will be necessary to immediately remove the rim and tire from the machine and determine the cause of noise and repair or replace defective parts.

NOTE

Refer to WARNING on deflation of tires before removing wheels from machine.

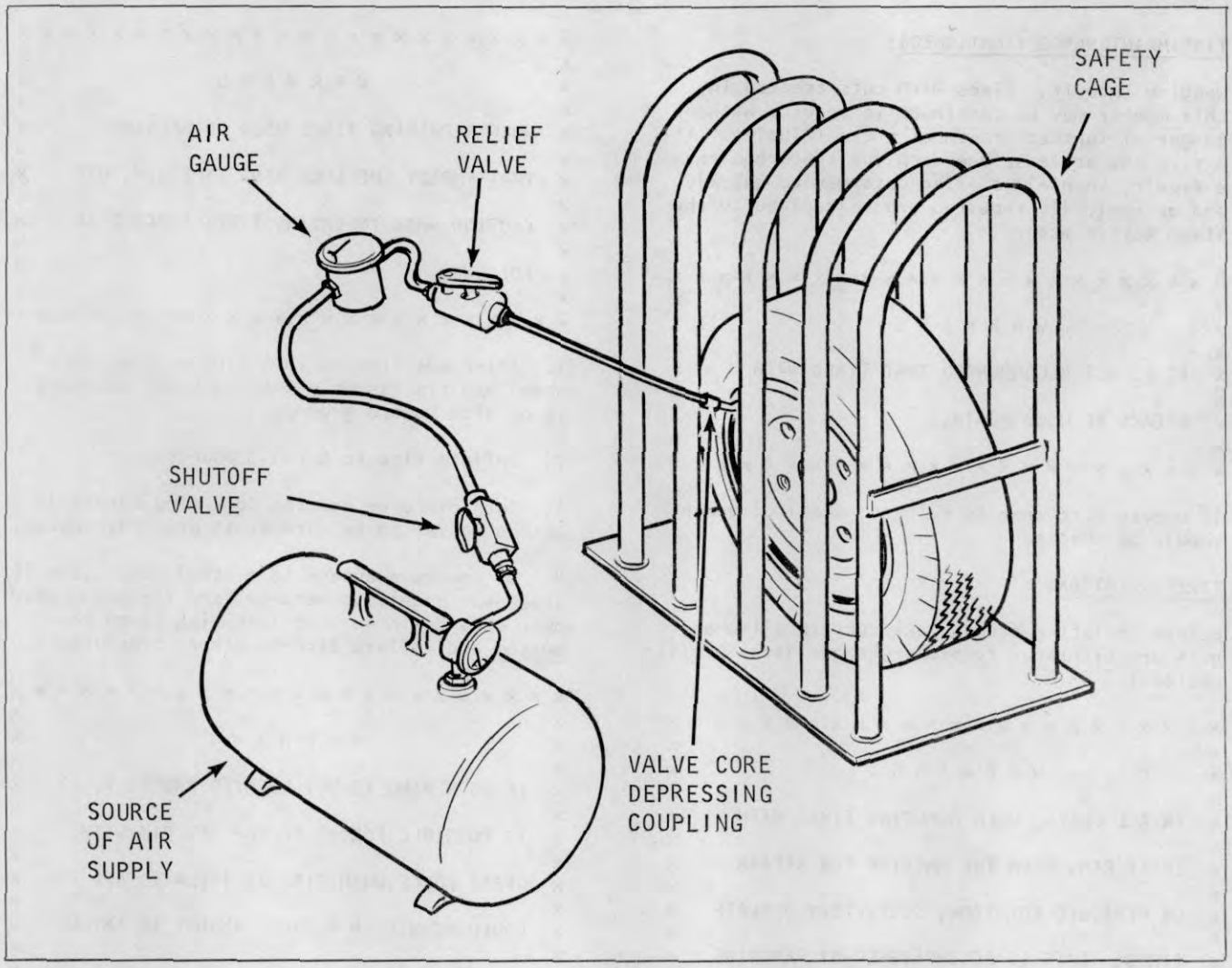


Plate 9702. Typical Tire Inflation Procedure

Torque wheel stud nuts or wheel bolts to the values listed in specifications. Excessive torque of wheel nuts can cause stud and rim damage.

Any replacement parts used should be of a quality equal to that provided in the original manufacture.

Inflation

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 CAUTION x
x x
x ALL FASTENERS SHOULD BE PROPERLY INSTALLED x
x x
x BEFORE INFLATING WHEEL/TIRE ASSEMBLY. 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

Tires with split wheels should be inflated in a safety cage or when properly installed on the vehicle. In either case, make sure all nuts and bolts are properly installed and torqued according to specifications.

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 CAUTION x
x x
x USE ONLY AN APPROVED SAFETY CAGE DESIGNED x
x x
x FOR THIS PURPOSE. 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

Tires used on lock-ring type wheels should be inflated in a safety cage (see previous caution) or use a clip-on type air chuck and stand aside (in-line with the tire tread) during inflation. Insure that rings are properly

Plate 7613. Typical Split Wheel

seated prior to inflation. An inflated tire contains potentially explosive energy that can blow rings loose.

All wheel/tire assemblies should be inflated in a safety cage. The air hose should have a special set-up as shown in Plate 9702. The hose should have an adapter so that it can be securely fastened to the valve stem. Using this set-up you would:

1. Attach air hose to valve stem.

2. Open shut-off valve allowing compressed air to enter tube.

3. Shut off air supply occasionally to check pressure in tube at air gauge.

4. Inflate to proper capacity. If pressure exceeds proper inflation capacity, depress the relief valve to release excess air pressure.

5. This alternating procedure is followed until proper inflation is reached. See specifications.

I M P O R T A N T

MAINTAIN UNIFORM INFLATION IN BOTH TIRES OF A DUAL ASSEMBLY SO THAT WEIGHT IS EQUALLY SUSTAINED.

NEVER RE-INFLATE A TIRE THAT HAS GONE FLAT WITHOUT FIRST INSPECTING IT AND THE WHEEL ASSEMBLY.

The tire inflation arrangement as shown in Plate 9702 can be made up from local suppliers.

Parts can be ordered from the following suppliers:

Relief Valve - Model 250V-1/4"

Humphrey Products
P.O. Box 2008
Kilgore at Sprinkle Rd.
Kalamazoo, Mich.

Shut-Off Valve - Imperial #77E(1/4 to 1/4 1 PT)

Kendall Industrial Supplies, Inc.
702 N. 20th St.
Battle Creek, Mich. 49016

Air Gauge - Marshaltown #23 (160 lb, 1/4 1 PT, 2 1/2" diameter gauge)

Kendall Industrial Supplies, Inc.
702 N. 20th St.
Battle Creek, Mich. 49016

Safety Cage

Meyers Tire Supplies
6400 Epworth Blvd.
Detroit, Mich.

DIRECTIONAL TREAD TIRES

All directional tread tires are to be mounted in the correct position with respect to the arrow cast on the side of the tire as explained and illustrated below.

Directional Tread Dual Tires:

1. Inside dual tire arrow to point in the direction of foward rotation, see Plate 6422.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward front of truck.)

2. Outside dual tire arrow to point in the direction of rearward rotation, see Plate 6423.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward rear of truck.)

Directional Tread Single Drive Tires:

1. Tire arrow to point in the direction of forward rotation, see Plate 6422.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward front of truck, see Plate 6422.

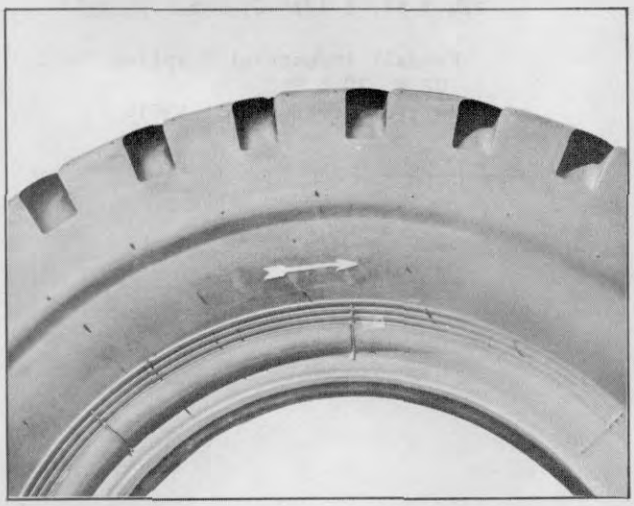


Plate 6422. Inside Dual Tire
(or Single Drive Tire)
(Arrow to point toward front of truck)

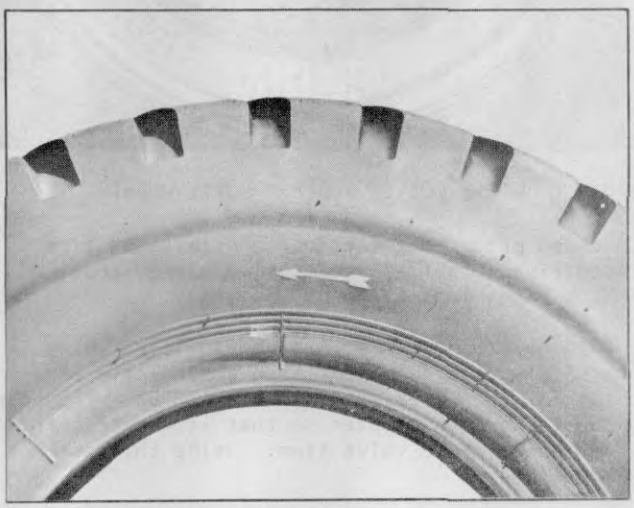


Plate 6423. Outside Dual Tire
(Arrow to point toward
rear of truck)

SOLID OR CUSHION 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.

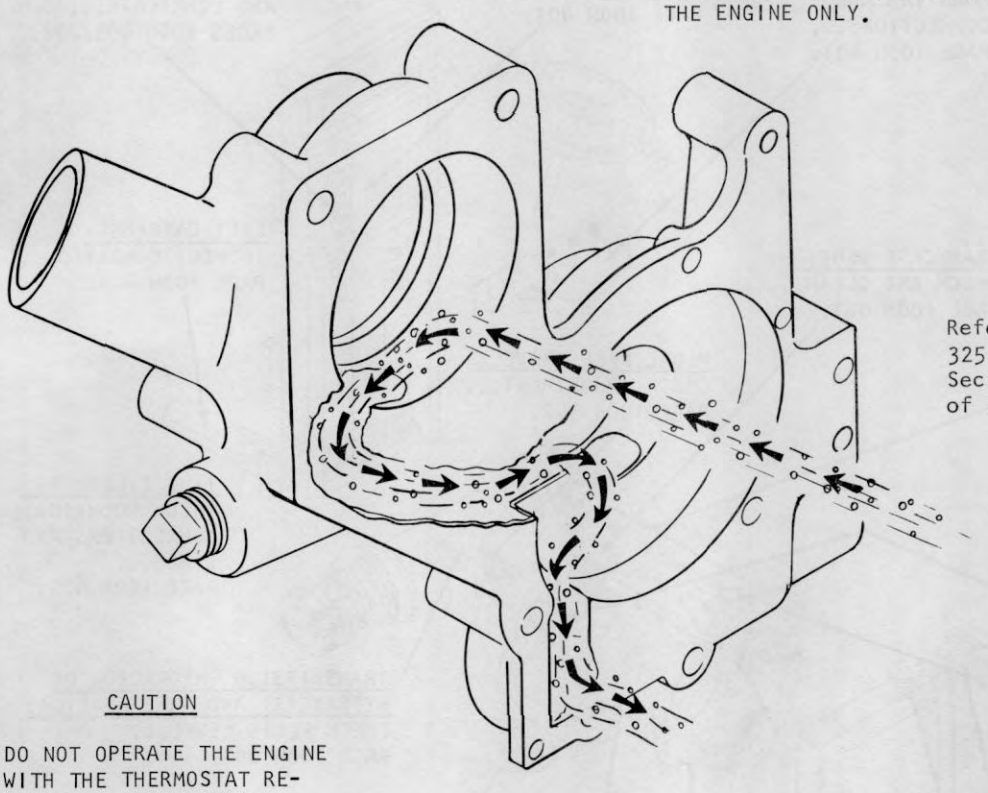
3. Check steering axle alignment regularly to protect against fast, irregular tread wear and separation.

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.

CAUTION

DO NOT REMOVE THERMOSTAT FOR ANY REASON AND RUN ENGINE.....THE ENGINE WILL OVERHEAT CAUSING SERIOUS DAMAGE. AS YOU CAN SEE BELOW...REMOVING THERMOSTAT WILL ALLOW THE WATER TO BY-PASS THE RADIATOR AND CIRCULATE THROUGH THE ENGINE ONLY.



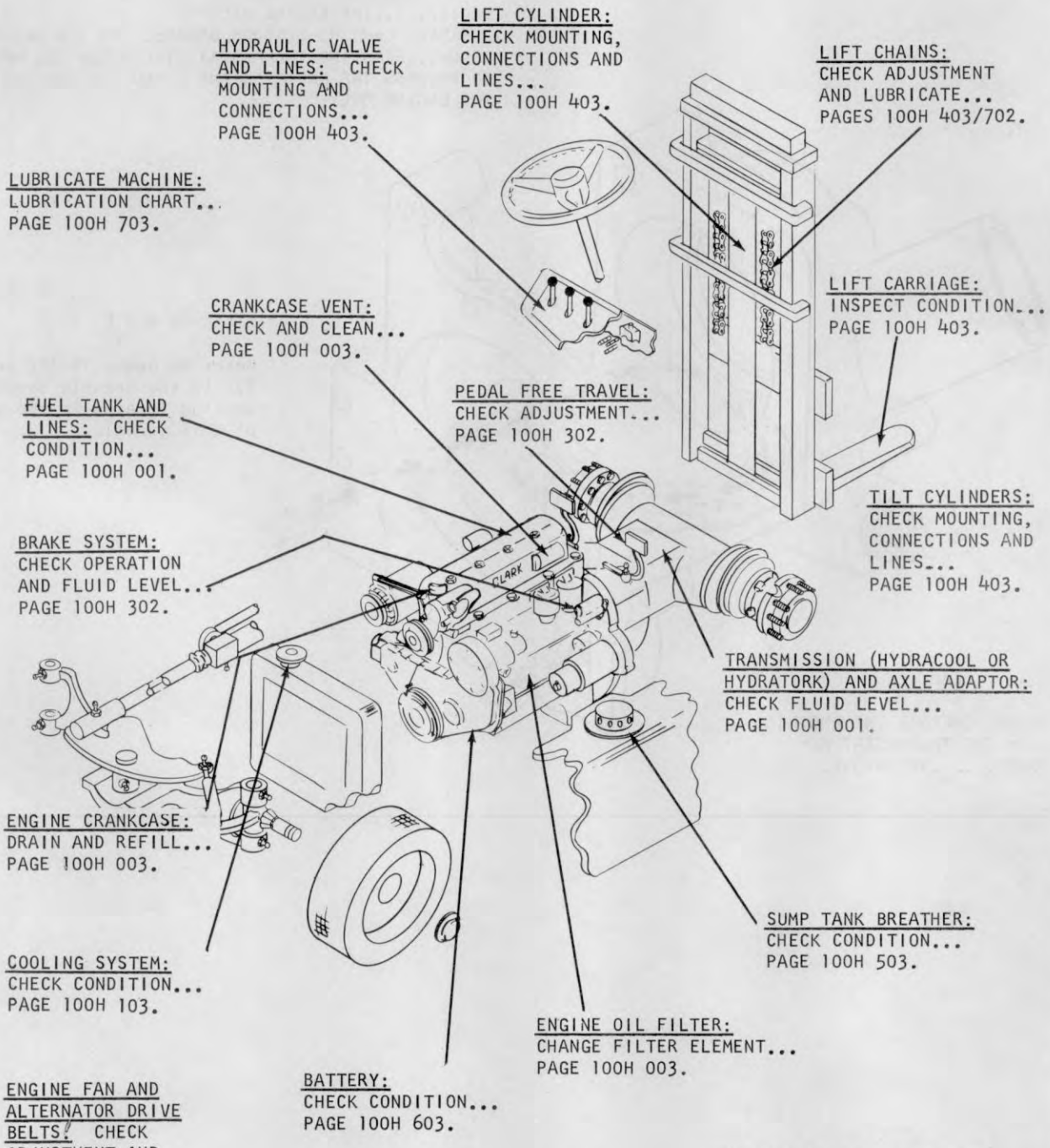
CAUTION

DO NOT OPERATE THE ENGINE WITH THE THERMOSTAT REMOVED.....SEE ABOVE.

N O T E

Refer to pages TS-322 and 325 in the Trouble Shooting Section located in the back of this manual.

100 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION.



LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION

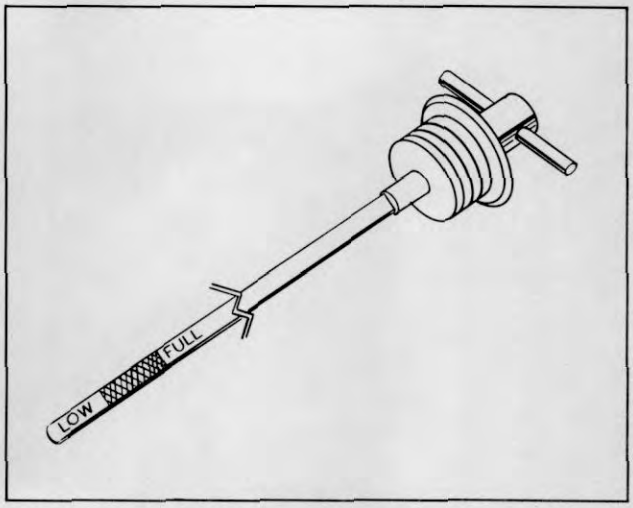


Plate 9739. Typical Transmission And Axle Adapter Dipstick.

Plate 9751. Typical Transmission/ Differential Fill

TRANSMISSION (STANDARD/AUTOMATIC) AND AXLE ADAPTER FLUID LEVEL CHECK:

1. Make sure vehicle is on a level surface, then set parking brake.

2. Start and run engine till normal operating temperature is reached.

3. At engine idle, tip upright forward, shift gear selector thru all gears, then leave transmission in neutral and engine at idle.

4. Clean dirt from around dipstick area, pull out dipstick, wipe off all fluid with a clean cloth and return dipstick to filler neck.

5. Pull out dipstick again and check fluid level. If necessary, add enough fluid thru the filler neck to raise the fluid level to the full mark on the dipstick. DO NOT OVERFILL.

FUEL LINES:

Make certain that fuel line connections are secure. Check fuel lines for obstructions and leaks. Check screen in fuel filler cap to make certain that it is properly installed and not damaged.

```
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  THE FUEL TANK IS AN INTEGRAL PART OF THE           x
x                                                     x
x  MACHINE FRAME AND ANY WELDING IN THIS              x
x                                                     x
x  AREA SHALL NOT BE ATTEMPTED BEFORE FIRST           x
x                                                     x
x  TAKING ADEQUATE SAFETY PRECAUTIONS.                x
x                                                     x
x  REPORT TO DESIGNATED PERSON IN AUTHORITY.          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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ENGINE CRANKCASE:

1. Every 100 operating hours drain the engine crankcase at operating temperature and clean the magnetic drain plug.

Plate 10187. Typical Oil Filter Change

2. Change the engine oil filter element as shown above.

Plate 10188. Typical Crankcase Fill Procedure

3. Refill crankcase using recommended oil listed below. (USE YOUR DIPSTICK --- crankcase capacity is 5 qts. with filter change.

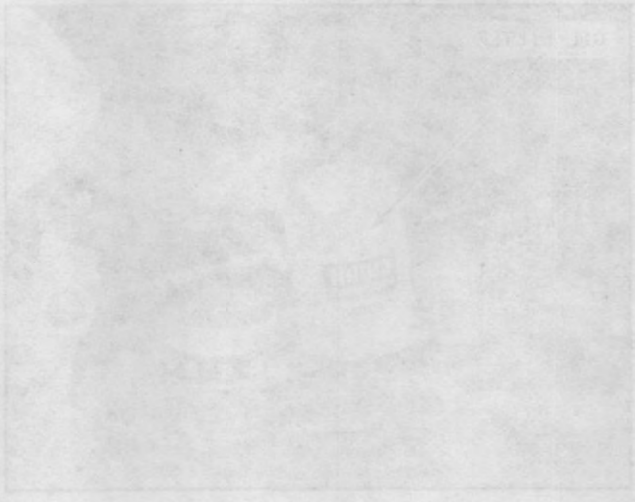
SAE 10W---0 deg. to 32 deg. F.
SAE 20W---33 deg. to 75 deg. F.
SAE 30---above 75 deg. F.

4. Start engine and check oil filter for leaks at cover. Run engine at idle a few minutes, then shut down engine. Allow time for engine oil to return to crankcase (approx. 5 min.) and then check oil level with the dipstick. Add oil as necessary to bring oil level to full mark on the dipstick.

Plate 10186. Typical Oil Level Check

SERVICE CONDITIONS:

Oil performance will reflect engine load, temperature, fuel quality, atmospheric dirt, moisture and maintenance. Where oil performance problems arise or are anticipated, the oil supplier should be consulted. When extended drain periods are contemplated, his analysis or that of a reputable laboratory should determine the suitability of oil for further service.



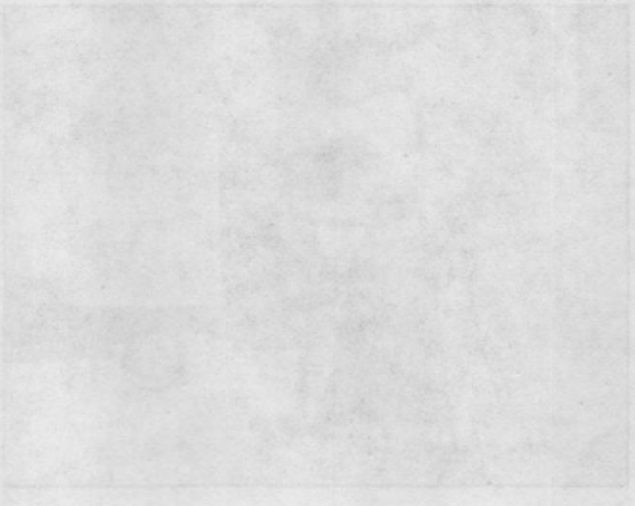


Plate 6458. Radiator Pressure Cap (7#)

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

IMPORTANT

WHEN FILLING THE RADIATOR, BE SURE THE COOLANT LEVEL IS 2-3/4" BELOW THE FILLER NECK. FILL TO THE TAB LOCATED IN THE RADIATOR. ALSO, ALWAYS CHECK COOLANT WITH THE ENGINE SHUT DOWN (NOT RUNNING).

COOLING SYSTEM

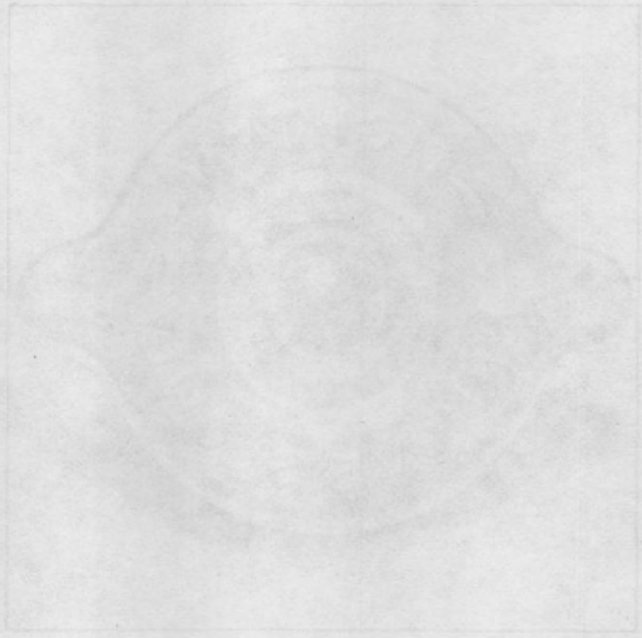
Check radiator, hoses and water pump for leaks.

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 Degree 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.



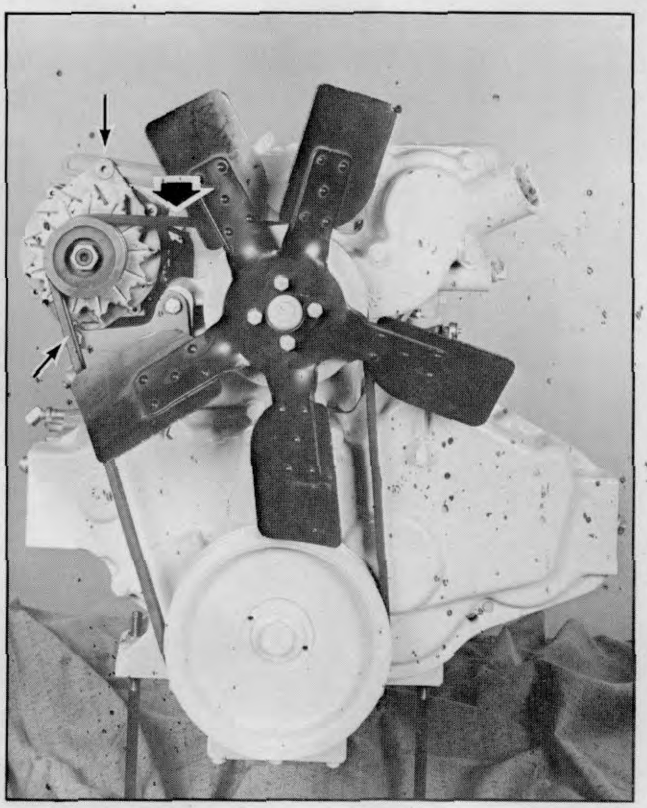


Plate 9769. Typical Fan Belt Deflection

FAN AND DRIVE BELT ADJUSTMENT:

The drive belt should have a specific finger pressure deflection midway on the short span, 1/2 - 3/4 inch.

```
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  CHECK FAN BELT DEFLECTION WITH ENGINE OFF.  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
```

C A U T I O N

IF THE FAN CAN BE ROTATED EASILY WITH A FINGER PULLING ON THE FAN BLADES, THE BELT IS TOO LOOSE AND MUST BE ADJUSTED.

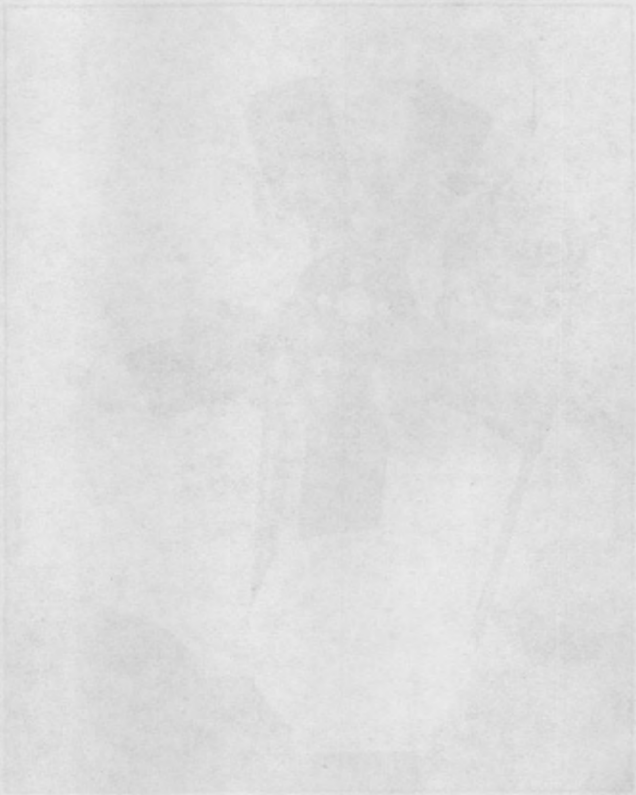
If the belt requires adjustment, use the following procedure:

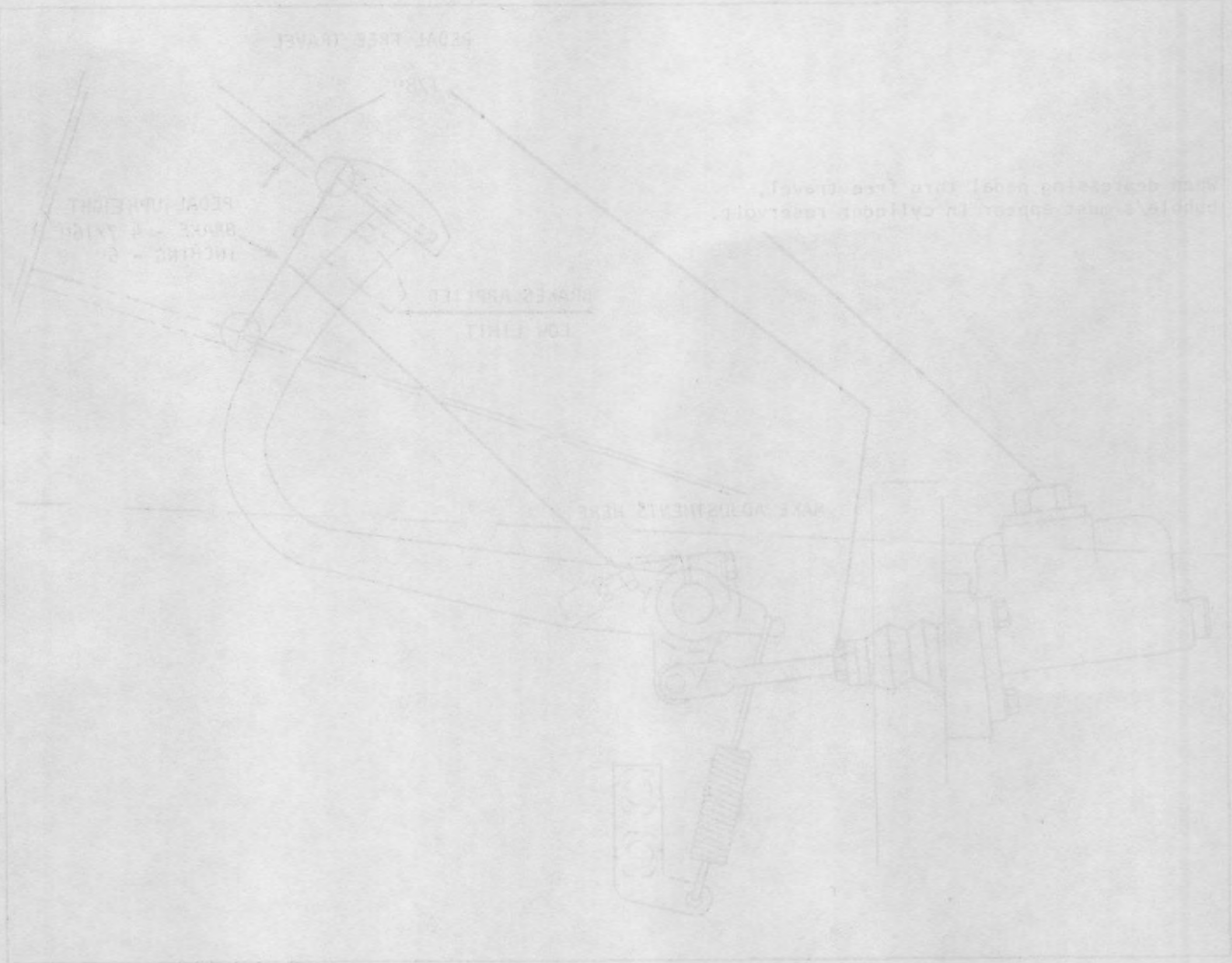
1. Loosen the alternator brace adjusting bolt and the two lower mounting bolts.

2. Move alternator toward cylinder block to loosen drive belt and away from cylinder block to tighten belt. Tighten bolts when correct finger deflection in obtained.

C A U T I O N

WHEN TIGHTENING BELT TENSION, APPLY PRESSURE AGAINST THE STATOR LAMINATIONS BETWEEN THE END FRAMES AND NOT AGAINST EITHER END FRAME. WHEN ADJUSTING FOR DEFLECTION, PULL ALTERNATOR BY HAND. DO NOT USE A PRY BAR. 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.





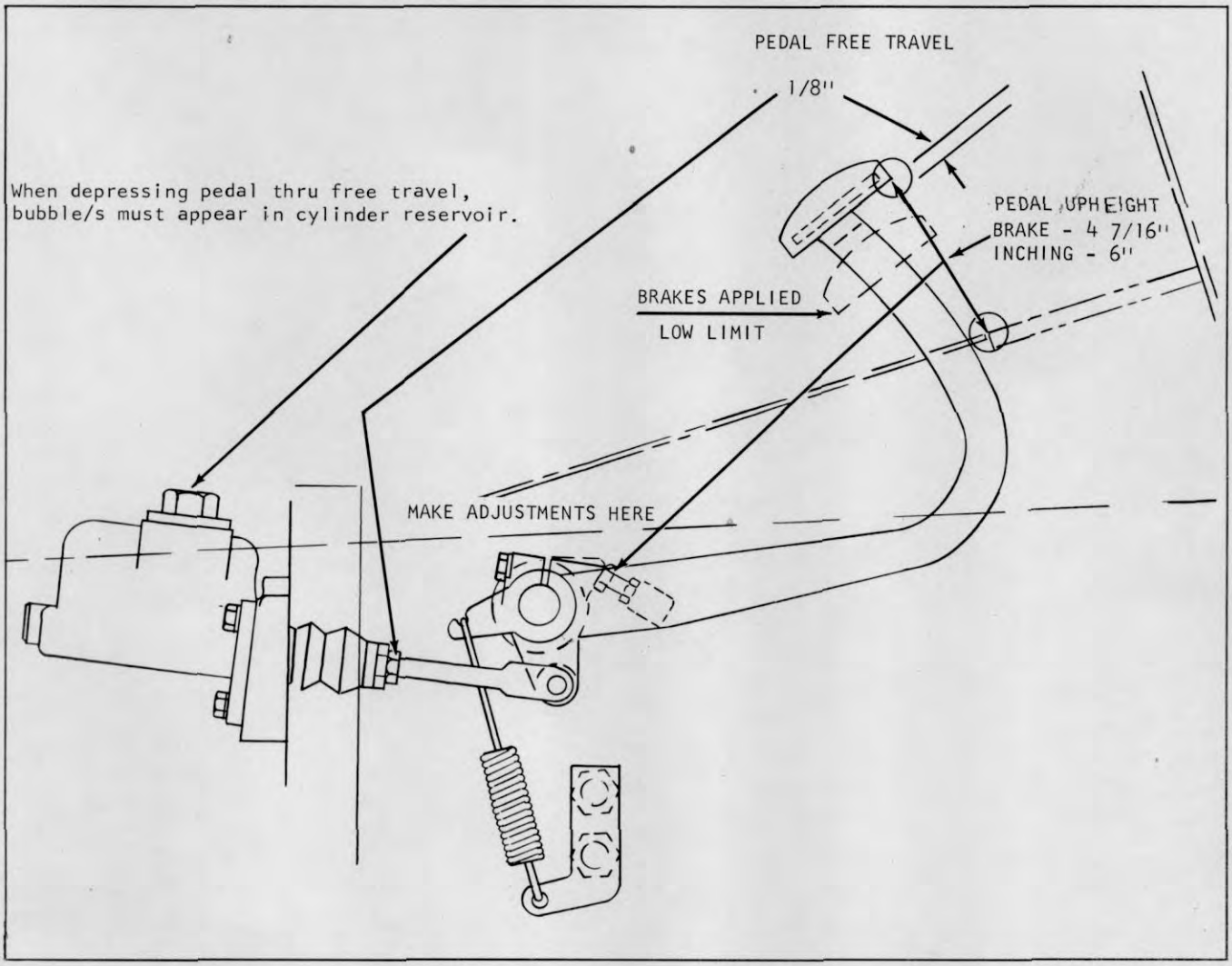


Plate 9753. Typical Pedal Adjustment

BRAKE/INCHING PEDAL FREE TRAVEL C500-35,45,55D:

Check the brake pedal free travel by; placing a ruler in front of the pedal, letting it rest on the floor plate. Push pedal down by hand until resistance from the master cylinder is felt. Distance traveled should be no more or no less than 1/8". Any distance traveled other than this requires an adjustment. This adjustment is accomplished by loosening the lock nut and turning the clevis as shown above.

BRAKE/INCHING PEDAL UPHEIGHT:

Pedal upheight must be that shown above which is measured at the same place as free travel, but pedal must be in the up position. If adjustment is necessary, adjust stop bolt as shown above.

ACTUATION STROKE:

If brake pedal travels beyond "low limit", this could indicate either: lack of fluid, air in the system, or brake linings need adjustment.

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 CORRECT BRAKE ADJUSTMENT IS IMPORTANT FOR x
x x
x SAFE OPERATING CONDITIONS. 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

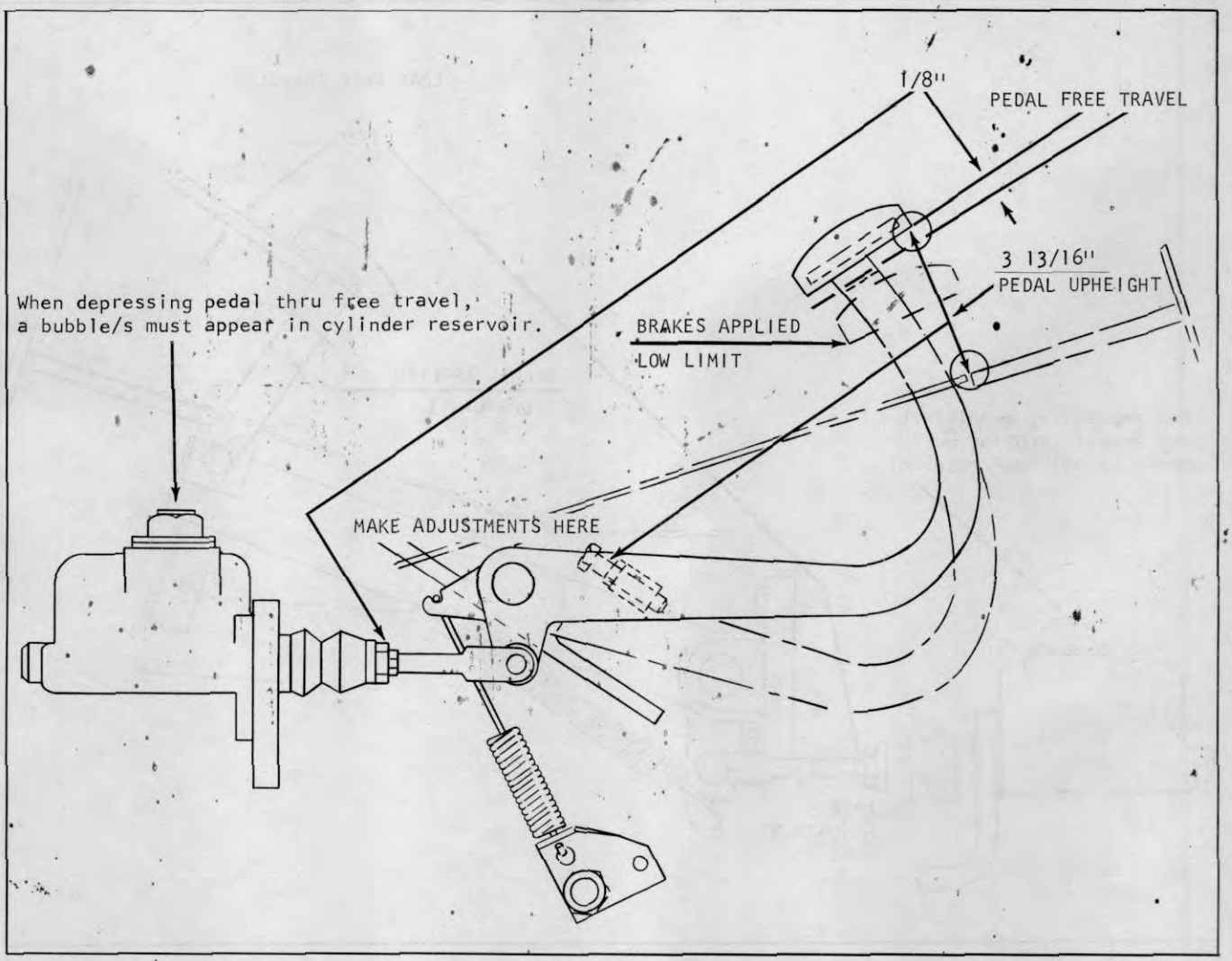


Plate 9754. Typical Pedal Adjustment

BRAKE/INCHING PEDAL FREE TRAVEL C500H-35,45,55D:

Check the brake pedal free travel by; placing a ruler in front of the pedal, letting it rest on the floor plate. Push pedal down by hand until resistance from the master cylinder is felt. Distance traveled should be no more or no less than 1/8". Any distance traveled other than this requires an adjustment. This adjustment is accomplished by loosening the lock nut and turning the clevis as shown above.

BRAKE PEDAL UPHEIGHT:

Brake pedal upheight must be 3 13/16", which is measured at the same place as free travel, but pedal must be in the up position. If adjustment is necessary, adjust stop bolt as shown above.

ACTUATION STROKE:

If brake pedal travels beyond "low limit", this could indicate either: lack of fluid, air in the system, or brake linings need adjustment.

```
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  CORRECT BRAKE ADJUSTMENT IS IMPORTANT FOR          x
x                                                     x
x  SAFE OPERATING CONDITIONS.                         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
```

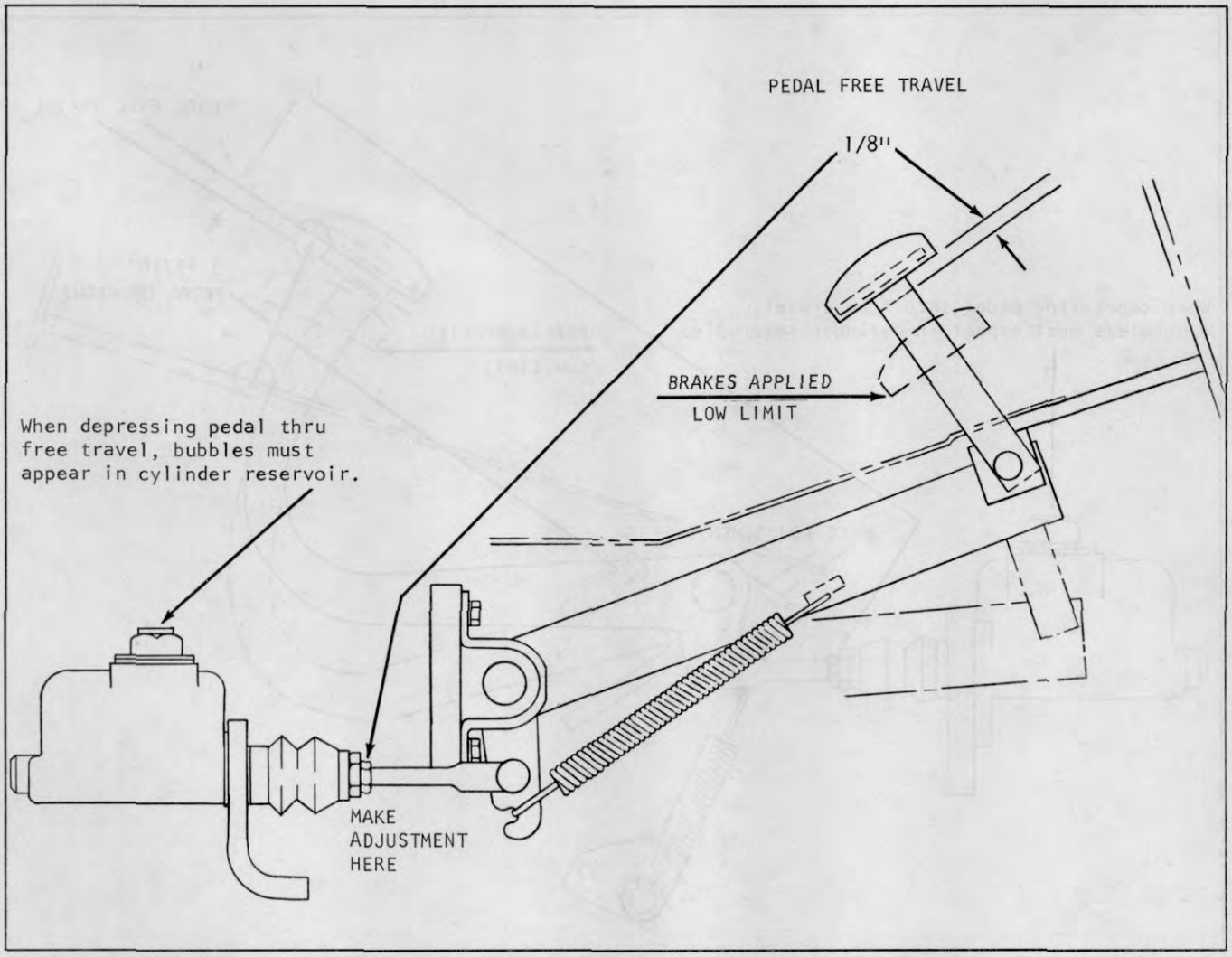


Plate 9755. Typical Pedal Adjustment

BRAKE/INCHING PEDAL FREE TRAVEL C500(H)Y45,55D:

Check the brake pedal free travel by; placing a ruler in front of the pedal, letting it rest on the floor plate. Push pedal down by hand until resistance from the master cylinder is felt. Distance traveled should be no more or no less than 1/8". Any distance traveled other than this requires an adjustment. This adjustment is accomplished by loosening the lock nut and turning the clevis as shown above.

ACTUATION STROKE:

If brake pedal travels beyond "low limit", this could indicate either: lack of fluid, air in the system, or brake linings need adjustment.

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 CORRECT BRAKE ADJUSTMENT IS IMPORTANT FOR x
x x
x SAFE OPERATING CONDITIONS. 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

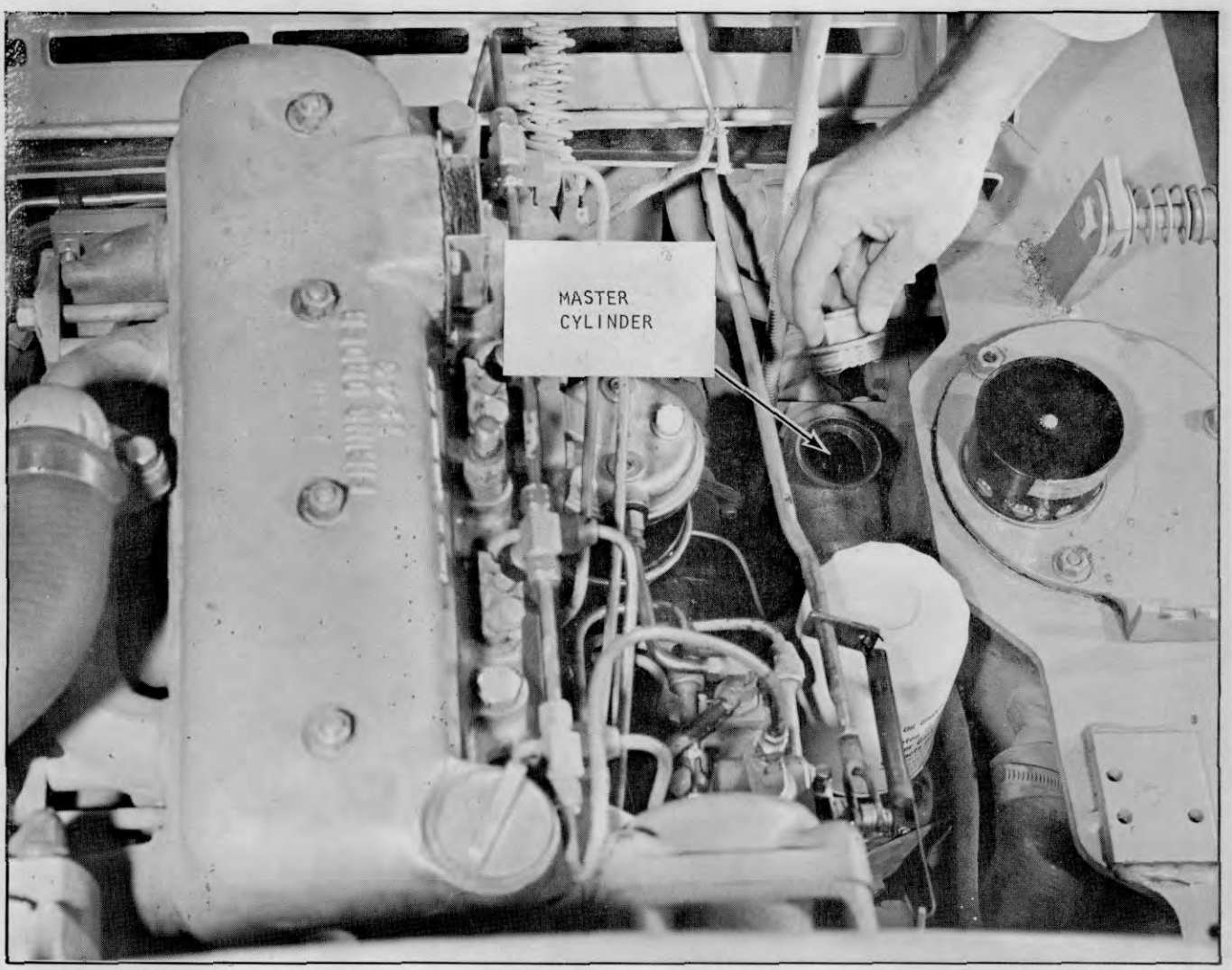


Plate 10181. Typical Master Cylinder

MASTER CYLINDER:

Check the brake fluid level in the master cylinder. The 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 number 1800200).

Check the master cylinder filler cap vent hole for obstructions. Vent must be open at all times. Clean if necessary.

BRAKE PEDAL:

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 CORRECT BRAKE PEDAL FREE TRAVEL IS IMPOR- x
x x
x TANT 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 x x

An improperly adjusted pedal 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. This will cause lining wear and excessive fuel consumption.

Plate 10182. Typical Inching Master Cylinder

INCHING MASTER CYLINDER:

Check the brake fluid level in the inching master cylinder. The 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 number 1800200).

Check the inching master cylinder filler cap vent hole for obstructions. Vent must be open at all times. Clean if necessary.

INCHING/BRAKE PEDAL:

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 CORRECT BRAKE PEDAL FREE TRAVEL IS IMPOR- x
x x
x TANT 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 x x x

An improperly adjusted pedal will block the internal ports so that upon releasing the brake pedal, fluid will be trapped in the liner and hold the brake linings in contact with the brake drums. This will cause lining wear and excessive fuel consumption.

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, proceed as follows:

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 KEEP CLEAR OF LOAD AND CARRIAGE WHEN X
X X
X MAKING ADJUSTMENTS TO AVOID INJURY IF X
X X
X ANY MALFUNCTION SHOULD OCCUR AND CAUSE X
X X
X LOAD OR CARRIAGE TO FALL. 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

1. Elevate carriage to about 4 feet.

2. Smear grease on the innerslide channel as shown in Plate 8622.

3. Pick up a capacity load.

N O T E

It is important that the chain adjustment be made with a capacity load. In this manner you will allow for chain stretch.

4. Making sure upright is either vertical or aft of vertical, lower load to the bottom.

5. Remove capacity load.

6. Raise carriage and measure the distance from where the center of the bottom carriage roller stopped, to the bottom edge of the inner slide. Distance must not be less than 1/2".

LUBRICATE MACHINE

Lubricate all miscellaneous linkage with SAE 20 oil and all grease fittings with chassis grease. (Refer to Lubrication Chart.)

C A U T I O N

WHEN LUBRICATING MACHINE INSPECT FOR LEAKING

HYDRAULIC LINES, FITTINGS, AND ELECTRICAL WIRING.

HYDRAULIC CONTROL VALVE AND LINES

Inspect for damage, leakage and security of mounting.

LIFT BRACKET

Inspect for damage, bent forks, etc.

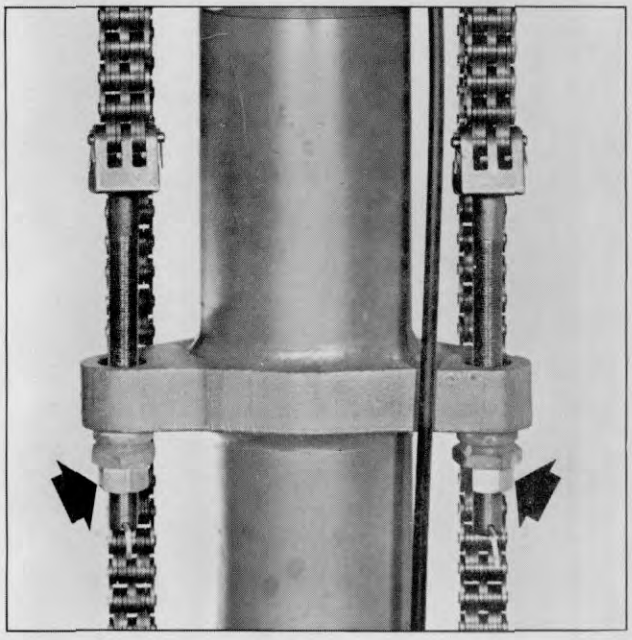


Plate 6634. Lift Chain Adjustment (Chain Anchor Rods)

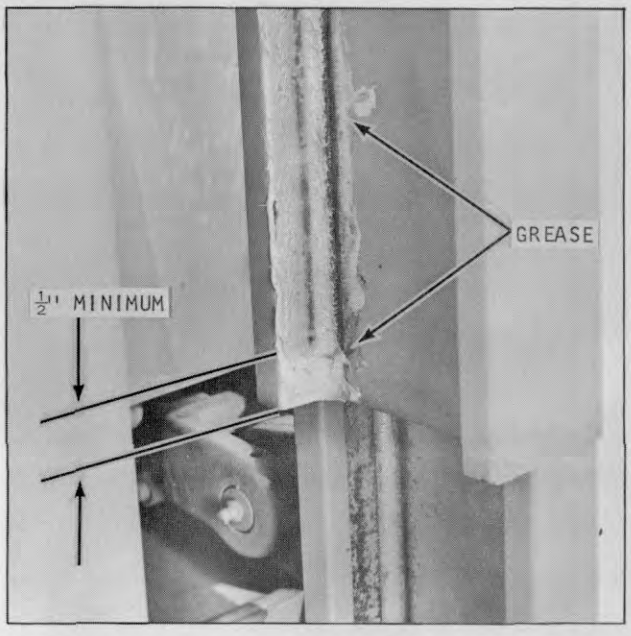


Plate 8622. Lift Chain Adjustment

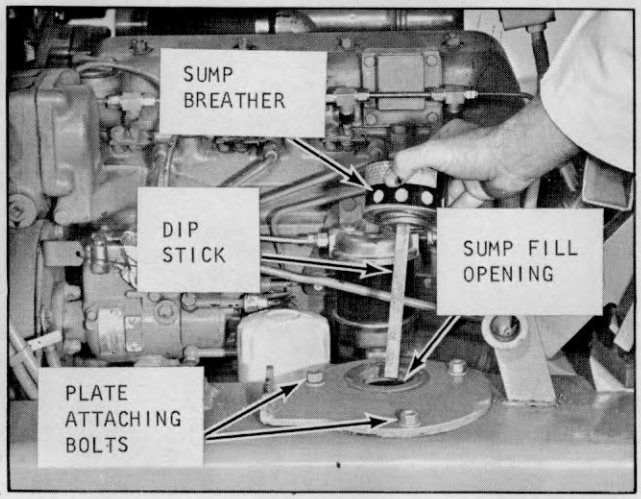


Plate 10180. Typical Hydraulic Sump Breather

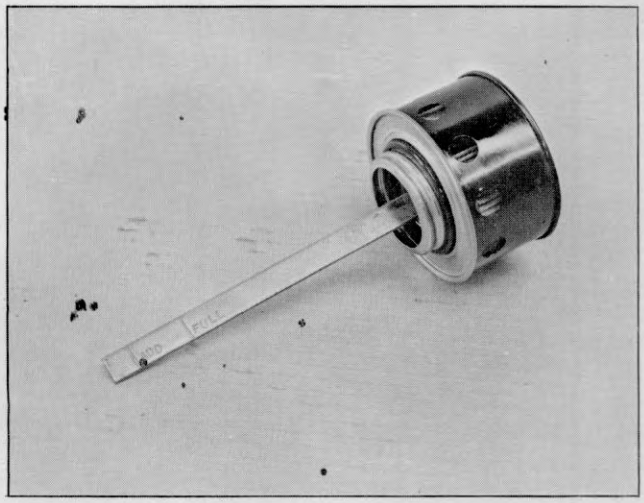


Plate 9736. Typical Hydraulic Sump Tank Dipstick

HYDRAULIC SUMP TANK BREATHER:

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

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 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

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.

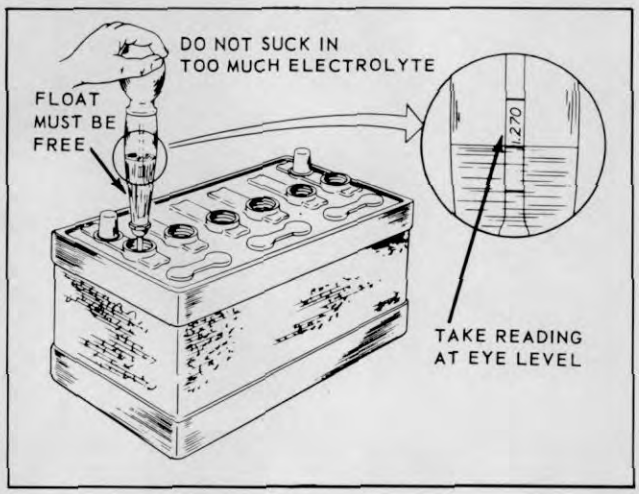


Plate 6271. Checking
Specific Gravity of Battery

Make sure that all connections are tight at battery, starter, generator 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. (Turning two headlights on low beam will equal the 10 ampere load - this method may be used in place of the load placed across the terminals)

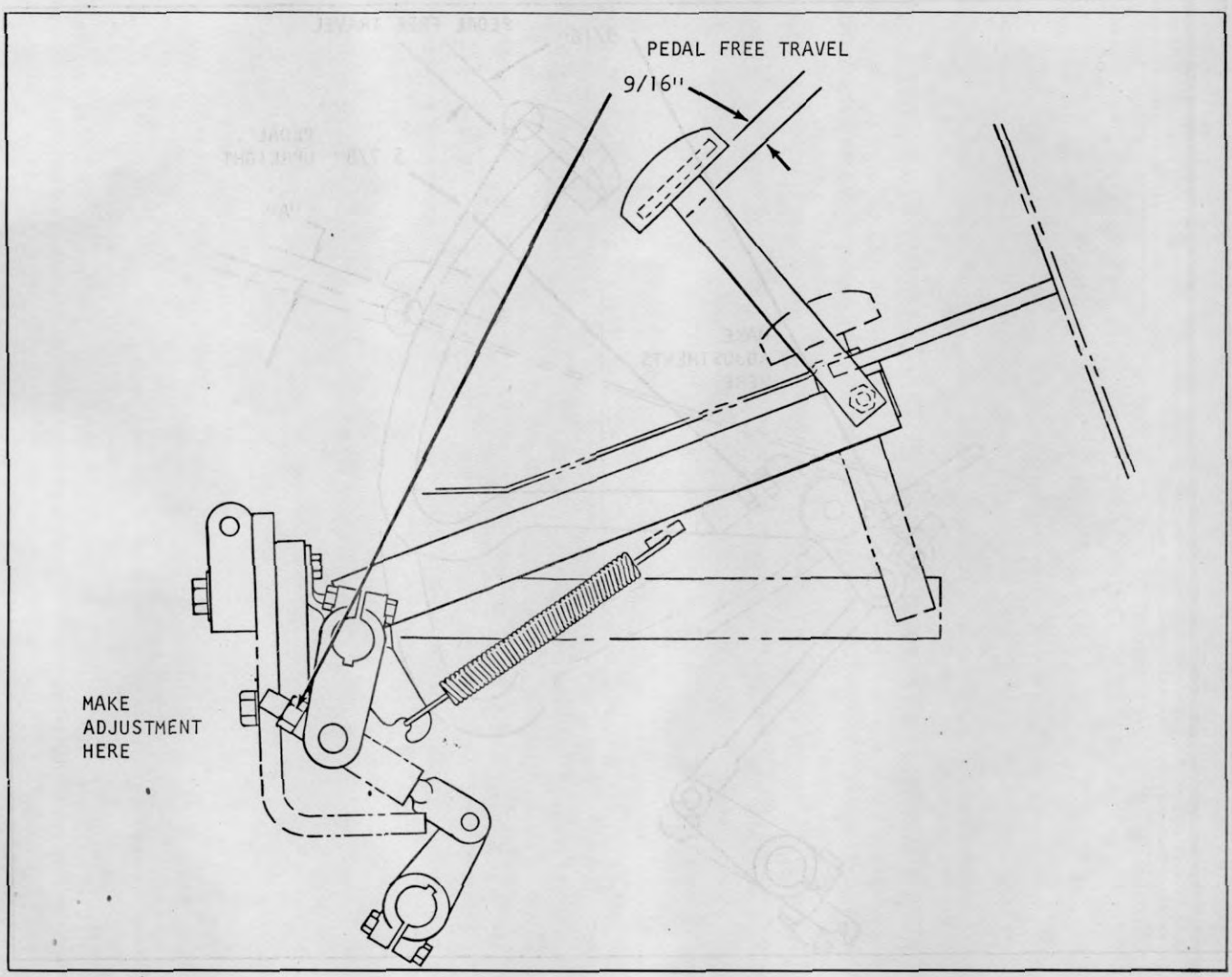


Plate 9756. Typical Pedal Adjustment

CLUTCH PEDAL FREE TRAVEL CHECK
C500(H)Y45,55D:

Place a ruler in front of the clutch, resting one end on the floor plate and gently, by hand, depress clutch pedal until resistance is felt. Measure this distance. It should be 9/16". If not then an adjustment is necessary.

Refer to TS 309 and make the adjustment.

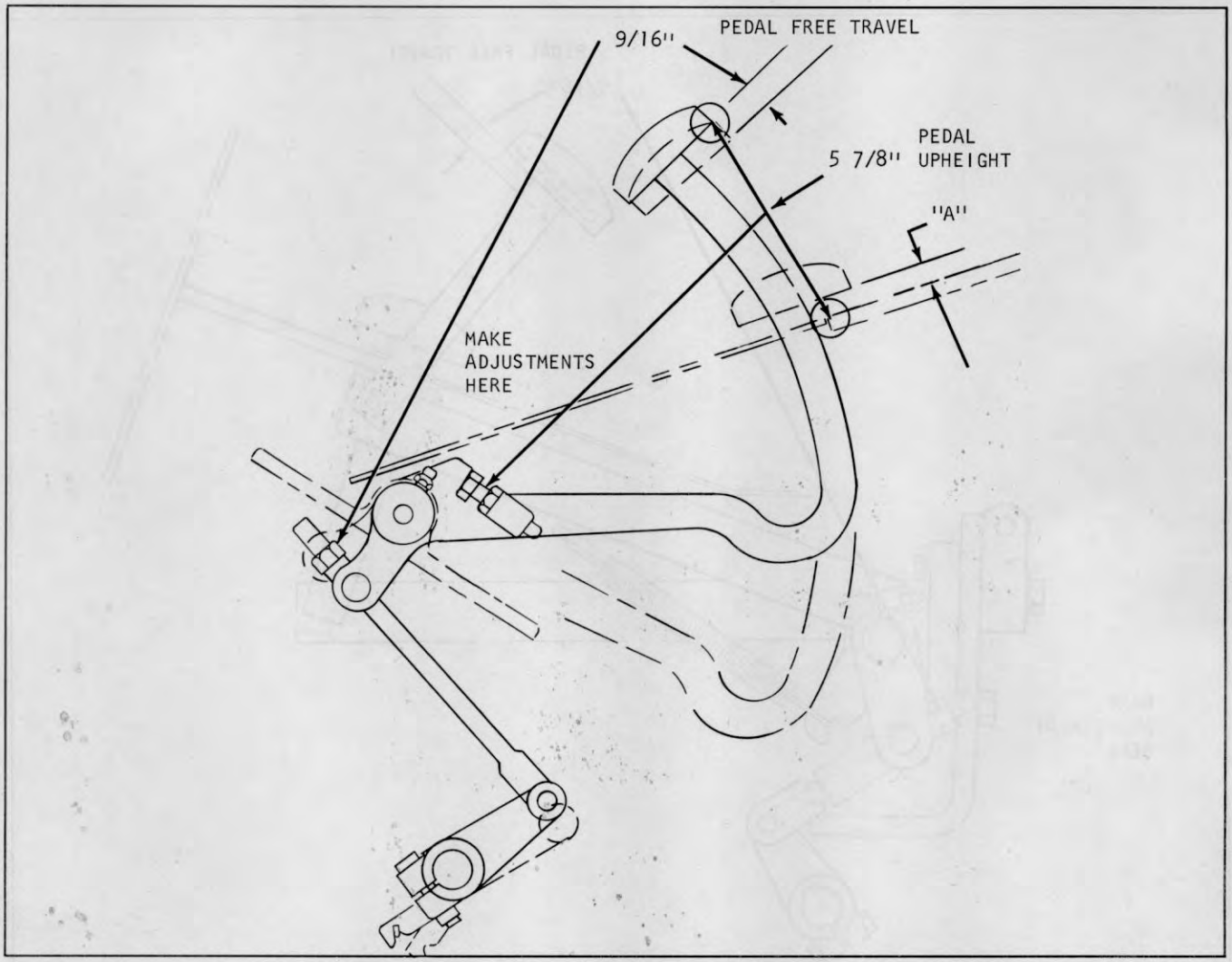


Plate 9757. Typical Pedal Adjustment

CLUTCH PEDAL FREE TRAVEL CHECK
C500(H)35,45,55D:

Place a ruler in front of the clutch, resting one end on the floor plate and gently, by hand, depress clutch pedal until resistance is felt... measure this distance....it should be 9/16". If not, then an adjustment is necessary.

Refer to Trouble Shooting Section (page TS 310) located in the rear of this manual for adjustment procedures.

CLUTCH PEDAL UPHEIGHT CHECK:

First push clutch pedal down till it bottoms out. Measure the distance between the floor plate and the front bottom edge of the pedal... add this dimension to 5 7/8". The sum of these two dimensions is your clutch pedal upheight dimension. Release the clutch pedal and measure the total upheight as shown in illustration.

If adjustment is necessary, refer to TS 310.

INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE

ENGINE OIL.....
SAE 10W ---- 0 deg. to 32 deg. F.
SAE 20W ---- 33 deg. to 75 deg. F.
SAE 30 ----- above 75 deg. F.

Use oils which meet or exceed API service DS (series 3) requirements or MIL-L-45199A.

Shell Rimula Motor Oil
Sunfleet S-3 Motor Oil
Gulf Super Duty Motor Oil
Citgo C-500
URSA S-3 Motor Oil
Purol Super Heavy Duty Motor Oil....or the equivalent to the above....

TRANSMISSION FLUID.....
Automatic Transmission Fluid, Type "A", Suffix "A". Fluid Containers must display a qualification number prefixed by AQ-ATF. Clark Part Number 879803. Automatic Transmissions and Hydracool Clutch....Standard Transmissions. Transmission/Axle Adaptor/Power Steering System have a common sump. (Alternate fluid: Dexron)

Shell Automatic Transmission Fluid Donax T-6
Sunoco Automatic Trans. Fluid Type "A", Suffix "A"
Sinclair Automatic Trans. Fluid Type "A", Suffix "A"
Gulf Automatic Trans. Fluid Type "A", Suffix "A"
AMOCO Automatic Trans. Fluid Type "A", Suffix "A"
Citgo Automatic Trans. Fluid Type "A", Suffix "A"
Texamatic Automatic Trans. Fluid Type "A" 1826-3528
Purelube Automatic Trans. Fluid Type "A", Suffix "A" or the equivalent to the above....

BRAKE MASTER CYLINDERS.....
SAE 70R3 (Heavy Duty Brake Fluid), Clark Part Number 1800200.
R.H. Brake Master Cylinder....and, Inching/Brake Master Cylinder.

Shell Super Heavy Duty Hydraulic Brake Fluid
Gulf Heavy Duty Hydraulic Brake Fluid
Atlas Heavy Duty Hydraulic Brake Fluid
Texaco Super Heavy Duty Hydraulic Brake Fluid
Pure Super Heavy Duty Hydraulic Brake Fluid
or the equivalent to the above.....

HYDRAULIC SUMP TANK.....
Hydraulic Fluid per Clark Specifications MS-68.
Clark Part Number 885385.

Shell LO Hydrax 127
Sunvis Industrial Oil #816 WRP
Gulf Harmony 43 AW
AMOCO Industrial Oil RL #14A
Citgo Pacemaker XD-15 MS-68 Hydraulic Oil
Texaco 729 Rando Oil HD-A
Puropale RX Hydraulic Oil #150
Molub-Alloy Industrial Hydraulic Oil #601
or the equivalent to the above.....

AXLE END/STEER WHEEL BEARINGS.....
NLGI #1 or NLGI #2....A smooth multi-purpose grease or refined mineral oil blended with a lithium soap thickner containing anti-wear, anti-rust and anti-oxidants with "EP" additives. To meet or exceed Clark Specifications MS-107 and Timken Test 40# minimum.

Shell Aluania "EP" Grease #1 or #2
Sun Prestige 741 "EP" #1 or 742 "EP" #2
Gulfcrown Grease "EP" #1 or #2
Amolith Grease "EP" #1 or #2
Citgo HEP Grease #1 or #2
Texaco Multifak "EP" #1 or Marfak All Purpose #2
Poco HT Grease "EP" #1 or #2
Molub-Alloy General Purpose Grease #1 or #2
or the equivalent to the above.....

CHASSIS LUBRICANT .....
NLGI #2 (same as stated above)

NLGI #2 (refer to the above)

CHAIN LUBE.....
Lift Chain Lube, Clark Part Number 886399.

OIL FILTERS.....
Oil Filter Cartridge Kit.
Engine Oil Filter/Hydraulic Sump Tank Fluid Filter/Transmission Fluid Filter.

<u>Technical Societies in Reference</u>:

AGMA..American Gear Manufacturers Association
API....American Petroleum Institute
ASTM...American Society for Testing Materials
ICEI...Internal Combustion Engine Institute
MIL...Military Specification
NGPA..Natural Gas Processors Association
NLGI..National Lubricating Grease Institute
SAE....Society of Automotive Engineers

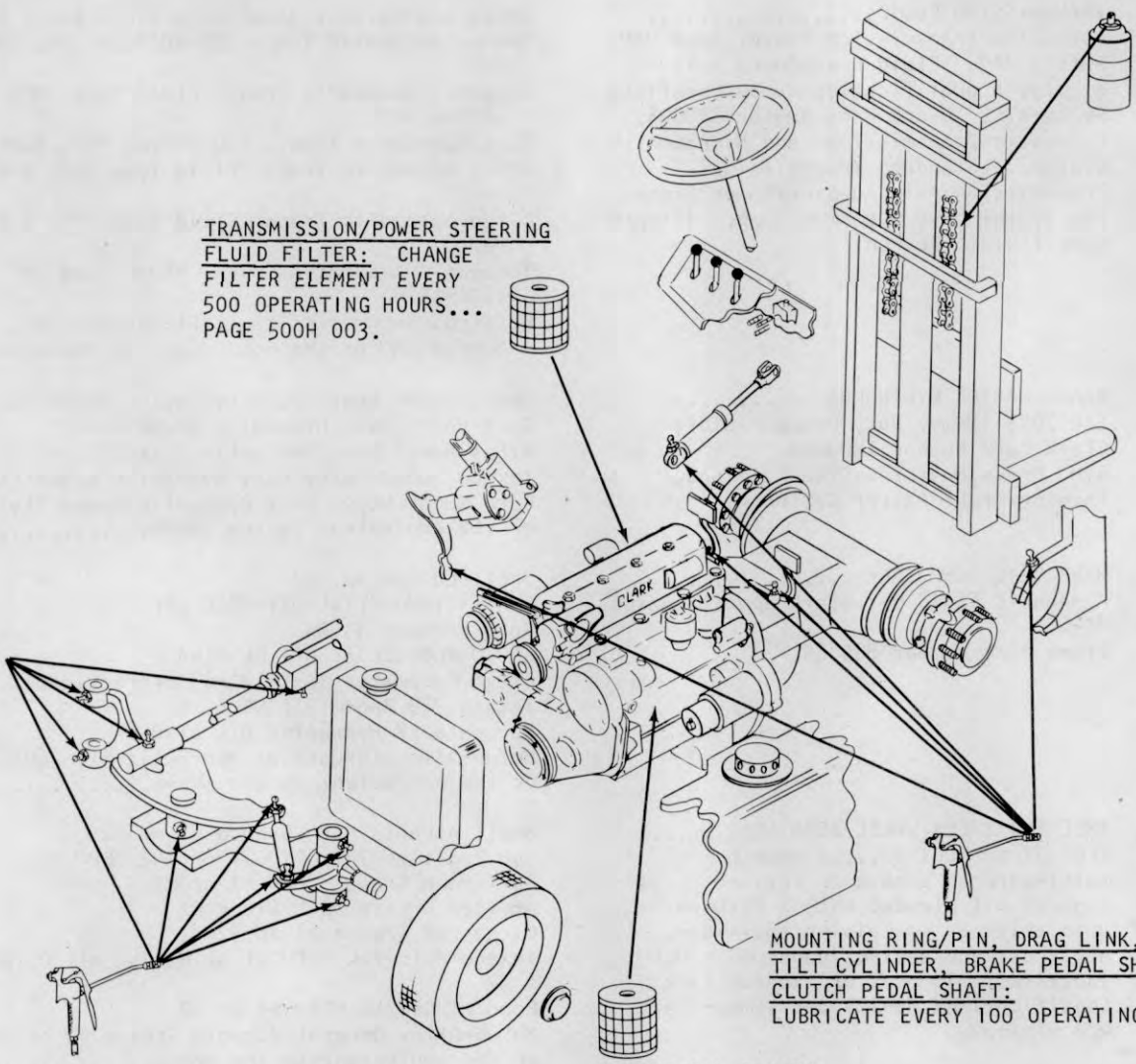
N O T E

WIPE GREASE FITTINGS FREE OF DIRT BEFORE APPLYING A GREASE GUN.

STEAM CLEAN MACHINE EVERY 500 OPERATING HOURS.

LIFT CHAINS:
LUBRICATE EVERY 100 OPERATING HOURS... EXCEPT WHEN OPERATING IN AN ABRASIVE ATMOSPHERE.

TRANSMISSION/POWER STEERING FLUID FILTER: CHANGE FILTER ELEMENT EVERY 500 OPERATING HOURS... PAGE 500H 003.



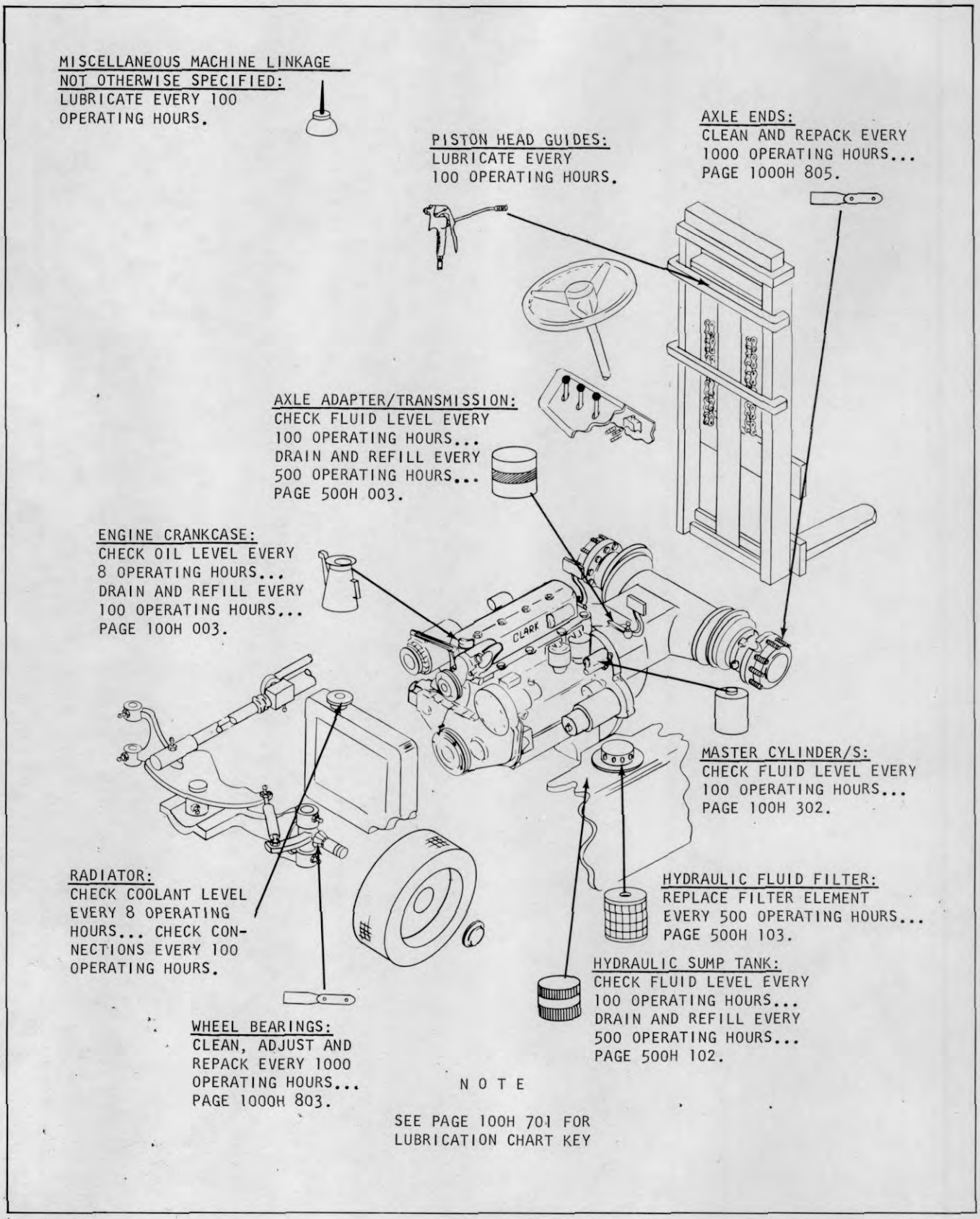
MOUNTING RING/PIN, DRAG LINK, TILT CYLINDER, BRAKE PEDAL SHAFT, CLUTCH PEDAL SHAFT:
LUBRICATE EVERY 100 OPERATING HOURS.

STEER SPIDER, KNUCKLE PINS, TIE RODS AND DRAG LINK:
LUBRICATE EVERY 100 OPERATING HOURS.

ENGINE OIL FILTER:
CHANGE FILTER ELEMENT EVERY 100 OPERATING HOURS... PAGE 100H 003.

N O T E

SEE PAGE 100H 701 FOR LUBRICATION CHART KEY

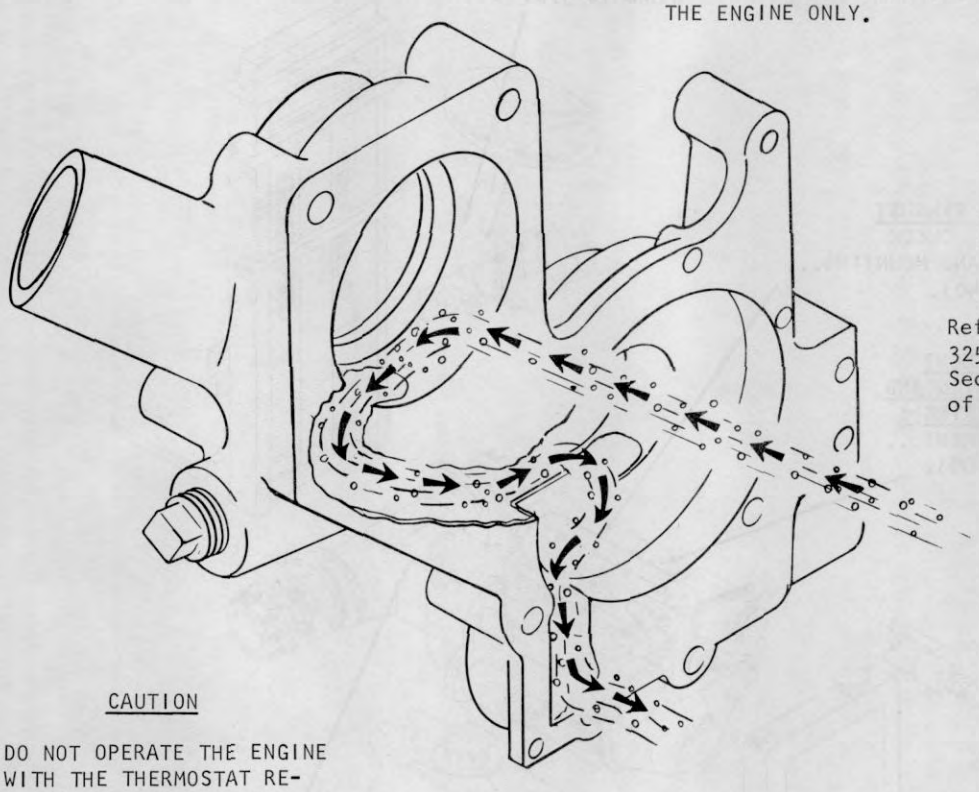


N O T E

SEE PAGE 100H 701 FOR LUBRICATION CHART KEY

CAUTION

DO NOT REMOVE THERMOSTAT FOR ANY REASON AND RUN ENGINE.....THE ENGINE WILL OVERHEAT CAUSING SERIOUS DAMAGE. AS YOU CAN SEE BELOW...REMOVING THERMOSTAT WILL ALLOW THE WATER TO BY-PASS THE RADIATOR AND CIRCULATE THROUGH THE ENGINE ONLY.



CAUTION

DO NOT OPERATE THE ENGINE WITH THE THERMOSTAT REMOVED.....SEE ABOVE.

N O T E

Refer to pages TS-322 and 325 in the Trouble Shooting Section located in the back of this manual.

500 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION.

MACHINE NUTS, BOLTS AND CAPSCREWS: CHECK SECURITY OF MOUNTING... PAGE 500H 403.

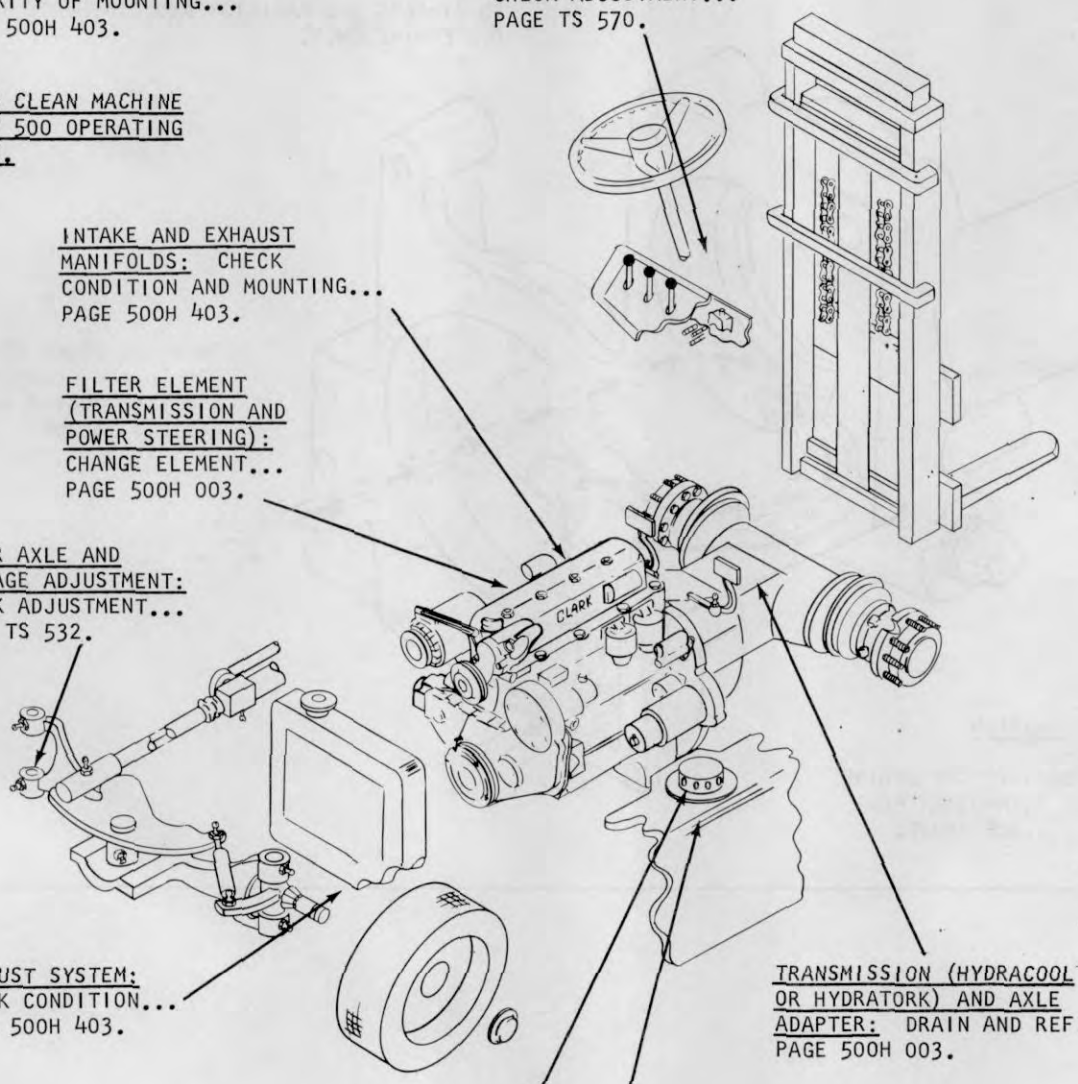
STEAM CLEAN MACHINE EVERY 500 OPERATING HOURS.

STEERING GEAR: CHECK ADJUSTMENT... PAGE TS 570.

INTAKE AND EXHAUST MANIFOLDS: CHECK CONDITION AND MOUNTING... PAGE 500H 403.

FILTER ELEMENT (TRANSMISSION AND POWER STEERING): CHANGE ELEMENT... PAGE 500H 003.

STEER AXLE AND LINKAGE ADJUSTMENT: CHECK ADJUSTMENT... PAGE TS 532.



EXHAUST SYSTEM: CHECK CONDITION... PAGE 500H 403.

TRANSMISSION (HYDRACOOL OR HYDRATORK) AND AXLE ADAPTER: DRAIN AND REFILL... PAGE 500H 003.

SUMP TANK FILTER: CHANGE ELEMENT... PAGE 500H 103.

HYDRAULIC SUMP TANK: DRAIN AND REFILL... PAGE 500H 102.

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

LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION

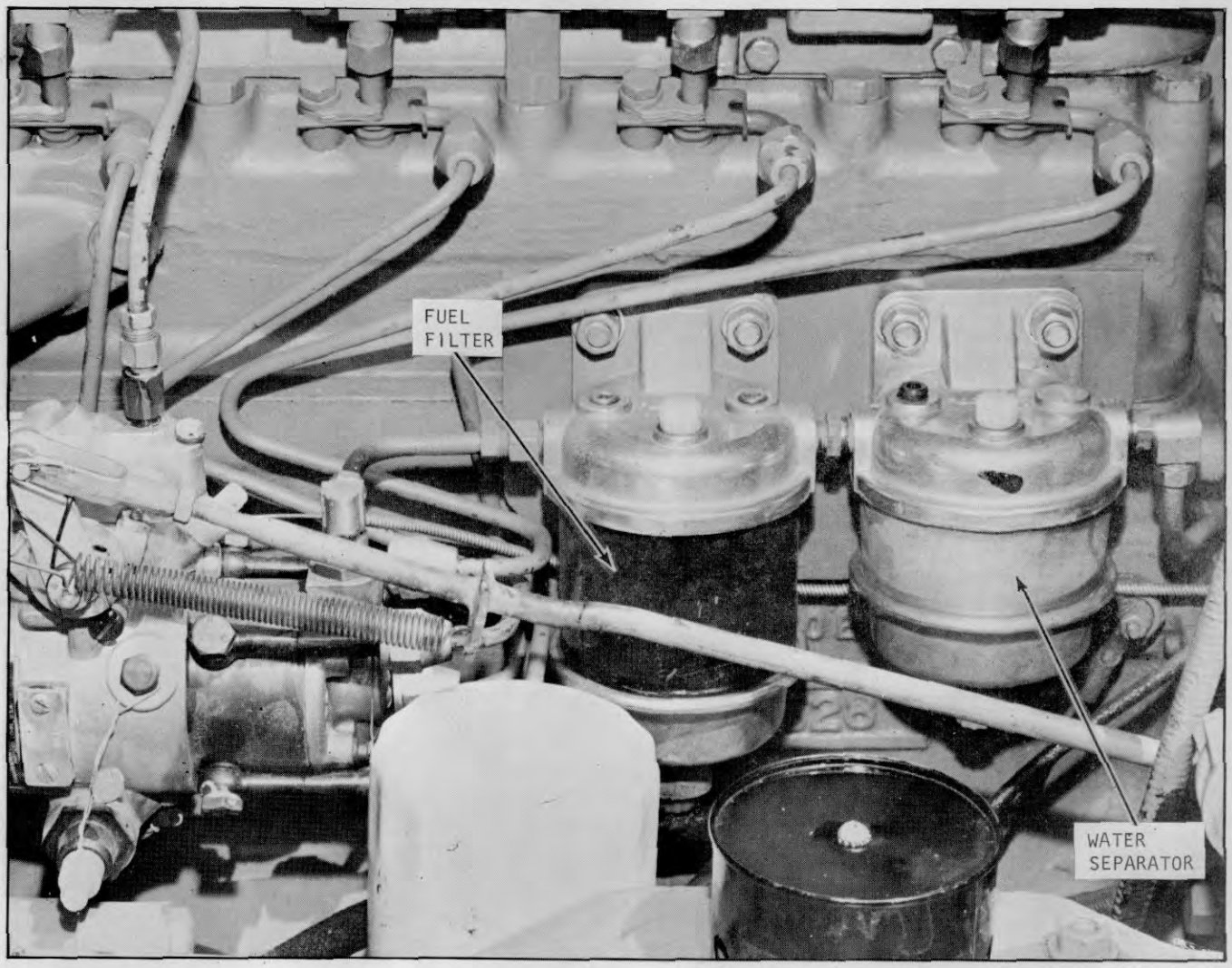


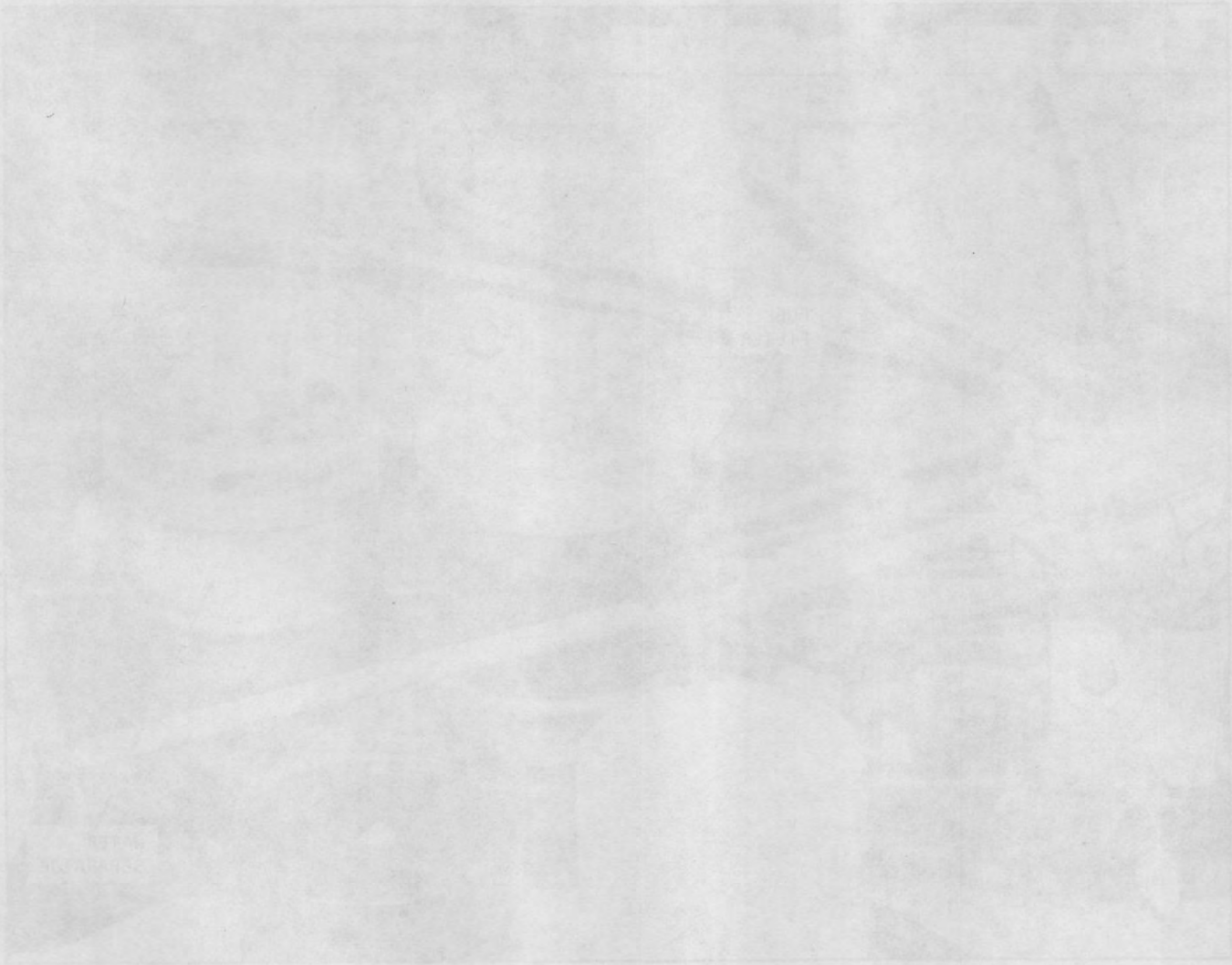
Plate 10196. Typical Fuel Filter

FUEL FILTER:

Prior to entering the injection pump, and after leaving the transfer pump, the fuel passes through a water separator and a filter designed to remove very minute particles. Approximately every 500 hours the element in this filter should be replaced with a new one. To assist in venting air from the filter shell, the cover has a vent fitting that may be opened. Close this vent after using.

WARNING

A CERTAIN AMOUNT OF FUEL WILL ESCAPE WHEN THE FILTER HOUSING IS REMOVED. A PRECAUTION SHOULD BE TAKEN TO CATCH AND CONTAIN THIS FUEL. ALSO, THE ENGINE SHOULD BE COLD AND THERE SHOULD NOT BE PRESENT IN THE AREA ANY FORM OF OPEN FLAME OR SPARK WHICH COULD POSSIBLY IGNITE THE GASOLINE FUMES.



TRANSMISSION AND POWER STEERING SYSTEM FLUID FILTER:

The fluid filter is of the throw-away type. The element should be discarded whenever fluid is drained. To remove element, simply unscrew.

To install a new element:

1. First smear a little oil on the element seal.

2. Turn element on till seal touches facing.

3. Then turn element 3/4 of a turn more.

N O T E

A new filter should be installed whenever the fluid is drained or whenever a repair to the transmission is made.

Plate 10183. Typical Transmission Filter

CONVERTER (MACHINES SO EQUIPPED), AXLE ADAPTOR, TRANSMISSION AND TRANSMISSION SUMP SCREENS:

1. The transmission, axle adaptor and power steering have a common lubrication system and should be drained at operating temperature. Remove both drain plugs to facilitate complete draining (see Plates 9861 and 9772....next page).

2. Clean plug of all foreign material. See Plate 9861.

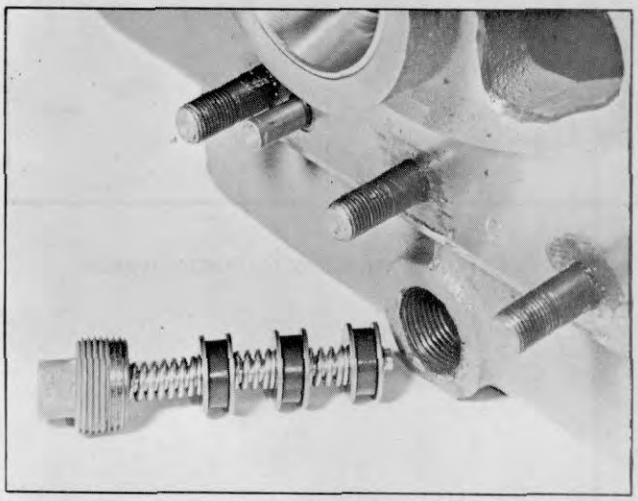


Plate 9861. Transmission Drain Plug

3. Remove and clean transmission sump screens. Check O-rings for damage, nicks, scratches....replace O-rings if found in this condition. Use a Stoddard type cleaning solvent to clean the screens. Blow dry with compressed air....directing air stream from inside ....outward thru screen.

4. Install screens and sump drain plug to bottom of transmission and axle adaptor.

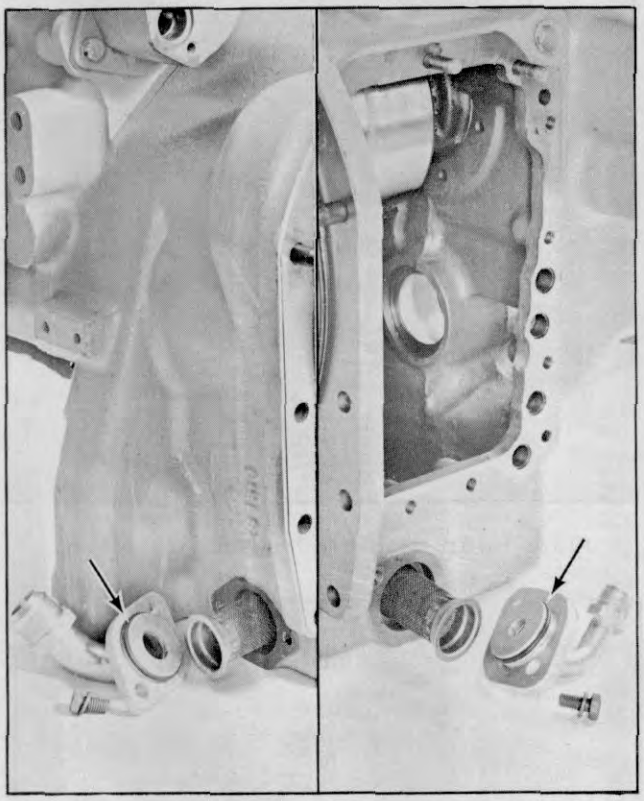


Plate 9860. Transmission Sump Screens

5. Replace drain plugs and refill transmission thru the dipstick opening on the axle adaptor with Type "A", Suffix "A" Automatic Transmission Fluid [Clark Part Number 879803. Fluid containers must display a qualification number prefixed by "AQ-ATF"].

6. Operate engine at fast idle for approximately 4 minutes to distribute lubricant throughout the system.

7. Shut down engine and check fluid level with dipstick. Add fluid as required to bring the level to the full mark on the dipstick.

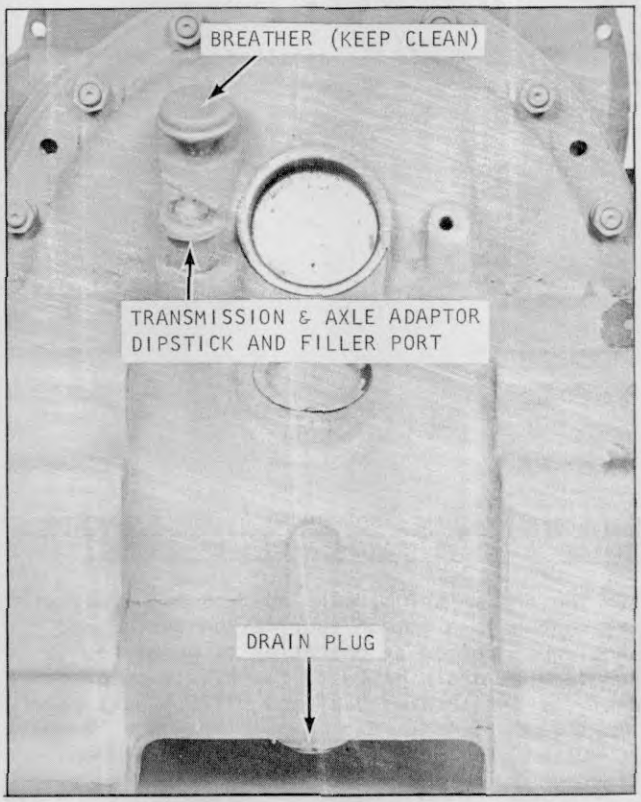


Plate 9772. Axle Adaptor/Transmission Dipstick, Breather and Adaptor Drain Plug

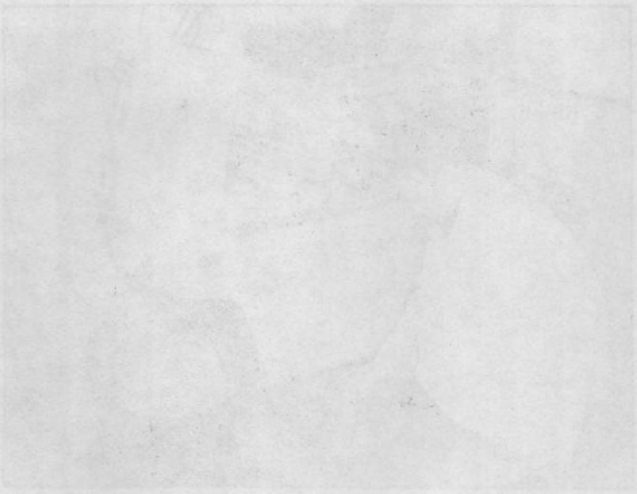


Plate 9773. Typical Sump Tank Drain

Plate 9794. Typical Sump Tank Drain

N O T E

After flushing and before refilling the sump tank.....replace the sump tank drain plug.

HYDRAULIC SUMP TANK

1. Lower upright and shut engine off.

2. Remove the plug at the pressure check point of the main control valve as shown above.

3. Connect a hose to the valve that reaches a 10 gallon container.

4. Place the end of the hose in the container and run engine at IDLE speed (500 to 550 RPM) until the steady stream of fluid starts to bubble and/or spurt. IMMEDIATELY shut down engine or pump will be seriously damaged.

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.

5. Reinstall the plug at the pressure check point on the main control valve.

6. Place a flat pan under the sump tank large enough to hold the remaining supply of fluid.

7. Unscrew the sump tank drain plug and drain the remaining fluid.

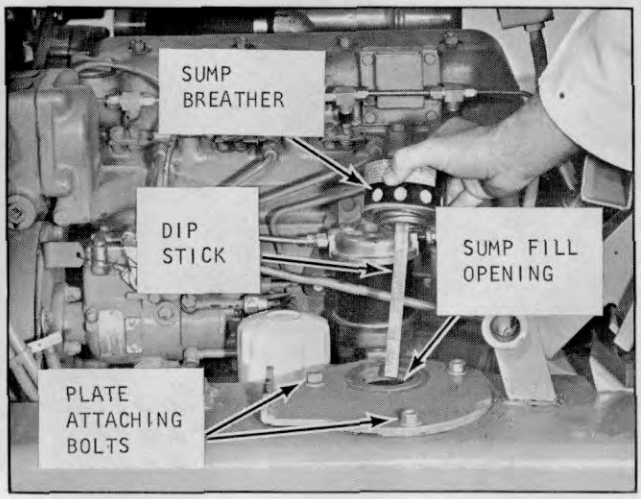


Plate 10180. Typical Hydraulic Filter Cover Plate

SUMP TANK FILTER:

1. Remove bolts that attach cover plate to top of sump tank.

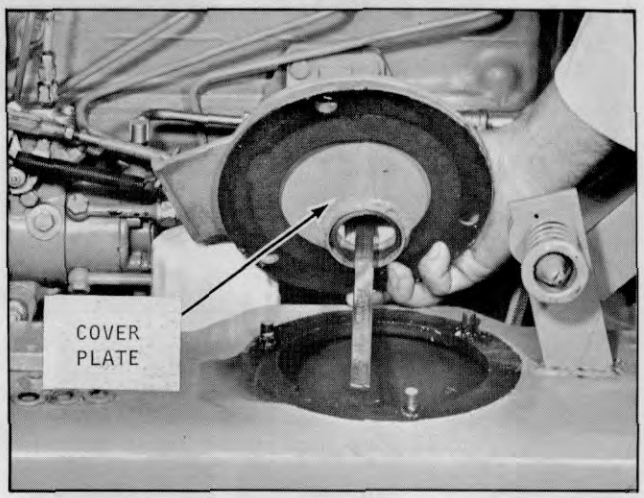


Plate 10184. Typical Hydraulic Filter Cover Plate

2. Lift off hydraulic sump tank filter plate.

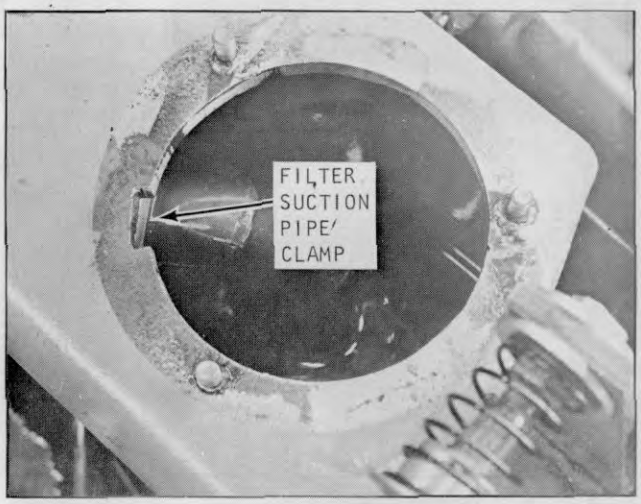


Plate 9622. Typical Hydraulic Filter Suction Pipe

3. Remove clamp from filter suction pipe.

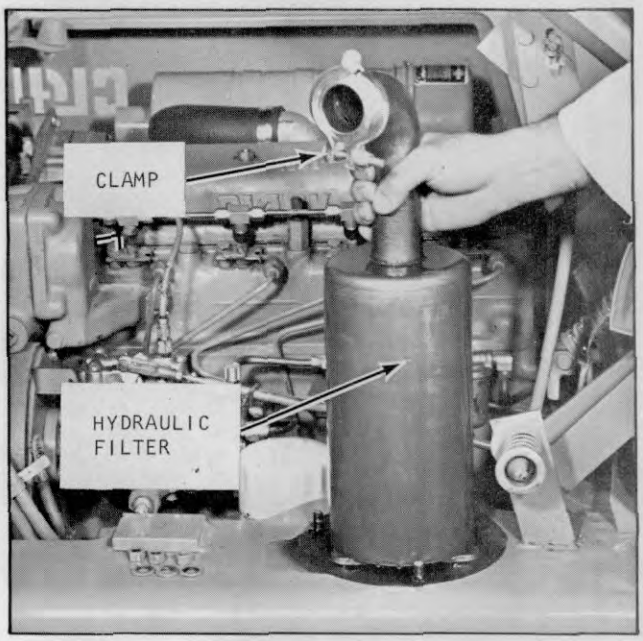


Plate 10185. Typical Hydraulic Filter

4. Lift filter assembly from sump tank.

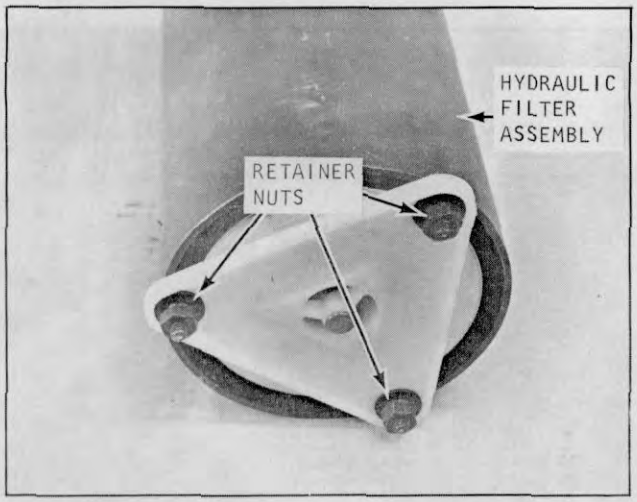


Plate 9733. Typical Hydraulic Filter Assembly

5. Remove filter element retainer nuts from filter assembly.

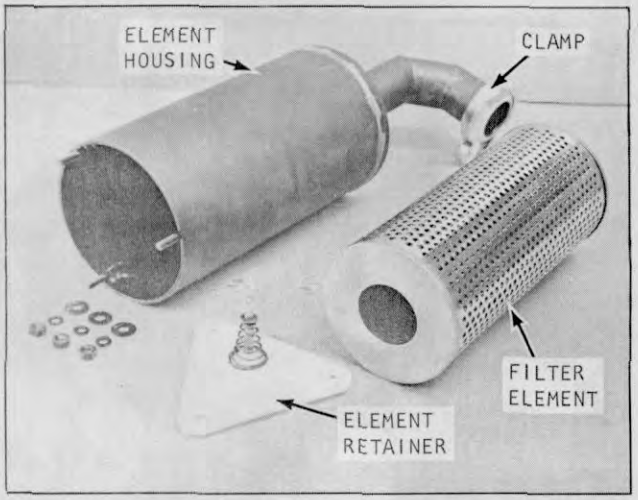


Plate 9734. Typical Hydraulic Filter Assembly

6. Remove filter element.

7. Flush sump tank with 2 quarts of clean hydraulic fluid. Be sure sump tank is absolutely clean.

8. Install a new filter element with seal area facing upward into filter case, (Plate 9741). After securing element in position with the element retainer plate and nuts (Plate 9733), install the filter assembly into the sump tank. Replace sump cover and tighten retainer bolts to 7 lb ft.

Plate 9741. Typical Filter Element

Plate 9735. Typical Hydraulic Sump Fill Procedure

9. Refill sump tank until level reaches the full mark shown on the dip stick. Use only hydraulic fluid per CLARK specifications, MS-68, CLARK part number 885385.

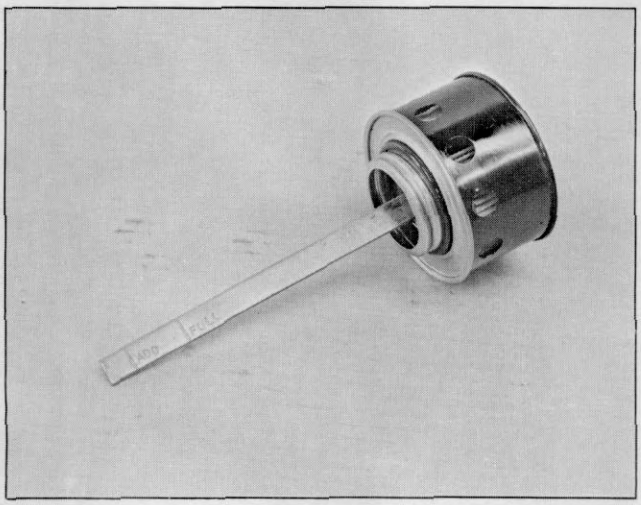


Plate 9736. Typical Hydraulic Sump Tank Dip Stick

C A U T I O N

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

STEERING ADJUSTMENT CHECK

1. Start engine, rotate steering hand wheel for a full turn....and hold....the steer pump should not operate over relief....when pump operates over relief, an audible hissing sound may be heard.

2. Now....rotate hand wheel for a full turn in the opposite direction and hold....again, pump should not operate over relief.

If pump operates over relief, a steering adjustment must be made. Refer to Trouble Shooting Section (page TS-532) located in the rear of this manual.

INTAKE AND EXHAUST MANIFOLDS:

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

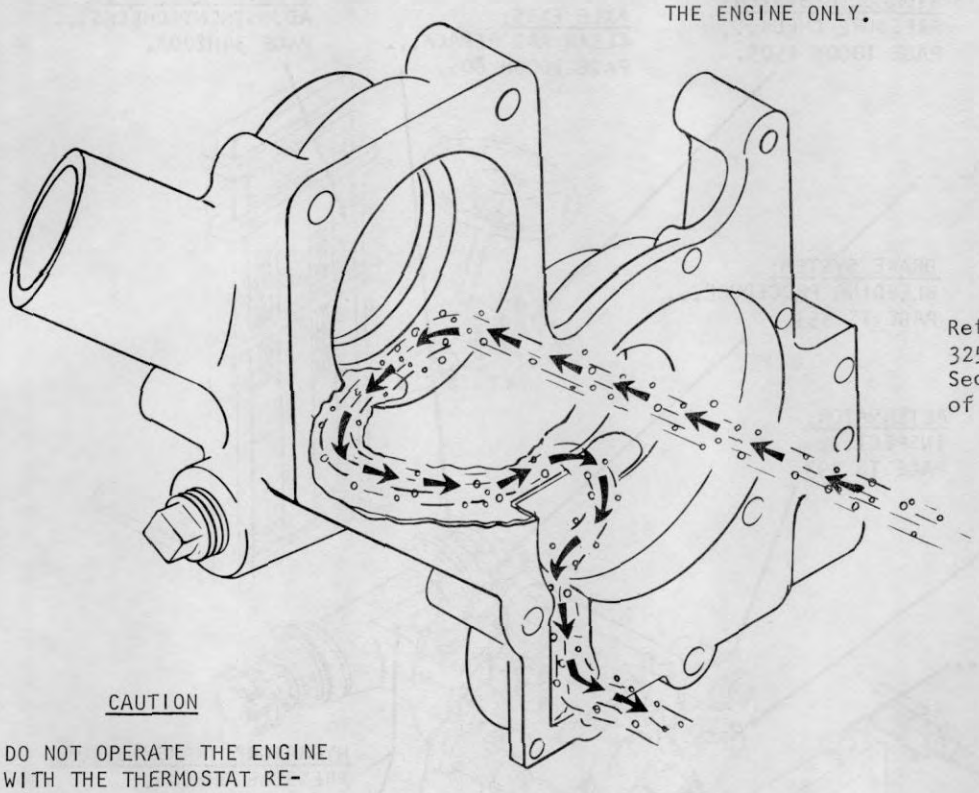
2. Inspect exhaust pipe and muffler for damage, leakage and security of mountings.

NUTS, BOLTS AND CAPSCREWS:

1. Check security of mounting. Tighten as required.

CAUTION

DO NOT REMOVE THERMOSTAT FOR ANY REASON AND RUN ENGINE.....THE ENGINE WILL OVERHEAT CAUSING SERIOUS DAMAGE. AS YOU CAN SEE BELOW...REMOVING THERMOSTAT WILL ALLOW THE WATER TO BY-PASS THE RADIATOR AND CIRCULATE THROUGH THE ENGINE ONLY.



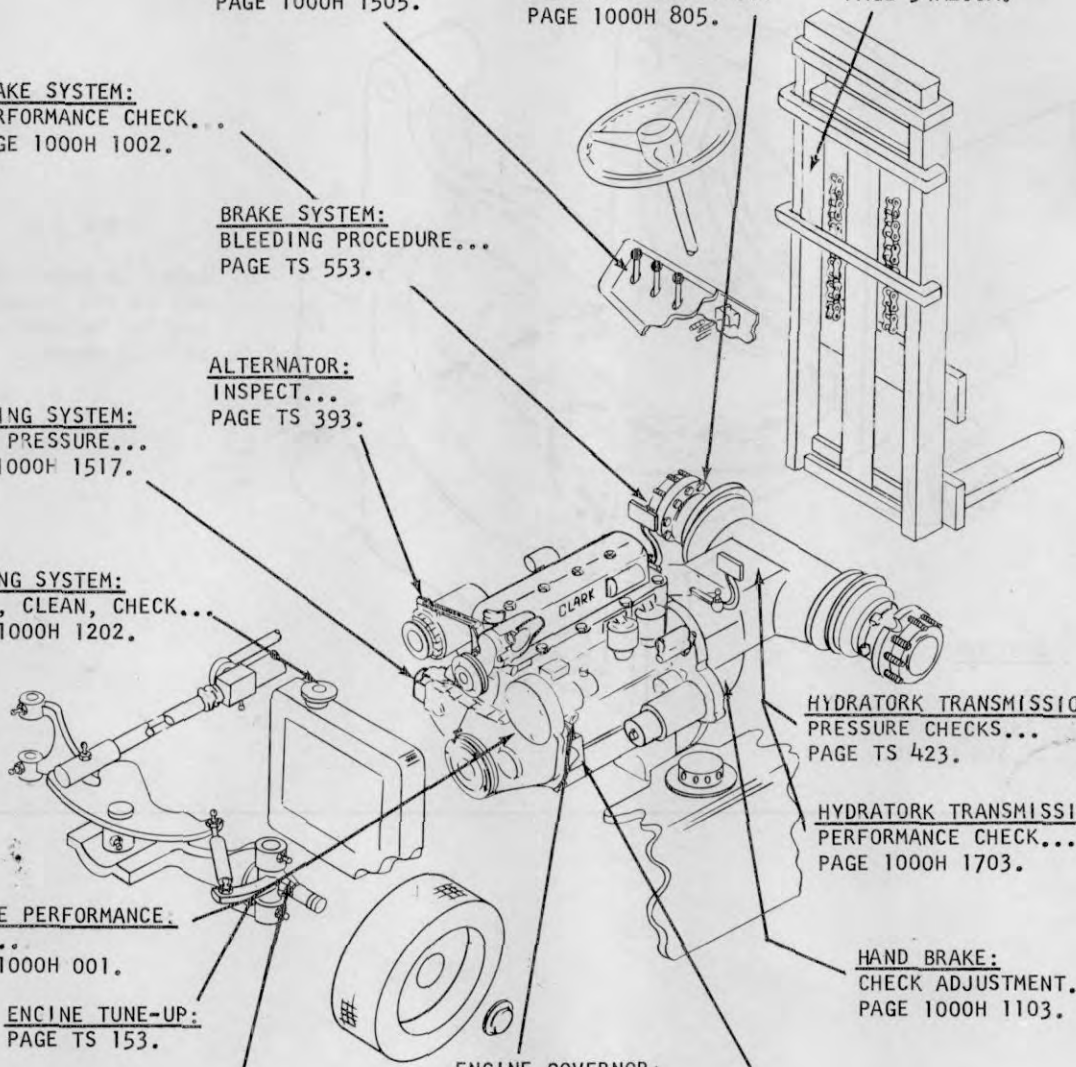
CAUTION

DO NOT OPERATE THE ENGINE WITH THE THERMOSTAT REMOVED.....SEE ABOVE.

N O T E

Refer to pages TS-322 and 325 in the Trouble Shooting Section located in the back of this manual.

1000H LUBRICATION AND PREVENTIVE MAINTENANCE INDEX.



HYDRAULIC SYSTEM:
PRESSURE CHECK...
PAGE 1000H 1505.

AXLE ENDS:
CLEAN AND REPACK...
PAGE 1000H 805.

LIFT CARRIAGE AND UPRIGHT ROLLERS:
ADJUSTMENT CHECKS...
PAGE 34M200A.

BRAKE SYSTEM:
PERFORMANCE CHECK...
PAGE 1000H 1002.

BRAKE SYSTEM:
BLEEDING PROCEDURE...
PAGE TS 553.

ALTERNATOR:
INSPECT...
PAGE TS 393.

STEERING SYSTEM:
CHECK PRESSURE...
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COOLING SYSTEM:
FLUSH, CLEAN, CHECK...
PAGE 1000H 1202.

HYDRATORK TRANSMISSION:
PRESSURE CHECKS...
PAGE TS 423.

HYDRATORK TRANSMISSION:
PERFORMANCE CHECK...
PAGE 1000H 1703.

ENGINE PERFORMANCE:
CHECK..
PAGE 1000H 001.

HAND BRAKE:
CHECK ADJUSTMENT...
PAGE 1000H 1103.

ENCINE TUNE-UP:
PAGE TS 153.

ENGINE GOVERNOR:
REFERENCE...
PAGE TS 164.

STEER WHEEL BEARINGS:
CLEAN, ADJUST, REPACK...
PAGE 1000H 803.

MAIN HYDRAULIC SYSTEM:
PRESSURE CHECK...
PAGE 1000H 1505.

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

ENGINE PERFORMANCE CHECK:

1. Before making check, run engine until unit is at operating temperature...this is important as the transmission oil temperature should be 200 degrees F. and the engine water jacket should be at operating temperatures...apply parking brake.

2. With the engine operating at idle and the transmission in NEUTRAL, check the fluid level on the dipstick. Fill if necessary to the FULL mark on the dipstick....using Type "A", Suffix "A" Automatic Transmission Fluid (Clark Part Number 879803....fluid containers must display a qualification number prefixed by "AQ-ATF"). Alternate fluid: Dexron.

3. With a tachometer, check engine for governed speed at full throttle. The unloaded engine RPM should be set at 2350.

4. Check the governed engine speed with partial load. With engine at full throttle and the tilt lever in full backward tilt, momentarily hold the tilt lever back to load the engine. With the engine loaded in this manner, the approximate engine RPM should be 2100.

C A U T I O N

PROLONGED STALLING OF THE CONVERTER CAN CAUSE

INTERNAL DAMAGE TO THE CONVERTER. STALL

CONVERTER ONLY LONG ENOUGH TO ATTAIN THE PEAK

RPM READING....MAXIMUM 30 SECONDS.

5. With a capacity load on the forks, check for normal stall RPM by positioning machine against an immovable object....or by applying a correctly adjusted parking brake....equipped with good brake linings. Place the machine in gear and accelerate engine to full throttle. Normal stall is 1350 to 1500 RPM. Hydracool models, accelerate engine to governed rpm, place machine in gear and slowly let out on the clutch ....engine should stall at 1350 to 1500 RPM.

If readings taken are not reasonably close to those listed above, appropriate repairs/adjustments should be made....refer to Engine Tune-Up in the Trouble Shooting Section located in the back of this manual on page TS 153 and refer to page TS 423 for Hydratork Transmission Pressure checks.

Plate 9768. Steer Wheel Bearings

CLEAN, REPACK AND ADJUST
STEERING WHEEL BEARINGS

Every 1000 operating hours or every six months of operation, whichever occurs first, clean, repack and adjust wheel bearings using a smooth stringy multi-purpose grease or refined mineral oil blended with a lithium soap thickner containing anti-wear, anti-rust and anti-oxidants with EP additives. To meet or exceed Clark Specifications MS-107 and Timken Test 40# minimum [NLGI #1 or NGI #2].

Shell Aluania EP Grease #1 or #2.
Sun Prestige 741 EP #1 or 742 EP #2;
Gulfcrown Grease EP #2;
AMOLITH Grease EP #1 or #2;
Citgo HEP #1 or #2;
Texaco Multifak EP #1 or Marfak All Purpose #2;
Poco HT Grease EP #1 or #2;
Molub-Alloy General Purpose Grease #1 or #2;

or the equivalent of the above listed lubricants.

1. Raise the rear of the machine far enough to clear the floor and place heavy blocking under the machine frame....not under the counterweight....so it cannot accidentally become lowered. Deflate the tires....machines so equipped.... and remove the wheels from the hub assembly.

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 AFTER RAISING MACHINE AND BEFORE X

X MAKING ANY ADJUSTMENTS OR ADJUST- X

X MENT CHECKS, PLACE ADEQUATE (HEAVY) X

X BLOCKING (SUFFICIENT TO SUPPORT THE X

X WEIGHT OF THE MACHINE) UNDER THE X

X FRAME....NOT UNDER THE COUNTERWEIGHT X

X ....TO PREVENT ACCIDENTAL LOWERING X

X OR FALLING OF THE VEHICLE, THUS X

X PREVENTING PERSONAL INJURY TO MECH- X

X ANIC OR BYSTANDERS. 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

2. Clean the bearings in a Stoddard type cleaning solvent. After all solidified particles of lubricant are removed from the bearings blow 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. Dry the hub with compressed air.

3. Repack with a smooth stringy multi-purpose grease of refined mineral oil blended with a lithium soap thickner containing anti-wear, anti-rust and anti-oxidants with EP additives. To meet or exceed Clark Specifications MS-107 and Timken Test 40# minimum [NLGI #1 or NLGI #2].

ADJUSTMENT CHECK

1. Inspect adjustment of bearings by gripping top and bottom of tire, chuck 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.

N O T E

Before making wheel bearing adjustment, be sure play [looseness or wobble] is in the wheel bearings and not in the king pins. [If wheel bearings need adjustment clean and repack bearings before making adjustments. Refer to lubrication paragraph/s in preceding write-up].

ADJUSTMENT

2. 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.

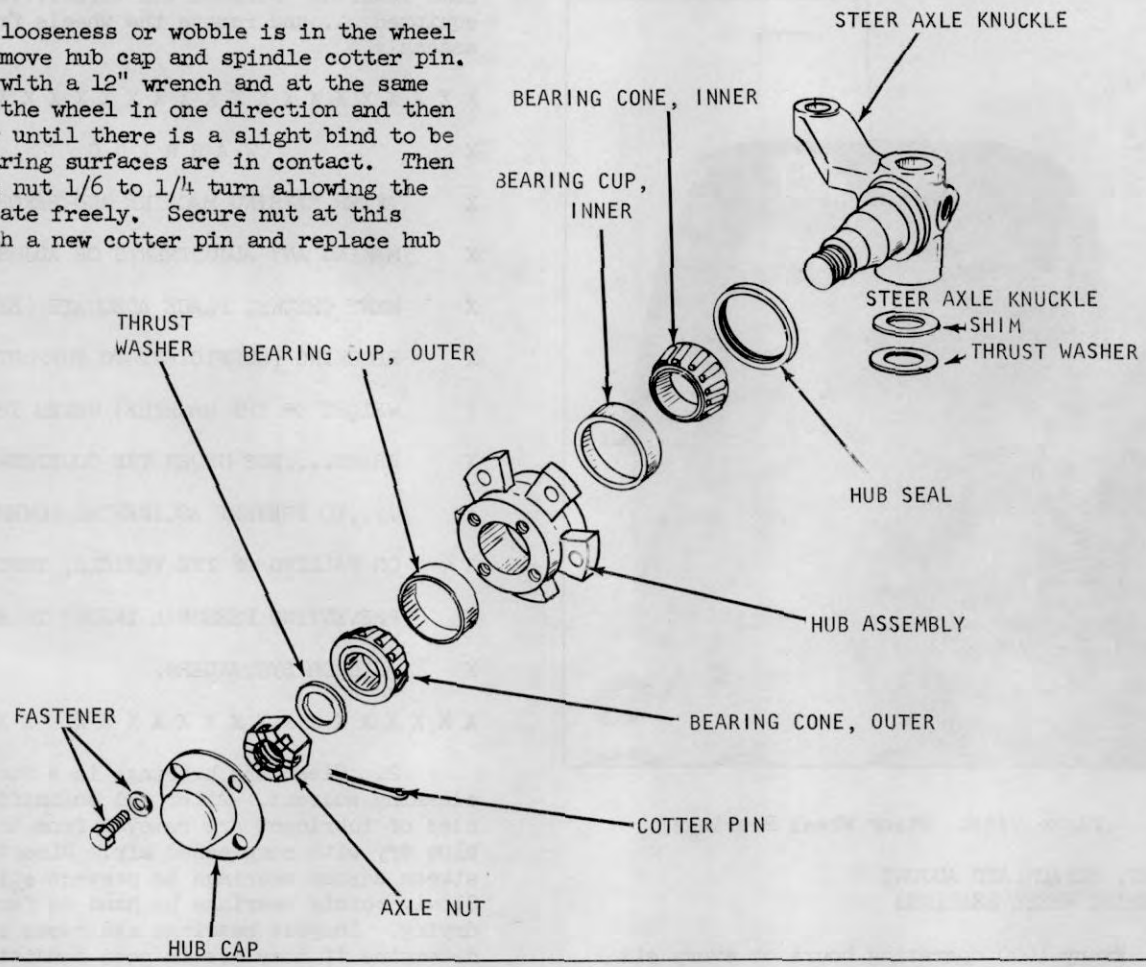

Plate 9857. Steer Wheel Bearings

CLEAN AND REPACK AXLE ENDS (CUSHION MACHINES):

Every 1000 operating hours or every six months of operation, whichever occurs first, clean and repack the axle ends using a smooth stringy multi-purpose grease or refined mineral oil blended with a lithium soap thickner containing anti-wear, anti-rust and anti-oxidants with EP additives. To meet or exceed Clark Specifications MS-107 additives.

Test 40# minimum (NLGI #1 or NGI #2).
- Shell Aluania EP Grease #1 or #2;
- Sun Prestige 741 EP #1 or 742 EP #2;
- Gulfcrown Grease EP #2;
- Amolith Grease EP #2;
- Citgo HEP #1 or #2;
- Texaco Multifak EP #1 or Marfak All Purpose #2;
- Poco HT Grease EP #1 or #2;
- Molub-Alloy General Purpose Grease #1 or #2; or the equivalent of the above listed lubricants.

Plate 9799. Raise Tires Clear of Floor

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. Deflate the tires....machines so equipped.... and remove the wheels from the hub assembly.

2. Remove the hub cap, cotter pin, washer, spindle nut and pull hub assembly from spindle.

3. Remove bearings and clean in a Stoddard type cleaning solvent. Slosh bearings up and down in solvent. Remove and tap large side of bearing against a block of wood to dislodge solidified particles of lubricant. Repeat operation until bearings are thoroughly clean. Blow bearings dry with compressed air. Direct air stream across bearing to avoid spinning. Slowly rotate bearing by hand to facilitate drying. Dip bearings in gear oil and wrap them in clean paper until they are to be reinstalled.

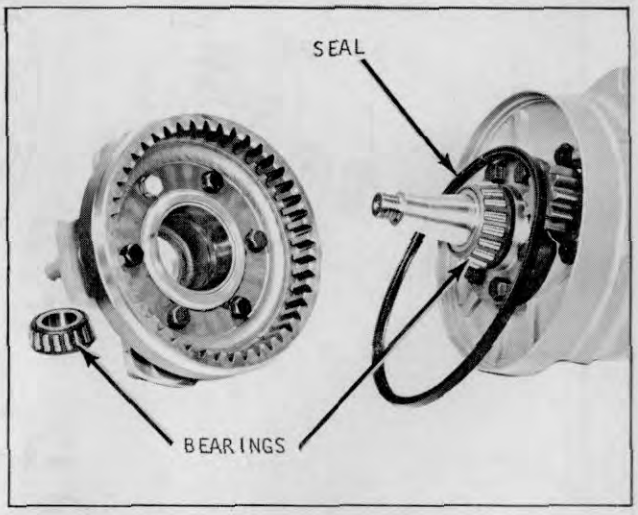

Plate 6892. Typical Axle End Assembly

4. Clean ring gear, pinion drive shaft, hub assembly, spindle and spindle support in a Stoddard cleaning solvent.

5. Inspect seal for cuts, scratches and nicks. It is necessary to replace seal if such a condition is found.

Plate 9775. Repack Axle End

6. Repack each axle end with specified lubricant. Each axle end holds approximately 1 pound of grease. Check axle end vent for obstruction, vent must be open.

7. Install bearings, seal, hub, washer, spindle nut, cotter pin and hub cap. Tilt upright back and remove blocking.

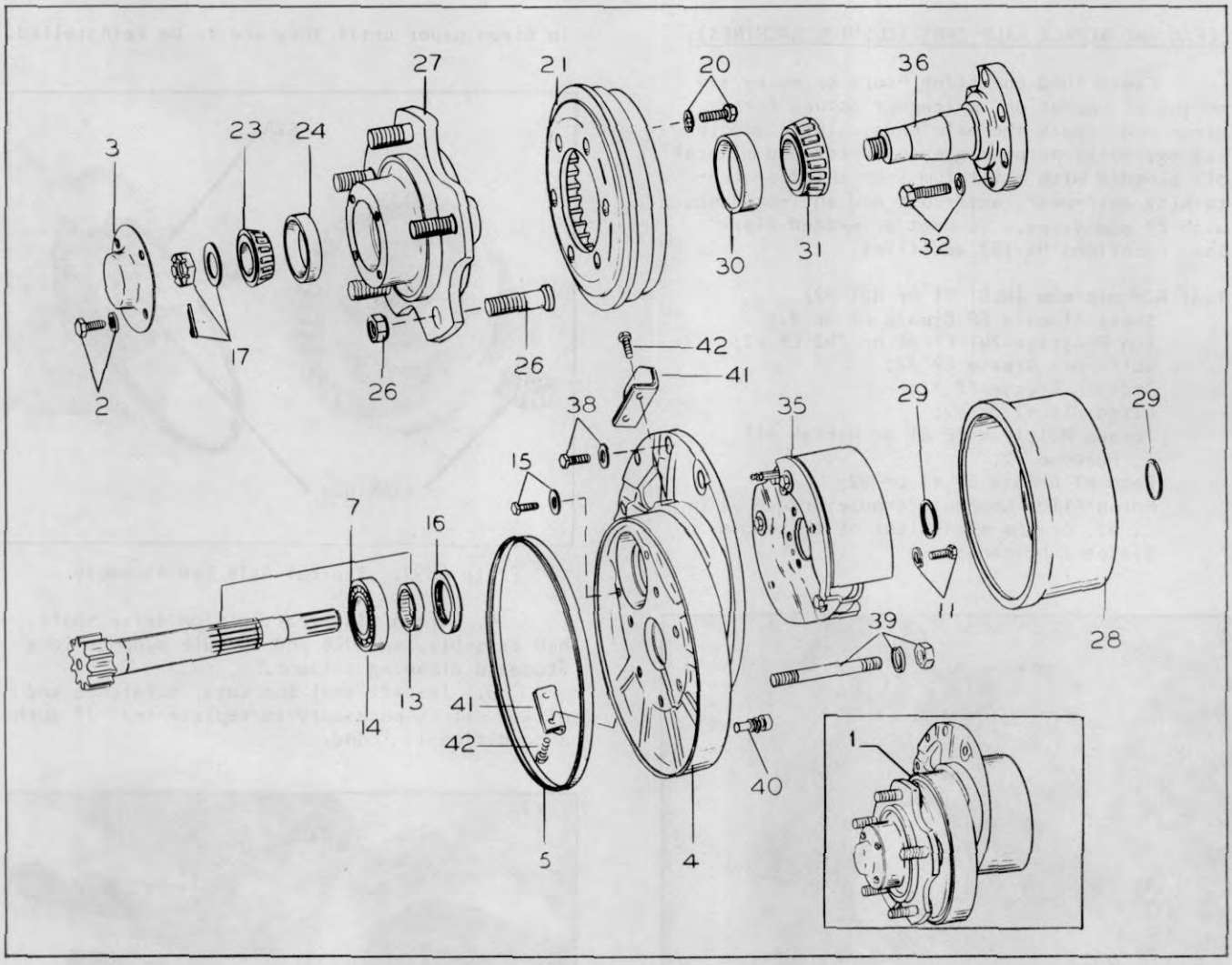

Plate 9859. Axle End Assembly - Typical Illustration

BRAKE ADJUSTERS

When the brake system is operating properly, the cam like action of the reaction arm allows self-adjustment for the total thickness of the brake linings, without any noticeable increase in brake pedal free travel. The self-adjustment feature eliminates the need for manual adjustment of the brakes.

When the brake linings become worn beyond their designed limits there will be a noticeable change in the brake pedal effort required to stop the machine or, brakes will become noisy during application. If either of these conditions exist the axle ends should be removed so an inspection of the brake linings can be made to determine their further serviceability. Report to designated person in authority.

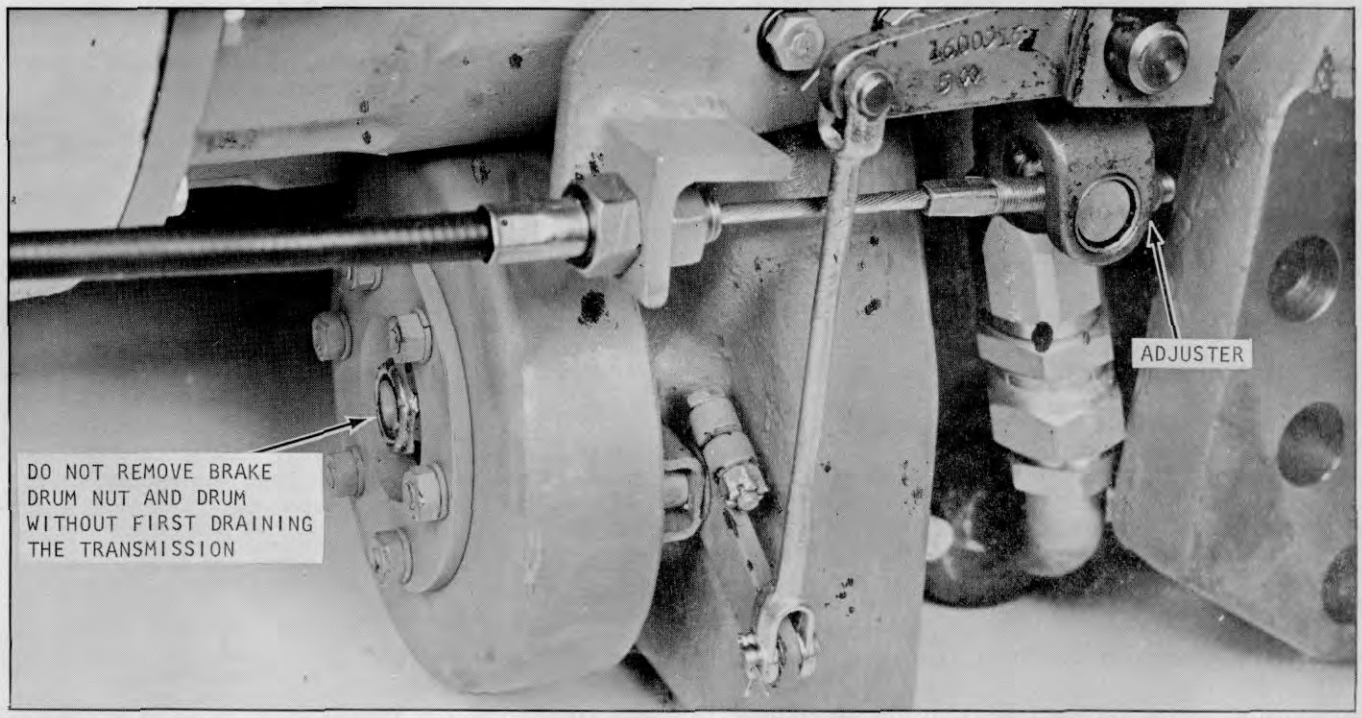

Plate 9762. Transmission Parking Brake Assembly

PARKING BRAKE ADJUSTMENT AND ADJUSTMENT CHECK:

Adjustment Check:

Make certain that the parking brake is working properly. Fully apply hand brake, moving lever from full forward to full rear position....cable tension should be strong enough so that the lever hesitates or remains in a vertical position before continuing on as lever passes through center position to full rear position. If not, rotate knurled knob on end of brake lever several turns clockwise.

Hydratork Models....now....again set hand brake lever, then....start engine (driver shall occupy driver's seat when making test) and place gear shift lever into low range. Depress accelerator pedal until engine runs up to full or maximum stall (approximately 1330 RPM)....truck should not move or creep.

C A U T I O N

DO NOT RUN ENGINE AT STALL MORE THAN 5 SECONDS.

Hydracool Clutch Models....now....again set hand brake lever, then....start engine and place gear shift lever into low range. Depress accelerator pedal until engine runs up to full governed, 2350 RPM....slowly let out on the clutch pedal ....truck should not move or creep....even at the point where the engine stalls.

N O T E

The parking brake must be capable of holding truck, with rated capacity load, on a 15% grade. Refer to the Index for Linkage Adjustments and Brake Bleeding Procedures.

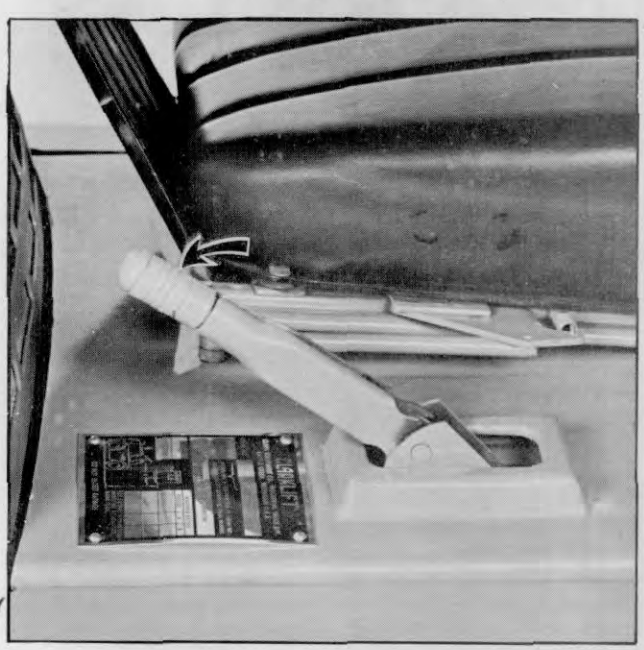

Plate 9781. Typical Parking Brake Lever

COOLING SYSTEM

Radiator Pressure Caps:

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

N O T E

If a new cap is required, always install a cap of the same type and pressure rating.

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

N O T E

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 important that cylinder head stud nuts be drawn down to specs as shown in "Engine Tune-Up".

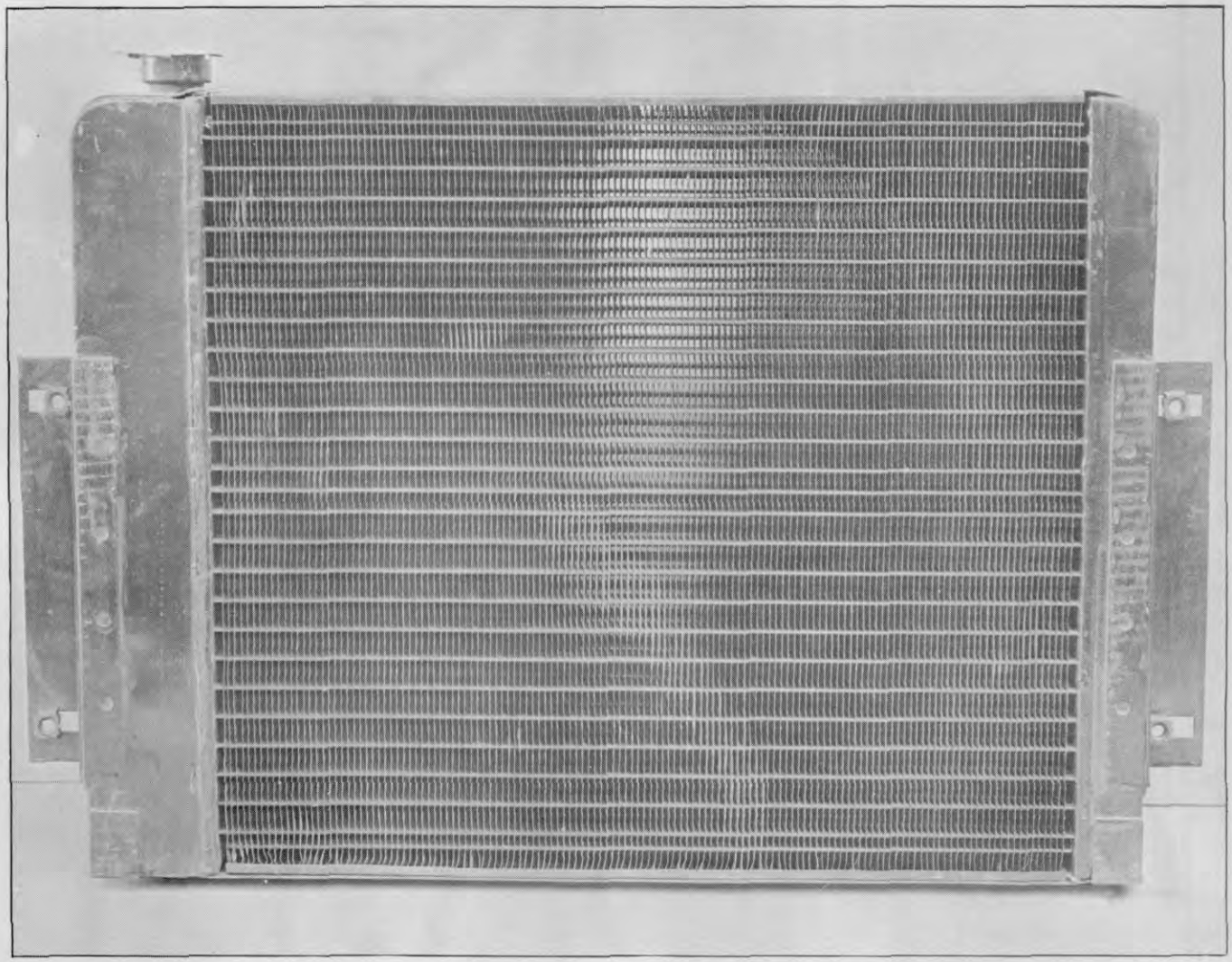


Plate 9740. Typical Cross-Flow Radiator

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; it 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. Over-cooling may be caused by operating conditions such as excessive idling, low speed 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.

CHECK MAIN HYDRAULIC SYSTEM PRESSURE AT THE HYDRAULIC PUMP OR HYDRAULIC VALVE

The hydraulic relief valve setting may be checked with a Mico Quadrigage (Clark Part No. 1800106) or, by installing a conventional pressure gauge with a 0-4000 PSI scale....at the discharge (pressure) line of the hydraulic pump; or, at the hydraulic valve, see illustration in opposite column.

1. Connect the pressure line from the gauge to the test port of the pump or valve by removing plug from test port.

2. Apply parking brake. Start engine and operate at governed rpm. Hold tilt lever back until the pressure builds up and moves the pressure relief valve off its seat....avoid holding the tilt lever longer than is necessary to check pressure reading on gauge....take reading....release accelerator and tilt lever.

3. The pressure reading will indicate the setting of the relief valve. If reading taken is not reasonably close to those listed in specifications, appropriate repairs should be made. Report to designated person in authority.

CHECK MAIN HYDRAULIC SYSTEM PRESSURE WITH A CIRCUIT TESTER.

If a Schroeder Hydraulic Circuit Tester (Clark Part No. 1800060) is available, the hydraulic relief valve setting and the rate of flow being delivered by the hydraulic pump may be checked as follows:

1. Connect the pressure line from the tester to the test port at the hydraulic pump, or at the test port of the hydraulic valve.... remove sump tank breather and insert the return line from the tester into the sump tank.

2. Apply parking brake. Start engine and operate at governed rpm. Hold tilt lever back while gradually closing the load valve until pressure reaches 1500 psi. Continue to hold the tilt lever until hydraulic fluid reaches test temperatures (120 degrees F.). With the hydraulic fluid at this temperature, make a note of the flow reading so it may be compared with the rate of flow found in the following step.

3. With engine operating at governed rpm, hold tilt lever in back position and continue to close the load valve until the pressure no longer increases on the gauge. (Close the load valve ONLY ENOUGH to reach the peak pressure reading and avoid holding the lever longer than necessary to check rate of flow and pressure.)

The pressure reading will indicate the setting of the relief valve. The flow reading should be compared with the flow register at 1500 psi. If the pump or valve is worn, flow will drop off appreciably as pressure is increased. This is due to internal oil slippage in the components.

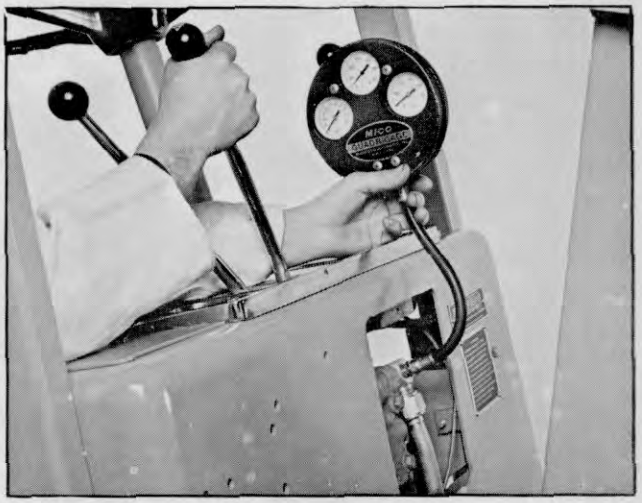


Plate 9916. System Pressure Check

N O T E

Severly vibrating gauges are often an indication of entrained air....check for suction line leaks.

If readings taken are not reasonably close to those listed in specifications, appropriate repairs should be made. Report to designated person in authority.

CHECK STEERING SYSTEM PRESSURE AT THE STEER PUMP

The hydraulic relief valve setting may be checked with a Mico Quadrigage (Clark Part No. 1800106) or, by installing a conventional pressure gauge with a 0-3000 PSI scale....at the discharge (pressure) line of the hydraulic pump....see illustration in opposite column.

1. Connect the pressure line from the gauge to the test port of the pump or valve by removing the plug from the test port.

2. Place blocking between axle and axle stop so that when the wheels are turned the pressure relief valve will move off its seat when pressure builds up.

3. Apply parking brake. Start engine and run at governed rpm. Rotate hand wheel all the way in one direction and hold....avoid holding the hand wheel (axle against stop)longer than is necessary to check pressure reading on gauge ....take reading....release hand wheel and accelerator.

4. The pressure reading will indicate the setting of the relief valve. If reading taken is not reasonably close to those listed in specifications, appropriate repairs should be made. Report to designated person in authority.

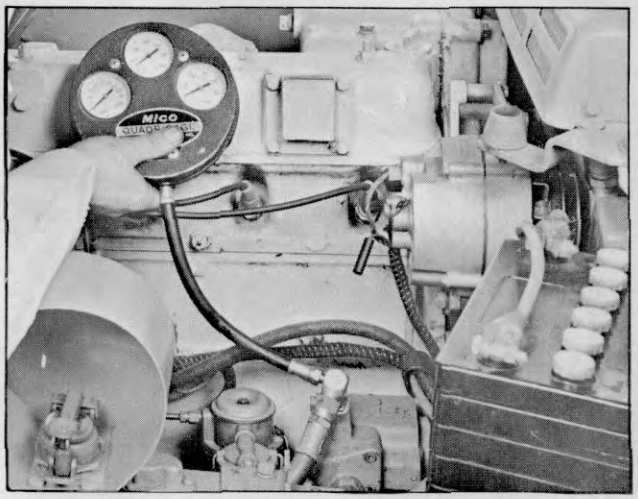


Plate 9851. Steer System Pressure Checks

TRANSMISSION PERFORMANCE CHECK:

1. Before making check, run engine until unit is at operating temperature...this is important as the transmission oil temperature should be 200 degrees F. and the engine water jacket should be at operating temperatures...apply parking brake.

2. With the engine operating at idle and the transmission in NEUTRAL, check the fluid level on the dipstick. Fill if necessary to the FULL mark on the dipstick....using Type "A", Suffix "A" Automatic Transmission Fluid (Clark Part Number 879803....fluid containers must display a qualification number prefixed by "AQ-ATF"). Alternate fluid: Dexron.

3. With a tachometer, check engine for governed speed at full throttle. The unloaded engine RPM should be set at 2350.

4. Check the governed engine speed with partial load. With engine at full throttle and the tilt lever in full backward tilt, momentarily hold the tilt lever back to load the engine. With the engine loaded in this manner, the approximate engine RPM should be 2100.

C A U T I O N

PROLONGED STALLING OF THE CONVERTER CAN CAUSE

INTERNAL DAMAGE TO THE CONVERTER. STALL

CONVERTER ONLY LONG ENOUGH TO ATTAIN THE PEAK

RPM READING....MAXIMUM 30 SECONDS.

5. With a capacity load on the forks, check for normal stall RPM by positioning machine against an immovable object....or by applying a correctly adjusted parking brake....equipped with good brake linings. Place the machine in gear and accelerate engine to full throttle. Normal stall is 1350 to 1500 RPM. Hydracool models, accelerate engine to governed rpm, place machine in gear and slowly let out on the clutch ....engine should stall at 1350 to 1500 RPM.

If readings taken are not reasonably close to those listed above, appropriate repairs/adjustments should be made....refer to Engine Tune-Up in the Trouble Shooting Section located in the back of this manual on page TS 153 and refer to page TS 423 for Hydratork Transmission Pressure checks.

NEUTRAL STARTING SWITCH

The neutral starting switch should be adjusted so that machine will not start except when the transmission control is in the (dead) neutral position.

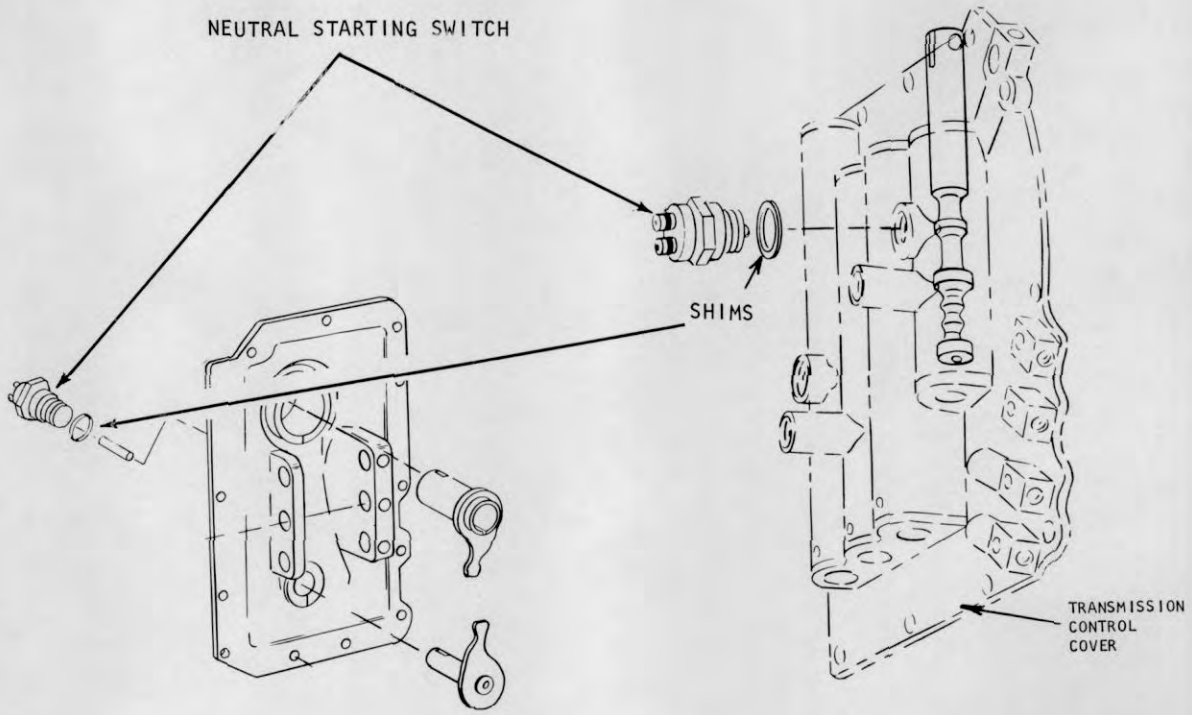
Adjustment Check

1. With driver's seat occupied, parking brake applied, and transmission in gear (clutch pedal depressed on hydracool models),....turn and hold ignition switch in the start position ....gently move shift lever towards neutral position.

2. If engine does not start, repeat adjustment operation in opposite direction.

3. If engine starts, coming from either direction on the shift lever prior to reaching neutral, switch should be adjusted by means of shims underneath the switch until engine will not start unless it is in (dead) neutral; that is, vehicle will not move regardless of shift lever position during the starting cycle.

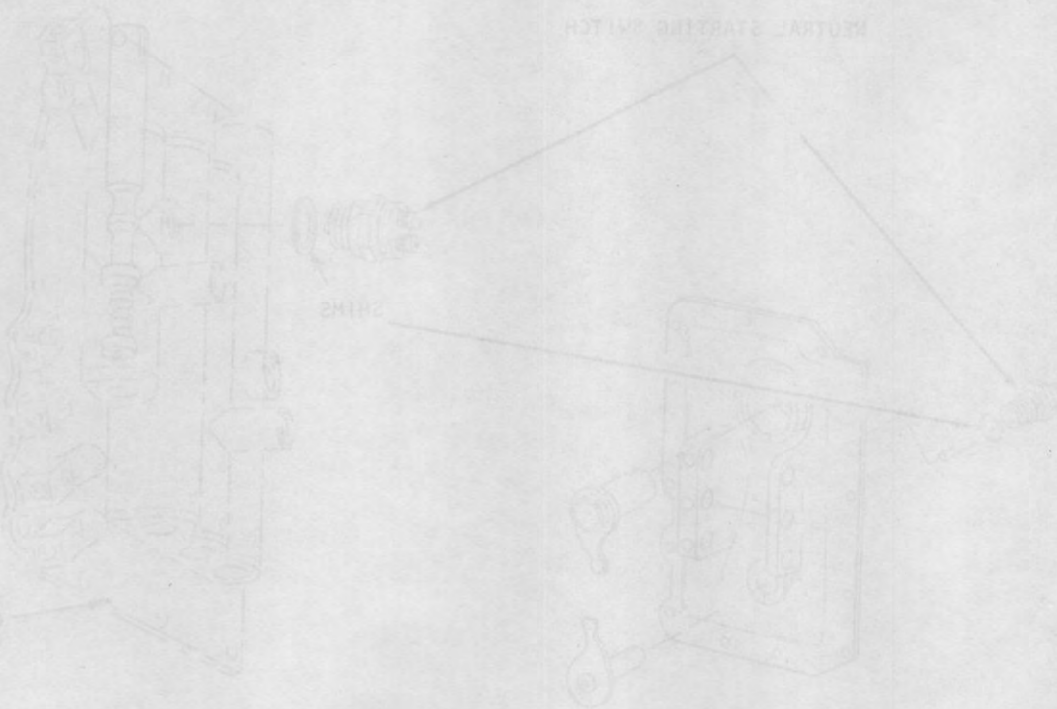
Typical
Illustration



Hydracool Clutch Models

Hydratork Transmission Models

Neutral Starting Switch



LIFT CARRIAGE AND UPRIGHT ROLLER ADJUSTMENT CHECK

1. Extend the upright to the upper limit.

2. Check to be sure there is no bind.

   a) Slowly....lower upright.

   b) Rail assembly should be free to lower smoothly....without hesitation or hang-up.

If there is a bind....rail assembly hesitates or remains in one position and then breaks free as the lift cylinder retracts.... this indicates improper roller adjustment and an adjustment should be made.

Refer to Lift Carriage and Roller Adjustment Procedure in Trouble Shooting (pages 34M200 and 201)....this is the last section located in the rear of the manual.

TROUBLE SHOOTING (ENGINE):

Engine Fails to Start or Starts with Difficulty:

Fuel System Low-Pressure Side.

Line valves not open or tank empty. Ice in lines or traps. Cold fuel thickens and does not flow rapidly. Dirt in lines or between filter and pump. Fuel gum blocking strainer or filter. Worn or damaged transfer pump. Air lock in fuel pump or injection pump.

First check by opening pump return line at injector and cranking engine over. Use hand primer pump if desired. A substantial flow of fuel without air bubbles should come from the line.

Fuel System High-Pressure Side.

Stop control in wrong position. Air blocks in high-pressure lines. Broken or disconnected pump-drive coupling.

Check for above troubles by loosening line coupling nuts a few turns at each nozzle. Crank engine over. A substantial flow of fuel should indicate each injection impulse. If no fuel appears, and an adequate flow of fuel is known to have reached the plunger, then plunger or delivery valve may be stuck as a result of poor fuel, improper storage, or inadequate lubrication.

Nozzles:

Cold weather and low cranking speeds are likely to cause hard starting if the nozzle spray patterns are poor. Similarly, gummed or corroded nozzles may cause trouble after storage. Remove nozzles from engine, reconnect to lines, crank engine over, and observe spray pattern. If proper equipment is available, check nozzle release pressures.

Injection Timing:

A newly overhauled engine, or one in which the pump or pump coupling has been replaced, may be badly out of time. Check pump timing.

Air Intake:

Clogged air cleaners, or protective covers accidentally drawn into the manifold, will cause starting difficulties.

Compression:

Other things being equal the easiest starting engine will ordinarily be the one with the best compression. When poor compression is indicated, check each cylinder for pressures within the range listed in specifications. A good Diesel type compression gauge should be used and the stop control should be in "Stop" position when cranking the engine over.

Liquid Lock:

It is possible for oil or water to form a positive stop between the piston crown and the cylinder head. This can occur if too much flushing oil has been poured into the cylinder for storage, or if cooling water has leaked past a head gasket. To detect this condition and thus prevent serious engine damage from this source, always try to bar the engine over if leakage is suspected, or after any lengthy period of storage. Do not force over center if resistance is felt. Remove injectors and locate source of trouble.

Cranking Speeds:

Low cranking speeds are not satisfactory for starting Diesel engines. Poor starter condition, or thick cold oil will reduce speeds to critical or sub-critical levels.

ENGINE STOPS:

Fuel:

Low Pressure system not providing adequate supply. Refer to previous listing of causes under Fuel System - Low-Pressure Side. If sufficient fuel is reaching the injection pump, sudden stoppage is unlikely from this source unless the timing coupling fails or mechanical difficulty occurs within the pump.

Lubrication:

Excessive loads, speeds, or temperatures may result in piston seizure. Neglect of filters may cause plugged oil passages and lubrication failure.

Load:

Excessive overloads or improper governor adjustment for the loads involved may cause the engine to stall.

LOW POWER AND UNEVEN RUNNING:

Injection System:

Inadequate supply of fuel to pump. Refer to Fuel System - Low Pressure Side, under Failure to Start. Timing inaccurate, check timing. Delivery valve operating improperly - Replace pump. Dirt or other damage to injection plunger - Replace pump. Leaking line couplings - Make visual check for fuel leakage at nozzle and delivery valve coupling. Air in lines - bleed high-pressure lines. Disconnect return line and observe overflow. Check with gauge for pressure in pump.

Nozzles:

Internally clogged or externally carboned injection nozzles; clean carefully. Injection nozzle pressure inaccurately set - readjust discharge pressure if the equipment is available, otherwise replace injector. Dribble, or fuel discharge after valve closes - may be caused by small amount of dirt or may indicate need for new nozzle valve.

Air Intake:

Examine manifold and air cleaners for possibility of obstructions.

Compression:

Low or uneven compression. Measure valve clearances and re-set if necessary. With properly set valves, continued indications of low compression signify the need for valve and seat overhaul, and possibly the replacement of piston rings or other members. Always make visual inspection for possibility of broken valve spring. Sticking valves may sometimes be freed up with penetrating oil or similar gum-cutting lubricants. Badly worn rocker arms cannot be adjusted accurately. Occasionally, sticking cam followers may give the same symptoms as sticking valves.

Fuel:

Fuel oil that does not meet the specifications may cause knocking, smoking, low power, overheating, and, as a result of excessive dilution, damage to the major parts of the engine.

SURGING OR IRREGULAR SPEED:

Governor:

Lack of proper storage restricts free action.

Injection Pump:

Lack of lubrication due to sludging restricts control action. Insufficient fuel supply from primary system - Refer to Fuel System - Low-Pressure Side. Irregular Operation of transfer pump; air entrainment in pump and lines, valves or nozzles. Check security and accuracy of pump timing.

OVERHEATING:

Cooling System:

Insufficient coolant - Measure coolant level. Frozen coolant - Place hand on hoses to detect frozen areas. Partial freezing, slush, and ice particles when present in only small amounts can cause severe overheating. Poor coolant circulation - Examine hoses inside and out for signs of collapse, rotting, and air leaks; replace if not in good condition. Lime deposits must be removed. Excessive heat from torque converter cooling system.

Water Pump:

Cranking a frozen engine will sometimes cause water pump damage; likewise corrosive cooling water may have destructive effects. Fan belt slipping - Vee-type fan belts should be of proper width to seat on sides of Vee without bottoming in groove. Excessive tension is undesirable and not necessary if correct belt is used.

Combustion:

Improper fuel - Fuel oil not meeting specifications may cause overheating and serious engine damage. Injection Timing Inaccurate - Late timing will reduce power severely and cause rapid overheating. Injection Nozzles - Observe nozzle spray patterns and test nozzle discharge pressure if equipment is available. Otherwise replace injectors.

Lubrication:

Improper oil or excessive time between oil changes - Replace with fresh oil of type satisfactory for Diesel lubrication; clean filters.

LOW OR FLUCTUATING OIL PRESSURE:

Oil:

Insufficient oil - Check and replenish oil regularly. Diluted or broken-down oil change more frequently, clean filters, overhaul engine, clean sump screen. Wrong oil viscosity, Change oil to proper viscosity. Oil foaming - Change oil grade, check for water leaks.

Pressure Regulation:

Relief valve - Sticking, carboned, seat worn, out of adjustment or vibrating loose, vent behind relief valve plugged. Gauge operating inaccurately - Clean gauge line; replace gauge.

Pump:

Inlet strainer screen clogged - Remove and clean. Damaged or worn pump vane - Oil lines and passages clogged - clean thoroughly (this condition may result from using detergent oils in engines already very dirty).

Mechanical:

Excessive bearing clearances on crankshaft - Engine ready for shop overhaul.

EXCESSIVE FUEL CONSUMPTION:

Injection Pump:

Tampering or improper calibration - Replace pump.

Leakage to crankcase; check oil level, replace seals.

KNOCKING OR UNUSUAL NOISES:

Operation:

The knocking sounds arising from unsatisfactory fuels, overloading improper timing, and similar operational variables are usually easy to recognize and distinguish from genuine mechanical noises. A common example of this is the idling fuel knock that occurs with some fuels and may be distinguished by the fact that all cylinders knock and the sound disappears under load. Overload knock on the other hand, is always accompanied by heavy black smoke and disappears when the load is reduced. Such conditions require some change in operating technique. Mechanical noises, however, may indicate the need for repairs or adjustments.

Installation:

Engine loose on mounts, vibration disturbances of loose control rods, air cleaner, muffler, or similar parts. Do not fail to check accessories such as compressors, generators, fans, and so on. A notched-out Vee belt, for example, can sometimes produce a misleading knocking sound.

Mechanical:

Loose bearings - Connecting rods, piston pins, camshaft, and crankshaft. Loose flywheel or distorted housing. Damage, looseness, or wear in water pump, oil pump, or injector pump drive. Excessive crankshaft end play. Improperly adjusted valves, sticking valves, rocker arms, or tappets. Excessive time since overhaul - Worn pistons, stuck or broken rings, carbon on piston crown.

Bearing Looseness - A loose connecting rod bearing may be located by running the engine briskly, and then closing the throttle. Rattling, as the engine slows down, is a good indication of one or more loose rod bearings. Main bearing knocks are harder to isolate and it is usually necessary to shut the engine down and test the bearings manually.

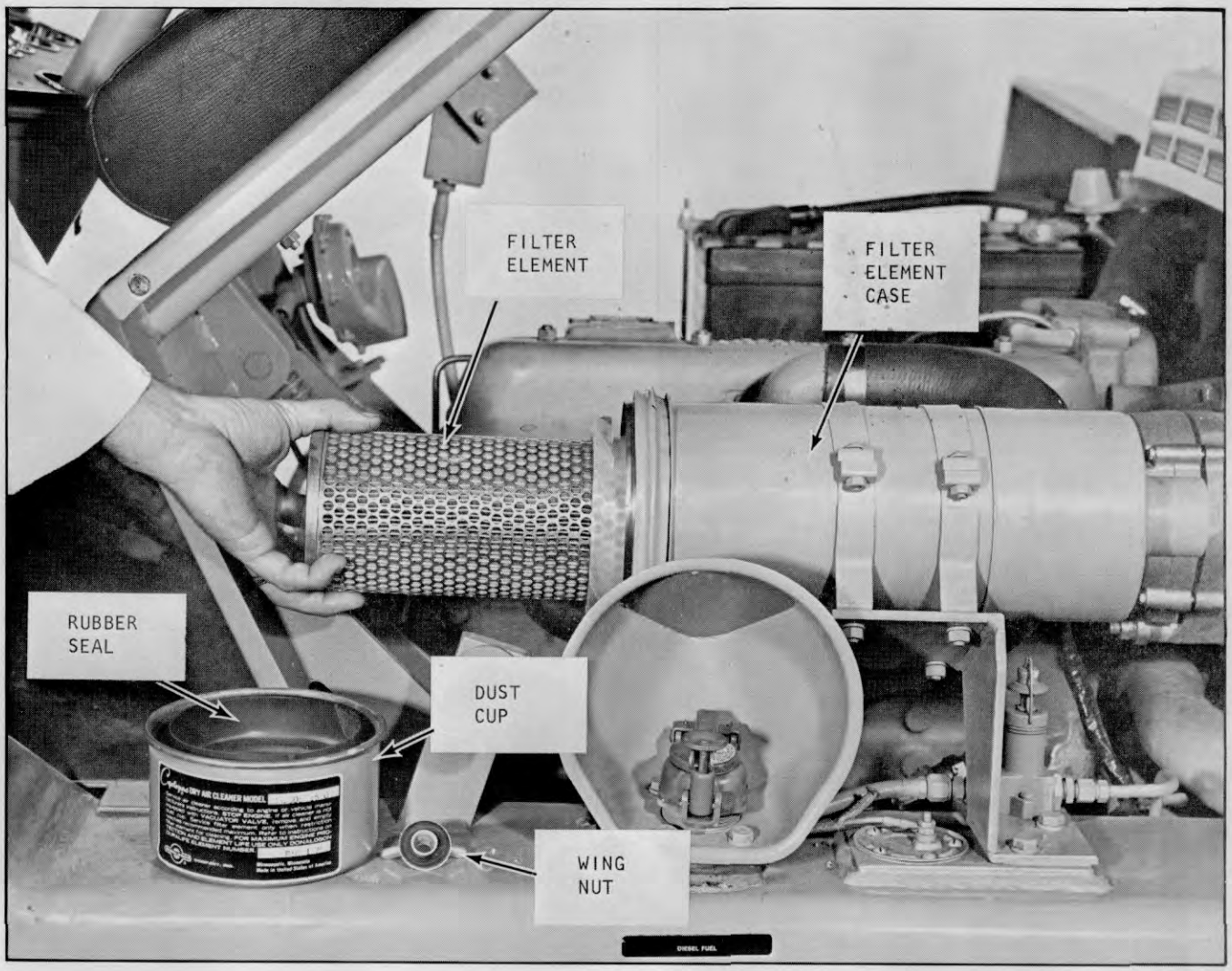


Plate 10179. Typical Air Cleaner Assembly

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:

Although various types of engine installations have differences in air-cleaner types, the operator should appreciate that the common purpose of all air cleaners is to collect dirt and grit thus keep it out of the engine working parts. As a result, the cleaners themselves must be cleaned. Sometimes this must be done several times each day if the dust conditions are exceptionally bad. Be sure air cleaner has been properly serviced and installed for tune-up.

2. Fuel Filter and Water Separator:

Replace the filtering elements in the fuel filter and the water separator.

3. Cylinder Head Fasteners:

Check all fasteners for correct torque as listed in specifications. Check cylinder head gaskets for leaks.

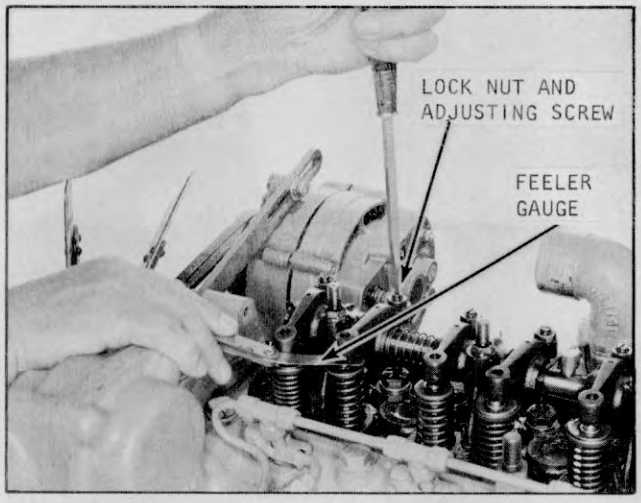


Plate 10210. Typical Valve Clearance Adjustments.

4. Valve Clearances:

Valve clearances listed in specifications and on the engine nameplate are for adjusting engines at normal room temperatures-not for hot engines.

When checking clearances, the rocker arm must be contacting the valve tips evenly and not be worn hollow. When the rocker arm to valve tip surfaces are worn hollow, it is impossible to make an accurate check with a feeler gauge. Never attempt to adjust valve clearances without loosening the adjusting screw lock nut and retightening it when completed.

For valve stem clearance adjustment, follow this procedure:

a....Remove the rocker arm cover hold down nuts.

b....Jar the rocker arm cover with the heel of your hand or a soft leather hammer to loosen the gasket from the cylinder head and remove the rocker arm cover.

c....Loosen the lock nut and the adjusting screw on the rocker arm stud and with a flat feeler gauge adjust the intake valve clearance .009 to .011 inch. Adjust the exhaust valve to have .019 to .021 inch clearance.

d....Tighten the lock nut and continue with the other lifters.

e....After all adjustments are made; clean the gasket surfaces, install a new valve cover gasket and replace the valve cover.

5. Compression Test:

A compression test aids in determining the condition of the valves, rings and head.

Perform this test before proceding with tune-up. Compression figures are listed in specifications.

6. Fuel Injection Nozzles:

The injectors are of the inward opening type and are adjusted at the factory. This opening pressure may be readjusted...providing the injectors are taken to a properly equipped service station.

1. Before removing an injector nozzle...disconnect the drain-back line and the fuel supply line at the couplings. To prevent the entrance of dirt to either the nozzles or the tubing... cap the openings with suitable caps or masking tape.

2. Remove the clamp securing the injector and lift out the nozzle. On engines which have been operating for some time...it may be necessary to tap the injector very lightly with a soft-face hammer. DO NOT USE VIOLENT METHODS TO LOOSEN STUCK NOZZLES...but work carefully and evenly on all sides to prevent cocking. Use extreme caution to avoid dropping dirt into the injector opening. (See illustration on next page.)

Unless service station equipment is available and the operator is skilled in its use...there is little actual repair work that can be accomplished on injectors. If a nozzle is suspected of improper operation, however, it may be given a general test by allowing it to spray into the atmosphere. Experience is the best indication of what may be considered a satisfactory spray pattern.

(a) Ideally, the spray will leave the nozzle in the form of a cone...its termination will be clean, and the solid-appearing center core of the cone will be surrounded by a fog-like shroud in which all fuel is evenly atomized. (See illustrations on next page.)

(b) Also...an apparent chattering of the spray is normal and is easily recognized. Actually, few nozzles will hold perfectly to this pattern after a period of service. In many cases the fog area will be streaked with more or less solid portions of fuel and the cone shape will not be so symmetrical. These conditions, if confined within reasonable limits are normal and cause little variation in actual engine performance. Certain other conditions, however, are definitely undesirable and will usually reduce engine performance substantially. These conditions are usually the result of valve damage or contamination and are characterized by:

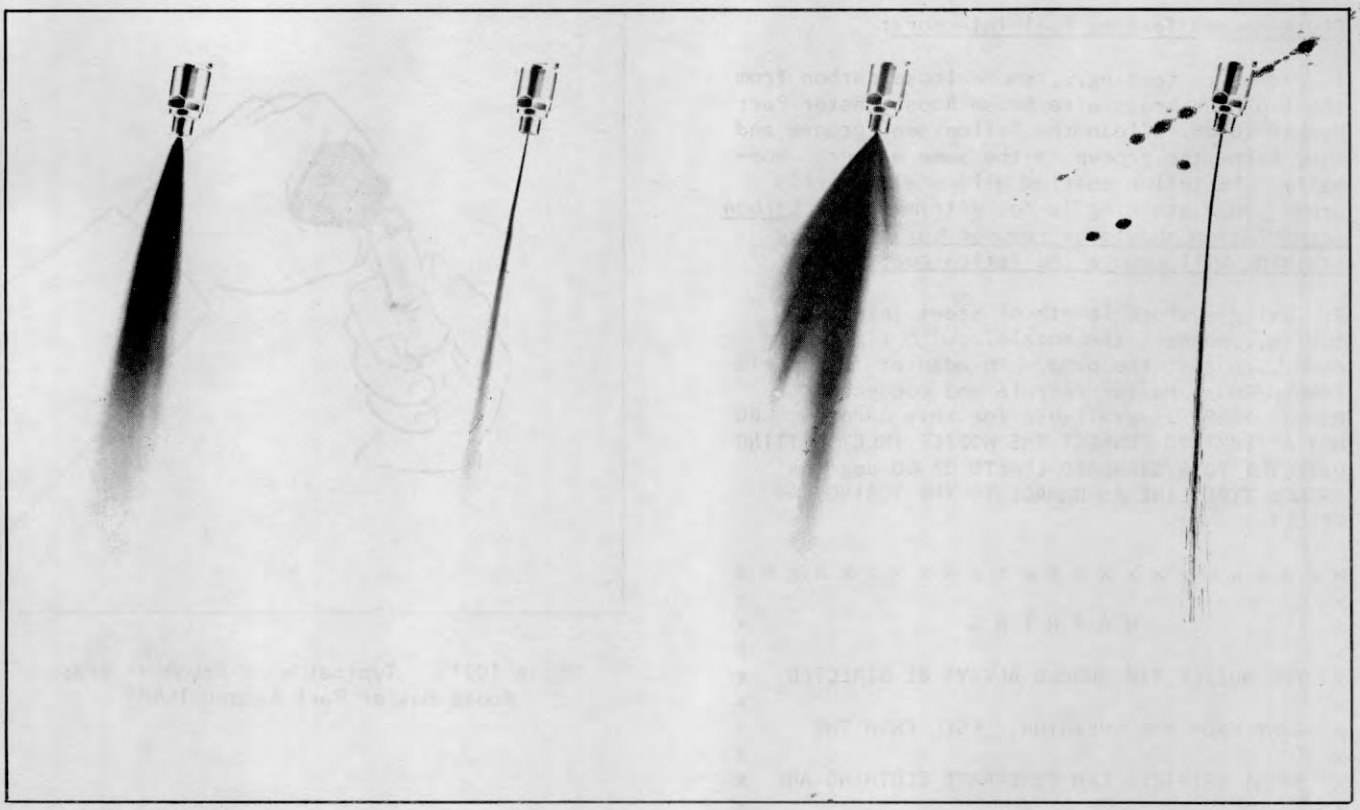
(c) dribbling

(d) sprays of badly distorted patterns

(e) and other rather self-evident troubles.

The best remedy...is replacement with another nozzle and return of the old one for repair.

Sometime, when the only real difficulty is carbon or gum interfering with the valve action, a thorough cleaning with a solvent such as "Gunk" will improve performance. This may be done with the pressure pump unit normally used to test injector release pressures. Force the cleaner through the nozzle until the chattering action seems free and normal. Follow with a complete flushing out by prolonged pumping of fuel oil or flushing oil. If the above treatment does not improve the nozzle's operation... a new nozzle is required. When handling injector nozzles, remember their precision construction and avoid striking the pintle, gripping in a vise, or similar abuses.



FULL-LOAD SPRAY PATTERN | IDLE SPRAY PATTERN | SPRAY RAGGED, UNSATISFACTORY | LEAKING NOZZLE VALVE, UNSATISFACTORY

Plate 10216. Typical Fuel Injection Spary Patterns

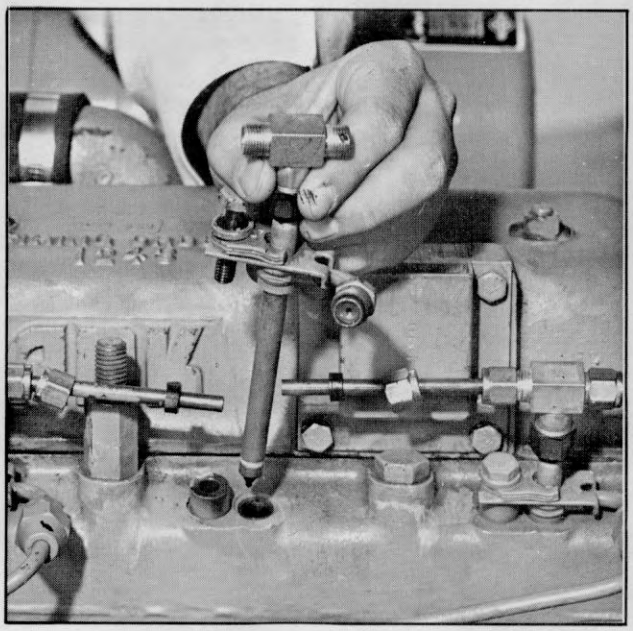


Plate 10413. Typical Fuel Injector

Flushing and Testing Fuel Injectors:

1. Prior to testing...remove loose carbon from the tip with brass wire brush Roosa Master Part Number 16488. Clean the Teflon seal groove and body below the groove in the same manner. Normally, the teflon coating will stain in this area. Such staining is not detrimental. Carbon accumulation should be removed but excessive brushing will remove the Teflon coating.

2. Using a short length of steel injection tubing...connect the nozzle...with tip facing down...to test the pump. An adapter (9/16" -18 Ermeto/Roosa Master ferrule and connector) Number 16492 is available for this purpose. DO NOT ATTEMPT TO CONNECT THE NOZZLE INLET FITTING DIRECTLY TO A STANDARD ERMETO OR 60 degrees SWAGED TYPE LINE AS DAMAGE TO THE TUBING CAN RESULT.

W A R N I N G

THE NOZZLE TIP SHOULD ALWAYS BE DIRECTED AWAY FROM THE OPERATOR...FUEL FROM THE SPRAY ORIFICES CAN PENETRATE CLOTHING AND SKIN AND CAUSE SERIOUS INFECTION AND INJURY.

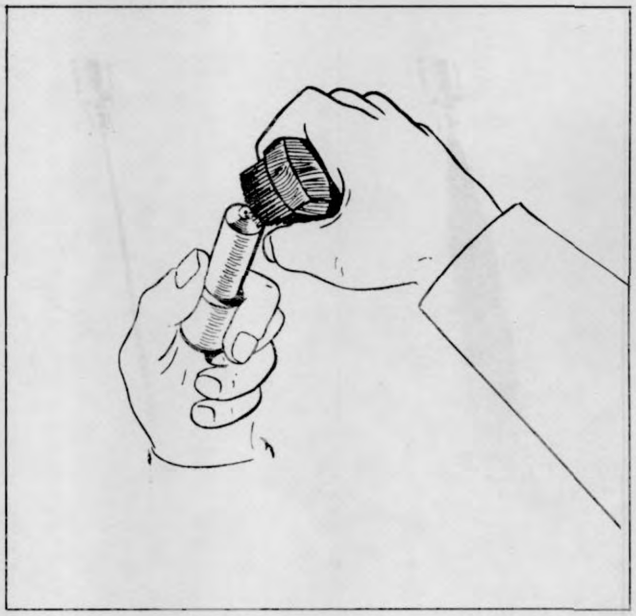


Plate 10215. Typical Wire Brush -- Brass Roosa Master Part Number 16488

7. Engine and Injection Pump Timing (Injection Pump Mounted on Engine):

```
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   DO NOT START OR ATTEMPT TO START ENGINE           x
x                                                     x
x   UNLESS THE INJECTION PUMP RETAINERS ARE           x
x                                                     x
x   SECURELY TIGHTENED AND ALL FUEL LINES TO          x
x                                                     x
x   AND FROM PUMP ARE CONNECTED.                      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
```

1. If the pump is on the vehicle...has not been removed and is only slightly out of time...then ...

2. Turn the engine over clockwise...until number one (1) piston is started on the compression stroke.

3. Carefully continue to turn engine clockwise... ...until the pointer is in line with the timing marks on the crankshaft pulley...if the pulley marks are turned clockwise past the pointer... the pulley must be turned 1/4 turn counterclockwise past the pointer and pulley marks and... again turned clockwise into position (3 deg. B.T.D.C.) to remove all gear lash.

4. Remove timing cover from side of pump, see illustration.

5. Loosen pump mounting fasteners...turn pump clockwise or counterwise until the mark on the cam and the mark on the governor weight retainer are aligned.

6. Install timing cover...check retainer bolts for security of mounting...bleed air out of the system...then start engine.

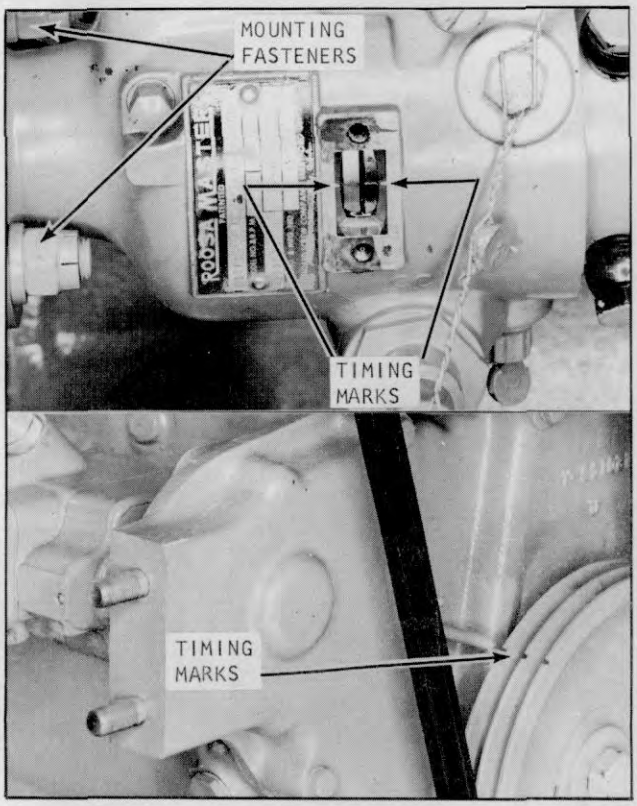
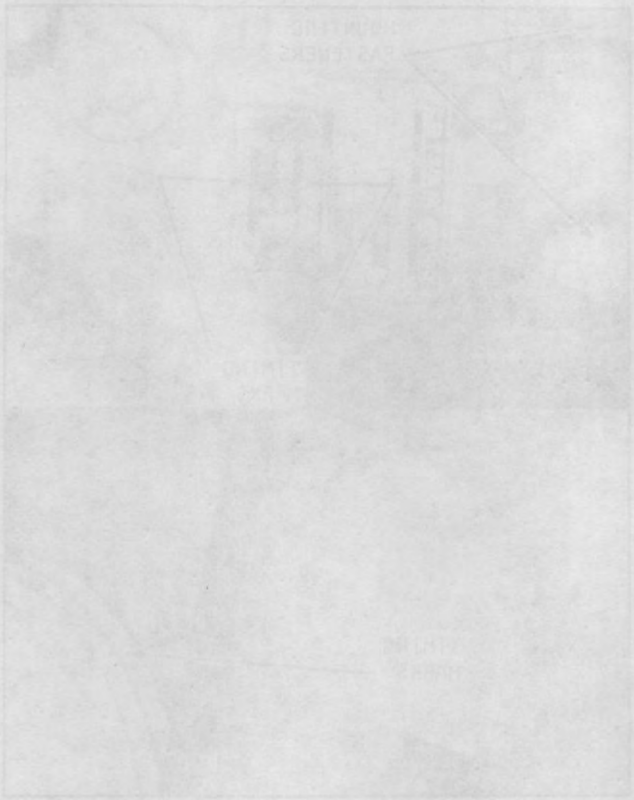


Plate 10467. Typical Timing Engine and Injection Pump



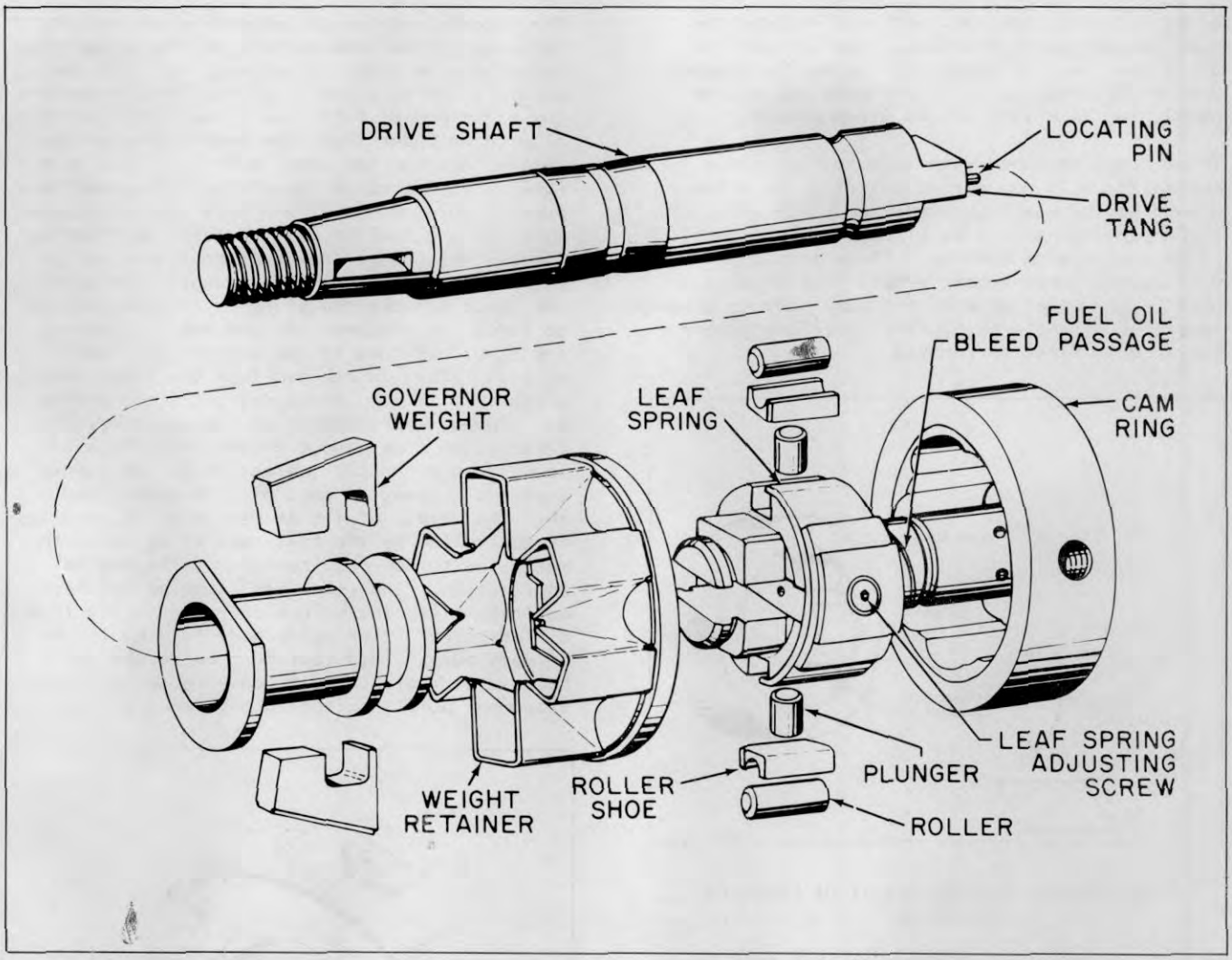


Plate 10212. Typical Roosa Pump Governor Parts

8. GOVERNING MODEL DB:

In the centrifugal governor the movement of the flyweights against the governor thrust sleeve rotates the metering valve. This rotation varies the registry of the metering valve slot with the passage to the rotor, thus controlling the flow of fuel to the engine.

This type of governor derives its energy from the centrifugal action of the flyweights pivoting on their outer edge in the retainer. Centrifugal force tips them outward, moving the governor thrust sleeve against the governor arm, which pivots on the knife edge of the pivot shaft, and is connected through a simple positive linkage to the metering valve. The force on the governor arm caused by the centrifugal action of the flyweights is balanced by the compression type governor spring, which is manually controlled by the throttle shaft linkage in regulating engine speed. A light idle spring is provided for more sensitive regulation at the low speed range. The limits of throttle travel are set by adjusting screws for proper idling and high speed positions.

A light tension spring allows the stopping mechanism to close the metering valve without overcoming the governor spring force. Only a very light force is required to rotate the metering valve to the closed position.

The load limiting device, or "fuel stop" consists of an arched leaf-type spring with each end "hooked" over the plunger shoe. By tightening the spring retaining screw with an Allen hexagonal wrench inserted through the plug opening in the bottom of the pump, the spring ends may be spread slightly and more fuel thereby permitted to enter the pumping chamber. Loosening the screw permits the spring to arch,

bring its ends together, and thus reduces the pump chamber maximum volume. Obviously, this adjustment must be made with the engine stopped and the internal parts of the pump rotated to permit the insertion of the Allen wrench.

Those pumps equipped with automatic advance mechanisms will not permit entering the Allen wrench at the cam locating screw since this screw terminates in a ball socket within the advance mechanism housing. These pumps, as well as all other recent pumps, have an access hole in the upper side of the pump body to allow insertion of the wrench. The cover and governor spring must first be removed.

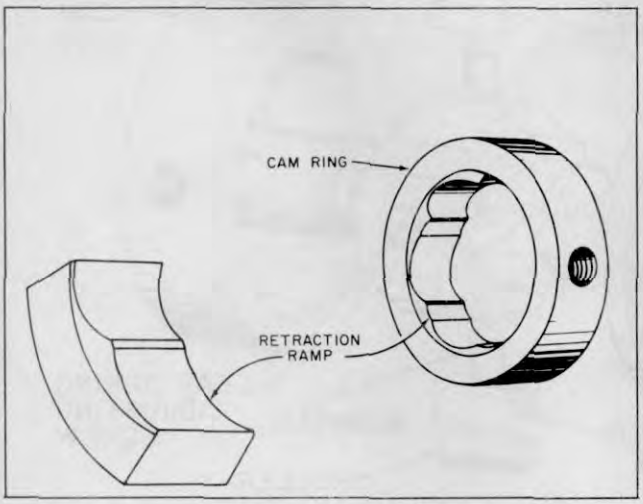


Plate 10213. Typical Detail Of Lobes In Cam Ring

It is very important to remember that this adjustment of the leaf spring is definitely not to be regarded as a field operation. Normal procedure provides for setting the spacing of the plungers with a micrometer while the plungers are extended by air pressure during pump assembly. The exact dimension depends on the engine, its application, and other detailed factors. Later this adjustment is modified slightly if necessary with the pump on a calibrating stand, or with the engine on a dynamometer equipped with a fuel measuring device.

The only reason this information is included here is to provide sufficient knowledge to make a minor adjustment of engine smoke under altitude conditions or other circumstances where such trimming is absolutely necessary. Never turn the adjusting screw more than a small fraction of a turn at a time. The plunger spacing is critical within a thousandth of an inch and the amount of adjustment that might seem reasonable on a carburetor idle screw, for example, would be far too much here.

The external torque adjustment screw does not serve quite the same purpose as the smoke stop adjustment on other injection pumps. It does, however, act as a limit or stop for the metering valve arm at full load speed. As the engine slows down under load, the metering valve arm remains against the stop (wide open) but more fuel is delivered to the plungers because the pump is turning slower and more time is available for the fuel to pass through the charging ports. This additional fuel increases as the engine slows down until the quantity entering the space between the plungers is great enough to force the plungers all the way out against the stops provided by the ends of the leaf springs. This is maximum fuel quantity, and because it is not introduced until the engine has slowed down somewhat an increase in torque takes place under these conditions. To avoid leaving an erroneous impression of the torque build-up action, it must also be understood that the output of the primary pump is accurately controlled by the fuel regulating valve to match the torque requirements of the engine application. Thus, one basic engine may have entirely different torque characteristics if a different regulator valve body is used in the primary pump. This fact must be recognized because it would be quite easy to select a replacement pump unsuited to a given job.

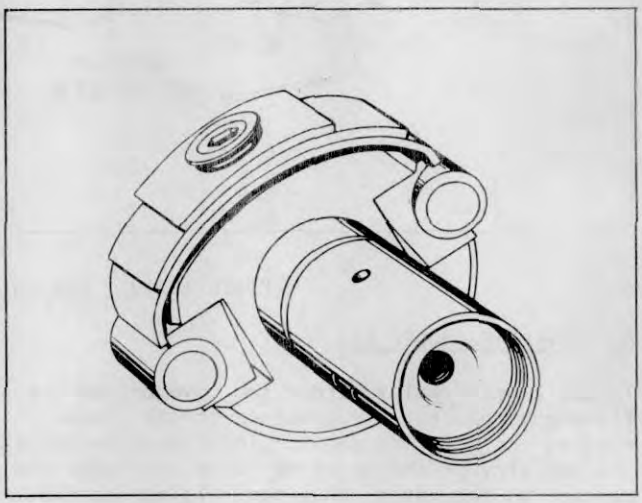


Plate 10214. Typical Assembly Of Distributor Rotor And Leaf Springs

END PLATE OPERATION MODEL DB:

The end plate, pressure regulating valve, priming by-pass spring and strainer are shown in the accompanying drawings.

The first shows the piston covering the hand priming port (A) and resting against the priming by-pass spring.

During hand priming, the pressure differential across the transfer pump, caused by the hand primer, forces the piston down, compressing the spring, until the priming port (A) is uncovered. Fuel then by-passes the stationary transfer pump to fill the system.

When the engine is in operation, fuel forces the piston up the sleeve until the regulating port or ports (B) are uncovered. Since the pressure on the piston is opposed by the regulating spring, the delivery pressure of the transfer pump is controlled by the spring rate and size and number of regulating ports.

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.

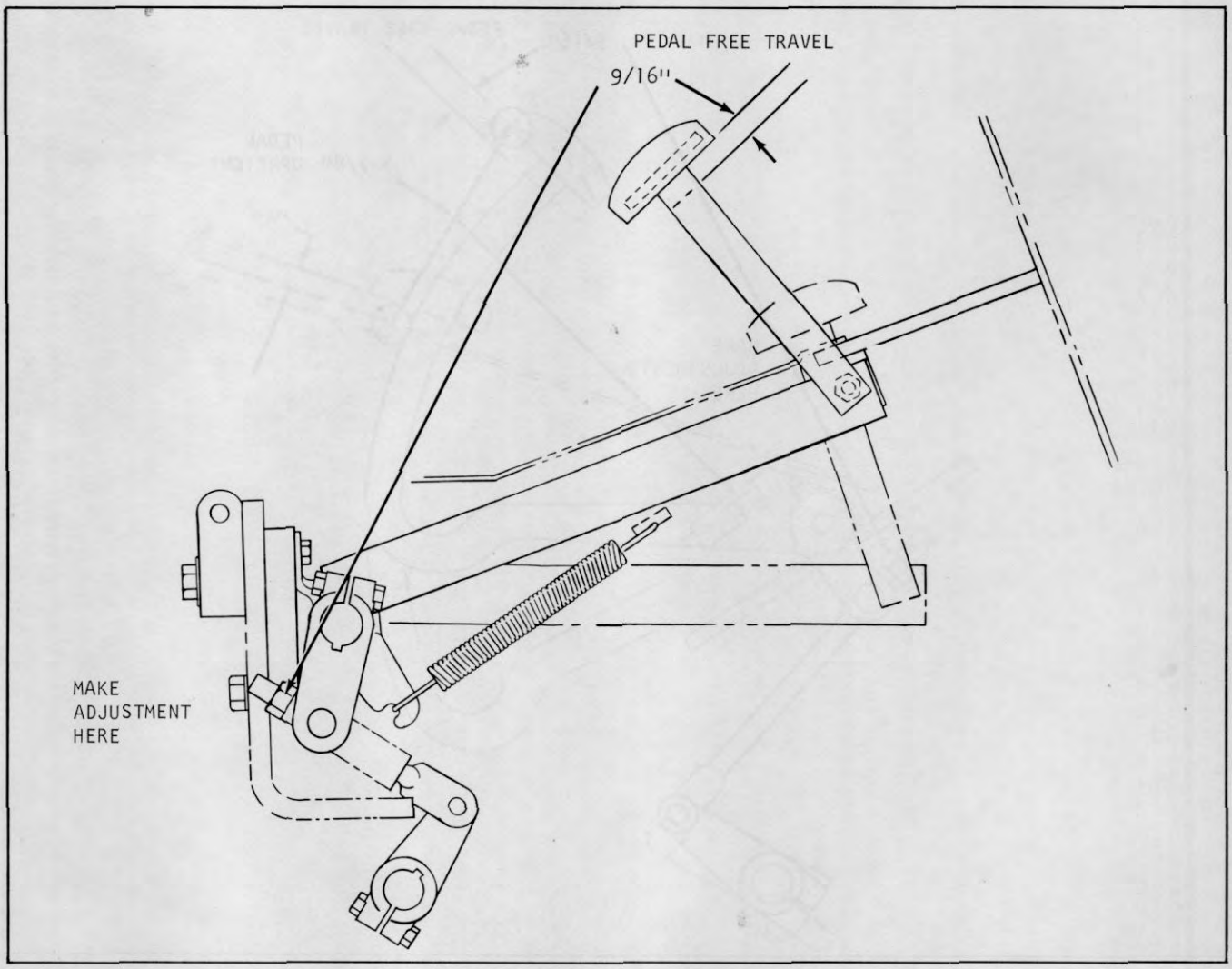


Plate 9756. Typical Pedal Adjustment

CLUTCH PEDAL FREE TRAVEL ADJUSTMENT
C500(H)Y45,55D:

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.

When adjustment becomes necessary, remove floor plates and adjust free travel at nut shown in illustration.

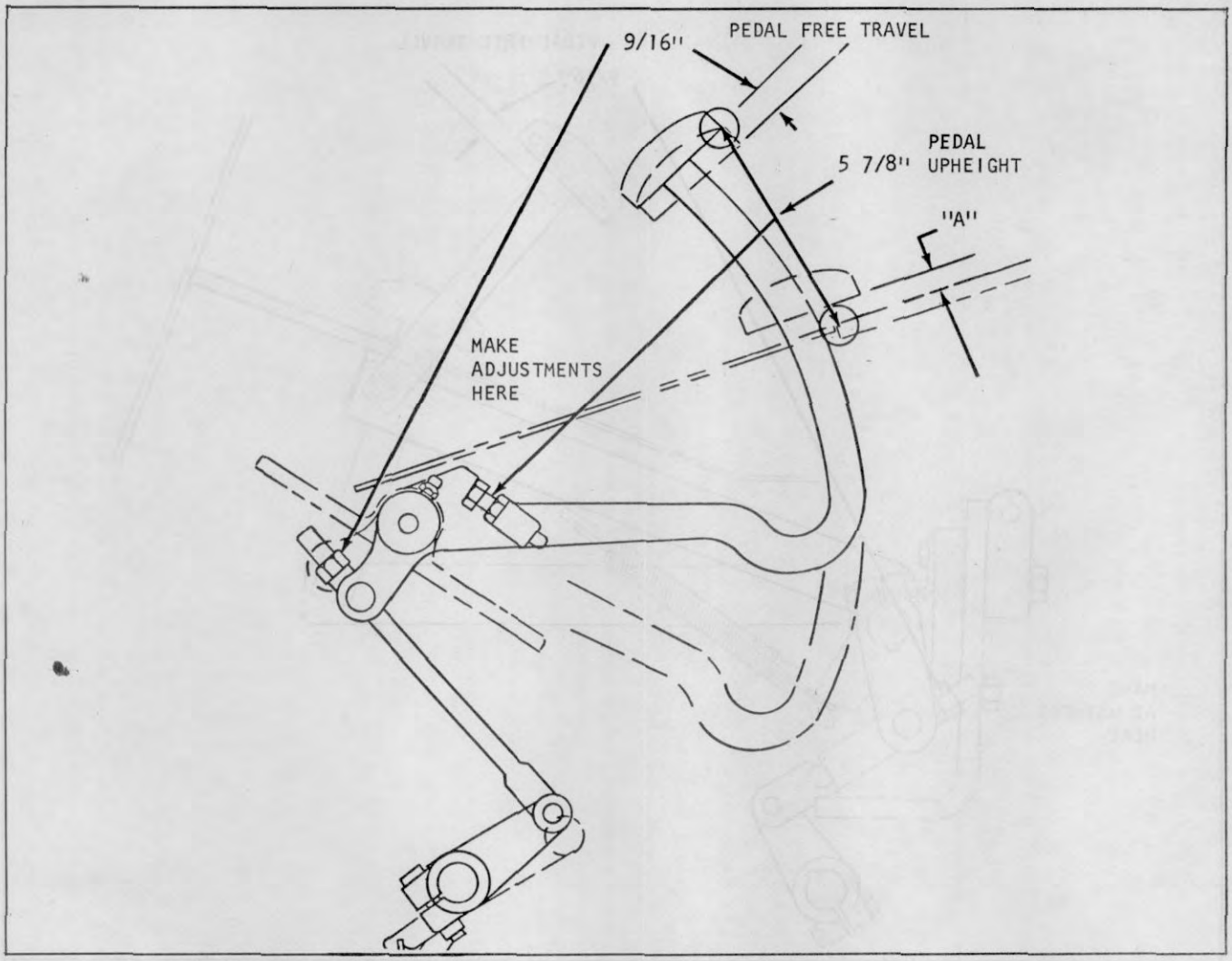


Plate 9757. Typical Pedal Adjustment

CLUTCH PEDAL FREE TRAVEL ADJUSTMENT
C500(H)35,45,55D:

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.

When adjustment becomes necessary, remove floor plates and adjust free travel at nut shown in illustration.

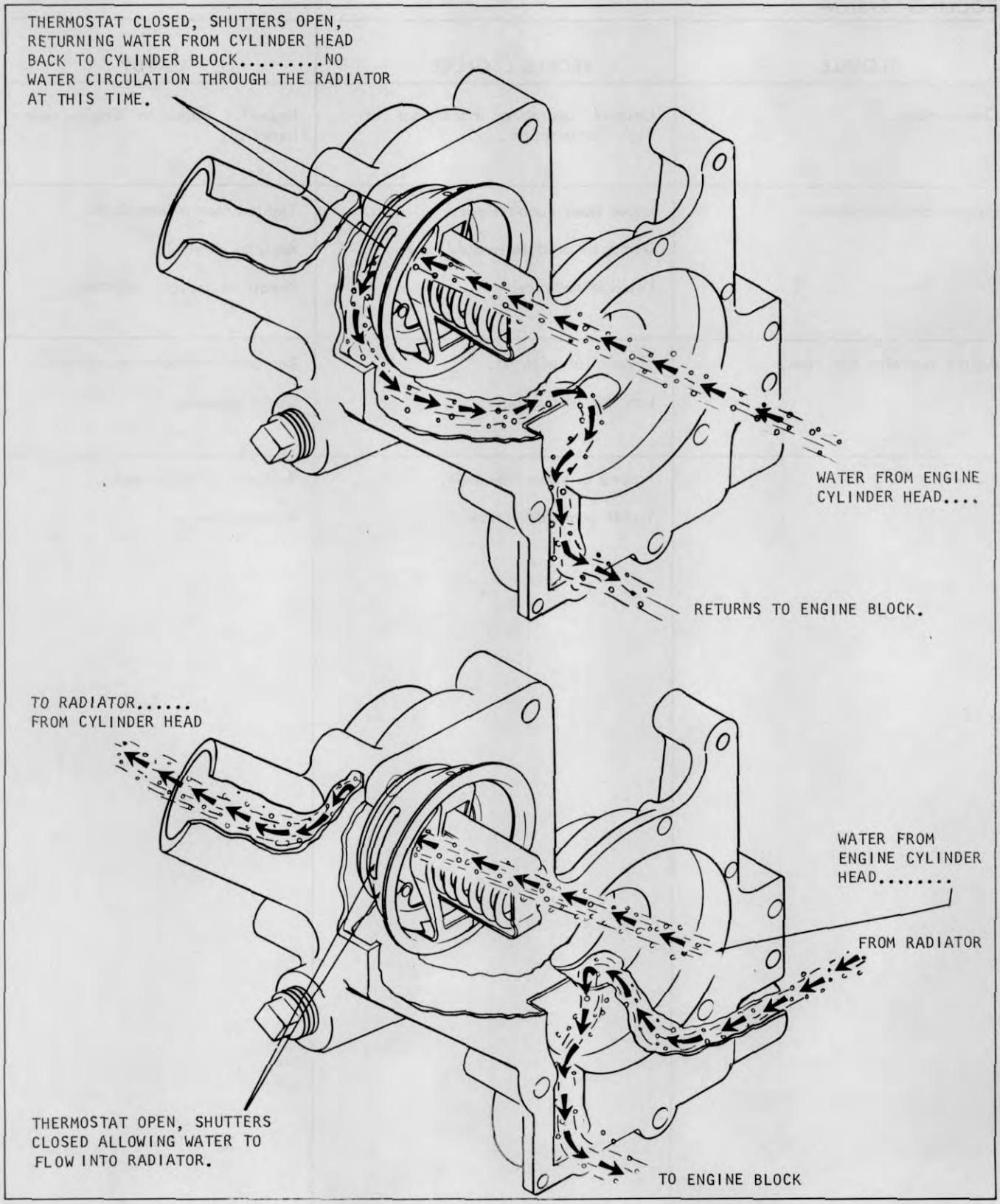
CLUTCH PEDAL UPHEIGHT ADJUSTMENT:

As explained on page 100H 654, "your" pedal upheight is dimension "A" plus 5 7/8".

Adjustment is made at nut shown in illustration.

COOLING SYSTEM

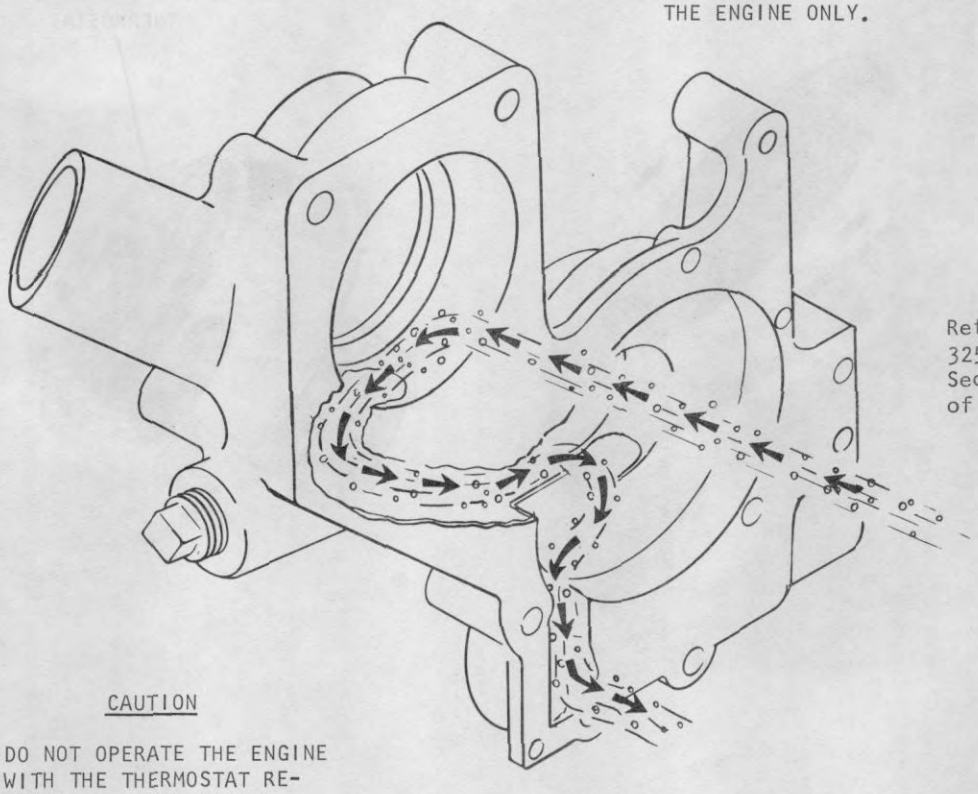
TROUBLE	PROBABLE CAUSE	REMEDY
Overheating.	Unusual operating conditions of high temperature.	Inspect. (Refer to "Engine overheats".)
Loss of cooling solution.	Loose hose connections. Damaged or deteriorated hose. Leaking radiator.	Tighten hose connections. Replace hoses. Repair or replace radiator.
Engine 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.



TYPICAL THERMOSTST OPERATION

CAUTION

DO NOT REMOVE THERMOSTAT FOR ANY REASON AND RUN ENGINE.....THE ENGINE WILL OVERHEAT CAUSING SERIOUS DAMAGE. AS YOU CAN SEE BELOW...REMOVING THERMOSTAT WILL ALLOW THE WATER TO BY-PASS THE RADIATOR AND CIRCULATE THROUGH THE ENGINE ONLY.



CAUTION

DO NOT OPERATE THE ENGINE WITH THE THERMOSTAT REMOVED.....SEE ABOVE.

NOTE

Refer to pages TS-322 and 325 in the Trouble Shooting Section located in the back of this manual.

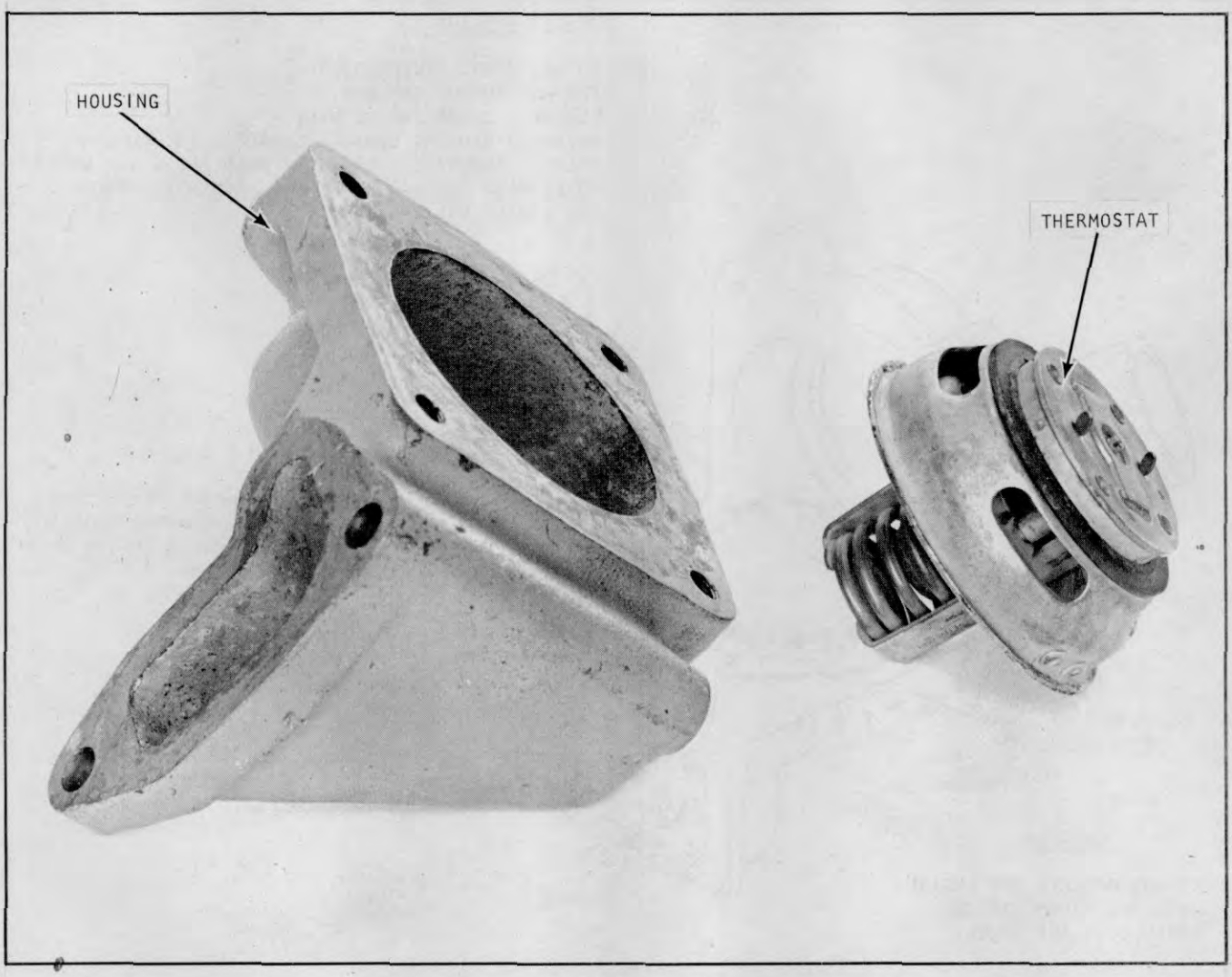


Plate 10189. Typical Thermostat Removed

THERMOSTAT REMOVAL.

1. Remove the bolts which retain the water outlet elbow to the cylinder head and the thermostat housing.

N O T E

Be sure to mark the bolts in such a manner, so that upon reassembly, the same bolts are placed back in the same holes they came from.

2. Inspect and test thermostat.

THERMOSTAT TEST:

The thermostat operation can be checked in the following methods:

1. Hang thermostat by its frame in a container of water so that it does not touch the bottom.

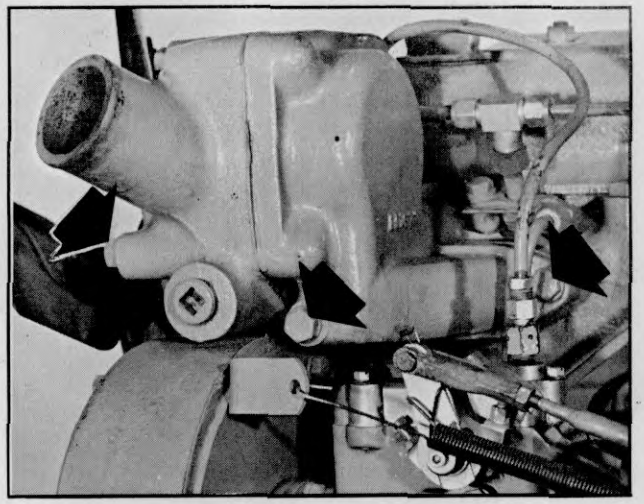


Plate 10191. Typical Thermostat Removal

COOLING SYSTEM:

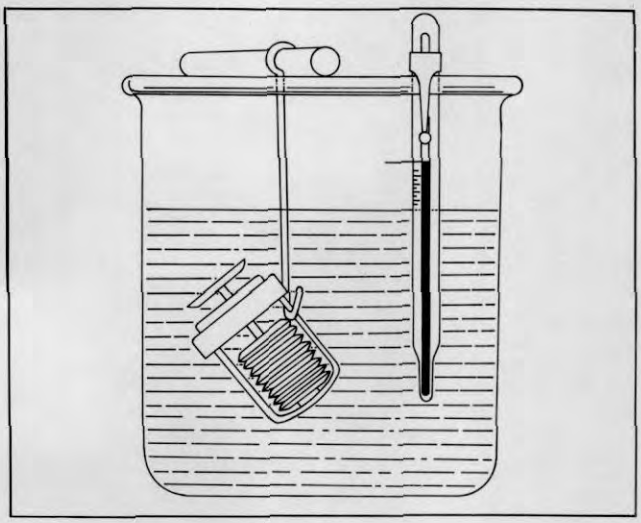


Plate 3553. Typical Thermostat Testing

2. Heat the water to 158 degrees F. and gradually raise the temperature by 10 degrees at a time, pausing at each step for 1 minute to see if the thermostat opens. If it starts to open much before 178 degrees. F. or doesn't start to open till much after 182 degrees F., then it is defective and should be replaced. Thermostat should be fully open at 202 degrees F.

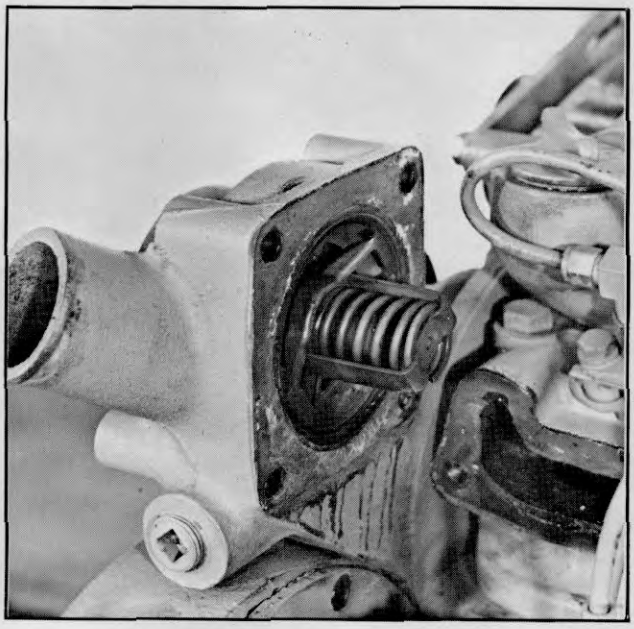


Plate 10411. Typical Thermostat

THERMOSTAT REPLACEMENT:

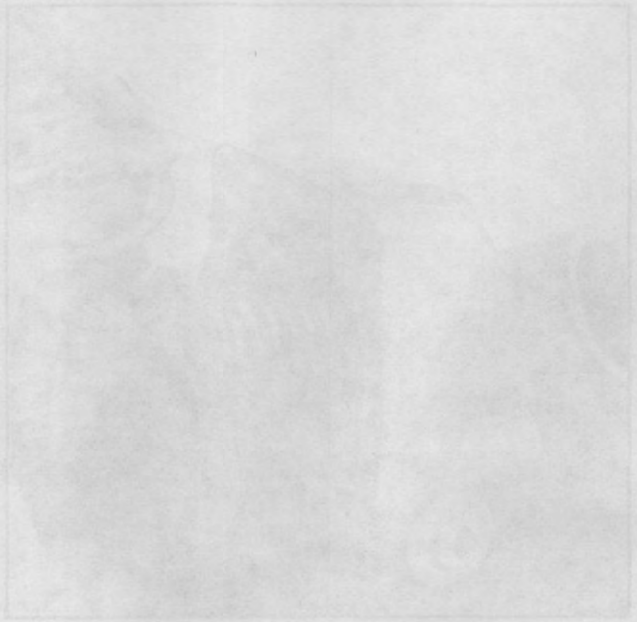
1. Using gasket sealer on both sides, affix both gaskets to the water outlet elbow flanges.

2. Place elbow with gaskets on the cylinder head assembly and against the thermostat housing.

3. Install all capscrews in their individual holes, finger tight.

4. "Gradually" and "alternately" tighten all screws to normal torque.

Plate 9779. Typical Thermostat



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.

ALTERNATOR

I M P O R T A N T

SINCE THE ALTERNATOR AND REGULATOR ARE DESIGNED FOR USE ON ONLY ONE POLARITY SYSTEM, THE FOLLOWING PRECAUTIONS MUST BE OBSERVED WHEN WORKING ON THE CHARGING CIRCUIT. FAILURE TO OBSERVE THESE PRECAUTIONS WILL RESULT IN SERIOUS DAMAGE TO THE ELECTRICAL EQUIPMENT.

1. When installing a battery, always make absolutely sure the ground polarity of the battery and the ground polarity of the alternator are the same.

2. When connecting a booster battery, make certain to connect the negative battery terminals together and the positive battery terminals together.

3. When connecting a charger to the battery, connect the charger positive lead to the battery positive terminal and the charger negative lead to the battery negative terminal.

4. Never operate the alternator on open circuit. Make absolutely certain all connections in the circuit are secure.

5. Do not short across or ground any of the terminals on the alternator or regulator.

6. Do not attempt to polarize the alternator.

I N S P E C T I O N

1. The terminals should be inspected for corrosion and loose connections.

2. The wiring should be inspected for frayed insulation.

3. Check the mounting bolts for tightness.

4. Check the belt/s for correct alignment....proper tension and wear. Belt tension should be inspected and adjusted, if necessary, every 100 operating hours and adjusted per the procedures listed on page 100H 203.

5. After extended periods of operation, or at time of engine overhaul, the alternator may be removed from the vehicle for a thorough inspection and cleaning of all parts. The alternator requires no other service other than the previously mentioned inspection. When it becomes necessary to perform tests and internal inspection at the alternator, see your nearest authorized Clark Equipment Dealer.

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.

TRANSMISSION

FLUID AERATION CHECK

A fluid level that is too high will cause the fluid to become aerated. Aerated fluid will cause low control pressure and the aerated fluid may be forced out the vent.

Check the transmission fluid level. Low fluid level can affect the operation of the transmission and may indicate fluid leaks that could cause transmission damage.

TRANSMISSION FLUID LEAKAGE CHECKS

Leakage at the control cover, inlet and outlet ports often can be stopped by tightening the attaching bolts. If necessary, replace the gasket.

Check the fluid lines and fittings between the transmission and the cooler in the radiator tank or on the transmission for looseness, wear, or damage. If leakage cannot be stopped by tightening a fitting, replace the defective parts.

The cooler can be further checked for leaks by disconnecting the lines from the cooler fittings and applying 5 psi air pressure to the fittings. If the cooler is leaking and will not hold this pressure, the radiator must be replaced. The cooler cannot be replaced separately.

Inspect the pipe plug on the left side of the transmission case at the front. If the plug shows leakage, torque the plug to specification. If tightening does not stop the leaks, replace the plug.

When converter drain plugs leak, remove drain plugs. Coat the threads with a sealing compound and install the plugs. Torque the drain plugs to specification.

I M P O R T A N T

THIS TRANSMISSION USES ONLY TYPE "A", SUFFIX "A" AUTOMATIC TRANSMISSION FLUID (CLARK PART #879803). CONTAINERS MUST DISPLAY A QUALIFICATION NUMBER PREFIXED BY AQ-ATF.

DRIVE AXLE

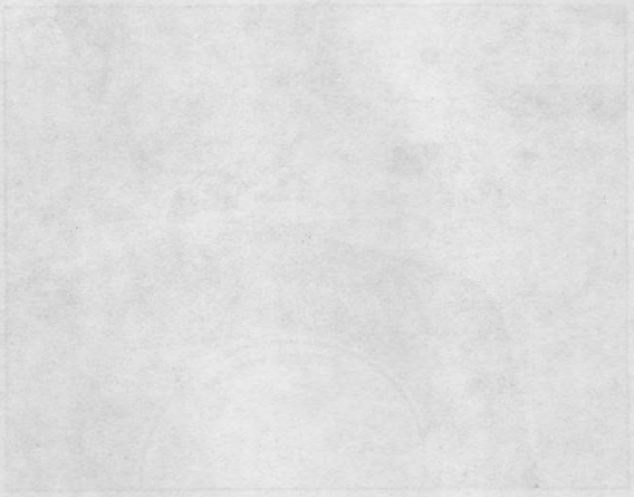
TROUBLE	PROBABLE CAUSE	REMEDY
Continuous Axle Noise.	Badly worn parts.	Replace worn parts with new.
	Unevenly worn tires.	Replace tires.
	Improperly adjusted wheel bearing.	Adjust correctly.
	Lack of lubricant.	Add sufficient lubricant of correct grade.
Axle Noise on Drive or on Coast Only.	Differential 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.

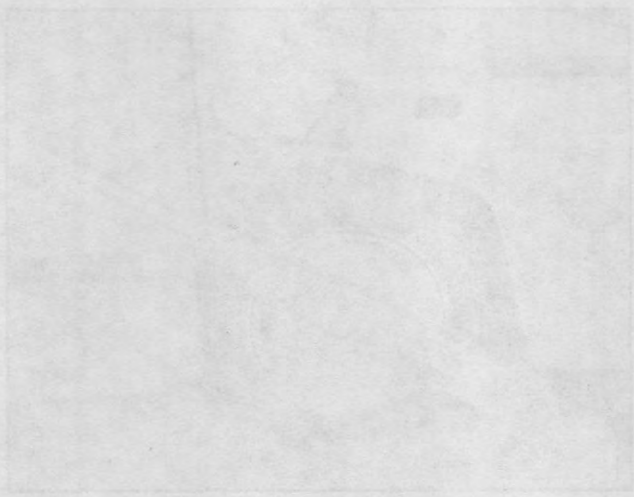
STEERING AXLE

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.





STEERING SYSTEM ADJUSTMENT AND ADJUSTMENT CHECKS.

N O T E

In making power steering adjustments, we are out to accomplish six basic things:

(a) To torque all items which have a bearing on steering.
(b) To eliminate end play and free play of the hand wheel.
(c) To center the hand wheel and the pitman arm with the steer wheels straight.
(d) To eliminate any steering linkage looseness caused by wear or misadjustment.
(e) To set the pitman arm stops so that the power steering pump will operate at its minimum pressure when steer wheels are turned full right and full left....with steer wheels off the ground.

The following procedures will achieve these objectives. They are laid out to enable you to do a thorough job, and, at the same time, do it efficiently and fast....without jumping around or backtracking. Thus, it will pay you to follow the steps in the order given. It is also important to remember that incorrect power steering adjustments can shorten the life of various steering system components.

Before starting any adjustment, strip the truck down to a point where you can get at the components. This includes: Removing the side hoods; removing the floor board; removing the entire seat assembly.

With these operations out of the way, we can now continue with the step-by-step procedures.

Plate 9840. Security Check

STEP 1: Check, and, if necessary, adjust the tilt cylinder rods to eliminate upright racking. Always make certain the tilt cylinder yoke nuts are torqued to 80 to 90 pound feet.

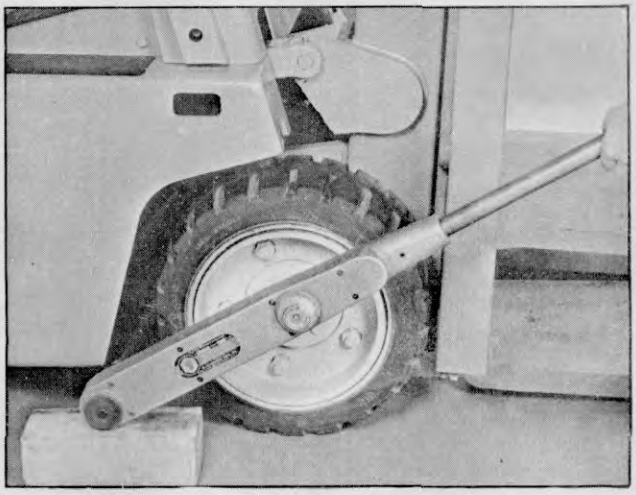


Plate 9841. Security Check

STEP 2: Torque the frame-to-axle adaptor bolts to 650 to 700 pound feet. It is not necessary to remove the wheels to do this.

N O T E

Torque the center cap screw first; then, torque the top cap screw....then, torque the bottom capscrew. Recheck torque, again starting with the center capscrew.

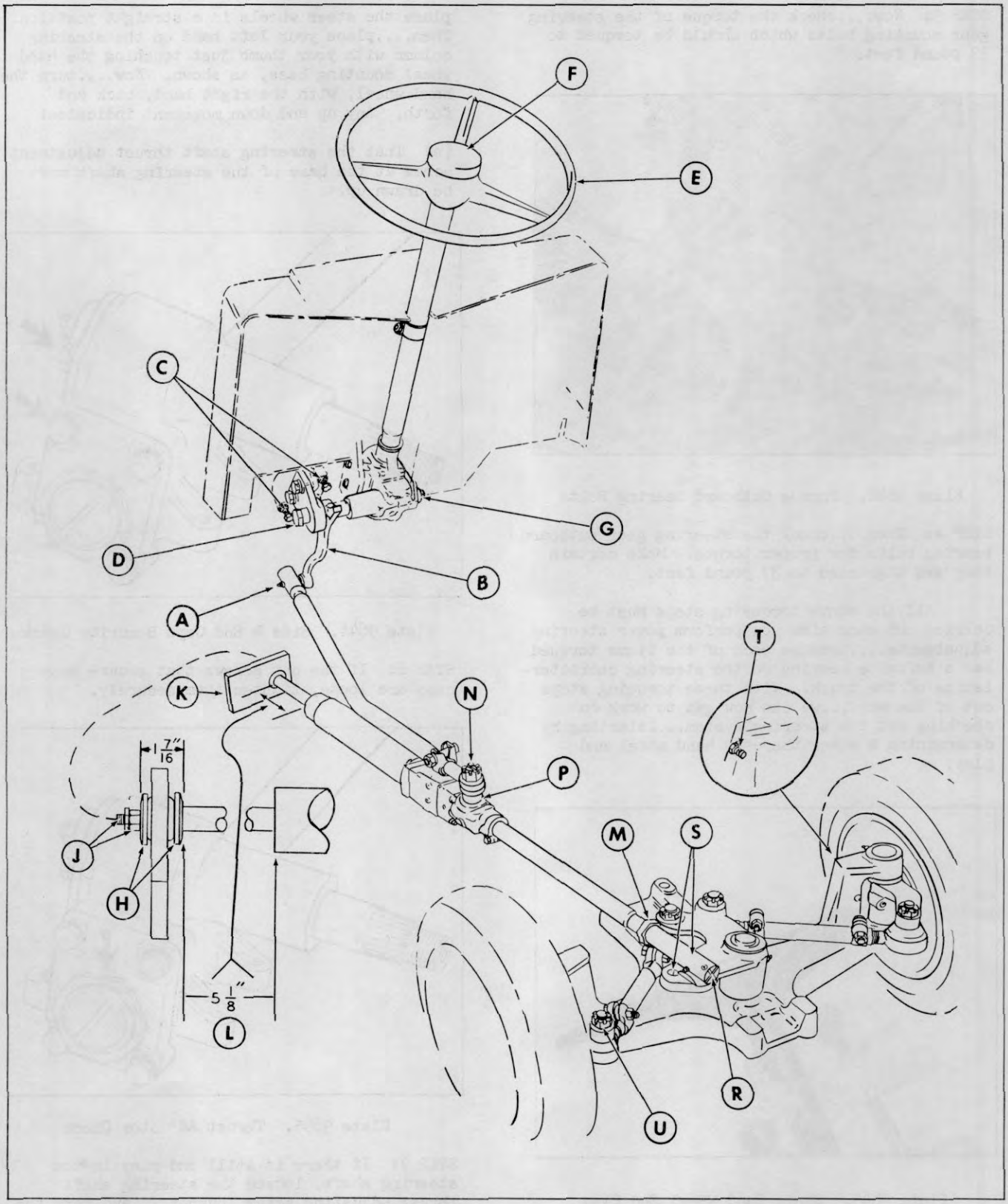


Plate 9856. Steering Axle and Linkage Adjustments

STEP 3: Now....check the torque of the steering gear mounting bolts which should be torqued to 33 pound feet.

Plate 9842. Torque Outboard Bearing Bolts

STEP 4: Then....check the steering gear outboard bearing bolts for proper torque. Make certain they are tightened to 37 pound feet.

All the above torqueing steps must be carried out each time you perform power steering adjustments....because each of the items torqued has a definite bearing on the steering characteristics of the truck. With these torquing steps out of the way....we can now get to work on checking out the steering system....starting by determining whether there is hand wheel end play.

Plate 9843. Check Hand Wheel End Play

STEP 5: To check for hand wheel end play....first place the steer wheels in a straight position. Then....place your left hand on the steering column with your thumb just touching the hand wheel mounting base, as shown. Now....turn the hand wheel, with the right hand, back and forth. Any up and down movement indicates:

(a) That the steering shaft thrust adjustment screw at the base of the steering shaft must be drawn up.

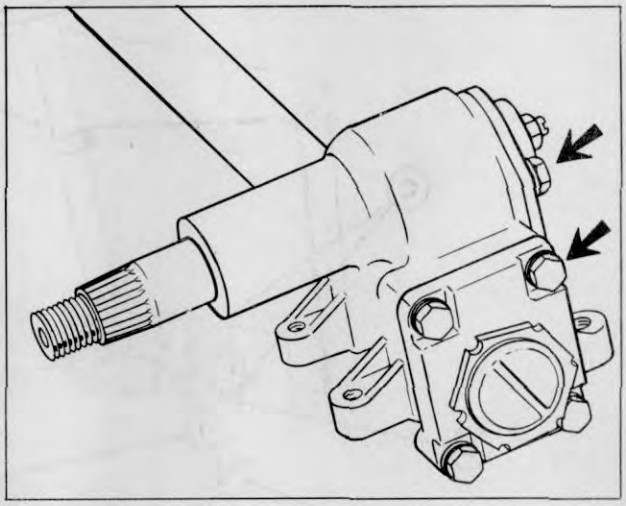


Plate 9844. Side & End Caps Security Check

STEP 6: If the cap screws that secure both caps are loose, tighten them securely.

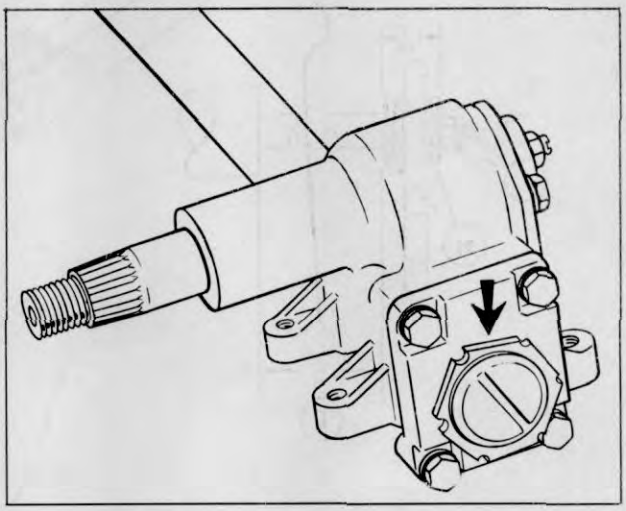


Plate 9845. Thrust Adjustor Check

STEP 7: If there is still end play in the steering shaft, loosen the steering shaft thrust adjusting screw locknut....and turn the adjusting screw in until end play is eliminated. Then....tighten the adjusting screw locknut.

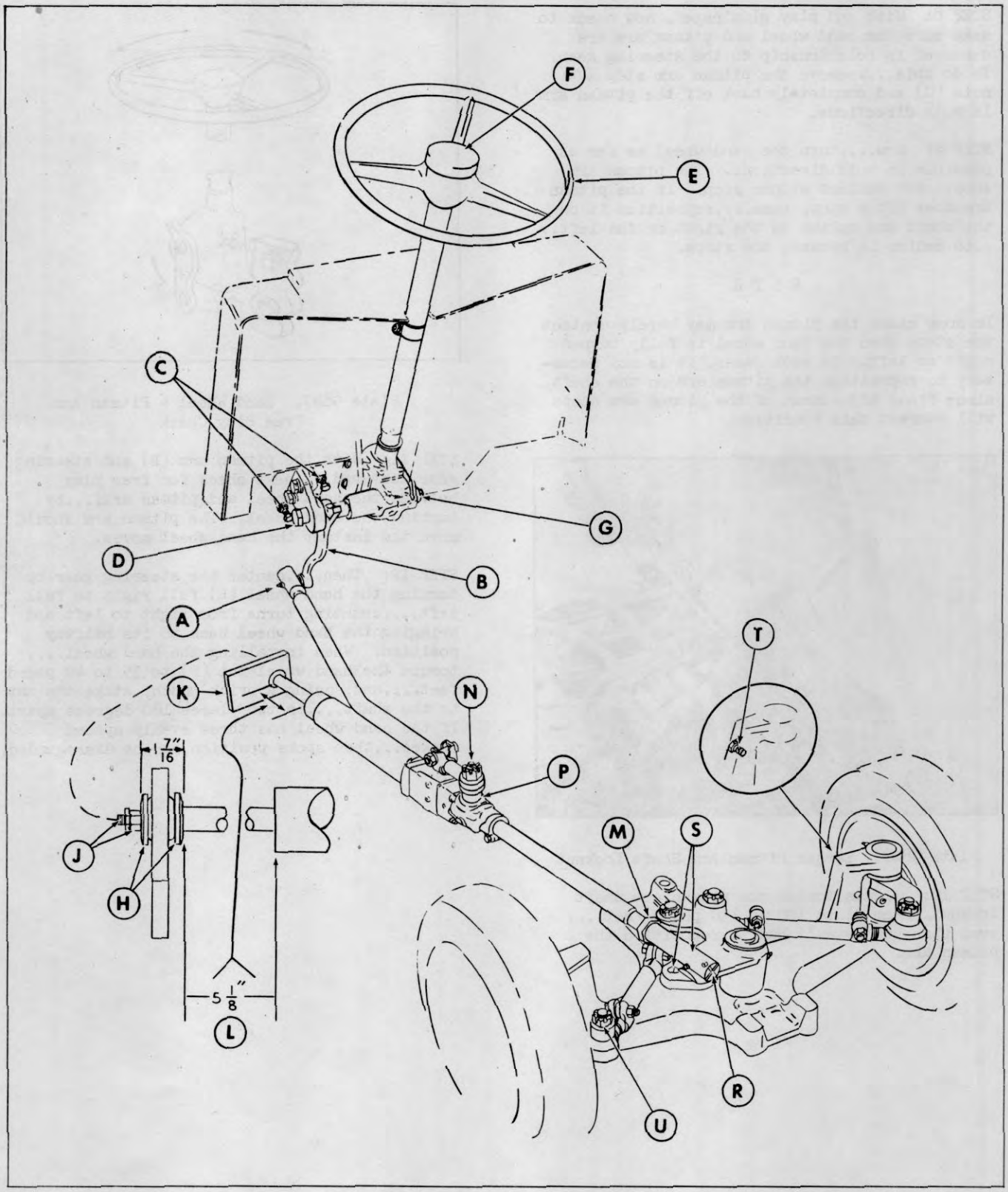


Plate 9856. Steering Axle and Linkage Adjustments

STEP 8: With end play eliminated, now check to make sure the hand wheel and pitman arm are centered in relationship to the steering gear. To do this....remove the pitman arm stop Jam nuts (C) and completely back off the pitman arm in both directions.

STEP 9: Now....turn the hand wheel as far as possible in both directions. The pitman arm should not contact either stop. If the pitman arm does hit a stop, then....reposition it on the shaft one spline to the right or the left.. ..to center it between the stops.

N O T E

In some cases the pitman arm may barely contact the stops when the hand wheel is fully turned right or left. In such cases, it is not necessary to reposition the pitman arm on the shaft, since final adjustment of the pitman arm stops will correct this condition.

Plate 9848. Torque Pitman Arm Shaft Locknut

STEP 10: Always torque the pitman arm shaft locknut (item D) to 120 to 130 pound feet.... even when you haven't had to reposition the pitman arm.

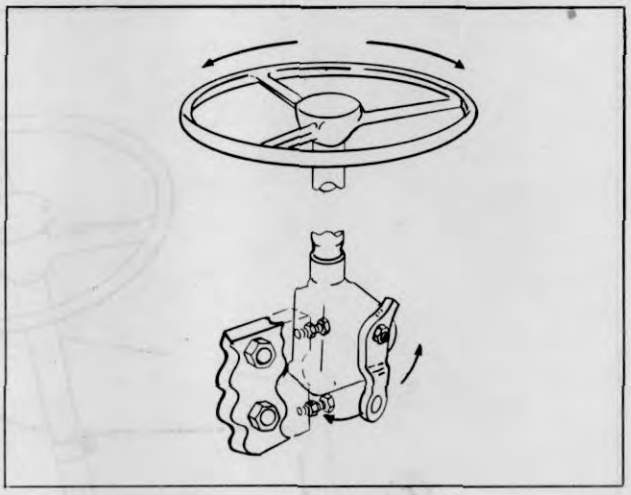


Plate 9847. Hand Wheel & Pitman Arm Free Play Check

STEP 11: With the pitman arm (B) and steering gear centered....next check for free play between the hand wheel and pitman arm....by turning the hand wheel. The pitman arm should move the instant the hand wheel moves.

STEP 12: Then....center the steering gear by turning the hand wheel (E) full right to full left....counting turns from right to left and bringing the hand wheel back to its halfway position. When installing the hand wheel.... torque the hand wheel nut (F) to 35 to 40 pound feet....and, using a prick punch, stake the nut to the shaft....in two places 180 degrees apart. If the hand wheel has three evenly spaced spokes...then spoke position can be disregarded.

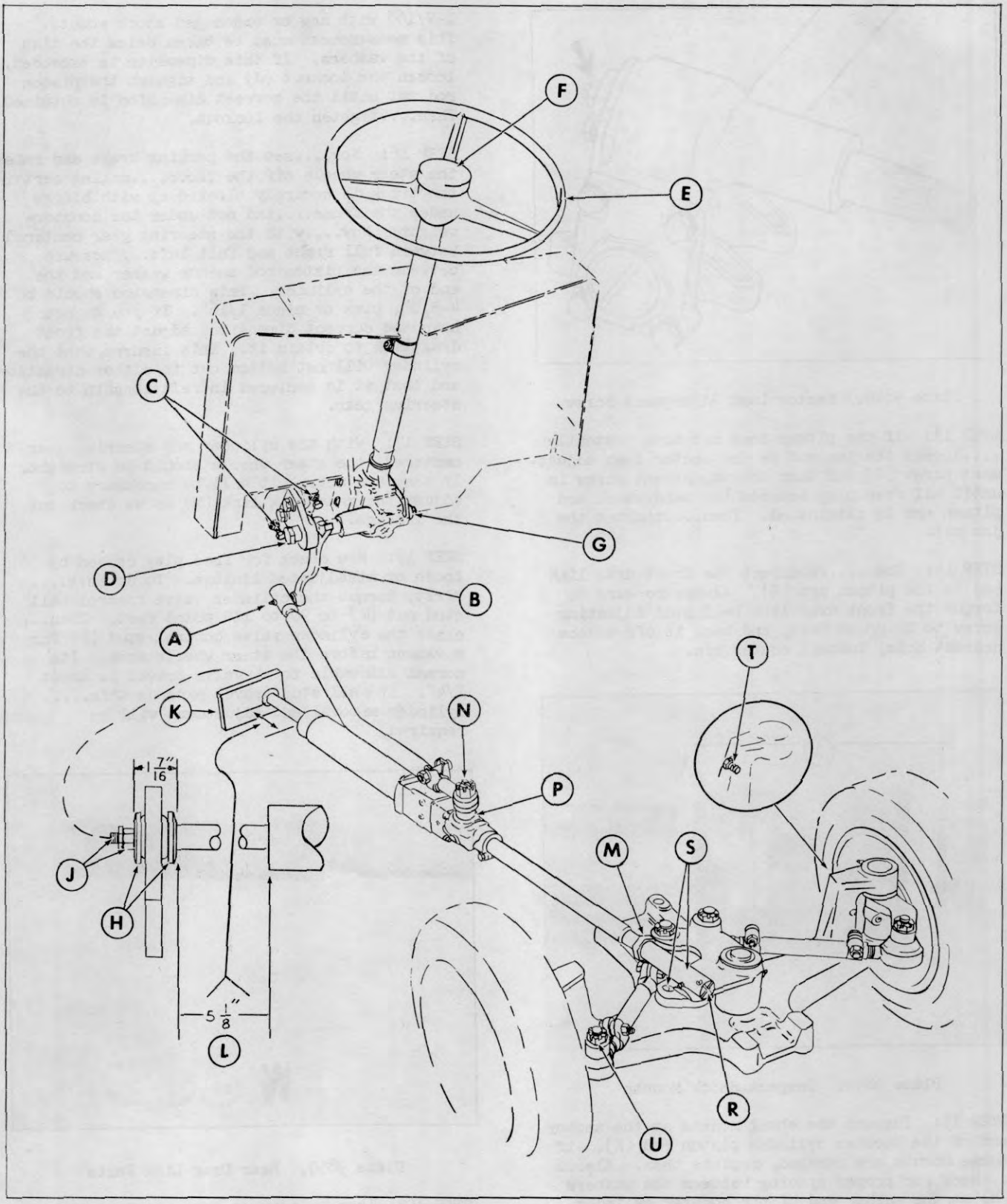


Plate 9856. Steering Axle and Linkage Adjustments

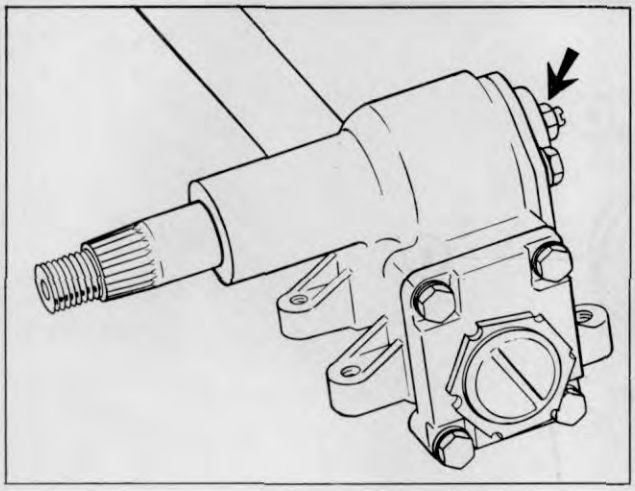


Plate 9846. Sector Lash Adjustment Screw

STEP 13: If the pitman does not move instantly ....loosen the jam nut on the sector lash adjustment screw (G) and turn the adjustment screw in until all free play between the hand wheel and pitman arm is eliminated. Then....tighten the jam nut.

STEP 14: Then....reconnect the front drag link (A) to the pitman arm (B). Always be sure to torque the front drag link ball stud adjusting screw to 20 pound feet, and back it off to the nearest hole, install cotter pin.

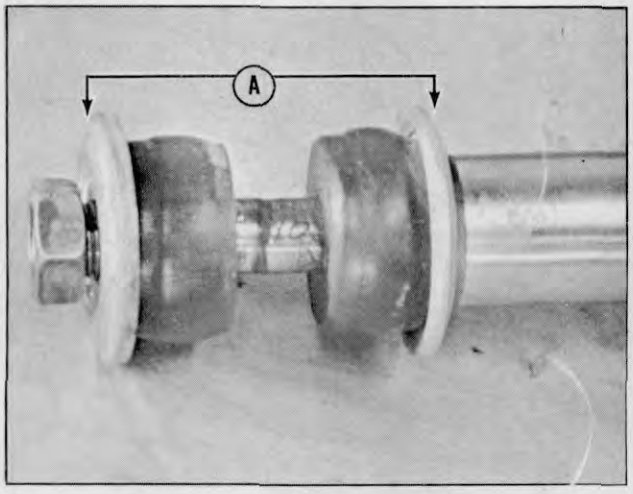


Plate 9849. Inspect Shock Mounts

STEP 15: Inspect the shock mounts at the anchor end of the booster cylinder piston rod (K). If these mounts are damaged, replace them. Also.. ..check for proper spacing between the washers (H) at the anchor end of the booster cylinder piston rod. The maximum dimension from outside to outside of steel washers should not exceed 1-7/16" with new or undamaged shock mounts. This measurement must be taken below the dish of the washers. If this dimension is exceeded, loosen the locknut (J) and tighten the piston rod nut until the correct dimension is obtained. Then....tighten the locknut.

STEP 16: Now....set the parking brake and raise the steer wheels off the floor....making certain the truck is securely blocked up with blocks under the frame....and not under the counterweight. Now....with the steering gear centered between full right and full left....measure between the piston rod anchor washer and the end of the cylinder. This dimension should be 4-5/8", plus or minus 1/16". If you do not have the correct dimension, adjust the front drag link to obtain it. This insures that the cylinder will not bottom out in either direction and that it is centered in relationship to the steering gear.

STEP 17: With the cylinder and steering gear centered, the steer wheels should be straight. If they are not....it will be necessary to adjust the rear drag link (M) as we check out the linkage.

STEP 18: Now check for free play caused by loose or misadjusted linkage. To do this.... first, torque the cylinder valve control ball stud nut (N) to 90 to 110 pound feet. Then... check the cylinder valve control stud (P) for movement before the steer wheels move. Its normal allowable total valve travel is about 1/4". If ball stud travel exceeds this..... cylinder removal and adjustment will be required.

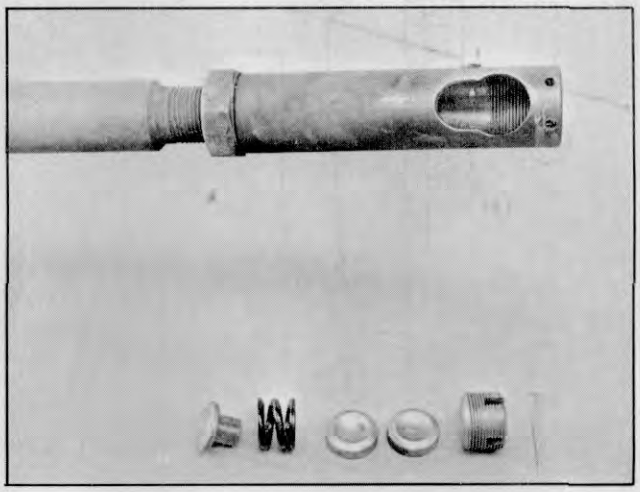


Plate 9850. Rear Drag Link Parts

STEP 19: Then....inspect the rear drag link (M). If necessary, adjust it to assure that the steer wheels are straight with cylinder and

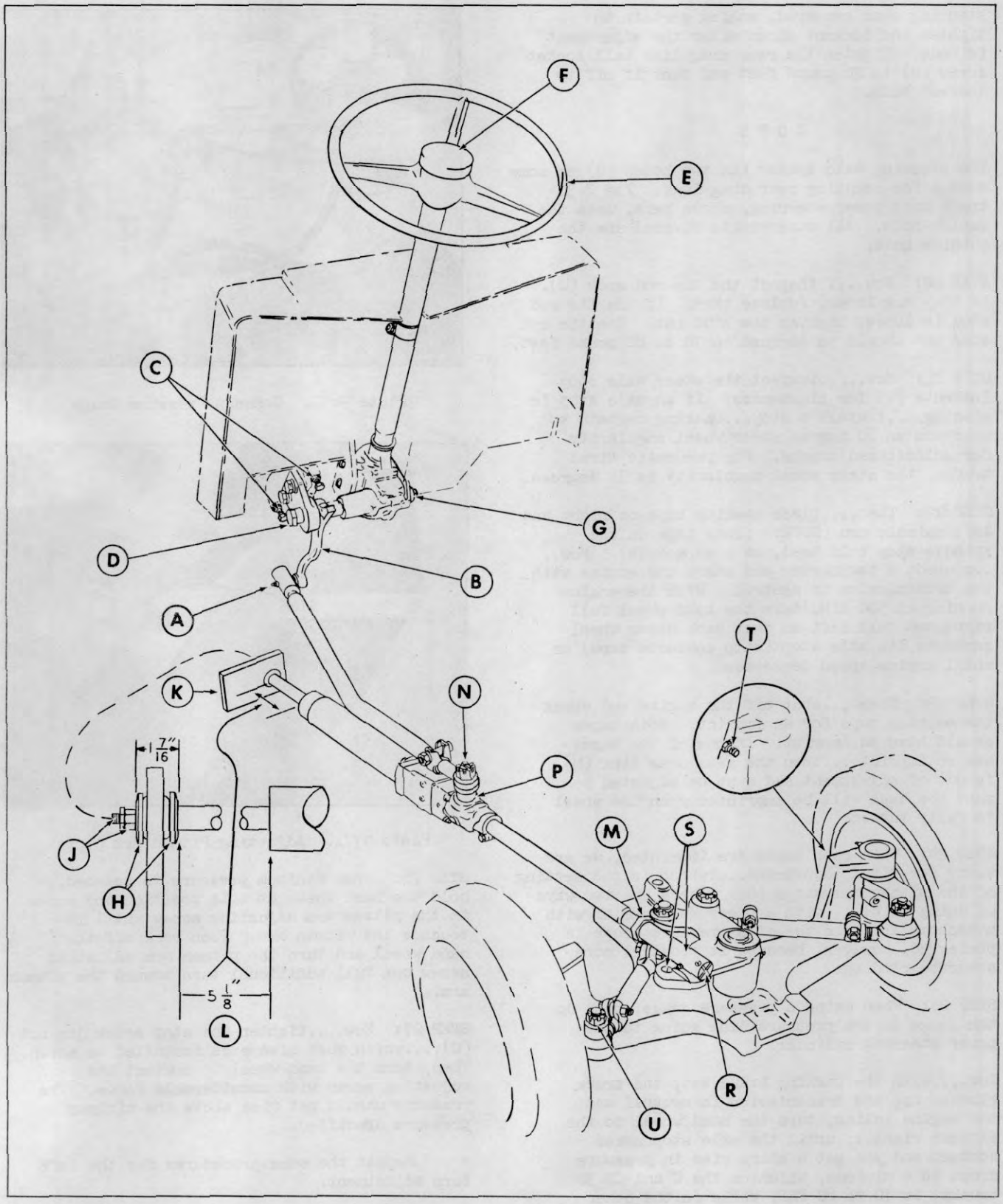


Plate 9856. Steering Axle and Linkage Adjustments

steering gear centered, making certain to tighten the locknut shown after the adjustment is made. Tighten the rear drag link ball socket screw (R) to 20 pound feet and back if off to nearest hole.

N O T E

The steering axle spider has two holes (S) on some models for mounting rear drag link. The C-30 truck with power steering, shown here, uses the inside hole. All other units covered use the outside hole.

STEP 20: Now.....inspect the tie rod ends (U). If they are loose, replace them. If the tie rod stud is loose, tighten the stud nut. The tie rod stud nut should be torqued to 70 to 80 pound feet.

STEP 21: Now.....inspect the steer axle stop locknuts (T) for tightenes. If an axle stop is missing....install a stop....making certain to maintain an 80 degree steer wheel angularity for solid tired trucks. For pneumatic tired trucks, the steer wheel angularity is 75 degrees.

STEP 22: Then....place masking tape on right and left spindle arm (NOTE: place tape on the spindle stop bolt head, on some models). Now.. ..connect a tachometer and start the engine with the transmission in neutral. With the engine running at 500 RPM, turn the hand wheel full right and full left so that each steer wheel contacts its axle stop (stop contacts tape) or until engine speed decreases.

STEP 23: Then....shut off the engine and check the masking tape for an imprint. Both tapes should have an imprint. If one of the tapes has no imprint....then the rear drag link (M) is out of adjustment and must be adjusted so that the tape will be imprinted when the wheel is fully turned.

STEP 24: When both tapes are imprinted, we are ready for final adjustment....which is the setting of the pitman arm stops (C). There are two ways of doing this... .with a pressure gauge or with a tachometer. The use of a pressure gauge is preferred, however, because it provides more accurate readings.

STEP 25: When using a pressure gauge, hook up the gauge in the pressure line going to the power steering cylinder.

Now....with the parking brake set, the truck blocked up, the transmission in neutral and the engine idling, turn the hand wheel to the extreme right....until the axle stop makes contact and you get a sharp rise in pressure drops to a minimum, which on the C and CH 30 trucks, is 70 to 80 PSI, while on the other trucks we are covering....the minimum pressure is 30 to 40 PSI.

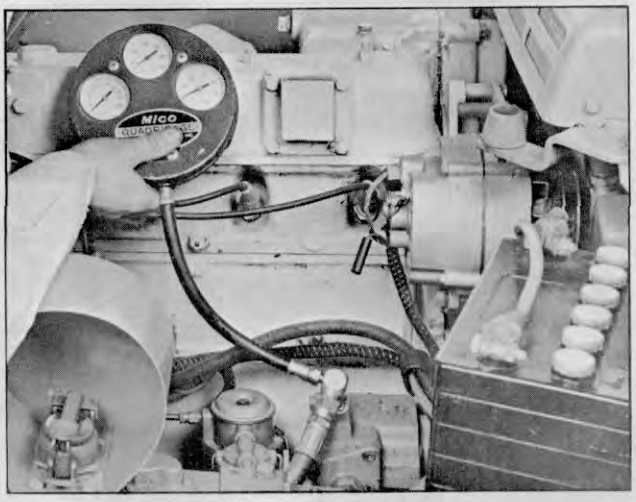


Plate 9851. Connect Pressure Gauge

Plate 9771. Adjusting Pitman Arm Stops

STEP 26: When minimum pressure is reached, hold the hand wheel at this position and screw in the pitman arm adjusting screw until it touches the pitman arm. Then back off the hand wheel and turn the pitman arm adjusting screw one full additional turn toward the pitman arm.

STEP 27: Now....tighten the stop screw jam nut (C)....which must always be installed as shown. Then, turn the hand wheel to contact the adjusting screw with considerable force. The pressure should not rise above the minimum pressure specified.

Repeat the same procedures for the left turn adjustment.

When the tachometer only is being used, the same routine is followed except that instead

of reading pressures, you will read RPMs. With the engine running at 500 RPM, turn the hand wheel to the extreme right until the RPM drops. Then....slowly back off the hand wheel until engine speed comes back to 500 RPM.

When 500 RPM is reached, hold the hand wheel at this position and screw in the pitman arm adjusting screw until it touches the pitman arm.

Then....back off the hand wheel and turn the pitman arm adjusting screw one full additional turn toward the pitman arm....and install and tighten the adjusting screw jam nut. Now.... turn the hand wheel to contact the adjusting screw with considerable force. The engine speed should not decrease. Repeat these same procedures for the left turn adjustment.

When the above adjustments have been made, disconnect any gauges used, and lubricate all axle and linkage points. Then lower the truck to the floor and install the seat assembly, floor board, and side hoods.

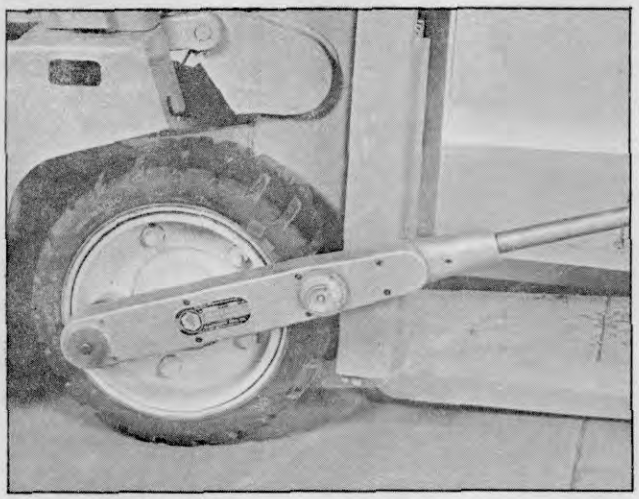


Plate 9852. Torque Drive Wheel Lug Nuts

STEP 28: Now....torque all drive wheel lug nuts to the correct torque:

290 to 300 pound feet (single drive) *
200 to 225 pound feet (wide drive) **

*Standard and Triple Stage Upright axle ends.
**Dual pneumatic tire models.

The above specifications cover both cushion and pneumatic tire model machines.

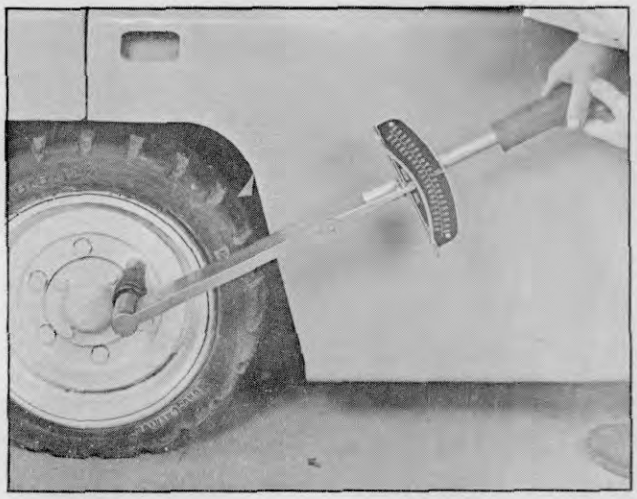


Plate 9853. Torque Steer Wheel Lug Nuts

STEP 29: Then....torque all steer wheel lug nuts to 115 to 125 pound feet....all models.

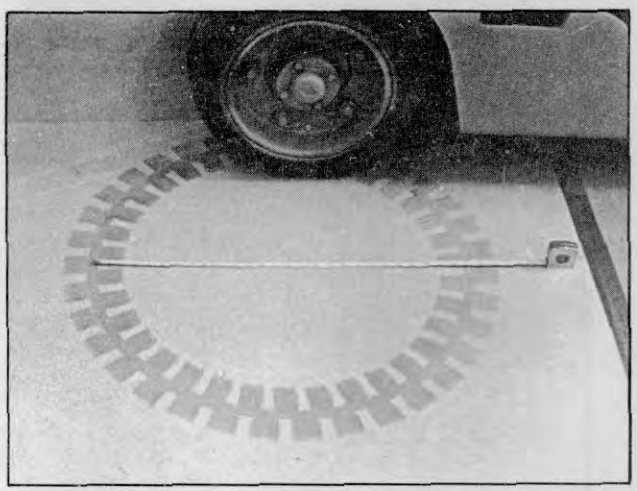
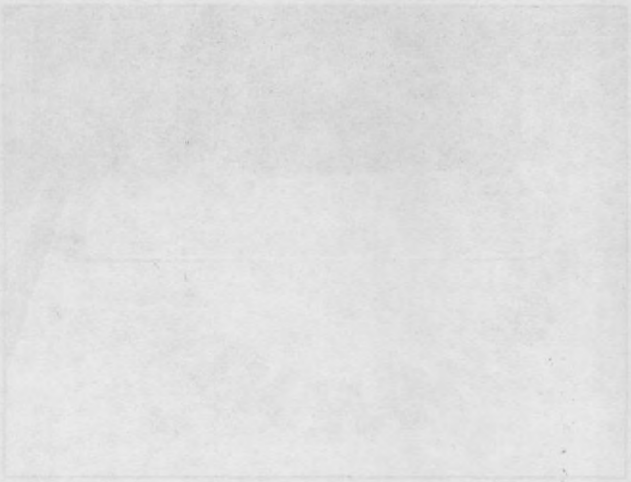
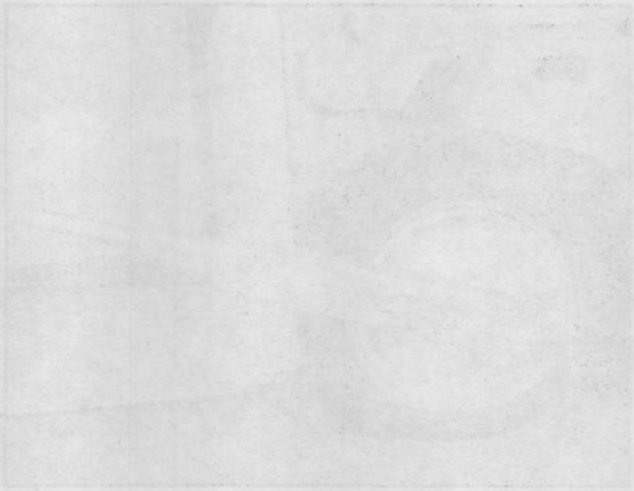


Plate 9854. Check Correctness of Adjustment

STEP 30: To check the correctness of your adjustments, drive the truck in full left and right turns and measure the inside turning diameter of each drive tire. The two diameters should be nearly equal.

STEP 31: The basically simple routine we have covered must be followed in every power steering adjustment. There is no short cut to doing the job right. And every step shown should be carried out in the order given. By so doing, you will insure that the job will be done right and efficiently.





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.

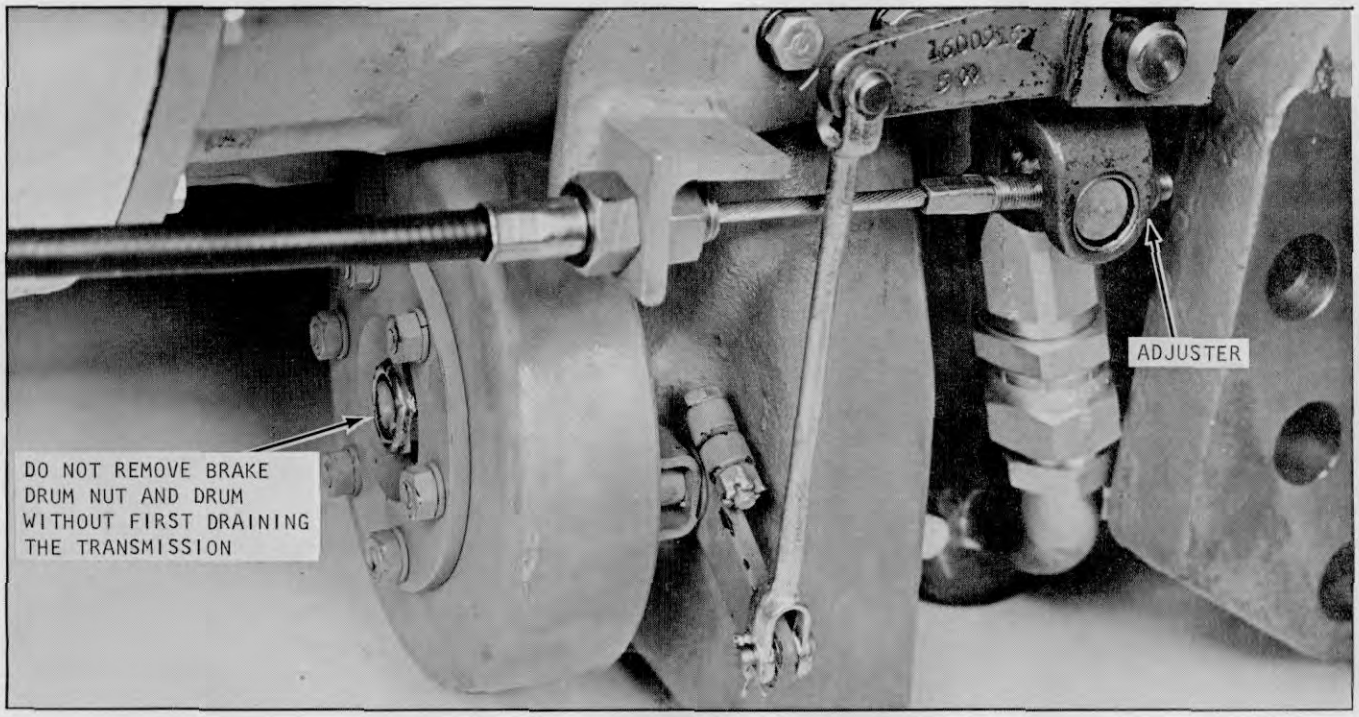


Plate 9762. Transmission Parking Brake Assembly

PARKING BRAKE ADJUSTMENT AND ADJUSTMENT CHECK:

Adjustment Check:

Make certain that the parking brake is working properly. Fully apply hand brake, moving lever from full forward to full rear position....cable tension should be strong enough so that the lever hesitates or remains in a vertical position before continuing on as lever passes through center position to full rear position. If not, rotate knurled knob on end of brake lever several turns clockwise.

Hydratork Models....now....again set hand brake lever, then....start engine (driver shall occupy driver's seat when making test) and place gear shift lever into low range. Depress accelerator pedal until engine runs up to full or maximum stall (approximately 1330 RPM)....truck should not move or creep.

C A U T I O N

DO NOT RUN ENGINE AT STALL MORE THAN 5 SECONDS.

Hydracool Clutch Models....now....again set hand brake lever, then....start engine and place gear shift lever into low range. Depress accelerator pedal until engine runs up to full governed, 2350 RPM....slowly let out on the clutch pedal....truck should not move or creep ....even at the point where the engine stalls.

N O T E

The parking brake must be capable of holding truck, with rated capacity load, on a 15% grade.

Parking Brake Adjustment:

1. Release hand brake lever....rotate knurled knob on end of lever counterclockwise to end of travel.

2. Place brake lever in the applied position ....full rear position.

3. Adjust nut on end of cable at the transmission brake (see above) until all slack is removed from the cable....some tension should be felt at the brake lever. Then....continue to adjust nut until bellcrank on cable bracket has moved upward....enough to set brake shoes against brake drum....pressing upward on bellcrank by hand will tell you when the brake shoes have contacted the drum as the bellcrank will move no further.

4. Now....release brake lever and move it to the full forward position.

5. Rotate knurled knob on end of lever.... clockwise several turns....enough to place a considerable amount of tension on the cable.

6. Now....apply hand brake and start engine.

7. Refer to the Adjustment Check procedure in the opposite column.

8. If the vehicle moves or creeps, release accelerator pedal, place shift lever in neutral position, and....release hand brake lever. Now ....rotate knurled knob clockwise several more turns....enough to place approximately twice the tension on the cable as before. Check adjustment again. Readjust until brake meets specifications.

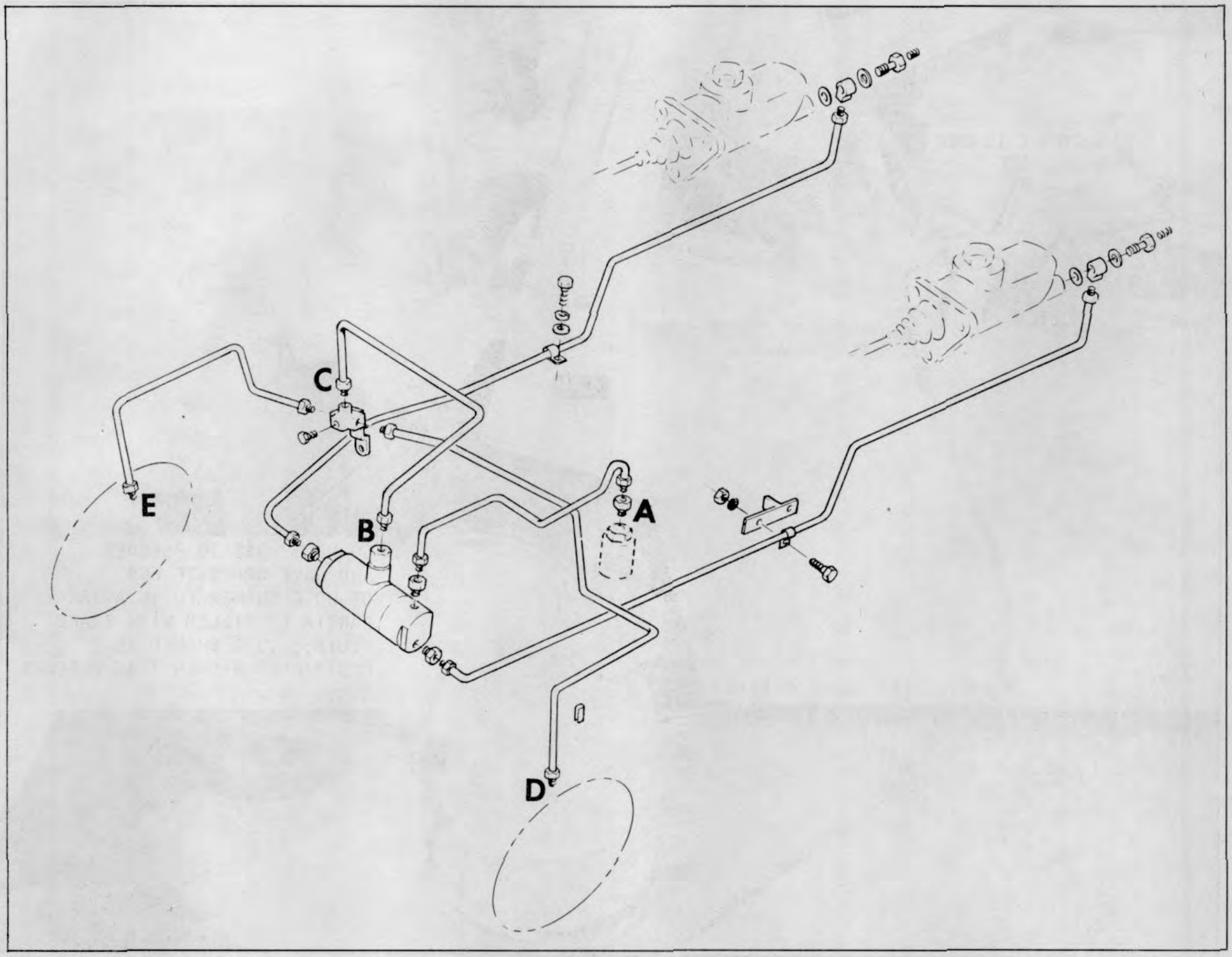


Plate 9747. Typical Brake Lines

PRESSURE BLEEDING PROCEDURE:

Make sure the bleeder tank contains enough of the right type of brake fluid to do the job. Do not intermix types of brake fluids. Never reuse brake fluid drained from any brake system.

1. Clean all dirt, grime, etc. from around the master cylinder reservoir cap and also from the inching master cylinder reservoir cap (machines so equipped).

2. Remove the master cylinder reservoir cap and fill reservoir with specified fluid (S.A.E. 70R3, CLARK part #1800200) to within 1/4" from top.

WARNING

MAKE SURE PRESSURE BLEEDER TANK HAS BEEN TESTED TO WITHSTAND PRESSURES TO EXCEED 30 PSI.

3. Put about 2 quarts of fluid in the bleeder tank, apply air pressure of no more than 30 PSI, and attach hose to master cylinder.

4. Place a flat pan under the axle adapter to catch fluid and bleed the system at points B-C until no bubbles are seen coming out.

Plate 9791. Typical Pressure Bleeding

5. For the wheel cylinders, attach a small hose to the bleeder fitting, submerge hose in a jar containing fluid, and bleed at points D-E until no bubbles show in the fluid at each point.

6. When air bubbles stop coming into the container, close the bleeder fitting and remove the tube.

7. Disconnect bleeder tank line from master cylinder and connect it to the inching master cylinder.

8. Follow the same procedure as outlined above and include bleeding point A to be done first.

9. When bleeding operation is completed, fill both cylinders to within 1/4 inch from the top.

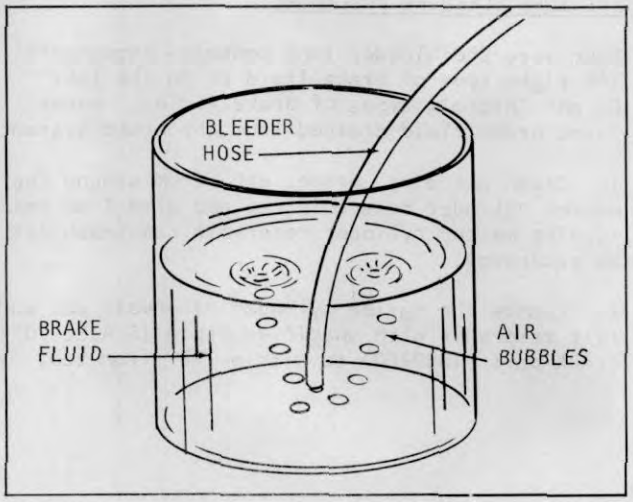


Plate 9746. Typical Bleeder Jar

MANUAL BLEEDING PROCEDURE

If a pressure bleeder is unavailable, the

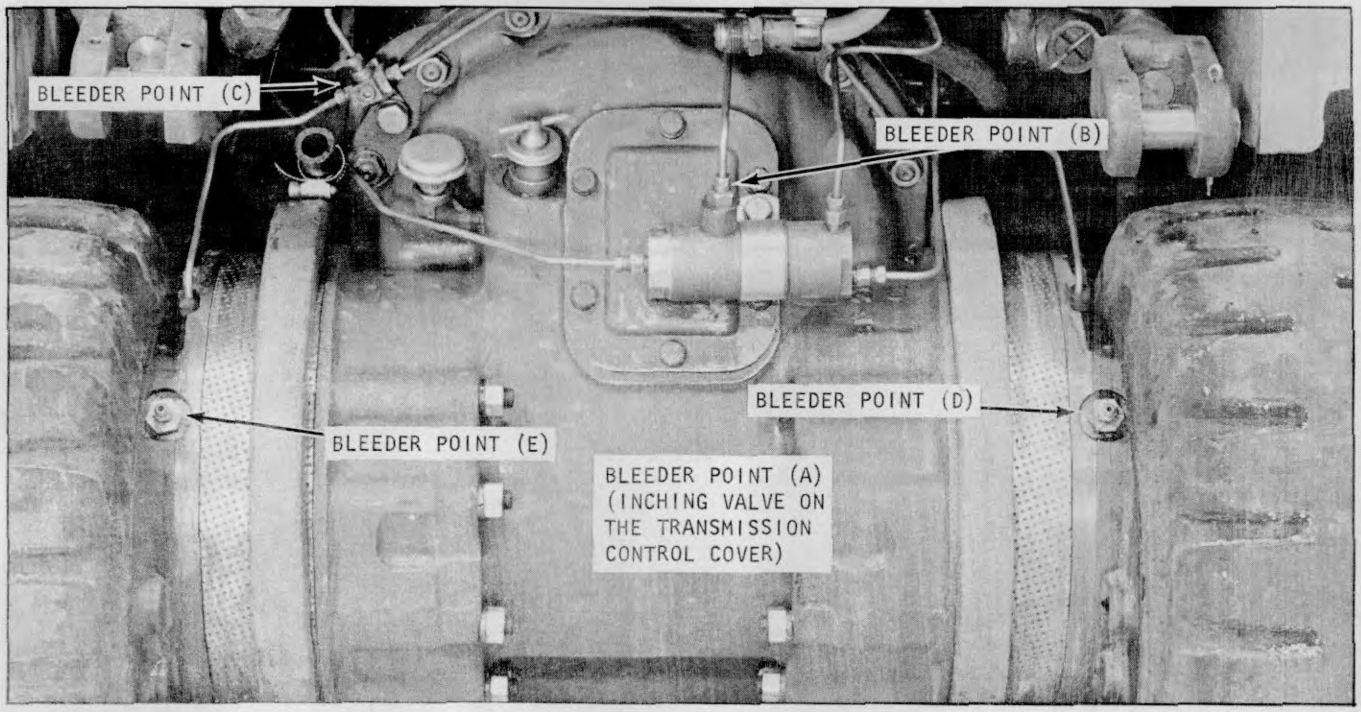


Plate 9761. Typical Bleeder Points

system may be bled manually. It must be remembered that the brake pedal should be depressed slowly and held 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 the master cylinder reservoir level often during manual bleeding and keep within 1/4 inch from 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 is not displaced upon releasing the brake pedal, a pedal adjustment is required.

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WARNING

RELEASE PRESSURE FROM BLEEDER TANK WHEN THRU.

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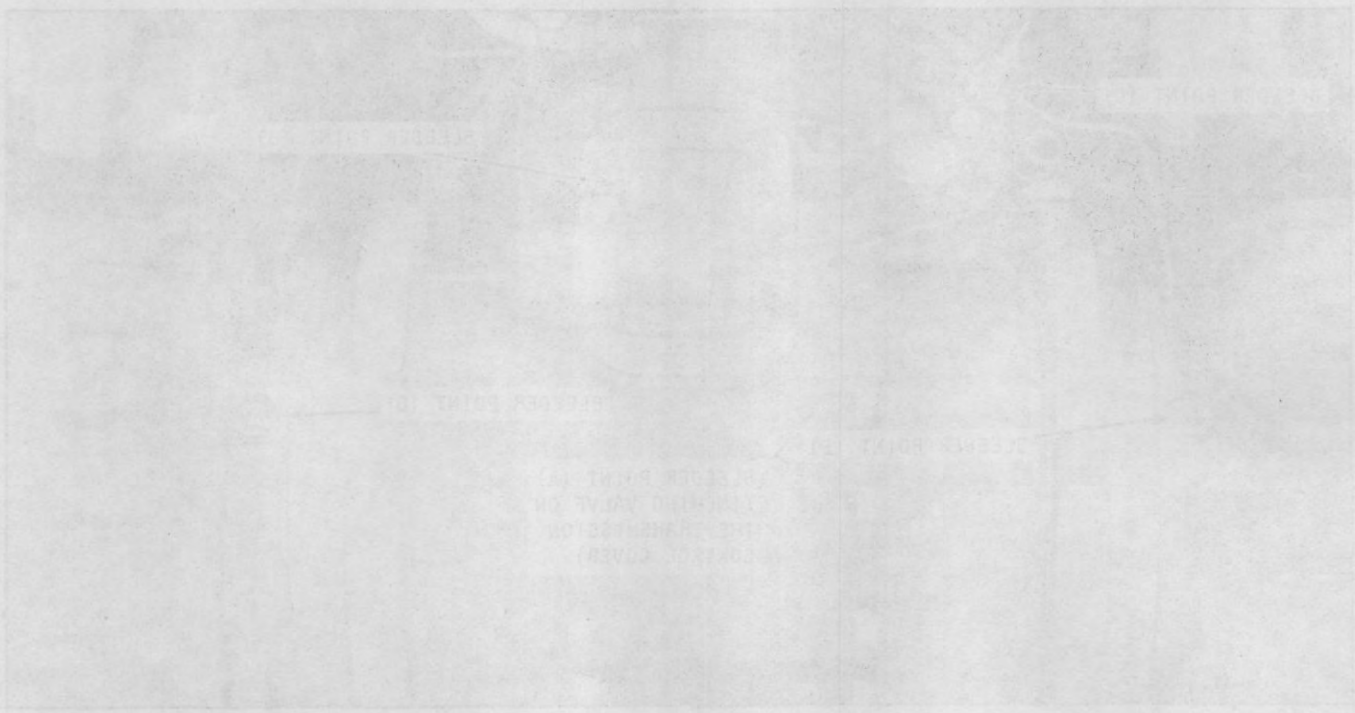
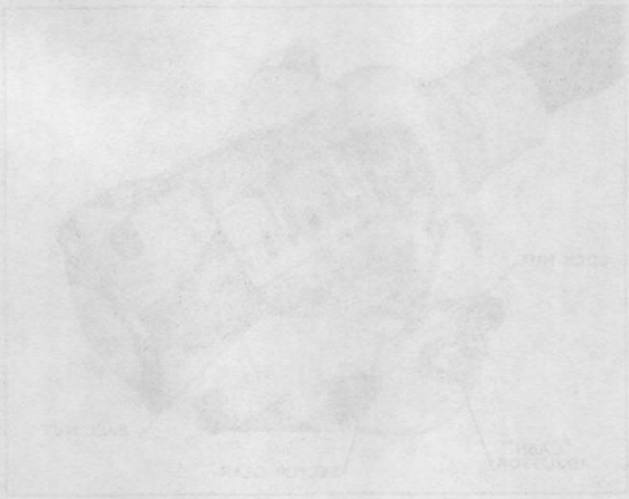




STEERING GEAR

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 AMOCO Lithium Multipurpose Grease 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.

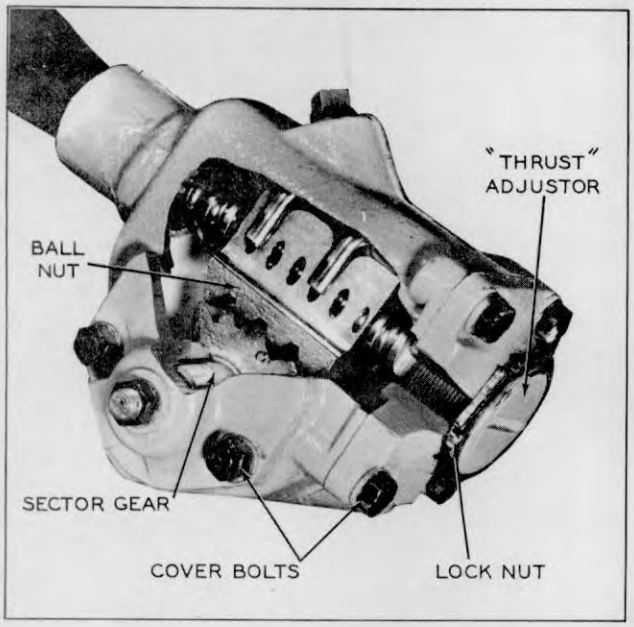


Plate 6636. Steering Gear Thrust Adjustment (Worm Bearings)

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.

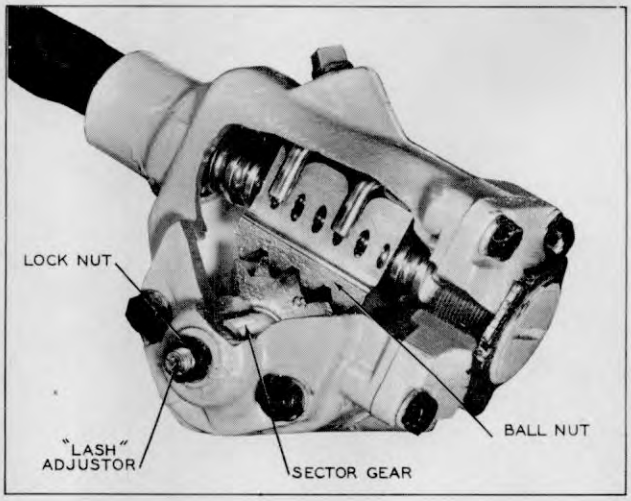


Plate 6637. Steering Gear Lash Adjustment (Sector Gear)

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 Figure 202b 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.

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.

TRANSMISSION, CONVERTER AND AXLE ADAPTOR (HYDRATORK DRIVE)

TROUBLE	PROBABLE CASE	REMEDY
Machine will not move in either direction.	Parking Brake not released.	Release brake.
	Control Linkage not Properly adjusted.	Readjust linkage.
	Oil level low.	Determine cause and correct. Fill to proper level with Type "A" Automatic Transmission Fluid Armour Qualified.
	No oil pressure.	Report to designated person in authority.
Machine will move in one direction only.	Control linkage not adjusted.	Adjust linkage.
	No oil pressure to Directional Selector. Seals and "O" Rings in Directional Selector may be defective.	Report to designated person in authority.
	Directional Selector Discs not releasing. Discs defective. Relief hole in D.S. Drum clogged.	Report to designated person in authority.
Machine moves slowly in both directions at wide open throttle.	Oil level low.	Fill to correct level and determine cause for loss of oil.
	Low oil pressure. Faulty Inching Valve, Faulty Relief Valve, Faulty Pump.	Report to designated person in authority.
	Brakes dragging.	Report to designated person in authority.
	Clogged Sump Screen.	Clean Screen.
Transmission overheating.	Low oil.	Check and fill to correct level.
	Low Directional Selector pressure (check with gauge). Inching valve not functioning properly.	Report to designated person in authority.
	Seals in selector defective.	Report to designated person in authority.
	Regulating valve sticking open.	Report to designated person in authority.
	Brakes Dragging.	Report to designated person in authority.
	Clogged Sump Screen.	Clean Screen.

TRANSMISSION, CONVERTER AND AXLE ADAPTOR (HYDRATORK DRIVE)

TROUBLE	PROBABLE CAUSE	REMEDY
Transmission Overheating (Continued)	Insufficient oil to Torque Converter and Cooler.	Report to designated person in authority.
	Cooler clogged internally stopping flow of oil.	Clean Cooler.
	Bushing in Torque Converter Impeller Hub worn, allowing oil to leak out.	Report to designated person in authority.
	Slipping Stator.	Refer to Transmission Pressure Checks
Machine has full power and overheats.	Overloading machine.	Check Capacity Loads. Never overload.
	Radiator core clogged externally.	Clean Core.
	Pressure Regulator Valve sticking, giving low pressure.	Report to designated person in authority.

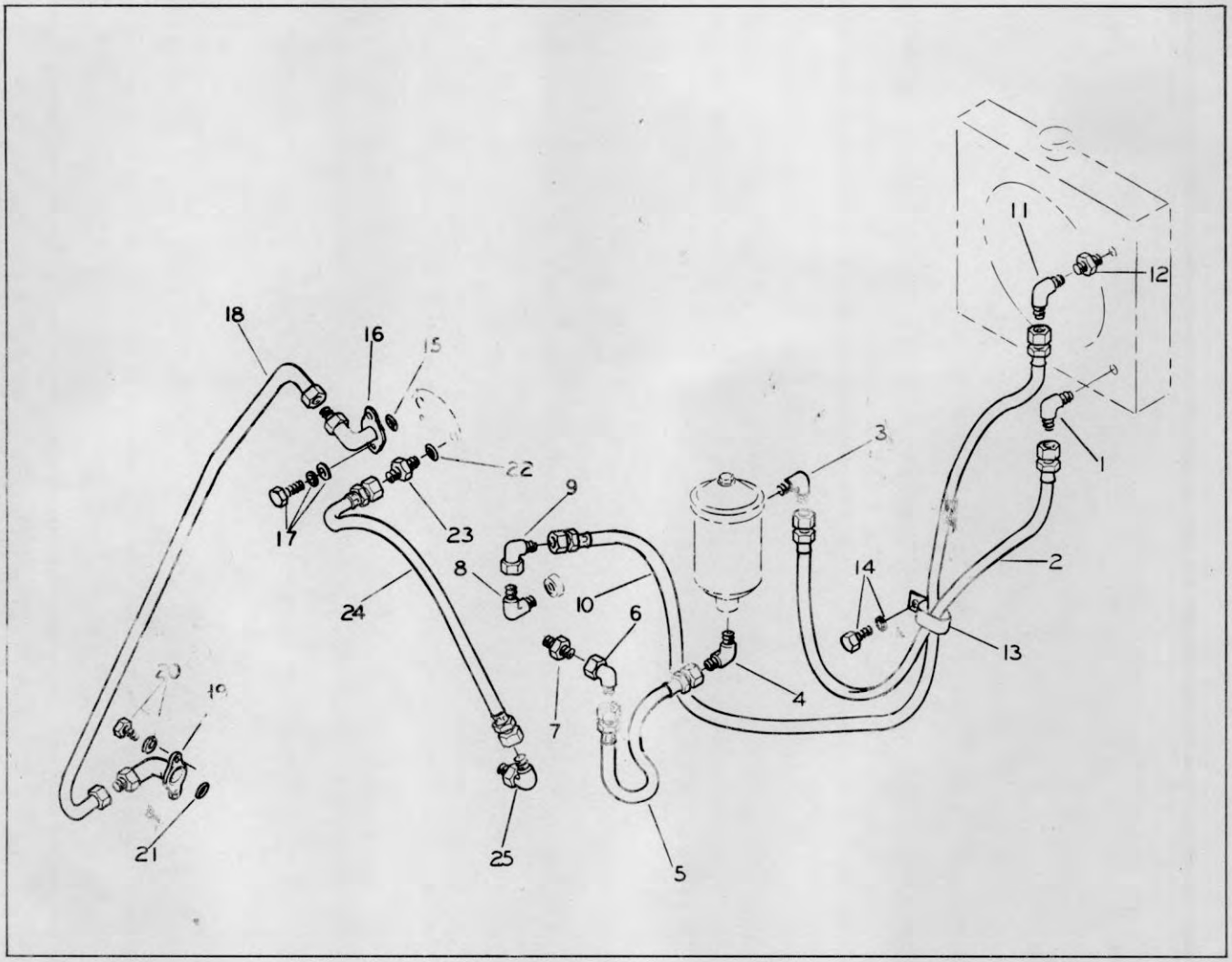


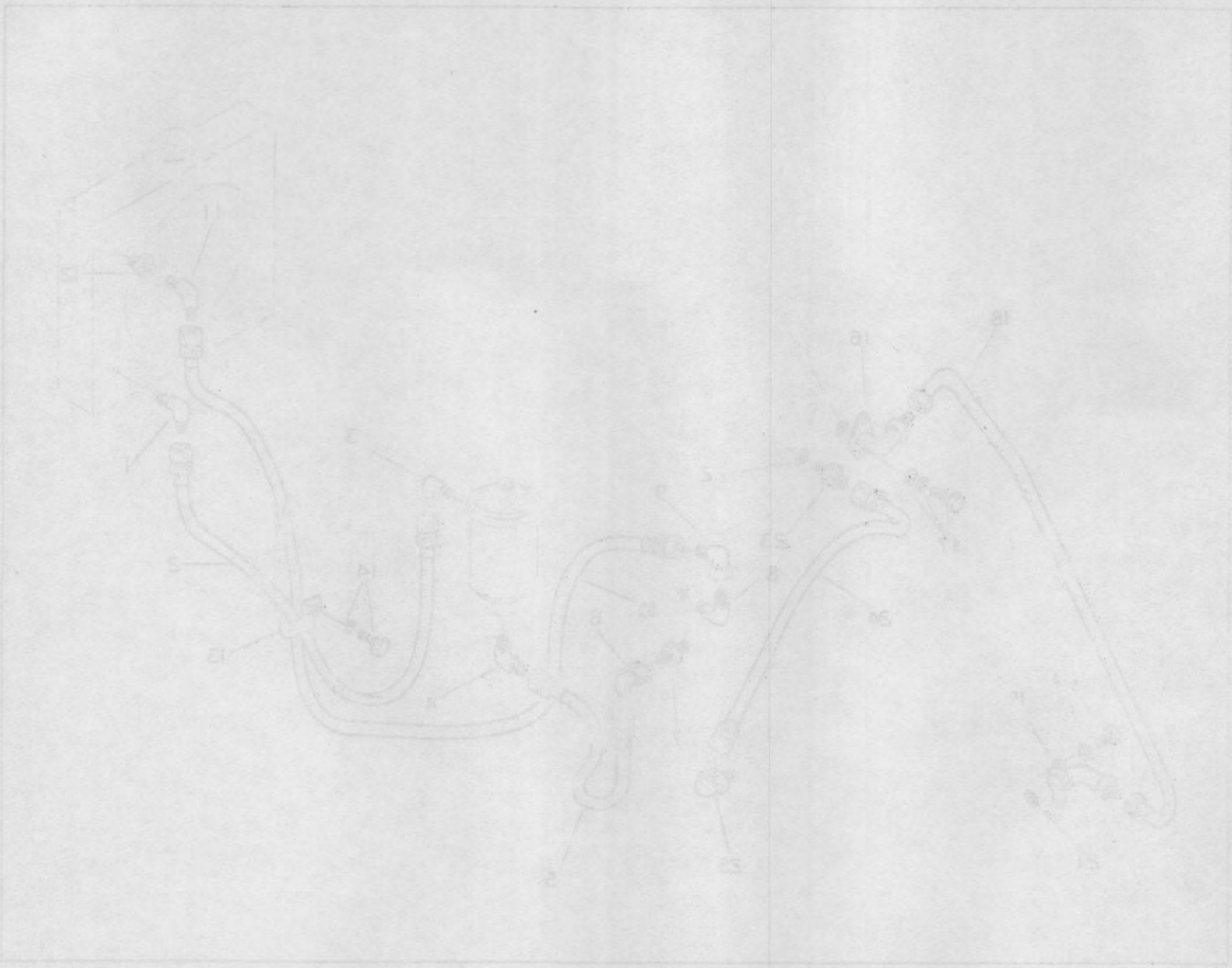
Plate 9745. Typical Transmission Cooling Lines

TRANSMISSION OIL COOLER CHECK

The following procedure is a process of elimination to locate possible restrictions.

1. Check all lines for kinks and line pinching conditions.
2. Disconnect line 5 from fitting 6 and place line in a 3 gal. (or larger) container.
3. Start and accelerate engine to 1300 RPM, place line 5 in a 2 qt. container for 5 sec. and then remove. If the container fills in this time limit, at this RPM, then there are no restrictions in the oil cooling system.
4. If 2 qts. are not collected in 5 seconds at 1300 RPM at line 5, the same procedure is followed for line 2 at fitting 3 and line 10 at fitting 11.

If the flow is still below 2 qts. in 5 seconds at 1300 RPM, then the trouble will be found in the transmission.



A. CARRIAGE REMOVAL

Before working on the upright, set parking brake and block drive wheels.

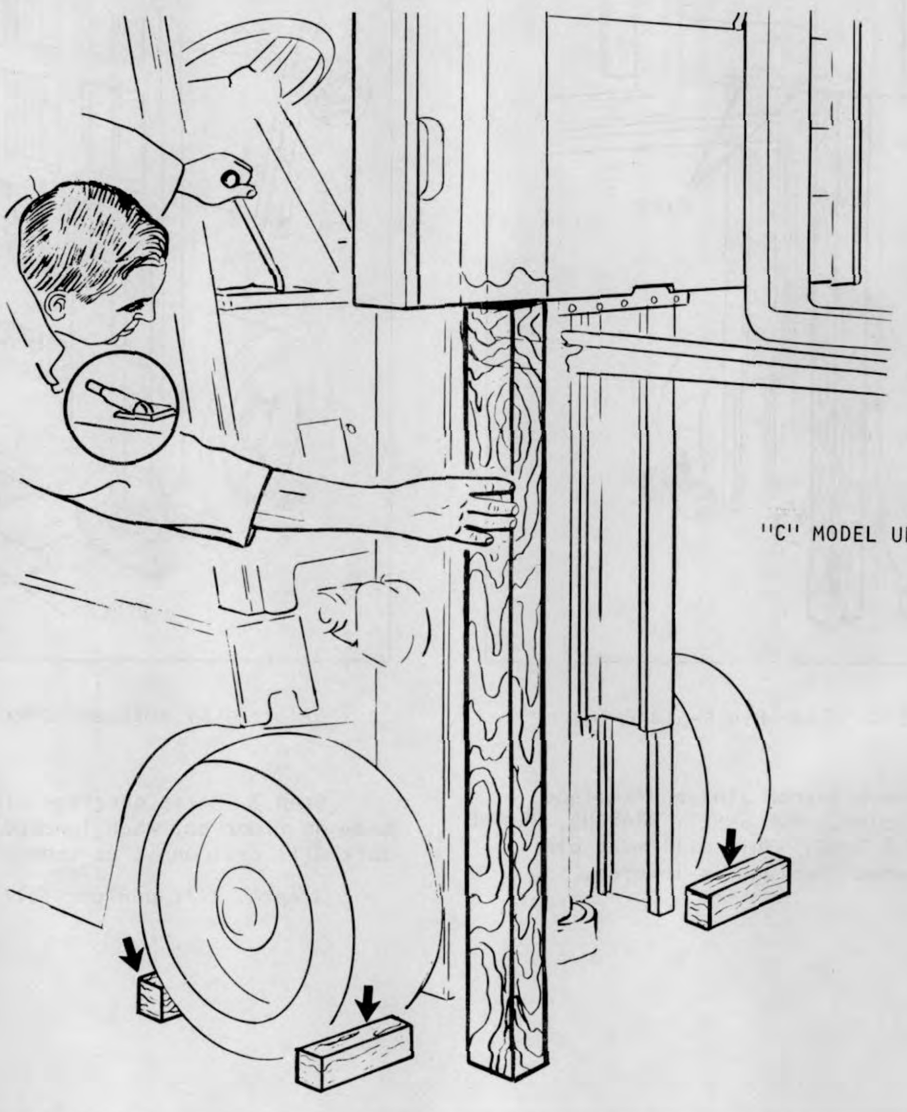


Plate 9559 Blocking Machine and Carriage

Step 1. Raise carriage about 4 feet. Place a 4" x 4" oak beam 3 to 4 feet in length between carriage and floor as shown. DO NOT STAND DIRECTLY UNDER FORKS. Standing to one side, lower carriage onto beam as shown.

WARNING

BEFORE WORKING ON UPRIGHT, SET PARKING BRAKE AND BLOCK DRIVE WHEELS AS SHOWN

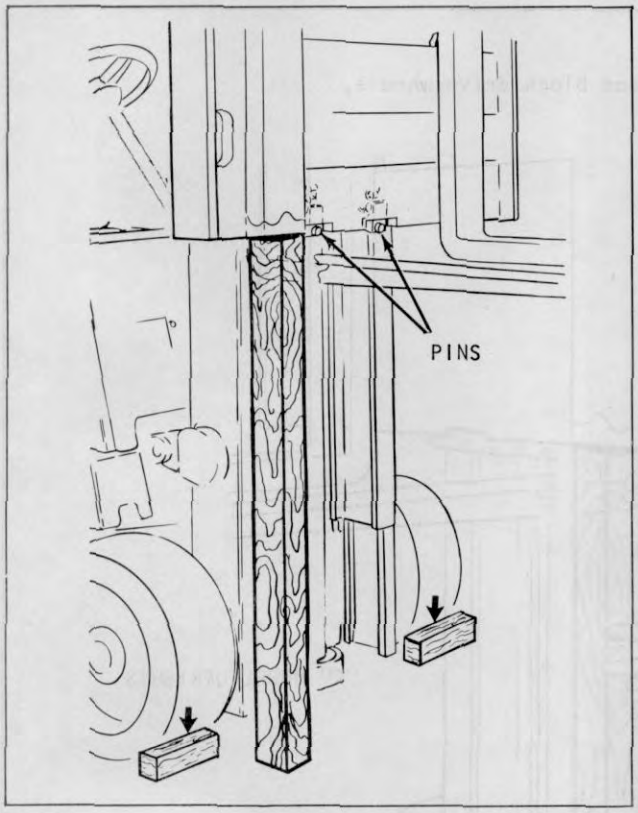


Plate 9593 Carriage Pin Replacement

Step 2. Remove anchor pins and replace with 3/8" x 2" bolts. FOR SAFETY REASONS, REMOVE *ONLY ONE PIN AT A TIME. This will make pin* removal easier when carriage is lowered.

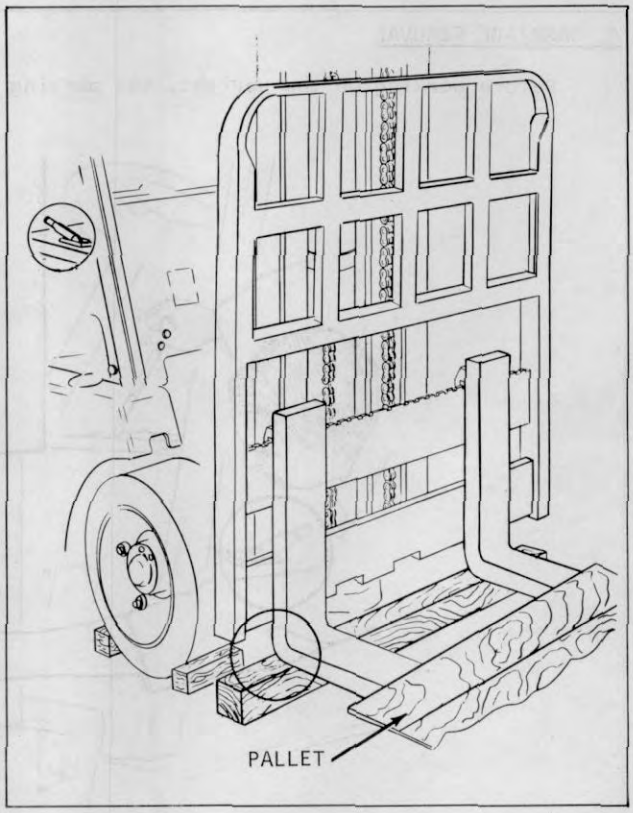


Plate 9560 Fork and Carriage Blocking

Step 3. Raise carriage off beam. Place beam on floor so, when lowered, the heal of the fork will rest on it as shown.

Step 4. Tilt upright full forward.

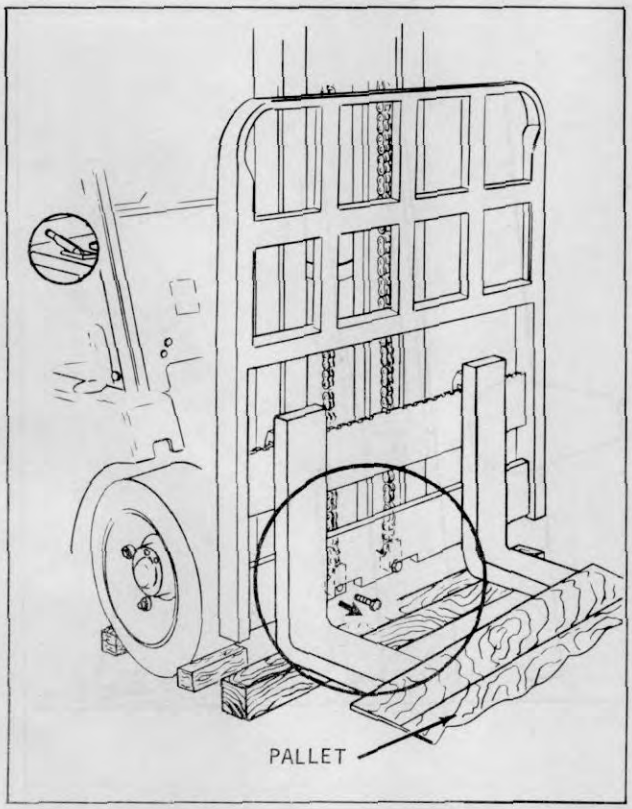


Plate 9561 Removing Bolts

Step 5. Remove 3/8" x 2" bolts. Place pallet on fork ends.

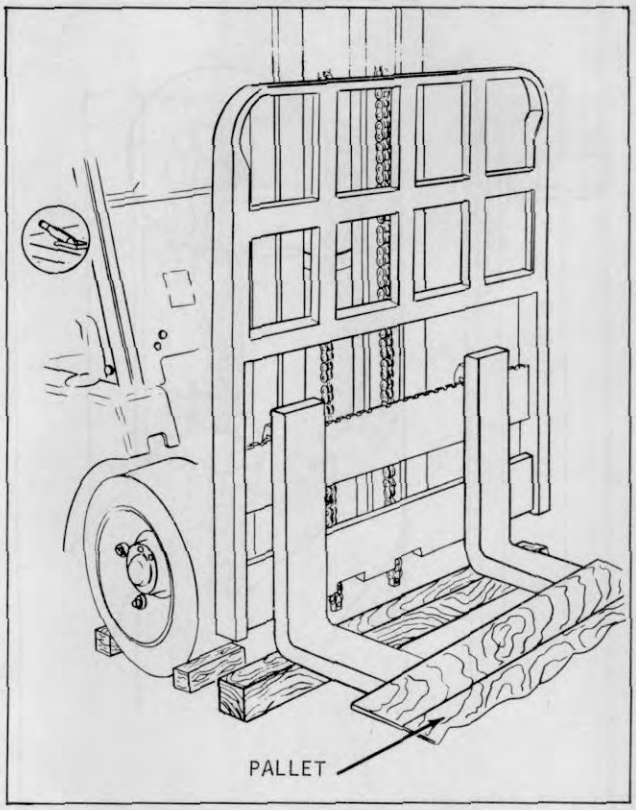


Plate 9562 Removing Chains From Anchors

Step 6. Pull chains out of carriage anchor brackets.

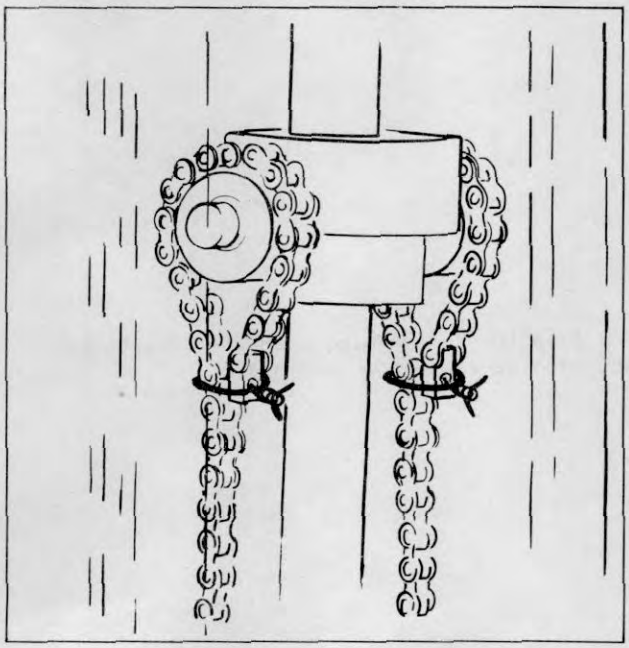


Plate 9563 Securing Chains (Typical)

Step 7. Wire chains around chain sheaves as shown

N O T E

Use the same method on all cylinders.

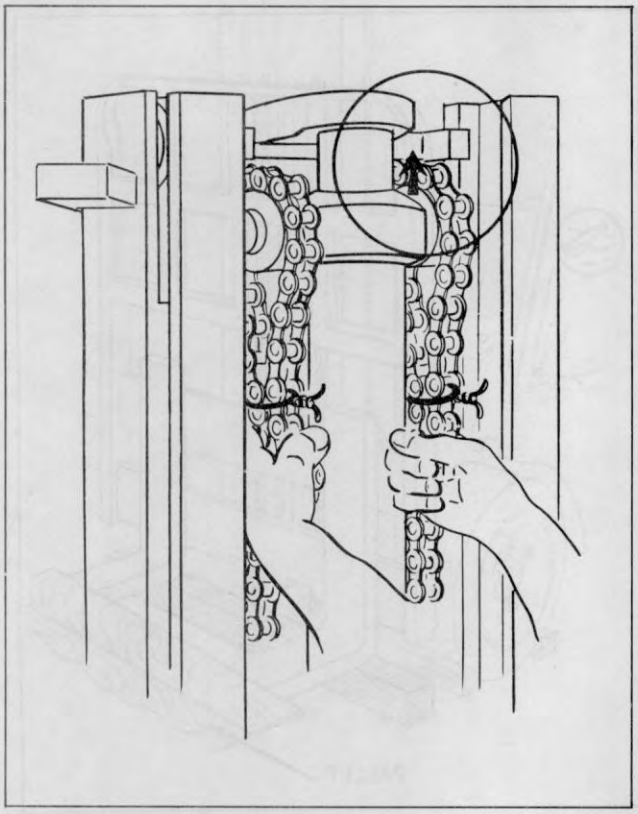


Plate 9564 Guiding Piston Head

Step 8. Guiding piston head with hands on chains raise piston to full up position.

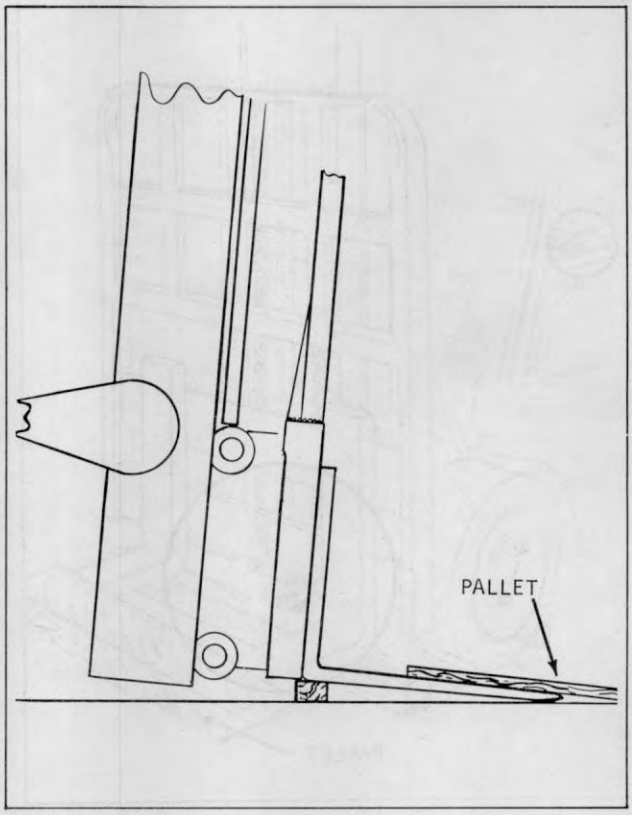


Plate 9565 Inner Rail Clearing Carriage Rollers

Step 9. Raise inner rail so it just clears upper carriage rollers. Leave upright at full forward tilt.

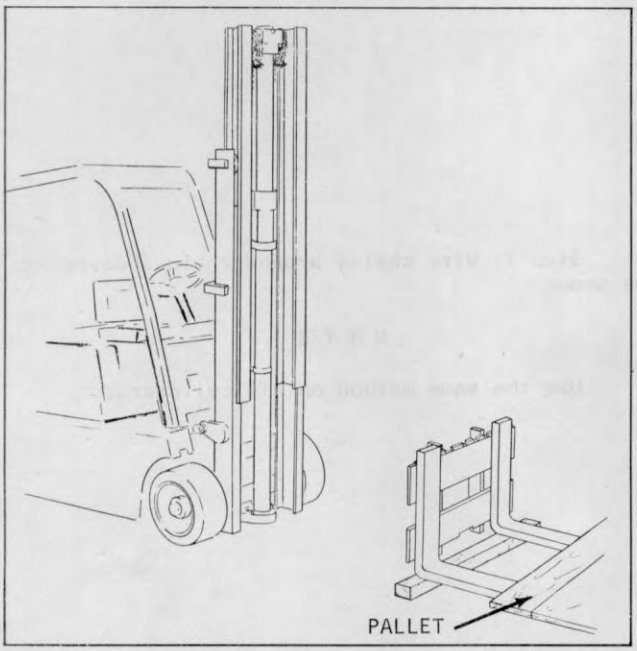


Plate 9566 Backing Machine Away From Carriage

Step 10. Remove blocks and release brake. Back machine away from carriage.

B. CARRIAGE ROLLER ADJUSTMENT

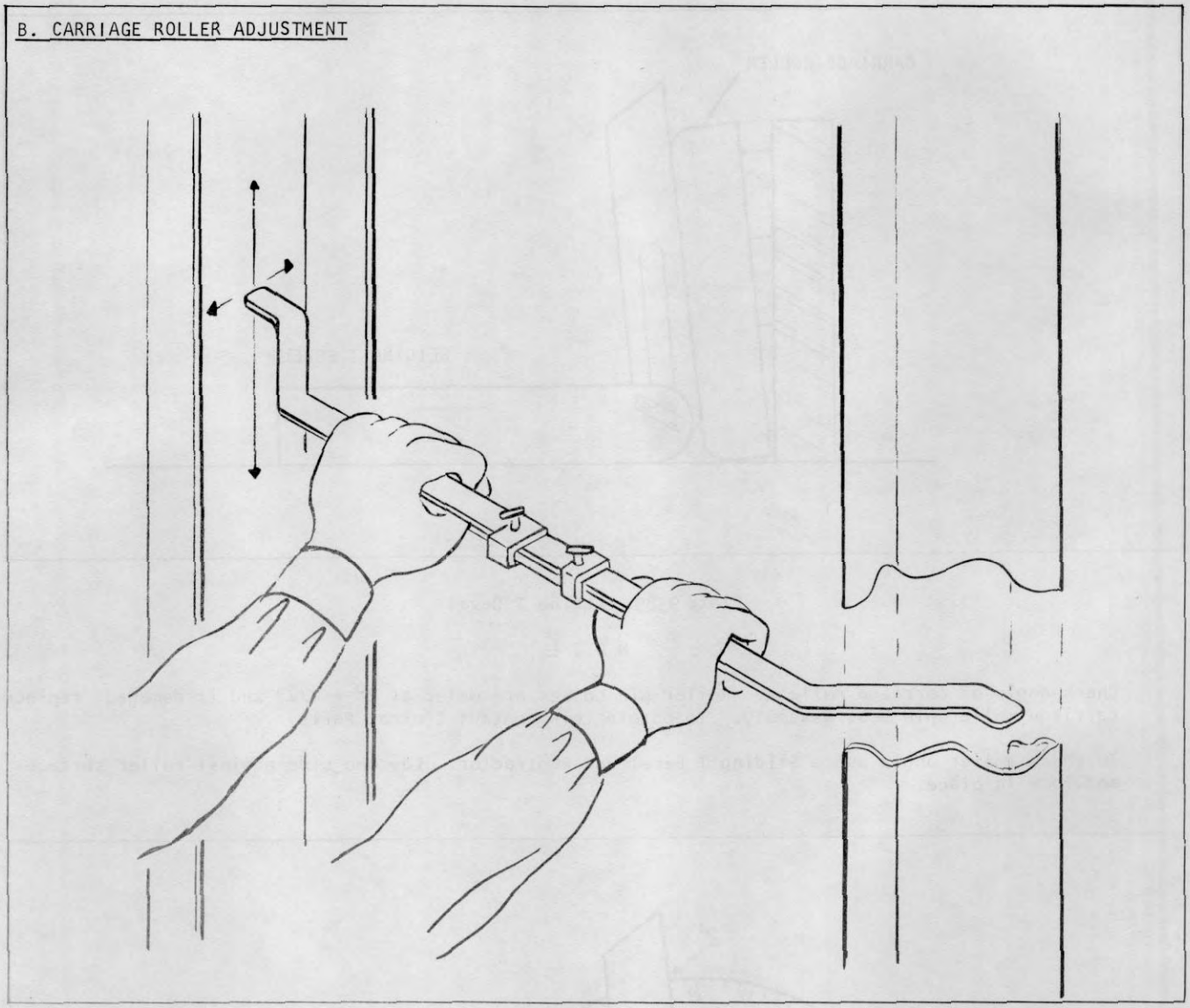


Plate 9567 Spanning Inner Rail

Step 1. Span inner rail with inside spanning tool to find the smallest distance between the rails. Lock tool in position.

N O T E

FOR SIX ROLLER CARRIAGE ONLY

After finding the smallest distance between rails, place a shim between the spanning tool and the inner rail, then lock spanning tool in position.

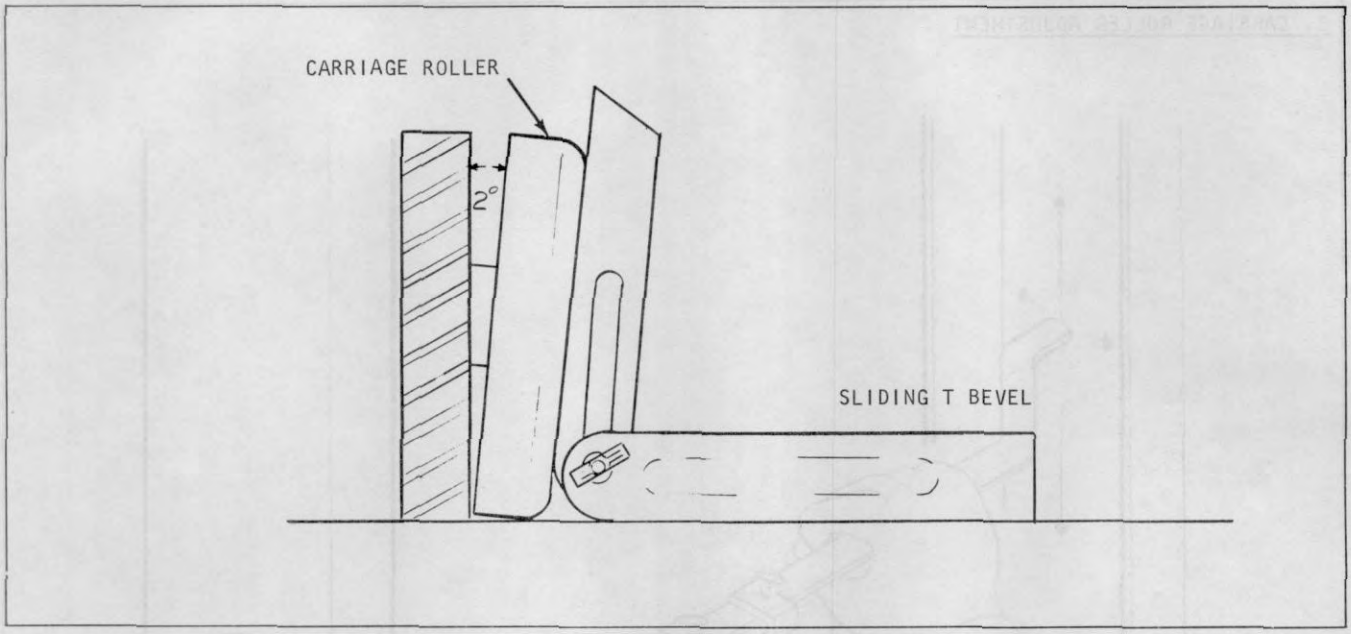


Plate 9589 Setting T Bevel

N O T E

Check angle of carriage rollers. Roller pin bosses are weled at $2^{o} \pm 1/2^{o}$ and if damaged, replace carriage roller pin boss assembly. To obtain this contact Central Parts.

To check roller angle use a Sliding T Bevel and Protractor. Lay one side against roller surface and lock in place.

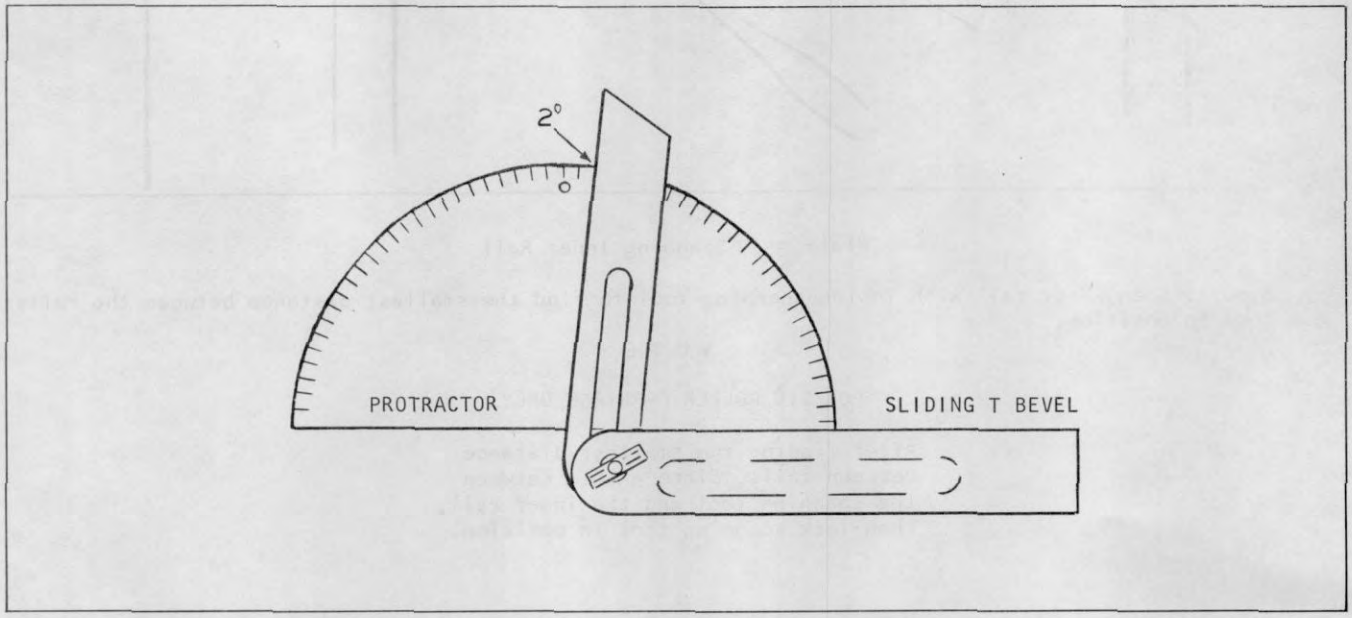


Plate 9590 Checking Roller Angle

Determine degree of angle by placing Protractor on Sliding T Bevel.

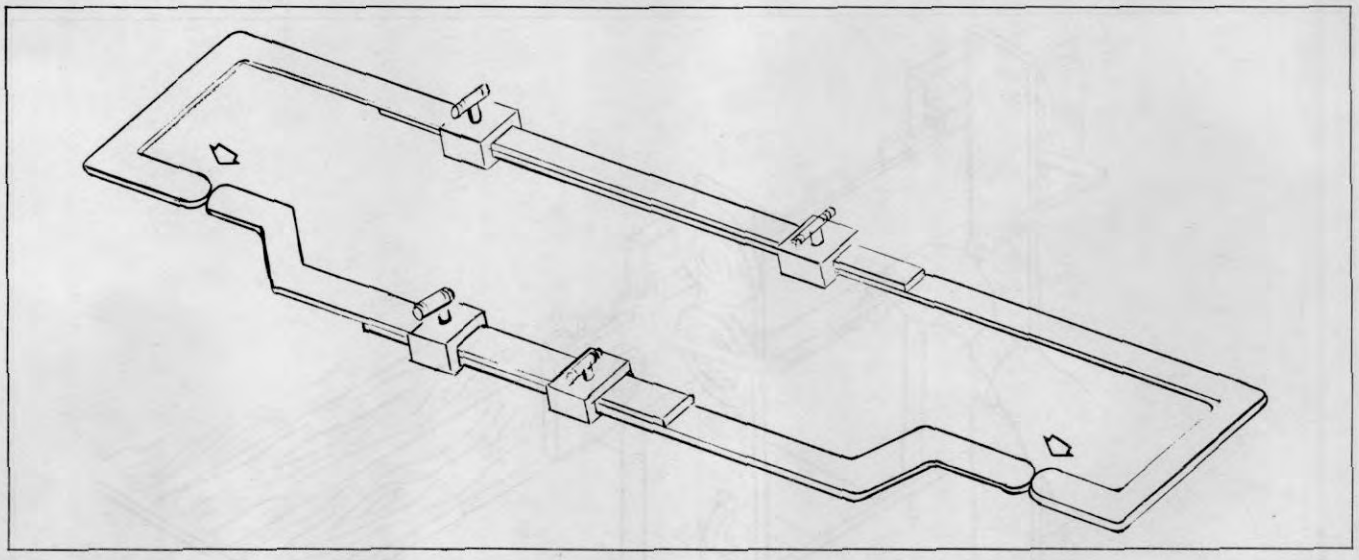


Plate 9568 Setting Outside Spanning Tool

Step 2. Set outside spanning tool to match inside spanning tool. Lock tool in position.

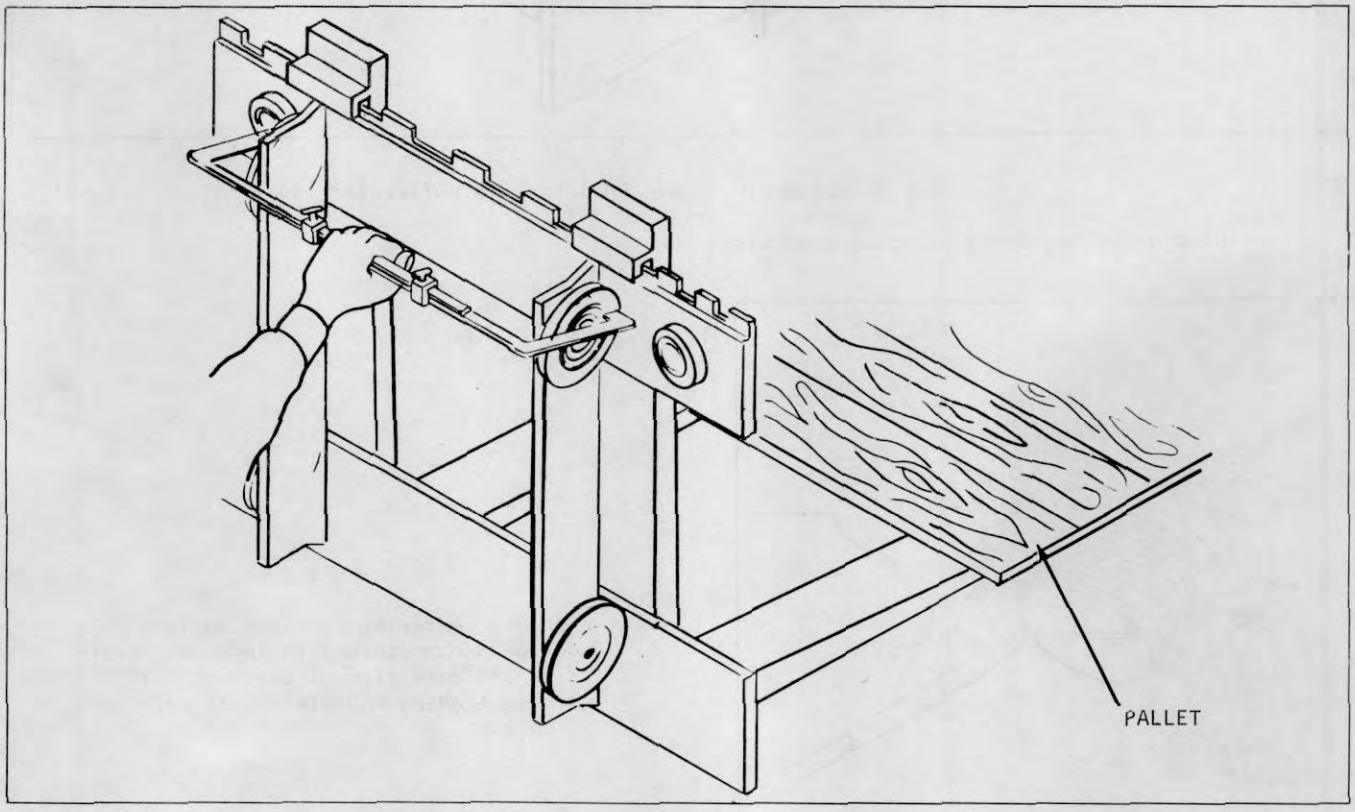


Plate 9569 Spanning Upper Rollers (Four Roller Carriage)

Step 3. Span upper carriage rollers at their outer most camber point. Add or subtract ...

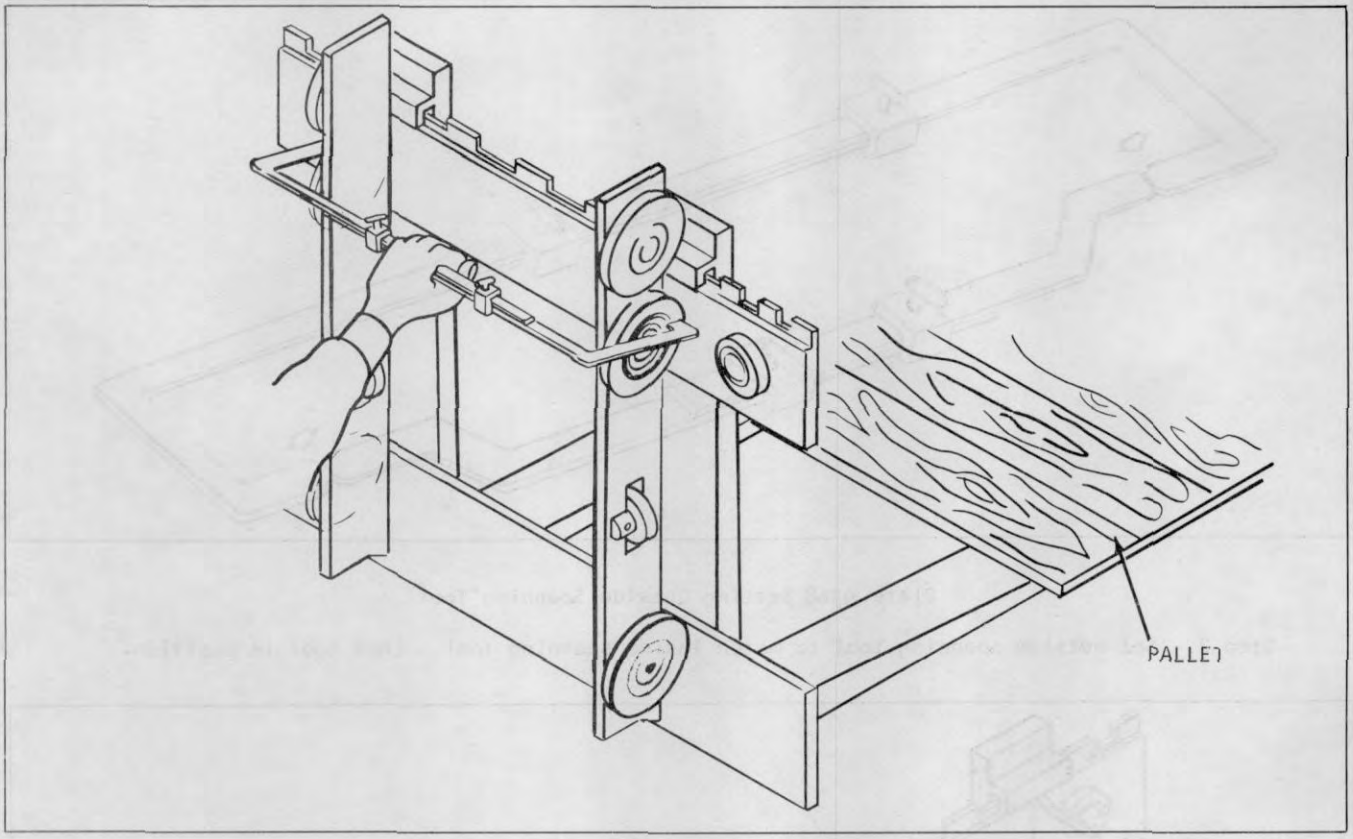


Plate 9570 Spanning Upper Rollers (Six Roller Carriage)

...shims at roller shaft to reach tool size.

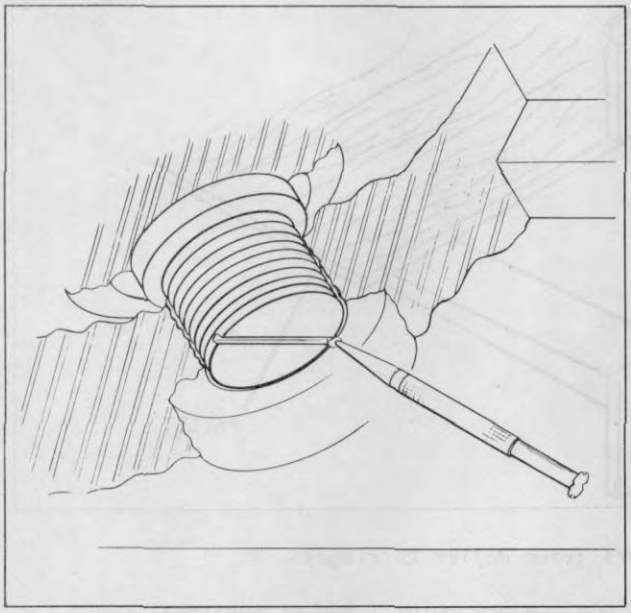


Plate 9571 Securing Outer Thrust Roller

N O T E

Before centering carriage rollers check outer thrust rollers for security and condition of bearings. If loose tighten and stake. If worn replace.

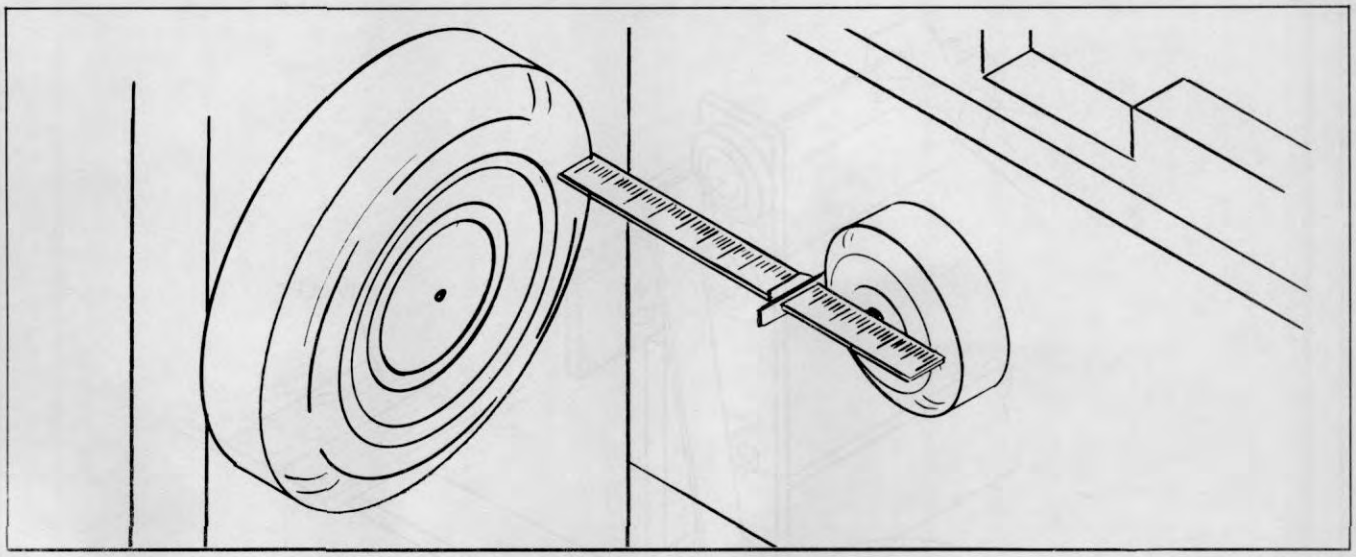


Plate 9572 Centering Carriage Rollers

Step 4. Center carriage rollers within outer thrust rollers by placing 6" scale on the carriage roller surface and measuring the distance to the outer thrust roller face. Add or subtract shims from one roller to the other to make measurement equal.

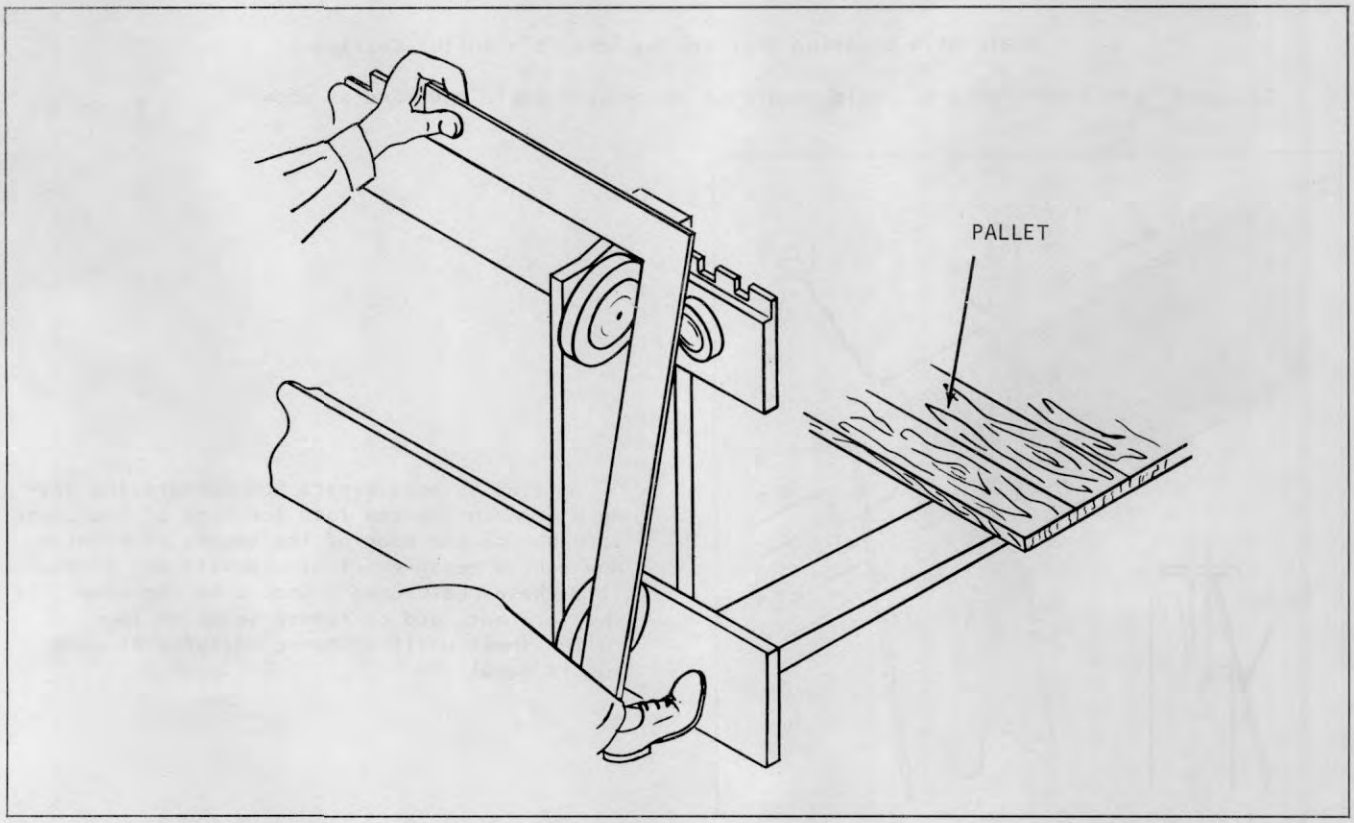


Plate 9573 Squaring Carriage Rollers (Four Roller Carriage)

Step 5. Square carriage rollers by placing carpenter's square at the outer most camber of the ...

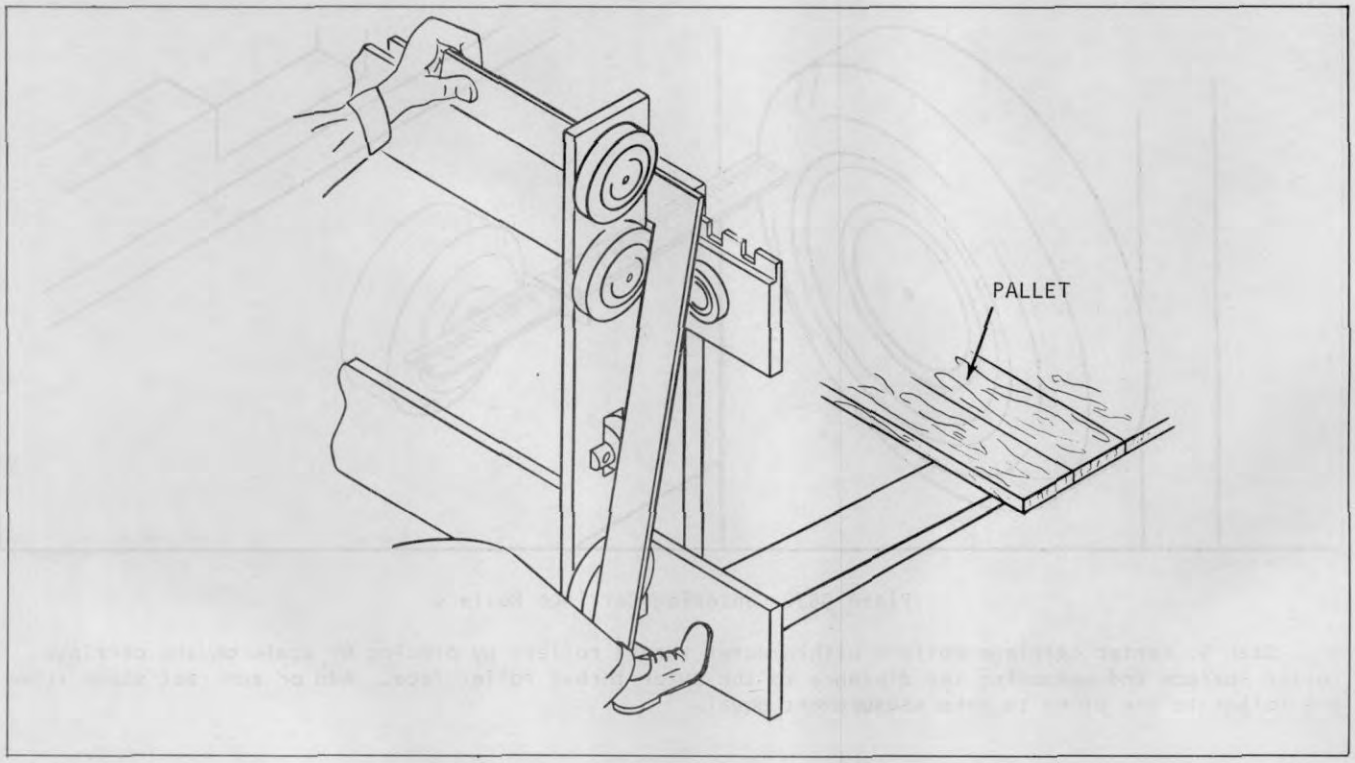


Plate 9574 Squaring Carriage Rollers (Six Roller Carriage)

... upper and lower rollers. Hold square in place with ankle and hand as shown.

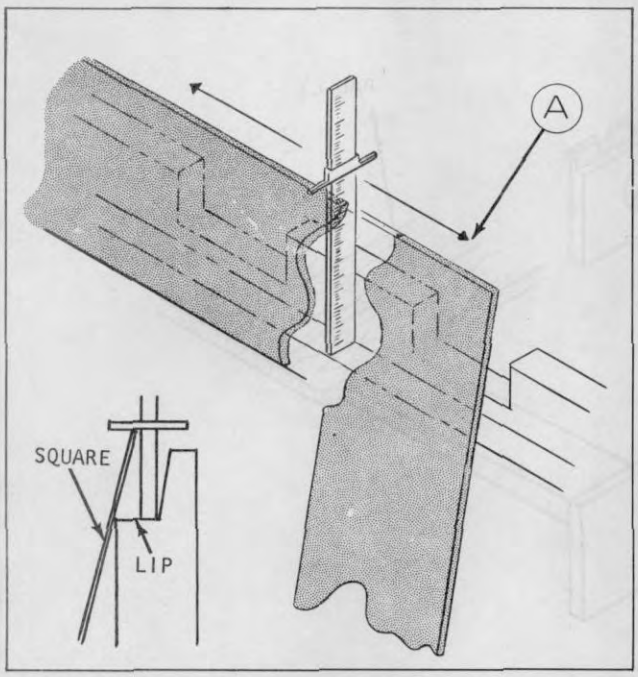


Plate 9575 Measuring For Squareness

Step 6. Hold square and measure the distance between the top face (or lip) of the upper fork bar to the edge of the square at Point A. Now take a measurement at opposite end of square .... these measurements should be the same. If they are not, add or remove shims on lower roller shaft until distance measured at each end is equal.

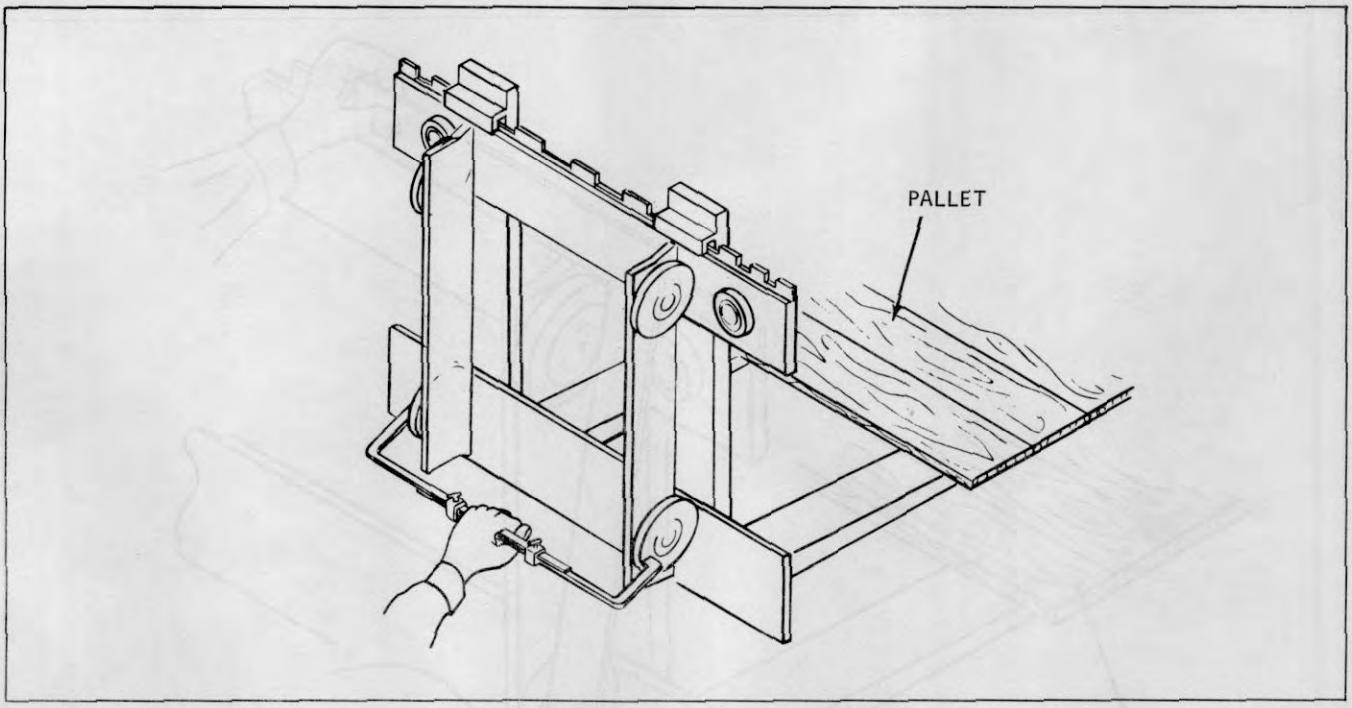


Plate 9576 Spanning Lower Rollers (Four Roller Carriage)

Step 7. Span lower rollers. Add or subtract shims to (the roller that has not been squared) ...

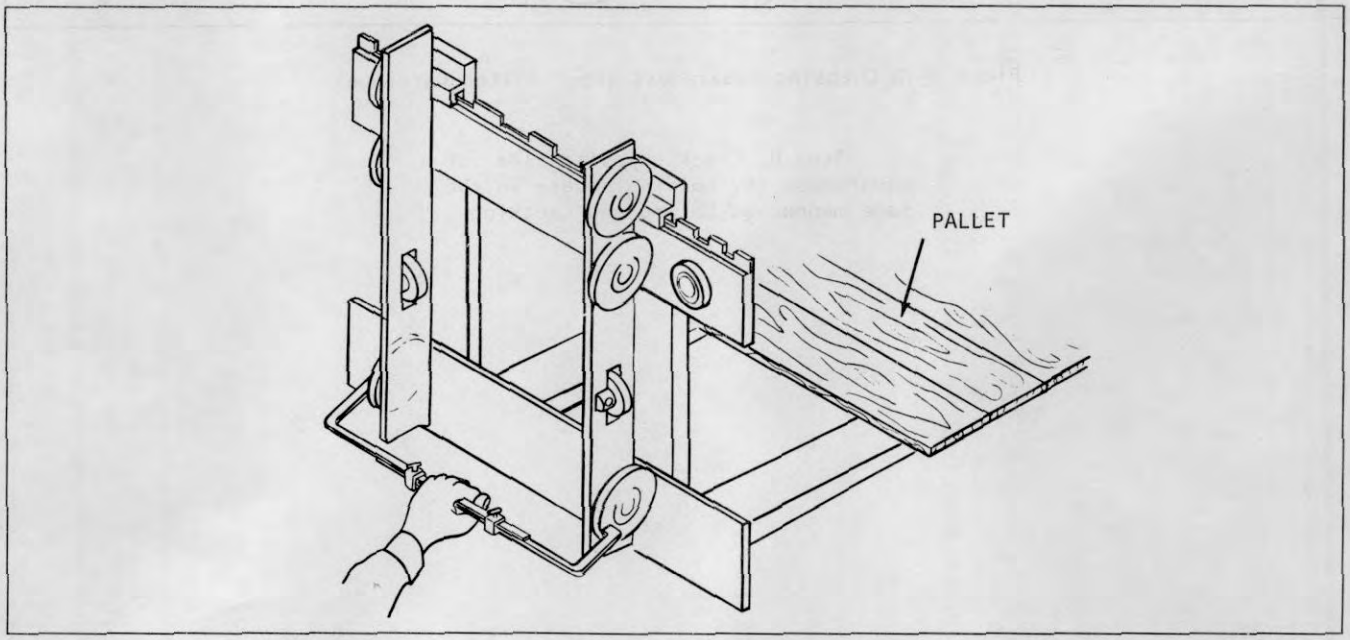


Plate 9577 Spanning Lower Rollers (Six Roller Carriage)

... reach the size of the outside spanning tool.

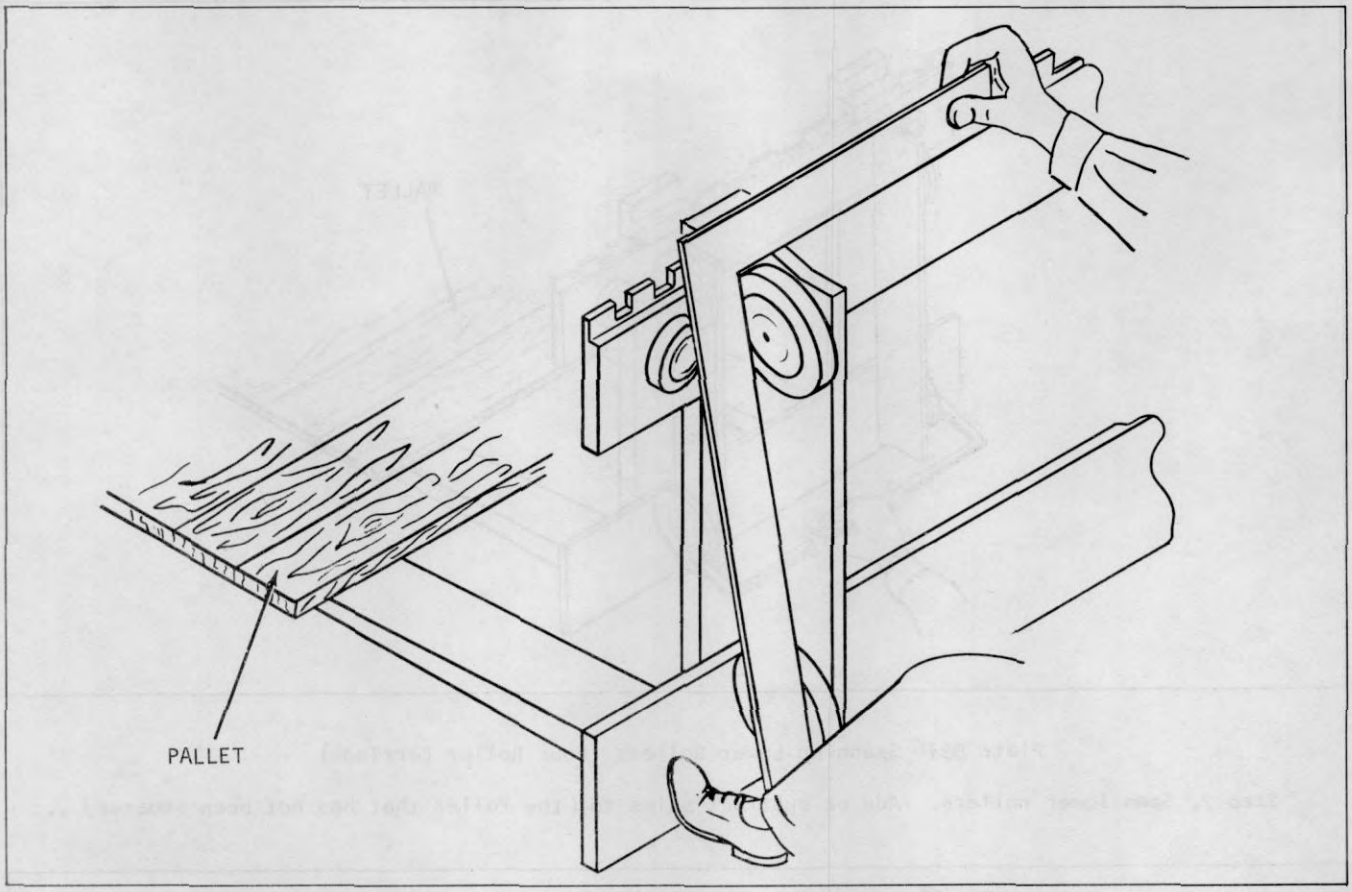


Plate 9578 Checking Squareness (Four Roller Carriage)

Step 8. Check opposite side for squareness (by holding square in the same manner as before and checking ...

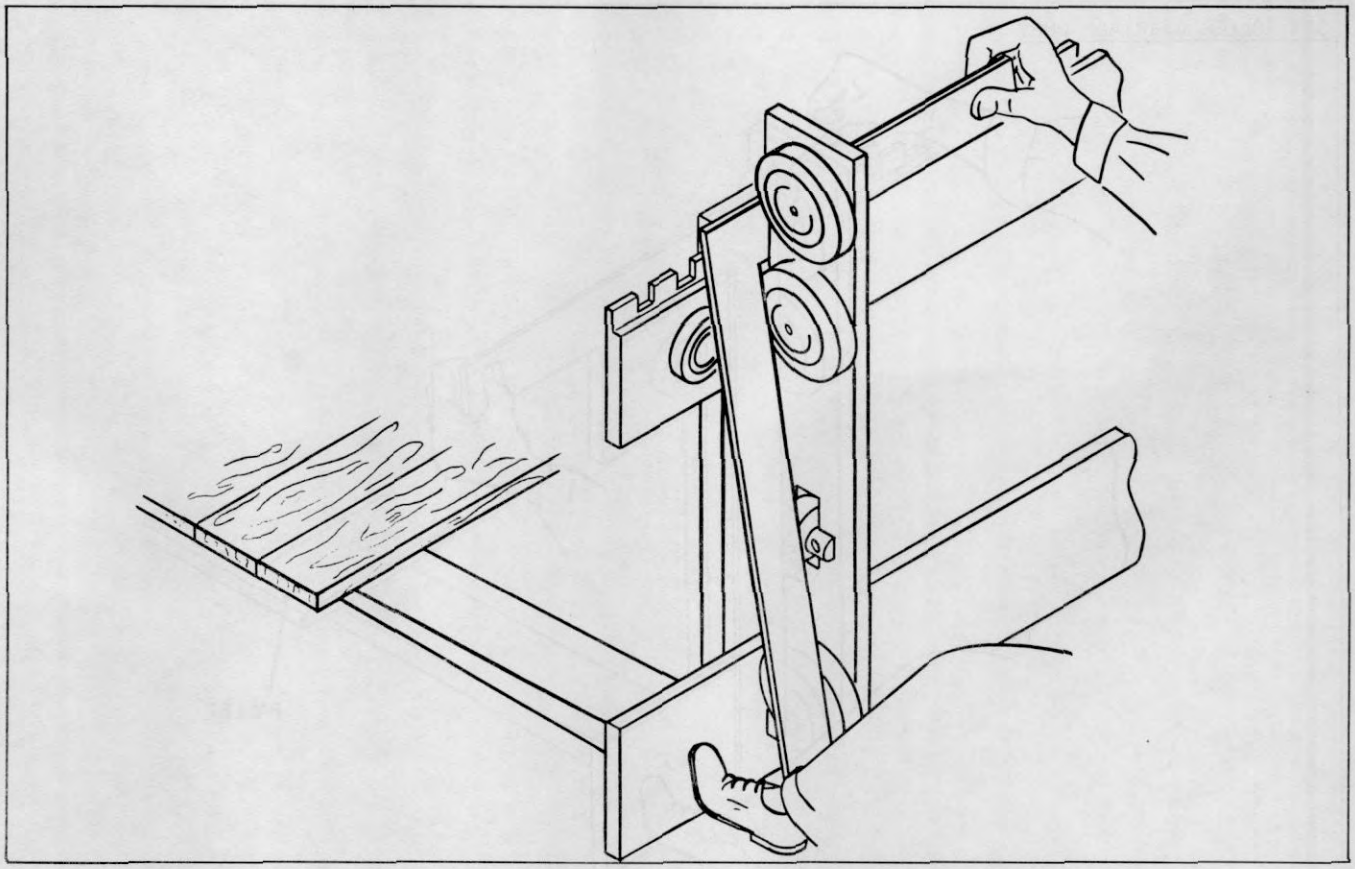


Plate 9579 Checking Squareness (Six Roller Carriage)

... measurement). This side will be square within 1/32"; if not, return to Step 5. and repeat procedure.

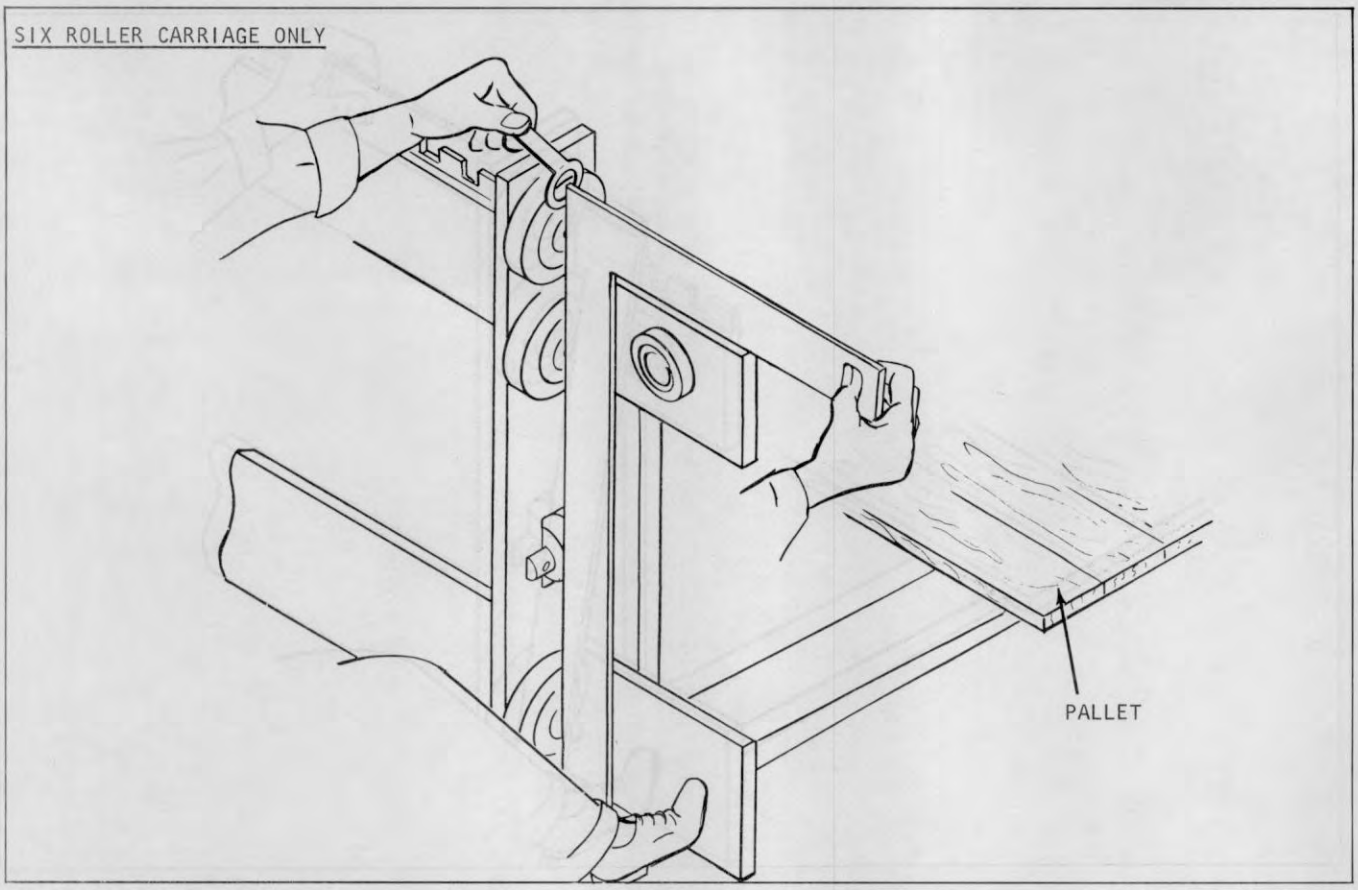


Plate 9580 Top Roller Clearance

Step 1. Place square on the vertical center line of the carriage rollers, as shown above. There must be some clearance between the square and the side surface of the top roller. This clearance should not exceed 1/32" or one shim

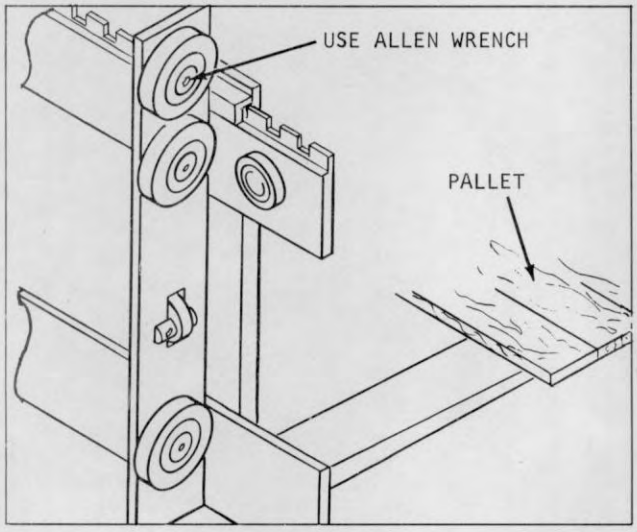


Plate 9581 Removing Top Roller

Step 2. If adjustment is necessary, remove allen screw, lock washer and flat washer to add or remove shims on shaft. Tighten screw securely after completing adjustment.

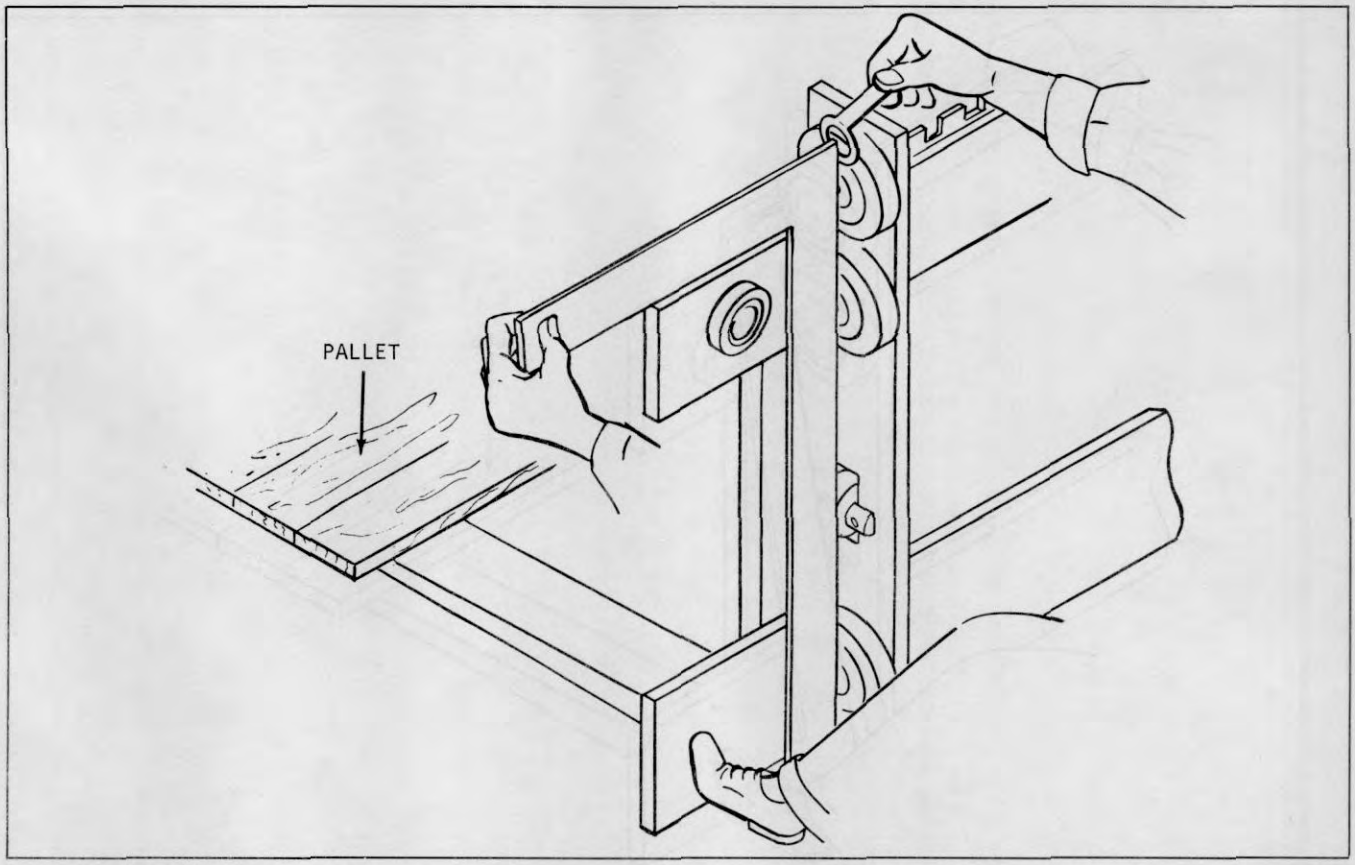


Plate 9582 Top Roller Clearance

Step 3. Check opposite upper roller in the same manner; adjust if necessary.

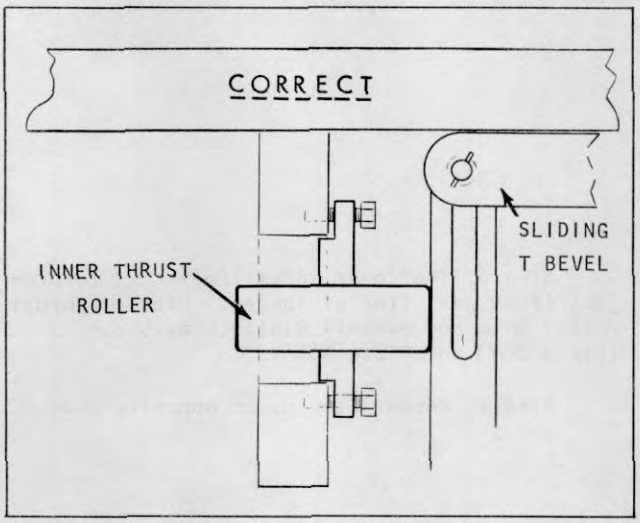


Plate 9583 Checking Squareness■CORRECT

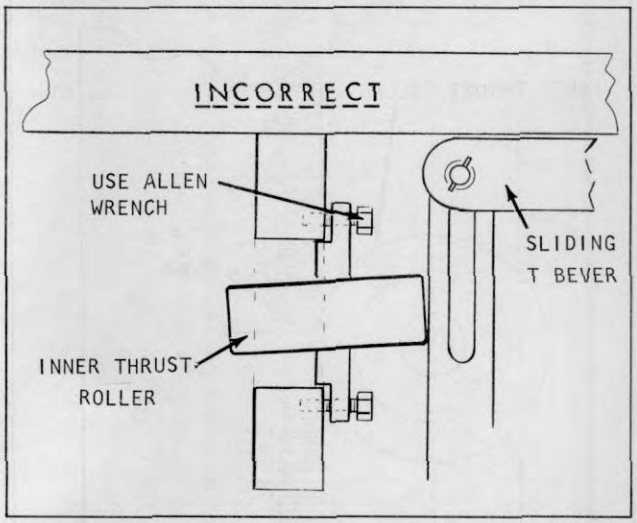


Plate 9584 Checking Squareness■INCORRECT

Step 4. Check squareness of inner thrust rollers with Sliding T Bevel. Set Sliding T Bevel to 90° using carpenter's square.

Step 5. Add or subtract shims for adjustment (Use allen wrench see Plate 9584).

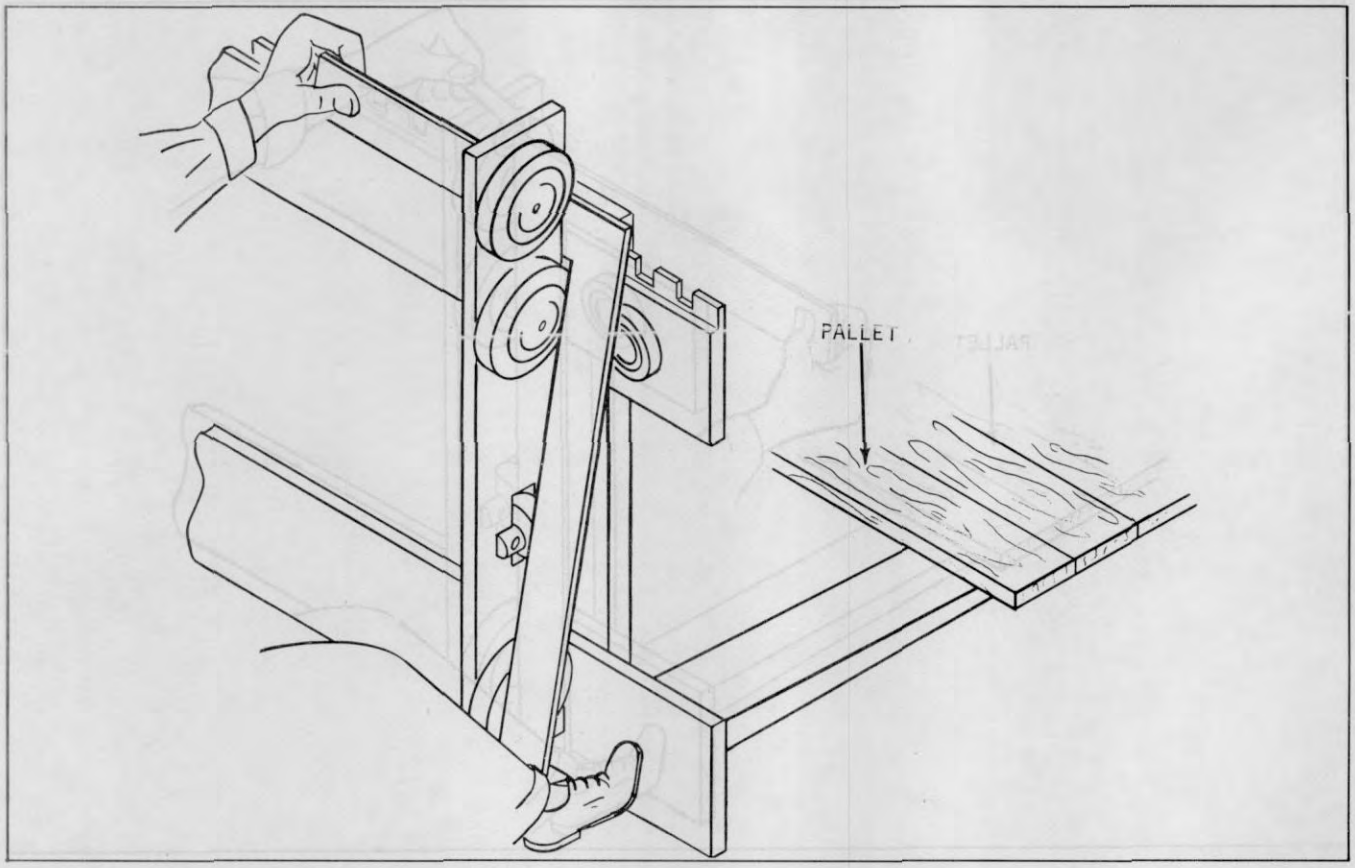


Plate 9574 Square And Side Thrust Roller

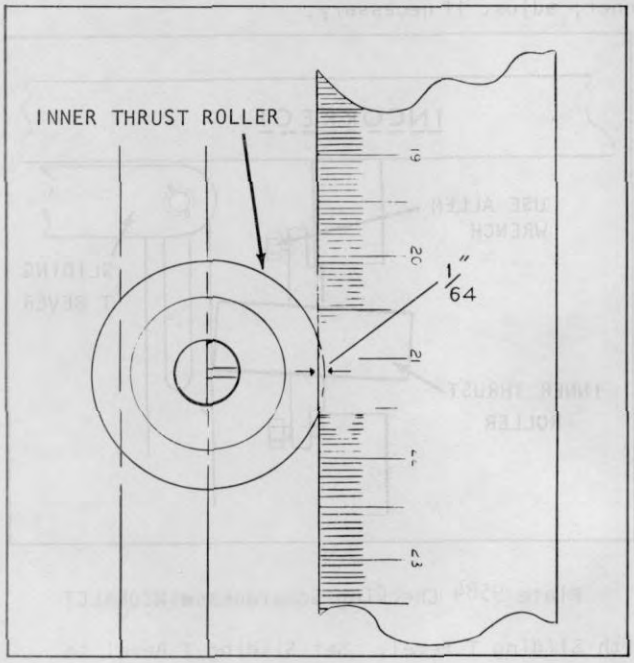


Plate 9585 Reading Roller Projection

Step 6. The inner thrust roller is to project 1/64" past line of square. Use one thrust roller shim and eyeball distance as shown (Plate 9573 and Plate 9585).

Step 7. Repeat Step 6. on opposite side.

C. CARRIAGE INSTALLATION

N O T E

Before installing carriage, check upright for proper shimming adjustment.

Step 1. Drive machine up to carriage and position upright to match tilt of carriage.

Step 2. Raise inner rails to just clear upper carriage rollers.

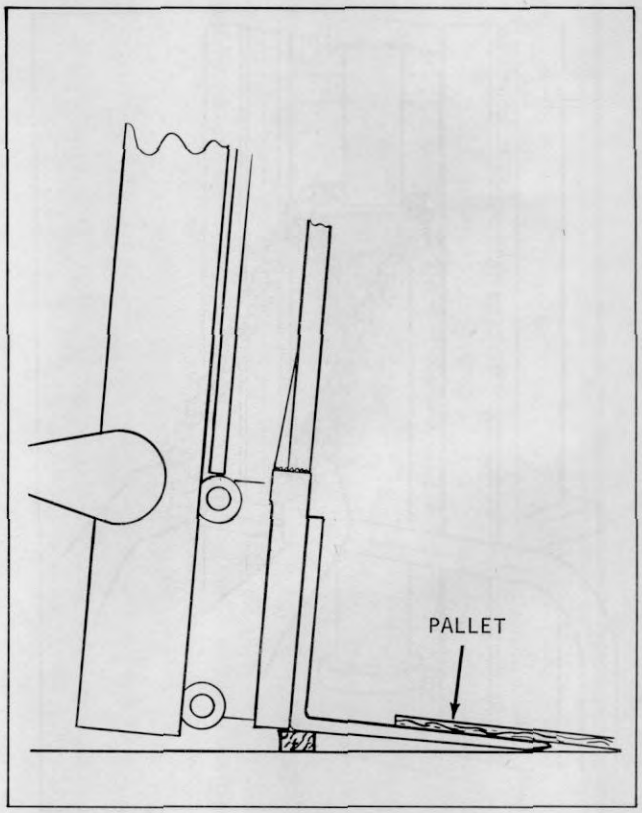


Plate 9565 Inner Rail Clearing Carriage Rollers

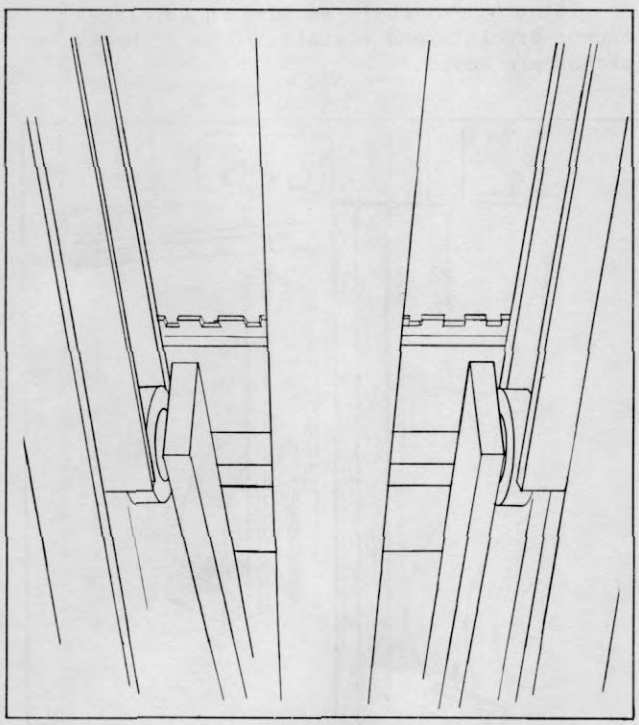


Plate 9591 Rollers Guiding Into Inner Rail

Step 3. Continue to drive machine forward until inner rails line up with upper carriage rollers, then.... slowly lower inner rails to full down position.

C A U T I O N

CHECK TO BE SURE THE TOP CARRIAGE ROLLERS ARE GUIDING INTO INNER RAIL.

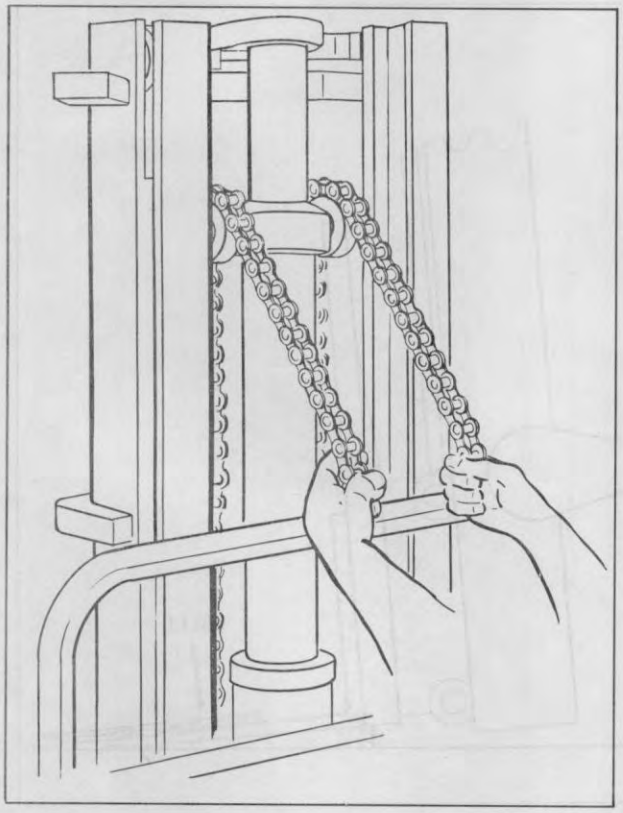


Plate 9586 Pulling Piston Head Down

Step 3(a). Remove wires holding lift chains.

(b). With a chain in each hand and someone holding the lift cylinder lever down, pull the piston to full down position. Place chains behind carriage.

Step 5. Raise carriage about 5' and place a 3' to 4' long 4"x4" wooden beam under it. DO NOT stand directly under forks. Lower carriage onto beam.

Step 6. Replace bolts with anchor pins.

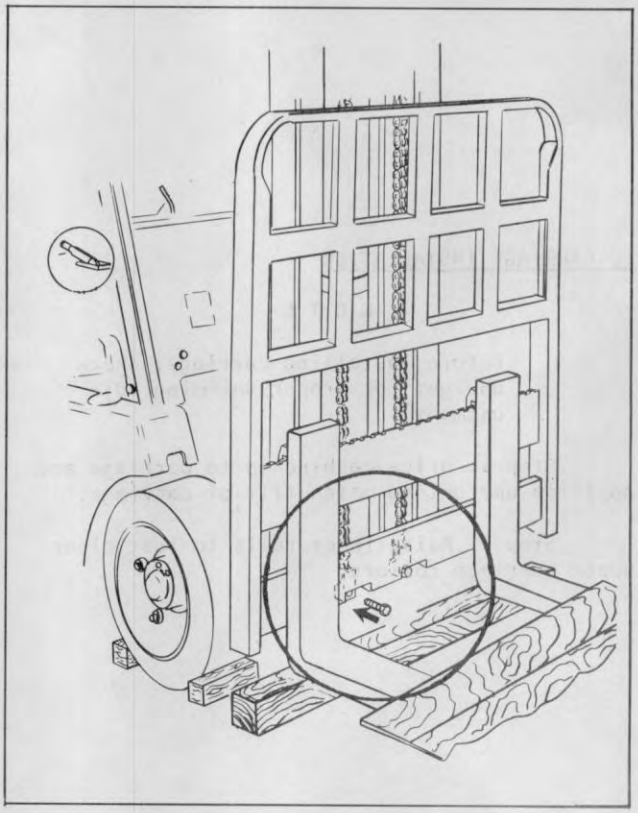


Plate 9587 Installing Bolts

Step 4. Put chain anchors in carriage anchor brackets and install 3/8" x 2" bolts in anchor pin holes.

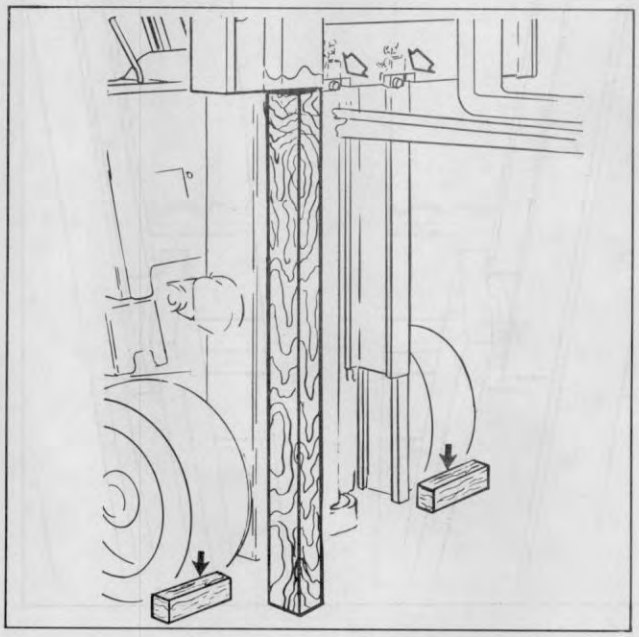


Plate 9593 Carriage Pin Replacement

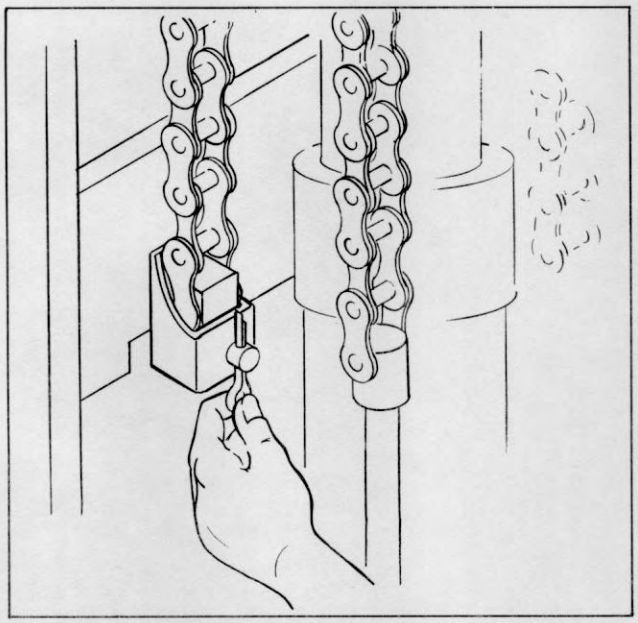
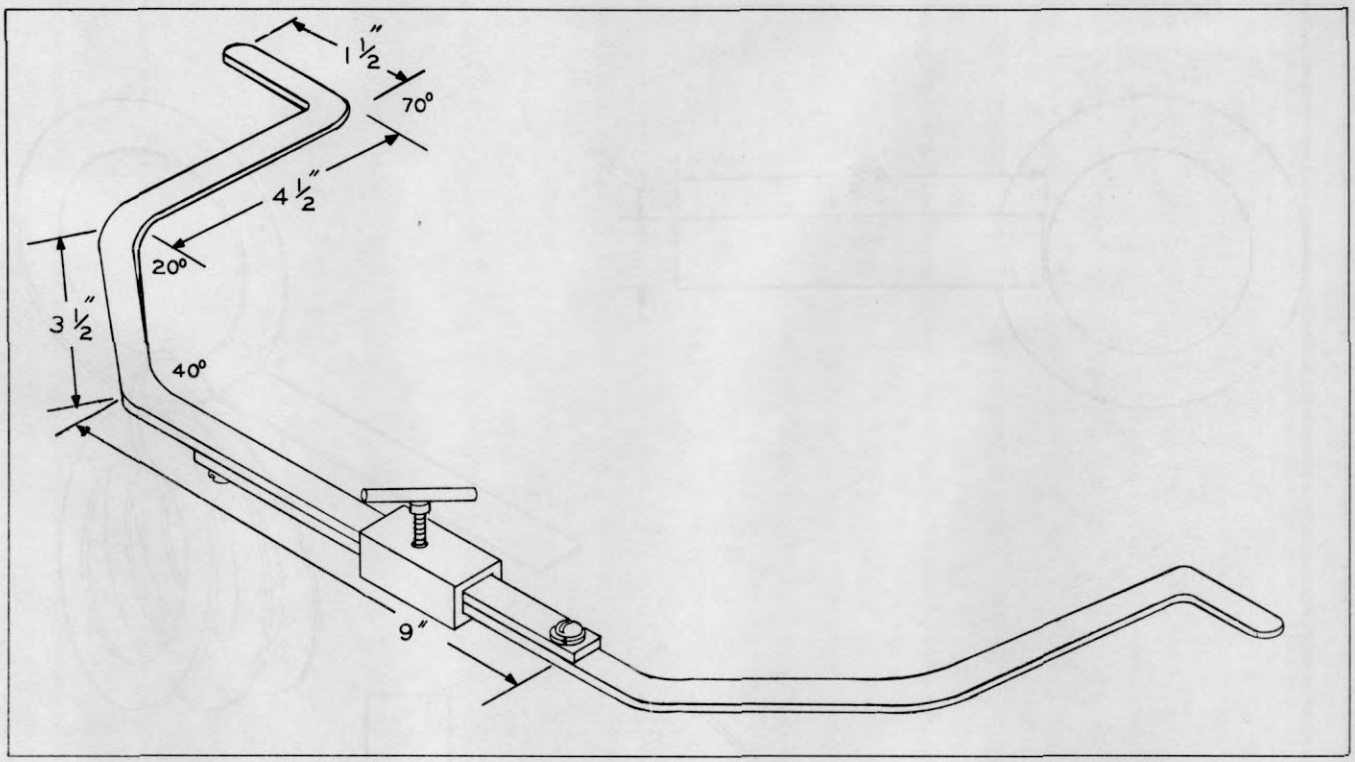


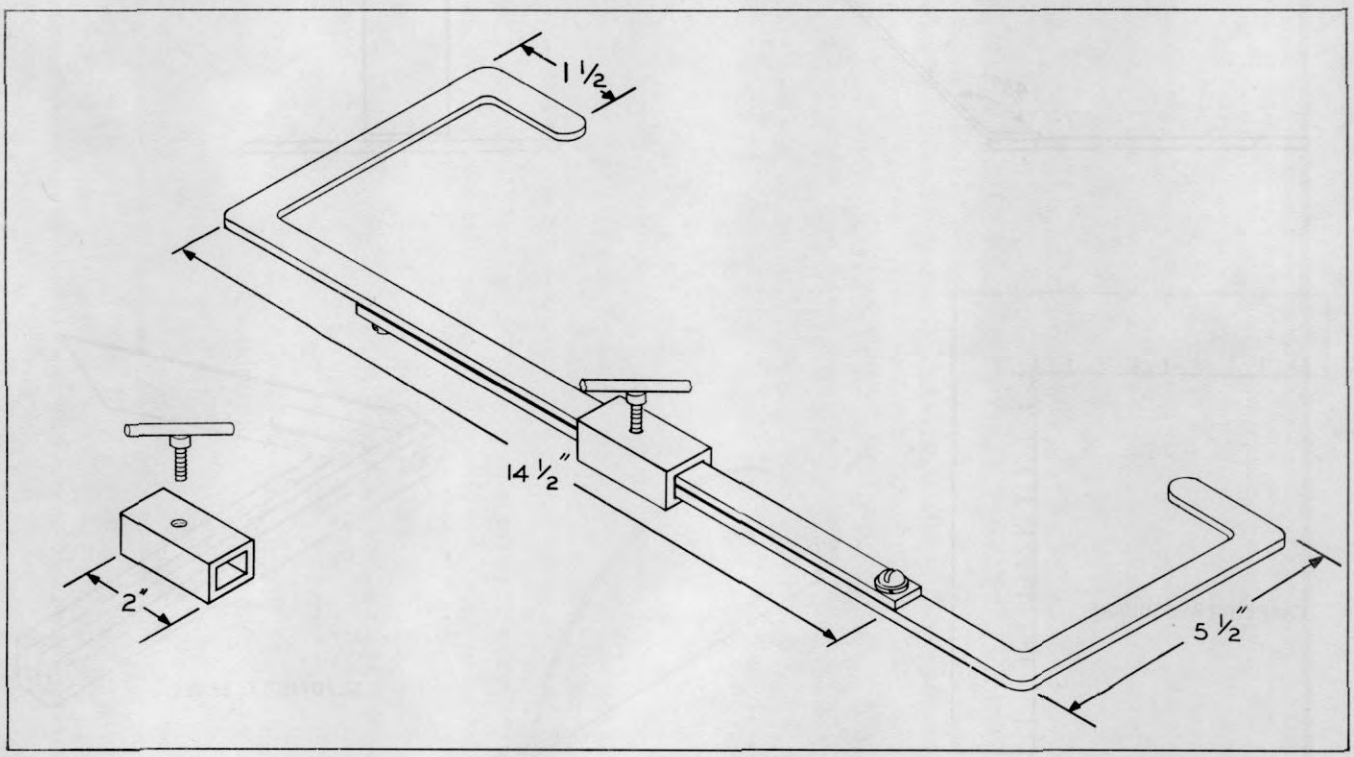
Plate 9588 Installing Cotter Pins

Step 7. Replace cotter pins in anchor pins.

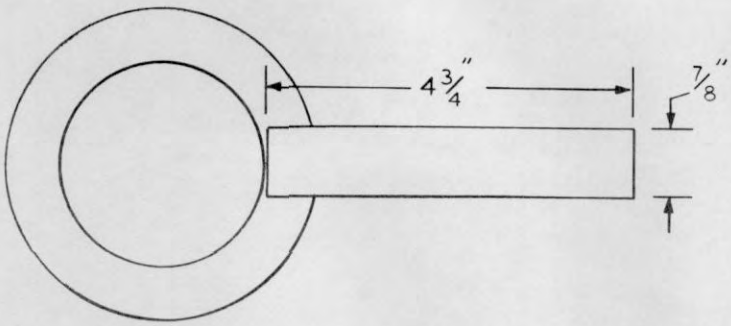
Step 8. Raise and lower carriage to full positions checking all phases of operation.

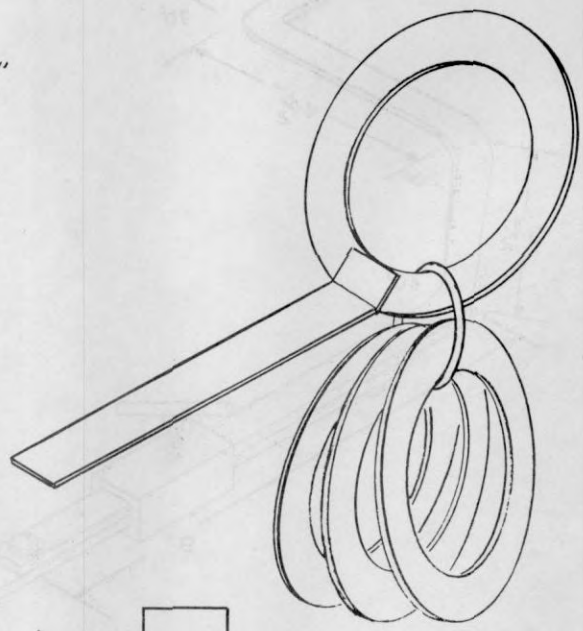


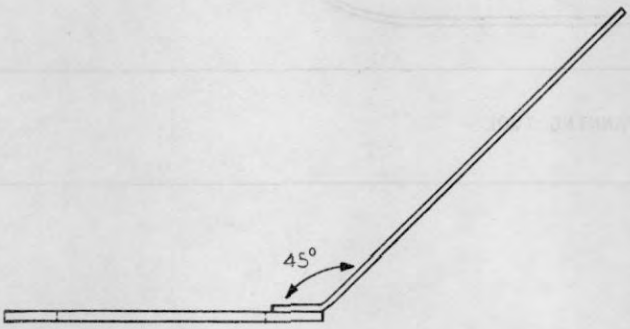
INSIDE SPANNING TOOL

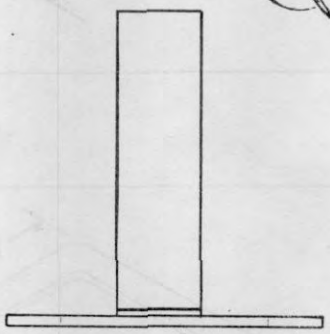


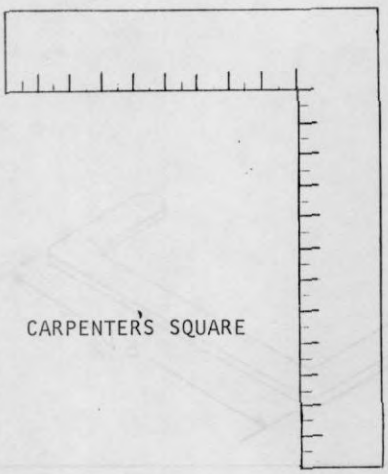
OUTSIDE SPANNING TOOL

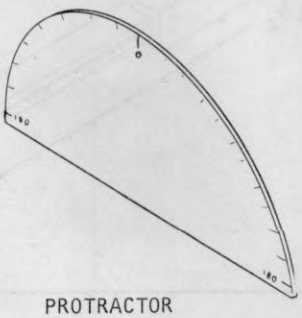




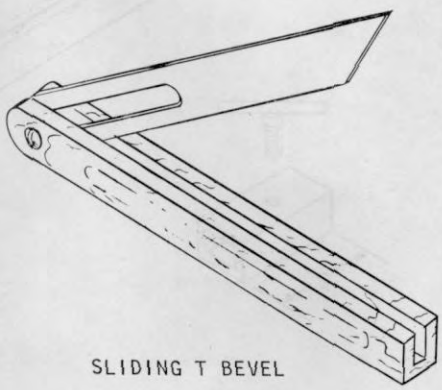





CARPENTER'S SQUARE



PROTRACTOR


SLIDING T BEVEL

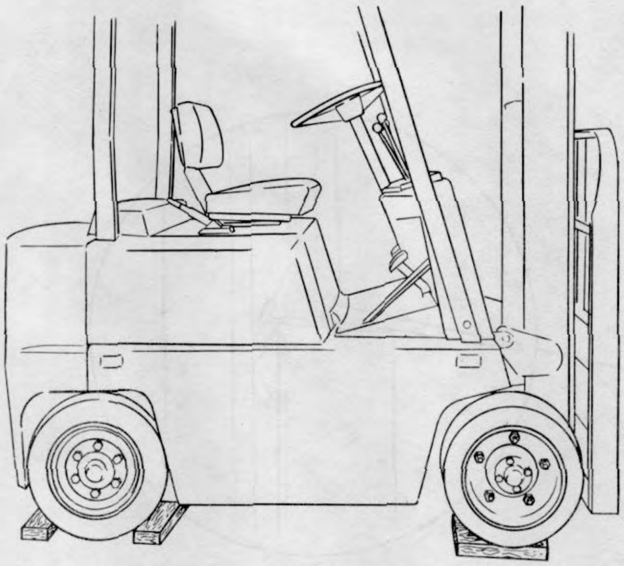


Plate 9811. Drive Wheels on Blocking, Block Steer Wheels

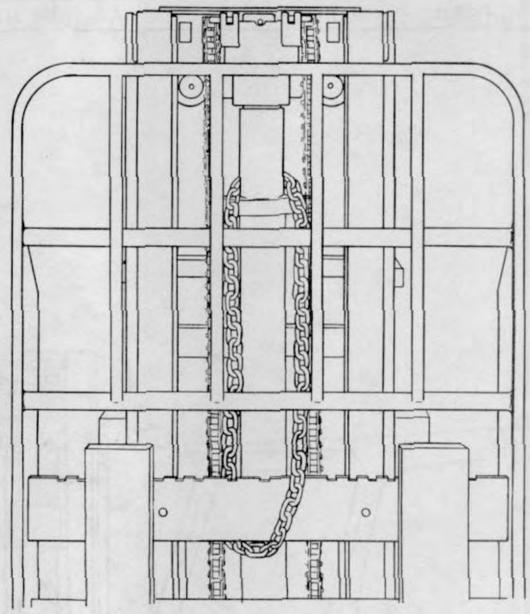


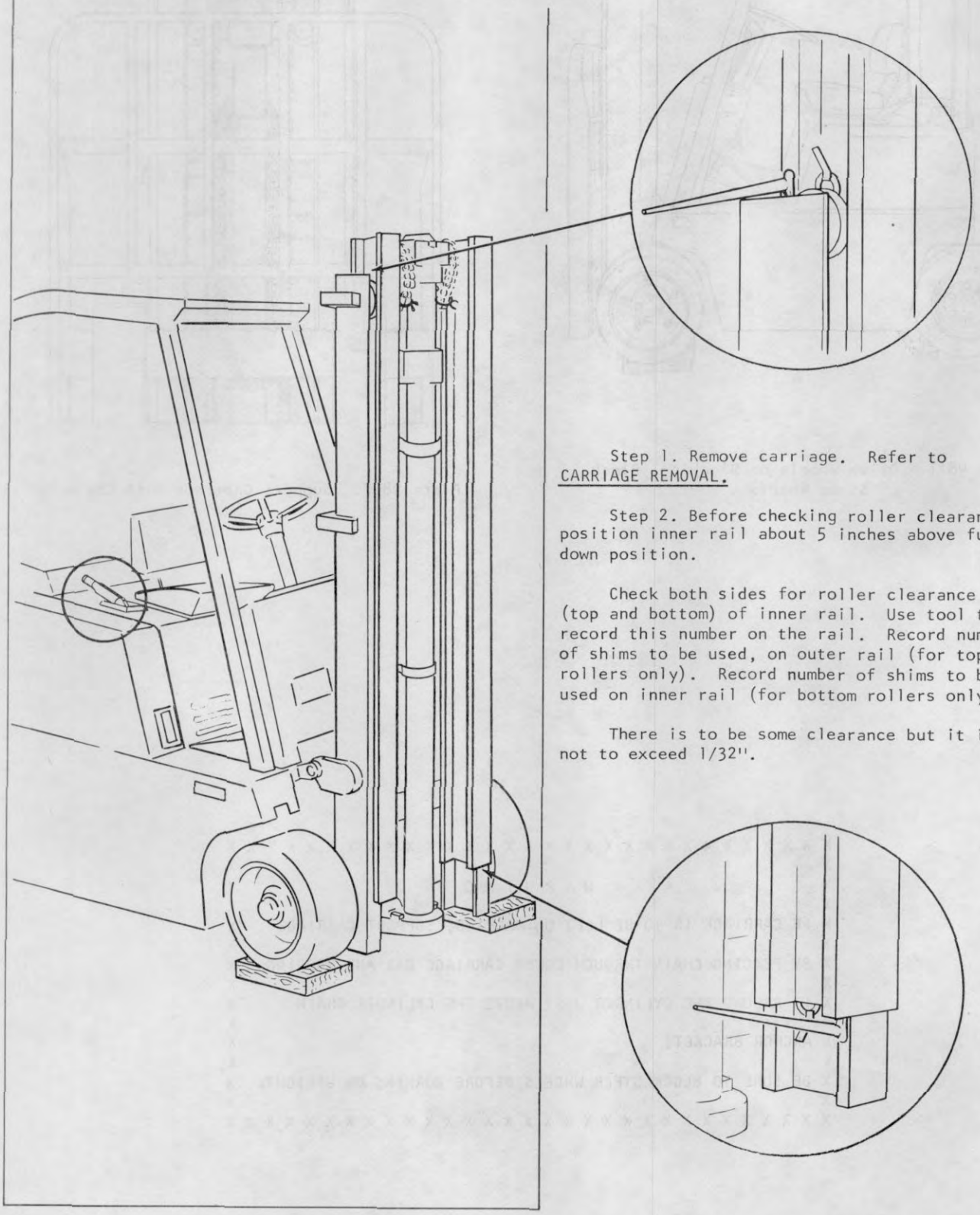
Plate 9807. Support Carriage with Chain

WARNING

IF CARRIAGE IS TO BE LEFT ON MACHINE, SUPPORT CARRIAGE BY PLACING CHAIN THROUGH LOWER CARRIAGE BAR AND RAPPING IT AROUND THE CYLINDER JUST ABOVE THE CYLINDER CHAIN ANCHOR BRACKET.

BE SURE TO BLOCK STEER WHEELS BEFORE WORKING ON UPRIGHT.

UPRIGHT ROLLER ADJUSTMENT -- STANDARD AND HILO SERIES 500



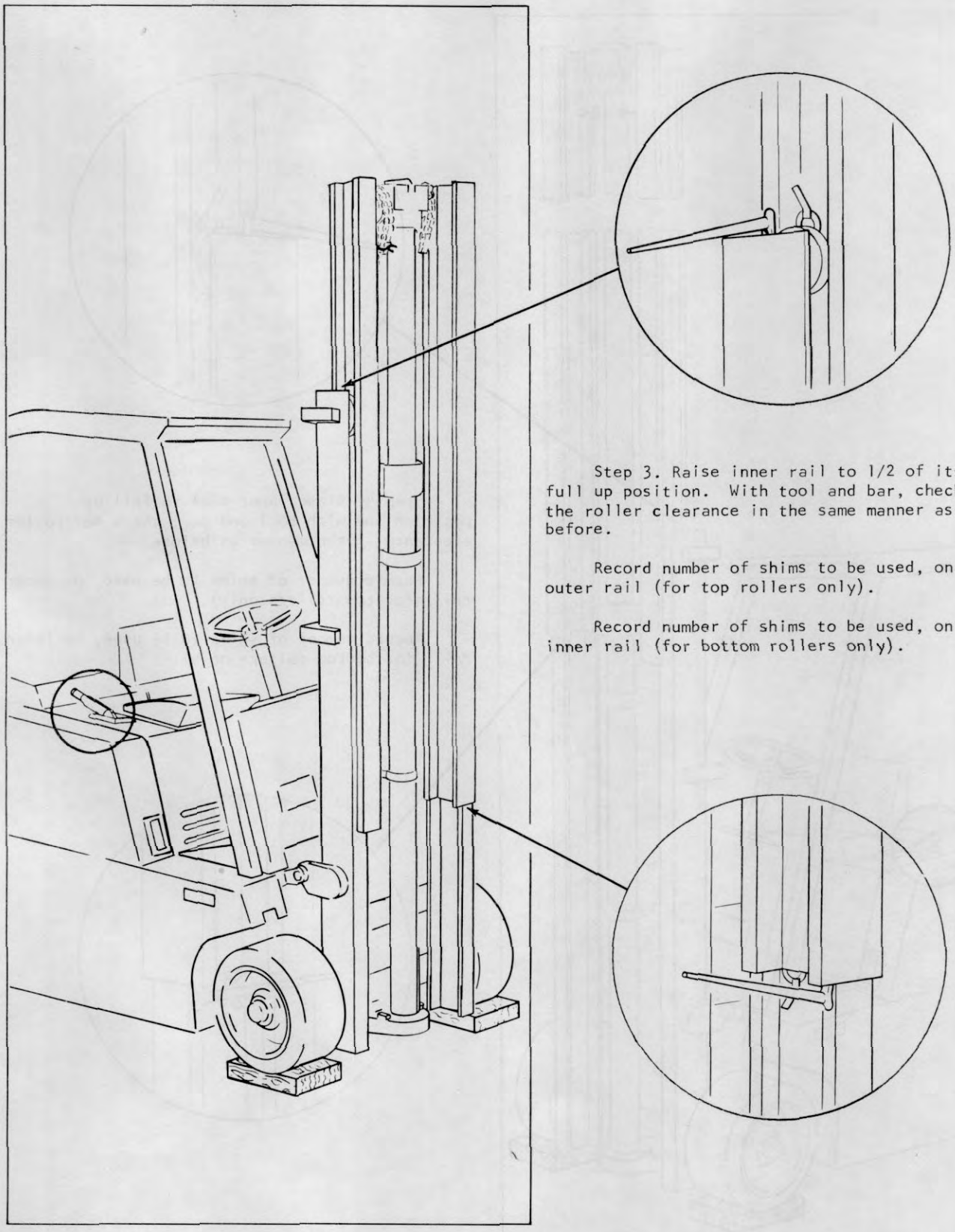
Step 1. Remove carriage. Refer to CARRIAGE REMOVAL.

Step 2. Before checking roller clearance, position inner rail about 5 inches above full down position.

Check both sides for roller clearance at (top and bottom) of inner rail. Use tool to record this number on the rail. Record number of shims to be used, on outer rail (for top rollers only). Record number of shims to be used on inner rail (for bottom rollers only).

There is to be some clearance but it is not to exceed 1/32".

Plate 9804

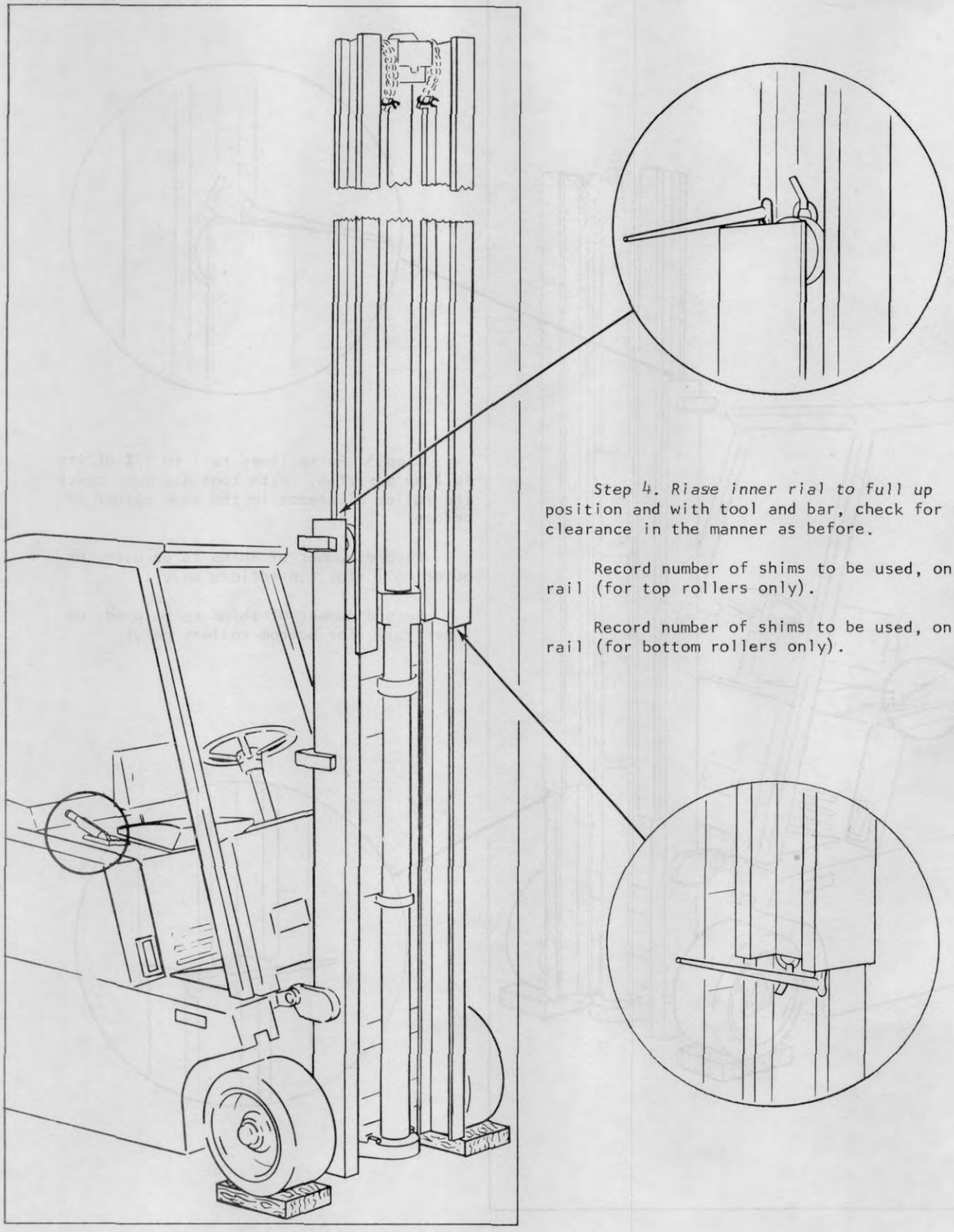


Step 3. Raise inner rail to 1/2 of its full up position. With tool and bar, check the roller clearance in the same manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rollers only).

Plate 9805



Step 4. Riase inner rial to full up position and with tool and bar, check for roller clearance in the manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rollers only).

Plate 9806

Step 5. Raise inner rail about 5 inches and remove stop block.

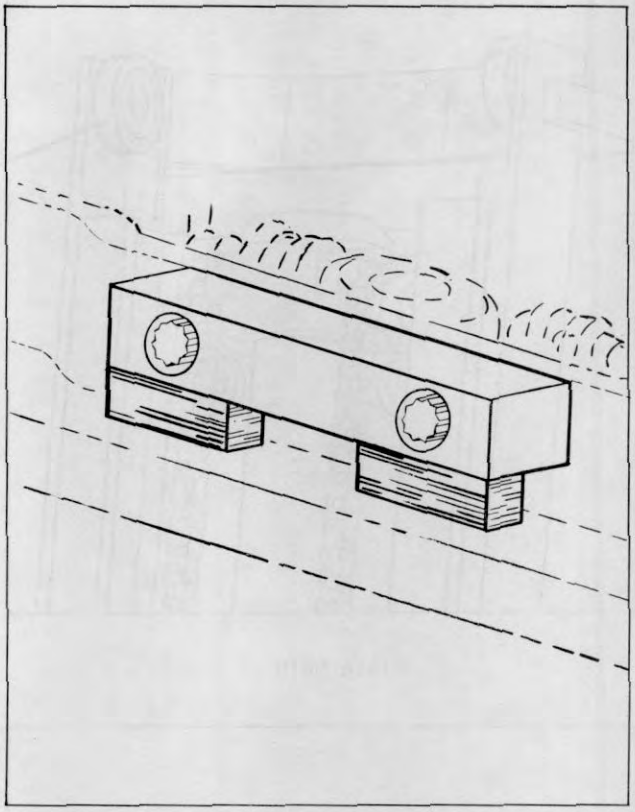
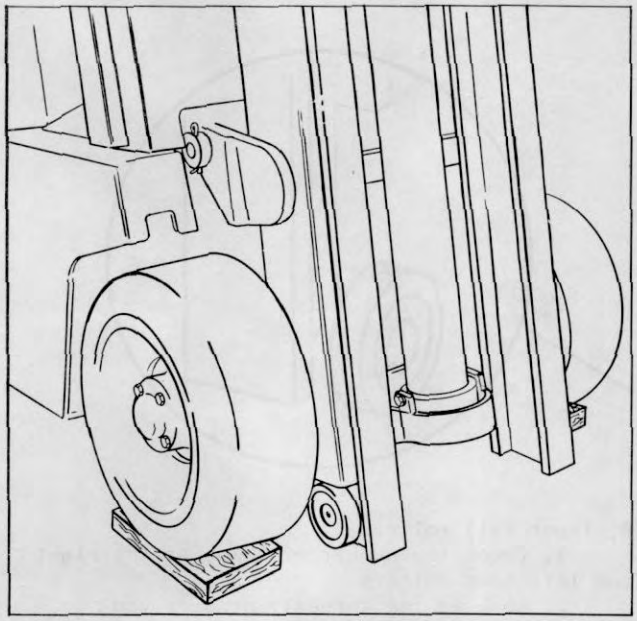


Plate 9808



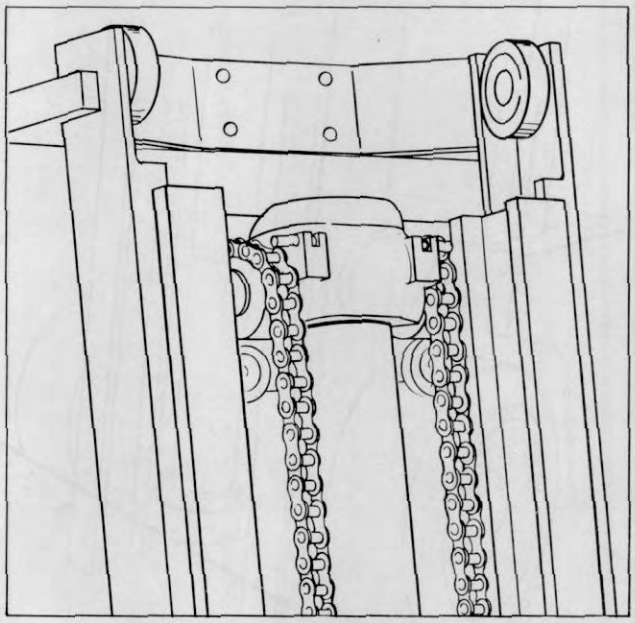


Plate 9809

Step 6. Lower inner rail until upper and lower rollers are clear for removal.

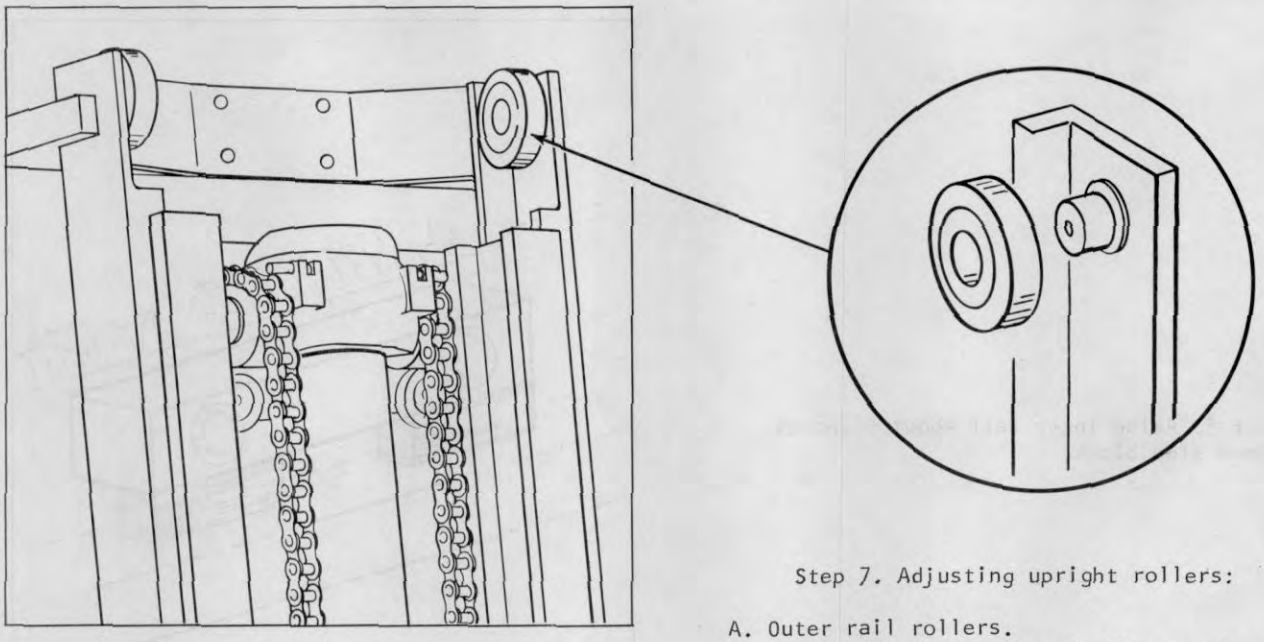


Plate 9810

Step 7. Adjusting upright rollers:

A. Outer rail rollers.

1. Count the number of shims at the right and left hand rollers.

2. Look at the three (3) numbers you recorded on the outer rail in Steps 2-3 & 4. The *smallest of these numbers is the total number* of shims to be added. A"0" means DO NOT add shims.

3. Your target for adjustment is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.

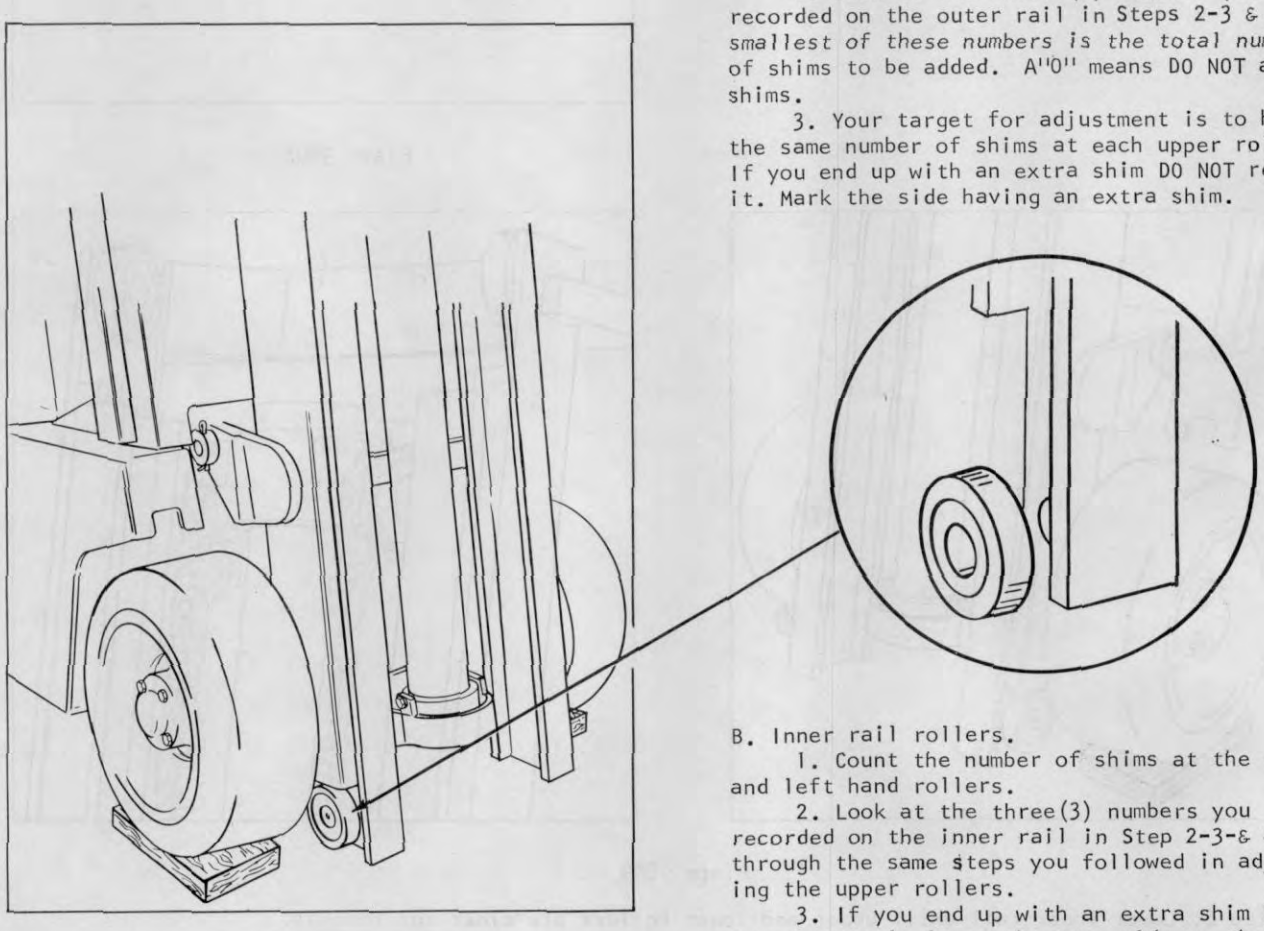


Plate 9812

B. Inner rail rollers.

1. Count the number of shims at the right and left hand rollers.

2. Look at the three(3) numbers you recorded on the inner rail in Step 2-3-& 4. Go through the same steps you followed in adjusting the upper rollers.

3. If you end up with an extra shim here too, besure it is on the same side as the extra upper shim.

Step 8. Raise inner rail about 5 inches above upper tie bar(of the outer rail) and install stop block and pad assembly.

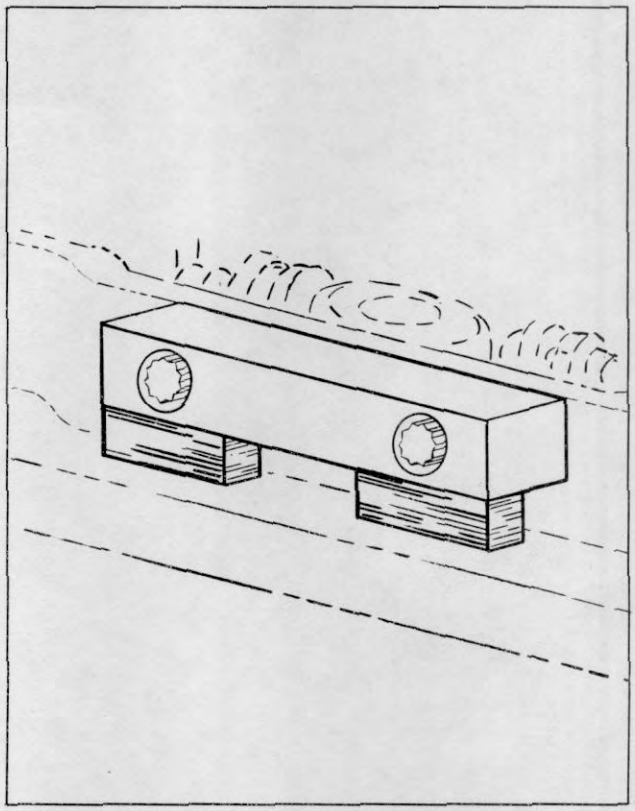


Plate 9808

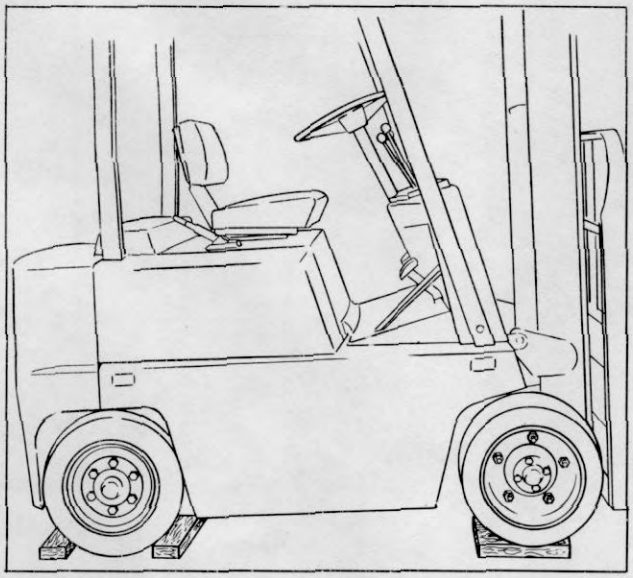


Plate 9811

Step 9. Remove carriage support chain and wheel blocks.