



INDUSTRIAL TRUCK DIVISION



OPERATORS MANUAL

NARROW AISLE TRUCKS

Solid State Control

NST 15SG-1-2063 thru 2182

NST 20SG-1-2063 thru 2182

NST 25SG-1-2063 thru 2182

NST 30SG-1-2069 thru 2182

NST 40SG-1-2069 thru 2182

Resistor Control

NST 15-1-2063 thru 2182

NST 20-1-2063 thru 2182

NST 25-1-2063 thru 2182

NST 30-1-2069 thru 2182

NST 40-1-2069 thru 2182

Book No. 0-285

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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.

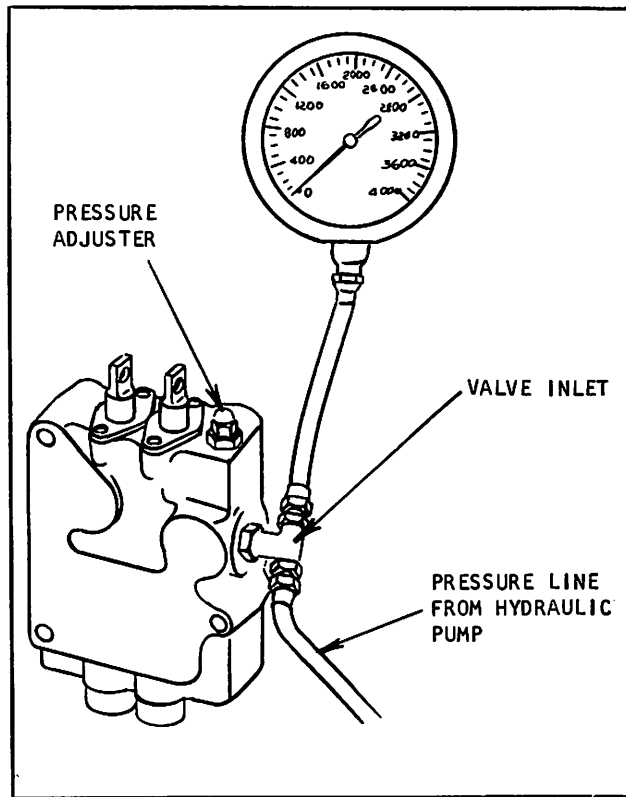


Plate 7333. Typical method for checking Hydraulic System Pressure

HYDRAULIC SYSTEM PRESSURE CHECKS

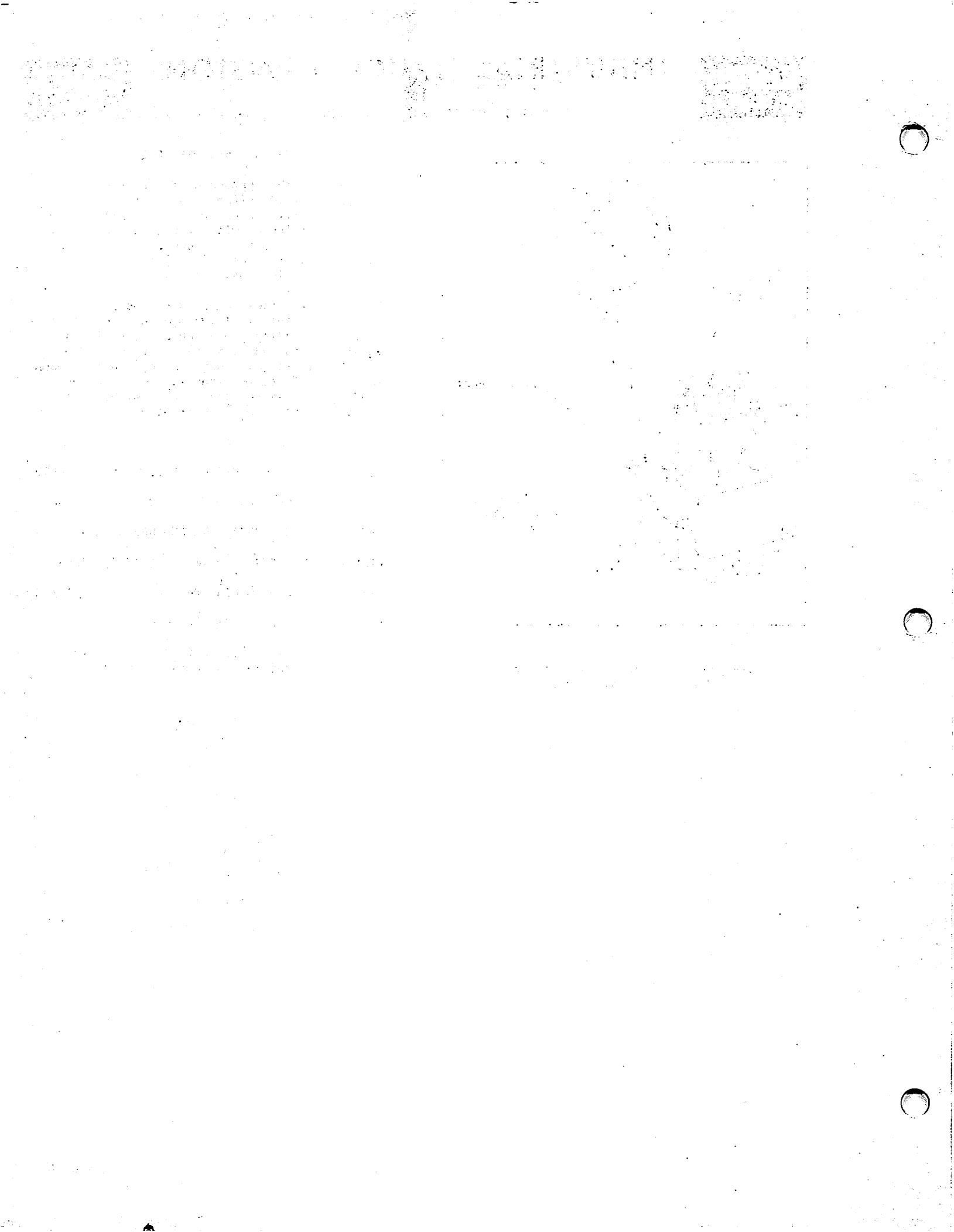
1. Remove the pressure check plug (if so equipped) from either valve and install a 0 - 4000 P.S.I. pressure gauge. If valve is not equipped with plug, then provide a suitable means for connecting a gauge at the inlet side of valve. A "tee" at the inlet side may be used.

2. Turn key switch on and operate a hydraulic control lever to extend, lift or reach (depending upon which circuit and valve is to be tested) position. When the hydraulic cylinder or cylinders reach the end of their travel, check gauge reading. Pressure should be within the limits listed in Specifications.

NOTE

DO NOT HOLD A CONTROL LEVER IN AN ACTUATED POSITION FOR ANY PROLONGED PERIOD AFTER THE CYLINDER OR CYLINDERS HAVE REACHED THE END OF THEIR (LIMIT) TRAVEL. THIS WILL CAUSE HEATING OF THE HYDRAULIC FLUID AND SHOULD BE AVOIDED.

If pressure is not as specified, report to designated person in authority.



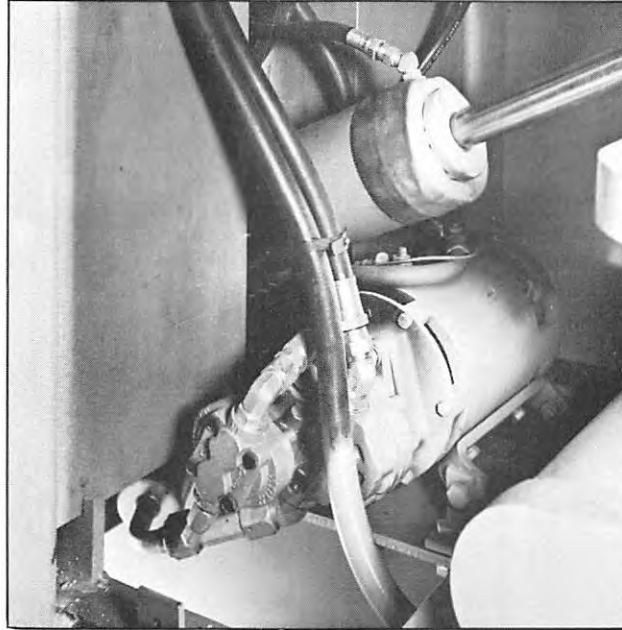


Plate 8304. Hydraulic Pump and Motor

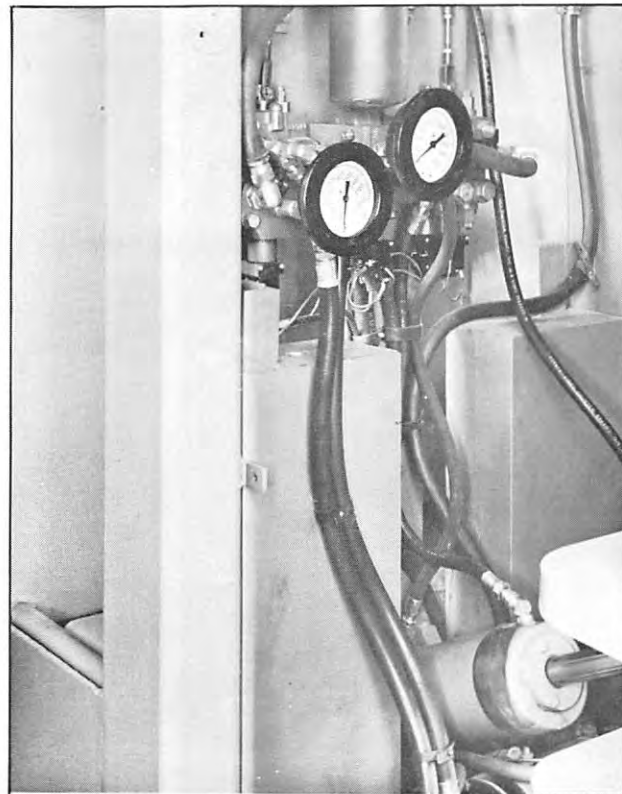
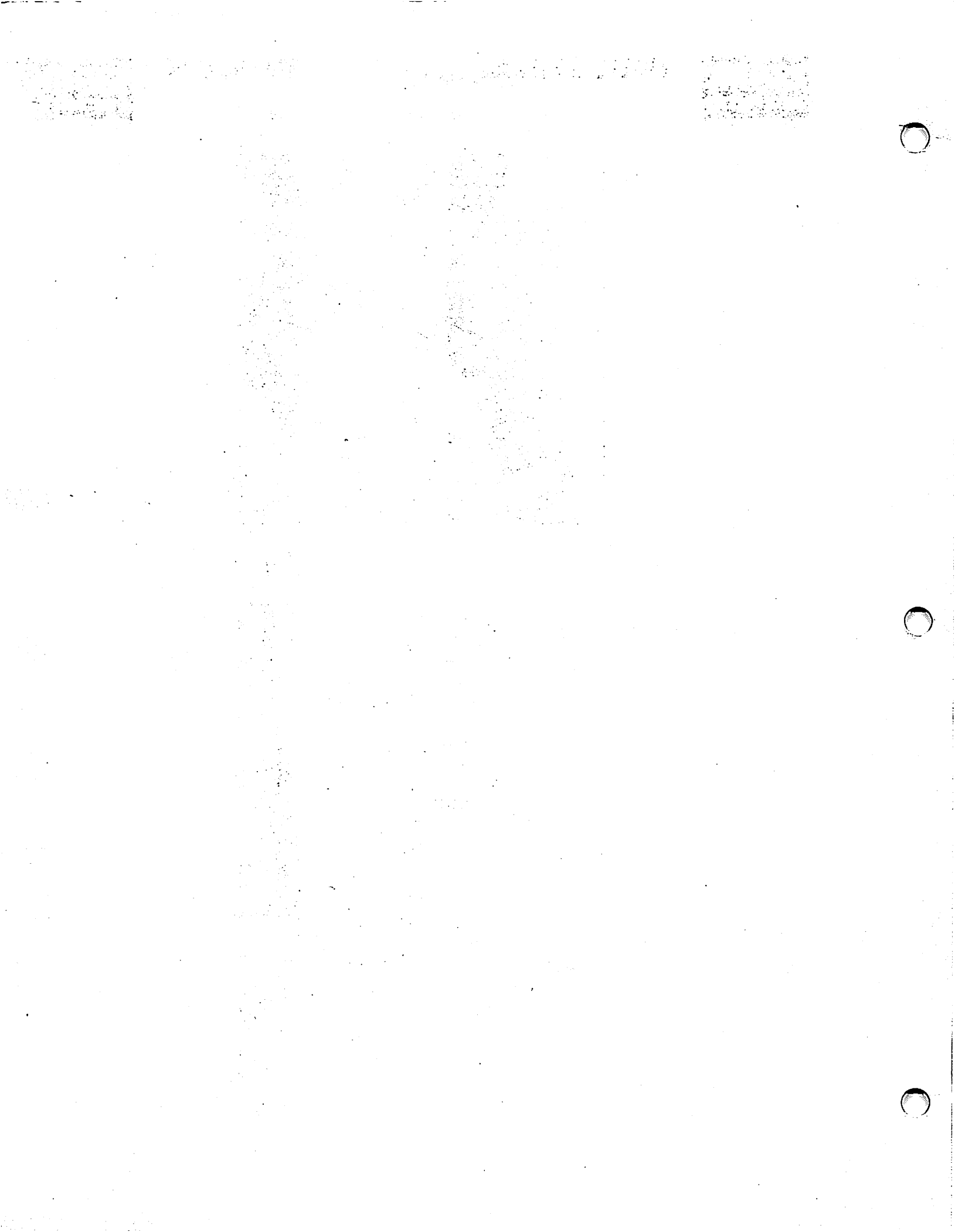


Plate 8305. Checking System Pressure





INDUSTRIAL TRUCK DIVISION



P L E A S E N O T E

I N S T R U C T I O N S O N U S E O F M A N U A L

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

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

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

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

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

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

| | | | |
|-------------------------------------|-------------------------|---|--------------------|
| Example: (8 Hours) | Time Interval (H=Hours) | & | Page Number (000-) |
| Hydraulic Sump Tank, level check... | 8H | | 503 |
| Brake Pedal Free Travel, check..... | 8H | | 373 |

The above states to check the sump tank fluid level every 8 operating hours and refer to page 503 for fluid recommendations etc. Also, to check brake pedal free travel at this interval and turn to page 373 for instructions.

Turn to the eight (8) hour section (8H) and then to the page listed — 503 or 373 etc. The instructions covered therein will pertain only to the checks or adjustments that should be performed at this TIME INTERVAL.

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

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

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

(continued)

I N S T R U C T I O N S O N U S E O F M A N U A L

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

N O T E

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

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

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

T A B L E O F C O N T E N T S

| PAGE | DESCRIPTION | PAGE | DESCRIPTION |
|------|-------------------------------|------|----------------------------|
| A001 | Instructions on use of manual | C070 | Overall controls |
| A002 | Instructions on use of manual | C071 | Battery connector |
| A073 | Table of contents | | Power key switch, controls |
| A074 | Table of contents | C073 | Battery charge indicator, |
| B071 | Illustration of truck(s) | | Hour meter |
| B073 | Specifications | C173 | Brake and Parking brake |
| B074 | Specifications | C303 | To pick-up a load |
| B075 | " | | To move a load |
| B076 | " | | To deposit a load |
| B077 | " | | Safety and Operating |
| B078 | " | | Suggestions |

L U B R I C A T I O N A N D P R E V E N T I V E M A I N T E N A N C E

| Time Interval (H-HOURS) | Page Number (000-) | DESCRIPTION |
|-------------------------|--------------------|--|
| H | 071 | INDEX |
| H | 072 | INDEX PAPER COLOR -- GREEN |
| | | 8 HOUR (Every 8 operating hours, or every shift) |
| 8H | 000 | Battery charge indicator, hour meter |
| | 273 | Brake (deadman) switch check |
| | 375 | Battery, service checks and maintenance |
| | 473 | Battery, service checks and maintenance |
| | 474 | Battery, service checks and maintenance |
| | 475 | Battery, service checks and maintenance |
| | 476 | Battery, service checks and maintenance |
| | 477 | Battery, service checks and maintenance |
| | 479 | Battery, removal and installation procedure(s) |
| | 503 | Hydraulic sump tank level check |
| | | 100 HOUR (Every 100 operating hours) |
| 100H | 000 | 100 Hour PM illustration |
| | 185 | Drive control adjustment |
| | 186 | Drive control adjustment |
| | 187 | Drive control adjustment |
| | 188 | Drive control adjustment |
| | 302 | Brake, check and adjust |
| | 303 | Brake, check and adjust |
| | 306 | Brake, check and adjust |
| | 307 | Brake, check and adjust |
| | 403 | Lift cylinder operation check |
| | | Tilt cylinder operation check |
| | | Reach cylinder operation check |
| | | Lift chain(s), check and adjust |
| | | Lubricate truck |
| | | Hydraulic control valve and lines, inspect |
| | | Lift carriage (Pantograph), inspect |
| | | Lift and tilt switches, check |
| | | Hydraulic sump (breather) filter, check |
| | | Contactors, inspect |
| | 473 | Lubrication chart PAPER COLOR -- BLUE |
| | 503 | Lubrication chart " |
| | 673 | Lubrication -continued- " |
| | 772 | Lubrication recommendations " |
| 867-L thru 881-L | | Lubrication specifications " |
| | | Lubrication chart(s) key " |



INDUSTRIAL TRUCK DIVISION



Time Interval (H-HOURS) Page Number (000-)

DESCRIPTION
- - - - -

| | | |
|-------|------|--|
| | | 500 HOUR (Every 500 Operating hours) |
| 500H | 000 | 500 HOUR PM illustration |
| | 173 | Sump tank, drain, flush and refill |
| | | Sump tank filter, change |
| | 174 | Sump tank breather, check/replace |
| | 473 | " |
| | | Caster adjustment |
| | | 1000 HOUR (Every 1000 operating hours) |
| 1000H | 000 | 1000 HOUR PM illustration |
| | 673 | Drive motor, inspect |
| | 674 | Drive motor brush spring tension, check |
| | 773 | Pump motor, inspect |
| | 774 | Pump motor brush spring tension, check |
| | 912 | Brake, bleeding procedure |
| | 913 | Brake, bleeding procedure |
| | 1507 | Hydraulic system flow and pressure check |
| | 1573 | Hydraulic system flow and pressure check |
| | 1940 | Wheels |

TROUBLE SHOOTING GUIDE

| | | | |
|---------|---------------|---------------------------|-----------------------|
| 17.7500 | | Solid state control | PAPER COLOR -- GREEN |
| 1000H | --- | Upright - "B" MODELS | PAPER COLOR -- PINK |
| 1000H | --- | UPRIGHT - "C" MODELS | PAPER COLOR -- YELLOW |
| | TSH001 | Hydraulic circuit diagram | |
| | IN - fold-out | Wiring diagram | |



INDUSTRIAL TRUCK DIVISION



SPECIFICATIONS

POWER SUPPLY

Type battery Lead Acid
 Voltage 24
 Ampere Hour Capacity 500
 Battery Weight 1260 lbs.

Overall height with 128 MFH Std. Upr.
 164 1/4 inches

Overall width
 34 rear front varies 34 to 58 inches

Ground clearance - under Straddle Arms.....
 2 inches

Grade clearance 15.6%

CONTACTORS

Replacement: when approximately 1/16" wear
 is reached.

N.O. contact gap will be 5/16" ± 1/32"
 N.C. contact gap will be 1/4" ± 1/32"

Battery Compartment Size
 32 3/4 W x 12 1/8 L x 31 1/2 H

Optional Sizes: 37 x 12 1/8 x 31 1/2
 32 3/4 x 16 5/8 x 31 1/2
 37 x 16 5/8 x 31 1/2

TIRES (in inches)

Front Load OPTIONAL
 (Polyurethane) (Polyurethane)
 (Tandem) 4 Dia. x 2 5/8; (Tandem), 5 x 2 2/8

Front Load OPTIONAL
 (Rubber)
 (Single), 10 x 5

Rear Steer-Drive Rubber
 (Single), 10 1/2 x 6 x 5

Caster Polyurethane
 (Dual) 6 x 2

DIMENSIONS

Without forks 66 3/8"

Width

Height with upright lowered (128" MFH
 Standard Upright) 83

Basic aisle for right angle stacking....
 71" + 6" operating clearance

Free lift (in inches)

Standard upright..... 17 1/4
 Hilo upright 46 3/4
 Triple stage..... 13

HYDRAULIC SYSTEM

Suction Filter (cleanable)..100 Mesh Screen

Return line filter (replaceable)..10 micron

Sump tank breather (replaceable).. 5 micron

Sump tank capacity 6.5 gallons

HYDRAULIC VALVE

Pressure relief valve setting...1750 P.S.I.

BRAKE SYSTEM

Type Spring applied, Hydraulic release

Service-Parking Brake Effectiveness.....
 Refer to page 100H 912

SPEEDS AND GRADES

| | |
|--------------|--------|
| Forward | M.P.H. |
| Loaded | 4.9 |
| Empty | 5.5 |

| | |
|--------------|-----|
| Reverse | |
| Loaded | 4.9 |
| Empty | 5.5 |

| | |
|----------------------|-----|
| Gradeability | |
| With Rated Load..... | 10% |
| Empty | 10% |

| | |
|---------------|--------|
| Lifting Speed | |
| Loaded | 33 FPM |
| Empty | 50 FPM |

| | |
|----------------|--------|
| Lowering Speed | |
| Loaded | 60 FPM |
| Empty | 80 FPM |



INDUSTRIAL TRUCK DIVISION



S P E C I F I C A T I O N S

- BATTERY CONNECTOR.....SB-2
- HYDRAULIC PUMPS.....See page 1000H 1573
- BRUSH SPRING TENSION.....See page 1000H 774

**ENGINEERING
SPECIFICATIONS**

CLARKLIFT® NST 15

1,500 pounds capacity, 24 inch load center



MODEL: NST 15

WEIGHT: With battery and 71"/106" standard upright — 4508 lbs. Includes 1220 lb. battery.

TIRES: Drive tire non-direction rubber — 10½" x 6" x 5"
Load wheels rubber 10" x 7" x 6¼"
Caster, dual, urethane — 6" x 2"

| | Empty | 1500 lb. Load |
|-----------------------|----------------------|----------------------|
| Travel Speeds | 5.9 MPH (519 FPM) | 5.4 MPH (475 FPM) |
| Lift Speeds | 93 FPM | 60 FPM |
| Lower Speeds | 45 FPM | 31 FPM |
| Grade Clearance — 49% | | |

BATTERY POWER SUPPLY: 24 volt battery is standard. A selection of various KWH capacities are available to suit operation.

STANDARD BATTERY COMP: 12½" L x 32¾" W x 31½" H

OPTIONAL BATTERY COMP: 12½" L x 37" W x 31½" H
16⅝" L x 32¾" W x 31½" H*
16⅝" L x 37" W x 31½" H*

DIMENSIONS:

| | |
|---|--------------------|
| *Length to front of forks | 51½" |
| *Wheelbase | 34⅜" |
| *Turning Radius | 44½" |
| Basic aisle for right angle stack | 52½" + load length |
| Underclearances | 4¼" |

*Increases 4½" with 16⅝" Long Battery Compartment

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstands mechanical abuse, are easily cleaned and resist most cleaning solvents.

CONTROLS: Two levers control:

1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 10° back and 3° forward is standard. Levers are directional in operation and return to neutral when released.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicators standard.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control — no tilt drift. Both lift and tilt cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump built into frame of ⅜" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a sump air breather filter, (2) a 25-micron full flow filter in hydraulic line, (3) bronze cylinder rod wiper rings, (4) 100 mesh filter screen.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 8" to 30" with standard load back rest. Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

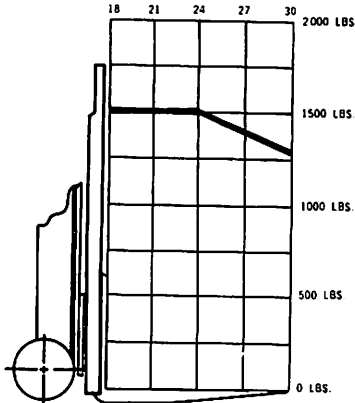
GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Driver's overhead guard and 48" high load back rest are standard. Standard color: yellow.

DIMENSIONAL SPECIFICATIONS

CLARKLIFT® NST 15

1,500 pounds capacity, 24 inch load center

CAPACITY CHART



CAPACITY RATING BASED ON MINIMUM BATTERY WEIGHT OF 1220 POUNDS WITH UPRIGHT IN VERTICAL POSITION.

UPRIGHT DIMENSION TABLE

| MFH | | OARL | FREE LIFT | | | O.A.M. RAISED WITH 48" LBR | |
|------|------|------|-----------|------|--------|----------------------------|-----|
| STD | M-LO | | STD | M-LO | TSU | STD-M-LO | TSU |
| 64 | --- | 50 | 18 | --- | --- | 112 1/2 | --- |
| 70 | --- | 53 | 18 | --- | --- | 118 1/2 | --- |
| 76 | --- | 56 | 18 | --- | --- | 124 1/2 | --- |
| 82 | --- | 59 | 18 | --- | --- | 130 1/2 | --- |
| 88 | --- | 62 | 18 | --- | --- | 136 1/2 | --- |
| 94 | 94 | 65 | 18 | 45** | 12 1/2 | 142 1/2 | 183 |
| 100 | 100 | 68 | 18 | 48** | 12 1/2 | 148 1/2 | 192 |
| *106 | 106 | 71 | 18 | 51** | 12 1/2 | 154 1/2 | 201 |
| 112 | 112 | 74 | 18 | 54** | 12 1/2 | 160 1/2 | 210 |
| 118 | 118 | 77 | 18 | 57** | 12 1/2 | 166 1/2 | 219 |
| 124 | 124 | 80 | 18 | 60** | 12 1/2 | 172 1/2 | 228 |
| *130 | 130 | 83 | 18 | 63** | 12 1/2 | 178 1/2 | 237 |

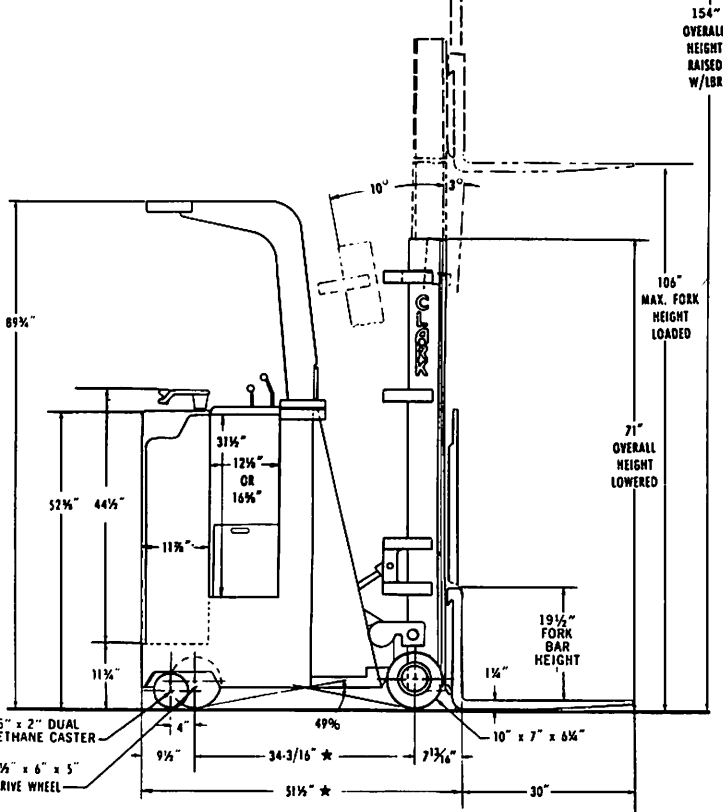
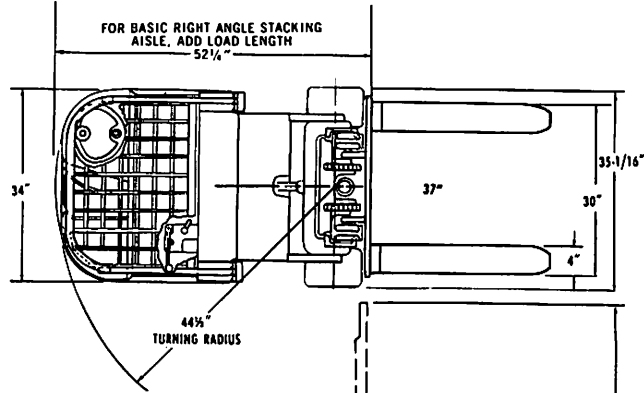
INTERMEDIATE HEIGHTS AVAILABLE IN INCREMENTS OF 3" MFH. FOR FORK HEIGHTS ABOVE 154" MFH CONTACT FACTORY FOR CAPACITY.

* INDICATES PREFERRED STANDARD SIZES.
** SUBTRACT 28" FOR LOAD BACK REST.



On all CLARK literature, dimensional and performance specifications are checked for accuracy by the engineering department.

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



* WITH 12 1/2" BATTERY COMPARTMENT
ADD 4 1/2" FOR 16 1/2" BATTERY COMPARTMENT

**ENGINEERING
SPECIFICATIONS**

CLARKLIFT® NST 20

2,000 pounds capacity, 24 inch load center



MODEL: NST 20

WEIGHT: With battery and 71"/106" standard upright — 5131 lbs. Includes 1220 lb. battery.

TIRES: Drive tire non-direction rubber — 10½" x 6" x 5"
Load wheels rubber 10" x 7" x 6¼"
Caster, dual, urethane — 6" x 2"

| SPEEDS: | Empty | 2000 lb. Load |
|---------------------|----------------------|----------------------|
| Travel Speeds | 5.7 MPH (501 FPM) | 4.9 MPH (431 FPM) |
| Lift Speeds | 93 FPM | 54 FPM |
| Lower Speeds | 43 FPM | 23 FPM |
| Grade Clearance — | 49% | |

BATTERY POWER SUPPLY: 24 volt battery is standard. A selection of various KWH capacities are available to suit operation.

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|---|--------------------|
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| *Wheelbase | 34⅞" |
| *Turning Radius | 44½" |
| Basic aisle for right angle stack | 52½" + load length |
| Underclearances | 4¼" |
| *Increases 4½" with 16⅝" Long Battery Compartment | |

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CONTROLS: Two levers control:

1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 10° back and 3° forward is standard. Levers are directional in operation and return to neutral when released.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

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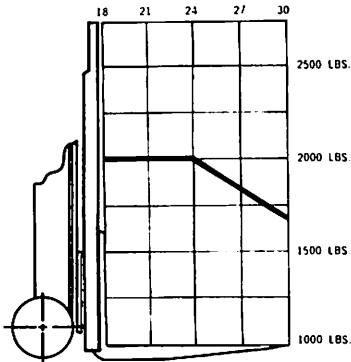
GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Driver's overhead guard and 48" high load back rest are standard. Standard color: yellow.

DIMENSIONAL SPECIFICATIONS

CLARKLIFT® NST 20

2,000 pounds capacity, 24 inch load center

CAPACITY CHART



CAPACITY RATING BASED ON MINIMUM BATTERY WEIGHT OF 1220 POUNDS WITH UPRIGHT IN VERTICAL POSITION.

UPRIGHT DIMENSION TABLE

| MFH | | | OAKL | FREE LIFT | | | O.A.M. RAISED WITH 48" LBR | |
|------|-------|-------------|------|-----------|---------------|--------|----------------------------|---------|
| STD | HI-LO | TSU FFL-TSU | | STD | HI-LO FFL-TSU | TSU | STD-HI-LO | TSU-FFL |
| 64 | --- | --- | 50 | 18 | --- | --- | 112 1/2 | --- |
| 70 | --- | --- | 53 | 18 | --- | --- | 118 1/2 | --- |
| 76 | --- | --- | 56 | 18 | --- | --- | 124 1/2 | --- |
| 82 | --- | --- | 59 | 18 | --- | --- | 130 1/2 | --- |
| 88 | --- | --- | 62 | 18 | --- | --- | 136 1/2 | --- |
| 94 | 94 | 135 | 65 | 18 | 45** | 12 1/2 | 142 1/2 | 183 |
| 100 | 100 | 144 | 68 | 18 | 48** | 12 1/2 | 148 1/2 | 192 |
| *106 | 106 | 153 | 71 | 18 | 51** | 12 1/2 | 154 1/2 | 201 |
| 112 | 112 | 162 | 74 | 18 | 54** | 12 1/2 | 160 1/2 | 210 |
| 118 | 118 | 171 | 77 | 18 | 57** | 12 1/2 | 166 1/2 | 219 |
| 124 | 124 | 180 | 80 | 18 | 60** | 12 1/2 | 172 1/2 | 228 |
| *130 | 130 | 189 | 83 | 18 | 63** | 12 1/2 | 178 1/2 | 237 |

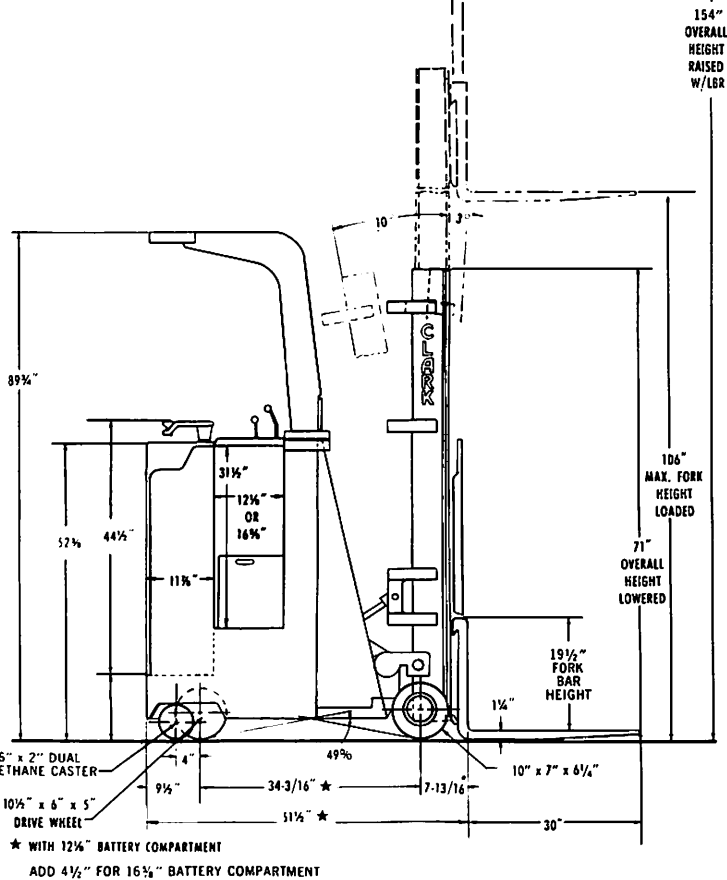
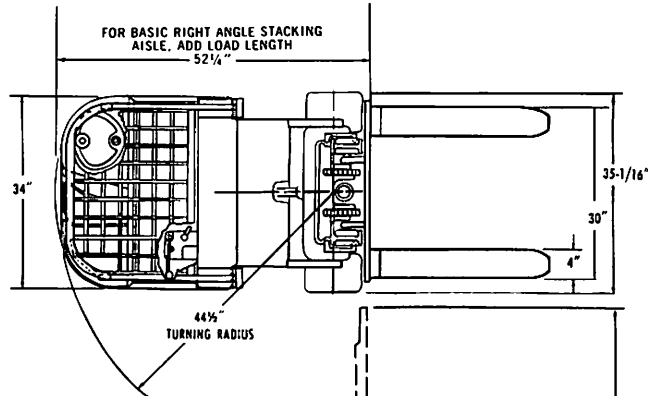
INTERMEDIATE HEIGHTS AVAILABLE IN INCREMENTS OF 3" MFH. FOR FORK HEIGHTS ABOVE 154" MFH CONTACT FACTORY FOR CAPACITY.

* INDICATES PREFERRED STANDARD SIZES.
** SUBTRACT 28" FOR LOAD BACK REST.



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



* WITH 12 1/2" BATTERY COMPARTMENT
ADD 4 1/2" FOR 16 1/2" BATTERY COMPARTMENT

**ENGINEERING
SPECIFICATIONS**

CLARKLIFT® NST 25

2,500 pounds capacity, 24 inch load center



MODEL: NST 25

WEIGHT: With battery and 71" / 106" standard upright — 5505 lbs. Includes 1220 lb. battery.

TIRES: Drive tire non-direction rubber — 10½" x 6" x 5"
Load wheels rubber 10" x 7" x 6¼"
Caster, dual, urethane — 6" x 2"

| SPEEDS: | Empty | 2500 lb. Load |
|-----------------------|----------------------|----------------------|
| Travel Speeds | 5.5 MPH (484 FPM) | 4.6 MPH (404 FPM) |
| Lift Speeds | 93 FPM | 45 FPM |
| Lower Speeds | 44 FPM | 22 FPM |
| Grade Clearance — 49% | | |

BATTERY POWER SUPPLY: 24 volt battery is standard. A selection of various KWH capacities are available to suit operation.

STANDARD BATTERY COMP: 12¼" L x 32¾" W x 31½" H

OPTIONAL BATTERY COMP: 12¼" L x 37" W x 31½" H
16½" L x 32¾" W x 31½" H*
16½" L x 37" W x 31½" H*

DIMENSIONS:

- *Length to front of forks 51½"
- *Wheelbase 34¾"
- *Turning Radius 44½"
- Basic aisle for right angle stack 52½" + load length
- Underclearances 4¼"
- *Increases 4½" with 16½" Long Battery Compartment

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstands mechanical abuse, are easily cleaned and resist most cleaning solvents.

CONTROLS: Two levers control:

1. Four speeds forward and reverse; also raises and lowers forks.
 2. Upright tilt; 10° back and 3° forward is standard.
- Lever are directional in operation and return to neutral when released.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicators standard.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control — no tilt drift. Both lift and tilt cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump built into frame of ¾" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a sump air breather filter, (2) a 25-micron full flow filter in hydraulic line, (3) bronze cylinder rod wiper rings, (4) 100 mesh filter screen.

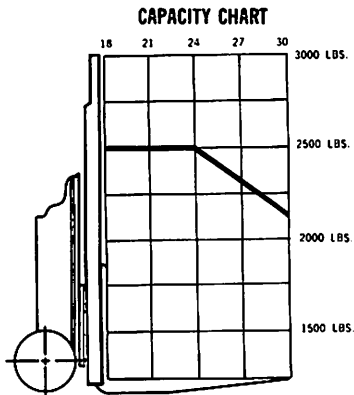
FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 8" to 30" with standard load back rest. Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Driver's overhead guard and 48" high load back rest are standard. Standard color: yellow.

DIMENSIONAL SPECIFICATIONS

CLARKLIFT® NST 25

2,500 pounds capacity, 24 inch load center



CAPACITY RATING BASED ON MINIMUM BATTERY WEIGHT OF 1220 POUNDS WITH UPRIGHT IN VERTICAL POSITION.

UPRIGHT DIMENSION TABLE

| MFH | | | OAKL | | | FREE LIFT | | | O.A.M. RAISED WITH 48" LBR | |
|-----|-------|-----|------|-------|------|-----------|-------|-----|----------------------------|-----|
| STD | HI-LO | TSU | STD | HI-LO | TSU | STD | HI-LO | TSU | STD | TSU |
| 64 | --- | --- | 50 | 18 | --- | --- | --- | --- | 112 1/2 | --- |
| 70 | --- | --- | 53 | 18 | --- | --- | --- | --- | 118 1/2 | --- |
| 76 | --- | --- | 56 | 18 | --- | --- | --- | --- | 124 1/2 | --- |
| 82 | --- | --- | 59 | 18 | --- | --- | --- | --- | 130 1/2 | --- |
| 88 | --- | --- | 62 | 18 | --- | --- | --- | --- | 136 1/2 | --- |
| 94 | 94 | 135 | 65 | 18 | 45** | 12 1/2 | --- | --- | 142 1/2 | 183 |
| 100 | 100 | 144 | 68 | 18 | 48** | 12 1/2 | --- | --- | 148 1/2 | 192 |
| 106 | 106 | 153 | 71 | 18 | 51** | 12 1/2 | --- | --- | 154 1/2 | 201 |
| 112 | 112 | 162 | 74 | 18 | 54** | 12 1/2 | --- | --- | 160 1/2 | 210 |
| 118 | 118 | 171 | 77 | 18 | 57** | 12 1/2 | --- | --- | 166 1/2 | 219 |
| 124 | 124 | 180 | 80 | 18 | 60** | 12 1/2 | --- | --- | 172 1/2 | 228 |
| 130 | 130 | 189 | 83 | 18 | 63** | 12 1/2 | --- | --- | 178 1/2 | 237 |

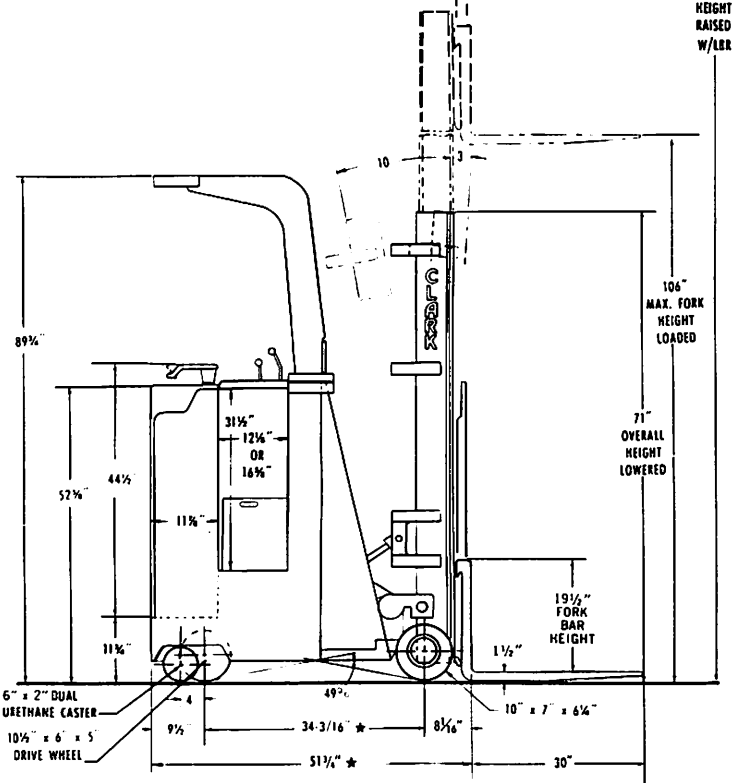
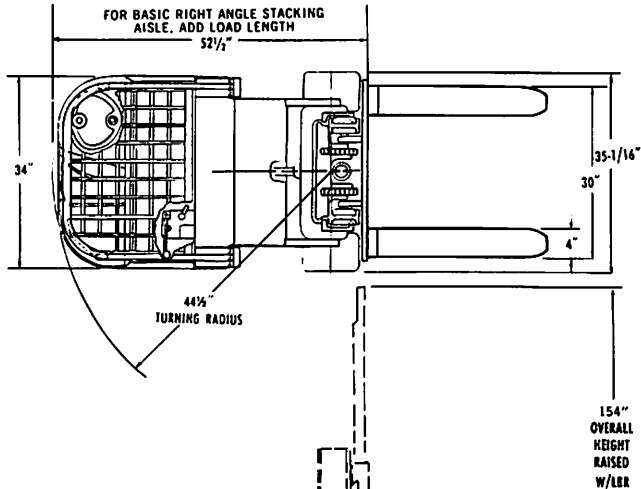
INTERMEDIATE HEIGHTS AVAILABLE IN INCREMENTS OF 3" MFH. FOR FORK HEIGHTS ABOVE 154" MFH CONTACT FACTORY FOR CAPACITY.

* INDICATES PREFERRED STANDARD SIZES.
** SUBTRACT 28" FOR LOAD BACK REST.



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



* WITH 12 1/2" BATTERY COMPARTMENT
ADD 4 1/2" FOR 16 1/2" BATTERY COMPARTMENT

**ENGINEERING
SPECIFICATIONS**

CLARKLIFT® NST 30

3,000 pounds capacity, 24 inch load center



MODEL: NST 30

WEIGHT: With battery and 71"/106" standard upright — 5847 lbs. Includes 1220 lb. battery.

TIRES: Drive tire non-direction rubber — 10½" x 6" x 5"
Load wheels urethane 10" x 5" x 6¼"
Caster, dual, urethane — 6" x 2"

| SPEEDS: | Empty | 3000 lb. Load |
|-----------------|----------------------|----------------------|
| Travel Speeds | 5.6 MPH (492 FPM) | 4.5 MPH (396 FPM) |
| Lift Speeds | 55 FPM | 35 FPM |
| Lower Speeds | 30 FPM | 16 FPM |
| Grade Clearance | — 41% | |

BATTERY POWER SUPPLY: 24 volt battery is standard. A selection of various KWH capacities are available to suit operation.

STANDARD BATTERY COMP: 12¼" L x 32¾" W x 31½" H

OPTIONAL BATTERY COMP: 12¼" L x 37" W x 31½" H
16⅝" L x 32¾" W x 31½" H*
16⅝" L x 37" W x 31½" H*

DIMENSIONS:

| | |
|------------------------------------|--------------------|
| *Length to front of forks | 58½" |
| *Wheelbase | 40½" |
| *Turning Radius | 51" |
| Basic aisle for right angle stack: | 59½" + load length |
| Underclearances | 4¼" |

*Increases 4½" with 16⅝" Long Battery Compartment

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstands mechanical abuse, are easily cleaned and resist most cleaning solvents.

CONTROLS: Two levers control:

1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 10° back and 3° forward is standard. Levers are directional in operation and return to neutral when released.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicators standard.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control — no tilt drift. Both lift and tilt cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump built into frame of ⅜" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a sump air breather filter, (2) a 25-micron full flow filter in hydraulic line, (3) bronze cylinder rod wiper rings, (4) 100 mesh filter screen.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 10" to 36" with standard load back rest. Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

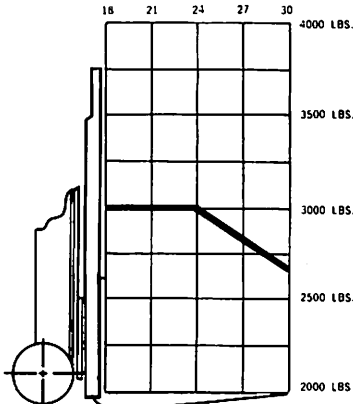
GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Driver's overhead guard and 48" high load back rest are standard. Standard color: yellow.

DIMENSIONAL SPECIFICATIONS

CLARKLIFT® NST 30

3,000 pounds capacity, 24 inch load center

CAPACITY CHART



CAPACITY RATING BASED ON MINIMUM BATTERY WEIGHT OF 1220 POUNDS WITH UPRIGHT IN VERTICAL POSITION.

UPRIGHT DIMENSION TABLE

| MFH | | OAML | FREE LIFT | | | O.A.M. RAISED WITH 48" LBR | |
|------|-------|------|-----------|-----------|-----|----------------------------|---------|
| STD | HI-LO | | STD | HI-LO FFL | TSU | STD-HI-LO | TSU-FFL |
| 64 | --- | 50 | 17 1/2 | --- | --- | 112 1/2 | --- |
| 70 | --- | 53 | 17 1/2 | --- | --- | 118 1/2 | --- |
| 76 | --- | 56 | 17 1/2 | --- | --- | 124 1/2 | --- |
| 82 | --- | 59 | 17 1/2 | --- | --- | 130 1/2 | --- |
| 88 | --- | 62 | 17 1/2 | --- | --- | 136 1/2 | --- |
| 94 | 94 | 65 | 17 1/2 | 45** | 13 | 142 1/2 | 183 |
| 100 | 100 | 68 | 17 1/2 | 48** | 13 | 148 1/2 | 192 |
| *106 | 106 | 71 | 17 1/2 | 51** | 13 | 154 1/2 | 201 |
| 112 | 112 | 74 | 17 1/2 | 54** | 13 | 160 1/2 | 210 |
| 118 | 118 | 77 | 17 1/2 | 57** | 13 | 166 1/2 | 219 |
| 124 | 124 | 80 | 17 1/2 | 60** | 13 | 172 1/2 | 228 |
| *130 | 130 | 83 | 17 1/2 | 63** | 13 | 178 1/2 | 237 |

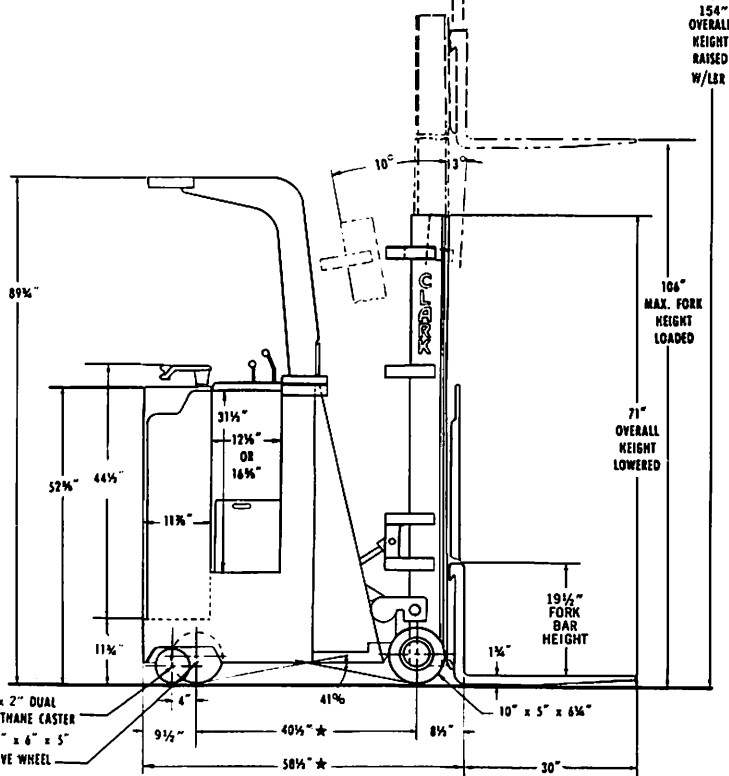
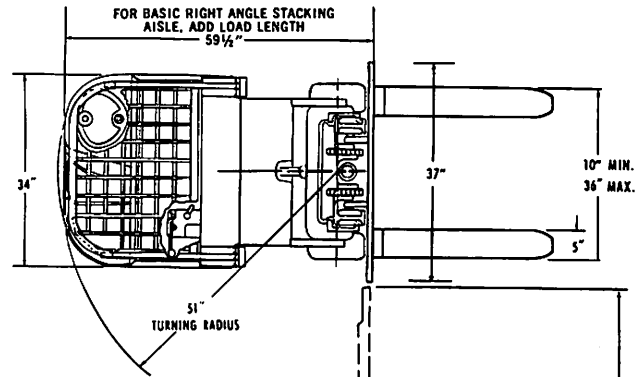
INTERMEDIATE HEIGHTS AVAILABLE IN INCREMENTS OF 3" MFH. FOR FORK HEIGHTS ABOVE 154" MFH CONTACT FACTORY FOR CAPACITY.

* INDICATES PREFERRED STANDARD SIZES.
** SUBTRACT 28" FOR LOAD BACK REST.



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* WITH 12 1/2" BATTERY COMPARTMENT
ADD 4 1/2" FOR 16 1/2" BATTERY COMPARTMENT

**ENGINEERING
SPECIFICATIONS**

CLARKLIFT® NST 40

4,000 pounds capacity, 24 inch load center



MODEL: NST 40

WEIGHT: With battery and 71"/106" standard upright — 5988 lbs. Includes 1220 lb. battery.

TIRES: Drive tire non-direction rubber — 10½" x 6" x 5"
Load wheels urethane 10" x 5" x 6¼"
Caster, dual, urethane — 6" x 2"

| SPEEDS: | Empty | 4000 lb. Load |
|-----------------------|----------------------|----------------------|
| Travel Speeds | 5.6 MPH (492 FPM) | 4.1 MPH (360 FPM) |
| Lift Speeds | 55 FPM | 31 FPM |
| Lower Speeds | 30 FPM | 16 FPM |
| Grade Clearance — 33% | | |

BATTERY POWER SUPPLY: 24 volt battery is standard. A selection of various KWH capacities are available to suit operation.

STANDARD BATTERY COMP: 12¼" L x 32¾" W x 31½" H

OPTIONAL BATTERY COMP: 12¼" L x 37" W x 31½" H
16⅝" L x 32¾" W x 31½" H*
16⅝" L x 37" W x 31½" H*

DIMENSIONS:

| | |
|-----------------------------------|--------------------|
| *Length to front of forks | 68½" |
| *Wheelbase | 50½" |
| *Turning Radius | 61" |
| Basic aisle for right angle stack | 69½" + load length |
| Underclearances | 4¼" |

*Increases 4½" with 16⅝" Long Battery Compartment

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstands mechanical abuse, are easily cleaned and resist most cleaning solvents.

CONTROLS: Two levers control:

1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 10° back and 3° forward is standard. Levers are directional in operation and return to neutral when released.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicators standard.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control — no tilt drift. Both lift and tilt cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump built into frame of ⅜" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a sump air breather filter, (2) a 25-micron full flow filter in hydraulic line, (3) bronze cylinder rod wiper rings, (4) 100 mesh filter screen.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 10" to 36" with standard load back rest. Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

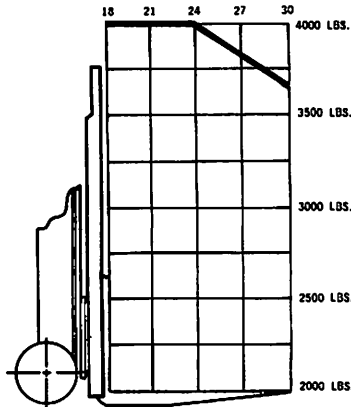
GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Driver's overhead guard and 48" high load back rest are standard. Standard color: yellow.

DIMENSIONAL
SPECIFICATIONS

CLARKLIFT® NST 40

4,000 pounds capacity, 24 inch load center

CAPACITY CHART



CAPACITY RATING BASED ON MINIMUM BATTERY WEIGHT OF 1220 POUNDS WITH UPRIGHT IN VERTICAL POSITION.

UPRIGHT DIMENSION TABLE

| MFH | | | | FREE LIFT | | | O.A.N. BASED WITH 48" LBR | |
|------|-------|---------|------|-----------|-----------|-----|---------------------------|---------|
| STD | HI-LO | TSU FFL | OAKL | STD | HI-LO FFL | TSU | STD-HI-LO | TSU FFL |
| 64 | --- | --- | 50 | 17½ | --- | --- | 112½ | --- |
| 70 | --- | --- | 53 | 17½ | --- | --- | 118½ | --- |
| 76 | --- | --- | 56 | 17½ | --- | --- | 124½ | --- |
| 82 | --- | --- | 59 | 17½ | --- | --- | 130½ | --- |
| 88 | --- | --- | 62 | 17½ | --- | --- | 136½ | --- |
| 94 | 94 | 135 | 65 | 17½ | 46** | 13 | 142½ | 183 |
| 100 | 100 | 144 | 68 | 17½ | 48** | 13 | 148½ | 192 |
| *106 | 106 | 153 | 71 | 17½ | 51** | 13 | 154½ | 201 |
| 112 | 112 | 162 | 74 | 17½ | 54** | 13 | 160½ | 210 |
| 118 | 118 | 171 | 77 | 17½ | 57** | 13 | 166½ | 219 |
| 124 | 124 | 180 | 80 | 17½ | 60** | 13 | 172½ | 228 |
| *130 | 130 | 189 | 83 | 17½ | 63** | 13 | 178½ | 237 |

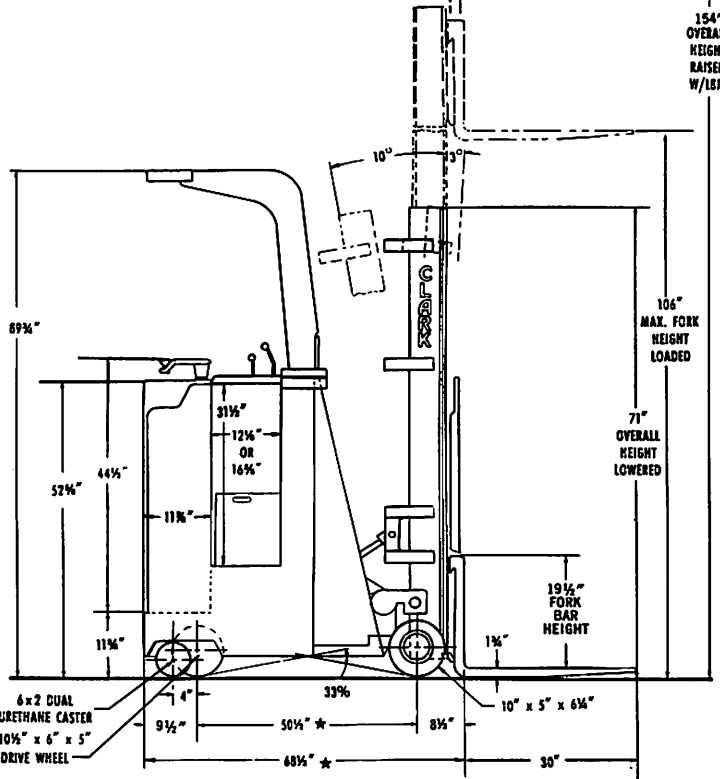
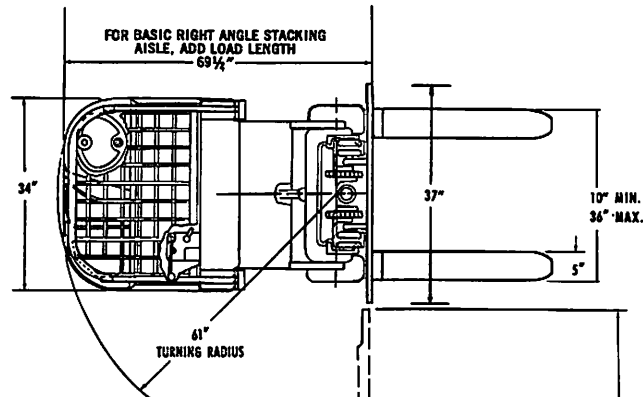
INTERMEDIATE HEIGHTS AVAILABLE IN INCREMENTS OF 3" MFH. FOR FORK HEIGHTS ABOVE 154" MFH CONTACT FACTORY FOR CAPACITY.

* INDICATES PREFERRED STANDARD SIZES.
** SUBTRACT 28" FOR LOAD BACK REST.



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6 x 2 DUAL URETHANE CASTER
10½" x 6" x 5"
DRIVE WHEEL

★ WITH 12½" BATTERY COMPARTMENT
ADD 4½" FOR 16½" BATTERY COMPARTMENT



INDUSTRIAL TRUCK DIVISION



IMPORTANT

SUBJECT: CAUTIONS CONNECTED WITH
THE OPERATION AND MAINTENANCE OF
SOLID STATE CONTROLLED TRUCKS.

C A U T I O N

WELDING ON SCR TRUCKS:

1. MAKE SURE TRUCK HAS NO GROUNDS.
2. DISCONNECT BATTERY.
3. PROTECT ELECTRICAL WIRING AND COMPONENTS FROM WELD SPLATTER WITH A SHIELD.

IF THE ABOVE IS NOT FOLLOWED.....
DAMAGE CAN RESULT TO WIRING AND
ELECTRICAL COMPONENTS ON A SOLID
STATE CONTROLLED TRUCK.

C A U T I O N

DO NOT STEAM CLEAN A SOLID STATE
CONTROLLED TRUCK AS EXCESSIVE MOIS-
TURE WILL INTERFERE WITH PROPER
OPERATION OF THE SOLID STATE COMPON-
ENTS.

C A U T I O N

BATTERY POLARITY MUST BE CORRECT OR
ELECTRICAL SYSTEM WILL BE DAMAGED.

C A U T I O N

DO NOT USE A MOTOR GENERATOR UNIT
SUCH AS READY POWER TO MOVE AND/OR
CHECK THIS MACHINE AS SERIOUS DAM-
AGE MAY OCCUR.

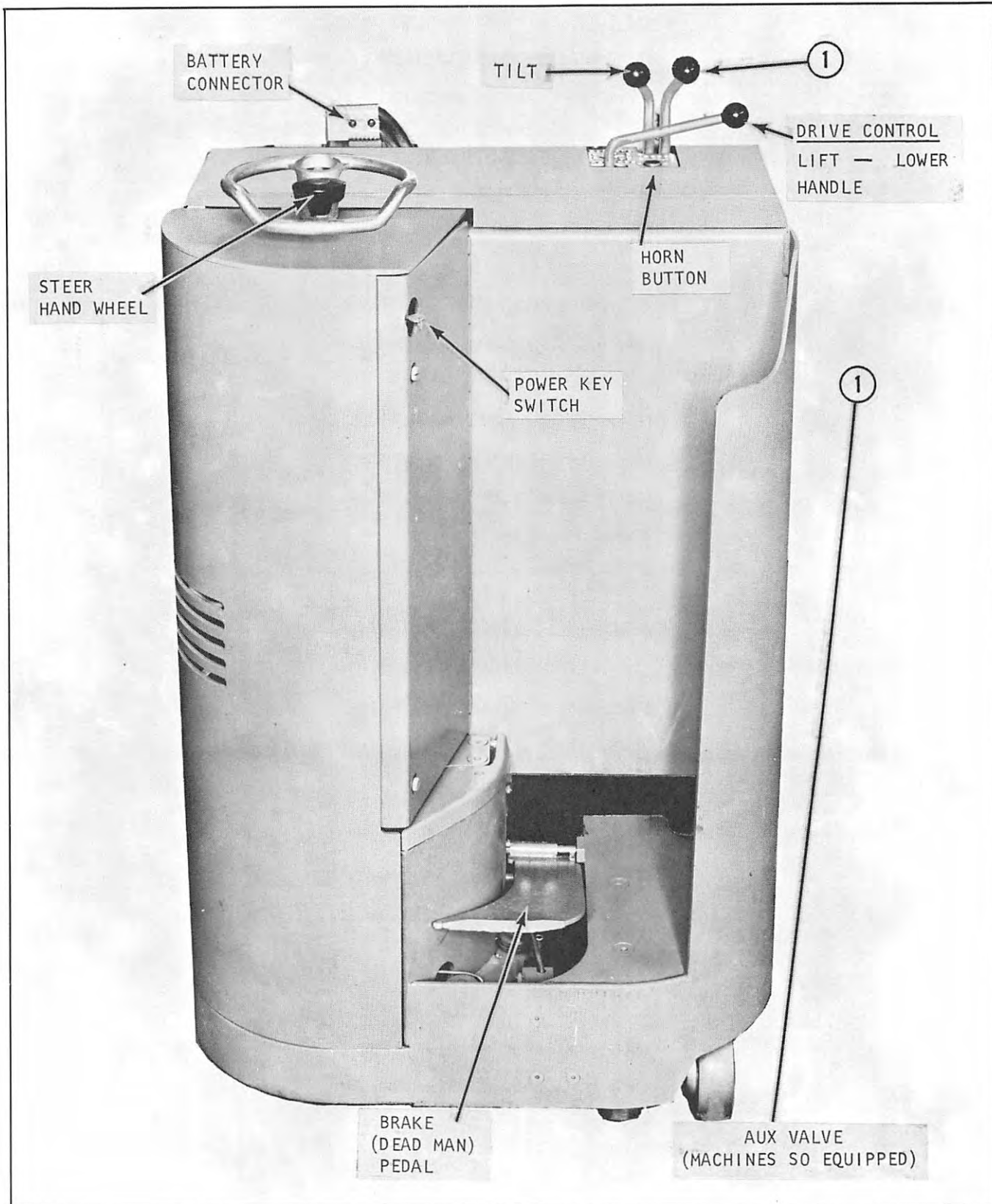


Plate 8262. Overall Controls

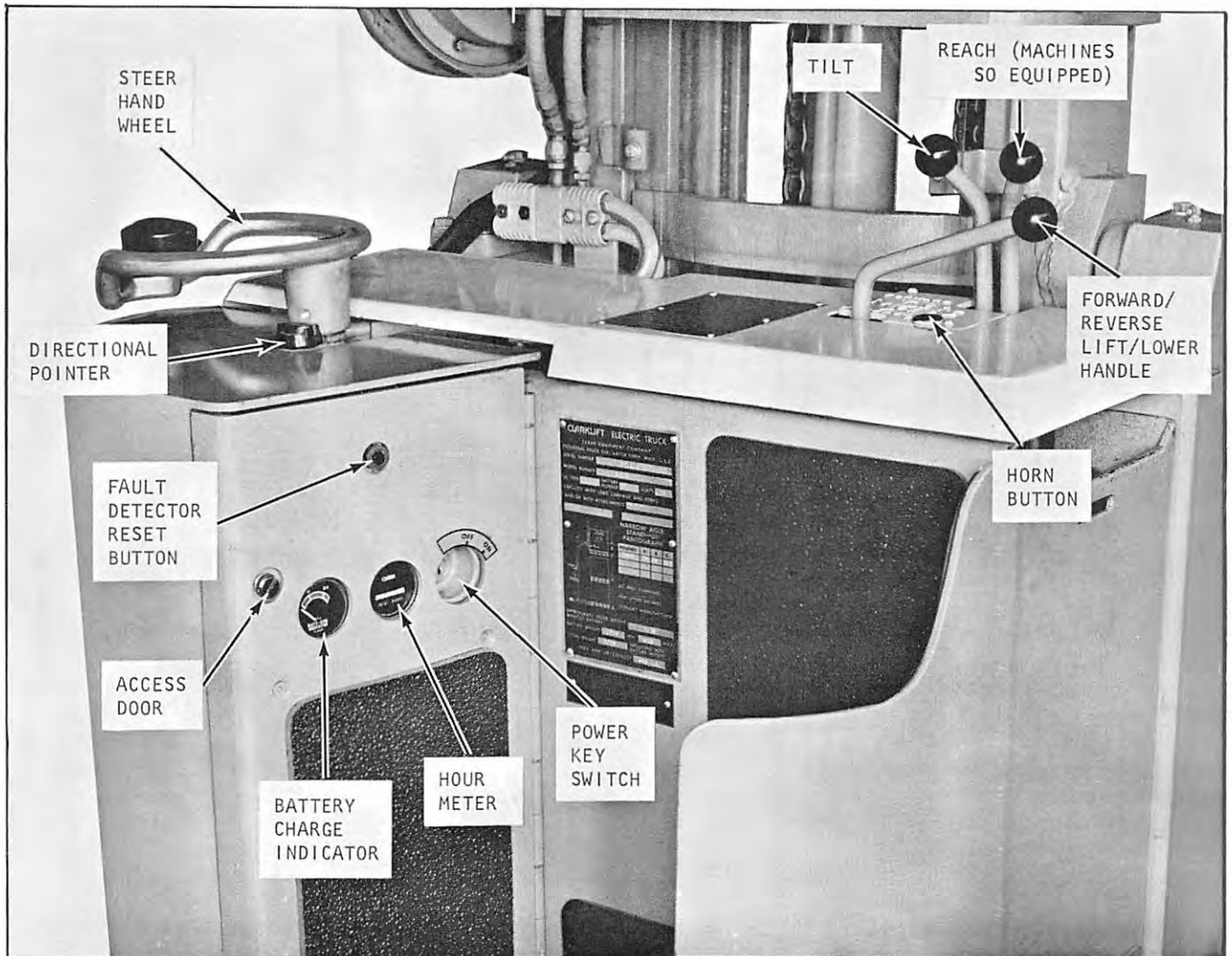


Plate 9460. Typical Overall Controls

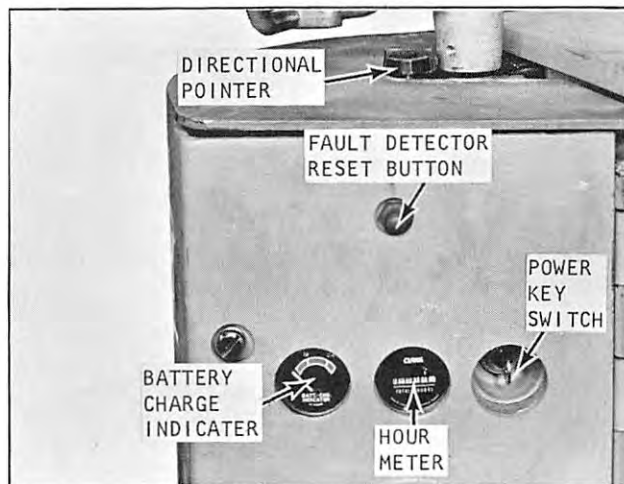
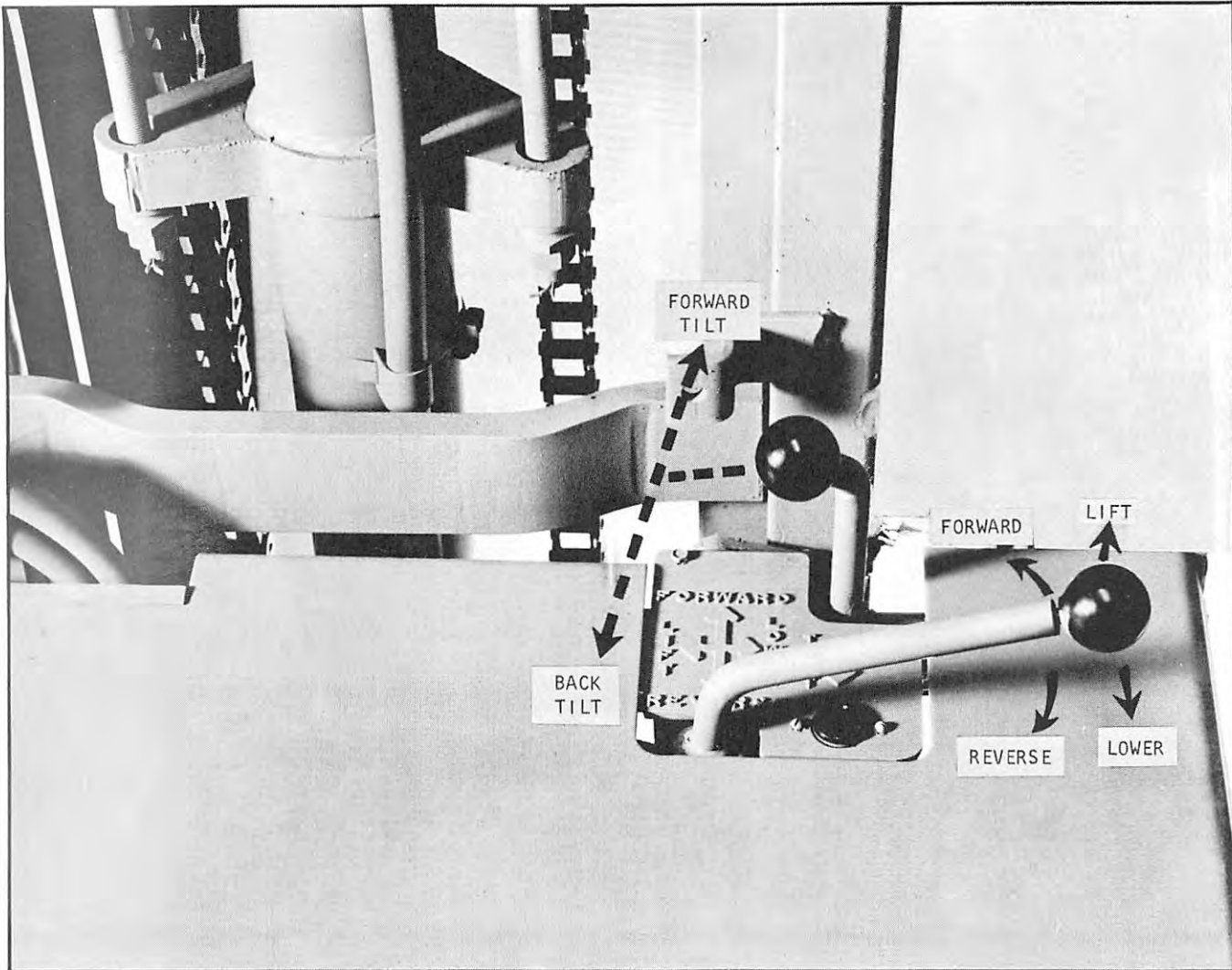


Plate 9461. Typical Instrument Locations

FAULT DETECTOR RESET BUTTON

The fault detector senses current overloads, shorts, etc. in the electrical drive system. When this occurs, the main source of electrical power is shut off by an open circuit. Should the machine stop during some operation, push on the reset button. If this doesn't close the circuit, report to the designated person in authority.



Controls
Plate 8263. Combination Drive and Lift-Lower Control Handle
Tilt Lever

BATTERY CONNECTOR: Connect battery to truck.

POWER SWITCH KEY: Turn key to ON position, and stand on brake (deadman) pedal.

COMBINATION DRIVE AND LIFT-LOWER CONTROL HANDLE: Move control handle forward to go forward and vice versa. The control handle operates an accelerating master control (switch) box that provides the same number of speeds for both forward and reverse. There are four individual speeds with time delay acceleration and plugging control.

The drive control handle also serves to raise and lower the upright lift carriage and load, see Plates 8262 and 8263.

NOTE: Do not hold hydraulic control levers in extreme actuated position after a load has reached its limit. A high oil pressure will result which will heat the oil and cause undesirable high operation temperatures.

CAUTION

AVOID OVERLOADING AS THIS SHORTENS THE LIFE OF THE TRUCK AND INCREASES MAINTENANCE.

WARNING

OVERLOADING A TRUCK COULD RESULT IN PERSONAL INJURY — REFER TO SPECIFICATIONS FOR MAXIMUM LOAD CAPACITIES.

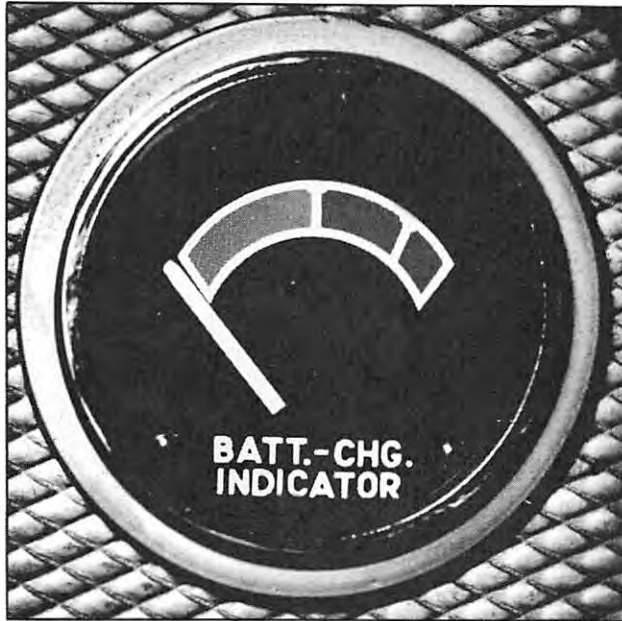


Plate 7515. Battery Charge Indicator

With the key switch in the "on" position, the battery charge indicator will show the available battery voltage. When the indicator needle registers in the red portion of the indicator scale, the battery should be recharged. It is recommended that at this time a specific gravity test be taken with a hydrometer to more accurately determine battery condition.



Plate 7162. Hour Meter

The hour meter accurately records the actual hours of machine operation. This will serve as an aid in determining the time intervals for lubrication and preventive maintenance services.

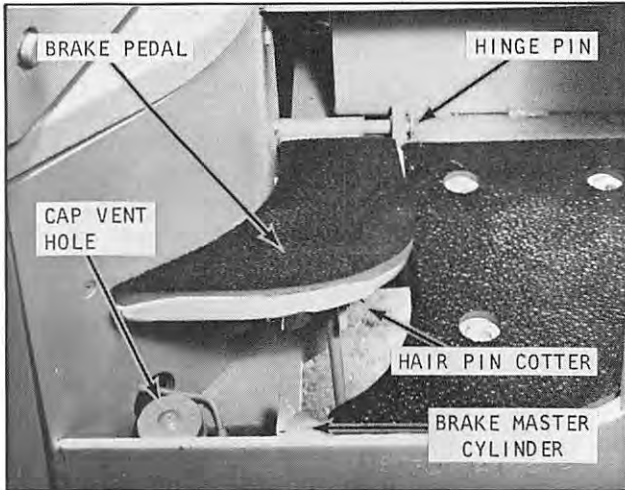


Plate 8264. Brake Pedal

BRAKE AND PARKING BRAKE: The brake pedal is located on the left side of the operator's compartment. The brake is designed to actuate as the brake pedal is released from the down position — driver steps off pedal. Partial brake applications (slowly releasing pedal) allows the driver to brake gradually.

Before the brake is applied, a deadman switch is actuated and all electrical power is shut off to the drive motor. It is impossible to operate the truck with the pedal in the UP position.

Although the brake is released by hydraulic pressure, it is spring-applied and therefore



Plate 7513. Steer Wheel with Directional Pointer

serves as a safe parking brake. **NOTE:** Always turn power key switch to the OFF position when leaving truck.

STEERING: A horizontal steering wheel (shown above) is connected to the steerable drive wheel by roller chains and sprockets thus providing approximately 180° steering.

A "directional pointer" located on the top side of the steer wheel (see above) indicates the direction in which the steer/drive wheel is facing.

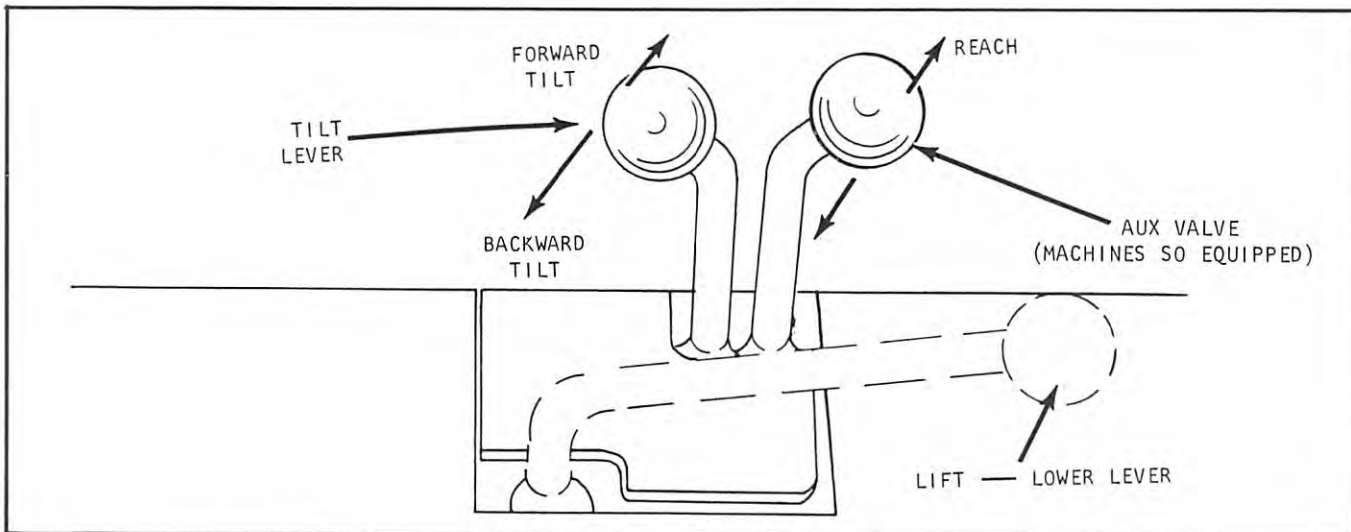


Plate 8280. Hydraulic Control Levers



INDUSTRIAL TRUCK DIVISION



OPERATIONS

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. 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.

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x
x                               W A R N I N G                               x
x
x AN OVERHEAD GUARD IS INTENDED TO OFFER                                x
x PROTECTION FROM THE IMPACT OF SMALL                                  x
x PACKAGES, BOXES, BAGGED MATERIAL, ETC.,                             x
x REPRESENTATIVE OF THE JOB APPLICATION,                              x
x BUT NOT TO WITHSTAND THE IMPACT OF A                                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.



INDUSTRIAL TRUCK DIVISION



OPERATIONS

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 up grade.

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



INDUSTRIAL TRUCK DIVISION



OPERATIONS

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 use open flames for checking electrolyte level in storage batteries.

NOTE

The preceding is reproduced from:

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

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PREVENTIVE MAINTENANCE:

1. Arrange for systematic inspection and lubrication. See that the truck is properly lubricated and in good repair at all times. Refer to pertinent lubrication chart for lubrication instructions.
2. Avoid overloading the truck, as a safety measure against possible injury to the driver and fellow workmen. Overloading also shortens the life of the truck and increases maintenance. Refer to Name (Serial No.) Plate.
3. Take proper care of the battery. Check height of electrolyte solution daily. Never allow the water level to be below the top of the plates. When replacing evaporation, fill cells to proper level only -- overfilling causes loss of acid and reduces capacity. Use only water approved for battery use. Keep top of battery clean and dry at all times. A light coating of vaseline or a light cup grease on the battery terminals will help prevent corrosion. If terminals become corroded, wash off corrosion with a soda and water solution and rinse thoroughly. See that the battery is properly charged after each day or shift.
4. Wiring should be checked periodically to make certain all connections are tight and intact.
5. The hydraulic system should be checked periodically for worn hoses, loose fillings and/or leaks, and security of mountings.
6. A periodic check of the brake system should be made for lining wear. Proper brake adjustment should be maintained at all times.
7. Charging equipment should be carefully maintained. Maintenance, operation, and service of charging equipment should be carried out in accordance with the battery manufacturers instructions.

CONFIDENTIAL

1. The first part of the document is a list of names and addresses of persons who have been identified as having information concerning the activities of the organization.

2. The second part of the document is a list of names and addresses of persons who have been identified as having information concerning the activities of the organization.

3. The third part of the document is a list of names and addresses of persons who have been identified as having information concerning the activities of the organization.

4. The fourth part of the document is a list of names and addresses of persons who have been identified as having information concerning the activities of the organization.

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6. The sixth part of the document is a list of names and addresses of persons who have been identified as having information concerning the activities of the organization.

7. The seventh part of the document is a list of names and addresses of persons who have been identified as having information concerning the activities of the organization.



INDUSTRIAL TRUCK DIVISION



OPERATIONS

CHANGING AND CHARGING STORAGE BATTERIES:

N O T E

The two types of batteries in common use are (1) lead and (2) nickel-iron. They contain corrosive chemical solutions, either acid or alkali, and therefore present a chemical hazard. On charge, they give off hydrogen and oxygen which, when mixed with air in certain concentrations, may be explosive. They are of relatively small bulk and great weight making handling a special consideration.

1. Battery charging installations should be located in areas designated for that purpose. Facilities should be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

2. When racks are used for support of batteries, they should be made of materials not conducive to spark generation or be coated or covered to achieve this objective.

Handling Batteries:

1. A conveyor, overhead hoist, or equivalent material handling equipment should be provided for handling batteries.

2. Chain hoists should be equipped with load-chain containers. When hand hoist is used, uncovered batteries should be covered with a sheet of plywood or other non-conducting material to prevent the hand chain from shorting on cell connectors or terminals. A properly insulated spreader bar should be used with any overhead hoist.

3. Reinstalled batteries should be properly positioned and secured in the truck.

4. A carboy tilter or siphon should be provided for handling electrolyte. Always pour acid into water; not water into acid. Personnel maintaining batteries should wear protective clothing such as face shield, long sleeves and gauntlet gloves.

5. Electrical installations should conform to the National Electrical Code (NEPA No. 70; USA Standard C1-1965) and any local ordinances.

6. Trained and authorized personnel should change or charge batteries.

7. Trucks should be properly positioned and brake applied before attempting to change or charge batteries.

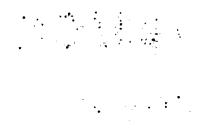
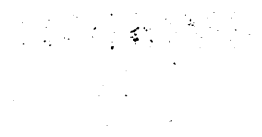
8. When charging batteries, the vent caps

should be kept in place to avoid electrolyte spray. Care should be taken to assure that vent caps are functioning. The battery (or compartment) cover (s) should be open to dissipate heat.

9. Smoking should be prohibited in the charging area.

10. Precautions should be taken to prevent open flames, sparks, or electric arcs in battery charging areas.

11. Tools and other metallic objects should be kept away from the top of uncovered batteries.





INDUSTRIAL TRUCK DIVISION



I N D E X

| DESCRIPTION | TIME INTERVAL (H-HOURS) | PAGE NUMBER (000-) | |
|--|----------------------------|-----------------------|---------------------|
| Battery charge indicator | 8H | 273 | 8 HOUR |
| Battery service | | 473 | |
| Battery, removal/installation | | 479 | |
| Brake switch check | | 375 | |
| Hour meter | | 273 | |
| Hydraulic sump tank level check | | 503 | |
| | | | |
| Brake check | 100H | 302 | 100 HOUR |
| Brake pedal check | | 302 | |
| Drive control check | | 185 | |
| Contactors | | 673 | |
| Hydraulic control valve and lines | | 403 | |
| Hydraulic sump tank breather | | 503 | |
| Hydraulic sump tank filter | | 503 | |
| Lift and tilt switches | | 473 | |
| Lift carriage (Pantograph), inspect | | 403 | |
| Lift chain(s), check and adjust | | 403 | |
| Lift, reach and tilt cylinders, check | | 403 | |
| Lubrication chart(s) | | 772 | PAPER COLOR -- BLUE |
| Lubrication specifications, recommendations, key | 867-L thru 881-L | | PAPER COLOR -- BLUE |
| Service/Parking brake, check and adjust | | 306 | |



INDUSTRIAL TRUCK DIVISION



| | | | |
|-----------------------------|------|-----|----------|
| Caster adjustment | 500H | 473 | 500 HOUR |
| Sump tank breather, check | | 174 | |
| Sump tank filter, check | | 174 | |
| Sump tank, drain and refill | | 174 | |

| | | | |
|---|-------|------|-----------|
| Brake, bleeding procedure | 1000H | 912 | 1000 HOUR |
| Drive motor brush spring tension check | | 674 | |
| Drive motor, inspect | | 673 | |
| Hydraulic system flow and pressure checks | | 1573 | |
| Pump drive motor brush spring tension check | | 774 | |
| Pump drive motor inspect | | 773 | |

TROUBLE SHOOTING

| | | | |
|------------------------------|---------|------|---------------------|
| UPRIGHT - "B" MODEL UPRIGHTS | 1000H | ---- | PAPER COLOR -- PINK |
| UPRIGHT - "C" MODEL UPRIGHTS | 1000H | ---- | YELLOW PAPER |
| SOLID STATE CONTROL | 17.7500 | ---- | GREEN PAPER |

HYDRAULIC CIRCUIT DIAGRAM TSH001

ELECTRICAL WIRING DIAGRAM & SCHEMATIC FOLD-OUT PAGE (IN REAR OF MANUAL)

N O T E

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

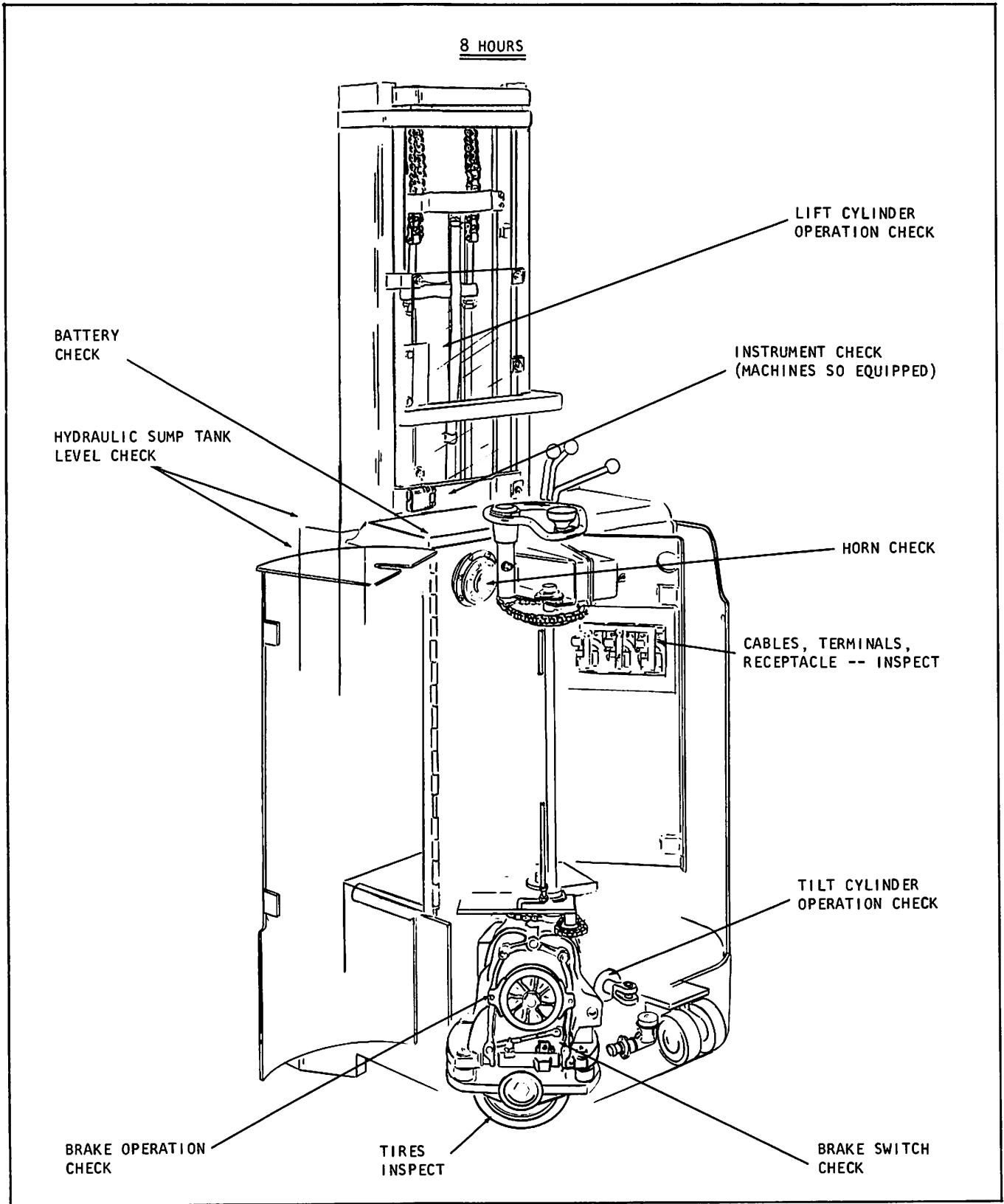


Plate 8269. Lubrication & Preventive Maintenance Illustration

NOVEMBER 1964

1964



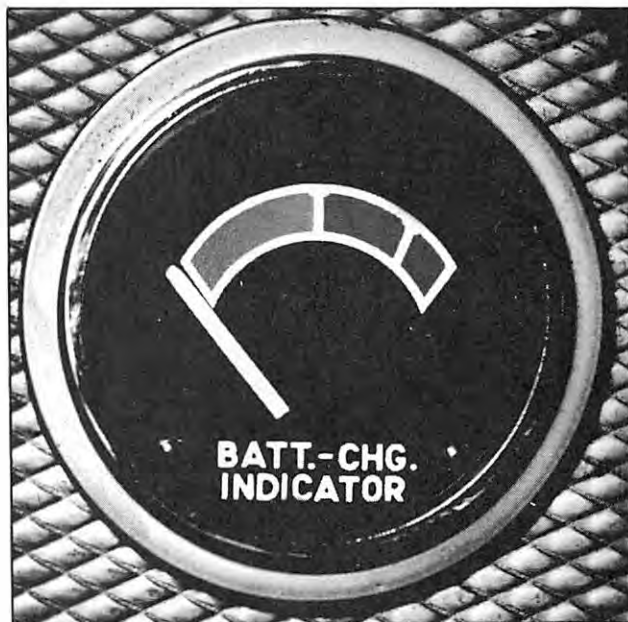


Plate 7515. Battery Charge Indicator

With the key switch in the "on" position, the battery charge indicator will show the available battery voltage. When the indicator needle registers in the red portion of the indicator scale, the battery should be recharged. It is recommended that at this time a specific gravity test be taken with a hydrometer to more accurately determine battery condition.

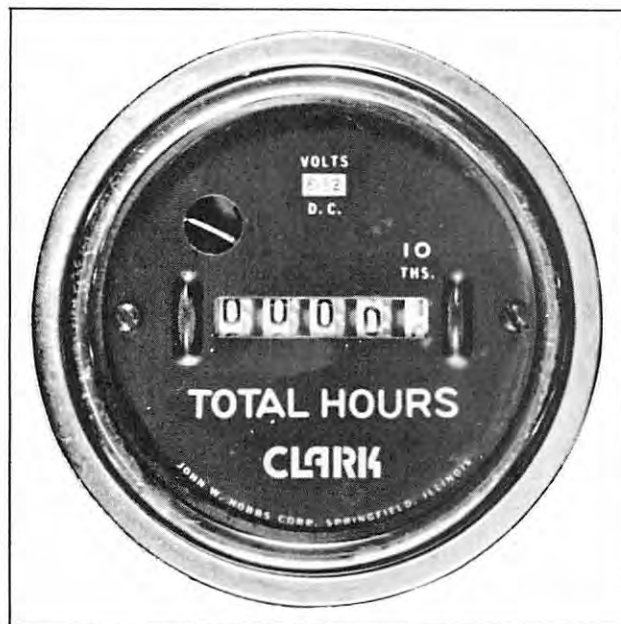


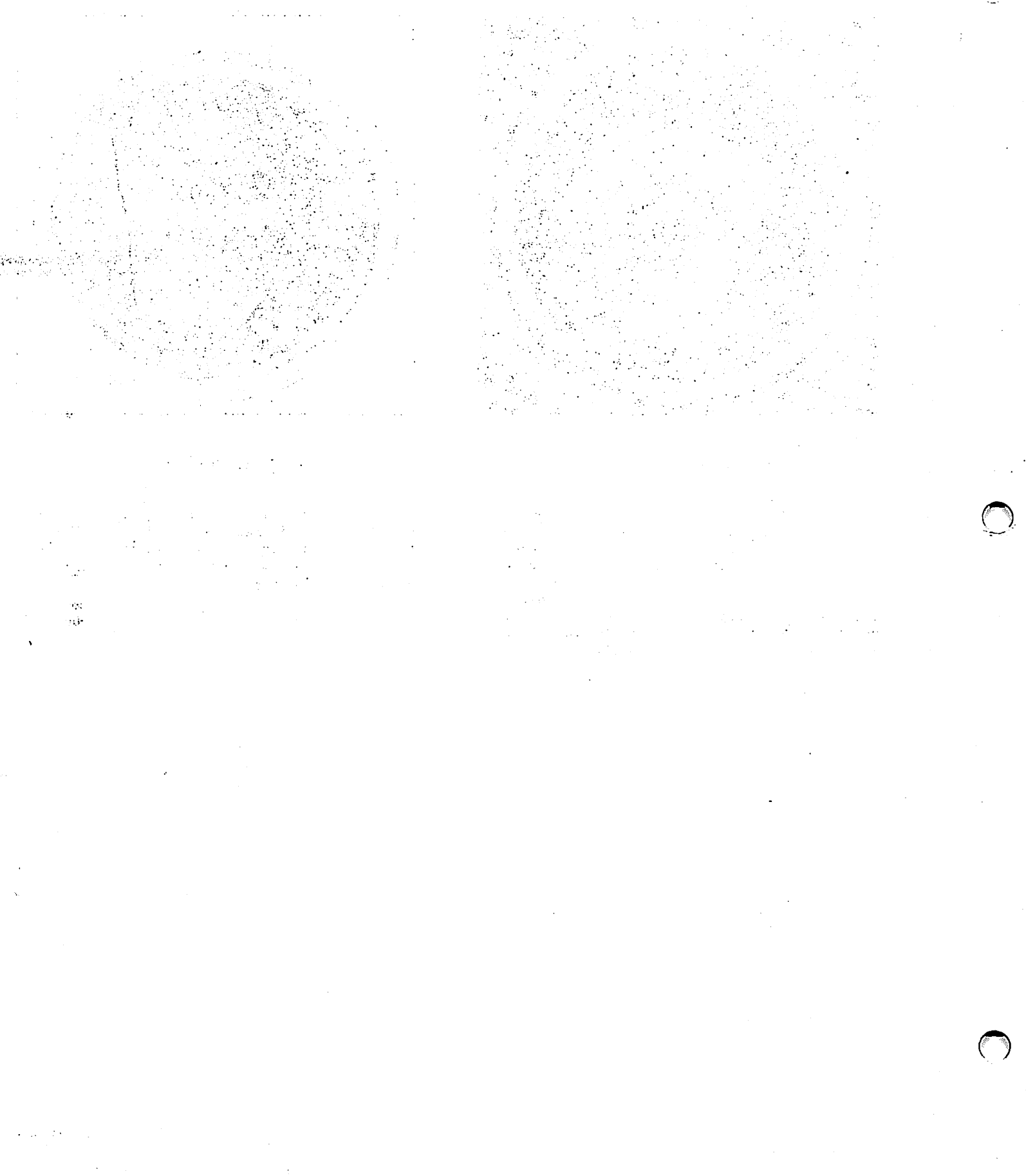
Plate 7162. Hour Meter

The hour meter accurately records the actual hours of machine operation. This will serve as an aid in determining the time intervals for lubrication and preventive Maintenance services.

WOLFEHART 2009 JANUARY

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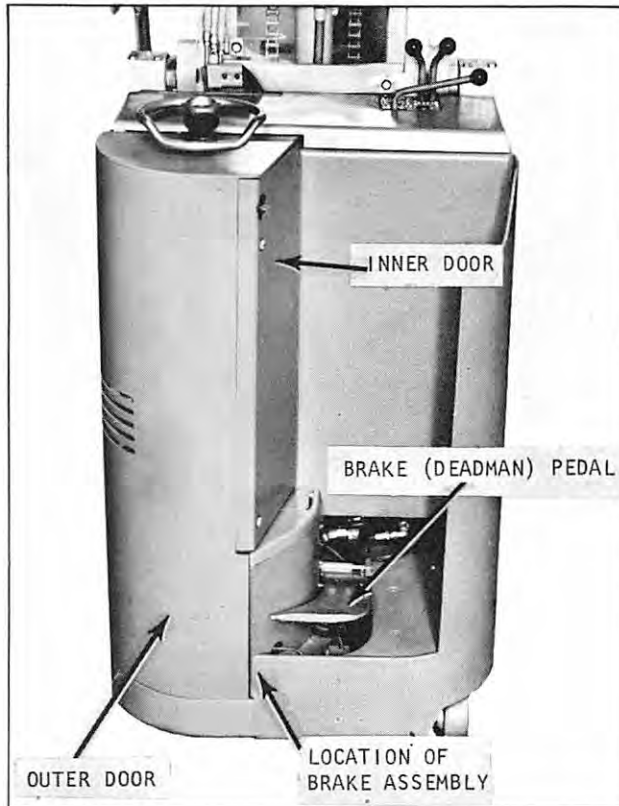


Plate 7535. Location of Brake Assembly

**BRAKE (DEADMAN) SWITCH
ADJUSTMENT CHECKS**

1. Turn key switch off.
2. Open both inner and outer doors.
3. Rotate steer hand wheel so the brake assembly is visible from rear of truck.
4. Depress and then release brake pedal. Brake switch should open (actuate) before R.H. brake shoe contacts brake drum.

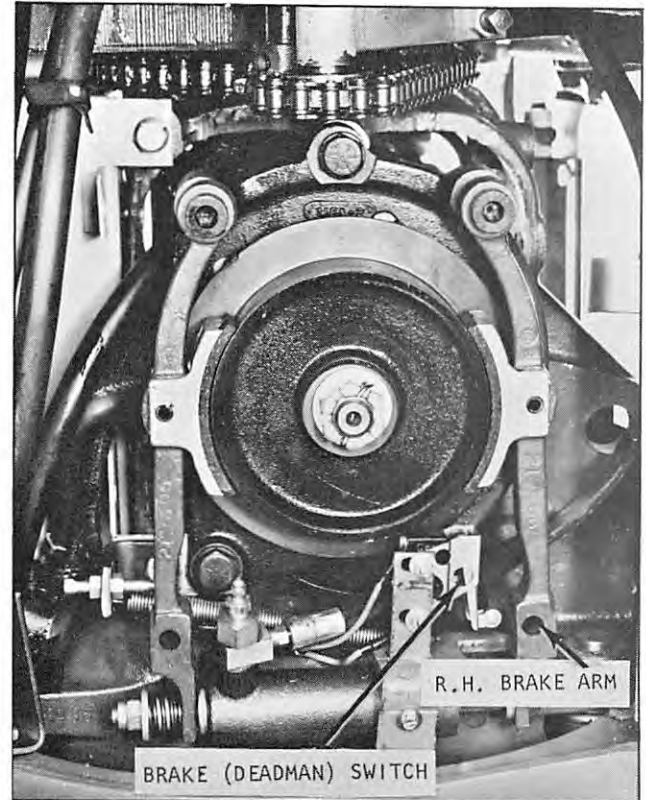


Plate 7536. Brake (Deadman) Switch Adjustment

As the driver releases pedal from the down position, which should contact brake arm and actuate just before the brake shoe (located on the switch side) contacts brake drum. If an adjustment is necessary, refer to page 100H 303.

Brake switch adjustment is important. The switch must actuate, cut electrical current to the drive motor, before the brake shoes touch brake drum. If correct adjustment is not maintained, lining wear will increase, heating of the drive motor will result as the motor is trying to operate against the brake.

MEMORANDUM FOR THE DIRECTOR

DATE: 1/15/54
BY: [Illegible]

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INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

BATTERIES - LEAD-ACID

The lead-acid battery has a lead peroxide positive plate, a sponge lead negative plate, and the electrolyte is a solution of sulphuric acid.

The battery does not store electricity. When the battery is connected to an electrical circuit, a chemical reaction starts inside the battery. This chemical action produces lead sulphate on both the positive and negative plates, and the chemical actions produce the electric current through the electrical circuit. This action continues only as long as the circuit is complete from negative pole to the positive pole. As the battery plates become coated with lead sulphate the voltage output of the battery decreases. When both the positive and negative plates have become thoroughly coated with lead sulphate, both plates act alike (or like similar metals). This causes the current to stop flowing.

When the point is reached where the battery is discharged, the battery must be charged. Charging is accomplished by connecting the battery to a direct current source in such a manner that the electricity flows through the battery in the opposite direction of the normal battery current.

BATTERY LIFE

Economical and efficient operation of the electric fork lift truck depends, to a great extent, upon the efficiency and life of the battery.

During the operation of the fork lift truck, many things occur which, if not corrected or prevented, can greatly reduce the life of the battery.

The operator should be acquainted with the limits, capacities and capabilities of his truck. He should know the correct point of power to use to move all loads up to the rated capacity of the truck.

Batteries are rated in ampere hours over a set period of time, and should be of a proper size for the particular work intended. Extending the work means over-discharging the battery. This will greatly shorten its life. Overcharging the battery by using too high a rate of charge, will cause it to gas vigorously after it has reached its fully charged state and will also shorten its life.

If service requirements demand only partial discharge of the battery, it is unnecessary to recharge following each partial discharge. When the hydrometer reading indicates the battery is 75% discharged, (approximately 1130 specific gravity) arrangements should be made to recharge.

Controlling the "charge" and "discharge" of the battery is a very important contributing factor in determining battery life.

The discharge of a battery can be controlled in several ways.

Batteries are rated according to the job for which they are being used. A fully charged battery is capable of doing a certain amount of work or lasting a certain length of time in a specific service. With information of this type, a schedule or duty cycle can be worked out and the batteries can be changed or serviced with very few failures.

Experienced operators can tell from the action of the truck, when the battery is reaching the point where it should be charged or changed. Prompt action in seeing that the battery is serviced at this time can result in longer battery life.

Several "meters" or "indicators" are available for use on battery powered trucks. These indicators show the operator the state of charge of the battery, how much useful power is left in the battery, or just simply warns the operator when the battery should be charged.

MAINTENANCE

Keep the "tops" of the battery clean and dry at all times. Normally wiping the top of the battery with a damp cloth is sufficient. If the battery is removed from the truck, it can be hosed off with clean water. If electrolyte is spilled, it will not dry off. Neutralize the acid with a solution of ordinary "bicarbonate of soda" and rinse thoroughly with clean water.

A light coating of vasoline or a light cup grease on the terminals will help prevent corrosion. If the terminals have become corroded, wash off the corrosion with a soda solution and rinse thoroughly.

The vent plugs should be in place at all times when using, cleaning, and charging the battery. They should be cleaned weekly by immersing in a bucket of clean water for one half hour. Check the vent holes in the vent plugs and clean out.

The vent holes must be open to allow gas to escape from the cell.

The batteries should be numbered and assigned to a given truck. A record should be kept of (1) daily hydrometer reading on a pilot cell at the beginning of each charging, (2) a weekly reading of the pilot cell after charge, and (3) a hydrometer reading of all cells and temperature of one cell each "4" months before and after charging. When battery shows nonuniformity of these readings and an inability to work through a shift, it is an indication that replacement is necessary.



Plate 4018. Hydrometer Check Method

TWO-RATE CHARGING

"Two-Rate" charge, as the name implies, consists of two average rates. A "high" rate is provided at the beginning of the charge, while, toward the end of the charge, this is automatically changed to a "low" rate. (In actual operation, both high and low-rate is obtained in modern charging equipment by the use of a voltage relay in a rate charging circuit). When the battery cell voltage rises to approximately 2.37 volts per cell, at

77° F., the voltage relay automatically lowers the charging rate. The same voltage relay operating with a time switch can also be used to stop the charge automatically.

"Two-Rate" charging is generally used with rectifiers, although it is also used with a generator when the voltage is too high for the taper charge. For dependable, day-in and day-out repeat performance, the quality of the voltage relay and time switch is important.

TAPER-CHARGING

The "Taper" charge (Modified constant potential) is obtained inherently (a natural characteristic) in a circuit design by balancing the charging source against the battery voltage rise during charge. As the battery voltage rises, it approaches the value of the charging source and hence, there is less difference between the charging source and battery voltage. As a consequence, the flow of charging current will taper off in value opposite to the way the battery voltage rises.

"Taper" charge requires a close tolerance (plus or minus 3%) of charging source voltage (2.63 times the number of cells) when more than one charge circuit is on the same machine. A single circuit taper charge does not need this close voltage limit as the inherent taper is obtained as a natural part of the shunt generator load characteristic.

However, taper charge circuits are specifically designed for a definite number of cells, in the battery, to achieve the inherent taper. The only duty performed by a voltage relay time switch control, on the taper circuit, is to stop the charge.

NICKEL-IRON-ALKALINE STORAGE BATTERIES

The alkaline storage battery is known as the "nickel-iron-alkaline type" because nickel oxide is used in the positive elements, and iron in the negative elements; while the electrolyte is an alkaline solution containing potash and lithia.

TYPE AND SERIES

Each cell bears a distinguishing type letter and size number plainly stamped upon the cover. A serial number, just under the type letter and size number combination, denotes date of manufacture. All cells having the same type letter are similar in operating characteristics and



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

are made from the same class of plates and size. Therefore, the capacity of the cell simply varies with the number of plates. The "size number" indicates the number of positive plates. The total number of positive and negative plates is one more than twice the size number.

INSPECTION ON RECEIPT

Alkaline batteries are shipped in either a "charged" or "discharge" condition. The cells shipped charged, are intended for service within a short time without further charging. If the cells are not put into service within a month, it will be found advisable to charge one or two hours before using.

A red label, included with the battery in each shipment, indicates that the cells are charged ready for immediate use on receipt.

A green label, indicates that the cells are in a discharged condition and must be given an extra charging time as specified by the manufacturer.

Upon receipt of the battery, inspect each cell for solution height. Use a glass tube for this purpose. DO NOT use a match or other open flame for inspection.

If electrolyte has been spilled, if plate tops are visible above the surface of the solution, or if the inside of packing case, etc., shows yellowish stains. The loss must be replaced; preferably with Refill Alkaline Storage Battery Solution, or lacking this, with RENEWAL Solution diluted to a specific gravity of 1.215 by the addition of distilled water. The proper height of solution above plate tops is as follows: Cell type is stamped on the cover of each cell.

"A" Type Cells - 1/2"
"C" Type Cells - 1"
"D" Type Cells - 1 1/4"

When the level of solution is only a small amount below the proper height, fill with pure distilled water and in the future, use pure distilled water for replenishing the solution.

CONNECTIONS

The positive pole of an "alkaline cell" is designated by a red bushing around the pole and a plus (+) mark stamped on the cell cover.

The negative pole, is designated by a black bushing around the pole; no designating mark on the cover.

The connections between cells, in a tray, are made of solid wire with lugs on both ends. These are known as "connectors". The flexible, rubber-covered cables used to join trays together are known as "jumpers".

To avoid unnecessary electrical losses, all electrical connections must be tight. (To obtain this, it is necessary to see that all the contact surfaces between the poles and lugs are clean and make good contact.) Remove any Esbaline, grease, or dirt that may stick to the tapered surfaces of the poles or the inside of the lugs before connecting. If necessary, use 00 sandpaper or 00 emery cloth for this purpose. NEVER use a file or anything that will harm the contact surfaces.

A loose or dirty contact on a cell pole will cause excessive heating, and may be detected by touching the connectors after the current has been passing through them for some time.

DISCONNECTING LUG

A "disconnecting jack" or "lug puller" is supplied with each battery. This jack is designed to straddle the connector or jumper lug and, by means of a jack screw, break the lug loose from the cell pole.

CHARGING

Direct current must be used to charge any storage battery. If only alternating current is available, it is necessary to convert to direct current by the use of a motor generator set, mercury arc rectifier, or other suitable form of current rectifier.

An alkaline battery may be charged at either a constant current rate throughout the entire charging period, or at a modified constant potential rate. In either case the average rate should be such that the battery can be brought from a discharged state to full charge within between six and seven hours. In connecting a battery to the charging circuit, always connect the positive terminal to the positive side of the line, and the negative terminal to the negative side of the line.

It is not necessary to take specific gravity reading during charge, as the electrolyte does not change appreciably.

Before starting to charge, see that the solution is at the proper level. If the solution is low, bring it to the proper level by adding pure distilled water as instructed under watering. If the battery is in a compartment, open the cover before starting a charge. DO NOT charge in a hot place or allow the temperature of the solution to exceed 115° Fahrenheit on charge.

CHARGE TEST FORK

The charge test fork was developed to provide an easy means of determining the state of charge of an alkaline battery.



Plate 4008. Charge Test Fork Check

This is done by obtaining a key voltage reading which, on reference to the charts supplied for use with instrument, will indicate the amount of charge necessary to restore the battery to a fully charged condition.

ELECTROLYTE

The specific gravity of the electrolyte in fully charged alkaline cells has a normal operating range of between 1.215 and 1.160, with electrolyte at the proper level and corrected for temperature.

The specific gravity reading of the electrolyte (of an alkaline cell) has no value in determining its state of charge, as the specific gravity does not change during the charging or discharging periods

to any marked extent. It, therefore, is only necessary to take infrequent readings, to determine if the specific gravity has dropped to the point where a change of electrolyte is desirable.

There are two kinds of alkaline potash electrolyte which are normally used when a "change" of solution is found necessary. Renewal solution, which has a specific gravity of approximately 1.250; is normally used to replace old electrolyte, the gravity of which has dropped to the low limit ranging between 1.160 and 1.170. Refill solution has a specific gravity of approximately 1.215 and is used to replace spillage. DO NOT use any potash solution other than alkaline electrolyte, as the presence of impurities or improper compounding of such solution may permanently injure your battery.

WATERING CELLS

Before putting a new electric filler into service; see that the tank is washed thoroughly to remove any foreign matter and then rinse tank, hose and filler thoroughly by running distilled water through them. Then fill the tank with distilled water and mount in a convenient place at least four or five feet above the cells to be watered.

To operate, insert the nozzle into the filler opening in the top of the cell. If the solution is already at the proper height, the bell signal will ring. If bell does not ring, start flow of water by opening valve by pushing down lever on filler handle. When the bell rings, remove the nozzle from the cell, close cell filler cap and proceed to next cell.

LAYING UP BATTERY

If battery is to be laid up for any length of time (in excess of one year) be sure that the plates are covered to the proper height with solution and that the battery is discharged and short circuited. The battery should be stored in a cool dry place.

Alkaline batteries are easy to lay up. Merely discharge to zero voltage and short circuit. They may be left standing idle indefinitely, without injury, if stored in this short circuited condition. The battery may be stored for 6 months to a year without discharging and short circuiting.



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

C A U T I O N S

NEVER put lead battery acid into an alkaline battery or use utensils that have been used with acid; you may ruin the battery.

NEVER bring a "lighted match" or other "open flame" near a battery.

NEVER lay a "tool" or any piece of "metal" on a battery. Always keep the filler caps closed except when necessary to have them open for filling as provided for in these instructions.

ALWAYS keep batteries clean and dry externally.

ALKALINE ELECTROLYTE is injurious to the skin or clothing and must be handled carefully. Solution spilled on the person should be immediately washed away with plenty of water.

DO NOT use the electric filler, or fill cells while a battery is on charge.

USE ONLY pure distilled water for watering the battery.

WEAR GOGGLES when cleaning or changing solution.

CABLES, TERMINALS AND BATTERY RECEPTACLE.

Check cables, terminals and receptacle for condition and security of mounting. Correct as necessary.

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NOTICE TO THE PUBLIC

1954

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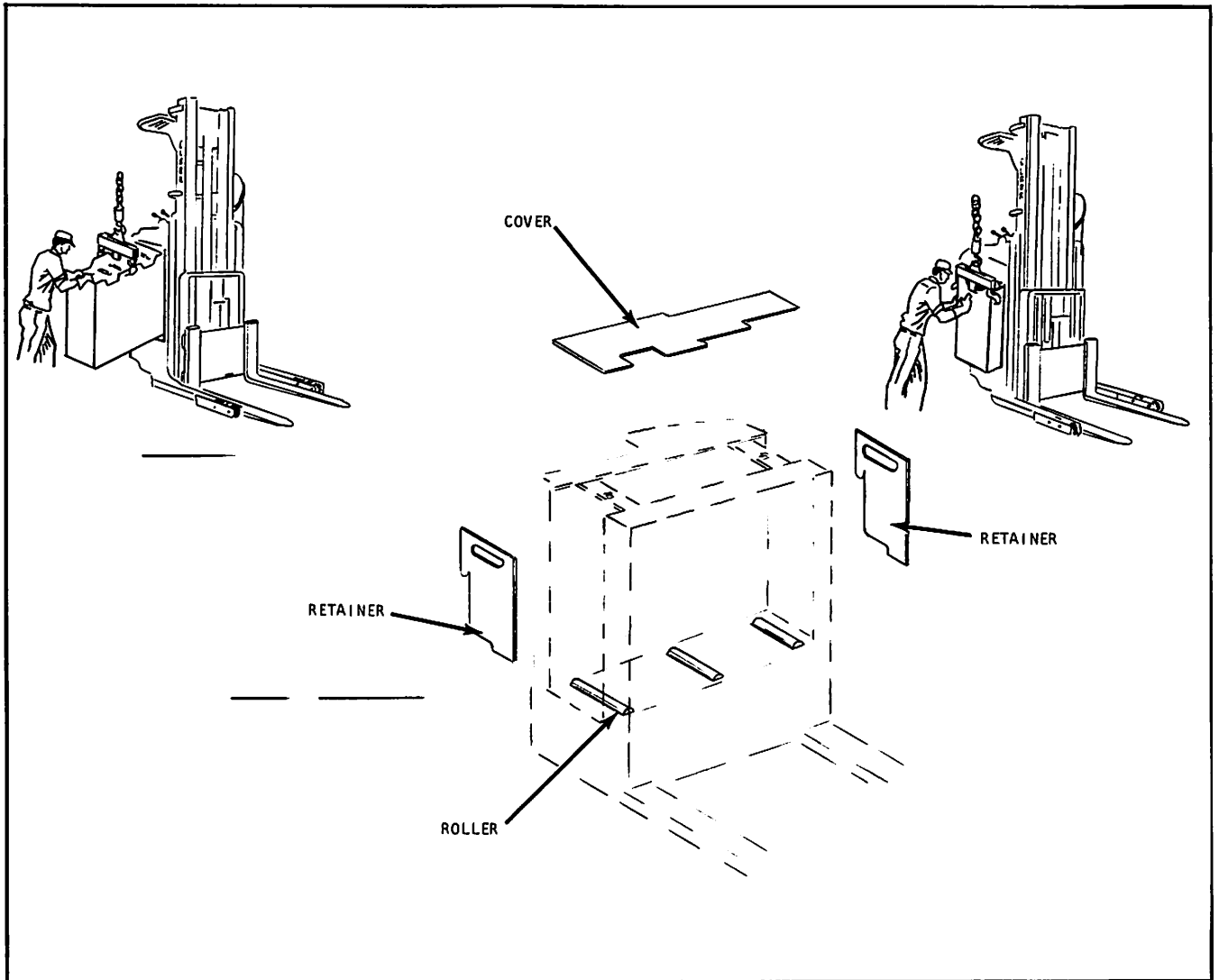


Plate 7520. Battery Installation

BATTERY

The battery is mounted on three (3) rollers and may be removed from either side of the machine. Lifting slots are provided in the battery casing for ease in handling.

NOTE

THE BATTERY MAY BE SERVICED IN THE VEHICLE BY REMOVING THE BATTERY BOX COVER.

BATTERY INSTALLATION

Remove battery box cover and one battery retainer. Place battery carrier in center slots of battery. Use chain hoist to lift battery into position and slide battery into compartment as far as hooks will allow (see above).

CAUTION

BE SURE BATTERY IS RESTING SECURELY ON TWO ROLLERS SO THAT IT WILL NOT TIP OR FALL WHEN CARRIER IS REMOVED.

Remove carrier from battery and slide battery into position, as shown above, then install battery retainer and cover.

WARNING

DO NOT ALLOW CHAIN HOIST, OR BATTERY CARRIER OR ANY METAL OBJECT TO COME IN CONTACT WITH CELL CONNECTORS, TERMINAL POSTS ETC., THUS CAUSING A DIRECT SHORT RESULTING IN BATTERY DAMAGE, AND POSSIBLE PERSONAL INJURY.

1950

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HYDRAULIC SUMP TANK(S) ... LEVEL CHECK

Check hydraulic sump fluid level in the following manner:

1. Lower upright.
2. Remove oil level plug ... hydraulic fluid should be at level of hole.
3. Remove breather filter plug and inspect. Be sure breather holes are not plugged, replace filter if dirty.

If necessary ... fill sump to proper level using fluid recommended on page 100H 772.

3. Install plugs and operate valve control levers to allow any air in the lines to escape ... then recheck sump fluid level before placing truck in operation.

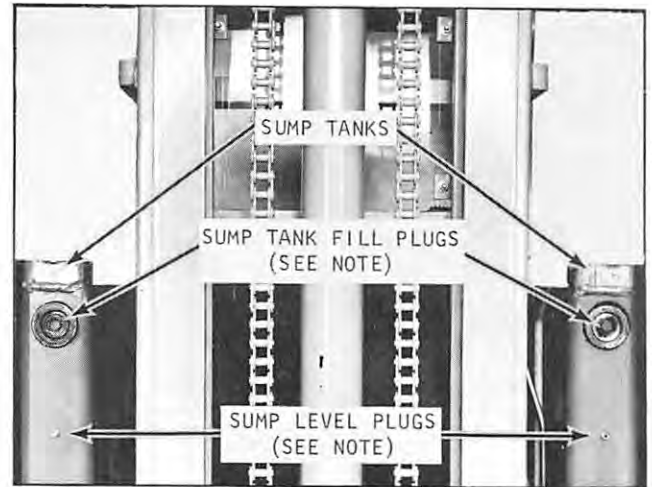


Plate 7528. Hydraulic Sump Tanks

HYDRAULIC CONTROL LEVER

I M P O R T A N T

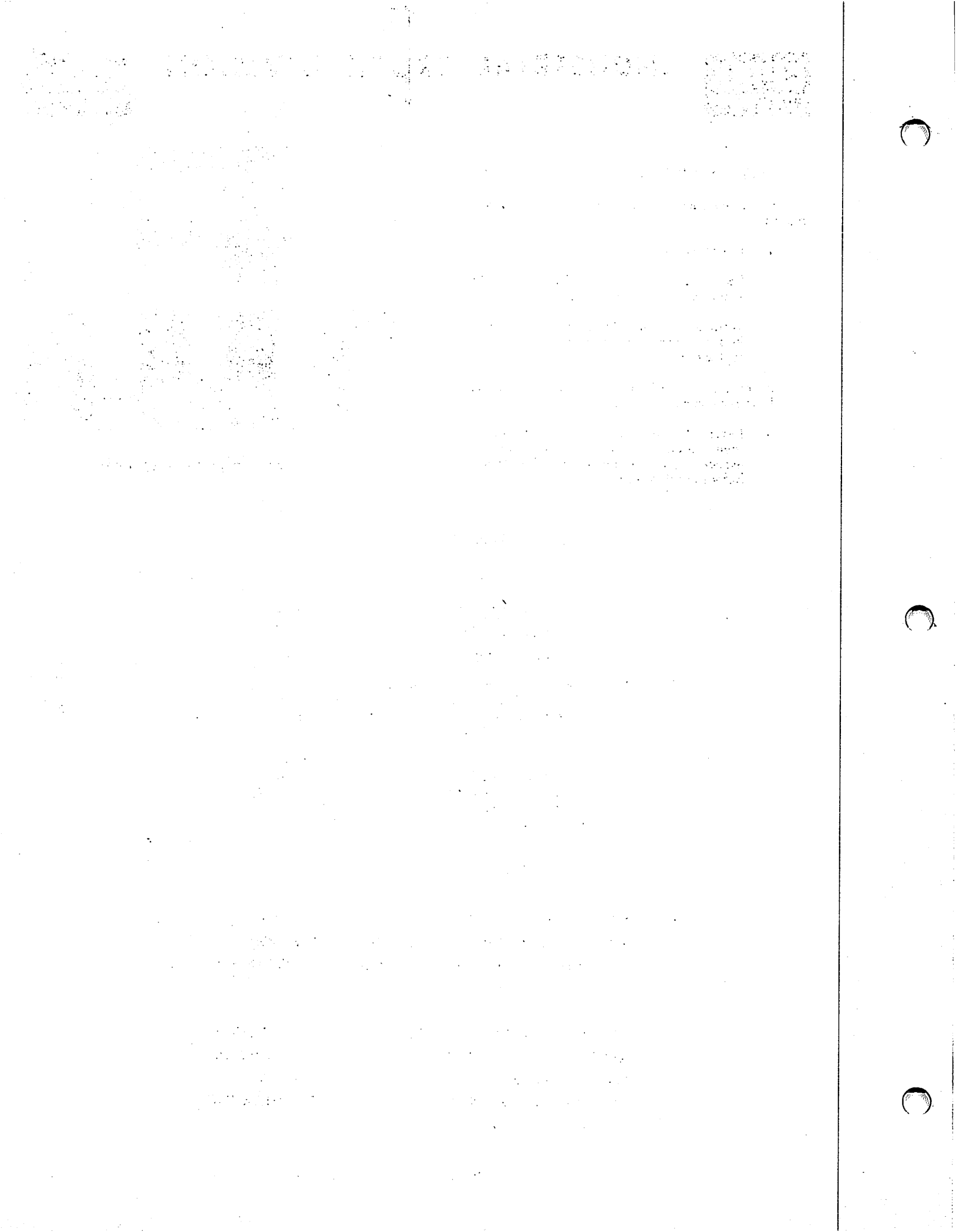
Every 8 operating hours (or every shift) ... elevate upright to upper limit ... to lubricate the top portion of the lift cylinder.

1. Check lift and tilt operation, and check reach operation (if applicable). The cylinders should actuate when control levers are moved either way from neutral position.
2. When a load is elevated and the control levers are in neutral position ... the load should remain stationary with no noticeable downward, backward, or forward drift. If load drifts excessively ... report condition to the proper authority.

C A U T I O N

NEVER ALLOW THE LIFT CARRIAGE TO REMAIN IN AN ELEVATED POSITION FOR ANY PROLONGED PERIOD. LIFT CARRIAGE SHOULD BE LOWERED WHEN NOT IN USE.

DO NOT HOLD CONTROL LEVERS IN EXTREME POSITIONS AFTER THE UPRIGHT OR LIFT CARRIAGE HAS REACHED ITS LIMIT OF TRAVEL. TO DO SO WILL RESULT IN HIGH HYDRAULIC OIL PRESSURES AND POSSIBLE OVER-HEATING OF THE FLUID.



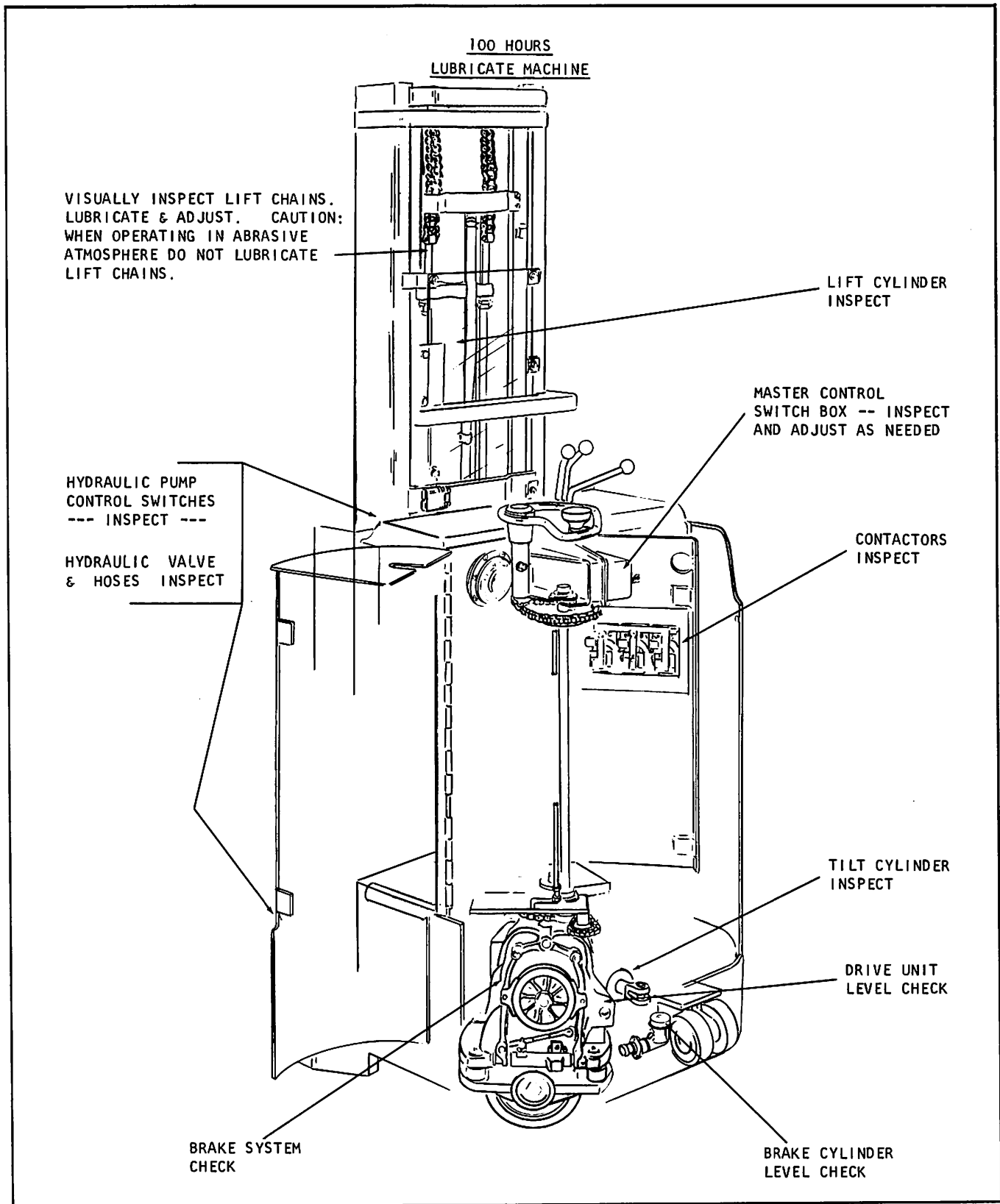


Plate 8270. Lubrication & Preventive Maintenance Illustration

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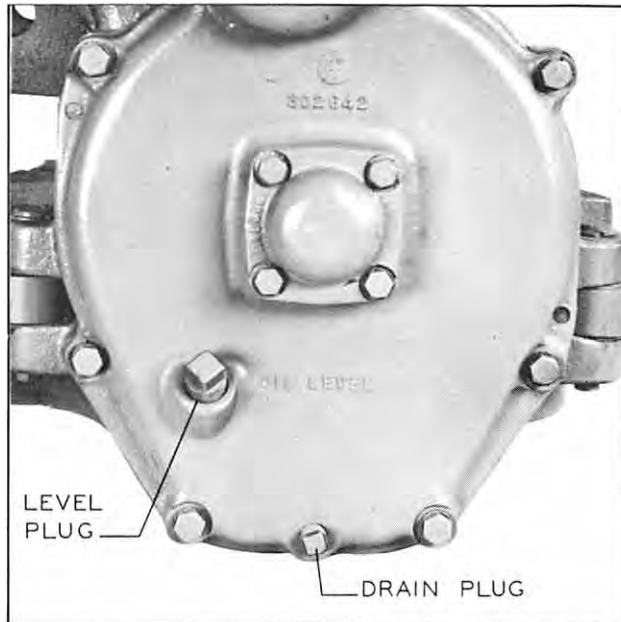


Plate 4274. Drive Unit Assembly

DRIVE UNIT LUBRICANT LEVEL CHECK

Verify lubricant level ... fill if necessary with:

DEXRON AUTOMATIC TRANSMISSION FLUID
(or Type "A", Suffix "A" ATF)
(AQA-Armour Qualified)

Typical Product Recommended by
Major Brand Oil Suppliers

-
- Shell Auto. Trans. Fluid Donax T-6, Dexron
 - Sunoco Auto. Trans. Fluid, Dexron.
 - ARCO Auto. Trans. Fluid, Dexron.
 - Gulf Auto. Trans. Fluid, Dexron.
 - Mobil Auto. Trans. Fluid 220, Dexron.
 - Texaco 1859 Texamatic Fluid, Dexron.
 - Citgo Auto. Trans. Fluid, Dexron.
 - AMOCO Auto. Trans. Fluid, Dexron.

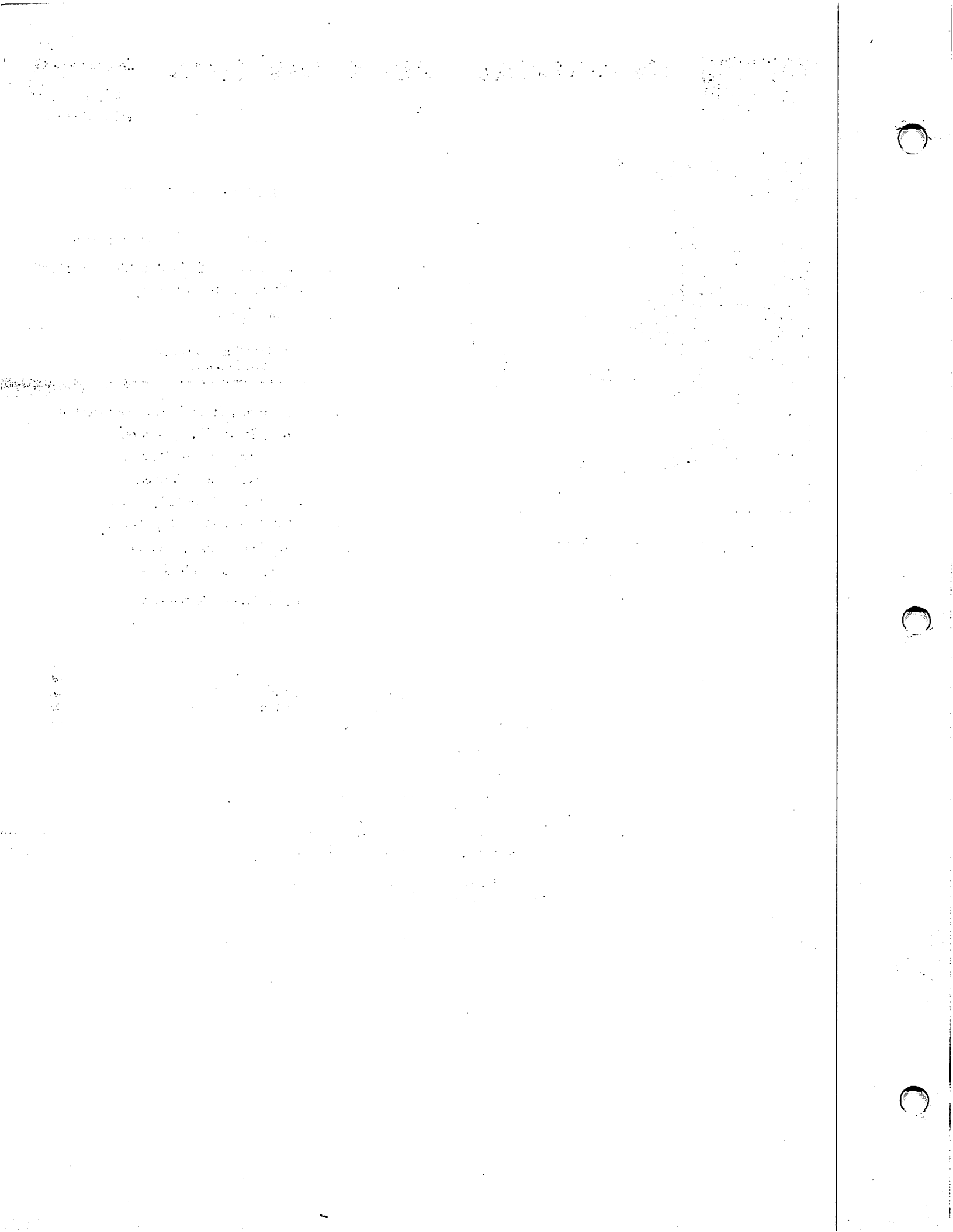
... or the equivalent to the above.

1. Clean dirt from around level plug and remove the plug. Fill until fluid reaches the height of the level plug opening.

DO NOT OVERFILL AS THE
EXCESS QUANTITY WILL
SERVE NO USEFUL PURPOSE.

If the oil level is too high, it will cause excessive oil churning and attendant high oil temperature and possible leakage.

2. After drive unit has been filled to the proper level, replace level plug.



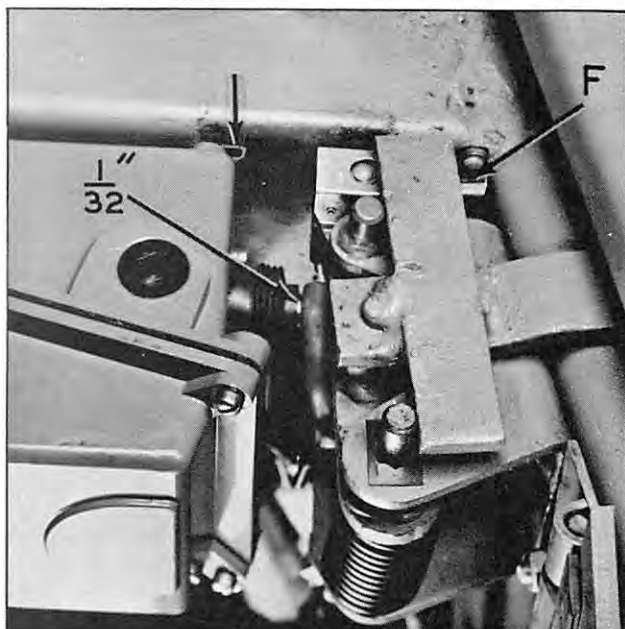


Plate 7483. Neutral Position Brake (Deadman) Pedal in the UP position. Switch Box adjusted for Plunger extension of 1/32" from full retracted position.

WARNING

MAKE ALL ADJUSTMENTS WITH POWER SWITCH KEY IN THE "OFF" POSITION.

1. With control handle linkage in neutral position (as shown above), switch box should be adjusted so that plunger is 1/32 inch from full retracted position.

The frame is provided with elongated holes (shown above, see arrow) for adjustment purposes. First, check adjustment by depressing plunger inward with a screwdriver. Plunger should move inward 1/32 inch. If adjustment is necessary, loosen switch box mounting screws and move box in direction necessary. Tighten screws and recheck adjustment.

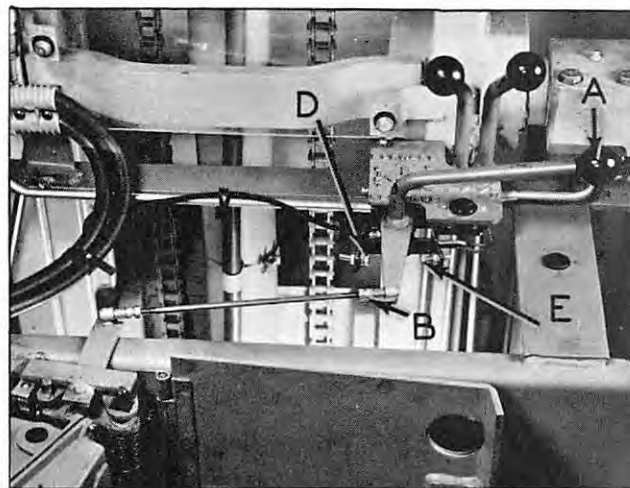


Plate 7484. Control Handle (A) in neutral position. Ball Joint (B) adjusted so control arm is on center line of the mounting bracket. Center by adjusting Stops (D & E shown above).

2. With Control Handle in neutral position, the control arm should be on center line of mounting bracket (see above).

If centering adjustment is necessary, remove Ball Joint (B) from ball joint stud by slipping the spring applied sleeve, of the joint, sideways so joint may be pulled free of stud. Now, screw the ball joint in direction necessary to put control arm on center line of mounting bracket. Reinstall and tighten jam nuts.

ACCELERATING MASTER (SWITCH) BOX AND
DRIVE CONTROL HANDLE LINKAGE
CHECKS AND ADJUSTMENTS

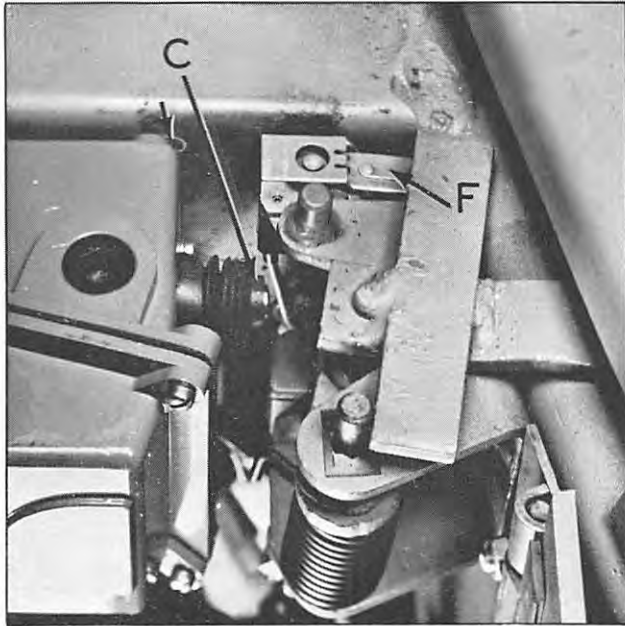


Plate 7485. Control Arm Actuated FORWARD. Brake (Deadman) Pedal in the DOWN position.

3. Step on brake (deadman) pedal. Move control handle REARWARD until control arm contacts Stop (D), see Plate 7484. Plunger (C) should extend approximately $\frac{7}{8}$ inch from the switch box (see above).

If adjustment is necessary, loosen jam nut on Stop (D), see Plate 7484, and rotate stop in direction necessary to obtain correct adjustment. Tighten jam nut.

4. With brake (deadman) pedal still depressed, move control handle FORWARD and check for correct adjustment at Stop (E), see Plate 7484. Adjust, if necessary, as outlined in Step 3.

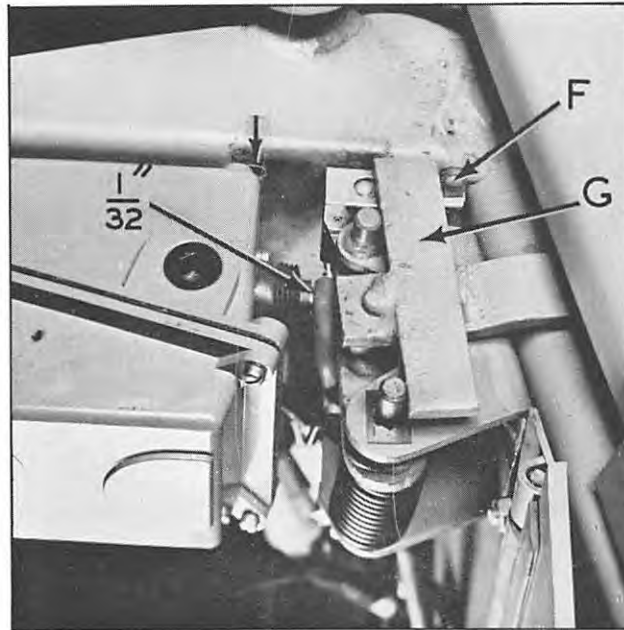


Plate 7486. Neutral Position Switch Arm (F) full up.

5. Switch Arm (F) must fully extend up beyond the actuating lever as shown above and in Plate 7487, on the following page.

If clearance adjustment is necessary, loosen switch mounting screws and move switch in direction necessary, as shown in Plate 7487. The mounting bracket is provided with elongated holes for this adjustment. Tighten mounting screws after correct adjustment is obtained.

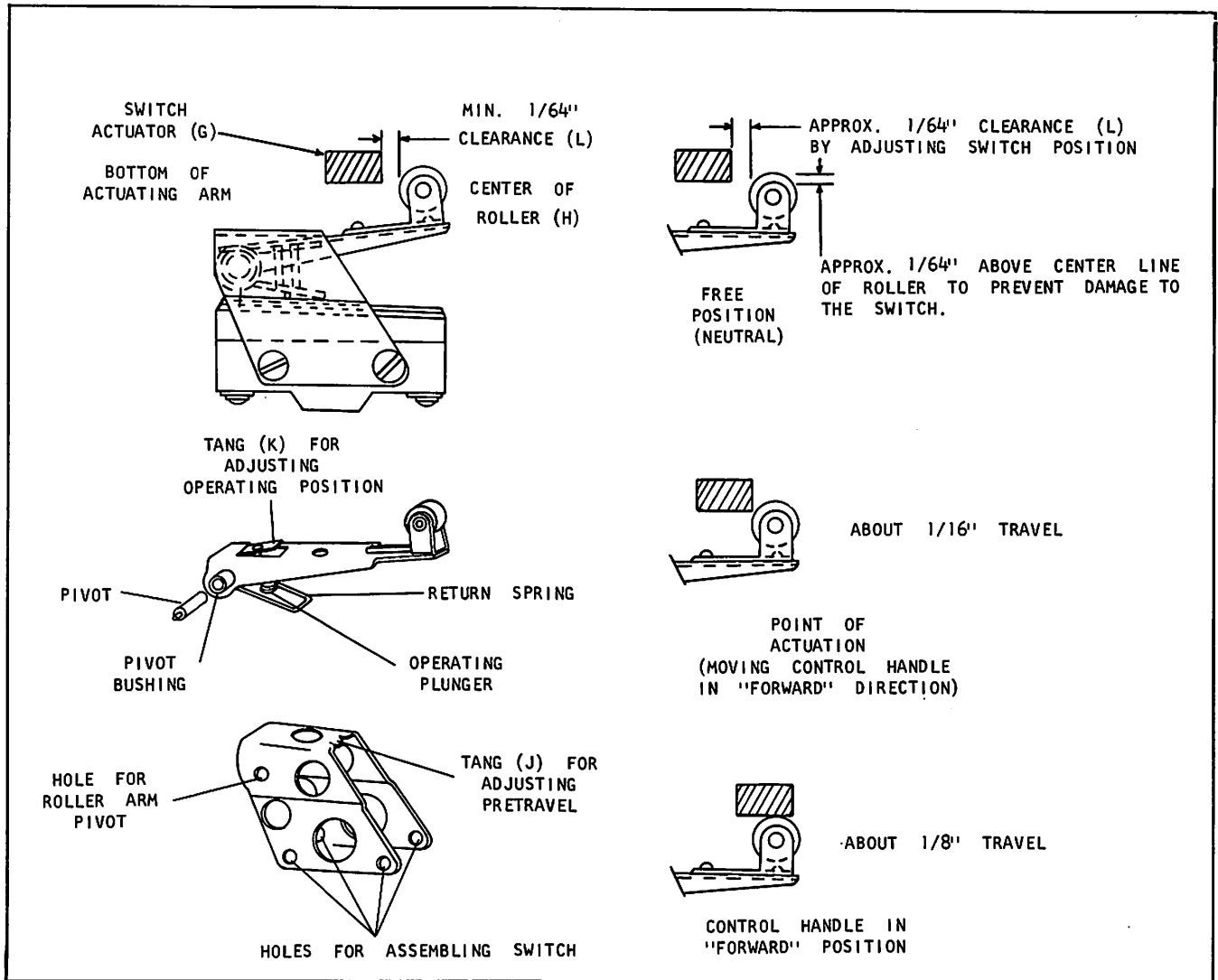


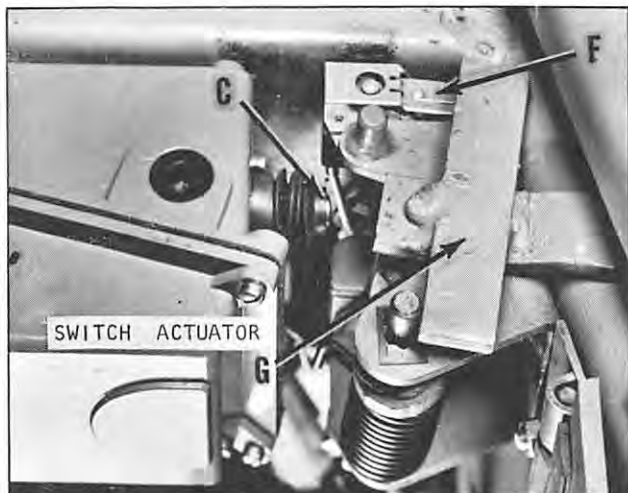
Plate 7487. Directional Switch Adjustment

6. Bottom of the Switch Actuator (G) should be on center line of Switch Roller (H). The actuator should contact switch roller at the center line of roller or slightly above center line (as shown above), actuator must not contact switch roller below center line or damage to switch may result.

If vertical adjustment of roller is necessary, bend TANG (J) downward to lower switch arm & roller or vice versa.

7. Switch should actuate as Actuator (G) contacts and then depresses switch Roller (H).

If adjustment of actuating point of switch is necessary, bend TANG (K), on the switch arm, downward just enough so that switch will actuate approximately 1/16 inch before roller is fully depressed by actuator (G).



ACCELERATING CONTROL ASSEMBLY, SEE NEXT PAGE

Plate 7488. Control Arm Moved Forward.
Brake (Deadman) Pedal in the DOWN Position.

8. Upon moving the control handle forward, Switch (F) must operate before the I.M.S. switch actuates (located in the switch box). The adjustment may be checked in the following manner:

(a) Depress brake pedal.

(b) Slowly move control handle forward. Directional Switch (F) should actuate first, then the control box I.M.S. switch should actuate. An audible click may be heard as each switch is actuated. If both switches are heard about the same time (or only one click is audible, indicating both switches are operating at the same time), then re-adjust time delay (red screw) for .2 second delay so first the directional switch and then the I.M.S. switch actuates. Refer to the ACCELERATING MASTER CONTROL (SWITCH BOX) ASSEMBLY adjustment procedures listed in the following write-up.

ACCELERATING MASTER CONTROL (SWITCH BOX) ASSEMBLY

The accelerating master switch for truck control is a manually operated pilot device to control magnetic contactors, which in turn, control the traction motor of the truck. It provides four individual speeds and has time delay acceleration and plugging control.

The plugging magnet (item 35), refer to the following page, is polarized correctly for negative battery to armature when the resistor center tap is connected to the upper coil terminal (as viewed on the machine).

1. Control assembly, accelerating
2. Housing, accel control assy base
3. Cover, accelerating control assembly
4. Gasket, accelerator control assy cover
5. Switch, accelerating control
6. Bus, accelerating control long
7. Bus, accelerating control short
8. Base, accelerating control switch
9. Adjuster, accelerating control switch
10. Yoke assembly, accelerating control sw
11. Spring, accel cont switch operating
12. Retainer, accel contr switch oper spg
13. Spring, accel contr camshaft return
14. Retainer, accel contr camshaft sprg
15. Guide, accel control camshaft spring
16. Arm accel control camshaft
17. Pivot, accel control camshaft arm
18. Fastener, accel control shaft arm pivot
19. Boot, accelerating control camshaft
20. Camshaft, accelerating control
21. Lockout, accelerating contr 4th speed
22. Bearing, accel control camshaft
23. Guide, accel control valve spring
24. Spring, accelerating control valve
25. Piston, accelerating contr dash pot
26. Ring, accel control dash pot piston
27. Seal, accel control piston camshaft
28. Washer, accel contr valve cap seal
29. Valve cap, accelerating control
30. Dash pot assembly, accel control
31. Fastener, accelerating control dash pot
32. Adjuster, accel contr (0 to 2nd) timing
33. Adjuster, A C (3rd to 4th) timing
34. Adjuster, A C (2nd to 3rd) timing
- 35.* Magnet assembly, accel contr plugging
36. Frame assembly, A C magnet outside pole
37. Frame assembly, A C magnet center pole
38. Armature assembly, accel contr magnet
39. Latch, accelerating control magnet
40. Support, accel contr magnet resistor
41. Fastener, accel contr magnet terminal
42. Insulator, accel contr magnet resistor
43. Lead assy, accel contr magnet resistor
44. Resistor, accelerating control magnet
45. Coil, accelerating control magnet
46. Fastener, accelerating control cover
47. Spring, accel control magnet latch
48. Fastener, accelerating control switch
49. Fastener, A C magnet outside frame
50. Fastener, A C magnet center frame
51. Fastener, A C magnet armature
52. Fastener, accel control magnet resistor
53. Fastener, A C magnet resistor terminal
54. Fastener, accel control switch base
55. Fastener, accel control assy

* Item 35, Plugging Magnet -- (item 44) Resistor equipped with SLIDER for adjustment purposes, refer to write-up "PLUGGING CONTROL" for adjustment procedures.

CAUTION

THE SCREWS HOLDING THE MAGNETIC CONTROL ASSEMBLY (ITEM 38) SHOULD NEVER BE LOOSE-
NED, AS
THIS RENDERS IT TOTALLY INEFFECTIVE.

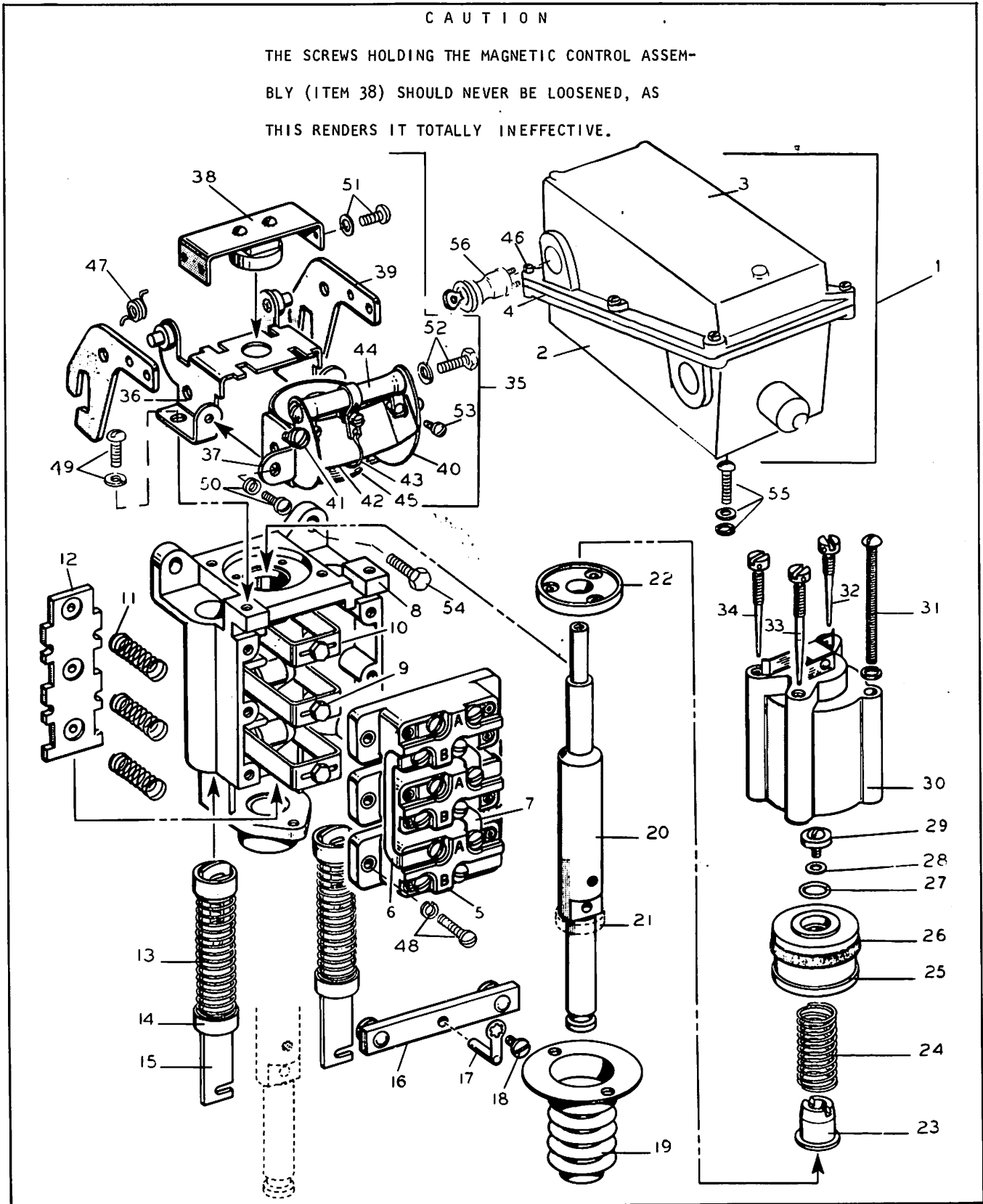


Plate 7499. Typical Accelerating Control Assembly



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LUBRICATION AND PREVENTIVE MAINTENANCE

ADJUSTMENT OF TRAVEL CONTROL

In either direction, truck should always move on level floor, loaded or empty, at 1 M.P.H. or faster.

Perform following visual checks:

| | Approx. no load speed M.P.H. |
|---|------------------------------|
| 1st Speed: F or R Contactor (on drive unit) closes | 2.5 (adjustable) |
| 2nd Speed: 1-A Contactor (on inner door) closes | 3.3 (adjustable) |
| 3rd Speed: 2-A Contactor (on inner door) closes (2-A Contactor remains closed) | 4.5 |
| 4th Speed: 1-A Contactor opens (2-A Contactor remains closed) | 5.5 |

ADJUSTMENT OF PLUGGING CONTROL

With proper full sized battery in the truck, but with battery at a low state of charge, adjust SLIDING CONTACT on small control resistor DOWNWARD until truck will go into 2nd (and higher) speed positions when truck is blocked so it cannot move. However, excessive DOWNWARD adjustment of the resistor will allow uncontrolled PLUGGING.

Test for this by driving truck in each direction in 3rd or 4th speed and rapidly reversing direction. When properly adjusted, truck should always slow down in 1st speed position and then proceed in the opposite direction with the controls passing through 2nd and higher speed positions.

If truck PLUGS or REVERSES DIRECTION at any speed position other than 1st, this is UNCONTROLLED PLUGGING and it will be necessary to adjust resistor by sliding contact UPWARDS until controlled plugging is achieved.

ADJUSTMENT OF TIME DELAYS:

Adjust colored screws (IN for longer — OUT for shorter time delays) for the following timed periods:

NEUTRAL to 2nd SPEEDS:

* .2 second delay — adjust RED screw (upper screw)

2nd to 3rd SPEEDS

.4 seconds delay --- adjust WHITE screw (lower left screw)

3rd to 4th SPEEDS:

.6 seconds delay — adjust BLACK screw (lower right screw)

*To start up on a grade, it is required that the time delay setting between 1st and 2nd speed be short enough for 2nd speed (and higher) positions to pick-up. Approximately .2 second delay should be adequate for 10% grade. Shorter delay time may be required for steeper grades. The normal anti-plug function will not permit the master control to pick-up 2nd point of power if the truck can roll backwards at any appreciable speed.

Timing of the master control is made with the adjusting screws on the end of the dash pot (item 30), refer to the preceding page. This dash pot is an air escapement device using the air in front of the piston to flow through an orifice to reach the rear side of the piston.



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

Ports are arranged with controlling adjustments to control the timing between 1st and 2nd, 2nd and 3rd, and 3rd and 4th. These are found in order starting at right rear of switch and proceeding counterclockwise (as viewed in the vertical position shown on the preceding page. The RED adjusting screw controls the timing before reaching 2nd speed. This is set to provide sufficient time for the directional contactor to close, and establish its holding circuit before the switch reaches 2nd speed. It is recommended that this screw be left as shipped from the factory. The WHITE adjusting screw is for the time between 2nd and 3rd speeds, and the BLACK adjusting screw is for the timing between 3rd and 4th speeds. Speeds are factory set and should be adequate for average applications without further adjusting.

MAINTENANCE (Refer to the preceding page)

The cam operated control switch (item 5) may be replaced when necessary simply by removing connectors (items 6 & 7) and the mounting screws (items 48). DO NOT CHANGE THE SETTING OF THE ADJUSTING SCREWS (ITEM 9). If it becomes necessary to replace the roller arm and yoke assembly (item 10) only then should an adjustment be made at screw (item 9). This setting should be .056 inches measured from the top of the adjusting screw to the mounting surfaces of the control switch with the operating shaft (item 20) fully extended.

If fine filings or foreign materials are found on the pole faces of the plugging magnet (item 35), they should be removed with an air hose to insure consistent operation.

The two operating shaft bearings (item 22) are "Oilite" bushings and require no further lubrication. The piston ring (item 26) is a graphite impregnated synthetic rubber material that is self lubricating and requires no additional lubrication of any kind.

If an increase in timing between speeds occurs, it may be an indication that dash pot and piston require cleaning (item 30). Remove dash pot and 3 colored adjusting screws from dash pot. (NOTE THAT SCREWS ARE OF DIFFERENT LENGTHS AND MUST BE REASSEMBLED IN THEIR RESPECTIVE HOLES.) Wash dash pot thoroughly in a Stoddard type cleaning solvent and blow out adjusting screw holes with air hose. Wipe piston (item 25), piston ring (item 26), adjusting screws (items 32, 33 & 34) with solvent dampened cloth. Reassemble and adjust screws to give desired timed acceleration (refer to adjustment paragraph).

REFER TO
TROUBLE SHOOTING
GUIDE

IF 1st AND 2nd SPEEDS SEEM
VERY LOW, CHECK CONNECTION
TO MAIN RESISTORS FOR AGREE-
MENT WITH THE WIRING DIAGRAM.

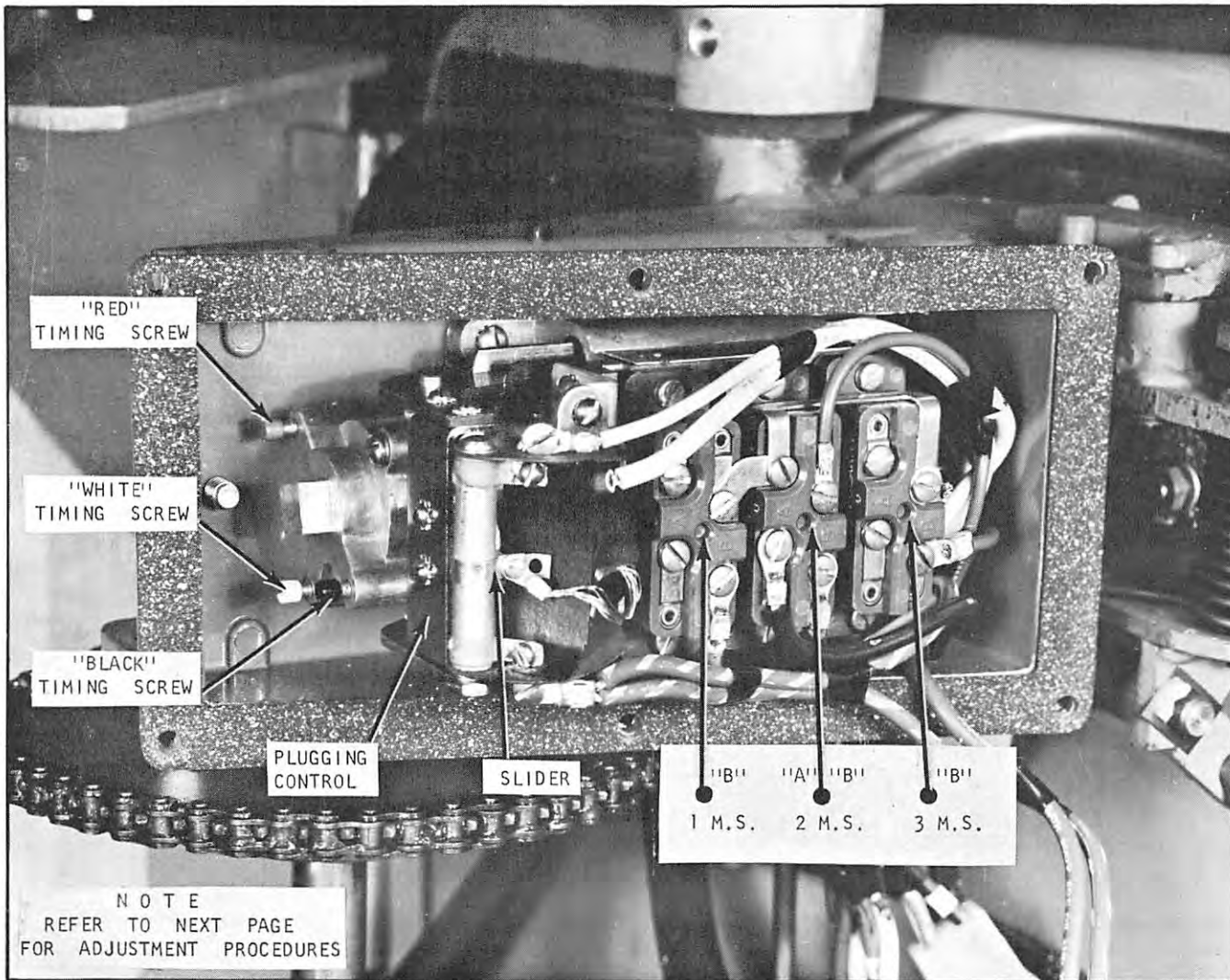


Plate 7500. Accelerating Master Control (Switch) Box

NOTE

| | |
|--------------|-------------------|
| 1 M.S. - "B" | (normally open) |
| 2 M.S. - "A" | (normally open) |
| 2 M.S. - "B" | (normally closed) |
| 3 M.S. - "B" | (normally open) |

**ACCELERATING
SWITCH OPERATING SEQUENCE**

ACTUATING CONTROL HANDLE FORWARD:

- 1 M.S. - "B" closes, Forward Contactor actuates completing circuit to the Drive Motor.
- 2 M.S. - "A" closes, and 2 M.S. - "B" opens; 1-A Contactor actuates — 2nd Point of Power, or 1st Acceleration.
- 3 M.S. - "B" closes, 2-A Contactor closes (bypasses all resistors) — 3rd Point of Power, or 3rd Speed.
- 2 M.S. - "B" Closes, and 2 M.S. - "A" opens; 1-A Contactor opens — 4th Point of Power, or 4th Speed.

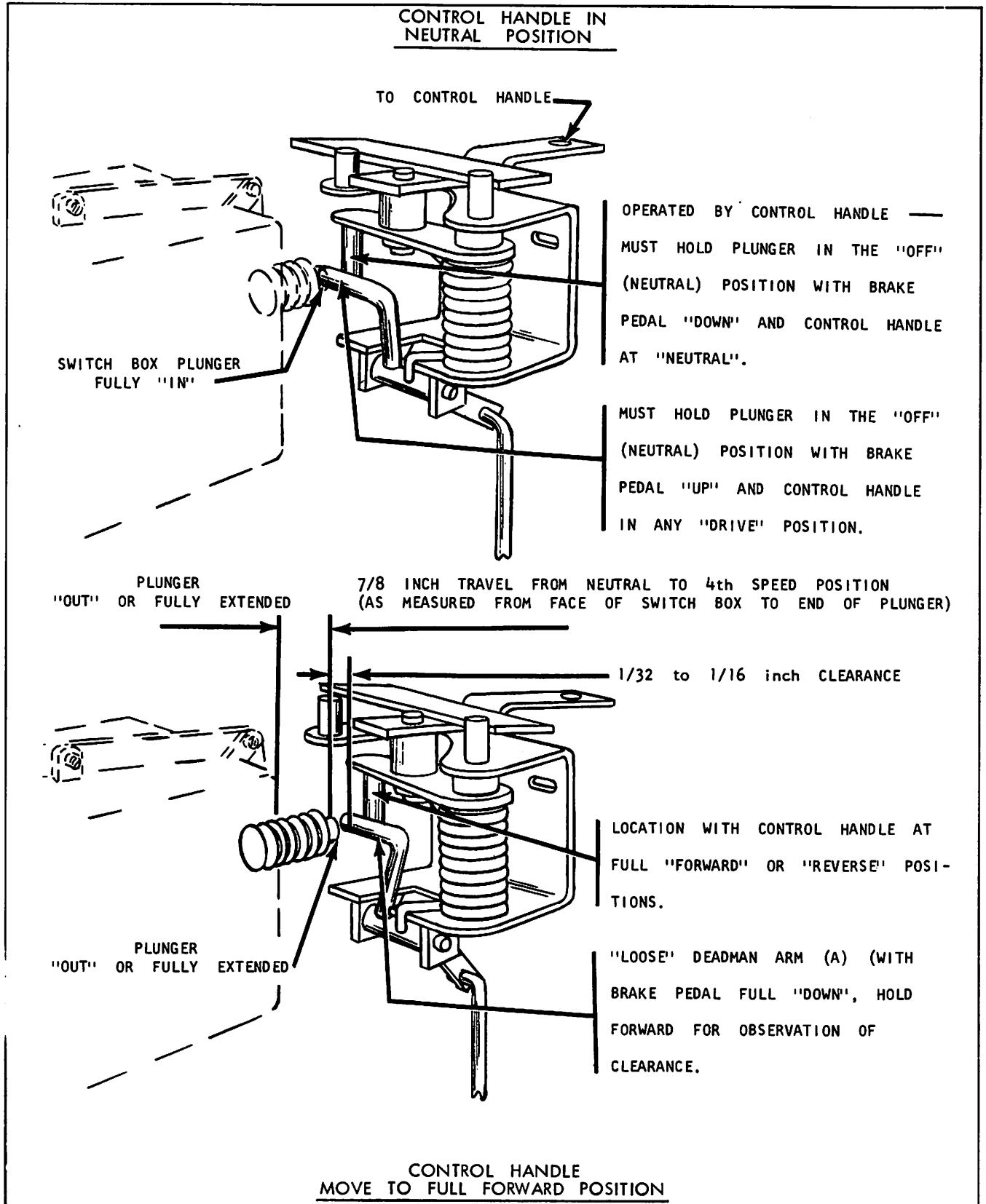


Plate 7501. Drive Control Adjustment

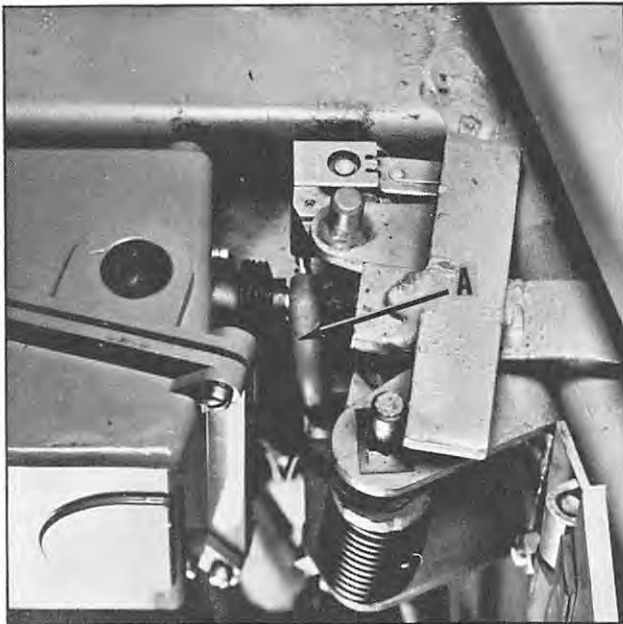


Plate 7502. Combination Drive and Brake Control Rod Spring Adjustment

DRIVE CONTROLS (LOWER PORTION)

Combination Brake and Drive Control Adjustment Check

1. With power key switch off, fully depress brake pedal.
2. Move drive control handle to full forward position.
3. Check for correct adjustment of the switch box plunger as follows:

(a) With brake pedal in the down position, there should be approximately 1/32 to 1/16 inch clearance between Deadman Arm (item A), see Plate 7501, and switch box plunger.

(b) With brake pedal in the DOWN position and drive control handle all the way FORWARD, slowly release brake pedal. Deadman Rods (4 & 5), see Plate 7501 and 8277, should actuate Deadman Arm (item A) which returns switch box plunger to the OFF or RETRACTION POSITION shown in the above plate.

If any of the previous adjustment checks are found to be incorrect, make adjustments per the following procedure.

Adjustment

1. Remove battery from machine.
2. Depress brake pedal and hold.
3. The Off-Set Arm (1), see Plates 8265, 8266, 7505, should be adjusted 7/16 of an inch below top of battery roller. This distance is measured from the bottom of the off-set arm to the top of the battery roller.

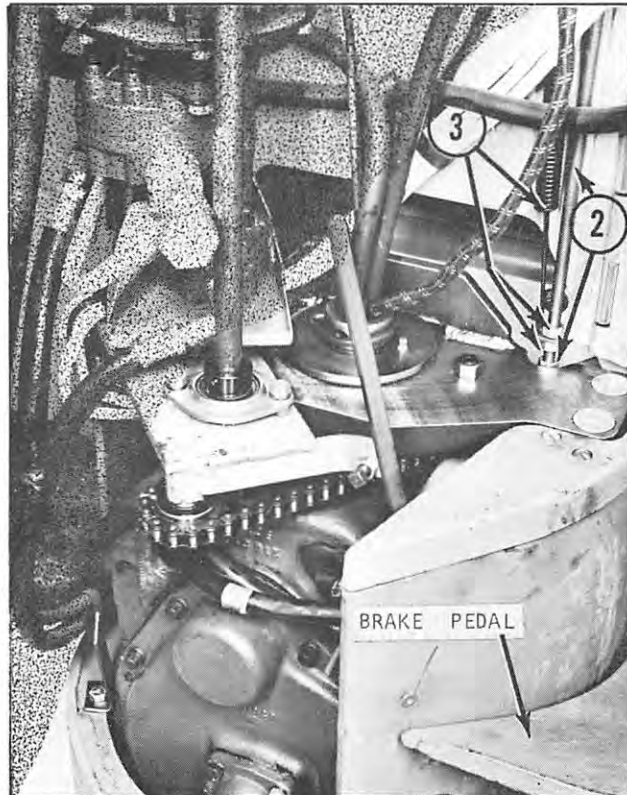


Plate 8265 Deadman Rod Adjustment (as viewed from rear of machine — both rear doors open)

The off-set arm adjustment is necessary so the arm will miss the contactor box (located on the drive unit) and, so it will not contact the battery when the brake pedal is in the UP position.

4. If necessary, loosen Jam Nuts (1), see Plate 7505, and rotate nuts in the direction necessary to obtain correct adjustment.

Check adjustment. With pedal down, rotate hand wheel until contactor box is beneath Arm (1). If the two components come in contact with one another, correct the adjustment. However, be sure the arm is not adjusted too high. Arm must not contact battery with pedal in the UP position. Therefore, the 7/16 inch dimension must be held.

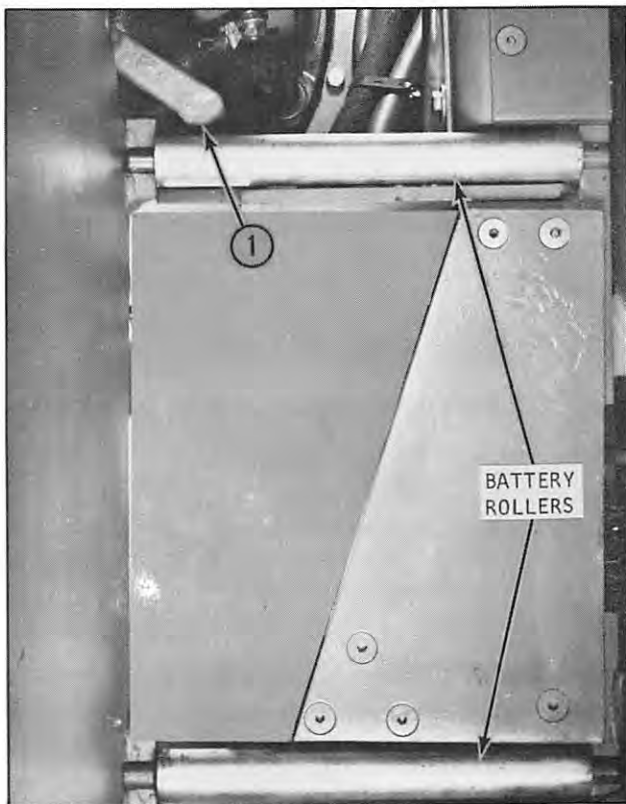


Plate 8266. Off-Set Arm Adjustment
(With Brake Pedal DOWN, off-set arm MUST NOT TOUCH drive unit contactor box — with brake pedal UP, off-set arm MUST NOT come in contact with battery.)
(viewed from battery compartment)

5. Tighten Jam Nuts (1) after obtaining correct adjustment.

If the off-set arm requires adjustment, it will be necessary to re-adjust Deadman Rods (4 & 5) as follows:

1. With brake pedal fully depressed and held in this position, move drive control handle all the way forward and hold.

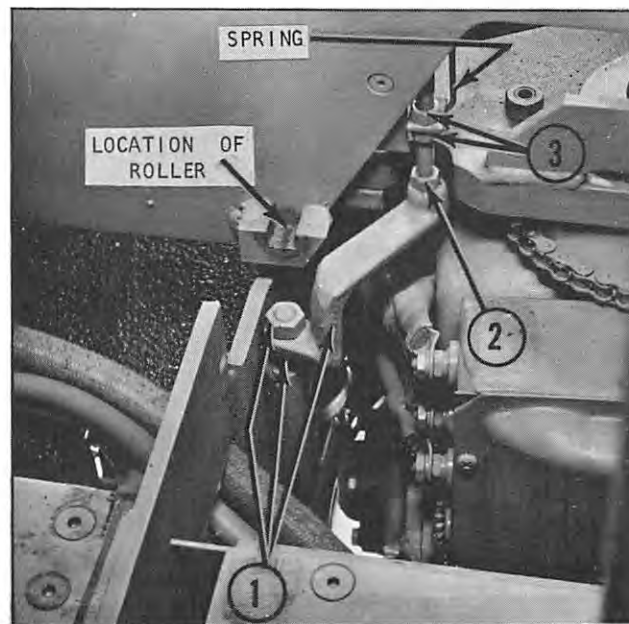


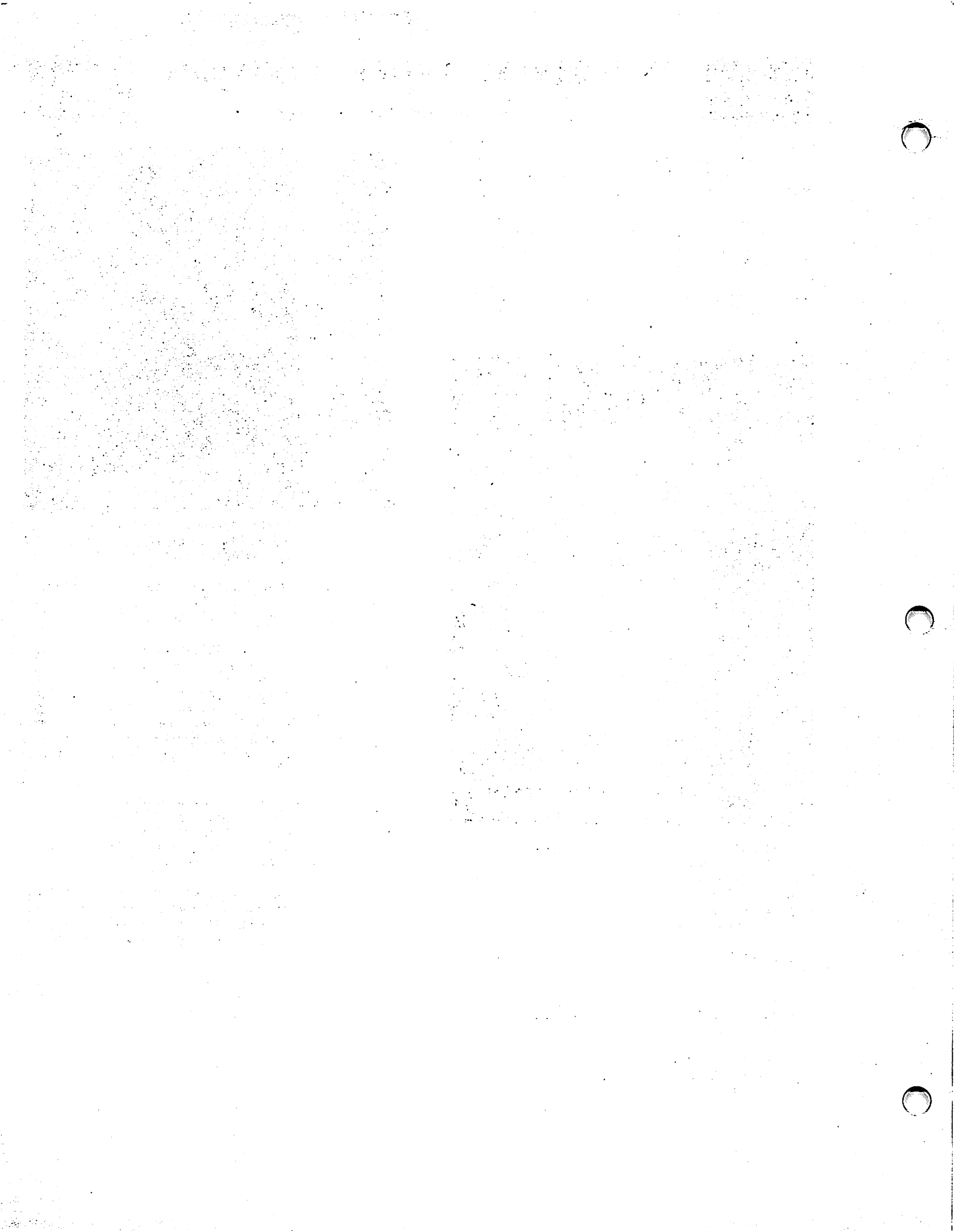
Plate 7505. Off-Set Arm Adjustment (item 1)
Deadman Rod Adjustment (item 2)
Pedal Spring Adjustment (item 3)

2. Loosen Jam Nut (2), see Plates 8265 and 7505, and adjust Rod (4), see Plate 8277 on the next page, to come in contact with Rod (5).

NOTE: Deadman Arm (A) should be held by hand (in the position shown in Plate 7501) while adjusting Lower Rod (4) to come in contact with Upper Rod (5). Using this method, the mechanic may feel Rod (4) contact Rod (5) as Deadman Arm (A) will start to move away from the "held" position when correct adjustment is obtained. After completing adjustment, tighten Jam Nut (2).

3. With drive control handle held in the full forward position, slowly release brake pedal. Deadman Arm (A) should return the switch box plunger to the OFF or RETRACTED POSITION shown in Plate 7502, refer to the preceding page.

If adjustment is necessary, loosen Jam Nuts (3), see Plate 8265 on preceding page, and adjust to increase pedal spring tension. After satisfactory adjustment is obtained, tighten jam nuts.



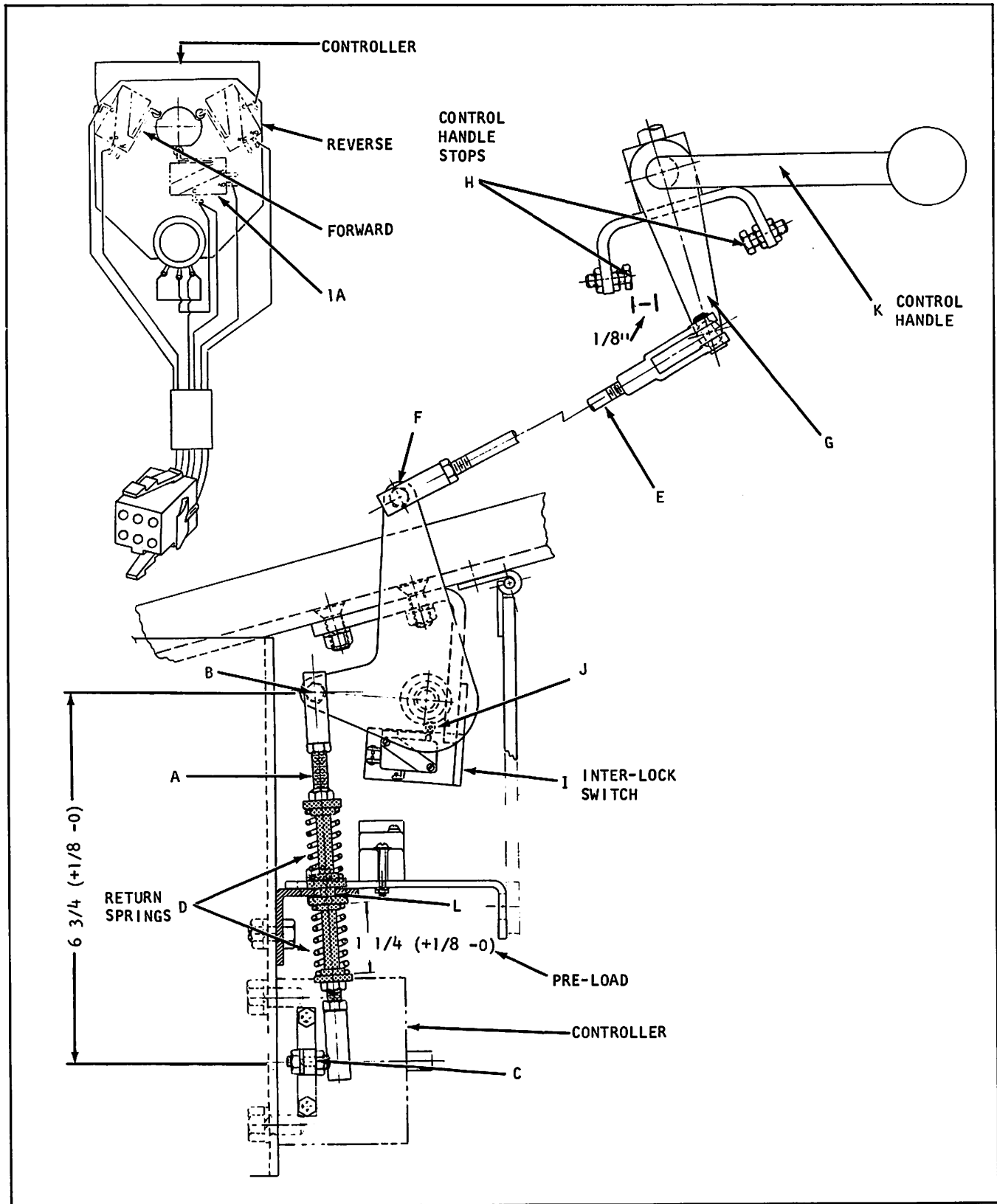


Plate 9447. Typical Upper Drive Controls

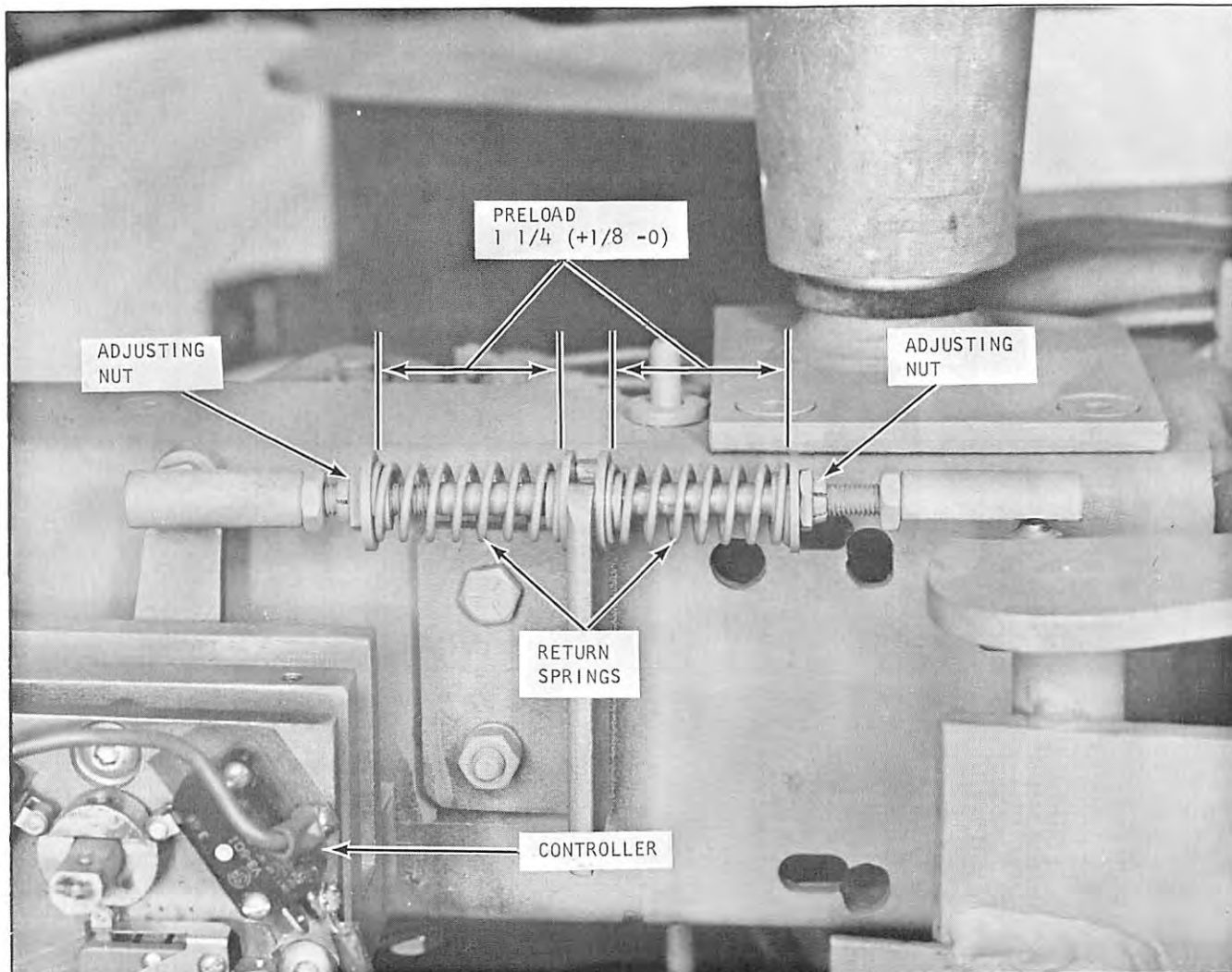


Plate 9448. Typical Return Springs

DRIVE CONTROL LINKAGE ADJUSTMENTS (Plate 9447)

Objective: To adjust drive control linkage to controller in such a manner that: all switches operate in their proper sequence, there is no rubbing of linkage rod against bracket slot, and control handle arm is midway between stop brackets. All dimensions referred to in this write-up are for initial adjustment. Should any of the dimensions here-in give the wrong results on your machine, then the dimension should be changed to suit the particular condition.

1. Disconnect rod "A" from bellcrank at position "B" and rod "E" from bellcrank at position "F".
2. Check controller arm "C" to make sure it is in a vertical position when controller is in neutral.

N O T E

Some controller arms are adjustable by loosening the setscrew. Some are not adjustable due to the detent in the controller shaft. In this latter case, disregard adjusting.

3. Adjust rod "A" to measure $6 \frac{3}{4} (+ \frac{1}{8}-0)$ " and attach to bellcrank "B".
4. Adjust springs "D" to measure $1 \frac{1}{4} (+ \frac{1}{8}-0)$ " each.
5. Rotate bellcrank in both directions, watching to see if there is any rubbing action (at extreme ends of travel) in bracket slot "L". If not, go to step 6. If so, adjust as follows: If the rod rubs slot "L" while being turned clockwise, then the rod must be shortened. If the rod rubs slot "L" while being turned counter-clockwise then rod "A" must be

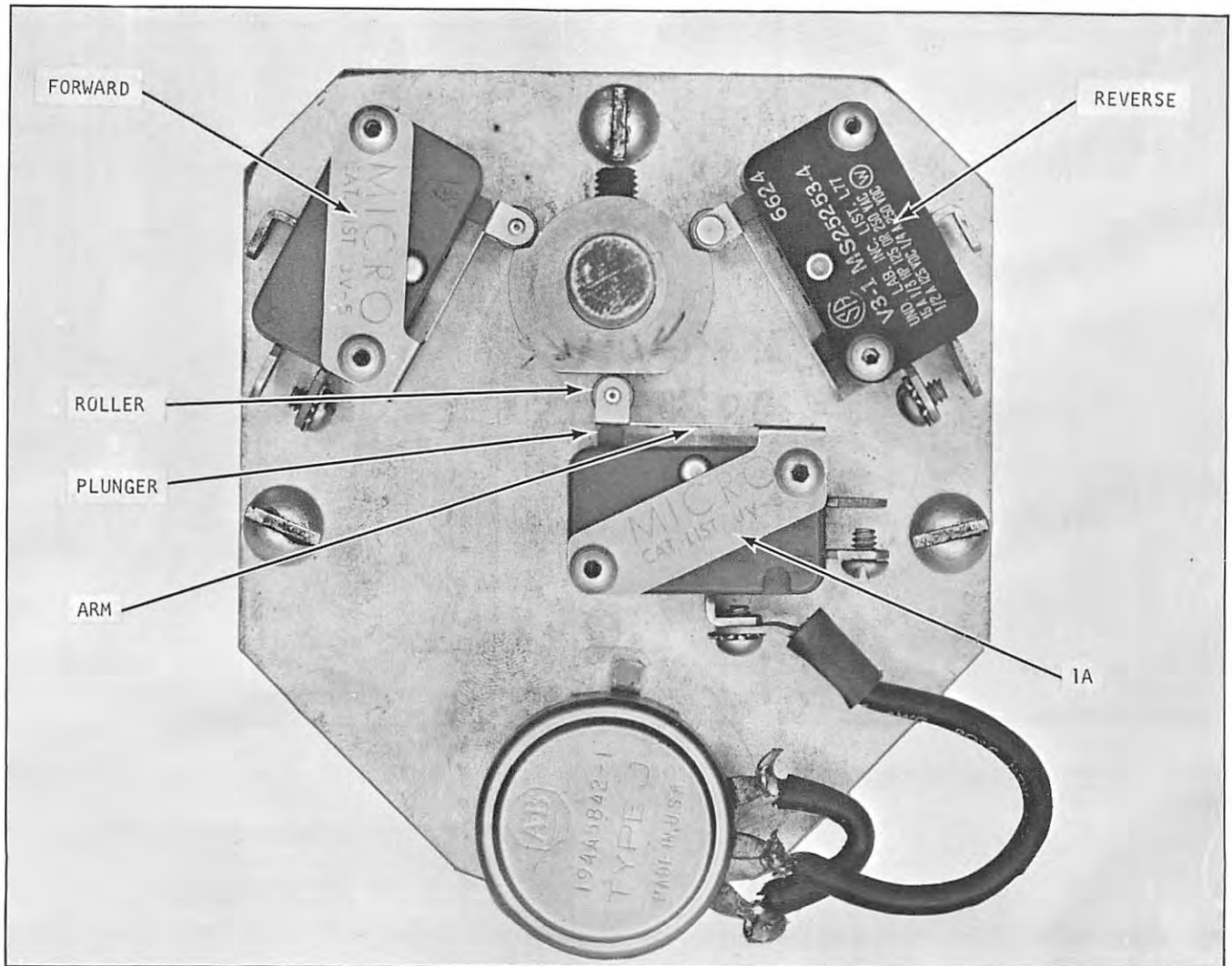


Plate 9492. Typical SCR Controller

lengthened. Continue this procedure until no rubbing action is noted.

6. Now check to see if the bottom (flat) part of the controller cam is horizontal and adjust if necessary.

7. Refer to plate 9492 and determine if switches are adjusted to the cam as shown and here described: The forward and reverse switch rollers must be just setting in their respective detents so that the arm of the switch just touches the switch plunger. Next determine that the 1A switch roller is positioned midway of the bottom surface (machined from the cam) and that the arm is also just touching its plunger.

If the switches are not adjusted properly, then adjust as follows:

NOTE

Switches are mounted to a Tapping plate. Mounting screws pass thru oversized holes in the bracket to a tapping plate. (See plate 9493.)

(a) Loosen the screws on one of the switches that is out of adjustment just enough so switch is moveable (being careful not to over-loosen because backing plate would then fall off).

(b) Position switch as described previously and tighten screws while holding switch in this position.

(c) Follow this same procedure with any other switches not adjusted properly.

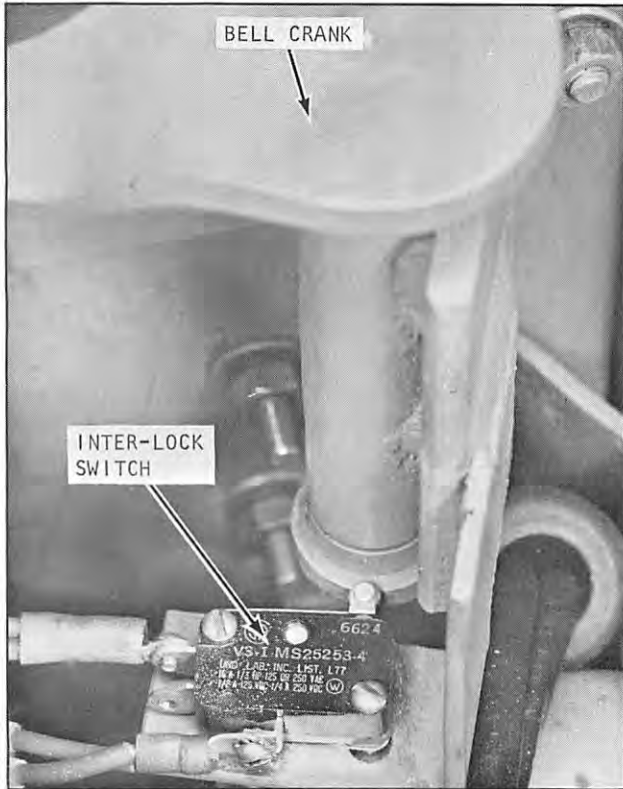


Plate 9449. Typical Interlock Switch

8. Attach rod "E" at bellcrank position "F" and arm "G" so that arm "G" is midway between stop brackets.
9. Adjust interlock switch so that it actuates before forward or reverse switches.
10. Move control handle forward until 1A switch actuates, hold, and adjust right hand stop 1/8" from arm "G". Do the reverse of this for the remaining stop.

REVIEW CHECK

If everything is adjusted properly, the following conditions should be present:

1. With control handle in neutral all switch rollers (F, R, 1A, interlock) should be in their proper positions (detents).
2. Control handle arm "G" should be midway between its stops "H".
3. When control handle is moved forward the first "click" should be in the interlock switch actuating, the second "click" should be the F switch actuating and the third "click" should be the 1A switch actuating.

4. When the control handle is moved in reverse the first "click" should be the interlock switch actuating, the second "click" should be the R switch actuating and the third "click" should be the 1A switch actuating.

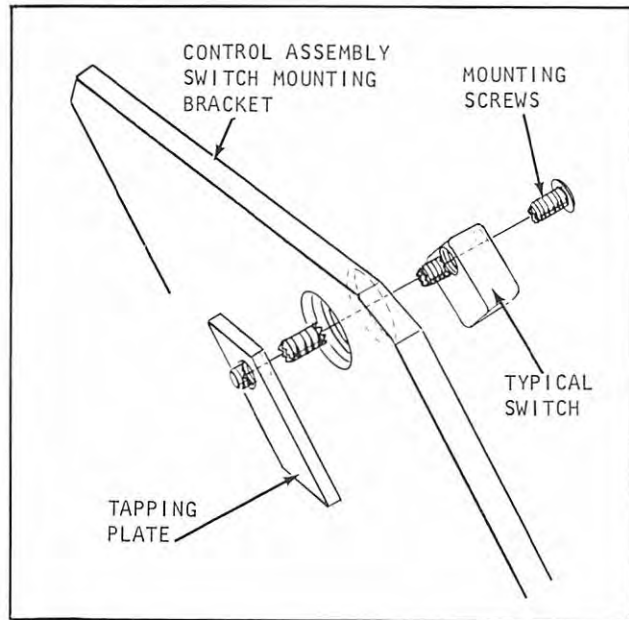


Plate 9493. Typical Controller Switch Mount

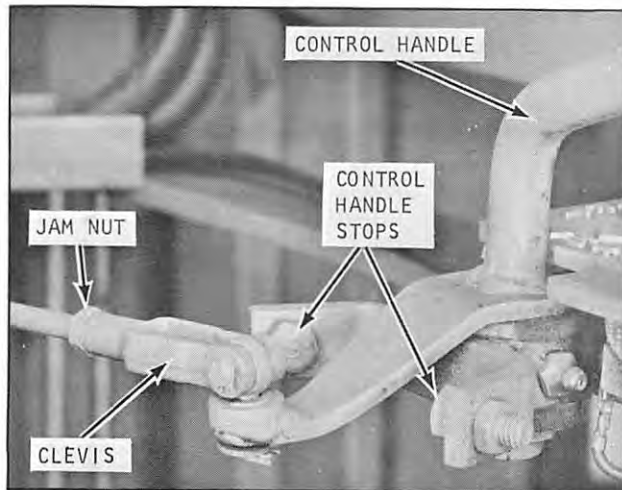


Plate 9450. Typical Control Handle Stops

1950

1951

1952

1953

1954

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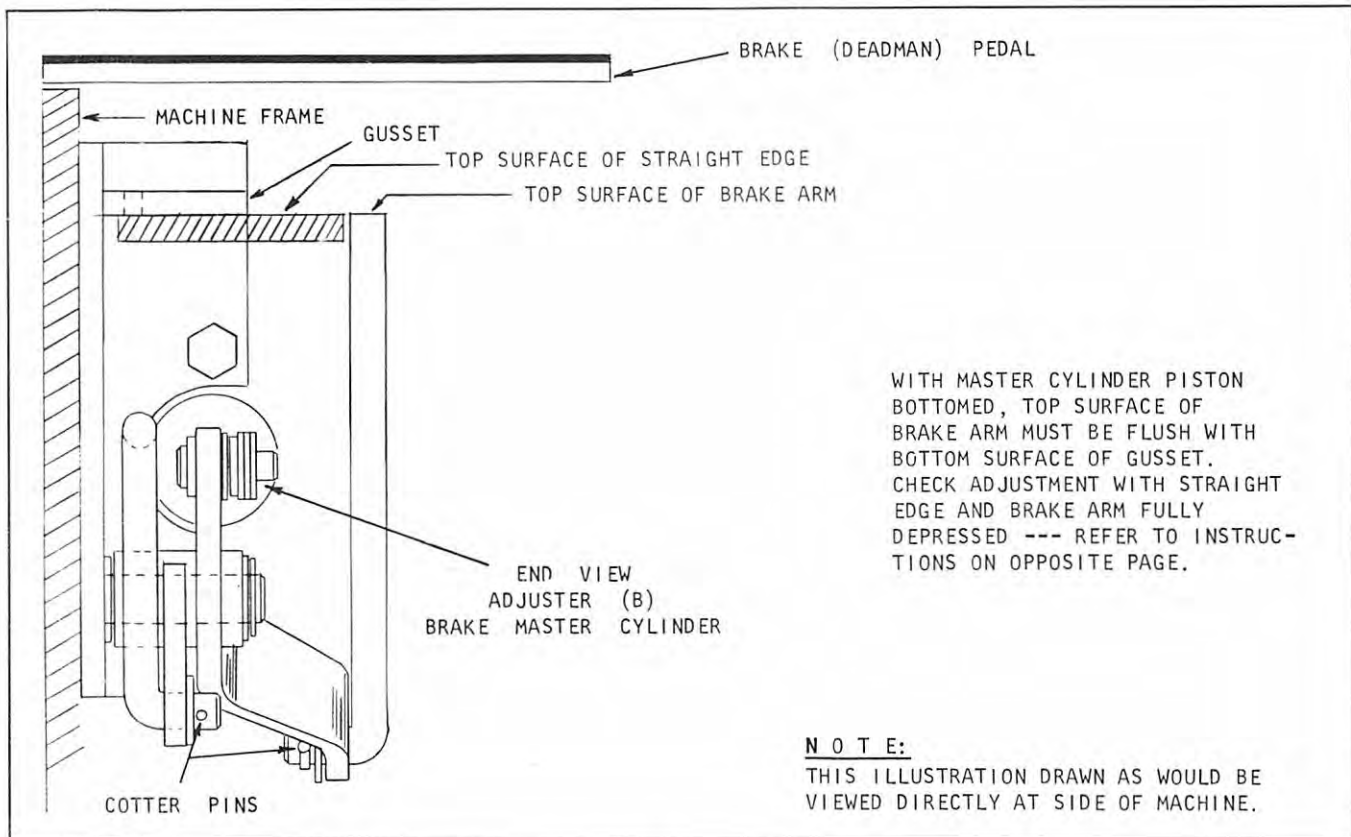


Plate 8267 Brake (Deadman) Pedal Arm (fully depressed)

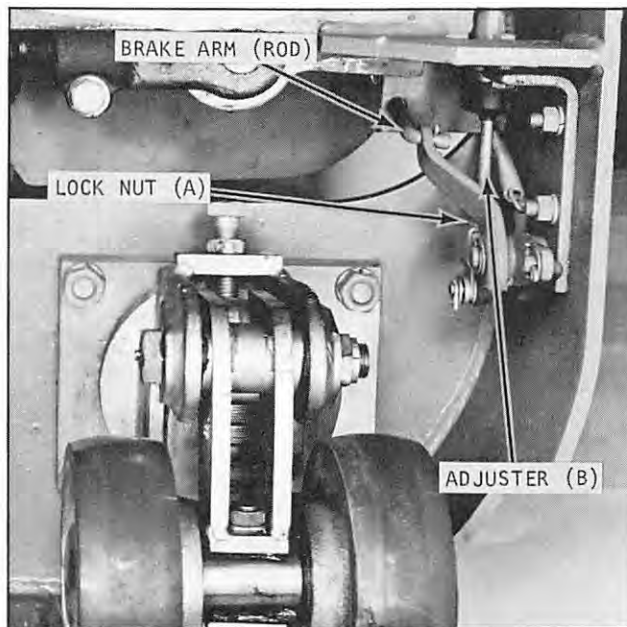


Plate 8268. Brake Cylinder, Pivot Arm and Pedal Rod Adjustment

BRAKE PEDAL LINKAGE ADJUSTMENT

NOTE: The brake pedal (when fully depressed) MUST rest on the machine frame and not on the brake linkage. In other words, the brake arm must not support the brake pedal with the pedal in the down position. If such a condition should exist, this means that the master cylinder piston has bottomed and the piston and brake arm are the full support of the machine operator when standing on the brake pedal. Such a condition causes excessive strain on the master cylinder and linkage and could very well cause damage to these components. On the other hand, the linkage must not be adjusted for too short a piston stroke.

1. Remove hair pin cotter connecting brake arm to brake pedal. Remove brake pedal from machine by rotating hinge pin from its self locking down position to the up position. This hinge pin is located at the front or pivot end of the brake pedal. With pin in the up (unlocked) position, move pin to the left releasing pin from the right side of the frame — move pedal to the right and remove from machine.

2. Clean dirt from around the filler cap of the master cylinder reservoir and unscrew cap. Brake fluid should be within 1/4 inch of the top — replenish with S.A.E. 70R3 hydraulic brake fluid (Clark Part No. 1800200) and replace cap. NOTE: Check cap vent hole for obstruction. Vent hole must be open at all

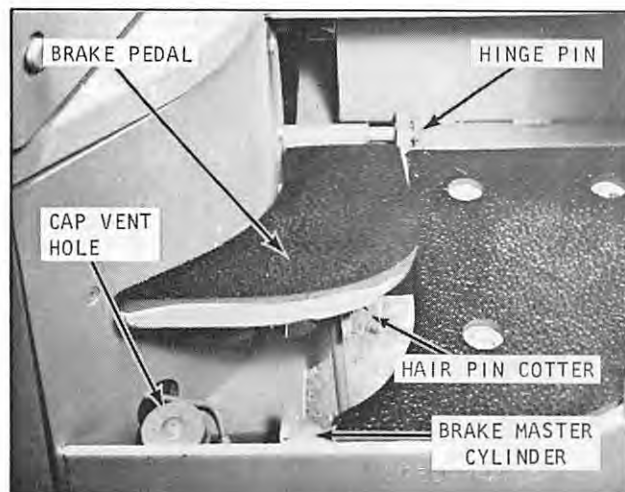


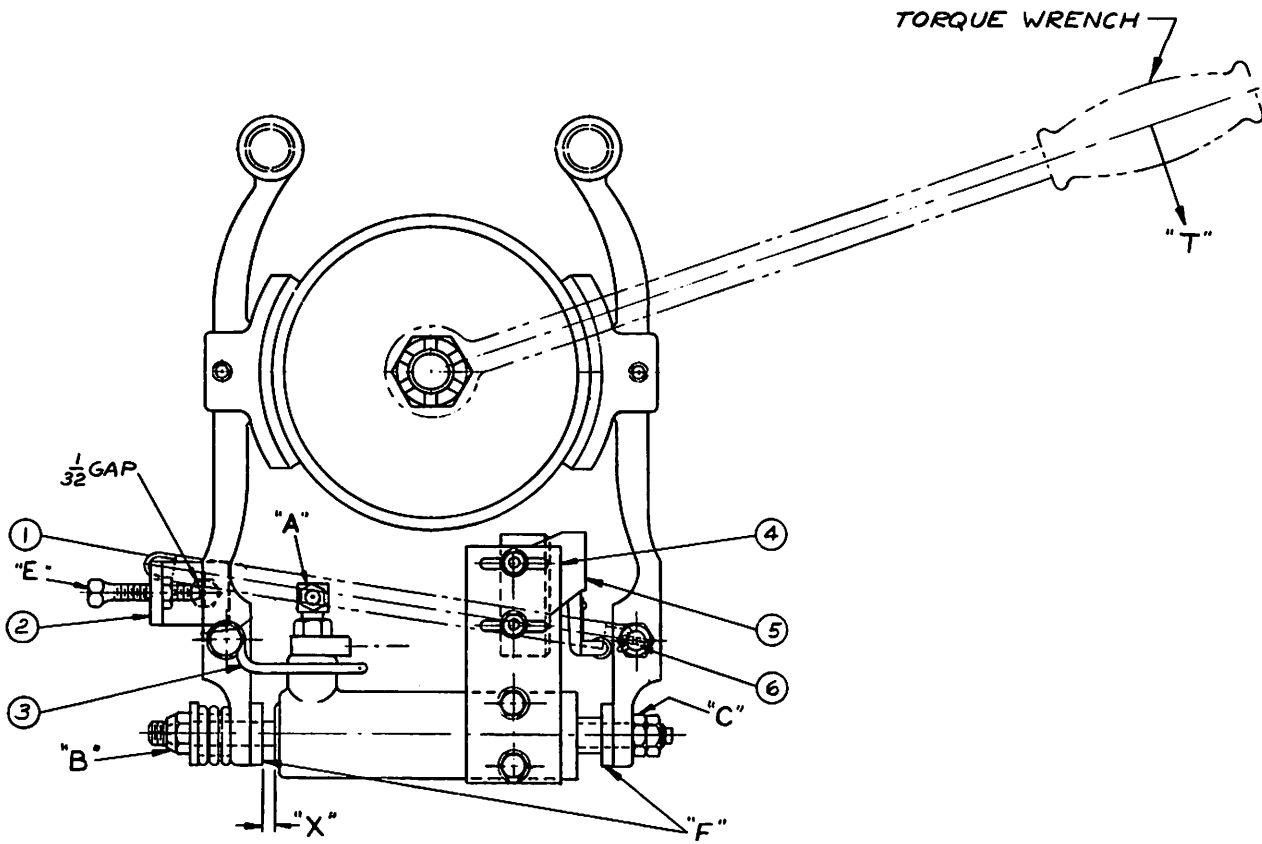
Plate 8264. Brake Pedal

times — clean if needed.

3. Place a straight edge (flat) under gusset (D), see Plate 8267 on preceding page. Depress brake arm downward as far as it will go.

4. Loosen lock nut (A), see Plate 8268 on preceding page. Rotate adjuster (B) until the top surface of the brake arm is flush with the upper surface of the straight edge, see Plate 8267.

5. Tighten lock nut (A) and check adjustment as explained above. Repeat adjustment procedure until correct adjustment is obtained, then replace brake pedal. Connect brake rod to brake pedal with hair pin cotter.



"T" = CALCULATED TORQUES BASED ON MIN. REQUIREMENTS OF HOLDING TRUCK ON 15% GRADE

TABLE "D"

| MODEL | WEIGHT LOADED | "T" - POUND/INCHES | |
|--------|------------------|--------------------|------|
| | | 18.36-1 | 22-1 |
| NST 15 | 6300 | 235 | 200 |
| NST 20 | 7300 | 275 | 230 |
| NST 25 | 8200 | 320 | 265 |
| NST 30 | 8900 | 350 | 290 |
| NST 40 | 10500 | 400 | 325 |

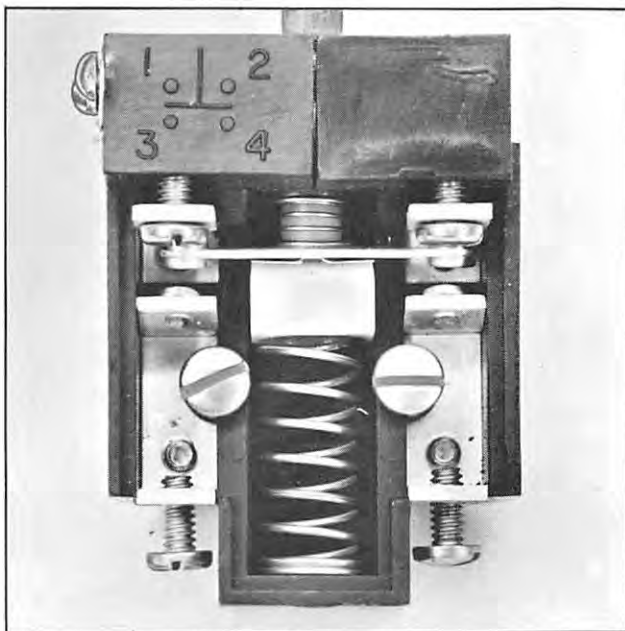


Plate 7443. Typical Pump Control Switch

PUMP CONTROL SWITCHES

The pump control switches are mounted at the valve spool end covers and are activated by movement of the valve spool.

SWITCH ADJUSTMENT

1. Loosen the two screws clamping switch to valve.

2. Position switch on spool end cover so that movable switch contacts are centered between stationary contacts. (Switch contacts are viewed thru clear plastic cover on switch.)

NOTE

ADJUSTMENT OF SWITCHES MUST BE MADE WITH VALVE SPOOL IN NEUTRAL POSITION.

3. After correct adjustment is obtained tighten switch clamping screws.

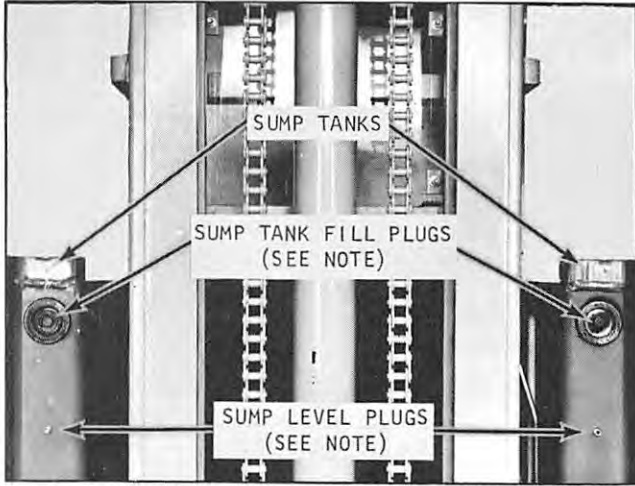


Plate 7528. Location of (Breather) Filter

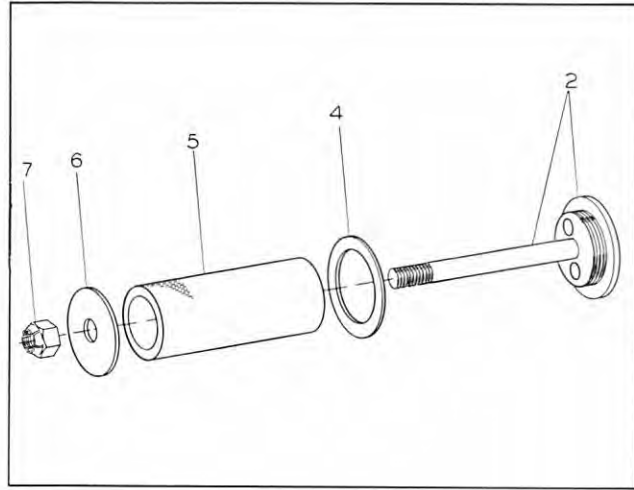


Plate 7527. Hydraulic Sump (Breather) Filter

HYDRAULIC SUMP (BREATHER) FILTER CHECK

1. Remove sump fill plug breather/s located in the upper sump tank/s at the top. See above illustrations.

2. Disassemble breather and inspect. If breather is not fit for further service (dirty or clogged with foreign material), then replacement is necessary.

3. Check both air holes for obstructions. Holes must be open.

4. Check breather gasket for further service and replace if necessary.

5. Reassemble components and install.

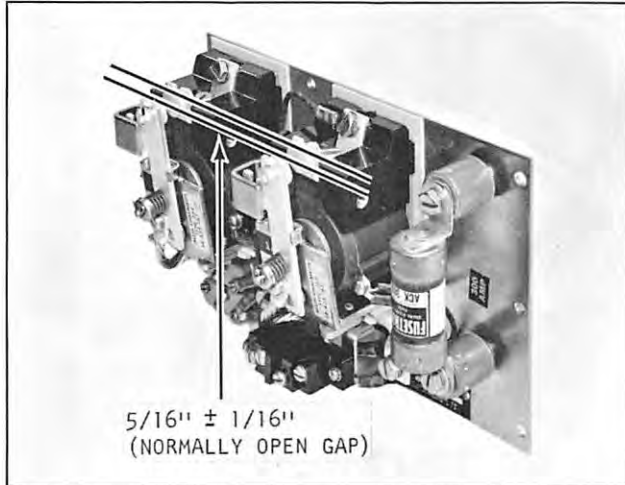


Plate 9455. Typical Frame Mounted Contactor Panel

CONTACTORS

Keep the contactor as free from dust and dirt as possible. This can be accomplished by periodically blowing off with low air pressure or wiping with a clean dry cloth. DO NOT LUBRICATE. Contact tips are of silver alloy and require no cleaning. Replace with a new contact tip when maximum contact wear (approximately 3/32") is reached.

N O T E

If contact tip carrier and/or springs are discolored from heat, replace them as well.

Contact Tip Torque

Tighten to nominal value of 19 inch-lbs.

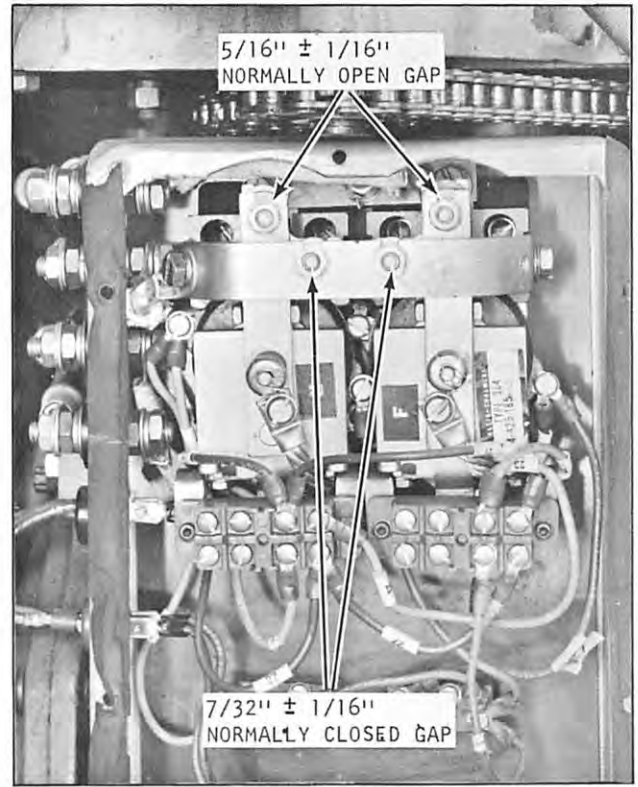


Plate 9456. Typical Contactor Panel Mounted on Drive Unit

ADJUSTMENTS

There are no adjustments necessary on these contactors. The normally open contact gap will be 5/16" plus or minus 1/16" and the normally closed gap is 7/32" plus or minus 1/16".

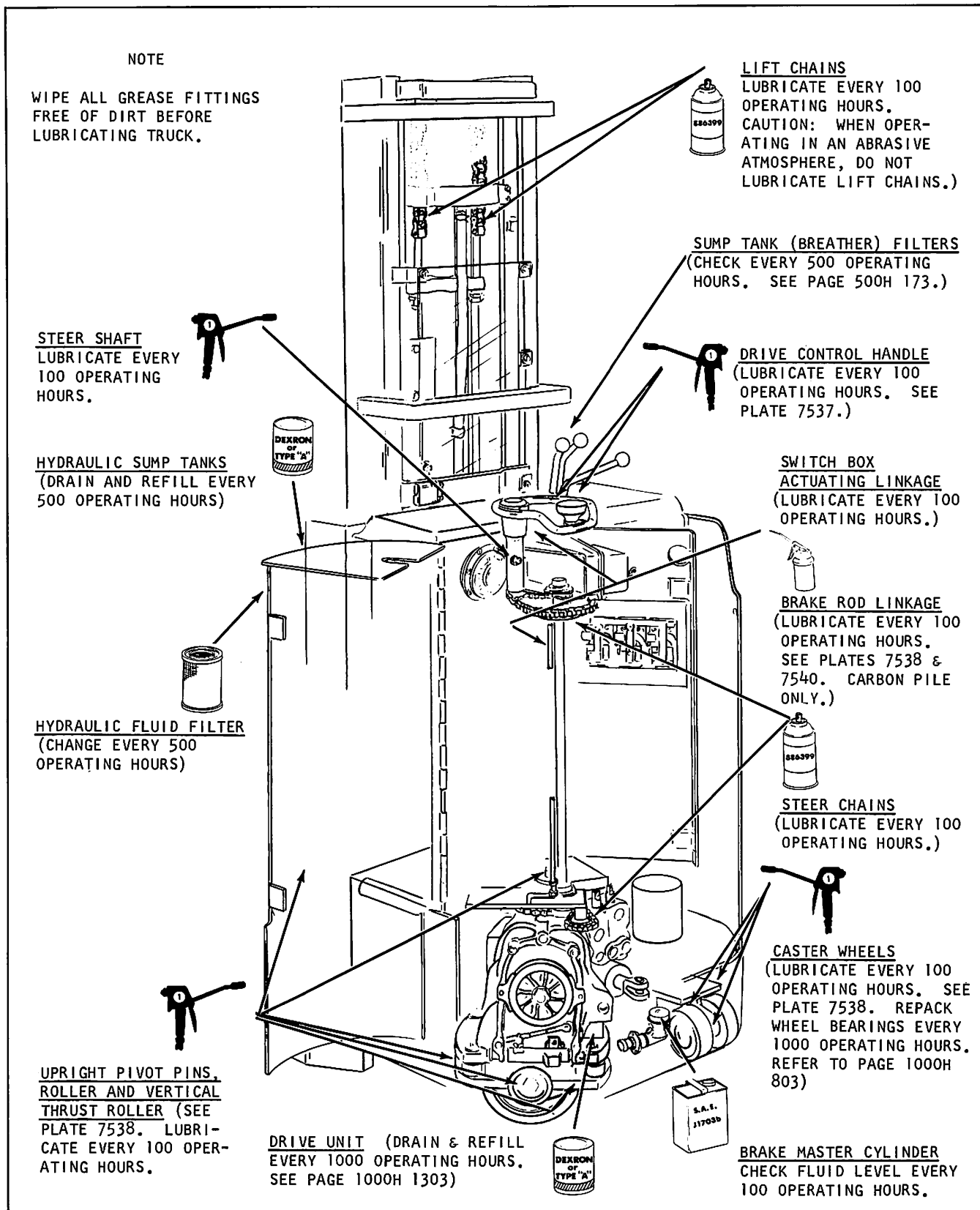
The force required to separate the normally closed tips is 4 oz. (measured at the tips).

The force required to separate the normally open tips is 1-3/4 pounds (measured at tips).

The force required to seat the normally open tips is 4-1/2 pounds (measured at the armature).

NOTE

WIPE ALL GREASE FITTINGS FREE OF DIRT BEFORE LUBRICATING TRUCK.



STEER SHAFT
LUBRICATE EVERY 100 OPERATING HOURS.

HYDRAULIC SUMP TANKS
(DRAIN AND REFILL EVERY 500 OPERATING HOURS)

HYDRAULIC FLUID FILTER
(CHANGE EVERY 500 OPERATING HOURS)

UPRIGHT PIVOT PINS, ROLLER AND VERTICAL THRUST ROLLER (SEE PLATE 7538. LUBRICATE EVERY 100 OPERATING HOURS.

DRIVE UNIT (DRAIN & REFILL EVERY 1000 OPERATING HOURS. SEE PAGE 1000H 1303)

LIFT CHAINS
LUBRICATE EVERY 100 OPERATING HOURS. CAUTION: WHEN OPERATING IN AN ABRASIVE ATMOSPHERE, DO NOT LUBRICATE LIFT CHAINS.)

SUMP TANK (BREATHER) FILTERS
(CHECK EVERY 500 OPERATING HOURS. SEE PAGE 500H 173.)

DRIVE CONTROL HANDLE
(LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATE 7537.)

SWITCH BOX ACTUATING LINKAGE
(LUBRICATE EVERY 100 OPERATING HOURS.)

BRAKE ROD LINKAGE
(LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATES 7538 & 7540. CARBON PILE ONLY.)

STEER CHAINS
(LUBRICATE EVERY 100 OPERATING HOURS.)

CASTER WHEELS
(LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATE 7538. REPACK WHEEL BEARINGS EVERY 1000 OPERATING HOURS. REFER TO PAGE 1000H 803)

BRAKE MASTER CYLINDER
CHECK FLUID LEVEL EVERY 100 OPERATING HOURS.

Plate 9494. Typical Lubrication Chart

GREASE FITTINGS

NLGI #1 per MS-107B
(an EP Grease #1 or #2)



MISCELLANEOUS LINKAGE

Engine Oil ... S.A.E. #20



**DRIVE UNIT and
HYDRAULIC RESERVOIR**

DEXRON AUTOMATIC TRANS-
MISSION FLUID or Type "A",
Suffix "A" ATF (AQA-Armour
Qualified) as available.



HYDRAULIC BRAKE FLUID

Use only Heavy-Duty Brake Fluid
which meets the requirements of
S.A.E. J1703b.



LIFT CHAIN LUBE

Clark Part No. 886399



OIL FILTER CARTRIDGE KIT

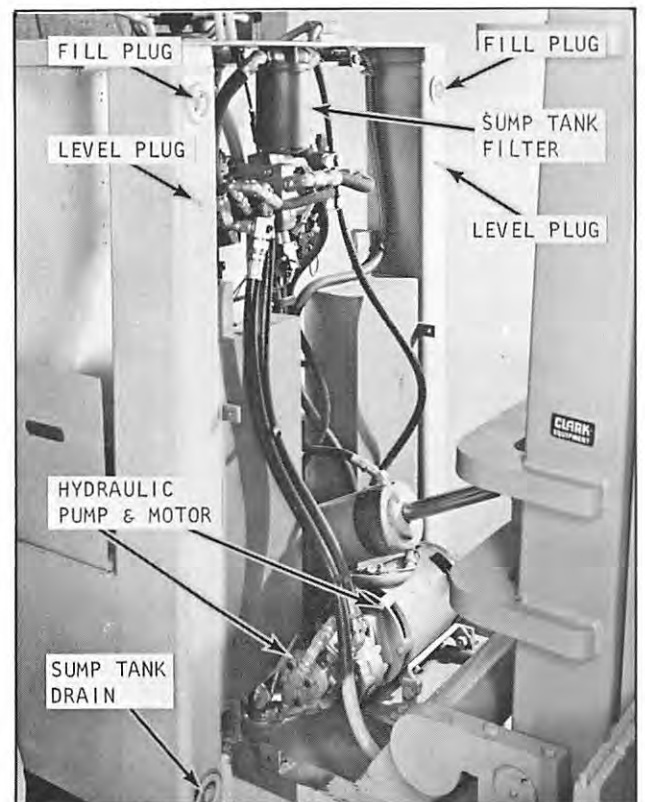


Plate 8274. Typical Hydraulic System

CONFIDENTIAL - SECURITY INFORMATION

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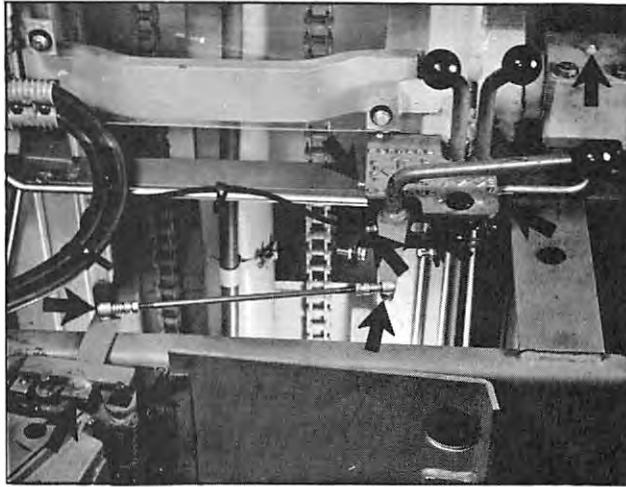


Plate 7537. Drive Control Handle Lubrication. Two grease fittings; all moving parts to be lubricated, sparingly, with S.A.E. number 20 engine oil.



Plate 9491. Typical Hydraulic Filter
Hydraulic Filter Location

On earlier models the hydraulic filter is located on the underside of the machine.

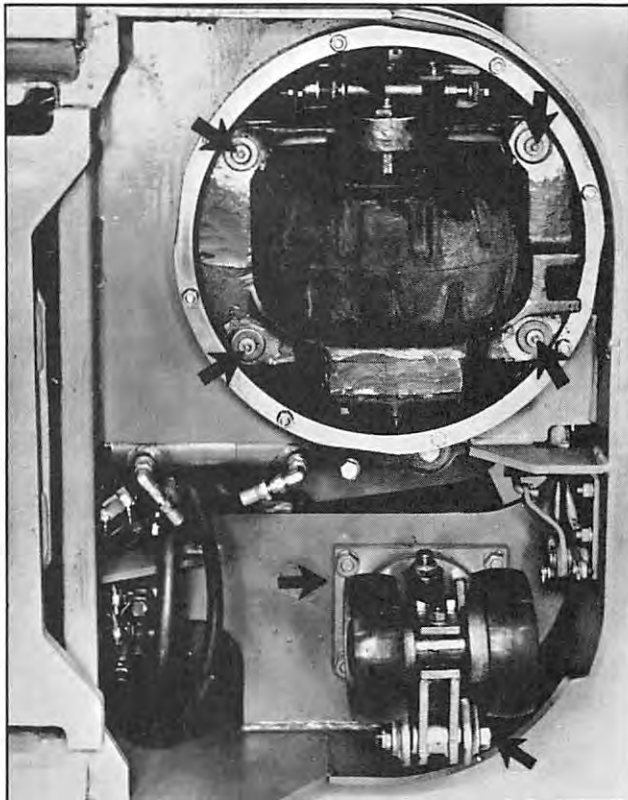


Plate 7538. Caster, Radial Roller and Wheel Shaft, Lubricate all grease fittings per Lube Chart. Lubricate brake linkage only, DO NOT LUBRICATE BRAKE, with S.A.E. number 20 engine oil every 100 operating hours.

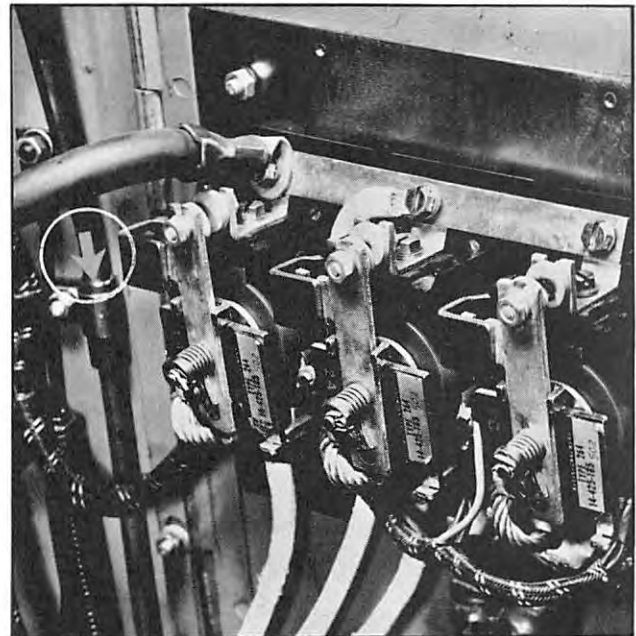


Plate 7540. Brake Rod Linkage. Lubricate with S.A.E. number 20 engine oil.

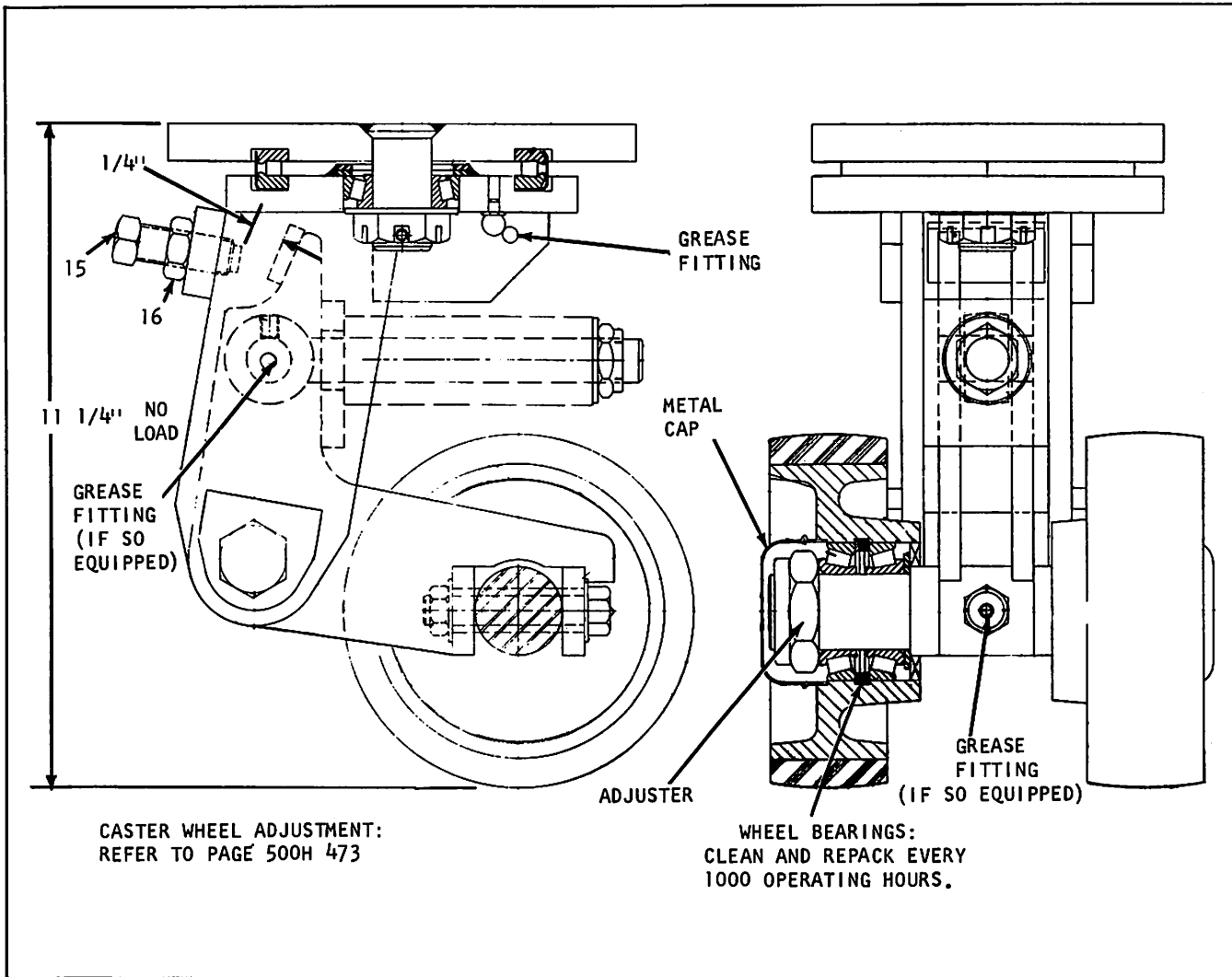


Plate 7529. Typical Caster Wheel Assembly

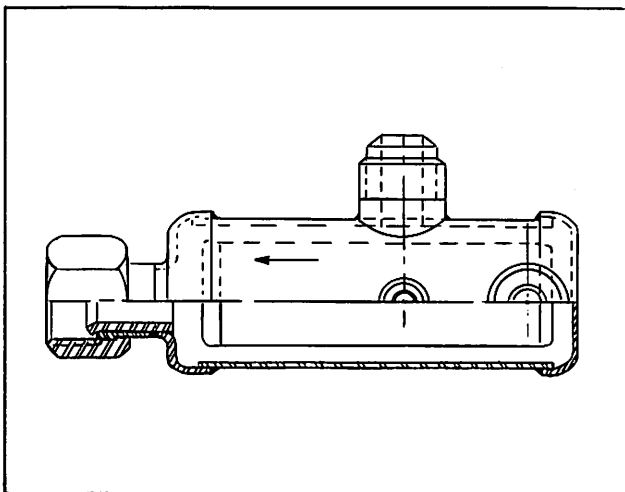


Plate 9446. Typical Hydraulic Fluid Filter

CASTER LUBRICATION

Lubricate casters at grease fitting with NLGI #2 (Amolith grease EP #2 or its equivalent).

FILTER CLEANING

Clean every 100 operating hours by immersing in solvent and blowing out with air. Blow air in nut end (against direction of arrow).

NOTE

Filter to be of 100 mesh screen.

LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(A/B) ENGINE CRANKCASE OIL
FOR ... MISCELLANEOUS LINKAGE



TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

(C) TRANSMISSION LUBRICANT
FOR ... STANDARD MANUAL SHIFT
(SYNCHROMESH) TRANSMISSIONS
AND GEAR BOXES.

SPECIFICATION Regular type gear
lubricant of straight mineral gear
oil for API GL-1 Service per SAE
Report J308a. ("EP" lubricants
are not approved.)

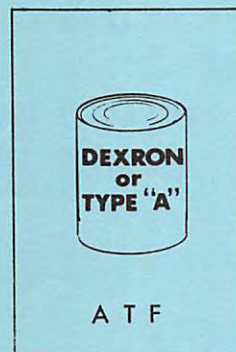


Chevron RPM Gear Oil
Shell Dentax 90 Gear Oil
Sunoco Gear Oil
ARCO Mineral Gear Oil
Gulf Transmission Oil
AMOCO Gear Lubricant
Citgo Regular Gear Oil
Texaco Thuban 90
Mobilube C Gear Oil
Molub-Alloy Trans., Gear Lube
...or the equivalent to the above.

ABOVE 0 deg F. - SAE #90
BELOW 0 deg F. - SAE #80

(D) TRANSMISSION FLUID

FOR ...
...POWRSHIFT FORWARD & REVERSE UNIT
...POWRWORKER HYDRAULIC SYSTEMS
...POWER STEERING RESERVOIRS
...POWRSHIFT TRANSMISSIONS
...HYDRACOO (WET) CLUTCH TRANS.
...HYDRATORC TRANSMISSION
...AUTOMATIC TRANSMISSION
...FLUID COUPLING DRIVES
...TORQUE CONVERTERS
...ELECTRIC TRUCK DRIVE UNITS*
... (WHEN SPECIFIED ON LUBE CHARTS*)
...NARROW AISLE TRUCK HYDRAULIC SYS.



Shell Auto. Trans. Fluid Donax T-6,
Dexron.
Sunoco Auto. Trans. Fluid, Dexron.
ARCO Auto. Trans. Fluid, Dexron.
Gulf Auto. Trans. Fluid, Dexron.
Mobil Auto. Trans. Fluid 220
Dexron.
Texaco 1859 Texamatic Fluid,
Dexron.
Citgo Auto. Trans. Fluid, Dexron.
AMOCO Auto. Trans. Fluid, Dexron.
...or the equivalent to the above.

SPECIFICATION USE DEXRON AUTO-
MATIC TRANSMISSION FLUID or Type
"A", Suffix "A" ATF (AQA-Armour
Qualified) as available.

LUBRICATION SPECIFICATIONS

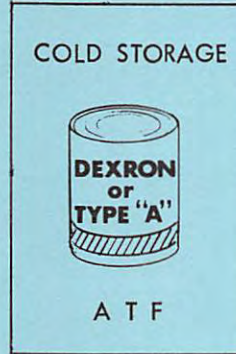
LUBRICATION CHART KEY

(D) TRANS. FLUID - continued -
DRIVE UNIT FLUID

FOR ... -COLD STORAGE OPERATION-

FOR ... DRIVE UNIT(S)
NARROW AISLE TRUCKS
POWRWORKERS
ELECTRIC RIDER TRUCKS

SPECIFICATIONS Refer to Specifica-
tions listed under Item 'D' on the
previous page.



TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

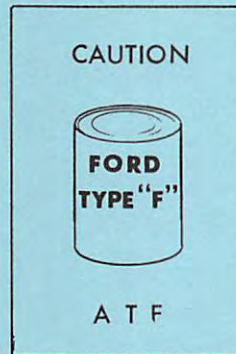
Refer to the previous page
under Item 'D'.

(E) TRANSMISSION FLUID - FORD

FOR ... ALL FORD AUTOMATIC TRANS-
MISSIONS AND CONVERTERS.

SPECIFICATIONS Automatic Trans.,
Fluid, Type 'F', which meets
FORD MOTOR COMPANY Specification:

M2C33E (UNDYED) -or-
M2C33F (RED DYED)



Shell Auto. Trans. Fluid
Donax T-7, Type 'F'.
Sunoco Auto. Trans. Fluid,
Type 'F'.
ARCO Auto. Trans. Fluid, Type 'F'.
Gulf Auto. Trans. Fluid, Type 'F'.
Citgo Auto. Trans. Fluid, Type 'F'.
Texaco 1876 Texamatic Fluid,
Type 'F'.
Mobil Auto. Trans. Fluid 210,
Type 'F'.
...or the equivalent to the above.

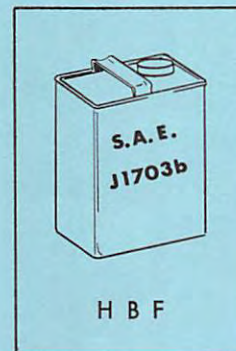
C A U T I O N

DEXRON AND TYPE 'A' FLUIDS ARE NOT COMPATIBLE WITH TYPE 'F' FLUIDS AND SHOULD NOT BE MIXED. DEXRON FLUID OR TYPE 'A' FLUID SHOULD NOT BE USED IN THESE TRANSMISSIONS AND CONVERTERS ... (CTA 'E' MODELS) ... TO DO SO WILL RUIN CLUTCH DISC FACINGS.

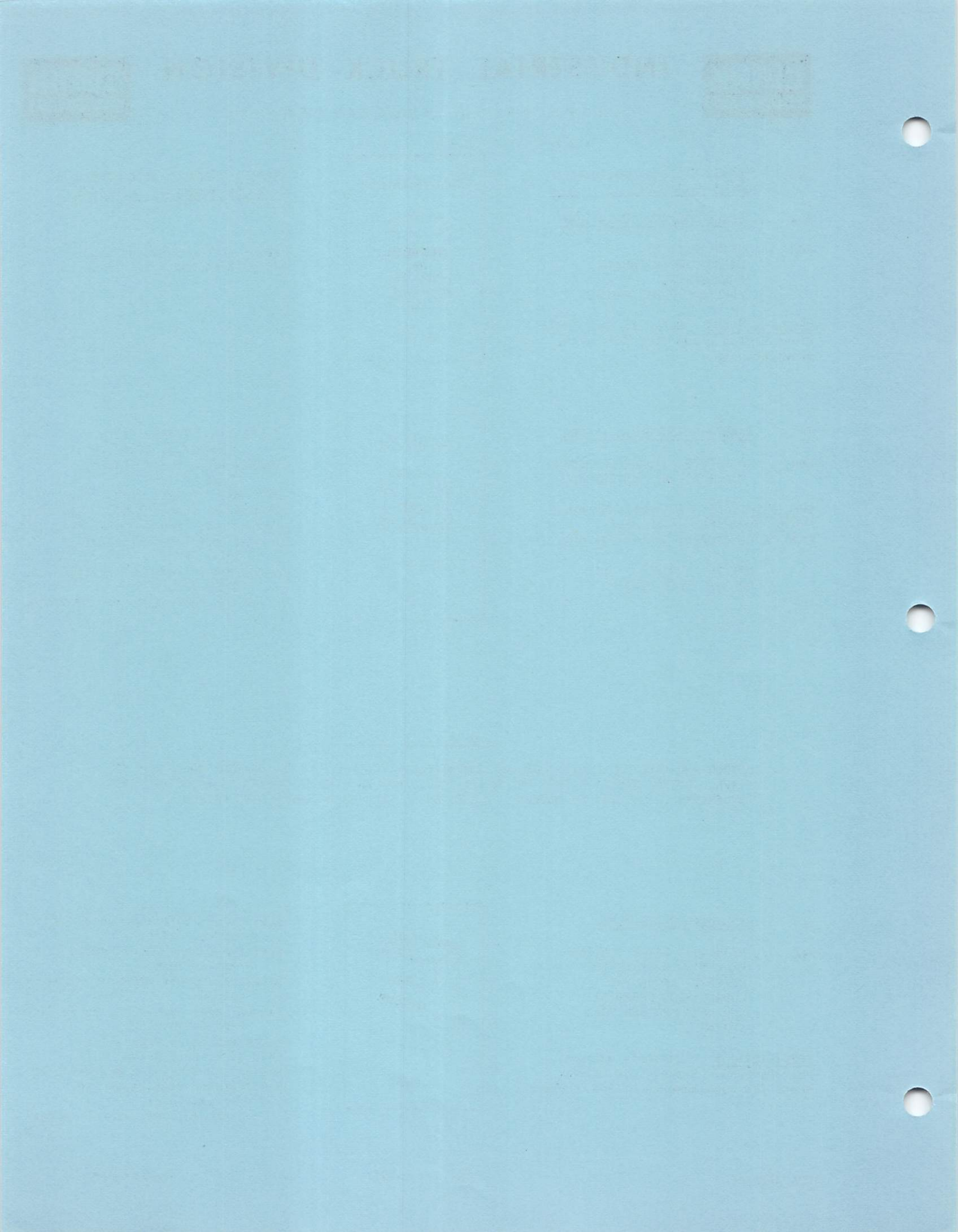
(F) HYDRAULIC BRAKE FLUID

FOR ... HYDRAULIC BRAKE SYSTEMS
EXCEPT WHEN SPECIFIED
DIFFERENTLY ON THE
LUBRICATION CHART(S)
AND NOT USED FOR COLD
STORAGE.

SPECIFICATION Use only heavy-
duty Hydraulic Brake Fluid which
meets the requirements of SAE J1703b.



Shell Super Safety or Donax 'B'
Brake Fluid.
Gulf Super Heavy Duty Hydraulic
Brake Fluid.
Atlas Heavy Duty Hydraulic Brake
Fluid.
Texaco Super Heavy Duty Hydraulic
Brake Fluid.
Mobil Hydraulic Brake Fluid.
ARCO Heavy Duty Brake Fluid.
Wagner 21B Hydraulic Brake Fluid.
Hollingshead 2665 Heavy Duty
Brake Fluid.
...or the equivalent to the above.



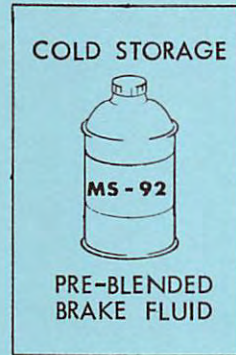
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(F) HYDRAULIC BRAKE FLUID
 FOR ... -COLD STORAGE OPERATION-
 FOR ... ALL HYDRAULIC BRAKE SYSTEMS
 EXCEPT WHEN SPECIFIED
 DIFFERENTLY ON LUBRICATION
 CHART (S).

SPECIFICATION Use Fluid per CLARK
 Specification MS-92:

Recommended fluid: 85% by volume,
 Isopropyl Alcohol: 15% by volume.



TYPICAL PRODUCT RECOMMENDED BY
 MAJOR BRAND OIL SUPPLIERS

Extreme Low Temperature Hydraulic
 Brake Fluid:

Dow Chemical Company
 (Pre-Blended
 Clark Fluid Number 300)

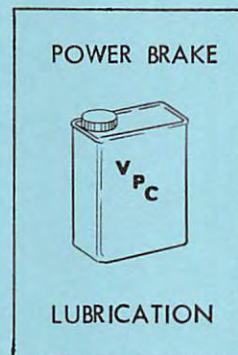
... Dow Chemical Fluid HD35-4
 ... Hollingshead Formula 2665

(G) POWER BRAKE VACUUM CYLINDER
 LUBRICANT

FOR ... BENDIX HYDROVAC UNIT

SPECIFICATION Bendix Vacuum
 Power Cylinder Oil or approved
 equivalent.

Apply after installation
 and periodic maintenance
 per instruction.



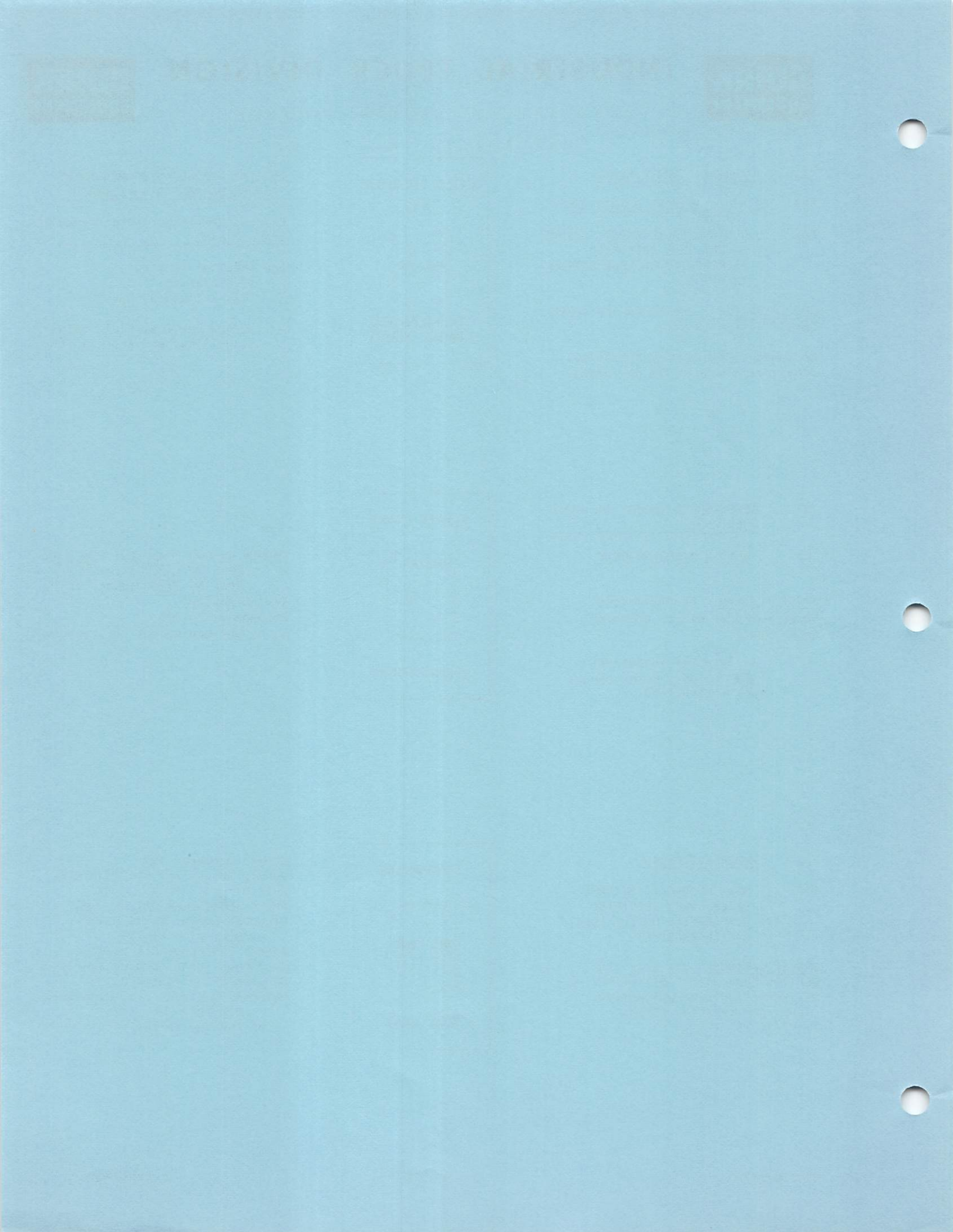
Bendix Vacuum Power Cyl Lubricant
 Part No 377299 (2 oz Tube)
 Part No 377300 (Quart Can)
 Texaco Rabtex
 AeroShell Fluid 4
 ...or the equivalent to the above.

(H) HYDRAULIC FLUID
 FOR ... MAIN HYDRAULIC SYSTEMS
 EXCEPT WHEN SPECIFIED
 DIFFERENTLY ON THE LUBRI-
 CATION CHART (S).

SPECIFICATIONS Use only high
 quality hydraulic fluid with Zinc
 Anti-Wear Additive which meets
 Clark Specification MS-68.



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 Fluid.
 Texaco 729 Rando Oil HD-A
 ARCO Duro AW-16 or Duro AWS-150
 Chevron EP Hydraulic Oil 9
 Molub-Alloy Industrial Hydraulic
 Oil #601.
 ...or the equivalent to the above.





INDUSTRIAL TRUCK DIVISION



LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(H) -continued-

TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

HYDRAULIC FLUID

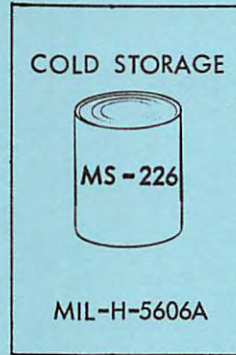
FOR ... -COLD STORAGE OPERATION-

FOR ... MAIN HYDRAULIC SYSTEMS
EXCEPT WHEN SPECIFIED
DIFFERENTLY ON THE LUBRI-
CATION CHART(S).

SPECIFICATIONS Use Hydraulic
Fluid which meets MIL-H-5606A
per CLARK Specification MS-226.

A petroleum base hydraulic fluid
with additives to improve viscosity
index, oxidation resistance, and
anti-wear characteristics blended
to form a stable product under
storage and operational conditions
between -65 and +160 deg. F. meet-
ing MIL-H-5606A* per CLARK
Specifications MS-226.

*The restrictive
cleanliness specifica-
tions of later revisions
is not required.



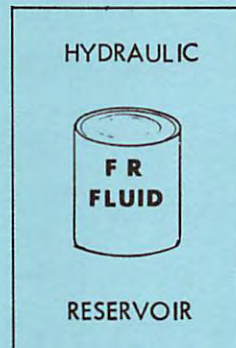
Shell Product #60421
AeroShell Hydraulic Fluid 4
...or the equivalent to the above.

HYDRAULIC FIRE RESISTANT FLUID

FOR ... SPECIAL APPLICATIONS

FOR ... MAIN HYDRAULIC SYSTEMS
EXCEPT WHEN SPECIFIED
DIFFERENTLY ON THE LUBRI-
CATION CHART(S).

SPECIFICATIONS High quality
Water-Glycol Fire Resistant
Hydraulic Fluid composed of
approximately 42% water and
58% glycol with a nominal
viscosity of 200 SUS at 100F.
Pour point -60 deg. F min.
To contain proper additive
balance to impart optimum
stability, lubricity, wear and
corrosion protection. Approved
by Factory Mutual Insurance
Underwriters.



Citgo Pacemaker Glycol - FR
Fluid, Grade 20.
Houghto-Safe 620
Texaco Hydraulic Safety Fluid 200
...or the equivalent to the above.

NOTE

For data pertaining
to the "testing" of
Water-Glycol ...
refer to the last
page of this KEY.



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LAURENCE





INDUSTRIAL TRUCK DIVISION



LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(J) DRIVE AXLE GEAR LUBRICANT:

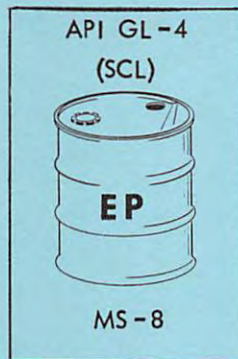
FOR: ... DRIVE AXLES,
HEAVY DUTY DIFFERENTIALS,
PLANETARY WHEEL ENDS.

SPECIFICATIONS: Extreme pressure type gear lubricant with sulfur-chlorine-lead (SCL) 'EP' additive for API GL-4 Service per SAE Report J308a. To meet CLARK Specification MS-8.

Below 0 to -10 de F -- SAE 80
Normal Temperature -- SAE 90
100 deg F and above -- SAE 140

NOTE

SAE 80 and SAE 140 viscosities, when used, should contain like additives as specified by MS-8 (SAE 90). DO NOT ADD (MIX) DIFFERENT TYPES OF LUBRICANT.



TYPICAL PRODUCT RECOMMENDED BY MAJOR BRAND OIL SUPPLIERS

Shell HDR Gear Oil 90 EP
Shell HDR Gear Oil 140 EP
Chevron RPM Special Gear Lube SCL
Sunoco XD Gear Lubricant
Gulf Hypoid Gear Lubricant A.P.T.
AMOCO Superla Gear Lubricant
Citgo Gear Oil Lead Base
Texaco Gear Lube HD 90
Molub-Alloy Drive Axle Lube #518
Mobilube 46
ELCO Gear Safety 28
...or the equivalent to the above.

(K) GENERAL PURPOSE GREASE:

FOR: ... CLARK AXLE ENDS
WHEEL BEARINGS
STEERING GEARS
JOINTS, LEVERS & BUSHINGS
POWRORKER and NARROW
AISLE TRUCKS - ALL POINTS

SPECIFICATIONS: NLGI #1 per MS-107B

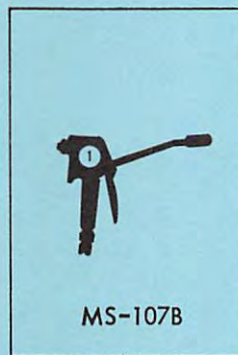
GENERAL PURPOSE GREASE:

FOR: ... STEER AXLE TRUNNION BRGS.
UPRIGHT MAST ROLLERS &
SLIDES,
UNIVERSAL JOINTS,
WATER PUMP BEARINGS,
GENERAL CHASSIS LUBRICATION.

SPECIFICATIONS: NLGI #2 per MS-107C

A multi-purpose grease of refined mineral oil blended with a lithium soap thickener or equal containing anti-wear, anti-rust and anti-oxidants with EP additives.

Clark Specification:
MS-107B - Grade No. 1
MS-107C - Grade No. 2



Shell Alvania EP Grease #1 or #2
Sun Prestige 741 EP #1 or #2
Gulfcrown Grease EP #1 or #2
AMOLITH GREASE EP #1 or #2
Citgo HEP Grease #1 or #2 or
Citgo AP Grease.
Texaco Multifak EP #1
or Marfak ALL Purpose #2.
Molub-Alloy General Purpose
Grease #1 or #2.
ARCO Litholine Ind. Grease #2 EP
or Litholine EP #2 Grease.
Mobilgrease 76 or 77
...or the equivalent to the above.

REFER TO THE ABOVE FOR RECOMMENDED SUPPLIERS.

ADDITIONAL RECOMMENDATIONS

- *Chevron BRB-2
- *Shell AeroShell Grease 5
- *Recommended for Water Pumps and Universal Joints.



INDUSTRIAL TRUCK DIVISION

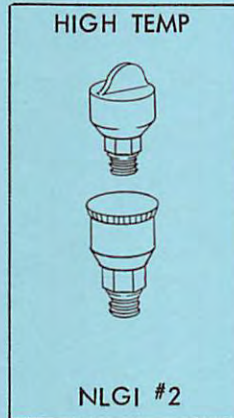


(L) HIGH TEMPERATURE GREASE

FOR ... CLUTCH THROWOUT BEARINGS
CLUTCH PILOT BEARINGS
DYNATORK PILOT BEARINGS

SPECIFICATIONS A high temperature grease of refined mineral oil base with a lithium soap thickener or equal compounded with additives to give high load-carrying ability and resistance to water and high temperature. To withstand temperatures of -20 deg F (to) +300 deg F. NLGI Grade No. 2.

Reference Specification:
(For typical product.)
MIL-G-3545C



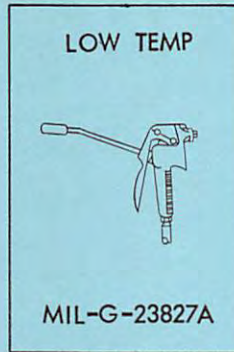
TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

Shell AeroShell Grease #5
Gulfcrown Grease EP #2
AMOLITH Grease EP #2
Citgo HEP Grease #2 or
Citgo AP Grease.
Texaco High Temperature Grease
1999 #2.
Mobilgrease 28
...or the equivalent to the above.

(M) LOW TEMPERATURE GREASE

FOR ... -COLD STORAGE OPERATION-

FOR ... GENERAL CHASSIS GREASE
UPRIGHT MOUNTING
UPRIGHT LIFT CHAINS
ALL MOVABLE PARTS EQUIPPED
WITH GREASE FITTINGS,
BRAKE (AND CLUTCH) PEDAL
LINKAGE.
(Narrow Aisle Trucks and
Powrworkers)
DRIVE UNIT FITTINGS
PANTOGRAPH
CASTER WHEELS
STEER CHAIN
LOAD WHEELS WITH FITTINGS



SPECIFICATION An extreme low temperature aircraft quality grease meeting Specification MIL-G-23827A, or equivalent product. Temperature range -100 to +250 deg F.

Texaco #2346 Low Temperature
Grease "EP".
American Oil SUPERMIL
Grease A-72832.
...or the equivalent to the above.

(N) SPECIAL GREASE

FOR ... STRADDLE CARRIERS
EQUALIZING LINKAGE
HOOK & HANGER BUSHINGS
HOIST MECHANISM

SPECIFICATIONS A smooth high quality grease of refined mineral oil base with a lithium soap thickener or equal compounded with corrosion and oxidation inhibitors and containing 1 to 3% moly (molybdenum disulfide).
NLGI #2



American Molyolith Grease #92006
Molub-Alloy General Purpose
Grease #2.
Molytex #2
...or the equivalent to the above.



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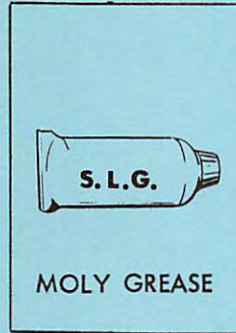
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(N) SPECIAL GREASE - continued -

FOR: ... DISTRIBUTOR CAMS

SPECIFICATION: Refer to previous page.



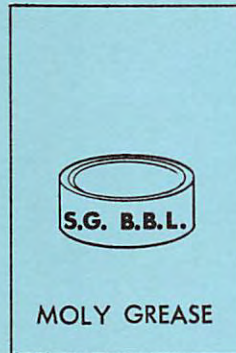
TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

Clark Part Number: 1800636

SPECIAL GREASE - continued -

FOR: ... DELCO STARTER BEARINGS

SPECIFICATION: Refer to previous page.



Clark Part Number: 1800574

(P) SPECIAL GREASE:

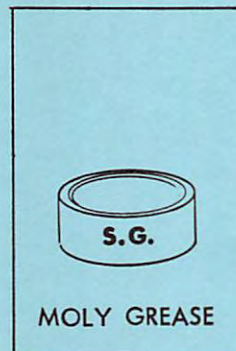
FOR: ... GENERATOR PUMP DRIVE TANG
PUMP & MOTOR SHAFT SPLINES

SPECIFICATIONS: A lithium base or equal multi-purpose grease blended with selected additives to provide high load-carrying capacity with superior protection against corrosion and high-temperature oxidation and containing 3 (to) 5% moly (molybdenum disulfide).

NLGI #2

N O T E

Grease products under this specification are suitable for use on ball and roller bearings operating under extreme loads or in severe environments, and for extended lubrication intervals including chassis, sleeve bearings, cams and sliding mechanisms, etc., under heavy loads, shock and vibration.



Clark Part Number: 1800531



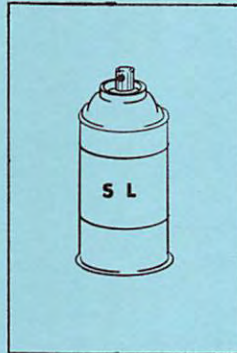
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(R) SPECIAL LUBRICANT

FOR ... CLUTCH THROWOUT BEARING-CARRIER RAILS

SPECIFICATION Use an approved Dry Film Type Lubricant or the equivalent.



TYPICAL PRODUCT RECOMMENDED BY MAJOR BRAND OIL SUPPLIERS

Graph-O-Kote #220 (Aerosol-can)
(Joseph Dixon, Crucible Company,
Jersey City, N.J.)

Molub-Alloy #369 Dry Lube.

Dow Corning Molykote 321
Bonded Lubricant

...or the equivalent to the above.

(S) COLD STORAGE OPERATION

FOR ... ELECTRICAL SWITCHES AND TERMINALS.
- ELECTRIC RIDER TRUCKS -

FOR ... SOLID STATE CONTROL EQUIPPED TRUCKS.

SPECIFICATION Spray Coating



Krylon, Inc.,
Norristown, Pa. -6412-

Sprayon 707 PDRP
26300 Fargo Avenue
Bedford, Ohio -44146-

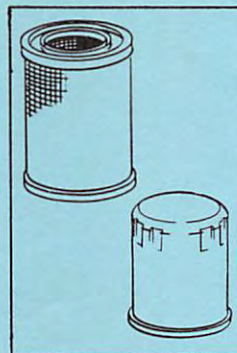
...or the equivalent to the above.

(‡) OIL & FLUID FILTERS

FOR ... TRUCK SYSTEM(S)

SPECIFICATIONS Replacement parts to be of a quality equal to that provided in the original equipment.

‡Consult CLARK Service Parts Publication(s) for recommended replacement parts.



Oil Filter Cartridge Kit(s)
(Reference: Appropriate
Parts Manual)

INDUSTRIAL TRUCK DIVISION



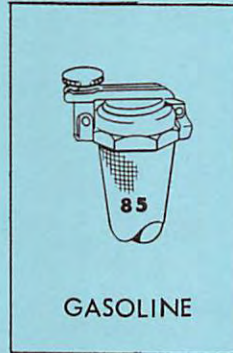
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(T) ENGINE FUEL - GASOLINE
FOR ... INDUSTRIAL GASOLINE ENGINES

SPECIFICATIONS Fuel to be Auto-
motive Quality Regular Grade
Gasoline containing a corrosion
inhibitor.

Minimum Motor Octane
Number - 85



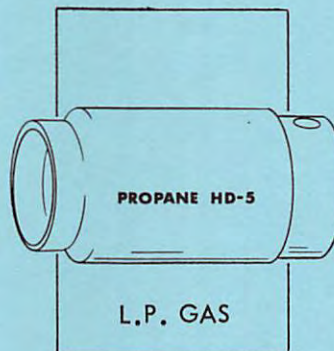
TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

Shell Regular Gasoline
Sunoco 200 Gasoline
Good Gulf Gasoline
American Regular Gasoline
Citgo Regular Gasoline
Texaco Firechief Gasoline
ARCO Gasoline Regular
Mobil Gasoline Regular
...or the equivalent to the above.

(U) ENGINE FUEL - L.P.GAS
FOR ... INDUSTRIAL L.P.GAS
POWERED ENGINES

SPECIFICATIONS Use LPG meeting
PROPANE HD-5 (NGPA Specification
2140-62) or ASTM D2154 (Special
Duty Propane) requirements.

Minimum Motor Octane
Number - 95



Citgo L.P. Gas (HD-5)
Texaco 436 Propane
...or the equivalent to the above.

(V) ENGINE FUEL - DIESEL
FOR ... INDUSTRIAL DIESEL
POWERED ENGINES

SPECIFICATIONS Fuel to be Auto-
motive Quality Diesel Fuel Oil as
defined by ASTM D975, Grades
No. 1-D and 2-D, and having a
Sulfur Content of less than 0.5%
weight.

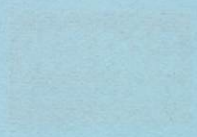
Recommended Cetane
Number - 45 Minimum



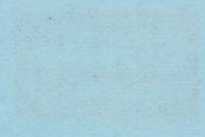
Shell Premium Dieseline OR45
Sun Diesel Fuel 245-T
ARCO Premium Diesel
ARCO Diesel #1 and #2
Gulf Diesel Fuel #1 or #2
AMOCO Diesel Fuel #1D and American
Premier Diesel Fuel #2D
Citgo Diesel Fuel #1 or #2
Texaco Diesel Chief #1
Mobil Fuel Diesel & Mobil Diesel
Fuel Special
...or the equivalent to the above.

NOTE

AN ASTM NO. 1-D FUEL IS PREFERRED
WHERE MINIMUM SMOKE AND ODOR IS
REQUIRED OR WHERE LIGHT LOAD AND
SPEED WITH CONSIDERABLE IDLING IS
ENCOUNTERED AND FOR COLD-WEATHER
USE GENERALLY.






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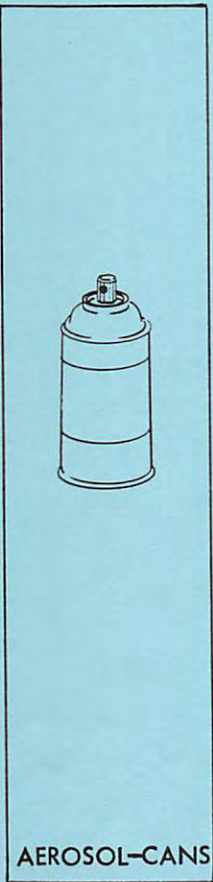


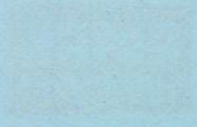
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

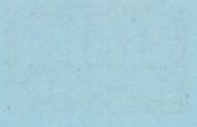
LUBRICANTS ETC., BY CLARK PART NUMBER

| PART NUMBER | DESCRIPTION |
|---|--|
| HYDRAULIC BRAKE FLUID 884677 1800200 850487 |  1 - quart can 1 - case of 16-ounce cans 1 - case of 6 one-gallon cans |
| HYDRAULIC SYSTEM FLUID 885385 885382 |  1 - case of 24 one-quart cans 1 - case of 6 one-gallon cans |
| AUTOMATIC TRANSMISSION FLUID 879803 879804 941615 |  1 - quart can 1 - case of 24 one-quart cans 1 - case of 6 one-gallon cans |
| BATTERY CLEANER 886398 | 1 - case of 12 one-pint cans |
| LUBRICANT 886396 | 1 - case of 12 one-pint cans |
| PENETRATING OIL 886397 | 1 - case of 12 one-pint cans |
| BELT DRESSING 1800078 | 1 - case of 12 one-pint cans |
| CHAIN LUBE 886399 | 1 - case of 12 one-pint cans (Roller & Leaf Chain Lube) |
| SPRAY KOTE 886784 | 1 - case of 12 16-ounce cans (Transparent Protective Insulating Sealer with Clear Lube.) |
| SPRAY LUBE 886785 | 1 - case of 12 16-ounce cans (Black Heavy-Duty "EP" Lubricant.) |
| DEGREASER 1800330 | 1 - case of 12 one-pint cans |
| CONQUER SPRAY 1801145 | 1 - case of 12 16-ounce cans |
| DEGREASER 1801146 | 1 - case of 12 16-ounce cans |





HOUGHTON MIFFLIN & COMPANY



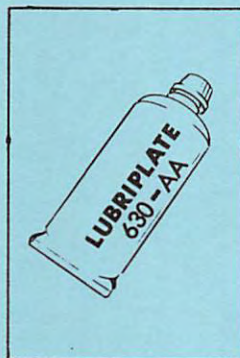
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

LUBRIPLATE

FOR ... SLIP TUBES, SLEEVES,
SPRING APPLIED SLEEVES,
LINKAGE BALL JOINTS, ETC.

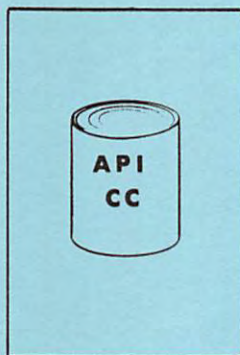
SPECIFICATION Lubriplate 630-AA
or equivalent.



Fiske Brothers Refining Company
...or the equivalent to the above.

CRANKCASE MOTOR OIL

| | |
|-----------------|---------|
| S.A.E. 10W | 1800946 |
| S.A.E. 20W | 1800990 |
| S.A.E. 30 | 1800947 |
| S.A.E. 10W - 30 | 1800948 |



1 - case of 24 one-quart cans
1 - case of 24 one-quart cans
1 - case of 24 one-quart cans
1 - case of 24 one-quart cans

TECHNICAL SOCIETIES IN REFERENCE (PREVIOUS PAGES)

| | | |
|------|-------|--|
| AGMA | ----- | American Gear Manufacturers Association |
| API | ----- | American Petroleum Institute |
| ASTM | ----- | American Society for Testing and Materials |
| EMA | ----- | Engine Manufacturers Association |
| MIL | ----- | Military Specification |
| NGPA | ----- | Natural Gas Processors Association |
| NLGI | ----- | National Lubricating Grease Institute |
| SAE | ----- | Society of Automotive Engineers |

INDUSTRIAL TRUCK DIVISION



INDUSTRIAL TRUCK DIVISION



LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

PRODUCTS IN REFERENCE

AMERICAN OIL COMPANY
STANDARD OIL DIVISION

AMOCO
Amolith
Molyolith

SHELL OIL COMPANY

Rotella, Rotella T Motor Oil
Rimula Motor Oil
Dentax Gear Oil
Spirax Gear Lubricant
Alvania Grease
AeroShell

ATLANTIC RICHFIELD COMPANY

ARCO

SUN OIL COMPANY

CHEVRON OIL COMPANY

Chevron Products

Sunfleet Motor Oil
Sunoco Products
Sun Prestige
Sunvis Oil

CITIES SERVICE OIL COMPANY

Citgo Products

THE ELECO CORPORATION

ELCO

GULF OIL CORPORATION

Gulf Products
Gulfcrown

TEXACO, INC

Texaco Havoline or URSA
Thuban
Texamatic
Molytex

IMPERIAL OIL & GREASE COMPANY., INC

Molub-Alloy

MOBIL OIL CORPORATION

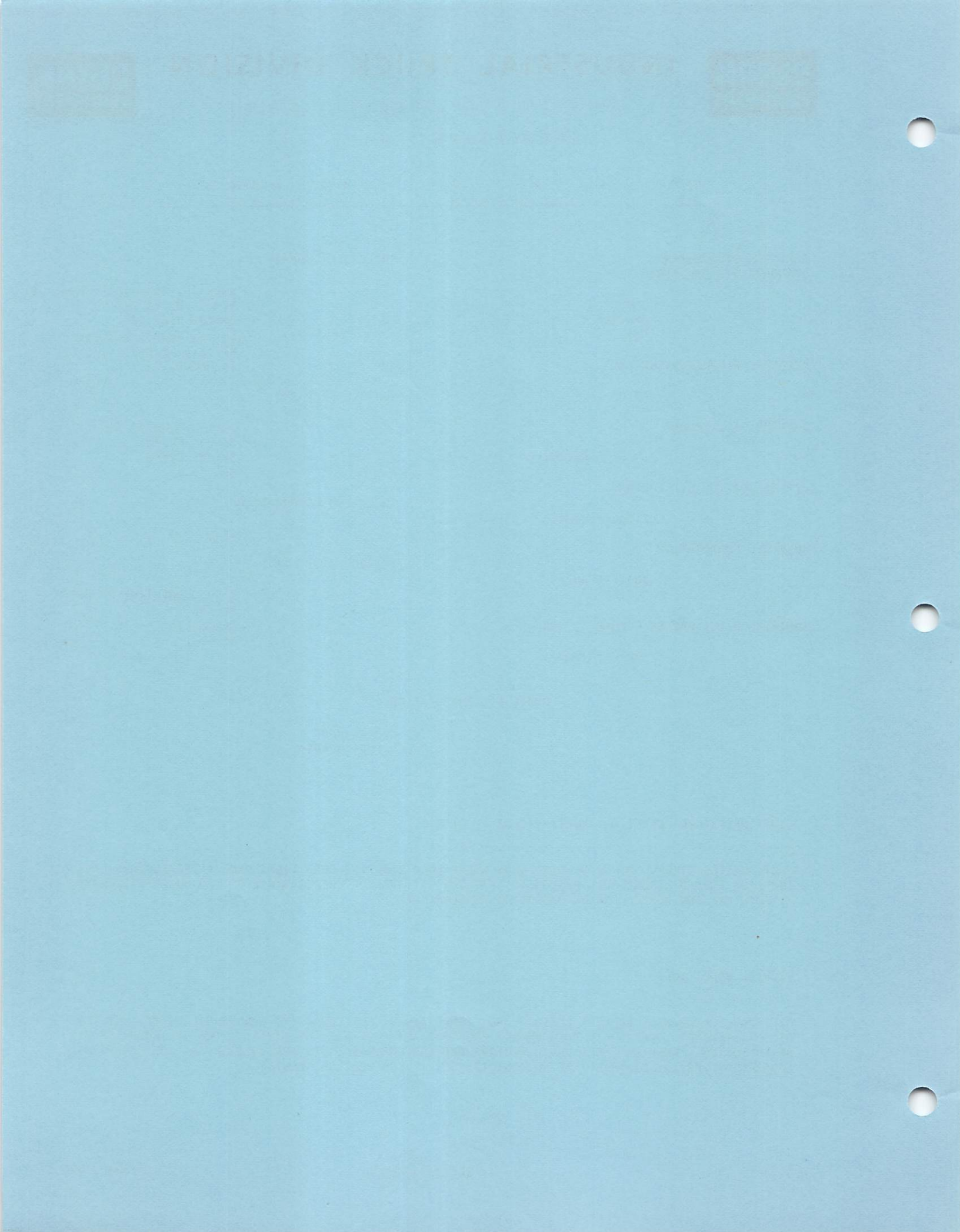
Mobilube
Mobilgrease

LOW TEMPERATURE OPERATION (MULTI-VISCOSITY OILS)

MULTI-VISCOSITY OIL SHOULD BE USED ONLY WHERE COLD STARTING CONDITIONS MAKE IT NECESSARY. THE OIL SUPPLIER SHOULD ASSUME FULL RESPONSIBILITY FOR SATISFACTORY PERFORMANCE OF THE MULTI-VISCOSITY OIL AT BOTH LOW AND NORMAL ENGINE OPERATING TEMPERATURES.

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.





INDUSTRIAL TRUCK DIVISION



LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

Reference: HYDRAULIC FIRE RESISTANT FLUID (SPECIAL APPLICATIONS)
Ref. Specification(s): 871-L-224-1971 Water-Glycol

THE FOLLOWING "TEST PROCEDURE" WAS DEVELOPED BY CITGO ... BE SURE TO REQUEST "TEST PROCEDURE(S)" FROM THE SUPPLIER OF THE PRODUCT USED IN YOUR EQUIPMENT.

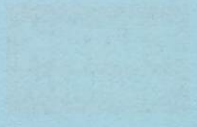
The Cities Service Research and Development Department has developed a simple and rapid method for determining the alkalinity level of CITGO Pacemaker Glycol-FR Fluid. This procedure is based on the use of Quantab B001, an indicating device calibrated to permit the direct determination of free alkalinity present in the fluid. Quantabs are available from Ames Company, Inc, Elkhart, Indiana.

CITIES SERVICE TEST PROCEDURE -- CONTROL OF FREE ALKALINITY

1. Measure 90 ml. of distilled water into a 100 ml. graduate.
2. Add 10 ml. of the CITGO Pacemaker Glycol-FR Fluid from the system to be tested. This measurement should be accurate in order to assure proper alkalinity readings.
3. Stopper the graduate and shake well for approximately 30 seconds.
4. Place approximately 10 ml. of the diluted fluid into a small (150 ml.) beaker or other suitable receptacle.
5. Remove the end tab from a Quantab B001 indicator and place the Quantab into the beaker with the 10 ml. sample of diluted fluid.
6. After the fluid has wetted the entire column (about 15 to 20 minutes) read the height of the color alternation on the Quantab as shown by a change from blue to green opposite the Quantab scale.
7. If the Quantab scale reading is 3.2 or above, no alkalinity adjustment is required; if the scale reading is below 3.2, add 1 quart of morpholine for each 50 gallons of fluid in the system.

An alkalinity check should be made twenty-four hours after the water content or alkalinity of the fluid is adjusted. Alkalinity levels should be checked frequently during the first month after a system has been converted to CITGO Pacemaker Glycol-FR Fluid. Thereafter, a regular schedule for checking alkalinity should be set up depending on experience and the needs of the system.

Control of alkalinity by direct measurement of the pH of the system fluid is not recommended. Where laboratory facilities are available the free alkalinity of CITGO Pacemaker Glycol-FR Fluid may be measured by electrometric titration. A sample of fluid from the system is diluted with distilled water and titrated to a pH of 6.3 with standardized 0.1N HCL. If the milliequivalents per liter of HCL is below 60, one quart of morpholine should be added for each 50 gallons of fluid in the system. The control valve of "60" in this procedure corresponds to the 3.2 scale reading of the Quantab B001 indicator in the Cities Service Test Procedure.



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INDUSTRIAL TRUCK DIVISION



WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

**GIVE MACHINE SERIAL NUMBER
WHEN ORDERING PARTS**

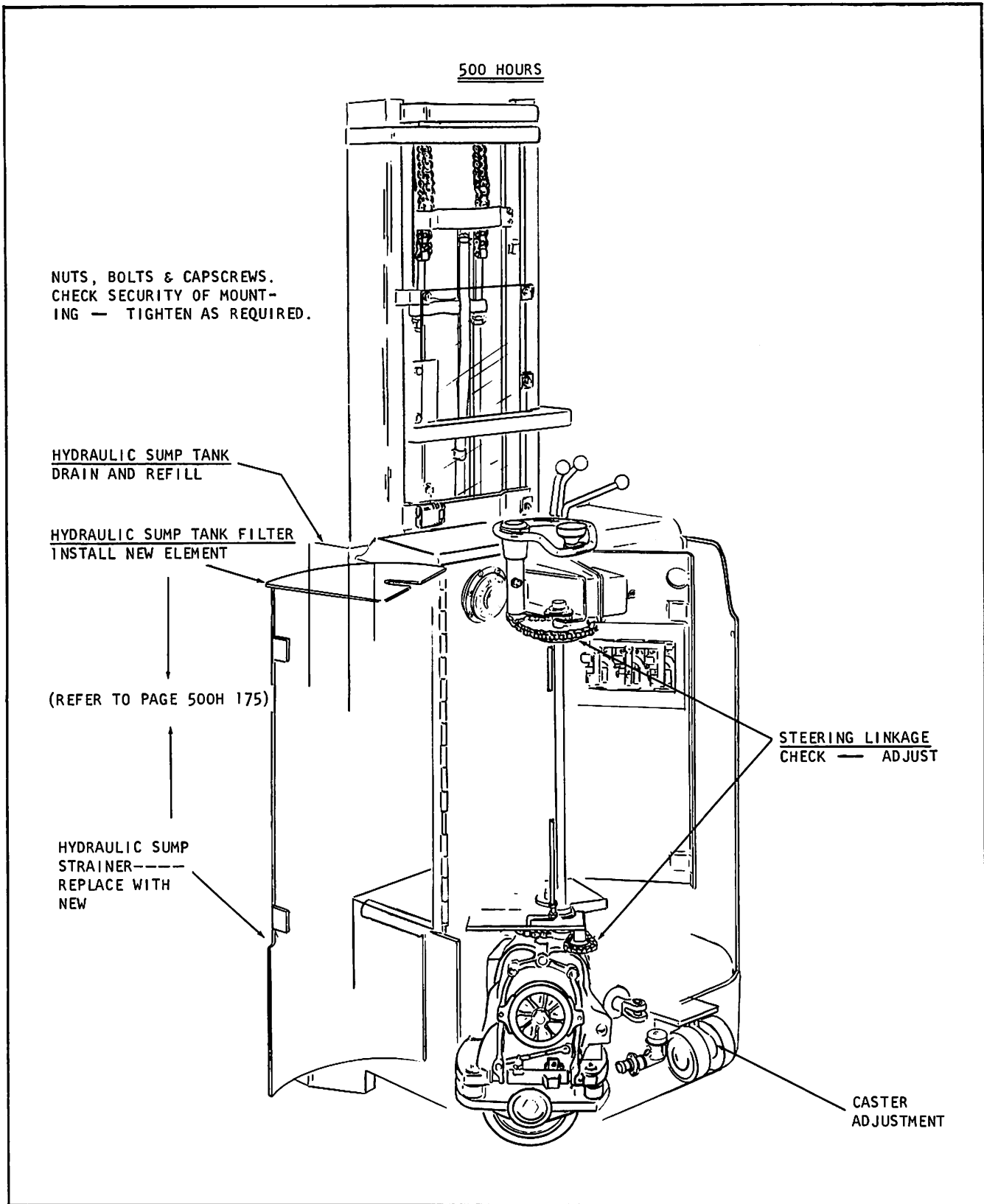


Plate 8272. Lubrication & Preventive Maintenance Illustration

DRAIN SUMP TANKS CHANGE FILTER: CHECK BREATHER AND REPLACE WITH NEW IF NECESSARY.

CAUTION

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

1. Lower forks to the floor.
2. Turn switch key 'off'.
3. Place a container under each drain plug (of the hydraulic sump tanks located in the frame at each side of the upright), see Plate 8275.
4. Remove drain plugs and drain fluid.

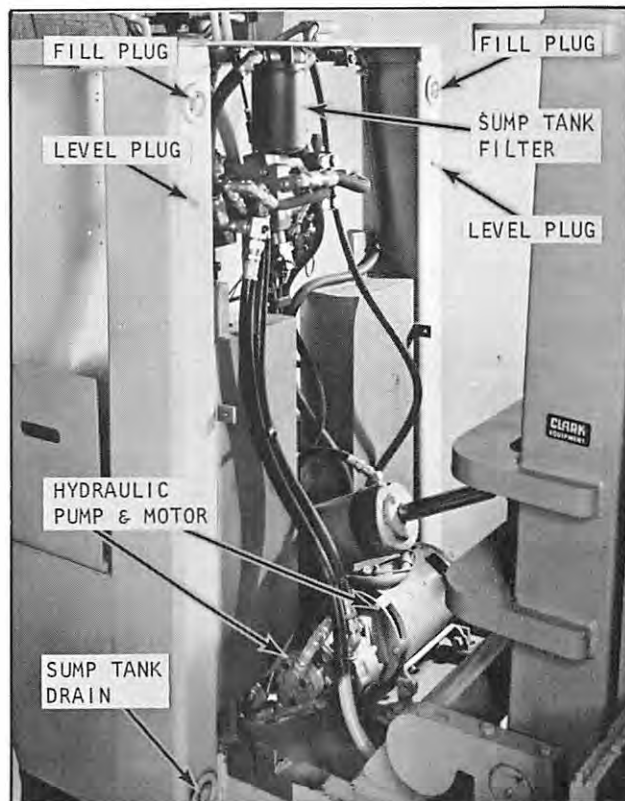


Plate 8274. Location of Sump Filter

5. Remove sump breather located in the right hand sump tank at the top, see Plate 7528 on the next page. If breather is not fit for further service (dirty, clogged with foreign material,

etc.), then replacement is necessary. Check both air holes in the breather cap for obstructions. Holes must be open (see Plate 7527 next page). Do not install breather at this time.

6. After tanks have drained, remove fill plug on left hand tank, see Plate 7528 next page. Pour at least two quarts of new hydraulic fluid thru each fill plug opening to flush tank. When tank has completely drained, replace drain plugs.

CAUTION

DO NOT START PUMP WHILE SUMP TANK IS EMPTY. DAMAGE TO HYDRAULIC PUMP WILL RESULT WITH NO FLUID IN THE SYSTEM. WHEN FILLING OR CHECKING SUMP TANK, THE UPRIGHT FORKS MUST BE LOWERED TO THE FLOOR.

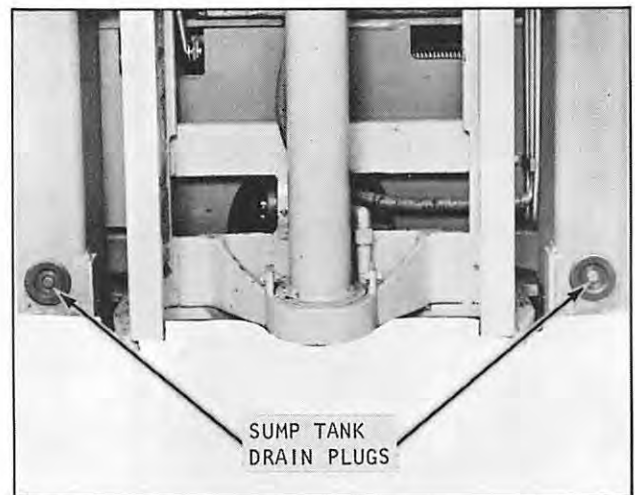


Plate 8275. Draining Sump Tank

7. Remove old hydraulic filter cartridge and discard. Install new cartridge, see Plate 8274.
8. Fill sump from either side until fluid reaches bottom of level plug holes, see Plate 7528 next page. Install level plugs finger tight.
9. Turn power key switch on and operate hydraulic control levers several times to force air, trapped in the lines, into the sump where it can escape. Turn key switch off.

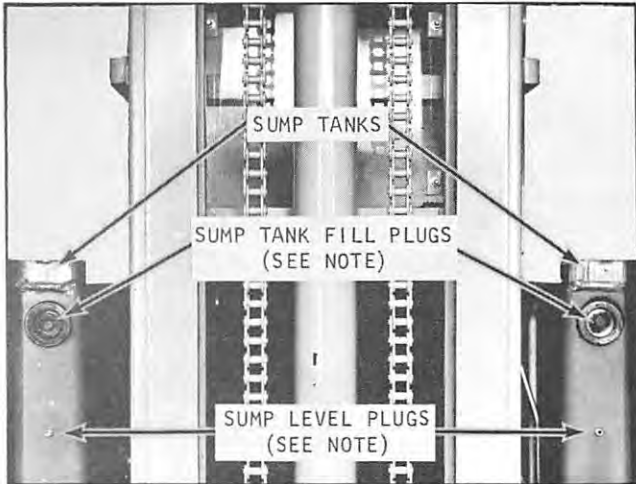


Plate 7528. Hydraulic Sump Tanks

10. Check fluid level at level plugs — add fluid if necessary. Replace and tighten level plugs. Install sump breather in the R.H. sump tank (as viewed from the front of machine). Install fill plug in the L.H. sump tank.

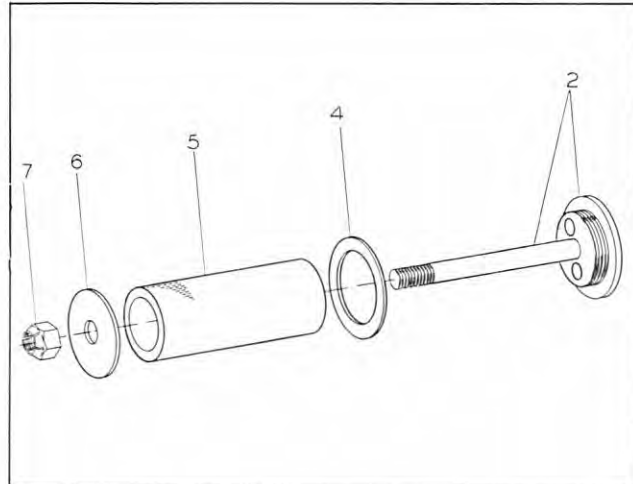


Plate 7527. Hydraulic Sump Tank Breather

CAUTION

ALWAYS OPERATE HYDRAULIC CONTROL LEVERS SEVERAL TIMES AFTER FILLING SUMP TANK TO PURGE AIR FROM THE SYSTEM. CHECK OIL FILTER FOR LEAKS AND RECHECK FLUID LEVEL AFTER PURGING AIR FROM THE SYSTEM.

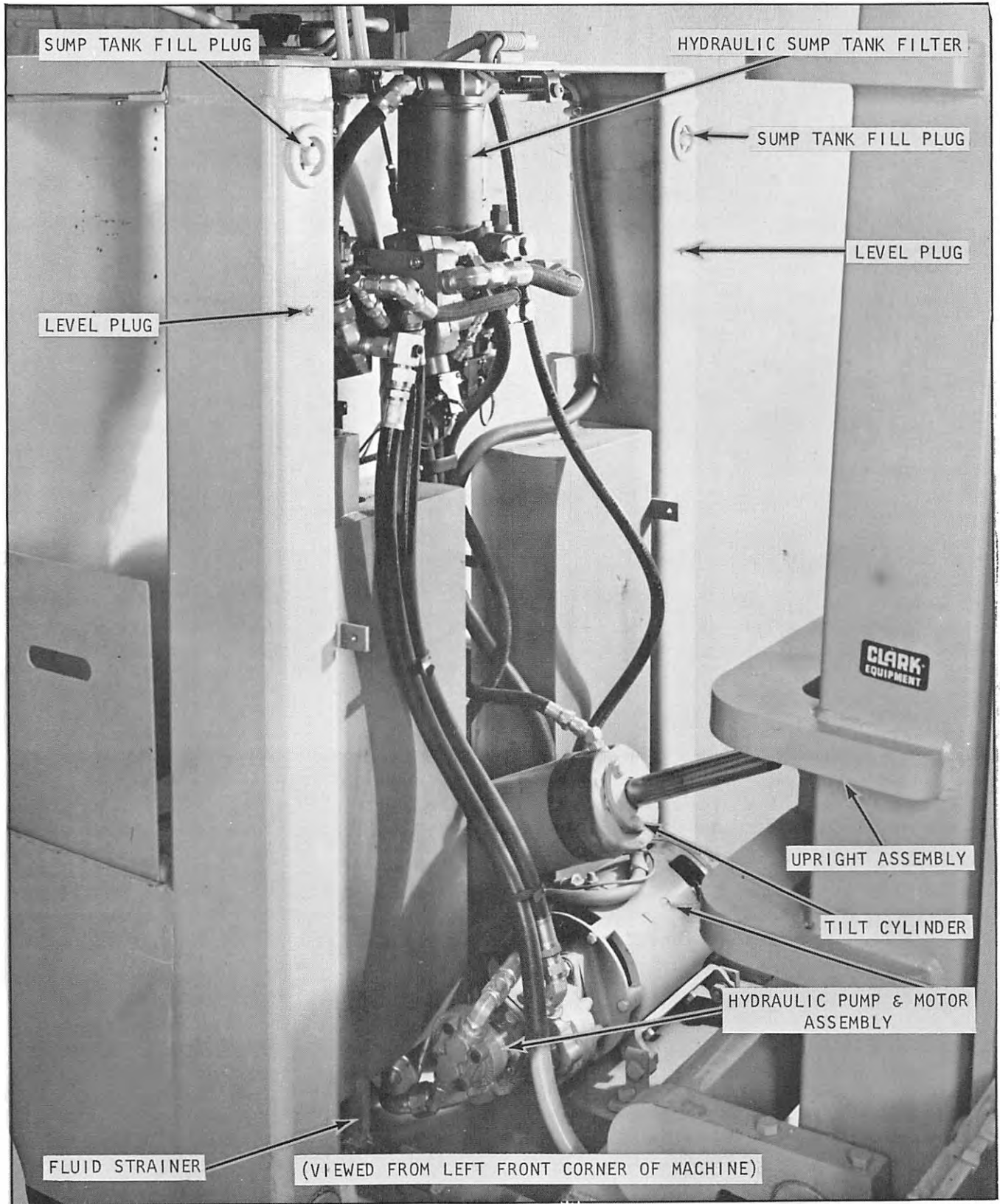
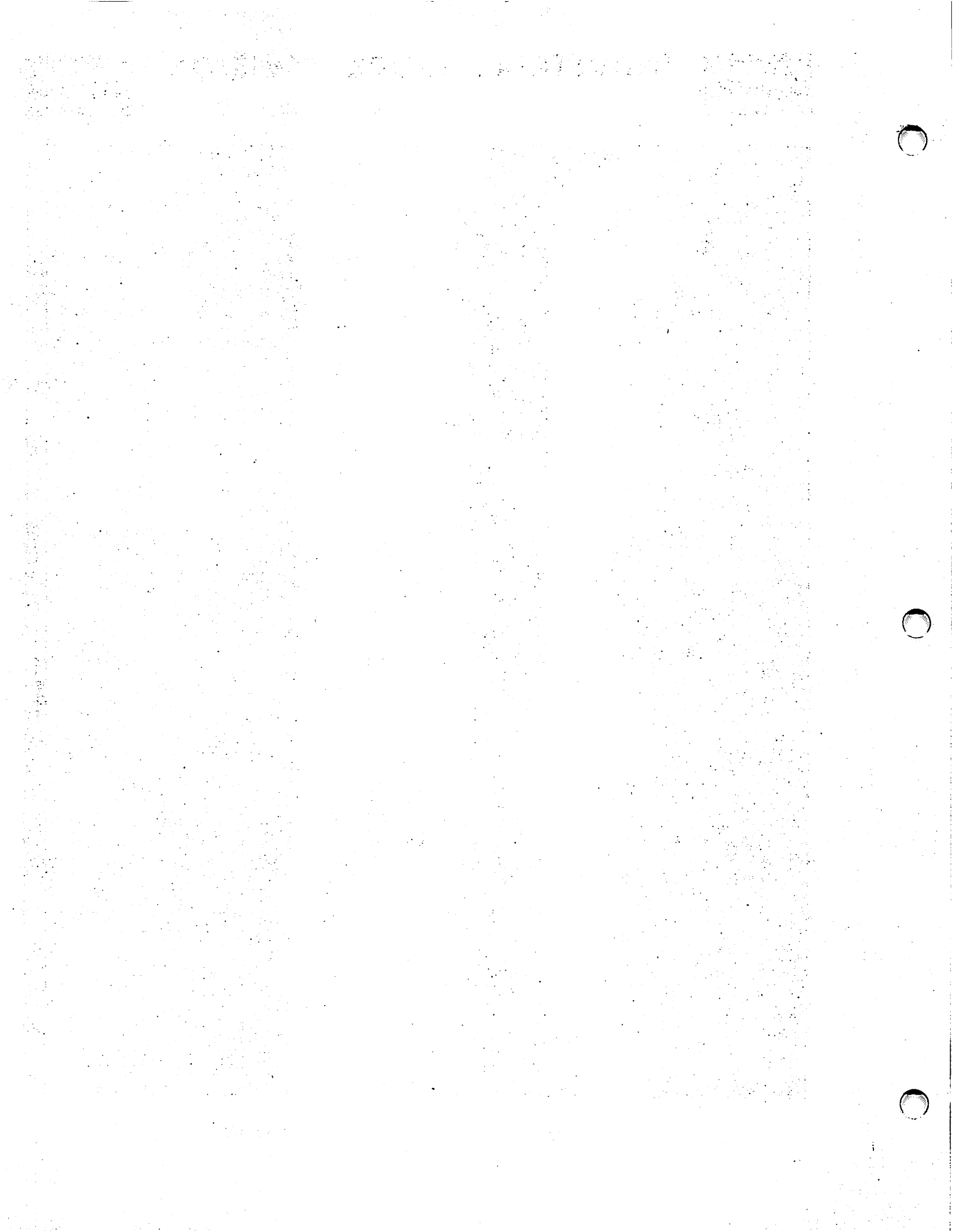


Plate 8279. (VIEWED FROM LEFT FRONT CORNER OF MACHINE)
WHEN FACING FRONT OF MACHINE



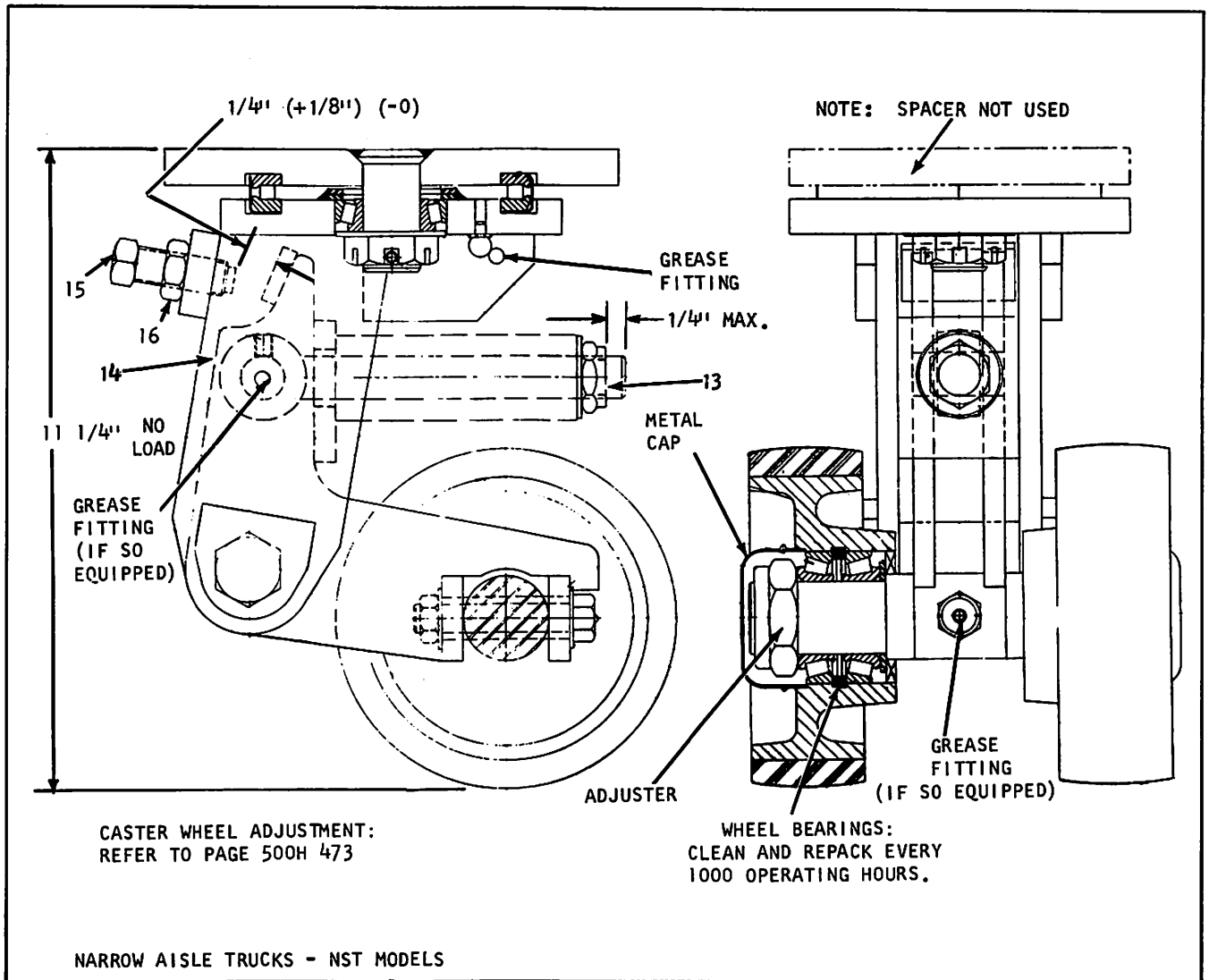


Plate 11498. Caster Adjustment - NST

CASTER ADJUSTMENT CHECK - and - ADJUSTMENT PROCEDURES

1. Loosen hug lock nut, ITEM 13, to within 1/4" from end of bolt, as shown above.
2. Loosen jam nut, ITEM 16, and back stop bolt, ITEM 15, about 1/4".
3. Drive the NST (caster wheel) onto a 1/4" flat metal plate lying on a level floor.
4. Screw in stop bolt, ITEM 15, finger tight until it bottoms out on "L" bracket (stop), ITEM 14.
5. Tighten jam nut, ITEM 16, securely. This completes the adjustment.

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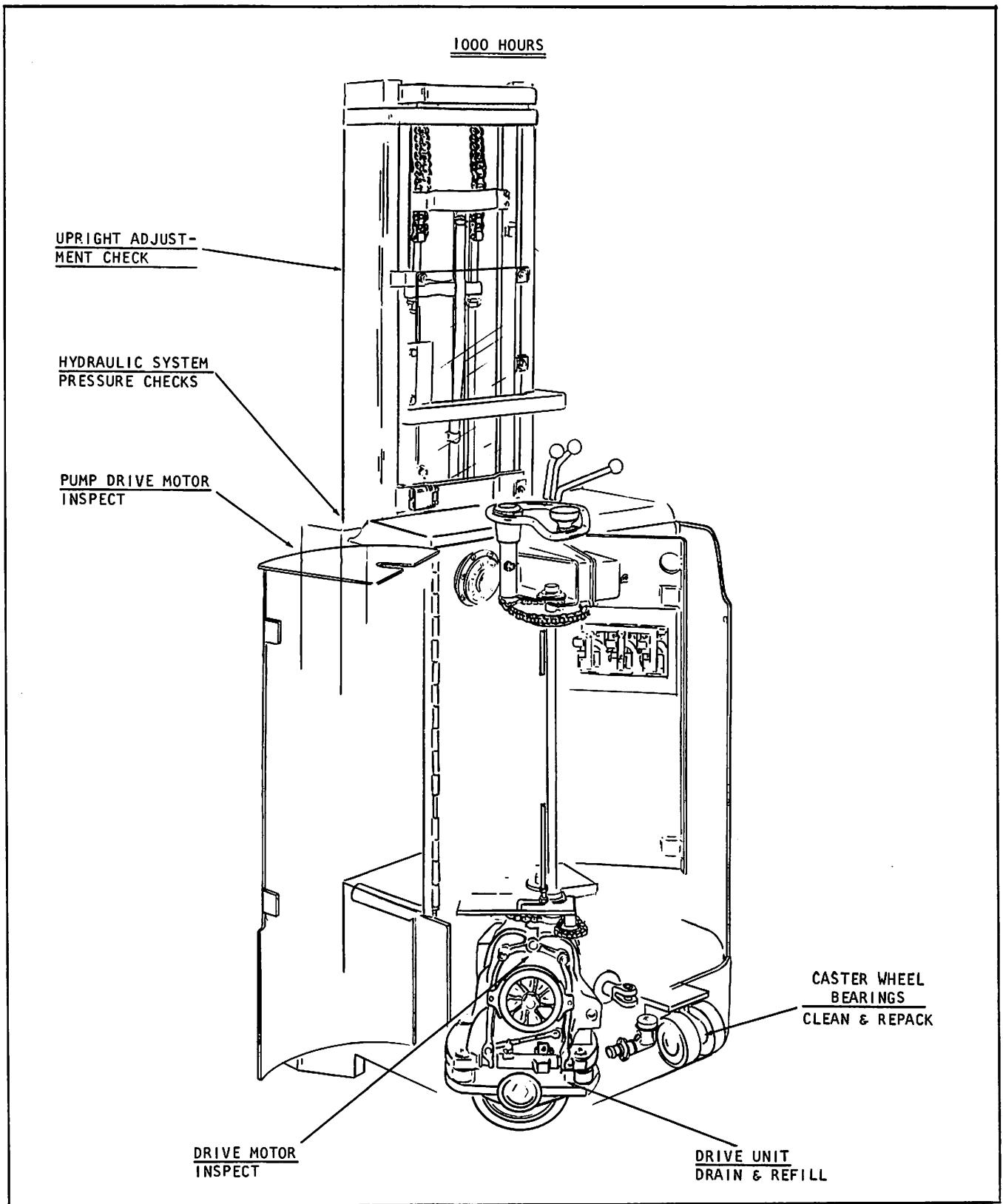


Plate 8273. Lubrication & Preventive Maintenance Illustration

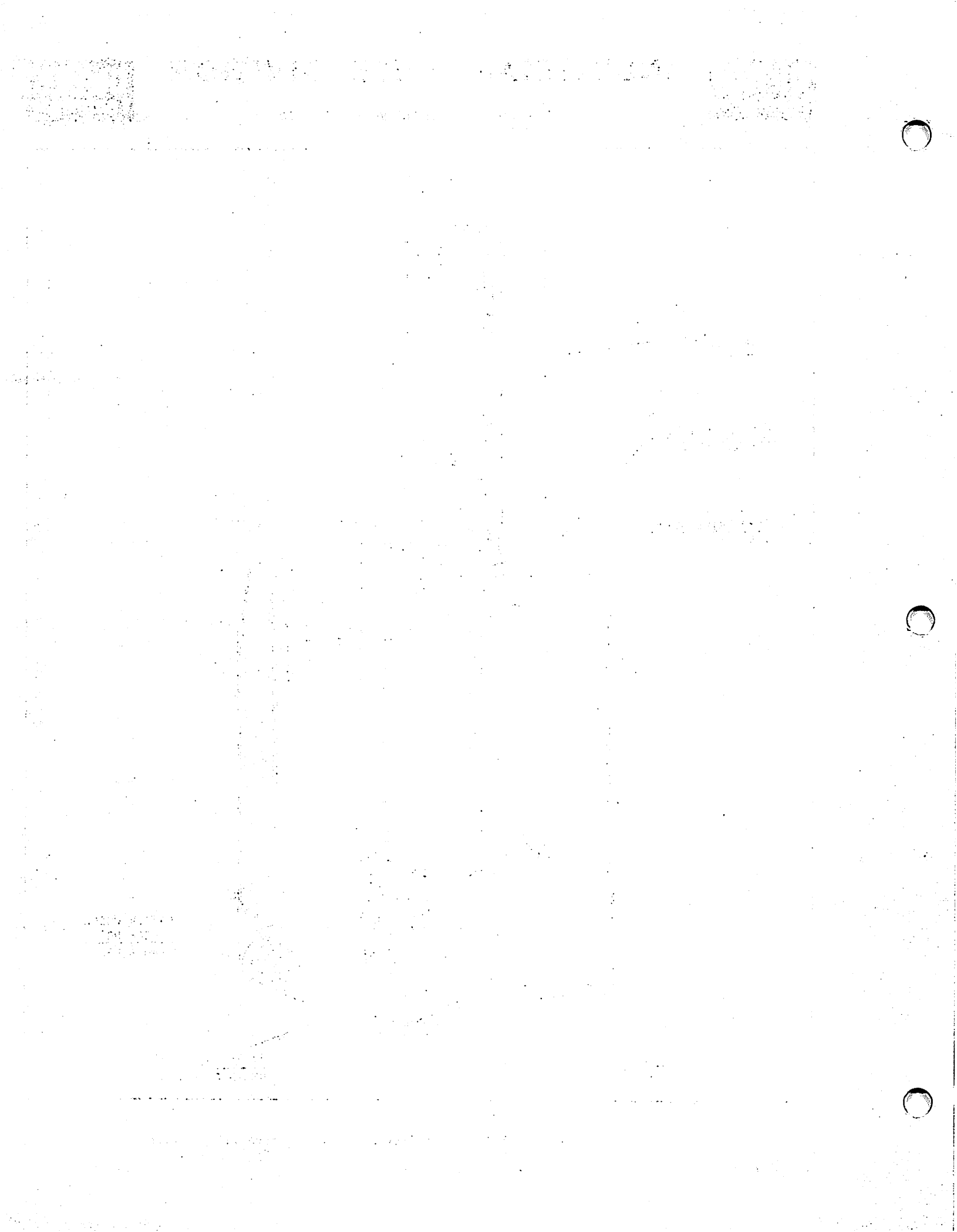




Plate 7518. Typical Drive Motor

DRIVE MOTOR

Wiring: Inspect all connecting wires to be sure they are secure. Insulation should not be worn or damaged.

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

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

Brushes: The brushes should slide freely in their holders and make full contact on the commutator. Worn brushes

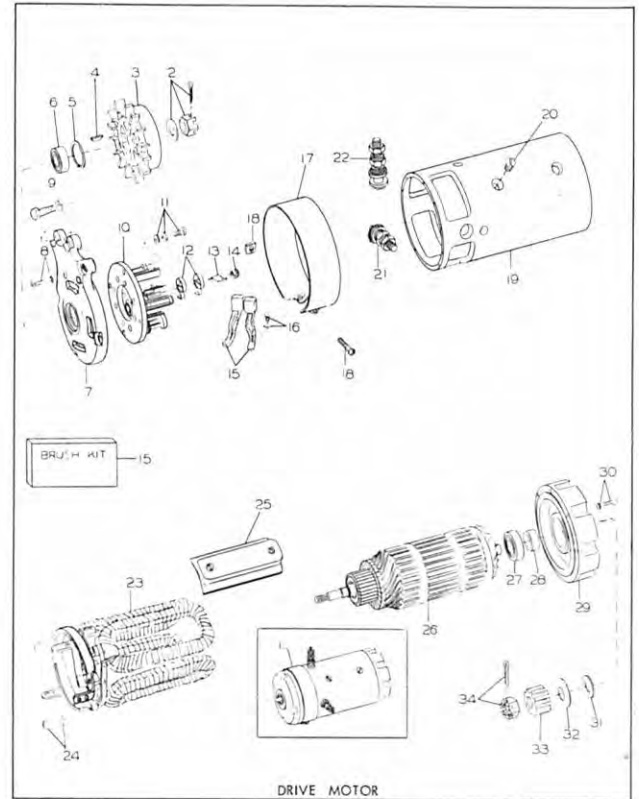


Plate 7519. Typical Drive Motor

(length of worn out brushes 5/16") should be replaced. Badly chipped, broken or oil soaked brushes should also be replaced. Brushes may be wiped with a dry clean cloth to remove loose particles of dirt.

CAUTION

DO NOT CLEAN THE BRUSHES IN ANY KIND OF SOLVENT OR ALLOW THEM TO COME IN CONTACT WITH GREASE OR OIL.

Length of new brush is 1-1/16"

Length of worn out brush 5/16"

Length of usable brush 3/4"

Brush Spring Tension: If the tension is too great, the commutator and brushes will wear excessively. Conversely, if the tension is not great enough, arcing will occur causing damage to the commutator. To change brush spring tension, twist the spring at the holder with long nose pliers.

C A U T I O N

DO NOT ALLOW SPRING TO SNAP DOWN ON BRUSH.

Spring tension should be adjusted so that each brush has the correct tension (see below). Adjust the spring tension to the high limit of the specification. This will allow the spring to maintain adequate pressure for a longer period of time as tension will gradually decrease due to shortening of the brush caused by normal wear. Use a suitable spring scale to measure the pressure of the brush on the commutator. With a thin strip of paper placed between the brush and commutator, pull up on the spring scale and slightly pull on the paper. When the pressure of the brush is reduced enough to allow the paper to be pulled out, read the indication on the scale.

BRUSH SPRING TENSION

Early Models (red springs):

New 6.5-7 lbs.
Old 2-2.5 lbs.

Late Models (yellow springs):

New 35-40 oz.
Old 14 oz. min.

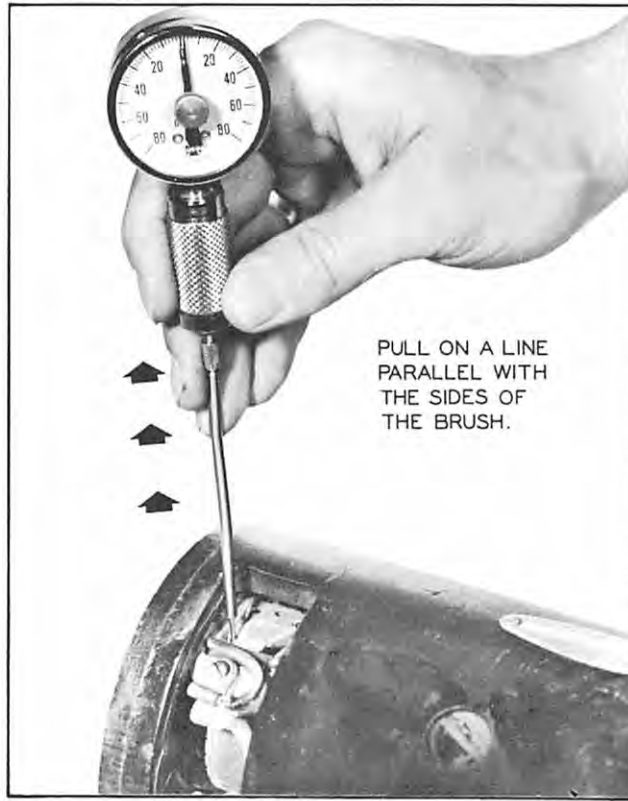


Plate 6450. Checking Brush Spring Tension

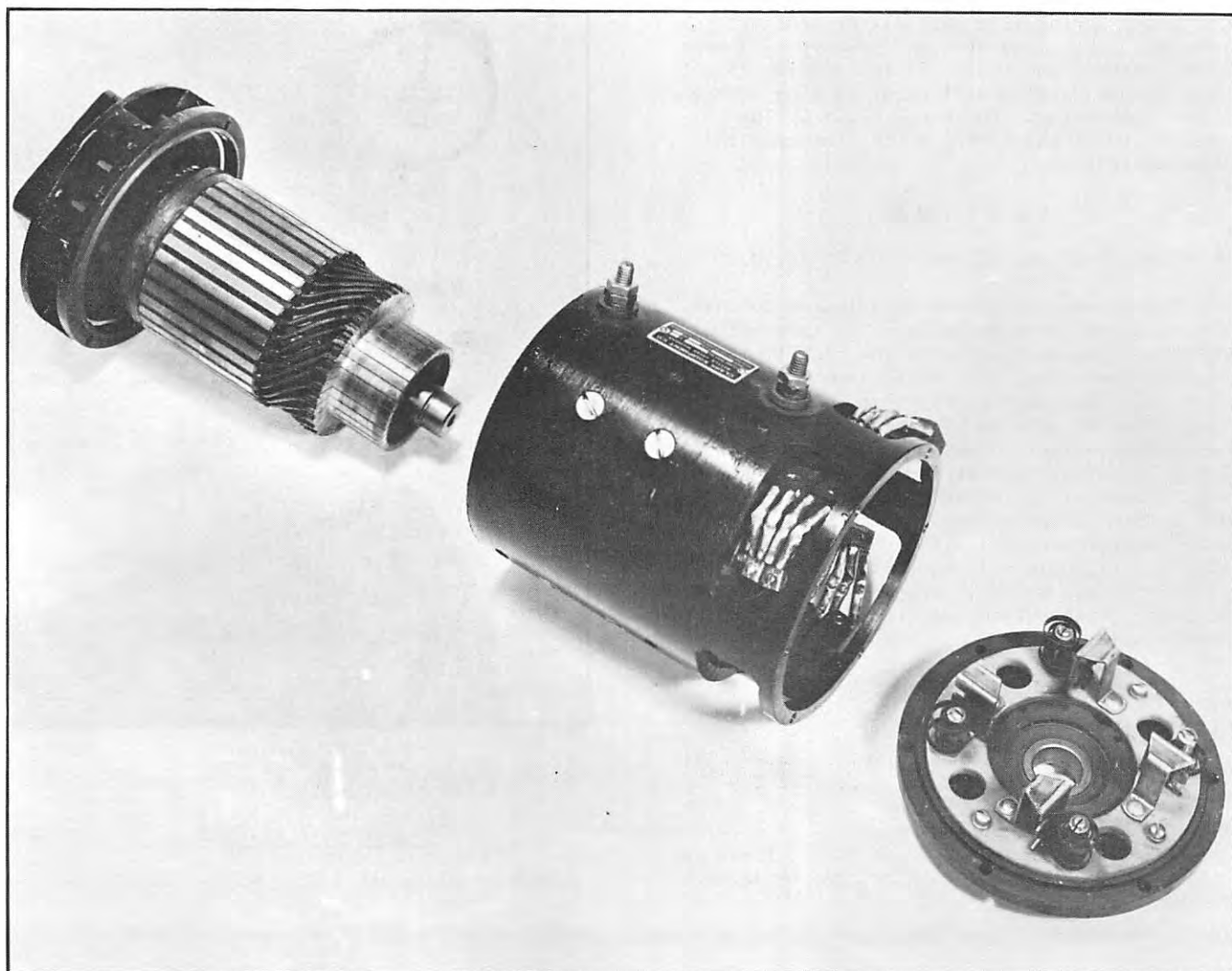


Plate 7530. Typical Pump Drive Motor

PUMP MOTOR

Wiring: Inspect all connecting wires to be sure they are secure. Insulation should not be worn or damaged.

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

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

Brushes: The brushes should slide freely in their holders and make full

contact on the commutator. Worn brushes (length of worn out brush: $5/16$ inch) should be replaced. Badly chipped, broken or oil soaked brushes should also be replaced. Brushes may be wiped with a dry clean cloth to remove loose particles of dirt.

CAUTION

DO NOT CLEAN THE BRUSHES IN ANY KIND OF SOLVENT OR ALLOW THEM TO COME IN CONTACT WITH GREASE OR OIL.

Brush Spring Tension: If the tension is too great, the commutator and brushes will wear excessively. Conversely, if the tension is not great enough, arcing will occur causing damage to the commutator. To change brush spring tension, twist the spring at the holder with long nose pliers.

C A U T I O N

DO NOT ALLOW SPRING TO SNAP DOWN ON BRUSH.

Spring tension should be adjusted so that each brush has the correct tension (see below). Adjust the spring tension to the high limit of the specification. This will allow the spring to maintain adequate pressure for a longer period of time as tension will gradually decrease due to shortening of the brush caused by normal wear. Use a suitable spring scale to measure the pressure of the brush on the commutator. With a thin strip of paper placed between the brush and commutator, pull up on the spring scale and slightly pull on the paper. When the pressure of the brush is reduced enough to allow the paper to be pulled out, read the indication on the scale.

BRUSH SPRING TENSION

Early Models (red springs):

- New 6.5-7 lbs.
- Old 2-2.5 lbs.

Late Models (yellow springs):

- New 35-40 oz.
- Old 14 oz. min.

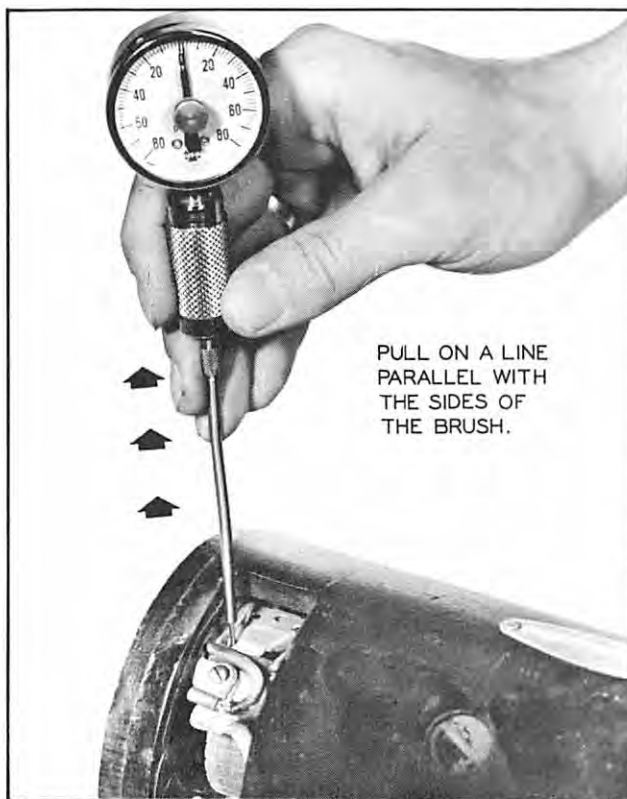


Plate 6450. Checking Brush Spring Tension

BRUSH SPECIFICATIONS

- Length of new brush is.....1-1/16 inch
- Length of worn out brush is.....5/16 inch
- Length of useable brush is.....3/4 inch

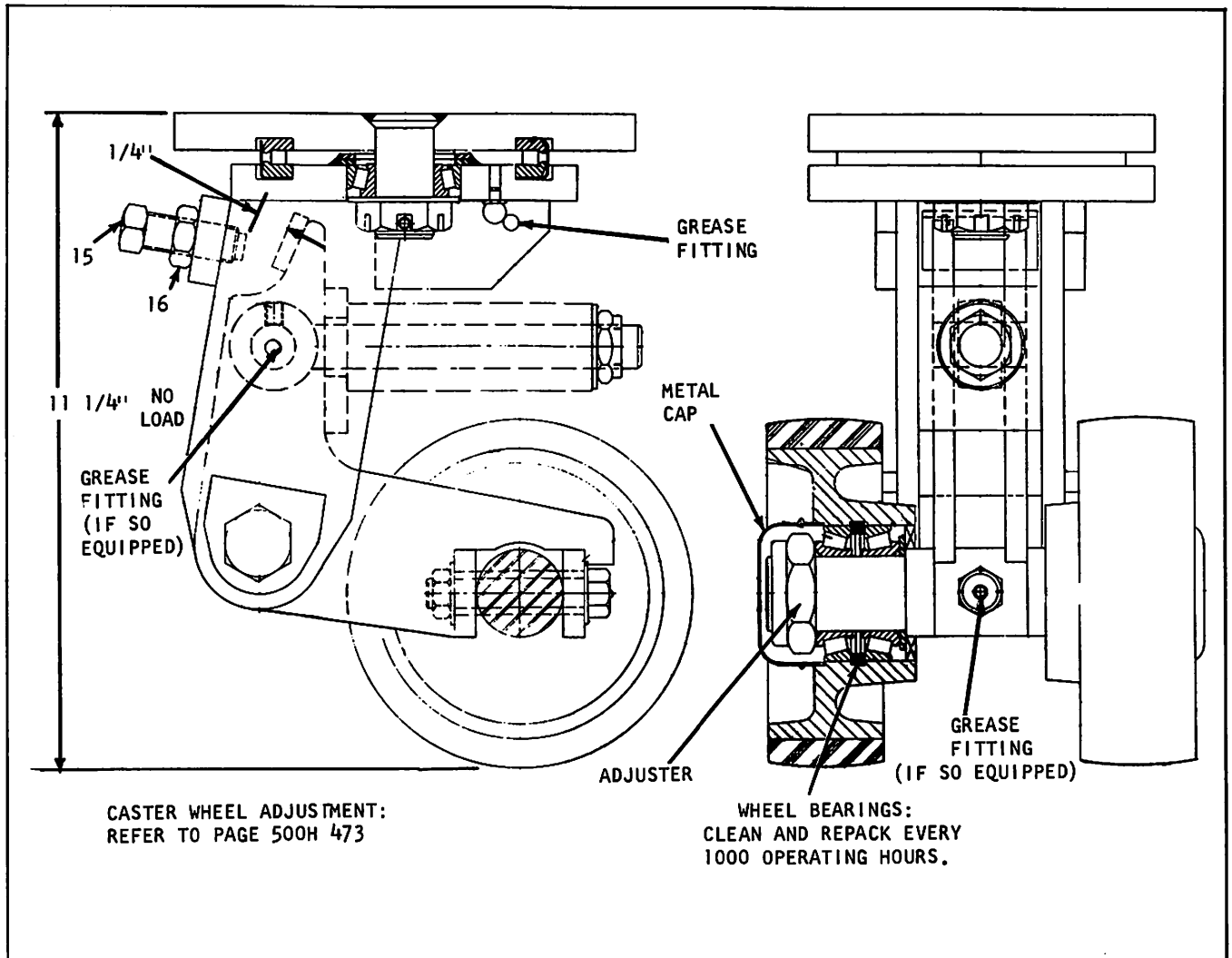


Plate 7529. Typical Caster Wheel Assembly

CASTER WHEEL BEARING LUBRICATION AND ADJUSTMENT

Remove, clean and repack the bearings every 1000 operating hours. Use NLGI #1 (Amolith Grease EP #1 or its equivalent.)

Check grease seals for further serviceability, replace if required.

Adjust bearings after lubrication.

1. Tighten adjuster until wheel is snug then back off 1/8 to 1/4 turn.
2. Tap each side of wheel hub with a mallet to position the bearing cups and free the wheel.

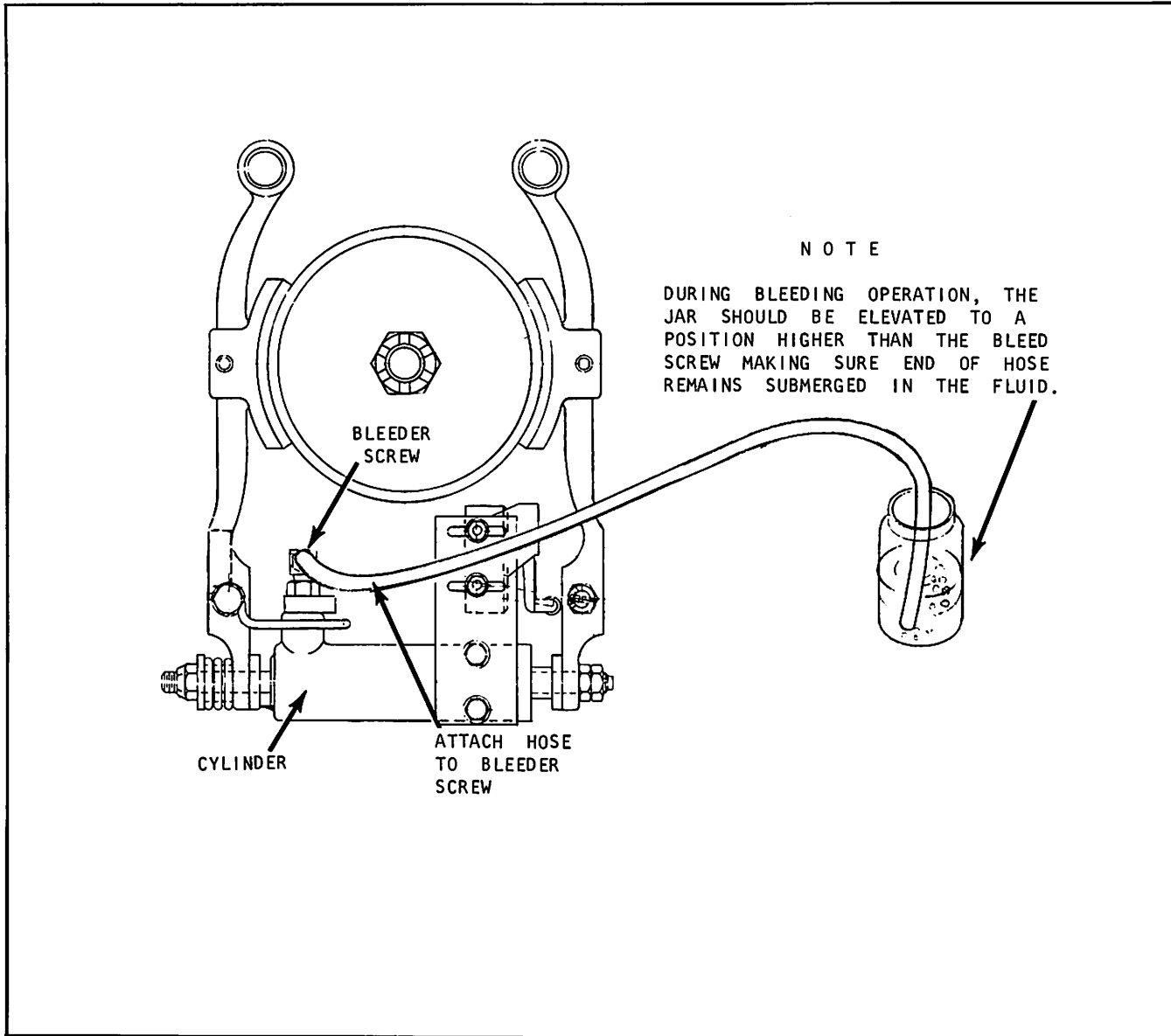


Plate 7531. Service-Parking Brake

BLEEDING PROCEDURE

1. Clean dirt from around filler cap of the master cylinder. Remove cap. Brake fluid should be within 1/4 of an inch from the top.

CAUTION

KEEP BRAKE FLUID OFF DRUM, SHOES AND LININGS.

2. Install a bleeder hose on the cylinder bleeder screw and submerge the unattached end of the hose in a clean transparent jar containing several inches of brake fluid.

NOTE: DURING BLEEDING OPERATION, THE JAR

SHOULD BE ELEVATED TO A POSITION HIGHER THAN THE BLEEDER SCREW MAKING SURE THAT THE END OF THE HOSE REMAINS SUBMERGED IN THE FLUID AT ALL TIMES.

3. Loosen bleeder screw and slowly depress brake pedal to the down position (hold pedal in this position) watch fluid flow from bleeder screw and close connection before flow stops, then release pedal. Repeat this operation until fluid appears clear of air bubbles. Check master cylinder reservoir level periodically during bleeding operation, fill to within 1/4 of an inch of the top with S.A.E. 70R3 heavy duty brake fluid. Clark Part Number 1800200.

(A) ENGINE CRANKCASE OIL

FOR ... GASOLINE, L.P. GAS
ENGINES AND NATURALLY
ASPIRATED DIESEL ENGINES.

SPECIFICATION TO MEET API Service Classification "CC" and "SC" per SAE Report J183 and/or MIL-L-2104B* Sulfated ash content 1.00% weight maximum. Zinc content 0.06 to 0.10% weight maximum.

This specification includes oils meeting Specification MIL-L-46152 when applicable. Also, API Service "SC"/"SD" (Formerly "MS") oils may be preferred under stop-and-go or light service conditions.

*Although Specification MIL-L-2104B has recently been superceded, oils of this quality will continue to be available.



TYPICAL PRODUCT RECOMMENDED BY MAJOR BRAND OIL SUPPLIERS

Chevron RPM DELO Multi-Service Oil
Shell X-100 or Rotella, Rotella T
Sunfleet H.P. Motor Oil
ARCO Fleet X.H.D. Motor Oil
or ARCO Fleet H.D.
Gulflube Motor Oil X.H.D.
Citgo C300 Motor Oil
AMOCO 200 Motor Oil
Texaco Havoline
or URSA Extra Duty Motor Oil
Mobil Delvac 1100B
or 1200 Series Motor Oil
...or the equivalent to the above.

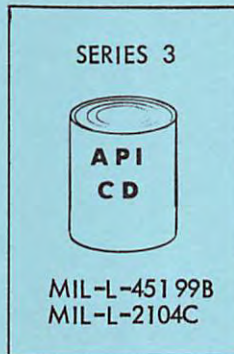
OILS FORMULATED FOR L.P.G. ENGINES

Cito L.P. Gas Engine Oil
Chevron Gas Engine Oil HDAX

(B) ENGINE CRANKCASE OIL (cont.)

FOR ... TURBOCHARGED DIESEL ENGINES
or DIESEL ENGINES USING
HIGH SULFUR CONTENT FUEL
(OVER 0.5% SULFUR).

SPECIFICATION TO MEET API Service Classification "CD" per SAE Report J183 and equivalent Series 3 and/or MIL-L-45199B specifications. Also MIL-L-2104C when applicable. Sulfated ash content 1.65% maximum.



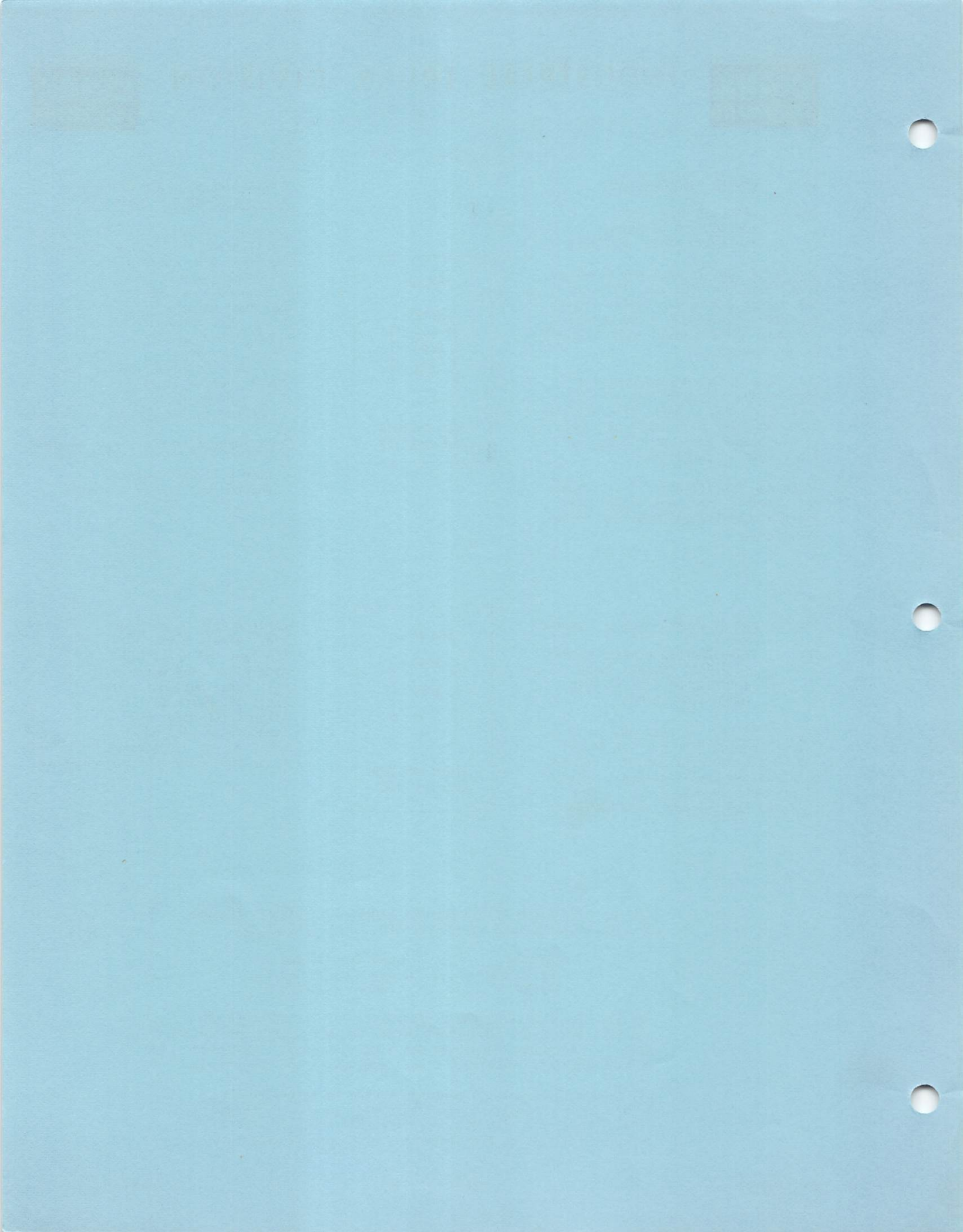
Chevron DELO Super 3 Oil
Shell Rimula Motor Oil
Sunfleet S-3 Motor Oil
ARCO Fleet MS-3 Motor Oil
Gulf Super Duty Motor Oil
AMOCO 300 Motor Oil
Citgo C-500 Motor Oil
Texaco URSA LA-3 Motor Oil
Mobil Delvac 1300 Series Motor Oil
...or the equivalent to the above.

FOR ALL OPERATIONS WITHIN NOMINAL TEMPERATURE RANGES, THE USE OF SINGLE-GRADED OILS IS RECOMMENDED...AS LISTED BELOW.

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

SAE #30 OIL OF MIL-L-2104B PERFORMANCE LEVEL IS RECOMMENDED FOR YEAR AROUND USE IN DETROIT DIESEL ENGINES...(Limitations - Zinc . 0.10% maximum, sulfated ash 1.0% maximum.). The use of Multi-grade oils in Detroit Diesel engines is not recommended.

Oil Change Intervals ... a helpful guide in determining the intervals is an engine oil analysis made several different times. Local oil distributors offer this service. And by using it you can set P.M. intervals with greater certainty.





INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

- TO ADJUST BRAKE -

1. LOOSEN BLEEDER SCREW "A" AND BLEED OUT ALL AIR (CAUTION - KEEP BRAKE FLUID OFF DRUM AND SHOES), REFER TO OPPOSITE PAGE FOR BLEEDING PRODECURES. AFTER BLEEDING CHECK ADJUSTMENTS AS OUTLINED BELOW.
2. ADJUST FOR GRADUAL BRAKE APPLICATION BY ADJUSTING GAP "X" TO 3/16" WITH NUT "B". (NOTE - NUT "C" TO BE SUFFICIENTLY TIGHT SO BUSHING INSIDE OF SPRING WILL NOT PULL AWAY FROM BRAKE ARM)
3. ADJUST BRAKE HOLDING TORQUE BY RAISING DRIVE TIRE FROM FLOOR AND ADJUSTING NUT "C" UNTIL TORQUE WRENCH READS CORRECT RATING (TABLE "D") WITHOUT DRUM SLIPPING. SAFELY BLOCK MACHINE. REFER TO PAGE 100H 303.
4. ADJUST L.H. BRAKE ARM STOP "E" FOR APPROXIMATELY 1/32 GAP.
5. ADJUST BRAKE SWITCH TO OPEN BEFORE R.H. BRAKE SHOE TOUCHES DRUM.

- TO ADJUST FOR LINING WEAR -

6. REPEAT STEPS 1 THRU 5; WHEN WEAR BECOMES TOO GREAT FOR THIS ADJUSTMENT MOVE SPACERS "F" TO OUTSIDE OF BRAKE ARMS. - THEN REPEAT STEPS 1 THRU 5.

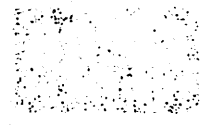
TABLE "D"

| MODEL | WEIGHT LOADED | "T" - POUND - INCHES 18.36-1 |
|-------|------------------|---------------------------------|
| NST20 | 1,500 | 275 |
| | 2,000 | |
| NST30 | 2,500 | 300 |
| | 3,000 | |
| NST40 | 4,000 | 375 |



40121111: 1019

ANNEX 11A



DRIVE UNIT ... DRAIN AND REFILL

Fill with:

DEXRON AUTOMATIC TRANSMISSION FLUID

(or Type "A", Suffix "A" ATF)
(AQA-Armour Qualified)

Typical Product Recommended by
Major Brand Oil Suppliers

Shell Auto. Trans. Fluid Donax T-6, Dexron
Sunoco Auto. Trans. Fluid, Dexron
ARCO Auto. Trans. Fluid, Dexron
Gulf Auto. Trans. Fluid, Dexron
Mobil Auto. Trans. Fluid 220, Dexron.
Texaco 1859 Texamatic Fluid, Dexron.
Citgo Auto. Trans. Fluid, Dexron.
AMOCO Auto. Trans. Fluid, Dexron.
... or the equivalent to the above.

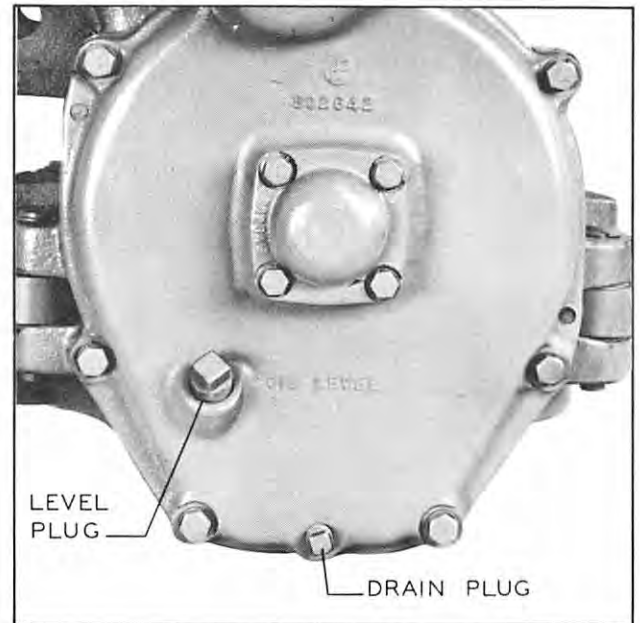


Plate 4274. Drive Unit Assembly

1. Remove drain plug and allow drive unit to completely drain.
2. Replace drain plug.
3. Clean any dirt from around level plug and remove plug.
4. Fill unit until level reaches the height of the level plug.

DO NOT OVERFILL AS THE
EXCESS QUANTITY WILL
SERVE NO USEFUL PURPOSE.

If the oil level is too high, it will cause excessive oil churning and attendant high oil temperature and possible leakage.

5. After drive unit has been filled to the proper level, replace level plug.

...

...

...

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INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

HYDRAULIC SYSTEM CHECKS

- Pressure Checks -

1. Remove the pressure check plug (if so equipped) then install a 0 - 3000 PSI pressure gauge as shown in Plate 8305. If plugs are not provided, then provide a suitable means for connecting a gauge to the connections as shown. A "tee" may be used similar to that shown in the illustration.
2. Turn key switch on and operate a hydraulic control lever (depending upon which pump is to be tested). When the hydraulic cylinder or cylinders reach the end of their travel, check gauge reading. Pressure should be within the limits listed below.

N O T E

Do not hold a control lever in an actuated position for any prolonged period after the cylinder or cylinders have reached the end of their (limit) travel. This will cause heating of the hydraulic fluid and should be avoided.

If pressure is not as specified, report to designated person in authority.

- Flow Checks -

3. Remove pressure gauges and install flow gauges in their place.
4. Follow Step 2 and check for the specified hydraulic flow listed below.

If flow is not as specified, report to designated person in authority.

FLOW IN GPM/PUMP RPM

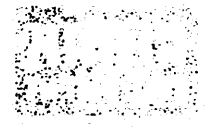
NST 15-20-25-30-40

| | <u>300 PSI</u> | <u>1000 PSI</u> | <u>1500 PSI</u> |
|------------------------|-------------------|------------------|------------------|
| <u>TANDEM PUMP</u> | | | |
| <u>LIFT PUMP</u> | 10 GPM/2650 RPM | 7.3 GPM/2000 RPM | 5.8 GPM/1650 RPM |
| <u>TILT/REACH PUMP</u> | 2.3 GPM/35000 RPM | 2 GPM/3000 RPM | 1.5 GPM/2550 RPM |

REFER TO ILLUSTRATIONS ON OPPOSITE PAGE

10/10/10

10/10/10 10/10/10 10/10/10



HOW TO IDENTIFY THE:

"C" MODEL UPRIGHT

Note the INNER RAIL TIE BAR
is mounted VERTICALLY to the rails.

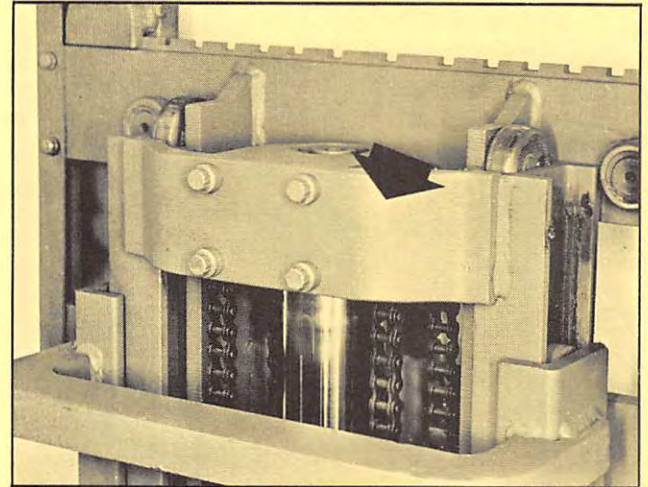


Plate 11847

"B" MODEL UPRIGHT

Note the INNER RAIL TIE BAR
is mounted HORIZONTALLY to the rails.

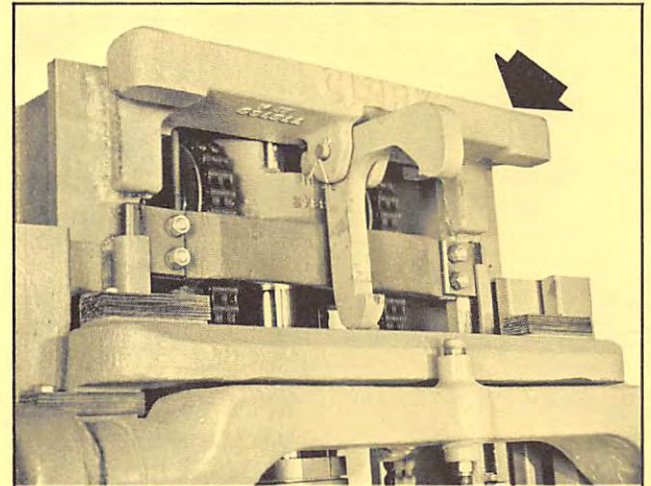


Plate 11848

"B" MODEL UPRIGHT

Note this upright has the TIE BAR
mounted inbetween the rails.

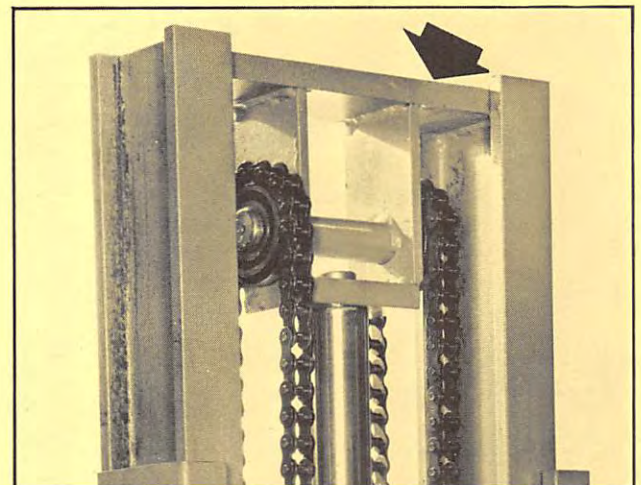
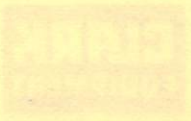
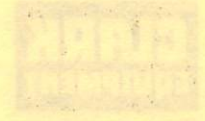


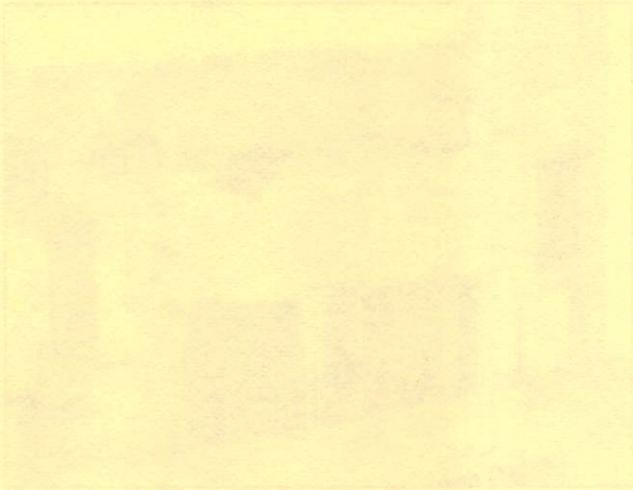
Plate 11849



INDUSTRIAL TRUCK DIVISION



HOW TO IDENTIFY THEM



Model 1100

70" MODEL WEIGHT

Note the inner rail the bar is mounted VERTICALLY to the rails.



Model 1100

70" MODEL WEIGHT

Note the inner rail the bar is mounted HORIZONTALLY to the rails.



Model 1100

70" MODEL WEIGHT

Note this picture has the 110 bar mounted between the rails.

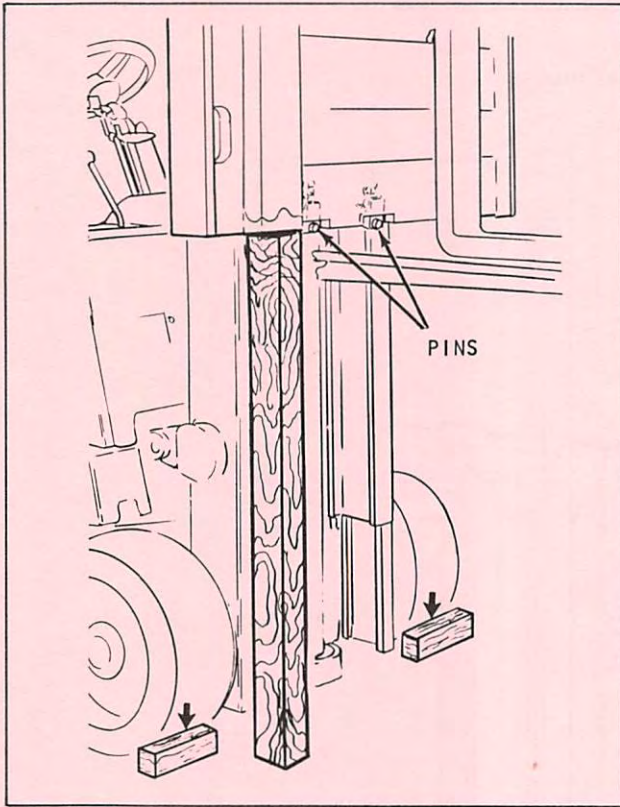


Plate 9593 Carriage Pin Replacement

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.

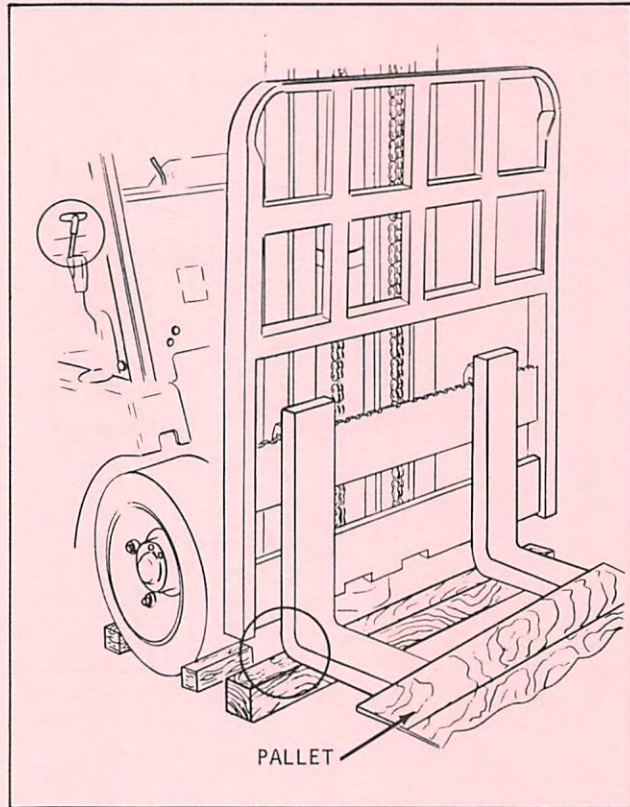


Plate 9560 Fork and Carriage Blocking

Step 3. Raise carriage off beam. Place beam on floor so, when lowered, the heel of the fork will rest on it as shown.

Step 4. Tilt upright full forward.

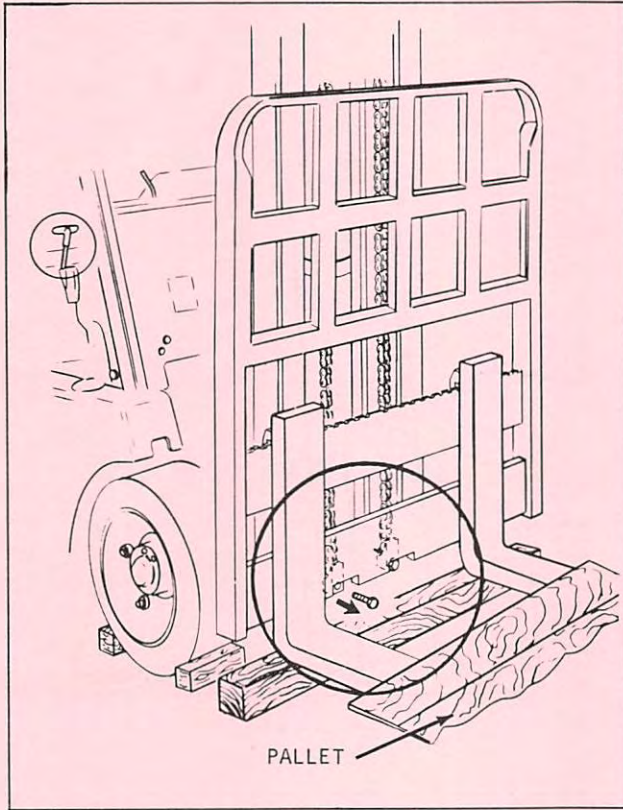


Plate 9561 Removing Bolts

Step 5. Remove 3/8" x 2" bolts. Place pallet on fork ends.

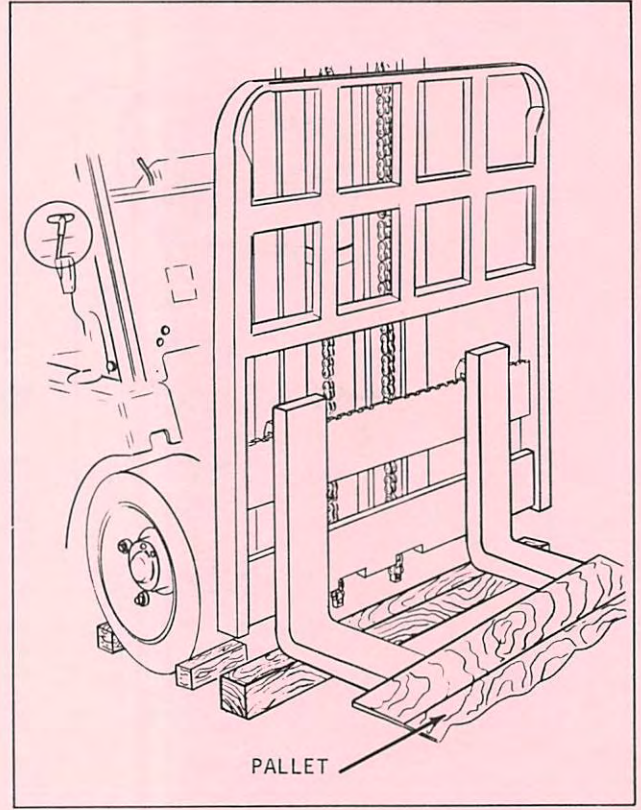


Plate 9562 Removing Chains From Anchors

Step 6. Pull chains out of carriage anchor brackets.

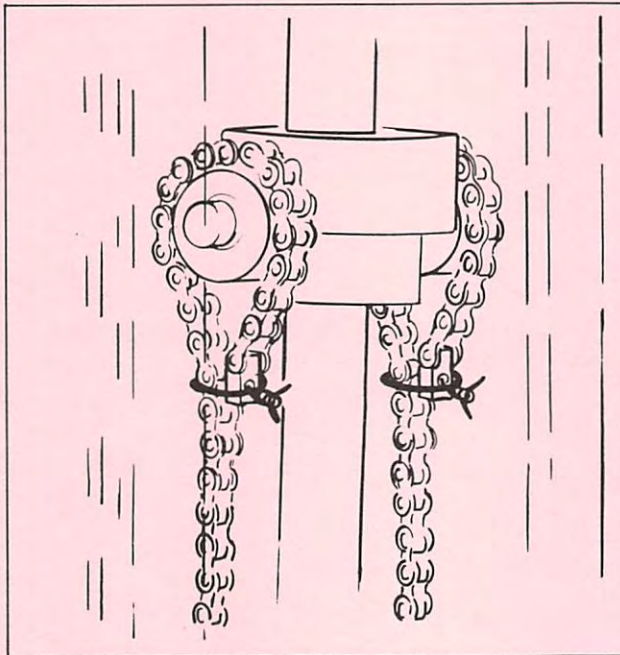


Plate 9563 Securing Chains (Typical)

Step 7. Wire chains around chain sheaves as shown

NOTE

Use the same method on all cylinders.

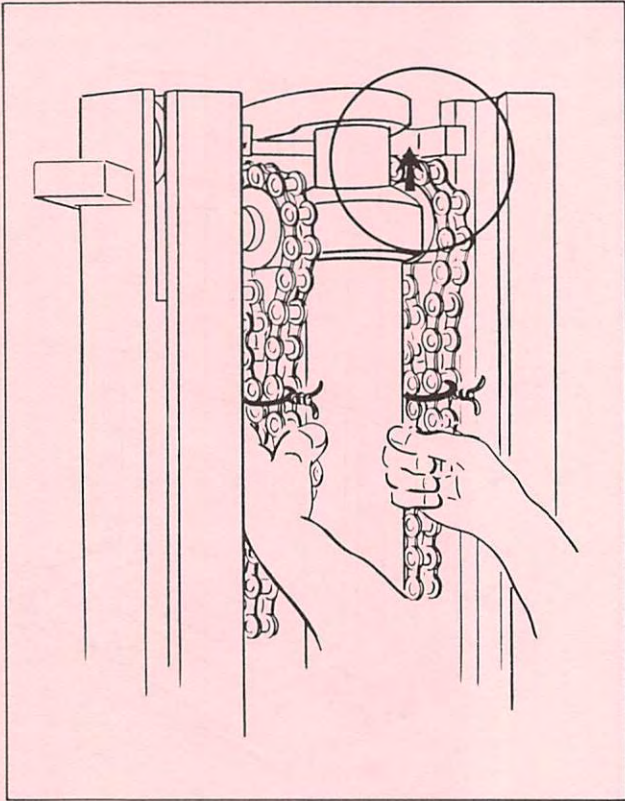


Plate 9564 Guiding Piston Head

Step 8. Guiding piston head with hands on chains raise piston to full up position.

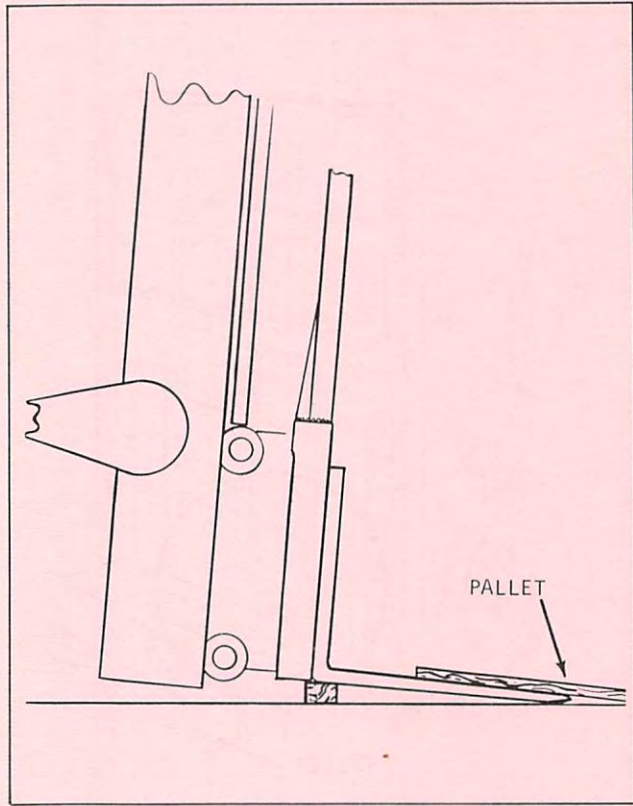


Plate 9565 Inner Rail Clearing Carriage Rollers

Step 9. Raise inner rail so it just clears upper carriage rollers. Leave upright at full forward tilt.

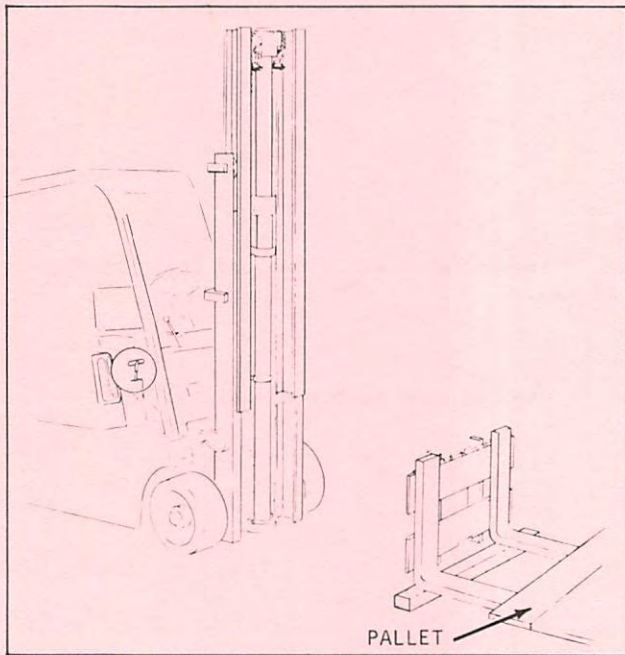


Plate 9566 Backing Machine Away From Carriage

Step 10. Remove blocks and release brake. Back machine away from carriage.

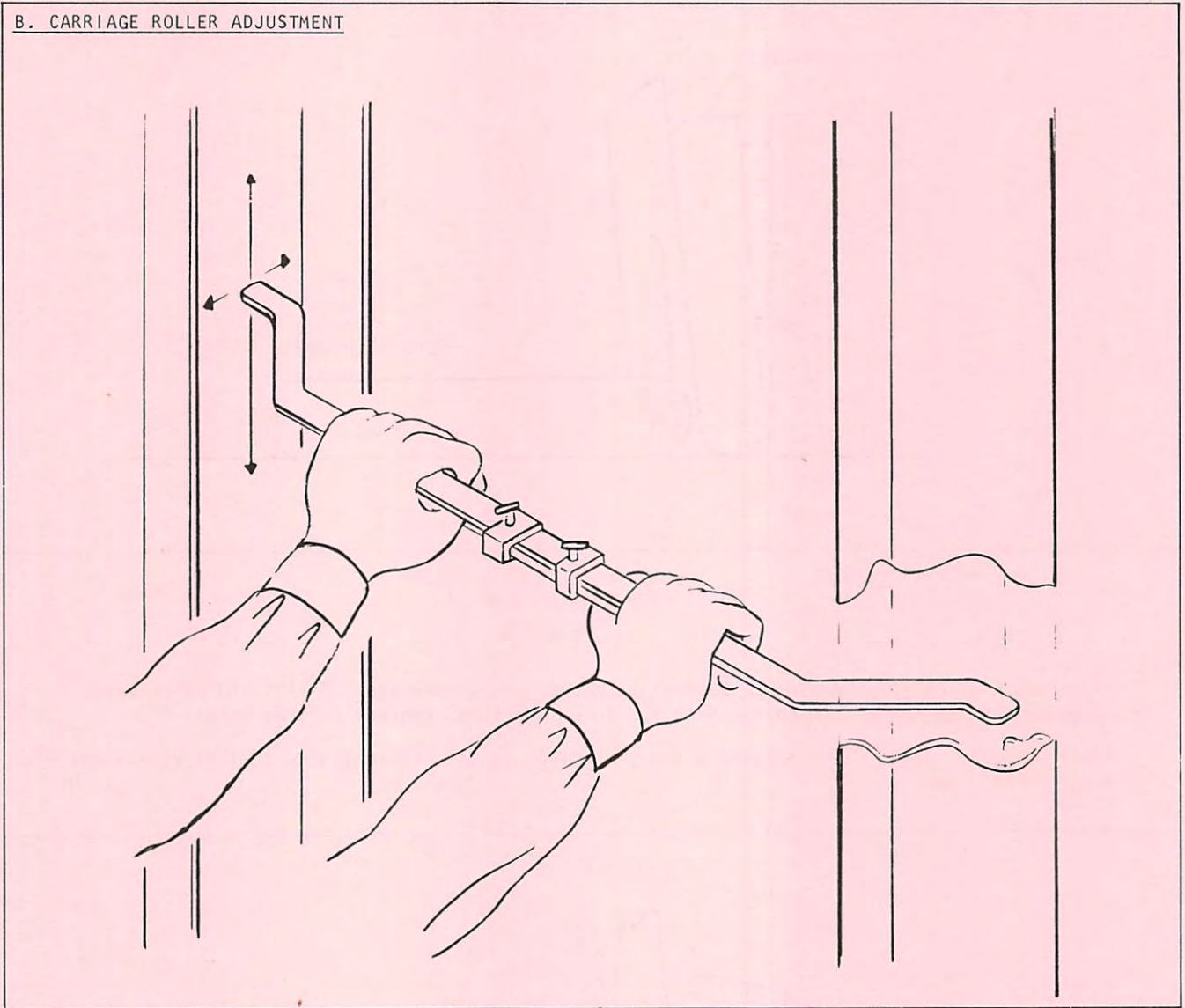
B. CARRIAGE ROLLER ADJUSTMENT

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.

NOTE

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.

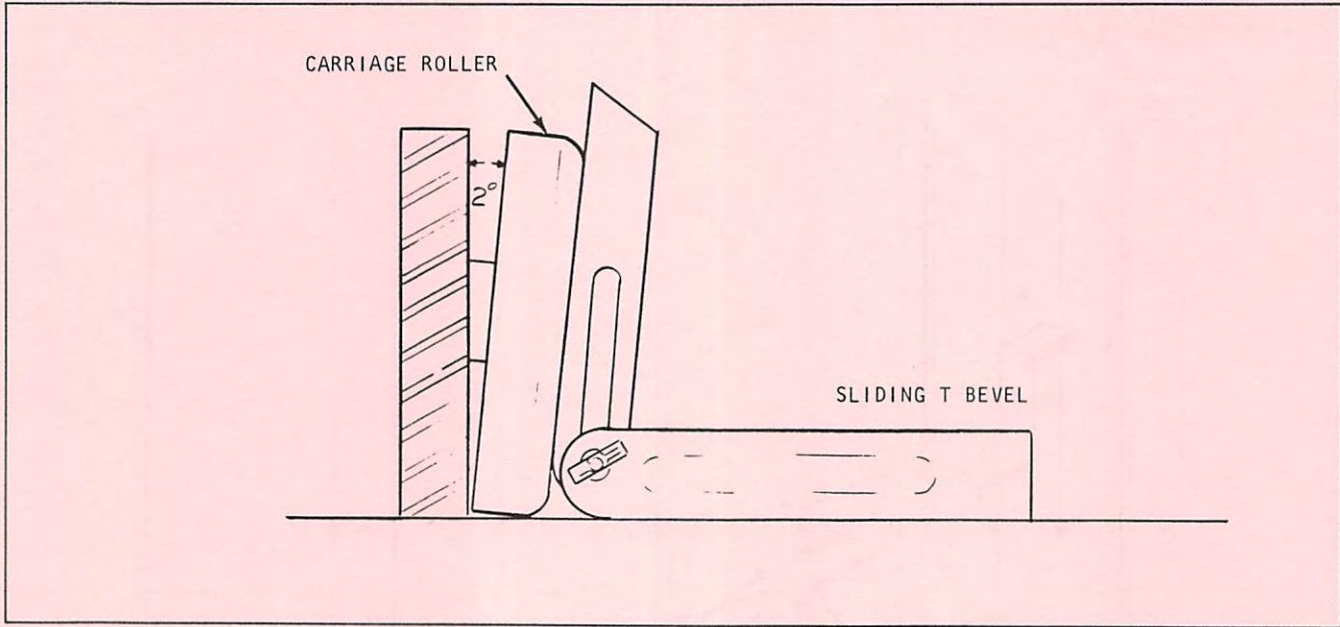


Plate 9589 Setting T Bevel

N O T E

Check angle of carriage rollers. Roller pin bosses are welded at $2^\circ \pm 1/2^\circ$ 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.

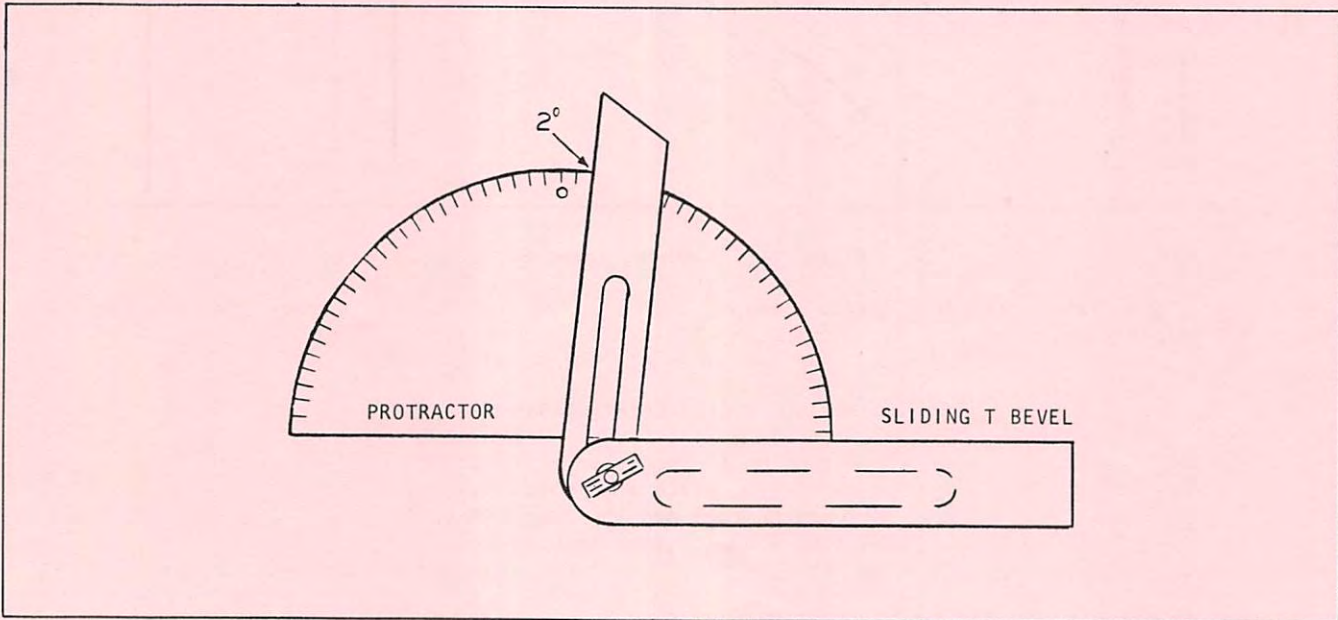


Plate 9590 Checking Roller Angle

Determine degree of angle by placing Protractor on Sliding T Bevel.

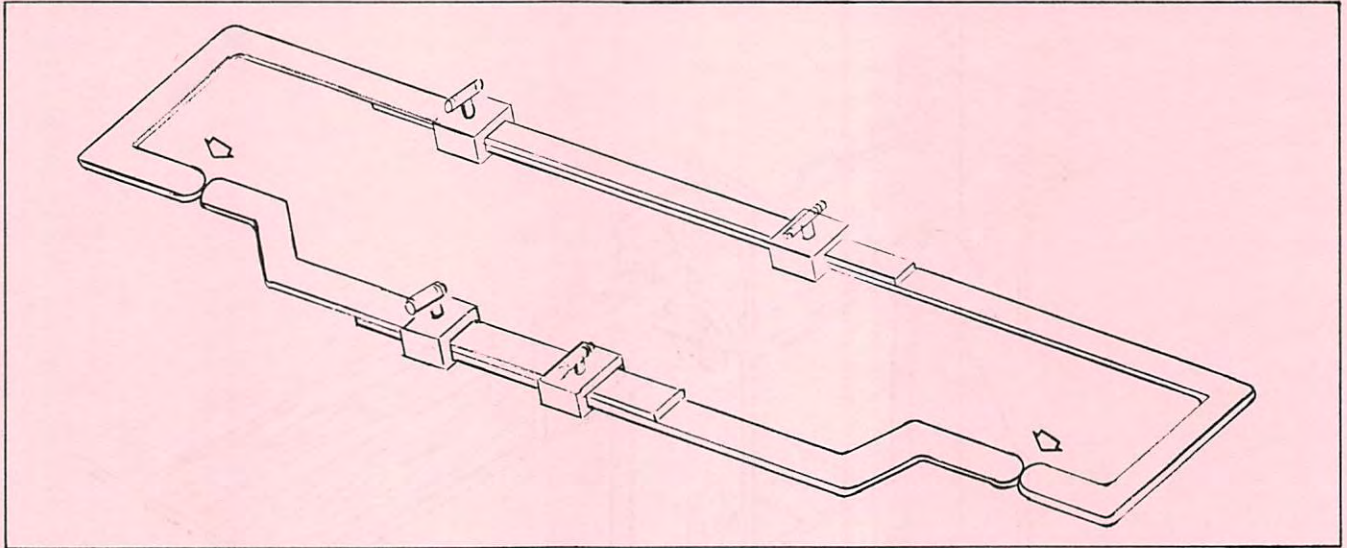


Plate 9568 Setting Outside Spanning Tool

Step 2. Set outside spanning tool to match inside spanning tool. Lock tool in position.

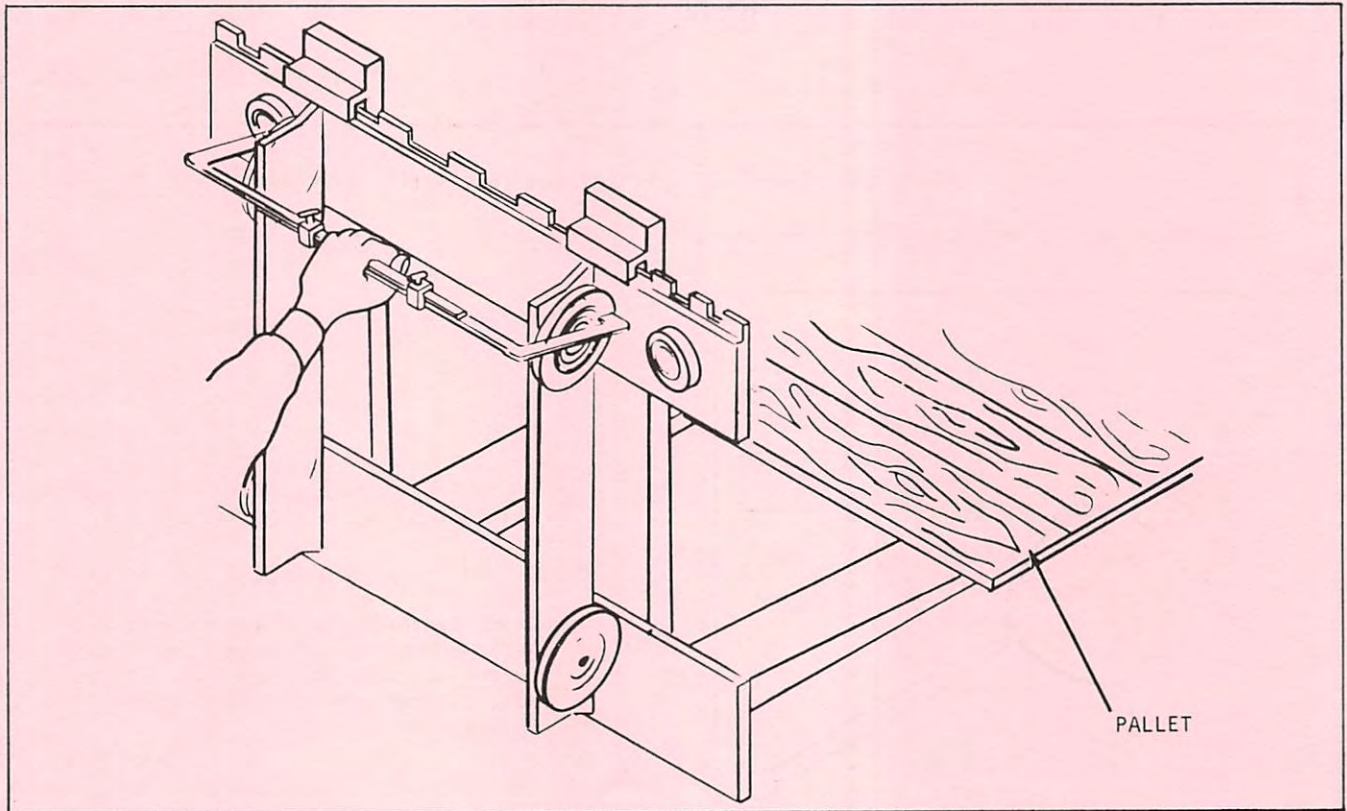


Plate 9569 Spanning Upper Rollers (Four Roller Carriage)

Step 3. Span upper carriage rollers at their outer most camber point. Add or subtract ...

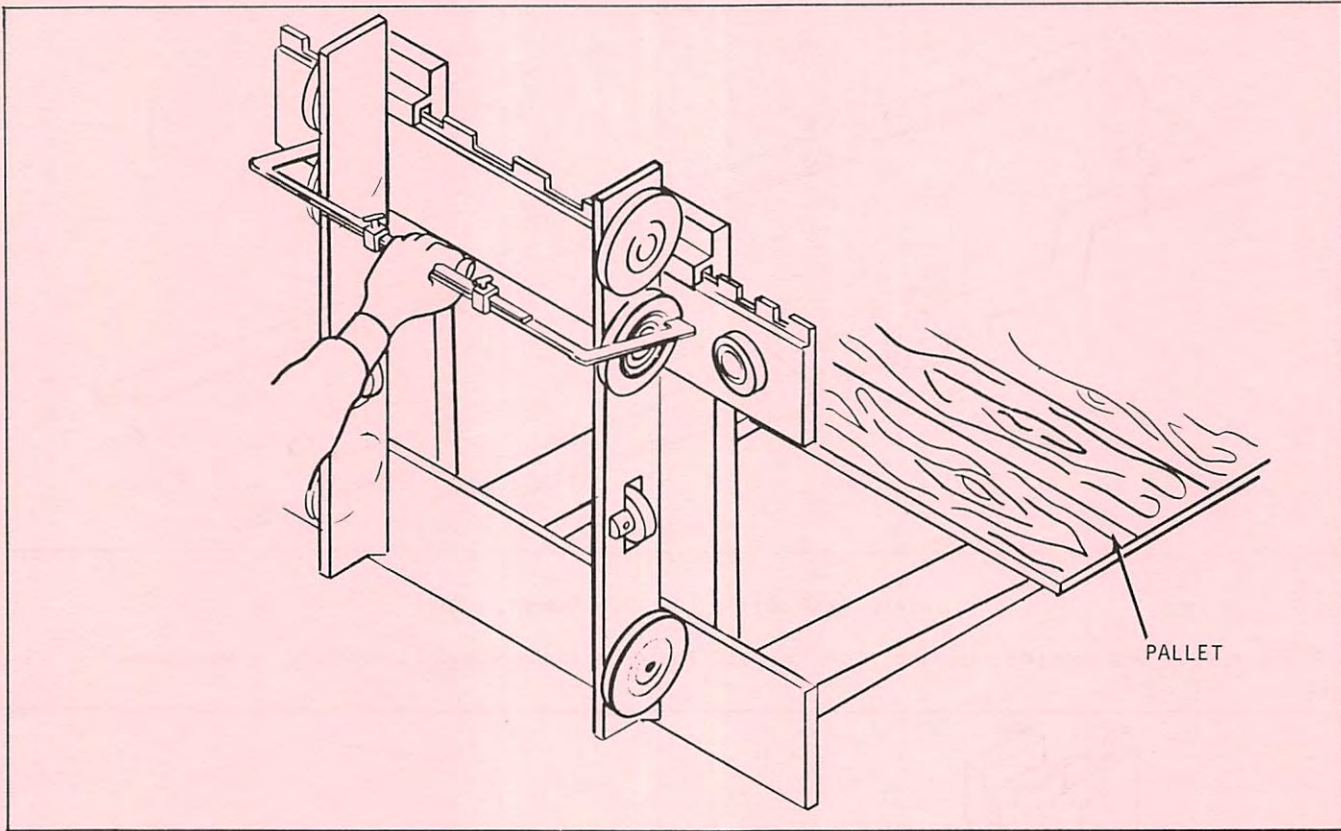


Plate 9570 Spanning Upper Rollers (Six Roller Carriage)

...shims at roller shaft to reach tool size.

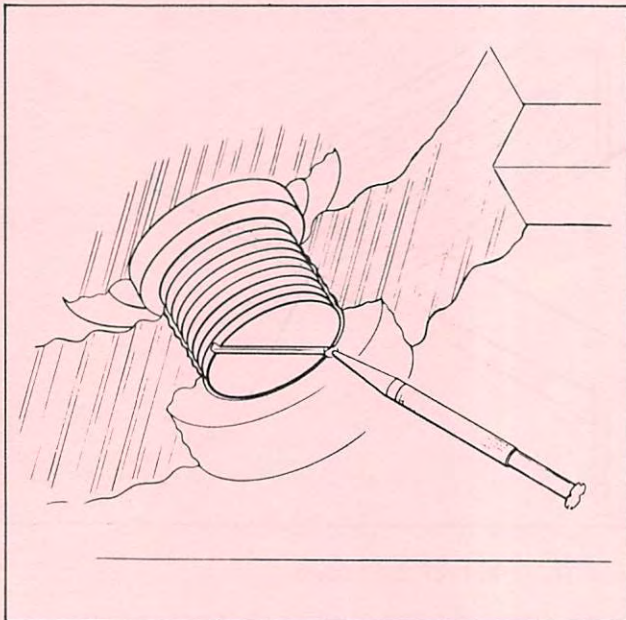


Plate 9571 Securing Outer Thrust Roller

N O T E

Before centering carriage rollers check out thrust rollers for security and condition of bearings. If loose tighten and stake. If worn replace.

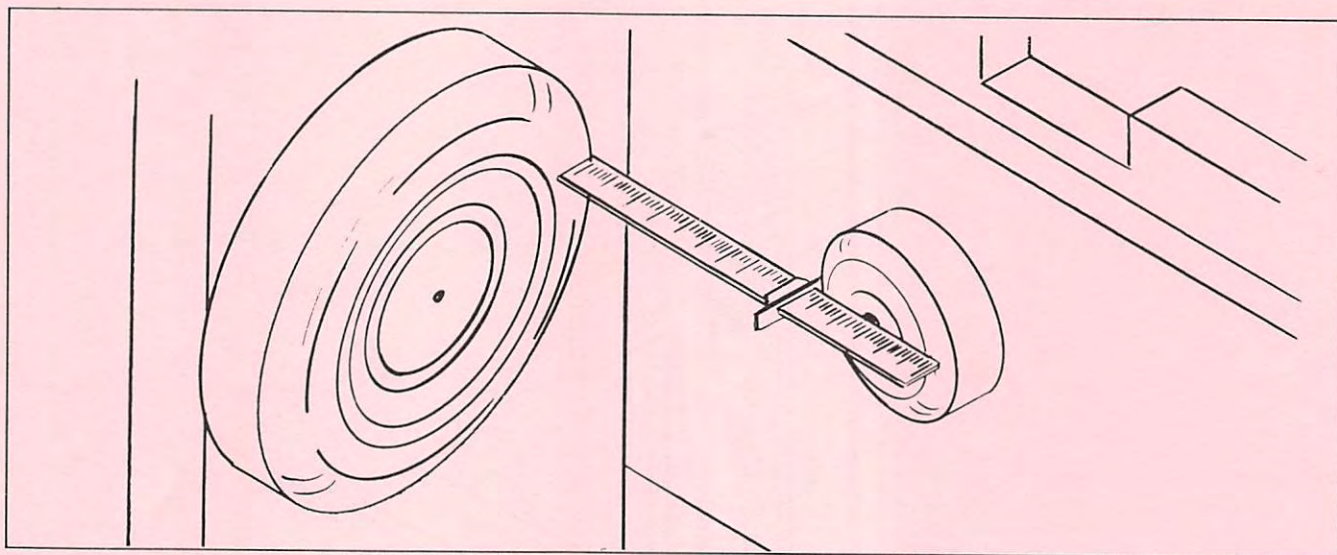


Plate 9572 Centering Carriage Rollers

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.

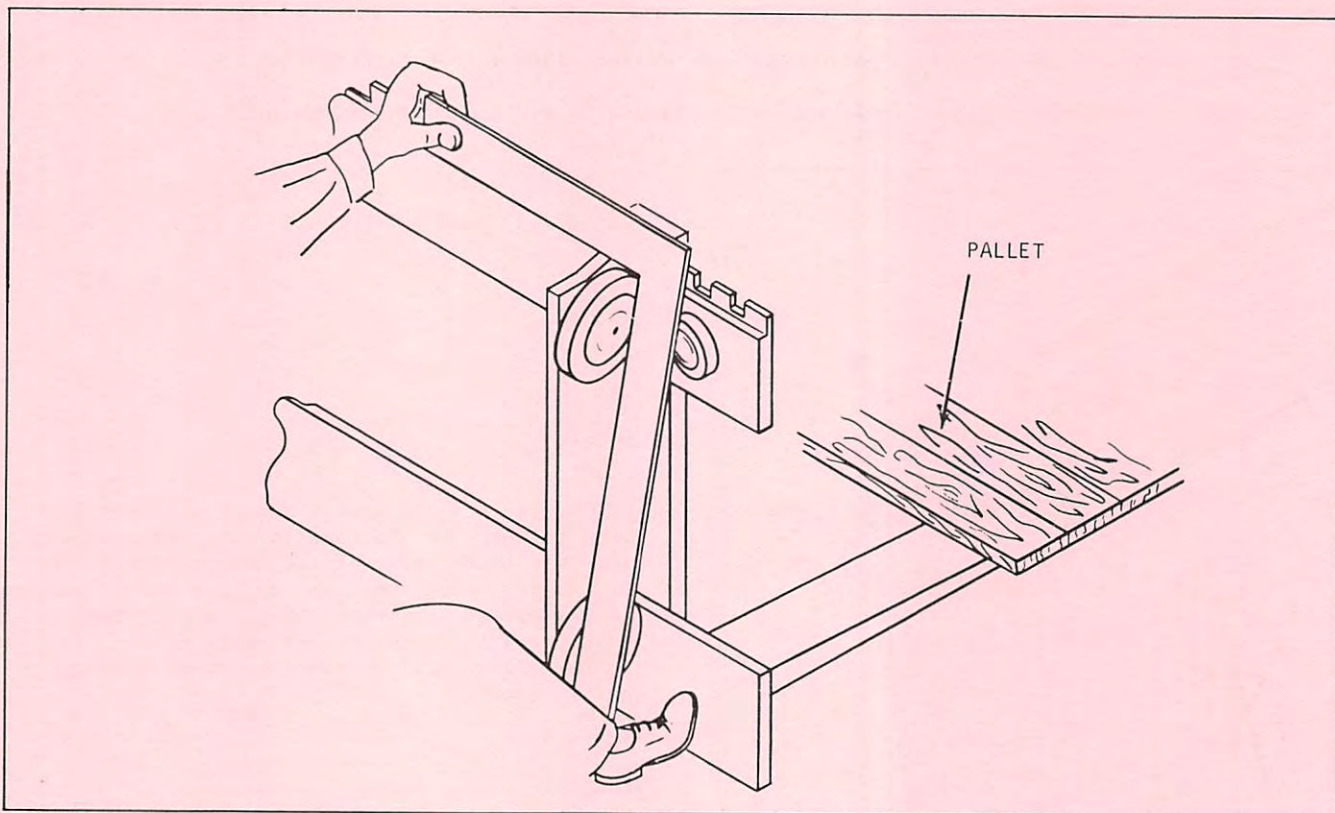


Plate 9573 Squaring Carriage Rollers (Four Roller Carriage)

Step 5. Square carriage rollers by placing carpenters square at the outer most camber of the ...

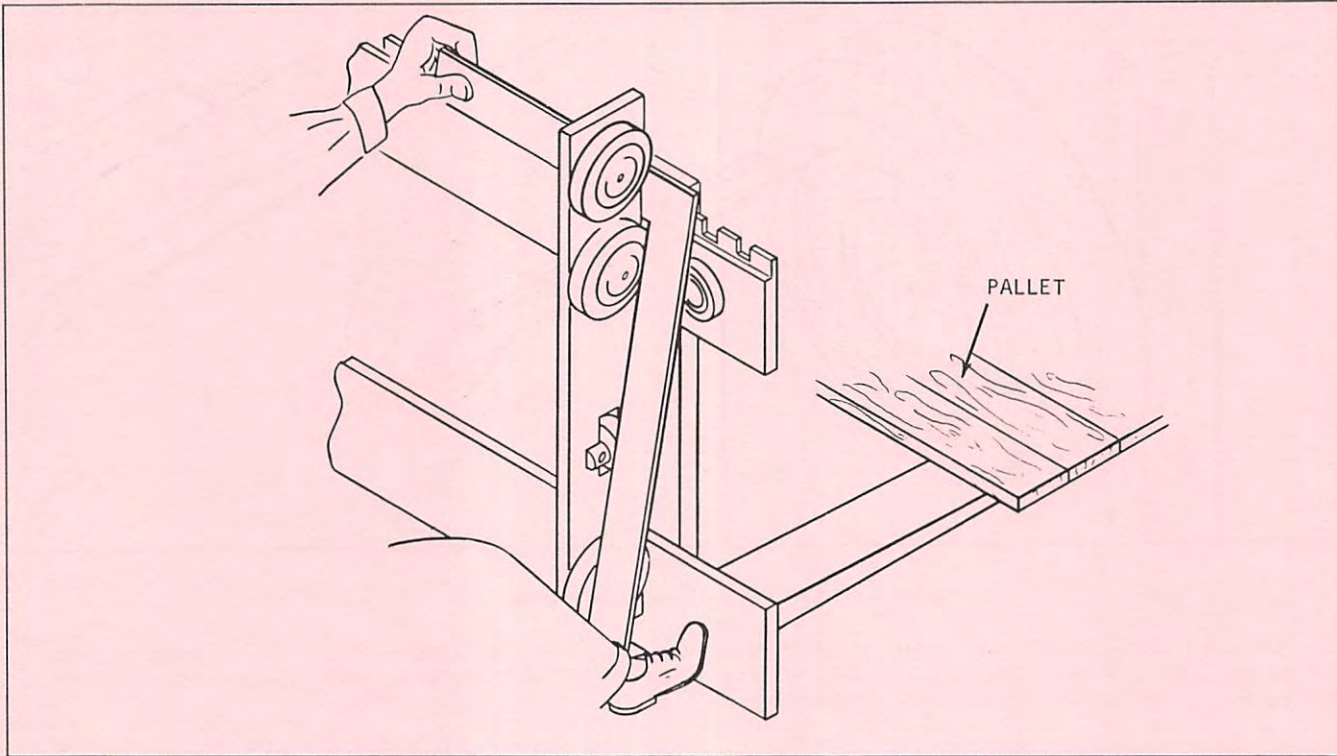
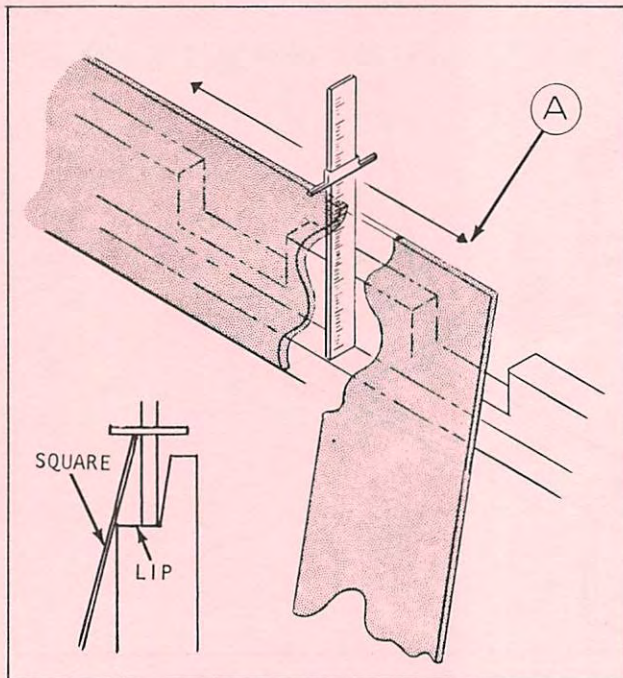


Plate 9574 Squaring Carriage Rollers (Six Roller Carriage)

... upper and lower rollers. Hold square in place with ankle and hand as shown.



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 9575 Measuring For Squareness

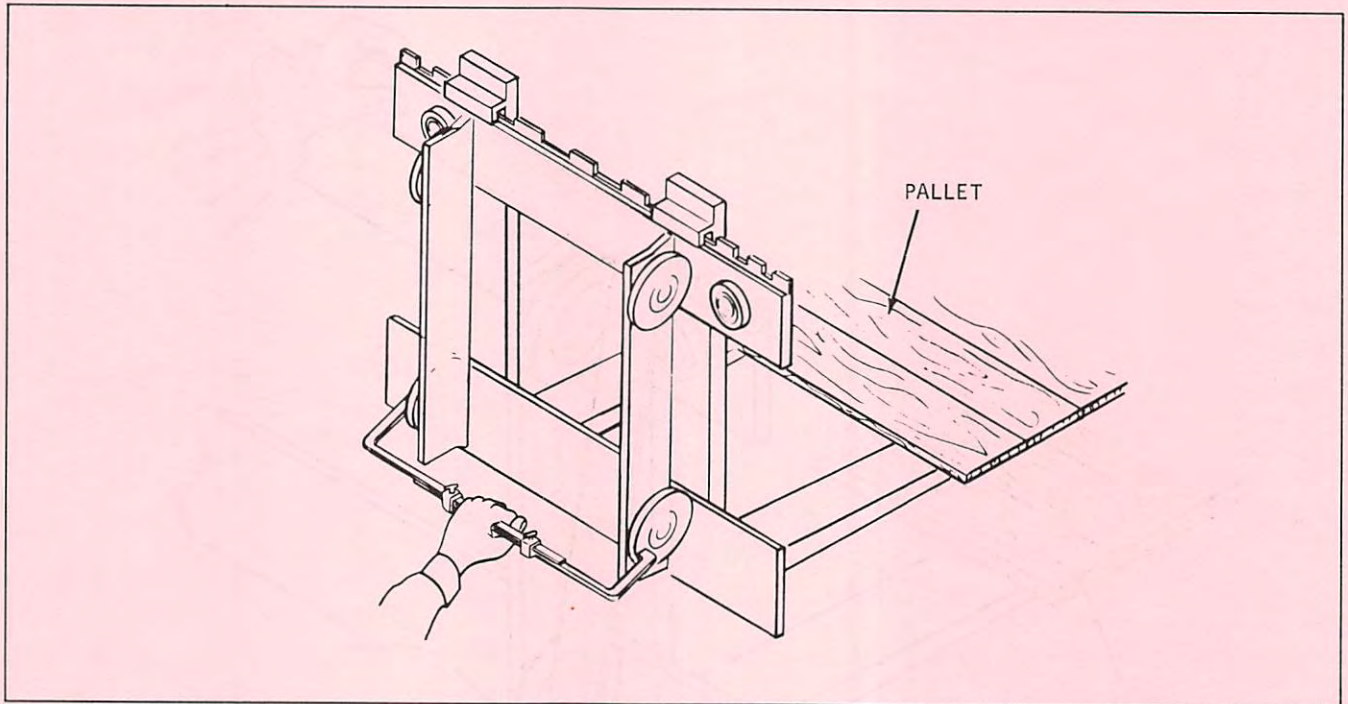


Plate 9576 Spanning Lower Rollers (Four Roller Carriage)

Step 7. Span lower rollers. Add or subtract shims to (the roller that has not been squared) ...

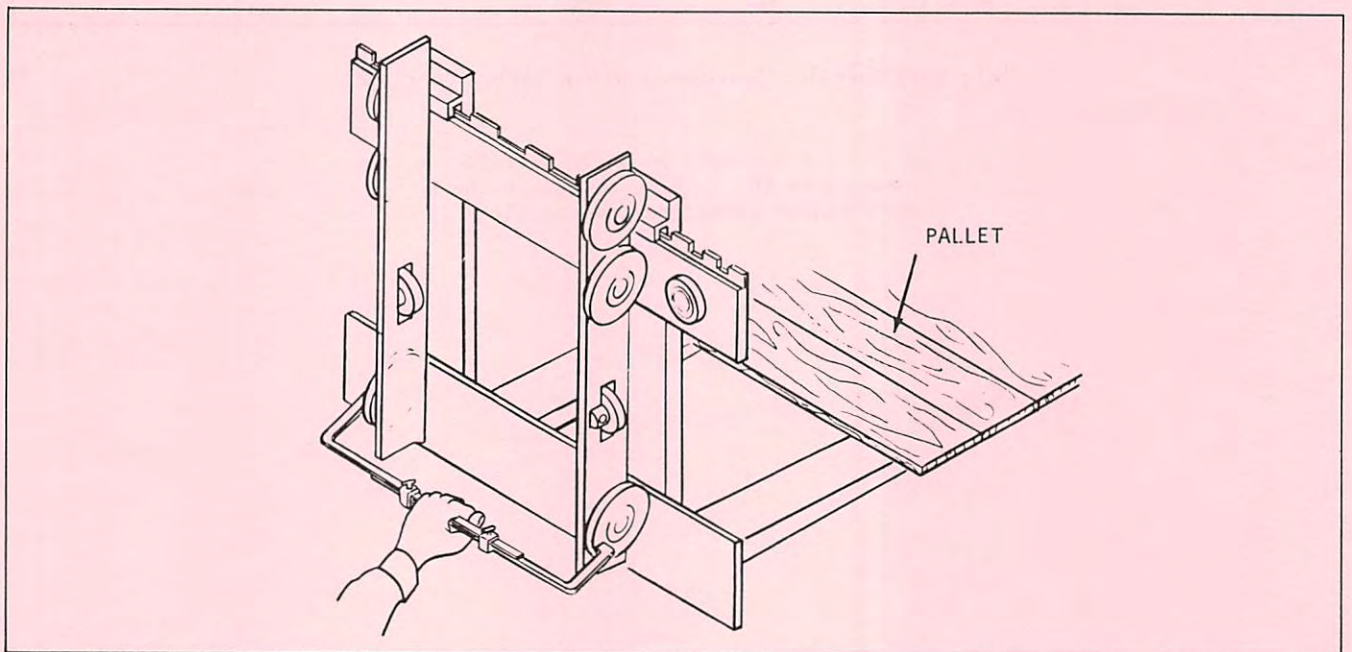


Plate 9577 Spanning Lower Rollers (Six Roller Carriage)

... reach the size of the outside spanning tool.

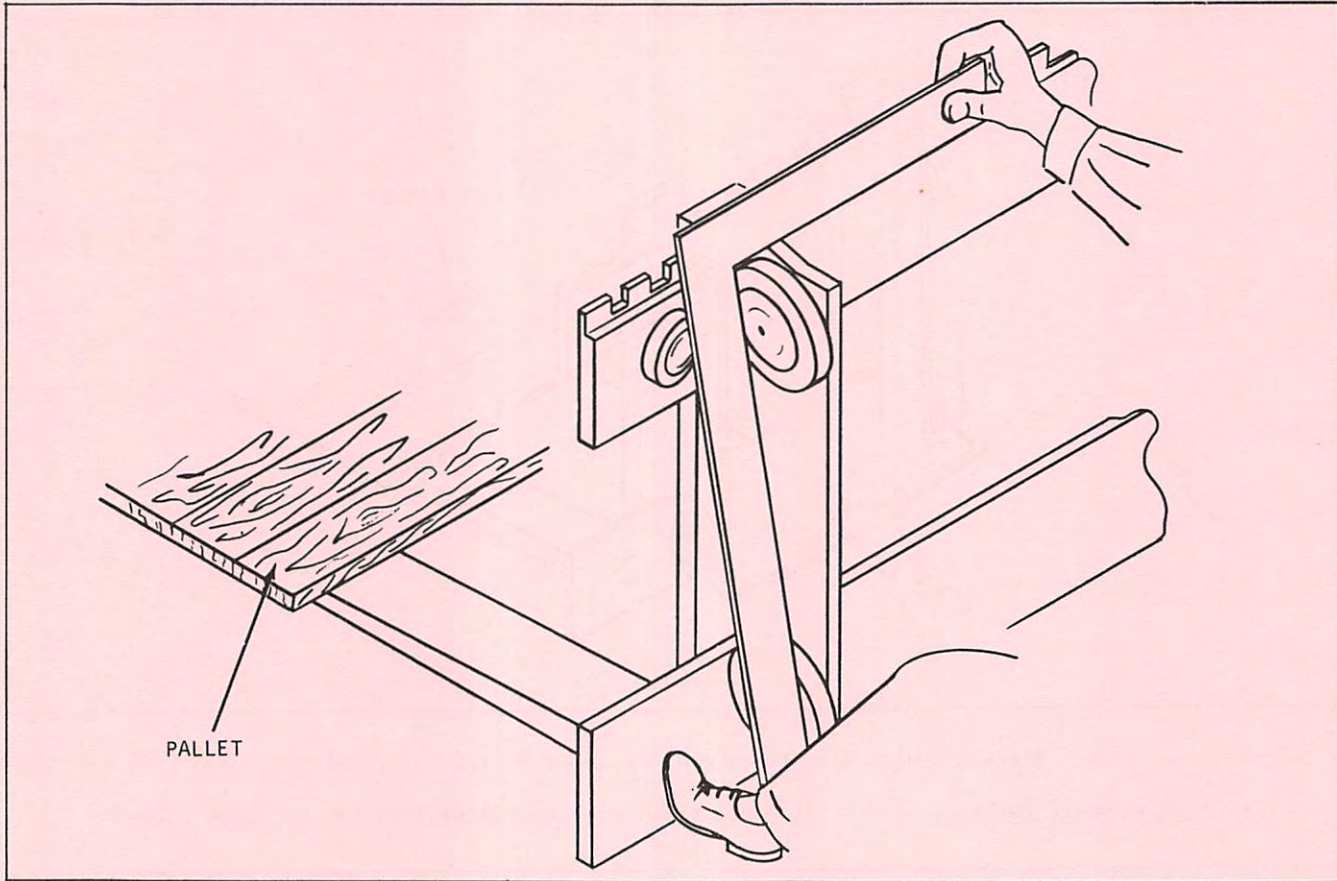


Plate 9578 Checking Squareness (Four Roller Carriage)

Step 8. Check opposite side for squareness (by holding square in the same manner as before and checking ...

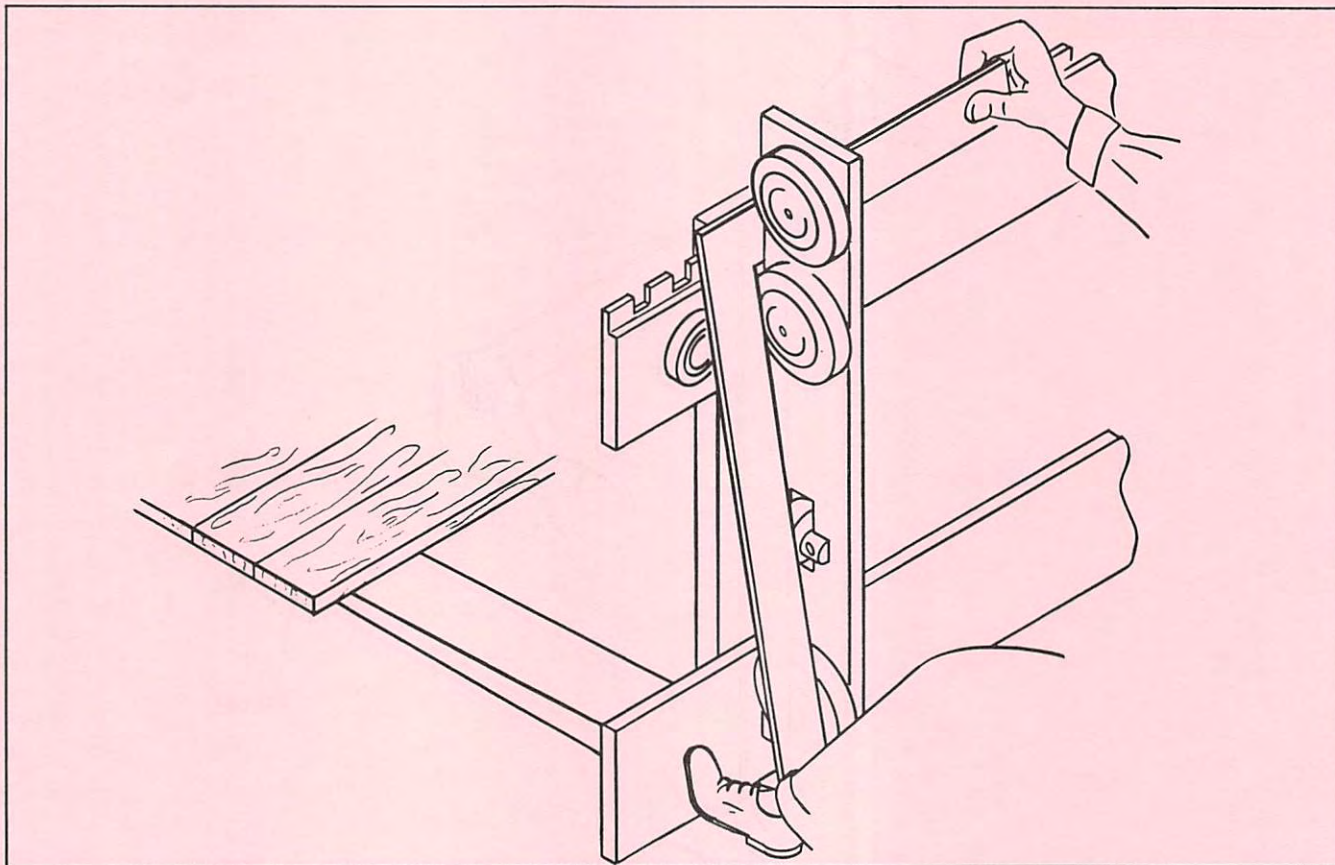


Plate 9579 Checking Squareness (Six Roller Carriage)

... measurement). This side will be square within $1/32''$; if not, return to Step 5. and repeat procedure.

SIX ROLLER CARRIAGE ONLY

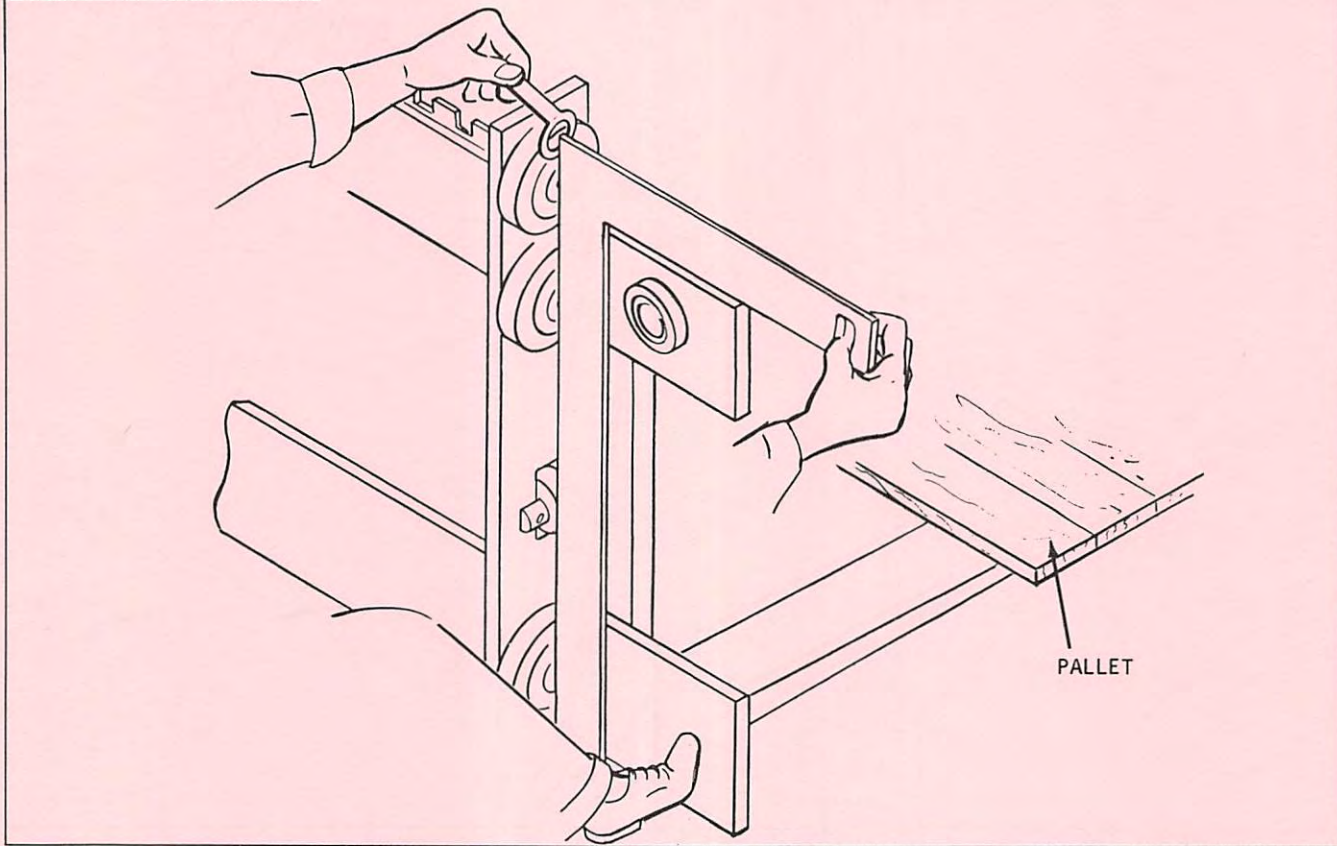


Plate 9580 Top Roller Clearance

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

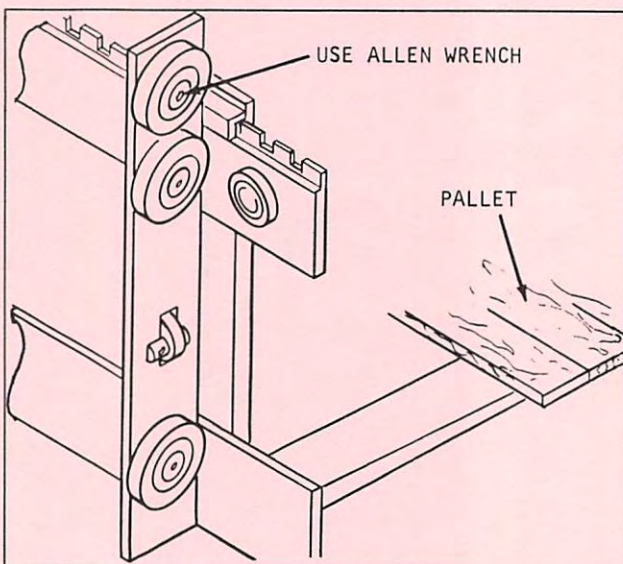


Plate 9581 Removing Top Roller

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.

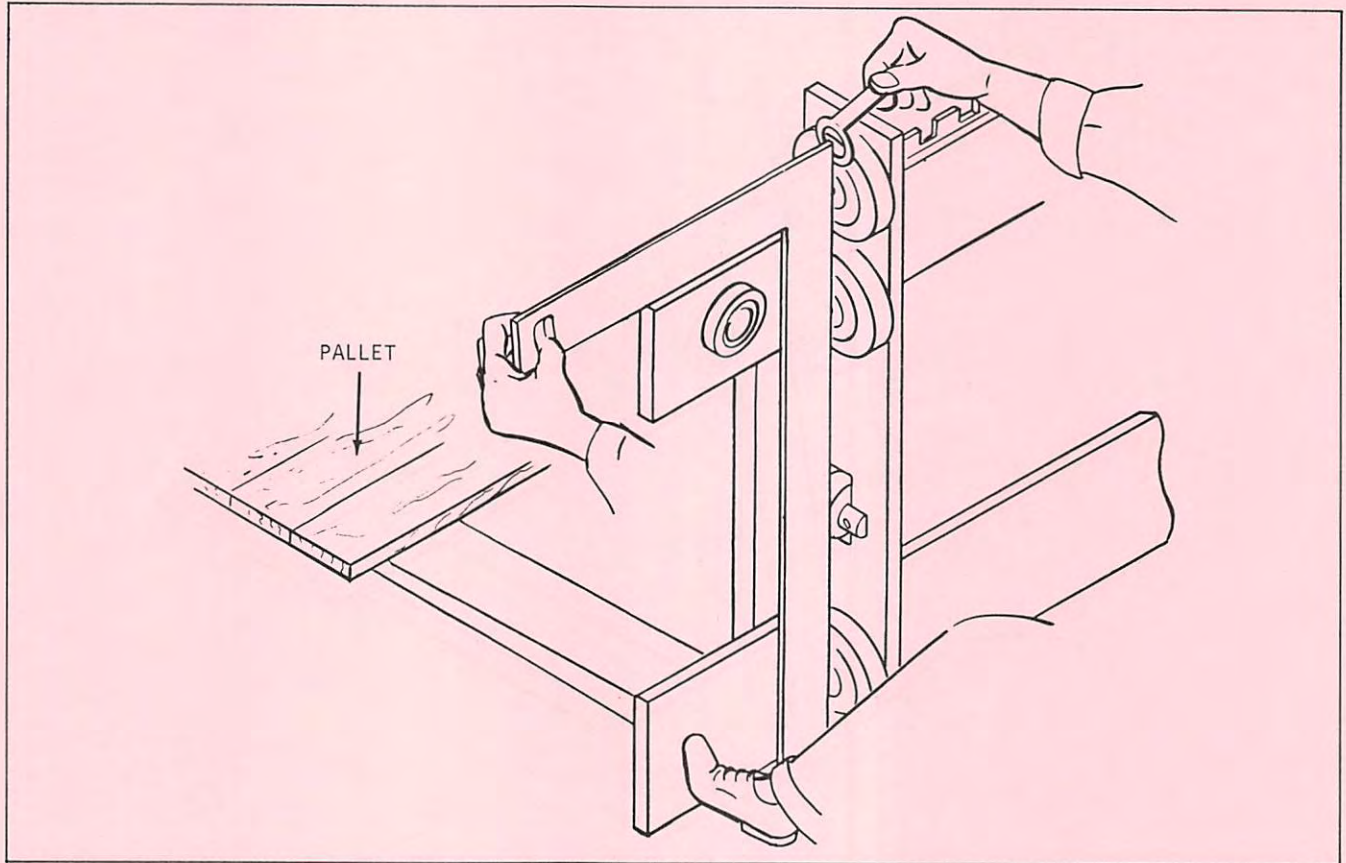


Plate 9582 Top Roller Clearance

Step 3. Check opposite upper roller in the same manner; adjust if necessary.

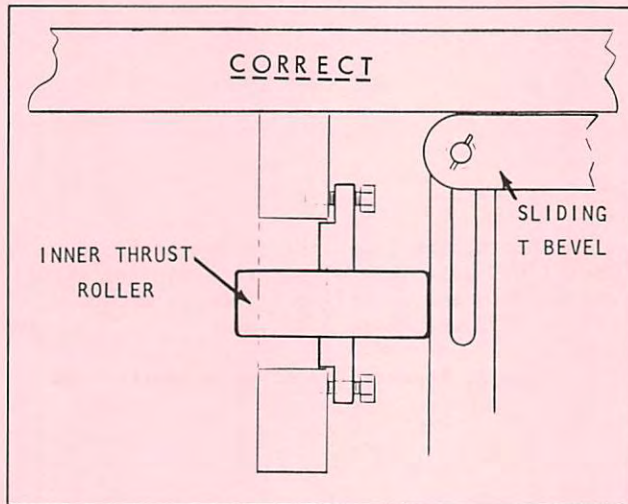


Plate 9583 Checking Squareness ■ CORRECT

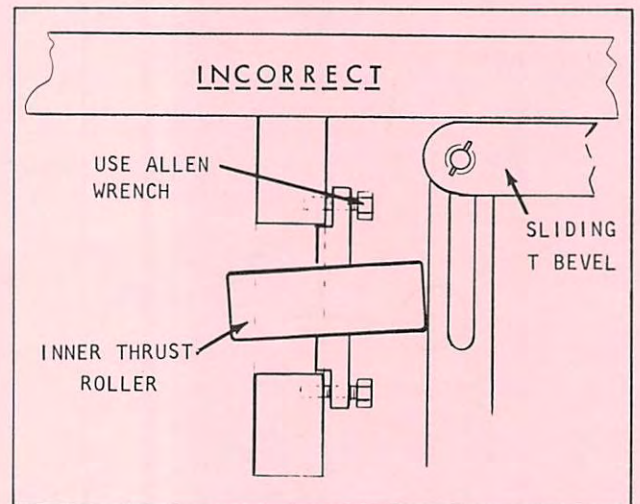


Plate 9584 Checking Squareness ■ INCORRECT

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).

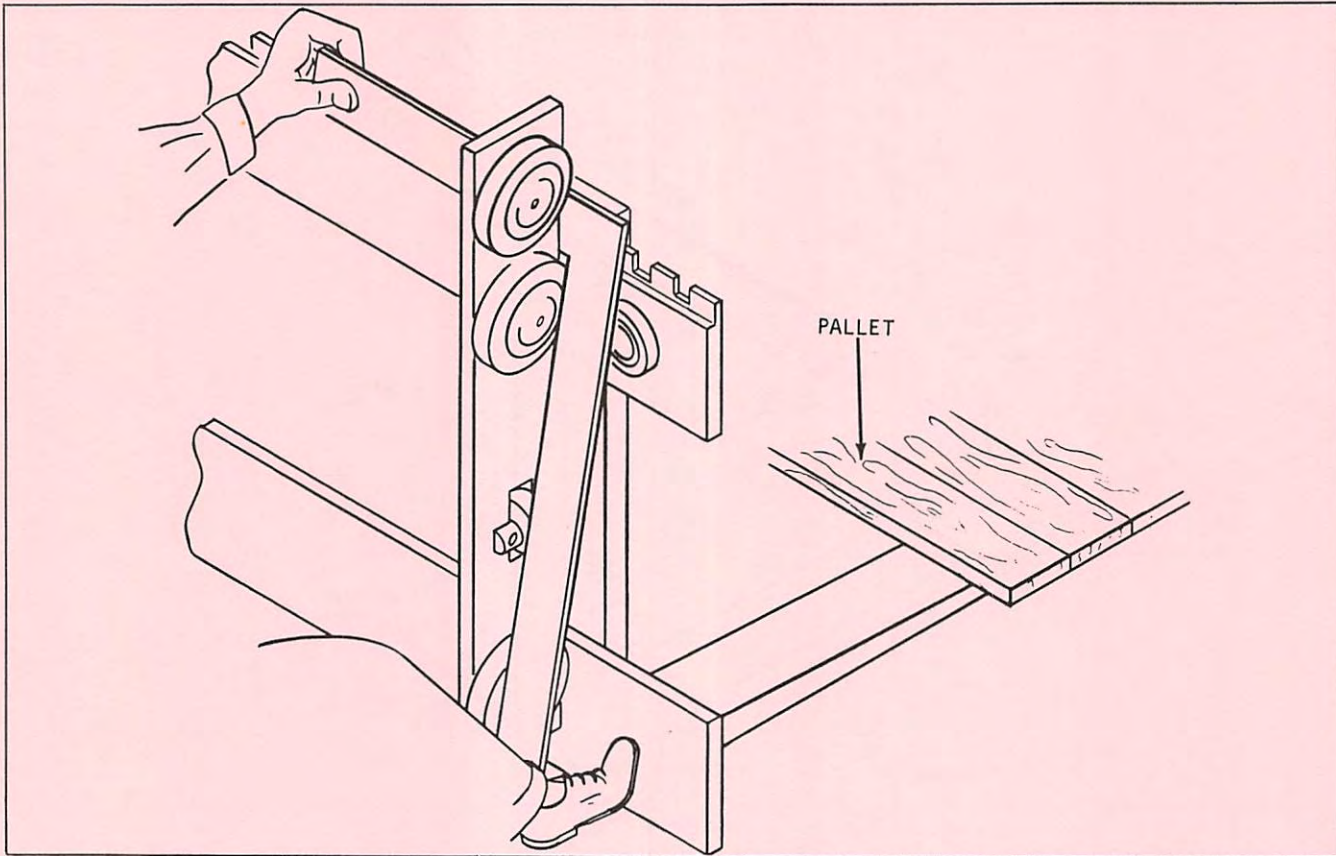


Plate 9574 Square And Side Thrust Roller

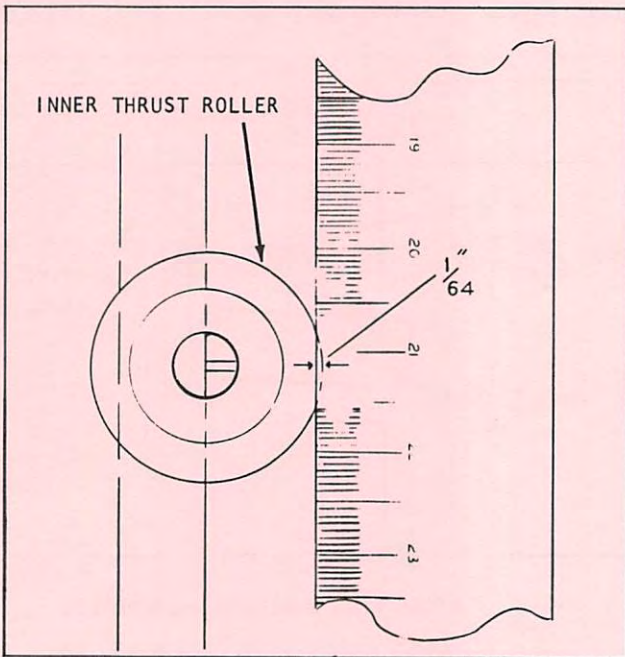


Plate 9585 Reading Roller Projection

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.

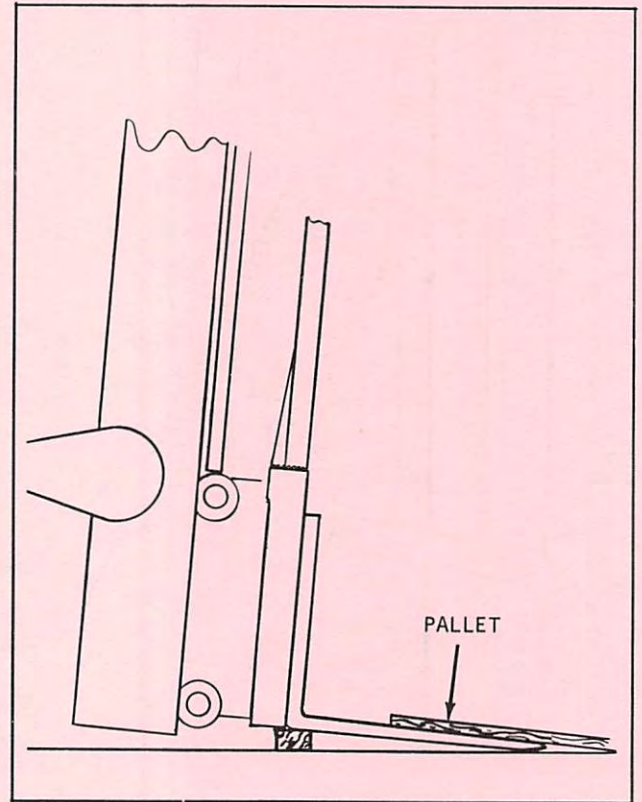


Plate 9565 Inner Rail Clearing Carriage Rollers

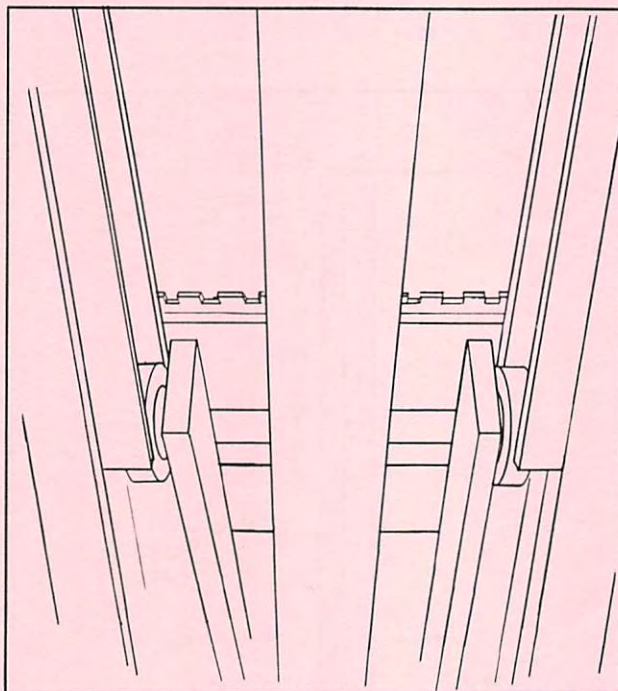


Plate 9591 Rollers Guiding Into Inner Rail

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.

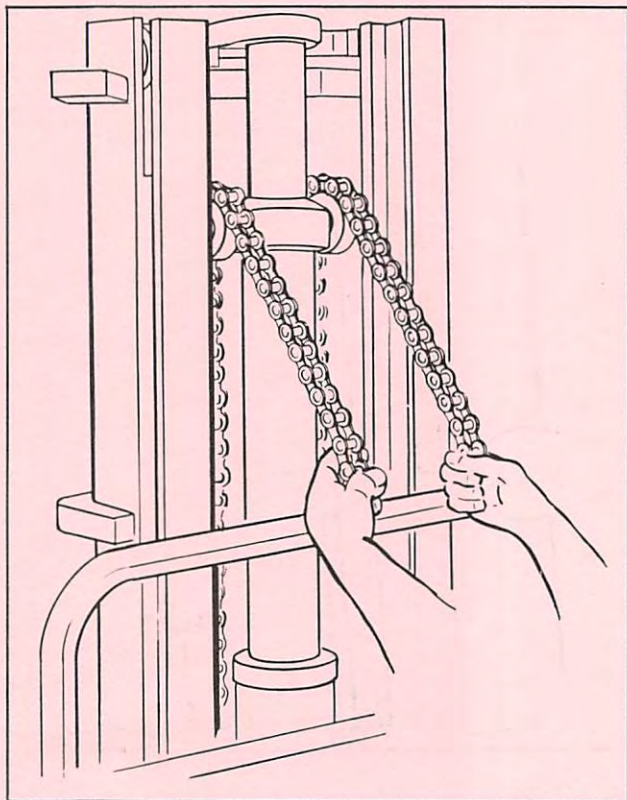


Plate 9586 Pulling Piston Head Down

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.

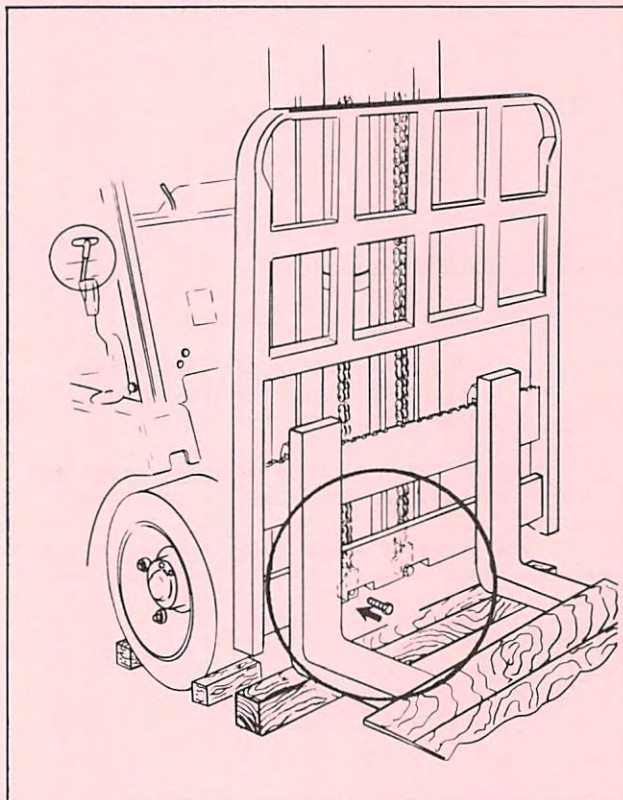


Plate 9587 Installing Bolts

Step 4. Put chain anchors in carriage anchor brackets and install $\frac{3}{8}$ " x 2" bolts in anchor pin holes.

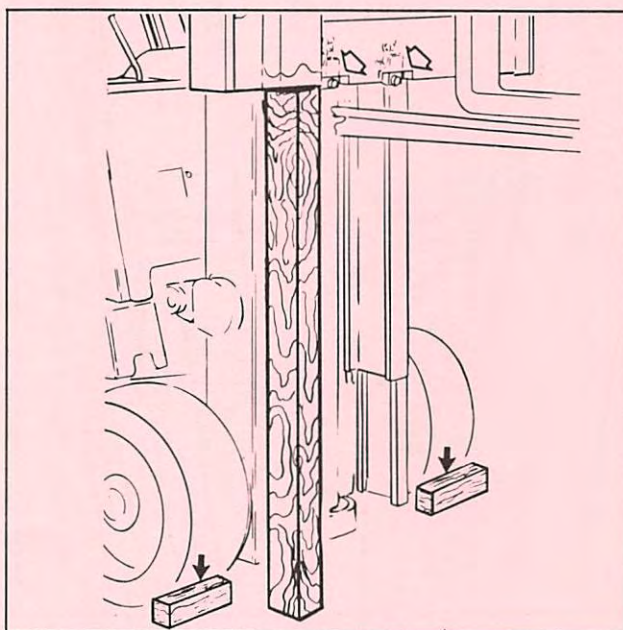


Plate 9593 Carriage Pin Replacement

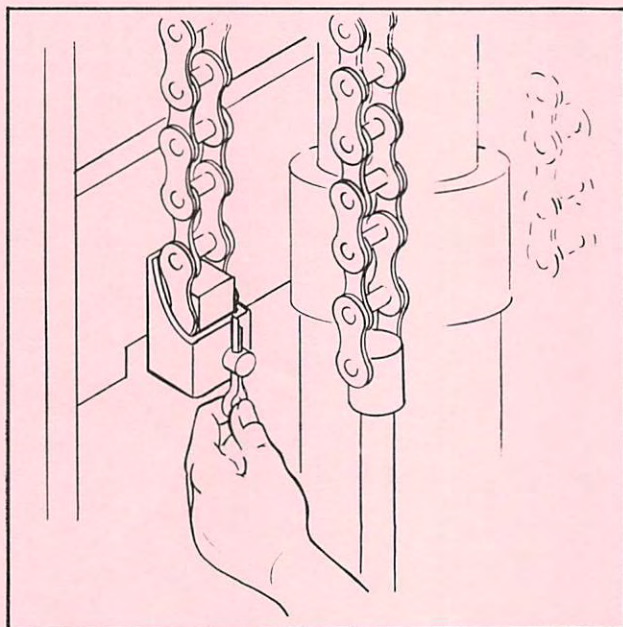


Plate 9588 Installing Cotter Pins

Step 7. Replace cotter pins in anchor pins.

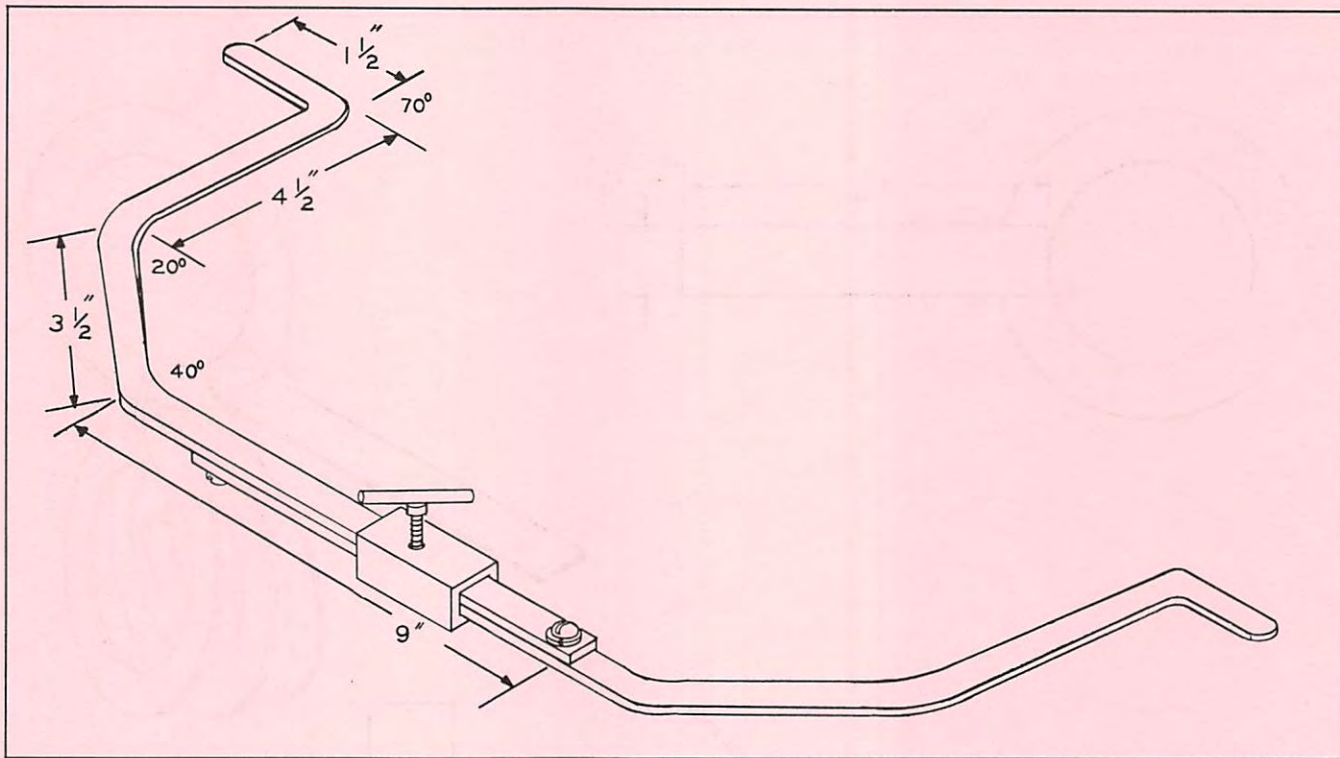
Step 8. Raise and lower carriage to full positions checking all phases of operation.

INDUSTRIAL TRUCK DIVISION

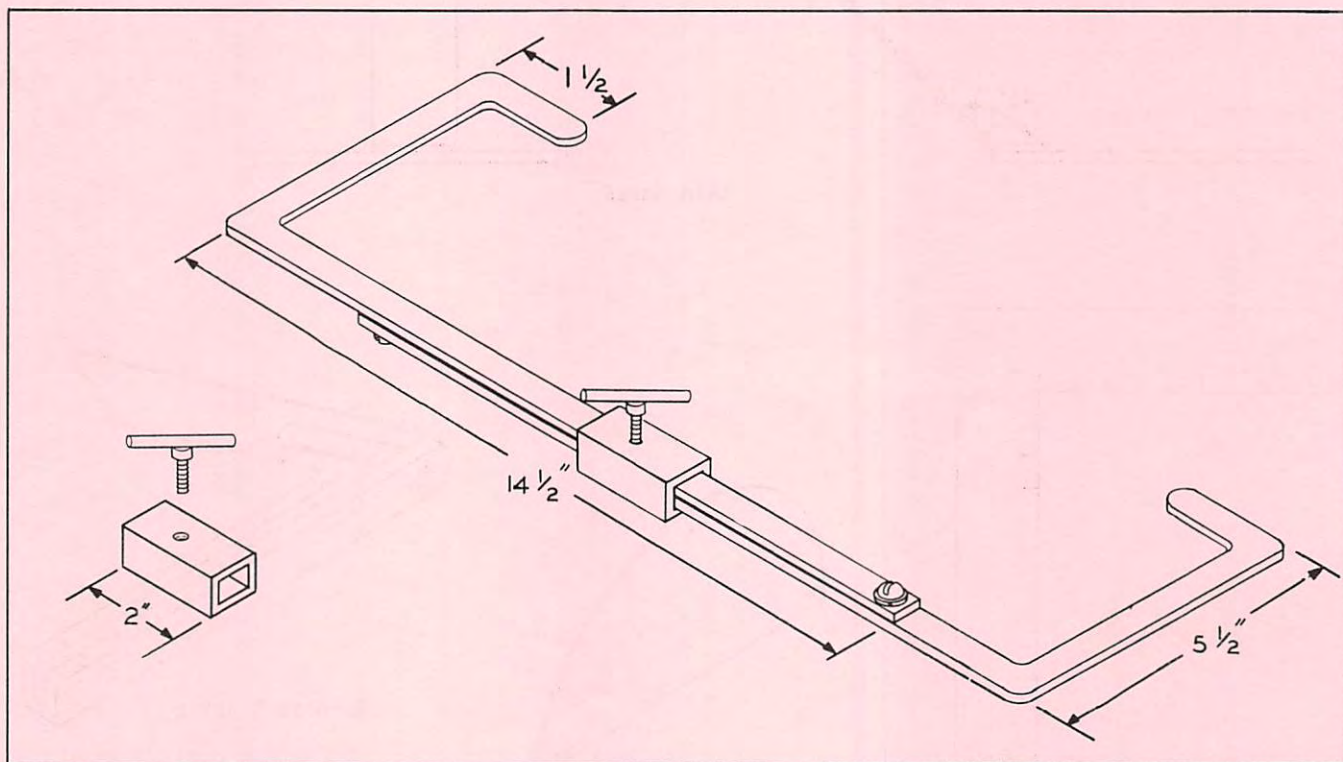
UNITED STATES DEPARTMENT OF COMMERCE



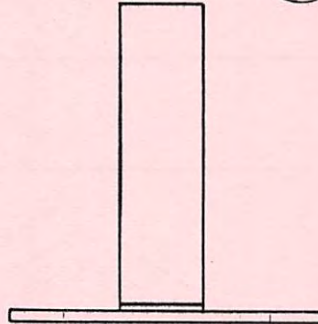
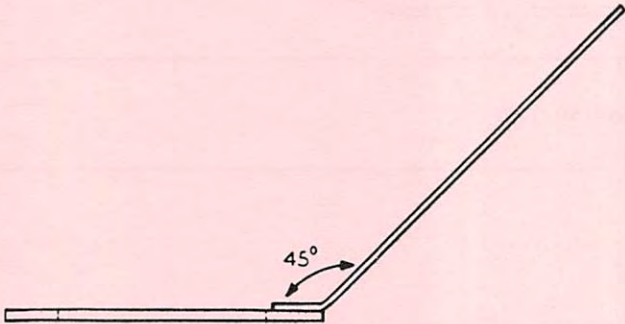
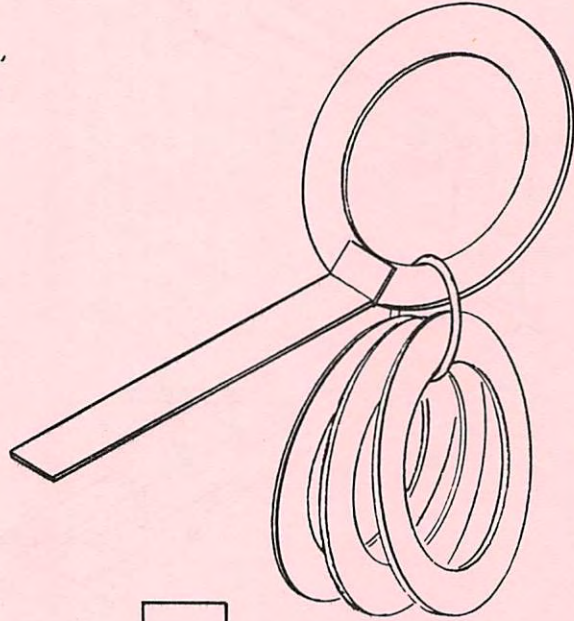
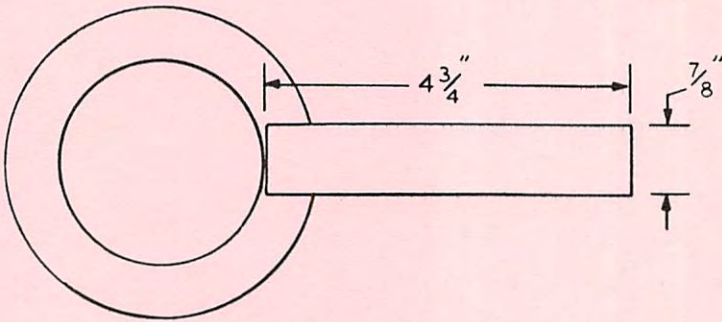
UNITED STATES DEPARTMENT OF COMMERCE
INDUSTRIAL TRUCK DIVISION
WASHINGTON, D. C. 20540



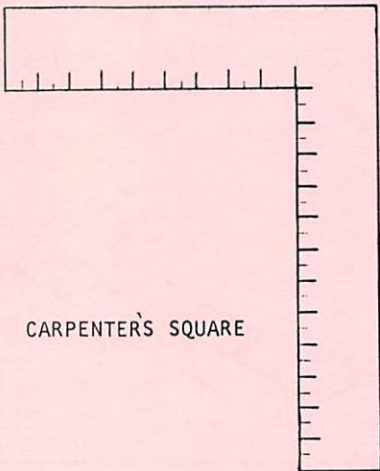
INSIDE SPANNING TOOL



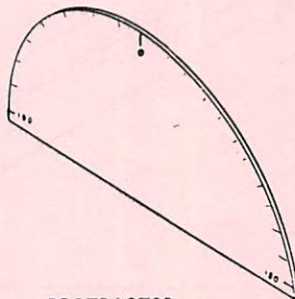
OUTSIDE SPANNING TOOL



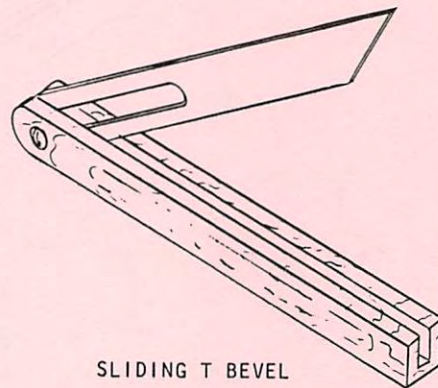
SHIM GAUGE



CARPENTER'S SQUARE



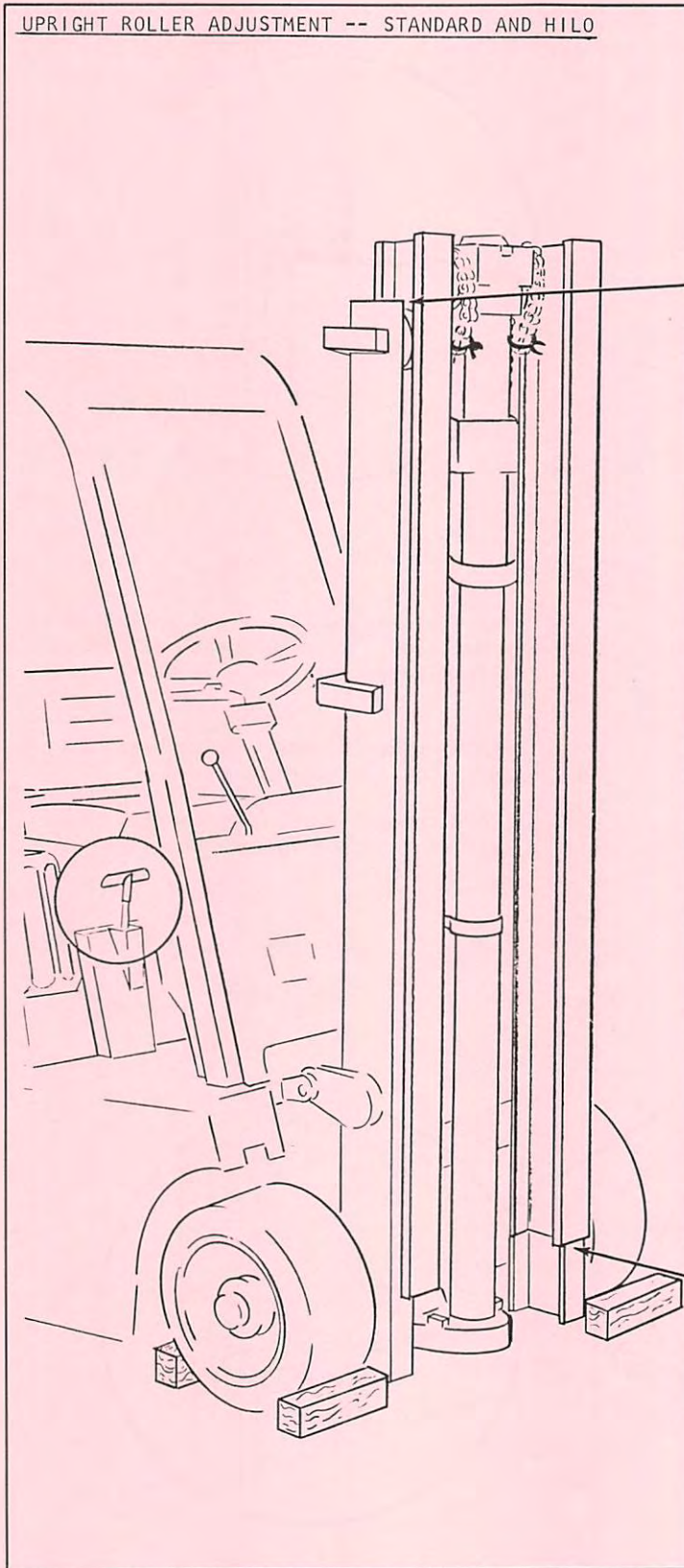
PROTRACTOR



SLIDING T BEVEL

UPRIGHT ROLLER ADJUSTMENT

UPRIGHT ROLLER ADJUSTMENT -- STANDARD AND HILO

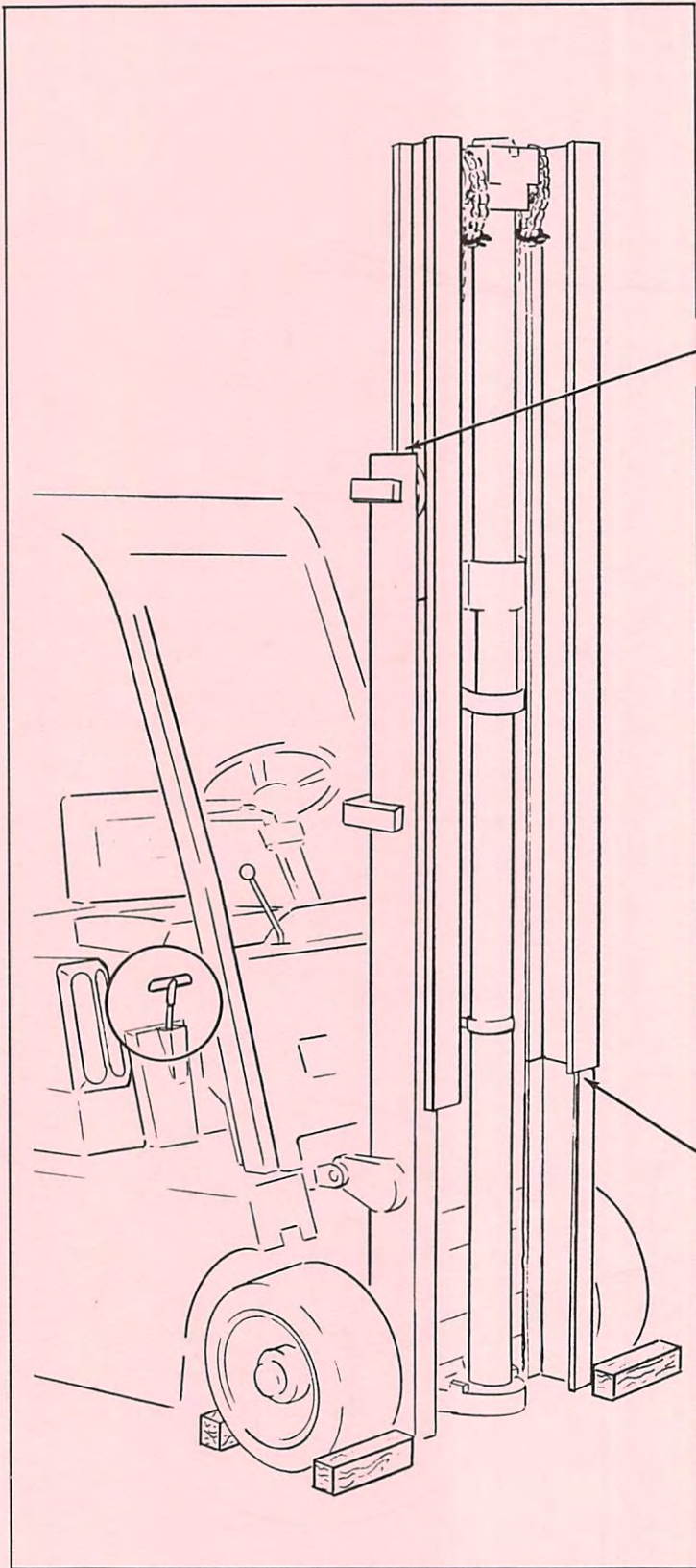


Step 1(a). Remove carriage. Refer to CARRIAGE REMOVAL.

Before checking roller clearance, position inner rail about 5" above full down position.

Check both sides for roller clearance at (top and bottom) of inner rail. Use tool to determine the number of shims to be added and 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".

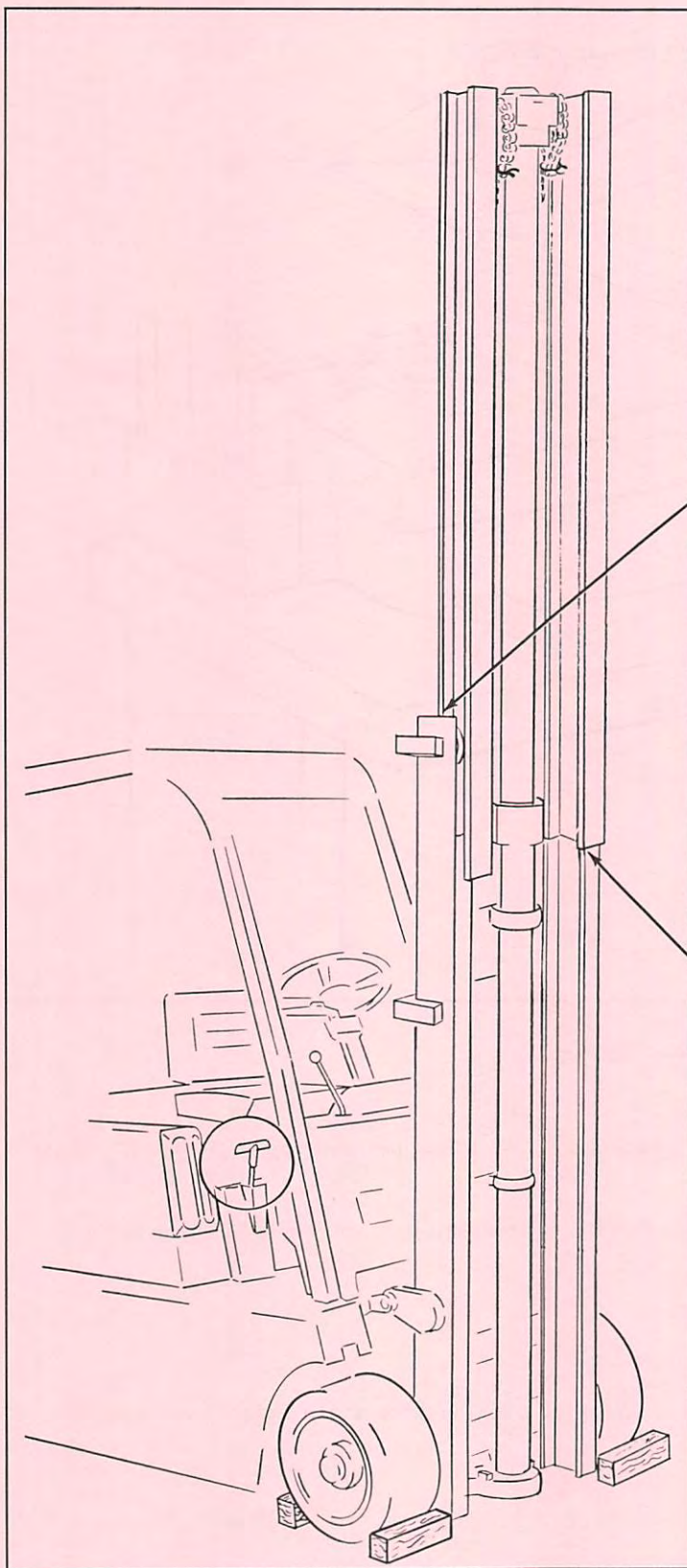


Step 1(b). Raise inner rail to 1/2 of its full up position. With tool and bar, check the roller clearance in the same manner as before.

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 9625



Step 1(c). Raise inner rail 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 9626

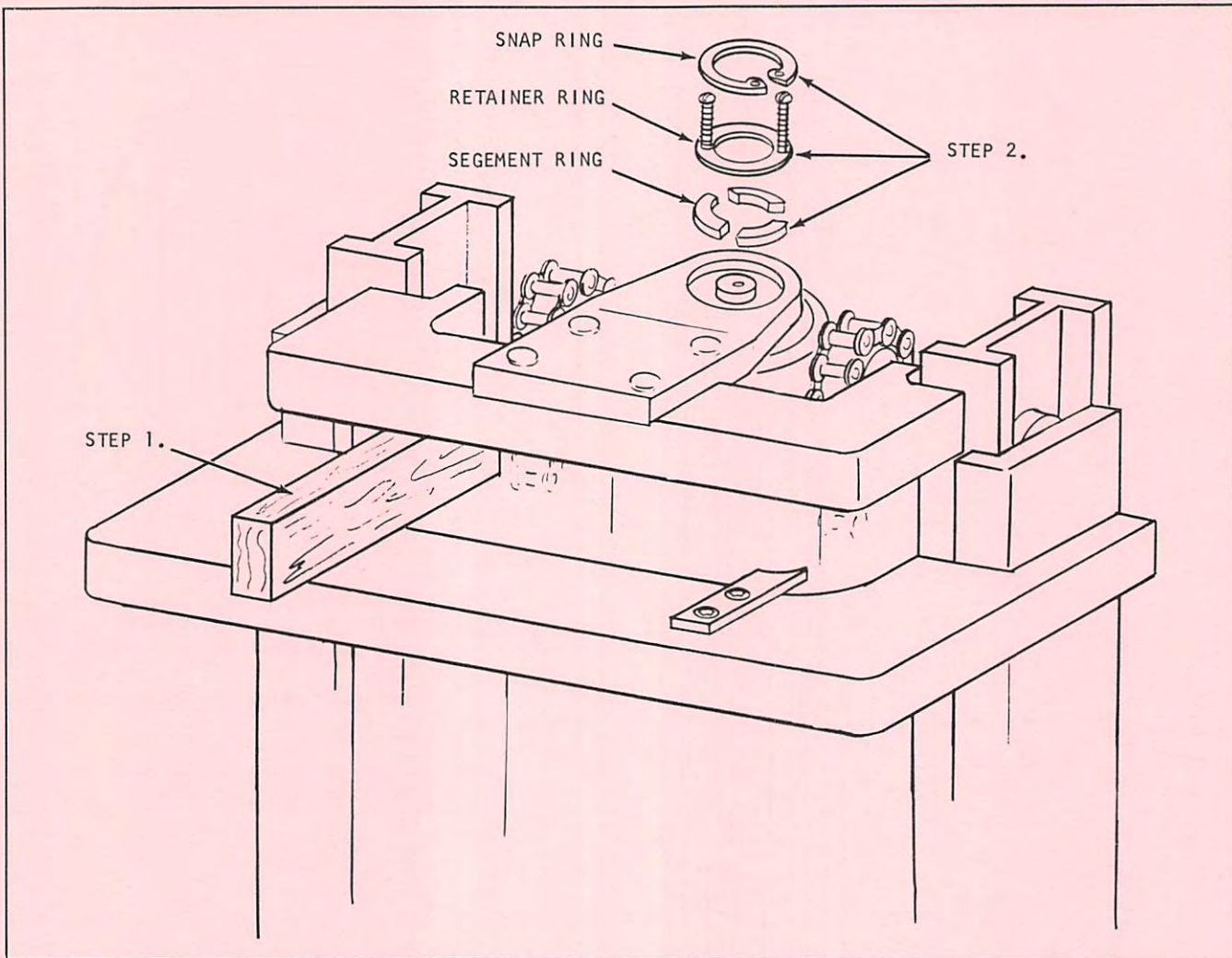


Plate 9627

REMOVAL OF INNER RAIL

Step 1. Raise inner rail about 5 inches and place a 2" x 4" block between upper tie bars. Lower inner rail until block supports it.

The upright you are working with may have a different piston anchor than the one shown above, remove it accordingly.

Step 2(a). Secure piston head with chain hoist.

(b). Remove lift cylinder from upper anchor

1. Remove snap ring

2. Place two (2) #6-32X2" round head slotted machine screws (in holes provided) in retainer ring.

(c). Remove segement ring.

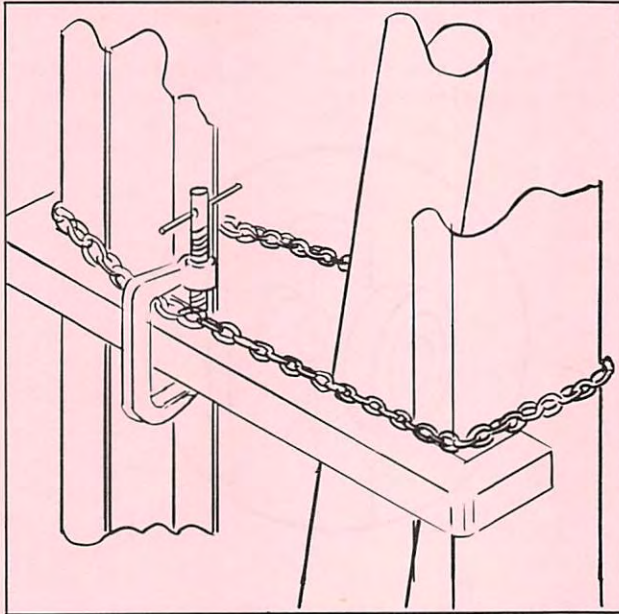


Plate 9628

Step 3. Place a safety strap or chain around outer rail as shown.

Step 4. Lower piston head out of anchor using pry bar. With the upright tilted forward the piston will rest on the strap or chain.

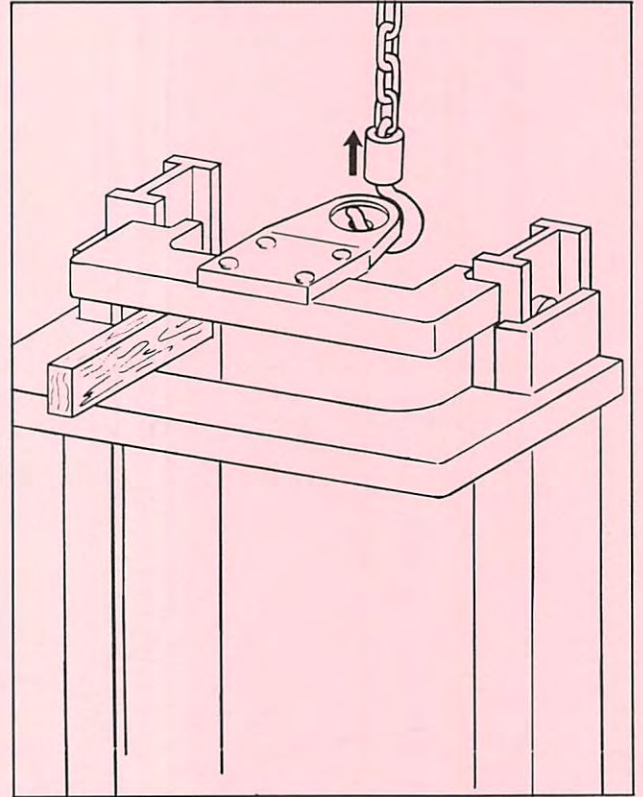


Plate 9630

Step 6. Place lifting device hook in hole of cylinder anchor. Raise about 2" and remove block between tie bars.

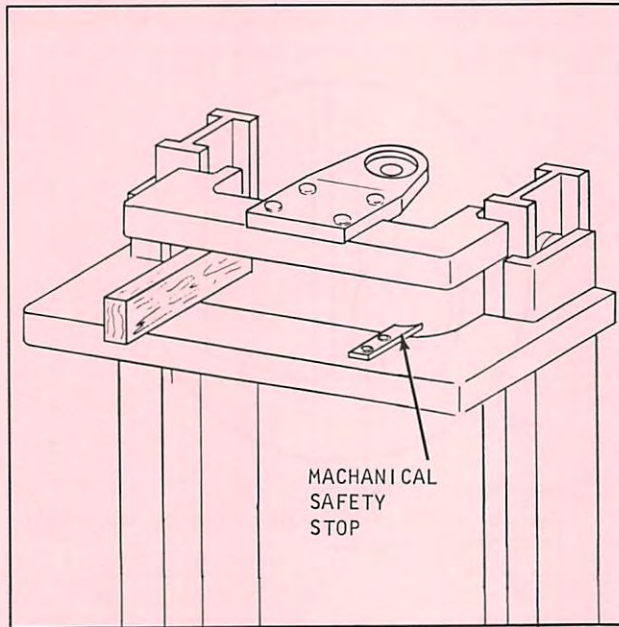
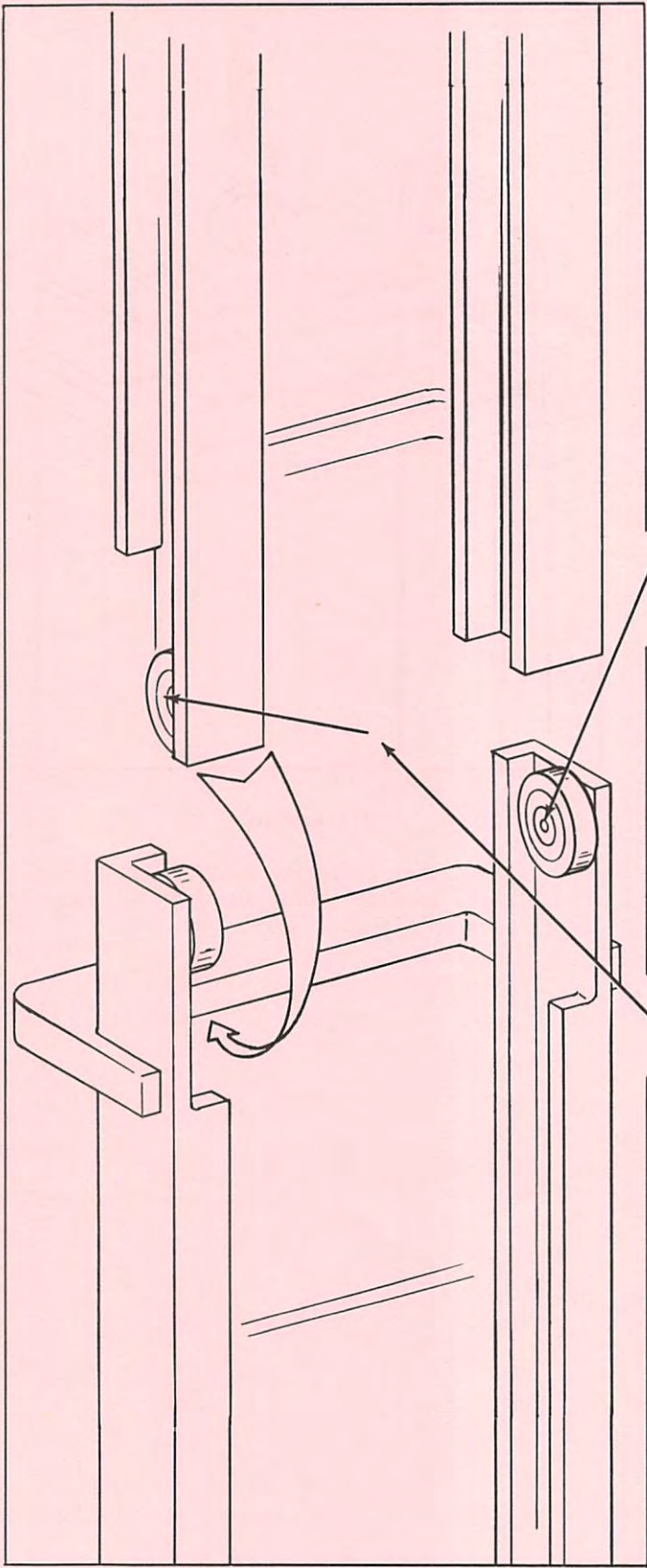


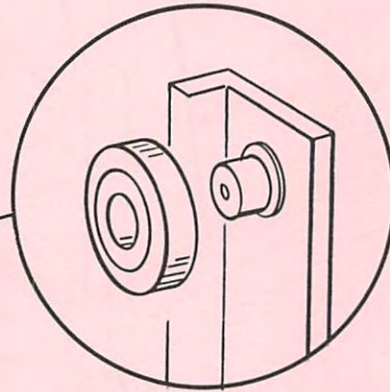
Plate 9629

Step 5. Remove mechanical safety stops with allen wrench.



Step 7. Raise inner rail out of outer rail.

Step 8. Leave inner rail in this position while adjusting rollers.



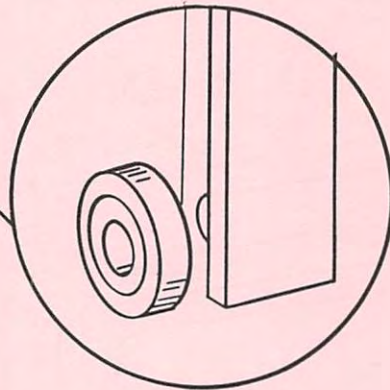
Step 9. Adjusting upright rollers:

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 Step 1. 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.



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 1. Go through the same steps you followed in adjusting the upper rollers.

3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace inner rail.

Plate 9631

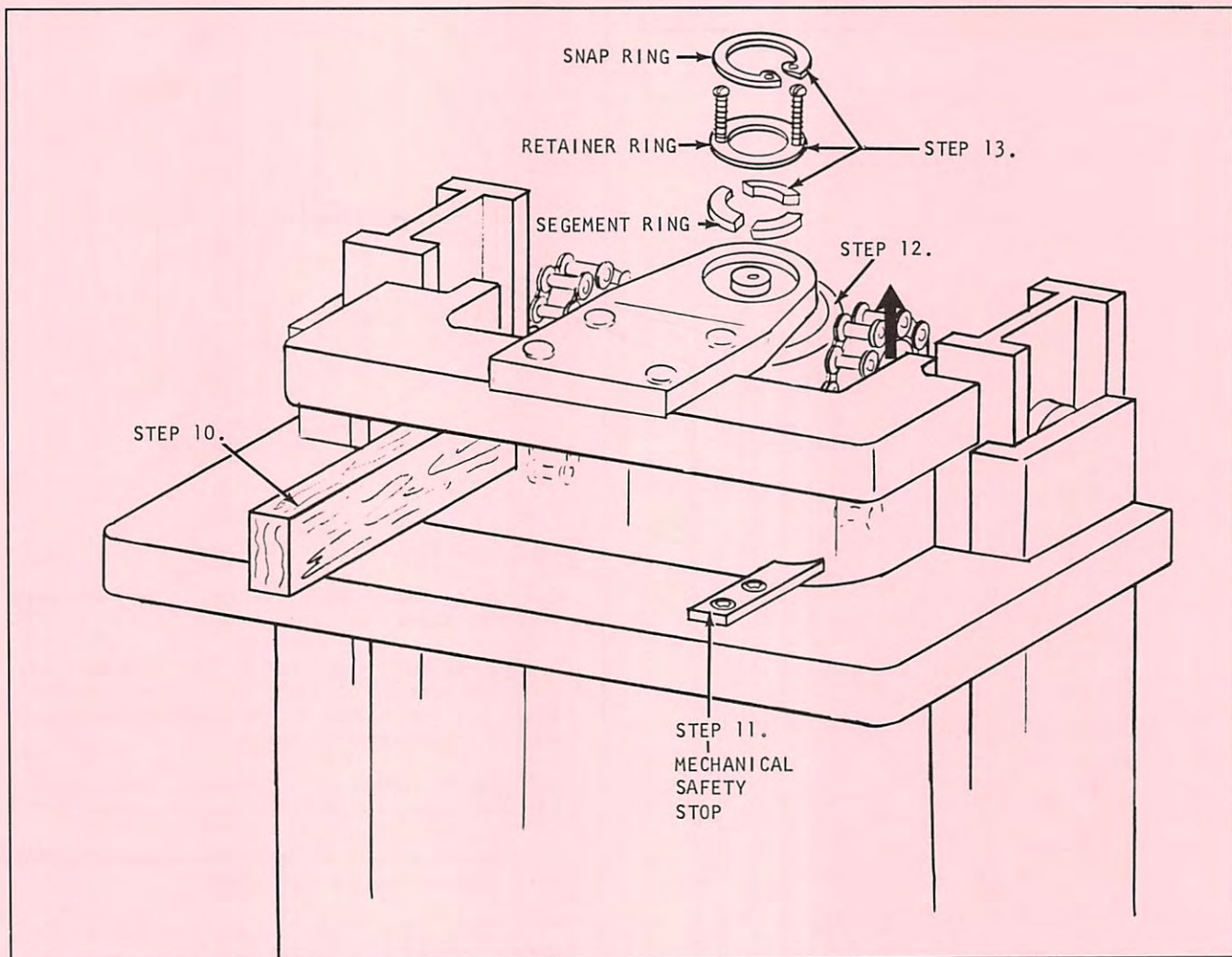


Plate 9632

Step 10(a). Place block between upper tie-bars. Lower inner rail until block supports it.

(b). Unhook lifting device.

Step 11. Install mechanical safety stops. Be sure to install lock washer and screw fasteners.

Step 12. Guide piston into anchor with one hand and move the lift lever with the other.

Step 13. Secure lift cylinder to anchor.

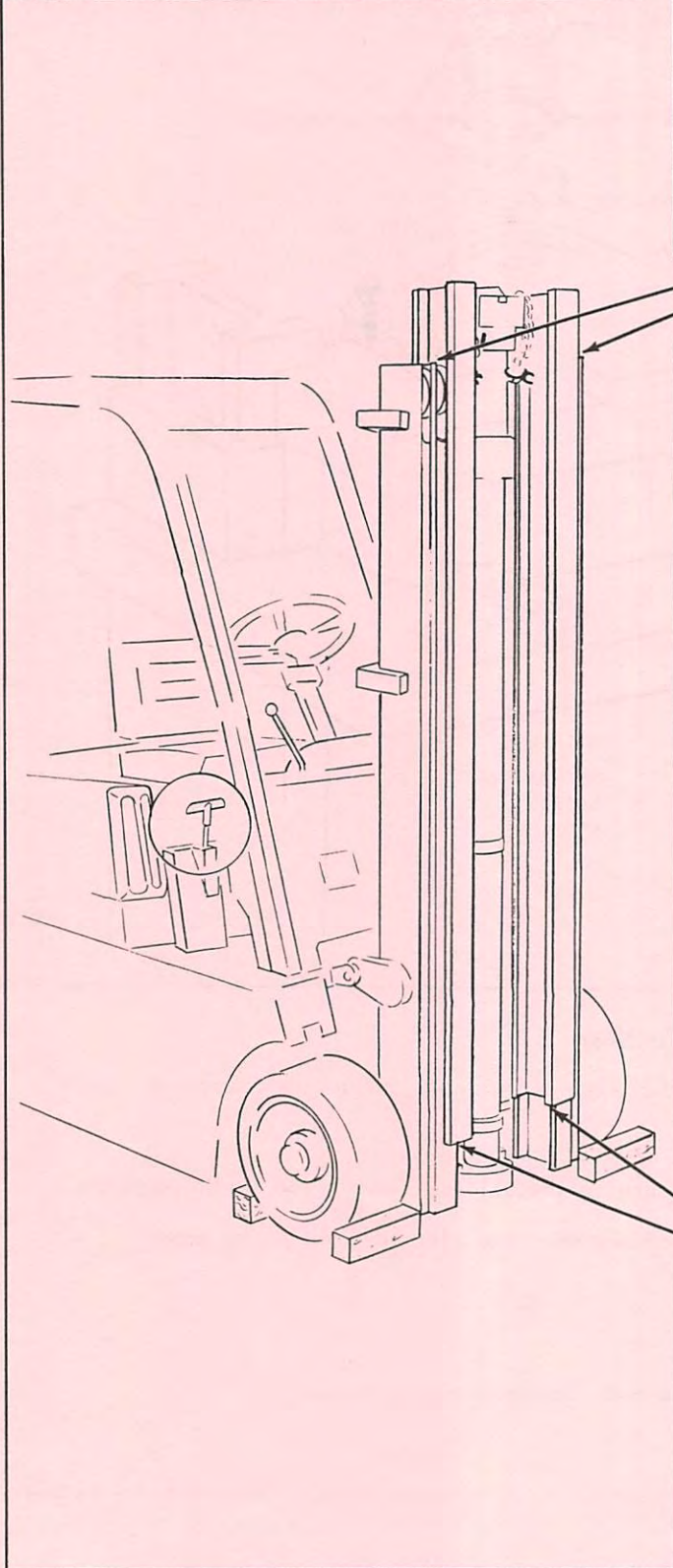
(a). Install segment ring.

(b). Install retainer ring and remove both slotted machine screws.

(c). Install snap ring.

(d). Raise and lower to full positions checking piston and anchor. Remove block between tie bars.

UPRIGHT ROLLER ADJUSTMENT -- STD. AND F. F. TRIPLE



Step 1(a). Remove carriage.

Before checking, 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 determine the number of shims to be added and record this number on the rail.

Record number of shims to be used, on intermediate 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 inch.

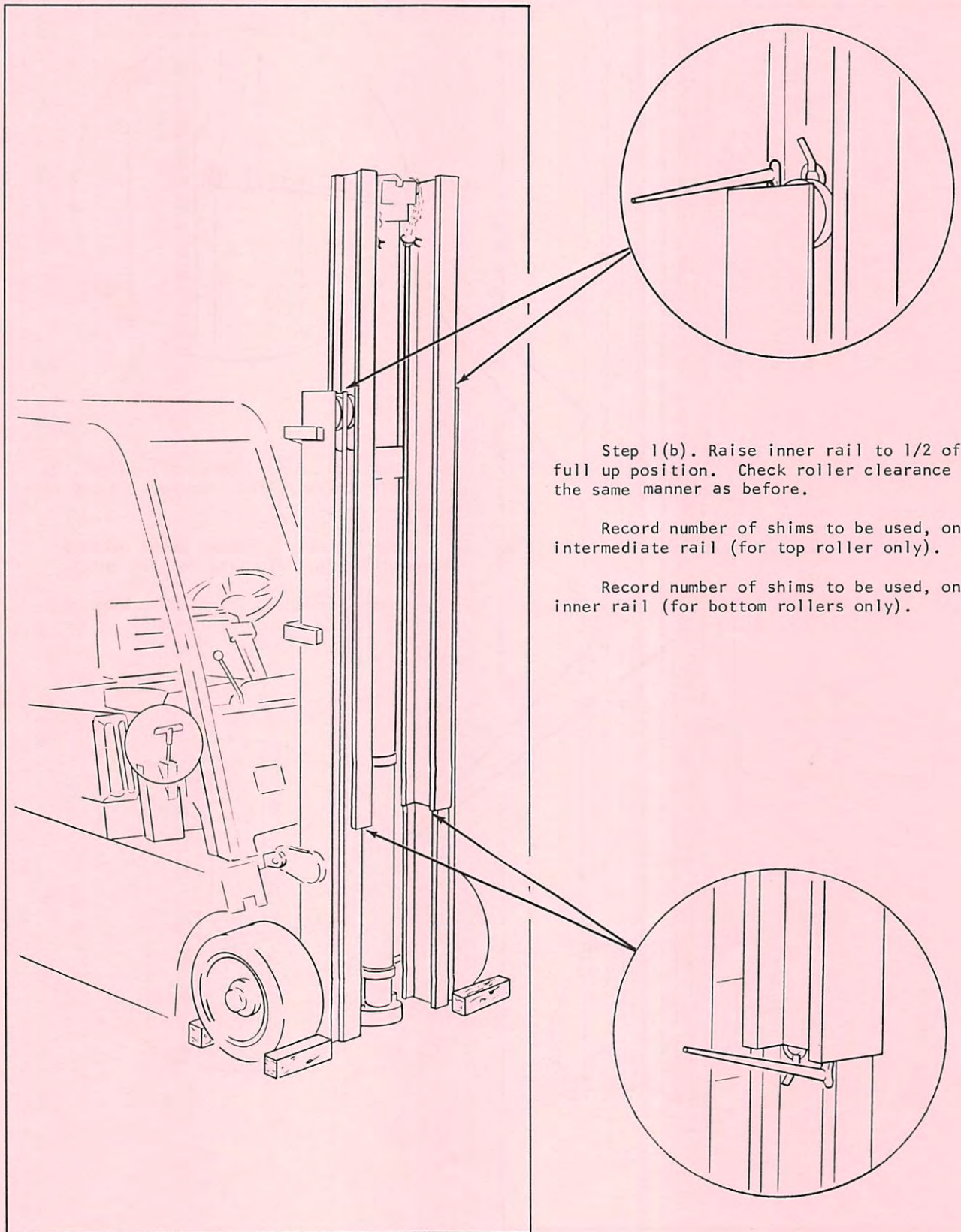
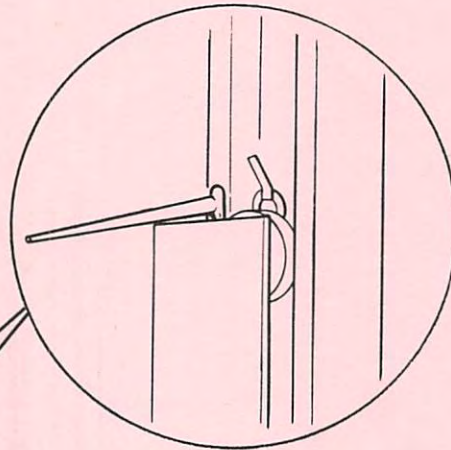
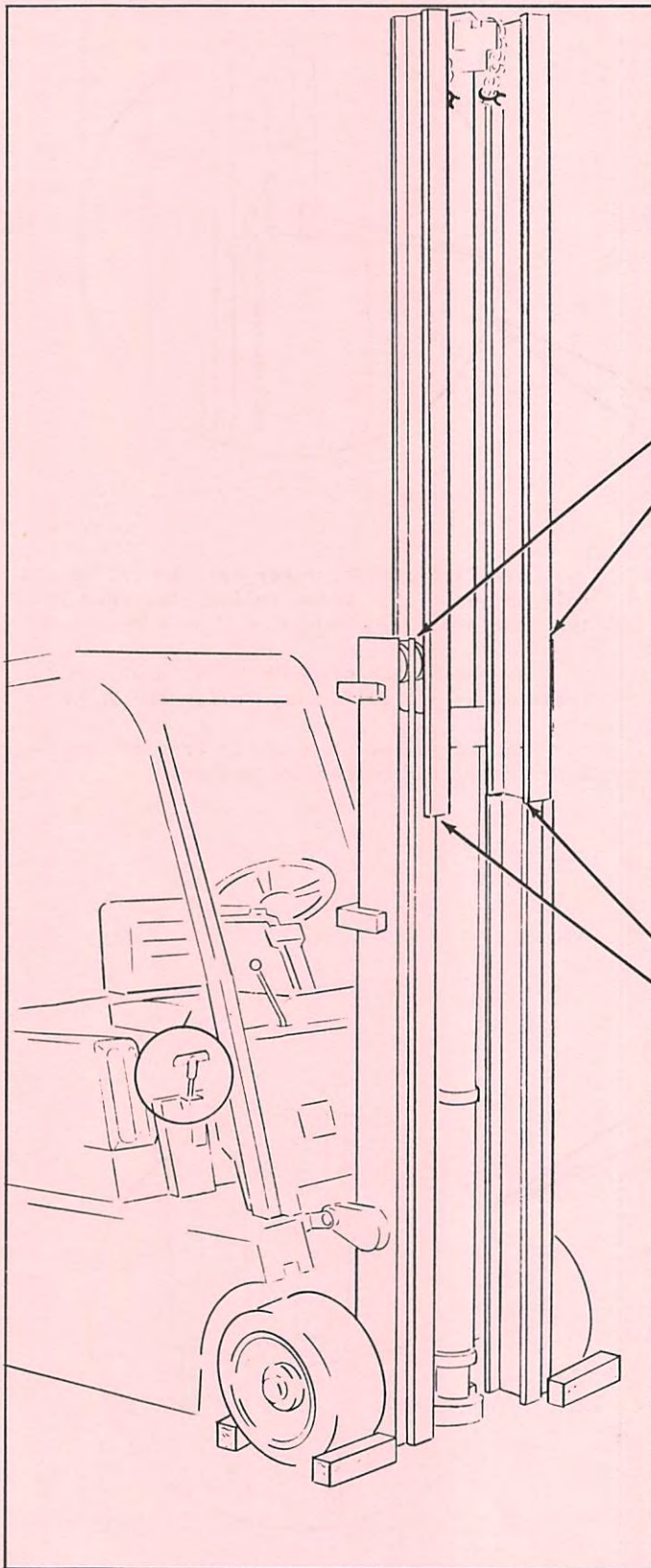


Plate 9637



Step 1(c). Raise inner rail to full up position. Check roller clearance in the same manner as before.

Record number of shims to be used, on intermediate rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rails only).

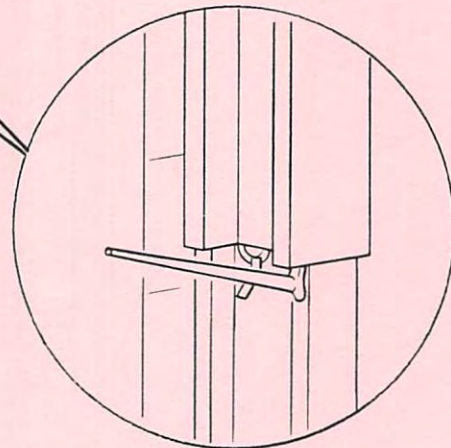
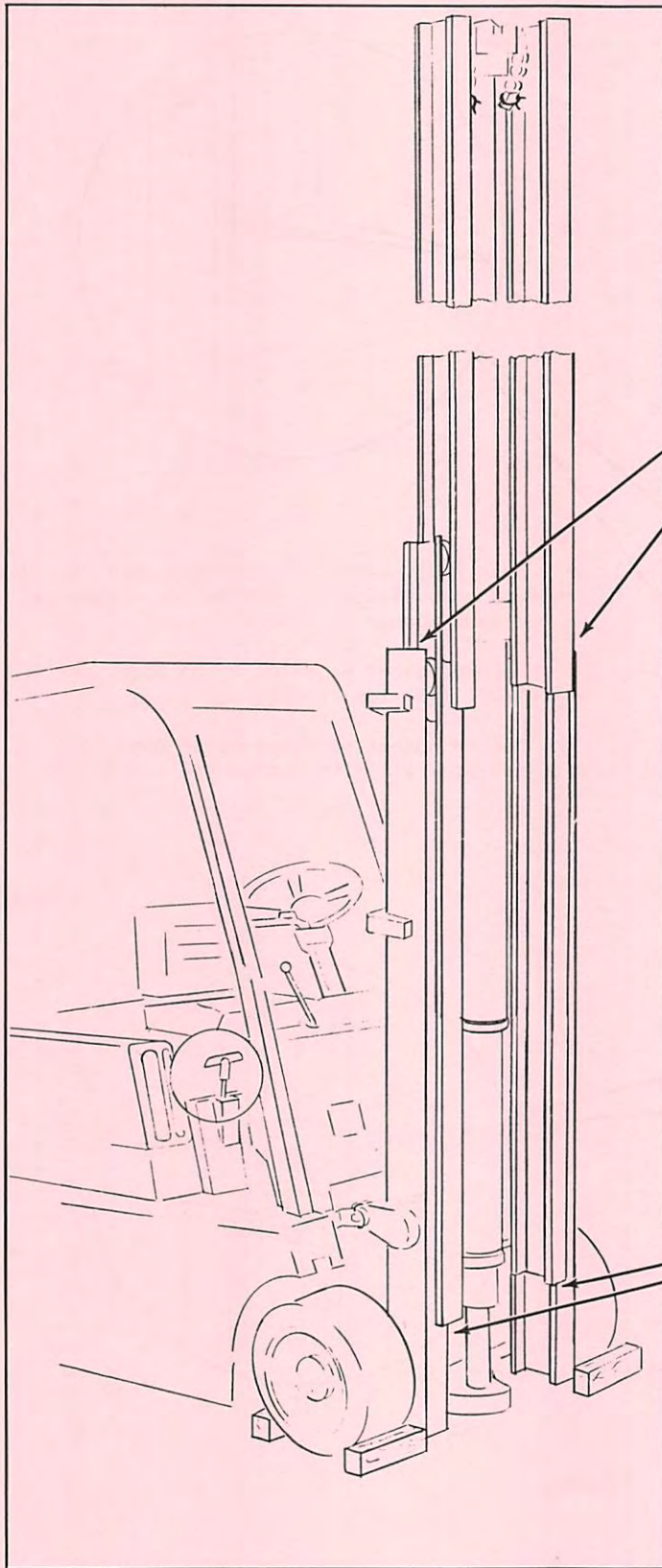


Plate 9638

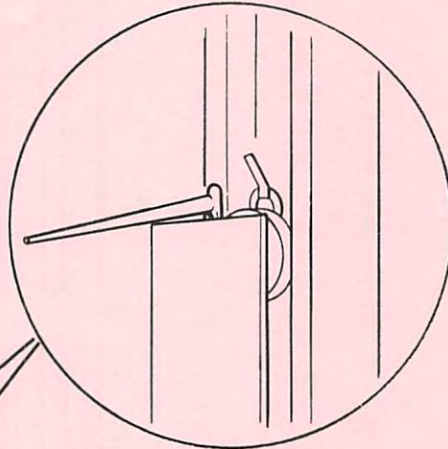
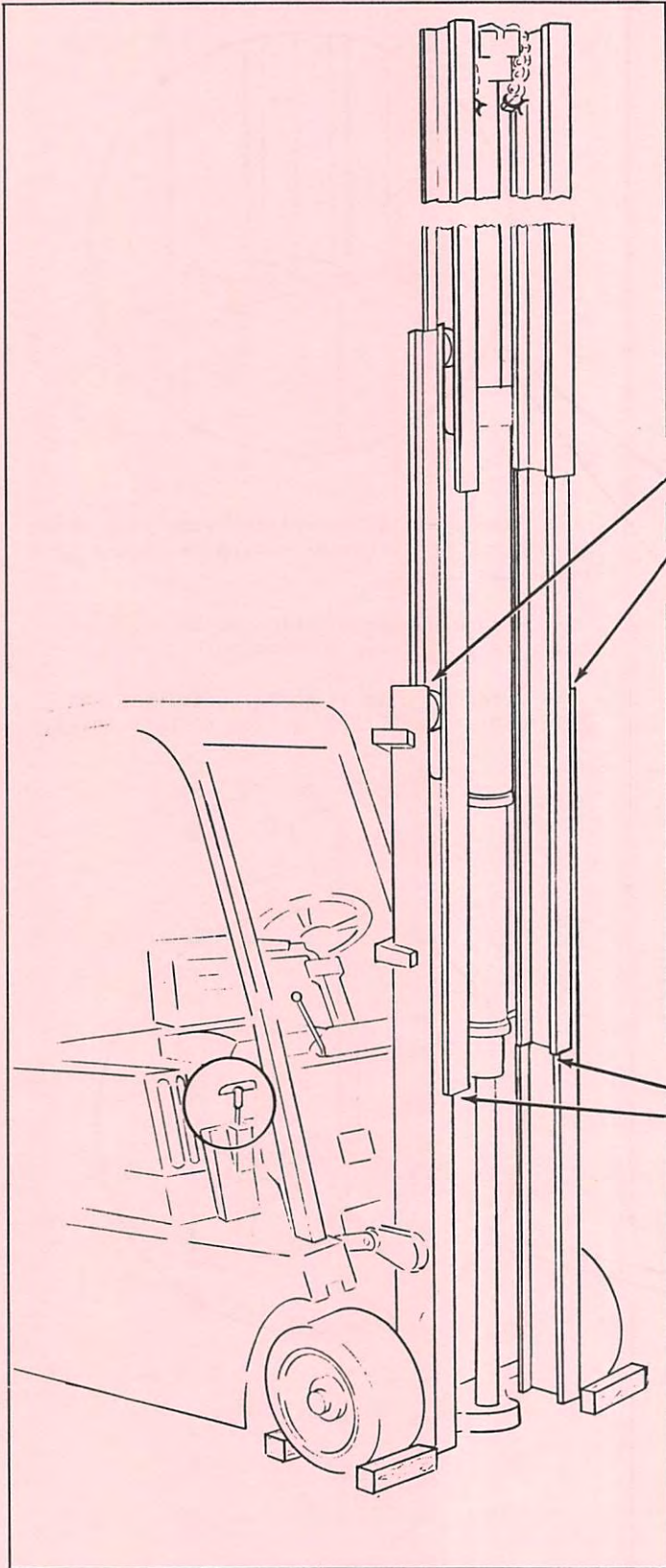


Step 2(a). Raise intermediate rail about 5 inches. Check roller clearance in the same manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on intermediate rail (for bottom rollers only).

Plate 9639



Step 2(b). Raise intermediate rail to 1/2 its full up position. Check 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 intermediate rail (for bottom rollers only).

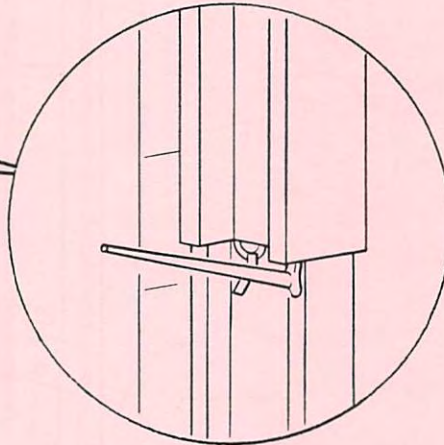
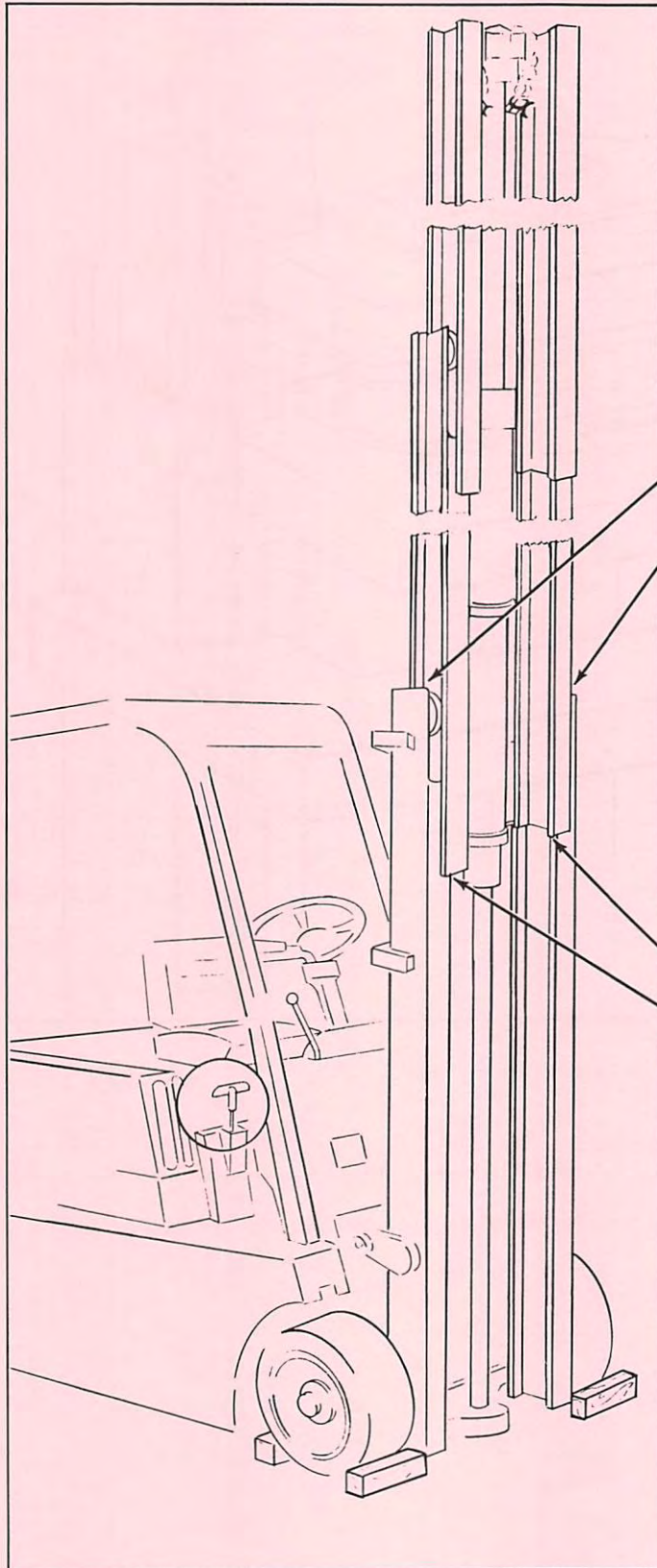


Plate 9640



Step 2(c). Raise intermediate rail to full up position. Check 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 9641

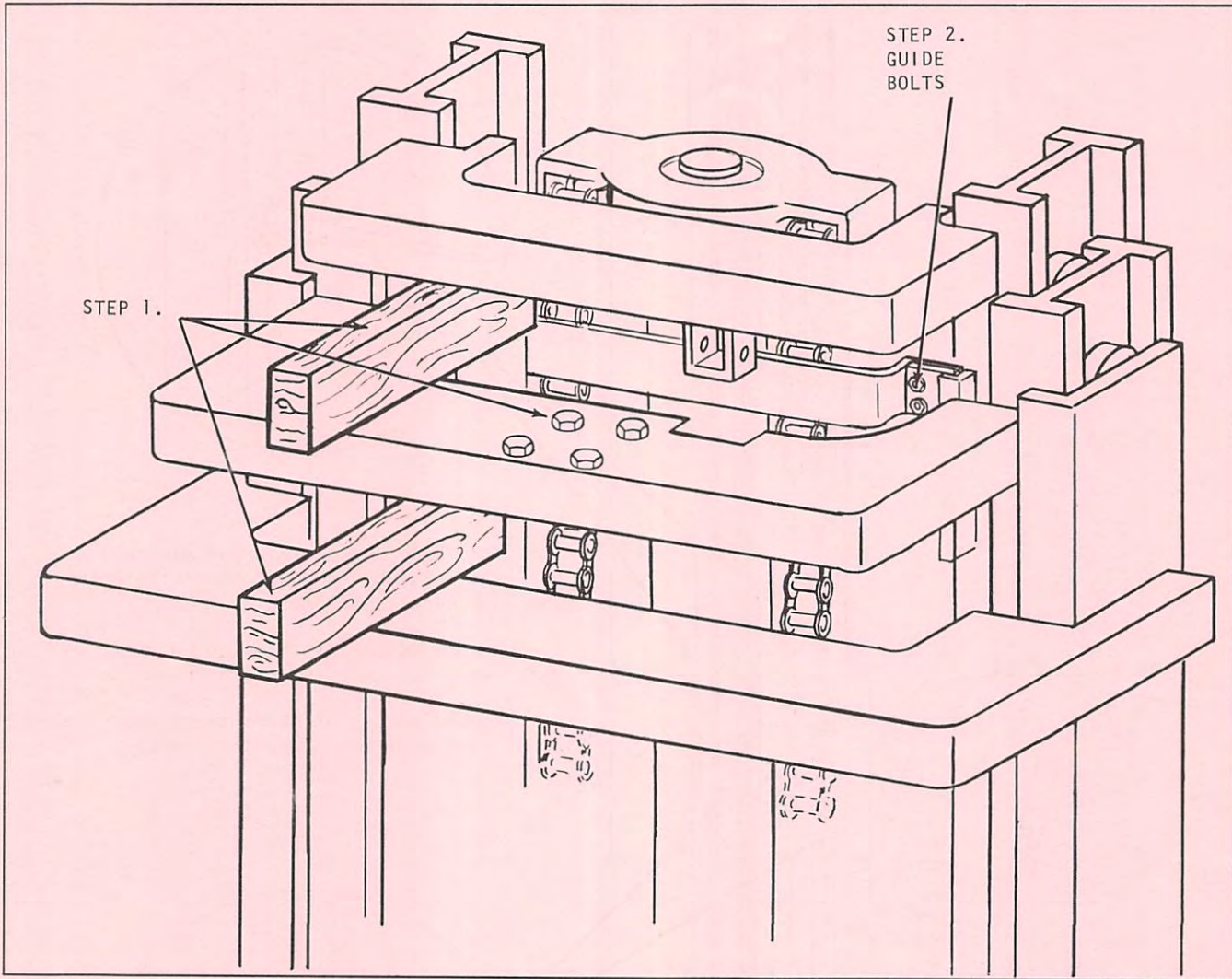


Plate 9642 Standard Triple Piston Head

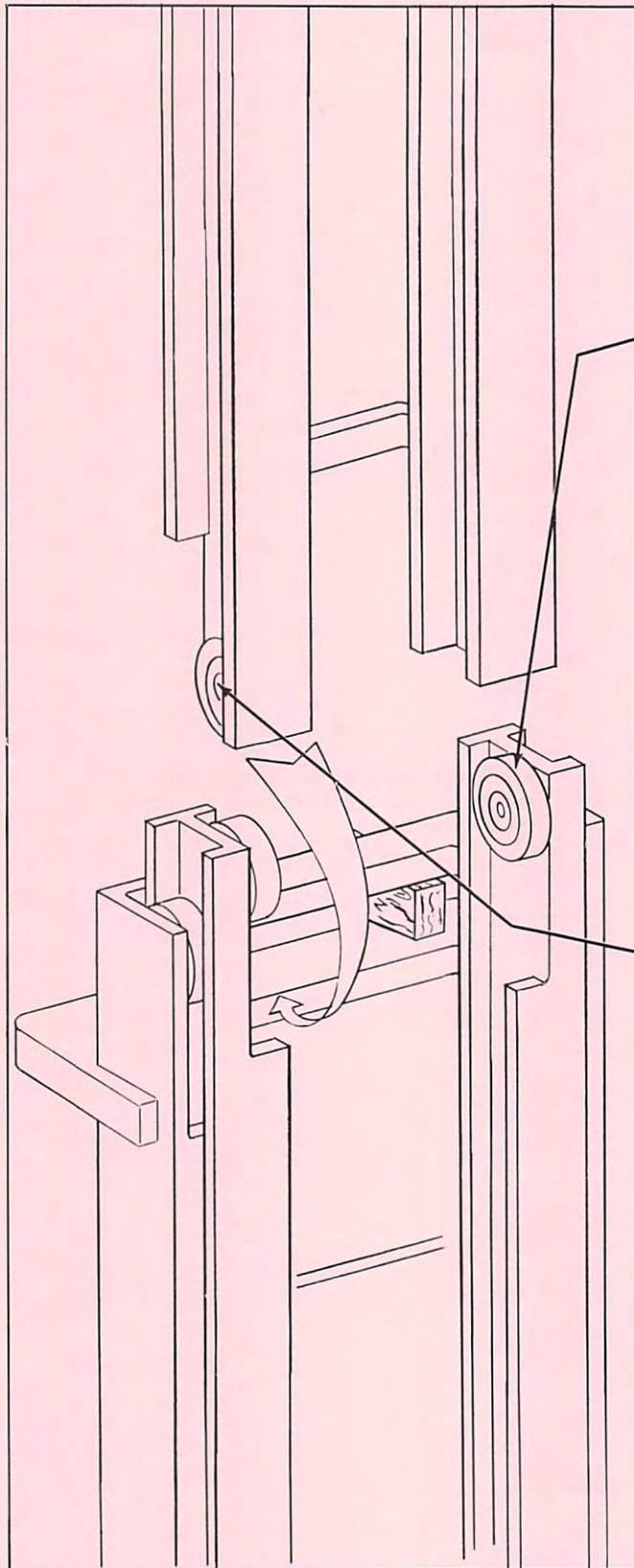
REMOVAL OF RAILS--STANDARD TRIPLE

Step 1. Place blocks between inner and intermediate rail tie bars. Remove mechanical safety stops.

Step 2. Pull piston head down far enough to get at piston head guide bolts. Remove both piston head guides.

Step 3. Pull piston head to full down position.

Step 4. Remove inner rail and leave it in this position while adjusting rollers.



A. Intermediate 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 intermediate rail in Step 1. 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 adjusting 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.

B. Inner rail rollers.

1. Count the number of shims at the right and left hand rollers.

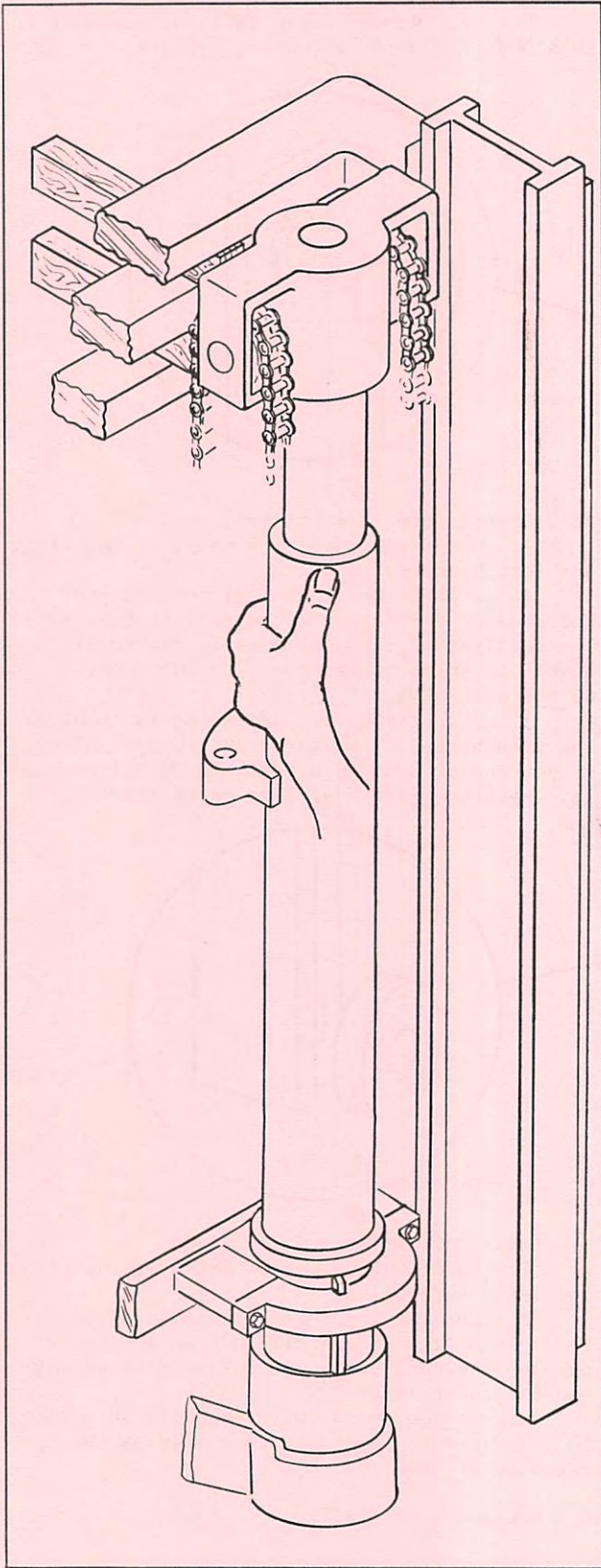
2. Look at the three (3) numbers you recorded on the inner rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.

3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace inner rail.

NOTE

Refer to next page.



N O T E

With one hand pull piston head forward to let tie bar pass by piston head freely.

Plate 9644

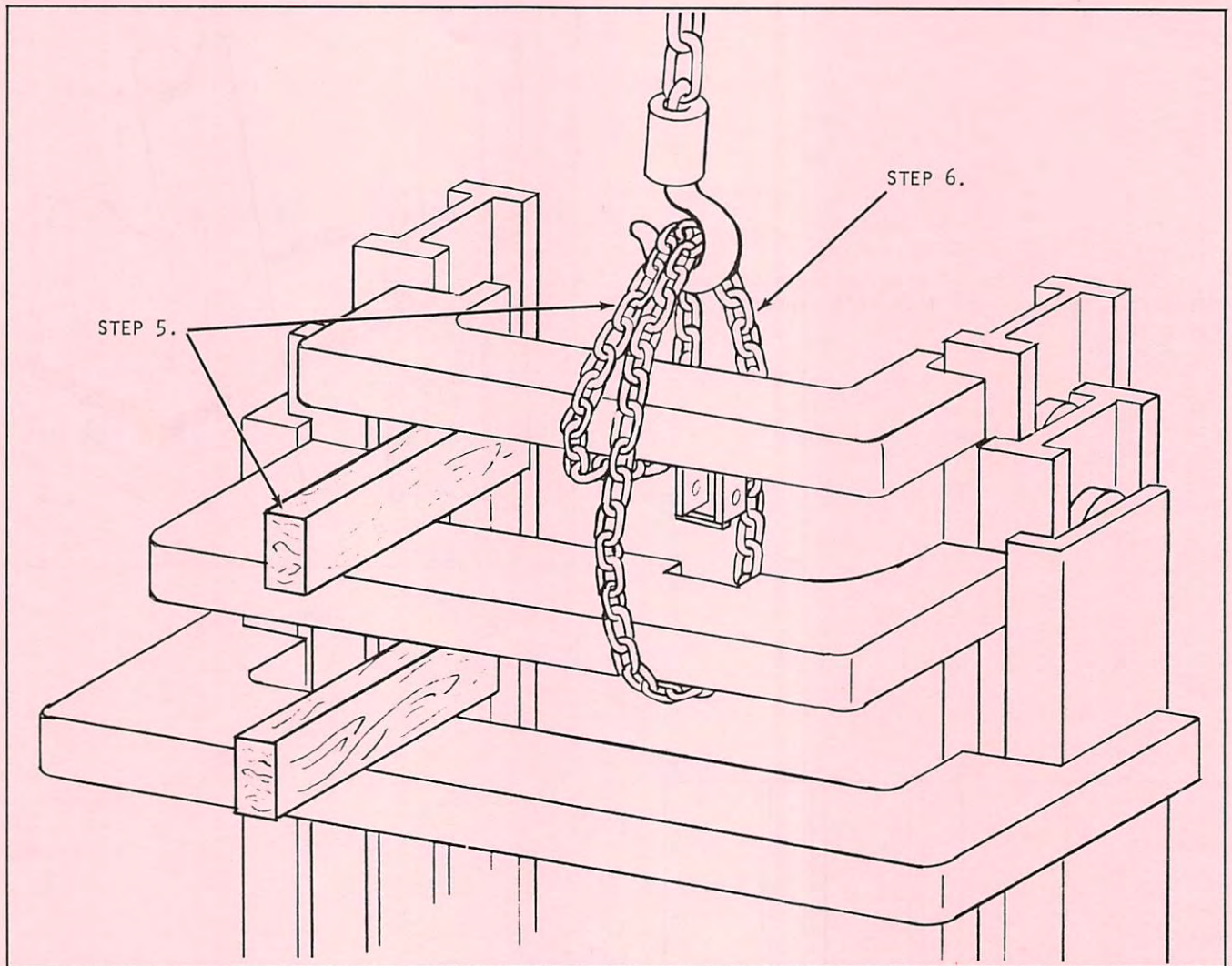


Plate 9645 Chain Placement

Step 5. Replace block and remove chain hoist.

Step 6. Remove intermediate rail assembly.

(a). Place chain around inner and intermediate rail assembly as shown above.

Step 6(b). Place a strap or chain around outer rail and secure. This will support lift cylinder.

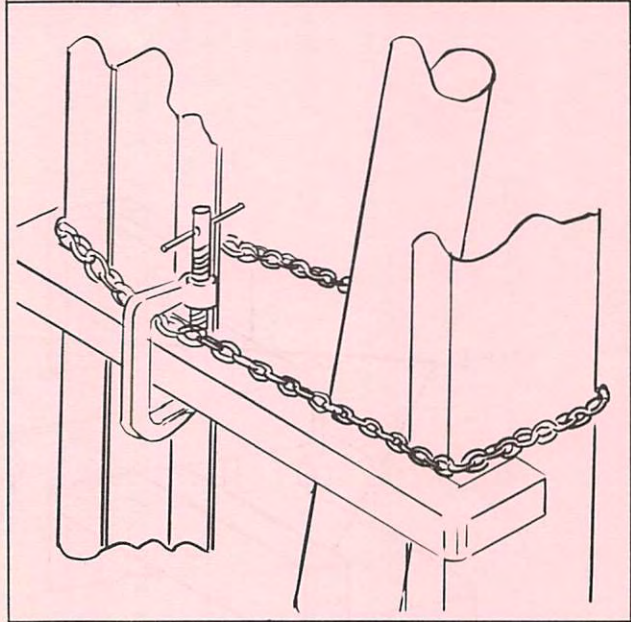
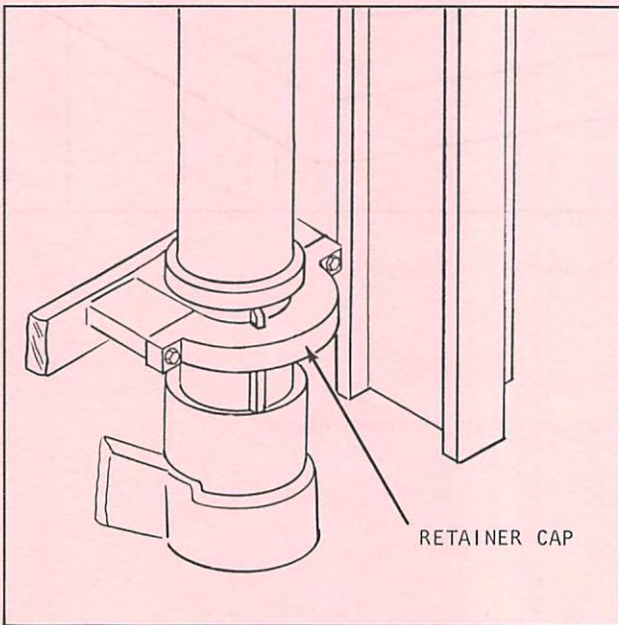
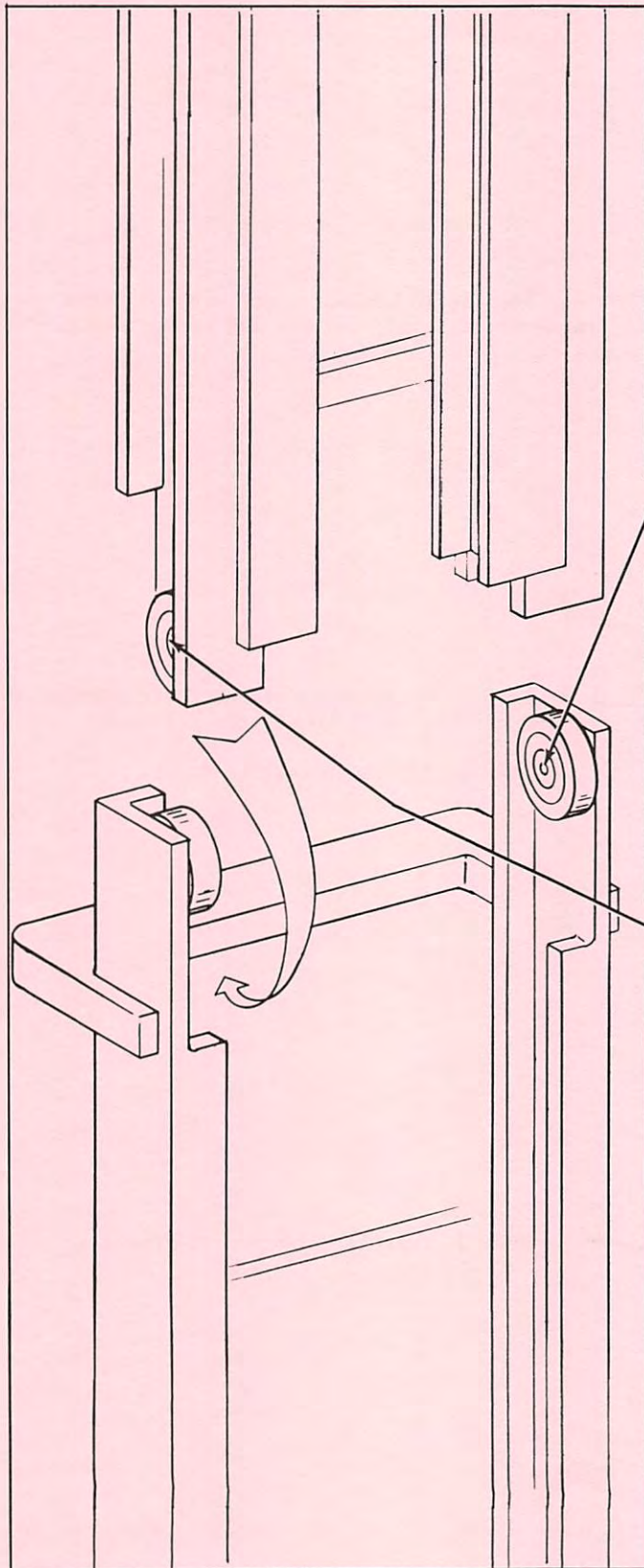


Plate 9628



Step 6(c). Remove lift cylinder retainer cap.

Plate 9646



Step 6(d). Lean cylinder forward to rest on strap, as shown in Plate

Step 6(e). Leave intermediate rail assembly in this position while adjusting rollers.

A. Outer rail rollers:

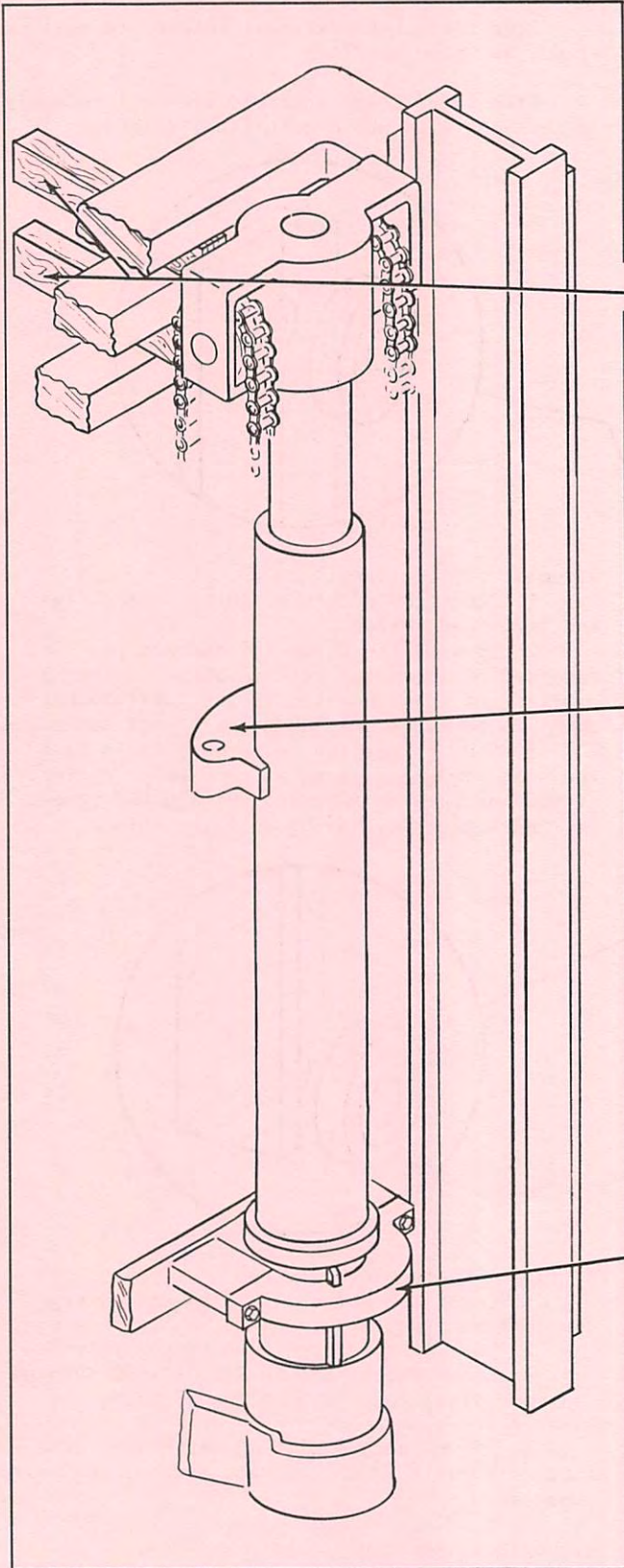
1. Count the number of shims at the right and left hand rollers.
2. Look at the three (3) numbers you recorded on the outer rail in Step 1. The smallest of these numbers is the total number of shims to be added. A "0" means DO NOT add shims.
3. Your target for adjustment is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.

B. Intermediate rail rollers:

1. Count the number of shims at the right and left hand rollers.
2. Look at the three numbers you recorded on the intermediate rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.
3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace intermediate rail assembly.

Plate 9647



Step 6(f). Replace block between intermediate rail assembly tie bar and remove chain.

Step 7. Place chain around chain anchors on cylinder. Use hoist to support cylinder.

Step 8. Remove supporting strap.

Step 9. Install cylinder retainer cap.

Plate 9648

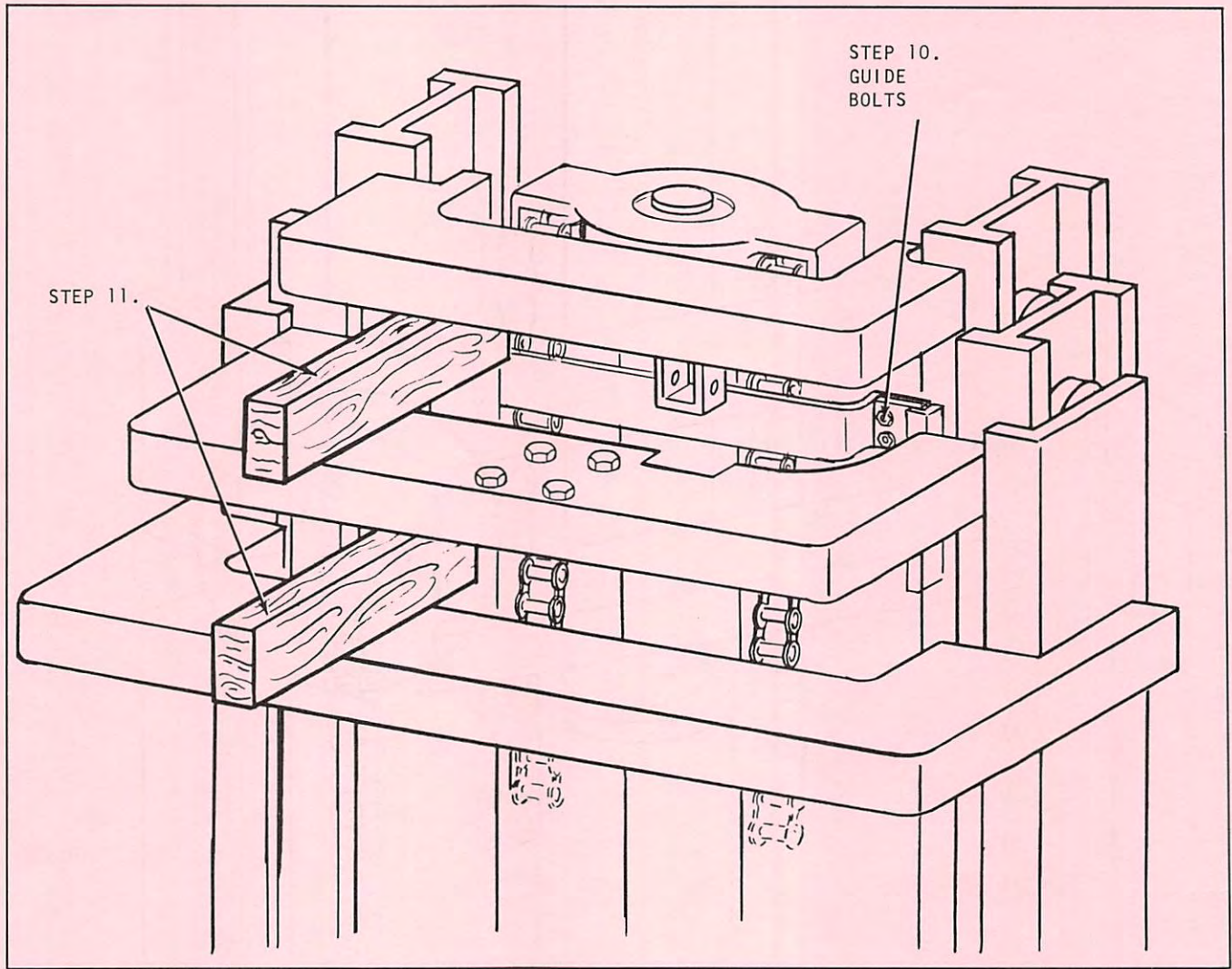


Plate 9649 Standard Triple Piston Head

Step 10. Install both piston head guides.

Step 11. Install mechanical stop. Raise rails and remove blocks.

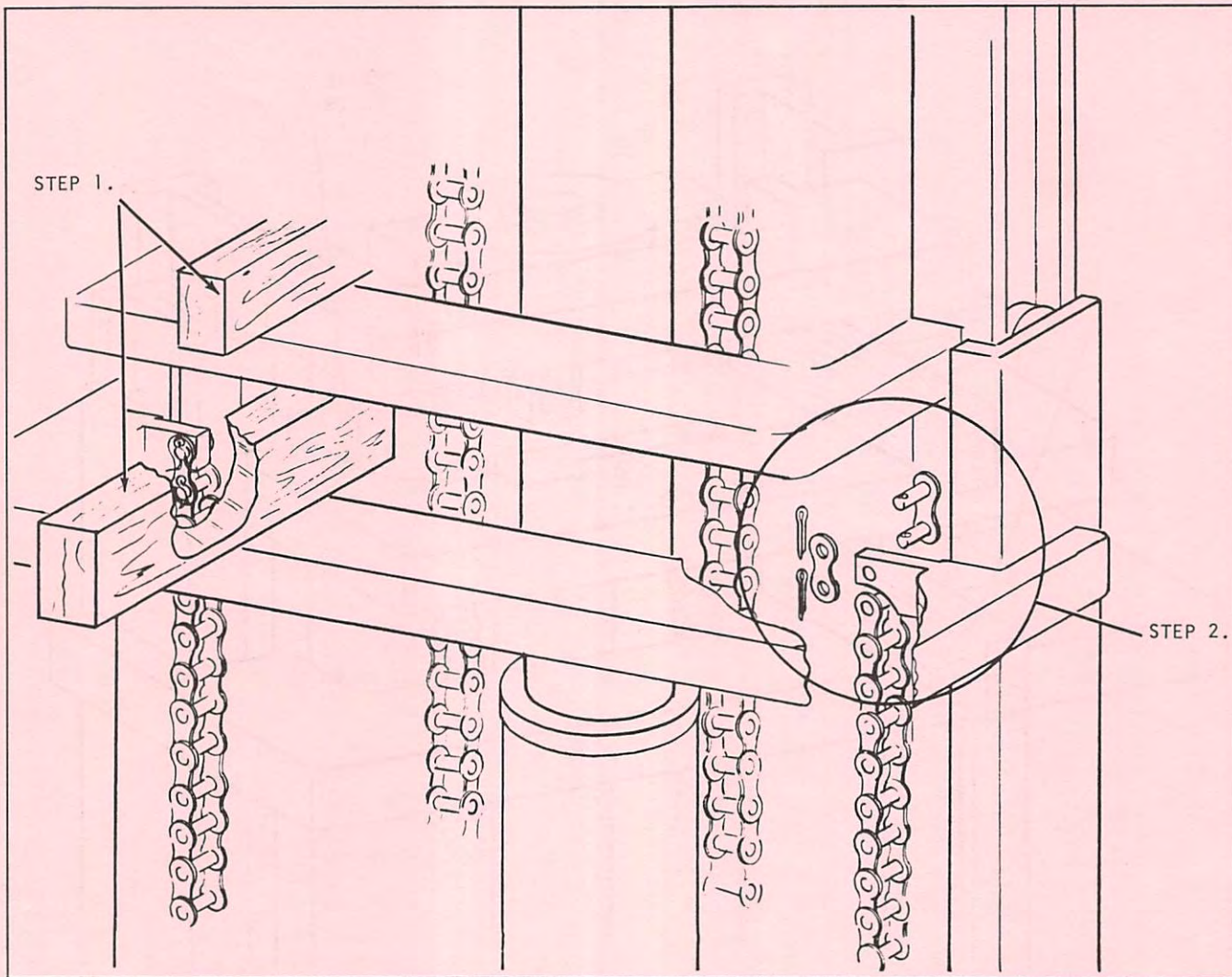


Plate 9650 Rear Lift Cylinder Removal

UPRIGHT REMOVAL--FULL FREELIFT TRIPLE

Step 1. Place blocks between inner and intermediate rail tie bars.

Step 2. Remove rear lift chains at the top or master link end.

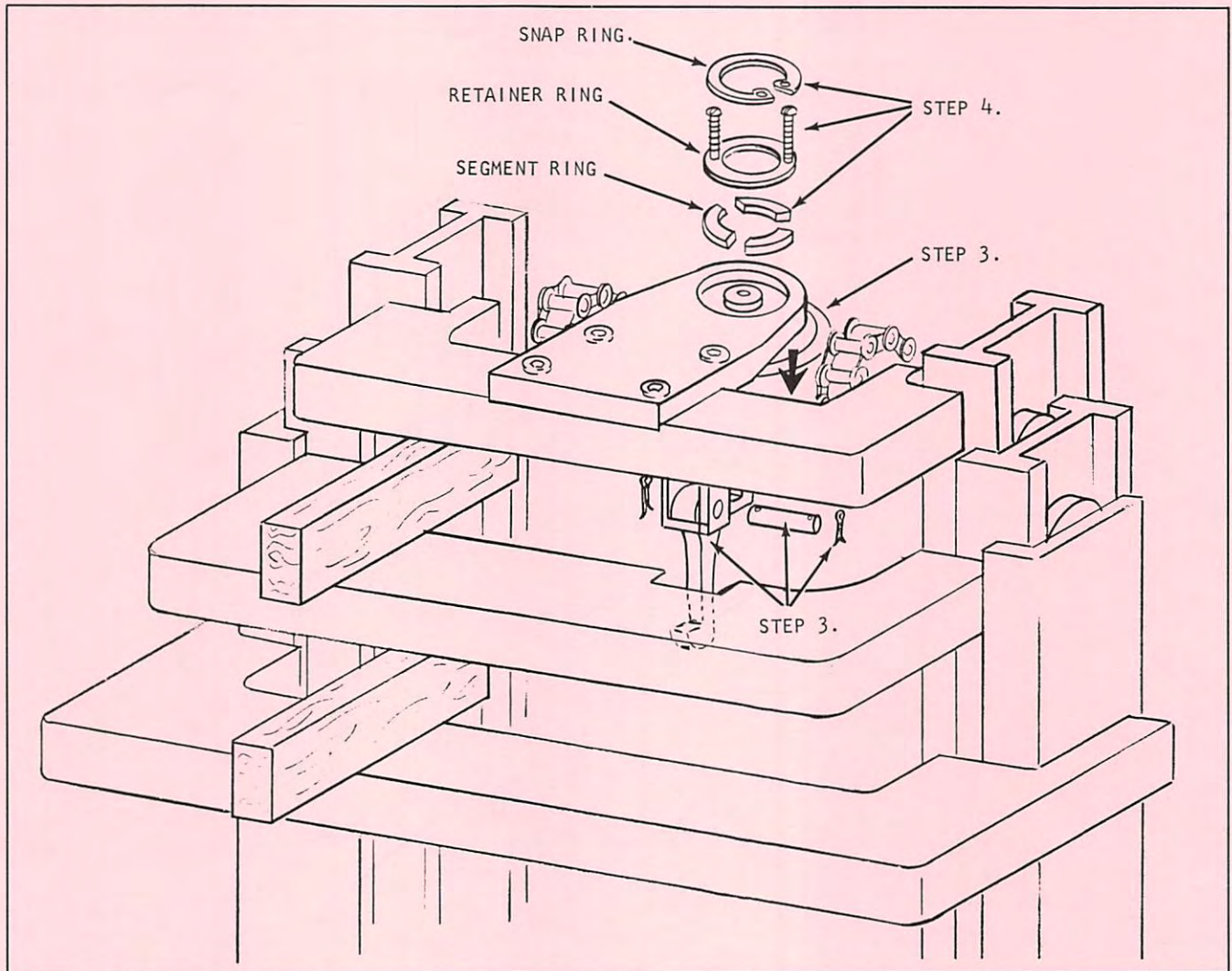


Plate 9651 F.F.T. Piston Head

Step 3. Pull piston head down

Remove mechanical safety stop pin and remove stop.

Step 4(a). Secure piston head with chain hoist.

(b). Remove lift cylinder from upper anchor.

1. Remove snap ring.

2. Place two (2) #6-32X2" round head slotted machine screws (in holes provided) in retainer ring.

(c). Remove segment ring.

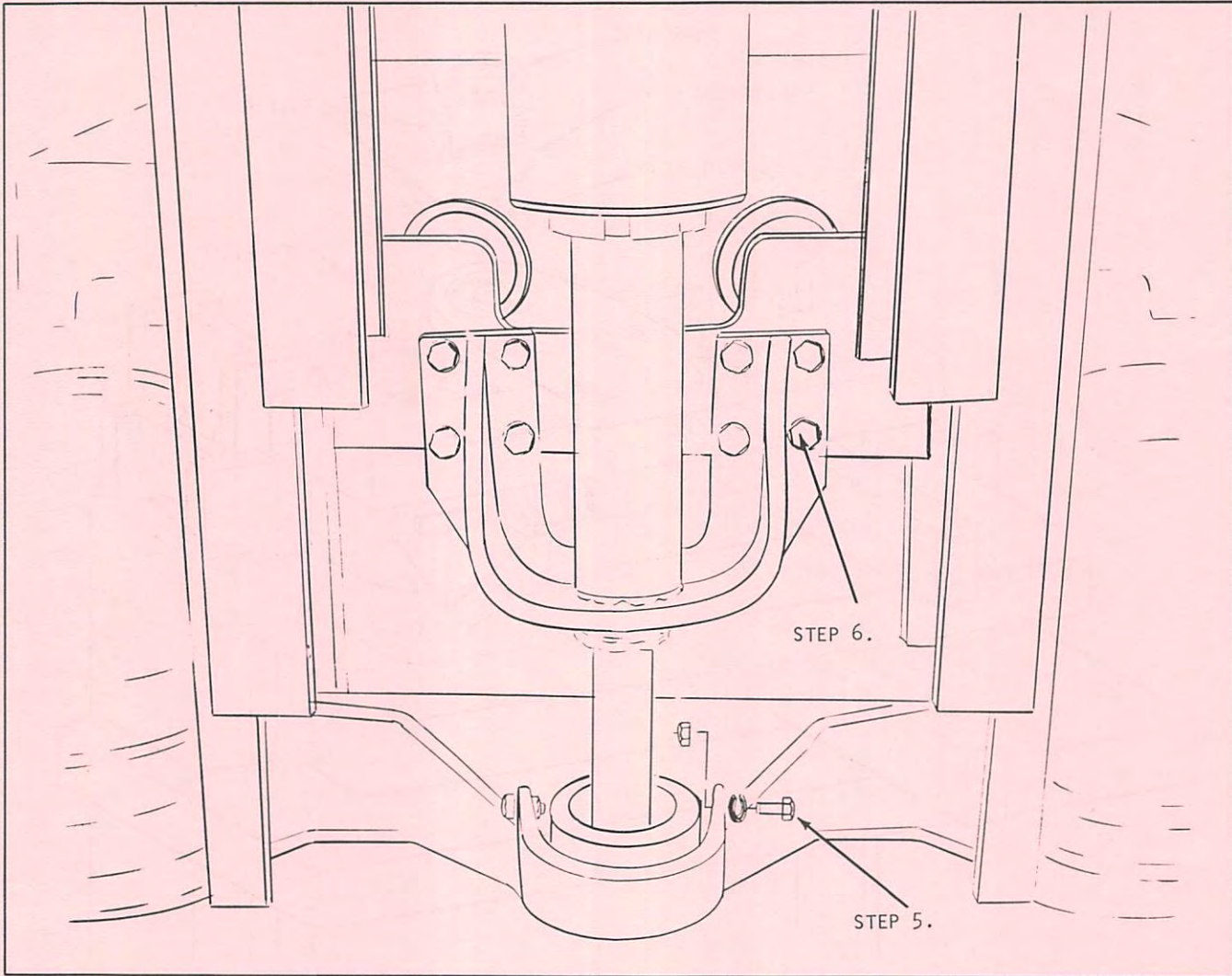


Plate 9652 Cylinder Lifting Bracket

Step 5. Remove lift cylinder support bolts.

Step 6. Remove cylinder lifting bracket.

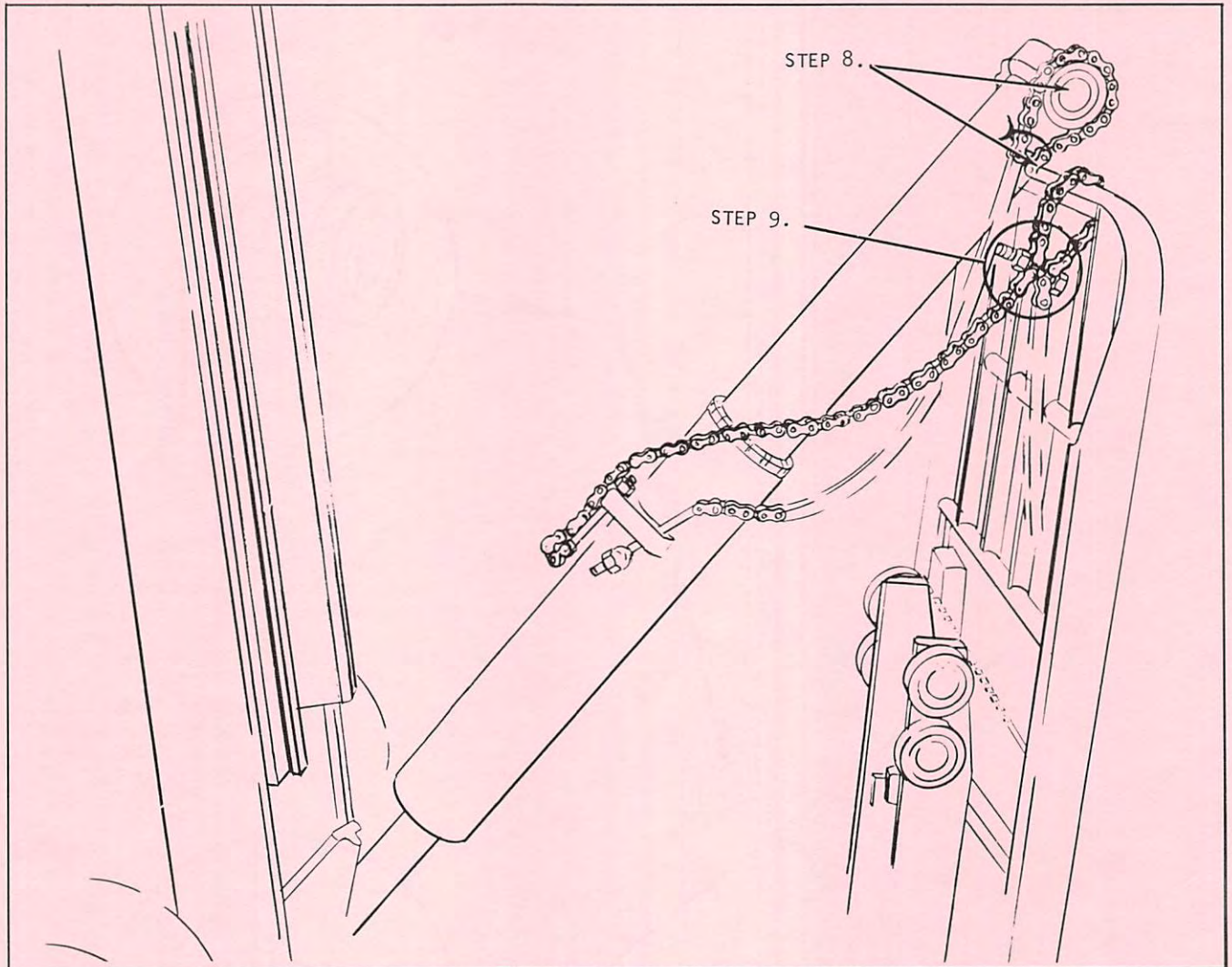


Plate 9653 Supporting Cylinder

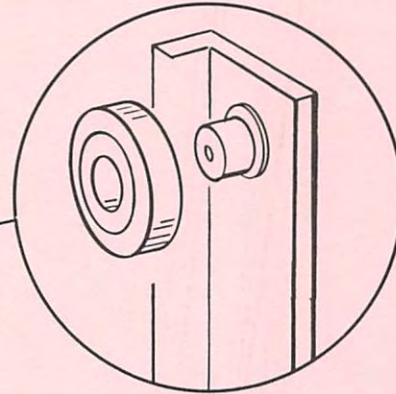
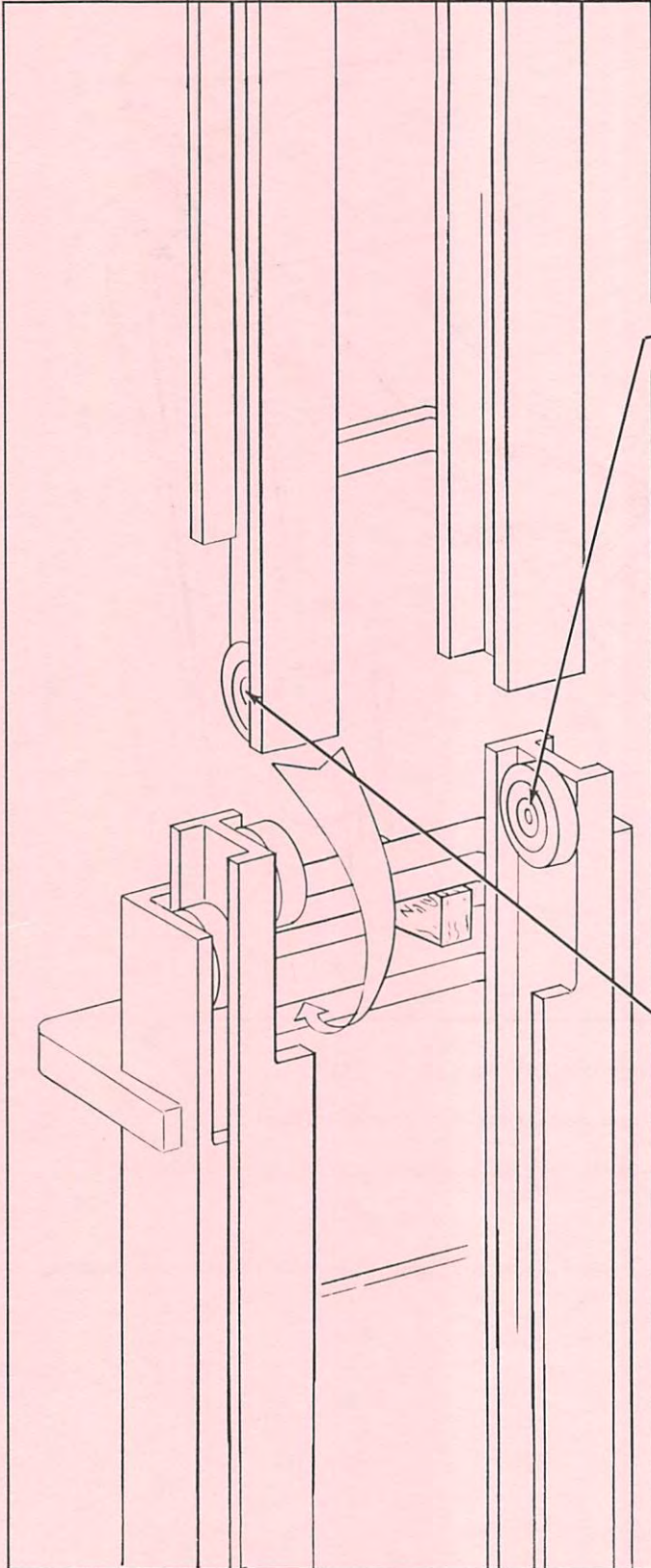
Step 7. Lower cylinder and lean it toward the load back rest (on the carriage).

Step 8. Place padding type material on the load back rest to prevent scoring of the cylinder.

Let cylinder rest onto load back rest.

Step 9. Place rear lift chains around top bar of load back rest and place bolts through chains, as shown above. This will prevent cylinder from falling.

Step 10. Remove inner rail and leave it in this position while adjusting rollers.

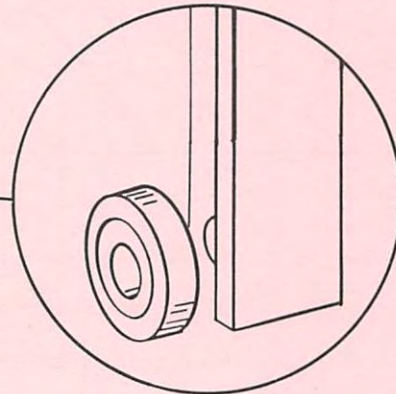


A. Intermediate rail rollers:

1. Count the number of shims at the right and left hand rollers.

2. Look at the three (3) numbers you recorded on the intermediate rail in Step 1. 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 adjusting 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.



B. Inner rail rollers.

1. Count the number of shims at the right and left hand rollers.

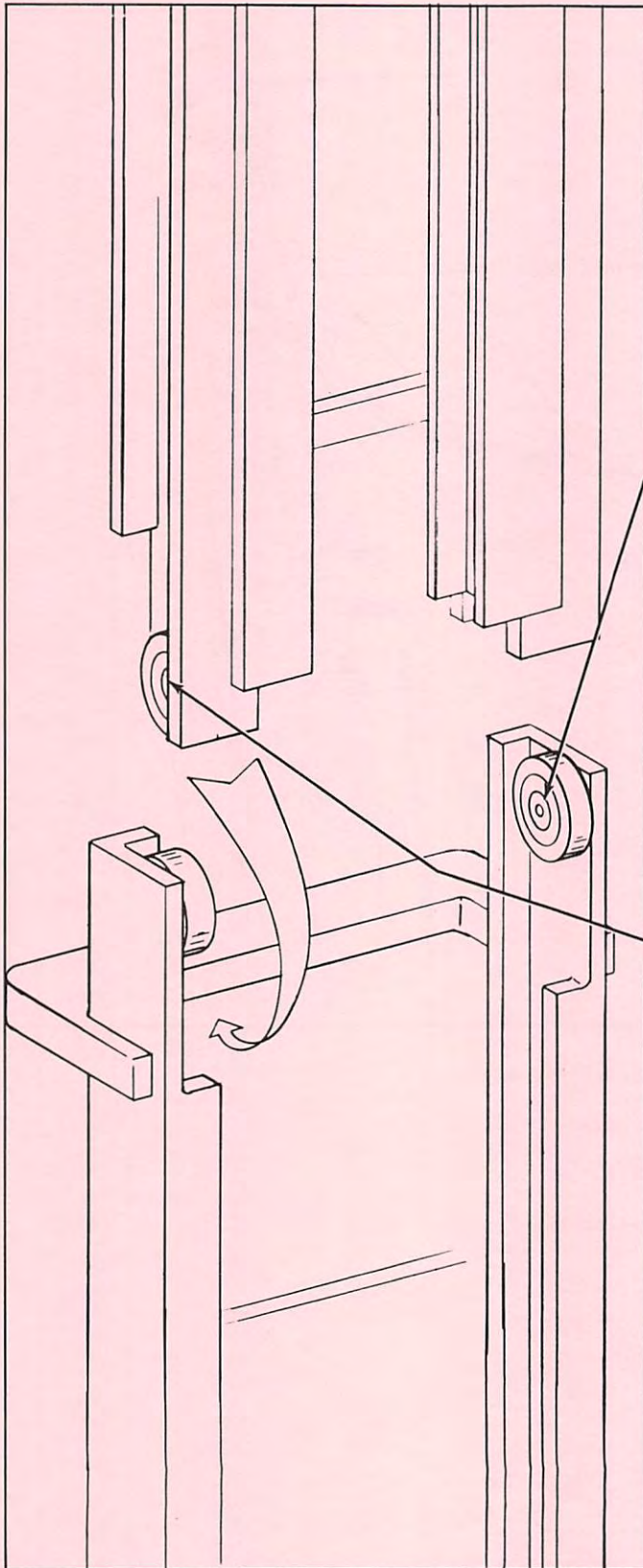
2. Look at the three (3) numbers you recorded on the inner rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.

3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace inner rail.

Plate 9654

Step 11. Leave intermediate rail assem. in this position while adjusting 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 Step 1. 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.

B. Intermediate rail rollers:

1. Count the number of shims at the right and left hand rollers.
2. Look at the three numbers you recorded on the intermediate rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.
3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace intermediate rail assembly.

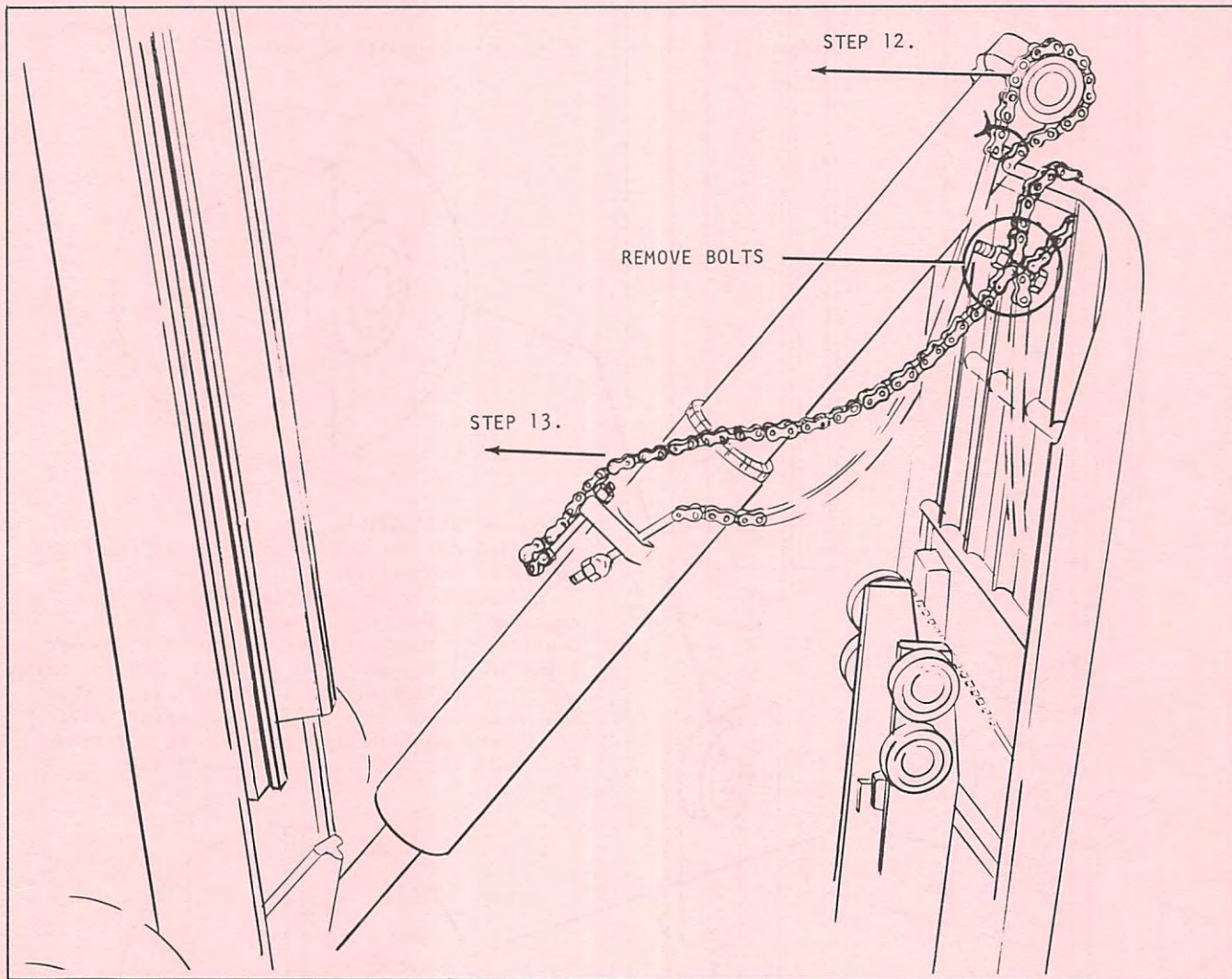


Plate 9656 Cylinder Replacement

Step 12. Using chain hoist, place cylinder back between rails.

N O T E

When installing cylinder watch position of cylinder line and tube, to prevent damage.

Step 13. Pull rear lift chains through back of upright.

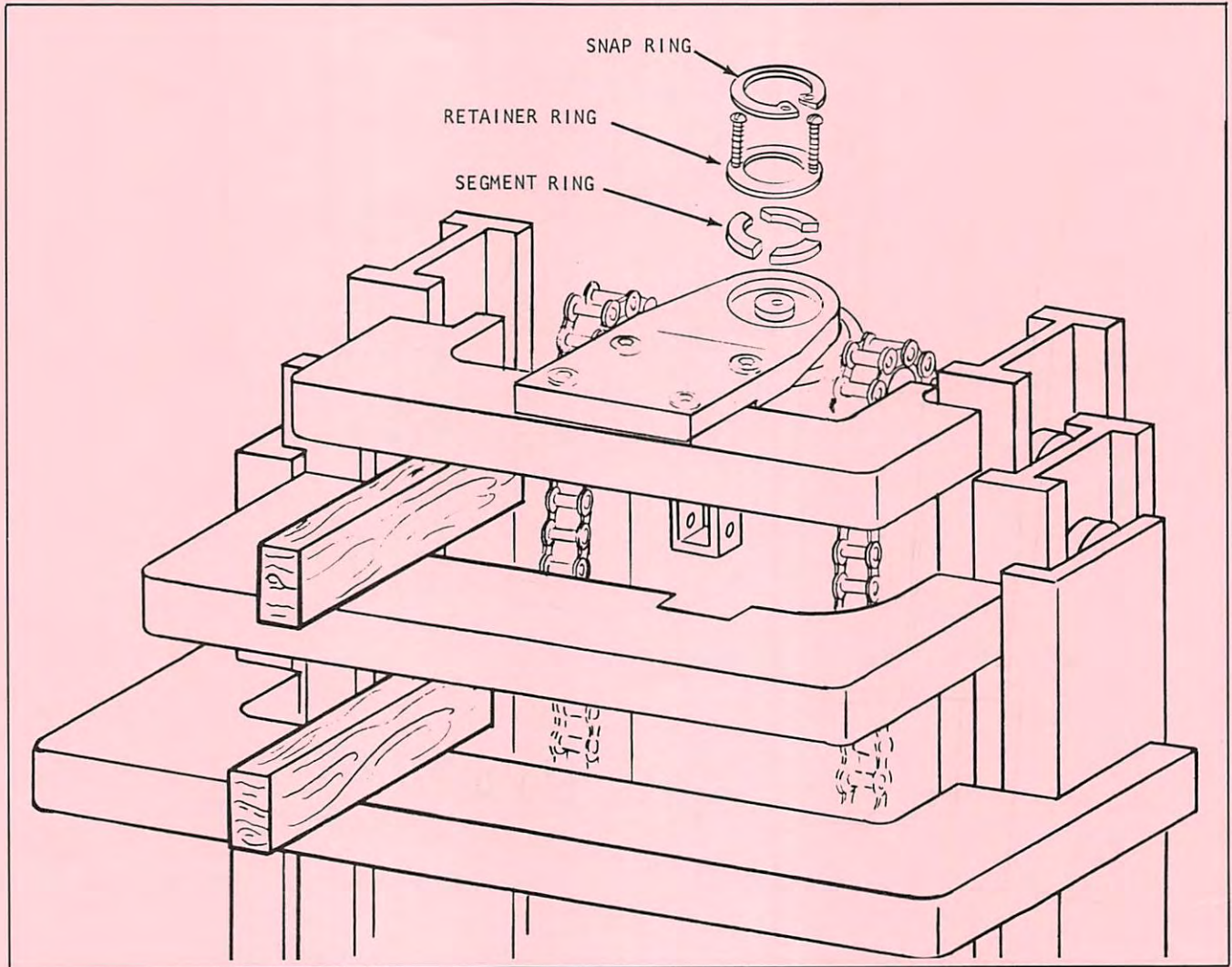


Plate 9657 Piston Head F.F.T.

Step 14(a). Install segment ring.

(b). Install retainer ring and remove both slotted machine screws.

(c). Install snap ring.

(d). Raise and lower to full positions checking piston and anchor. Remove blocks between tie bars.

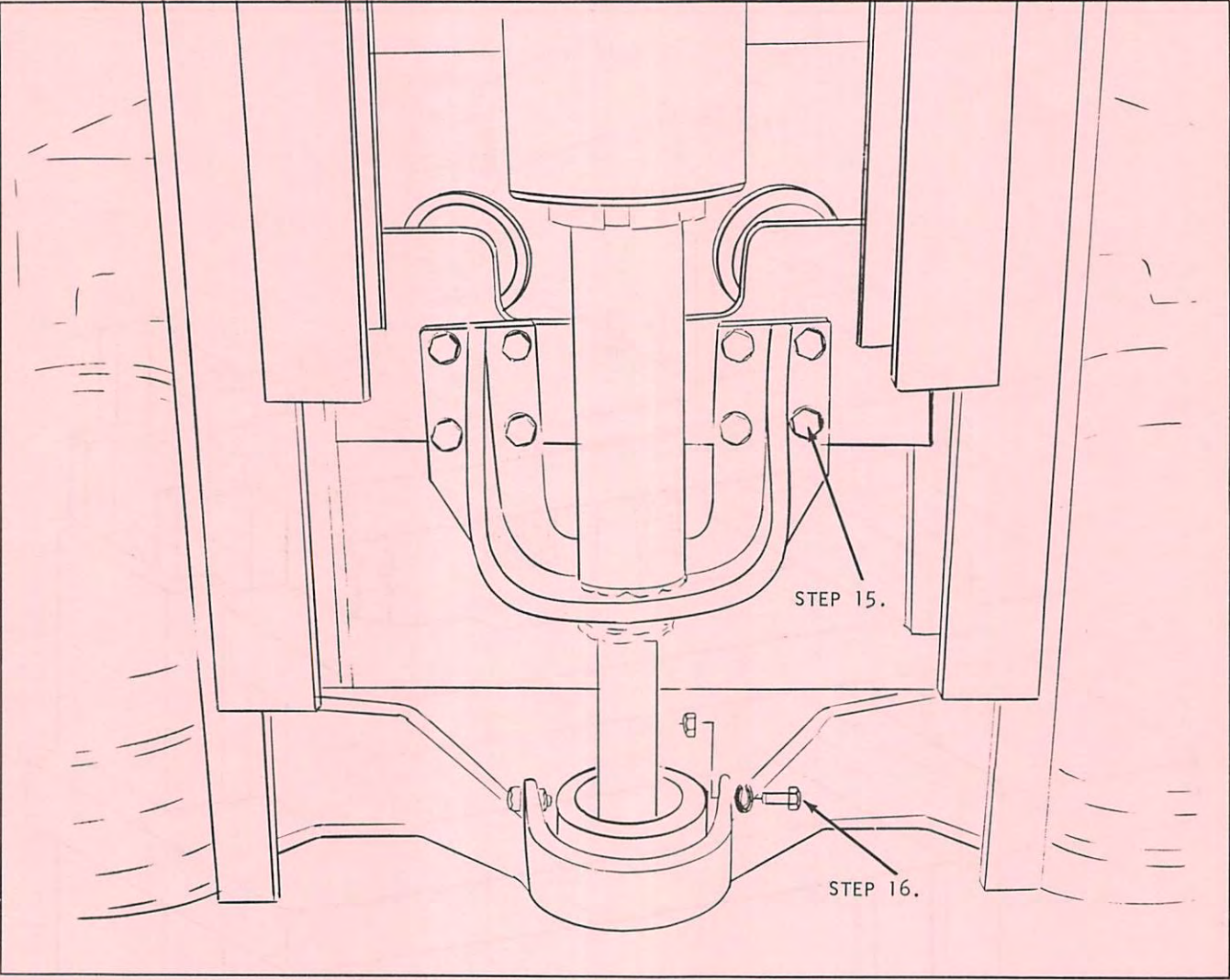


Plate 9658 Cylinder Lift Bracket

Step 15. Install cylinder lifting bracket.

Step 16. Install lift cylinder support bolts.

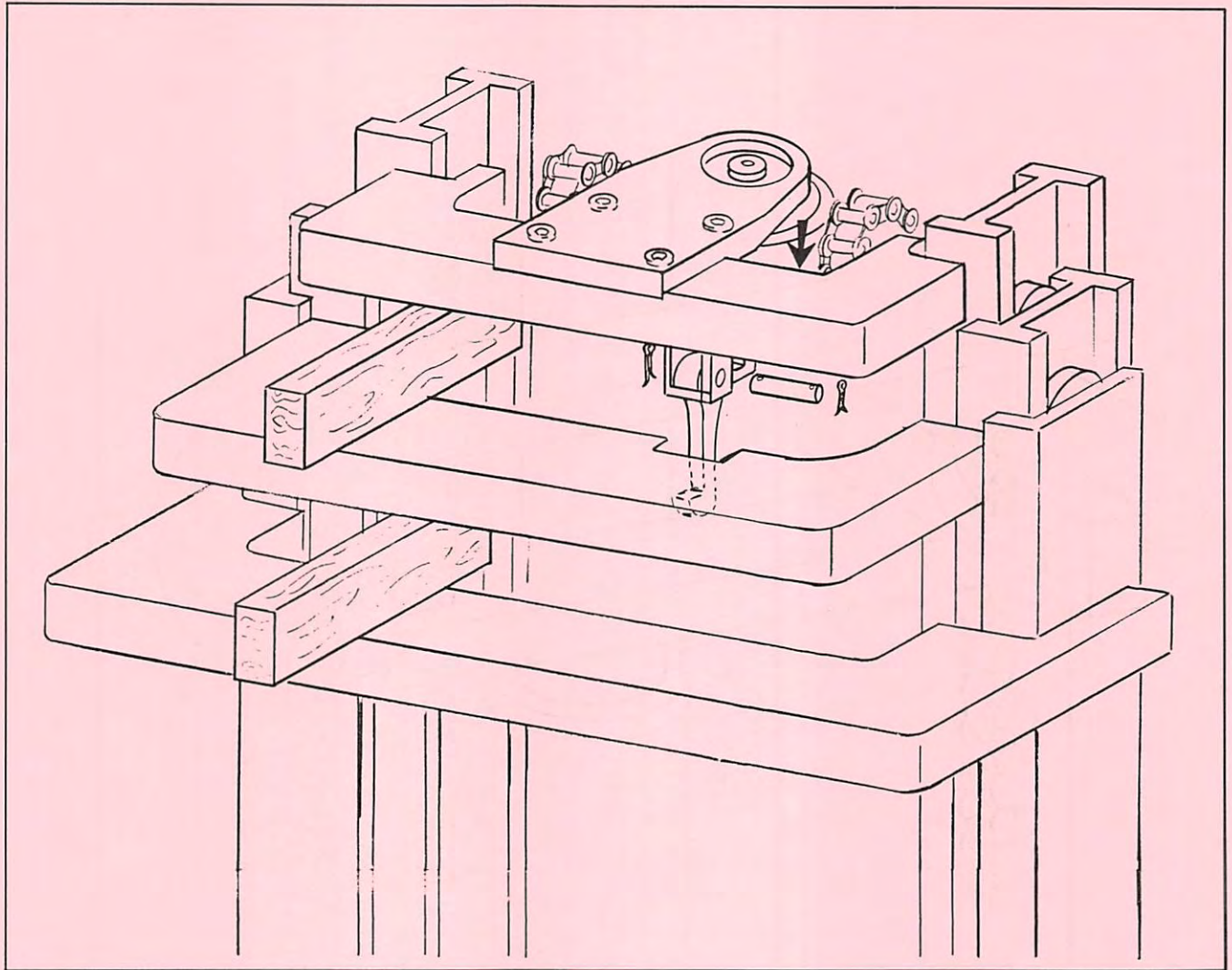


Plate 9659 Safety Stop

Step 17. Pull piston head down.

Install mechanical safety stop.

Replace cotter keys.

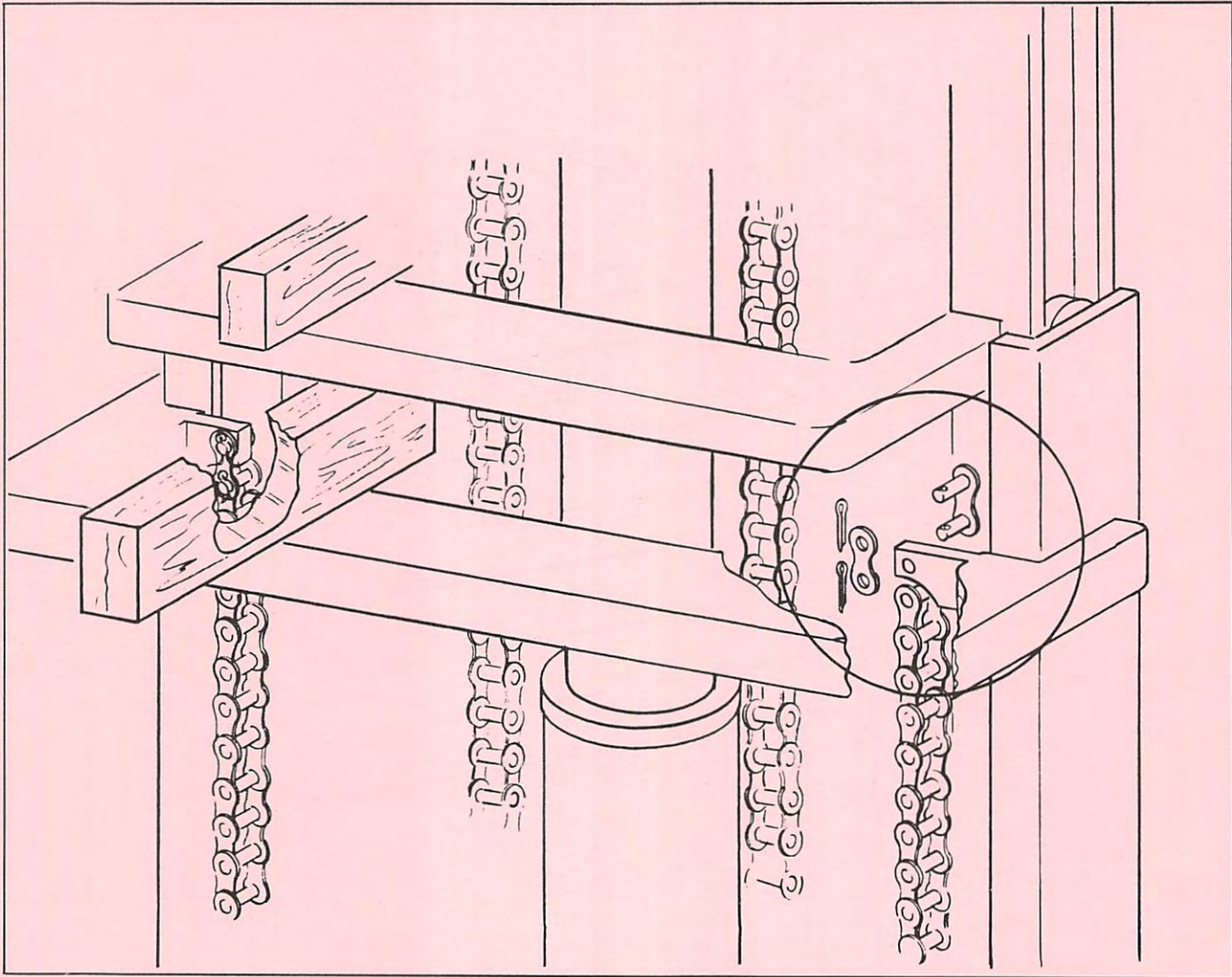


Plate 9660 Replacing Rear Lift Chains

Step 18. Install rear lift chains.

Check chain tension for adjustment. If adjustment is necessary be sure to secure adjusting nuts before operating machine.

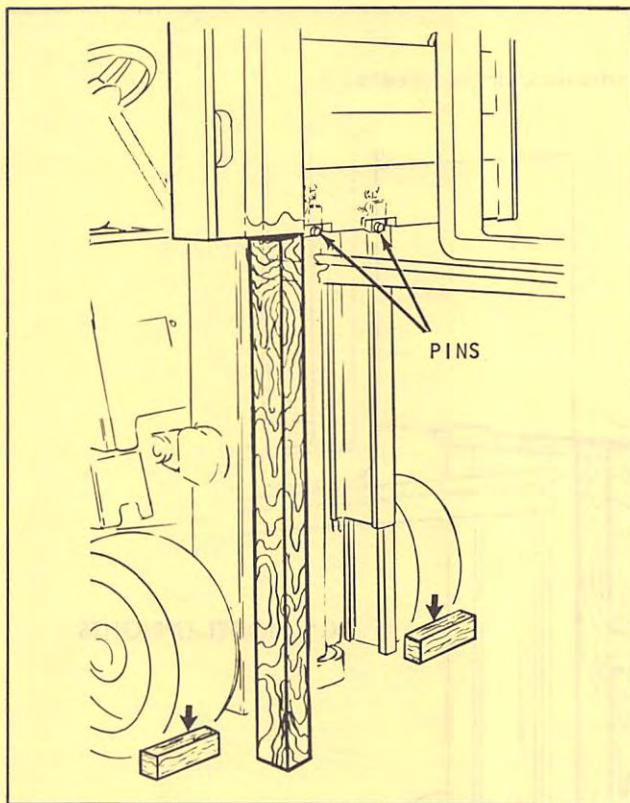


Plate 9593 Carriage Pin Replacement

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.

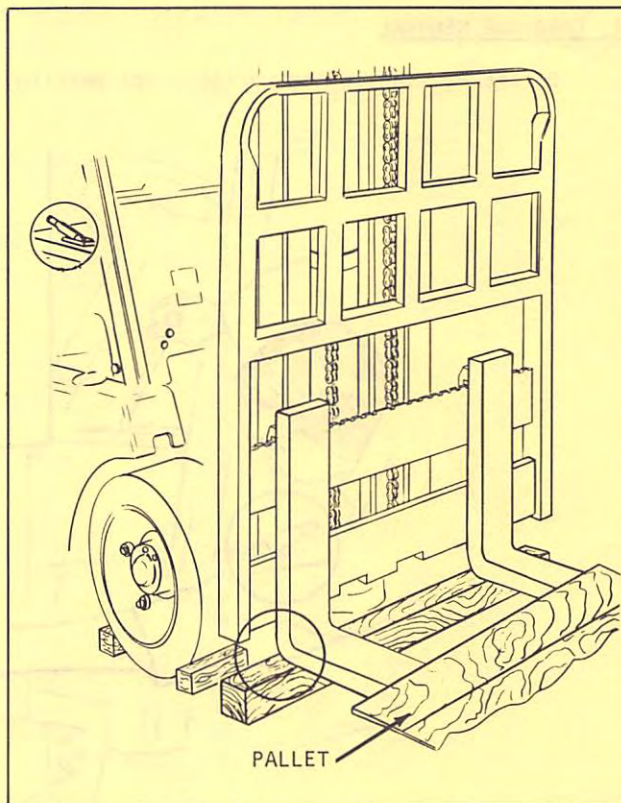


Plate 9560 Fork and Carriage Blocking

Step 3. Raise carriage off beam. Place beam on floor so, when lowered, the heel of the fork will rest on it as shown.

Step 4. Tilt upright full forward.

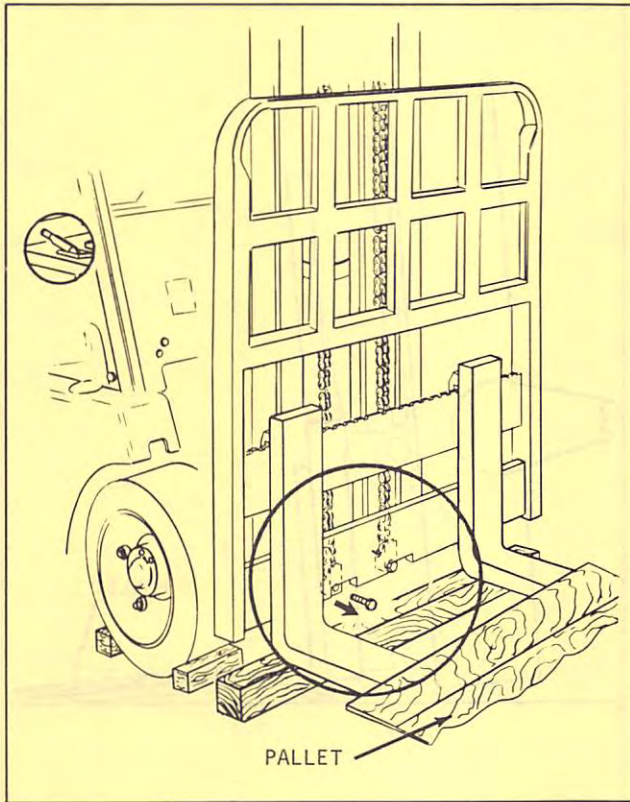


Plate 9561 Removing Bolts

Step 5. Remove 3/8" x 2" bolts. Place pallet on fork ends.

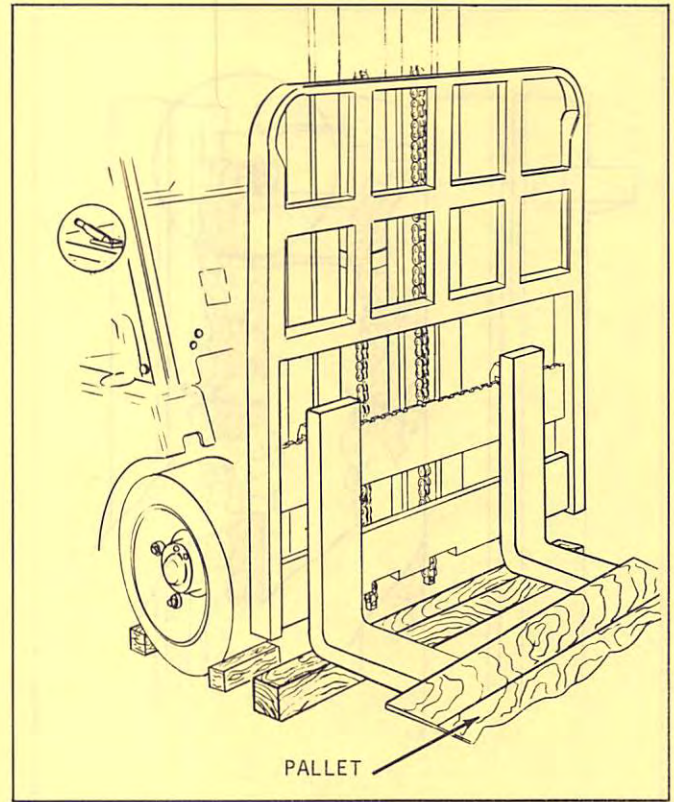


Plate 9562 Removing Chains From Anchors

Step 6. Pull chains out of carriage anchor brackets.

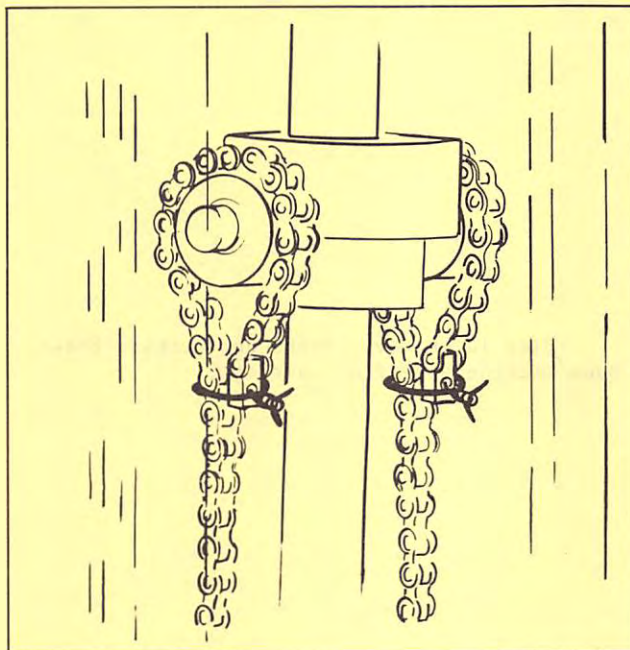


Plate 9563 Securing Chains (Typical)

Step 7. Wire chains around chain sheaves as shown

N O T E

Use the same method on all cylinders.

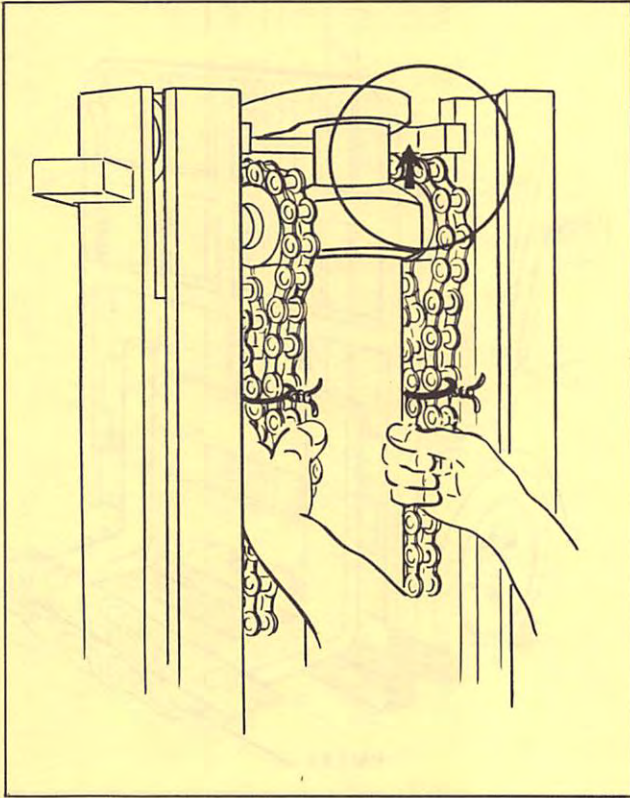


Plate 9564 Guiding Piston Head

Step 8. Guiding piston head with hands on chains raise piston to full up position.

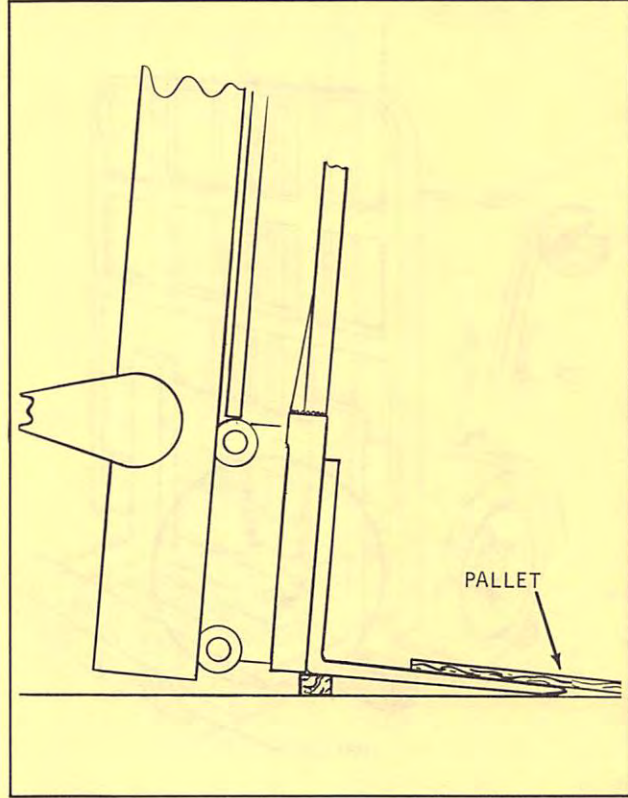


Plate 9565 Inner Rail Clearing Carriage Rollers

Step 9. Raise inner rail so it just clears upper carriage rollers. Leave upright at full forward tilt.

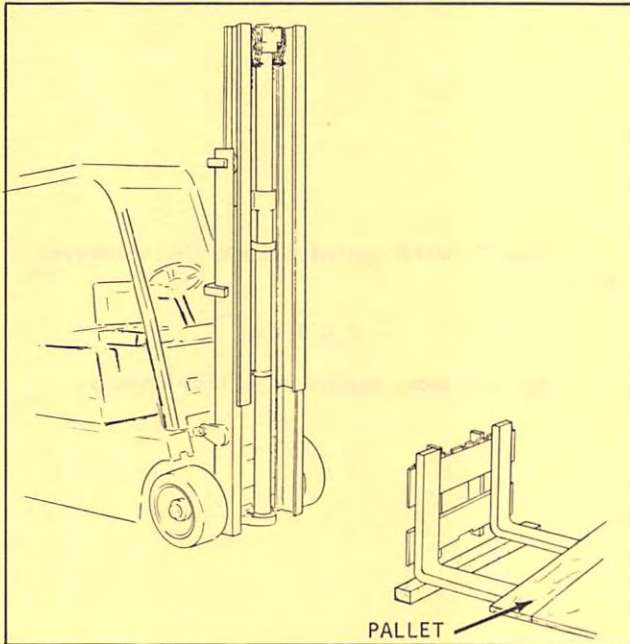


Plate 9566 Backing Machine Away From Carriage

Step 10. Remove blocks and release brake. Back machine away from carriage.

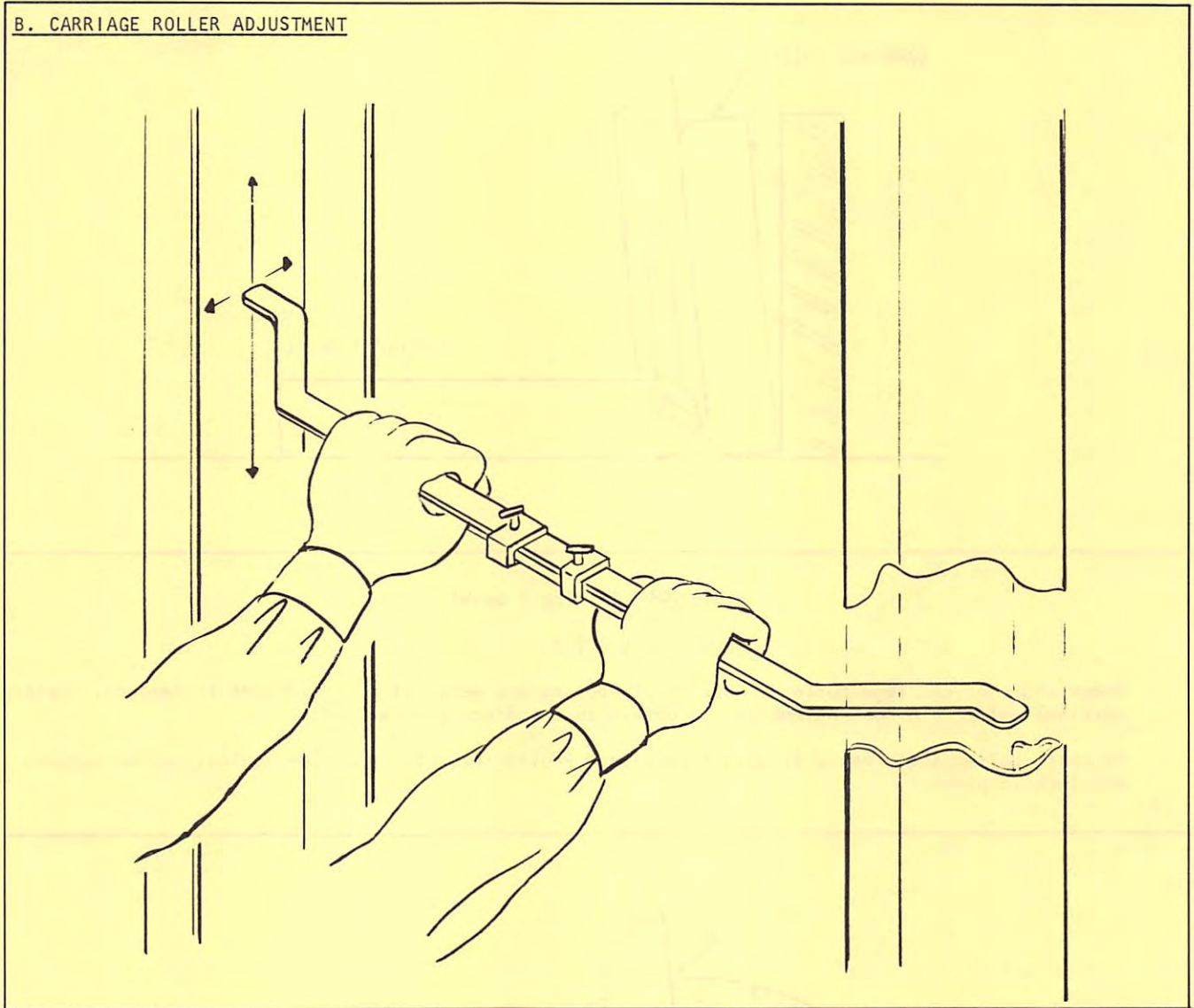
B. CARRIAGE ROLLER ADJUSTMENT

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.

NOTE

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.

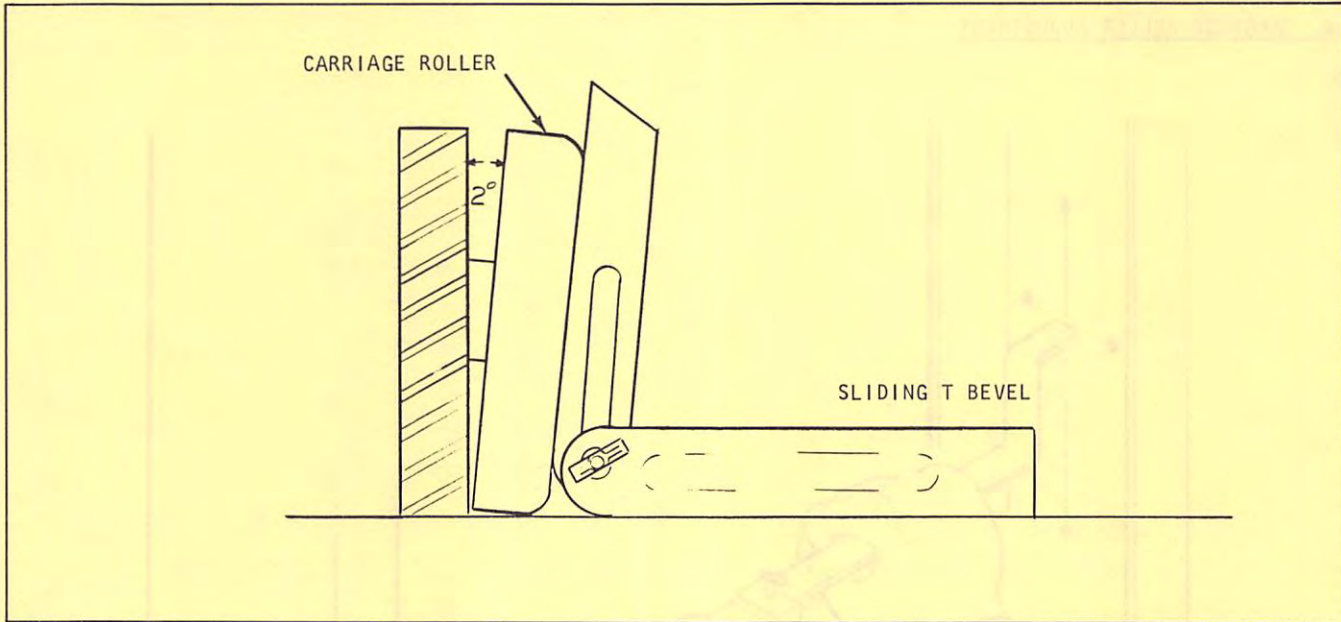


Plate 9589 Setting T Bevel

N O T E

Check angle of carriage rollers. Roller pin bosses are welded at $2^{\circ} \pm 1/2^{\circ}$ 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.

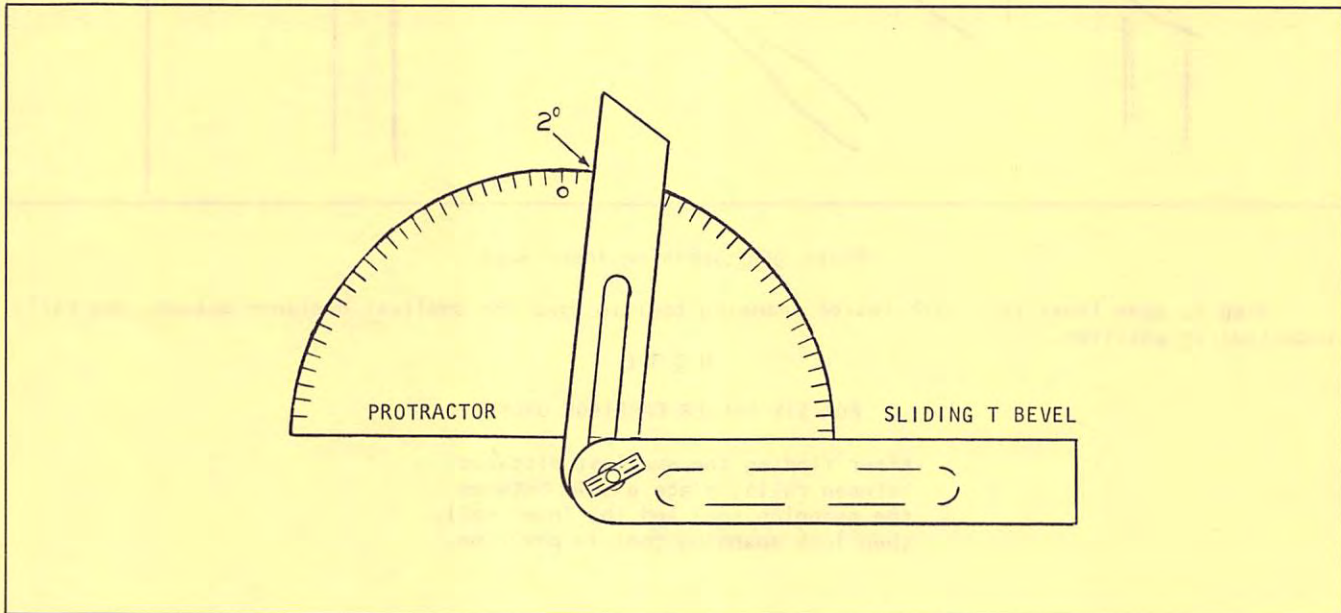


Plate 9590 Checking Roller Angle

Determine degree of angle by placing Protractor on Sliding T Bevel.

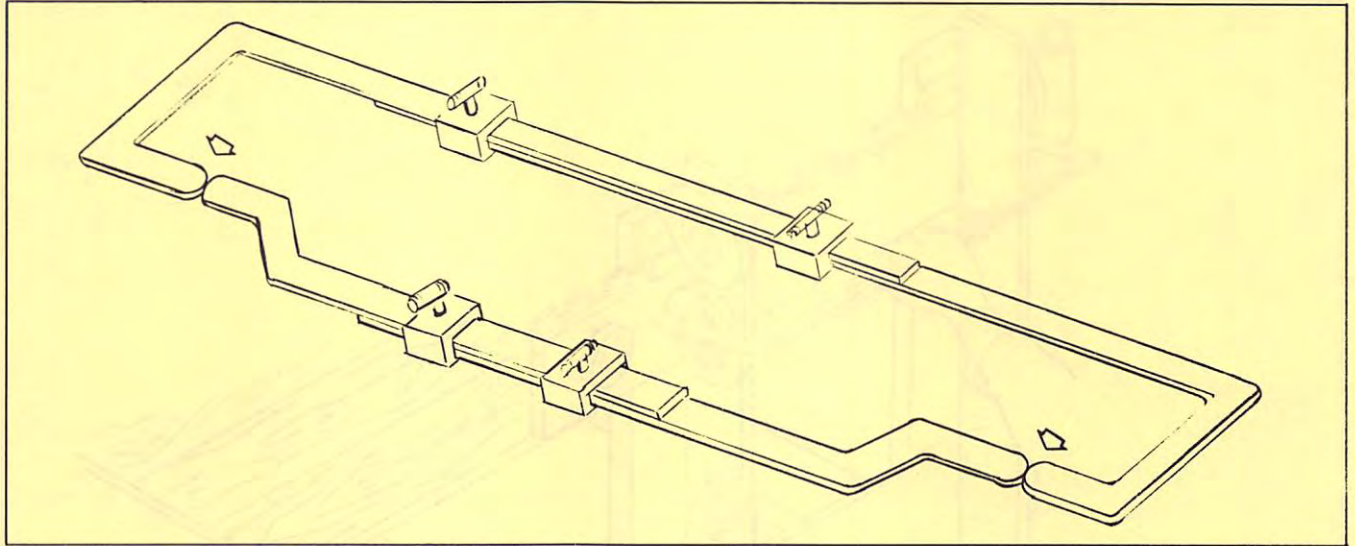


Plate 9568 Setting Outside Spanning Tool

Step 2. Set outside spanning tool to match inside spanning tool. Lock tool in position.

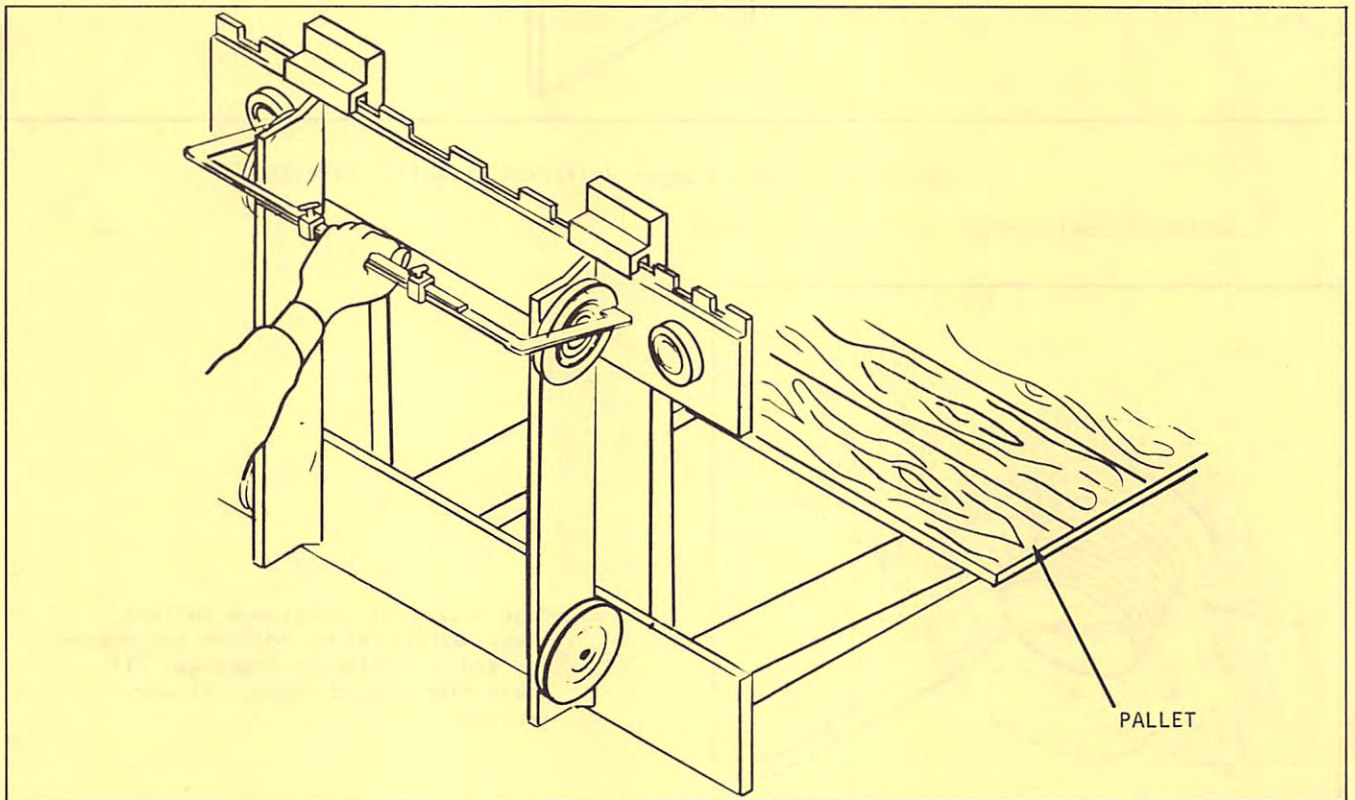


Plate 9569 Spanning Upper Rollers (Four Roller Carriage)

Step 3. Span upper carriage rollers at their outer most camber point. Add or subtract ...

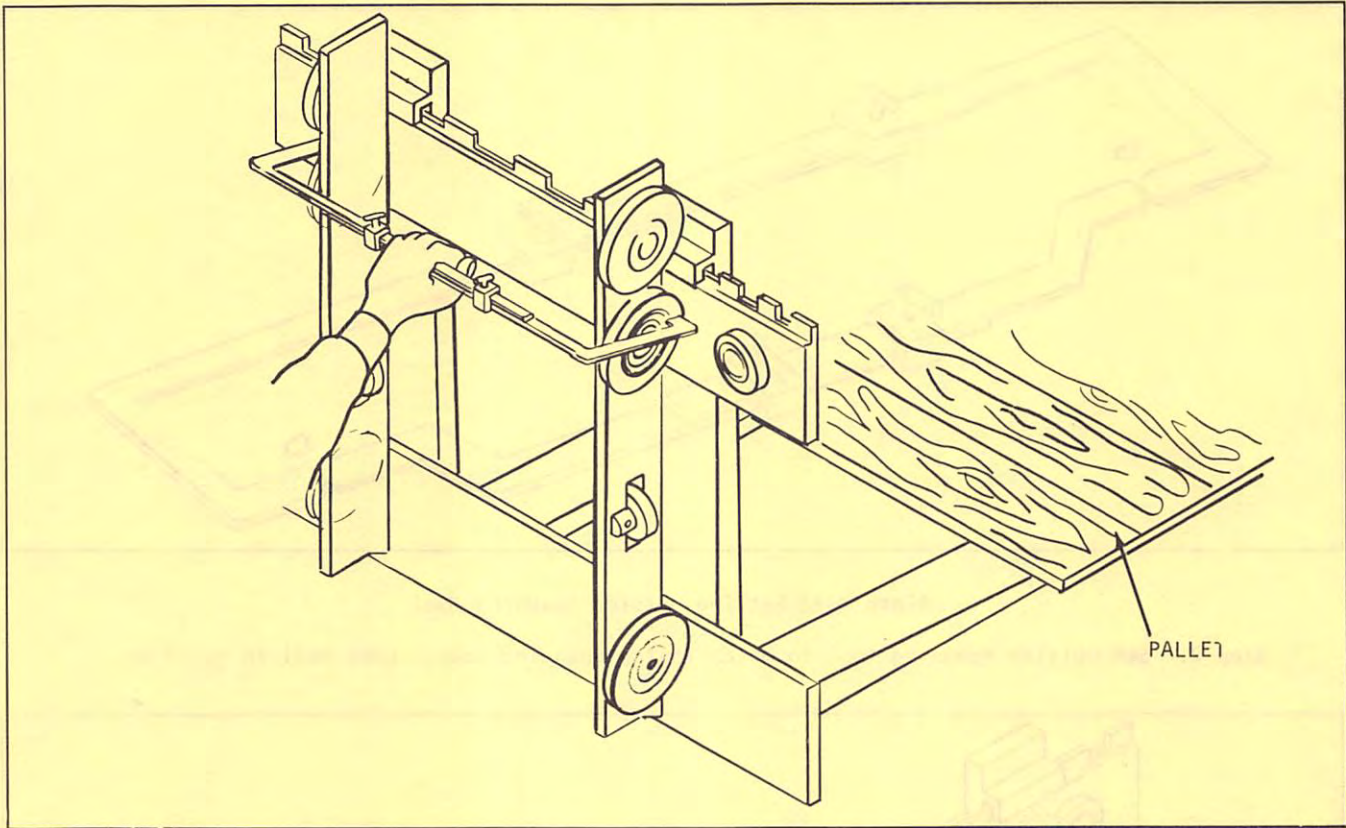


Plate 9570 Spanning Upper Rollers (Six Roller Carriage)

...shims at roller shaft to reach tool size.

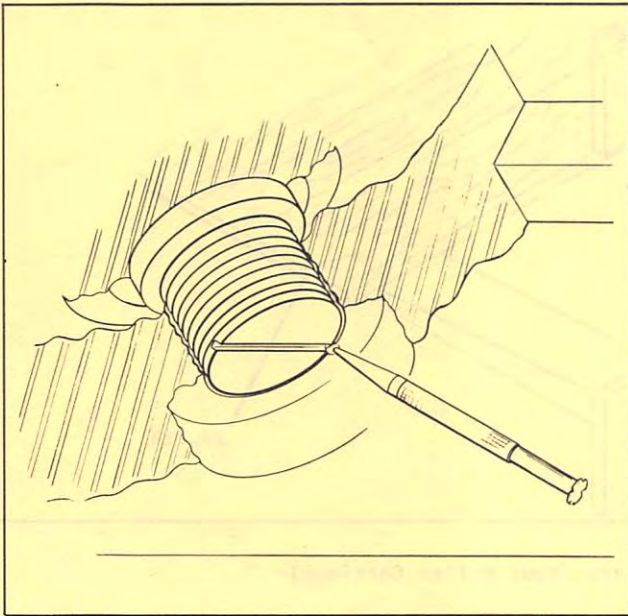


Plate 9571 Securing Outer Thrust Roller

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.

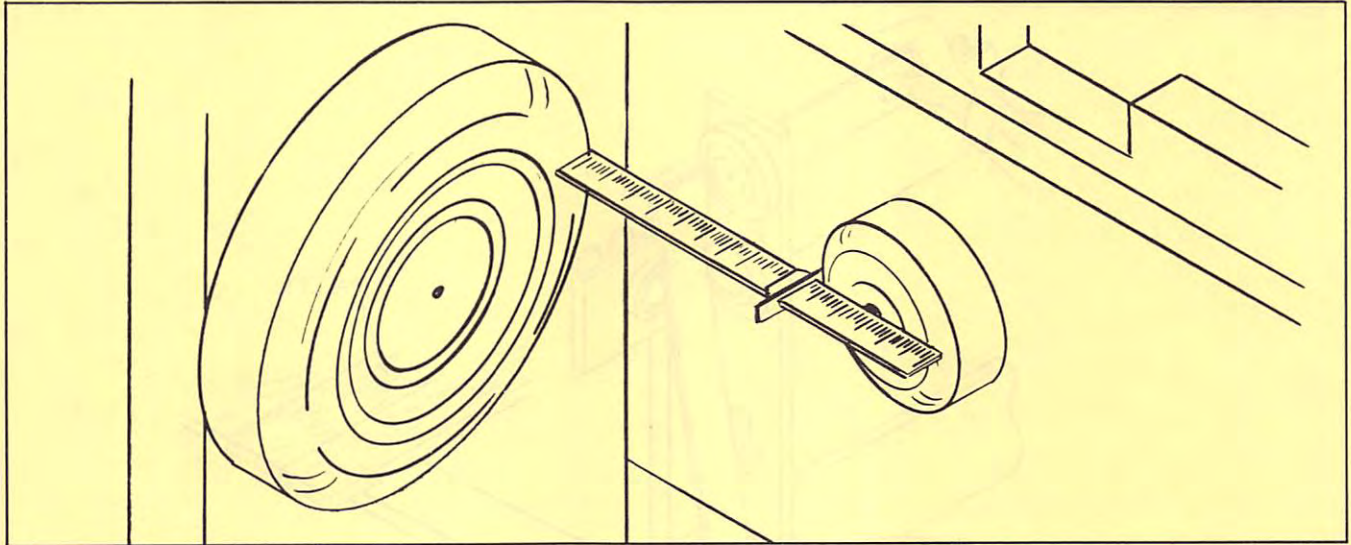


Plate 9572 Centering Carriage Rollers

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.

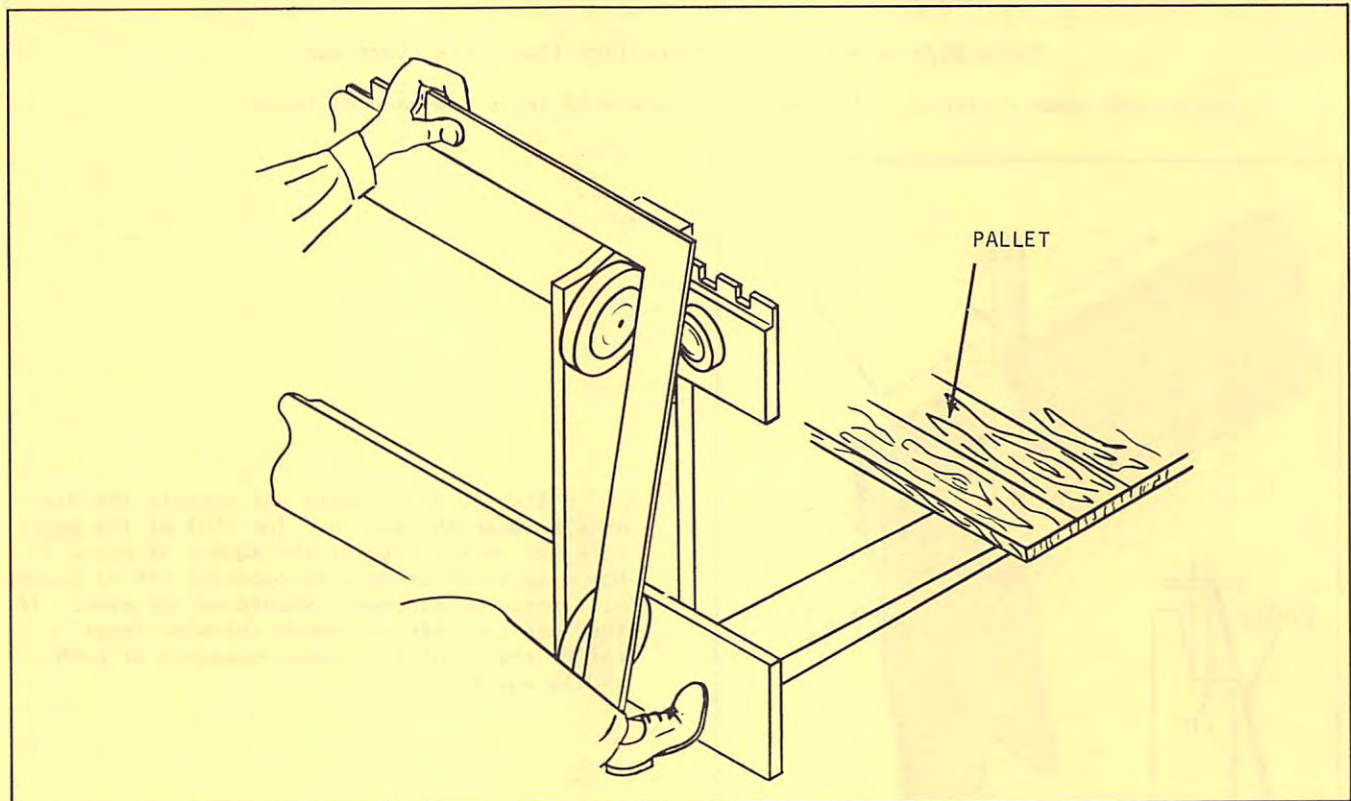


Plate 9573 Squaring Carriage Rollers (Four Roller Carriage)

Step 5. Square carriage rollers by placing carpenter's square at the outer most camber of the ...

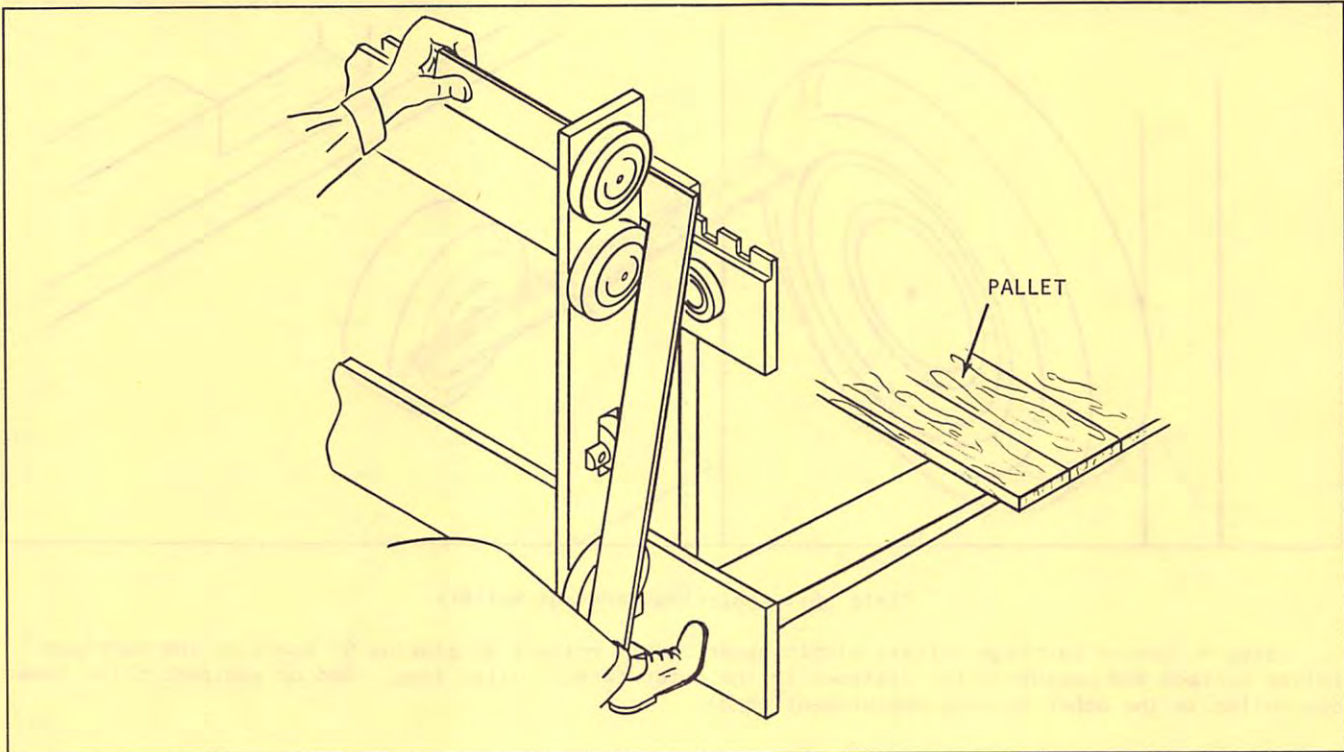
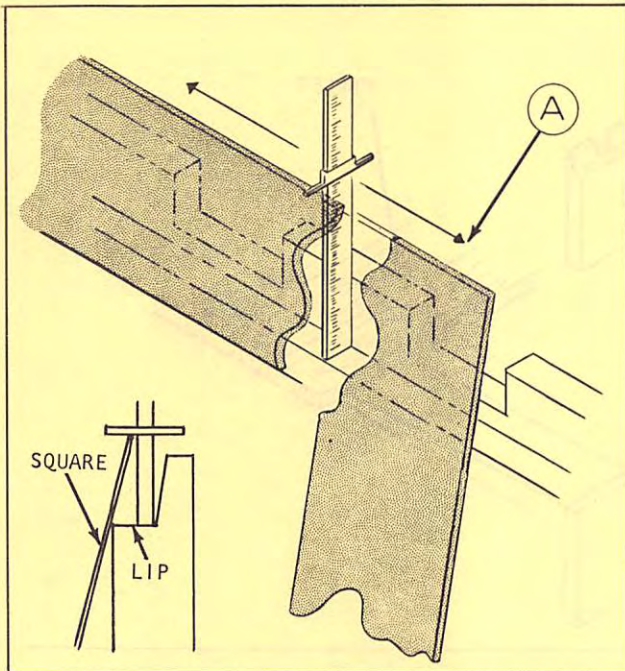


Plate 9574 Squaring Carriage Rollers (Six Roller Carriage)

... upper and lower rollers. Hold square in place with ankle and hand as shown.



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 9575 Measuring For Squareness

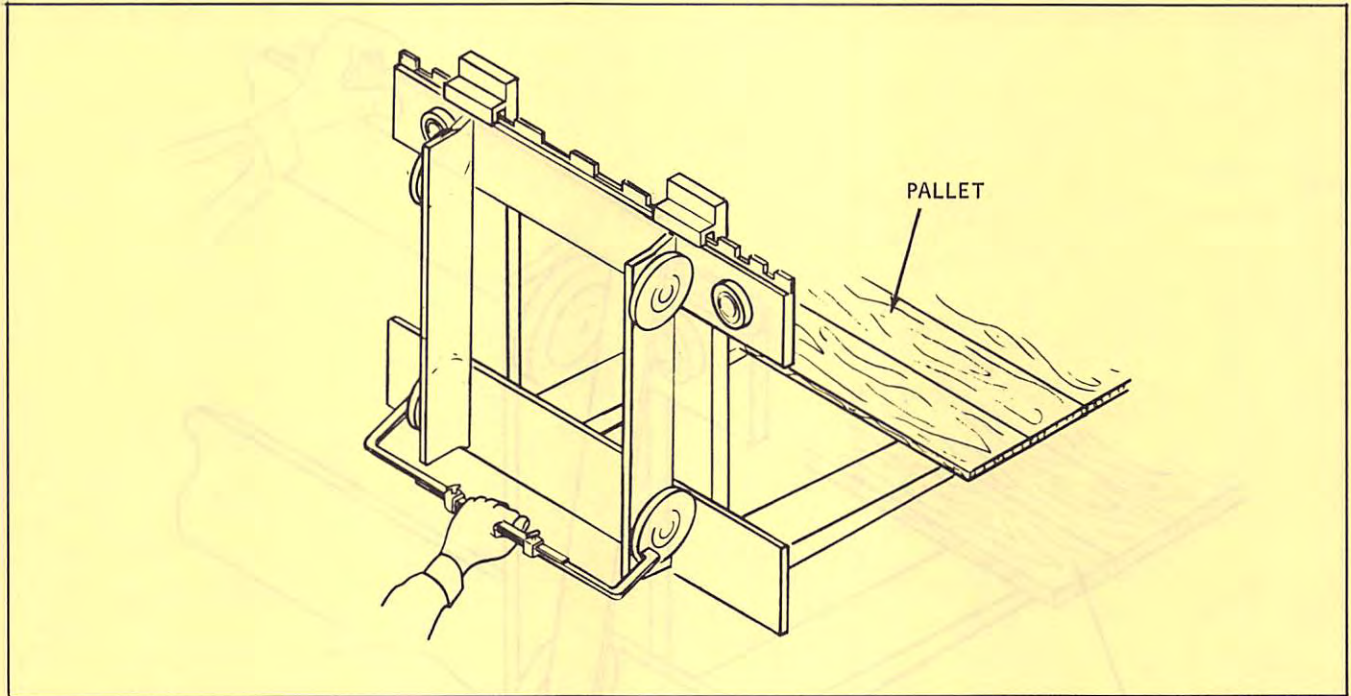


Plate 9576 Spanning Lower Rollers (Four Roller Carriage)

Step 7. Span lower rollers. Add or subtract shims to (the roller that has not been squared) ...

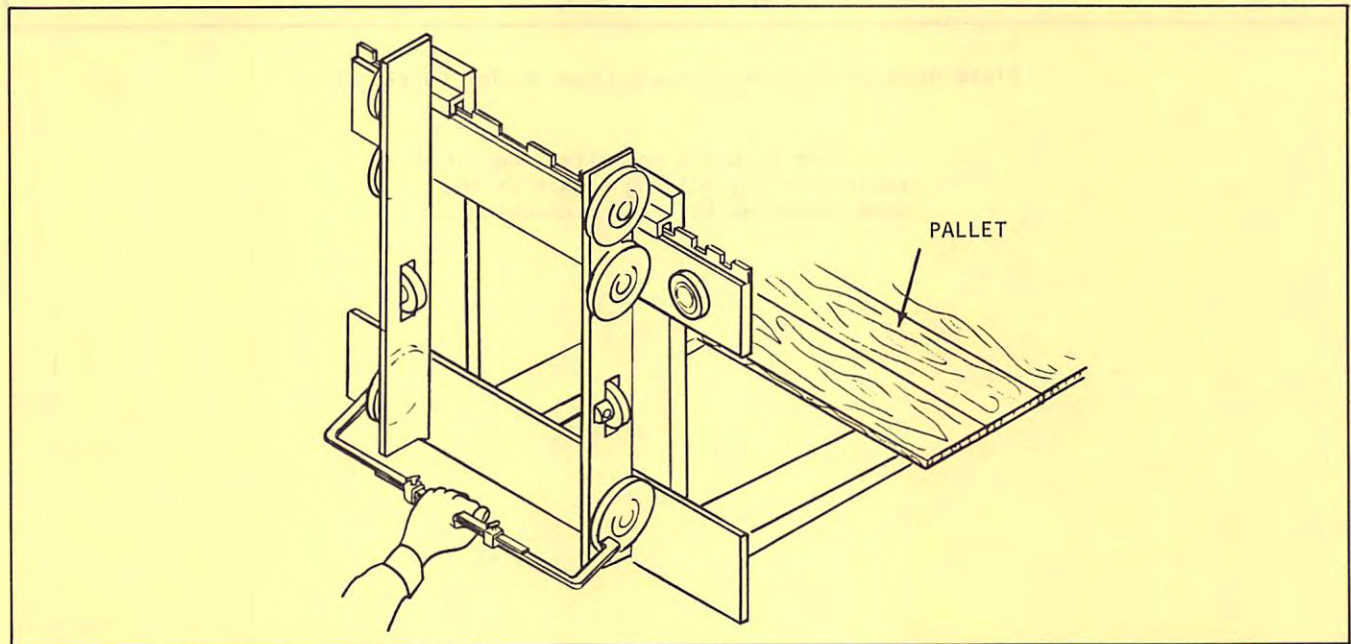


Plate 9577 Spanning Lower Rollers (Six Roller Carriage)

... reach the size of the outside spanning tool.

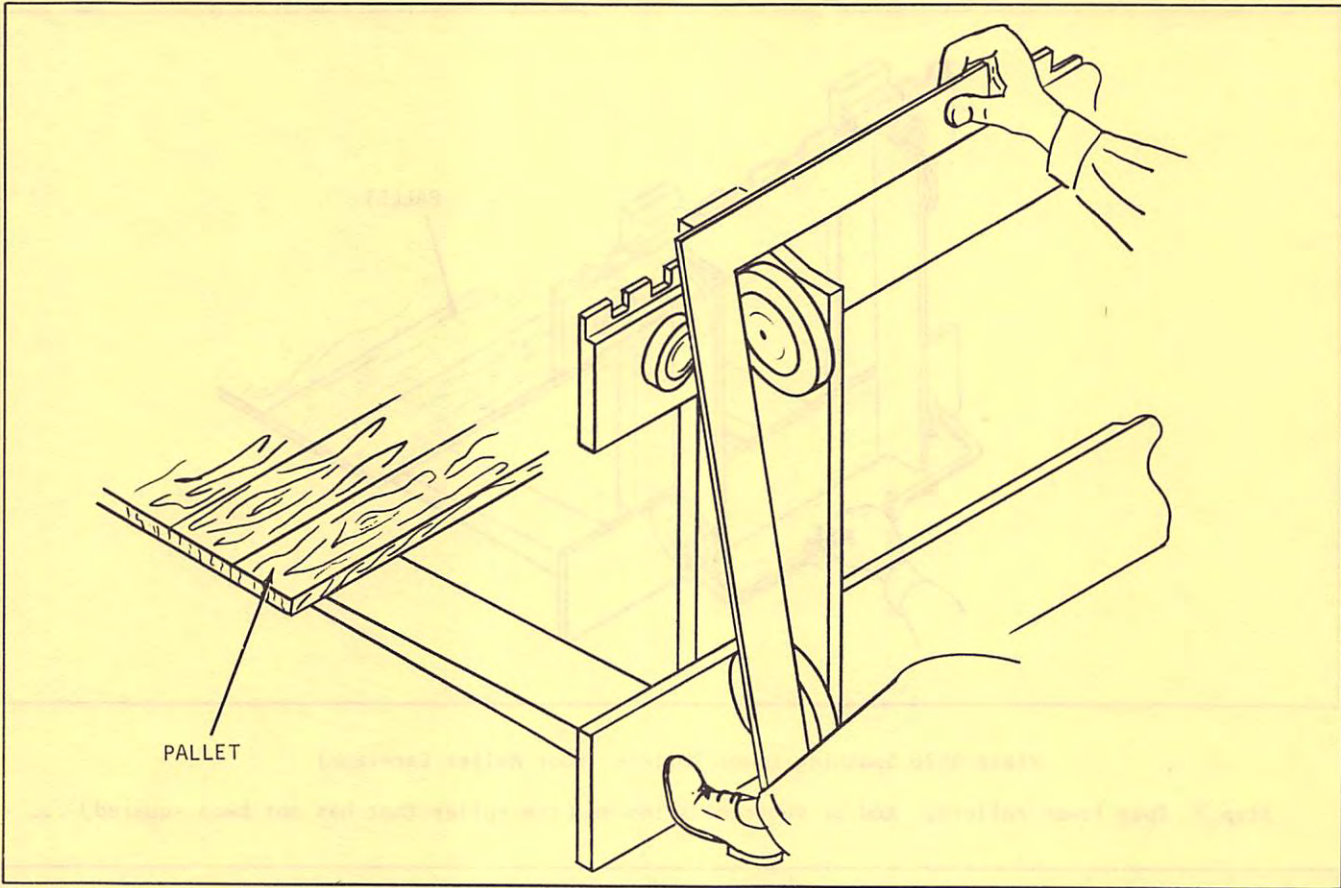


Plate 9578 Checking Squareness (Four Roller Carriage)

Step 8. Check opposite side for squareness (by holding square in the same manner as before and checking ...)

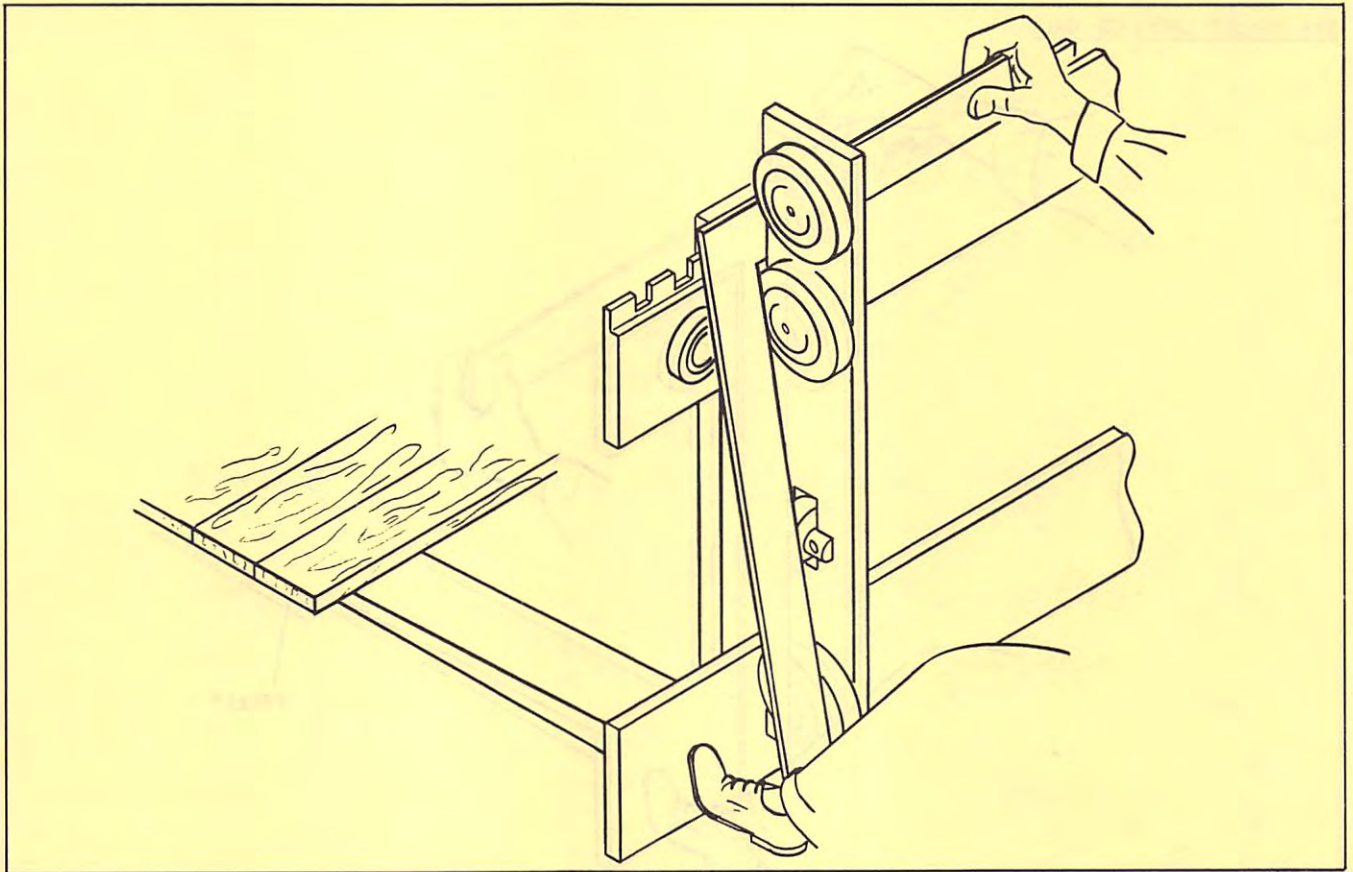


Plate 9579 Checking Squareness (Six Roller Carriage)

... measurement). This side will be square within $1/32''$; if not, return to Step 5. and repeat procedure.

SIX ROLLER CARRIAGE ONLY

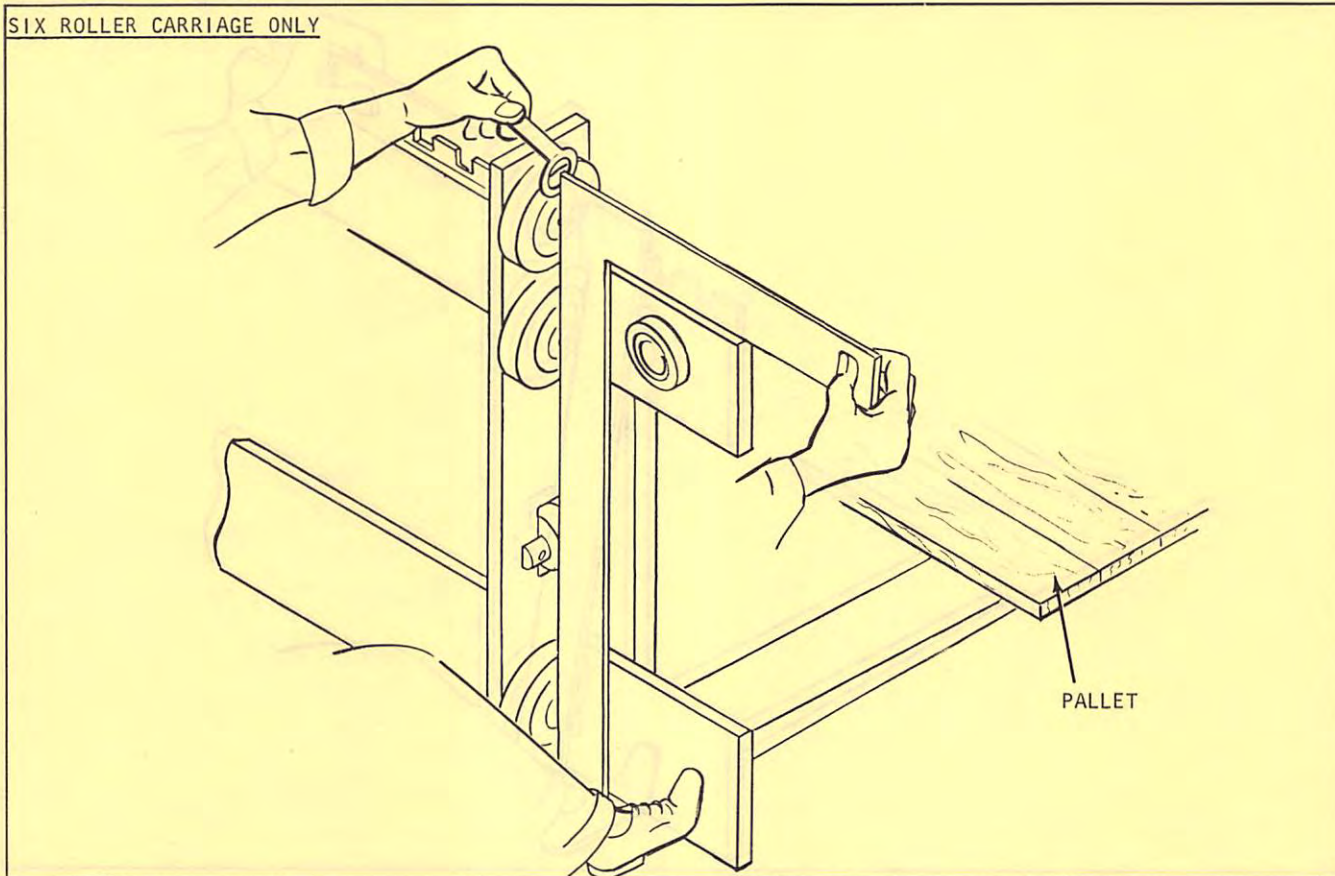


Plate 9580 Top Roller Clearance

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

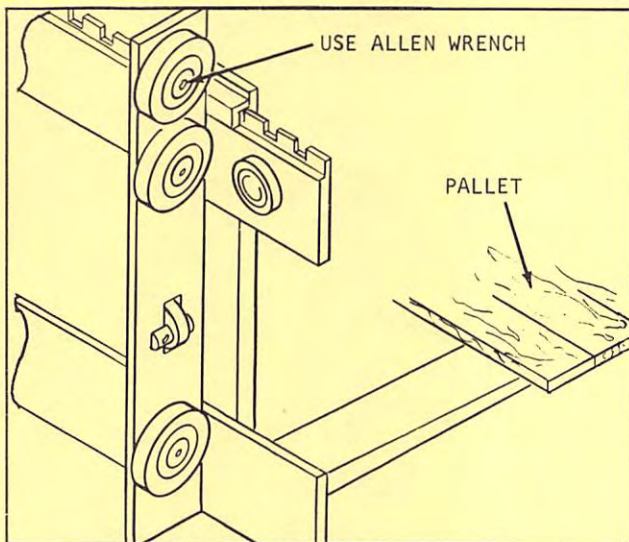


Plate 9581 Removing Top Roller

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.

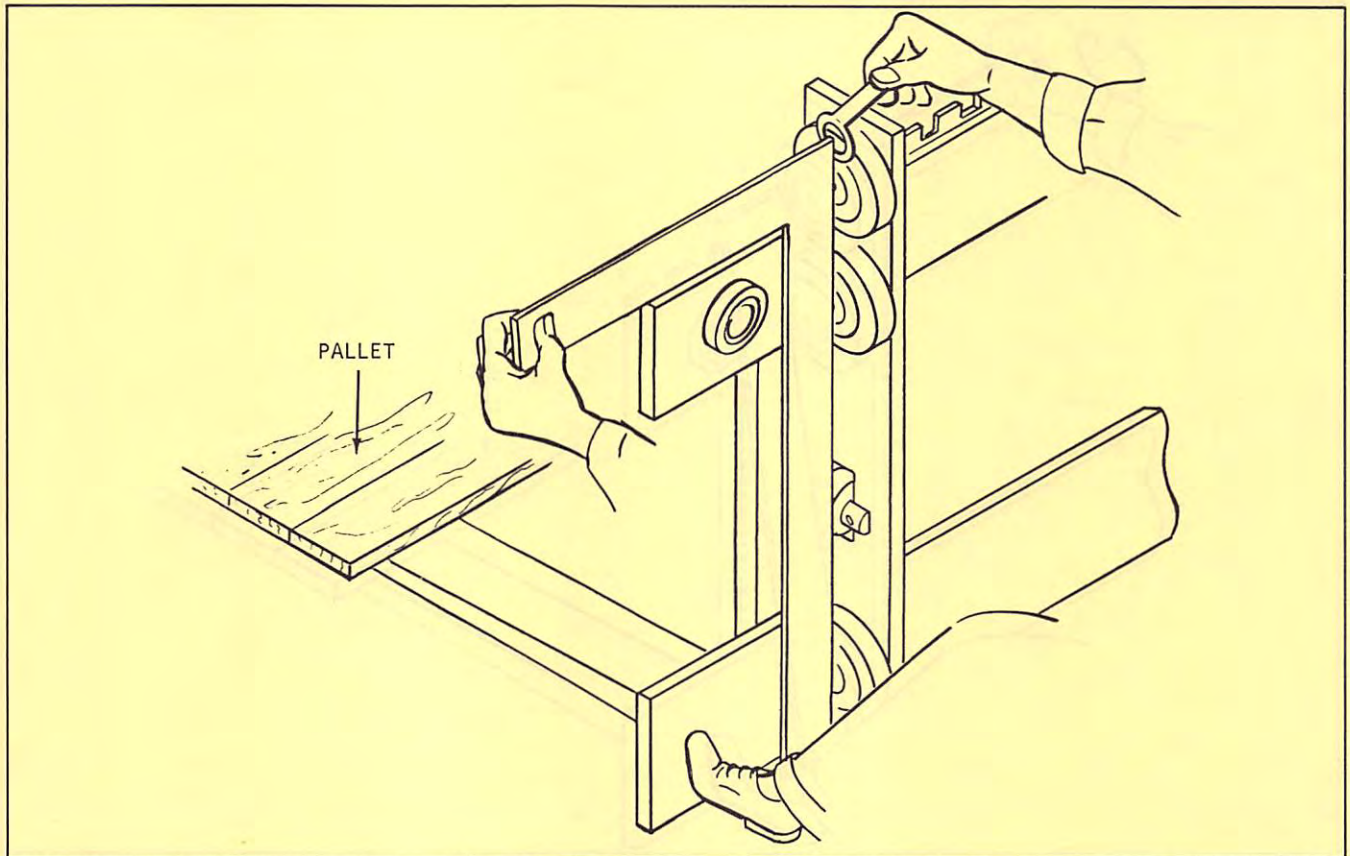


Plate 9582 Top Roller Clearance

Step 3. Check opposite upper roller in the same manner; adjust if necessary.

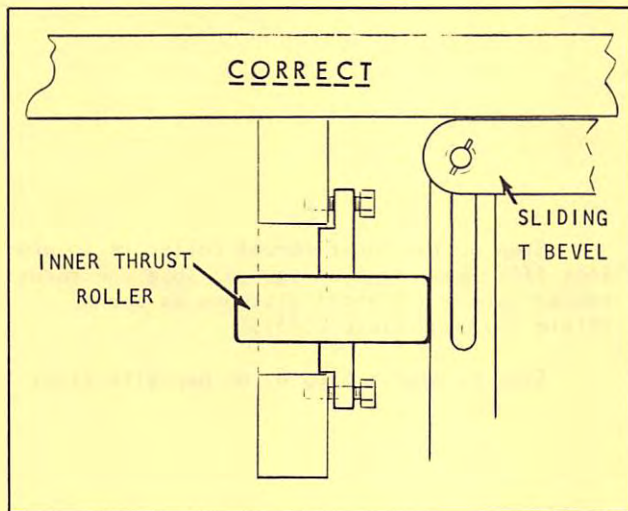


Plate 9583 Checking Squareness ■ CORRECT

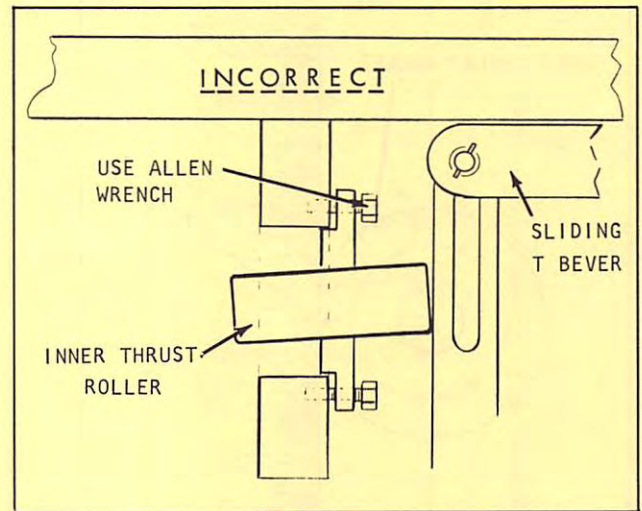


Plate 9584 Checking Squareness ■ INCORRECT

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).

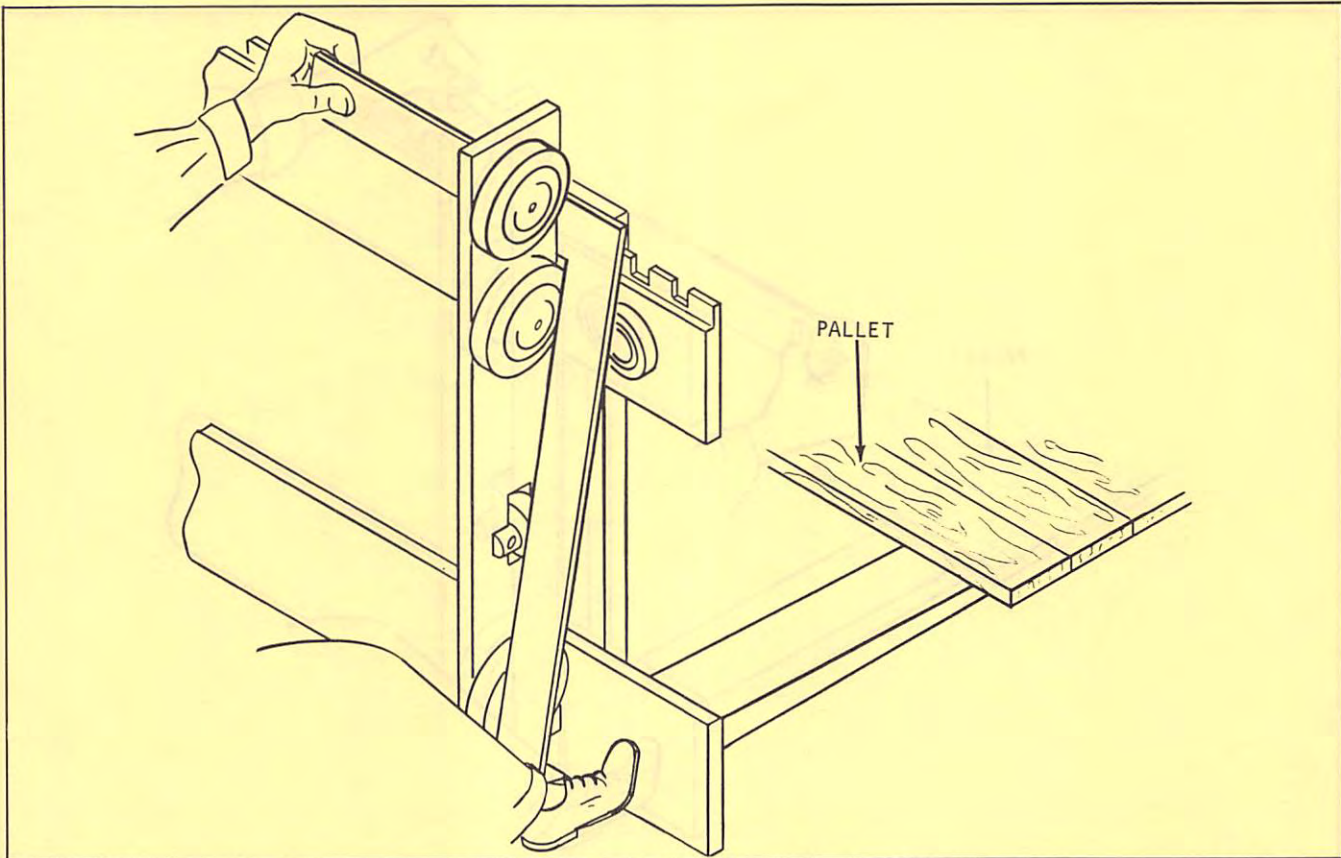


Plate 9574 Square And Side Thrust Roller

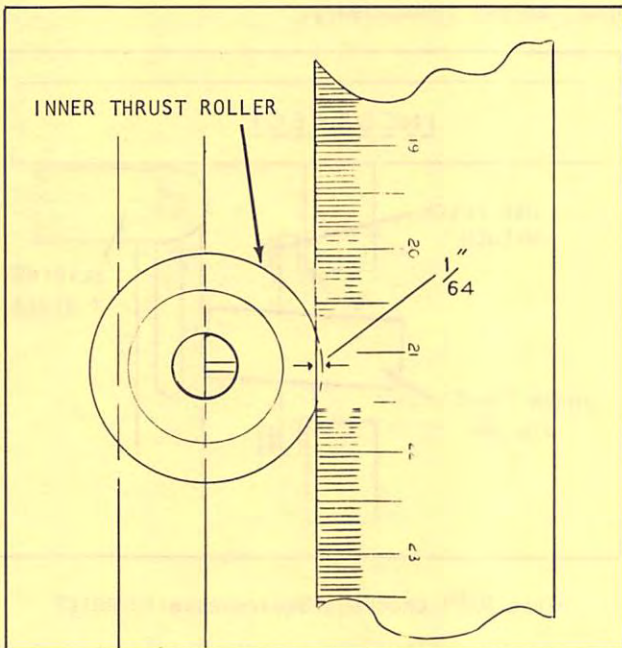


Plate 9585 Reading Roller Projection

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.

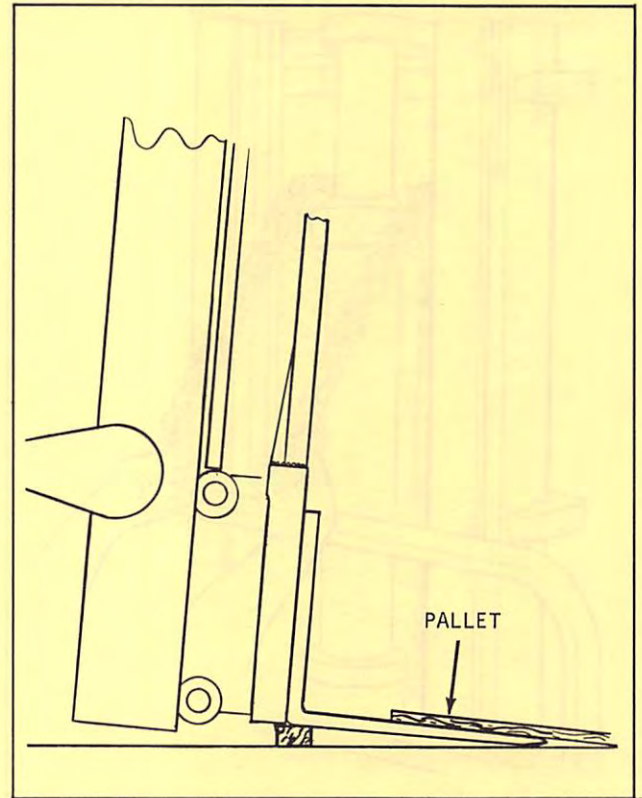


Plate 9565 Inner Rail Clearing Carriage Rollers

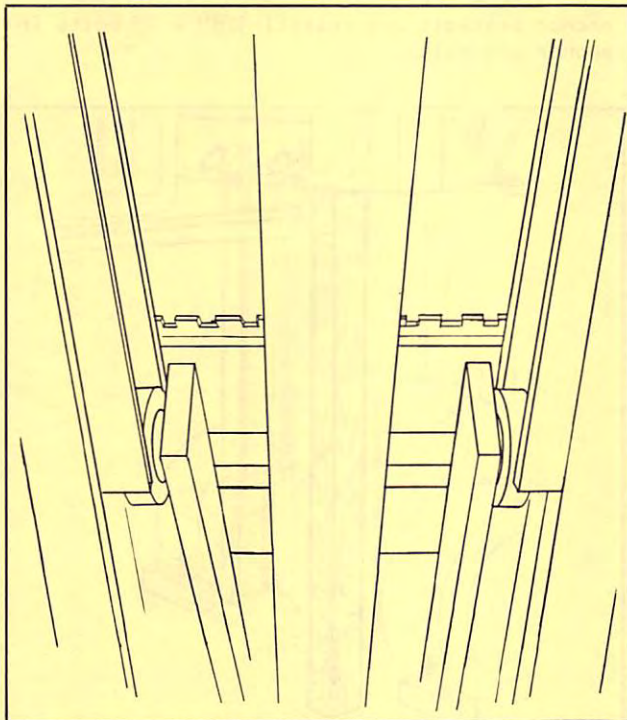


Plate 9591 Rollers Guiding Into Inner Rail

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.

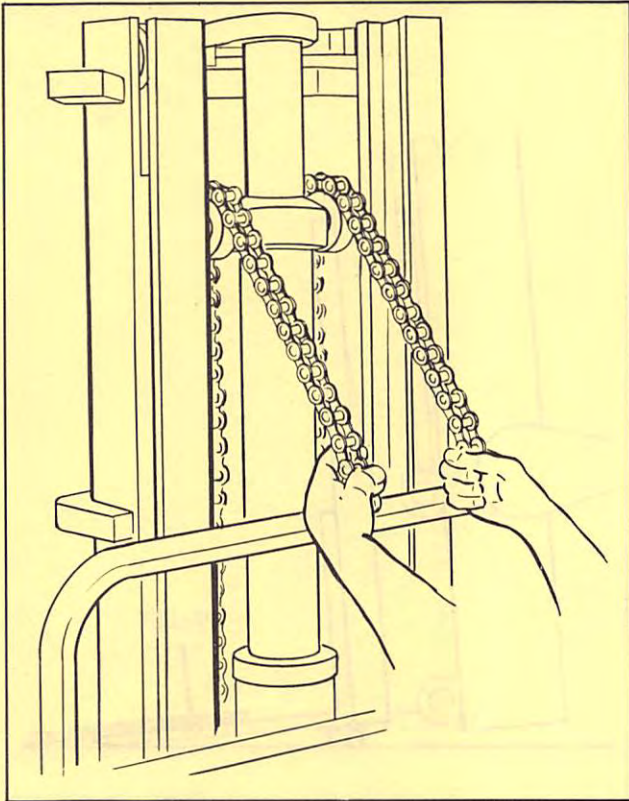


Plate 9586 Pulling Piston Head Down

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.

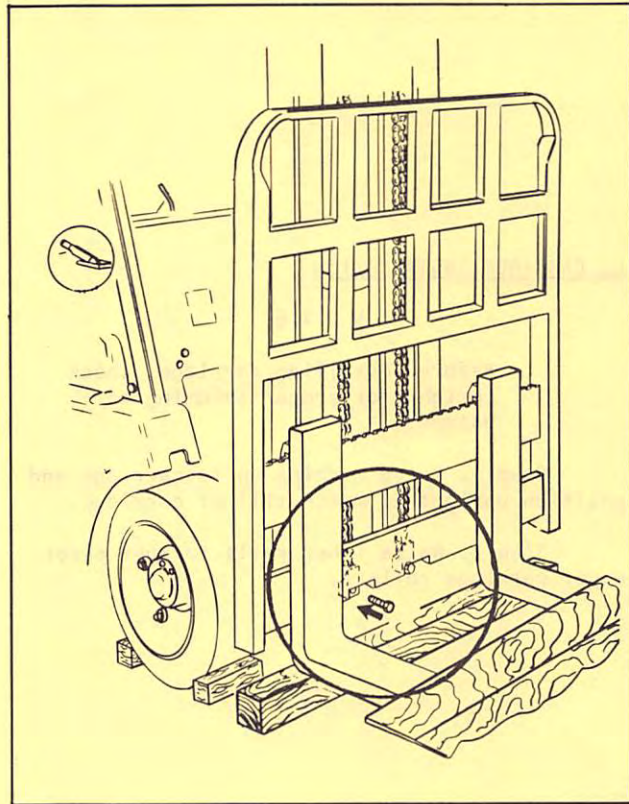


Plate 9587 Installing Bolts

Step 4. Put chain anchors in carriage anchor brackets and install 3/8" x 2" bolts in anchor pin holes.

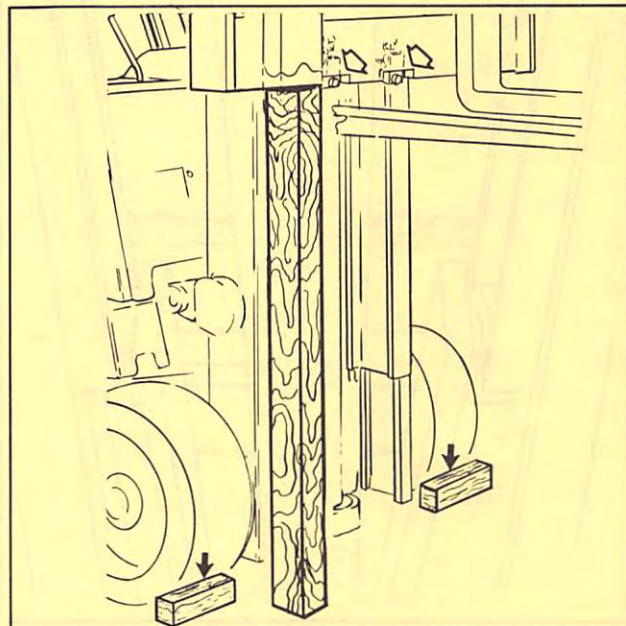


Plate 9593 Carriage Pin Replacement

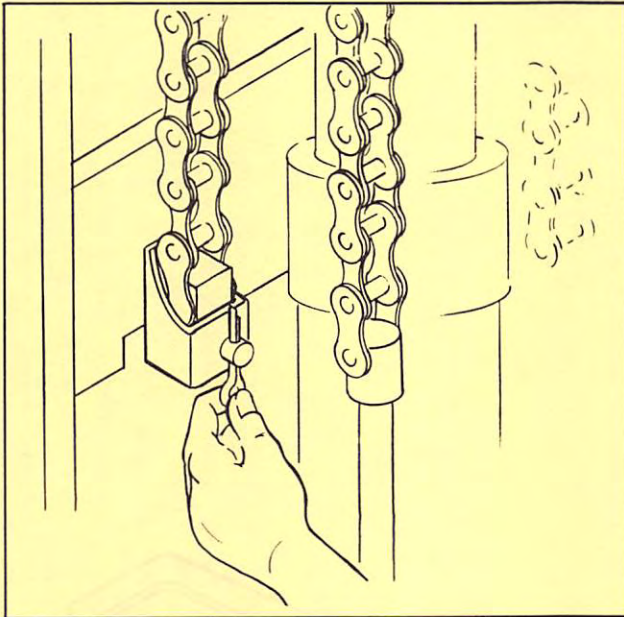
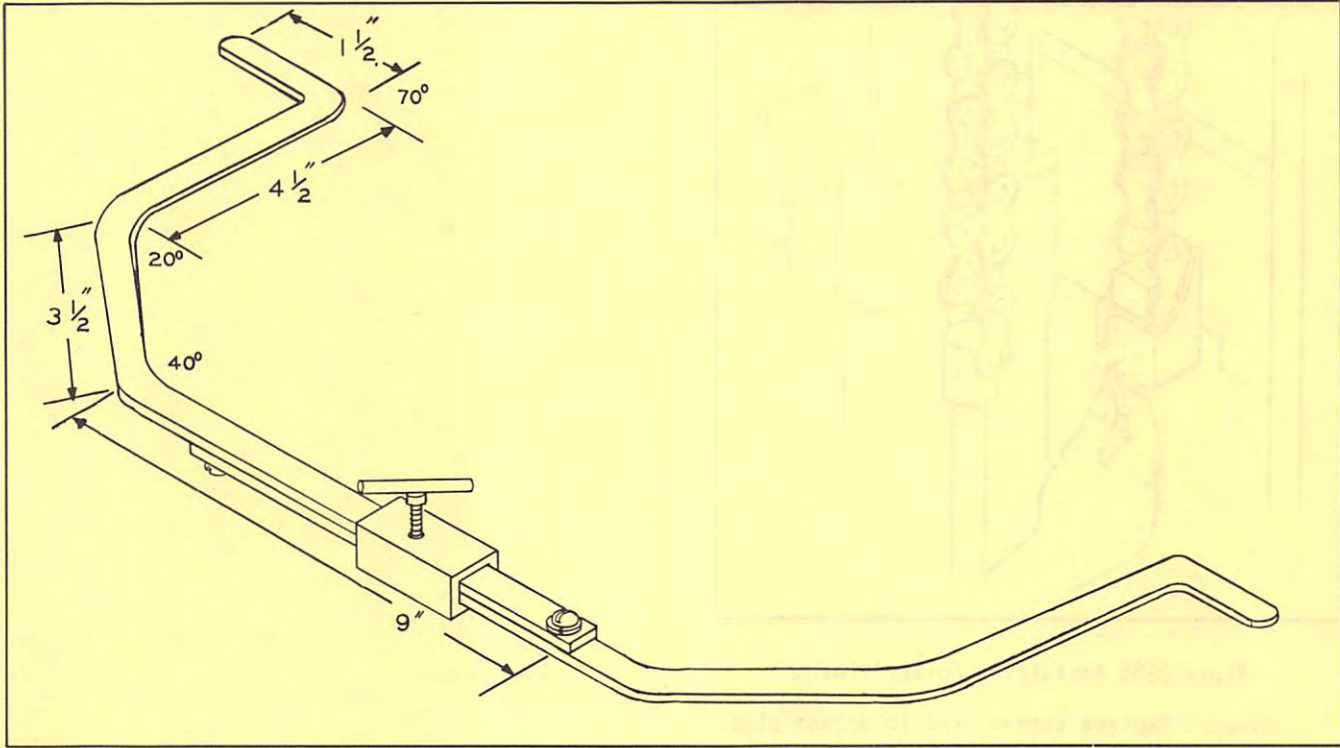


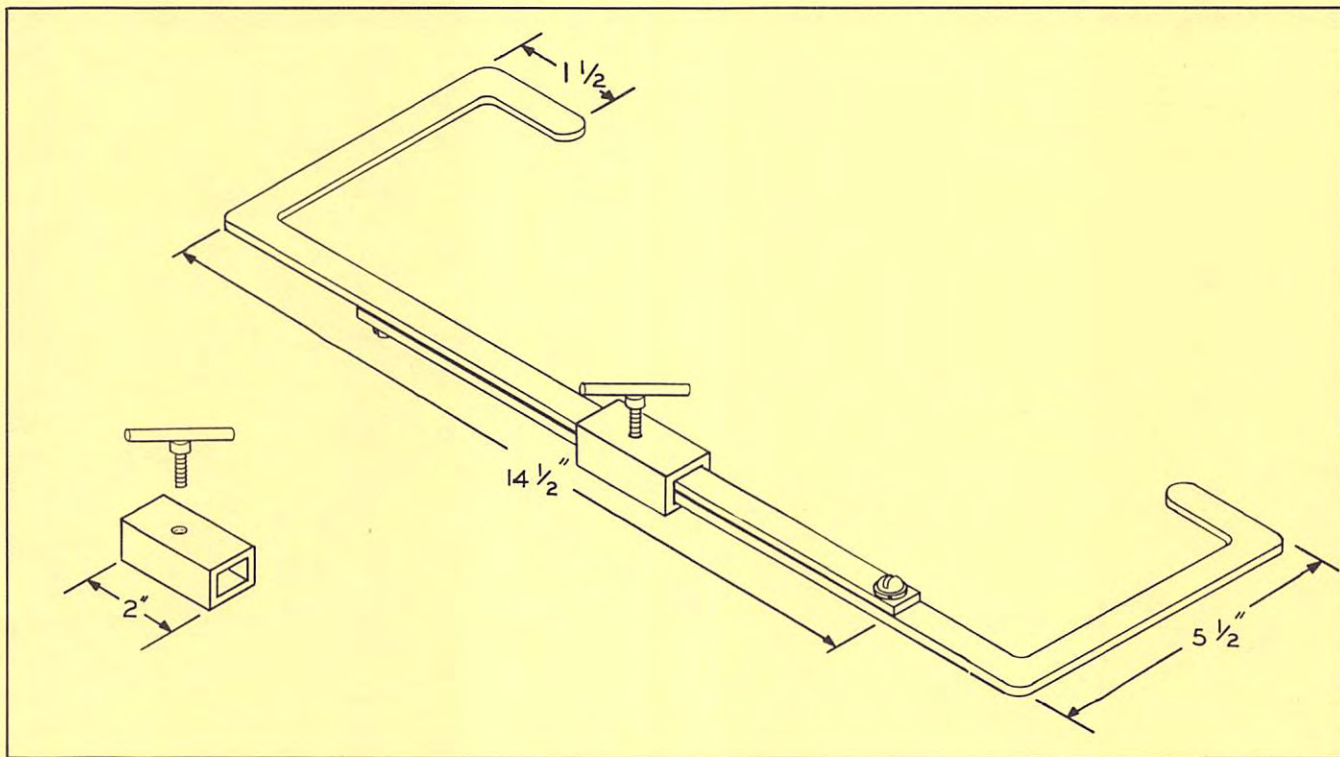
Plate 9588 Installing Cotter Pins

Step 7. Replace cotter pins in anchor pins.

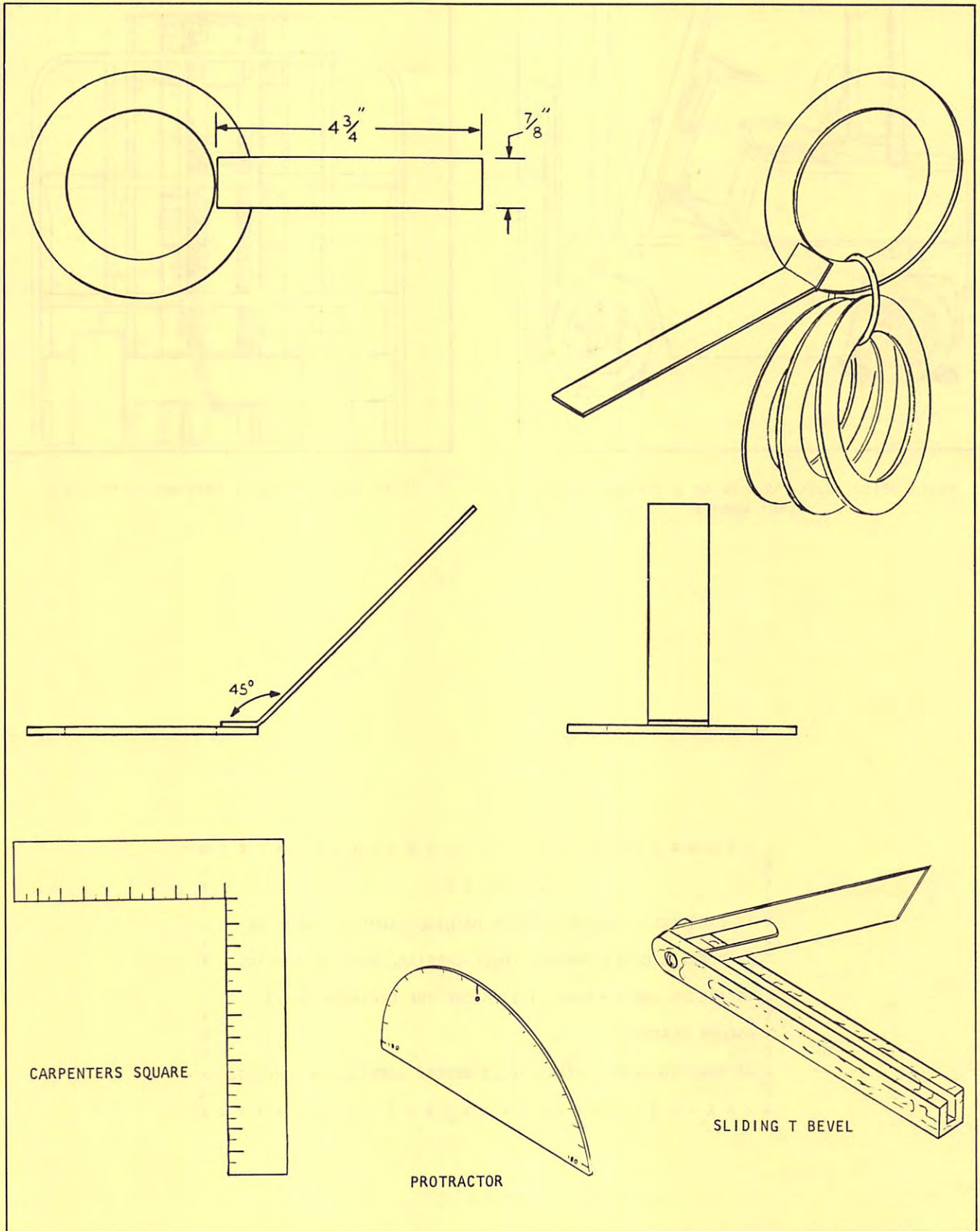
Step 8. Raise and lower carriage to full positions checking all phases of operation.



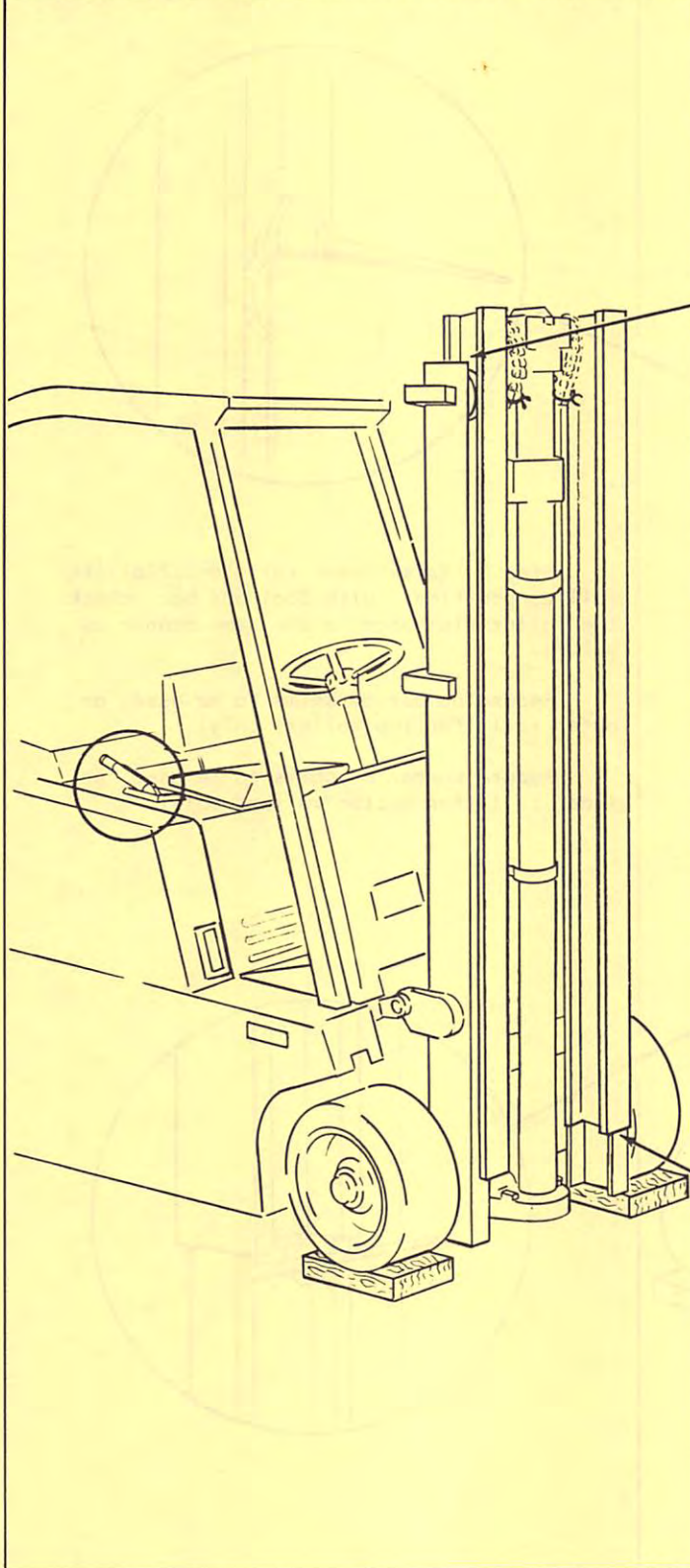
INSIDE SPANNING TOOL



OUTSIDE SPANNING TOOL



UPRIGHT ROLLER ADJUSTMENT -- STANDARD AND HILO SERIES 1500

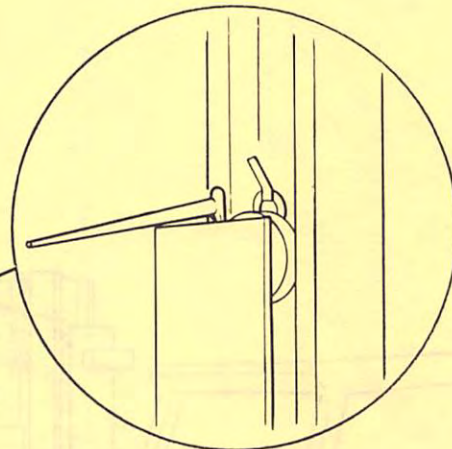
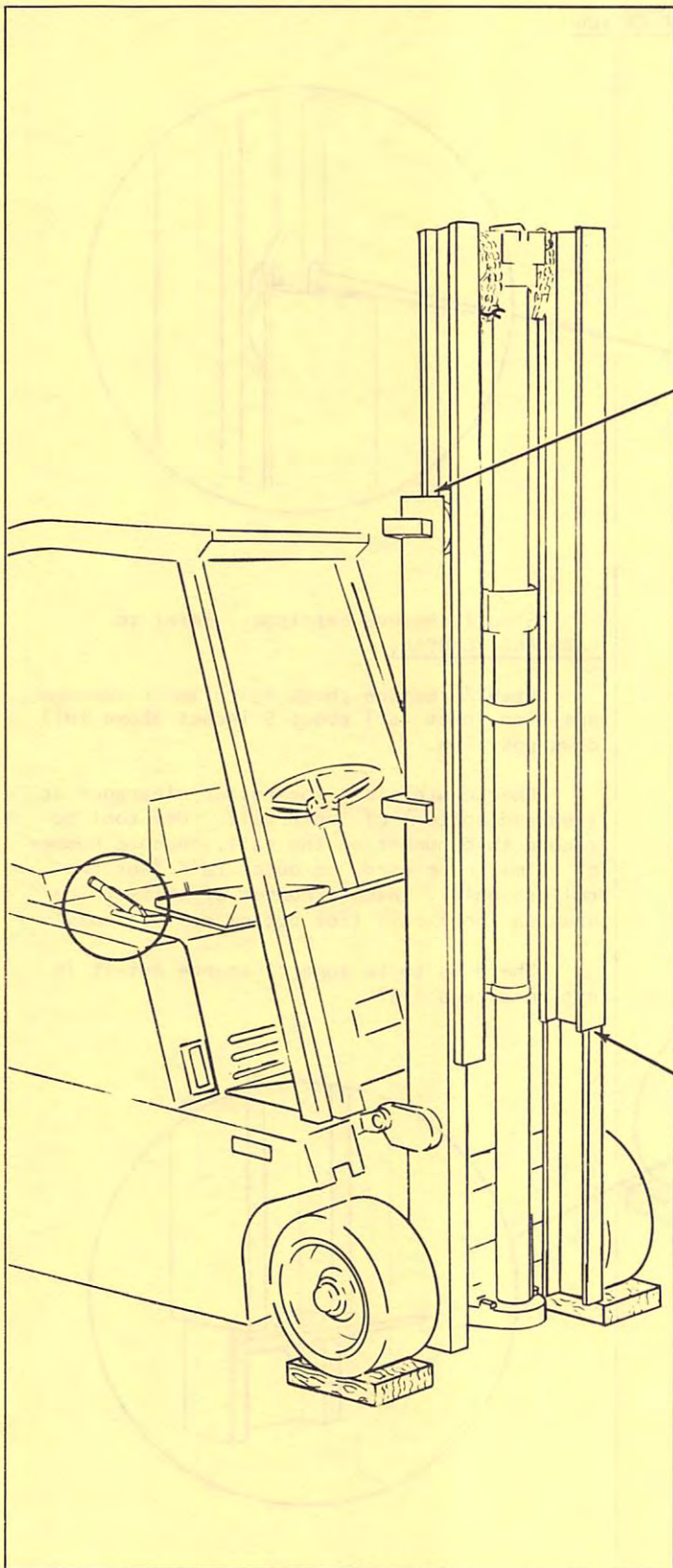


Step 1. Remove carriage. Refer to CARRIAGE REMOVAL.

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).

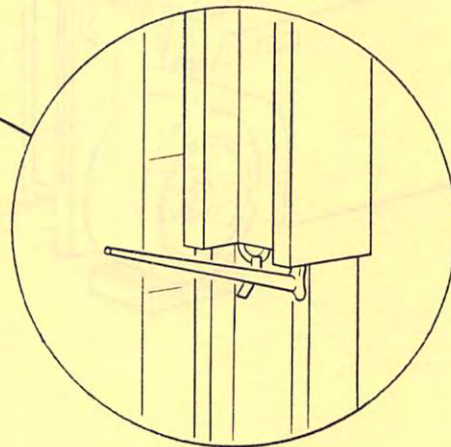
There is to be some clearance but it is not to exceed $1/32''$.

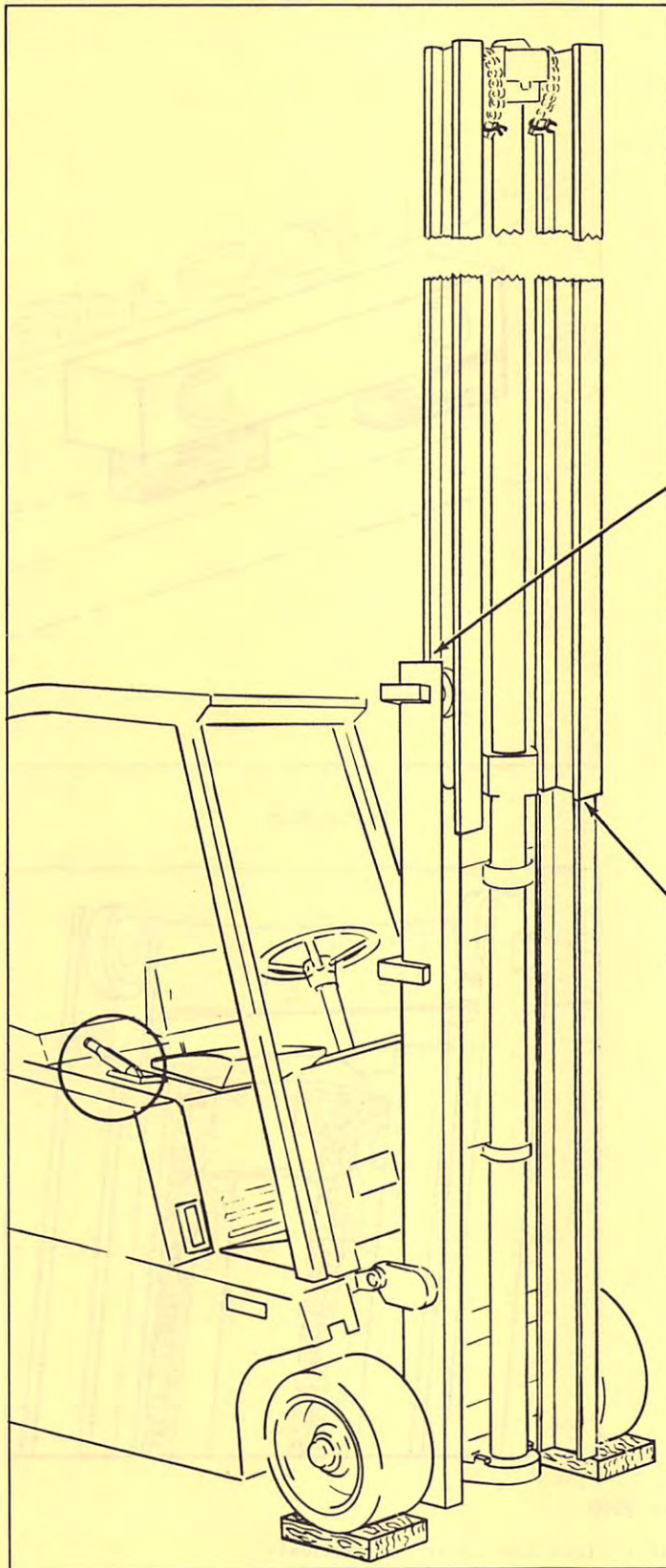


Step 3. Raise inner rail to 1/2 of its full up position. With tool and bar, check the roller clearance in the same manner as before.

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).





Step 4. Raise inner rail 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.

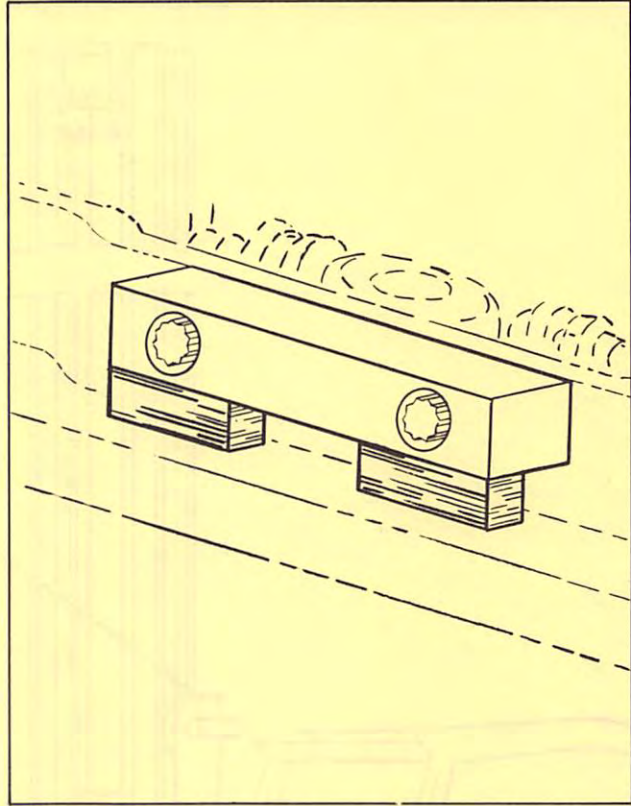


Plate 9808

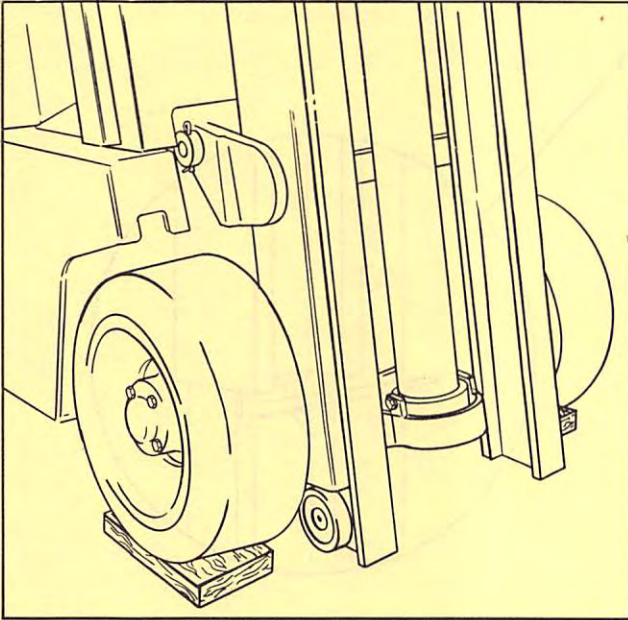
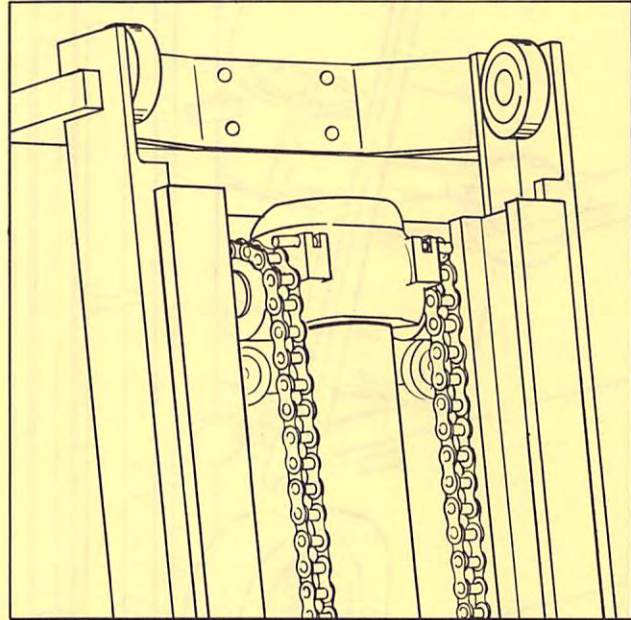


Plate 9809

Step 6. Lower inner rail until upper and lower rollers are clear for removal.



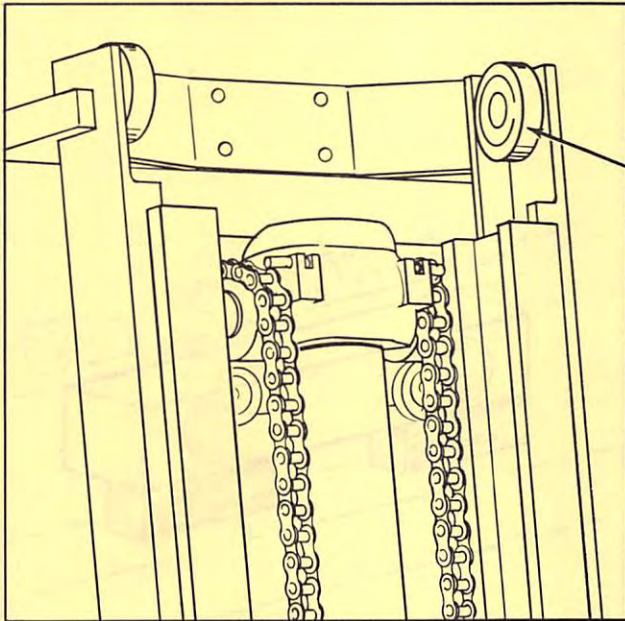


Plate 9810

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.

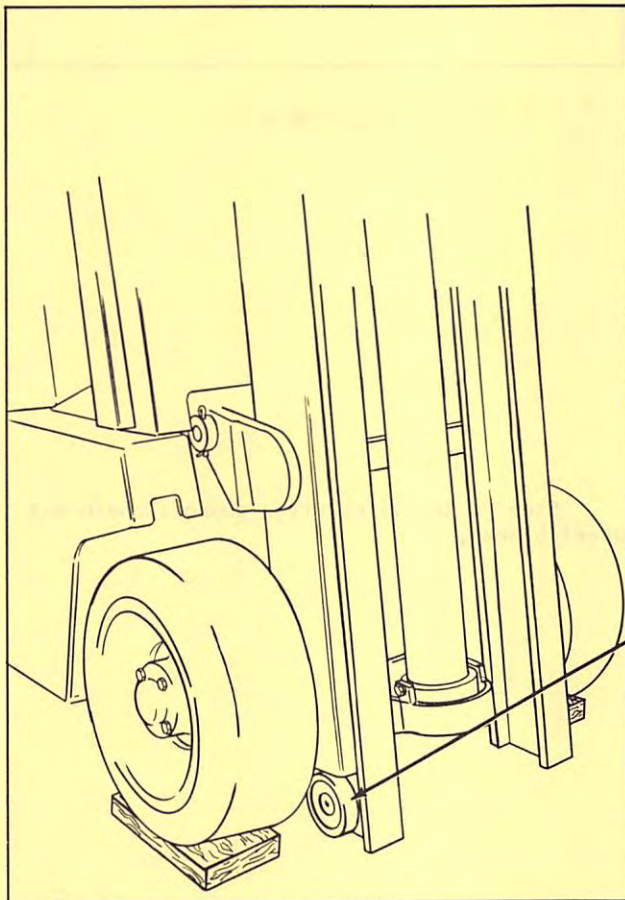


Plate 9812

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, be sure 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.

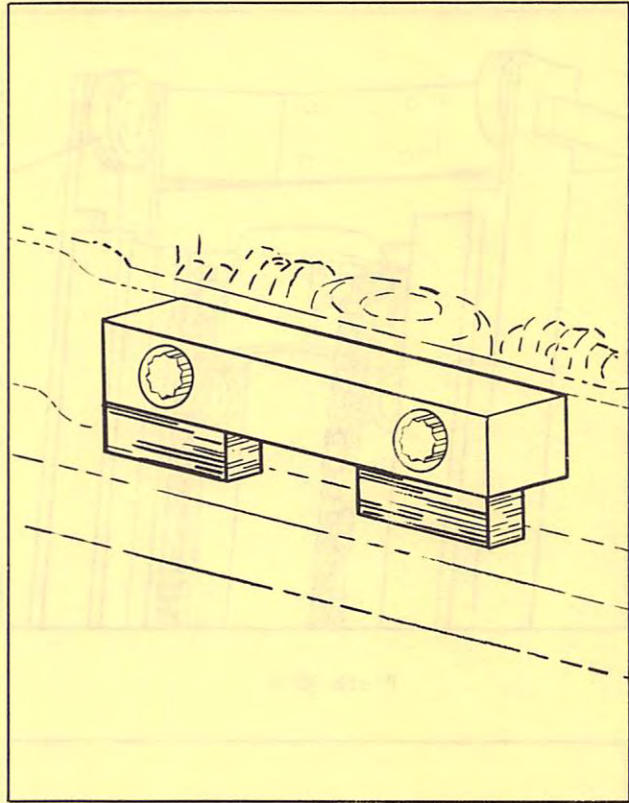


Plate 9808

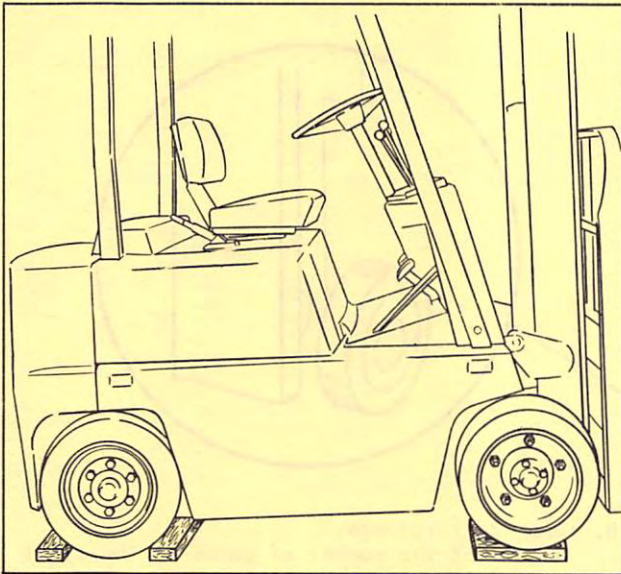
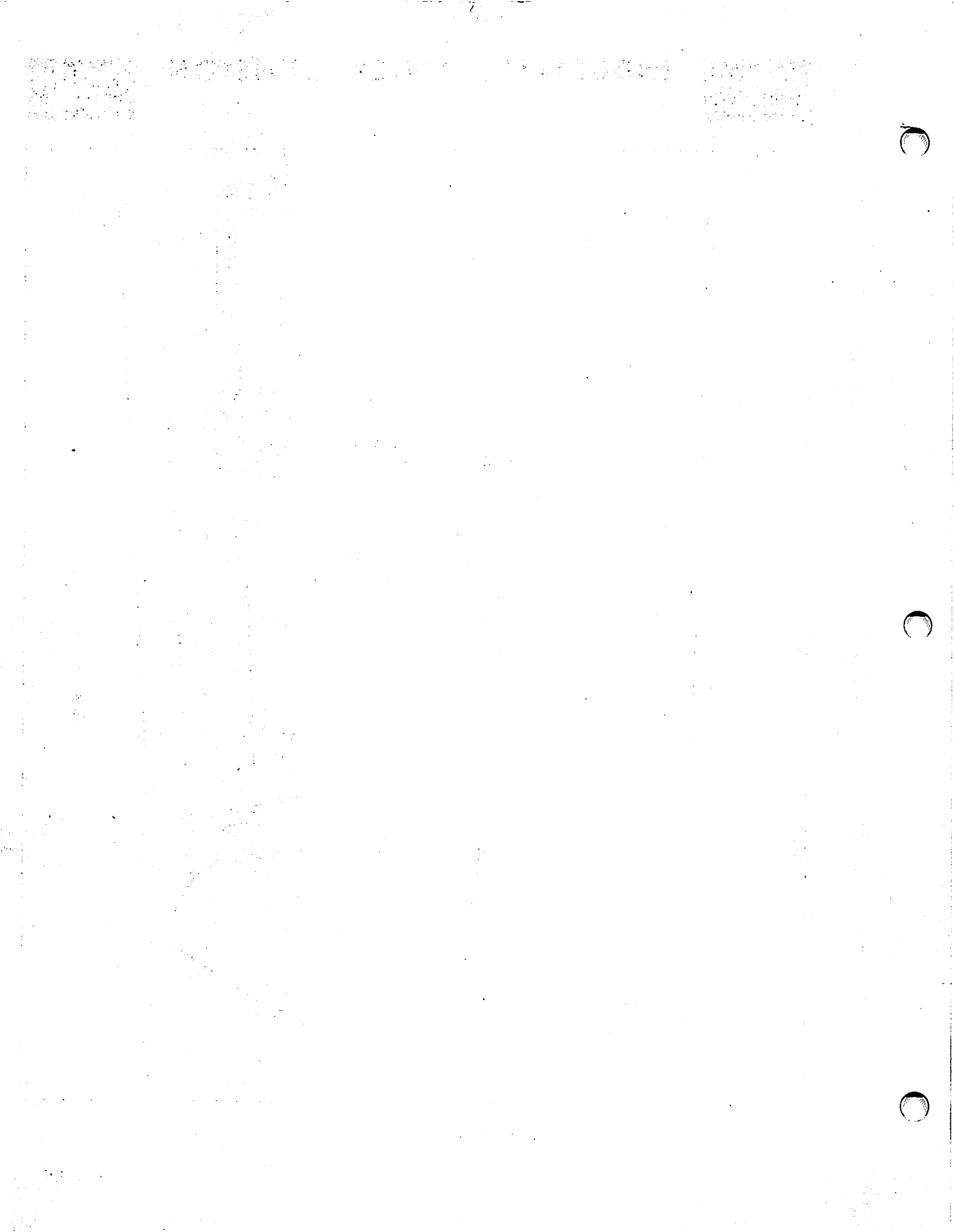


Plate 9811

Step 9. Remove carriage support chain and wheel blocks.



NS-NSP-NST/SG

GE C-185

SUBJECT: PROPER SCR CHECK OUT PROCEDURE FOR GE C 185 SYSTEM; NS-NSP and NST. IMPORTANT: Machines must be thoroughly checked before being put into service.

The attached CHECK OUT SHEET must be filled out and has to accompany the installation report before we will accept any warranty claims.

DO NOT use a motor generator unit such as Ready Power to move and/or check machines as serious damage may occur.

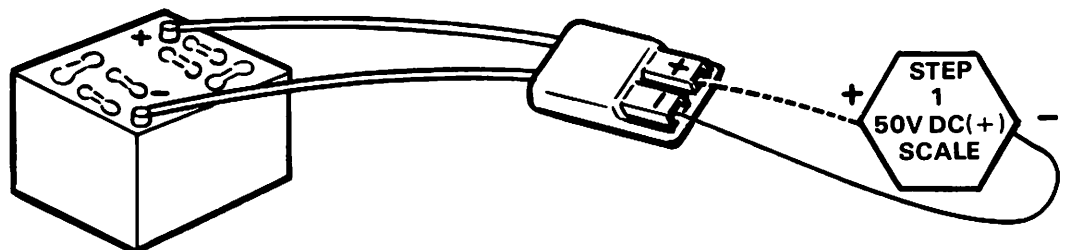
If, for any reason, a machine does not comply with the adjustment, inspection and test procedures, the figures you enter on the check out sheet will have to be known prior to contacting the factory.

The following checks MUST be made with a Simpson V-O-M 260 Meter or equivalent.

NOTE: IF METER READINGS ARE NOT WITHIN SPECIFICATIONS OF EACH STEP, REFER TO ADDITIONAL TROUBLESHOOTING INSTRUCTIONS FOLLOWING THE CHECK OUT PROCEDURE. DO NOT CONNECT BATTERY UNTIL STEP 7.

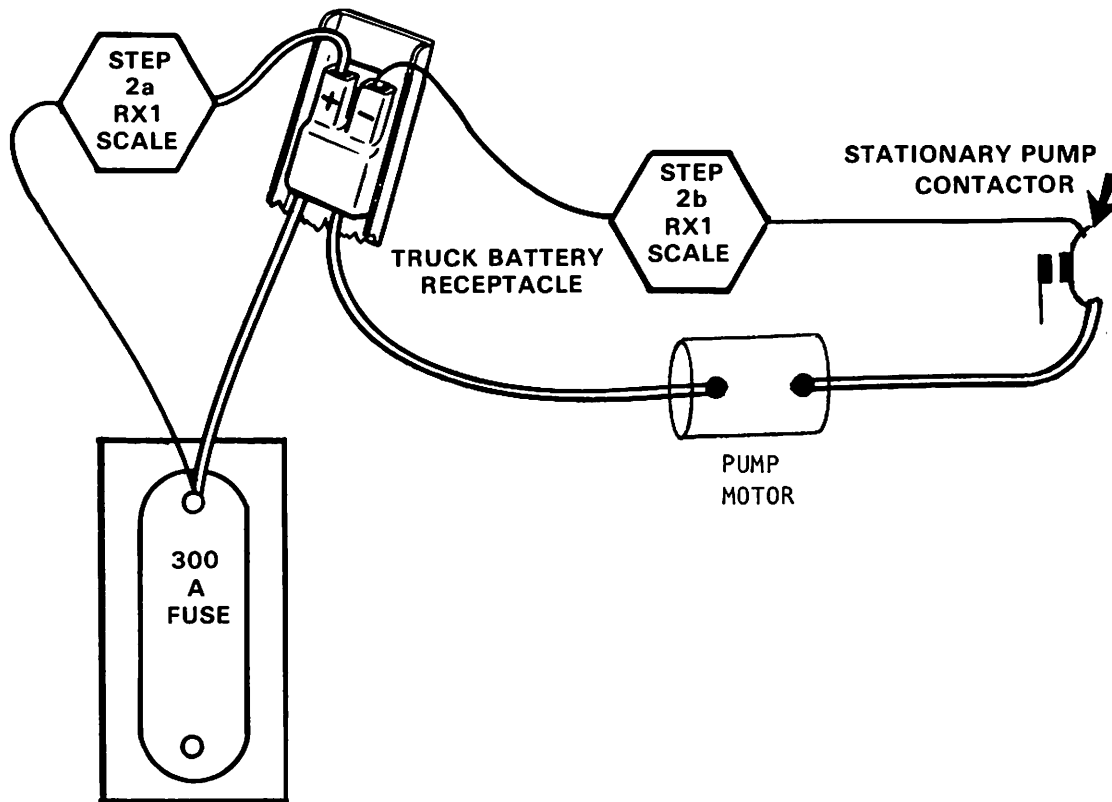
1. CHECKING BATTERY POLARITY & BATTERY VOLTAGE.

With voltmeter set on the 50 V DC (+) scale, place the red lead on positive (+) and the black lead on negative (-) battery connector. You should read battery volts. If meter needle moves backwards, the power cables are connected wrong in the battery and should be reversed before connecting battery to machine.



2. CHECKING TRUCK POLARITY. Checking continuity of power cables for proper polarity.

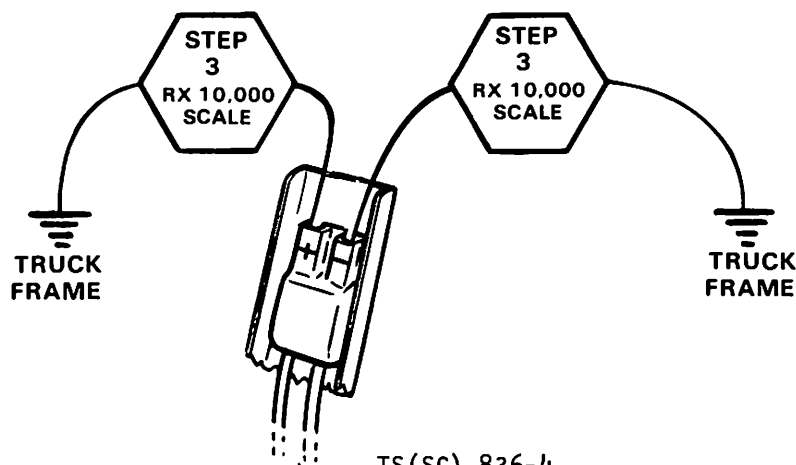
- a. With ohmmeter on RX1 scale, either lead red or black on the positive side of truck battery receptacle, the other lead on the 300A fuse. Should have no resistance.
- b. Still on the RX1 scale, either lead red or black on the negative side of truck battery receptacle, the other lead on the stationary pump contactor power tip, should have no resistance.



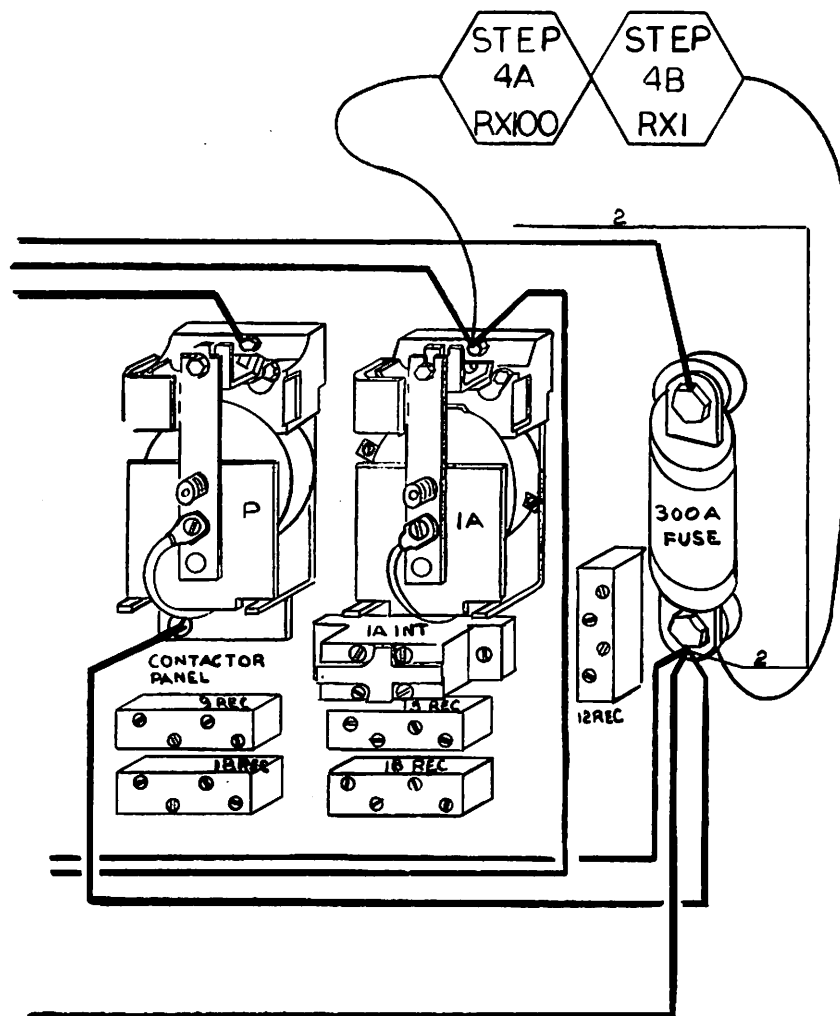
3. GROUND TEST.

With ohmmeter set on RX 10,000 ohm scale, check for grounds.

- a. Positive (+) of truck receptacle to truck frame.
 - b. Negative of truck receptacle to truck frame. With 1A contactor held closed.
- .Resistance for 3a and 3b should be 50,000 ohms or higher on new trucks, 30,000 ohms is acceptable on used trucks.

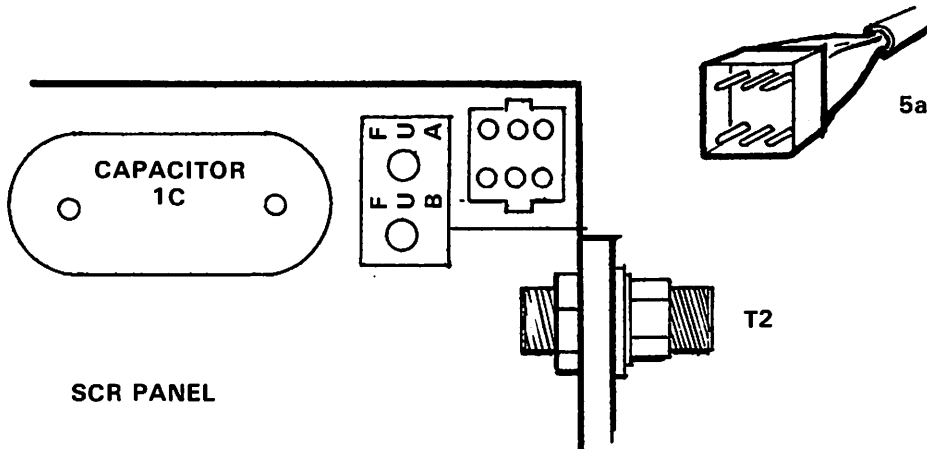


4. CHECKING CONTROL WIRING USING OHMMETER.
 - a. With all switches open, measure 1500 ohms (to infinity) between wires 2(+) on the 300 amp fuse and 13 (-) on the stationary 1A contactor power tip.
 - b. Close key and deadman switches. Place directional lever in forward and measure 30 or more ohms between wires 2(+) and 13(-) (RX1 scale). Remove back up light wire (if used) at Rev. contactor. Repeat above check with directional lever in Rev.

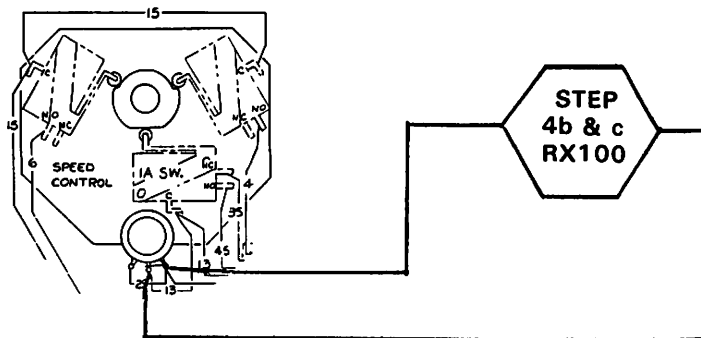


5. CHECKING SPEED POT, F, R AND 1A SWITCHETTE OPERATION.

a. Disconnect plug from SCR panel.



- b. Connect ohmmeter (RX100 scale) on wires 29 and 13(—), push directional lever forward until forward start switch clicks. Meter at click should read between 5000 and 6000 ohms when control is moved slightly. Make same check with directional lever in rev.
- c. With ohmmeter still connected to wires 29 and 13(—), push directional lever forward completely. 1A switch should click, meter at click should read 200 ohms or less when control hits stop. Make same check with directional lever in rev.



d. Reconnect plug in SCR panel.

6. CHECKING CONTACTORS MANUALLY.

Before connecting battery, manually push the armature plate in until power tips contact and wipe. NOTE: Interlocking switchette should not actuate until after power tips make contact. This check is performed to detect contactor binding, switchette operation and wire interference with contactor tips.

THE BATTERY SHOULD BE FULLY CHARGED AND SPECIFIC GRAVITY 1.250 OR HIGHER. CAUTION: DO NOT USE ANY OTHER POWER SOURCE — BATTERY ONLY AND WITH NO POWER CABLE EXTENSIONS.

NOTE: If fault detector is used, jump 61 and 65 wires.

7. CONNECT BATTERY. CHECK CONTACTORS ELECTRICALLY. — key on, deadman switch closed.

a. Make the following voltage test with the pump contactor and the forward and reverse contactors isolated with a piece of cardboard between power tips prior to connecting the battery. Disconnect wire #45 on the 1A switch located on the speed control to isolate "1A" contactor.

b. With insulator in normally open power tip gaps of contactors, electrically operate F & R. With F contactor closed, depress R contactor armature plate and F coil should drop out and vice versa. This is an interlocking switchette check.

Remove jumper from 61 and 65 wires.

8. CHECKING CREEP SPEED.

a. Remove insulator from F & R contactors and close directional switch. Adjust creep speed on Card 1 as desired. Approx. 1 RPM of drive wheel.

WITH DRIVE WHEELS JACKED UP AND INSULATOR IN POWER TIP GAPS OF 1A CONTACTOR, CHECK MAXIMUM SPEED VOLTAGE AND CURRENT LIMIT. THESE ADJUSTMENTS HAVE BEEN PRESET AT THE FACTORY AND SHOULD NOT REQUIRE ADJUSTMENT.

9. CHECKING SPEED VOLTAGE AND CURRENT LIMIT.

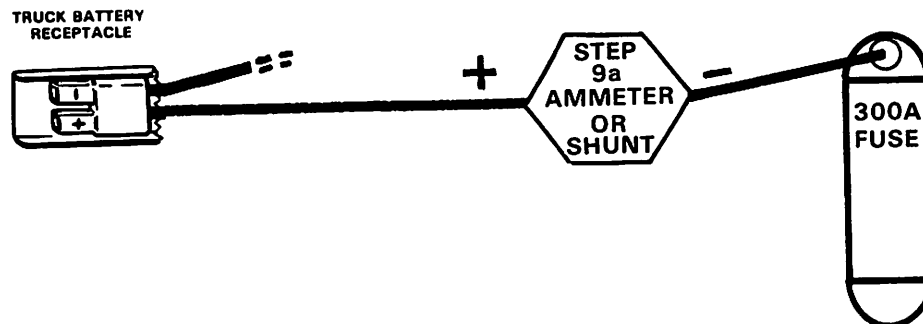
NOTE: DO NOT STALL MOTOR FOR MORE THAN 30 SECONDS AT A TIME. ALLOW TIME FOR MOTOR COOLING BETWEEN STALLS. DO NOT OPERATE MOTOR AT HIGH SPEEDS OR REVERSE DRIVE MOTOR WITH DRIVE WHEELS JACKED UP.

Equipment required:

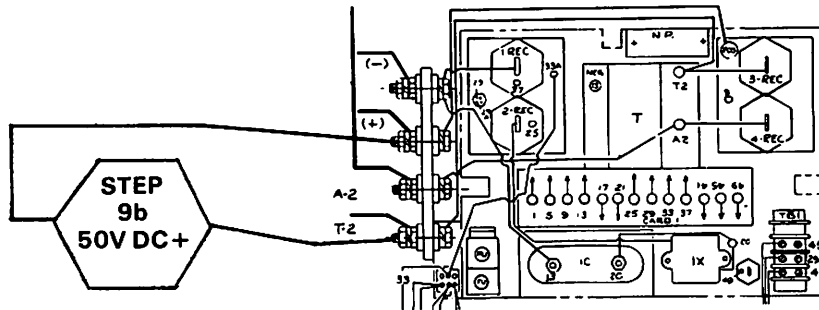
1. Volt Ohmmeter, Simpson 260-5P or equivalent.

2. Sun ammeter (part number 1800979) or 50 MV 600 amp shunt and 50 MV 600 ammeter.

a. Disconnect the positive power cable from 300A fuse and connect the ammeter (or shunt) between the power cable and the 300A fuse.



b. Connect the volt meter between the positive terminal and T2 on the S.C.R. panel.



NOTE: 45 wire is still disconnected for C and D test.

- c. Check maximum speed voltage first by moving the directional lever to full SCR speed position and applying the brakes until battery current is 60 to 70 amps. Volt meter reading should be 16-18 volts. If not, adjust the top SCR speed on Card #1.
- d. Now check current limit by moving the directional lever to the full power position and applying the brakes until the wheels come to a standstill. There must be no rotation of drive wheel for this check. The meter should read between 190 amps minimum -- 210 amps maximum. If not, adjust current limit potentiometer on Card #1.

10. OPERATION.

Reconnect wire #45 and check 1A contactor pick up time for approximately 1 sec. With wheels on the ground, give truck a general operational check out, including plugging without load from various speeds. Adjust plugging distance with trimpot on Card #1 as desired (CW to decrease distance).

Table 1

Failures Which Cause No Motor Torque With SCR Control

| SYMPTOMS | WHAT TO DO |
|--|--|
| <p>1A. Contactors do not pick up. No control voltage from positive to negative.</p> | <ul style="list-style-type: none"> ● Check power fuses. ● Check battery for low specific gravity and connections for looseness or broken fittings. |
| <p>1B. Contactors do not pick up. Control volts present from positive to negative.</p> | <ul style="list-style-type: none"> ● (For these tests, if fault detector is used, disconnect wire 24 from fault detector terminal 3). ● (See NOTE 1) Connect jumper from battery positive to positive side of F or R coil. If device does not pick up, check coil for continuity. Also jumper negative to opposite terminal to check for opens in negative connections. ● (See NOTE 1) With jumper on battery positive move other end to wire 6 on F interlock or 4 on R interlock. Coils should pick up. This proves F and R electrical interlocks. ● (See NOTE 1) Using jumper continue to check remaining components in circuit such as directional switch, brake switch, seat switch and key switch by moving end of jumper to positive side of each of these devices. |
| <p>1C. Contactors close. No power and no SCR hum with accelerator in SCR range.</p> | <ul style="list-style-type: none"> ● (See NOTE 1) With F or R picked up and wire 45 disconnected at SCR terminal board, check for control volts positive at SCR terminal board (wire 41) to negative (wire 13A). If there is zero volts at this point, check F or R normally open interlocks and 1A coil for continuity. ● (See NOTE 1) With F or R picked up and wire 45 disconnected at SCR terminal board, check for control volts positive at 1 REC heat sink (wire 33) to negative (wire 13A). If there is zero volts at this point, check: FUB, F or R power tips, and continuity of wiring from battery positive to 1 REC heat sink. |

NOTE 1: Drive wheels should be off the floor.

1C (Continued)

- (See NOTE 1) With F or R picked up and wire 45 disconnected from SCR terminal board, measure approximately 3 volts from (wire 29) to negative (wire 13A) with directional lever pot near creep speed. Volts will drop to zero as accelerator is moved toward full speed. If readings are not correct, first place a jumper wire between wires 29 and 29A which bypasses the thermal protector. Depress the directional lever and check for the above voltage. If voltage readings are correct, replace thermal protector.

If the above tests will produce no voltage change, place a jumper between wires 29A and 13A. This bypasses the speed pot and the truck should now run at top SCR speed. If top speed is obtained, check speed pot per Table 4I. If motor fails to operate, check card per Table 4A.

- Check 1 REC for open circuit or open gate (See 4H).
- Check card (See 4A).

1D. Contactors close, but very little power and high-pitch SCR hum.

- Check 2 REC for a shorted condition in the conducting direction (See 4H).

1E. Contactors close. Very little or no power with low SCR hum, even when accelerator is in top SCR position.

- (See NOTE 1) Disconnect wire 5A from 3 and 4 REC heat sink and wire 9 from F and R contactors. Reapply power and if control operates normally, replace card.
- (See NOTE 1) Check setting on card, creep speed and top speed. Also if current limit is full counter-clockwise speed will be slow.

1F. Contactors close. Very little power with a normal SCR hum.

- Check 3 REC for open condition (See 4G). If 3 REC is found to be open, check 1, 2, and 5 REC for proper operation.
- Check 4 REC for short (See 4G).

NOTE 1: Drive wheels should be off the floor.

Table 2

Failures Which Cause Full Motor Torque With SCR Control

| SYMPTOMS | WHAT TO DO |
|---|--|
| <p>2A. Contactors close. Full SCR speed immediately with audible hum.</p> | <ul style="list-style-type: none"> ● Check potentiometer for proper resistance (see 4I). ● Check for grounds in wires 29 and 29A or shorted accelerator pot. |
| <p>2B. Contactors close. Full speed immediately with no audible hum.*</p> | <ul style="list-style-type: none"> ● Check for welded power tips on 1A contactor. ● Check timer section of card (See 4Ad). |
| <p>2C. Contacts close. Full speed immediately with no audible hum.* <u>Capacitor not charged.</u></p> | <ul style="list-style-type: none"> ● Check for open gate circuit to 5 REC (See 4H and 4Aa). ● Check 5 REC for shorted condition (see 4H). If 5 REC shorted, also check 4Ac. ● Check continuity of wiring from 1C to 5 REC and from 5 REC through T3, T4 to T1 and 1 REC wire 33. ● Check capacitor 1C (See 4D). ● Check 1 REC for short (See 4H). |
| <p>2D. Contactors close. Full speed immediately with no audible hum.* <u>Capacitor Charged.</u></p> | <ul style="list-style-type: none"> ● Check for open 2 REC (See 4H). ● Check for open gate in 2 REC (See 4H). ● Check for open gate circuit to 2 REC (See 4Ab). |

* If truck is equipped with a fault detector and it fails to shut down the control on the above faults, check fault detector per GEK-7940.



INDUSTRIAL TRUCK DIVISION



Table 3

Misoperation of Special Features

| SYMPTOMS | WHAT TO DO |
|---|--|
| 3A. Failure of 1A contactor to operate. | <ul style="list-style-type: none">● (See NOTE 1) With all direction switches closed, jumper negative to SCR terminal board (wire 41). 1A should pick up immediately. This checks the 1A coil.● (See NOTE 1) Move negative jumper to SCR terminal board (wire 45). 1A should pick up after approximately 1 second delay. This checks the timer section of Card 1.● If the two above tests check good, then check 1A switch in directional speed control for proper operation. |
| 3C. Severe reversal. | <ul style="list-style-type: none">● Check settings of plugging trimpot on Card 1 (See 6b).● Check 4 REC (See 4G).● Check continuity of wires 5 and 9.● Check FUA (if used). |
| 3D. Very soft reversal. | <ul style="list-style-type: none">● Check same as 3C. |

NOTE-1: Drive wheels should be off the floor.

Table 4

Checking Components

Before touching electrical components, disconnect the battery and discharge capacitor 1C.

4A CARD 1 (See Table 6 for tuneup of Card 1).

The following is a list of simple tests that can be performed with a volt-ohm meter. Remove card from panel by loosening two screws at bottom of box, pull box straight up to disengage from receptacle. Connection can be made to card pins with insulated clips.

a) 5 REC FIRING CIRCUIT:

VOM on RX100 scale. Connect VOM positive lead to pin 13, negative lead to pin 49, circuit should read 1700 to 2100 ohms. Reverse leads and read infinity.

b) 2 REC FIRING CIRCUIT:

VOM on RX100 scale. Connect VOM positive lead to pin 21, negative lead to pin 25; circuit should read 1170 to 1430 ohms. Reverse leads and read infinity.

c) TRANSFORMER FILTER:

VOM on RX100 scale. Connect VOM positive lead to pin 21, negative lead to pin 33; circuit should read 2050 to 2750 ohms. Reverse leads and read infinity.

d) 1A TIMER:

Connect volt-ohm meter positive to 41, negative to 45, and set scale to 50-volts d-c. Using a 36-volt test battery, connect battery positive through a 25-ohm 2-watt resistor to terminal 41. Connect battery negative through a normally open switch to terminal 45. Close switch and observe battery voltage on VOM, after approximately 1 second voltage should drop to 0 volts indicating timer action. Do not hold power on after timer turns on.

4D CAPACITOR 1C

Disconnect battery and discharge capacitor. Remove Card 1. Measure ohms through the capacitor using the RX10,000 scale. Meter should read zero ohms and then swing to above 100,000 ohms. Replace capacitor if above reading is not obtained.

4F CONTACTOR COIL AND ACCESSORY FILTER
(7, 8, 9, and 12 REC)

On some magnetic panels, the contactor coils will either be varnish tape-wound or encapsulated in green epoxy. For the varnish tape-wound type, a separate filter is required and will be mounted adjacent to the coil. The new green epoxy encapsulated coil contains the necessary filtering and is not visible from the exterior of the device.

a) **Separate Filter (Typical Cat. No. 148B6203G14)**

These are varistors and should be checked as follows: Disconnect battery and discharge capacitor 1C. Disconnect the leads to the filter block. Connect a 36-volt d-c test battery in series with the varistor and a volt-ohm meter set on the 1ma. scale as shown in Figure 7. If the varistor is good, there will be a noticeable deflection of the meter needle when the leads are touched to the filter block terminals. If no deflection is obtained, replace the filter block.

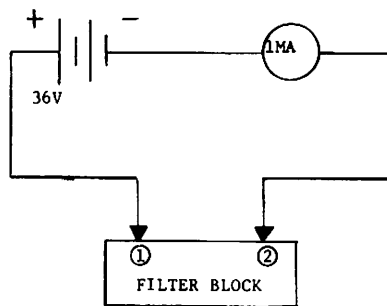


Figure 7

b) **Integral Coil Filter**

When this filter fails, it will be evident by a severe cracking of the coils in the vicinity of the coil terminals.

4G RECTIFIERS

When checking diodes, disconnect battery and discharge capacitor 1C to prevent burning out the ohmmeter. When reassembling rectifiers, refer to Table 5.

3 and 4 REC: Disconnect pigtail. 3 and 4 REC are diodes with about 7 to 12 ohms in the conducting direction ($\begin{matrix} + & \rightarrow & - \end{matrix}$) measured on the RX1 scale, and infinite resistance in the non-conducting direction ($\begin{matrix} - & \rightarrow & + \end{matrix}$) measured on the RX10,000 scale.

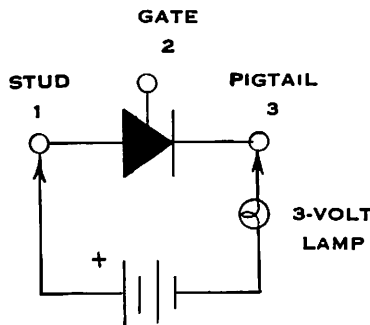
15 and 16 REC: Disconnect one lead. Check same as 3 and 4 REC above.

4H SCR'S (1 REC, 2 REC, 5 REC)

These are silicon control rectifiers. Before checking, disconnect battery and discharge capacitor 1C. Remove card and box from panel and lay aside, this opens the gate circuits to all three devices. Disconnect pigtail of 1 and 2 REC or lead to terminal of 5 REC.

To check an SCR, it is necessary to have a 3-volt battery and a 3-volt lamp. (A test flashlight such as a BRIGHT STAR No. 1618CT circuit continuity tester is excellent for this test.)

Connect the plus lead to the stud (1), connect negative lead to the pigtail (3) as shown in Figure 8.



3-VOLTS
Figure 8

- a) The lamp should not light. If the lamp does light, the SCR is shorted and must be replaced.
- b) If check (a) was satisfactory, test the SCR for its ability to be turned on by the gate. Touch gate (point 2) to point 1. If gate is operative, the lamp should come on and must remain on when the gate is removed.
- c) If lamp cannot be lit under step (b) the SCR is open and must be replaced.

When reassembling SCR's, refer to Table 5.

4I POTENTIOMETER IN DIRECTIONAL CONTROL

To check operation of the potentiometer, disconnect battery and disconnect wire 29A from thermal protector or SCR terminal board. Connect VOM from wire 29A to negative (13A) with scale set to RX 100. With accelerator in creep-speed position, the ohm reading should be 3,500 to 6,600 ohms; with accelerator in top-speed position, reading should be 200 ohms or less. If these readings are not obtained, loosen pinion gear clamp and adjust rotation of pot shaft relative to accelerator shaft or replace.

With wires disconnected as above, check for resistance of 1 megohm or higher from pot wires to truck frame.

4J THERMAL PROTECTOR (TP)

Remove both connections from TP and with a VOM read approximately 50 ohms terminal to terminal, if heat sink is at room temperature. Set VOM to highest ohm scale and check pins to heat sink, reading should be infinity.

4K FILTER BLOCK (HF)

To check, disconnect all wires from filter block. With VOM on RX10,000 scale, touch the leads to the filter terminals to charge the filter. After a few seconds, reverse the meter leads and touch the filter terminals. The VOM needle will deflect and return to infinity. If this capacitor action is not observed, replace the filter block.



INDUSTRIAL TRUCK DIVISION



Table 5 **Replacement of Semiconductors**

When replacing semiconductors such as 1, 2, 3, 4 and 5 REC; it is not necessary to torque these devices to a specific value. However, the device should be screwed into the heat sink and tightened to a snug fit.

The use of a heat transfer grease (such as GE Versilube G-350-M or equivalent) is recommended.

Locking devices must be properly adjusted to prevent semiconductor from becoming loose.



INDUSTRIAL TRUCK DIVISION



Table 6B Tuneup Procedure

COMPLETE ALL STEPS a thru e.

- a) Turn CURRENT-LIMIT trimpot fully clockwise.
- b) Turn PLUGGING trimpot fully clockwise. (Steps a and b prevent any interaction when setting the speed adjustment.)
- c.) Adjust CREEP SPEED as desired.
- d) TOP SCR SPEED

Refer to Note 5

Check TOP SCR SPEED by first moving the accelerator until the F or R contactor operate. Do not move accelerator to the point where 1A picks up.

Apply the brakes until battery current is about 70 to 80 percent of the loaded level amperes with motor directly across the battery and motor fields connected the same as are used in the SCR control.

| <u>Typical Battery Current</u> | <u>SCR Model</u> |
|--------------------------------|------------------|
| 45 - 50 Amps | 100 |
| 75 - 80 Amps | 200 |
| 120 - 130 Amps | 300 |

Adjust the TOP SCR SPEED trimpot until the voltmeter reads motor volts as indicated below:

| <u>Battery Volts</u> | <u>Motor Volts</u> | <u>CURRENT LIMIT AMPS (MAXIMUM)</u> | | |
|--------------------------|------------------------|-------------------------------------|---------------------------|---------------------------|
| | | <u>C155 Model 100</u> | <u>C185 Model 200</u> | <u>C290 Model 300</u> |
| 12 | 7 - 9 | 100 | 200 | 300 |
| 18 | 13 - 16 | 100 | 200 | 300 |
| 24 | 17 - 22 | 100 | 200 | 300 |
| 36 | 25 - 32 | 100 | 200 | 300 |
| 48 | 34 - 43 | NA | 185 | 300 |
| 72 | 50 - 65 | NA | 150 | 300 |

e) CURRENT LIMIT

Turn the current limit trimpot fully counterclockwise. When the trimpot is fully counterclockwise, the card is designed so that the control may be cut off (no pulsing occurs).

Check to be sure the plugging trimpot is turned fully clockwise.

Depress the accelerator until F or R operate but not the 1A contactor.

Apply the brakes until the wheels come to a standstill and remain at a standstill.

Slowly turn the CURRENT LIMIT TRIMPOT in a clockwise direction until the current reaches a value as shown in the above table, or as specified by the truck manufacturer.

NOTE: The current limit values as given in the table above represent the typical maximum values that we suggest for each control when operated on a given voltage and these values must not be exceeded.



INDUSTRIAL TRUCK DIVISION



Since these controls are used on a variety of types and sizes of trucks for various applications, it is common for the truck manufacturer to set the current limit at some value below the maximum. For this reason it is recommended that you obtain the actual current limit setting for your particular truck from the truck manufacturer.

NOTE: Do not stall the motor for more than 30 seconds at a time. Allow time for motor cooling between stalls. Do not operate motor at high speeds or plug the motor with wheels jacked up.

After setting to correct value, disconnect meter and reconnect wire 29 to the thermal protector.

f) STATIC PLUGGING

To adjust the static plugging, the truck should be in its normal running condition and on the ground. Turn the PLUGGING trimpot fully counterclockwise (this may cut off control operation no pulsing). This will give the longest distance for stopping. If pulsing of the control has stopped, turn plugging trimpot clockwise (clockwise rotation decreases stopping distance) until control just starts to pulse. Then turn the trimpot about 30 degrees more clockwise rotation and try truck for stopping distance. If stopping distance is too short or too long, continue to adjust trimpot until desired stopping distance is obtained.

If the desired stopping distance cannot be obtained, there may be a coarse trimpot adjustment on the card that is accessible from the slot on the side of the card box. This may be turned CW or CCW to give extended range to the normal plugging trimpot.

g) 1A TIMER

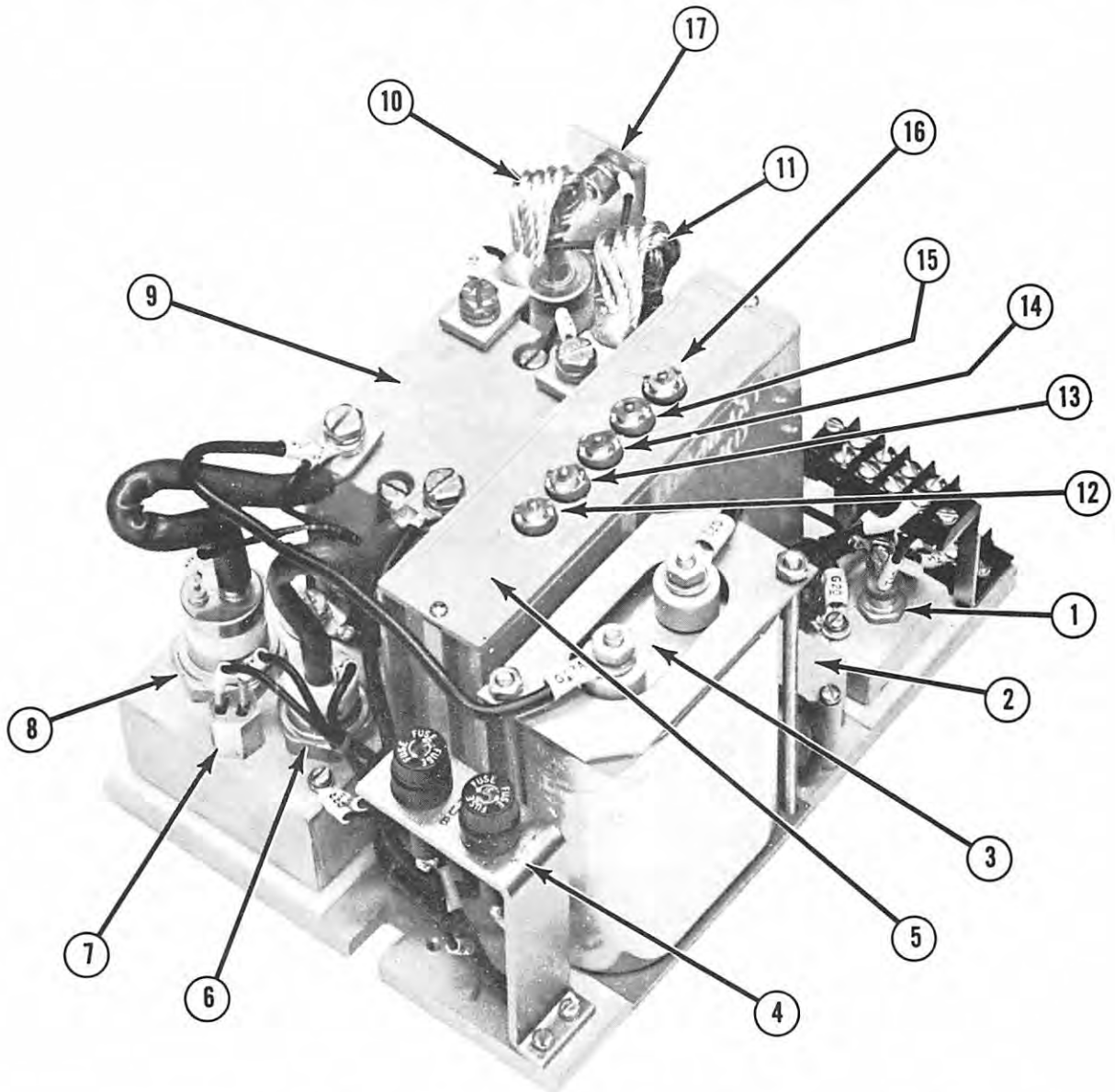
The 1A TIMER is factory set at approximately 1 second on all models.

Check truck performance. If the 1A contactor picks up too early, resulting in jerky operation, turn the 1A Timer trimpot CW to increase time delay, to a value that provides desired operation.

After all the trimpots have been set, each should be sealed with a silicon rubber compound such as RTV (bath-tub sealer). This will discourage further adjusting by unauthorized personnel.

TYPICAL PHYSICAL ARRANGEMENT AND IDENTIFICATION OF COMPONENTS

(Refer to wiring diagram furnished with truck for precise arrangement of components.)



- | | |
|-----------------------------------|---------------------------------|
| (1) BLOCKING SCR (5 REC) | (9) PULSE TRANSFORMER (1T) |
| (2) CURRENT-LIMITING REACTOR (1X) | (10) FLY-BACK DIODE (3 REC) |
| (3) COMMUTATING CAPACITOR (1C) | (11) PLUGGING DIODE (4 REC) |
| (4) CONTROL CIRCUIT FUSES | (12) CREEP-SPEED ADJUSTMENT |
| (5) OSCILLATOR CARD (CARD 1) | (13) TOP-SPEED ADJUSTMENT |
| (6) TURN-OFF SCR (2 REC) | (14) STATIC-PLUGGING ADJUSTMENT |
| (7) THERMAL PROTECTOR | (15) CURRENT-LIMIT ADJUSTMENT |
| (8) MAIN SCR (1 REC) | (16) 1A TIMER ADJUSTMENT |
| | (17) PLUGGING SENSOR |

Figure 9—Typical SCR Static Panel.



INDUSTRIAL TRUCK DIVISION



DEALER CHECK-OUT SHEET FOR GE C-185 SYSTEM NS, NSP, NST

Truck Serial No. _____ Date _____

1. Battery Polarity Checked? _____ Battery Voltage _____ Volts

2. Truck Polarity _____ Specific Gravity _____

a. Positive Lead to 300A fuse Checked? _____

b. Negative Lead to Pump Contactors Checked? _____

3. GROUND TEST (+) to Frame _____ ohms, (-) to Frame _____ ohms.

4. CHECKING CONTROL WIRING.

a. Term's 2 (+) to 13 (-) (all switches open) _____ ohms

b. Term's 12 (+) to 16 (key, deadman & directional switches closed) _____ ohms

5. SPEED POT, F, R, & 1A SWITCHETTE OPERATION

a. Wires 29 and 13 (-) — F switch actuates _____ ohms.

R switch actuates _____ ohms.

b. Wires 29 and 13 (-) — 1A switch actuates _____ ohms.

6. Checked contactors manually? _____

7. Checked contactors electrically? _____

8. Checked creep speed? _____

9. CHECKING SPEED VOLTAGE AND CURRENT LIMIT

c. Maximum speed voltage _____ volts.

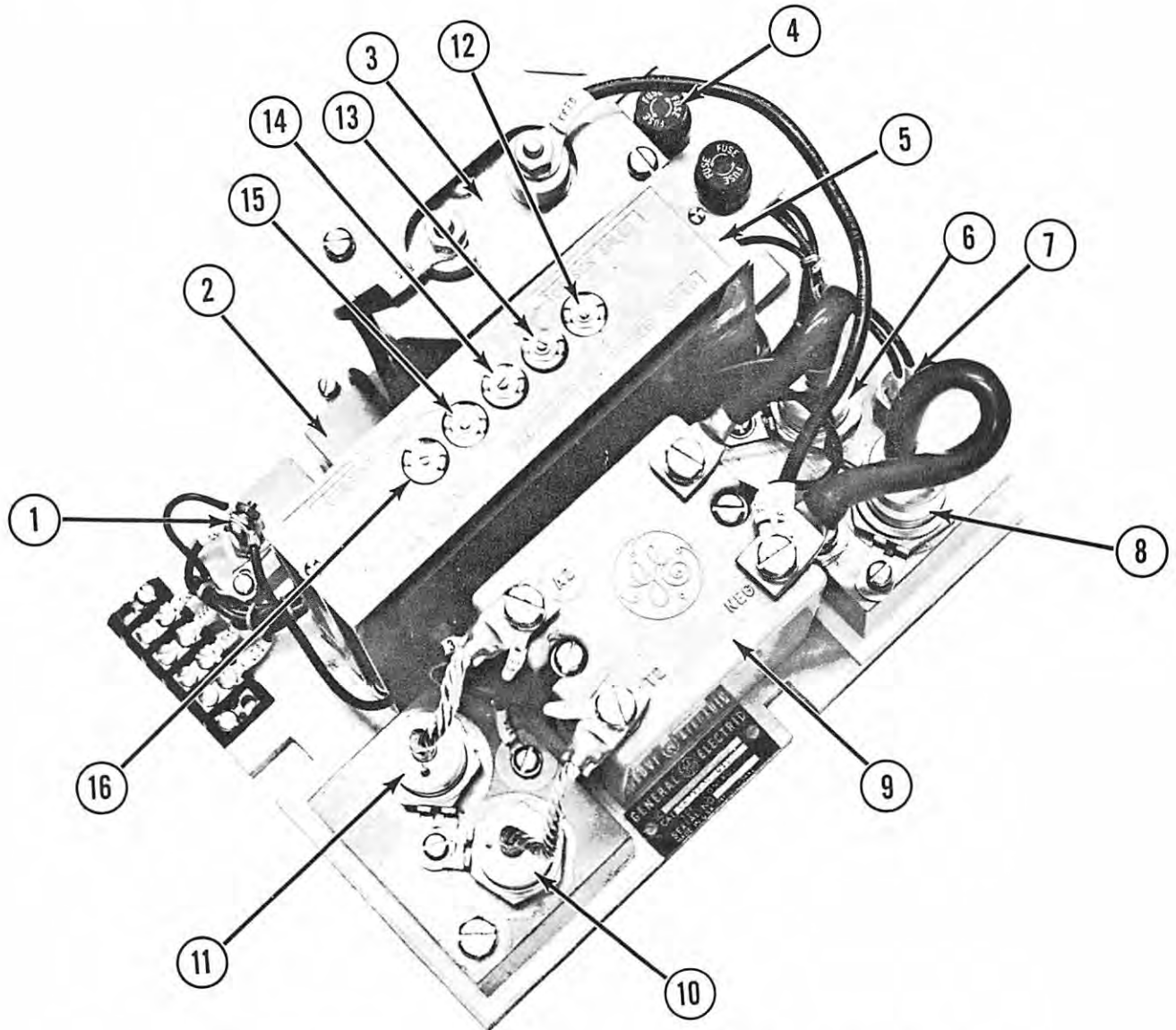
d. Current limit _____ amps.

Adjustments sealed on card 1.

Mechanic _____ Hour Meter Reading _____

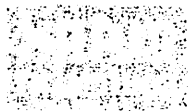
TYPICAL PHYSICAL ARRANGEMENT AND IDENTIFICATION OF COMPONENTS

(Refer to wiring diagram furnished with truck for precise arrangement of components.)



- | | |
|----------------------------------|--------------------------------|
| 1. Blocking SCR (5 REC) | 9. Pulse Transformer (1T) |
| 2. Current-Limiting Reactor (1X) | 10. Fly-Back Diode (3 REC) |
| 3. Commutating Capacitor (1C) | 11. Plugging Diode (4 REC) |
| 4. Control Circuit Fuses | 12. Creep-Speed Adjustment |
| 5. Oscillator Card (Card 1) | 13. Top-Speed Adjustment |
| 6. Turn-Off SCR (2 REC) | 14. Static-Plugging Adjustment |
| 7. Thermal Protector | 15. Current-Limit Adjustment |
| 8. Main SCR (1 REC) | 16. 1A Timer Adjustment |

Figure 9 — Typical SCR Static Panel.



UNIVERSITY OF CALIFORNIA



Department of Chemistry

San Diego, California





INDUSTRIAL TRUCK DIVISION



NOTICE

THE WIRING DIAGRAM IN THIS MANUAL IS FOR
A STANDARD TRUCK, WITHOUT SPECIAL CUSTOM
FEATURES.

THE PARTS BOOK FOR THIS SERIAL NUMBER
INCLUDES WIRING DIAGRAM/S COVERING SPECIAL
CUSTOM OPTIONS INCORPORATED AT TIME OF
SHIPMENT.

BATTERY MUST COMPLY WITH THE FOLLOWING PARAGRAPHS FROM U/L 583 STANDARD FOR ELECTRIC BATTERY POWERED INDUSTRIAL TRUCKS, COVERING BATTERY CONSTRUCTION

PARAGRAPHS:

43. The battery shall be provided with support and protection by means of a noncombustible enclosure which, if of metal, shall be no less than 0.053-inch thick (no. 16 msg) and shall be flanged not less than 1/2 inch on all sides or be provided with a construction that gives equivalent strength. A cover shall remain closed by the force of gravity or shall be provided with a fastener.

44. A metal cover shall have such strength and rigidity that, in conjunction with an air spacing provided between it and the battery terminals, the battery terminals will not be short-circuited when a 250-pound force is applied to any one square foot area of the cover. In lieu of the spacing, insulation designed to prevent short-circuiting of the battery terminals shall be secured to the inner surface of a metal battery-compartment cover.

45. A battery furnished with a noncombustible tray and cover intended to form the ultimate enclosure for the battery shall comply with the requirements of paragraphs 43 and 44.

46. The battery enclosure shall be provided with means for ventilation that will minimize the possibility of accumulation of explosive hydrogen-air mixtures above the battery.

48. Cells employing metal containers (such as alkaline batteries) shall be insulated from one another and from a metal tray or metal battery compartment. Insulation of wood or other material shall be (1) treated or painted to minimize deterioration by the battery electrolyte, and (2) constructed to minimize the risk of damage to the insulation in the normal operation and maintenance of the truck.

49. The connections shall be such that the potential between any two adjacent cells will be not more than 24 volts (nominal).

51. Battery leads shall be of a size and current-carrying capacity adequate for the application. They shall be neoprene insulated or insulated with an equivalent material, resistant to acids and/or alkalis, and able to withstand flexing, handling, and impact at temperatures between 54 deg. C (130 deg. F) and minus 29 deg. C (minus 20 deg. F). The insulation thickness shall be no less than 1/16 inch for a no. 8-2 AWG wire and no less than 5/64 inch for a no. 1-4/0 AWG wire.

53. One part of the connector shall be permanently mounted to either the truck or the battery enclosure. The length of the cable attached to the free part of the connector shall be as short as practicable, without interfering with the disconnecting operation and without placing stress on terminals.

54. The live parts shall be recessed from the face of the connector to minimize the possibility of shorting.

55. A battery connector shall have the proper rating for use in its particular application.

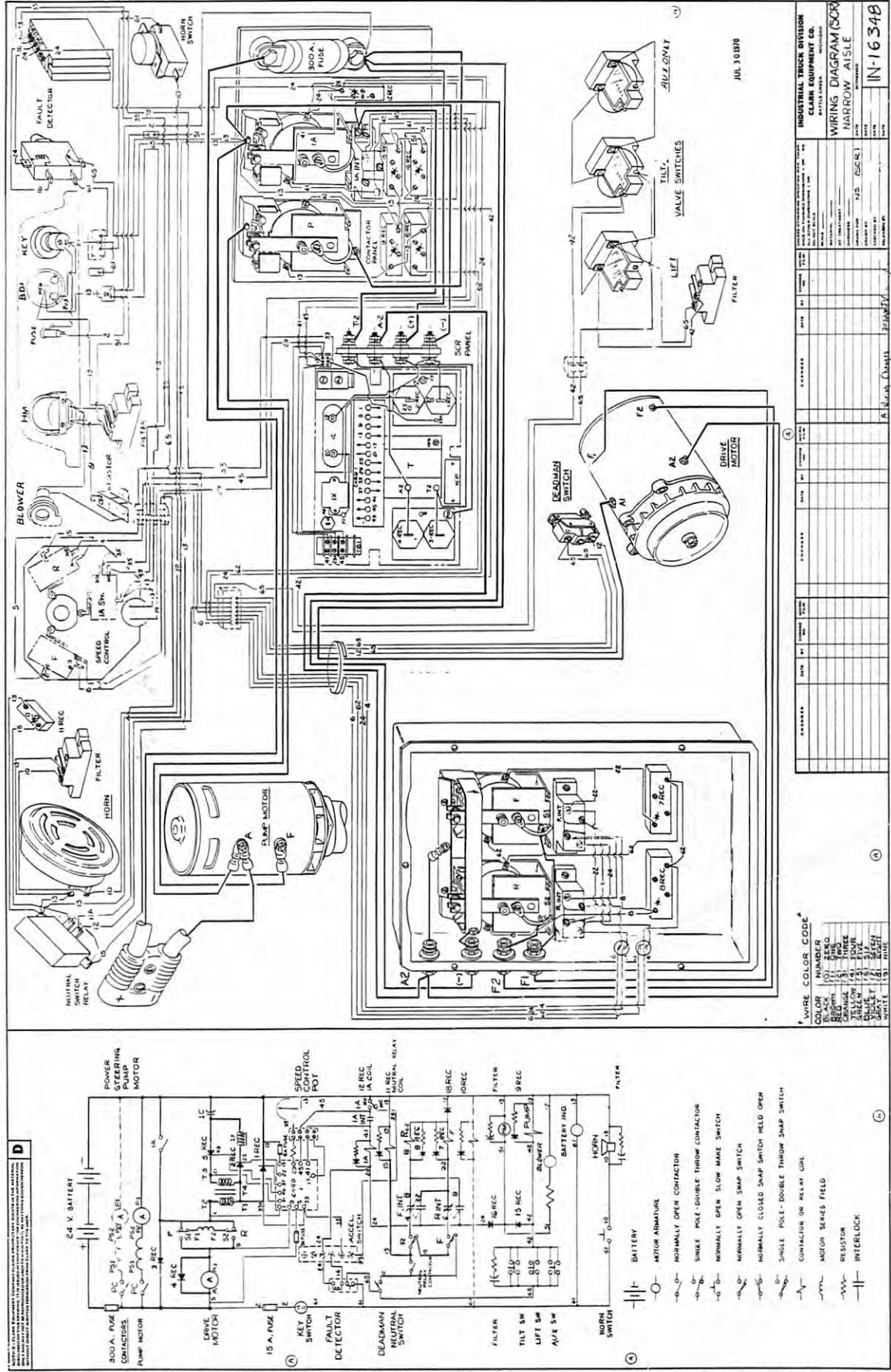
56. The removal portion of the connector shall be provided with means for being grasped to permit removal.

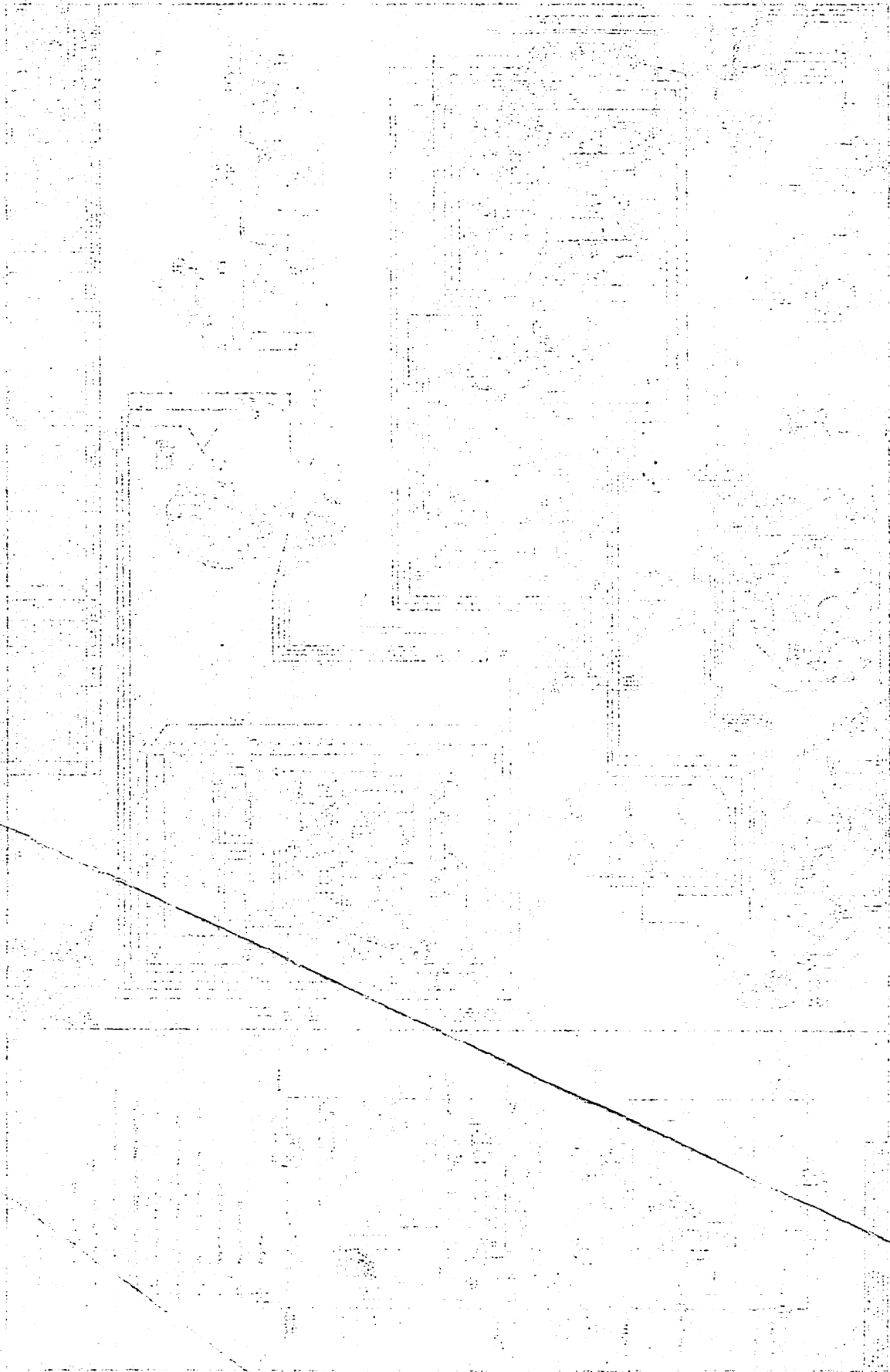
For EE Construction Batteries Must Comply With The Following Additional Paragraphs:

123. The battery enclosure shall be provided with a cover with means for locking it in the closed position to deter opening by unauthorized persons. Insulation designed to prevent shorting of the terminals shall be secured to the inner surface of a metal enclosure, over the terminals.

124. All upper openings shall be covered with a heavy-gauge wire mesh, expanded metal, or a perforated cover. The size and shape of the opening shall not permit passage of a rod having a diameter greater than 1/2 inch. If the distance between an uninsulated live part and the opening is greater than 4 inches. The opening may be larger than that previously mentioned, provided no opening will permit passage of a rod having a diameter greater than 3/4 inch. The diameter of the wires of a screen shall be no less than 0.051 inch if the screen openings are 1/2 square inch or less in area, and shall be no less than 0.081 inch for larger screen openings. Perforated sheet steel and sheet steel employed for expanded-metal mesh shall be no less than 0.042 inch in thickness if uncoated (no. 18 MSG) and no less than 0.046 inch if zinc-coated (no. 18 GSG) for mesh openings or perforations 1/2 square inch or less in area. They shall not be less than 0.080 inch in thickness if uncoated (no. 13 MSG) and no less than 0.084 inch if zinc-coated (no. 13 GSG) for larger openings.







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