NOTICE

THIS BOOK SHOULD BE KEPT WITH MACHINE

OPERATING AND SERVICE INSTRUCTIONS

No. 4 8 2

FOR

PACER 300 - SUPER 300

POWER GRADERS
(With Attachments)

THIS OPERATOR'S MANUAL APPLIES
TO MACHINES NUMBERED SERIALLY
FROM No. 2434 AND UP

PRICE $1.50 PER COPY

CONTACT YOUR NEAREST AUSTIN-WESTERN DISTRIBUTOR.
THERE IS ONE NEAR BY.

- TO THE OPERATOR -

Your Grader is the result of a combination of advanced engineering and research, skilled manufacturing, and the latest developments in metallurgical science. The entire design and construction is such that it can withstand usage with a minimum of maintenance, and will operate smoothly and easily with maximum safety to the operator.

A fine mechanism such as this grader will always respond best to considerate treatment and care. Therefore, before operating it, we suggest that even the experienced operator review the entire contents of this booklet. While the material in this booklet has been prepared in sufficient detail to be of maximum assistance to inexperienced operators, the "Old Timers" will find much information and many of the illustrations of considerable help.

If you should need information not given in this booklet, or require the services of a trained mechanic, we urge you to use the extensive facilities offered by the Austin-Western Distributor in your locality. Distributors are kept informed on the best methods of servicing and are equipped to provide prompt, high class service in the field, or in an up-to-date service station.

When in need of parts always give the Austin-Western Distributor your grader and engine serial numbers. We suggest that you write these serial numbers in the spaces provided below for ready reference when parts are required.

Grader Serial No. _____
(Stamped on name plate, also on frame, on left hand side of grader above front axle)

Engine Serial No. _____
(Stamped on engine block)

- WARRANTY -

Company warrants all Austin-Western products sold to Distributor for six (6) months after date of shipment, this warranty being limited to the replacement at the factory of such parts as it appears to Company upon inspection by Company to have been defective in material or workmanship. Company makes no warranty in respect to engines, tires, rims, electrical apparatus, or any other trade accessory not manufactured by Company, such being subject to the warranty of their respective manufacturers. No warranty is made or authorized to be made by Company other than herein set forth. Distributor agrees not to alter any products purchased hereunder nor to do anything that will in any way infringe, impeach or lessen the validity of the patents or trade-marks under which Company's products are made or sold.

We reserve the right to make changes or add improvements at any time without incurring any obligation to make such changes on machines sold previously.

INDEX

NOTE: HOW TO USE THIS INSTRUCTION MANUAL

This manual, No. 482 is composed of 6 Sections as follows:

SECTION - 1.....SPECIFICATIONS

SECTION - 2.....LUBRICATION

SECTION - 3...UNLOADING AND GENERAL INSTRUCTIONS TO OPERATOR

SECTION - 4.....GRADER OPERATION

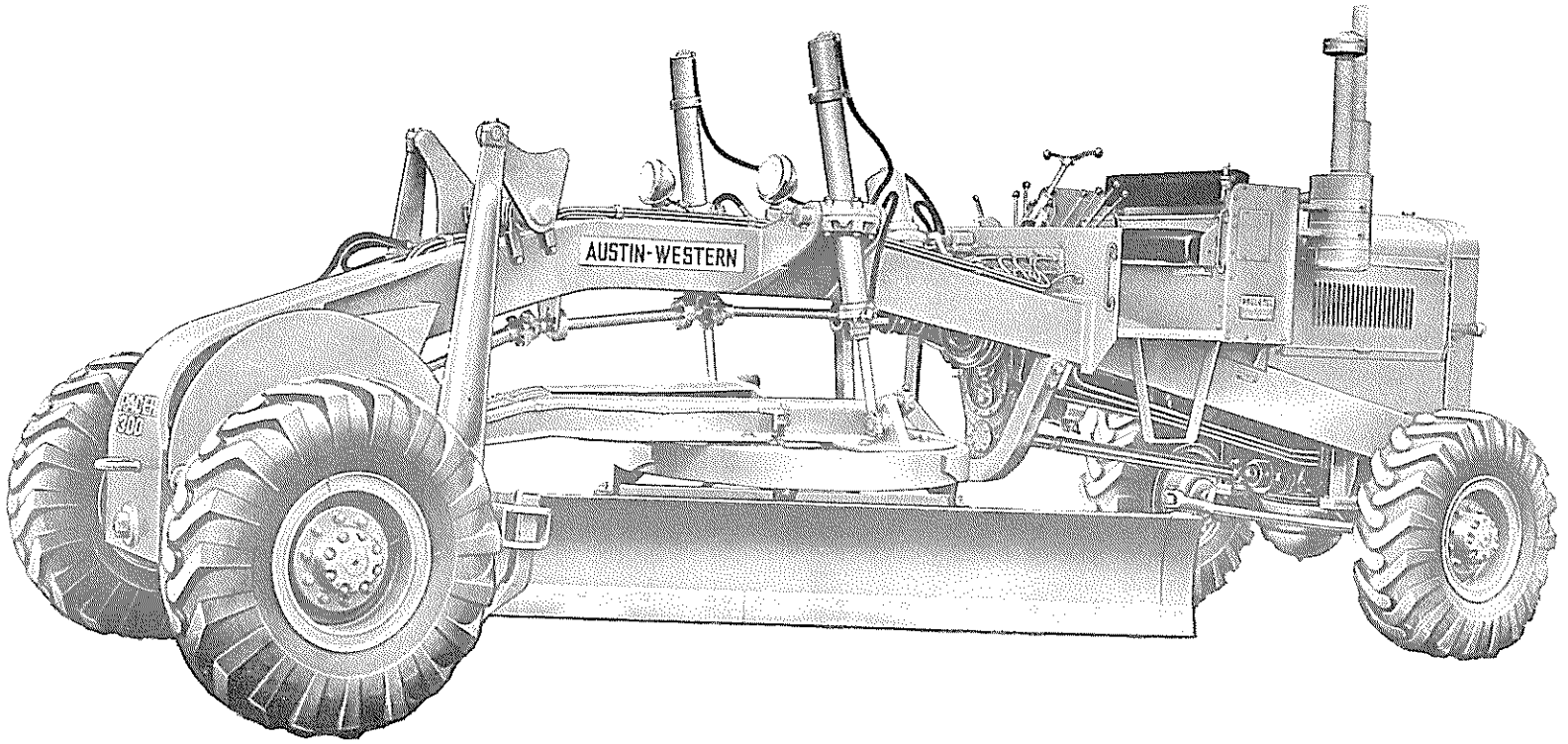
SECTION - 5.....POWER GRADER OVERHAULING AND ADJUSTMENTS

SECTION - 6.....OPTIONAL EQUIPMENT AND ATTACHMENTS

INDEX

NOTE: Throughout this manual the use of the terms "LEFT" and "RIGHT" must be understood to avoid confusion when following instructions.

"LEFT" and "RIGHT" indicates left and right sides of the grader as viewed from the operator's seat; or when standing back of and facing the radiator.



Left Side View

STANDARD EQUIPMENT - All-wheel drive and steer hydraulic control, including steering: Diesel motor with electric starter, battery and generating unit; upholstered seat; 13-foot moldboard; hydraulic foot-operated service brake, and hand-operated mechanical parking brake on drive shaft. Single 14:00 x 24 - 12 ply rating, low pressure tires. No cab or hood sides for engine are included as standard equipment.

ENGINES (DIESEL)

Make	GMC 4-71	CUMMINS C-160
Cylinders, number	4	6
Bore and stroke	4½" X 5"	4-7/16" X 5"
Gov. Speed W/O T.C.	1900 RPM	2000 RPM
H. P. at Gov. Speed	118	120
Gov. Speed W/ T.C.	2000 RPM	2000 RPM
H. P. at Gov. Speed	122	120
Cubic inch displacement	283.7 (2 cycle)	464 (4 cycle)
Electric starter	Yes	Yes
Electrical System Voltage	12	12
Ignition	Comp.	Comp.
Weight (Approx.)	1660#	1695#

TORQUE CONVERTERS

Make	Allison	Clark Eq.
Model	TCRD 379	CT 374-1
Weight	215#	430#
Torque multiplication	2.5 to 1	3.15 to 1

OPERATING WEIGHTS
ADD 450 LBS. TO TOTAL WEIGHT FOR SHIPPING

NO SCARIFIER:		
Total weight	21,649	21,684
Weight on front wheels	9,079	9,079
Weight on rear wheels	12,570	12,605
Blade pressure	16,707	16,787
WITH SCARIFIER:		
Total weight	22,949	22,984
Weight on front wheels	10,214	10,214
Weight on rear wheels	12,735	12,770
Blade pressure	18,885	18,885

CAPACITIES

Lub. oil capacity (crankcase & filter)	17 Qts.	20 Qts.
Lub. oil capacity - filter only-Approx.	2 Qts.	2 Qts.
Air cleaner oil cup	3-3/4 Qts.	3 Qts.
Fuel Tank	53 Gal.	53 Gal.
Hydraulic oil (entire system)	23 Gal.	23 Gal.
Front axle gear carrier	28 Qts.	28 Qts.
Rear axle gear carrier	26 Qts.	26 Qts.
Transfer case and transmission	14 Qts.	14 Qts.
Cooling System with Heater	36 Qts.	34 Qts.
Torque Converter	11 Qts.	28 Qts.

DIMENSIONS:

Wheelbase	236¼"
Overall length	298-3/4"
Overall height, no cab	9'-10-½"
Overall height, with cab	10'-3-7/8"
Overall width	7'-10-3/4"
Turning radius	33'-8"

APPROX. SPEEDS IN M.P.H.
RATED R.P.M. W/T.C.

1st	2.27
2nd	3.68
3rd	5.37
4th	7.84
5th	12.75
6th (traveling speed)	19.69
Low reverse	2.31
High reverse	8.45

BLADE:

Length, standard	13'-0"
Width (vertical height moldboard and bit)	26"
Thickness, moldboard	3/4"
Cut below ground	17-1/2"
Lift above ground	17"
Blade base	100½"
Blade side shift (precision)	50"
Circle side shift	21-3/4"
Total side shift (by power)	71-3/4"
Added side shift (Manual)	26"
Total side shift (power and manual)	97-3/4"
Max. blade reach beyond tire	91-1/8"
Bank cutting angle	up to 90°

CIRCLE:

Diameter	5'-2"
Circle center to front axle	104"
Material	8 X 4-13/16 X 1¼" steel angle; rolled to shape
Rotation (standard Order)	360°

GOOSENECK (DRAWBAR):

Size and shape of draft members	4 X 6 X 7/8" angle
Weight per foot lbs.	27.2
Draft connection	5" ball and socket

FRAME:

Size and shape. (ship channel, boxed)	10"
Weight per foot (lightest section)	119#

DRIVES:
Front - with differential; Full floating axles.
Type universal wheel joints - Rzeppa
Rear, rigid, no differential. Full-floating axles.
Type of rear steer.. Rzeppa
Wheels steer only.

CONTROLS:
Hydraulic, operated from the cab.
Steer, front and rear wheels.
Raise and lower blade, including high lift.
Side shift blade.
Reverse blade circle.
Side shift circle frame.
Operate scarifier, bulldozer, snow plows and snow wing.

HYDRAULIC DATA:
Pump..... Vane Type
Capacity at 1975 rpm..... 15.3 G.P.M.
Kind of oil.. SAE No. 10W
Valves:
Make.....Austin-Western

BRAKES: Foot operated service brake (14" x 2-3/4") hydraulic internal expanding; and hand operating mechanical internal expanding parking brake. Brake assembly mounted on transfer case away from mud and water encountered in off-the-road operation to brake both front and rear propeller shafts and thus effectively brake front and rear wheels.

LUBRICATION: High pressure.

ATTACHMENTS AND EXTRAS

SCARIFIER ("V" Type) (Hydraulically Controlled)
Weight, approx. lbs. 1,300
Number of teeth..... 11
Spacing, center to center..... 4½"
Total swath..... 46"
All teeth have removable points; measure 1" x 3" and are made of hardened alloy steel

SNOW PLOW (Hydraulically Controlled)
Giant "V" Type

Plowing width	9'-2"
Height	7'-2"
Overall width	12'7"
Weight, Approx.#	(3,200* (3,500**

SNOW WING (Hydraulically Controlled)

Weight, approx. lbs.	3,380
Blade length	14'
Blade height, outer end	43"
Blade height, inner end	36"
Blade thickness	¼"
Cutting bit length	13'
Height cutting edge, inner end	5'-5"
Height cutting edge, outer end with inner end down	8'-2"
Overall storage width	10'-1"
Overall storage height	10'-2"

REVERSIBLE SNOW PLOW (Hydraulically controlled)

Weight, approximate lbs.	(2,287* (2,587**
Blade width	12'
Blade height	42"
Plowing width	120½"
Plowing angle (R. or L. hand)	32°
Lift above ground Blade straight	26½"
Blade angled (lowest point)	10-3/4"

BULLDOZER (Hydraulically Controlled)

Weight, approx. lbs.	(1,650* (1,950**
Length	9'-0"
Height	40"
Lift above grade	13"
Drop below grade	17"

CAB
(Provides headroom of 6'-4"

Open type, approx. weight lbs.	270
Cab enclosure, approx. weight, lbs.	455
Enclosed cab complete, approx. weight, lbs.	725

Cabs are of steel construction
Enclosed cab has safety glass panels - all around
Windshield wiper standard equipment with cab.

HOOD SIDES FOR ENGINE
Weight, lbs..... 31

ELECTRIC LIGHTS
Two headlights on side of frame, two red tail-lights on rear, with switch in cab; weight, 25 lbs.

TIRE PUMP
Single cylinder, battery operated, complete with hose; weight 53 lbs.

BLADE EXTENSION
1' or 2' for either right or left side. Weight, 60 lbs. per foot.
Overlaid end bits R.H. & L.H.

ODOMETER
Located in cab.
REAR DRAWBAR
AUXILIARY BRAKE
BOOSTER STEER
DUO-MATIC STEER (Front steer only)
2 speed hydraulic with wheel.

HEATER
Type..... Hot water

WINDSHIELD DEFROSTER
Type..... Fan
HOUR METER

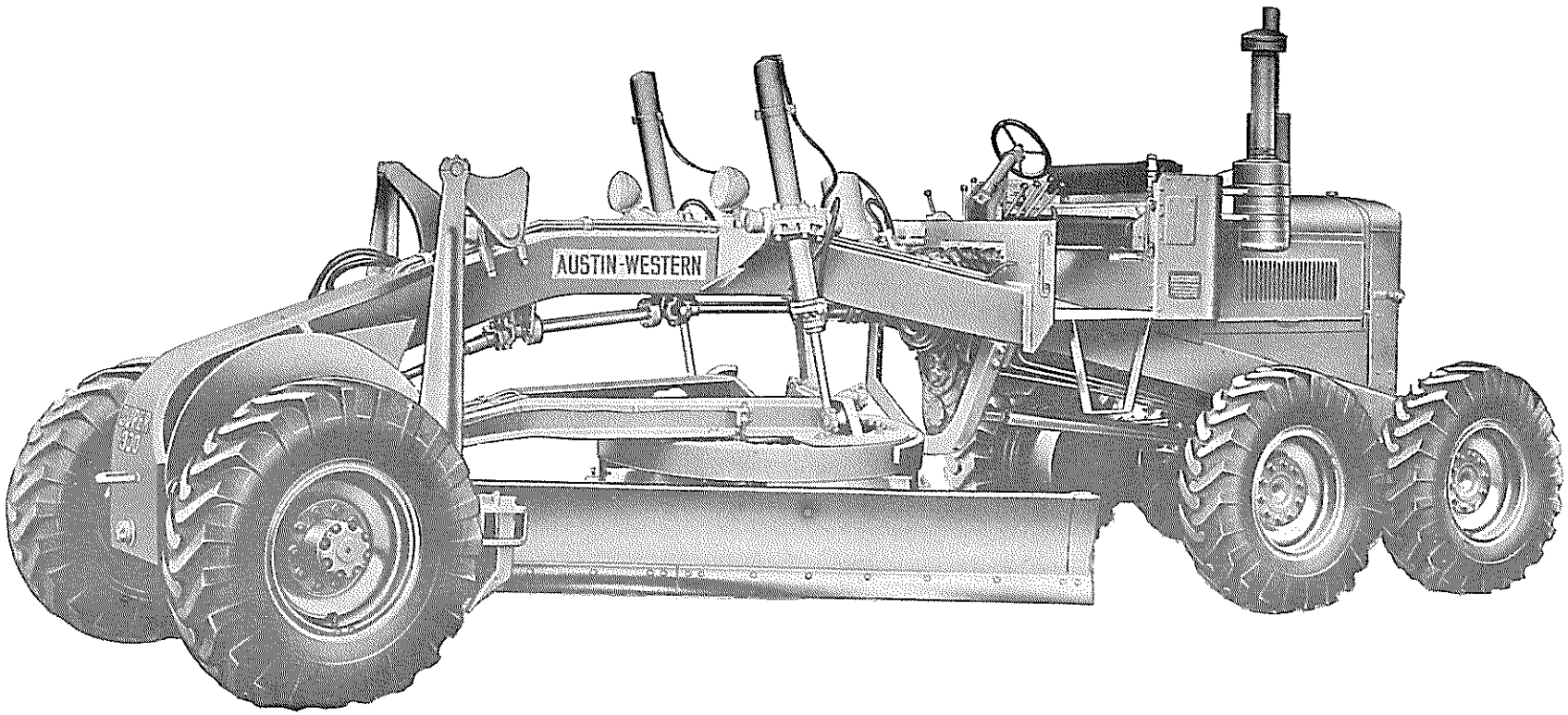
*Weight of attachment that will use the operating parts already mounted on grader.

**Weight of attachment complete, including all necessary operating parts.

Specifications Subject to Change Without Notice.

NOTE: Throughout this manual the use of the terms "LEFT" and "RIGHT" must be understood to avoid confusion when following instructions.

"LEFT" and "RIGHT" indicates left and right sides of the grader as viewed from the operator's seat: or when standing back of and facing the radiator.



Left Side View

STANDARD EQUIPMENT - All-wheel drive and steer hydraulic control, including steering; Diesel motor with electric starter, battery and generating unit; upholstered seat; 13-foot moldboard; hydraulic foot-operated service brake, and hand-operated mechanical parking brake on drive shaft. Single 13:00 X 24 -10 ply rating, low pressure tires. No cab or hood sides for engine are included as standard equipment.

ENGINES (DIESEL)

Make	GMC 4-71	CUMMING C-160
Cylinders, number	4	6
Bore and stroke	4½" X 5"	4-7/16" X 5"
Gov. Speed W/O T.C.	1900 RPM	2000 RPM
H. P. at Gov. Speed	118	120
Gov. Speed W/ T.C.	2000 RPM	2000 RPM
H. P. at Gov. Speed	122	120
Cubic inch displacement	283.7 (2 cycle)	464 (4 cycle)
Electric Starter	Yes	Yes
Electrical System Voltage	12	12
Ignition	Comp.	Comp.
Weight (Approx.)	1660#	1695#

TORQUE CONVERTERS

Make	Allison	Clark Eq.
Model	TCRD 379	CT 374-1
Weight	215#	430#
Torque multiplication	2.5 to 1	3.15 to 1

OPERATING WEIGHTS
ADD 450 LBS. TO TOTAL WEIGHT FOR SHIPPING

NO SCARIFIER:		
Total Weight	23,313	23,348
Weight on front wheels	9,013	9,013
Weight on rear wheels	14,300	14,335
Blade pressure	16,665	16,665
WITH SCARIFIER:		
Total weight	24,613	24,648
Weight on front wheels	10,148	10,148
Weight on rear wheels	14,465	14,500
Blade pressure	18,763	18,763

CAPACITIES

Tandem chain case	24 Qts.	24 Qts.
Lub. oil capacity (crankcase & filter)	17 Qts.	20 Qts.
Lub. oil capacity - filter only-Approx.	2 Qts.	2 Qts.
Air cleaner oil cup	3-3/4 Qts.	3 Qts.
Fuel Tank	53 Gal.	53 Gal.
Hydraulic oil (entire system)	24 Qts.	24 Qts.
Front axle gear carrier	28 Qts.	28 Qts.
Rear axle gear carrier	26 Qts.	26 Qts.
Transfer case and transmission	14 Qts.	14 Qts.
Cooling System with Heater	36 Qts.	34 Qts.
Torque Converter	11 Qts.	28 Qts.

DIMENSIONS:

Wheelbase	236½"	Max. blade reach beyond tire	91-1/8"
Overall length	315½"	Bank cutting angle	up to 90°
Overall height, no cab	117-3/4"		
Overall height, with cab	123½"		
Overall width	95½"		
Turning radius	414"		
Tandem box clearance	13"		

APPROX. SPEEDS IN M.P.H.
RATED R.P.M.

1st	2.20	6th (Traveling speed)	19.09
2nd	3.57	Low reverse	2.23
3rd	5.20	High reverse	8.2
4th	7.59		
5th	12.32		

BLADE:

Length, standard	13'-0"
Width (vertical height moldboard and bit)	26"
Thickness, moldboard	3/4"
Cut below ground	17-1/2"
Lift above ground	17"
Blade base	108½"
Blade side shift (precision)	50"
Circle side shift	21-3/4"
Total side shift (by power)	71-3/4"
Added side shift (manual)	26"
Total side shift (power and manual)	97-3/4"

CIRCLE

Diameter	5'-2"
Circle center to front axle	104"
Material. 8 X 4-13/16 X 1½" steel angle; rolled to shape.	
Rotation (Standard)	360°

GOOSENECK (DRAWBAR):

Size and shape of draft members	4 X 6 X 7/8" angle
Weight per foot lbs.	27.2
Draft connection	5" ball and socket

FRAME:

Size and shape.(ship channel, boxed)	10"
Weight per foot (lightest section)	119#

DRIVES:
Front with differential. Full floating axles. Type universal wheel joints - Cardan
Rear, rigid, no differential. Semi-floating axles.
Type of rear steer... 5th Wheel

CONTROLS:
Hydraulic, operated from the cab.
Steer, front and rear wheels.
Raise and lower blade. including high lift.
Side shift blade.
Reverse blade circle.
Side shift circle frame.
Operate scarifier, bulldozer, snow plows and snow wing.

HYDRAULIC DATA:
Pump..... Vane type
Capacity at 1975 rpm.... .....15.3 G.P.M.
Kind of oil.. SAE No. 10W
Valves:
Make.....Austin-Western

BRAKES: Foot operated service brake (14" x2-3/4") hydraulic internal expanding; and hand operating mechanical internal expanding parking brake. Brake assembly mounted on transfer case away from mud and water encountered in off-the-road operation to brake both front and rear propeller shafts and thus effectively brake front and rear wheels.

LUBRICATION: High pressure.

ATTACHMENTS AND EXTRAS

SCARIFIER ("V" Type) (Hydraulically Controlled)

Weight, approx.lbs.	1,300
Number of teeth	11
Spacing, center to center	4½"
Total swath	46"

All teeth have removable points; measure 1" X 3" and are made of hardened alloy steel.

SNOW PLOW (Hydraulically Controlled)
Giant "V" Type

Plowing width	9'-2"
Height	7'-2"
Overall width	12'-7"
Weight, Approx.#	(3,200* (3,500**

SNOW WING (hydraulically Controlled)

Weight, approx. lbs.	3,680
Blade length	14'
Blade height, outer end	43"
Blade height, inner end	36"
Blade thickness	¼"
Cutting bit length	13'
Height cutting edge, inner end	5'-5"
Height cutting edge, outer end with inner end down	8'-2"
Overall storage width	8'-9"
Overall storage height	10'-10"

REVERSIBLE SNOW PLOW (Hydraulically Controlled)

Weight, approximate lbs.	(2,287* (2,587**
Blade width	12'
Blade height	42"
Plowing width	120½"
Plowing angle (R. or L. hand)	32°
Lift above ground Blade straight	26½"
Blade angled.... (lowest point)	10-3/4"

BULLDOZER (Hydraulically Controlled)

Weight, approx. lbs.	(1,650* (1,950**
Length	9'-0"
Height	40"
Lift above grade	13"
Drop below grade	17"

CAB
(Provides headroom of 6'-4")
Open type, approx. weight lbs..... 270
Cab enclosure, approx. weight, lbs..... 455
Enclosed cab complete, approx. weight, lbs.. 725
Cabs are of steel construction
Enclosed cab has safety glass panels - all around
Windshield wiper standard equipment with cab.

HOOD SIDES FOR ENGINE
Weight, lbs.....31

ELECTRIC LIGHTS
Two headlights on side of frame, two red tail-lights on rear, with switch in cab; weight, 25 lbs.

TIRE PUMP
Single cylinder, battery operated, complete with hose; weight 53 lbs.

BLADE EXTENSION
1' or 2' for either right or left side. Weight, 60 lbs. per foot.
Overlaid end bits R.H. & L.H.

ODOMETER
Located in cab.
REAR DRAWBAR
AUXILIARY BRAKE
BOOSTER STEER
DUO-MATIC STEER (Front steer only)
2 speed hydraulic with wheel.

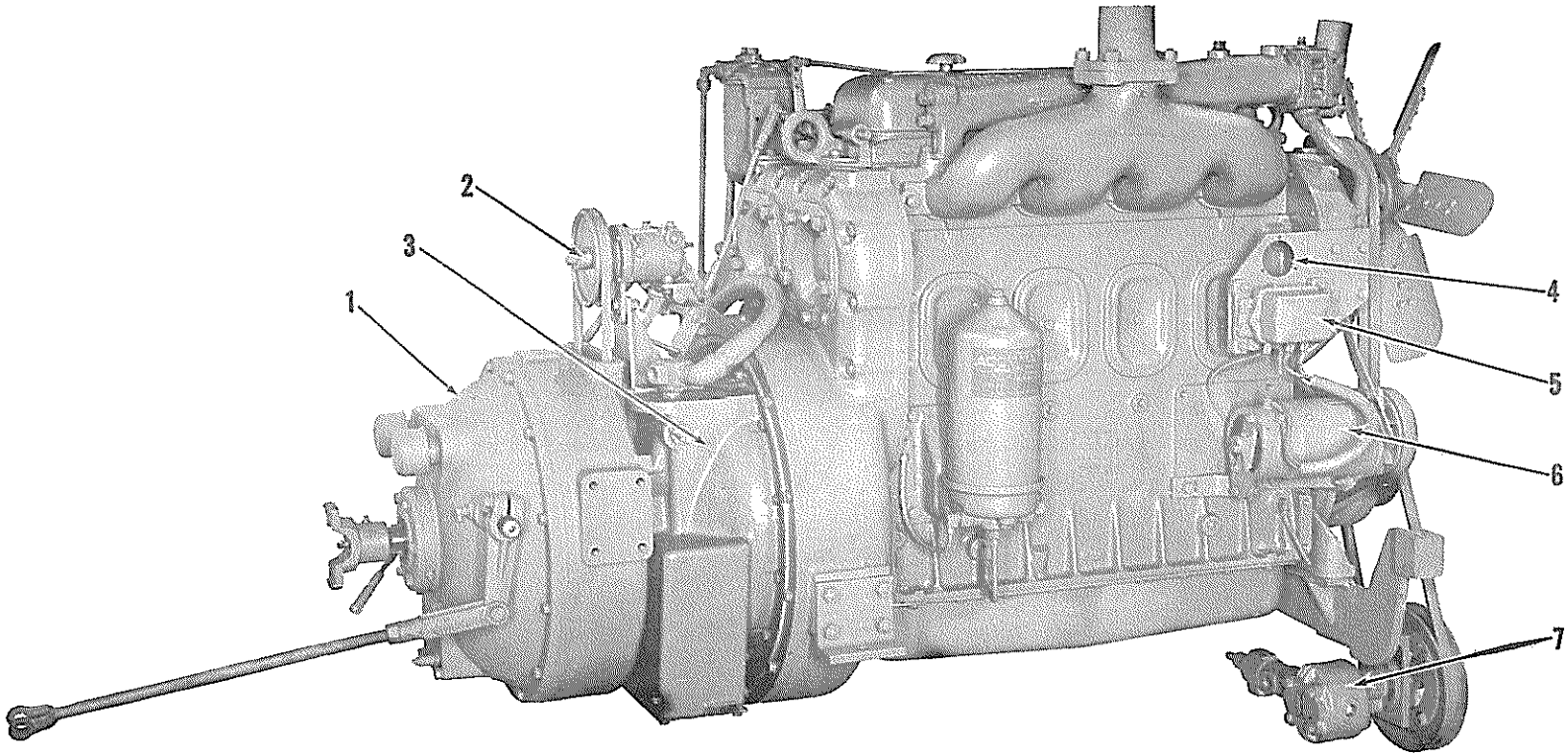
HEATER
Type..... Hot water.

WINDSHIELD DEFROSTER
Type..... Fan
HOUR METER

*Weight of attachment that will use the operating parts already mounted on grader.

**Weight of attachment complete, including all necessary operating parts.

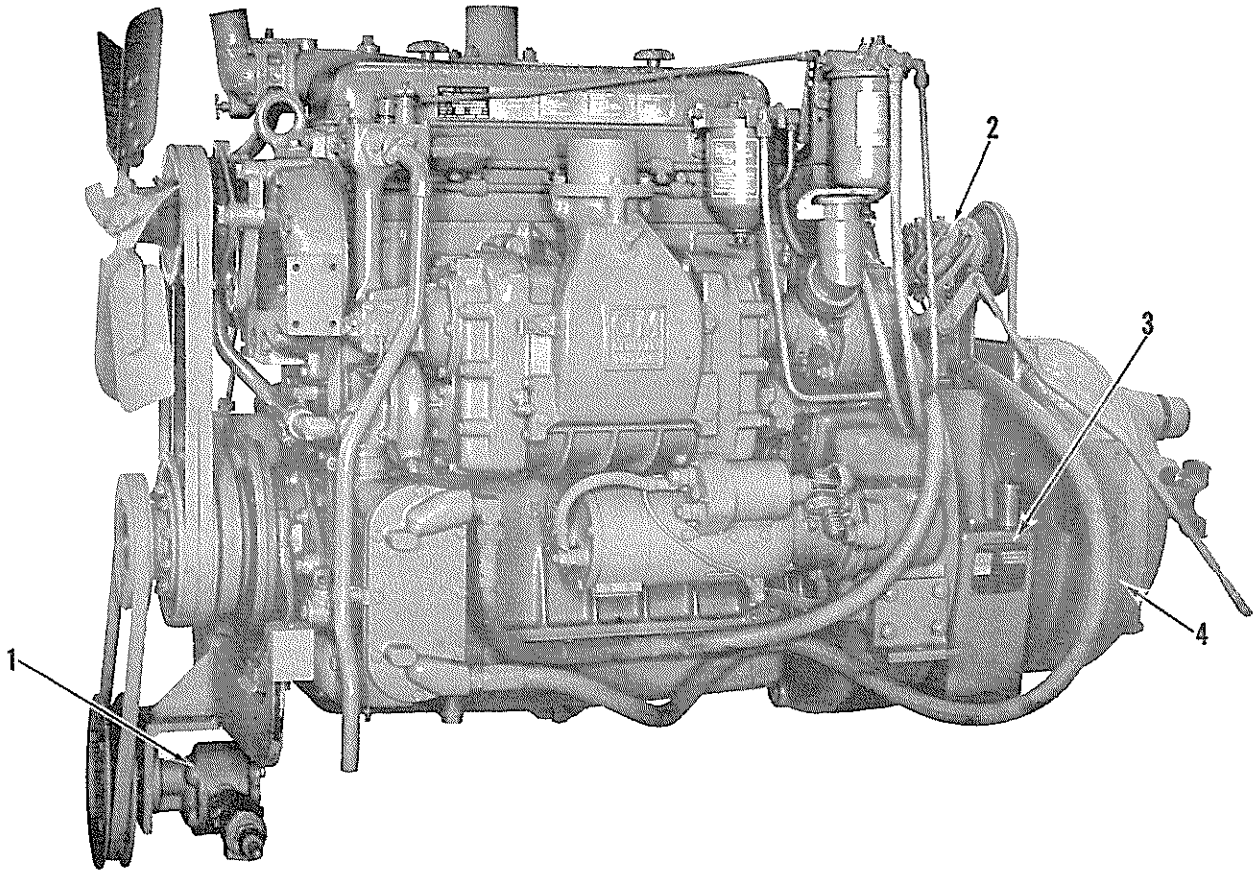
Specifications Subject to Change Without Notice.



GMC-4080 ENGINE (GENERATOR SIDE) WITH ALLISON CONVERTER

1. Clutch Housing
2. Tail Shaft Governor
3. Allison Converter
4. Hour Meter Mounting Bracket
5. Voltage Regulator
6. Generator
7. Hydraulic Pump and Relief Valve

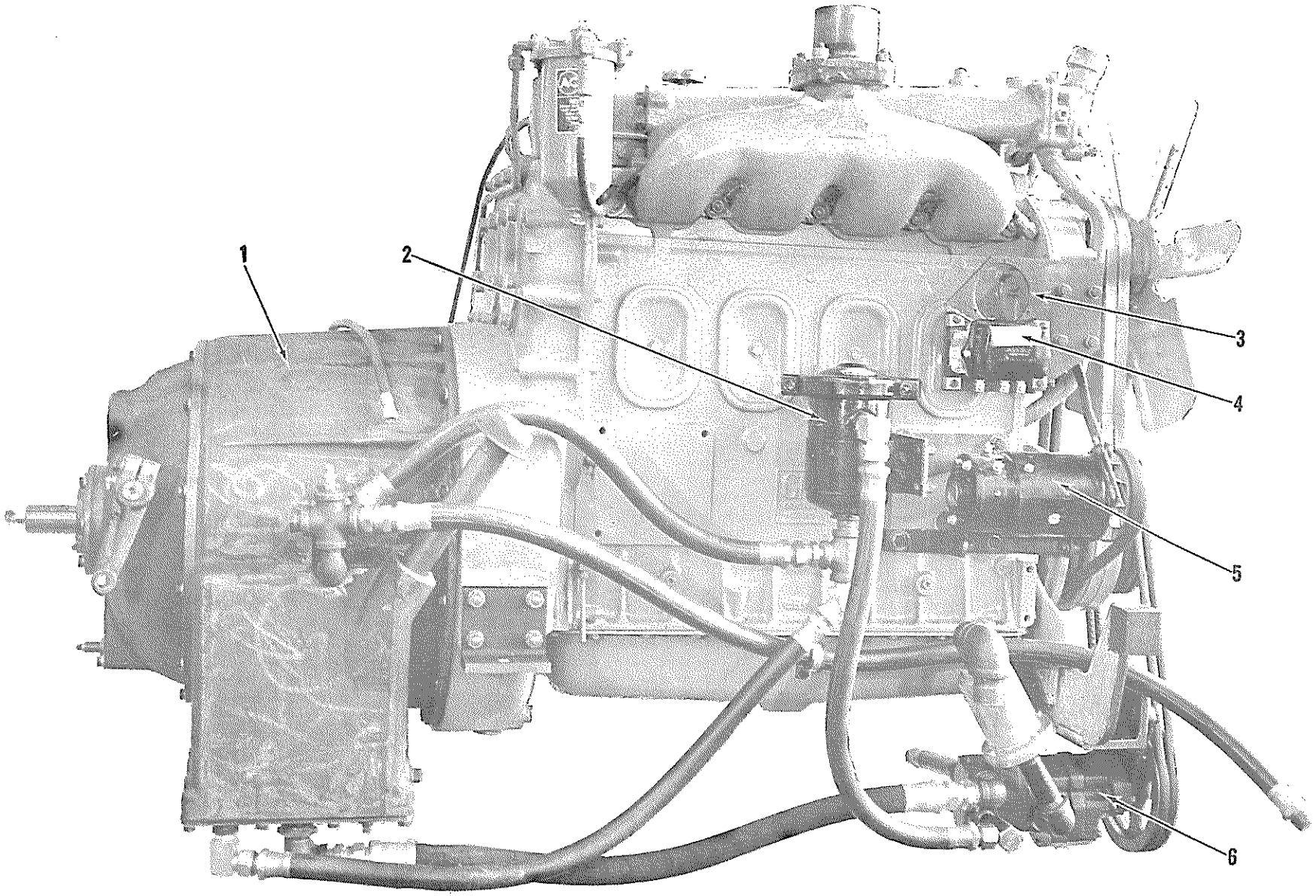
See Engine Manual for details and parts descriptions.



GMC-4080 ENGINE (BLOWER SIDE) WITH ALLISON CONVERTER

1. Hydraulic Pump and Relief Valve
2. Tail Shaft Governor
3. Allison Converter
4. Clutch Housing

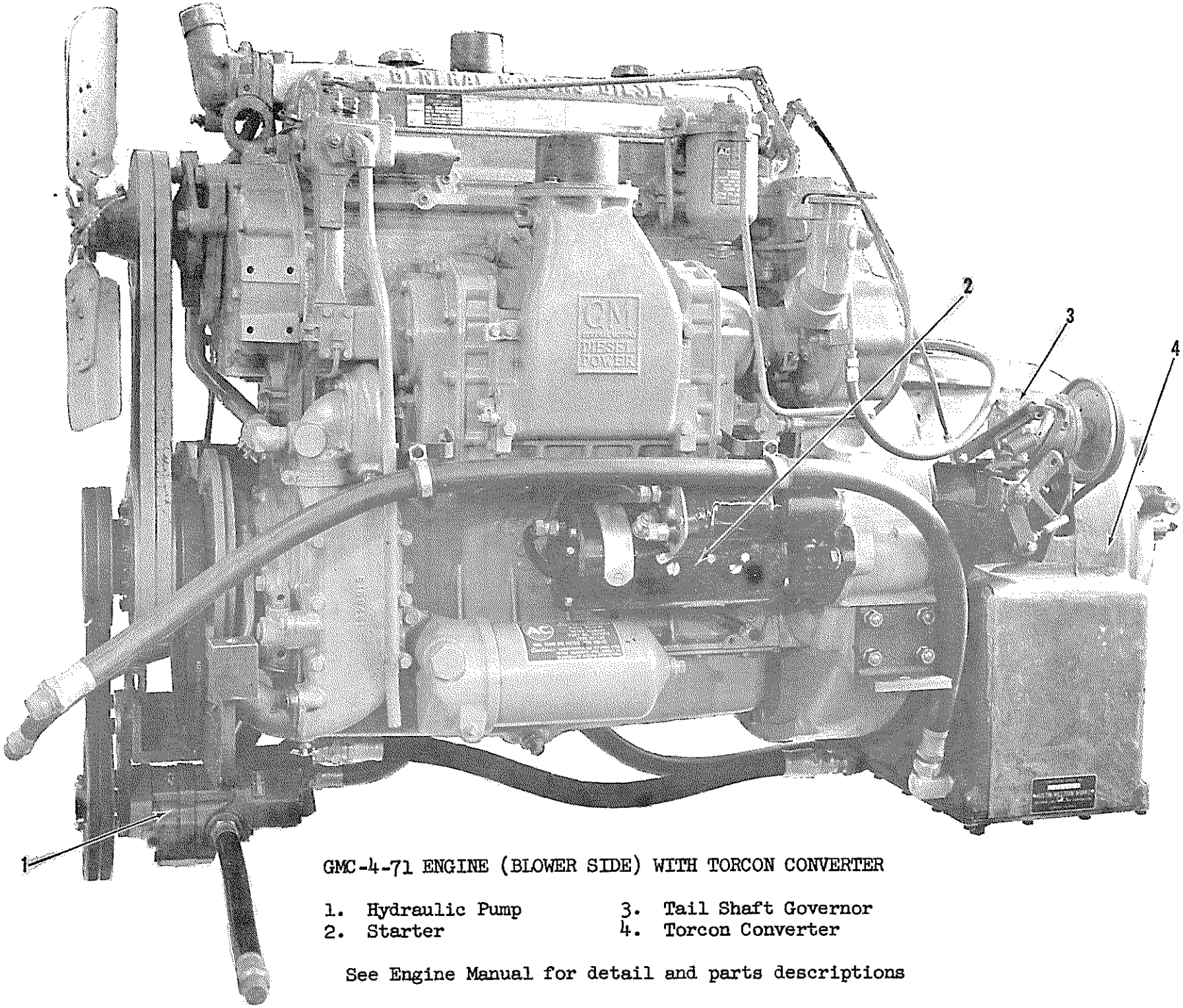
See Engine Manuals for details and parts descriptions



GMC-4-71 ENGINE (GENERATOR SIDE) WITH TORCON CONVERTER

1. Torcon Converter
2. Converter Oil Filter
3. Hour Meter Mounting Bracket
4. Voltage Regulator
5. Generator
6. Hydraulic Pump and Filter

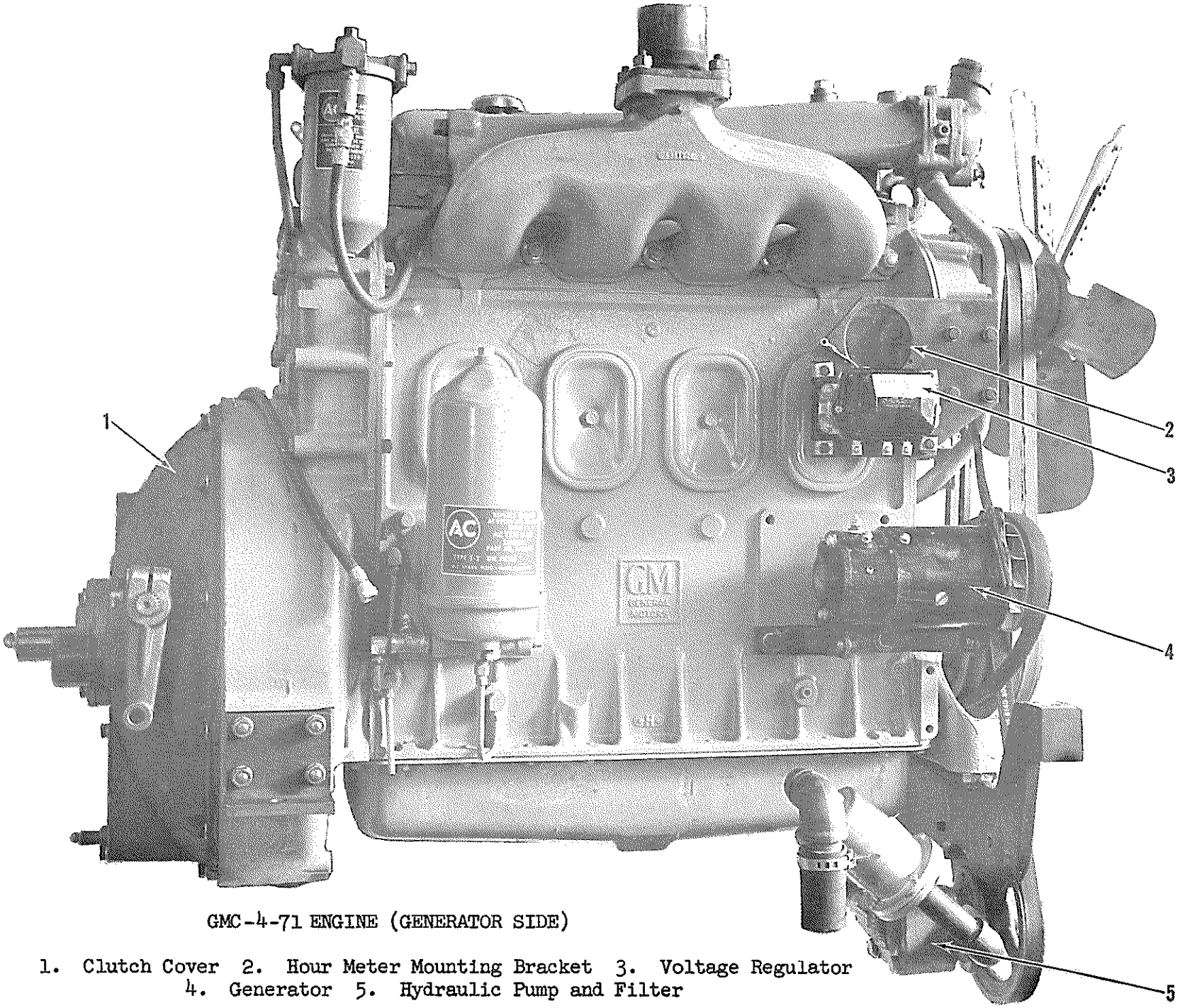
See Engine Manual for details and parts descriptions



GMC-4-71 ENGINE (BLOWER SIDE) WITH TORCON CONVERTER

1. Hydraulic Pump
2. Starter
3. Tail Shaft Governor
4. Torcon Converter

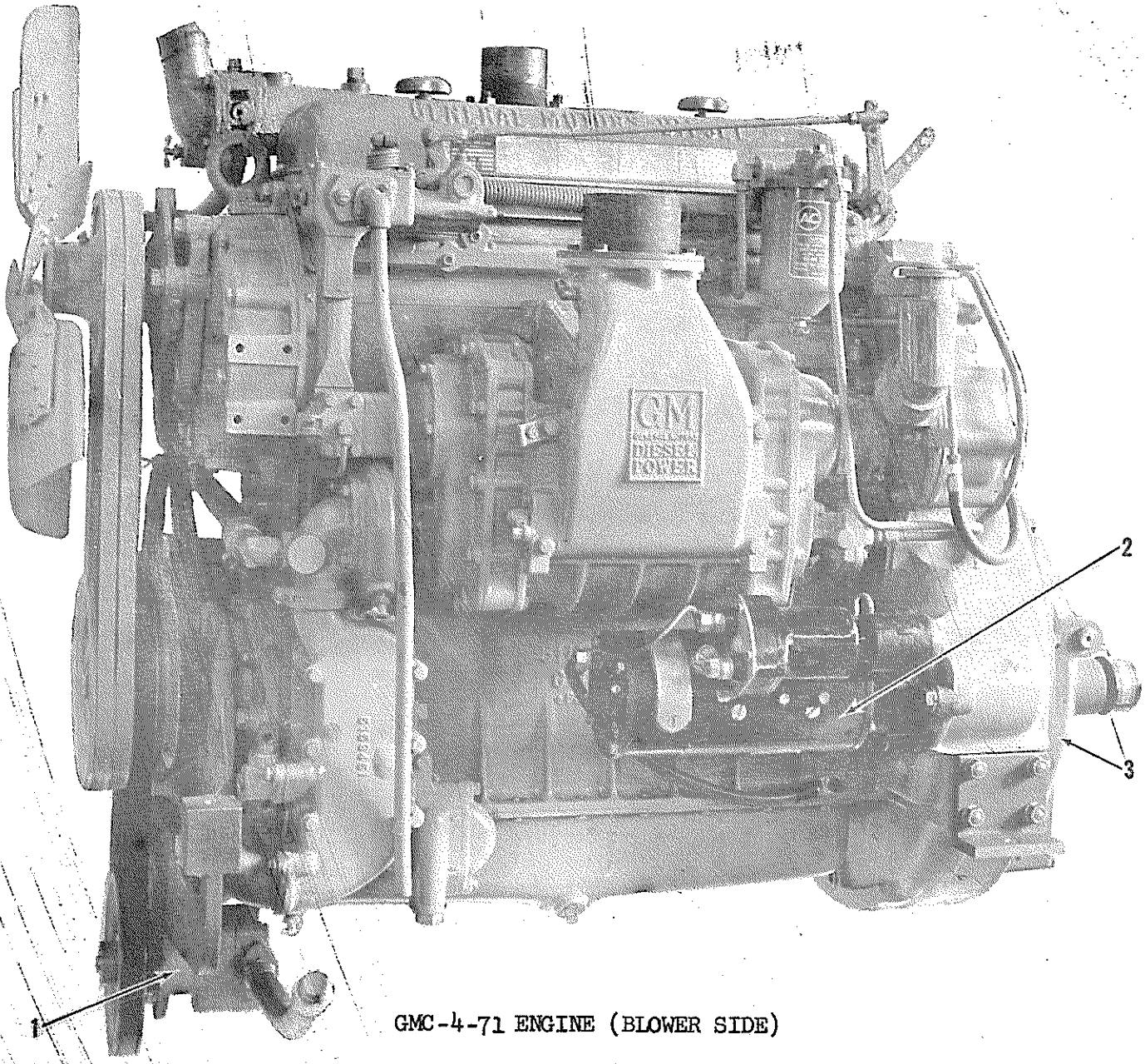
See Engine Manual for detail and parts descriptions



GMC-4-71 ENGINE (GENERATOR SIDE)

1. Clutch Cover 2. Hour Meter Mounting Bracket 3. Voltage Regulator
4. Generator 5. Hydraulic Pump and Filter

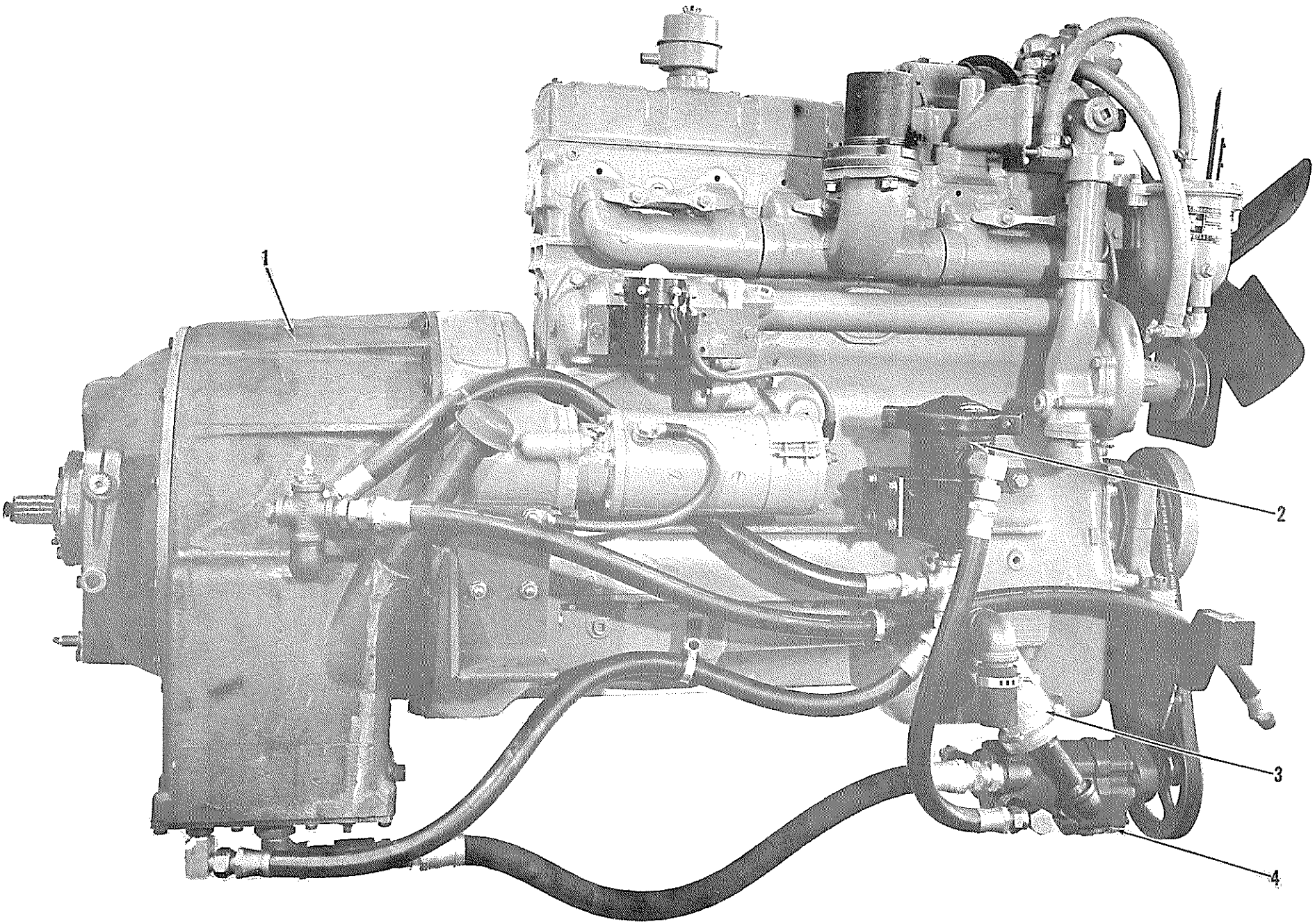
See Engine Manuals for details and parts descriptions



GMC-4-71 ENGINE (BLOWER SIDE)

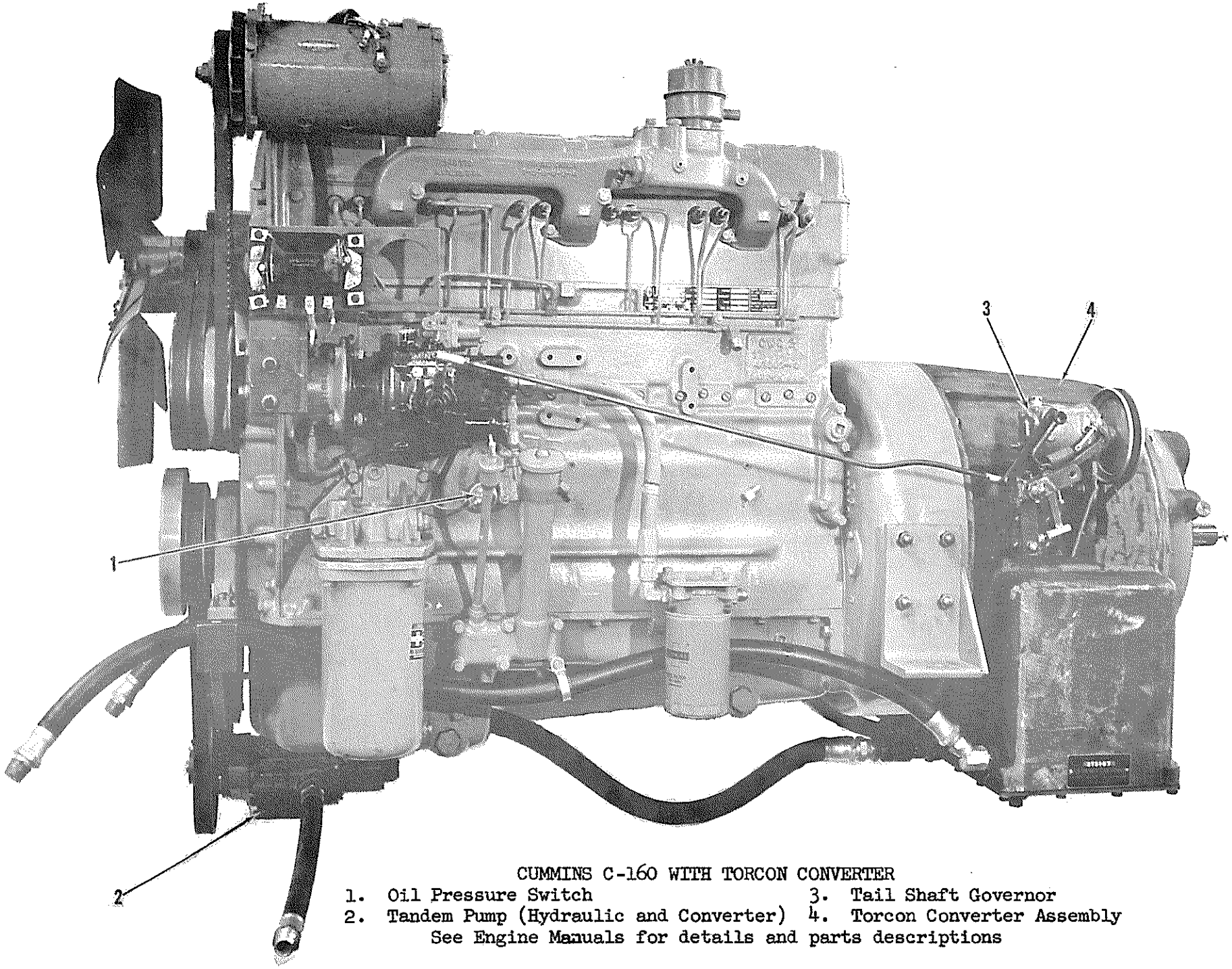
1. Hydraulic Pump 2. Starter 3. Clutch Cover

See Engine Manual for details and parts descriptions



CUMMINS C-160 WITH TORCON CONVERTER

1. Torcon Converter Assembly
2. Converter Oil Filter
3. Hydraulic Oil Filter
4. Tandem Pump (Hydraulic and Converter)



CUMMINS C-160 WITH TORCON CONVERTER

1. Oil Pressure Switch
2. Tandem Pump (Hydraulic and Converter)
3. Tail Shaft Governor
4. Torcon Converter Assembly

See Engine Manuals for details and parts descriptions

SECTION 2 - LUBRICATION
PACER - 300

We recommend that the owner use the lubricants shipped with the machine. However, weather conditions or climate may warrant a change to a heavier or lighter weight lubricant. The following pages indicate the location of lubricant points and the interval for servicing.

We suggest that should oil levels indicate that lubricant should be added, the original oil should be drained and an approved lubricant available locally should be installed. Do not mix unknown brands.

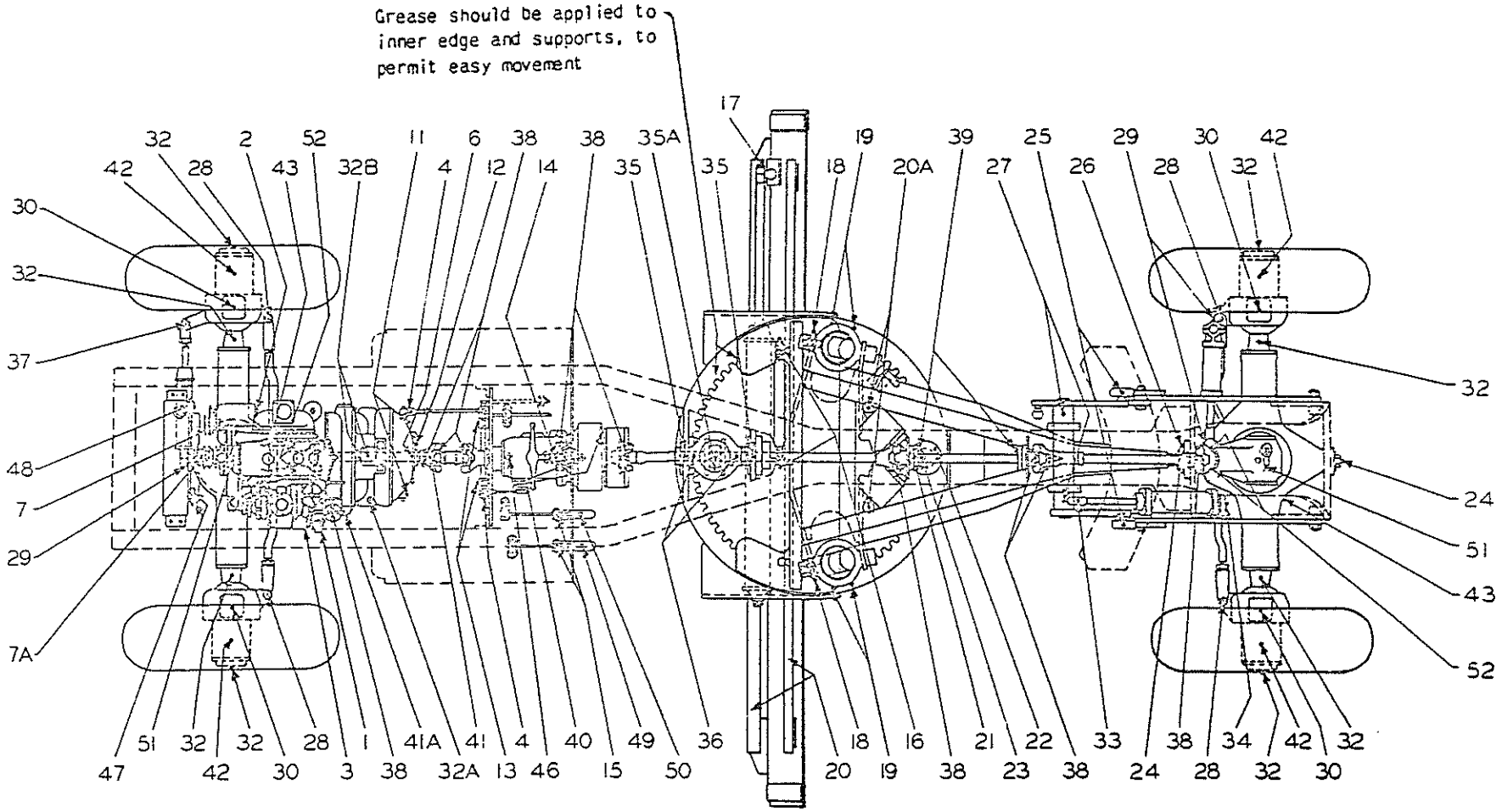
When flushing housings and gear boxes it is recommended that regular flushing oils be used in preference to kerosene, gasoline or other thin fuels.

RECOMMENDED LUBRICATION SPECIFICATIONS

1. All Year Around
2. Above 90°
3. Above 32°
4. Above 10°
5. Below 32°
6. Below 10°
7. Below 0°
8. 0° to 32°
9. 10° to 32°
10. 32° to 90°

	SAE-5W	SAE-10-10-W	SAE-20-20-W	SAE-30	SAE-80-90 MULTIPURPOSE GEAR LUBE	WHEEL BEARING GREASE	TYPE "A" AUTOMATIC TRANS. OIL	TYPE "C" AUTOMATIC TRANS. OIL	GENERAL PURPOSE GUN GREASE "LITHIUM" TYPE PREFERRED
GUN GREASE									1
PACKED BEARINGS						1			
AXLE HOUSINGS					1				
A-W TRANSMISSION					1				
HYDRAULIC SYSTEM	5	3							
ALLISON CONVERTER-EXTERNAL RELIEF VALVE							1		
ALLISON CONVERTER-INTERNAL RELIEF VALVE							6	4	
TORCON CONVERTER							1		
GMC-ENGINES		7	8	3					
IHC-ENGINES		6	9	3					
CUMMINS ENGINES		5	10	2					
ALLISON CONVERTER DRIVE RING						1			

Refer to Page 3 and 4 for
Lubrication Chart Key



LUBRICATION CHART
PACER 300

Key to Lubrication Chart - Refer to Page 2

Ref.	Point of lubrication:	Remarks:
1.	Cummins C-160 diesel engine	See separate Cummins Operator's Manual
1.	GM 71 series diesel engine	See separate General Motors Operator's Manual
2.	Generator)	
3.	Starting motor)	Add 2 or 3 drops of oil every 8 hours of operation.

LUBRICATE DAILY (8 to 12 HOURS OF OPERATION)
Two strokes of lubricator at each grease fitting
(General-purpose pressure gun grease "Lithium" type preferred)

	Air cleaners (Cummins or GM 71 series engine)	Check oil level daily
4.	Pins, rods, levers, parts with oil holes, etc	Occasionally lubricate with a few drops of motor oil
16.	Ball - high lift link (on lift arm and circle)	Pressure gun grease
17.	Ball - side shift (on blade)	Pressure gun grease
18.	Balls - blade lift rams (on circle)	Pressure gun grease
19.	Balls - blade lift rams (upper and lower sockets)	Pressure gun grease
20.	Rods - blade side shift (upper and lower)	Clean with diesel fuel and lightly oil to prevent corrosion and seizing
20A.	Bearings - pivot pins (circle reverse hydraulic motor)	Pressure gun grease
21.	Bearing - pinion shaft (circle reverse hydraulic motor)	Pressure gun grease
22.	Bearing - pinion (circle reverse hydraulic motor)	Pressure gun grease
23.	Bearing - crank pin (circle reverse hydraulic motor)	Pressure gun grease
24.	Pivot shafts - front and rear (front axle)	Pressure gun grease
26.	Ball - draw bar (socket and cap)	Pressure gun grease
28.	Tie rod ends - front and rear axle	Pressure gun grease
29.	Balls - steering rams (front and rear)	Pressure gun grease
35.	Bearings - high lift (front and rear)	Pressure gun grease
35A.	Bearing - piston rod end (high lift ram)	Pressure gun grease
36.	Bearings - pivot (high lift ram)	Pressure gun grease
37.	Bearing - rear steering ram	Pressure gun grease

LUBRICATE WEEKLY (50 to 60 HOURS OF OPERATION)
Two strokes of lubricator at each grease fitting
(General-purpose pressure gun grease "Lithium" type preferred)

6.	Clutch - throwout bearing	Pressure gun grease
7.	Pump - hydraulic	See pump instructions
7A.	Bearings - fan hub (see engine sections)	Pressure gun grease
11.	Clutch - throwout shaft	(one stroke of lubricator) Pressure gun grease
12.	Bearing - clutch shaft	Pressure gun grease
13.	Clutch - pedal cross shaft	Pressure gun grease
14.	Bearing - steering post	Pressure gun grease
15.	Pedals - brake and circle latch	Pressure gun grease
25.	Balls - scarifier lift	Pressure gun grease
27.	Bearings - scarifier lift	Pressure gun grease
30.	Trunnion bearings - front and rear (upper)	Pressure gun grease
32.	Steering knuckles - front and rear axle	Pressure gun grease
32A.	Torque Converter	Check oil level when oil is hot (engine running at idle) and add oil of type specified in torque converter section
32B.	Tail-shaft governor reservoir "DAILY"	NOTE: Every 500 hours, drain and refill. check oil level at plug. Add oil if necessary using engine oil. See torque converter section.
33.	Ball - scarifier ram	Pressure gun grease
34.	Bearings - scarifier ram base	Pressure gun grease

LUBRICATE MONTHLY (200 HOURS OF OPERATION)
Two strokes of lubricator at each grease fitting
(General-purpose pressure gun grease "Lithium" type preferred)

38.	Universal joints - propeller shafts	Pressure gun grease
39.	Bearing - propeller shaft support	Pressure gun grease
40.	Clutch brake	Pressure gun grease
41.	Clutch - pilot bearing (GM 71 series engine)	Pressure gun grease

(continued)

Key to Lubrication Chart - Refer to Page 2 (Contd.)

ef.	Point of Lubrication:	Remarks
	LUBRICATE ONCE PER YEAR (APPROXIMATELY 2000 HOURS OF OPERATION)	
2.	Bearings - front and rear wheels.....	Remove the wheel drive flanges and check bearing adjustment. Adjust bearings if necessary. Inspect grease compartment and replenish with wheel bearing grease. Also check when overhauling.
	CHECK WEEKLY (50 to 60 HOURS OF OPERATION)	
3.	Gear carriers (front and rear axle).....	Use SAE-80-90 extreme pressure lubricant. NEVER MIX GRADES OR KINDS OF EXTREME PRESSURE LUBRICANTS. If in doubt, drain, flush and refill.
6.	Transfer case)	
6.	Transmission).....	Check every 50 hours of operation and refill if necessary with SAE-80-90 extreme pressure lubricant. NEVER MIX GRADES OR KINDS OF EXTREME PRESSURE LUBRICANTS. Check oil level after grader has stood at least one hour. NOTE: Drain and flush every 1000 hours of operation (or at least twice a year). Refill with extreme pressure lubricant.
	NOTE: The transfer case filler plug determines the oil level in both the transfer case and transmission case, as both oil compartments are interconnected. Approximate capacity is 14 quarts.	
7.		
8.	Hydraulic oil.....	Check oil level pet cocks (47) and refill with (antifoam) SAE-10W for temperatures of 32° F. and above. For temperatures below 32° F. use SAE-5W. Drain and clean entire hydraulic system at least twice a year.
	Battery.....	Check and add distilled water if needed.
	CHECK EVERY 4 WEEKS	
9.	Master cylinder - circle latch)	
0.	Master cylinder - brake).....	Check the hydraulic master cylinder and refill with genuine Lockhead #21 brake fluid.
	CHECK PERIODICALLY	
1.	Vent plugs - gear carriers..... (front and rear axle)	Keep air vent in plug open to prevent accumulation of air pressure. CAUTION; Do not remove unless for cleaning because of dirt or dust stoppage.
2.	Bearings - pinion shafts..... (front and rear gear carrier)	After repairing or overhauling front gear carrier unit, be sure to remove the pipe plugs (52) (front carrier only) and inject about one pint of SAE-80-90 extreme pressure lubricant.
		After repairing or overhauling rear gear carrier unit, but before bull gear is installed, place unit on floor or table with opening up. Pour about one pint of SAE-80-90 extreme pressure lubricant into case. Lift case toward vertical position using the universal joint yoke as a pivot point, and at the same time, turn case sideways. This will let the lubricant flow thru the cast oil passages to the outboard pinion bearing.
		If you do not do this you may start out with dry pinion bearings.

e recommend that you use only the best lubricants obtainable varied to suit temperature changes.

SECTION 2 - LUBRICATION
SUPER - 300

We recommend that the owner use the lubricants shipped with the machine. However, weather conditions or climate may warrant a change to a heavier or lighter weight lubricant. The following pages indicate the location of lubricant points and the interval for servicing.

We suggest that should oil levels indicate that lubricant should be added the original oil should be drained and an approved lubricant available locally should be installed. Do not mix unknown brands.

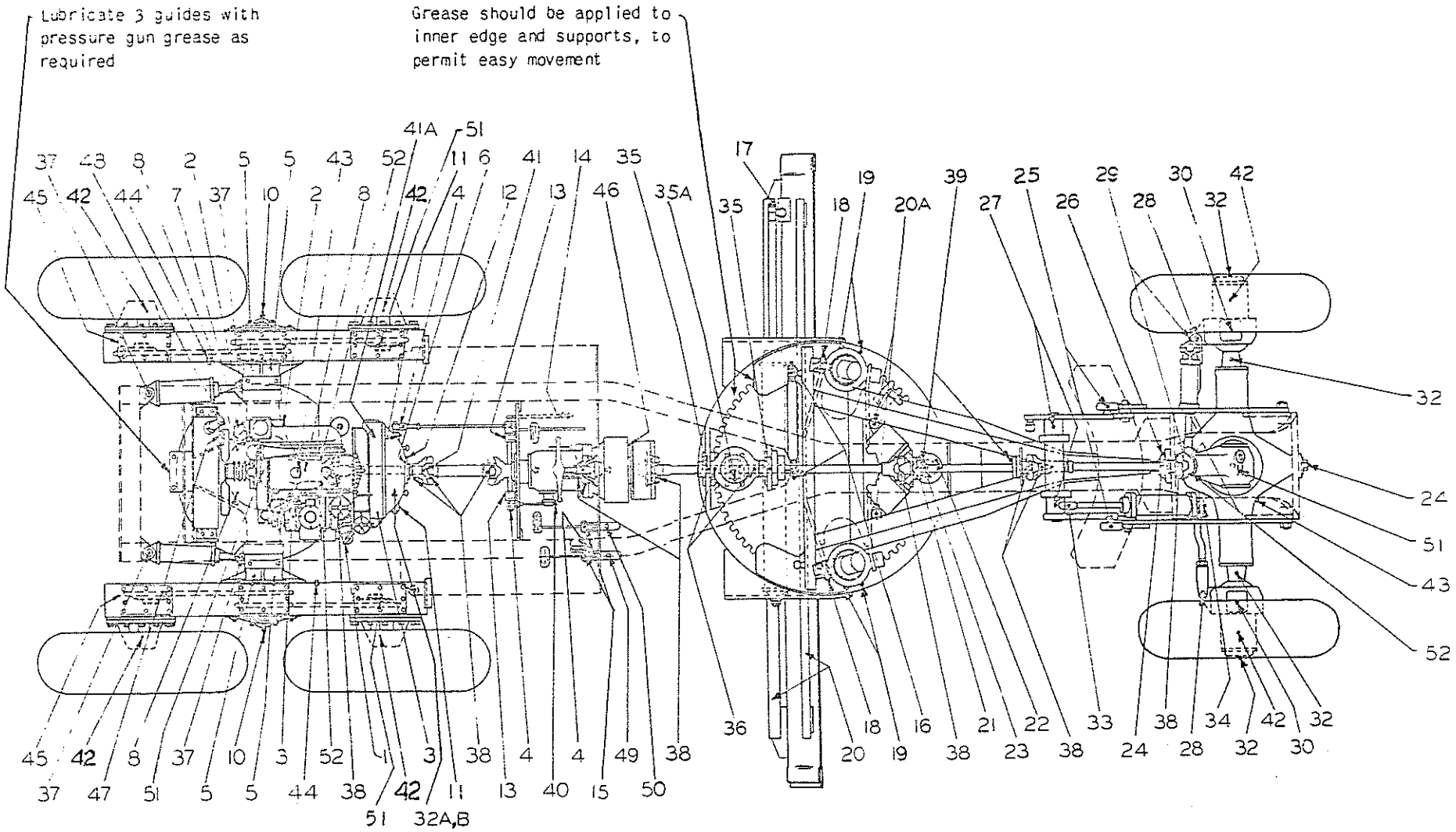
When flushing housings and gear boxes it is recommended that regular flushing oils be used in preference to kerosene, gasoline or other thin fuels.

RECOMMENDED LUBRICATION SPECIFICATIONS

1. All Year Around
2. Above 90°
3. Above 32°
4. Above 10°
5. Below 32°
6. Below 10°
7. Below 0°
8. 0° to 32°
9. 10° to 32°
10. 32° to 90°

	SAE-5W	SAE-10-10-W	SAE-20-20-W	SAE-30	SAE-80-90 MULTIPURPOSE GEAR LUBE	WHEEL BEARING GREASE	TYPE "A" AUTOMATIC TRANSMISSION OIL	TYPE "C" AUTOMATIC TRANSMISSION OIL	GENERAL PURPOSE GUN GREASE "LITHIUM" TYPE PREFERRED
GUN GREASE									1
PACKED BEARINGS						1			
AXLE HOUSINGS					1				
A-W TRANSMISSION					1				
HYDRAULIC SYSTEM	5	3							
ALLISON CONVERTER-EXTERNAL RELIEF VALVE							1		
ALLISON CONVERTER-INTERNAL RELIEF VALVE							6	4	
TORCON CONVERTER							1		
GMC-ENGINES		7	8	3					
IHC-ENGINES		6	9	3					
CUMMINS ENGINES		5	10	2					
ALLISON CONVERTER DRIVE RING						1			

Refer to Pages 3A and 4A for Lubrication Chart Key



LUBRICATION CHART
Super 300

Key to Lubrication Chart - Refer to Page 2A

Ref.	Point of Lubrication:	Remarks:
1.	Cummins C-160 diesel engine	See separate Cummins Operator's Manual
1.	GM 71 series diesel engine	See separate General Motors Operator's Manual
2.	Generator	Add 2 or 3 drops of oil every 8 hours of operation.
3.	Starting Motor	

LUBRICATE DAILY (8 to 12 HOURS OF OPERATION)
Two strokes of lubricator at each grease fitting
(General-purpose pressure gun grease "Lithium" type preferred)

	Air Cleaners (Cummins C-160 or GM 71 series engine)	Check oil daily.
4.	Pins, rods, levers, parts with oil holes, etc.	Occasionally lubricate with a few drops of motor oil
5.	Bearings - pivot case	(Six strokes of Lubricator) General-purpose pressure gun grease "Lithium" type preferred (One fitting at top and one fitting at bottom - each side)
16.	Ball - high lift link (on lift arm and circle)	Pressure gun grease
17.	Ball - side shift (on blade)	Pressure gun grease
18.	Balls - blade lift rams (on circle)	Pressure gun grease
19.	Balls - blade lift rams (upper and lower sockets)	Pressure gun grease
20.	Rods - blade side shift (upper and lower)	Clean with diesel fuel and lightly oil to prevent corrosion and seizing
20A.	Bearings - pivot pins (circle reverse hydraulic motor)	Pressure gun grease
21.	Bearing - pinion shaft (circle reverse hydraulic motor)	Pressure gun grease
22.	Bearing - pinion (circle reverse hydraulic motor)	Pressure gun grease
23.	Bearing - crank pin (circle reverse hydraulic motor)	Pressure gun grease
24.	Pivot shafts - front and rear (front axle)	Pressure gun grease
26.	Ball - draw bar (socket and cap)	Pressure gun grease
28.	Tie rod ends - front axle	Pressure gun grease
29.	Balls - front steering ram	Pressure gun grease
35.	Bearings - high lift (front and rear)	Pressure gun grease
35A.	Bearing - piston rod end (high lift ram)	Pressure gun grease
36.	Bearings - pivot (high lift ram)	Pressure gun grease
37.	Bearings - rear steering rams	Pressure gun grease

LUBRICATE WEEKLY (50 to 60 HOURS OF OPERATION)
Two strokes of lubricator at each grease fitting
(General-purpose pressure gun grease "Lithium" type preferred)

6.	Clutch - Throwout bearing	Pressure gun grease
7.	Pump - hydraulic	See pump instructions
7A.	Bearings - fan hub (see engine sections)	Pressure gun grease
8.	Bushing - circle (rear axle)	Pressure gun grease
10.	Bearings - rear axle shaft	Pressure gun grease
11.	Clutch - throwout shaft	(One stroke of lubricator) Pressure gun grease
12.	Bearing - clutch shaft	Pressure gun grease
13.	Clutch - pedal cross shaft	Pressure gun grease
14.	Bearing - steering post	Pressure gun grease
15.	Pedals - brake and circle latch	Pressure gun grease
25.	Balls - scarifier lift	Pressure gun grease
27.	Bearings - scarifier lift	Pressure gun grease
30.	Trunnion bearings - front axle (upper)	Pressure gun grease
32.	Steering knuckles - front axle	Pressure gun grease
32A.	Torque converter	Check oil level when oil is hot (engine running at idle) and add oil of type specified in torque converter section. NOTE: Every 500 hours, drain and refill.
32B.	Tail-shaft governor reservoir	"DAILY" check oil level at plug. Add oil if necessary using engine oil. See torque converter section.
33.	Ball - scarifier ram	Pressure gun grease
34.	Bearings - scarifier ram base	Pressure gun grease

LUBRICATE MONTHLY (200 HOURS OF OPERATION)
Two strokes of lubricator at each grease fitting
(General-purpose pressure gun grease " Lithium" type preferred)

38.	Universal joints - propeller shaft	Pressure gun grease
39.	Bearing - propeller shaft support	Pressure gun grease
40.	Clutch brake	Pressure gun grease
41.	Clutch - pilot bearing (GM 71 series engine)	Pressure gun grease

Ref.	Point of Lubrication:	Remarks
	LUBRICATE ONCE PER YEAR (APPROXIMATELY 2000 HOURS OF OPERATION)	
2.	Bearings - front and rear wheels.....	Remove the wheel drive flanges and check bearing adjustment. Adjust bearings if necessary. Inspect grease compartment and replenish with wheel bearing grease. Also check when overhauling.
	CHECK WEEKLY (50 to 60 HOURS OF OPERATION)	
3.	Gear carriers (front and rear axle).....	Use SAE-80-90 extreme pressure lubricant. NEVER MIX GRADES OR KINDS OF EXTREME PRESSURE LUBRICANTS. If in doubt, drain, flush and refill.
4.) 5.)	Pivot case - rear axle.....	Check high level oil plug (44) every 50 hours of operation and refill at cover (45) if necessary with SAE-80-90 extreme pressure lubricant. NEVER MIX GRADES OR KINDS OF EXTREME PRESSURE LUBRICANTS. Check oil level after grader has stood at least one hour. NOTE: Drain and flush every 1000 hours of operation (or at least twice a year). Refill with extreme pressure lubricant.
	NOTE: Approximate capacity of each case is 6 gallons.	
6. 6.	Transfer case) Transmission).....	Check every 50 hours of operation and refill if necessary with SAE-80-90 extreme pressure lubricant. NEVER MIX GRADES OR KINDS OF EXTREME PRESSURE LUBRICANTS. Check oil level after grader has stood at least one hour. NOTE: Drain and flush every 1000 hours of operation (or at least twice a year). Refill with extreme pressure lubricant.
	NOTE: The transfer case filler plug determines the oil level in both the transfer case and transmission case, as both oil compartments are interconnected. Approximate capacity is 14 quarts.	
7.) 8.)	Hydraulic oil.....	Check oil level pet cocks (47) and refill with (antifoam) SAE-10W for temperatures of 32 F. and above. For temperatures below 32 F. use (antifoam) SAE-5W. Drain and clean entire hydraulic system at least twice a year.
	Battery.....	Check and add distilled water if needed.
	CHECK EVERY 4 WEEKS	
9. 0.	Master cylinder - circle latch) Master cylinder - brake).....	Check the hydraulic master cylinder and refill with genuine Lockheed #21 brake fluid.
	CHECK PERIODICALLY	
1.	Vent plugs - gear carriers..... (front and rear axle)	Keep air vent in plug open to prevent accumulation of air pressure. CAUTION: Do not remove unless for cleaning because of dirt or dust stoppage.
2.	Bearings - pinion shafts..... (front and rear gear carrier)	After repairing or overhauling front gear carrier unit, be sure to remove the pipe plugs (52) (front carrier only) and inject about one pint of SAE-80-90 extreme pressure lubricant. After repairing or overhauling rear gear carrier unit, but before bull gear is installed, place unit on floor or table with opening up. Pour about one pint of SAE-80-90 extreme pressure lubricant into case. Lift case toward vertical position using the universal joint yoke as a pivot point, and at the same time, turn case sideways. This will let the lubricant flow thru the cast oil passages to the outboard pinion bearing. If you do not do this you may start out with dry pinion bearings.

We recommend that you use only the best lubricants obtainable varied to suit temperature changes.

SECTION 3

UNLOADING AND GENERAL INSTRUCTIONS TO OPERATOR

1. INSPECTION BEFORE UNLOADING GRADER.

a. General

Before unloading the grader check it thoroughly for damage during shipment.

Inspect the tires carefully, also the glass and the cab, if so equipped.

The tool packing list should be checked carefully and any shortage or damage should be immediately reported to an authorized agent of the transportation company involved. In case of damage or pilferage, you have a right to demand that your copy of the transportation document be noted by the transportation company, showing whatever shortage or damage is involved.

2. BEFORE STARTING ENGINE

Before starting the engine or moving the grader the following units should be checked and serviced if required.

a. ENGINE

Check crankcase oil level. (see Engine Manual for capacities and lubricants). Check radiator coolant level - if drained, install drain plug and fill with clean water and anti-freeze if needed.

Open fuel valve under fuel tank and add fuel if required.

b. HYDRAULIC SYSTEM

Check oil level in reservoir. Fill to oil level shown in Section 3.

c. Wash all grime and dust laden grease from all exposed machined parts, such as hydraulic ram piston rods, back of all wheel trunnion sockets, and circle.

The piston rods and trunnion sockets need not be relubricated. Use a handful of high pressure grease and apply lubricant to the inside bore of the circle, also the under side of same. Do not lubricate the top side of the circle.

d. Lubricate balance of grader with grease gun provided. (See Section 2, for points to be lubricated and lubricant specifications.)

e. Fill brake master cylinder with fluid and test brakes. (See Section 5.)

f. Check tire pressures. Do not over or under inflate tires. (See Decalcomania on main frame, also page 19, Section 3.)

g. Check clutch pedal clearance. See Section 5, for all adjustments, including clutch brake.

3. UNLOADING MOTOR GRADER.

Remove blocks from front, sides, and rear of all wheels. Pull spikes from car floor.

Start engine. (See engine starting instructions.)

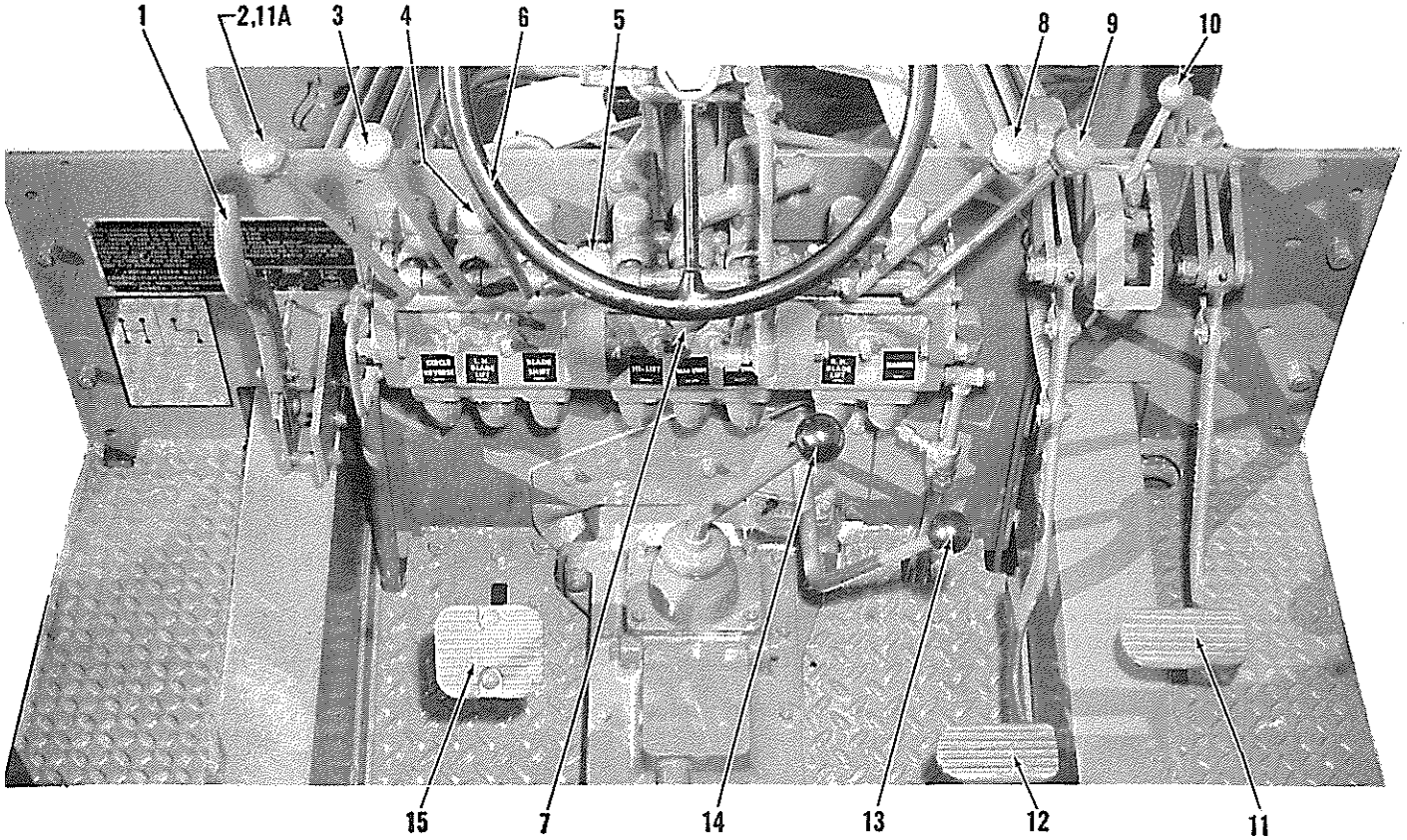
Raise moldboard to highest position. It may be necessary to place moldboard in highlift position to clear the end of rail car or trailer when unloading on steep ramps.

Test brakes before moving off car. Move grader slowly off rail car or trailer in low gear.

3A. FRONT AND REAR AXLE STEERING ANGLE.

The steering angle of the front axles on all models and the rear axle of the Pacer models should be checked before putting the grader in operation.

IMPORTANT: The steering angle of these axles should be equal in either direction. The normal steering angle is 25° each way on the front axle and 15° each way on the rear axle. If adjustment is required to equalize the steering angle, it is accomplished at the threaded end of the steer ram assemblies (Section 5, page 55 and 56).



4. OPERATING CONTROLS.

The operator should thoroughly familiarize himself with the various controls and speed changes as shown.

There are important differences between various graders; therefore, regardless of previous experience with other graders, the operator will secure the best results if he fully understands what each control is for and how to use it.

(1) HAND BRAKE. (To apply, pull back. Press the lock and push forward to release).

(2) CIRCLE ROTATION. (Pull back to rotate circle anti-clockwise. Push forward to rotate circle clockwise).

(3) LEFT HAND BLADE LIFT. (Pull back to raise blade. Push forward to lower blade).

(4) MOLDBOARD SIDE SHIFT. (Pull back to shift left direction. Push forward to shift right direction).

(5) CIRCLE SIDE SHIFT. (Pull back to side shift left direction. Push forward to side shift right direction).

(6) FRONT STEER-WHEEL OR LEVER TYPE. (Clockwise-steer right, counter clockwise-steer left).

(7) REAR STEER. (Pull back to steer right. Push forward to steer left).

(8) RIGHT HAND BLADE LIFT. (Pull back to raise blade. Push forward to lower blade).

(9) SCARIFIER. (Pull back to raise scarifier. Push forward to lower scarifier).

(10) ENGINE SPEED CONTROL. (Pull back to increase speed. Opposite to reduce speed).

(11) CIRCLE LATCH. (Step on pedal to release the circle latch). Not used with solenoid type latch.

(11A) CIRCLE LATCH. (Solenoid Operated) Squeeze button to release the circle latch.

(13) TRANSFER CASE GEAR SHIFT. (See page 3 for shift chart for speeds).

(14) TRANSMISSION GEAR SHIFT. (See page 3 for shift chart for speeds).

(15) CLUTCH PEDAL. (Step on pedal to release clutch. Do not ride this pedal with your foot).

5. PREPARING GRADER FOR BLADE OPERATION.

After completely lubricating and fueling the grader and learning the location and method of the various controls proceed as follows:

(1) Adjustment of Blade Tilting Links.

Loosen the four vertical and the two horizontal bolts at the links (22), page 57, Section 5.

For all general grading, set both tilting links in the central position.

When cutting hard pan, clay, or caliche, tilt moldboard back to suit local conditions.

Tilt moldboard ahead full distance for light maintenance or cutting ice.

(2) Cleaning Paint off Face of New Moldboard.

Apply paint remover to paint. Let set for a few minutes and rub clean using old cloth or sack. Always oil all moldboard faces at end of each day's work.

(3) Moldboard Extension.

Extensions are available in 1 ft. or 2 ft. lengths.

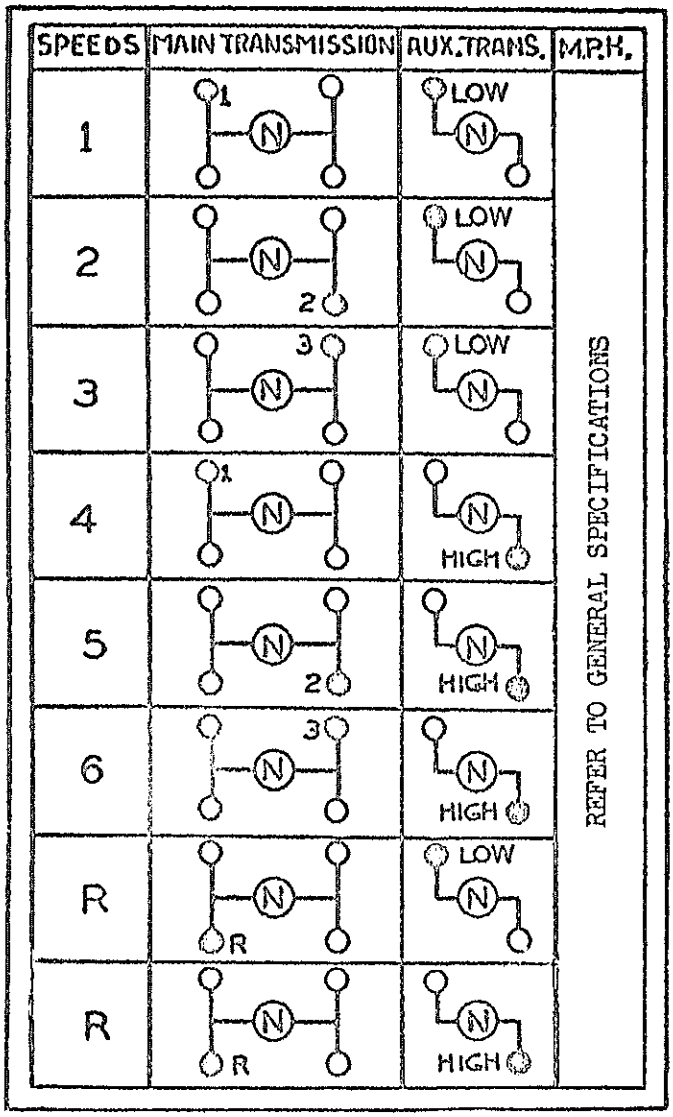
1 ft. or 2 ft. extensions may be placed on both moldboard ends, or, one of either length may be put on either right or left moldboard end and none on the other moldboard end. One extension cannot be added to another.

The standard length moldboard is 13 ft. (bits are 6 ft. and 7 ft).

The maximum length of moldboard, with extensions, is 17 ft.

NOTE: Always remove all extensions when doing heavy grading work.

See the repair parts book for bits and extensions repair part numbers. When ordering bits or extensions always show quantity of each part wanted together with the repair part number.



6. GEAR SHIFT CHART.

The 300 Series power grader is fitted with six forward speeds and two reverse.

The 1st and 2nd speeds are generally used when ditching, heavy road maintenance, bulldozing, and finishing. (When performing heavy work place the hand throttle in wide open position).

The 3rd and 4th speeds are used for heavy to light maintenance work and snow removal. Adjust throttle to suit operating conditions.

The 5th and 6th speeds are used in transporting machine overland.

CAUTION: Do not disengage Clutch or shift into neutral when descending hills. Do not clash gears when shifting. (Stop the machine when shifting).

7. ENGINE (General Information)

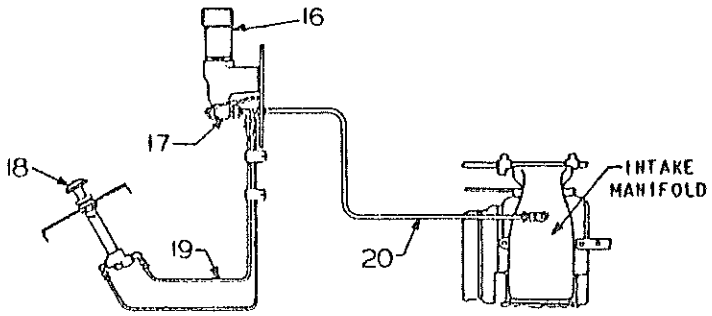
A. Starting the Engine.

1. Always place transmission in neutral before attempting to start engine.

2. Fuel supply, crankcase oil level and radiator coolant level should always be checked before starting motor is used.

3. Press down on clutch pedal before pressing the starter button. Do not operate the starting motor for prolonged periods of time and allow sufficient time for starting motor to cool before repeating the starting operation. (Refer to engine manual for details.)

4. Ether starting system for cold weather operations.



Ether Starting System

a. At low air temperatures the engine may require use of a cold starting aid consisting of a starting fluid primer. The above photo shows the location of the "Chevron" starting chamber (16) and hand primer (18). To operate this starting expedient proceed as follows:

(1) Unscrew (counter-clockwise) upper chamber cap of puncturing tool (16). Place one or two capsules of fluid (large or small, depending upon requirements established by trial) in the chamber. Screw (clockwise upper chamber cup tightly onto the lower chamber. Adjust engine throttle lever (10), page 2, Section 3, to starting position. Push puncturing plunger to bottom, thus puncturing capsule(s) and releasing fluid. Unlock primer plunger (18) by turning counter-clockwise. Simultaneously crank engine (starting button) and pump primer plunger (18) until engine starts. Continue to pump primer plunger until engine runs normally on regular fuel and until all fluid in entire applicator is injected into engine.

(2) Relock primer plunger (18). Again unscrew upper chamber cap of puncturing tool (16). Remove and discard empty capsule(s), observing precautions against fire and toxic hazards and cutting hand on barbs near bottom end of puncturing plunger. Again screw upper chamber cap (16) tightly into lower chamber. Occasionally remove the lower screen, located inside the chamber, and carefully clean out all broken pieces of capsules. Also remove the fitting which screws into the intake manifold and clean the small nozzle hole. Clogged nozzles, pipes, or base will prevent fuel from flowing into the intake manifold and result in hard starting.

PRECAUTIONS: Chevron starting fluid is highly inflammable, explosive, and toxic. Gelatine capsules dissolve in water and soften at high temperatures. Puncturing plunger carries barbs near bottom to help retract empty capsules from lower chamber. Therefore safe handling of fluid, capsules and plunger requires extreme caution in avoiding: Proximity of fluid capsules to open flame, sparks or hot surfaces. Spillage or leakage of fluid. Breathing of fumes from fluid. Contact of capsules with water. Subjection of capsules to high ambient temperatures (about 120° F.). Cutting of hand by barbs on puncturing plunger. "Chevron Starting Capsules" may be procured from your fuel oil supplier. These capsules are made by the California Oil Company, Barber, New Jersey, and sold under the trade name "Chevron Starting Capsules".

B. Engine Operating.

After the engine has started, check the oil pressure gauge. It should register approximately 30 to 50 pounds in 5 seconds time. If the engine is cold, and oil may be thick and viscous and will probably show a high pressure on the gauge for the first minutes of operation.

Operate the engine at minimum speed until the water temperature gauge starts to move.

Desirable cooling water temperature: 160-185° F. Check engine coolant level. Avoid prolonged engine idling.

A good operator will note loss of oil pressure or excessive water temperature and make the necessary correction immediately before the engine is damaged. The oil filter elements should be serviced as recommended in the engine service manual. Proper fan belt tension must be maintained for best cooling performance.

c. STOPPING THE ENGINE.

The engine should idle for at least three to five minutes before being stopped, the idling being necessary so the engine may cool off gradually and uniformly.

When an engine is running under load there are parts of it that will be hot, particularly the top of piston and bottom of the cylinder head.

Stopping suddenly without allowing the engine to cool will cause the water close to these hot spots to boil, creating steam with probable distortion of engine parts.

After the engine has been idled a sufficient length of time, push speed control lever (10), page 2, Section 3 forward. To stop engine, pull up on fuel shut-off. (If engine does not stop, pull up on the engine emergency shut-off control, until the engine completely stops.) The emergency shut-off control is for use in emergencies only.

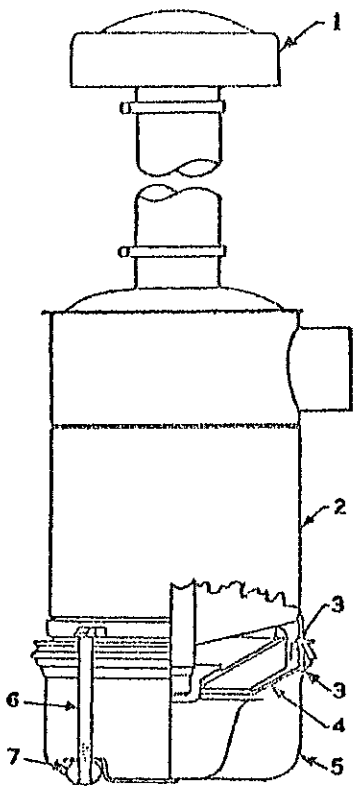
d. ENGINE MAINTENANCE.

Refer to engine operators and maintenance manual. For maximum engine efficiency and long life service, the engine manufacturers recommendations should be followed at all times. General cleanliness and visual daily inspections will detect minor adjustments and needed maintenance.

8. AIR CLEANER.

a. General

Clean air for combustion is assured by an oil type air cleaner. A heavy screen in the air intake cap (1) prevents



large particles from entering the air cleaner. The air then passes to the oil cup (5), where it goes through a bath of oil. As the air rises to the intake manifold it passes through a series of oil-bathed screens and the fine dust is removed. As the oil from the screens works back down, it carries the dirt with it and the dirt settles in the oil cup (5).

b. Refilling Oil Cup (Daily).

Loosen the two wing nuts (7) and remove the cup (5). Remove the lower tray (4) for cleaning purposes.

Clean and completely refill the oil cup every day, or after every eight hours of operation (every two or three hours when operating under dust conditions). Refill the oil cup (5) to the oil level bead with grade of oil specified on page 1, Section 2. (Fill the inner cup also). Note that the oil level mark is on the inside of the oil cup. Do not overfill the oil cup.

Before replacing the oil cup, clean or wipe any oil or grit from the top bead of the oil cup and the removable tray. The lower tray (4) and the oil cup (5) are fitted with rubber gaskets or "O" rings (3) to insure an airtight connection at these points. Caution must be used to be sure these "O" ring gaskets are in place and undamaged when the air cleaner is serviced. If "O" rings are cut or damaged they must be replaced.

c. Washing the Cleaner.

(1) After every 40 hours of operation, particularly if the air is heavily laden with dust, chaff, or lint, remove the entire air cleaner from the engine, completely disassemble it and wash the parts thoroughly in kerosene.

Be sure to clean out the air intake pipe.

After all the parts have been thoroughly cleaned, replace the air cleaner body on the power unit. Make sure all joints are air-tight and pipes lined up.

Replace the air intake cap.

Completely fill the oil cup (5) to the proper level with the specified grade of oil and replace it on the air cleaner. Be sure it is held securely in place and that the cup clamps (6) are tightened equally.

d. Air Intake Cap and Screen.

The screen in the air intake cap (1) prevents chaff and other coarse dirt from getting into the air cleaner.

This screen should be checked every 40 hours and kept clean and free from all chaff, oil, dust, or paint, as clogged holes in the screen will reduce the power of the engine by restricting the flow of air.

e. General Precautions.

As an added precaution against dirt getting into the engine, frequently inspect the flexible rubber hose connection between the air cleaner and the cleaner pipe. If it shows any sign of deterioration, replace it.

Inspect the air cleaner hose clamps periodically, keeping them in place and drawn up tight.

CAUTION: Failure to service the air cleaner as explained in paragraphs (b), (c) and (d), will result in dust entering the engine, causing rapid premature wear to the internal engine parts, such as piston and sleeve groups, also valves and crank shaft assembly. The costs are borne by the owner, including labor parts installation.

9. ELECTRICAL EQUIPMENT. (12 volt system)

a. Adjustment.

Improper adjustment of any of the electrical units may result in serious damage to the equipment.

It is recommended that unless the mechanic is familiar with the operation and adjustment of the units, he make no attempt to do this work.

If repair or adjustment is required, it is suggested that a qualified electrical mechanic do the actual work, as he will have the necessary testing equipment and technical information required to perform this job.

Before working on any part of the electrical system, first disconnect one battery cable. Do not reconnect the cable until all other equipment has been connected. This will avoid shorting and causing damage to any of the electrical units.

Be sure all terminals are clean and securely fastened and that there are no broken wires anywhere in the electrical system.

b. Specifications.

The wiring diagram of this 12 volt wiring system is shown on page 23 and 25.

The "Positive" side of the batteries is grounded at the starter.

The starter is solenoid operated, with starter switch button located at the operator's position.

The standard generator, with standard regulator, is 12 volt, 375 watt capacity. Also see General Motors Operator's Manual for further general instructions.

Extra heavy duty generator equipment is available where additional load is placed on the electrical system. Consult Parts Catalog for information.

For accessory wiring diagram, see page 22, Section 3, of this manual.

10. STORAGE BATTERIES.
(Located Back of Operator's Seat)

a. New storage batteries should be registered with the nearest battery service station.

b. The batteries store the current produced by the generator and energize the starting motor and the electrical controls that are part of the electrical system. See that the batteries are kept fully charged. In extreme cold weather, the terminal voltage of a battery drops as much as 30%, and it is sometimes advisable for quick starting to connect an additional six volt battery in series. The additional battery should be removed as soon as engine is started. Connect the batteries to the unit. See Wiring Diagram, page 23 and 25. On initial start be sure to polarize generator.

Check the electrical connections on the ammeter, starting motor, starting switch, generator, and voltage regulator.

Keep all battery terminals clean and tight. Loose connections cause the voltage regulator to chatter, which may result in early failure of the regulator. If terminals show a tendency to corrode, clean and apply a thin coat of vaseline. Keep the outside of the battery clean. Neutralize any electrolyte on the surfaces with a cloth saturated with ammonia or bicarbonate of soda (one pound of soda to one gallon of water), then wash off and dry.

c. Vent Holes. Keep vent holes in battery filler caps open.

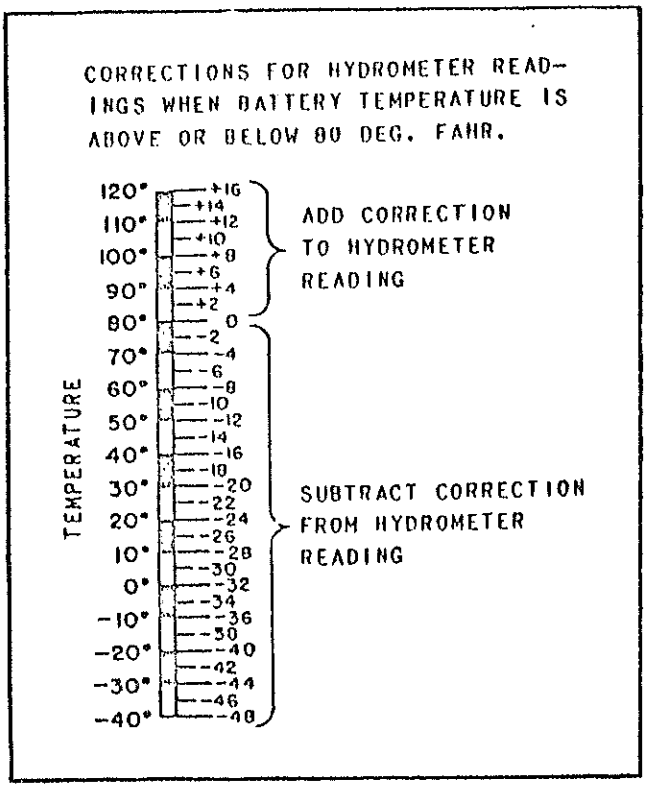
d. Electrolyte Level. The electrolyte in each cell should be 3/8" above the separators. Keep the electrolyte up to this level at all times to prevent battery failure. When the electrolyte falls below this level, pure distilled water should be added. Never use hydrant water or any water which has been in a metal receptacle. Keep pure distilled water in a glass jar on hand for battery use only. To put water in a cell, use a clean syringe. When adding water to the battery in temperature near the freezing point (32° F.), always operate the engine long enough to mix the water and the electrolyte, or damage to the battery from the water freezing will result.

> CAUTION: Acid or electrolyte should never be added except by a skilled battery man. Under no circumstances add any special battery "dopes", solutions, or powders.

e. Specific Gravity of Electrolyte. The specific gravity of the electrolyte indicates the relative condition of the battery charge and warns when it may be necessary to increase the generator charging rate or to recharge the battery.

Inspect the battery once a week or more often to maintain correct specific gravity. Specific gravity reading of at least 1.250 corrected to 80° F. should be maintained (see chart).

If the specific gravity of the electrolyte is less than the required figure in the chart, the generator charging rate should be increased, or the battery should be recharged with standard auxiliary battery recharger.



Hydrometer Reading Correction Chart

When testing for specific gravity, use both a battery hydrometer and thermometer. Remove the filler caps. With the thermometer, test the temperature of the electrolyte. Then insert hydrometer in each cell and determine the specific gravity reading.

Specify gravity readings should not be made immediately after water has been put into the battery. Take readings either before the water is added or after the battery has been on charge for sometime.

All cells should show approximately the same specific gravity reading. Wide variation indicates something wrong. See your nearest battery service station.

f. Battery Voltage. With the battery fully charged, and on charge at the normal rate, the average cell voltage at 80° F. ranges between 2.5 and 2.7 volts; at 100° F., between 2.4 and 2.6 volts.

11. COOLING SYSTEM.

a. Operation.

The cooling system automatically maintains the most desirable engine temperature under normal operating conditions.

When the engine is started cold, a thermostat of the by-pass type prevents circulation to the radiator and allows the coolant to circulate only through the cylinder head and around the cylinders of the engine. When an efficient operating temperature has been reached, the thermostat is wide open and the by-pass is closed, allowing the coolant to circulate through the engine block, cylinder head, and radiator.

Check the tension of the fan belt frequently. Keep radiator filled with clean, soft, fresh water. Radiator fins must be kept free of accumulated dirt, leaves, insects, etc. Remove the hood sides to assist in better ventilation at the radiator core fins.

b. Radiator Core.

Overheating is often caused by bent or clogged radiator fins. If the spaces between the fins become clogged, clean them with an air or water hose. When straightening bent fins, be careful not to injure the tubes or break the bond between the fins and tubes.

c. Filling Cooling System.

Close the drain in the bottom of the radiator.

Filling the radiator with water to a level slightly below the bottom of the filler neck will allow for expansion of the coolant under normal operation conditions. Soft, or rain water is recommended as it does not contain minerals which form scale and eventually clog the passages.

d. COLD WEATHER OPERATION.

(1) Keep the radiator filled with a good anti-freeze mixture ("Ethylene Glycol"), or if the system is drained nightly, the introduction of warm water added slowly will facilitate starting.

(2) When operating temperature is 32° F. (0° C.) or lower, there is danger of the water freezing in the cooling system. To overcome this condition use one of the recommended anti-freeze solutions.

Before filling the cooling system with anti-freeze, drain and clean the system. Refill system following instructions in paragraph (c), page 8, section 3, and check the radiator, water pump, all gaskets, and hose connections. If any leaks are found make repairs before filling with anti-freeze.

(3) Drain the cooling system by opening the drain at the bottom of the radiator and engine block. Remove the radiator fillercap. See that the drain is not plugged and that the water drains out completely. Anti-freeze solutions. Never mix anti-freeze solutions, as it will be difficult to determine how much protection against freezing the solution has.

Never use honey, salt, kerosene, fuel oil, glucose or sugar, calcium chloride, or any alkaline solution as an anti-freeze.

Do not use denatured alcohol as an anti-freeze if other materials are available, because it boils at 173° F. If it is necessary to use alcolhol, check the solution frequently with the hydrometer to be sure you have adequate protection for the prevailing temperature. Replenish solution when necessary at your responsibility.

(4) IF NO ANTI-FREEZE IS AVAILABLE drain the cooling system completely after operation. Before refilling, cover the radiator completely, start the engine, and fill the system immediately with water. This will prevent the radiator from freezing during the warm-up period.

12. FUEL SYSTEM.

Keep the diesel fuel tank well filled to avoid condensation of moisture within the tanks. Be sure the vents at the fuel tank are open and the cap is on tight.

First and second stage fuel filters should be checked and elements replaced at regular intervals. Suction lines from fuel tank to filter should be checked for air leaks. Low pressure fuel lines should be checked and replaced if there are any signs of deterioration or cracks.

a. SAFETY FIRST! Never fill the fuel tank when near an open flame or when the engine is operating. When pouring in the fuel keep the funnel and container in contact with the metal of the tank to avoid the possibility of an electric spark igniting the fuel. Never light matches near the tank vent, as the air within several feet is permeated with a highly explosive vapor.

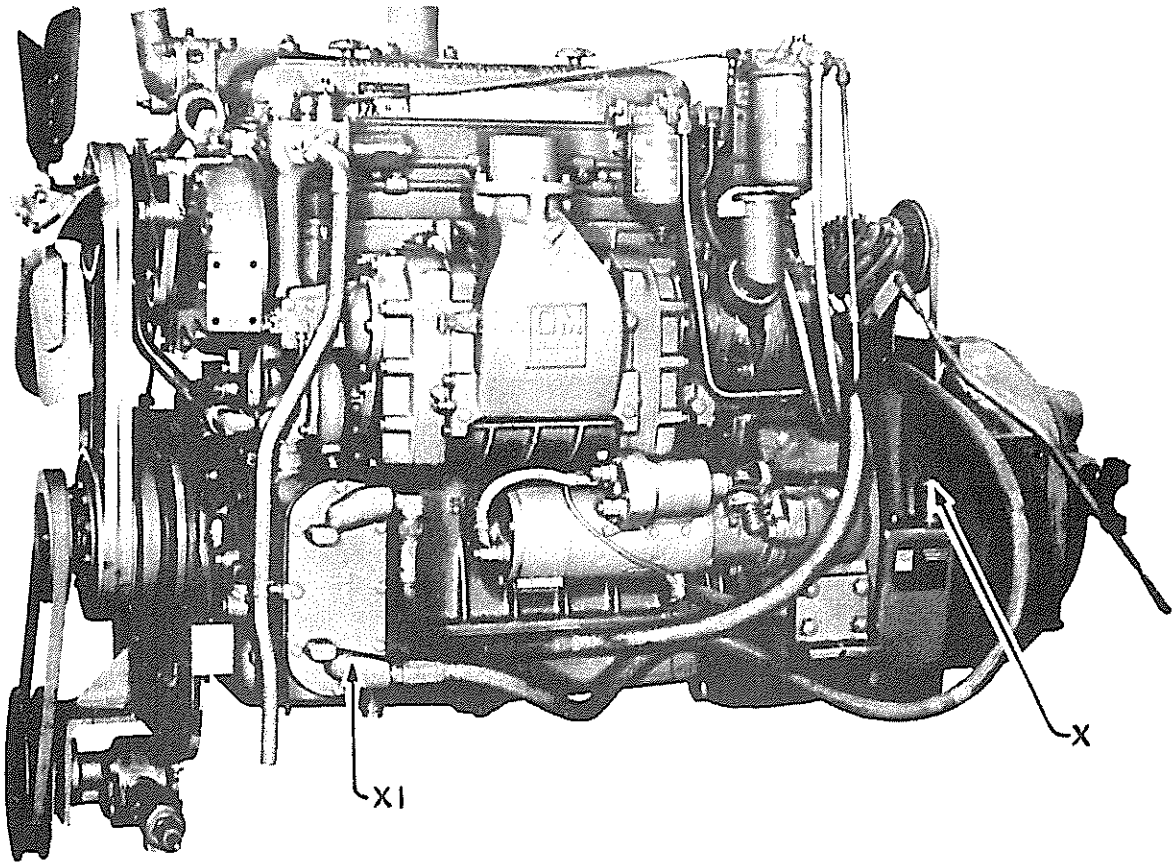
13. TORQUE CONVERTER OPERATION.

The torque converter acts as a fluid coupling between the power unit and the transmission. By use of a tail shaft governor used in conjunction with the torque converter, we are able to maintain constant operating speeds. For normal operation the throttle control should be set at approximately 2/3 to 3/4 speed. This throttle setting will allow the tail shaft governor to automatically increase the engine speed as the machine undertakes increased loads. For proper operation of these units the linkage must be properly adjusted. (See Section 5)

14. ALLISON TORQUE CONVERTER.

a. Operation Information.

Normal operating temperature for the Allison Converter is approximately 220° F. The initial warm up period is a very important part of the converter operation. The engine should be run at idle speed until the converter oil has reached the minimum operating temperature. If temperature rises above normal, the transmission should be shifted to a lower gear.



Allison Torque Converter Assembled to GM-471 Engine

Do not operate machine if oil temperature exceeds 250°.

Normal operating pressure of the Allison Converter is 15 - 25 psi.

b. Simple Maintenance.

Because the converter has only four major moving parts which are running in oil, the job of maintaining the converter is relatively simple. The oil level should be checked daily and an eye kept open for oil leaks.

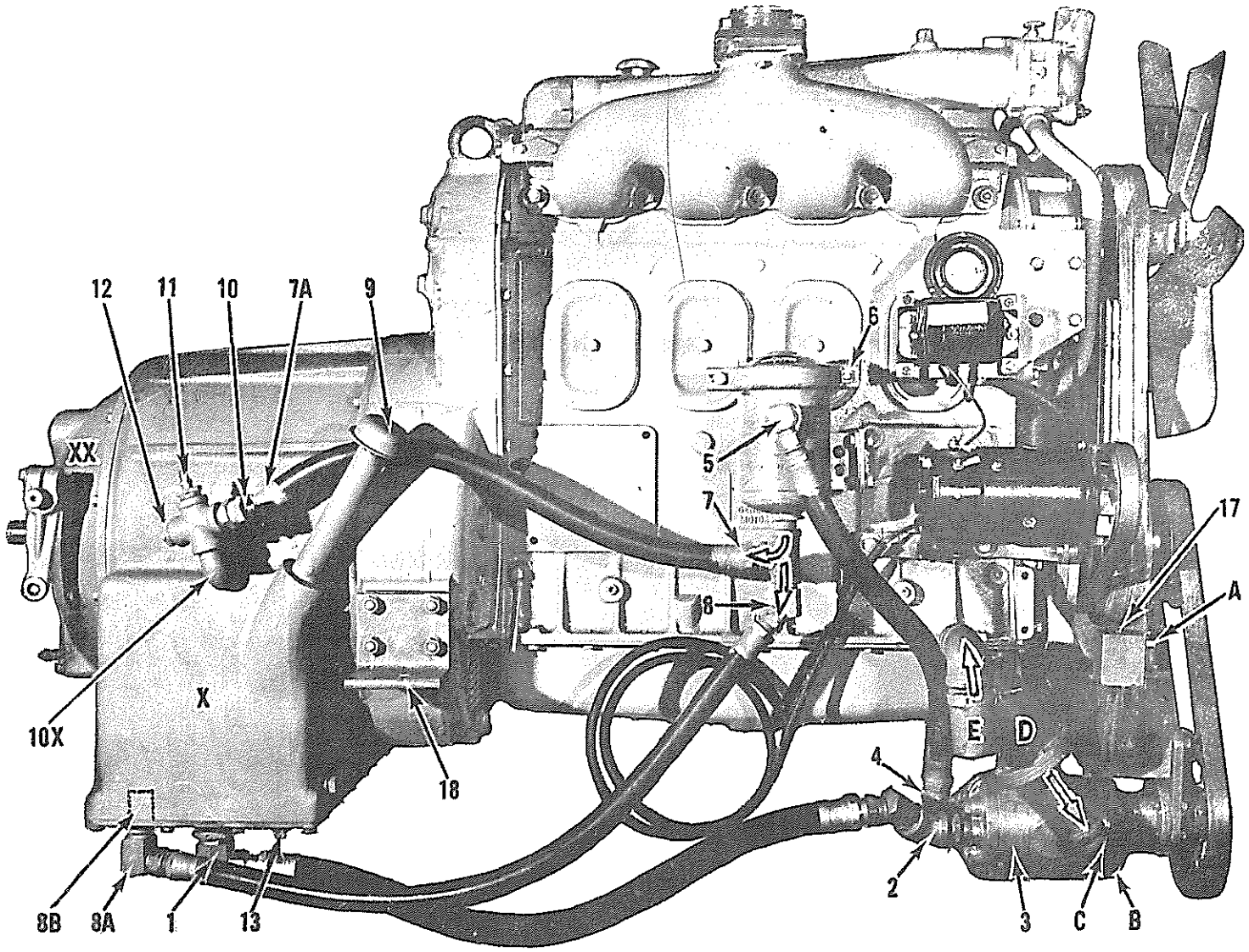
(1) Checking Oil Level.

How to Check Oil Level. The oil level must be checked while the converter is operating, engine idling. Withdraw the dip stick (X) shown above, wipe it off, then insert it, making certain it is "bottomed". Pull it out and check the reading. If the oil is at, or below, the add mark, bring the oil level up to the "full" mark. Do not overfill the converter, for too much oil will cause foaming and high oil temperature.

(2) When to Change Oil. Oil must be changed every 500 hours of operation (or whenever oil shows traces of dirt caused by the effect of high operating temperatures.)

(3) Type of Oil. (Please also read next item 4.) For Allison converters having the external by-pass valve converters under serial #8072) is Type "A" automatic transmission oil.

(4) Type of Oil. For Allison converters serial #8073 and up, having the internal by-pass valve, use the following oils. For +10° and higher use automatic transmission oil, Type C. For tempertures lower than +10° use automatic transmission oil Type A.



15. A-W TORCON CONVERTER. For use with GM-471 or Cummins C-160 Diesel engine. Used with Transmission, and Transfer Case group shown on pages 17 to 22, Section 5.

A. Converter (X) is of A-W design; however, the 14" internal Turbine is made by Clark Equipment Company, group #CT-374-1. Hydraulic Transmission Fluid, Type A, is used in the oil reservoir. The maximum hot oil pressure at wide open throttle (grader stopped) is 40-50 PSI. For most efficient operation, the converter oil temperature should be kept between 200° F. and 240° F.
CAUTION: Never let the converter temperature exceed 250° F. Downshift first.

B. The above photo show the left side of the GM-471 Engine, the Converter (X) with dry clutch (XX) attached, also the two stage Hydraulic Pump reference (3).

C. The pump (3) has two separate internal pumping compartments.

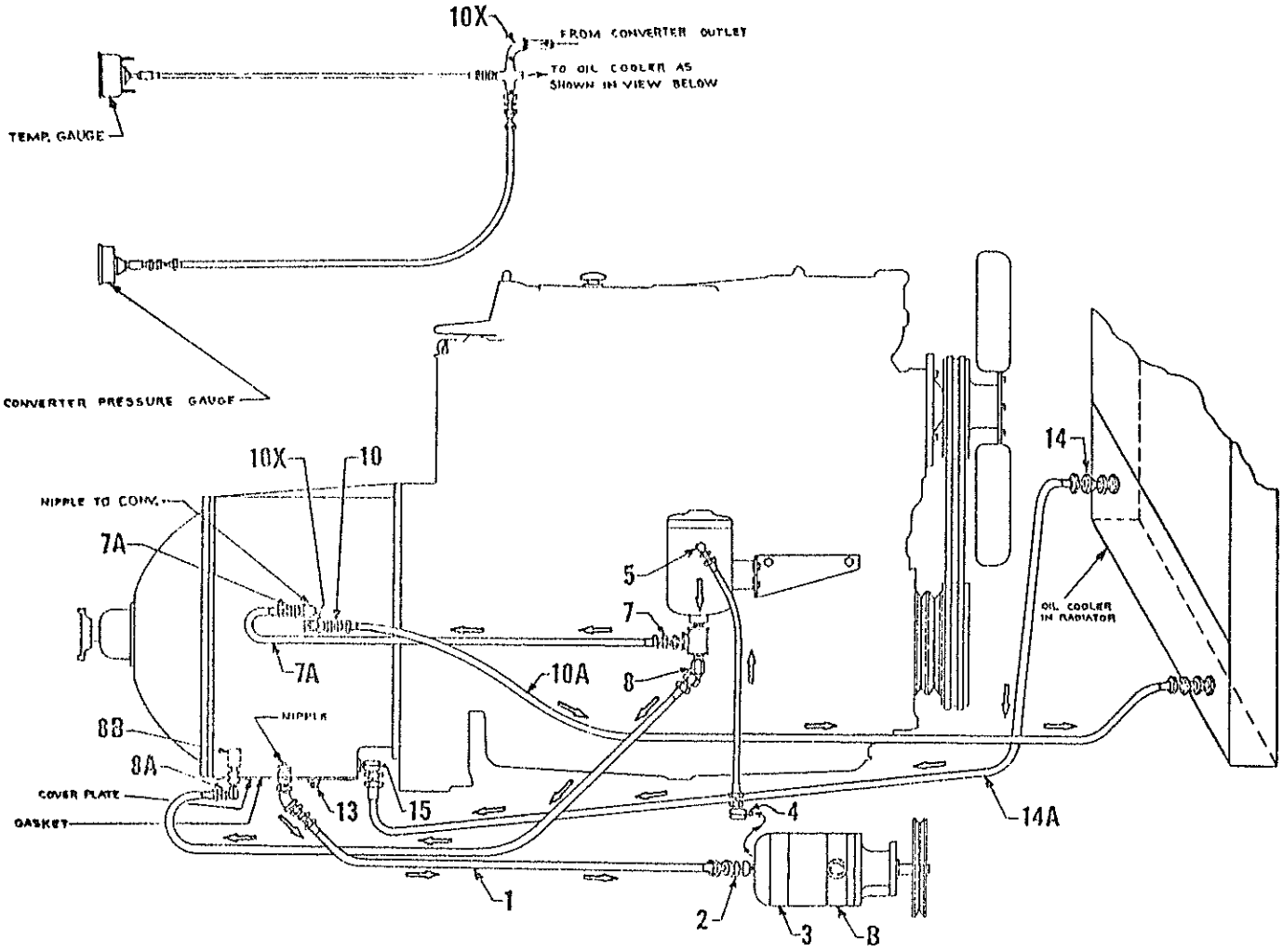
First Compartment. For power steering and grader controls.

Arrow (B) points to the end which pumps SAE-10W oil, required for steering the grader and moldboard controls. It draws oil from the oil reservoir hose Ref. (6) page 16 The oil flows up the suction hose (E), (see above), then down through the cleanable oil strainer (D), then down into the suction side of the pump (C).

Second compartment. For Converter operation.

CAUTION: There is an internal seal group which separates compartment (B) from compartment (3).

Arrow (3) points to the end which pumps type (A) fluid from the Converter oil circuit The oil flows as follows: From the bottom of the reservoir through line (1) to Ref. (2)



The above shows the A-W Torcon Converter piping diagram.

(see above diagram), then through the suction side of the pump, then out at fitting (4) and up to the filter inlet port (5). After the oil is cleaned by the internal filter element, the oil flows downward through the hose (7) and (7A), thereafter it flows inward to the converter as shown in the above diagram.

On a cold start when the oil does not flow readily through line (7), the oil may momemtarily flow downward through line (8) and (8A), then upward through the internal relief valve (8B) inside the reservoir. (see above)

The hot return oil flows from the converter through the following lines: From fitting (10) through piping (10A) to the oil cooler located in the bottom of the radiator core. After the oil is cooled it flows through line (14A) to the bottom of the reservoir return fitting (15).

D. CONVERTER FLUID.

Use Hydraulic transmission Fluid, Type A.

1. The reservoir oil level bayonet gauge and filler cap is item (9) page 11. Check the oil level every 8 hours of operation, with engine idling. Keep the level to the full mark on the gauge. Cleanliness is important.

2. The reservoir lower drain plug is Ref. (13). The converter oil temperature bulb is attached at the threaded port (12). The Converter oil pressure gauge tubing is attached at fitting (11).

E. CONVERTER OIL FILTER. See group (6) page 11.

1. Removal of clamp ring (6) and the cap will expose the inner removable non-cleanable element. Cleanliness is important, therefore do not remove the cap until it has first been washed and dried.

2. Never try to wash or clean or reuse the old element. Carefully lift the old element out of the housing. Proceed at once to install a new clean unused element and be sure to replace the cap group with new gasket as soon as possible, so that contamination will not find its way into the converter oil circuit. Cleanliness is important.

3. The part number of the filter element is Purolator Products Inc. 33316-13. The Purolator part number of the gasket is 62866.

NOTE: The Purolator part number of the filter group (all assembled) is 63148-3. The AW part number of the group is PGF-17270, one filter required per grader.

F. CONVERTER MAINTENANCE SCHEDULE.

1. At first 50 hours of operation.

The element and "O" ring should be replaced after the first 50 hours of operation. Add fluid as required. Cleanliness is important. Use clean dispensing containers. Do not use flushing oil for internal cleansing purposes. Entrapped flushing oil will contaminate the refill.

2. At first 100 hours of operation.

Remove the oil drain plug Ref. (13) page 10 to drain the fluid from the reservoir. Do not use flushing oil.

To refill the reservoir proceed as follows:

Cleanliness is important. Reinstall drain plug (13). Remove breather cap (9) and pour quantity of unused, clean Hydraulic Transmission Fluid, Type A, into the reservoir at filler tube (9).

Repeat filter element installation as shown under Paragraph E, sub-paragraphs 1, 2, and 3.

Start and idle the engine at slow speed, and continue to fill until the fluid remains at the full mark on level bayonet gauge.

Converter fluid level is always measured with the converter in operation, and at engine idle speed.

3. After schedule number 2, and every 500 hours of operation thereafter, repeat filter element installation as shown under paragraph E, sub-paragraphs 1, 2, and 3.

4. Every 1000 hours of operation (cold or hot weather operation). Repeat fluid and filter changes as shown under paragraph F, sub-paragraph 2.

G. STARTING THE A-W TORCON CONVERTER.

The initial warm up period is the most important part of converter operation. After the engine has been started, the throttle should be left in idle position until the engine water and converter oil temperatures have reached the minimum operating temerature.

This method of starting will allow the viscosity of the oil in the converter to thin down enough so it will flow freely thoughout the converter's working parts.

The grader can be put to work at partial throttle and light loads, after the minimum warm up period has been completed.

Under no condition should the grader be put to heavy work, immediately after starting the engine. Always allow the engine ample time to warm up at low throttle setting.

H. Always consult the Lubrication and Preventive Maintenance section, as shown in the General Motors or Cummins Diesel Engine Operator's Manual, packed in the tool box and shipped with the grader.

I. The A-W Torcon serial number will be stamped into a name plate attached to the lower right side of the reservoir. The Turbine serial number will be stamped below the A-W serial number. The Turbine itself will have the same number stamped into the Turbine group.

J. TORCON CONVERTER TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Low converter pressure	Converter pressure regulating valve stuck open.	Check regulating valve for dirt and foreign matter; clean or replace.
	Low oil level	Add oil to proper level
	Worn oil pump	Replace
	Worn piston rings.	Trouble is internal and will require complete teardown.
High converter oil pressure	Converter pressure gauge	Check gauge and replace if necessary
	Oil cooler restricted	Check oil lines to oil cooler and oil cooler, for restrictions. Clean or replace.
	Converter pressure regulating valve stuck closed.	Check regulating valve for dirt and foreign matter; clean or replace.
	Oil too heavy	Check oil weight, oil for converter, must be Type "A", Automatic Transmission Fluid.
	Cold oil	Converter pressure in cold weather will vary; as soon as converter gets hot, pressure should drop.
Over-heating	Oil level too high	Lower to proper level
	Converter safety valve stuck open.	Check safety valve for dirt and foreign matter; clean or replace.
	Line to oil cooler or oil cooler restricted causing safety valve to stay open.	Clean oil lines to cooler and oil cooler; replace if necessary.
	Oil cooler too small	Install larger cooler
	Worn oil pump	Replace oil pump
	Worn piston rings	Rings are internal and a complete teardown will be required to replace piston rings and "O" rings.
Noisy converter	Low oil level	Fill to proper level
	Worn coupling gears.	Replace
	Worn oil pump	Replace
	Damaged bearings	A complete teardown will be necessary to determine this; replace if necessary.

16. HYDRAULIC SYSTEM.

a. General.

The hydraulic system on A-W power graders is sealed in its entirety, except for the breather filler cap.

It consists of an anti-foam reservoir, filters, pump, control valves, rams, and necessary piping.

It requires periodic attention, and this can be summed up as shown in the following paragraphs.

b. Hydraulic Oil.

1. The oil in the hydraulic system can be contaiminated by dust of a gritty nature that is finer than the openings in the screen of the hydraulic oil strainer. By maintaining the quality of the oil in the hydraulic system, you increase the life of the pump, valves, and rams, and you also keep your machine at a high degree of efficiency. Change the hydraulic oil at least twice a year, flushing out the supply tank thoroughly, using clean hydraulic oil only. Keep oil supply free from dust. Use clean cans when changing oil.

2. The kind of oil to use in the hydraulic system is SAE-10W for temperatures above 32° F. For temperatures below 32° F. use SAE-5W. Using a heavier oil than the above will cause air bubbles and foaming. Either a paraffin or asphalt base oil will be acceptable.

c. Reservoir. (See page 16)

1. Consists of an extended filler tube with cap at the top. A cleanable screen is provided at the inner end of the filler tube.

2. Removable clean out cover.

3. Vent.

4. Keep oil level between the two cocks.

5. This is the high pressure oil line which goes to the left end of the valve bank, at the operator's position.

6. Oil flows from the reservoir to the suction side of the hydraulic pump.

7. Drain plug location.

8. This is a vertical internal baffle plate, which is welded in place. Its purpose is to force all returned oil to raise upward and then flow over to the internal suction pipe opening (6).

9. When the relief valve discharges oil into the reservoir the oil is diverted downward through an internal tube. The oil then flows upward; see arrows showing the direction of oil flow to the oil suction pipe (6).

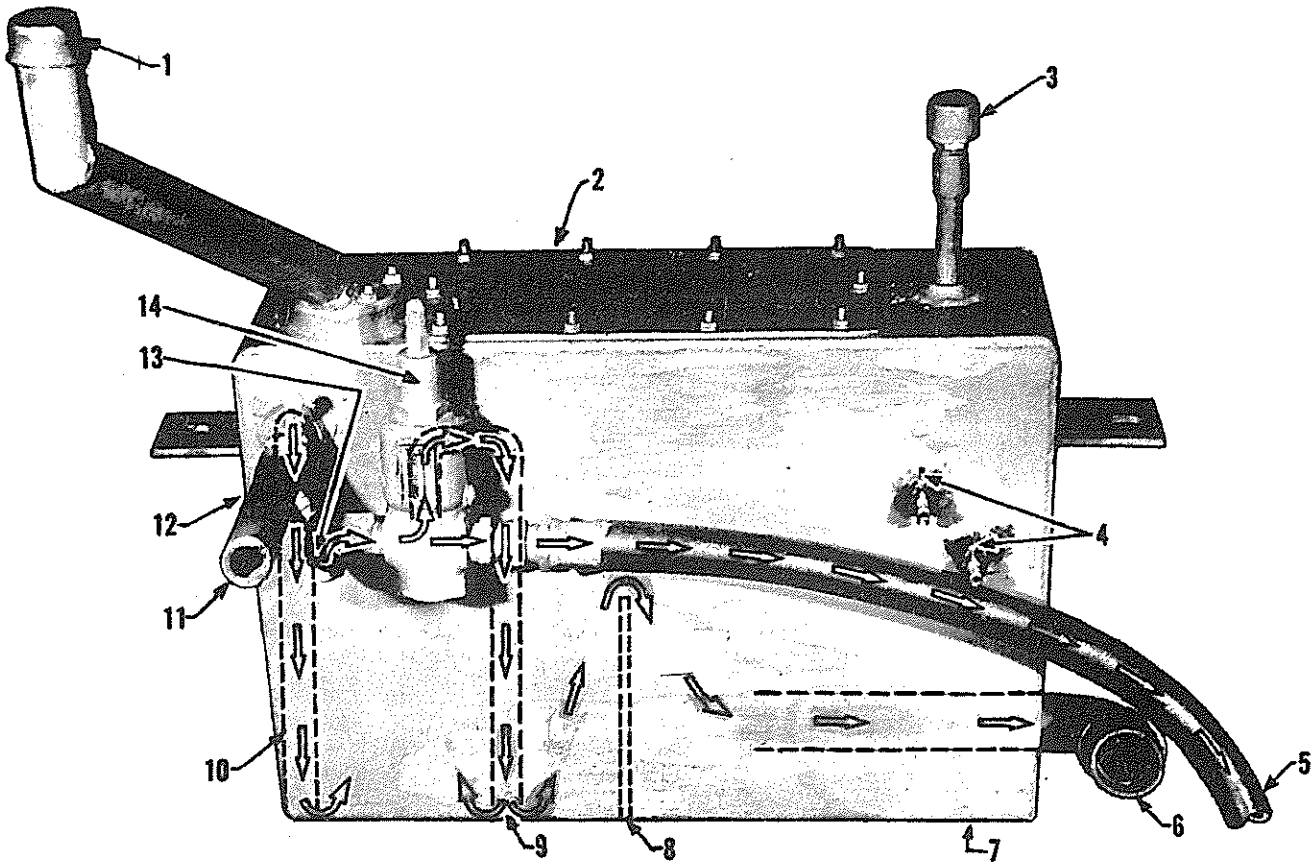
10. Low pressure oil returned to the reservoir from the right end of the hydraulic bank eventually returns through piping and a hose (11), then flows downward through an internal pipe.

12. Slight oil seepage at the hydraulic valve bank is returned via piping to the reservoir at a port near ref. (12).

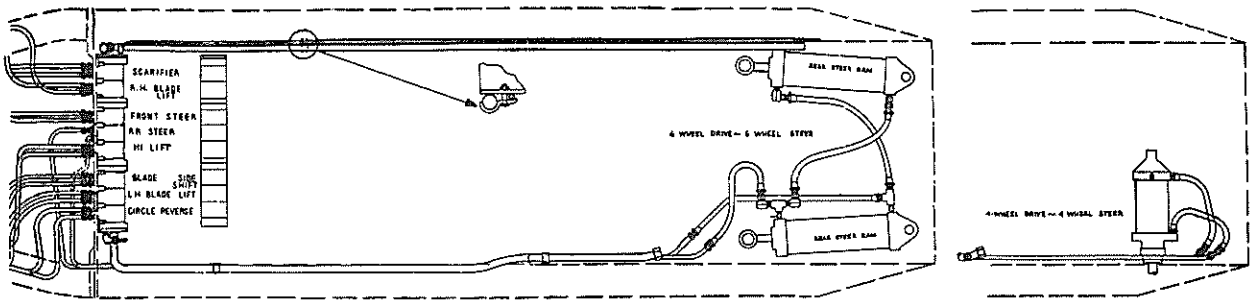
13. This is the high pressure oil fitting which receives the oil from the high pressure side of the hydraulic pump.

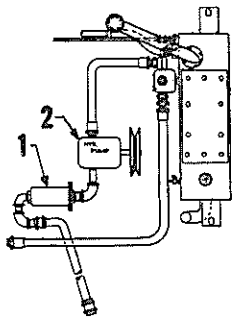
14. The spring loaded relief valve is set to unload at 1500 PSI on super machines and 1200 PSI on pacer models.

Never attempt to set relief valve without using a pressure gauge, as too high a relief valve setting will materially shorten the life of hydraulic working parts or damage other units in the hydraulic system.



THE ABOVE PHOTO SHOWS THE HYDRAULIC OIL RESERVOIR.





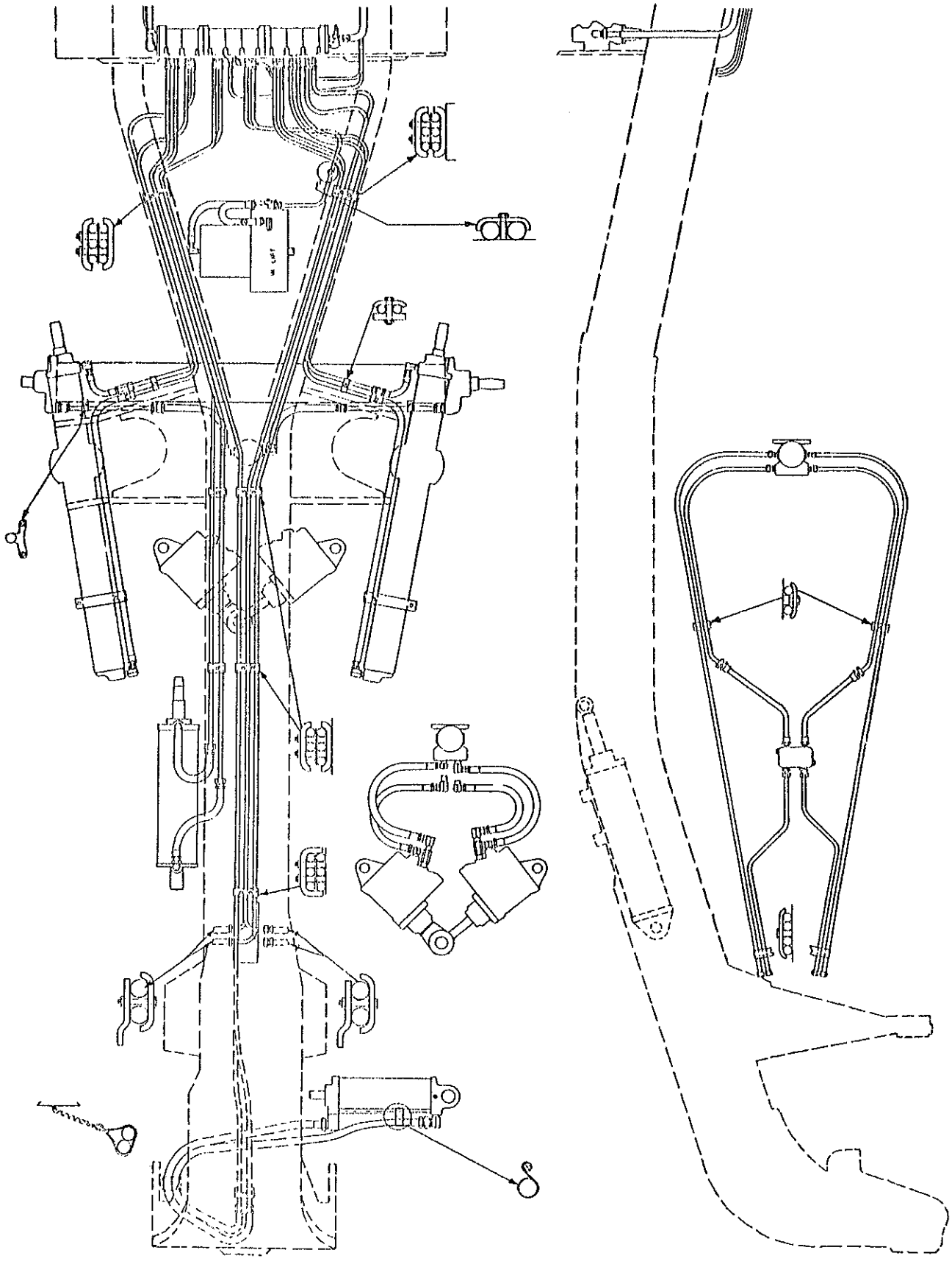
d. Pump Strainer.

1. The strainer (1) shown at right, is located in the suction supply line between the reservoir and the hydraulic pump (2).

This strainer will probably need more attention than any other item and should be your first thought in case of sluggish operation or failure of the oil to properly move the rams.

2. To clean the strainer, unbolt the body (1) from the head. Remove the screen, and wash it out thoroly with air and kerosene, and reinstall.

Should loss of power occur (slow action in rams or a howling noise in the pump), your trouble is most likely due to a clogged screen in the hydraulic oil strainer, or to the quality of oil used.



17. PIPING DIAGRAM FOR "PACER AND "SUPER" GRADERS. TILLER BAR STEER.

18. HYDRAULIC PIPE FITTINGS, HOSE AND PIPING.

a. Hydraulic Pipe Fittings.

CAUTION: In reassembly, pull nut up finger tight and then give one-fourth turn only with a wrench. This is important and must be observed when disconnecting and reconnecting established lines.

To install a new pipe or fittings proceed as follows:

Step 1. Cut Tubing Square.

Use a tube cutter with a rotating cutting wheel, or cut with a saw. Then file or grind end reasonably square. Remove burrs.

Step 2. Assemble Nut and Ring to Tube.

Make sure head of sleeve (A) is toward nut.

Step 3. Insert Tube into Fitting.

Make sure tube rests squarely on shoulder point (B).

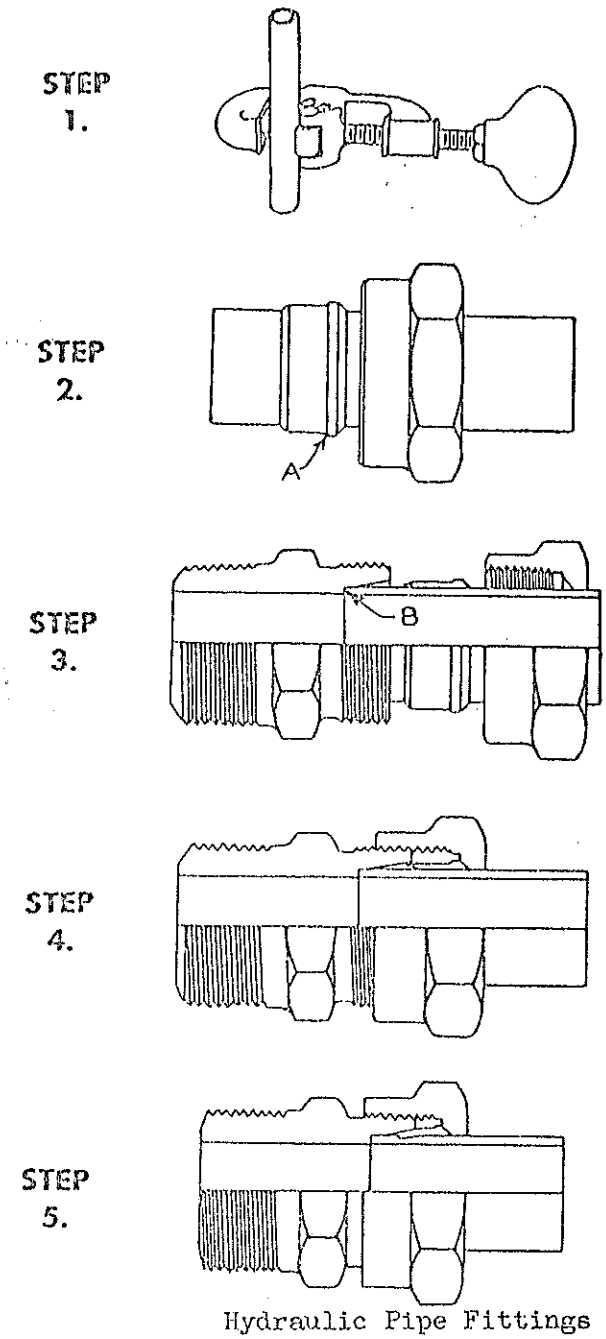
Step 4. Tighten Finger Tight.

Bring nut down on sleeve and make finger tight, as shown in illustration Step 4.

Step 5. Tighten with Wrench.

Give nut one and one-half turns only with wrench to bring up as tight as shown in illustration Step 5.

CAUTION: Never tighten over two turns as this will distort the sleeve and tubing, thereby preventing a leak-proof seal.



Hydraulic Pipe Fittings

b. Hydraulic Hose.

The connecting hose is amply strong to stand the pressures encountered. Constant vibration may tend to loosen some of the fittings and they should be inspected occasionally and tightened with special wrenches provided.

c. Hydraulic Piping.

Always procure replacement piping from the nearest Austin-Western distributor.

19. TIRE INFLATION CHART.	"Pacer" Only		"Pacer" Only		"Super" Only	
TIRE SIZE	14.00 X 24, 12 ply		16.00 X 24 12 ply		13.00 X 24 & 14.00 X 24 12 ply & 10 ply	
	Inflation		Inflation		Inflation	
	Front	Rear	Front	Rear	Front	Rear
With or without Scarifier.....	25	35	20	25	30	25
With Bulldozer.....	30	35	20	20	40	25
With Snow Plow and Wing.....	35	55	25	40	40	30
With Rear Roller.....	20	45	20	45	—	—

Note, all tires listed above have 5° tapered bead seats, for use with inner tubes and flaps. Tubeless tires of sizes listed above having 5° taper bead seats may also be used.

The tire pressures shown in the above chart are ideal for maximum tire flotation and general construction.

20. TIRE MAINTENANCE.

A. Matching New Tire - New Grader. We recommend that all tires be matched to within 1/8" of the same rolling radius. Rolling radius is the distance (in inches) from the ground to the center of each wheel driving axle.

B. To match tires, proceed as follows: The grader should be on a level floor, carrying a correctly distributed rated capacity load. Example-See above chart for various attachments. Inflate the tires as shown.

Carefully measure the rolling radius at each tire as shown under paragraph A. Over inflation of 2 to 4 lbs. as required, will result in matched or uniform rolling radii at all tires.

C. The above is based on the assumption that all tires are of the same name brand, and same size, same number of plies, type of tread, and 5° Tapered Bead Seat.

D. Matched rolling radii will provide equal tire to ground traveling speed at all tires. This will result in higher tire mileage, satisfactory axle gear lubricant temperatures, and maximum work factor from the fuel as it is burned.

E. Matching Used Tires. Used Tires should also be held as shown under paragraphs A, B, and D. We recommend all used tires be of same size, same number of plies, bead seat, and nearly same type and height of lugs at the treads. When certain tire treads show a tendency to wear more than others, the worn tires (with wheels) should be removed and attached to the hubs at the opposite side of the grader. Rotation of tires is necessary in order to hold all tire treads to the same wear pattern and uniform height of all lugs. As tire treads wear it may be necessary to over-inflate certain tires as much as 5 lbs. in order to maintain uniform rolling radii within 1/8".

F. Retreaded tires should be installed in complete sets. (not singly-because retreaded tires generally are larger in diameter than new tires; therefore the establishment of uniform rolling radii becomes problematical.)

G. A-W Graders have differentials at the front axle; however, it is important that the same rolling radii be maintained at both right and left front tires. Failure to comply with this may result in the differential internal parts being subjected to unnecessary rotation and wear, when the grader is traveling in a forward or reverse direction.

H. The "Super", and "Pacer" graders do not have differentials at the rear axles. Excess tread skidding will be held to a minimum when the rear tires have equal rolling radius.

I. Unequal rolling radius will develop waste of the following types. Excessive fuel waste. Excessive tire wear, and replacement there-of. Overworking of the drive units and unusually high axle lubricant temperatures-which may lead to costly axle, and drive services.

J. When operating A-W graders at excessive side tilt, approaching a 2 to 1 slope, the tire inflation in all tires may be increased 10 lbs. over the pressures on chart. This increase in tire pressure when operating at or near a 2 to 1 slope will stabilize the tires and prevent them from rolling slightly sidewise on the rims. Damage to the tire sidewalls will be reduced when the additional tire pressure is raised by about 10 lbs.

When the construction slope work approaches a 3 to 1 slope, the tire pressure in all tires should be lowered to values as shown on chart, page 19.

NOTE: Tandem graders - those without the "A-W Front Wheel Drive"- at best can only be effectively used in 3 to 1 slope construction work.

K. WATER WEIGHTS FOR FRONT AND REAR TIRES. Not recommended or required.

L. TIRE CHAINS.

Tire chains may be used on all wheels in snow removal with standard size tires.

Tire chains must have cross chains every other side link. Never use tire chains having cross chains every two or three side links or more.

21. GM DIESEL ENGINE FUEL LINES. (Shown at right.)

1. Diesel fuel tank.

2. Fuel tank shut-off valve. (Valve must be open to run the engine.)

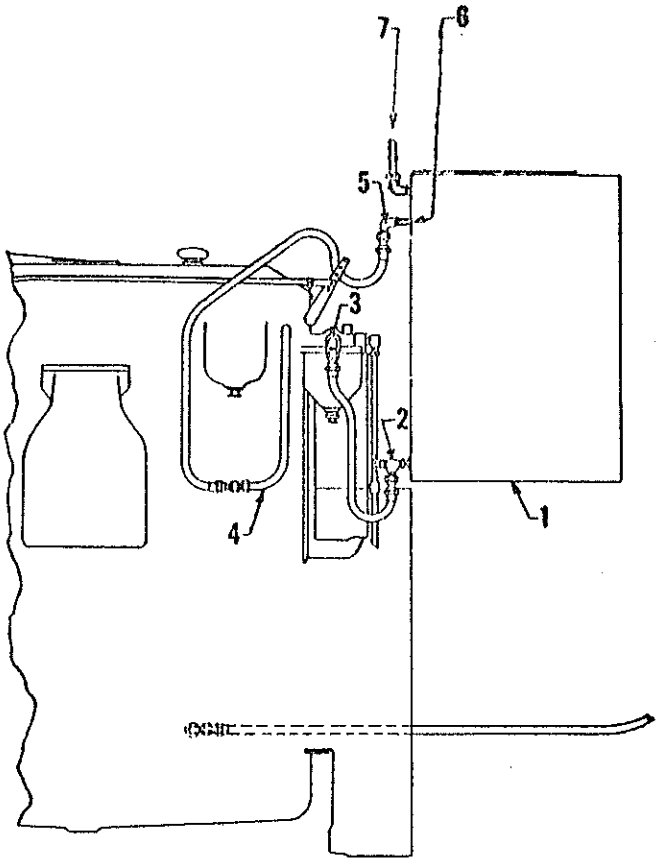
3. Fuel inlet to primary oil filter.

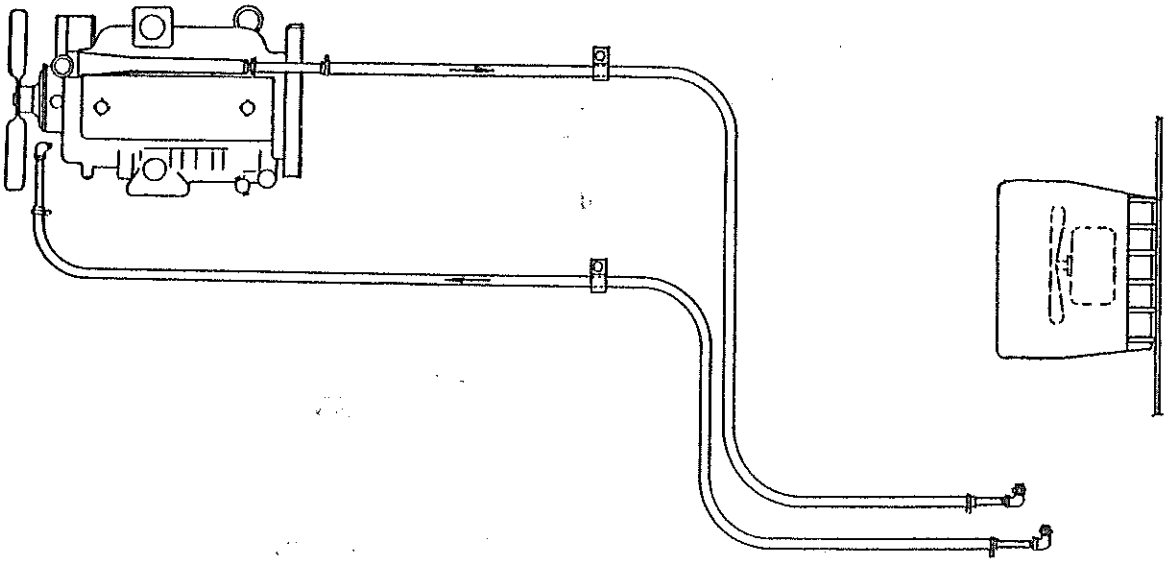
4. Fuel oil return line, (at engine block) to fuel tank (1).

5. Fuel oil return elbow near top of the fuel tank (1).

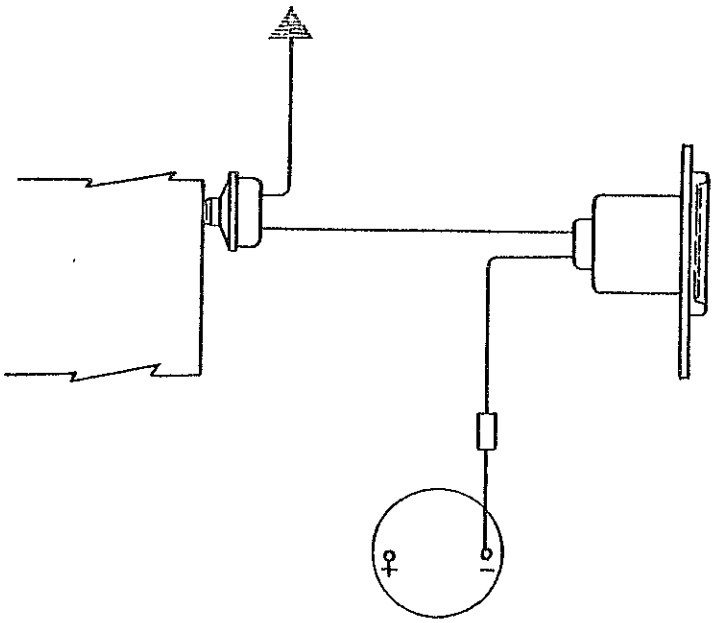
6. Return fuel oil is discharged at highest point in the fuel tank. The fuel drops down into the fuel tank.

7. The air being lighter is discharged outward at breather (7). Keep the breather open.

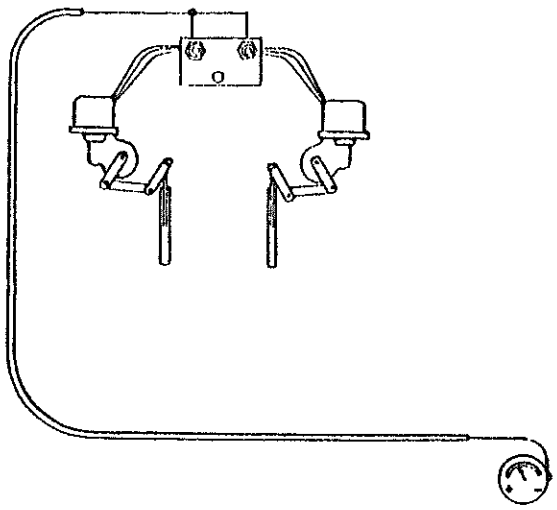




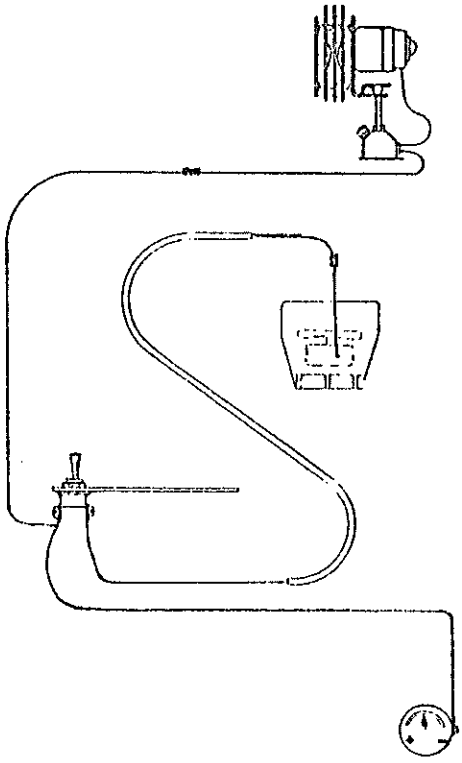
22. WATER HEATER AND PIPING - GMC-471 ENGINE. (See above and Repair Parts booklet for part number data.)



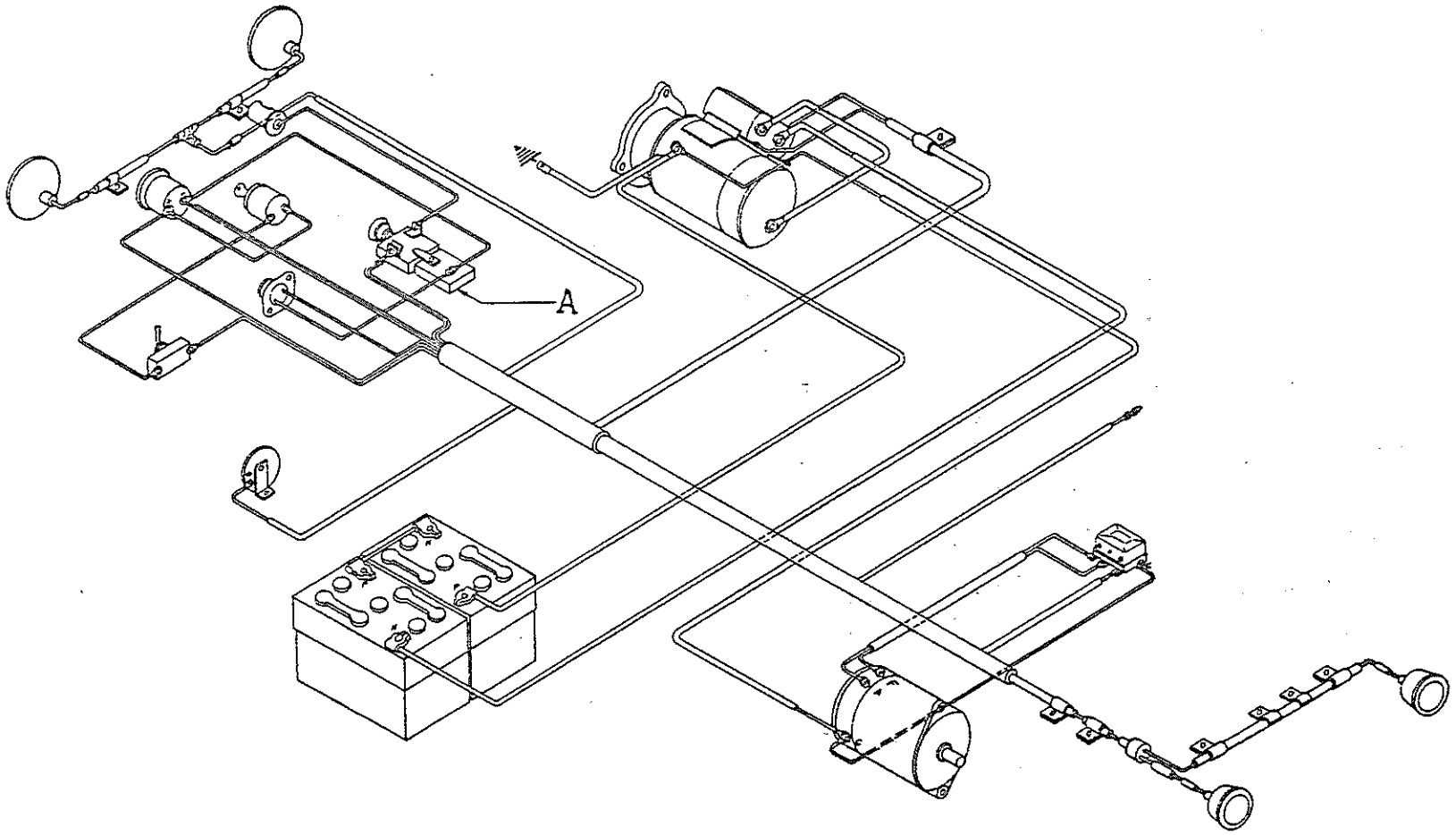
23. HOURMETER WIRING DIAGRAM.



24. WINDSHIELD WIPER WIRING DIAGRAM.
(See diagram above and Repair Parts booklet for part number data.)

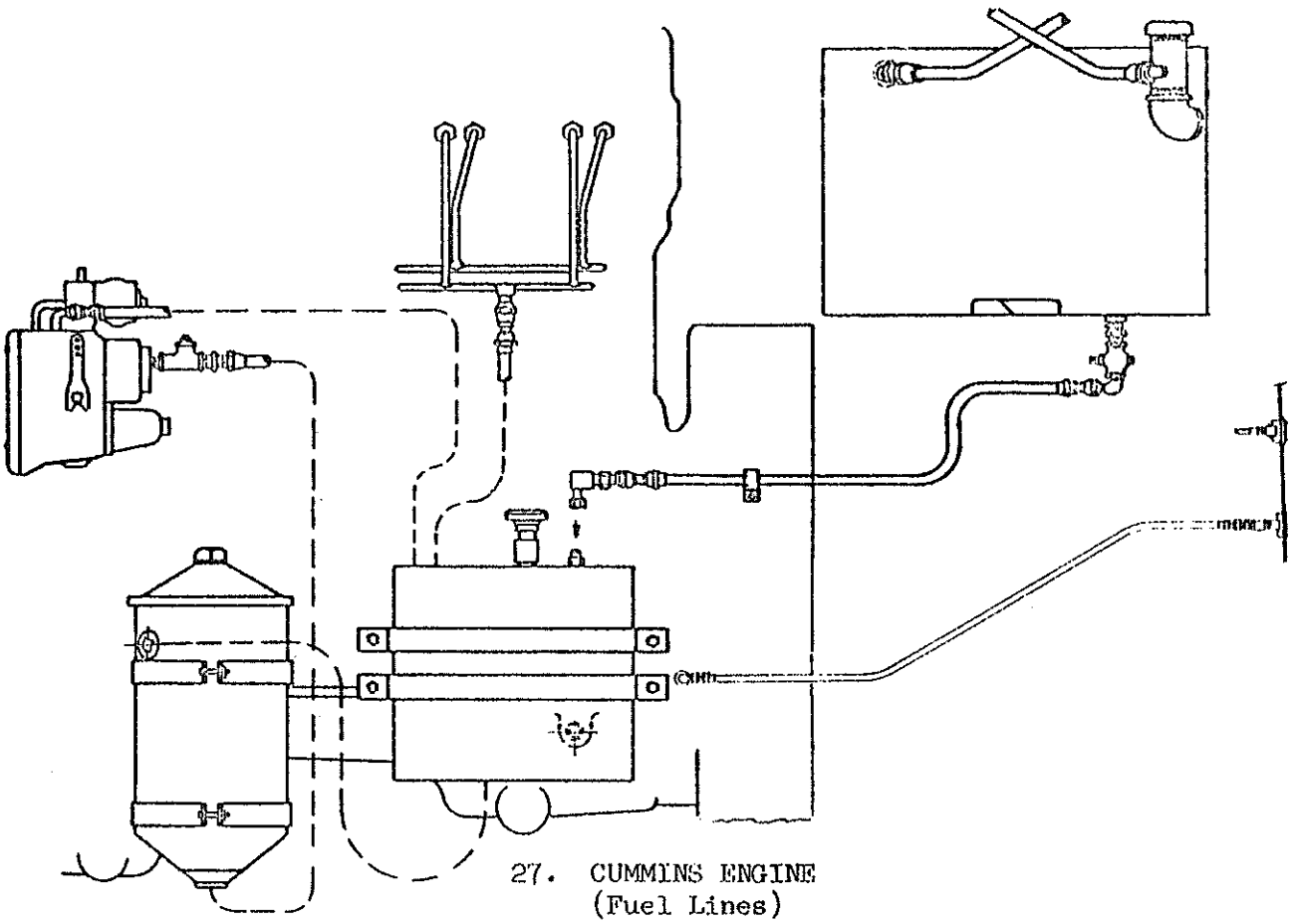


25. WATER HEATER-FAN WIRING DIAGRAM.
(See diagram above and Repair Parts booklet for part number data.)

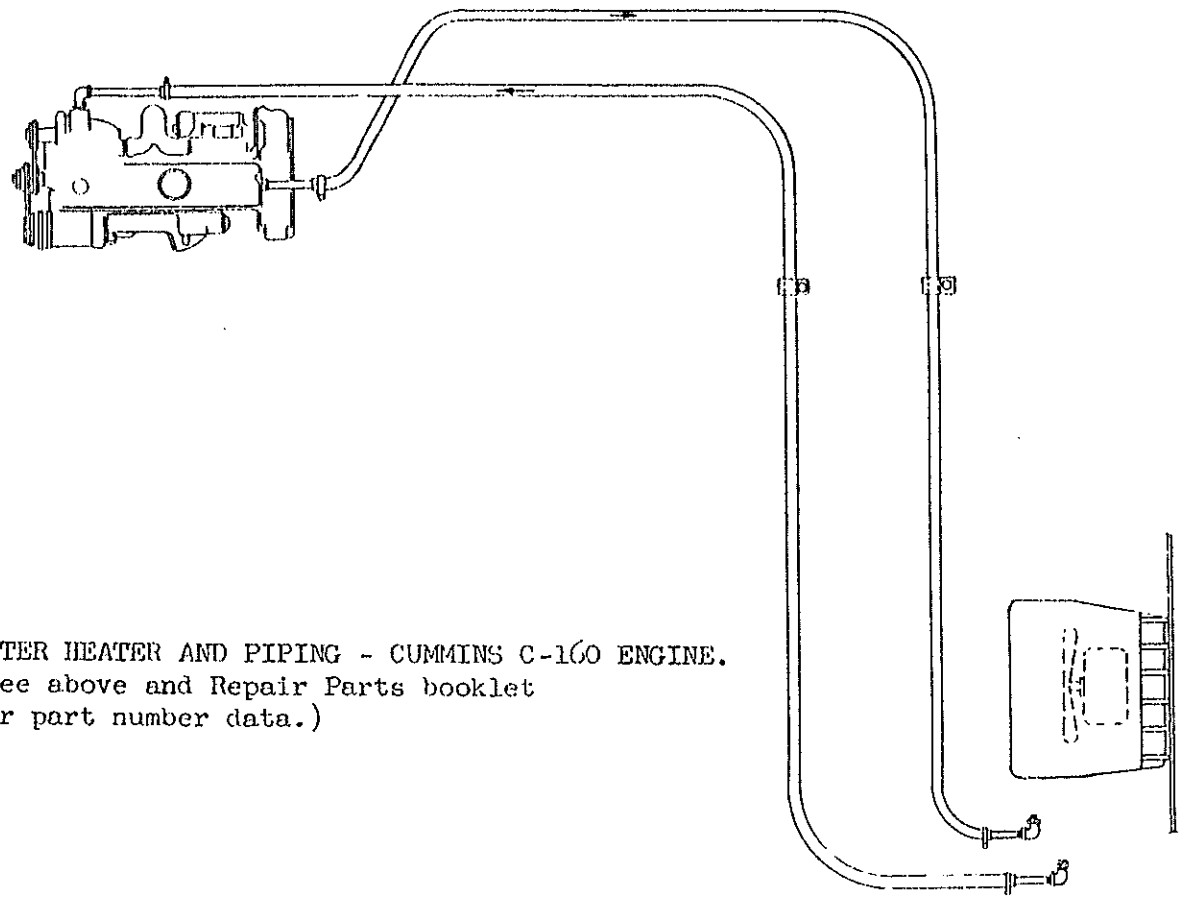


26. WIRING DIAGRAM FOR GM-471 DIESEL ENGINE.

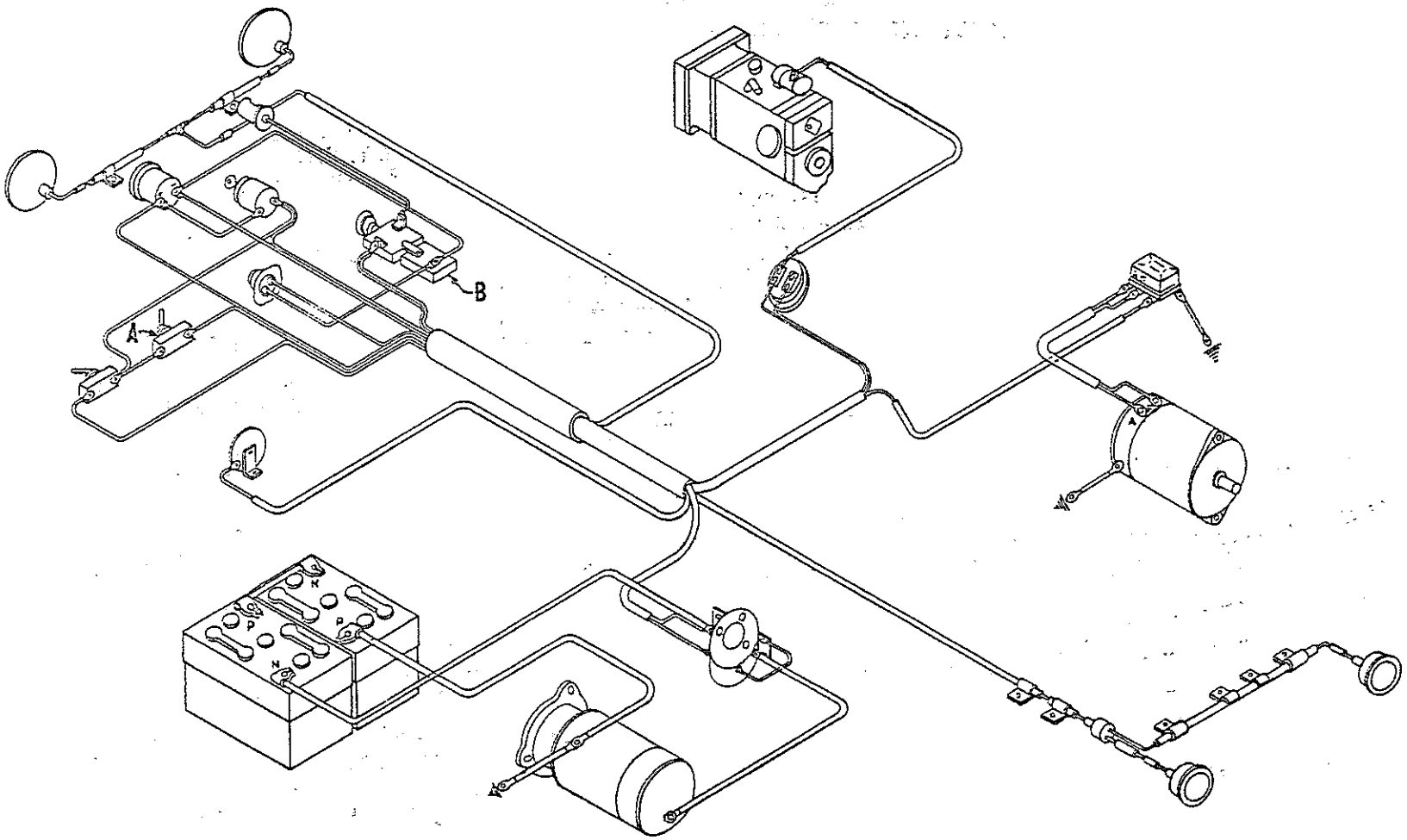
NOTE: Ref. (A) consists of a 30 AMP. circuit breaker or safety device.



27. CUMMINS ENGINE
(Fuel Lines)

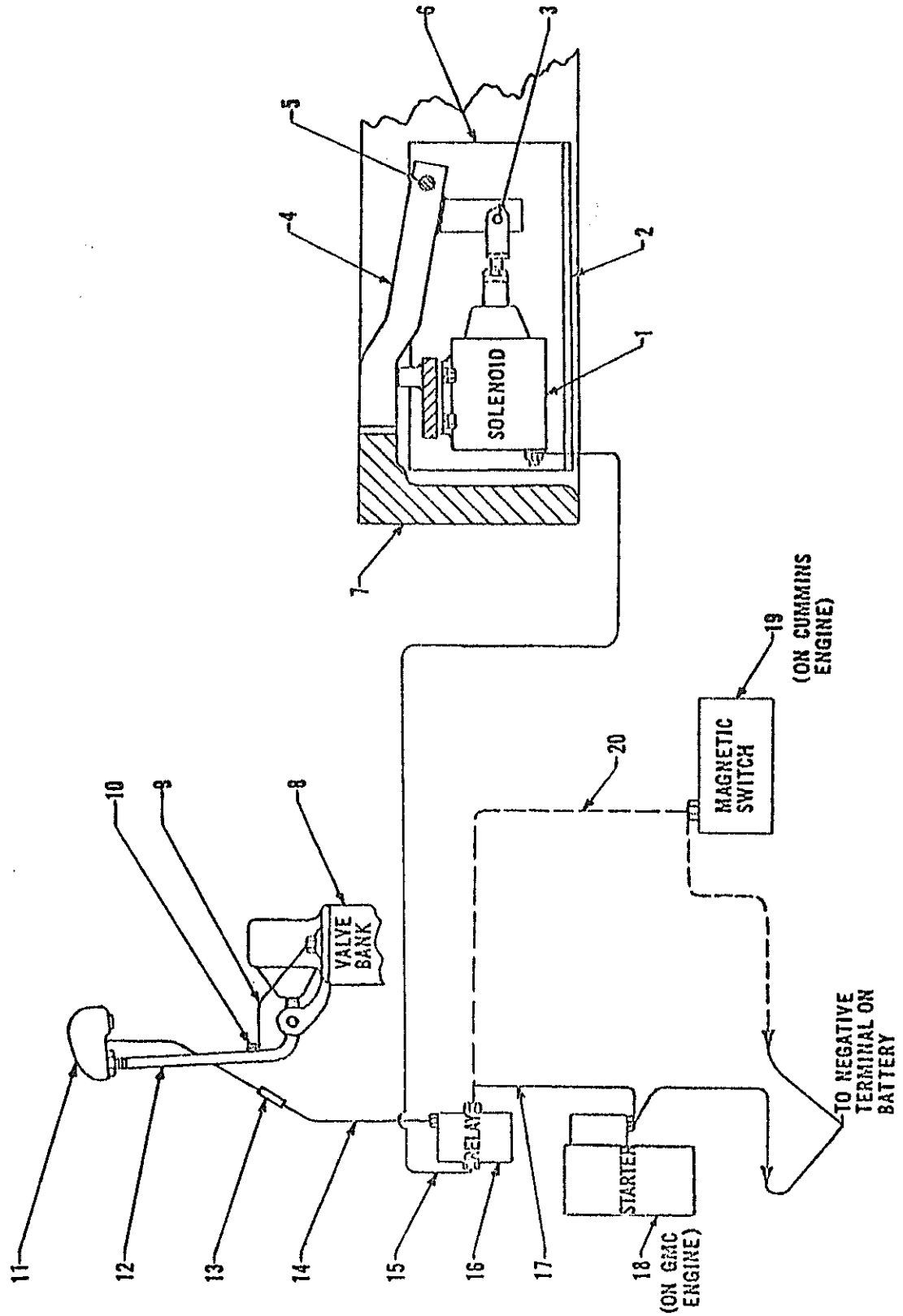


28. WATER HEATER AND PIPING - CUMMINS C-160 ENGINE.
(See above and Repair Parts booklet
for part number data.)



29. WIRING DIAGRAM FOR CUMMINS - C -160 DIESEL ENGINE.
NOTE: Ref. (A) override switch for fuel shut off safety switch-used in conjunction with starter until engine develops oil pressure.

Ref. (B) consists of a 30 AMP. circuit breaker or safety device.



CIRCLE LATCH MECHANISM (SOLENOID TYPE)
(On Pacer 300 - Super 300)

SECTION 4

GRADER OPERATION

The data on these pages show the "A-W" grading but one side of the road. The other side is handled in the same manner.

NOTE: For all operating purposes and intent, the photos and illustrations shown in this section will apply similarly to A-W graders fitted with "Six Driving Wheels" or "Four Driving Wheels".

1. EARTH ROAD CONSTRUCTION.

a. Operating.

We recommend the operator first practice with the controls, slowly placing the moldboard in the various positions illustrated and explained in the following pages. By proceeding in this way he will learn all of the various operations much quicker.

The hydraulic "Finger Control Levers" at the operator's station, when manipulated, control the flow of oil. The operator controls the amount of oil flow; namely, from the smallest perceptible amount to full flow of 15.3 gallons of oil per minute.

The A-W power grader, with All-Wheel Steer, will turn around on a thirty foot road or less, and therefore it is very easy to quickly maneuver it into practical position for maximum loading of the work to be done. For similar reasons the A-W may be quickly and easily turned at the end of the section.

For many years Austin-Western power graders have been satisfactorily operated with all drive wheels on slopes of all types of specifications, running from (2 to 1) to level grade.

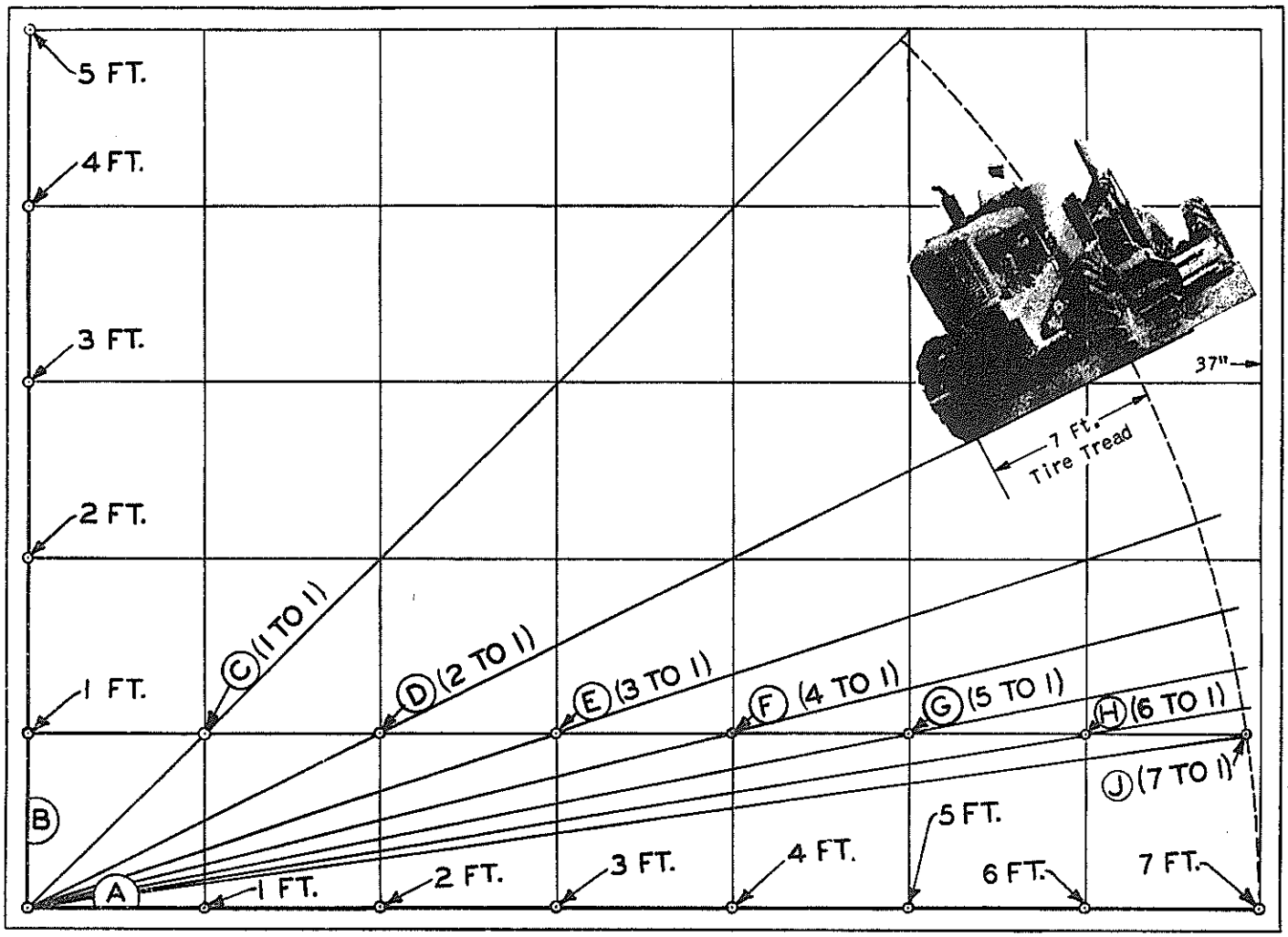
When operating an Austin-Western power grader, always "ride the bank" with all wheels, in order that the grader may be placed in position to most effectively load the engine for maximum work. The reason for this is that All-Wheel Steer and All-Wheel Drive make it possible to effectively hold and load the grader.

Follow these suggestions when grading with an A-W grader and the work will be accomplished and finished in the shortest possible time.

When grading less than (2 to 1) to vertical bank, or extremely high bank sloping jobs, see the recommendations on pages 2, 12, 13, and 15 to 19, inclusive, Section 4.

2. GRADING ON (3 to 1) SLOPE.

The front and rear wheels are steered in order to place the frame in offset position. (Maximum of 2 to 1 slope).



3. GRADING SLOPE CHART.

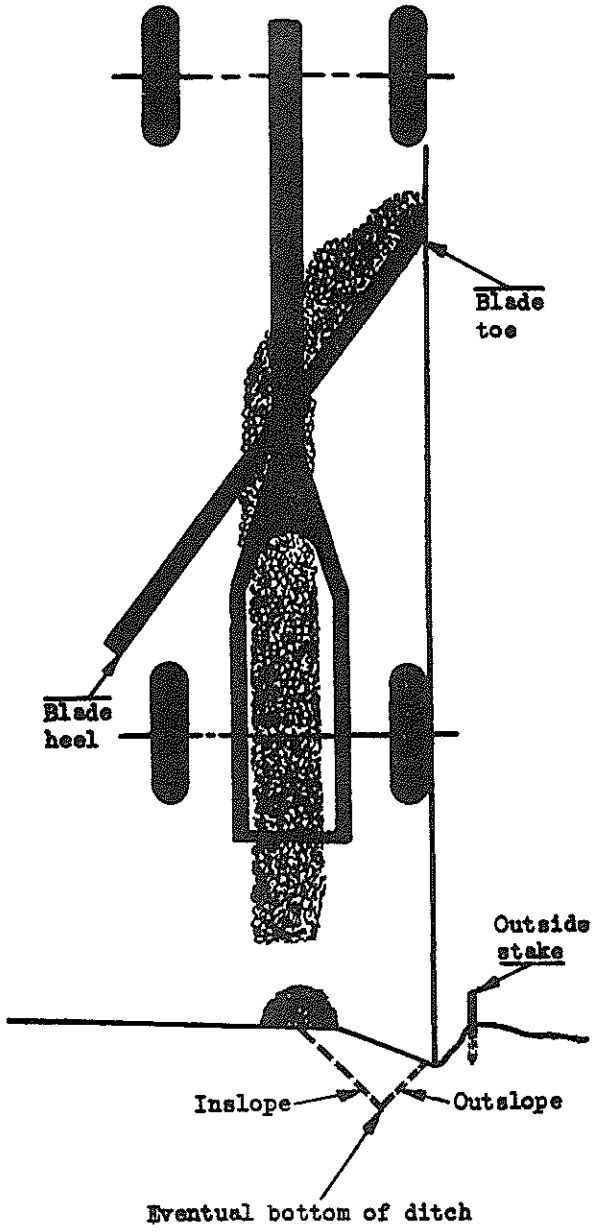
This chart has purposely been made 7 inches wide because the center distance from the right rear tire tread to the left rear tire tread is about 7 ft. One inch spacing on the lower horizontal line (A) represents one foot. One inch spacing on the right and left vertical lines (B) represent one foot.

(C) This line represents a (1 to 1) slope. All bank sloping work from perpendicular to horizontal may be done with the A-W moldboard in the high lift position. See pages 15 to 19 inclusive, Section 4.

(D) This line represents a (2 to 1) slope. By placing all driving wheels on the slope, grading may be very satisfactorily done from line (D) down and thru lines (E), (F), (G), (H), and (J), when soil conditions permit. The extreme right end of line (D) shows the right hand tires of the grader will be elevated about 37 inches higher than the left tires.

(E) This line represents a (3 to 1) slope.

NOTE: When grading from line (D) to horizontal, locating the moldboard under the grader and placing all wheels on the bank, will make it possible for the operator to finish the work in a better way and in the shortest possible time. The reason for this is the full weight of the grader can most effectively be placed on the moldboard and all driving wheels. The engine, in turn, will be in position to drive the grader at its fully loaded capacity.



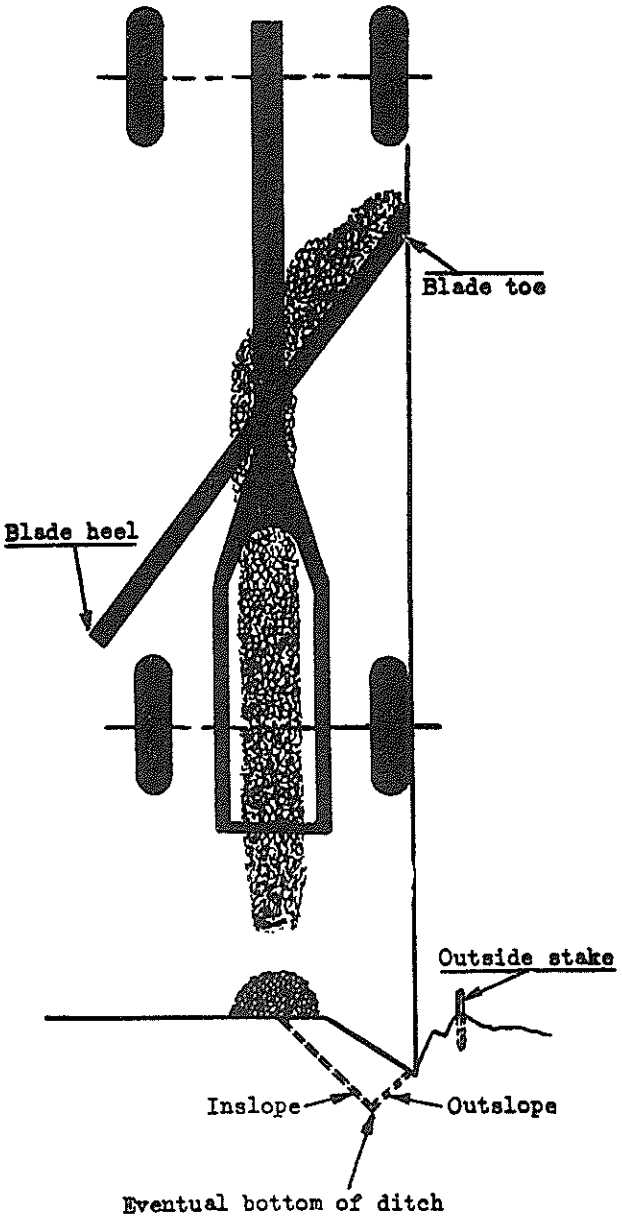
4. *STARTING A NEW DITCH.*

When starting a new ditch do not attempt to cut too deep the first time thru. Straight steering considered.

(1) Rotate circle, lever (2). Side shift the moldboard, lever (4), setting the toe of the blade behind the front wheel.

(2) Elevate heel of blade, lever (3), so material is delivered between the rear wheels as shown.

NOTE: Page 2, Section 3, shows the locations of all control levers, such as (2), (4), and (3) listed above. Keep this in mind when reading the text as shown on the following pages.



5. *SECOND PASS, OR CLEANING OLD DITCH.*

(1) Rotate the circle, lever (2). Side shift the moldboard, lever (4), setting the toe of the blade behind the front wheel, but not clear out to outside edge of tire.

(2) Lower heel of blade, lever (3), so material is delivered between the rear wheels as shown.

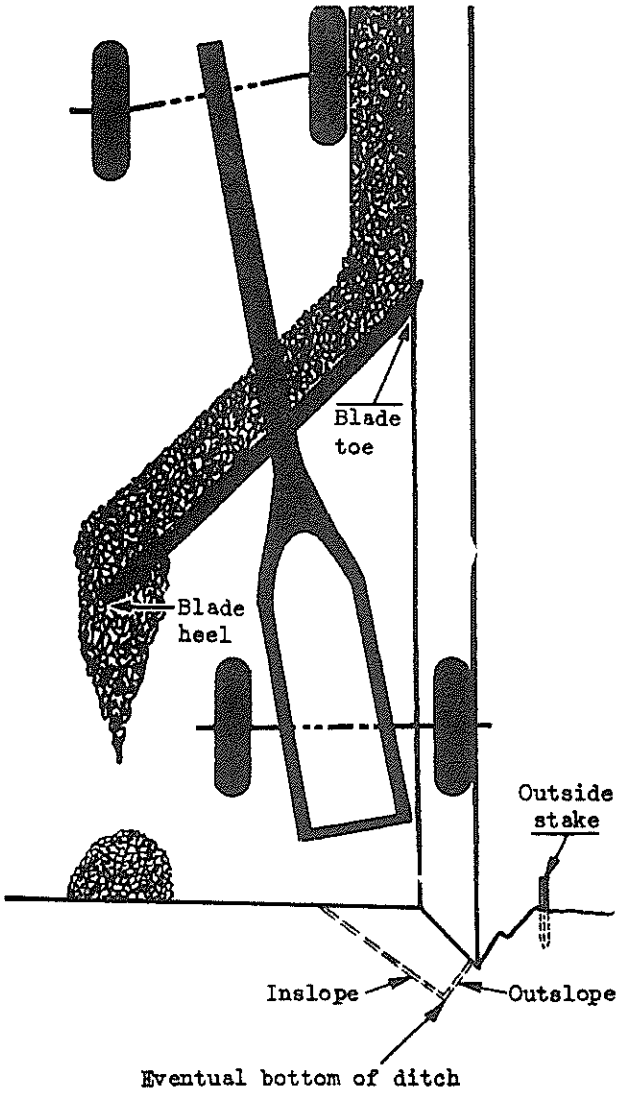
NOTE: All consecutive ditch cuts are made in the same fashion as shown. Remember, as ditch progresses deeper, the point of blade must follow the dotted line to eventual shape of the ditch slopes and bottom of ditch. This means that when another ditch cut is made, both front and rear wheels must be positioned a little further to the left in order that the toe of the blade can cut and follow the dotted line to the eventual bottom of the ditch.

6. *CUTTING WET DITCH.*

When there is water in the ditch, steer the grader with rear wheels offset, as shown in the above photo.

This places all rear wheels on solid footing and permits the use of full engine power and capacity of the grader on this type of ditch work. Also cleaning old ditches having overhanging rock ledges, trees, and etc.

Steering the grader as shown, positions the cab away from ledge or obstruction.



The third pass or windrow move-over is always the most difficult for any but the Austin-Western All–Wheel Drive and All–Wheel Steer power grader, due to the side load on the heel of the blade affecting the course of the wheels.

To perform this operation, proceed as follows:

(1) Steer rear wheels, lever (7), to maximum, toward the blade toe.

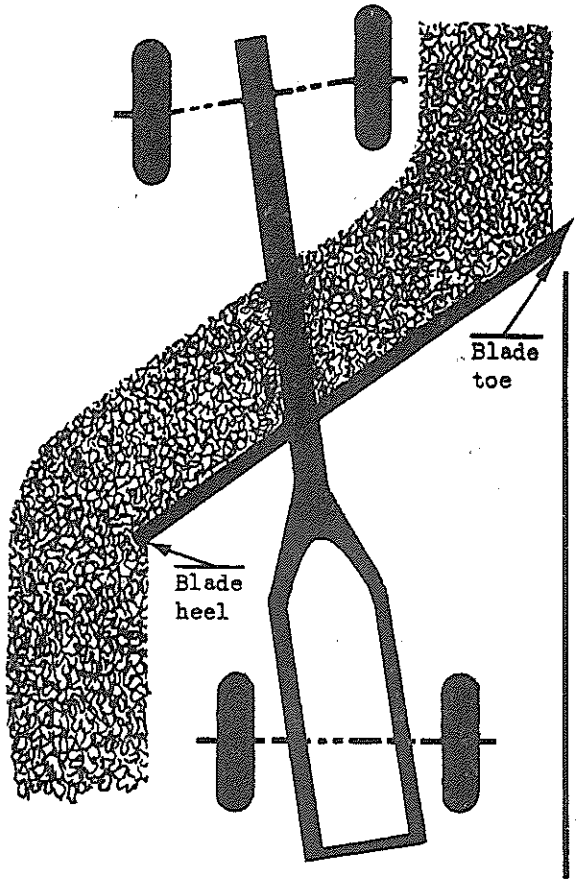
(2) Rotate circle, lever (2), and shift the moldboard sideways, lever (4), sufficiently to reach the windrow.

(3) Steer the grader offset, levers (6) and (7), as shown, with both front wheels missing the windrow.

(4) All consecutive windrow move-over passes near the ditch or crown of the road are made in the same fashion; namely, both front wheels on one side of the windrow and all rear wheels on the other side. The job will be finished quicker if this is done because the full engine power is used effectively.

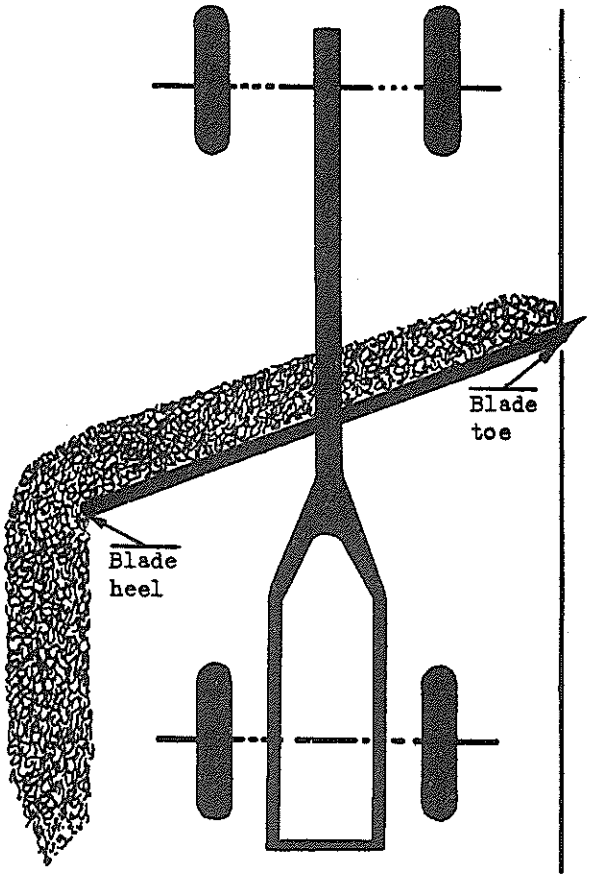
7. *THIRD PASS, OR WINDROW MOVE-OVER.*

8. *WINDROW MOVE-OVER IN BLOW SAND*



(1) Steer rear wheels, lever (7), to extreme, toward blade toe.

(2) Rotate circle, lever (2), and side shift, lever (4), to suit conditions, approximately as shown. Guide grader with front steer, lever (6), missing windrow with both front and rear wheels.



The above shows wheel and blade adjustment for conventional maintenance operation.

9. *HANDLING OIL-MIX, OR HEAVY MAINTENANCE. (See above)*

10. *CONVENTIONAL MAINTENANCE. (See above)*

Extreme wide reach for finishing shoulders, slopes, etc., leaving no tire marks.

(1) Moldboard is side shifted, lever (4), as far as it will go.

(2) Circle side shift ram piston rod, lever (5), is retracted to position the circle to the extreme right side.

(3) Rear wheels are steered, lever (7), to extreme, toward heel of blade.

(4) Drive machine by using front steer, lever (6).

(5) Circle may be rotated, lever (2), to give desired cutting angle on moldboard, and also adjusted so windrow of material is deposited just inside of rear wheel as shown.

11. *WIDE REACH, OR RESLOPING OF GRADE SHOULDERS.*

12. *FLAT BOTTOM DITCH.*

Circle side shift ram piston rod, lever (5), is almost fully retracted. Circle can be rotated, lever (2), to suit different width flat bottom ditches. Precaution must be taken not to foul moldboard into tires, transfer case, and guard.

13. *GRADING IN REVERSE "BETWEEN FORMS."*

The fully reversible blade and rear steer are an ideal and very practical combination when operating and steering the grader while blading in reverse. The reason for this is because the front wheels are not steered; instead, the *operator steers the grader by using the rear steer control.* Since he is looking back, it naturally follows he can steer the rear end of the grader much easier than by using the front steer control.

Both rough and finish grading between forms and grading dead end streets, is work which lends itself to the reverse grading feature of the A-W power grader.

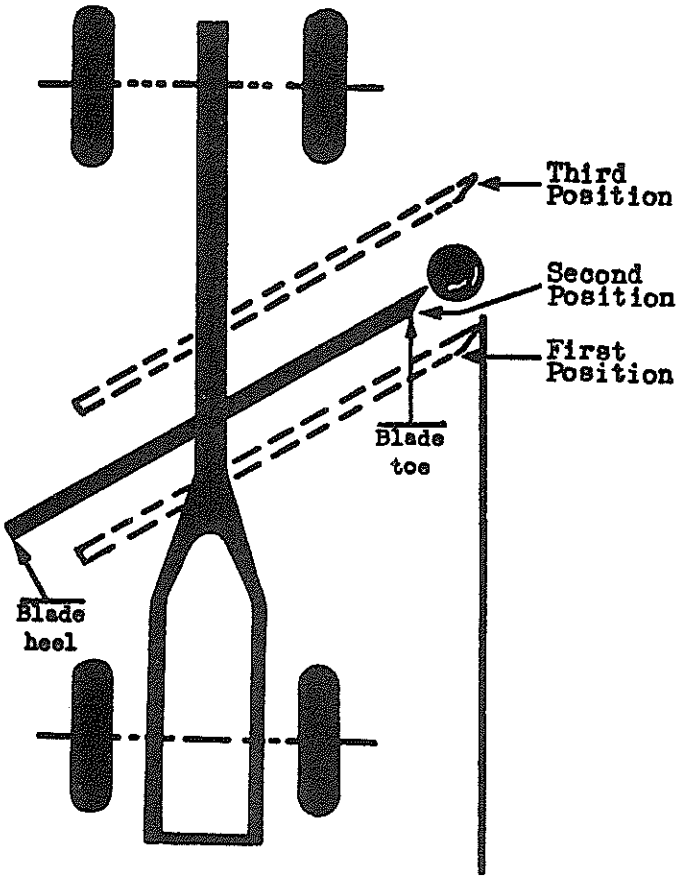
14. *GRADING IN REVERSE.*

(Full Reversible Circle)

(1) Moldboard may be reversed, lever (2), with scarifier on the machine, by rotating the circle clockwise when machine is set up for right side high lift. (Anti-clockwise when set up for left side high lift). The reverse procedure is used to get moldboard back into forward position again.

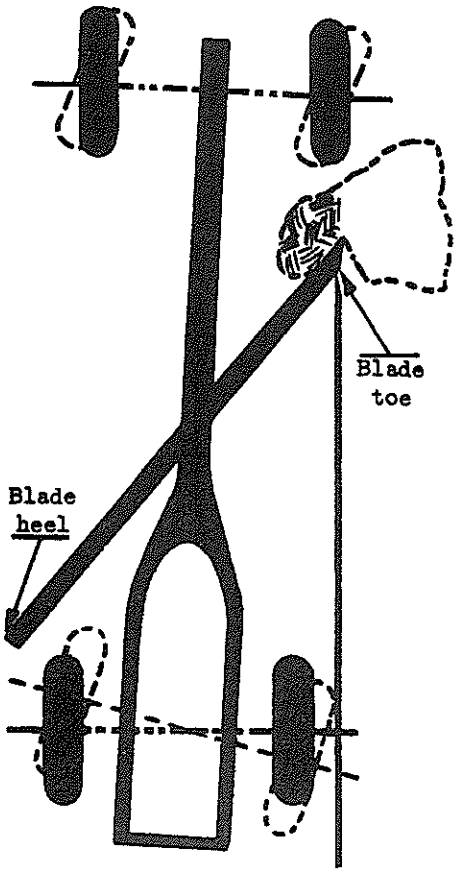
(2) Moldboard is side shifted, lever (4), so end of it just clears back side of scarifier block. The circle should be on a level with the machine both fore and aft, as well as sideways, in which position cutting edge is clearing ground approximately 2 inches. Caution should be taken not to foul tires and transfer case guard.

(3) Use rear steer, lever (7), for guiding machine when grading in reverse.



15. *GRADING CLOSE TO AN IMMOVABLE OBJECT. (See photo above and illustration to left)*

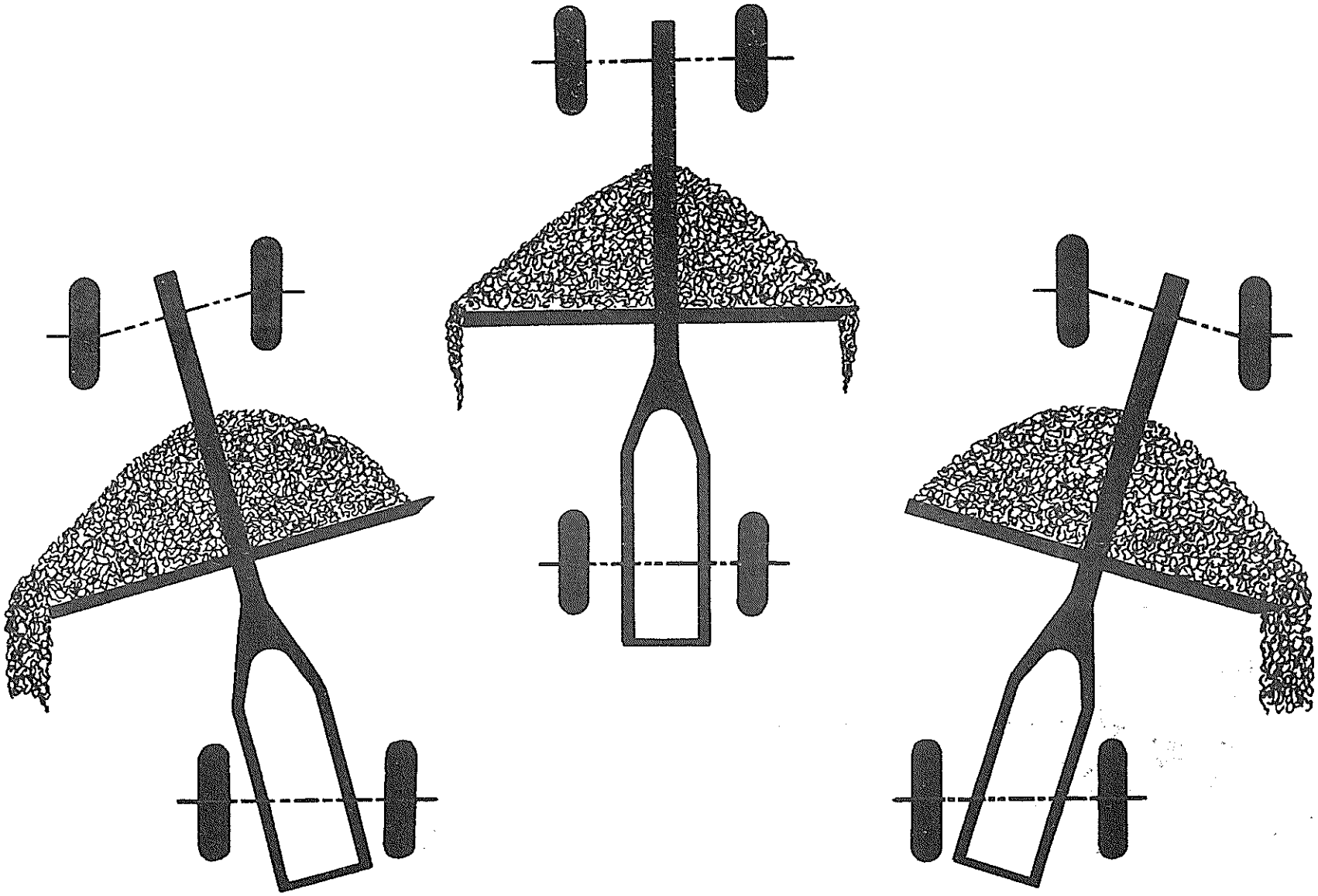
The moldboard can be either extended or retracted, side shift lever (4), without leaving the "floor", and "grade" maintained close to obstructions. Ditch lines can be straightened with ease. This operation saves hand labor finishing time because the blade can cut right up to the guard rail, post, or bridge abutment. The grader is momentarily stopped and blade shifted hydraulically sideways without the operator leaving his station. Grader is then moved forward and blade shifted outward at once to full grading width.



16. *BACKING OUT.*

(See photo above and illustration to left)

When obstructions are encountered, steer front and rear wheels, levers (6) and (7), as shown by dotted lines. Shift into reverse, lever (14), and slowly back up. The machine will move sidewise as it goes backwards away from obstruction or out of the ditch.



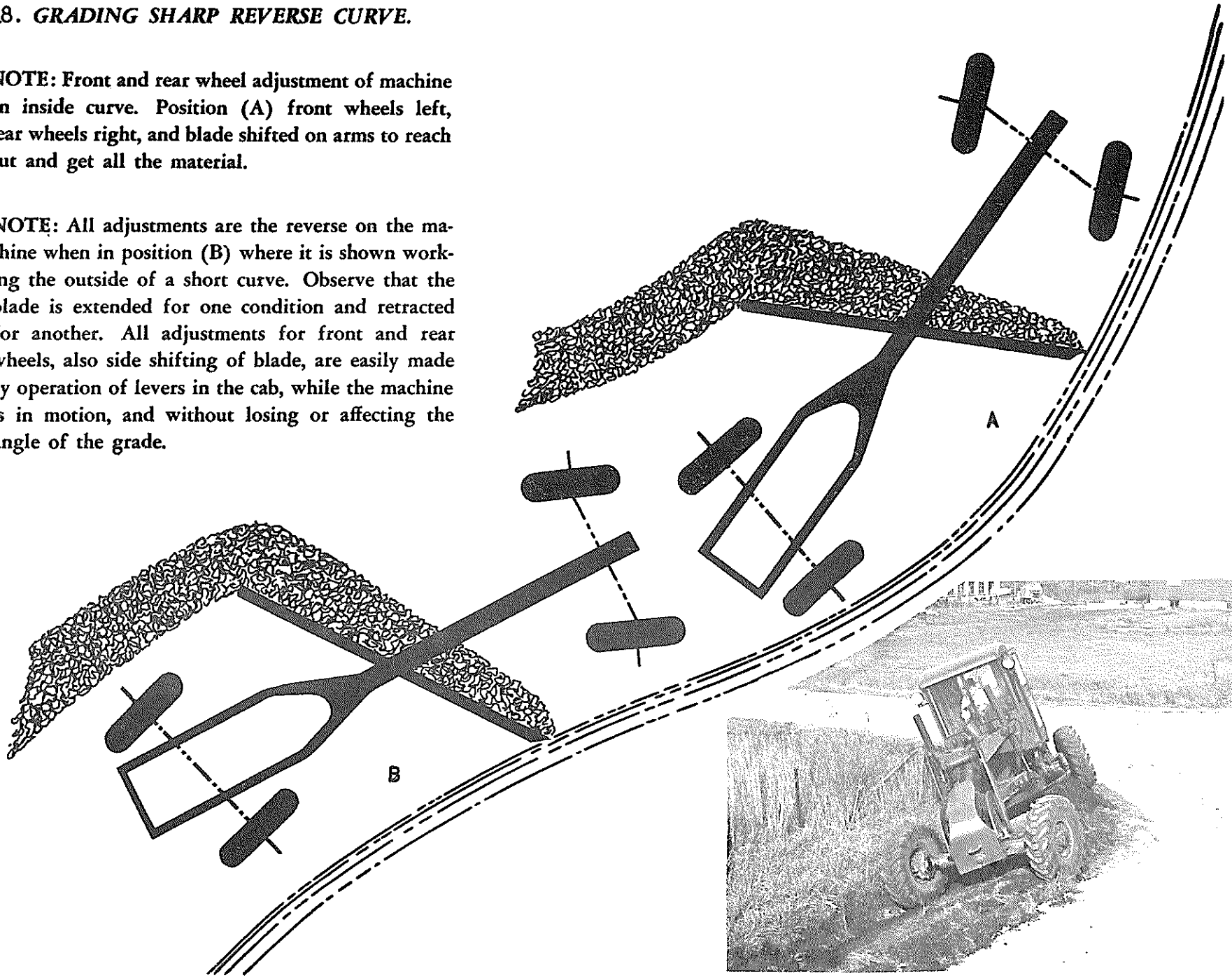
17. *CUTTING HIGH AND FILLING LOW PLACES.*

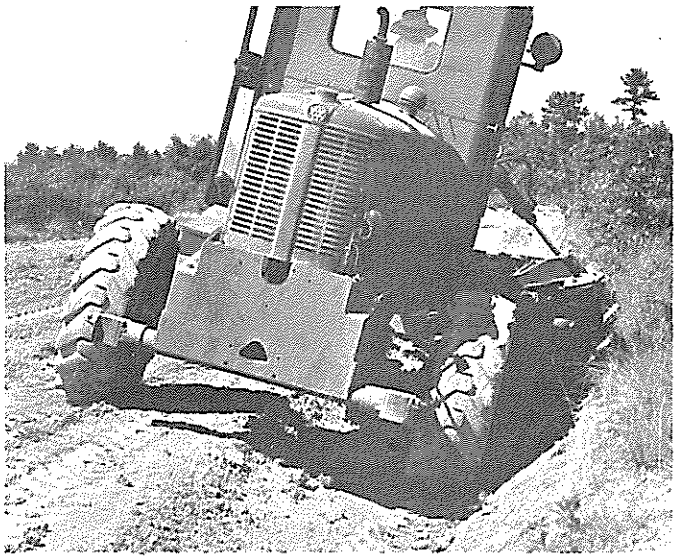
This operation is performed easiest by setting the blade square across the frame and controlling the "drifting" by adjusting the rear wheels to suit. The rear wheel adjustment responds to a valve in the cab. It is simple and easy.

18. *GRADING SHARP REVERSE CURVE.*

NOTE: Front and rear wheel adjustment of machine on inside curve. Position (A) front wheels left, rear wheels right, and blade shifted on arms to reach out and get all the material.

NOTE: All adjustments are the reverse on the machine when in position (B) where it is shown working the outside of a short curve. Observe that the blade is extended for one condition and retracted for another. All adjustments for front and rear wheels, also side shifting of blade, are easily made by operation of levers in the cab, while the machine is in motion, and without losing or affecting the angle of the grade.



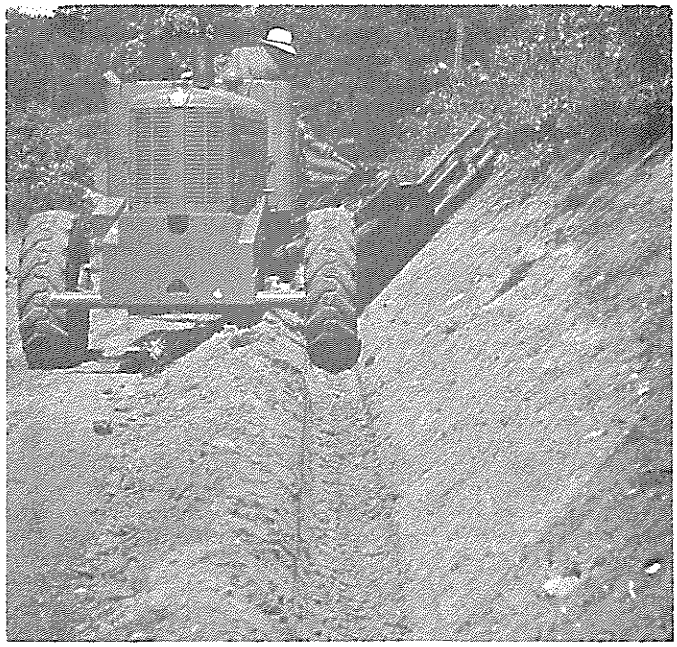


19. *GRADING THE OUTSLOPE OF A LOW BANKED DITCH.*

All-Wheel Steer makes it possible for all wheels to drive on smooth ground.

The rear drive wheels are steered to the right sufficiently to permit the right rear wheels to drive and ride the bank slightly. Most of the windrow passes to the left side of the right rear tires, and therefore the operator finds he can finish the complete outslope job quicker and better.

The front drive wheels are steered and drive on smooth ground also, as shown. The toe of the moldboard is turned down in order to grade near the fence line.



20. *HEAVY GRADING OF HIGH BANK SLOPES.*

a. As shown in the above photo, the right front wheel is riding the smooth bank in order to permit the grader and engine to do its most effective work when heavy or light grading work is to be done. The left front wheel is also driving on smooth ground.

b. The above photo shows the right rear wheels riding the bank slightly. It is driving on smooth ground because the windrow is delivered to the left of it. All wheels effectively travel on smooth ground, permitting the work to be finished in the shortest possible time.

c. The above photo shows the A-W grader sloping a bank. A tremendous cut has been taken off the bank. Heavy cuts of this type are easy work for the A-W grader, for the following reasons:

(1) All wheels drive and steer on smooth ground.

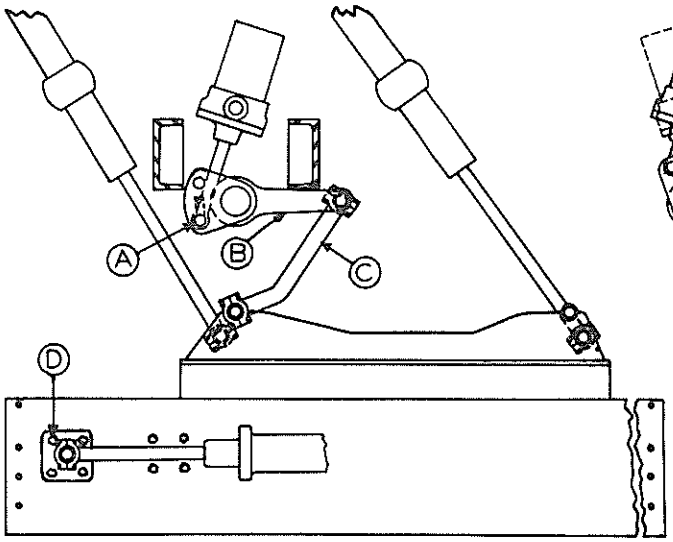
(2) The right front wheel is located close to the bank ahead.

(3) The grader is steered in the offset position by the All-Wheel Steer. The windrow passes to the right side of the right rear wheels. Hard or soft spots in the bank do not cause the moldboard to first suck into the bank, then push it out of the bank, because both front and rear wheels, together with moldboard, are held into the work by the All-Wheel Drive and All-Wheel Steer.

The surprising feature is that the operator *can cut more or can cut less at the bank, as he wishes, by steering the rear wheels only.*

NOTE: The front wheels and both right and left blade lift controls at the operator's station, are used but very little when taking heavy or light moldboard cuts from a bank of this kind.

Bank sloping work with a A-W power grader is easily performed and quickly finished.

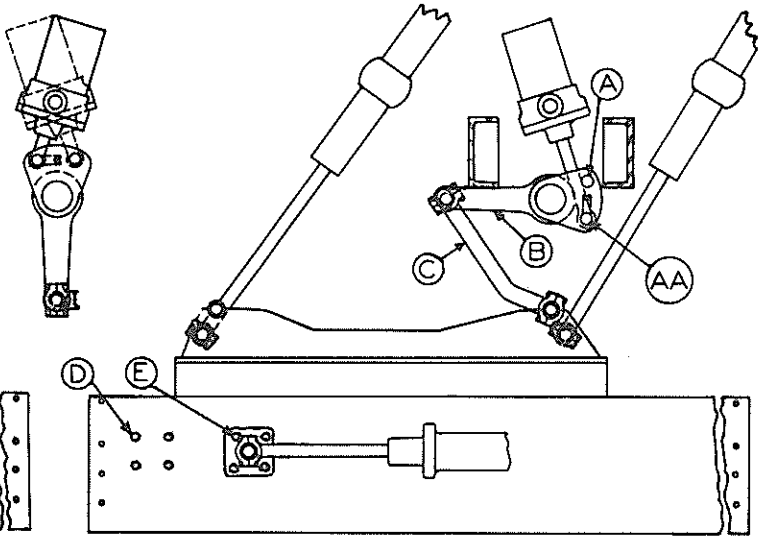


21. *RIGHT HAND HIGH LIFT.*

Before shipment from the factory, the A-W power graders are assembled with the moldboard and controlling linkage parts in position for right hand operation, as shown in drawing above.

As viewed from the operator's seat, the top of the circle side shift cylinder will be tilted toward the right. The removable pin (A) is located in the lower hole as shown.

Arm (B) is contacting the bottom side of the right frame rail (this is explained on page 17). Link (C), at its lower end, is connected to the trunnion ball located at the left side of the circle cross member (this is shown on page 19). The moldboard side shift bracket (D) is attached with four bolts in the location as shown above.

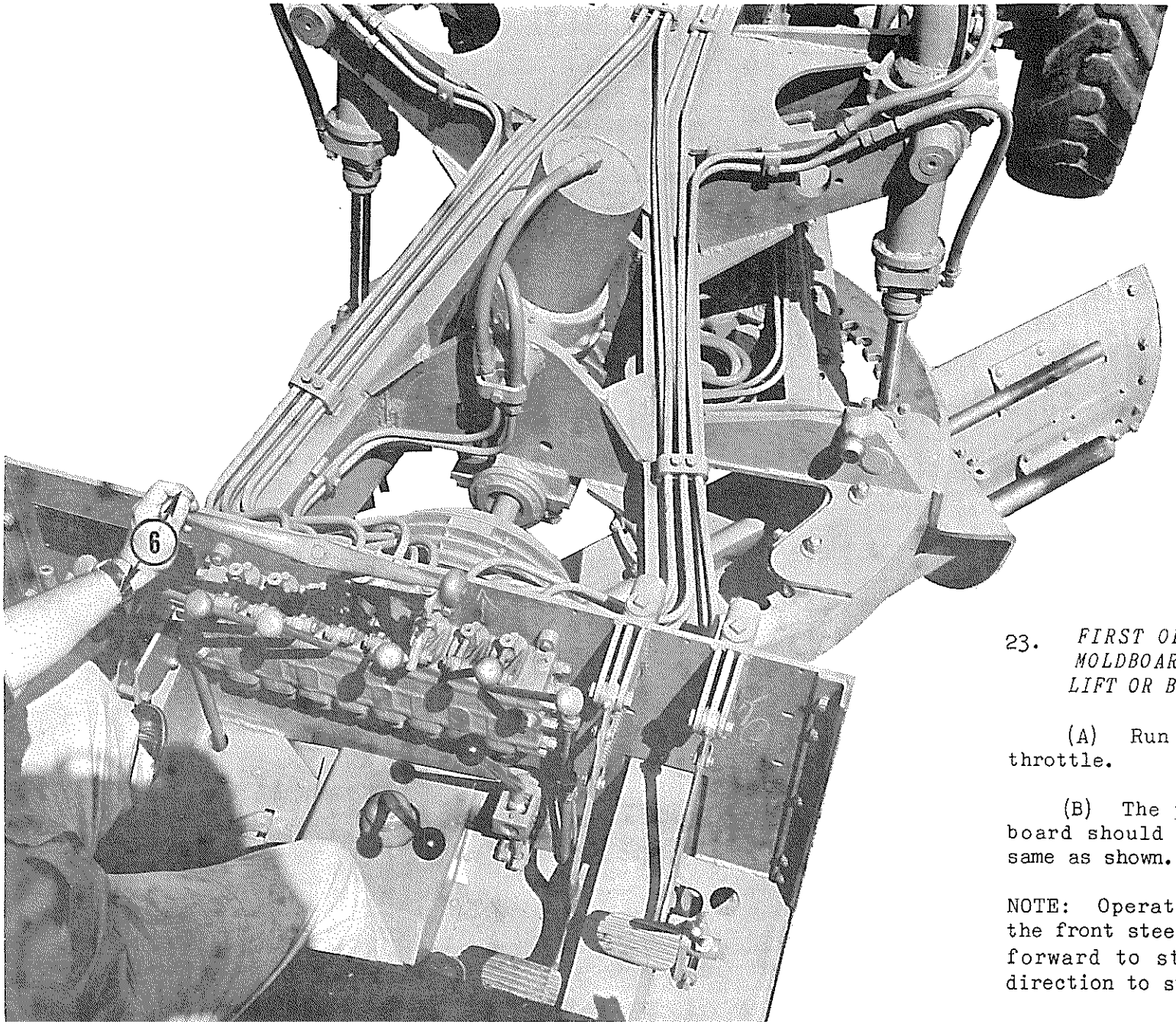


22. *LEFT HAND HIGH LIFT.*
(See photos below.)

To change from right to left hand high lift operation (drawing above), place the circle directly under the grader, and lower the moldboard to the ground.

Remove link (C) and pin (A). Then swing the piston rod to the right and reinstall the pin into the hole at (AA). Reinstall link (C) as shown, connecting its lower end to the right side of circle. Remove the bracket at (D). Use hydraulic power to side shift the bracket into position, and reinstall the four attaching bolts at (E).

The A-W grader is now mechanically changed over to provide maximum left hand operation, as shown in the two photos below. After some practice, the operator will be able to effectively operate the grader and do the same quality of work as shown in the preceding pages.

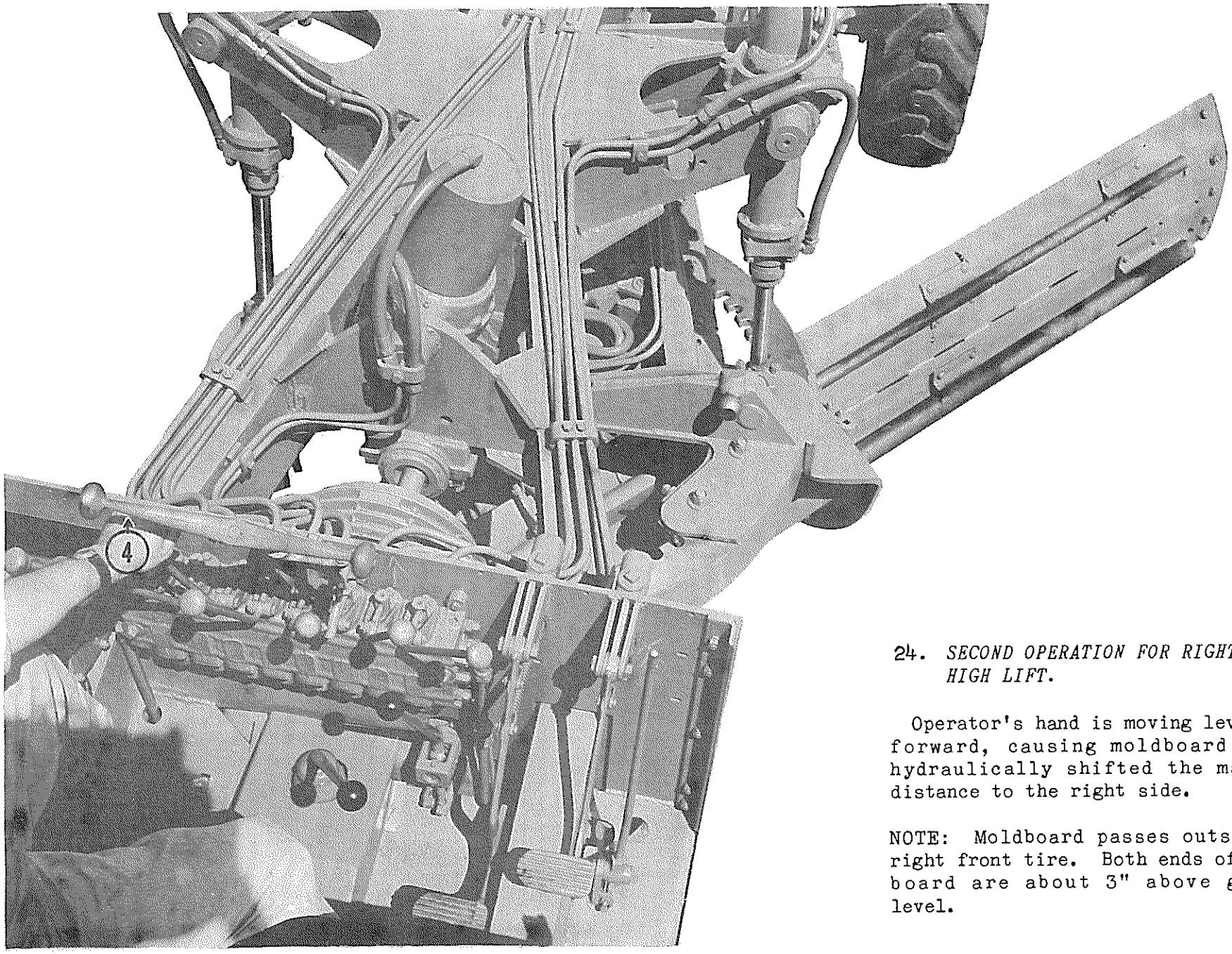


23. *FIRST OPERATION FOR PLACING MOLDBOARD IN RIGHT HAND HIGH LIFT OR BANK SLOPING POSITION.*

(A) Run engine at wide open throttle.

(B) The position of the moldboard should be approximately the same as shown.

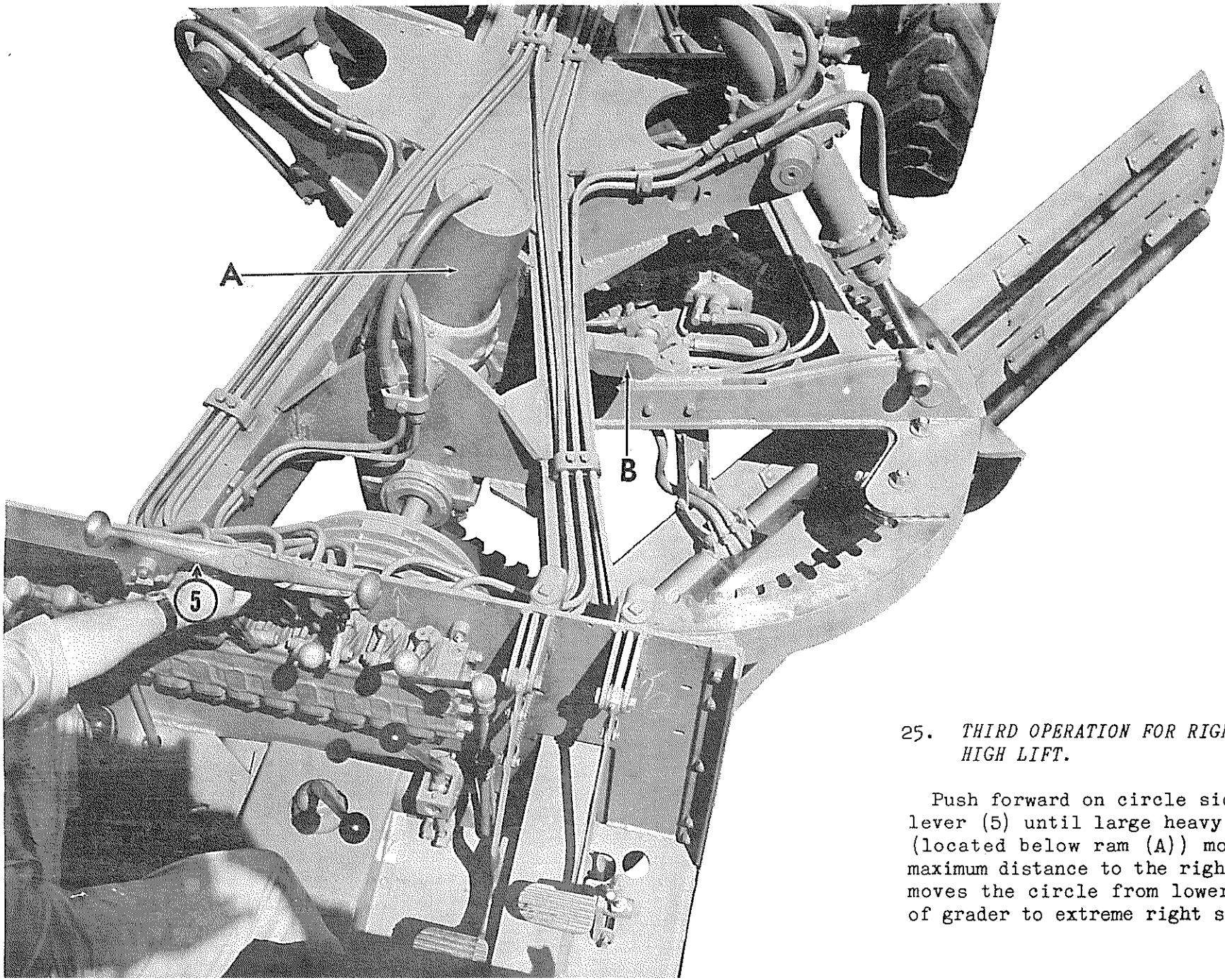
NOTE: Operator's left hand is on the front steering lever (6). (Push forward to steer right; opposite direction to steer left.)



24. *SECOND OPERATION FOR RIGHT HAND HIGH LIFT.*

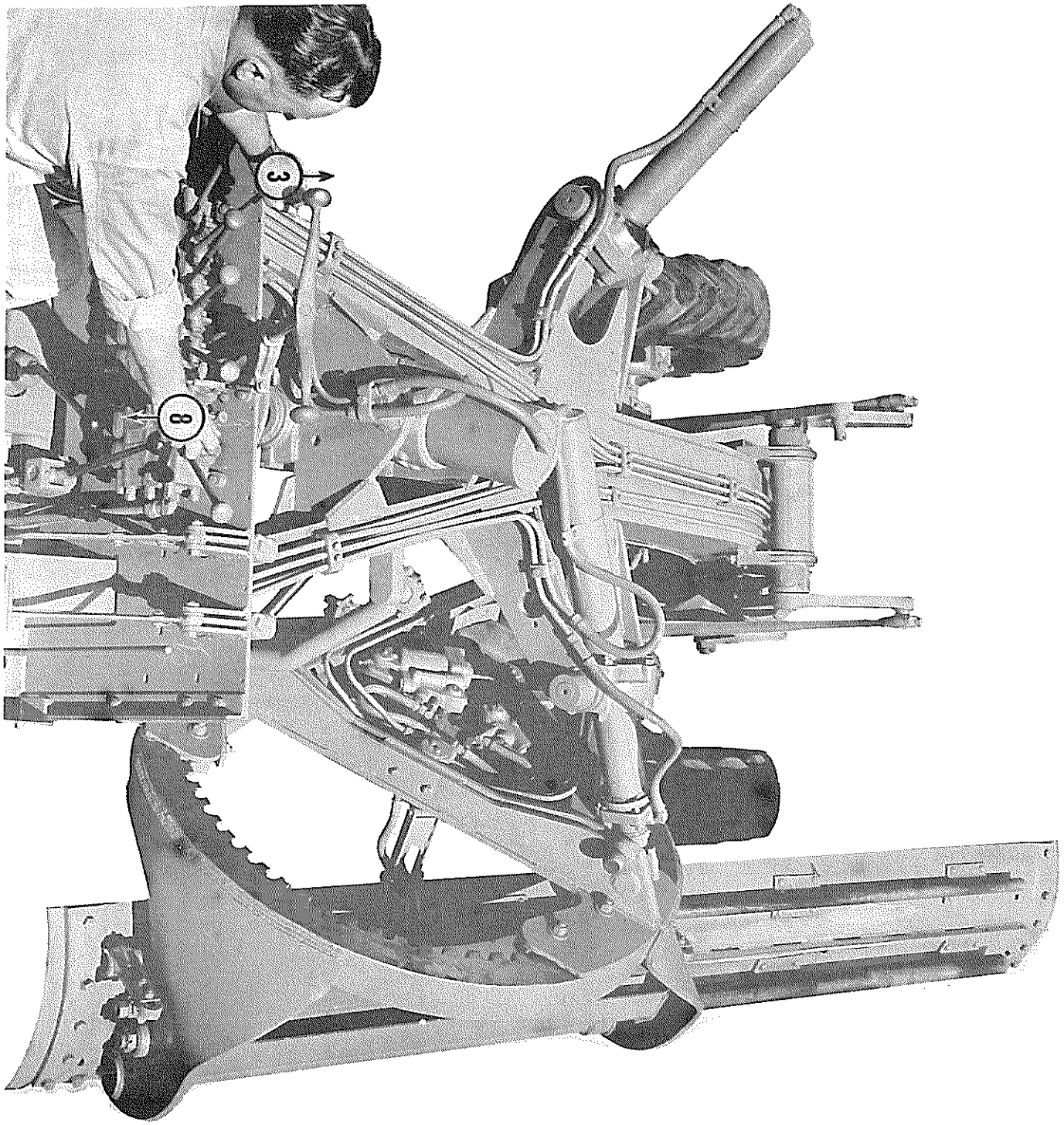
Operator's hand is moving lever (4) forward, causing moldboard to be hydraulically shifted the maximum distance to the right side.

NOTE: Moldboard passes outside of right front tire. Both ends of moldboard are about 3" above ground level.



25. *THIRD OPERATION FOR RIGHT HAND HIGH LIFT.*

Push forward on circle side shift lever (5) until large heavy arm (B) (located below ram (A)) moves the maximum distance to the right. This moves the circle from lower center of grader to extreme right side.

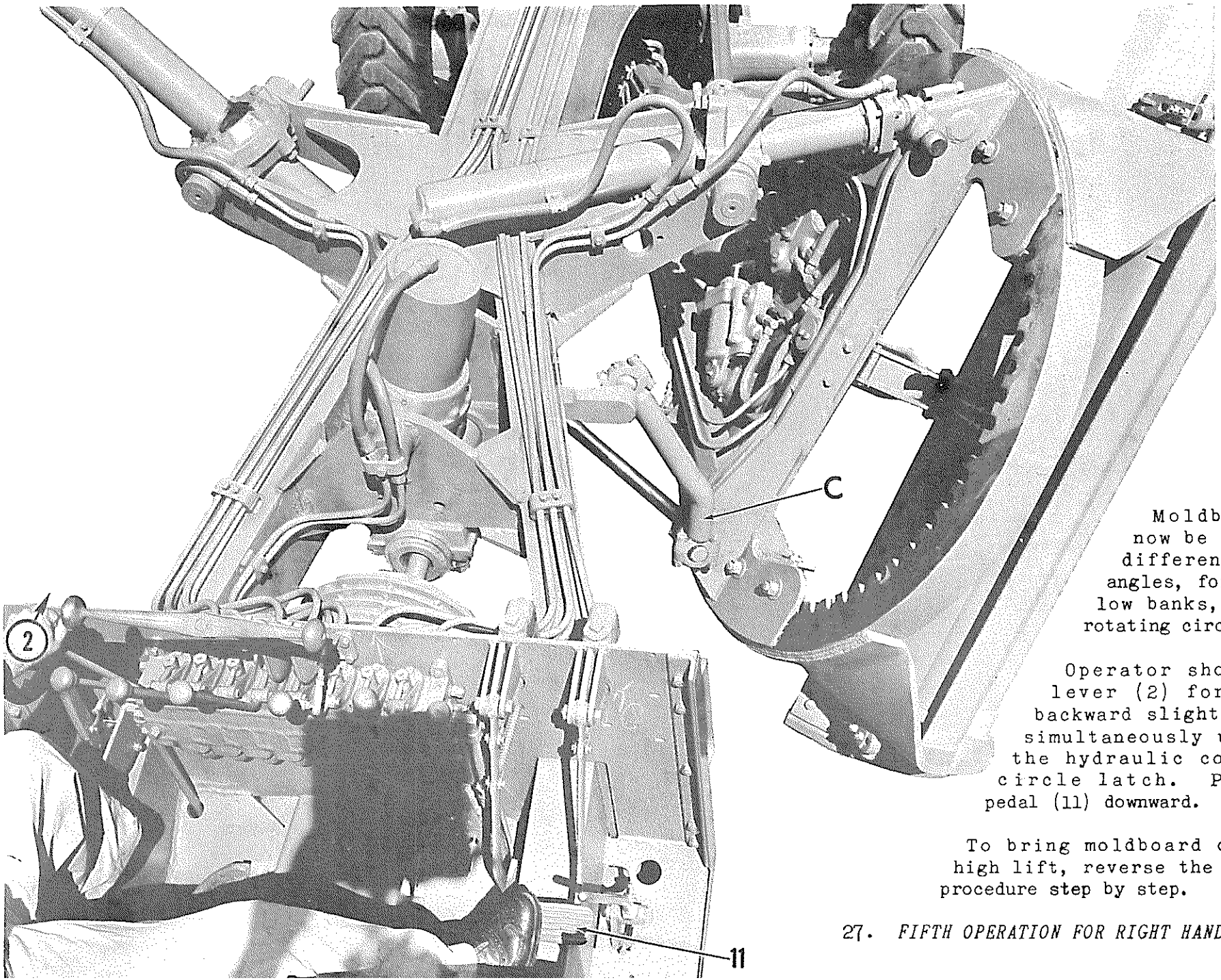


26. *FOURTH OPERATION FOR RIGHT HAND HIGH LIFT.*

(A) Pull back on the right hand blade lift control lever (8).

(B) Push forward on the left hand blade lift control lever (3).

This raises the right side of the circle and pushes the left side of the circle downward and outward simultaneously, into the position as shown.



Moldboard may now be placed in different cutting angles, for high and low banks, etc., by rotating circle.

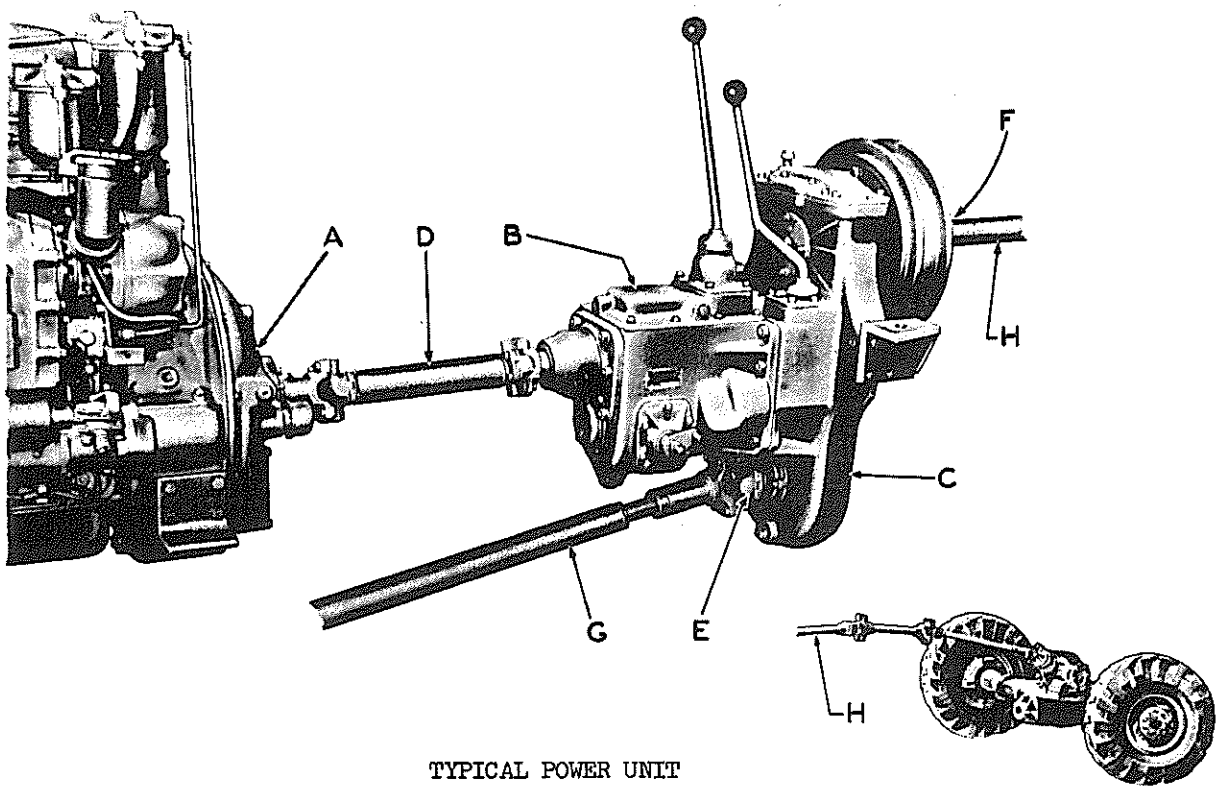
Operator should move lever (2) forward and backward slightly, while simultaneously unlocking the hydraulic controlled circle latch. Push foot pedal (11) downward.

To bring moldboard down from high lift, reverse the foregoing procedure step by step.

27. *FIFTH OPERATION FOR RIGHT HAND HIGH LIFT.*

SECTION 5

POWER GRADER OVERHAULING AND ADJUSTMENTS



TYPICAL POWER UNIT

1. POWER DISTRIBUTION - ENGINE TO WHEELS.

Every pound of the total weight of the machine is on a power driven wheel, and in this manner every ounce of engine power is transmitted to the front and rear axles.

The engine and clutch unit (A) is connected to the transmission (B) and transfer case (C) by means of a short propeller shaft (D).

The transfer case attached to the transmission extends above and below the centerline of the transmission and has two output shafts, the lower one (E) extending toward the rear, and the upper one (F) extending toward the front.

From the lower rearward shaft a propeller shaft (G) connects to the input pinion shaft of the rear axle. From the upper forward output shaft (F) of this power divider, as it might well be called, there is a propeller shaft (H) with several universal joints to carry the power down under the arched frame to the front axle.

Both front and rear axles have a double set of gears to further multiply the power on the axle shafts themselves, and eventually to the driving wheels with tires.

2. FRONT AND REAR STEER.

The front steering angle is 25 degrees each way, and the rear steering angle is 15 degrees each way. Steering is done hydraulically by simply moving a valve handle requiring very slight fingertip effort.

3. FRONT AXLE.

The front axle unit of the A-W power grader is of the double reduction type. The drive from the propeller shaft to the front axles is made first thru a spiral pinion and bevel gear, and then thru a pinion and spur gear fully enclosed, running in oil. It is equipped with dust proof oil seals and mounted on anti-friction bearings thruout.

A differential is incorporated between the two axle shafts.

In making repairs to parts located at either end of main axle housing, including replacing the drive shafts, it is unnecessary to remove the main axle housing from front end of the grader frame. However, should repairs be necessary to gear carrier or main axle housing itself, then axle assembly must be removed from frame. If possible, place the machine on a level place and block rear wheels securely.

If machine can be operated, it will be easier to wash out the main axle housing before disassembly is started. First remove the drain plug and allow all the oil to flow from gear case. Then refill the case with kerosene or diesel fuel.

CAUTION: Do not use gasoline as it is dangerous because it may explode and cause a fire. Run machine slowly with the kerosene or fuel oil in gear case for several minutes both forward and reverse, and drain gear case. If you wish to get it absolutely clean, refill case a second time with clean kerosene or diesel fuel and repeat washing operation.

4. WHEEL REMOVAL AND REASSEMBLY. (For illustration, see page 3 or 3A)

All wheels are attached in the same manner, so the following will apply to either right or left hand wheel.

1. Remove the nuts (32) from the drive flange studs.

2. Remove the flange (1).

3. If the drive flange still sticks too tightly to be pulled off by hand, secure a couple of 1/2" hardened set screws to remove the flange. Lubricate the threads of hardened set screws well before inserting them in the threaded holes provided in the drive flange. Be sure to clean the threaded holes carefully and blow out all dirt present. The flange can then be forced off by screwing the set screws in thru the flange against the wheel face.

4. Unlock the bent over edge of lock washer (7) and remove the hub bearing lock nut (6).

5. Remove the lock washer (7), the drilled washer (8), and the adjusting nut (9) with pin (10).

Jack up on axle housing inside of wheel until wheel clears ground, and place a well greased metal plate under the tire. Lower jack until weight of wheel only rests on plate.

6. Slide the wheel off. Be sure to catch the bearing cone, forced off by wheel, so it does not fall on the ground and become dirty.

7. If the hub bearing felt (14) is worn or damaged, replace it by prying off the inner bearing and removing the washer (13) and felt (14).

8. Be sure to wash all the old grease from inside the wheel and from axle end and bearings. Repack the bearings with wheel bearing grease when reassembling. If bearings show any flat spots or chipping, replace both cone and cup.

9. In reassembly, after replacing the wheel and outer bearing replace the adjusting nut (9) (with pin (10) on outside). Tighten this nut up snugly. (Do not back it up for bearing clearance, as none is needed or desirable.)

10. Replace the drilled washer (8). Be sure one of the holes aligns with the pin protruding from the adjusting nut (9). If they fail to align, try taking the washer off and turning other side inward. If this fails to align the pin and a hole in washer, then the nut will have to be loosened slightly.

11. Replace the lock washer (7). Replace and securely tighten the lock nut (6). Bend one edge of the lock washer (7) so as to firmly fix the lock nut (6).

12. Replace the drive flange (1).

NOTE: Each drive flange (1) has a 1/8" pipe plug (X) recessed into the outside edge. When installing the flange, the plugged hole should mate a similar hole drilled sidewise into the wheel hub, and terminating into the compartment (A).

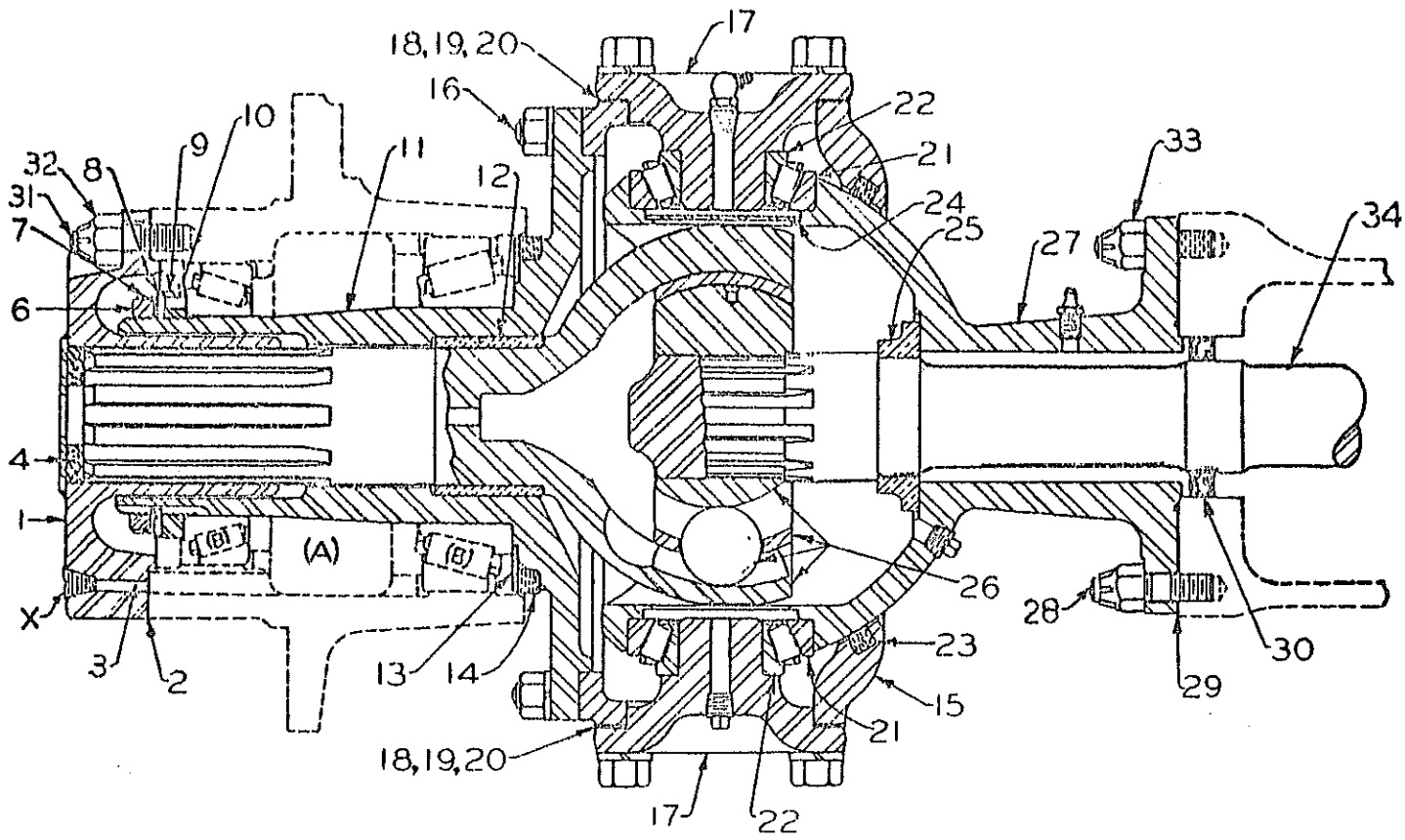
13. The two Timken bearings (B) are packed or completely charged with lubricant at time of assembly at the factory, therefore it should not be necessary to pump still more lubricant into the plugged port (X) when the grader is being used at temperatures above 22° F.

14. The purpose of the plug (X) in flange (1) is to make it possible (without removing the front wheels) to pump winterizing oil into compartment (A). When the temperature subsides to 22° F. and under, 1/4th pint of SAE-10W pumped into each wheel port (X) will winterize the wheel bearing grease at locations (B).

15. If an excess amount of lubricant is pumped through opening (X) into compartment (A) during temperatures above 22° F., the excess lubricant will flow past the wheel felt (14). This excess lubricant should be kept off the tires.

16. Replace lock washers and nuts on all studs.

17. Check all nuts and retighten, if necessary, after operating grader about an hour, and again after a day's operation.



The above shows the "Pacer" Grader type of Wheel Joint.
(Used in front and rear wheel drive)

5. UNIVERSAL JOINT WITH AXLE SHAFT REMOVAL.

a. Follow the instructions in paragraph covering "Wheel Removal", page 2, Section 5.

b. Bushing (12) and thrust collar (25) above, should not have excess end wear, otherwise the total end clearance may exceed the permissible amount, namely .075". (Minimum .050")

c. Remove the nuts and lockwashers from studs (16). Loosen the capscrews located in caps (17). Remove the steering knuckle (11). Grasp the splined end of universal joint and carefully pull the joint, with axle shaft, out of housing. Be especially careful not to damage the oil seal (30).

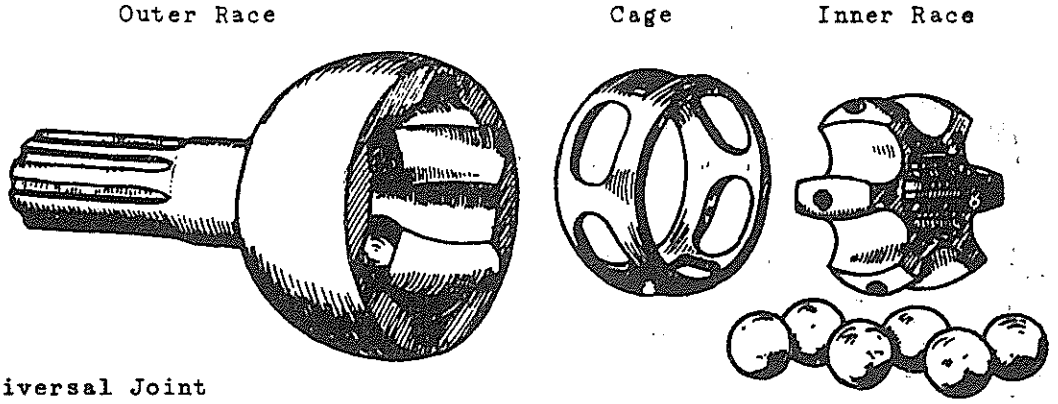
d. Place the universal joint and axle assembly on a bench (or a box if bench is not available).

e. The universal joint group (26) can now be tapped off the end of axle shaft. (Use a bronze plug and hammer.)

f. Wash all parts carefully with kerosene and check them carefully before reassembly.

6. AXLE UNIVERSAL JOINT DISASSEMBLY. (For Cleaning and Inspection Purposes Only)

a. Whenever the joint is removed from its housing for any purpose, it is a good idea to wash it and inspect it. If it is desired to disassemble it, study Page 4 and follow the procedure outlined.



Parts of Universal Joint

Universal Joint Assembly

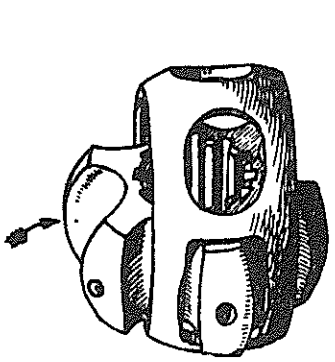


Illustration 1.

Removing or Inserting Inner Race Into Cage

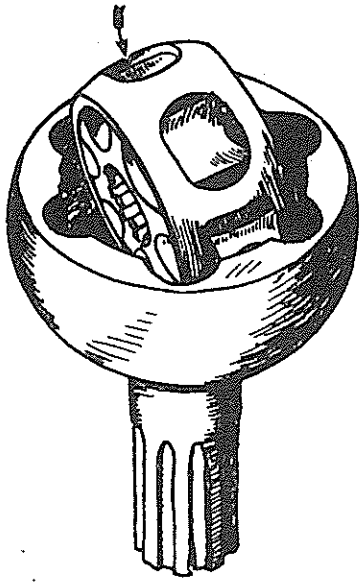


Illustration 2.

Removing or Inserting Inner Race and Cage Into Outer Race

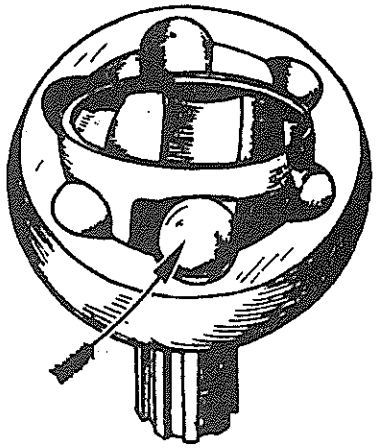


Illustration 3.

Removing or Inserting Balls

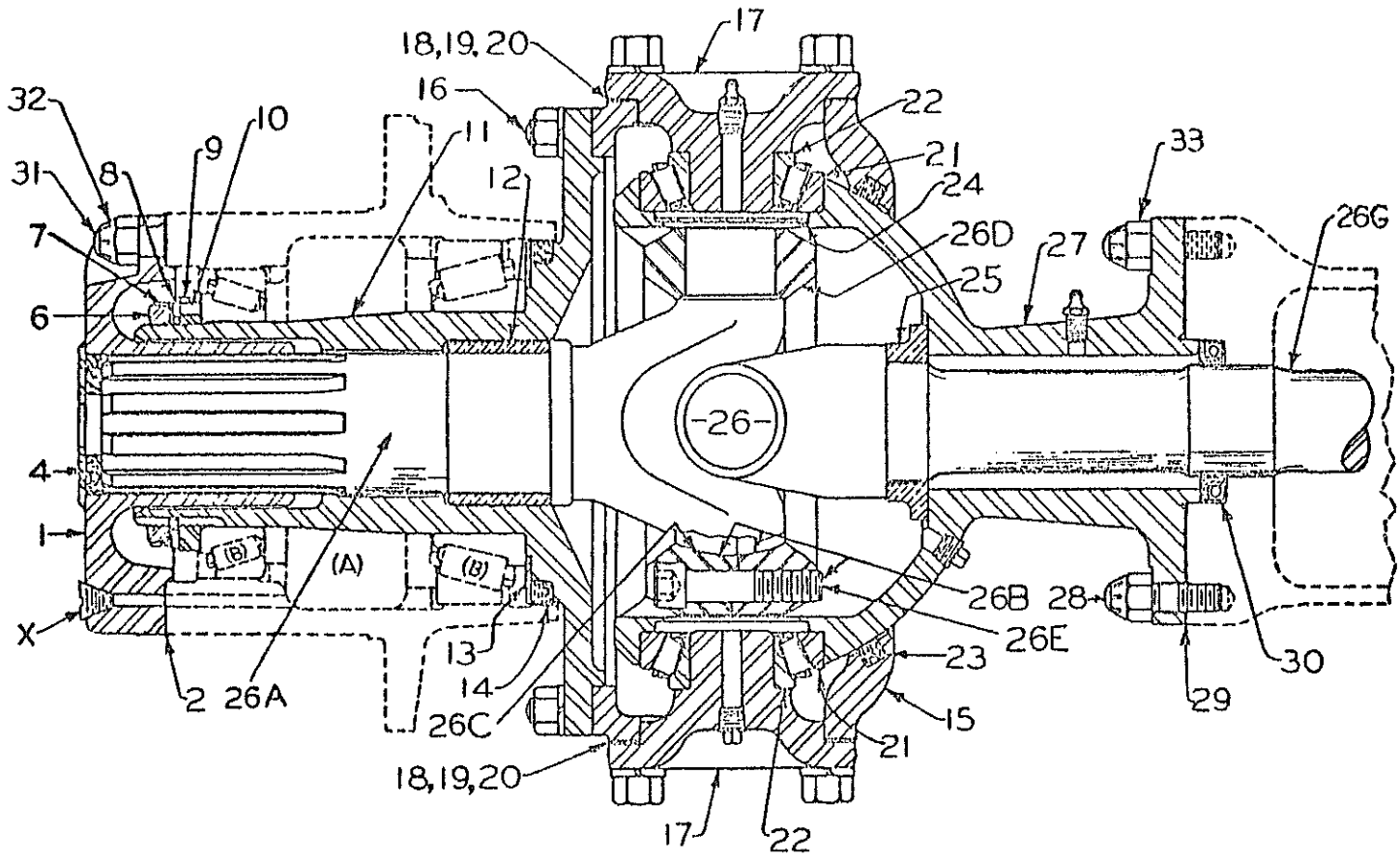
7. "PACER" GRADER UNIVERSAL JOINT.

b. By pushing down on one side of the inner race, the opposite side will automatically come up (Illustration 2), and one ball can then be removed. By pressing down at another point, another ball can be removed, and so on until all balls are removed.

c. Roll both the cage and inner race until they are standing on edge (Illustration 2). If the rectangular slots are not aligned with outer race, revolve the cage slightly to align. Then lift inner race and cage out.

d. Roll the inner race right angles to the cage so that one lug projects thru one rectangular slot in case. Remove inner race from cage (Illustration 1).

e. Clean and inspect all parts. If worn, chipped or cracked, procure a new drive joint group from your nearest Austin-Western distributor. It is not practical to replace any parts in a used joint with new parts. Therefore the entire joint group must be replaced as a unit.



The above shows the "Super" Grader "Cardan" type of front wheel joints.

5A. UNIVERSAL JOINT WITH AXLE SHAFT REMOVAL. ("Super" Graders)

a. Follow the instructions in paragraph 4, covering "Wheel Removal", page 2, sub-paragraphs 1 to 8 inclusive.

b. Remove all the nuts and lockwashers from studs (16), see above.

c. Loosen all the capscrews located in caps (17).

d. Remove the steering knuckle (11).

e. Grasp the splined end of universal joint now exposed and carefully pull the joint, with axle shaft attached, out of housing. Be especially careful not to damage the oil seal (30).

f. Place the universal joint and axle assembly on a bench (or a box if bench is not available).

g. Wash all parts carefully with kerosene. Check and lubricate them carefully before reassembly.

6A. AXLE UNIVERSAL JOINT DISASSEMBLY. (For Cleaning and Inspection Purposes Only)

a. Whenever the joint is removed from its housing for any purpose, it is a good idea to wash it and inspect it.

b. Clean and inspect all parts. If worn, chipped, or cracked, procure a new drive joint group, or parts, from your nearest parts depot.

Reassembly. The assembly and adjustments of these groups will be the same as shown in paragraphs 4, 8, 9 and 10.

8. WHEEL STEERING KNUCKLE DISASSEMBLY.

a. Follow instructions in paragraph 5, "Universal Joint with Axle Shaft Removal".

b. Remove fork bolts (1) page 6.

c. Remove the nuts from studs (28) page 3 or 3A, at end of axle housing.

d. Pull the entire trunnion and knuckle flange off the studs. It may stick and require force to remove it. At this point check the seal (30), in end of trunnion socket. Replace if necessary. Be sure to oil it well before reassembling.

e. Remove the capscrews from top pivot bearing cap (17) and remove the cap and shims (18), (19) and (20). Keep the cap and shims together. (It will be well to tie them together if original parts are to be reassembled again.)

f. Now remove the lower pivot bearing cap (17), following the same procedure used to remove the upper bearing cap (17).

g. Slip the knuckle flange (15) off flanged end of trunnion socket (27).

h. The felt (23) can now be removed and replaced with a new one, if necessary.

i. For Reassembling, reverse the above procedure.

CAUTION: Before reassembling wash and inspect all parts carefully. Cleanliness is essential in preventing wear.

9. WHEEL PIVOT BEARING ADJUSTMENT. (With the Wheel Removed but Steering Knuckle still on the Power Grader.) (See page 3 or 3A.)

a. Remove capscrews from top bearing cap (17) and cap and shims (18), (19) and (20). Keep cap and shims together. (It will be well to tie them together so they can be easily assembled in the original position.) Mark the cap (17) so it can be put back in the original position.

b. Carefully wash out the bearing cup (21) and its compartment. Remove all grit and chips present. Wash bearing cone and rollers carefully. If bearings show signs of chipping or flat spots, replace both cup and cone with new ones.

c. Remove the lower bearing cap (17) with shims (18), (19) and (20). Keep together for reassembly in original positions.

d. Wash the bearing cone and rollers and cup carefully. If there are any signs of chipping or flat spots, replace both the cup and the cone with new ones.

e. Pack bearings with grease. Reassemble caps with shims in original positions.

f. Tighten capscrews evenly on caps (17).

g. If there is any vertical end clearance in the bearings, adjust by removing equal amounts of shim thickness from both top and bottom. If too tight, add new shims of same thickness to both top and bottom.

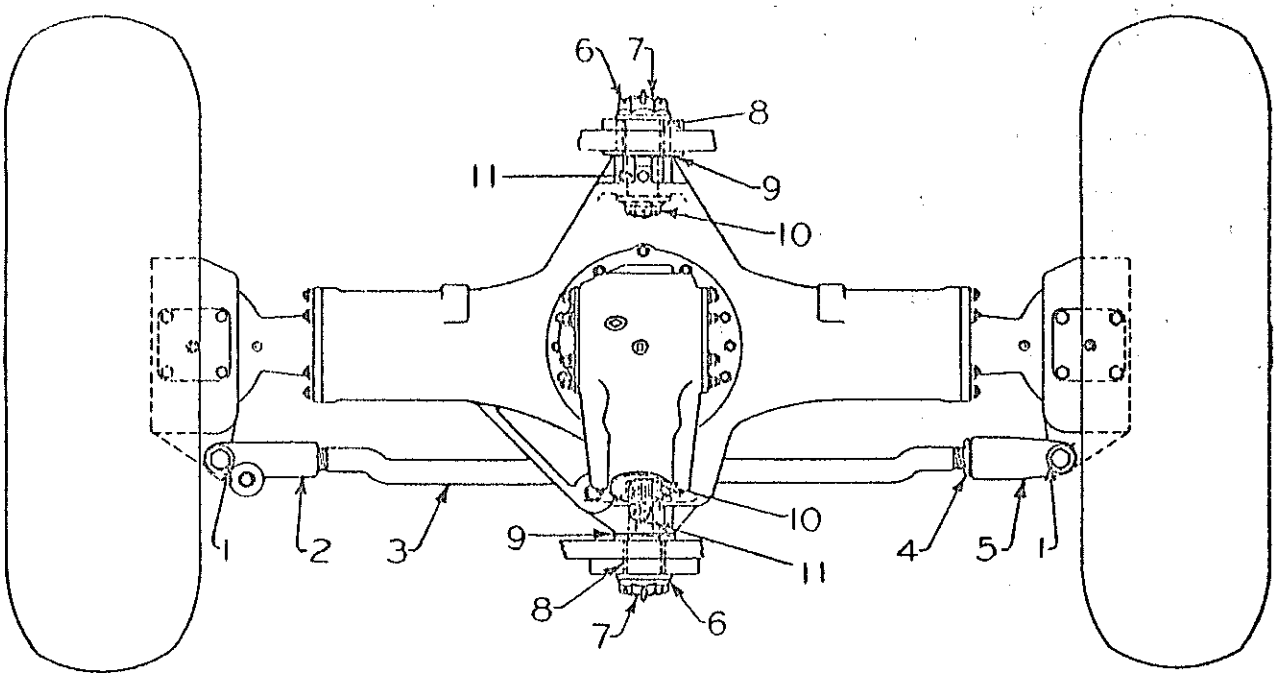
Continue this adjustment until the clearance is just out of bearings when screws are tight, then remove a thin shim (.005") from under both the top and the bottom bearing cap. This will bind the bearings slightly and is called "pre-loading". This is done to eliminate slight play from existing when these bearings are actually carrying the weight of machine while at work. The shims are of three thicknesses; .005", .007" and .020".

CAUTION: Capscrews holding top and bottom pivot caps (17) must be left loose until the axle and knuckle joint group are put in place and knuckle (11) is securely tightened by the nuts on studs (16). Otherwise, knuckle flange (15) will distort and the pre-loading effect be destroyed.

10. FRONT WHEEL TOE-IN ADJUSTMENT. (See Page 6) Also see section 3, page 1, paragraph 3A.

a. The axle is equipped with a tie rod adjusting nut (4) with both right and left hand threads. Turn the nut so that front toe-in is 0". Measurements to be made at the side wall of tires as close to center line of axle as possible.

b. No toe-out should be tolerated as this causes excessive tire thread wear.



11. REMOVAL OF FRONT AXLE ASSEMBLY FROM FRAME (See above).

a. Place machine on level place.

b. Revolve blade until it is square across the lock circle latch.

c. Block both rear wheels securely to prevent possibility of machine rolling forward or backward.

d. Remove nuts (6) and (10) from pivot pins (7). Remove setscrews (11).

e. Disconnect steering ram hydraulic hoses at their union ends.

f. Unlock and remove the four capscrews from front propeller shaft universal joint fitting yoke.

g. Start the engine and raise blade as high as possible. Place blocking under each end of blade about a foot from the ends.

h. Force blade downward. This will lift the front end of frame upward. Lift it only enough so that axle pivot pins are free of excessive binding.

i. Remove the pivot pins (7).

j. Again push blade down to lift frame high enough to clear axle.

k. Roll axle out from under front end of frame.

l. Reverse above procedure for reinstalling.

12. FRONT AXLE GEAR CARRIER REMOVAL. (See page 7.)

a. Remove axle from frame. (See paragraph 11.) Remove bottom drain plug to drain oil from axle.

b. Block up under axle housing to hold it when wheels are removed.

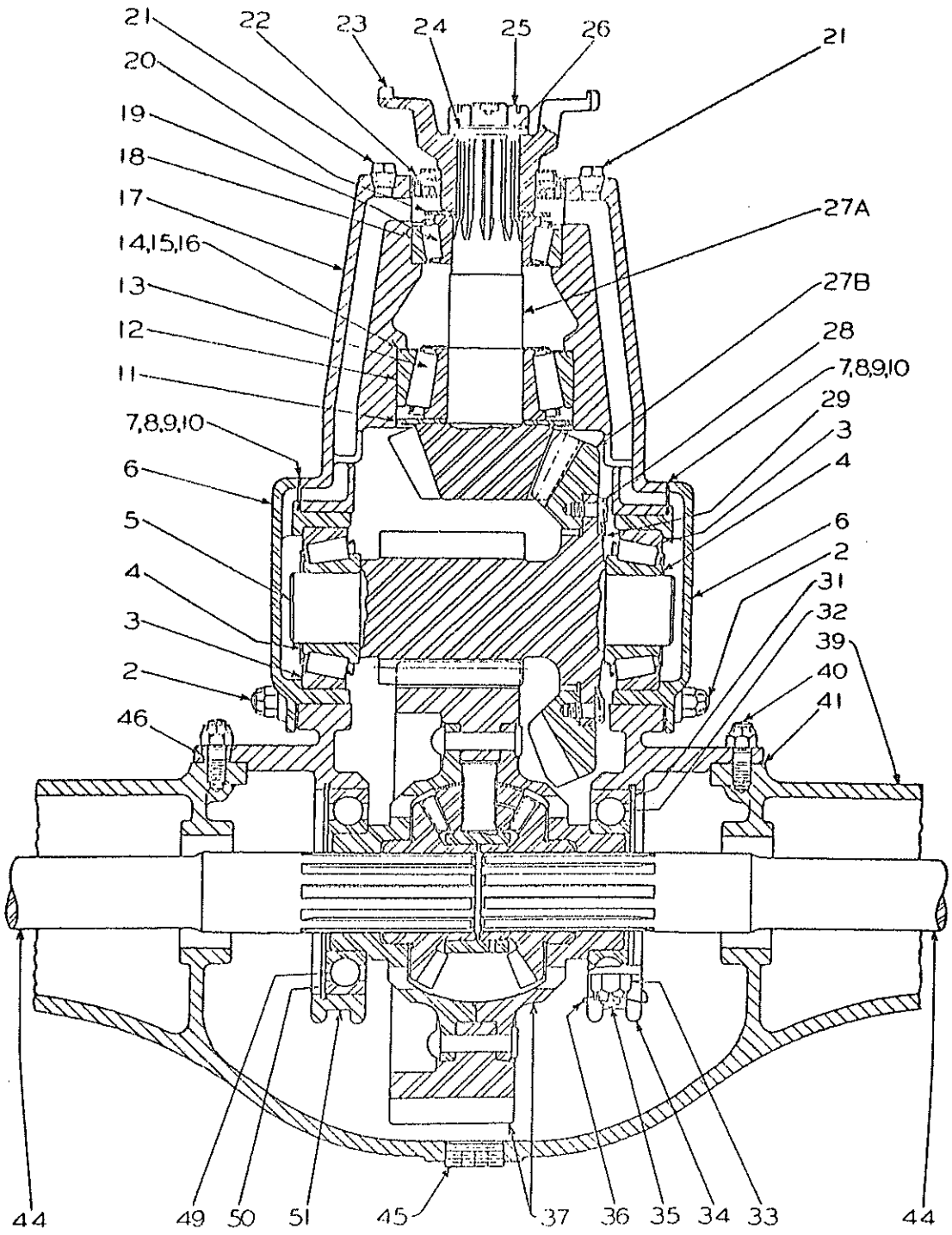
c. Remove the nuts from studs (28), page 3 or 3A, on both sides. Remove fork bolts at (1), see above.

d. Slide out, about 8", both the right and left wheel, with trunnion socket and axle still attached.

If the oil seals (30), page 3 or 3A. are damaged or worn, be sure to replace them before reassembling.

e. Remove the nuts from studs (40), page 7.

f. Lift the gear carrier out of main axle housing.



13. FRONT AXLE GEAR CARRIER DISASSEMBLY AND REASSEMBLY. (After Removing the the Assembly from Axle Housing)

a. Remove the lock wires and nuts on the four studs (35).

b. Remove the bearing caps (51) and (34). (If they are not already marked, mark them so they can be put back in exactly the same position in reassembly.)

c. Lift out the bull gear and differential group (37).

d. If ball bearings (32) and (49) on differential hub are worn, replace them with new ones.

e. If you desire to remove the one piece bull pinion and bevel gear hub (5), proceed as follows:

(1) Remove nuts and washers from studs (2).

(2) Remove the left bearing cap (6). Save the gasket (7) and all shims (8), (9) and (10). Wire these to the cap so they will be replaced in original position.

(3) Remove the right bearing cap (6), saving the gasket (7) and shims (8), (9) and (10). Wire them to the cap to prevent mix-up.

(4) Remove the bearing cone and roller assembly (4) from ring gear end of shaft (5). If bearing cone (4) cannot readily be driven from shaft, pour hot oil over bearing only, to expand it for easier removal. (When reassembling, polish both ends of shaft (5) using emery cloth so bearings will drive on and off easier.)

NOTE: Keep the shaft (5) cold.

(5) Remove the shaft (5) after removing the cap screw (28) holding the bevel gear (27B).

(6) If inspection shows chipping or flat spots on either bearing, replace both the cone and cup of that bearing.

(7) Clean and check all parts carefully before reassembly.

f. If you desire to remove the bevel pinion (27A) proceed as follows:

(1) Remove the cotter and nut (25).

(2) Remove washer (24) and universal joint fitting yoke (23).

(3) Place a bronze drift on threaded end of pinion shaft, and drive it back through bearing (19). Be careful to save all the shims (14), (15) and (16), also washer (20).

(4) Check oil seal (22) and replace it with new one if necessary.

(5) If inspection shows any flat spots or chipping on bearings (12), (13), (18), or (19), replace both the bearing cone and the cup of damaged bearing.

g. After all usuable parts have been carefully cleaned, proceed as follows:

(1) Assemble cup (12) with shims (14), (15) and (16), also cup (18), into the carrier casting (17).

(2) Place washer (11) and cone (13) on shaft (27A) as shown.

Next insert shaft (27A) into location.

Install cone (19), washer (20), seal (22), yoke (23), gasket (26), washer (24), and finally nut (25).

(3) Tighten nut (25) sufficiently to remove all end clearance at bearings (13) and (19). Do not over-tighten nut (25) because the bearings (13) and (19) will be adjusted too tightly endwise.

Shaft (27A) should turn freely, except for the friction applied by the seal (22) around the yoke (23).

(4) If you install too many shims (14), (15), or (16), the teeth of pinion (27A) will extend too far into the ring gear teeth near arrow (27B).

The teeth of both pinion (27A) and gear (27B) should be approximately flush with one another at the back side, or near arrow point (27B).

If you do not install a sufficient quantity of shims (14), (15), or (16), then the teeth of pinion (27A) will be outward from the teeth of gear (27B).

See pages 10 and 11, Section 5 for proper tooth contact.

(5) When installing a new bevel gear (27B), or a new pinion and gear hub (5), be sure to temporarily assemble the two together before putting them into the gear carrier. By doing this you will be sure they fit together properly. Special tools for setting proper tooth contact of ring gear and pinion are available at all A-W dealers.

The bevel gear is held firmly in place by capscrews (28) through the backing flange. It is therefore best to mark (with paint) the bevel gear and hub flange to make alignment easy. The bevel gear should be a snug fit on the hub (5).

Insert gear hub (5) (with gear (27B) slipped over end) into top of the gear carrier housing.

Align the bevel gear with flange and slip the gear into place tightly against the flange, as shown on page 7, Section 5.

Be careful not to damage the gear teeth.

Insert and tighten the screws (28). Install lock wire (29).

If necessary (not recommended) heat the bearing cones (4) in hot oil (not over 300° F.) and tap them into place against the gear hub shoulders. (Always replace worn bearings.) Both ends of shaft (5) can be polished down by means of emery cloth in order that the bearing cones (4) can be more easily removed.

Align the oil holes and replace both of the bearing caps (6), together with the gasket (7) and the shims (8), (9) and (10), but first make sure the bearing cup (3) is in good condition. If otherwise, replace it and bearing cone.

Check the position of gasket (7) and shims (8), (9) and (10), and the bearing caps (6).

Oil ports in case and cap must align and the shims must be properly placed, or the flow of oil will be cut off, and the lubrication of the bearing will then be insufficient.

If end play exists in the one piece pinion and gear hub (after the caps (6) are tightened), it can be eliminated by removing shims (8), (9), or (10), as required.

Be sure the pinion and gear hub has only a slight drag when both caps (6) are tight.

If pinion (27B) needs to be adjusted for proper mesh with bevel gear, add or remove shims (14), (15), or (16) as required.

(6) Place the large spur gear and differential group (37) in position after installing the two hub bearings (32) and (49).

The spur gear is offset to clear the bevel gear, so be sure you do not try to install it with the wrong side toward the bevel gears.

Replace the bearing caps (34) and (51) and tighten the nuts on studs (35) and wire them to prevent their loosening.

(7) Install a new gasket (41).

Lower the now completely assembled gear carrier down into front axle housing (39).

Put the tapered dowel bushing (46) in proper place and tighten this stud nut first; then tighten the rest of the nuts on studs (40).

(8) Carefully push the axles and wheels back into axle housing and replace and tighten the huglock nuts (33), page 3, Section 5.

(9) Check the tow-in adjustment. See page 5, Section 5, paragraph 10, "Front Wheel Tow-In Adjustment".

(10) Fill axle housing with recommended oil. (See lubrication charts.)

Pour about a pint of this oil into either hole located at front side of the pinion compartment near fitting yokes. These two holes have a 1/2" square head pipe plug (21), page 7, in them. This oil prevents the bearings (13) and (19) from insufficient lubrication when first starting newly assembled axle.

14. BEVEL GEAR AND PINION ADJUSTMENT.

a. General.

No other phase of axle maintenance is more important, yet less understood, then the adjustment of bevel drive gears and pinions in order to secure proper tooth contact.

It must be kept in mind that checking for tooth contact area and location is done with no load on the gear set.

When the area of tooth contact is toward either the heel or toe, the teeth will be overloaded at the end and chipping may occur.

When the area of contact is too high, then the load application is farther from the base of the teeth, thus increasing the bending load and possibly resulting in breaking teeth out at the base.

When the area of contact is less than specified, a higher localized load results in squeezing out the film of lubricant. A metal to metal contact such as this causes scoring, scuffing, or galling, which contributes to noisy operation and rapid wear.

Two other points to keep in mind are:

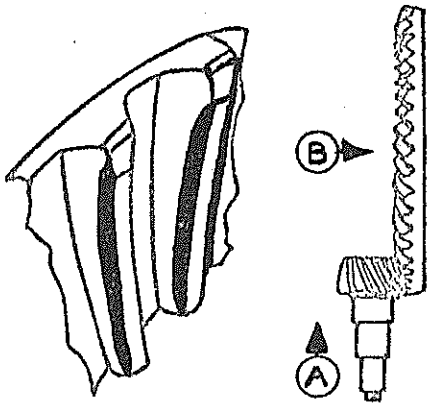
First: The factory adjustment of bevel drive gear and pinion sets is as correct as special equipment and years of experience in building thousands of axles can make it, and should not be disturbed except when absolutely necessary. For example, should it be necessary to dismantle and reassemble the gear carrier group to replace some part other than the gear and pinion, do not disturb the shim adjustment. Always replace worn bearings.

In addition to this, backlash should be checked and noted before disassembling the unit, in order that the gear may be adjusted to the original backlash when making final adjustments.

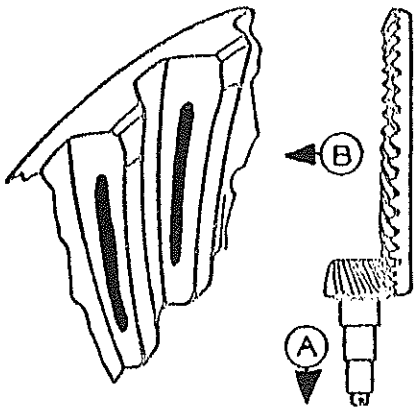
Second: Always bear in mind that gears and pinions are matched at the factory, and as far as possible should remain matched in service. Well matched sets operate quietly.

b. Checking Tooth Contact.

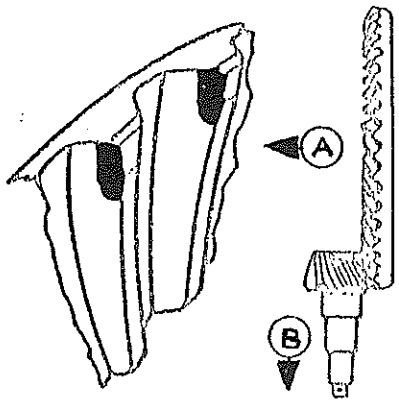
This is accomplished by means of oiled red lead applied lightly, or sparingly, to the drive side of the bevel gear teeth. When the pinion is rotated the red lead is squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts. Sharper contact impressions can be obtained by applying a small amount of resistance to the gear when rotating the pinion. (Hold a block of wood against the gear and use a wrench to rotate the pinion.) When making adjustments always check the drive side of the bevel gear teeth. Coast side contact will be automatically correct when the drive side contact is correct. As a rule, coating about 12 gear teeth with red lead is sufficient for checking purposes.



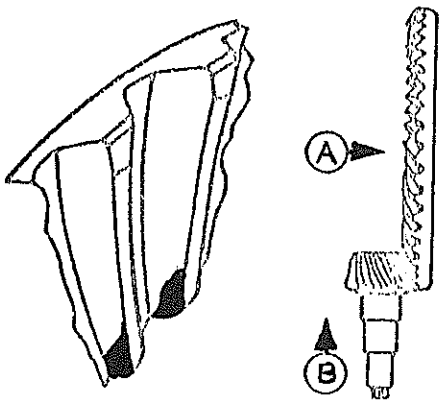
(1) The above diagram shows a HIGH NARROW CONTACT, which is undesirable and will result in noisy operation, galling, and overloading of the teeth. To obtain correct contact, add shims to move the pinion (A) in toward the toe of the gear teeth (toward the center of the axle) to lower contact area to the proper location. This adjustment will decrease the backlash between the pinion and gear teeth, which can be corrected by moving the gear (B) away from the pinion. A backlash of .008" is correct. Several adjustments of both pinion and gear may be necessary before correct contact and backlash are secured.



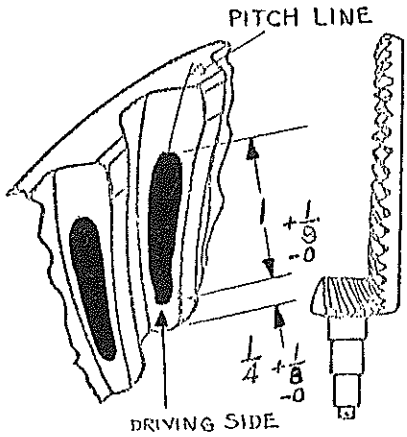
(2) The above diagram shows a LOW NARROW CONTACT, which will result in galling, grooving of teeth, and noise. To secure correct contact, remove shims to move pinion (A) out from gear (away from center of axle) a sufficient amount to move the contact area to the proper location. To obtain correct backlash (.008") move the gear (B) in toward the pinion.



(4) The above diagram shows a SHORT HEEL CONTACT, which produces approximately the same results as a short toe contact: noise, excessive gear tooth wear, and chipping of tooth edges. To correct this condition, the gear (A) must be moved in toward the pinion to increase the lengthwise contact and to move the contact toward the toe of the teeth. Correct backlash (.008") is obtained by moving the pinion (B) out toward the heel of the gear teeth (away from the center of the axle).



(3) The above diagram shows a SHORT TOE CONTACT, which, because the contact area overlaps the toe of the bevel gear teeth, will result in chipping of tooth edges and excessive wear at this point if not corrected. To secure correct contact, move the gear (A) away from the pinion. This will increase the lengthwise contact and move the contact area toward the heel of the gear teeth. Correct backlash (.008") is obtained by moving the pinion (B) in toward the gear (toward the center of the axle).



(5) The above diagram shows when ADJUSTMENTS HAVE BEEN PROPERLY MADE. This is the correct tooth contact that will be secured.
IMPORTANT - The tooth contact area shown in above diagram is to be held as close as possible to dimensions shown. Backlash to be no more than .008".
This adjustment results in a quiet running gear and pinion set, which, because the load is distributed over the teeth within the proper area, will deliver all the long service built into it.

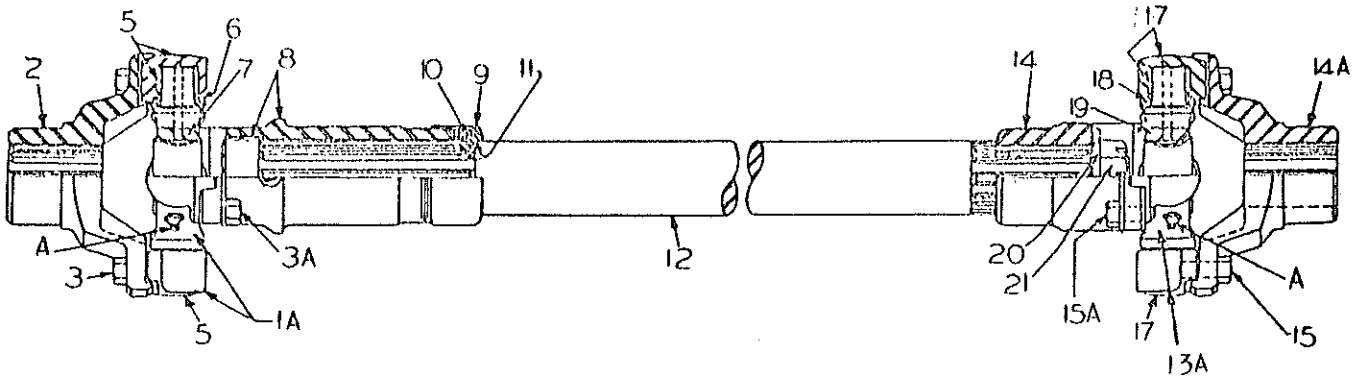
15. PROPELLER SHAFTS.

a. Lubrication.

The needle bearings are packed with lubricant at time of assembly. Grease fittings at (A), shown below, are provided in each bearing group.

The joints should be dismantled, cleaned, and inspected every 5000 hours of operation. Worn parts should be replaced at that time.

The needle bearings should be repacked with lubricant before assembly. (See lubrication chart, page 2, Section 2.)

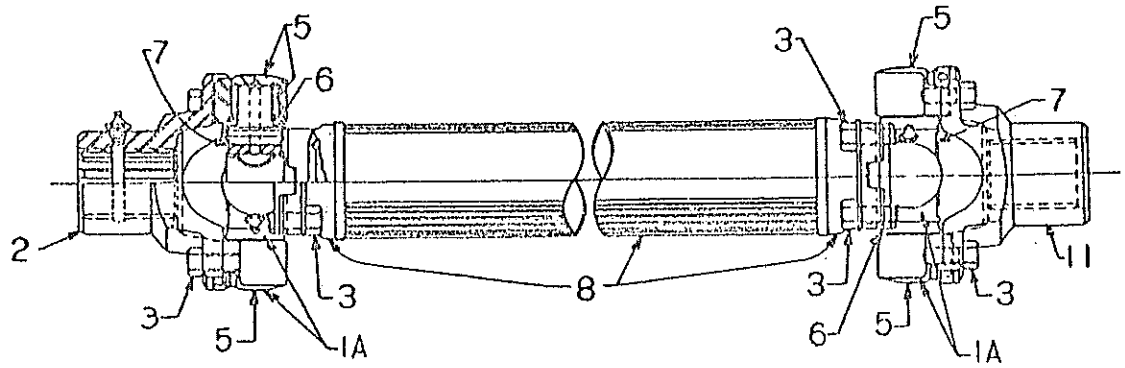


Front Axle End

Front Section of Front Propeller Shaft

b. Front Section of Front Propeller Shaft.

The slip yoke (9) must be installed at the rear end (away from the front axle). When assembling slip yoke (9) to shaft (13) be sure to time the yoke exactly as shown; both yokes (3) turned up.

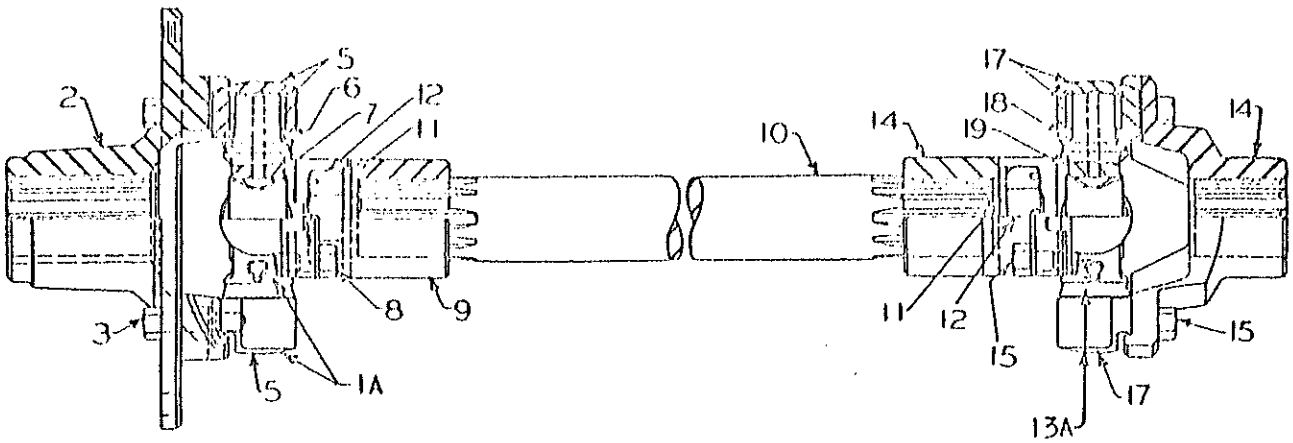


Clutch End

Clutch to Transmission Propeller Shaft

c. Clutch to Transmission Propeller Shaft.

When making repairs to the main clutch group, the tube group (8) may be removed after first removing the eight cap screws (3).



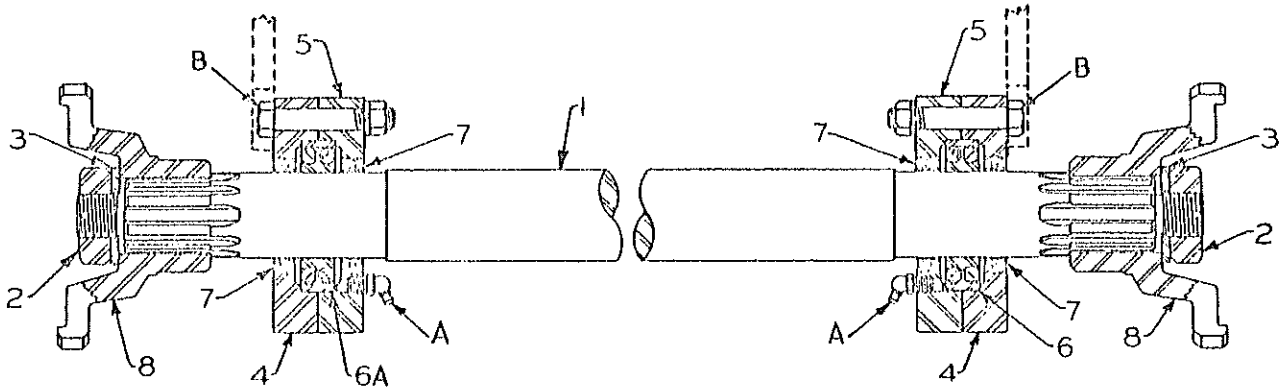
Transfer Case End

Rear Section of Front Propeller Shaft

d. Rear Section of Front Propeller Shaft.

Cap screws (3), (8) and (15) must be tight and locked in place.

NOTE: Please notice that fitting yoke (9) is timed to the splined shaft (10) with cap screws (8) to the side, also the fitting yoke (14), located at the right end of shaft (10), is shown correctly timed to the splined shaft (10). This procedure indicates the proper timing of these yokes to the propeller shaft "U" joints.



Center Section of Front Propeller Shaft

e. Center Section of Front Propeller Shaft.

The center section is mounted in, and rotates on, two anti-friction bearings (6) and (6A). Adjustments are not required.

Each bearing housing (5) is fitted with grease fitting (A). See lubrication chart, in Section 2.

The lips of the end seals (7) should be turned outward. Both nuts (2) should be tight and cottered.

NOTE: Please observe that both yokes (8) are correctly installed, or timed, on the splined shaft (1) with the flanges turned straight up and down.

16. HYDRAULIC BRAKE SYSTEM.

a. General.

The powerful hydraulic "Bendix Duo Servo" brake utilizes a standard hydraulic actuating system, having a compensating type master cylinder operated by a foot pedal, and a brake actuating cylinder at brake drum, together with the required piping, hose, and operating fluid. When a push is exerted on the foot pedal, pressure is created within the master cylinder, causing the column of fluid contained in the master cylinder, piping, etc., to move the drum cylinder pistons, which in turn forces the brake shoes into contact with the brake drum.

When the foot pedal is released, the brake shoe return springs retract the brake shoes and return the drum cylinder pistons to their normal or "off" position, thereby reversing the movement of the column of fluid within the system so that it flows back into the master cylinder.

b. Foot Pedal Adjustment.

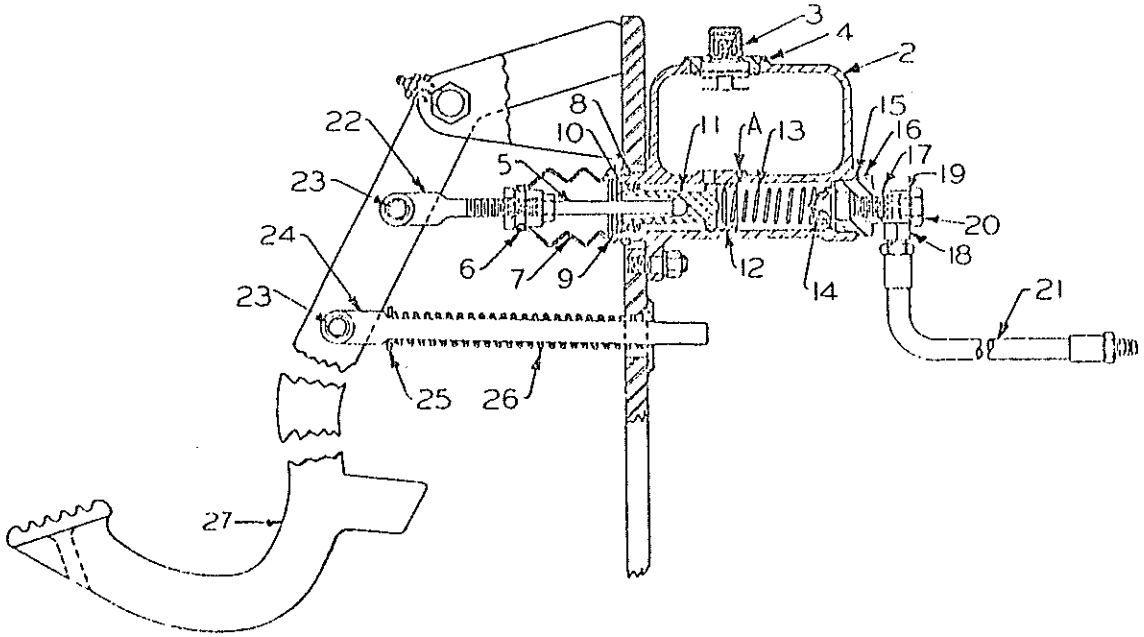
The foot pedal should be adjusted so that there is approximately 1" of free movement at the tread portion of the pedal before the pressure stroke begins. Should the master cylinder link be adjusted so that there is no backlash in the foot pedal, the master cylinder piston and cup may not return sufficiently to uncover the master cylinder compensating port (see (A) below), which may cause failure of the brake to fully release. If the brake does not fully release the frictional drag will cause the fluid to further expand as its temperature is raised. This expansion of fluid will cause an increase in brake drag and may, in extreme cases, result in self-application of the brake to the point where the grader cannot be moved until the pressure is relieved, either by bleeding, or allowing the fluid to cool.

c. Bleeding the Hydraulic Brake System.

Whenever the hydraulic line is disconnected from the master cylinder, it is usually necessary (after reconnecting the line) to bleed the entire hydraulic system at drum cylinder, to expel any air that may have been taken into the system. Fill the master cylinder reservoir with genuine Lockheed or Delco brake fluid before bleeding the line. Keep the reservoir at least half full of fluid at all times.

To bleed the line, unscrew the hex shouldered portion of bleeder screw three-quarters of a turn to the left and push pedal down slowly. This produces a pumping action which forces fluid through the tubing and drum cylinder, carrying with it any air that may be present in the line.

When air bubbles cease to appear, and the fluid stream is a solid mass, hold the brake pedal down and have a mechanic close the bleeder screw.



Fluid drained out of the system during the bleeding operations should not be used again as it may contain dirt or foreign matter which may be injurious to the system. After drum cylinder is bled the supply of fluid in the reservoir should be replenished.

> CAUTION: Be sure to keep the reservoir half full of brake fluid when bleeding the brake system. Should the reservoir be drained during the bleeding operations, air will again enter the system and rebleeding will be necessary.

d. Brake Adjustment.

Do not adjust brake when drum is hot. If brake is adjusted when drum is hot and expanded, the shoes may drag when the drum cools and contracts.

There are two points for adjustment in a brake system of this type to compensate for normal brake lining wear. These points are the adjusting screw (6) and the anchor pin (15), page 16, Section 5. The adjusting screw takes up the clearance between the brake lining and the brake drum. The anchor pin serves to centralize the shoes.

e. To adjust Brakes to Compensate for Wear.

(1) Jack up rear wheels and one front wheel clear of the floor.

(2) Remove the four 3/8" pipe plugs from brake drum.

(3) Release brake. Revolve wheels, causing brake to rotate until arrow that is cast into the brake drum , points down.

(4) Thru lower right hand 3/8" pipe plug hole in brake drum, insert a pry between the lining of the shoe (2) and the brake drum, and move the shoe assembly until the other shoe (2) is against the drum.

(5) Insert a .015" feeler gauge between the lining and the drum at lower end of shoe (2). Turn the adjusting screw with a screw driver, which causes the adjusting screw to force the brake shoes against the drum until .015" clearance between lining and drum is obtained. Check the clearance at the upper end of the shoe (2). .015" clearance at each end of this shoe indicates correct anchor pin position and insures proper brake lining contact with drum.

(6) In the event .015" clearance at each end of shoe (2) is not found in checking, it will be necessary to move the anchor pin to the correct position.

(7) To adjust the anchor pin, loosen the anchor pin nut (16), enough to permit turning the anchor pin with a screw driver (inserted through adjusting hole in upper face of the drum). To decrease clearance between the drum and lining at the anchor pin end of the shoe (2), turn the screw driver to the right. With the shoe (2) against the drum, turn the adjusting screw and anchor pin in the necessary direction to obtain .015" lining to drum clearance at both ends of shoes (2).

(8) Tighten anchor pin nut securely with a wrench while holding the anchor pin with a screw driver. Again check the shoe clearance to be certain the anchor pin has not moved.

(9) Install the four 3/8" pipe plugs into brake drum.

f. Precautions.

Use only alcohol to clean rubber parts and the inside of master and drum cylinders. Kerosene or gasoline may cause damage to, or failure of, the hydraulic system.

Do not allow grease, oil, paint, brake fluid, or foreign matter to come in contact with the brake lining.

If brake shoes are not properly lined, poor braking will result. It is better to install new brake shoe and lining groups when linings are badly worn.

17. HAND BRAKE.

The hand brake lever and interconnecting cable actuates lever (25). See below.

Periodic mechanical adjustments are not required to the hand brake mechanism.

Lubricate daily the hand lever pins and internal cable, using SAE-10W oil.

18. HYDRAULIC FOOT BRAKE MASTER CYLINDER.

The master cylinder and interconnecting parts require no periodic adjustment.

Do not allow the master cylinder reservoir to become less than one-half full of brake fluid at any time.

Keep filler cap (3), page 14, Section 5, clean on master cylinder to prevent air vent being plugged with dirt.

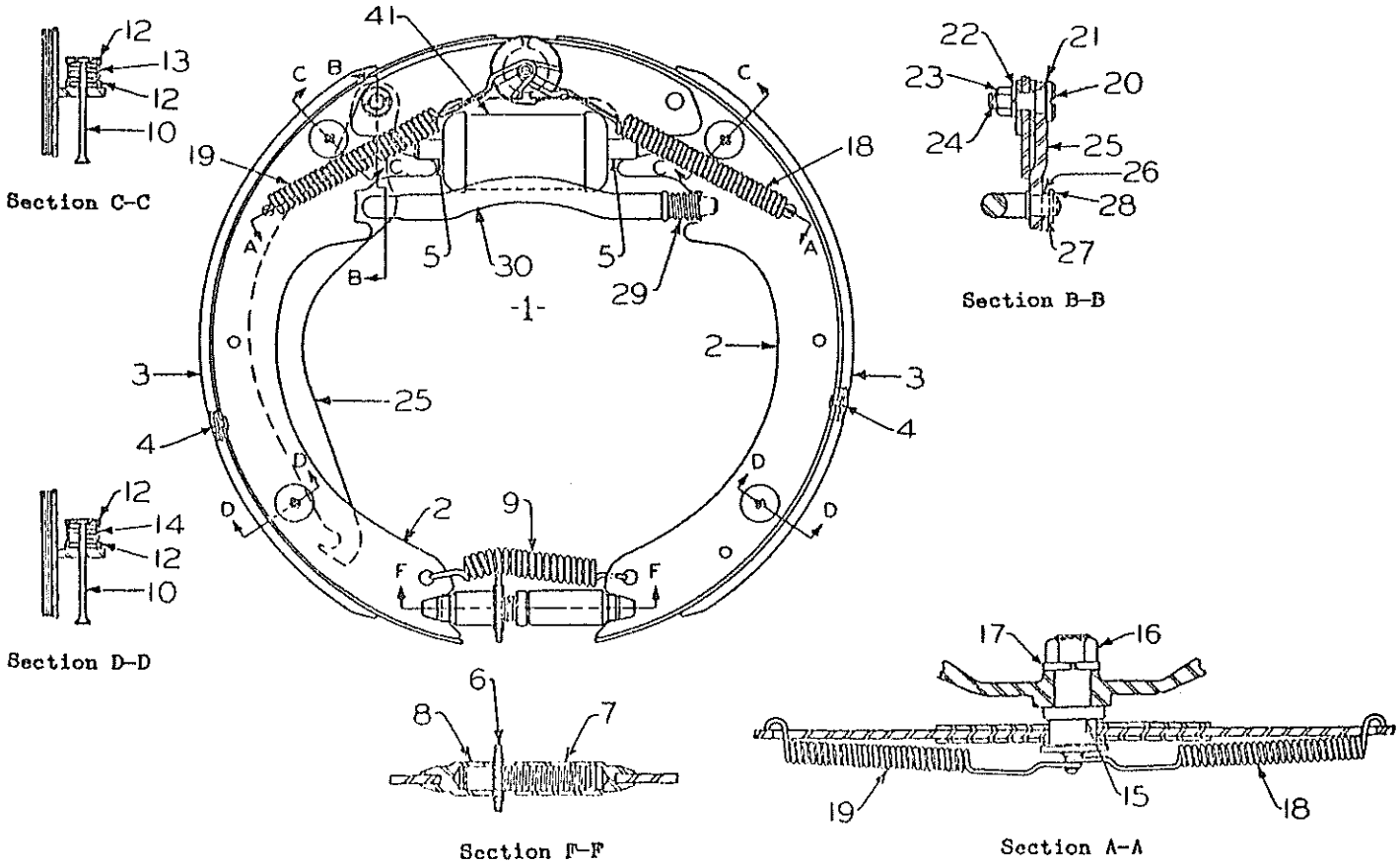
Use only genuine Lockheed or Delco brake fluids. Substitutes may do considerable damage to the hydraulic system.

CAUTION: Be sure to keep the reservoir half full of brake fluid when bleeding the brake system. Should the reservoir be drained during the bleeding operations, air will again enter the system and rebleeding will be necessary.

19. AUXILIARY BRAKE. (Special Order)

The auxiliary brake used on A-W graders is installed on a flange which is part of the rear gear carrier. The brake assembly is of the same basic type used for the primary brake. Hydraulic lines for the two brakes are in parallel and are actuated at the same time with one brake pedal. There is no emergency brake unit on the auxiliary brake.

All instructions pertaining to adjustment and maintenance apply to the auxiliary brake and must be performed at any time the primary brake is adjusted.



20. TRANSMISSION AND TRANSFER CASE REMOVAL.

a. General.

If internal repairs are to be made, then the assembled transmission and transfer case should be removed as a group from the grader frame.

Before dismantling, if the machine is in operating condition, it is best to drain the gear oil from the transmission and transfer cases and refill them with flushing oil (kerosene or diesel fuel) and run the machine slowly backward and forward for several minutes.

It is best to drain the first washout; refill with clean flushing oil, and repeat. In this way the second washing will usually get everything clean and free of oil.

CAUTION: Do not use gasoline, as there is danger of explosion and fire.

b. Transmission and Transfer Case Group Removal.

The engine, radiator, and engine accessories, need not be disturbed. This likewise applies to the operator's seat, battery box, and dash. Two hydraulic lines must be disconnected at the hydraulic valve bank.

Certain equipment, such as a cable hoist of not less the 1/2 ton capacity, and the necessary wood blocking, etc., is needed before starting the operation.

Follow the procedure outlined as follows:

(1) Remove the four capscrews at the following yokes: (28), Page 22, Section 5, (50) and (11), page 19, Section 5. The rear section of front propeller shaft, may now be removed, after removing the bolts (3), page 13, Section 5.

(2) Remove shift lever group with cover, after removing the nuts at (26), page 21, Section 5. Also remove the two sheet metal covers near the top of the transmission.

(3) Remove pin (7), page 26, Section 5. Then remove rod group, after removing the cotter pin near (9).

(4) Remove brake cable at hand lever.

(5) Remove hydraulic brake hose at master cylinder and (20), page 14, Section 5.

(6) Remove socket (89), with shift lever (77), page 20, Section 5. Also remove guard under the transfer case.

(7) Remove the two bolts (94) and (102).

(8) Place suitable blocking under transmission.

(9) Use one cable hoist and attach lifting end over the front two studs (26), page 21, Section 5. (Balance of hydraulic piping need not be removed.)

(10) Transmission and transfer case may now be shifted forward about four inches, and carefully lowered to the ground by means of the hoist.

(Remove blocking progressively as transmission and transfer case is being lowered to the ground.)

Reassembly is the reversal of the above procedure.

21. TRANSFER CASE DISASSEMBLY. (See page 19, Section 5.)

To remove the transfer case from the transmission, it is necessary to first follow the procedure outlined in paragraph 20 above.

The 2-speed transfer case is attached to the machined rear face of the transmission in the power division gear case and contains six gears. This case pilots over the outer race of the end bearings at the top transmission shaft.

Eight large studs (16) and (26A) hold the transmission and transfer cases together with an oil tight gasket in between.

After these two units are out of the power grader, proceed as follows:

(1) Remove cover (37) and oil guards (38), page 19, Section 5.

(2) Remove nut (52) on upper drive shaft (51), also universal joint brake flange (50). Remove the nuts from the studs (35) and (53). Bearing cap (34) may now be pulled out, after which the shaft (51) can be driven toward the splined end of the shaft. (Use light hammer and bronze drift on the opposite end when driving it out.) The brake plate (45), shims (41), with Timken bearing and cup, will come out with the shaft. Keep the shims wired to plate (45) while in dismantled state.

The upper gear (39) may now be lifted upward and out of the case, together with the rear Timken cone (4).

(3) Remove the nuts from studs at bearing support (67). Next pull out the bearing housing (67). The nut and washer (57) should now be removed. The gear (31) may now be pulled off shaft (24), together with the ball bearings (58), roller bearing (58A) and thick spacer (59), and thin spacer (60).

(4) The two lock screws (81), with lock wires (82), page 20, Section 5, may be removed, permitting the removal of shifter shafts (83) and (91). Also remove two springs (85) and two balls (84). Slip the shifter (30), page 19, Section 5, off the shaft. (Lift out forks (80) and (90), page 20, when dismantling. Insert these forks into slot in shifters when reassembling.) Then expand the snap ring (29), and slip it, with gear (28), off the shaft.

(5) The transfer case (1) may now be removed from the transmission case, after all nuts have been removed from the studs (16).

(6) Remove cap (71), with shims (72), (73) and (75). Keep the shims wired to cap (71).

(7) Next remove the nut (13) and yoke (11) from shaft (12). Use a medium weight hammer and drive against a bronze drift on the left or yoke end of the shaft, driving it out toward the right. The Timken cup and cone (4) at right side will come out with the shaft.

(8) Remove shaft group (22). The gear (2) and other cone may now be lifted up and out of the case.

22. TRANSFER CASE REASSEMBLY.

a. For reassembling, reverse the above procedure.

b. Before reassembling shaft (12), clean, inspect, and replace (if necessary) all parts, such as seals, gaskets, Timken and ball bearings, and spacers (7), (21), (48), (59) and (60).

c. Clean the complete transfer case and parts carefully, inside and out.

d. Place Timken cone (4) (taper outward) over the stub end of the shaft, and pass the yoke end of shaft (12) through the right lower hole in the case: then through parts as follows: gear (2), Timken cone (4), with taper outward. Tighten cap (8) solidly to the case (1), after being sure Timken cup (5) is in place. Assemble spacer (7) and tighten solidly the yoke (11), using washer and gasket with nut (13).

e. Next install cup (5) with taper inward, then a new gasket (72), together with shims (73), (74), (75), as required and cap (71). Shaft (12) should not have any end clearance. Lubricate both Timken bearings (4) with SAE-30 oil.

f. When a new gasket (26) is installed between the transfer and transmission cases, care must be used in evenly and alternately tightening the nuts on studs (16), otherwise the transfer case may be tipped slightly, later presenting difficulty in entering the last or outer ball bearing (58), nearest to cap (61).

We strongly recommend the use of a dial indicator attached to the right end of shaft (24) and indicating in the bore of the transfer case at the point where the outer roller bearing (58A) is located.

The indicator reading must not exceed .002" eccentricity. If it is greater than .002", then loosen the nuts on studs (16) and retighten them alternately until all are tight, then dial indicate the bearing bore again for final alignment. (Both faces of the transmission case and transfer case must be clean and smooth. A new gasket (26) should always be installed.)

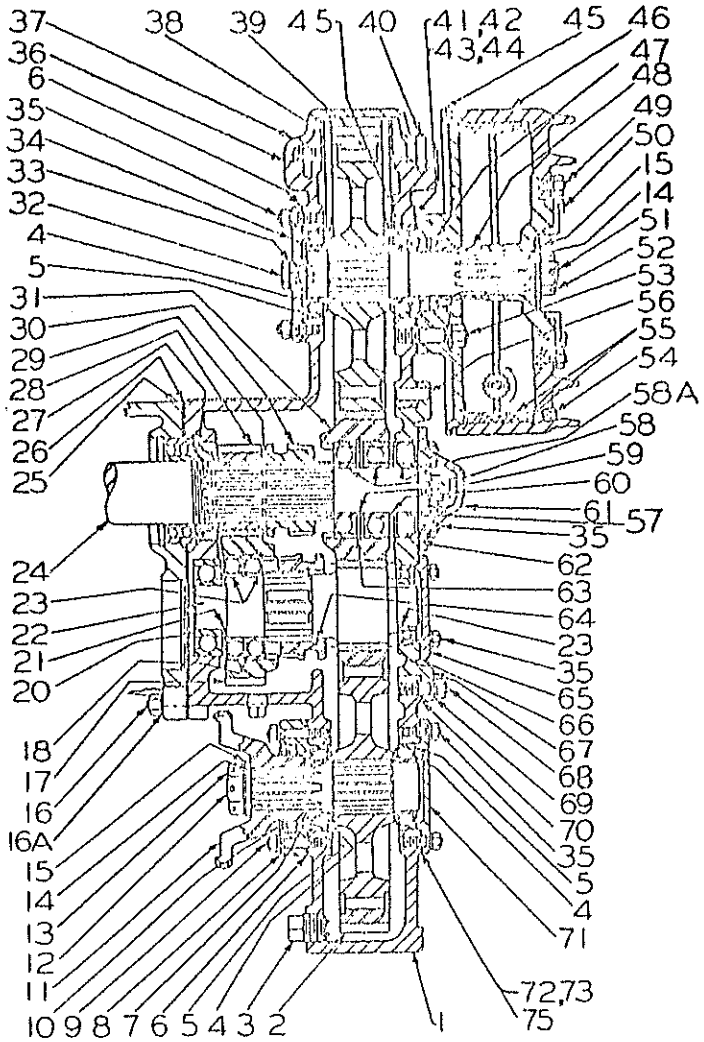
NOTE: Nut (27) must be on the shaft with the small diameter toward the right.

g. Slip gear (28) over shaft (24). Be sure the snap ring (29) is locked in the shaft groove. The shifter fork slot in shifter (30) should be nearest to gear (28). (Insert the fork (90), into the shifter slot before moving the shifter onto the spline of shaft (24).)

Assemble the shift clutch (64) on the countershaft (22), with the fork groove toward arrow (64). Install snap ring (18) into the bore of idler gear (17), also the two bearings (23). Then lubricate both bearings with SAE-30 oil and lightly drive the gear with bearings over the shaft (22). Next slip the spacer (21) and drive the lubricated single row ball bearing (20) over the shaft. Then install the assembled shaft (22) into the transfer case bore. Lightly drive the lubricated bearing (23) onto the stub end of shaft (22).

h. Reinstall shift fork (80), together with shifter shafts (83) and (91), locking the two set screws (81) by means of lock wires (82), as shown. Replace the balls (84), springs (85), spacer (86), and bracket (80).

Install the rear ball bearing (58), and the snap ring (63) in gear (31), and slip it over shaft (24). Next slip the following parts on the shaft in order shown: namely, spacer (59), bearing (58), spacer (60), bearing (58A), then assemble washer and nut (57). Lubricate the ball bearings and roller bearing (58A).



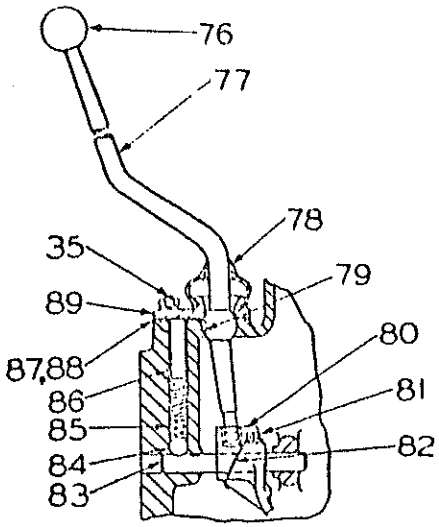
Transfer Case
(Section A-A)

NOTE: The location and end clearance of all gears, bearings, and spacers are controlled by the snap rings (29), (63), (18) and washer and nut (57).

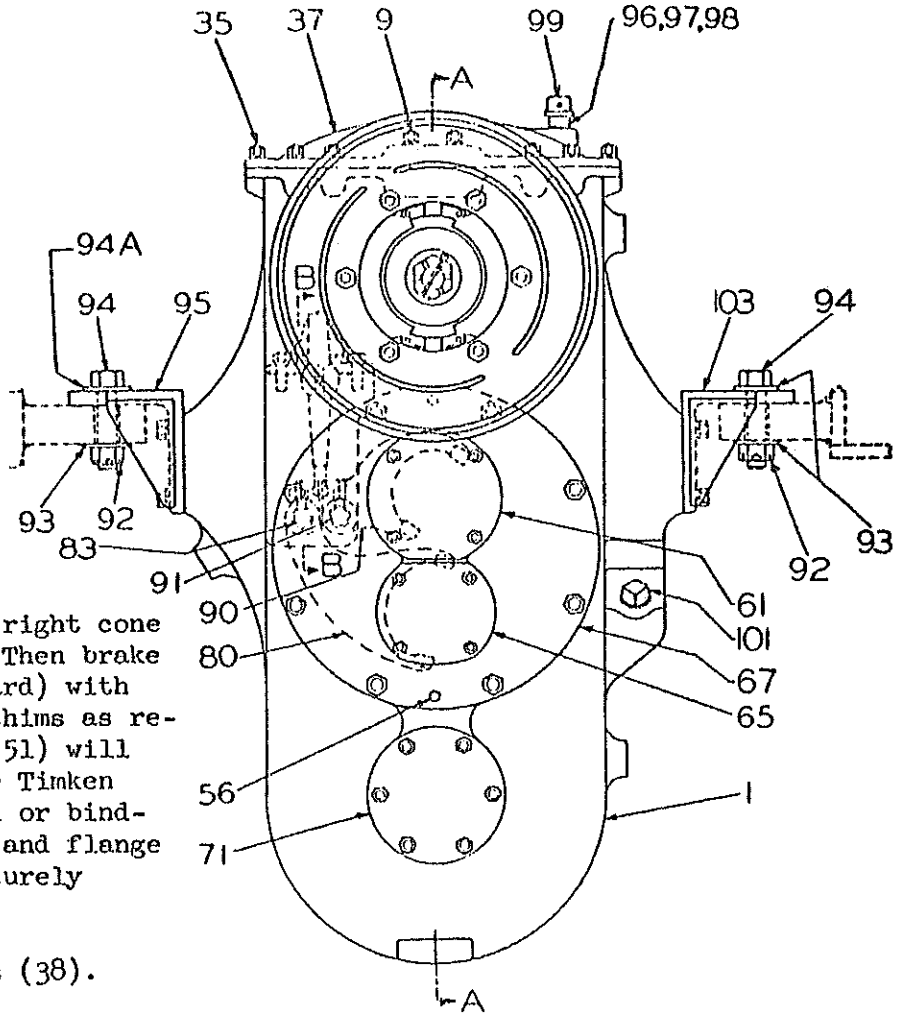
All snap rings should be concentric and the circular tension should solidly lock the rings in the snap ring grooves.

Next install bearing support (67), caps (61) and (65), by means of studs and lock washers and nuts provided. When shifters (30) and (64) are in neutral position, the gears (31), (22), (2) and (39) should rotate freely, except for friction developed by the seals (10) and (47).

i. Lower the gear (39) into position, after installing the left cone (4) (taper outward) with cup (5), together with cap (34) and gasket (6).



Section B-B



Transfer Case

Next insert shaft (51) and right cone (taper outward), with cup (5). Then brake plate (45) (seal lip turned inward) with all shims (41). Add or remove shims as required in order that the shaft (51) will not have any end clearance. The Timken bearings should not be preloaded or binding.) Next install spacer (48) and flange (50), with brake drum (46). Securely tighten and cotter the nut (52).

j. Install the oil collectors (38).

k. Reinstall cover (37), this page. Cap (99) has a drilled vent for ventilation purposes. Tube (96) extends downward into the transfer case about $2\frac{1}{2}$". Its end is cut on a 45 bias and the long side of the tube should be turned toward gear (39), page 19.

Never attempt to dismantle or make repairs to the transfer case without thoroughly studying the cross section diagram shown on preceding page.

23. TRANSMISSION SHIFT COVER.
(See page 21, Section 5)

a. It is not necessary to move the transmission or seat box to inspect the shift rails (15) and (11). It is only necessary to remove the nuts at studs (26) and lift off the shift lever group.

b. Then remove the nuts at studs (26A), after which the rail case cover may be lifted upward and turned over on its back, and removed from the right side of the grader. (Mechanic stands on the ground to do this.)

c. Remove the expansion plugs from the cover, also the three wired set screws from the shift rod ends.

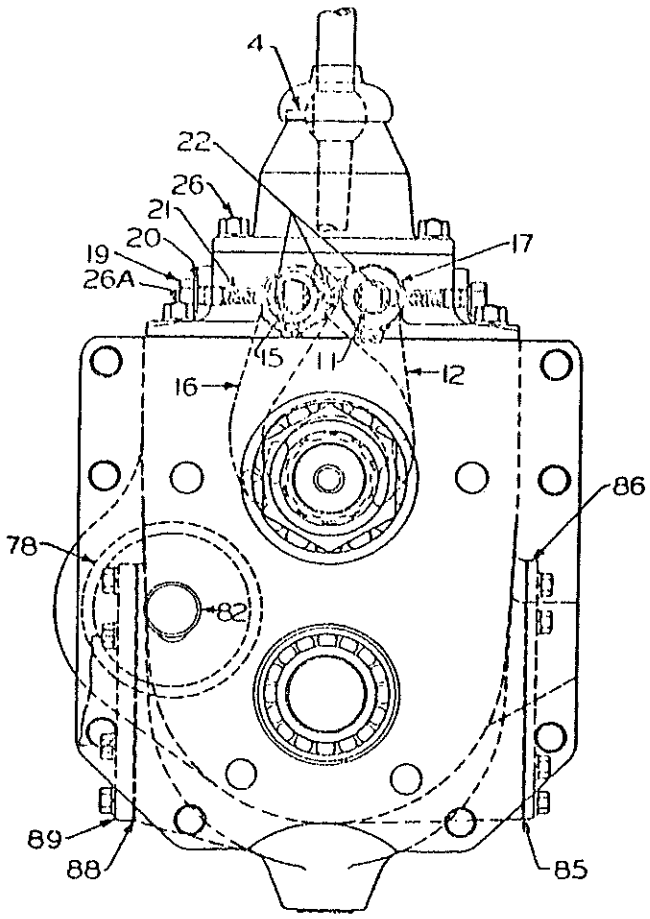
d. Remove the two capscrews (19) with washers (20). The two outer springs (21) and balls (22) will now come out.

e. Shift both rails into neutral, then either rail may be slid out of the cover hole. The three center balls will now fall out. Remove the other rail.

f. Reassembly is reversal of the above procedure.

g. The tension of springs (21) should not be too tight, otherwise hard shifting will be the result.

h. When installing the cover to the transmission, be sure the lower ends of both shift forks (21) and (16) slide into the shift grooves of shifters (38) and (49), page 22, Section 5.



24. TRANSMISSION DISASSEMBLY.

In order to disassemble any part of the transmission, follow the instructions under "Transmission and Transfer Case Removal", paragraph 20, which will permit the transfer case and transmission to be removed from the grader.

Now remove transfer case from transmission by following the instructions given under "Transfer Case Disassembly", paragraph 21, Section 5. You may now disassemble the transmission (as shown on page 22, Section 5, as follows:

a. Move both shifters (38) and (49) into mesh. Remove cotter and loosen nut (27).

b. Remove nuts from studs (32) and pull housing (31) with shaft (34) away from the transmission case. Remove nut (27) and yoke (28). Shaft (34) may now be tapped out of bearing (30). (Examine bearing (30), and if it requires replacing, be sure to do so. Also install a new seal (29).

c. Examine bearing (36). It may be pressed off the shaft (34) after removing nut (35). The end thrust on shaft (34) is taken by bearing (36). Snap ring on its outside diameter is held between the face of transmission case (77) and face of housing (31). The bearing (30) floats on its outside diameter within the bore of housing (31). The inner diameters of both bearings (30) and (36) are held to the shaft shoulders by the nuts (35) and (27).

d. Oil pocket (A) delivers oil through ducts at (B) and (C) to the forward side of bearing (30). In view of this, the gasket (33) and housing (31) must be reassembled with the oil ducts turned up as shown.

e. Oil flows through bearing (30), after which it flows through bearing (36) and back into the transmission case.

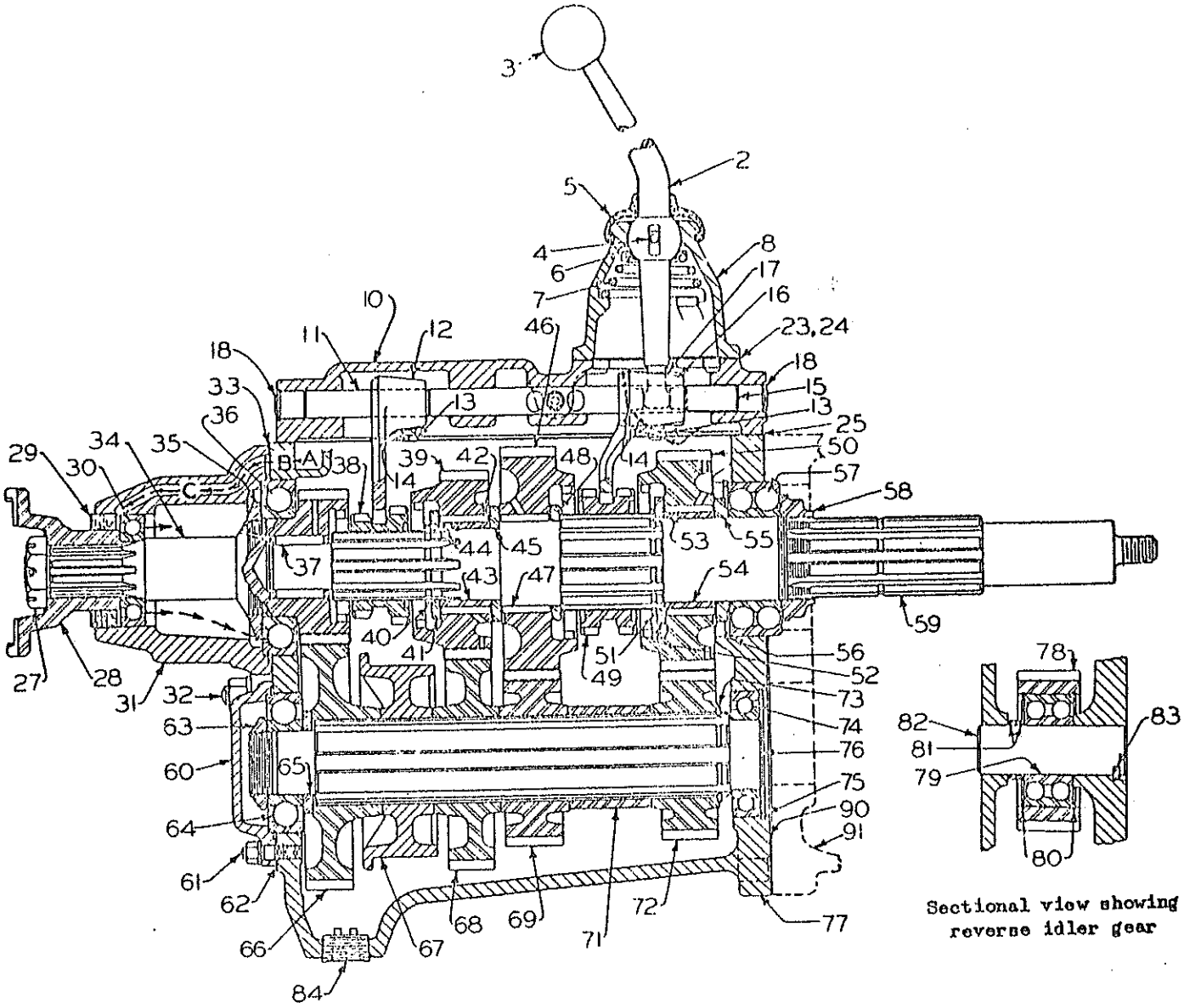
f. Slip the low and reverse shifter gear (49) to the left, and pry the snap ring (51) out of its groove. Slip both of these to left as far as they will go. Screw off the nut (58). Drive the main shaft (59) to the right until bearing (57) may be pulled off the shaft.

g. Lift up on clutch end of main shaft (59) and moving it toward the left, lift it out of case with gears mounted on it.

h. Washer (55) and reverse gear (50) may be slipped off the shaft, also forty-eight rollers (53), sleeve (54), thrust washer (52), snap ring (51), and low and reverse shifter gear (49).

i. Expand and slip the snap ring (40) off the shaft. Next slip the following parts off the shaft; washer (41), 2nd speed gear (39), forty-two rollers (42), and sleeve (43).

> CAUTION: There is a small pin (44) inside of this sleeve (43). Do not lose this pin as it must be used in reassembly.



Sectional view showing reverse idler gear

j. Next remove the thrust washer (45) and low speed gear (46), together with forty-two rollers (47) and finally thrust washer (48).

NOTE: All end clearances of bearings are controlled by the location of the snap ring grooves cut in the main shaft (59). The three gears (39), (46), and (50) are mounted on roller bearings, and each must have not less than .006" total end lubrication clearance between the supporting thrust washers and the ends of the gear hubs.

k. Remove countershaft bearing cap (60), and nut (63), also snap ring (75). Countershaft (76) may now be pressed, or driven out toward the transfer case.

l. All countershaft gears may now be removed from the case for cleaning and inspection.

m. The reverse idler gear (78) and reverse gear parts may be removed, after removing shaft (82), with key (83).

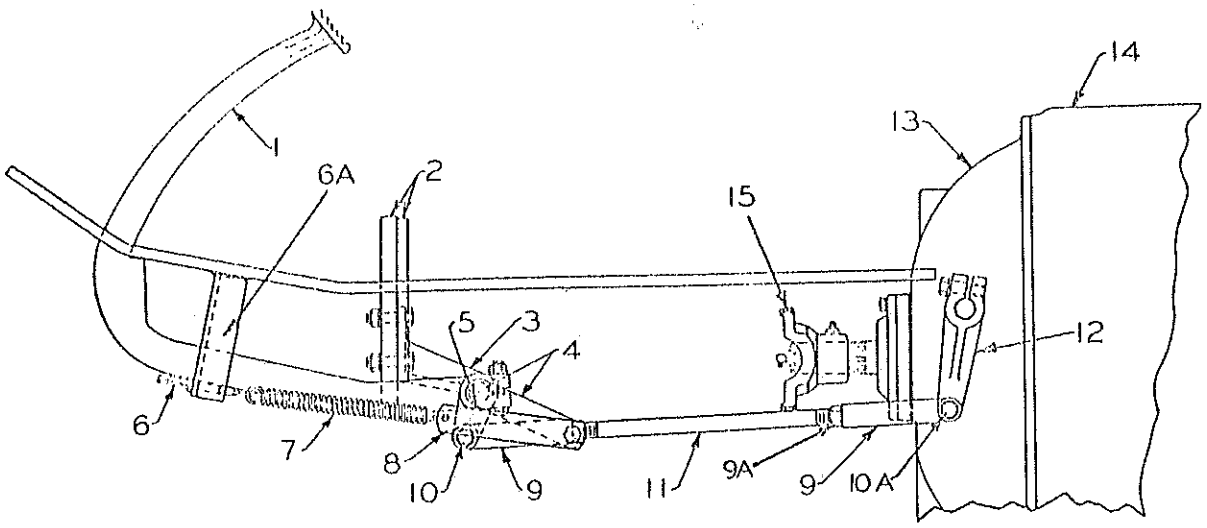
25. TRANSMISSION REASSEMBLY.

a. Clean and inspect all parts carefully. Always install new gaskets. Carefully check all snap rings for concentricity and tension before using them again.

b. Be sure to reassemble the countershaft gears as shown on preceding page.

c. Install a new adjusting nut (63), on the clutch end of the countershaft.

d. Reassembly is the reverse of the above procedure.



26. MAIN CLUTCH ADJUSTMENT.

a. General.

(1) First inspect the clutch pedal linkage. (See above drawing.)

(2) Spring (7) must have sufficient tension of its own to lift the pedal (1) clear up to the floorboard without pulling it up with your hand. If you can lift the foot pedal (1) upward against the floorboard with your hand, then the tension of the spring (7) should be made tighter, or the linkage parts (3), (4), (5), (9), and (10) may be binding, and require oiling to loosen them up.

(3) Make certain this return action is positive even with a slow foot action.

(4) Be sure the clutch lever (12) is located on the shaft so it does not strike the transmission bell housing either in released or full engaged position of clutch. The pin end of lever (12) slants toward the foot pedal (1) when the pedal is in highest position. This is shown above, with the pedal (1) in the raised and released position.

(5) The clutch itself, however, is in fully engaged position and there is ample clearance between the clutch throwout bearing (22), page 25, and the clutch fingers, to permit the clutch to operate satisfactorily, unless abused.

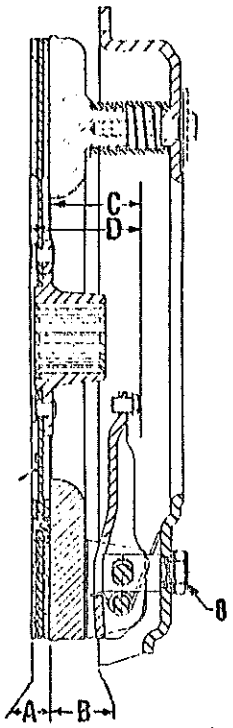
b. Clutch Adjustment.

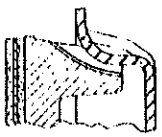
(1) To adjust clutch, first loosen lock nut (9A), (see above drawing), remove pin (10A), screw forked yoke onto the rod (11) about two turns, and reinstall pin (10A). Do not reinstall the cotter pin through pin (10A) or tighten the lock nut (9A) at this time. Instead depress foot pedal (1) and observe if the first free easy movement is from 2" to 3". If it is adjusted as shown, then replace the cotter pin and tighten lock nut (9A), because it is adjusted correctly.

(2) If the first free easy movement is more than 3", then you have shortened the rod (11) too much and the clutch will not disengage properly. This will result in gear clashing.

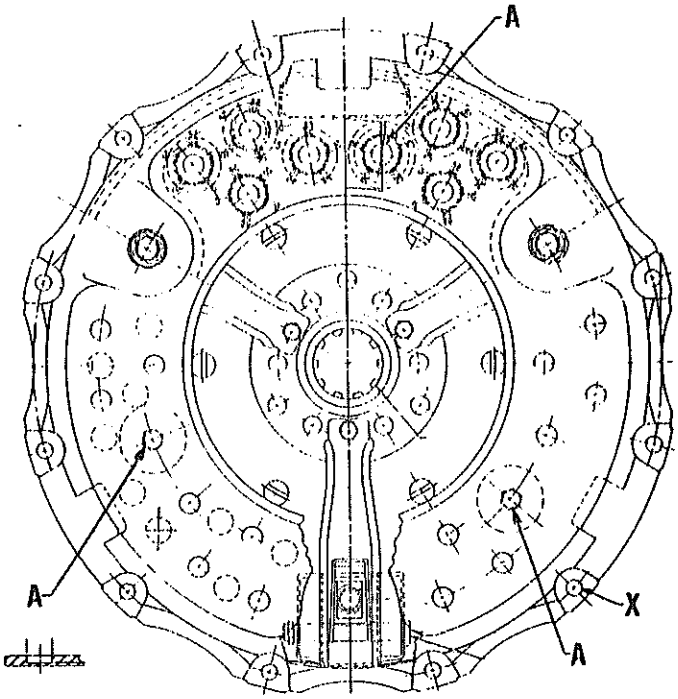
(3) To ascertain if the clutch is disengaging properly, stop the engine, have someone depress the clutch pedal to within 3" of floorboard. Then try to turn the propeller shaft yoke (15) with your hands. If it turns freely you can consider the clutch linkage is adjusted correctly and that the clutch is properly disengaging.

NOTE: When the clutch pedal is fully depressed to the floorboard, you cannot turn the yoke (15) easily, because the transmission clutch brake is applied. Raising the clutch pedal about 3" will release the transmission clutch brake. (See page 26 for clutch brake.)





DIMENSIONS:
(A) - .471 ± .011
(B) - 1.279 Important
(C) - 2.276 ± .015
(D) - 2-3/4 ± 1/16
With drive member in position, approximate only.



15" Clutch (Sectional View) 15" Clutch (Rear View)
Used with "300 Series" Graders with Dry Clutch or A-W "Torcon" Converter.

c. Clutch Adjustment Warning.

Do not disturb the factory setting of the three nuts (8), shown above, inside the clutch housing, as these have been properly set on a fixture at the factory, and without special tools it is impossible to obtain perfect alignment and adjustment. The only field adjustment necessary is in the outside linkage (rod and fork (11) and (9), page 23.) Never make any adjustment of the three nuts (8).

d. Clutch Abuse.

Abuse consists of slipping the clutch such as trying to move the grader in high reverse speed or any forward speed which the engine cannot pull. In such cases, shift the transmission gears to a lower speed which the engine can pull.

Do not slip the clutch unnecessarily lest you be burdened with costly repairs and the grader not available for work.

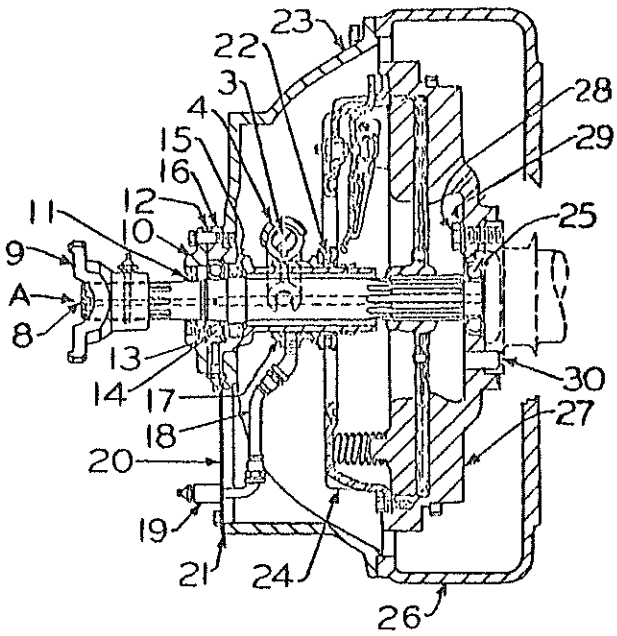
Riding the clutch pedal with your foot, or over-lubrication of the clutch release and pilot bearings, constitute other forms of abuse.

e. Clutch Lubrication.

1. Clutch throw-out bearing (22), page 25, is lubricated through the exposed high pressure fitting (19), extending through the plate (20). Do not over-lubricate this clutch throw-out bearing. Usually it only takes one, and not more than two strokes of pressure gun, to replenish grease. (Every 50 hours of operation).

2. The Clutch pilot bearing (25) is lubricated through a grease fitting screwed into the rifle drilled hole (A) of the clutch shaft (8). Consult lubrication chart, Section 2, for frequency of servicing operation.

3. Warped and cracked pressure plates, and prematurely worn facings, indicate excessive heat, and are generally caused by excessive clutch slippage, or over-greasing. In cases where too much lubricant has been applied accidentally, causing temporary slippage, wash the entire clutch compartment with kerosene to remove all traces of grease.



Clutch Compartment

f. Clutch Removal.

1. General:

The clutch may be easily removed from the A-W power grader in approximately 20 minutes. The engine or transmission will not be removed or disturbed in any way. This likewise applies to the cab, seat box, fuel tank, dash, hood, air cleaner, and battery box.

Ordinary hand tools, such as socket wrenches, are all that is required. One man can do the job easily.

2. To Remove Clutch: (See above)

a. Remove the eight capscrews at both yokes (9). Next remove the clutch to transmission propeller shaft group.

b. Remove the cotter and pin at the lower end of lever (12), page 23.

c. Remove the inspection door (20) (see above). Remove nipple (19) from hose (18). Unscrew hose (18) from shifter yoke (17).

d. Remove the capscrews from bearing cover (10). The shaft (8), with (10), (16) and (17), may be pulled straight out toward the transmission.

e. Remove the capscrews from cover (23) and lower it to the ground.

f. Use 3/8" x 2-1/2" N.C. capscrews with plain washers, and these should now be screwed into the three holes located in the pressure plate at (A), page 24. These screws will compress the clutch springs and keep the clutch group assembled during clutch removal.

g. The capscrews at (X), page 24, may now be removed, after which the clutch drive member group may be lifted out of the bell housing.

g. Clutch Installation.

1. General:

If a new driven disc is needed, the outside diameter of the disc should run true with the splined hole at hub. To check this, proceed as follows:

a. Mount the driven disc on the splines of shaft (8). Place the shaft on lathe centers. Rotate the shaft by hand and with dial indicator determine the amount of facing runout.

b. When the shaft (8) is rotated by hand, the outside face of the lining should run true; that is, within .030" dial indicator reading. Install a new straight disc if necessary.

2. To Install Clutch:

a. Replace clutch pilot bearing (25), (above) if worn. Assemble the bearing seal away from the crankshaft flange. Before assembly use a grease gun to fill the rifle drilled hole at point A. Pack the bearing with lubricant.

b. Clean out the flywheel of all dust and lining material.

(c) Install the driven disc into the flywheel, with the short end of the splined hub toward the crankshaft.

(d) Install the clutch (24), leaving the capscrews loose. Insert the shaft (8) thru the driven disc hub and clutch pilot bearing. Then tighten the clutch solidly to the flywheel. Remove shaft (8).

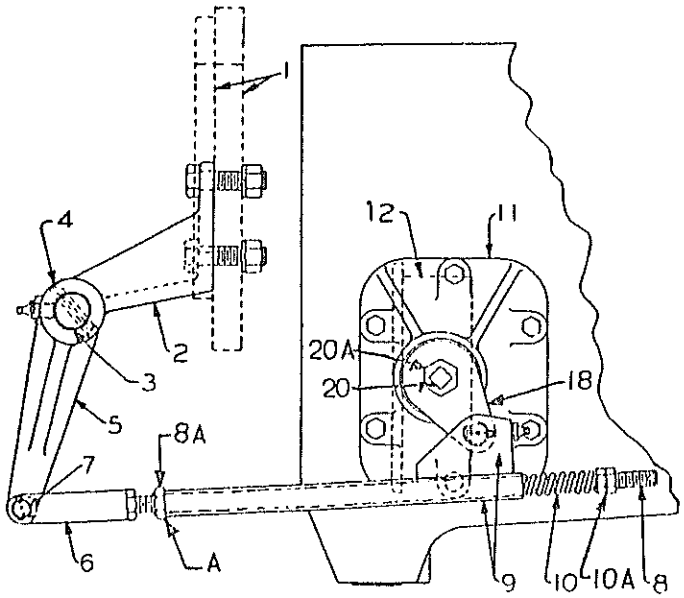
(e) Install and tighten the bell housing (23) to the housing.

(f) Assemble shaft (8) to sleeve (16). (Replace seals (11) and (15), keeping seal lips turned as shown. Replace bearing (14) if worn or damaged; then install snap ring (13).)

(g) Enter shaft (8) with sleeve (16) into bell housing. Slip cap (10) over shaft (8) and install capscrews in cap (10). Remove the capscrews (A), page 24, Section 5. Reinstall parts (18), (19) and (20), page 25, Section 5, and the propeller shaft.

(h) Lubricate all bearings (14), (22) and (25).

(i) Re-adjust clutch linkage, page 23, Section 5, paragraph b.



27. CLUTCH BRAKE. (See Above)

a. Function of Clutch Brake.

(1) The powerful Austin-Western clutch brake provides a speed retarding effort to the clutch driven member and transmission gears, when shifting gears.

(2) The internal brake consists of a drum (12), 5" in diameter, which is spline driven. A lined brake shoe and internal screw arrangement, together with external linkage, is interconnected to the clutch foot pedal (1), page 23, Section 5. When the foot pedal is pressed to the floorboard, the linkage moves lever (18), (below) to the left, and the threaded screw moves the lined shoe against the internal drum.

(3) When the engine is running full throttle and brake properly adjusted, and footpedal is depressed to the floorboard, the transmission gears will come to a rolling stop in about three seconds.

b. Clutch Brake Adjustment.

NOTE: Levers (5) and (18), (below) and interconnecting linkage are shown in released brake position.

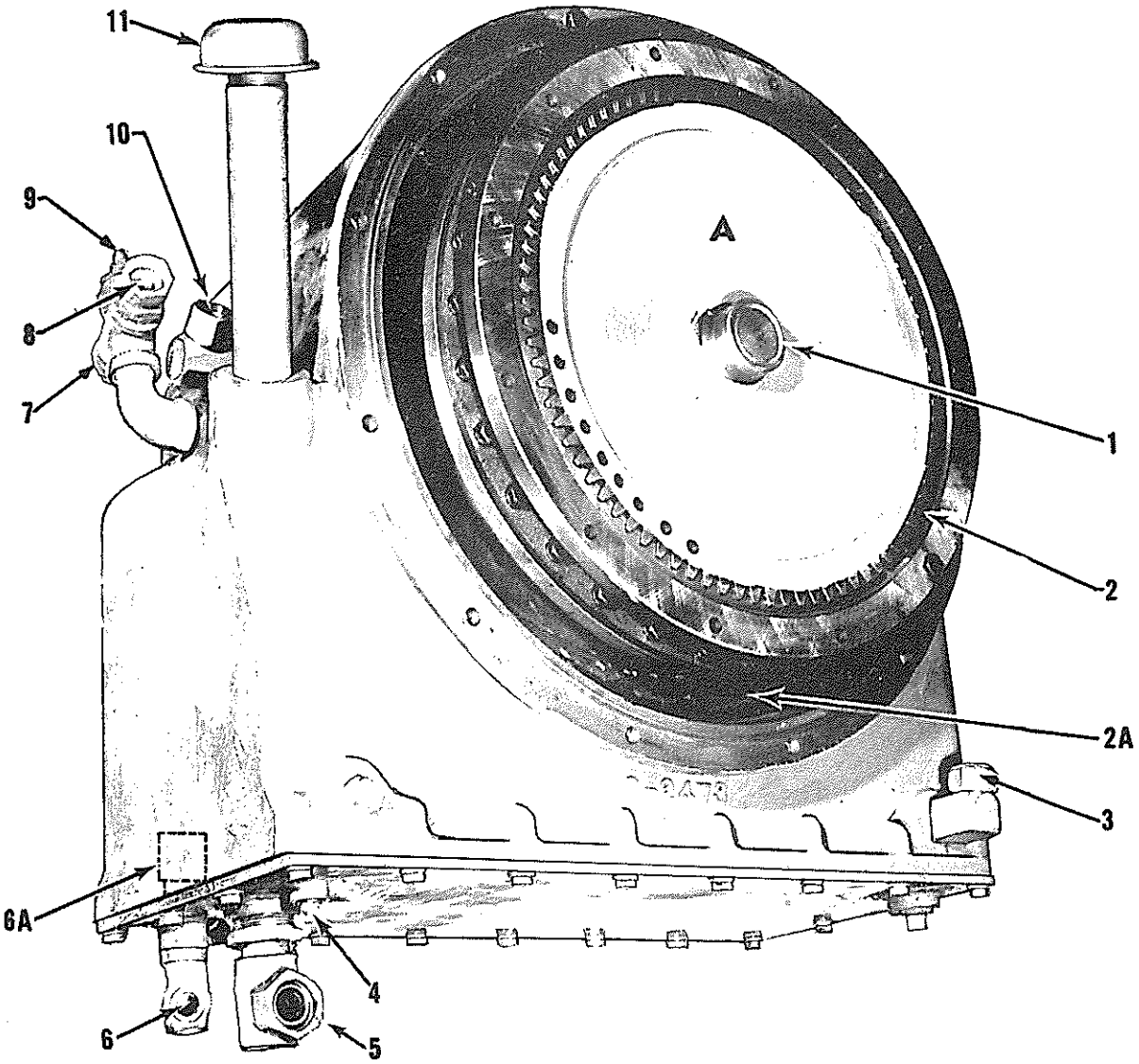
(1) First adjust the main clutch, page 23, paragraph b.

(2) With clutch pedal in fully raised position (engine stopped), the overall length of spring (10), (below) should be adjusted to about 1-3/4". Then lock the two nuts (10A) together as shown.

(3) Run engine at wide open throttle. Then have an assistant depress and hold the foot pedal to the floorboard.

(4) Loosen lock nut (20A), (see illustration at left) and adjust the screw (20) in order to establish about 1/16" space between the end of tube (9) and nut (8A). (Nut (8A) is welded to rod (8) and will move to the left about 1/16" when adjusting screw (20) is properly set and lock nut (20A) tightened.) Move the clutch pedal upward and downward full distance several times and observe at (A) for proper 1/16" spacing.

NOTE: The main clutch must be adjusted as shown on page 23, paragraph b, before the above adjustments are made.



28. A-W Torcon Converter Group.

A. The Converter Unit, Ref. (A) above, rotates within a dry compartment; see (2A). A lip type seal confines the Fluid inside the Converter unit and reservoir.

(1) Steel sleeve (1) pilots in the bore of the Engine flywheel.

(2) This is the Converter coupling gear. It bolts to the Engine Flywheel.

(3) Cooled oil is returned to the reservoir through this elbow.

(4) Oil reservoir drain plug.

(5) Pump for Converter, draws its oil supply through this elbow.

(6) On a cold start some of the Converter Fluid may flow through elbow (6), then upward to the internal relief valve (6A).

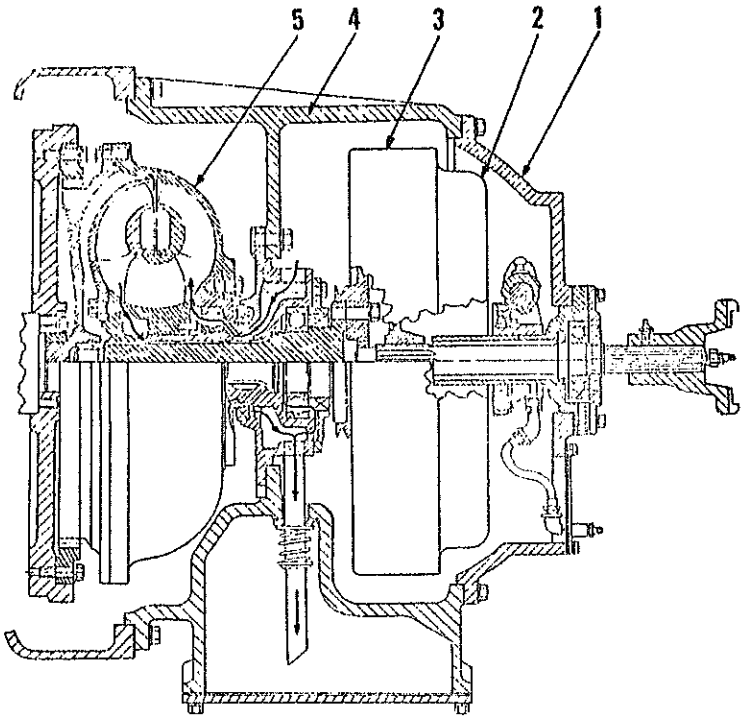
(7) The Converter oil temperature bulb is attached at this port.

(8) The low pressure hot return oil flows out this port, then flows to the oil cooler.

(9) Converter oil pressure gauge tubing is attached at the point.

(10) Converter Fluid flows from the hydraulic pump to this elbow, then to the internal area of the Converter.

(11) Reservoir oil filler cap.



29. A-W CONVERTER AND CLUTCH ASSEMBLY.

A. Removal Torcon Converter Element.

1. Drain oil from reservoir and remove all converter oil lines to reservoir.

2. Remove clutch linkage rod.

3. Remove propeller shaft connecting clutch and transmission.

4. Remove bolts and separate converter unit page 27, from engine flywheel housing.

5. Remove clutch cover group assembly (1), page 28.

6. Install 3/8"X2½" cap screws in clutch pressure plate, see (A), page 24, then remove pressure plate assembly (2), page 28.

7. Remove clutch flywheel (3) from converter turbine shaft.

8. Remove oil pipes to converter element and separate element (5) from housing (4).

30. DISASSEMBLY AND ASSEMBLY OF CONVERTER ELEMENT.

CAUTION: Cleanliness is extreme importance and absolute must in the repair and overhaul of this converter. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

A. Disassembly:

Where a bolt is secured with lockwire, cut wire and remove same.

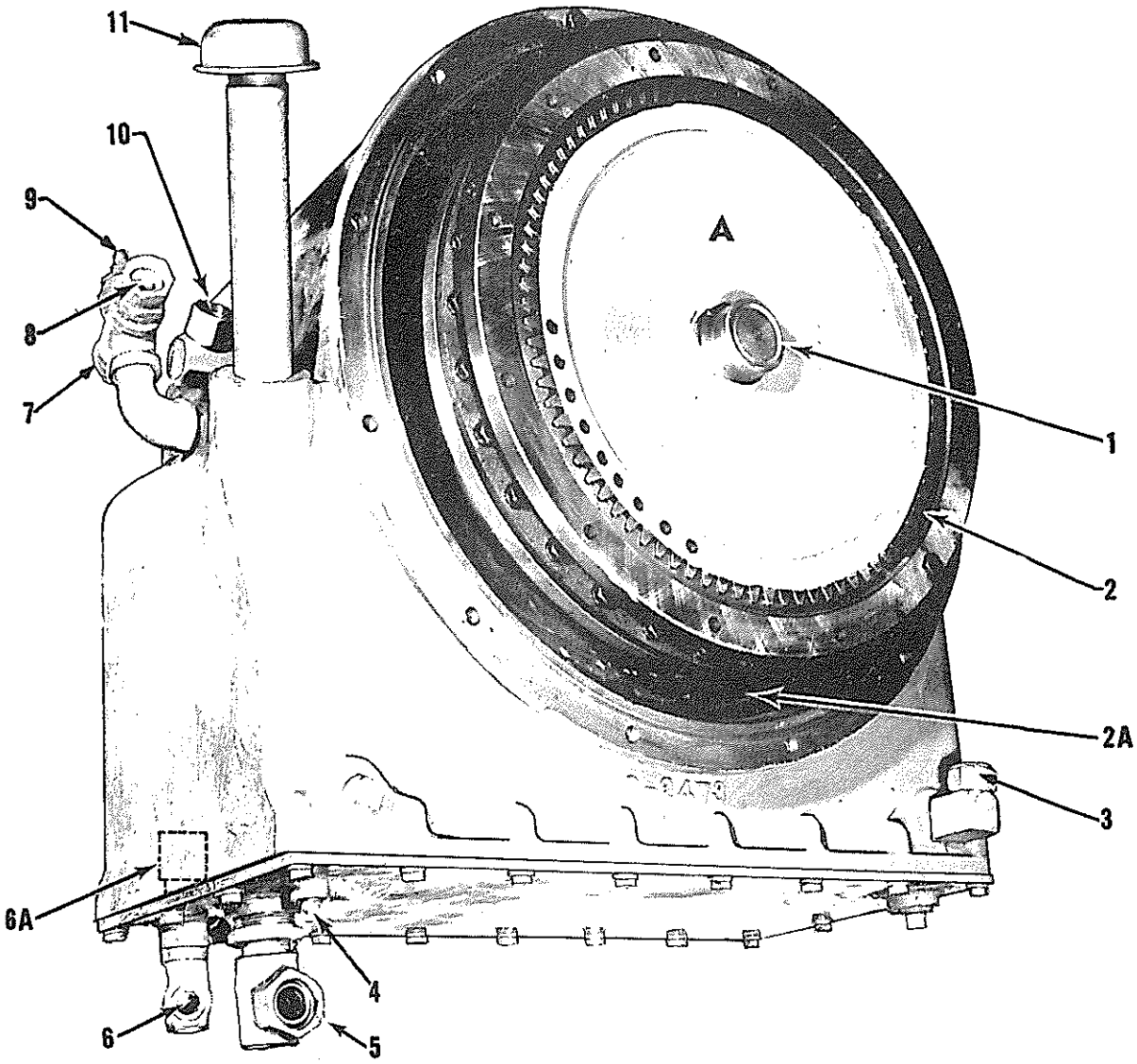
1. Remove bolts (11) and lockwashers (12); separate impeller cover, (9) from impeller (14). (See page 29).

2. Remove front turbine hub retainer ring (1).

3. Remove turbine (8) from shaft (34). Hub (7) will come out with turbine.

4. Remove rear turbine hub retainer ring (1).

5. Remove reaction member retainer ring (16).



28. A-W Torcon Converter Group.

A. The Converter Unit, Ref. (A) above, rotates within a dry compartment; see (2A). A lip type seal confines the Fluid inside the Converter unit and reservoir.

(1) Steel sleeve (1) pilots in the bore of the Engine flywheel.

(2) This is the Converter coupling gear. It bolts to the Engine Flywheel.

(3) Cooled oil is returned to the reservoir through this elbow.

(4) Oil reservoir drain plug.

(5) Pump for Converter, draws its oil supply through this elbow.

(6) On a cold start some of the Converter Fluid may flow through elbow (6), then upward to the internal relief valve (6A).

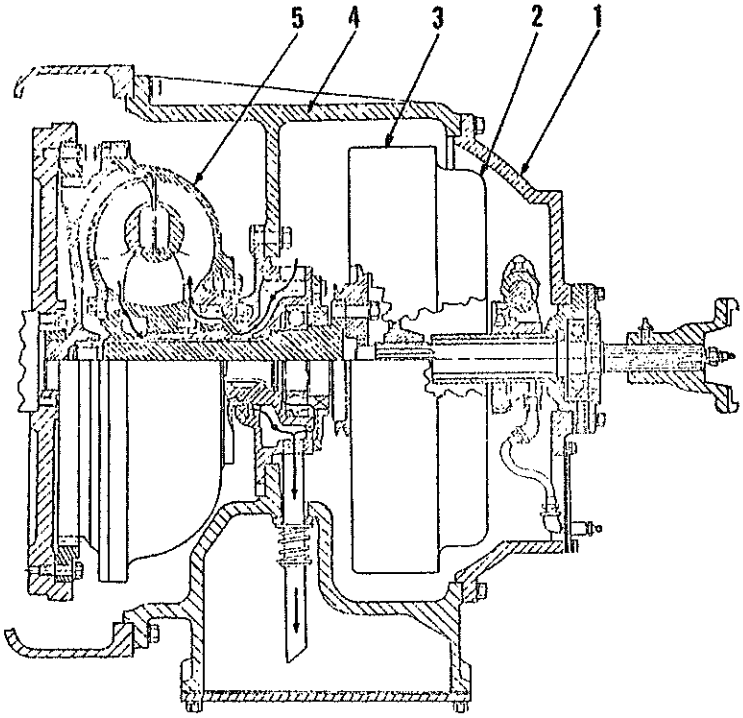
(7) The Converter oil temperature bulb is attached at this port.

(8) The low pressure hot return oil flows out this port, then flows to the oil cooler.

(9) Converter oil pressure gauge tubing is attached at the point.

(10) Converter Fluid flows from the hydraulic pump to this elbow, then to the internal area of the Converter.

(11) Reservoir oil filler cap.



29. A-W CONVERTER AND CLUTCH ASSEMBLY.

A. Removal Torcon Converter Element.

1. Drain oil from reservoir and remove all converter oil lines to reservoir.

2. Remove clutch linkage rod.

3. Remove propeller shaft connecting clutch and transmission.

4. Remove bolts and separate converter unit page 27, from engine flywheel housing.

5. Remove clutch cover group assembly (1), page 28.

6. Install 3/8"X2½" cap screws in clutch pressure plate, see (A), page 24, then remove pressure plate assembly (2), page 28.

7. Remove clutch flywheel (3) from converter turbine shaft.

8. Remove oil pipes to converter element and separate element (5) from housing (4).

30. DISASSEMBLY AND ASSEMBLY OF CONVERTER ELEMENT.

CAUTION: Cleanliness is extreme importance and absolute must in the repair and overhaul of this converter. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

A. Disassembly:

Where a bolt is secured with lockwire, cut wire and remove same.

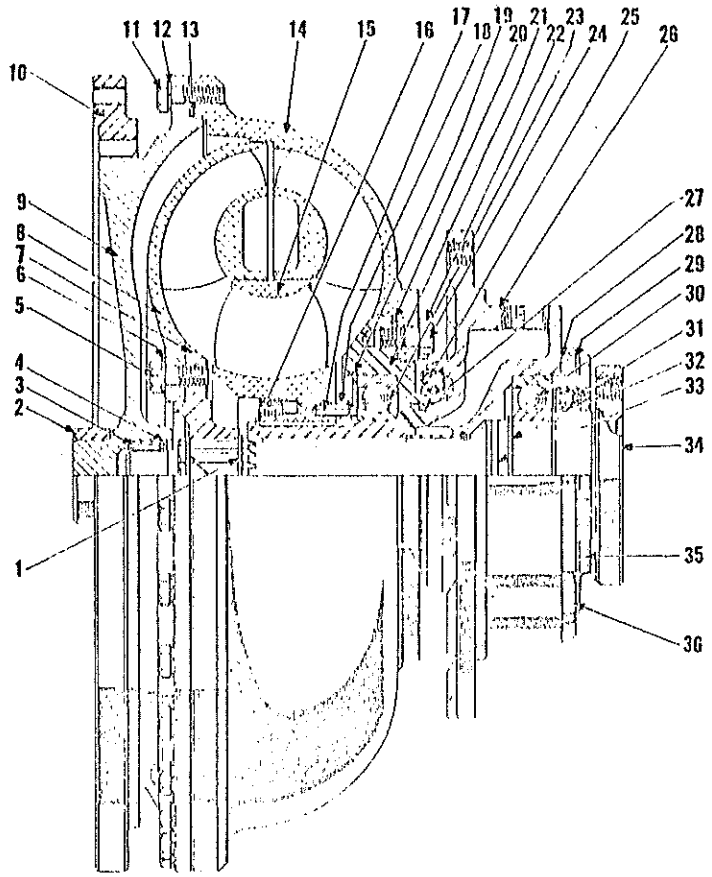
1. Remove bolts (11) and lockwashers (12); separate impeller cover, (9) from impeller (14). (See page 29).

2. Remove front turbine hub retainer ring (1).

3. Remove turbine (8) from shaft (34). Hub (7) will come out with turbine.

4. Remove rear turbine hub retainer ring (1).

5. Remove reaction member retainer ring (16).



6. Remove reaction member (15). Roll pin (17) and spacer (18) will come out with reaction member.

7. Remove impeller (14) and bearing (23) from shaft (34) as an assembly.

8. Unclinch lock plate (22) and remove impeller to impeller hub bolts (24). Separate impeller (14) from impeller hub (21).

9. Remove bearing retainer ring (19) and hub bearing (23) from impeller hub (21).

10. Remove bearing cap bolts (35) and lockwashers (29).

11. From pilot end of turbine shaft (34), press shaft and bearing assembly from stater support (26).

12. Remove oil sealing ring (33) and bearing retainer ring (32) from turbine shaft (34).

13. Press bearing (30) from shaft (34).

14. Remove bearing cap (36) and oil seal (31) as an assembly from turbine shaft.

15. Press oil seal (31) from bearing cap (36). NOTE: This should be done only if seal is to be replaced.

16. Remove oil sealing ring (27) from stator support (26).

17. Remove oil seal (25) from stator support. NOTE: This should be done only if seal is to be replaced.

18. Remove bearing retainer ring (4) from impeller cover (9).

19. Remove bearing (3) from cover (9). NOTE: This should be done only if bearing is to be replaced.

Cleanliness of the respective parts is absolutely necessary in re-assembling. Dirt, in its many forms can and will cause trouble. Therefore, before re-assembling the torque converter or any of its parts, be sure all parts have been thoroughly cleaned with a suitable cleaning fluid.

After cleaning, all parts should be dried with moisture free compressed air.

A thorough visual examination of all parts should be made before re-assembly. Any part that shows excessive wear or damage should be replaced. Small nicks or burrs may be removed with a hone or crocus cloth. It is recommended that all gaskets, oil seals, piston sealing rings, "O" rings and internal lockwashers be replaced.

The use of grease is recommended when positioning new gaskets in their respective locations. Piston sealing rings should be coated with grease to facilitate assembly.

Apply a light coating of permatex to the outside diameter of all oil seals.

B. RE-ASSEMBLY:

1. Press bearing (3) in impeller cover (8) and secure with retainer ring (4).

2. Press new oil seal (31) in bearing cap (36) with lip of seal in.

3. Install bearing cap and oil seal assembly on turbine shaft (34).

4. Press bearing (30) on shaft (34). Use caution not to damage oil seal (31).

5. Secure bearing (30) with retainer ring (32) and install new bearing cap gasket (28).

6. Install turbine shaft oil sealing ring (33).

7. Press new oil seal (25) in stator support (26), lip of seal in.

8. Install new oil sealing ring (27) on stator support.

9. Press turbine shaft and bearing assembly in stator support and secure bearing cap (36) with bolts (35) and lockwasher (29). Use caution not to damage oil sealing ring (33).

10. Press bearing (23) in impeller hub (21) and secure with retainer ring (19). Install new "O" ring (20) and hub (21).

11. Align holes in impeller (14) and holes in impeller hub (21).

12. Install lock plates (22) and bolts (24). Tighten bolts securely and bend lock plate over flat side of bolt head to prevent from loosening.

13. Install impeller assembly (14) on stator support (26). Use caution not to damage oil seal (25) or oil sealing ring (27).

14. Install roll pin (17) in reaction member (15).

15. Install reaction member spacer (18). on roll pin (17).

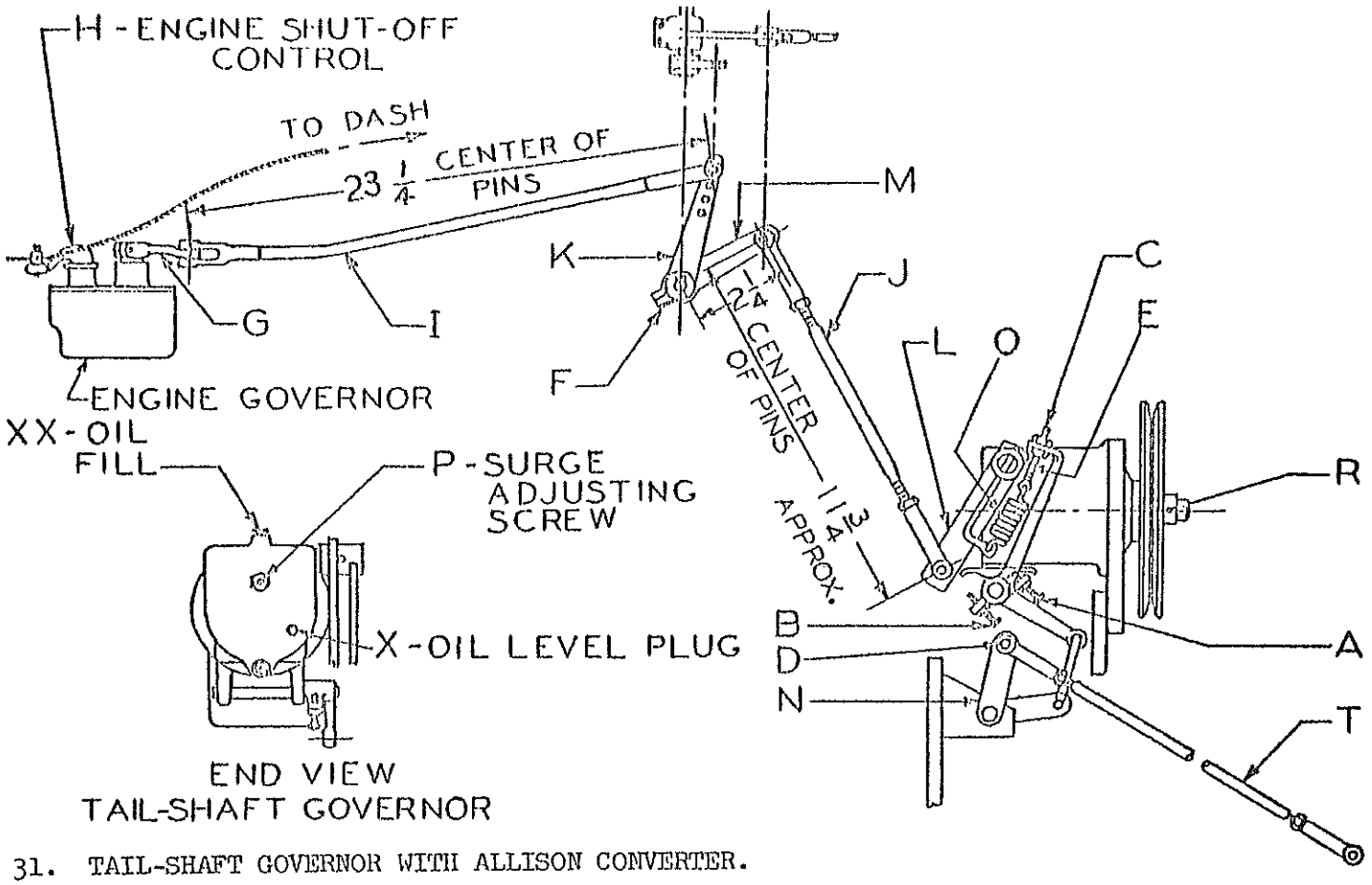
16. Install reaction member and spacer on stator support and secure with retainer ring (16).

17. Install rear turbine hub retainer ring (1).

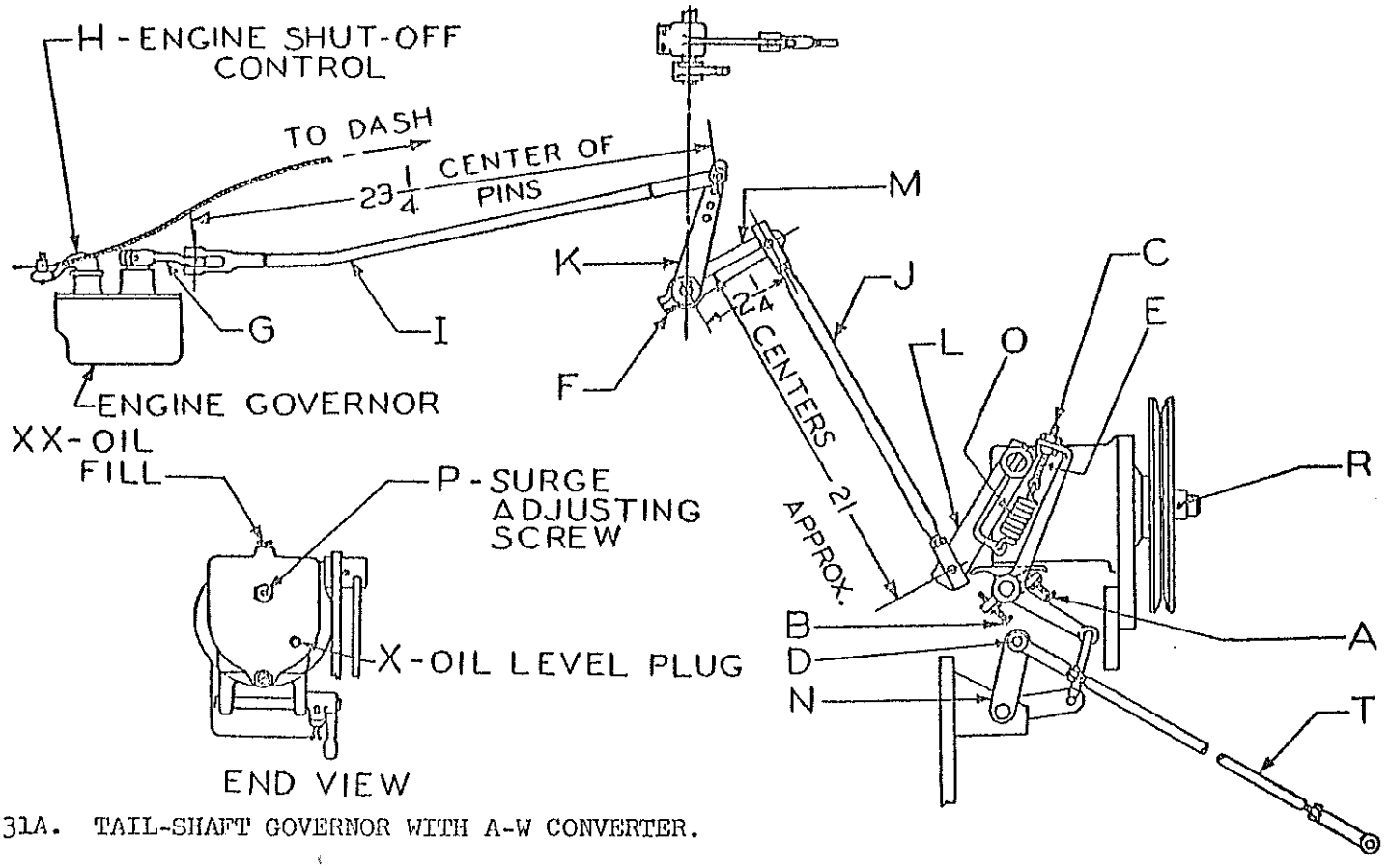
18. Install turbine and hub assembly (8 & 7) on turbine shaft (34). Secure with front turbine hub retainer ring (1).

19. Install new "O" ring (13) on impeller (14).

20. Align holes in impeller cover (9) with holes in impeller (14). Secure with bolts (11) and lockwasher (12). Use caution not to damage "O" ring (13).



31. TAIL-SHAFT GOVERNOR WITH ALLISON CONVERTER.



31A. TAIL-SHAFT GOVERNOR WITH A-W CONVERTER.

The above illustration shows "Converter" tail shaft governor linkage adjustment and other data. (Continued on next page).

A. GOVERNOR LINKAGE ADJUSTMENT.

1. If engine surges it can be corrected by adjusting surge screw (P) in or out, as the condition might require. Be sure to tighten jam nut after adjustment has been made.

2. Be sure socket head set screw (R) on governor pulley is securely tightened to eliminate any chance of pulley becoming misaligned causing premature belt failure.

3. Be sure to fill tail-shaft governor with engine oil at (XX) until it shows the proper level at oil level plug (X).

4. Disconnect control rod (I) at engine governor control and operate governor by hand. Check engine RPM at (G) by holding governor arm open to determine if engine develops approximately 2000 RPM. Stop engine.

5. Check belt on governor drive for proper tension and alignment of pulley to be sure the belt does not contact the opening in the converter housing.

6. Attach rod (I) to engine governor arm at (G) and to the top hole in arm (K). This arm is keyed to the cross shaft at the rear of engine block. Control rod (I) is approximately 23-$\frac{1}{4}$" between pin centers.

7. Disconnect engine throttle control rod (T) at pin (D).

8. Adjust eyebolt (C) to obtain about 1/4" gap at point indicated by (E). This distance may vary plus or minus depending on variation in connecting linkage. It may be necessary to adjust idling screw (A) to obtain this adjustment. At this time, spring (O) must be free so it can be moved easily, but not a loose adjustment.

9. Adjust control rod (J) to dimension shown from ball studs and connect arm (M) at cross shaft on rear of engine block and lever (L) on tail-shaft governor.

10. Loosen lock bolt (F) on arm (M).

11. Move lever (N) toward wide open throttle position. This will bring adjusting screw (B) against bumper plate. (This adjustment (B) is for full RPM and the threaded portion should extend through the lever arm about 3/8".)

12. Move arm (K) to bring engine governor to wide open position. (This a toward rear of engine block.)

13. With lever (N) and arm (K) held in wide open position, tighten lock bolt (F) on arm (M) securely. This insures the tail-shaft governor having full travel on the engine governor.

14. With governor linkage completely assembled, check travel of arm (K) to be positive of full travel on engine governor. At this time, if more travel is required, it can be obtained by backing full RPM adjustment screw (B) away from the stop.

15. Attach engine throttle control rod (T) at pin (D).

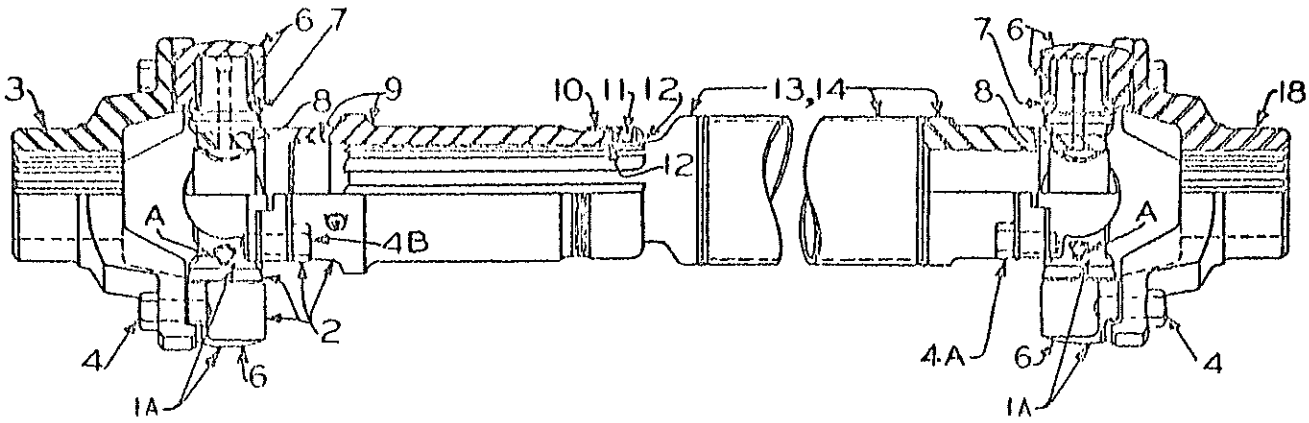
16. Start engine. Test tail-shaft governor action. To check the governor action, place transmission in 3rd gear and high range, set hand brake, and step on foot brake pedal. Open throttle to about the 4th notch on the throttle quadrant, or approximately 1/4 open position. Engage clutch. Governor will now respond under these simulated load conditions.

17. Check engine governor to be sure it has full travel at (G). Use tachometer and check RPM of engine, which should be about 1800 RPM under these conditions.

18. Idle engine, and check RPM at idle speed. The engine should idle at approximately 500 RPM. If this idle cannot be obtained, it may be necessary to change eyebolt adjustment (C).

19. Engine shut-off control (H) is the only means provided for shutting off engines equipped with tail-shaft governor.

Install endless belt on tail-shaft governor drive. (Use genuine A-W part.) To install this belt it is necessary to remove the propeller shaft (clutch to transmission), the clutch and clutch shaft, and the clutch cover from the unit.



Rear Axle End

32. "PACER" MODEL. REAR AXLE PROPELLER SHAFT.

The slip yoke group (9) must be installed nearest to transfer case.

When installing the slip yoke (9) on the male spline shaft (13) be sure the capscrew holes, at (4A) and (4B) on both ends of the shaft, are in line with one another.

33. REAR AXLE. "PACER" GRADER.

The rear axle unit of the A-W power grader is of the double reduction type. The drive from the propeller shaft to the rear axles is made first thru a spiral pinion and bevel gear, and then thru a pinion and spur gear, fully enclosed, running in oil. It is equipped with dustproof oil seals and mounted on antifriction bearings thruout.

The oil level is the 1" pipe threaded hole with square head pipe plug. It is located on the center line of axle on left hand side of grader, a few inches below the gear carrier (see "A", page 34).

Keep this filled with oil as recommended in the lubrication instructions, pages 3 or 5.

In making repairs to parts located at either end of the main axle housing, page 34, including replacing of the drive shafts, it is unnecessary to remove the main axle housing from the rear end of power grader frame.

If the machine is in operating condition it is best to drain the gear oil from the rear axle and refill it with kerosene or diesel fuel, and run the machine slowly, backward and forward several minutes. It is best to drain this first wash-out and refill with clean kerosene or diesel fuel, and repeat. In this way, a second washing will usually get everything clean and free of oil.

CAUTION: Do not use gasoline as there is danger of explosion and fire.

34. REAR WHEEL REMOVAL.

Both wheels are attached in the same manner, so the following will apply to either right or left hand wheel.

Follow the procedure shown on page 2, paragraph 4, "Wheel Removal and Reassembly".

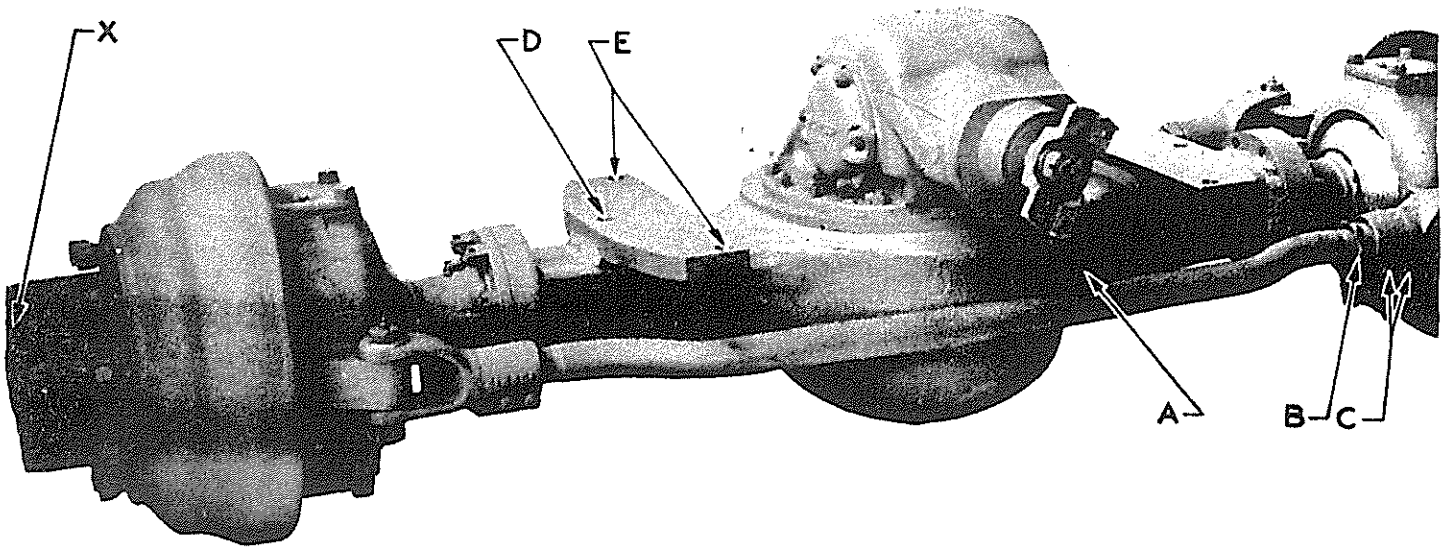
35. UNIVERSAL JOINT WITH AXLE SHAFT REMOVAL.

Follow the instructions as shown on page 2, paragraph 4, covering "Wheel Removal and Reassembly.

Follow the instructions shown on page 3, paragraph 5.

36. AXLE UNIVERSAL JOINT DISASSEMBLY. (For Cleaning and Inspection Purposes Only)

Follow the instructions as shown on page 3, paragraph 6.



"PACER" 300 GRADER REAR AXLE

37. REAR WHEEL STEERING KNUCKLE DISASSEMBLY.

Follow the instructions as shown in paragraphs 4 and 5.

Follow the instructions as shown on page 5, paragraph 8.

38. REAR WHEEL PIVOT BEARING ADJUSTMENT. (With the Wheel Removed but Steering Knuckle still on the Power Grader)

Follow the instructions as shown on page 5, paragraph 9.

39. REAR WHEEL TOE-IN ADJUSTMENT.

The A-W power grader is equipped with tie rod adjusting nut (B), (above) (which has both right and left hand threads). Loosen the clamping bolts (C) and adjust so there is no toe-in or toe-out. Check this monthly, and after overhauling axle. Measurements to be made at side wall of tires as close to the height of center line as possible.

40. REMOVAL OF REAR AXLE ASSEMBLY FROM FRAME. (See above)

It is not essential to roll the rear axle from under grader to remove the gear carrier, but it is preferable to do so.

1. Place machine on level place.

2. Revolve blade until it is square across and lock circle latch. Place blocking under each end of blade about a foot from the ends.

3. Block both front wheels securely to prevent possibility of machine rolling forward or backward.

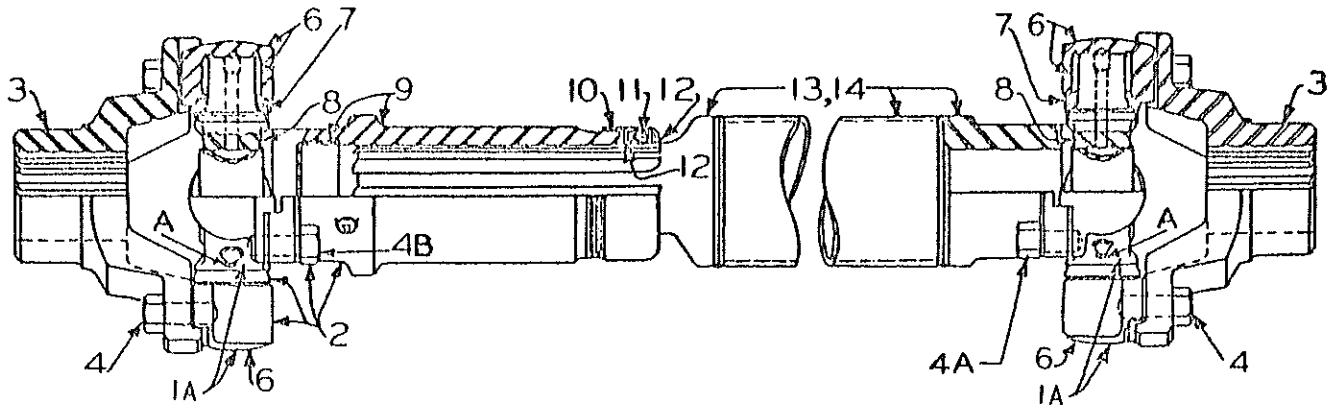
4. Move blade downward onto blocking to stabilize machine. Do not take any weight off grader with blade.

5. Remove capscrews from each axle mount (D) and capscrews and nuts (E) from each axle mount.

6. Force blade downward, lifting the front end. It will still be necessary to jack up under the rear bumper plate to lift the frame off the rear axle, but by lifting the front end first, it makes the lifting easier and keeps the power grader from tipping.

7. Roll rear axle back toward the rear and block under the axle bracket on frame.

8. Remove the jack from under bumper plate.



Rear Axle End

32A. "SUPER" MODEL. REAR AXLE PROPELLER SHAFT. (See above)

The slip yoke group (9) must be installed nearest to transfer case.

When installing the slip yoke (9) on the male spline shaft (15) be sure the capscrew holes at (4A) and (4B) on both ends of the shaft, are in line with one another.

33A. REAR AXLE. SUPER MODELS.

The rear axle unit of this A-W power grader is of the double reduction type. The drive from the propeller shaft to the rear axles is made first through a spiral pinion and spur gear, fully enclosed, running in oil. It is equipped with dustproof oil seals and mounted on anti-friction bearings throughout.

The filler and oil level is the 1" pipe threaded hole with square head pipe plug. It is located on the center line of axle on front side of housing, a few inches below the flange. Keep this filled with oil as recommended in the lubrication instructions.

In making repairs to parts located at either end of the main axle housing, including replacing of the drive shafts, it is unnecessary to remove the main axle housing from the rear end of power grader frame.

34A. REMOVAL OF REAR AXLE AND TANDEM ASSEMBLY FROM FRAME.

If the machine is in operating condition it is best to drain the gear oil from the rear axle and refill it with kerosene or diesel fuel, and run the machine slowly, backwards and forward for several minutes. It is best to drain this first wash-out and refill with clean kersoene or diesel fuel, and repeat. In this way a second washing will usually get everything clean and free of oil.

CAUTION: Do not use gasoline as there is danger of explosion and fire.

(1) Place machine on level place.

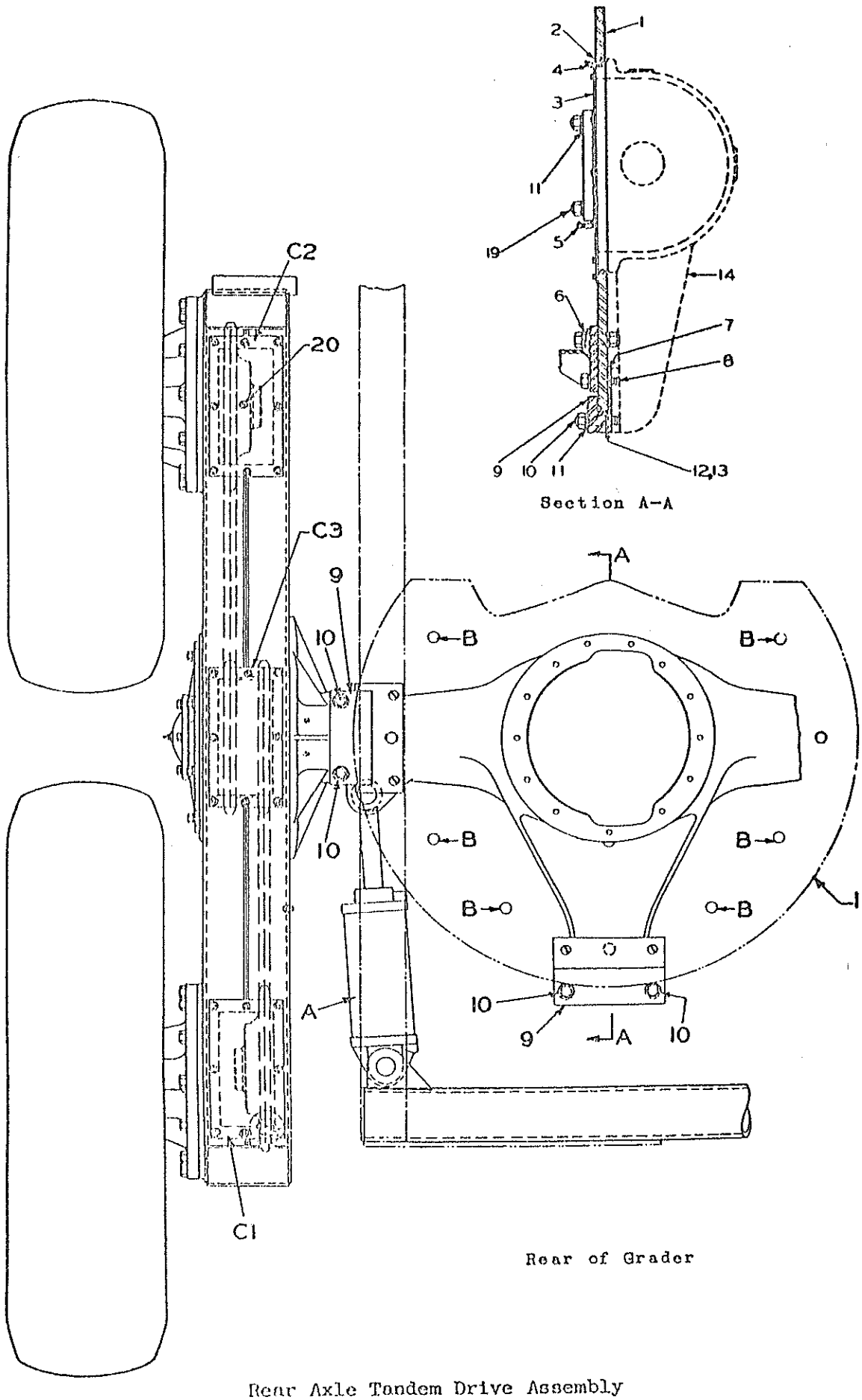
(2) Revolve moldboard until it is square scross. Lock circle latch. Place blocking under each end of the moldboard, about a foot from the ends.

(3) Block both front wheels securely to prevent possibility of machine rolling forward or backward.

(4) Remove the six capscrews (B), shown on page 33B, which attach the support plate (1) to the main frame itself.

(5) Remove the four capscrews at yoke (28), page 35, Section 5.

(6) Remove pin with keeper and disconnect the rear steering rams from the rear axle housing.



Rear Axle Tandem Drive Assembly

(7) Start the engine and operate (push forward) blade lift ram levers (3) and (8), page 2, Section 3. Operating these levers slowly and intermittently will raise the rear end of the main frame sufficiently to permit the rear axle, with wheels and tires, to roll away from the frame. (Place a jack under the rear bumper as a safety measure to stabilize and hold up the rear end of the grader frame.)

(8) The support plate (1), shown on page 33B, Section 5, may be removed from the axle housing, after removing the six nuts from studs (10). The three guides (9) should be marked in order that they will later be reinstalled in the same position.

The shims (12) and (13) should be wired to each guide during the dismantling operation.

The support plate bushing (2) should be inspected and replaced if damaged or worn. Spread lubricant by hand to the lower side near the guides (9).

35A. REAR WHEEL DRIVE CHAIN ADJUSTMENT.

To test the chain tension, remove the inspection cover (C1).

Jack up the housing at the left rear wheel and turn the top of the wheel toward the front of the grader and hold it there. With a short bar through hole (C1), test the upper chain tightness. You should be able to lift the chain about 1/2 inch.

If there is excess slack, the chain tension should be readjusted as follows:

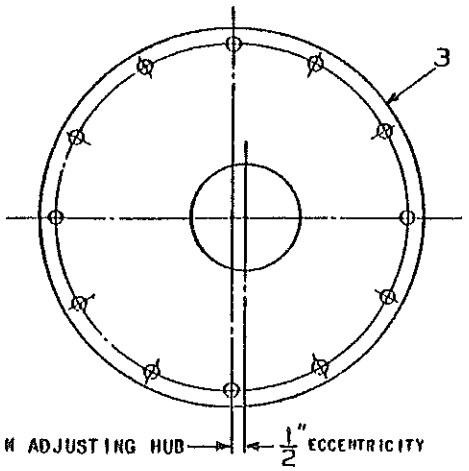
Remove all capscrews (10). To tighten the chain rotate the eccentric spindle hub (3) in correct direction. Install the capscrews (10).

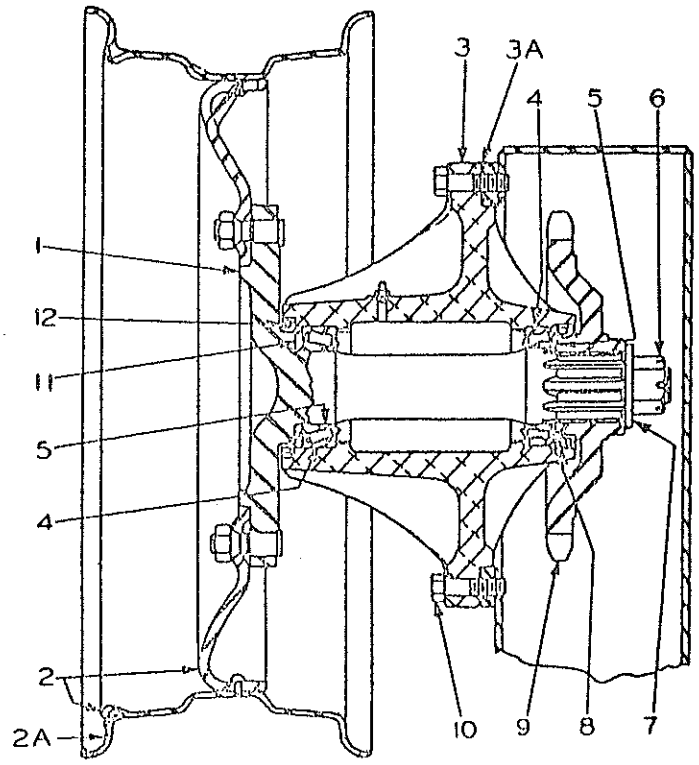
NOTE: It will be best to remove the wheel (2) from axle flange (1) before making this adjustment, in order to see the gasket (3A) and get the capscrew hole in the proper location.

Since all four rear wheels are driven by an enclosed roller chain, each wheel axle group has an eccentric hub (3), by means of which the chain tension can be adjusted as required. Each wheel, therefore, will have to be raised and chain adjustment procedure followed as directed, except the front tandem wheels have to be held rearward at the top of the tire when testing the chain tension.

The two Timken bearings (4) and (5) at right and left side of axle (1), should have no end clearance. Carefully adjust nut (6) to accomplish this adjustment; then insert a strong cotter pin into place to lock the nut (6).

* The seals should be installed with lips toward the wheel.



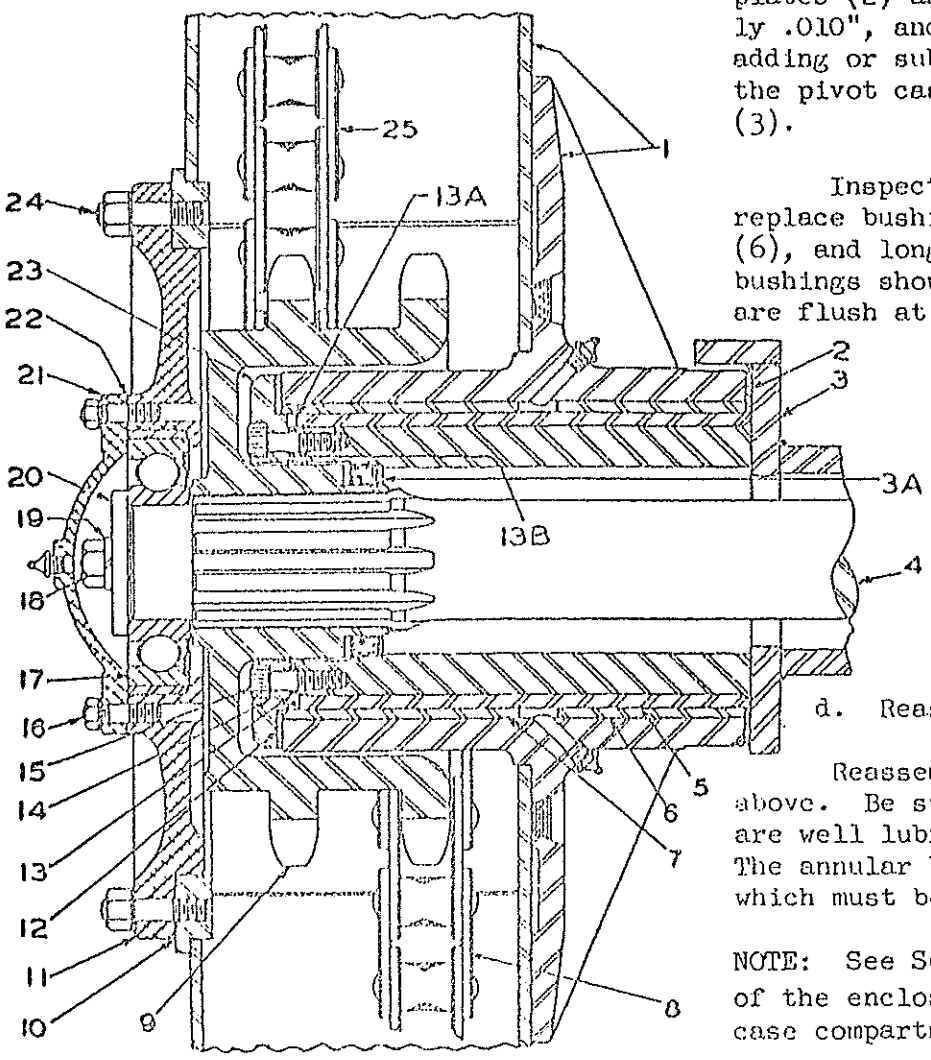


36A. REAR AXLE PIVOT CASE.
(See below)

a. General.

Power from the rear axle is transmitted from drive axle (4) (shown below) to drive sprocket (9). Chain (25) drives the front tandem wheel, while chain (8) drives the left rear wheel. Inspection cover (C3), page 33B, Section 5, may be removed to expose the sprocket (9) together with chains (25) and (8). Inspection covers (C1) and (C2) may also be removed as required. Chains (25) and (8) (shown below) have a master link, from which two cotter pins may be removed, together with link itself, after which both chains can be removed from the pivot case.

The illustration below shows the left hand pivot case, but the right hand pivot case is assembled similarly, and the instructions in the above and following paragraphs will apply to it also.



b. Drive Axle Removal.

Disconnect both drive chains (25) and (8) at a point near sprocket (9).

Remove cover (21) after removing nuts (with lock washers) at (16). Remove capscrew (18) and washers (19) and (20). Remove bearing support (11) after removing nuts, with lock washers, at (24). The sprocket (9) with shaft (4) may now be drawn out of the axle housing bore (3). Inspect bearing (17) before reassembly. Seal (3A) is assembled with the lip turned in toward gear carrier.

c. Pivot Case from Axle Housing Removal.

To remove pivot case from axle housing (3), proceed as outlined in paragraph b, above. Then place a supporting jack under the center of axle housing (3).

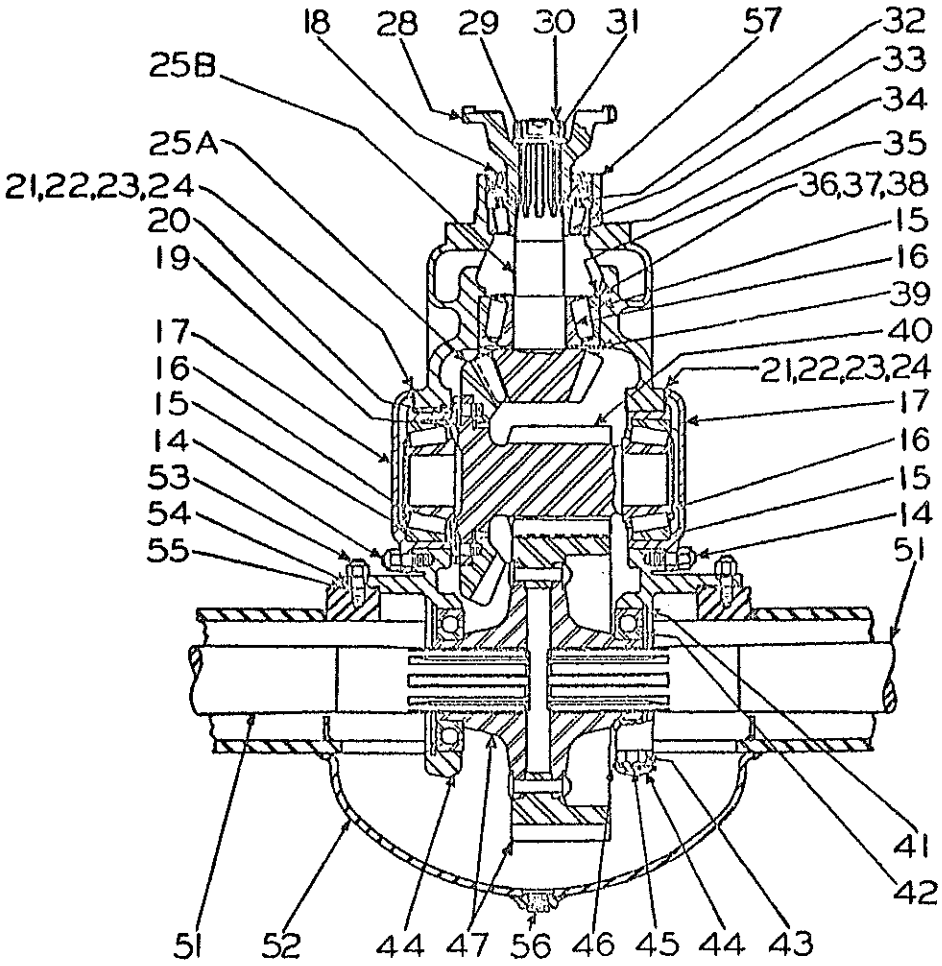
Remove all screws with lock washers at (15). Remove thrust plate (23) with shims (13). (The end clearance between plates (2) and (12) should be approximately .010", and this is accomplished by adding or subtracting shims (13). Pull the pivot case (1) off of axle housing (3).

Inspect, and if scored or worn, replace bushing (5), short (inner) bushing (6), and long (outer) bushing (7). These bushings should be pressed in until they are flush at the outside.

d. Reassembly.

Reassembly is the reverse of the above. Be sure that all bearing surfaces are well lubricated at time of assembly. The annular bearing (17) has a sealed side which must be turned inward.

NOTE: See Section 2, for lubrication of the enclosed chain or pivot case compartment.



41. REAR AXLE GEAR CARRIER. (Viewed from rear of machine toward front)

Gear and hub group (47) consists of solid drive on the rear axle of this machine, instead of a differential (37) used on the front axle as shown on page 7. The bevel gear (25A), shown above, locates on the left side of the housing.

42. REAR AXLE GEAR CARRIER REMOVAL.

a. Block up both ends of the axle housing, then remove both axle shafts (34), page 3, by following instructions found in paragraph 5, (b), (c) and (d) page 3 (Pacer Models); axle shafts (4) paragraph 36B page 34B (Super Models).

b. Remove the nuts from studs (53), also the one tapered bushing (54).

c. Lift out the gear carrier assembly as a group.

d. In reassembly, reverse the above procedure and use a new gasket (55). After starting all the nuts on studs (53), tighten first the one with the tapered dowel bushing (54) on it. Replace seals (30), page 3, or seals (3-A) page 34B.

43. REAR AXLE GEAR CARRIER DISASSEMBLY AND REASSEMBLY.

a. Remove the nuts on studs (45), caps (44), and washers (41).

NOTE: The written text as shown in the following list of paragraphs may be followed in further dismantling, cleaning, checking and reassembling the rear gear carrier, including proper bevel gear and pinion tooth contact:

(1) Paragraph 13, pages 7, 8, and 9.

(2) Paragraph 14, pages 10, and 11.

Always replace worn bearings with new ones. Always keep worn but useable Timken cups and cones mated or wired together during disassembly.

44. TIRE MOUNTING AND DEMOUNTING

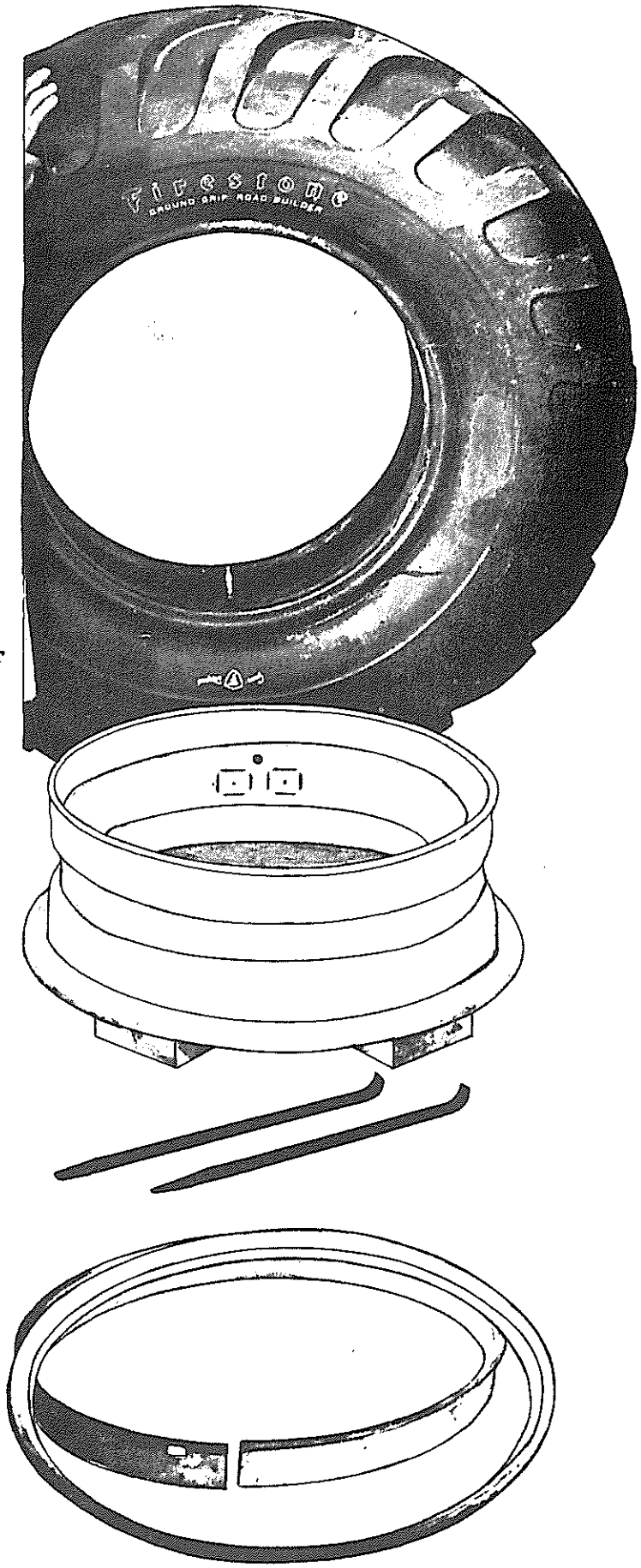
A. Tubeless Tires

The procedure for mounting and demounting tubeless tires follows closely the details outlined in paragraphs "B" & "C" for tube type tires. The exceptions to these instructions are the installation of the valve on the rim base before installing the tire. After lowering the tire onto the rim base a sealing ring or "O" ring is placed on the rim before installing the side flange and locking ring.

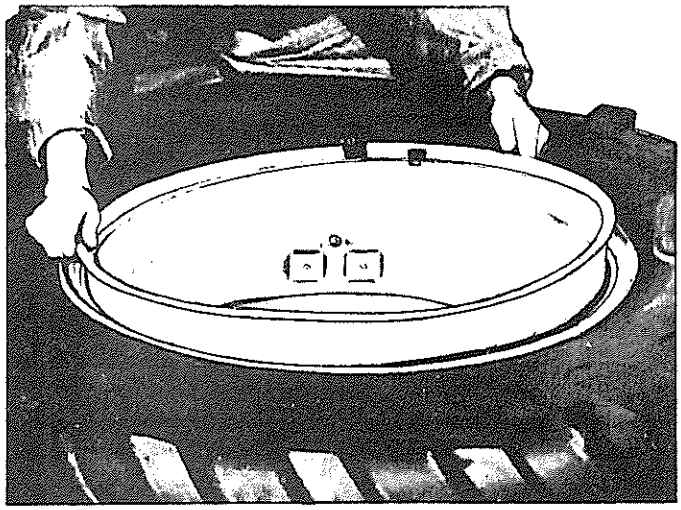
In order to inflate a just mounted tubeless tire, it may be necessary to wrap a chain or rope around the tread and tighten to force the tire bead against the rim. A large rapid volume of air is required to seat the tire properly against the rim. The chain or rope should be removed from the tire tread as soon as the tire bead is seated against the rim. Refer to tire inflation chart section 3 for proper inflation.

B. TIRE MOUNTING PROCEDURE. (Tube type tire)

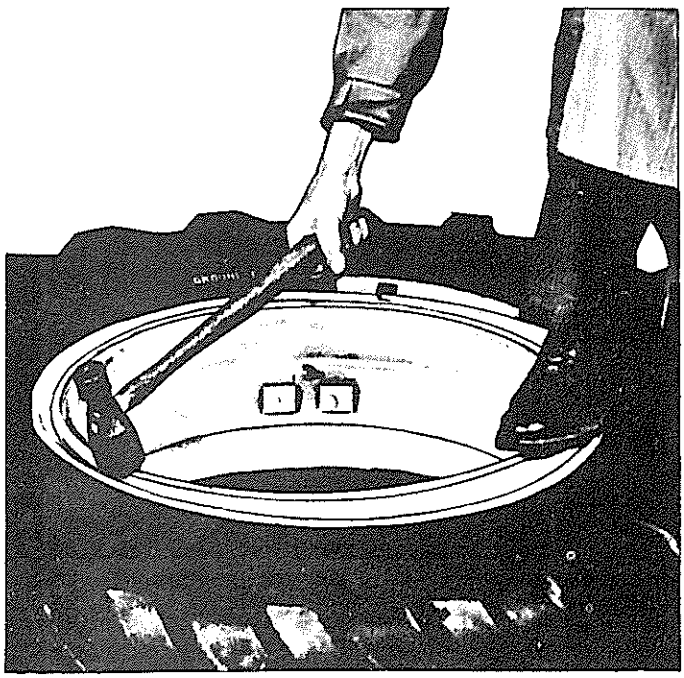
Assemble parts in position as shown. Note rim base is placed on wood blocks to provide clearance for tires. Rim nut is removed from valve and valve is properly placed to fit offset valve hole in rim. The rims should be straightened, cleaned and painted to make mounting earier and to prevent rust damage. All oil or grease should be removed from the rims and tires.



Lower tire onto rim base and apply rim nut to valve. Place the continuous side flange in position and then insert tapered toe of locking ring between side flange and tire bead as shown below.



Engage one end of the locking ring in the rim gutter and working progressively around the rim, hammer the ring in place, using a soft metal hammer as shown below.

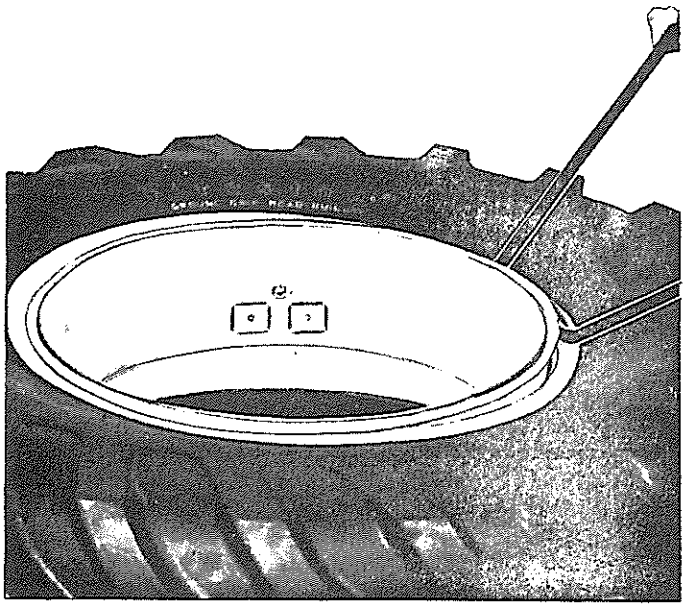


Carefully examine the assembly to make certain the locking ring is in place, then inflate to recommended pressure (see Section 3, page 19) to seat the tire beads. Completely deflate to permit proper positioning of tube and again reinflate to recommended pressure for service.

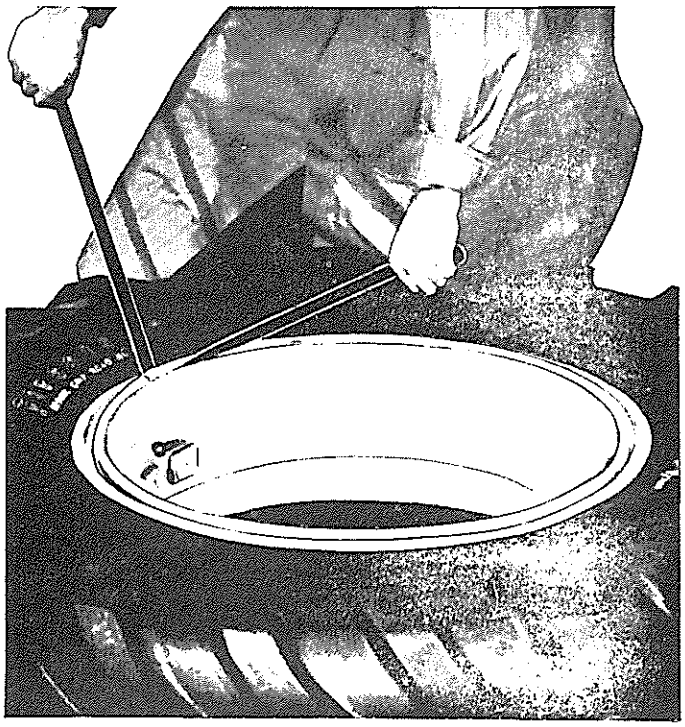
CAUTION: Do not use a heavy hammer to seat the lock ring because abuse of this kind may weaken the locking lip of the rim itself. Never stand over, or stand directly beside a tire or rim.

C. Demounting Procedure.

Completely deflate tire by removing valve core or using deflator cap. Use tire tools to free tire bead from the bead seat on removable flange side as shown below.



Insert tapered end of tire tool in notc located at split in locking ring to pry the ring out of the rim gutter at this point as shown below.



Use tire tools to progressively remove the locking ring, then remove the side flange ring as shown below.

Turn tire over and free tire bead on fixed flange side. Remove rim nut from valve and then force tire off the rim base.

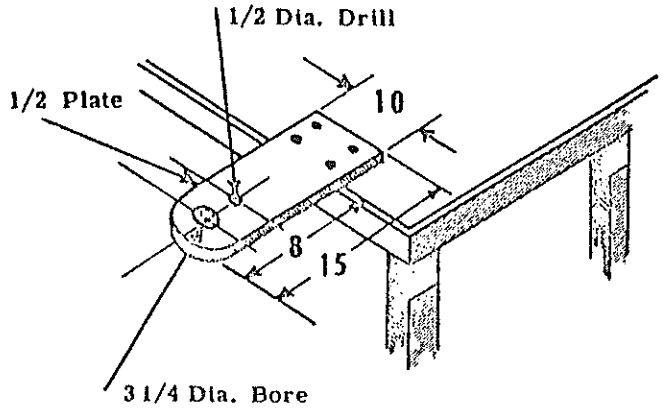
45. HYDRAULIC PUMP WITH DRIVE PULLEY.
For Pacer and Super Dry Clutch Graders.

A. General.

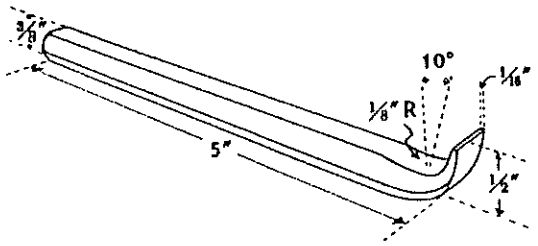
The hydraulic pump is a small, important unit and should be handled with care. Loss of volume will more than likely be due to loose connections or to a clogged screen in the hydraulic oil strainer. We strongly recommend leaving the pump alone. Should anything occur that would lead you to believe the pump might be in need of repair, procure another pump, or repairs, from your nearest Austin-Western distributor.

Adjust pump belt until belt doesn't slip when the pump relief valve unloads at 1500 P.S.I. Super models and 1200 P.S.I. Pacer models.

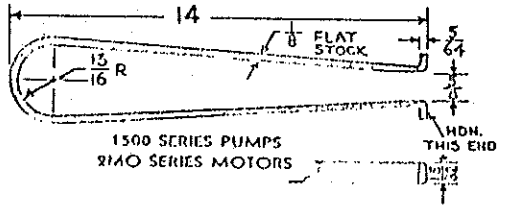
Special Tools for Pump Repair.
(Not furnished. Can easily be made locally.)



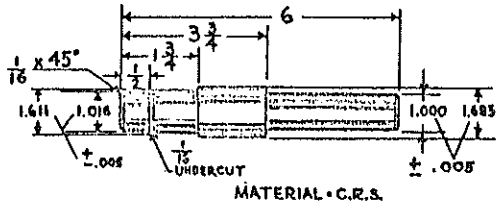
Bench Mount



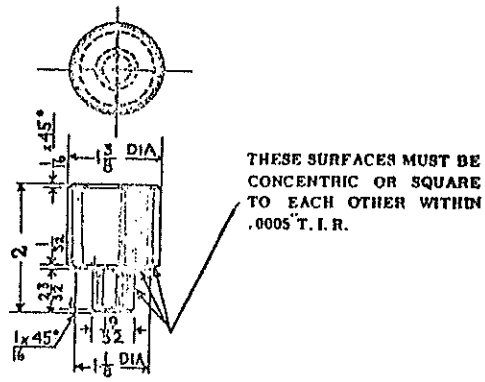
Bearing Pry Bar



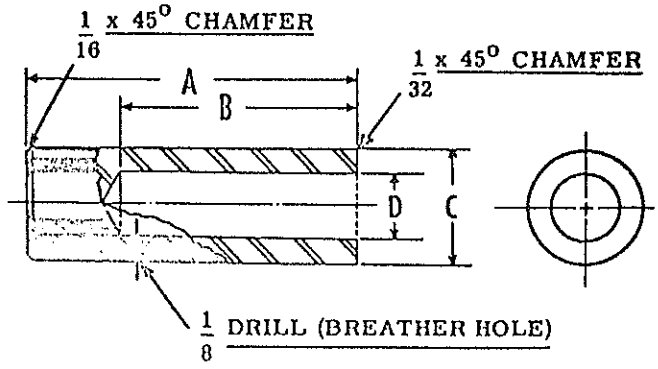
Bearing Puller



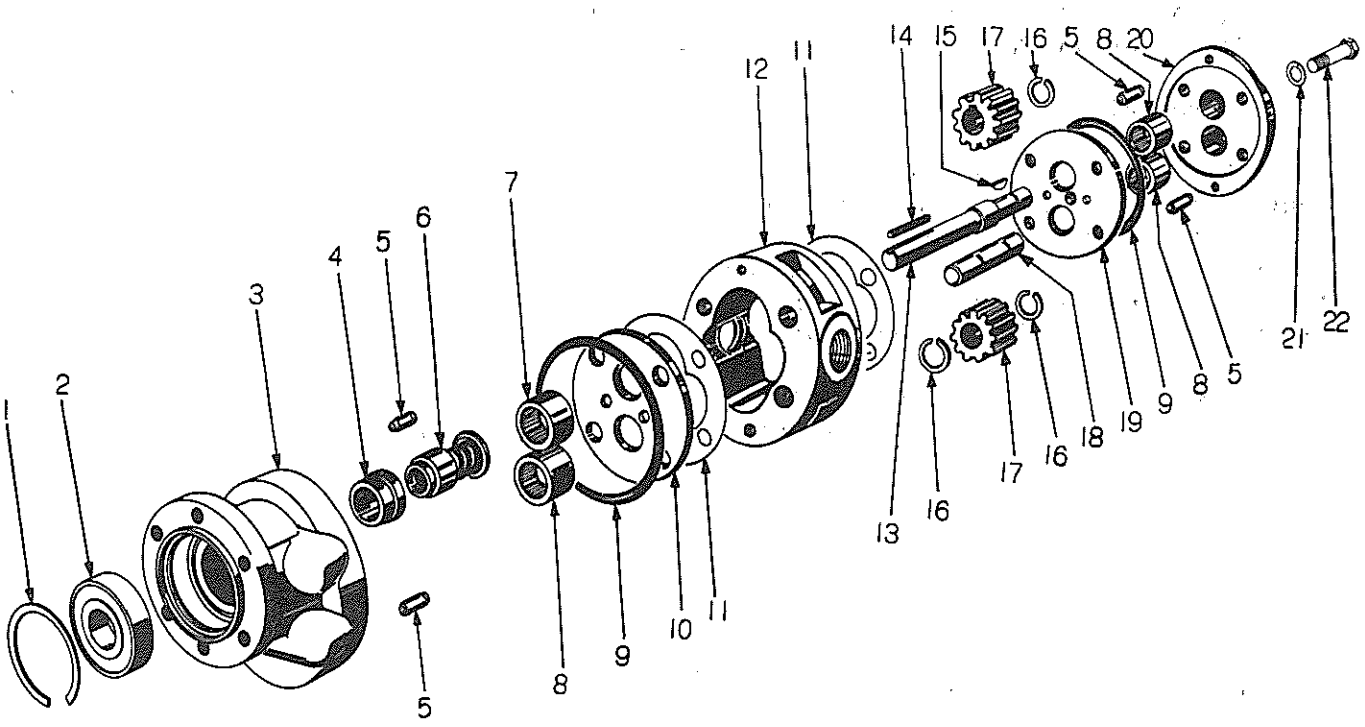
Seal Driver



Roller Bearing Driver



Outboard Bearing Driver



B. Hydraulic Pump Dismantling. (Hydreco Pump)

1. Clean outside of the pump with an oil solvent, fuel oil or gasoline, and dry thoroughly. With file or oil stone remove sharp edges or burrs from shaft splines, drill point, keyway or shaft end before proceeding with disassembly. Mark sections of pump with prick punch for proper reassembly.

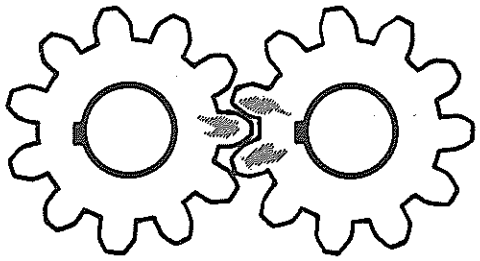
NOTE: Servicing is facilitated by bolting the adapter to a special bench mounted assembly plate. (See page 39.)

2. Remove the four cover capscrews (22) (see above). Remove the cover (20) which may come off separately or with the housing (12).

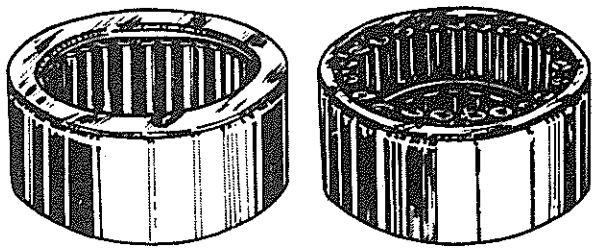
To prevent possibility of leakage, avoid scoring or nicking machine surfaces of pump sections. DO NOT USE A SCREW DRIVER to pry the sections apart. Tap with fibre hammer, if necessary, to loosen.

Note position of relief pocket and drilled holes in the wear plate (10) and (19) for proper reassembly. Mark the drive and driven gears (17) with an India stone, (see right, above) for proper reassembly.

Note the location and number of gaskets when disassembling.



Remove driver shaft (13) and gear (17). Unbolt adapter end from bench plate. By pressing on keyed end of shaft, press out the bearing (7). Remove seal assembly (4) and (6) and snap ring (16), freeing shaft (13) and wear plate (10). This pump is equipped with an outboard ball bearing. Be sure to coat end of shaft with white lead and remove any burrs before pressing out to prevent the



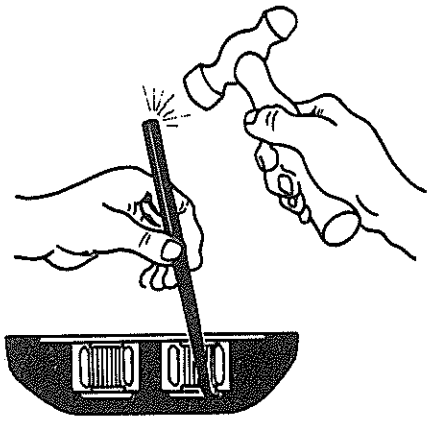
Type "A" Bearing. Type "B" Bearing.

bearing from being scored. Remove dowel pins (5) from adapter (3) and cover end (20), with pliers or a lever jaw wrench.

3. Type "A" Roller Bearings. (See page 40)

Check bearings for freeness of rollers and pitted, broken or excessively worn rollers. Replace bearing if it is possible to insert a feeler of .020" thickness between rollers.

More gap indicates rollers are worn excessively. Remove roller bearings by starting them with a tool shown on page 109. Insert tool under the bearing and into the cored hole between the bearing bores (see below). Complete removal of bearing using puller (see page 39) and tap out with heavy bar shown below.



3A. Type "B" Roller Bearings. (See page 40)

Remove retaining ring and all rollers. Start bearing shell out with tool, page 39. Complete removal with puller, page 39. Tap out with heavy bar as shown at right.

4. Ball Bearing. (Outboard bearing)

a. Remove outboard bearing retaining snap ring (1) with ring pliers.

b. Reach down through the drive shaft bearing bore with a brass drift and tap out the outboard bearing (2). Tap opposite sides alternately.

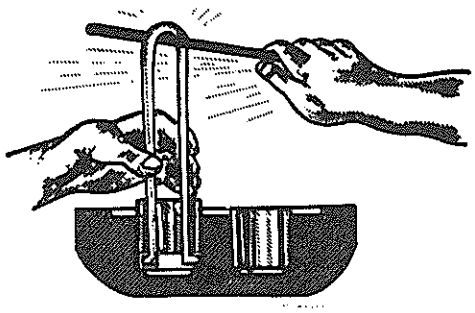
CAUTION: Replace roller or ball bearings only if necessary, and then only with the SAME MAKE AND TYPE as originally installed.

5. Seal Seat.

The seal seat (4) should not be removed unless the seal face is excessively worn or damaged. To remove the seal seat, invert the adapter (3) and drive out the seat (4) with a wooden block. If a new seat (4) is required, press into adapter, using a seal seat driver, page 39.

6. Gears.

If gears or shafts must be replaced, remove snap rings (16) and press off gears on an arbor press. (Some models may be furnished with shaft and gear made in one piece). To reassemble, coat gear bore with white lead, and after installing one snap ring, press onto shaft until the gear covers approximately one quarter of the key slot. Hold key in place and press gear onto shaft until it contacts snap ring. Install second snap ring. The same procedure is used for driven shaft except no key is required.



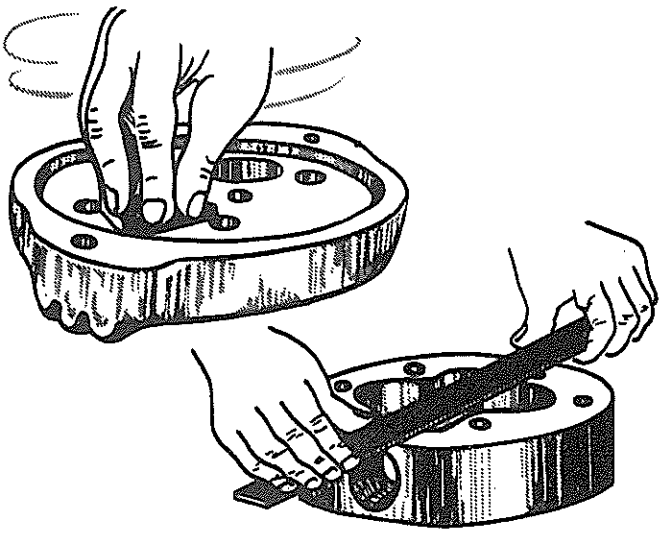
CAUTION: To prevent bending of drive shaft, push (drive or keyed end of shaft) through the gear and press on straight end of shaft.

C. Inspection and Check of Pump Parts For Wear.

1. Wash all parts in oil solvent, or fuel oil. Dry thoroughly with clean cloths or dry compressed air.

2. Inspect all parts of the pump.

3. With a small piece of flat file remove nicks and burrs from around the bearing bores and drilled holes of adapter (3) and cover (20) (see top of page 42. Clean up burrs and nicks on the machined mating surfaces of housing (12), cover (20) and adapter (3) (see top of page 42), with India stone and a fine mill file. Rewash before assembly.

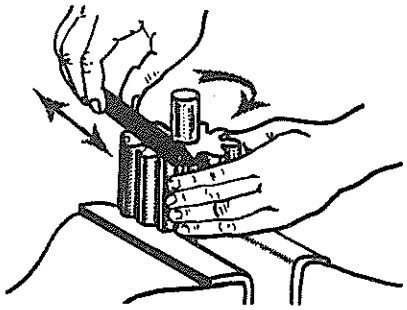


4. Shafts.

Inspect at bearing points and seal areas for rough surfaces and excessive wear.

5. Gears.

Inspect edge of teeth and gear face for scoring. Stone face of gears (see below) and edge of teeth before reassembly.



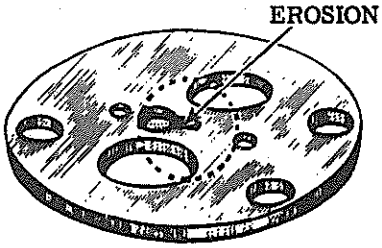
6. Gaskets.

Always replace housing gaskets (11) if damaged. Replace all seal rings (9).

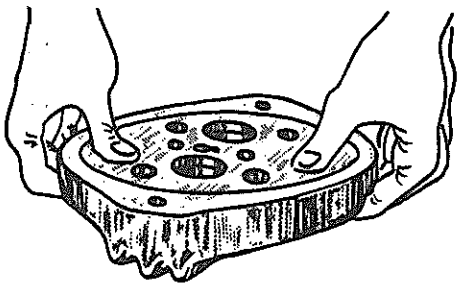
7. Wear Plates.

Replace if found scored or excessively worn.

NOTE: Do not turn wear plate (10) and (19) as counterbored relief pocket is on gear side only. If wear plate is steel backed, bronze side should be next to gears. Even though slight wear is shown on gear pattern, check for erosion path in vicinity of relief pocket, (see right, above) and replace if in evidence.



8. Check for proper seating of wear plate in adapter or cover, (below). A rocking motion indicates either a burr on face of adapter or cover.



9. Recommended Wear Tolerances.

a. Discard any housing (12) whose gear bores measure greater than 3.259" through the dowel pin hole centerline.

b. Replace both gears (17) if the differential between the housing width and the gears, with no gaskets in the pump, is in excess of .0035".

c. Assembled, the total end clearance between the gear faces and the housing width should be .0025" minimum and .0035" maximum.

d. Replace shafts(13) and (18) if wear at the roller pattern exceeds .001" from that of the major diameter.

e. Replace wear plates (10) and (19) that have severe score marks or show erosion marks in the vicinity of the counterboard relief pocket.

f. If the pump shafts have been replaced because wear at the roller patterns exceeded .001", also replace the bearings.

g. Replacement of seal assembly (6) and seat (4) is recommended if drive shaft is replaced.

D. Pump Assembly.

1. Type "A" Roller Bearings.

Lubricate rollers (7) and (8) with light grease. Coat I.D. of bearing bore with white lead. Press bearing assembly into bearing bore of adapter and cover with tool. (See page 39).

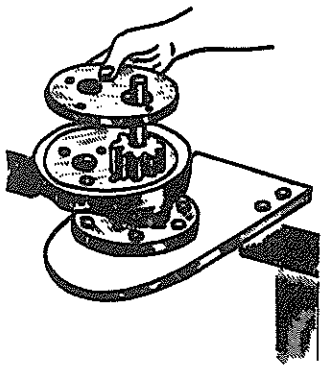
1A. Type "B" Roller Bearings.

Coat rollers with light grease, bearing bore with white lead and press bearing into bearing bore of adapter and cover.

2. Final Housing and Cover Assembly.

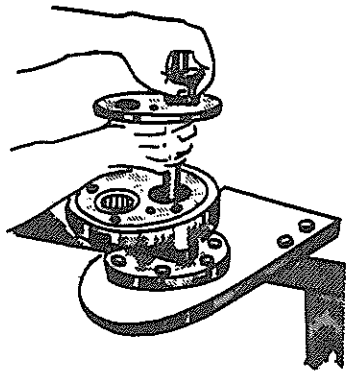
a. Install dowel pins (5) in adapter (3).

b. To assemble the wear plate (10), bearing and seal assembly (4) and (6), use the adapter end (3) bolted to the bench plate as a support. (See below). Insert the drive shaft (13) in the adapter end with the long end UP in the side that has a bearing driven in. Put the wear plate over drive shaft making sure the counterbored relief pocket is FACING the gear.



Place the bearing on the drive shaft. Now assemble the oil seal parts in the following order: Back up washer, coil spring, synthetic rubber ring. (Lubricate this ring with a light grease or oil) and the seal cup with lapped surface UP. Make certain the rubber ring (9) is not cut when placing it on the shaft and when passing it over the key slot or spline. Press the entire seat assembly down against the spring and compress it. When released, the spring should return the cup to the position held before compressing. If it sticks on shaft, replace the oil seal assembly.

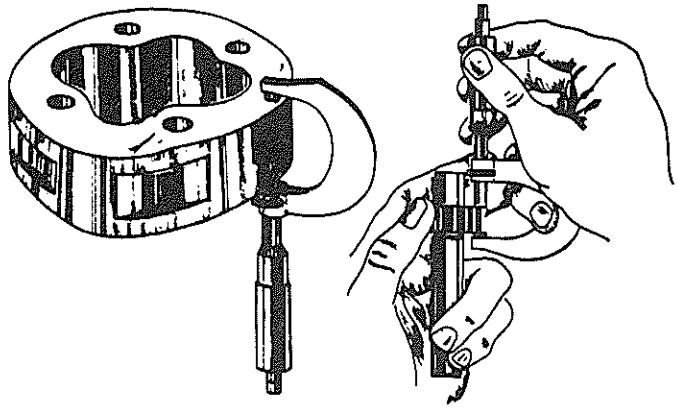
c. Wipe off any foreign matter from seal seat. Lubricate the lapped surfaces of the seal seat and seal cup with light oil. Turn the entire drive shaft assembly over and install in adapter end as shown below. Use a composition hammer to drive entire assembly down, driving bearing into bearing bore. Place "O" ring seal around wear plate. Lubricate with light oil the section of the wear plate that comes into contact with the gear face.



d. Pumps with Outboard Bearings.

With an India stone polish out any scratches on drive shaft that were made when shaft was driven out through the bearing.

e. Clearance between gear face and wear plate is provided by the plastic shim gasket between housing, adapter and cover. With micrometer, measure housing width and width of gears. (See below).



f. Insert driver assembled gear (17) and shaft (13) into adapter end. Line up marks previously made on gear faces if original gears are reinstalled.

(Page 40). If new gears are used keep keyways 180° apart. Note that on some models shaft and gear are made in one piece. Lubricate face of gears with light oil.

g. Place proper gasket as selected by chart (below), over gears and on face of wear plate (10). If it is not practical to use micrometers to measure gears and housing use a gasket that measures .002" thickness.

h. Line up punch marks and place pump housing (12) over gears and gasket. Tap down with fibre hammer.

i. Select another gasket from chart or if no measurement (para. 2e) is available, use a gasket of .002" thickness. Place gasket on housing face. Lubricate gear face with clean oil.

j. After selecting proper gasket from the chart, and putting it in place on the housing face, install the wear plate, making sure that the 1/16" deep counterbored relief pocket is in its original position facing the gears and is rotated 180° from the pocket of the adapter wear plate. Place seal ring (9) around the wear plate and position on wear plate with an equal air gap around each shaft. Put cover (20) in place and tap down, being careful not to pinch "O" ring seal (9).

Chart below indicates color, number and location of shim gaskets to be used to provide proper clearance between gear face and wear plate.

CLEARANCE CHART			
	Gear Width Greater (+) or less (-) THAN HOUSING WIDTH	NOTE: Only plastic shim gaskets are used on 1500 Series Pumps ADAPTER SIDE	COVER SIDE
1500 SERIES PUMPS	+.002	.002	.002
	+.001	.001	.002
	.001	.001	.001
	-.001	--	.001
	-.002	--	--
COLOR CODE:	.001 - Amber .002 - Red	.0015 - Purple	

If gears are so worn that housing width becomes more than .0035" greater than gear width, both gears (17) should be replaced.

k. Install dowel pins (5) in cover. Line up punch marks previously made on housing and cover and put in place. Tap cover down on dowel pins with fibre hammer until cover bottoms on housing. Be careful not to pinch "O" ring seal around wear plate.

Install four capscrews. Pump may be furnished with either hollow head capscrews or hex head type. If hex head, be sure that proper washer (21) is in place before installing. If for any reason replacement of capscrews is required, always use same type as originally furnished. If hollow head capscrews are used, the shoulder of the screw must ride against the spot face of the cover and both surfaces should be free of burrs to prevent leaks.

Tighten gradually opposite capscrews, using torque wrench set at 60 ft. pounds torque. After assembly, turn shaft with a 6" Crescent wrench. If shaft will turn with a slight drag and not too freely, proper clearances are assured between gears and wear plate. If shaft is too tight or too free, add or remove .001" or .002" gaskets as necessary for proper clearance.

3. Assembly of Outboard Bearings.

a. Coat I.D. of bearing bore with white lead.

b. Lubricate the bearing (2) with light grease.

c. Drive outboard bearing (2) down over drive shaft with special tool, until it bottoms. (See page 39.)

d. Insert snap ring (1) in bearing bore.

e. Remove grease plug and repack outboard bearing bore with good quality bearing grease. Use fingers for repacking. A grease gun will force grease into the oil seal and cause it to leak.

E. Break-In of Repaired Pumps.

1. If shop test stand is available on which the pump can be mounted and operated against full pressure and at maximum speed, the following procedure is recommended for break-in and test:

a. Start pump and run for 2 minutes at zero pressure. Be sure that test stand reservoir is filled and that all inlet and outlet lines are open.

b. By restricting pump discharge line with needle valve, raise discharge pressure to 500 PSI for 10 seconds and lower to zero pressure for 10 seconds. Continue this procedure for 5 minutes.

CAUTION: Do not apply pressure for more than 10 second intervals.

c. Stop pump and rotate drive shaft coupling by hand to determine if drive shaft is free. If it cannot be turned freely, remove and rebuild pump.

d. Resume test and apply 1000 PSI for 10 seconds intermittently for 5 minutes.

CAUTION: Do not apply pressure for more than 10 second intervals.

e. Stop pump and check freeness as in para. c. Check for possible leaks at mating surfaces of adapter, housing and cover and around seal assembly and the four assembly capscrews.

f. Be sure oil level is up to normal in oil reservoir. Start pump and run pressure to 1100 PSI and run flow test by whatever means is available on the test stand.

2. If a shop test stand is not available, the following alternate break-in and test procedure may be used:

a. Mount repaired pump in place on equipment and run pump at one quarter engine speed for 5 minutes at zero pressure.

b. Operate control valve until relief pressure is attained, then hold in this position for 10 seconds and release for 10 seconds. Follow this procedure for 10 minutes.

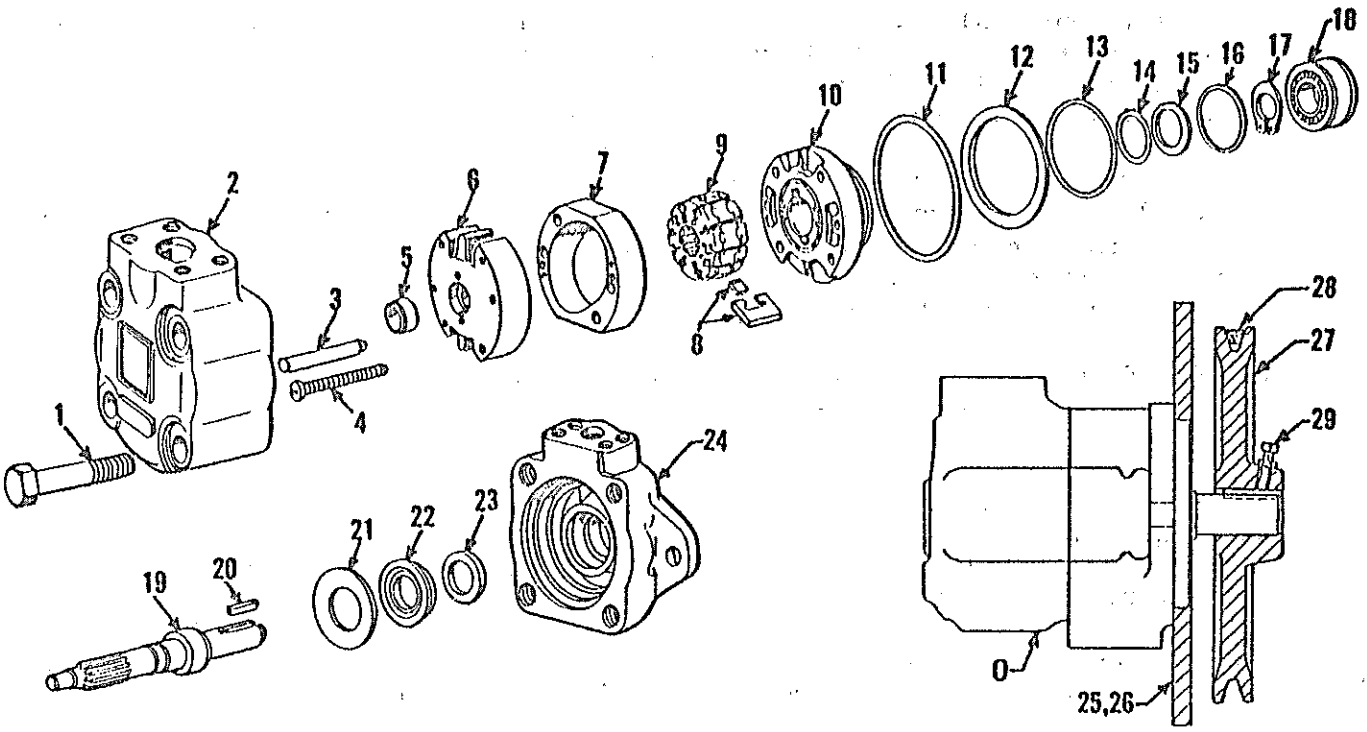
c. Increase engine speed to one-half throttle, and repeat step para. b for 10 minutes.

d. Increase engine speed to full throttle, and repeat step para. b for 5 minutes.

e. Idle engine and check pump for possible leaks at mating surfaces of housing, adapter end cover, shaft seal area, and any of the capscrews.

TROUBLE SHOOTING

POSSIBLE PUMP TROUBLES	CAUSES	REMEDIES
I. Cavitation, pump unusually noisy.	a) Low oil supply. b) Heavy oil. c) Dirty oil filter. d) Restriction in suction line.	a) Fill to proper level. b) Change to proper oil. c) Clean and replace filter. d) Remove.
II. Pump takes too long to respond or fails to respond.	a) Low oil supply. b) Insufficient relief valve pressure. c) Pump worn or damaged.	a) Fill to proper level. b) Reset to correct pressure setting using gauge. c) Inspect, repair or replace.
III. Oil heating up.	a) Foreign matter lodged between the relief valve plunger and relief valve seat. b) Using very light oil in a hot climate. c) Dirty oil. d) Oil level too low. e) Insufficient relief valve pressure. f) Relief valve pressure too high. g) Pump worn (slippage).	a) Inspect and remove foreign matter. b) Drain and refill with proper oil. c) Drain, flush and refill with clean oil. d) Fill to proper level. e) Set to correct pressure. f) Same as "e". g) Replace or repair.
IV. Oil foaming.	a) Air leaking into suction line from tank to pump. b) Wrong kind of oil. c) Oil level too low.	a) Tighten all connections. b) Drain and refill with a non-foaming type of hydraulic oil. c) Fill to proper level.



46. DISASSEMBLE, INSPECTION AND REPAIR. (Vickers pump)

A. Clean outside of pump with an oil solvent, fuel oil or gasoline and dry thoroughly. With file or oil stone remove sharp edges or burrs from shaft and keyway before proceeding to disassemble. Mark pump with prick punch for proper assembly.

Do not disassemble a pump further than is necessary to correct a malfunction. During disassembly, special attention should be given to identification of parts for proper reassembly. This is especially important in installing cartridge parts to their proper relationship in rotation. Place all disassembled parts on a clean, lint-free surface for inspection. Carefully remove any burrs by light stoning with a medium India stone. Clean all parts except "O" ring seals in a clean mineral oil solvent. After drying thoroughly, lay the parts on a clean, lint-free surface. All internal oil passages in the cover, rotor, pressure plate and body must be thoroughly cleaned.

CAUTION

Never use an air hose on or near the exposed parts because of the presence of water and dust in the air system.

All "O" rings, back-up rings and the shaft seal should be replaced for reassembly. All seals should be soaked in hydraulic fluid before being used. Refer to above and proceed with disassembly.

B. COVER END

1. Place pump in a machinist's vise, being certain to use protective jaws. Clamp vise on flats of mounting bracket to prevent damage to body.

2. Remove four cover bolts (1) that secure to cover (2) to the body (24). Remove the cover (2). Note position of inlet port of the cover with reference to outlet port of the body before removal so that the cover may be returned to its original position at reassembly.

3. Firmly grasp pump cartridge (7) and (9) and while turning it slightly, pull outward on the unit to remove it from drive shaft (19). Loosening of pump cartridge may be accomplished by prying under the flats of the ring with two screw drivers. Lay the cartridge aside on a clean smooth surface for disassembly and inspection. Remove large "O" ring from recess in body.

C. PUMP CARTRIDGE

1. Remove "O" rings (11 and 13) and back-up rings (12) from hub and outside diameter of pressure plate (10).

2. Remove two screws (4) from face of wear plate (6). Lift wear plate from locating pins (3) and remove pins. Remove ring (7) from around rotor (9). Remove vanes and inserts (8) from rotor (9) and remove rotor from pressure plate (10).

3. Wash and dry all cartridge parts. inspect surfaces of wear plate (6), pressure plate (10), ring (7) and rotor (9) for scoring and excessive wear. Light scoring may be removed by lapping. Replace parts if heavily scored. Check edges of vanes (8) for wear. Vanes must not have excessive play in rotor slots or burrs on edges. Replace if necessary. Check each rotor slot for sticky vane fit or wear. Vanes (8) should drop in rotor slots by their own weight when both the slots and vanes are dry. If wear plate (6) is found to be satisfactory, inspect inside diameter of bushing (5) for wear or scoring. Remove bushing if wear or scoring is evident. If wear plate (6) is to be replaced, do not remove bushing since a new plate will incorporate a new bushing.

D. SHAFT END

1. Lift out shaft key (20) from its seat in shaft (19). Remove bearing retaining ring (17) and shaft snap ring (16) from inside of body (24). Carefully remove drive shaft (19) and bearing from body (24) by gently tapping the keyed end of shaft (19) with a soft tipped hammer.

2. Test the bearing (18) for wear before removing it from the shaft (19). Rotate bearing (18), applying a little pressure to outer race, to determine whether the balls or races have become pitted, worn or cracked. Check for looseness. If in doubt, remove bearing (18) from shaft (19). Inspect outside diameter of drive shaft at the point of contact with bushing and sealing lip of shaft oil seal. If excessive scoring or wear is noted, replace shaft.

3. Remove washer (21) from around shaft bore in body. Using a suitable hooked tool or a drift, remove shaft oil seal (22) and felt seal (23) from body (24).

E. REASSEMBLY

NOTE

Immerse all parts in clean hydraulic oil to facilitate reassembly and provide initial lubrication.

F. SHAFT END

1. Install a new felt seal (23) and shaft oil seal (22) in counterbore and body (24). Soak both seals thoroughly in hydraulic oil before installing. Make certain that lipped edge of seal is toward inside of body. Use shaft oil seal driver to prevent damage to seal during installation. Lubricate the shaft oil seal diameter with petroleum jelly or grease.

2. Position shaft bearing (18) in place on drive shaft (19), being careful not to cock the bearing. Using an arbor press and supporting the inner race of the bearing, press bearing against shoulder of shaft. Lubricate the chamfered edge of the shaft. With tape around end of shaft to protect seal, install shaft and bearing into body until bearing is fully seated. If necessary, gently tap the shaft with a plastic headed hammer. Install shaft snap ring and bearing retaining ring, making certain both parts are firmly seated in place.

3. Shaft key (20) may be installed at this time or after pump has been completely reassembled.

G. PUMP CARTRIDGE

1. Install an "O" ring (14) and back-up ring in groove on hub diameter of pressure plate (10). Install a back-up ring (12) and "O" ring (18) around large step diameter of pressure

plate. Make certain that smooth sides of back-up rings face the sealing rings.

NOTE

Back-up rings are always installed away from pressure chamber.

2. Position large "O" ring (11) in diameter recess of body (24). Petroleum jelly or similar grease should be used to hold the ring in position during assembly of pump cartridge.

NOTE

Direction of rotation is designated as viewed from shaft end of pump. Right hand rotation is clockwise, left hand rotation is counter-clockwise.

3. Place rotor (9) on pressure plate (10) with arrow pointing in desired direction of rotation. Install insert in vane (8) and position both parts in rotor slot. The sharp edge of the vane must be toward direction of rotation.

4. Install locating pins (3) in pressure plate (10). Install ring (7) on locating pins with arrow facing direction of rotation. Lubricate rotor and ring with clean hydraulic oil.

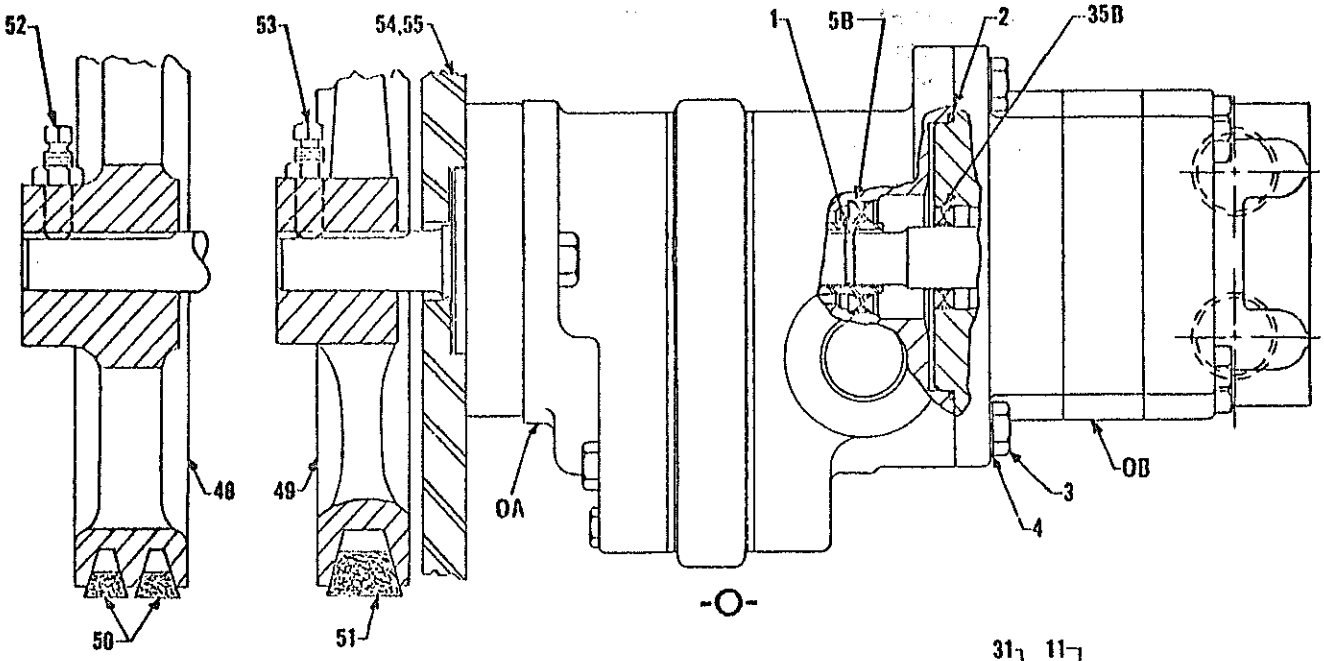
5. Press a new bushing (5) into bore of wear plate (6), if removed. Install plate on ring. Install two screws (4) and tighten until snug.

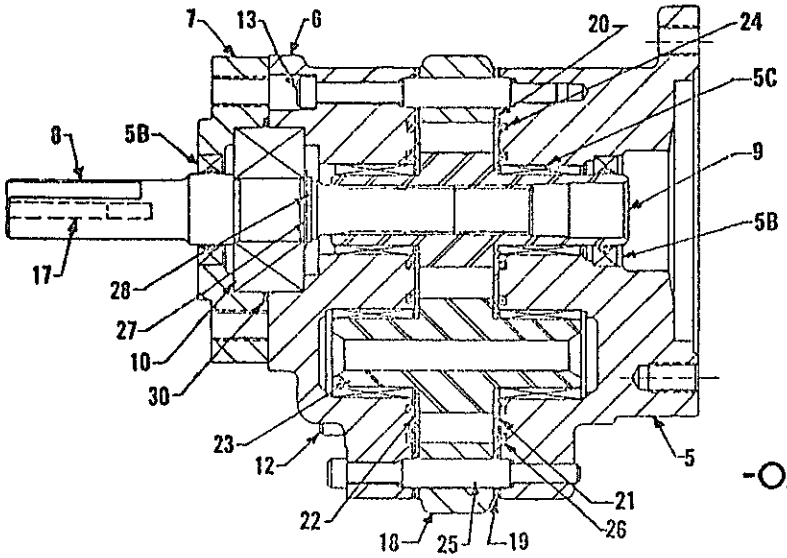
H. COVER END

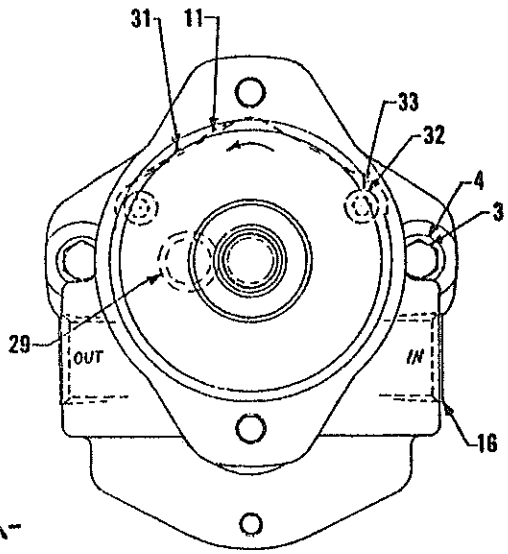
1. Carefully install pump cartridge on drive shaft (19) and seat it firmly in place in body (24).

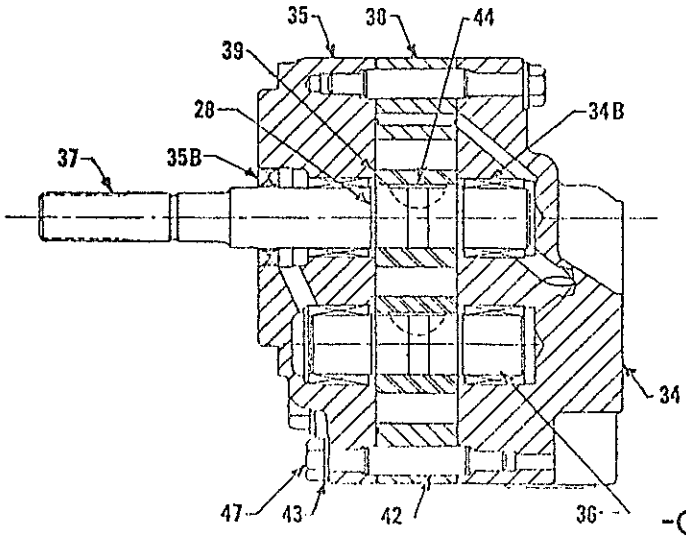
2. Install cover (2) making certain that the two locating pins (3) fit into the holes inside the cover (2). Seat cover firmly and secure in place with four cover bolts (1). The threads of the bolts should be oiled lightly and tightened to a torque of 55 $\pm$ 5 ft. pounds.

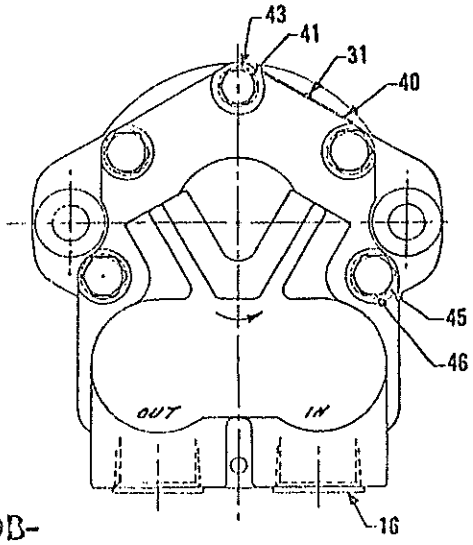
3. After the unit has been completely reassembled, pour a small quantity of clean hydraulic oil into the cover inlet port. Rotate drive shaft several turns by hand to check for free rotation and to insure complete lubrication of the cartridge parts. Cap the pump inlet and outlet ports to prevent entrance of foreign materials into the cover or body.











HYDRAULIC DUAL PUMP AND PULLEY.

47. HYDRAULIC DUAL PUMP OVERHAUL
(Webster-Electric)

A. Hydraulic pump dismantling.

1. Clean outside of pump with an oil solvent, fuel oil, or gasoline, and dry thoroughly. With file or oil stone, remove sharp edges or burrs from shaft splines, drill point, keyways or shaft end before proceeding with disassembly. Mark sections of pump with prick punch for proper reassembly.

NOTE: Servicing is facilitated by bolting the adapter to a special bench mounted plate.

2. Remove the two capscrews (3) and separate the two pump sections.

B. Disassembly - (Front Section.)

1. Remove the two capscrews (3) attaching the adapter assembly (7) to the pump body (5). Lift the adapter from the pump carefully to avoid damage to the seal (5-B) (Splines and key seats should be masked with tape by starting at seal seat and lapping each turn 1/16" over the last and progress outward.)

2. Inspect seal for wear and cuts and if found to be defective, press seal out of adapter and press in a new one.

3. Remove drive shaft (8) and ball bearing (10) CAUTION: Do not damage shaft. If necessary shaft can be left in pump until the stack has been separated and then removed by lightly tapping it out of the body.

4. Remove the eight capscrews. Two (13) thru the dowel pin holes and six (25) external.

5. With soft hammer, gently tap the stack apart until the pump can be disassembled by hand. CAUTION: Never pry any parts apart since this will raise a burr and possibly prevent satisfactory reassembly of the pump.

C. Assembly (Front Section)

1. Stone all mating surfaces to remove any burrs that may be present.

2. Wash all parts until clean in a solvent and air dry.

3. Install wear plate (21) (22) with flat surface down in both body and cover.

4. Install back-up ring (26) in body and cover.

5. Install O-ring (29) in recesses inside of wear plate grooves of cover and body.

6. Install wear plate retaining plate (19) on cover.

7. Install sealing ring (26) inside of retaining plate (19) with lip toward cover.

8. Install wear plate (21) with entrapment relief grooves in cover (5). Pressure loading ports (1/8") toward loading ring and bronze toward gear.

9. Install dowel pins (25) in gear plate (18).

10. Install gear plate (18) on cover (5)

11. Install gears and turn them to insure there is no interference with the gear plate. Lubricate gears with SAE No. 20 oil or system hydraulic fluid.

12. Install wear plate (22) without entrapment relief for body side (6).

13. Install wear plate retaining plate (20).

14. Install sealing ring (24) between wear plate (22) and retaining plate with lip toward body.

15. Install body (6) on pump.

16. Install eight capscrews. Two (13) through dowel pin holes and torque 18-22 ft. lbs. Six (25) external and torque 32-37 ft. lbs.

17. Press ball bearing (10) on shaft (8) with arbor press. Install washer (27) and snap ring (28) to secure bearing on shaft.

18. Install bearing and drive shaft assembly in pump.

19. Install adapter assembly.

20. Rotate drive shaft to insure no interference with rotating parts. A smooth heavy drag indicates a good pump. A jerky drag or frozen pump indicates an improperly assembled pump.

D. General

1. Alignment

The tolerances and allowances on all parts of this pump are held very close making alignment very important. All machining references are made from the dowel pin holes. The dowel pin fit should be a heavy wringing fit to a loose slip fit and the dowel pin should extend equidistant into the body and cover on reassembly of the pump. Since your pump has operated a considerable number of hours before rebuilding, it can be assumed that the bearing bores are in proper alignment.

2. Bearings

a. Needle bearings (5C) close visual inspection will generally indicate the condition of the bearing. The needles or shell should not be spalled or have case failure. The shaft and bearing shell should not contact and the needles should be held in securely by the shell. If a faulty bearing is found the assembly containing it should be replaced.

b. Ball bearings (10). This bearing should also be checked for spalling and case failure. This outer race should not turn in the housing bore.

c. All bearing components must be checked for cleanliness before rebuilding the pump. All bearing components must turn smoothly when assembled. If the components turn erratically after all possible foreign matter has been removed, the bearing must be considered defective and replaced.

3. Shaft Seals.

The lip of synthetic seals (5-B) should be checked to insure there are no cuts or nicks. The rubbing surfaces of mechanical seals must be smooth and free from nicks, scratches, and ridges. If a ridge can be felt with a finger nail on any rubbing surfaces of a seal it must be considered defective. All rubber sealing components of seals must be pliable and free from cuts and excessive wear. A defective seal will sometimes be indicated by air bubbles in the reservoir.

4. Drive Shafts.

If the wear of the seal can be felt with the finger nail the shaft (8) should be polished or replaced. As an expedient a seal seat with a smooth groove no more than a few thousandths deep will probably function without the shaft being altered. If wear has roughened the seat it is possible to polish with crocus cloth to a satisfactory finish if wear is not too deep. If the drive gear spline shows a considerable amount of wear it should be replaced.

5. Gears.

Gears (9) (23) that are to be used over should be free from burrs, scores, gouges, and pickup. The tooth tips should be lightly stoned to remove any burrs or pickup. The face of the gear should be sharp and square with the gear teeth. This edge should be free from burrs but never rounded. The bearing surfaces should be free from scores, pits, and spalling.

6. Gear and Gear Plates in general.

Always insure that there is no interference between the gears and gear plate before tightening a pump up. They should always be replaced in sets, never in components unless the other components can be restored to a like new condition. The damage done by the original components in seating themselves is generally so severe that it cannot be tolerated by new parts. Always try for the median clearance between the gears and gear plate of .0005 in thickness and .0015 on the diameter. Always insure that the drive shaft fits freely in the drive gear since end loading of the drive gear will upset the balanced loading of the pump.

7. Wear Plates.

Wear plates (21) (22) should be flat parallel and free from scores and gouges. If a wear plate is cleaned up by honing or grinding its clearance with the retaining plate should be .005. Never remove more than .010 from a wear plate.

8. Retaining Plates.

Retaining plates (19) should be flat parallel and free from burrs.

9. Sealing Rings.

Sealing rings should remain close to their original shape, heat will cause them to take a set. They should also be free from cuts and abrasion.

10. Loading Rings.

Loading rings should be free from cuts, nicks, and erosion. This ring can be easily removed by directing a compressed air stream at it.

11. Back-up Rings.

Back-up rings should be free from breaks, cuts, nicks and extrusion. Extrusion is caused by excess heat.

12. Body and Cover.

The pump side of the body and cover should be free from nicks, scratches, and cracks. The ball bearing bore should be smooth and free from wear caused by turning of the outer race of a defective ball bearing.

13. Adapter Assembly and Mounting Flange.

The Adapter Assembly and Mounting Flange should be free from burrs or anything that would tend to affect alignment with its power source.

14. General.

Cleanliness is of the utmost importance when working on any hydraulic equipment. A supply of cleaning solvent for cleaning is required with power cleaning equipment preferred. In general, all parts should be free from burrs, nicks, scratches, cuts, abrasions and sharp cutting edges. This is important in areas where seals, O-rings and alignment are concerned. Any part in contact with an O-ring and seal should have a surface finish of 40 RMS or better.

The reworking of parts in a machine shop should be done with caution. The removal of .010 from any part to clean it up probably would not affect the part

strengthwise, but the interference caused by its removal could lead to early failures of the pump. It is suggested new parts be used rather than attempt any extensive rework.

In reassembling the pump there should be no interference between the loading ring and sealing ring. Any extrusion from the flange or the sealing ring should be removed. O rings and seals that can become dislocated during assembly should be secured with a temporary adhesive (heavy grease for example).

Before tightening a pump after assembly always turn the gears a sufficient amount to assure removal of any foreign particles from between the gears and wear plates, and also that there is no interference between any of the parts. This is necessary because when the pump is tightened the rubber parts will not be properly seated and the pump will in all probability turn with difficulty making it impossible to tell whether it is normal or a malfunction.

Always torque all bolts evenly to avoid any distortion of the parts; this is important on the body and cover.

Lubricate the pump well before starting it; break it in slowly and apply about 200 PSI. of pressure to force the wear plates away from the gears for initial lubrication.

E. Disassembly (Rear Section)

1. Wash exterior of pump and scribe a line or center punch the cover, gear plate and body to indicate proper arrangement for reassembly.

2. Remove the eight capscrews (41,46 and 47) and the pump can be disassembled. Be careful not to damage the oil seal (35-B) in body assembly. Any sharp corners, grooves, shoulders and keyways will damage a new seal, therefore the outer end of the shaft should be wrapped with a layer of transparent scotch tape, starting at the seal seat, lapping each turn perhaps 1/16" over the last, progressing outward.

3. Inspect seal (35-B) for wear and replace if damaged. Note position of the seal case relative to the outer surface of the front body assembly (35) and press old seal out. The replacement seal should be inserted with the principal lip facing inward. Care should be exercised in pressing the seal squarely into the body (35).

4. The drive shaft (37) should be inspected for wear on the seal seat.

F. Reassembly (Rear Section)

1. Stone all mating surfaces to remove any burrs that may be present.

2. Wash all parts in a solvent and air dry.

3. Set body (35) with ground face up, the shaft extending downward.

4. Insert idler gear and shaft assembly and mesh with drive gear.

5. Stone sides of gear plate to remove any burrs. Using very diluted white shellac, (water like consistency), paint thin coat on body side of gear plate (38) staying 1/8" away from gear pockets where possible. Place over gear set observing the scribed witness marks on it and the body (35) and push firmly against body.

6. Shellac exposed gear plate surface.

7. Lubricate gears with clean SAE No. 10 oil.

8. Stone ground surface of cover (34) and lower onto shaft ends and dowels. Tap firmly into place, checking scribe marks.

9. Insert and tighten cover screws securely, then reverse pump and insert and tighten body screws.

When above procedure has been properly done, pump can be turned freely by hand. Any tightness is likely due to burrs or dirt, or lack of square machining where salvage work was performed. A momentary tightness can be due to surplus shellac hardening on the ends of the gears, but if so will break in brittle fashion after a degree or less of rotation. Any persistent or periodic tightness requires disassembly and correction.

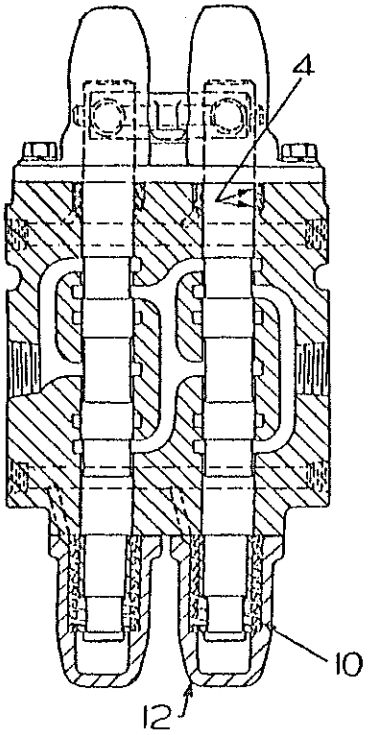
10. Install "O" ring (1) in groove on shaft (37) and coat with vaseline prior to mounting the front and rear sections together.

G. General

If cover (34) and body (35) surfaces are worn where gears bear, they should be resurfaced on a surface grinder, first stoning the back surface lightly with a flat hone to remove any burrs or nicks which might destroy paralellism.

It is almost certain to be necessary to replace gears if cover, and body require resurfacing. Always replace gears in sets. Normally the shafts do not require replacement unless abusive shock loads and over pressure operation have caused a keyway failure in the drive shaft.

If the wear of the seal can be felt with the finger nail on shaft (37) it should be polished or replaced. As an expedient a seal seat with a smooth groove no more than a few thousandths deep will probably function without the shaft being altered. If wear has roughened the seat it is possible to polish with crocus cloth to a satisfactory finish if wear is not too deep.



48. HYDRAULIC CONTROL VALVES.
(See above and Repair Parts Book.)

A separate trouble-free movable valve is used to control each operating ram, and all the valve bodies are bolted together to form a single unit. Each movable valve is held in a neutral position by the use of one spring (10). The spring (10) and parts within cap (12), do not require adjustment or cleaning whatsoever, from one season to another, and this likewise applies to the seals (4).

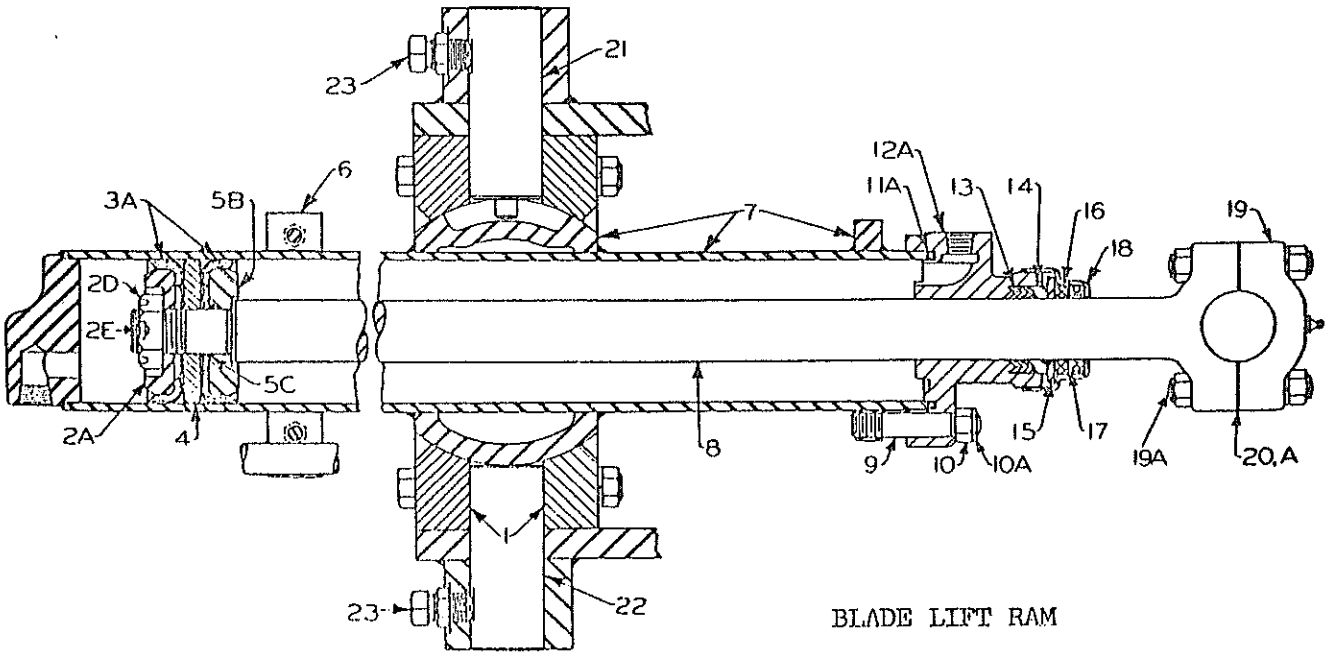
Should you believe the control valve group requires attention, contact your nearest Austin-Western distributor for service assistance.

49. HYDRAULIC RAM CYLINDERS.
(See below)

a. General.

The ram cylinders should require little or no attention through many years of trouble-free service. The honed cylinder walls are of special annealed quality steel, and pistons are of special construction to eliminate scoring, by the use of special molded cups and spacer shoes. The piston rods are chrome plated. Shims are provided at the ball sockets to permit easy adjustment after long hard wear. The piston rod glands contain a special packing ring assembly.

In making cylinder cup replacements do not replace with leather or other questionable material, as the special moulded steel back cups (3A), supplied as original equipment, are the only type recommended. Each cylinder has a special wiper ring (17) and felt (16) in the gland to prevent the entry of dirt in the packing chamber.



BLADE LIFT RAM

50. BLADE LIFT RAM.
(See page 53)

A. To dismantle and reassemble proceed as follows:

1. Lower the moldboard to the ground and with engine shut off, disconnect the two hose connections at the top and bottom of the ram.

2. Remove nuts off the studs (19A) and swing the rod (8) out sideways.

3. Remove nuts (10A) and (10). The head (12A) with rod (8), may now be pulled out of the cylinder (7) exposing the cups (3A).

4. To remove the cups (3A) together with the piston (4) and outer spreader (2A) and inner spreader (5B) from the rod (8), clamp the socket end of rod in a vise. By means of a suitable long wrench remove nut (2D). After removing the nut (2D) the cups and parts may be slipped off the rod (8). Loosen cap (18) and remove the head (12A) with seal parts.

5. Assembly is reversal of the above procedure.

6. Coat the inner bore of cups (3A) with quick setting compound, such as Perma-Tex #3, before placing them on the rod.

7. When retightening the nut (2D) use a socket wrench with 3 foot handle. Then drive against the end face of nut, using a bronze plug and hammer. Then retighten the nut still further. This is necessary in order to securely clamp the cups (3A) to the rod (8).

8. Before inserting the cups and rod (8) into the lower end of cylinder (7), be sure to install a new "O" ring (11A) into the recess of the head (12A). Piston ring squeezer or fine wire tightened over the end of the cup will have to be used in order to compress the cup for easy entry into the exposed bore of cylinder (7). Retighten the cap (18) with your hands.

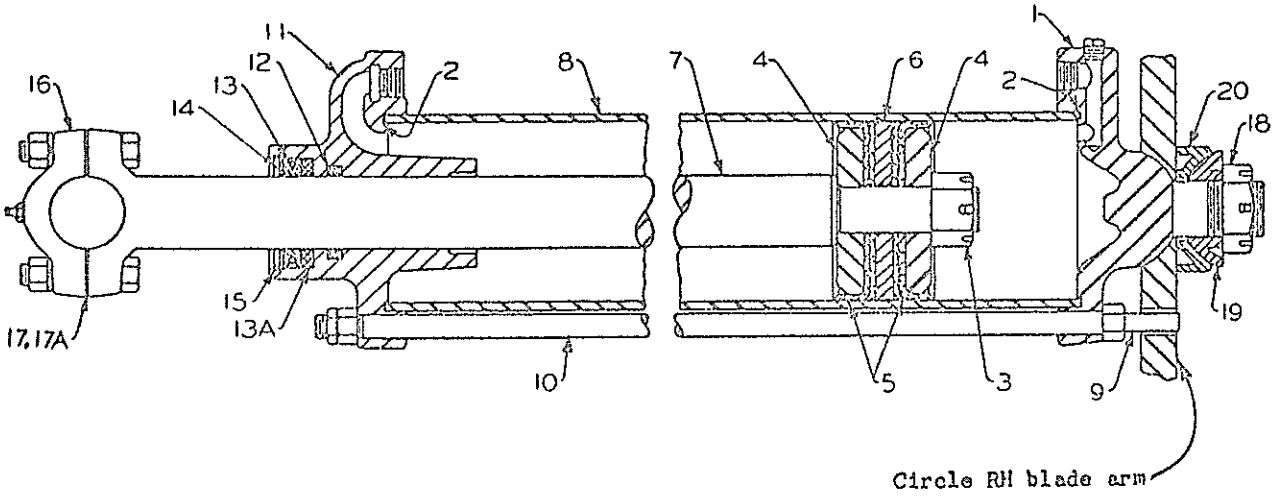
9. To remove the complete blade lift ram group from the machine, lower the moldboard to the ground and detach the two hydraulic hoses. Detach the ball socket (19). Remove the two setscrews (23) and pull out the two pins (21) and (22).

51. BLADE SIDE SHIFT RAM.
(See below)

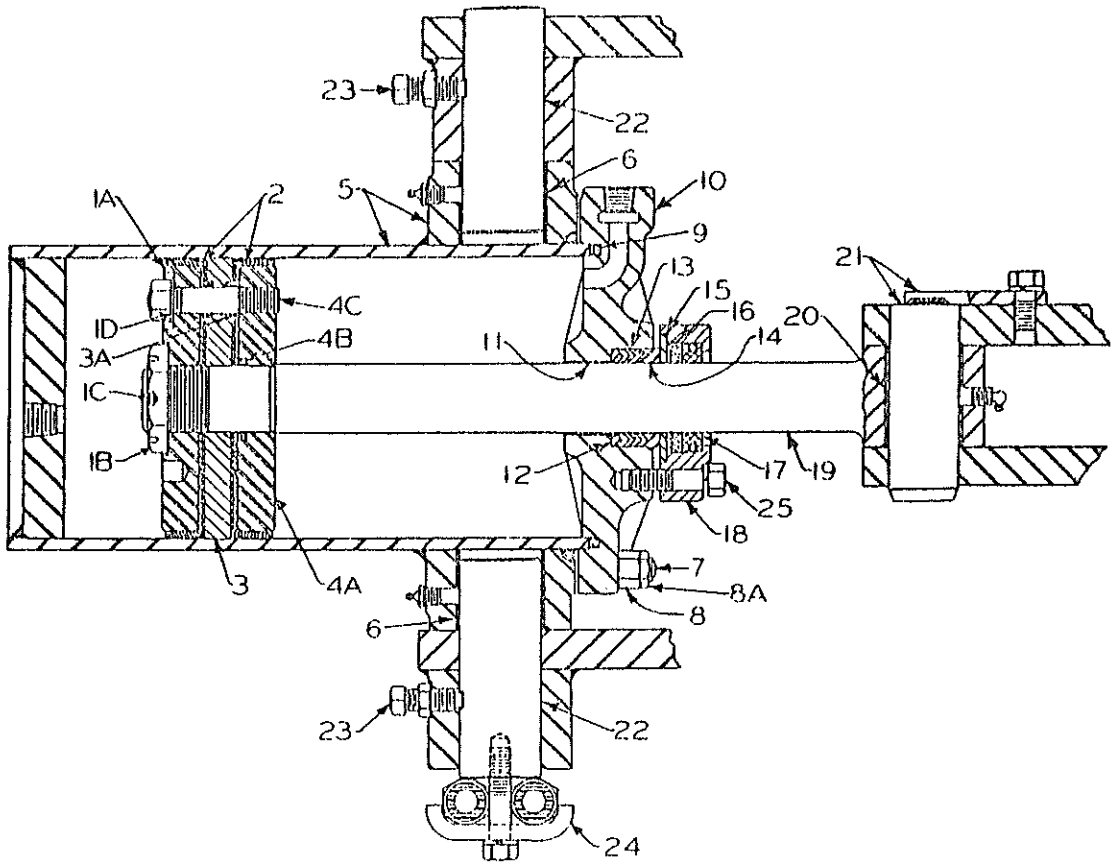
a. To remove the complete ram group, disconnect the ball socket (16), the two hydraulic hoses, the nut (18) and parts (19) and (20).

b. To dismantle and expose the ram cups (5), proceed as shown in paragraph 101, subpara. 3 to 8 inclusive. When assembling the cups, drive against spreader (4) in order to seat the cups (5).

c. When assembling, always install two new gaskets (2) and "O" ring (12). Nut (18) should only be tightened slightly, then cottered.



BLADE SIDE SHIFT RAM

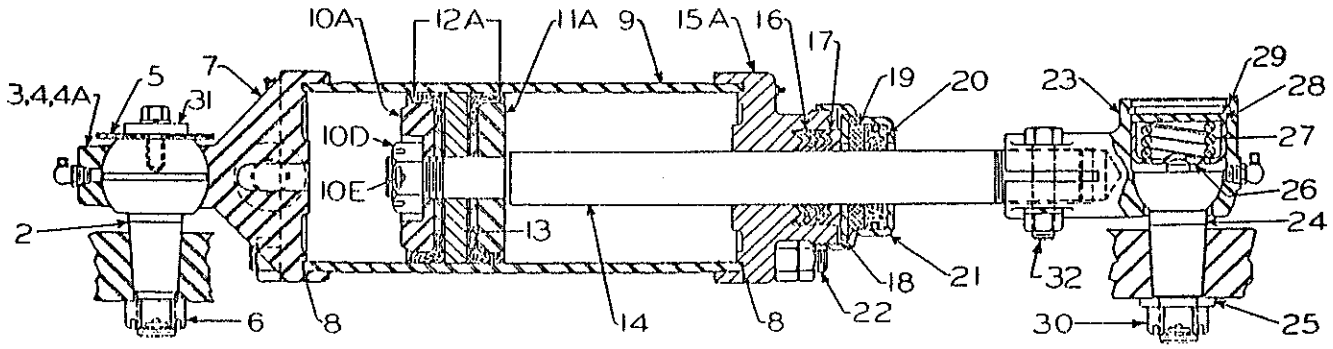


52. HIGH LIFT RAM.
(See above)

To remove the complete ram group, lower the moldboard to the ground and disconnect the two hydraulic hoses.

Remove pin (21). Then remove the two setscrews (23) in order to remove the two shafts (22).

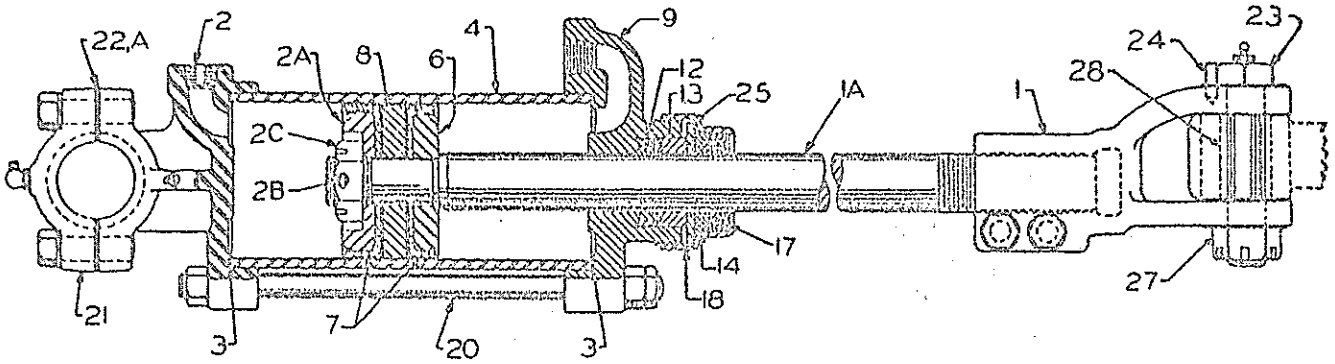
To dismantle and expose the ram cups (2) proceed as shown in paragraph 50, sub-paragraphs 3 to 8 inclusive.



53. FRONT STEER RAM.
(See above)

Remove cap (3), also disconnect the two hydraulic hoses. Remove nut (30), and then drive ball stud (24) upward to remove the complete ram.

To dismantle and expose the ram cups (12A) proceed as shown in paragraph 50, sub-paragraphs 3 to 8 inclusive.



54. REAR STEER RAM. "PACER" GRADER. (See above)

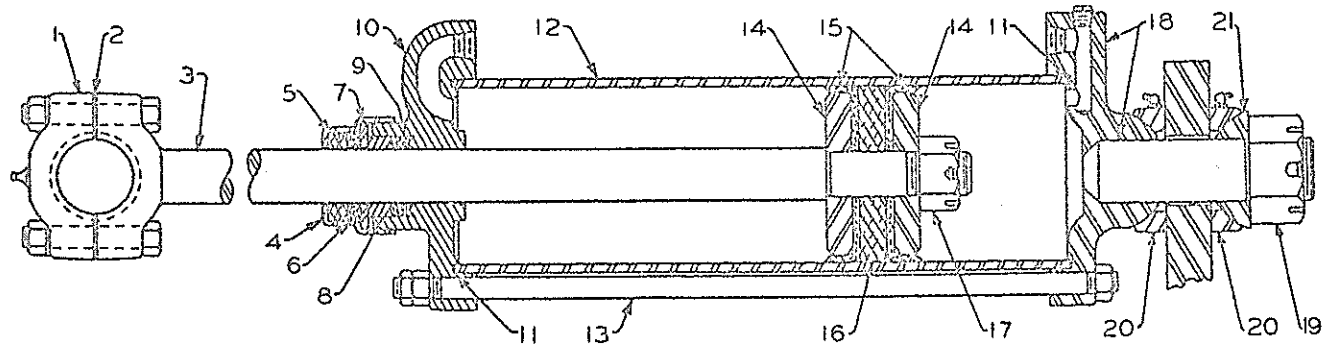
To remove the complete ram, remove the nut (27), bolt (23), cap (21), and disconnect the two hydraulic hoses.

To dismantle and expose the ram cups, (7) proceed as shown in paragraph 50, sub-paragraphs 3 to 8 inclusive.

When assembling the cups, drive against the spreader (6) in order to seat the cups (7).

Always install new gaskets (3).

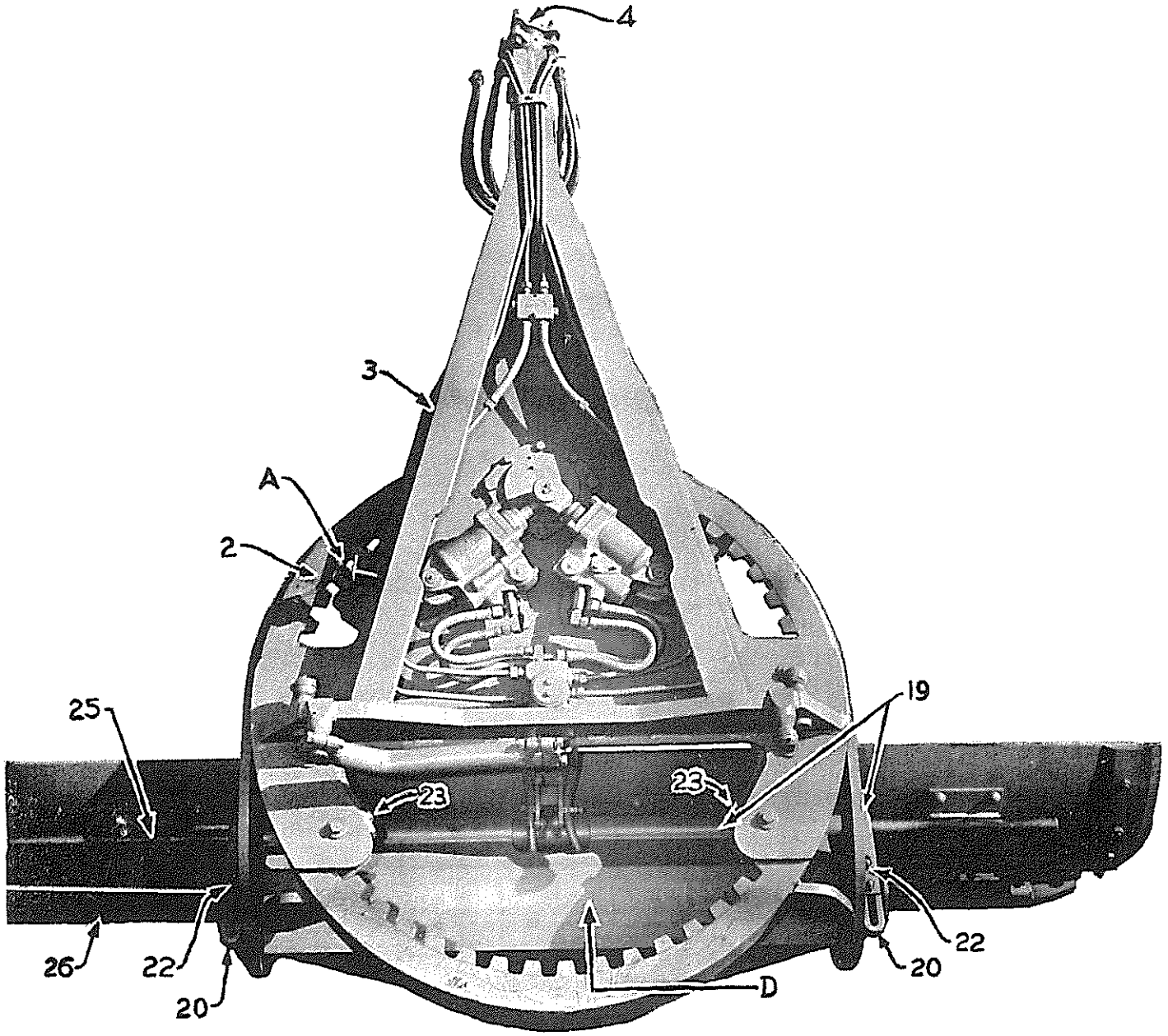
54A. REAR STEER RAM "SUPER" GRADER. See Repair Parts Book for illustration of internal parts. Removal of internal parts will be similar to data on page 54, paragraph 51.



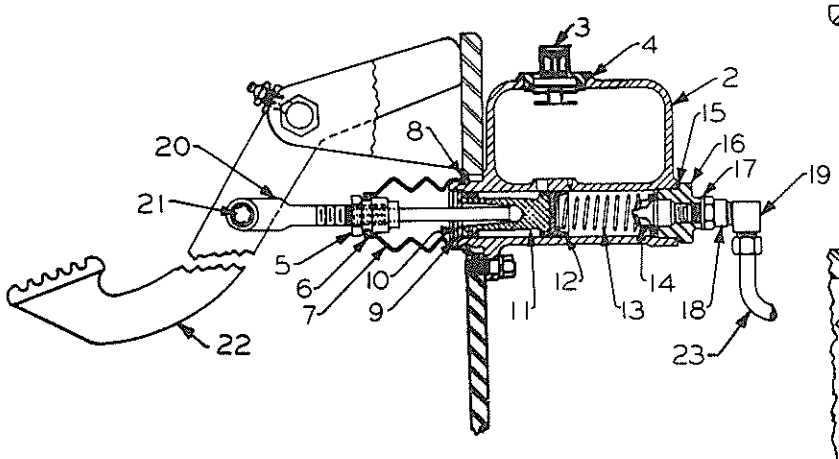
55. SCARIFIER RAM. (See above) (Also used with Bulldozer and front Snow Plows)

To remove the complete ram, lower the scarifier to the ground. Remove nut (19), also cap (1) and two hydraulic hoses.

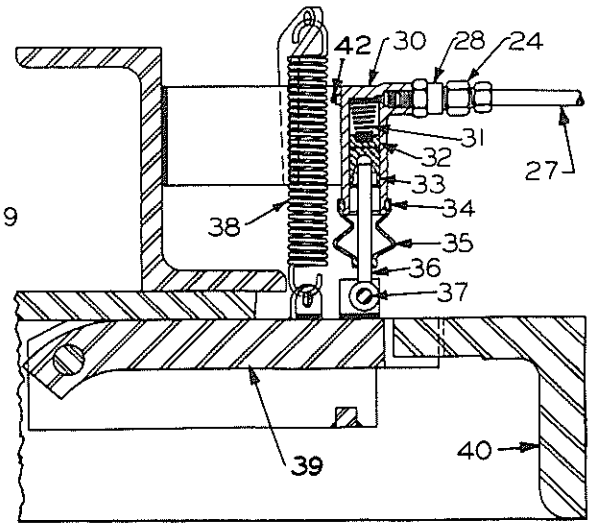
To dismantle and expose the ram cups (15) proceed as shown in paragraph 50, sub-paragraphs 3 to 8 inclusive.



56. CIRCLE AND DRAW BAR GROUP.



CIRCLE LATCH MASTER CYLINDER



CIRCLE LATCH AND CYLINDER

57. CIRCLE AND DRAW BAR.
(See Page 57)

a. General.

The strong all welded circle (2) supports the moldboard and tilting arrangement, (19) to (22) inclusive, and hydraulically operated side shift cylinder (D).

When blade is out of the ground, the combined circle and moldboard may be revolved 360° without discomfort to the operator. Without leaving his seat, the operator may side shift (either right or left) the full stroke of the ram, while the blade is in the ground and while the grader is moving.

The hydraulic "finger controls" at the operator's station, when manipulated, control the flow of oil. The operator controls the amount of oil flow: namely, from the smallest perceptable amount, to full flow of oil.

Do not lubricate the top side of the circle. The circle should be rotated at least half way every day, in order that high pressure grease may be evenly spread by hand, over the inside bore and the bottom flange of the circle.

b. Draw Bar.

The strong all-welded draw bar (3) has a ball and socket pulling arrangement (4) at the forward end.

Wear adjusting shims are provided, and after many years of hard, trouble-free service, the original clearance at the ball sockets may be reestablished.

Four adjusting screws (23) are provided for horizontal wear take-up. Shims may be removed to compensate for vertical wear.

c. Tilting Links.

To change the leaning position of the moldboard, proceed as follows:

1. Start engine and place moldboard bit straight across and on the ground.

2. Loosen the two vertical bolts which pass thru the slots of link (20) (two on each side).

3. Move hydraulic blade lift control levers at operator's station to tilt the moldboard as required, then retighten all bolts referred to above.

d. Moldboard.

The hydraulic controls at the operator's station should always be used when reversing the moldboard. The moldboard should be raised out of the ground when this operation is performed.

Both moldboard ends are forged with an offset which strengthens it and which makes it possible to bolt in renewable flush type end boots.

A good operator uses caution when operating the grader. He does not abuse it. He stops the grader and backs away from objects that should first be removed (dynamited), such as stumps and rocks. Be careful when operating the grader around street manholes or bridge abutments.

When the machine is being operated under muddy conditions during freezing weather, always apply a coating of anti-rust or water resistant grease to upper shaft (25) and lower shaft (26) for easy side shifting of blade.

The moldboard should be side shifted full stroke to the right and left sides, at termination of each days work. This is necessary in order to clean off the debris from both upper and lower shafts (25) and (26). Water resistant grease should then be applied by hand over the entire exposed length of both shafts.

When the machine is not being used, coat the shafts and moldboard with anti-rust or water resistant grease to keep them from rusting.

When operating under dry or dusty conditions, do not grease upper and lower side shift shafts.

e. Blade Extensions.

Blade extensions are provided to enlarge the usefulness of your machine for light work only.

58. HYDRAULIC BLADE CIRCLE LATCH.
(See page 57)

To unlock the circle it is necessary to stop the grader, then depress the foot pedal (22) which is conveniently located at the operator's station. The hydraulic piston (11) is thereby moved inward, forcing oil thru lines to the cylinder (30). The piston (33) being interconnected with the latch (39), forces the latch downward, thus unlocking it. The latch cannot be unlocked and the circle rotated while the moldboard is moving material. The circle reverse control lever at the operator's station may be manipulated slightly in order to free the latch for effortless disengagement.

To bleed the interconnecting lines of air, loosen screw (42) located at side of cylinder (30) and depress lever (22) several times. Then hold it downward and relock screw (42). Keep filler cap (3) clean on master cylinder to prevent air vent from being plugged with dirt. Use only genuine "Lockheed or "Delco" brake fluids. Be sure to keep the reservoir half full of fluid when bleeding the system of air. Should the reservoir be drained during the bleeding operation, air will again enter the system, and rebleeding will be necessary. When cleaning cylinder parts such as (2), (11), (33) and others, use alcohol.

NOTE: When reversing the circle proceed as follows: Use the hydraulic controls, levers (3) and (8), page 2 Section 3, and lift the moldboard and bit out of the ground. Release the blade circle latch. (Use foot pedal (11), page 2.) Always rotate the circle as required by using hydraulic power; lever (2), page 2. Never reverse the circle by placing one end of the moldboard in the ground and moving the grader either forward or backward.

59. ELECTRIC SOLENOID BLADE CIRCLE LATCH.

A. The following parts are not used with the Electric Solenoid Latch, namely; all items shown in the lower left and lower right of page 57, under the subject of Circle Latch Master Cylinder and Circle Latch and Cylinder. The foot pedal group shown on page 57 is also not used.

B. Circle Rotation Lever will have an electric switch attached to it at the top.

To unlock the Circle it is necessary to stop the grader. Squeezing upward with the finger tips at the switch will result in the electric current energizing the Solenoid, which in turn will unlock the latch. While depressing the switch button the operator may find it necessary to slightly move lever (2) forward or backward in order for the solenoid to unlock the latch at the circle.

Latch (39) page 57 is replaced with a similar latch having a lever at the bottom which in turn is actuated by an enclosed Solenoid group.

There is a sketch in the Repair Parts Book, identifying the items involving this Electric Latch.

60. CIRCLE REVERSE HYDRAULIC MOTOR.
(See page 60)

The hydraulic oil motor has been adjusted and timed properly at the factory and should not be tampered with unless it becomes necessary to disassemble for the purpose of making repairs or replacements. To time valves properly, proceed as follows:

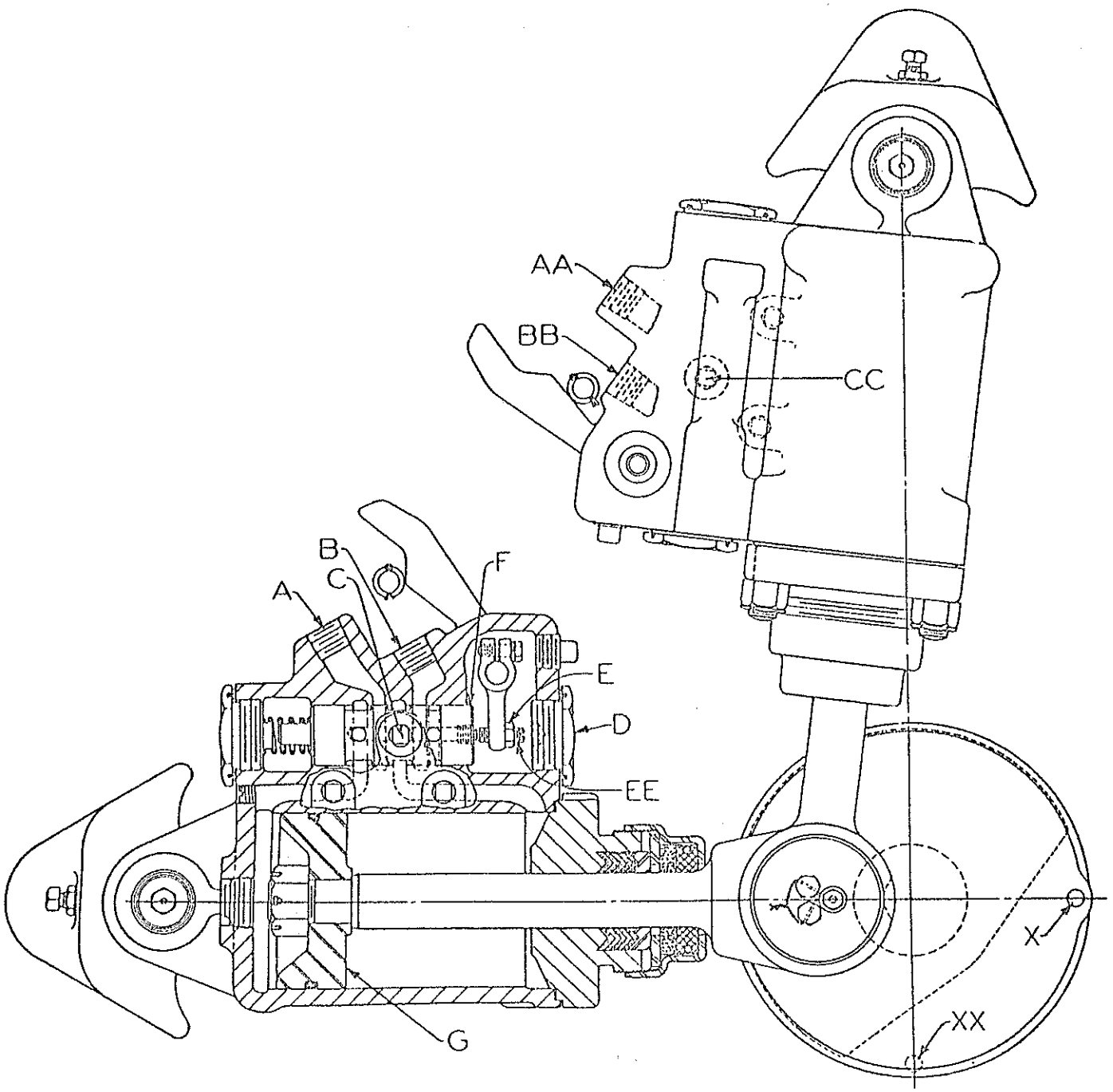
1. Rotate circle with power (as slowly as possible) to centering pin hole which has been provided on outer rim of crank pin flange located at (X) to matching hole in the housing. A 3/8" diameter cold rolled pin should be used. Final centering of pin hole must be done by manual movement of circle to avoid shearing of pin.

2. Disconnect the two hydraulic hoses at (A) and (B) from the cylinder and valve body which is to be timed. Remove one pipe plug (C) located on top of the body and nearest to openings (A) and (B). Attach air test hose to unplugged pipe plug hole (C). Remove valve end hex plug (D) at cam lever end. Loosen jam nut (E) on cam adjusting screw (EE). Adjust air pressure as low as possible. (Blowing on end of test hose with mouth pressure is O. K. as an alternate test.)

3. Proceed to adjust slotted cam screw (EE) in the end of the cam lever until the amount of air blown out of the two open ports (A) and (B) is equal. This means that the piston valve (F) is in dead neutral position, while the main 4" cylinder piston (G) is on dead center.

Tighten lock nut (E) and cam adjusting screw, making sure that position of screw (EE) does not change when tightening lock nut. Recheck air test after locking nut (E). Remove centering pin at (X). Screw in valve end hex plug (D) and air timing pipe plug (C). Connect hoses.

4. Rotate circle to opposite dead center hole location at (XX). Proceed to time other valve after removing the two hoses at (AA) and (BB), and the one pipe plug (CC) located under the body



Timing Hydraulic Oil Motor

OPTIONAL EQUIPMENT AND ATTACHMENTS

1.. HYDRAULIC BOOSTER STEERING - WHEEL CONTROL. (Special Order) (Field Installation)

a. Preliminary Check on Grader.

1. Check wheel alignment (no toe-in or out permissible).

2. Check steering ram adjustment so both wheels turn same to right or left.

3. Be sure to check the clamp bolts on ram rod end and tie rods, making sure they are tight.

b. Assembly Instructions.

1. Install steering wheel, shafts, and Ross steering gear unit.

2. Turn hand wheel (A), page 2, Section 6, all the way to the right and to the left.

The hand wheel should turn freely, but if not, look for binding in support bearings (B), page 2, Section 6.

3. Count the revolutions of hand wheel to determine center position.

With hand wheel set at half the total revolutions, assemble steering arm (C), at axle as close to dimension (N) as possible.

4. Assemble booster valve, flow control regulator, hoses and tubing according to piping diagram shown on page 6, Section 6.

5. Square head pipe plug is to be removed from top of gear carrier and replaced by socket head plug (H), page 2 to eliminate possible damage to hoses.

6. With booster valve in neutral and front wheels straight, assemble steering valve rod (K), page 2.

Next assemble linkage (C), by turning shaft (L) until dimension (M) is 27/32".

c. Steering Arm (C) Adjustment.

1. With set screws (J) out, steer wheels the maximum distance to right. Then screw in set screw against stop.

Turn wheel slightly to left and give set screw two extra full turns and lock into place.

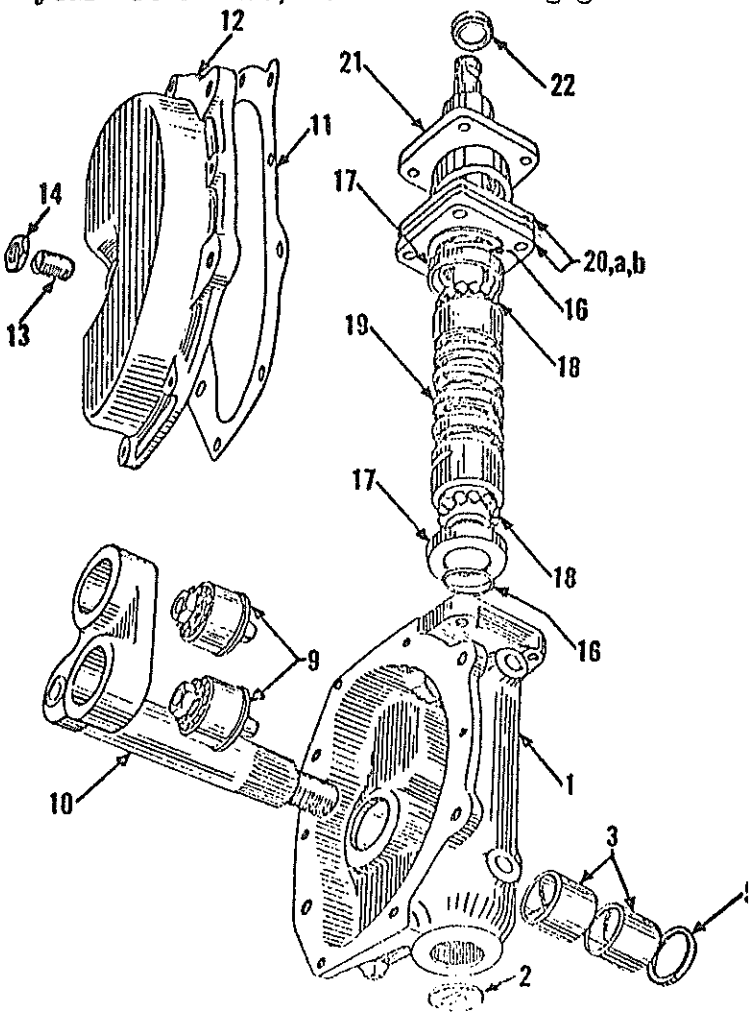
Follow the same procedure for steering to left.

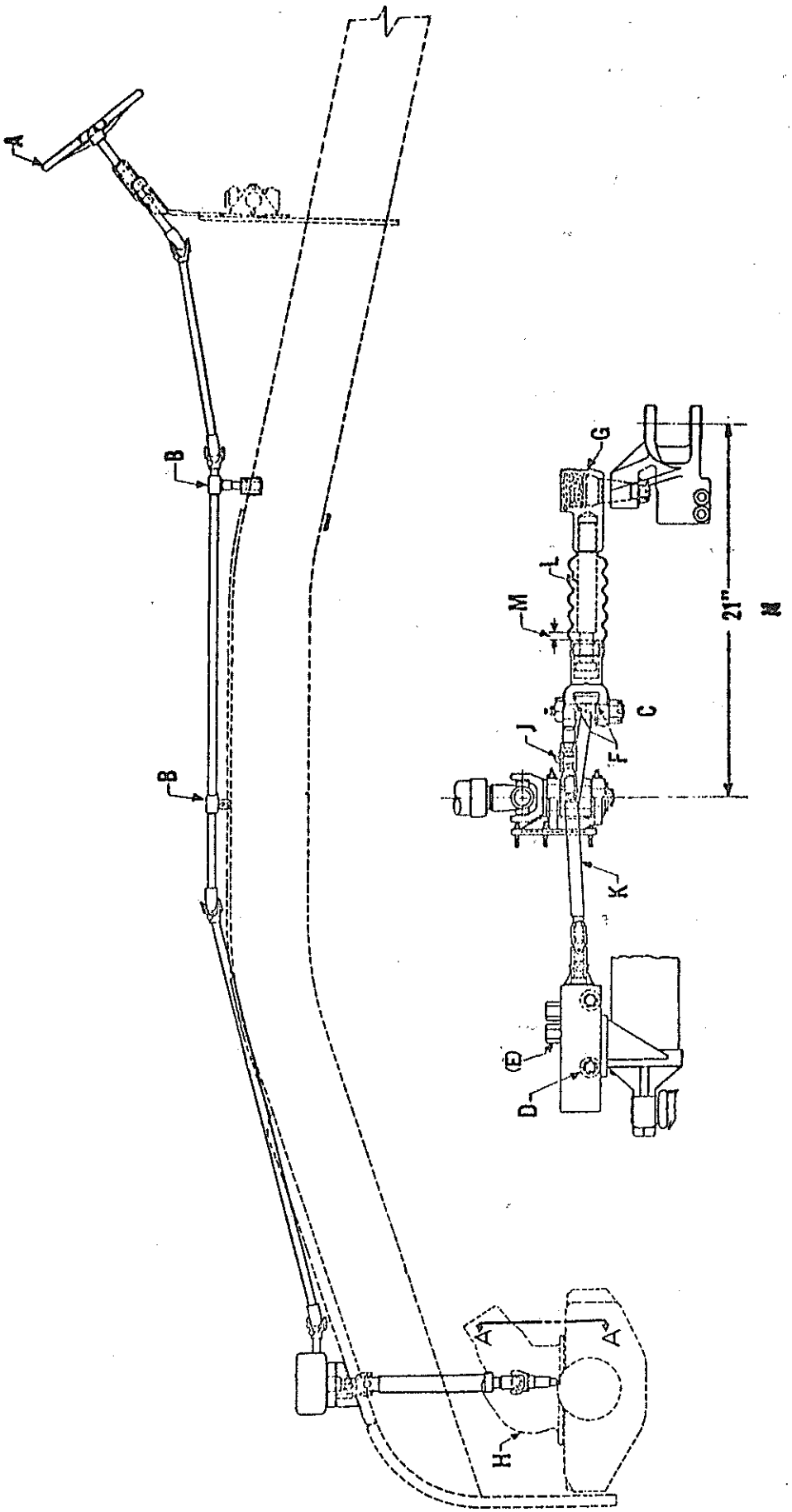
2. Shims (F), are provided for steering arm (C) to permit alignment with manual steering linkage (G).

d. Lubrication.

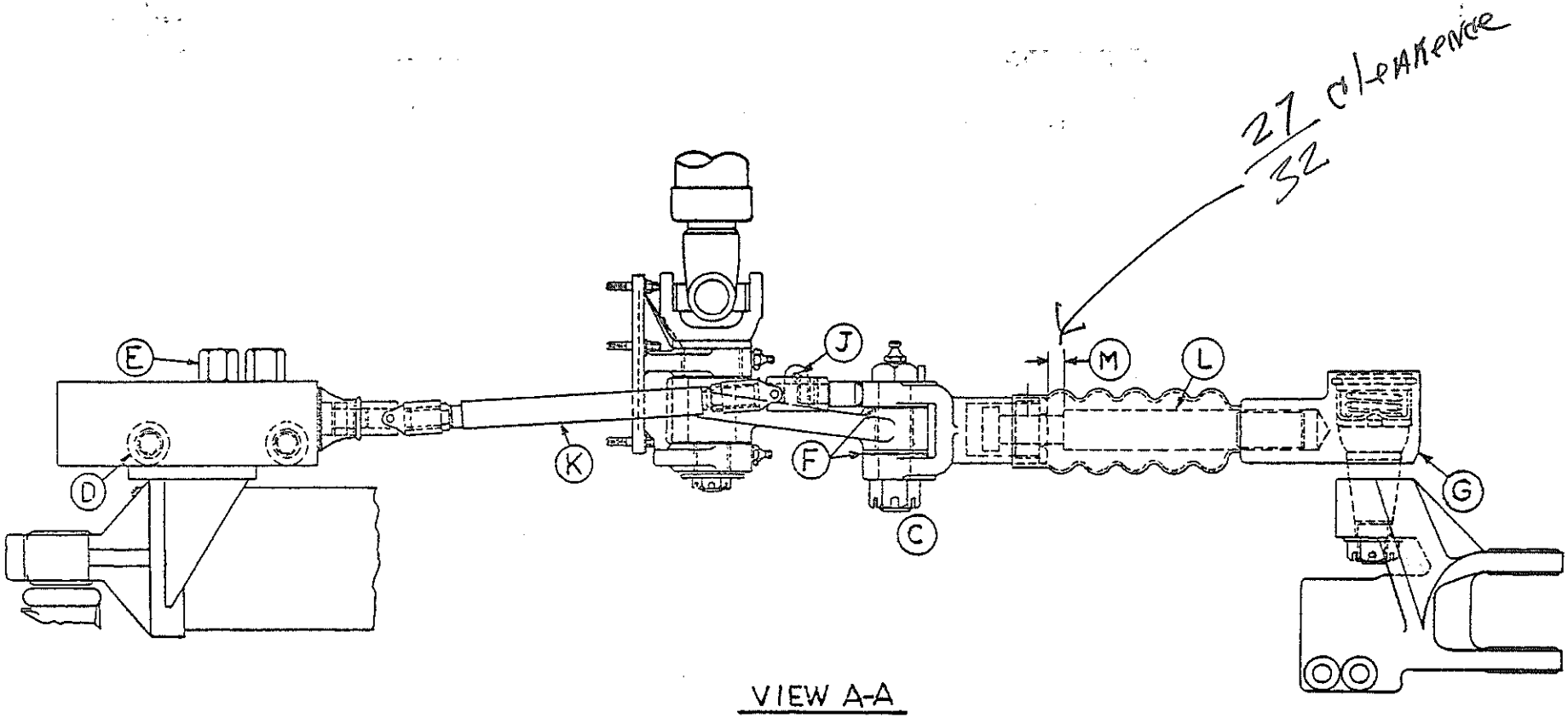
1. Lubricate each grease fitting with general-purpose pressure gun grease ("Lithium" type preferred); two strokes of lubricator every 50 hours of operation.

2. Add SAE-90 E.P. Gear Lube (for year around use) to Ross steering gear unit.





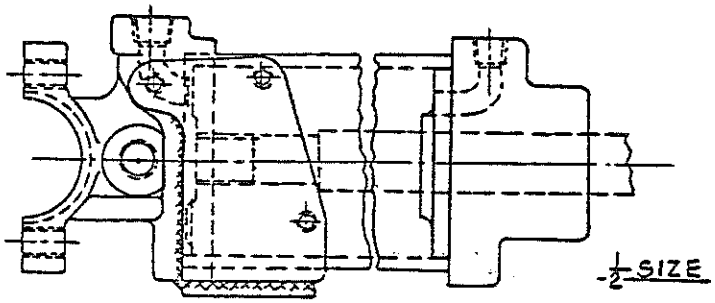
LINKAGE FOR BOOSTER STEERING
(See Repair Parts book for part numbers and data)

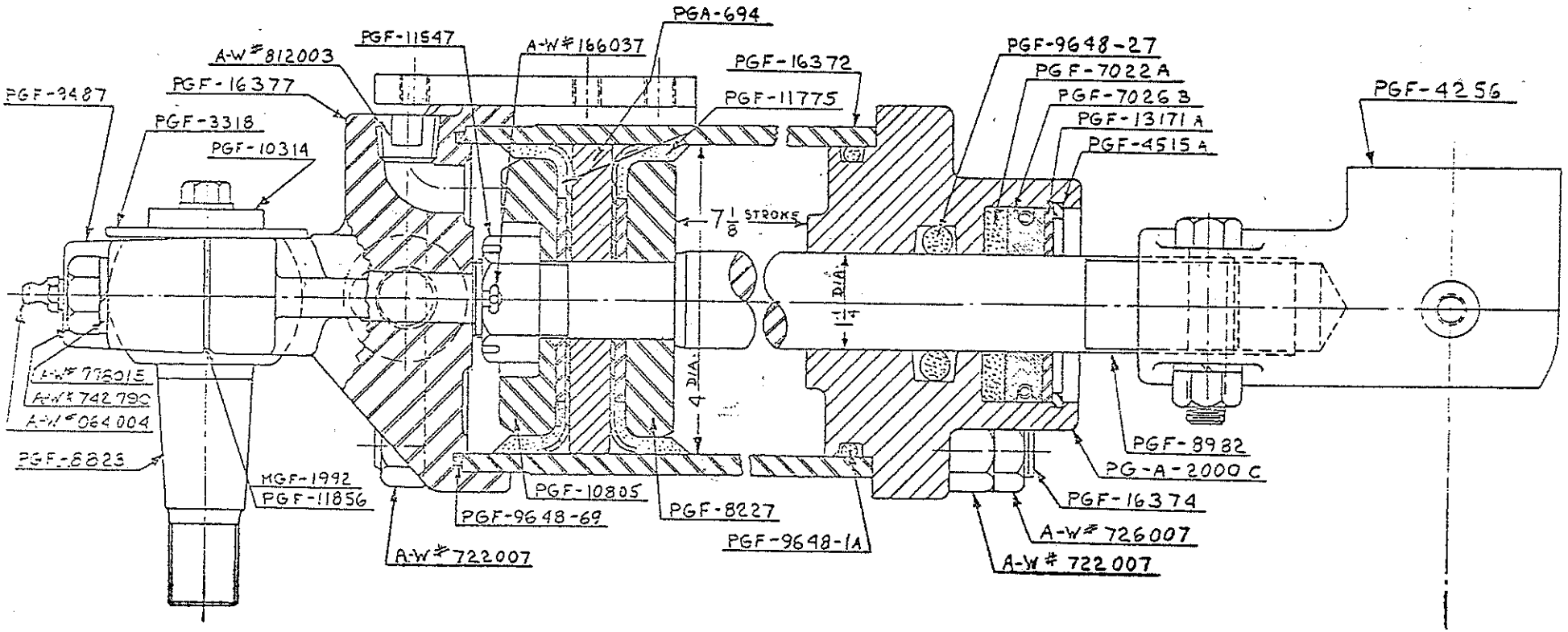


VIEW A-A

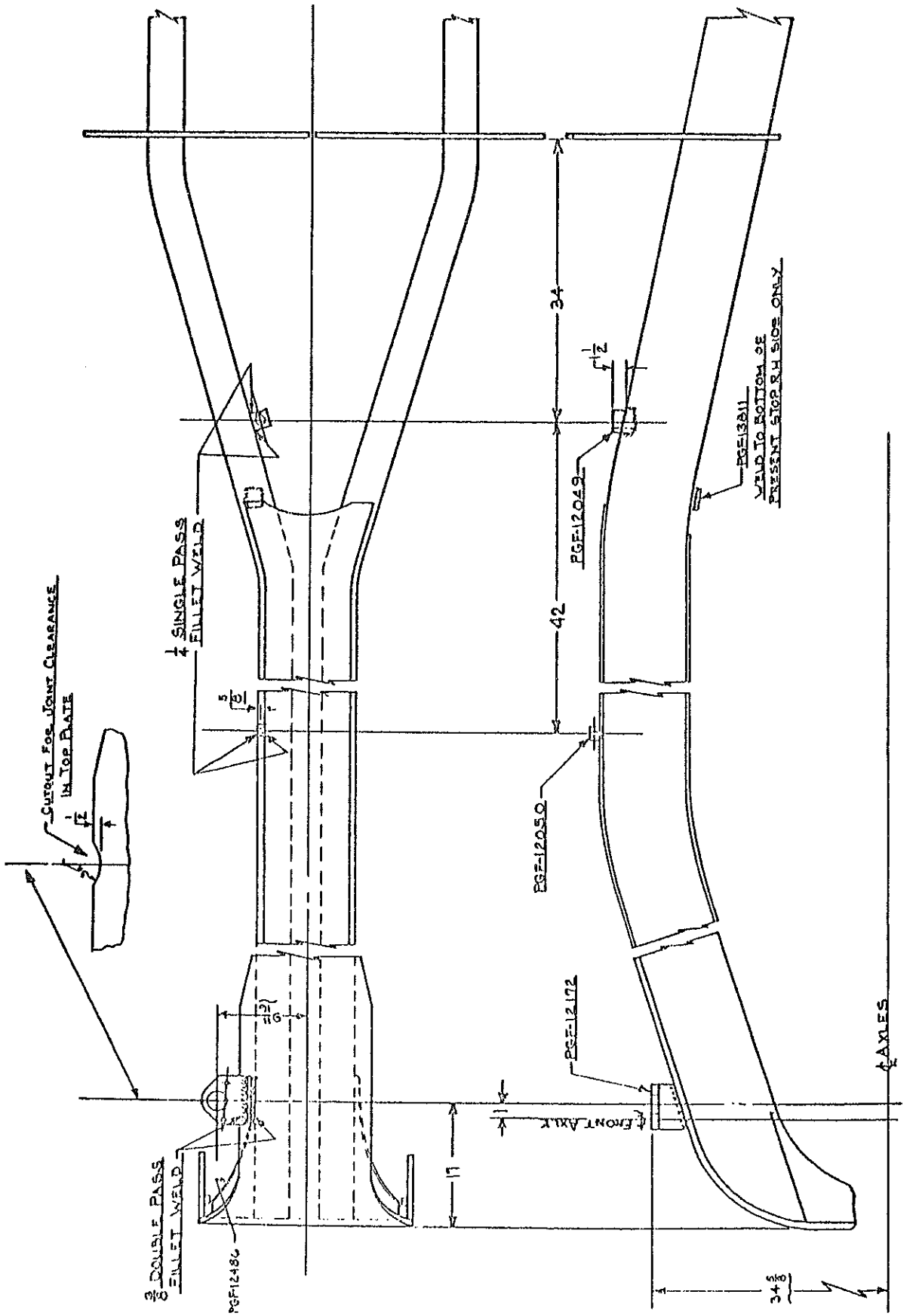
ENLARGED VIEW OF VALVE LINKAGE FOR BOOSTER STEERING

RAM TO BE ASSEMBLED
WITH PORTS AS SHOWN.



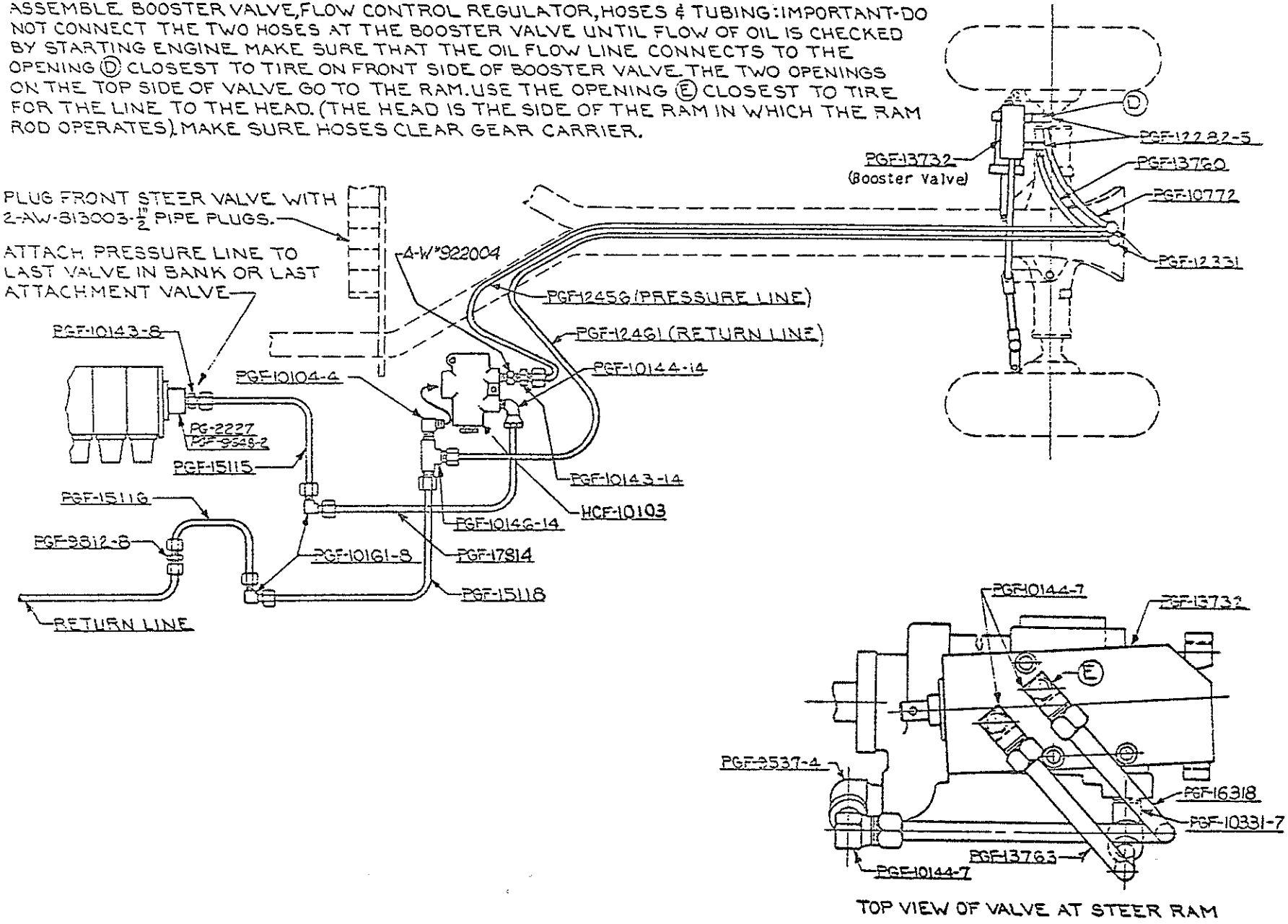


RAM FOR BOOSTER STEERING



SUPPORTS FOR BOOSTER STEERING

ASSEMBLE BOOSTER VALVE, FLOW CONTROL REGULATOR, HOSES & TUBING: IMPORTANT-DO NOT CONNECT THE TWO HOSES AT THE BOOSTER VALVE UNTIL FLOW OF OIL IS CHECKED BY STARTING ENGINE. MAKE SURE THAT THE OIL FLOW LINE CONNECTS TO THE OPENING (D) CLOSEST TO TIRE ON FRONT SIDE OF BOOSTER VALVE. THE TWO OPENINGS ON THE TOP SIDE OF VALVE GO TO THE RAM. USE THE OPENING (E) CLOSEST TO TIRE FOR THE LINE TO THE HEAD. (THE HEAD IS THE SIDE OF THE RAM IN WHICH THE RAM ROD OPERATES). MAKE SURE HOSES CLEAR GEAR CARRIER.



PIPING FOR BOOSTER STEERING

2. TWO-SPEED OR DUOMATIC STEERING.

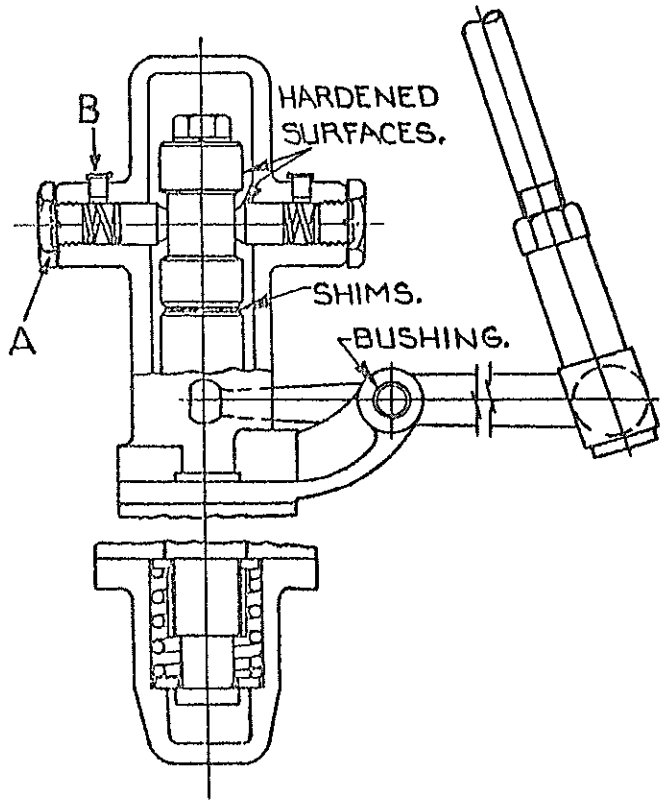
a. This methold of steering employs the use of a wheel in place of the standard tiller bar.

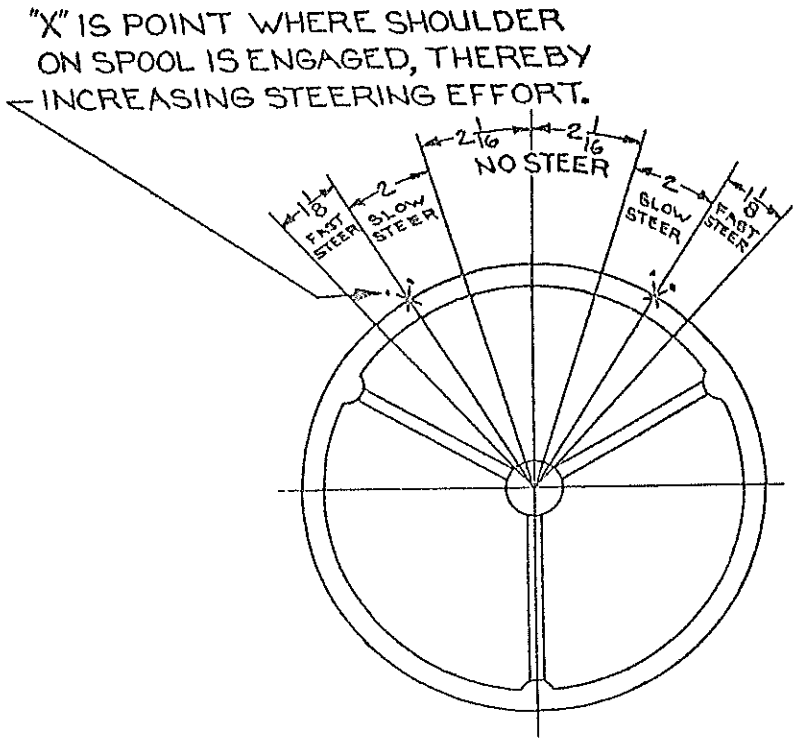
The valve plug is metered, allowing it to be operated in either a partial or fully open position,. thus giving two speed positions.

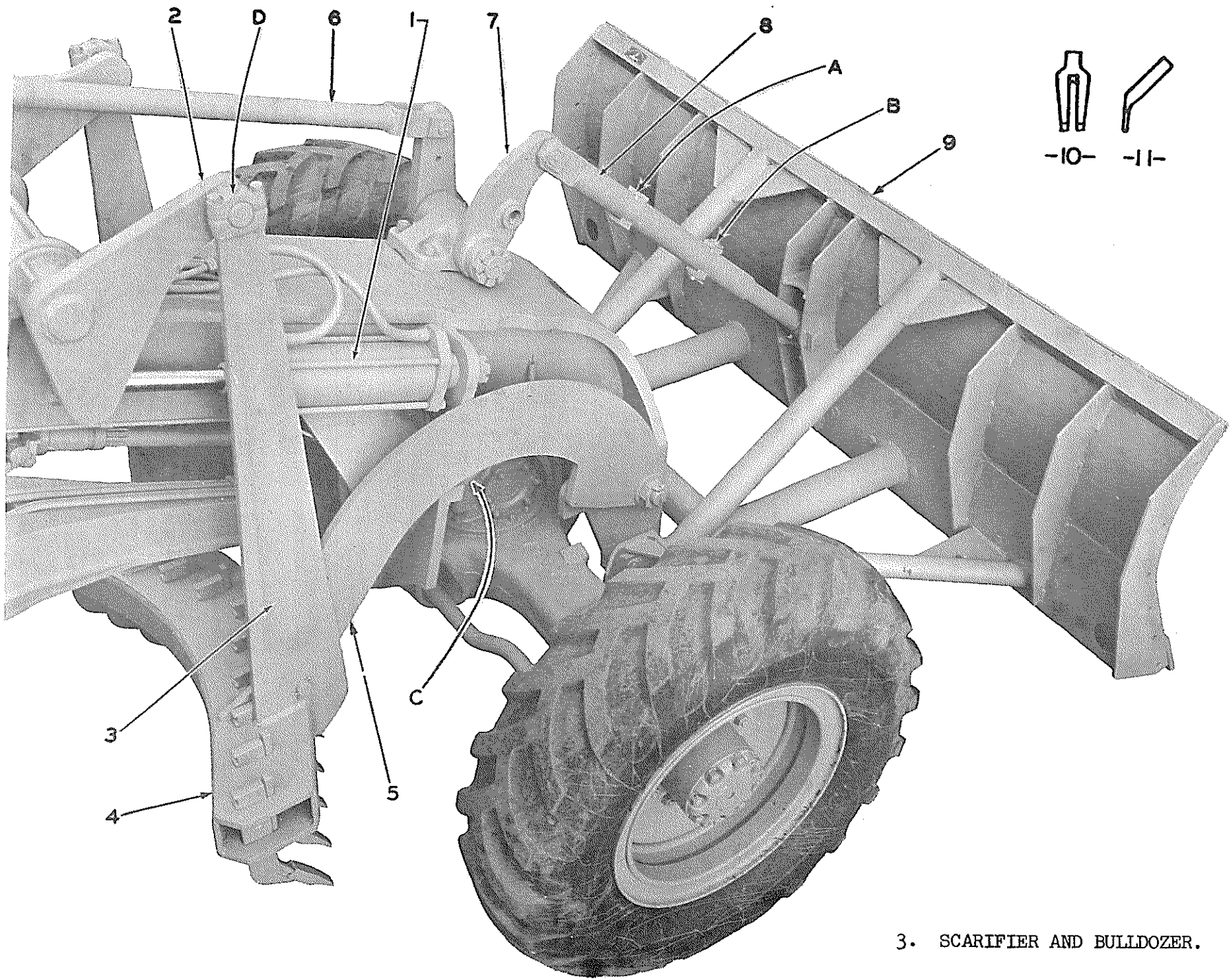
b. In addition to the metered valve plug, there is a spool which bolts to the upper end of the plug. Shims are placed between the plug and spool for centering the spool midway between the tapered poppets. These in turn are spring loaded and can be adjusted to the amount of pressure required at the wheel. This may be increased or decreased according to the preference of the operator.

c. The adjusting screws are fitted with lock nuts (A).

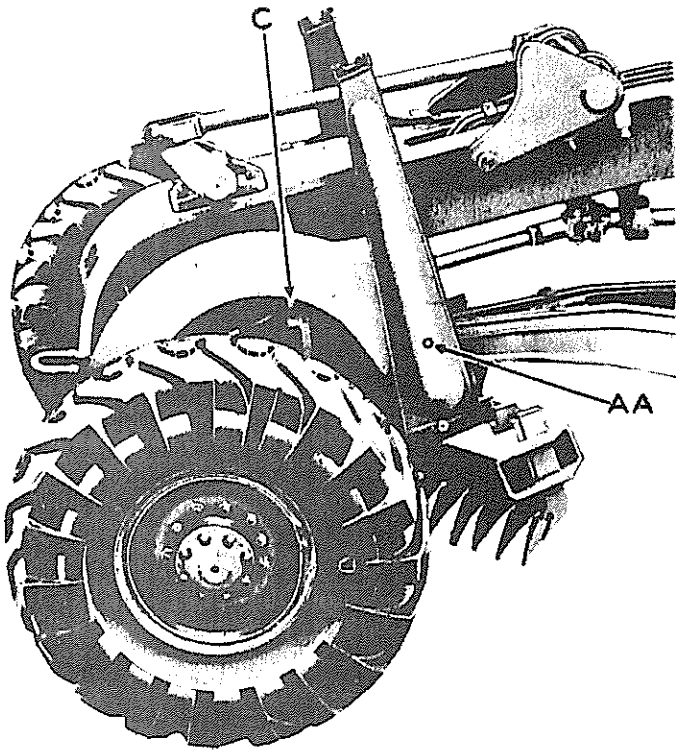
Be sure and oil the spring and poppets occasionally thru the two oil cups (B) provided for that purpose.







3. SCARIFIER AND BULLDOZER.



3. SCARIFIER AND BULLDOZER.
(See page 8)

a. General.

This grader may be fitted simultaneously with both scarifier and bulldozer attachments parts (1) to (9) inclusive, with hydraulic piping and connections.

NOTE: Lubricate all grease fittings with general-purpose pressure gun grease ("Lithium" type preferred); two strokes of lubricator every 50 hours of operation.

b. To Fit Grader With Scarifier Only.

Parts (1) to (5) inclusive shown on page 8 are required.

c. To Fit Grader With Bulldozer Only.

Parts (1), (2), (6), (7), (8) and (9) imclusive are required.

d. To Operate Scarifier.

The photo on page 8 shows the scarifier block (4) and bulldozer blade (9) in carrying position.

The scarifier tynes will be entered into the ground when the scarifier hydraulic control lever (9), page 2, section 3, at operator's station, is pushed ahead. The tynes are raised when the lever is pulled back. With pin (A) in upper hole of the telescopic tube (8), the bulldozer blade will not contact the ground.

Tynes may be raised or lowered in block (4), after first removing the wedges with driver (11). If Engine cannot pull a full set of tynes, remove the necessary and same number of tynes from both sides of the scarifier block. (The remaining tynes should be centered in the block.) Keep on removing tynes until the engine can pull the load.

When not using scarifier, remove all tynes. Proceed as shown in the following paragraphs: (1), (2), (3), and (4).

If scarifier teeth become worn or broken they may be easily replaced without removing tyne. Tooth driver (10) is provided with each scarifier attachment.

e. To Operate Bulldozer.

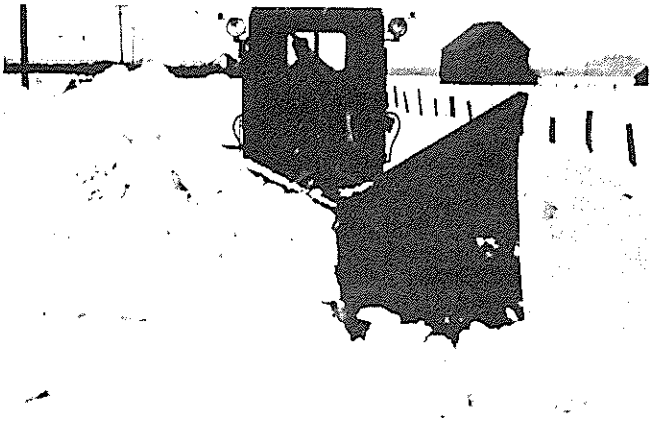
1. To change over from scarifier to bulldozer operation, turn outward both scarifier draft beam support levers (C), page 8. (One on each side of grader.)

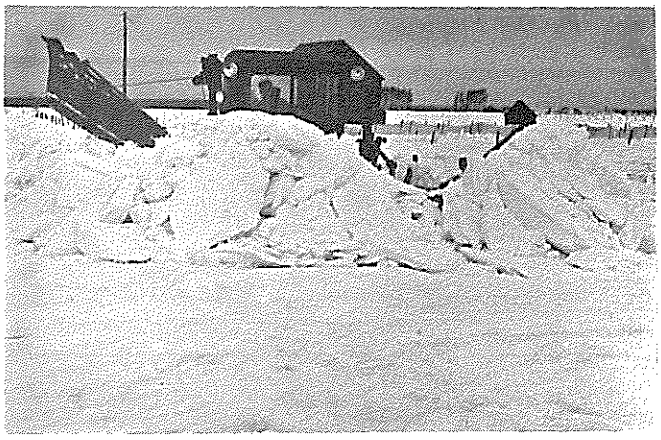
2. Lower the scarifier draft beams against the levers (C).

3. Remove both right and left arm ball caps (D).

4. Raise the bulldozer blade (9). Swing the arms (3) ahead and lock them to the draft beams (5) by use of bolt as shown at (AA) above.

5. Lower the bulldozer blade (9), page 8, to the ground, then remove pin (A). With hydraulic control, move tube (8) back sufficiently to enter pin into hole position (B). The bulldozer blade (9) may now be used effectively.





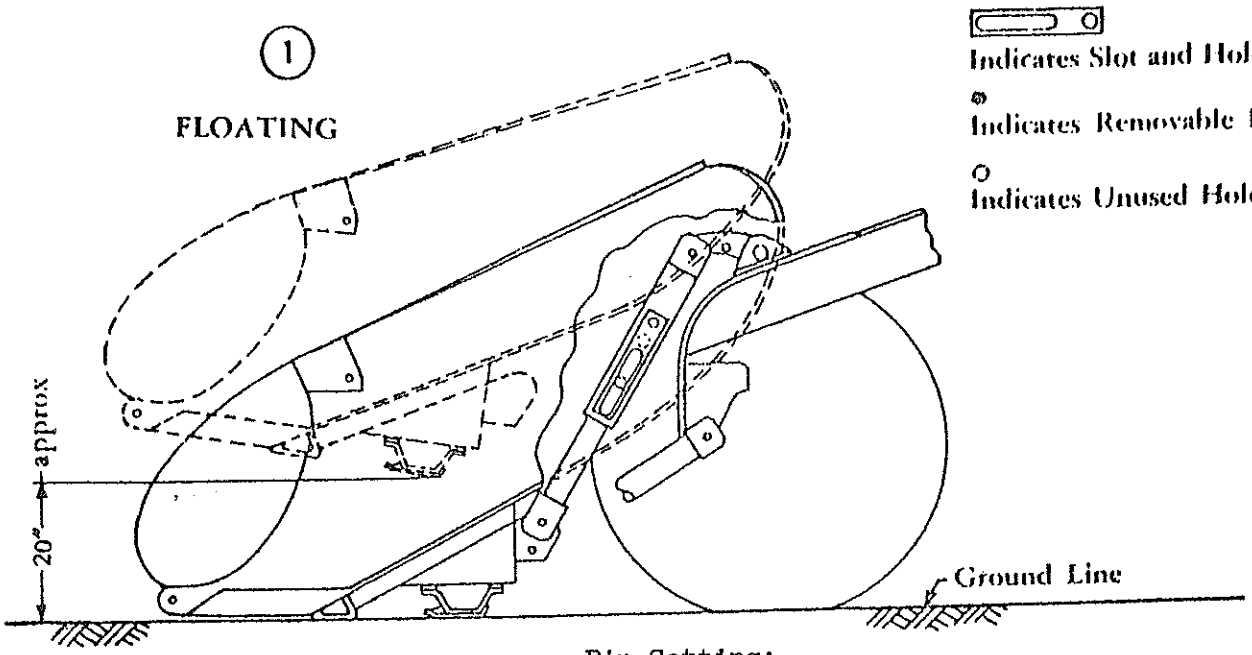
4. GIANT "V" SNOW PLOW.

The parts groups (1), (2), (6) and (7), page 8, must be on the grader in order to attach and operate the giant "V" plow attachment.

A pin through the slotted hole in the telescopic tube (A), shown above, is provided in order that the giant plow may float over rough ground.

The amount of float of the "V" plow is hydraulically controlled by the operator while in the cab. Actually he can operate the hydraulic controls to force the "V" plow cutting bit into the ground when plowing hard snow. This happens when the pin reaches the lowermost point of the slot in telescopic tube (A).

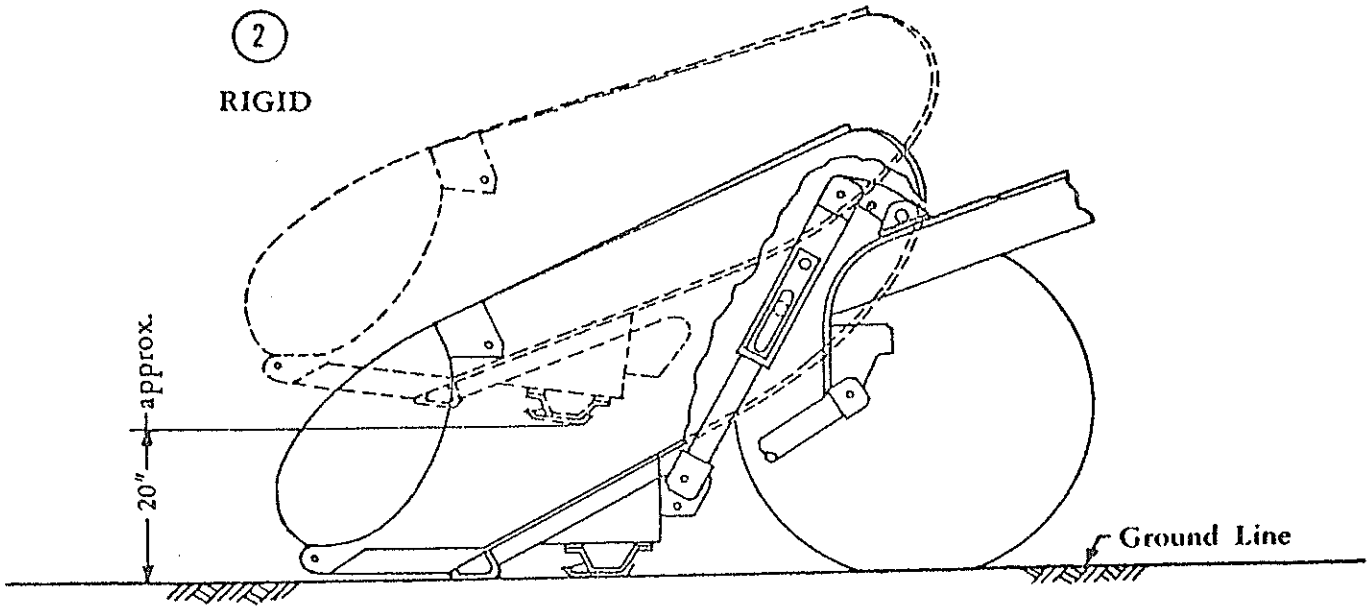
NOTE: Lubricate all grease fittings with multipurpose pressure gun grease ("Lithium" type); two strokes of lubricator every 50 hours of operation.



Pin Setting:

Pin is inserted thru tube slot and inner shaft hole.

This setting provides floating action in operating position. Ground clearance, with plow lifted, is approximately 20 inches. When ram is at end of stroke, with plow on ground, blade can float up 7 inches approximately and down 2 inches approximately.



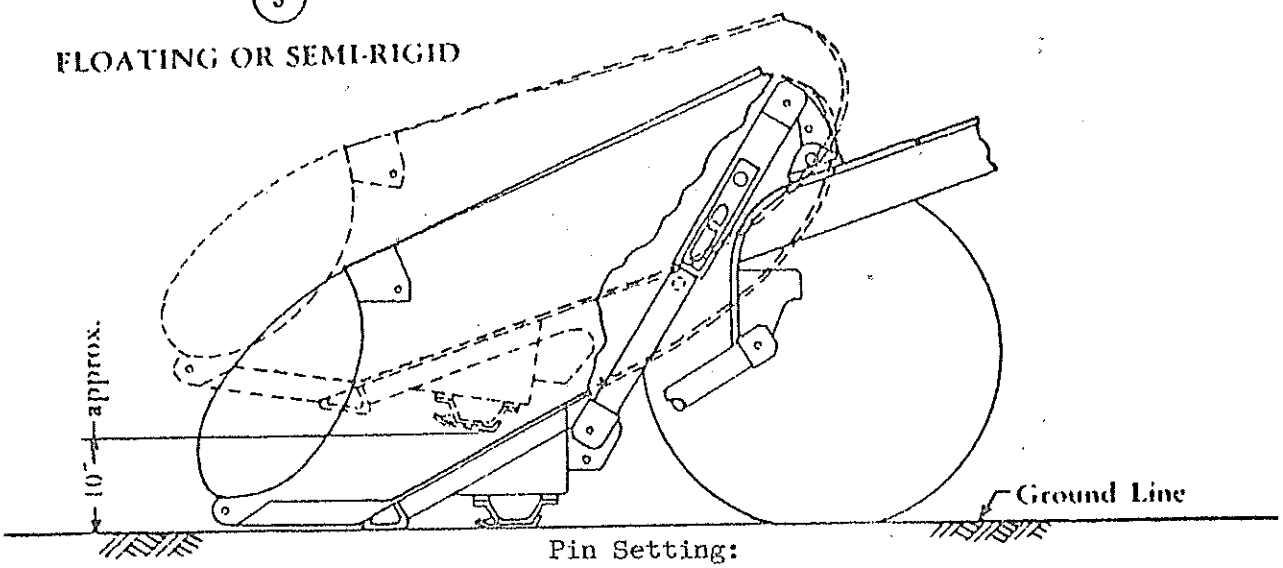
Pin Setting:

Pin is inserted thru tube hole and outer shaft hole.

This setting provides rigidity in operating position. Ground clearance, with plow lifted, is approximately 20 inches. Cut below grade is approximately 2 inches.

(3)

FLOATING OR SEMI-RIGID



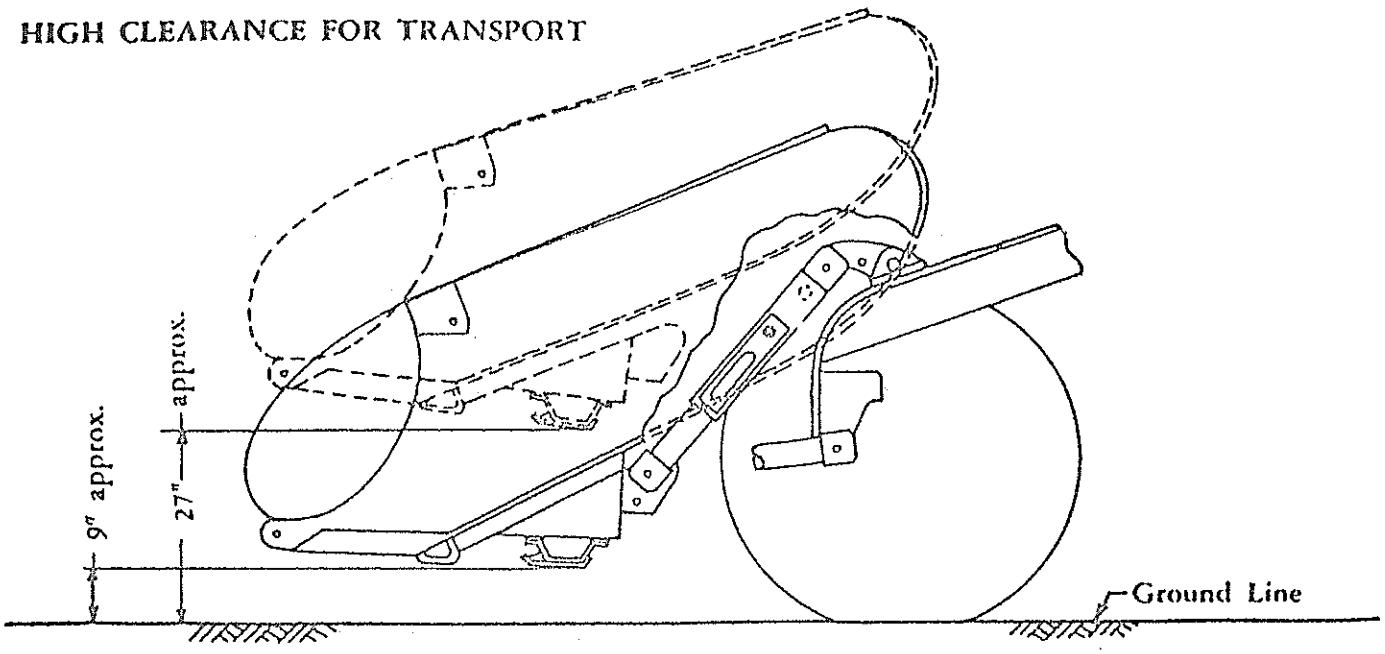
Pin Setting:

Pin is inserted thru tube slot and outer shaft hole.

This setting provides the same type of floating action as shown in #1 diagram. Sufficient ram stroke remains to hold the plow rigidly against the work, permitting downward float only. Ground clearance, with plow lifted, is approximately 10 inches.

(4)

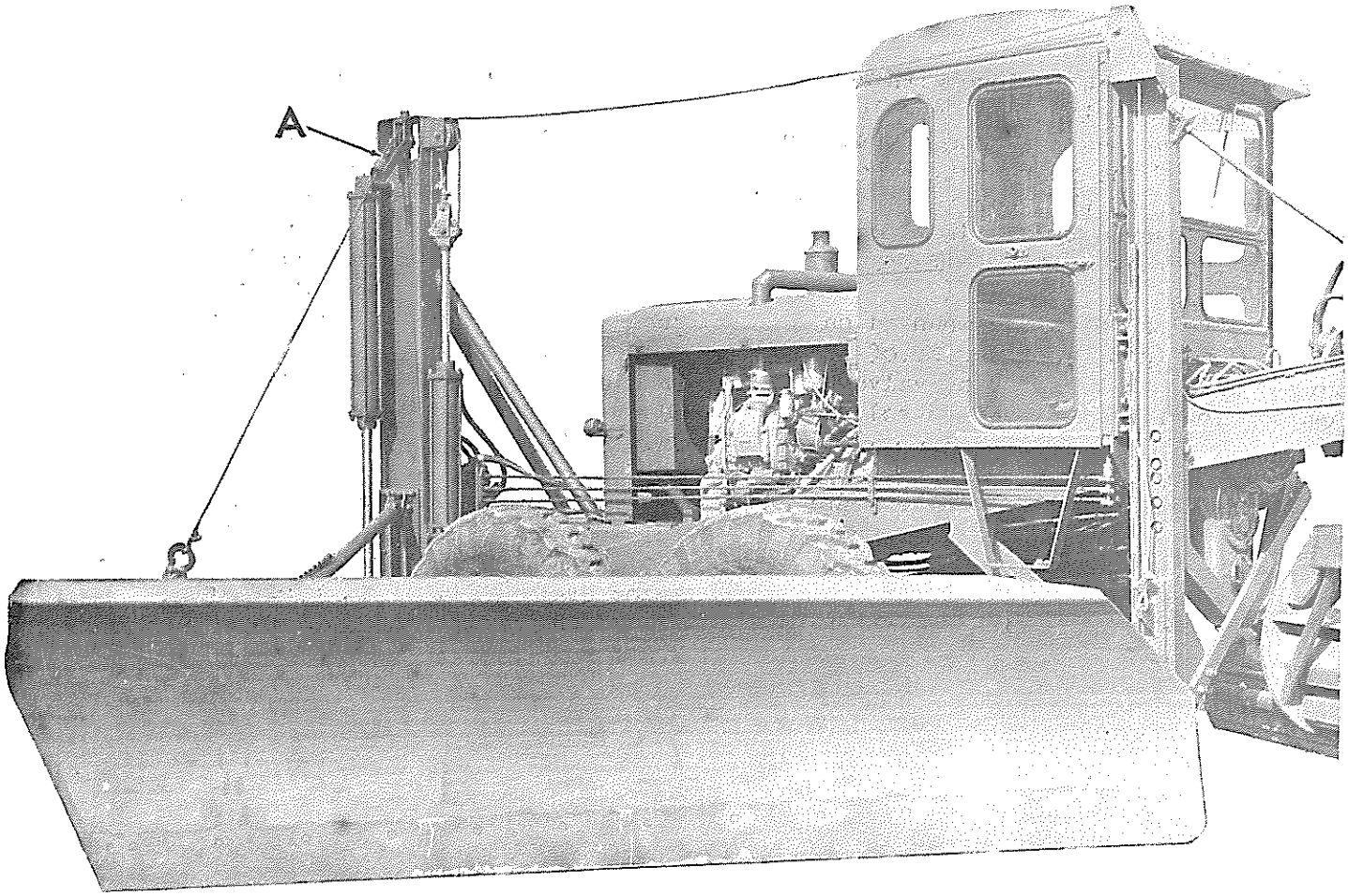
HIGH CLEARANCE FOR TRANSPORT



Pin Setting:

Pin is inserted thru tube hole and inner shaft hole.

This setting provides high clearance for transporting. It is necessary to block up plow to insert pin. Ground clearance, with plow lifted, is approximately 27 inches. Plow cannot be lowered to ground.



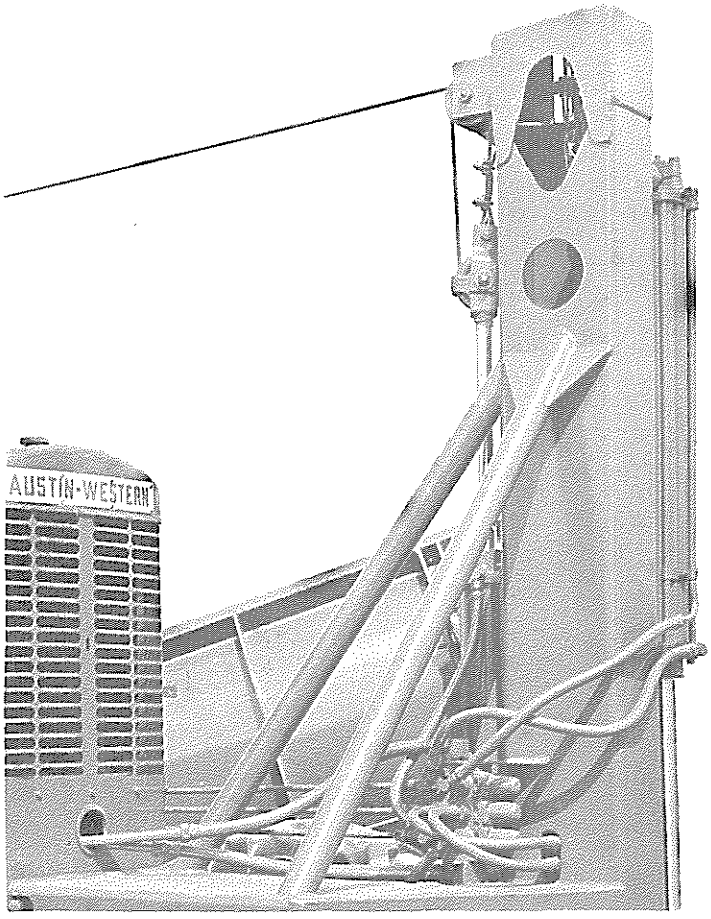
5. SNOW WING.

NOTE: For all operating purposes and intent, the photos, illsutrations, and test in this section will apply similarly to either "Pacer" or "Super" graders.

The complete snow wing attachment consists of a rear mast, front bracing, brackets and slide, control mast and wing assembly, all of which can be assembled on the grader in a few hours with common tools. (Each wing assembly has installation instructions included with the unit.)

The snow wing hydraulic system is mounted on the rear mast and need never be removed except for replacement.

Simple hydraulic hose connections to the present grader system are made with equipment provided.



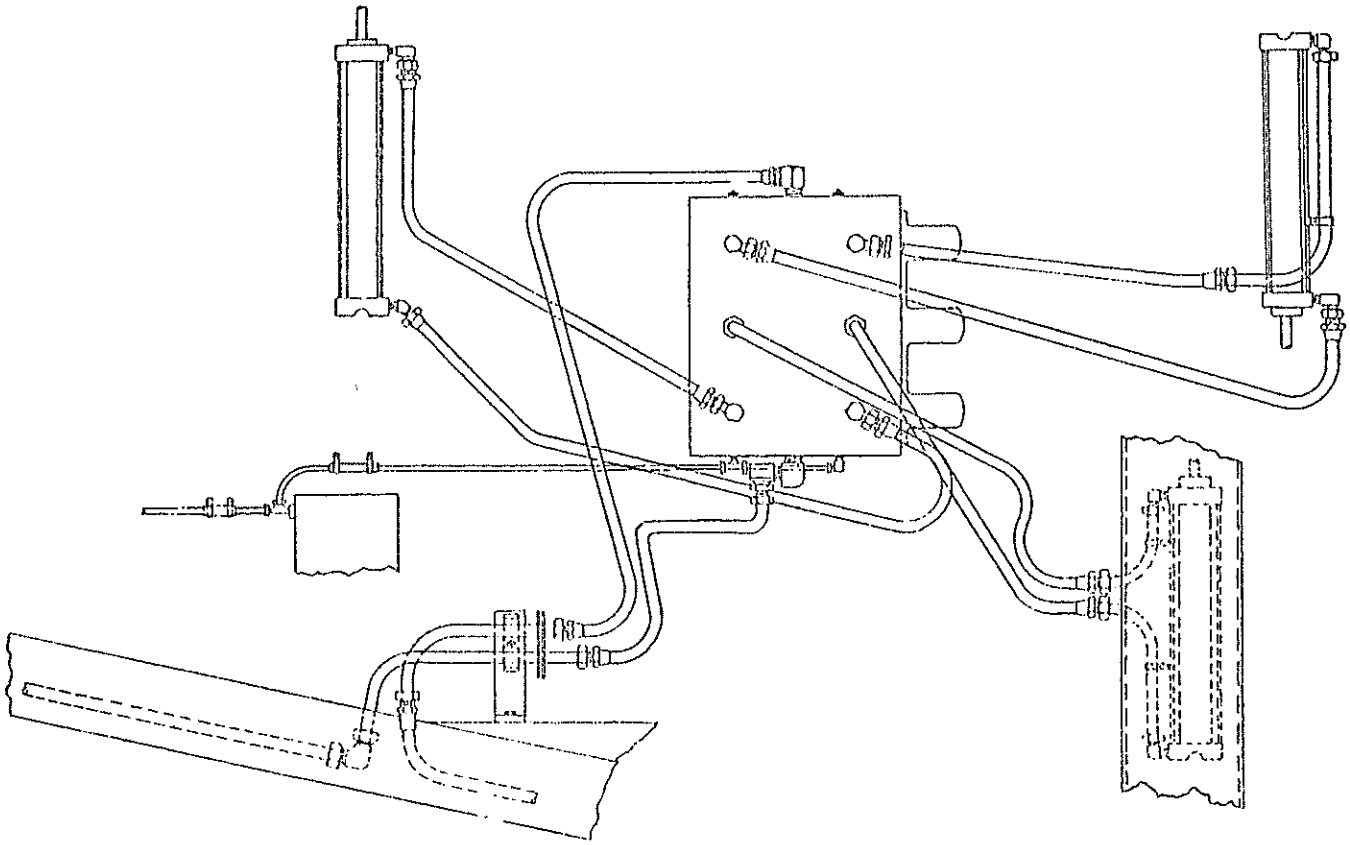
All wing movement is done with cable systems and hydraulic rams, one located inside the rear mast and one mounted on the outside of the rear mast. The base, or inside end, of the push rod assembly is raised and lowered by a hydraulic ram located on the rear mast.

All control handles are mounted on a mast in the right front corner of the cab. Control rods run back to the valve bank from the lower end of the control mast.

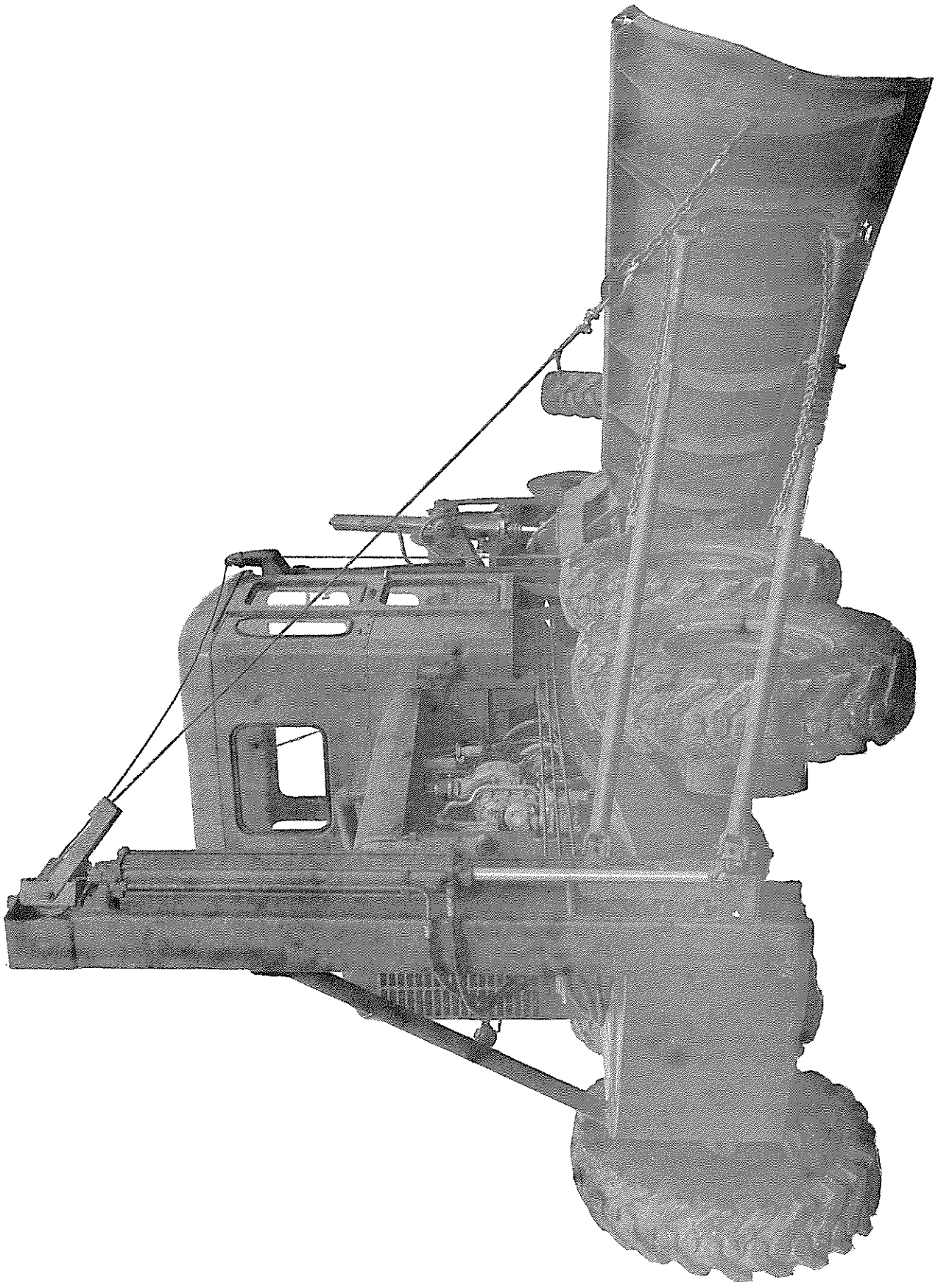
To raise any part of the wing, the control handle is pulled to the rear; and to lower, the control handle is pushed forward.

The rear end of the wing may be swung inward over the rear wheels permitting passage through a space 11 feet high, 10 feet wide, with an over-all machine length of approximately 30 feet. To accomplish this, the wing is first lowered to the ground. Both pins are removed from the telescopic rods and the forward end of the wing is raised about 2 feet off the ground. The rear lift ram is retracted and when the wing is high enough to reach, the loose end of the lift chain is inserted into a slotted bracket located on the fairlead at (A), page 13.

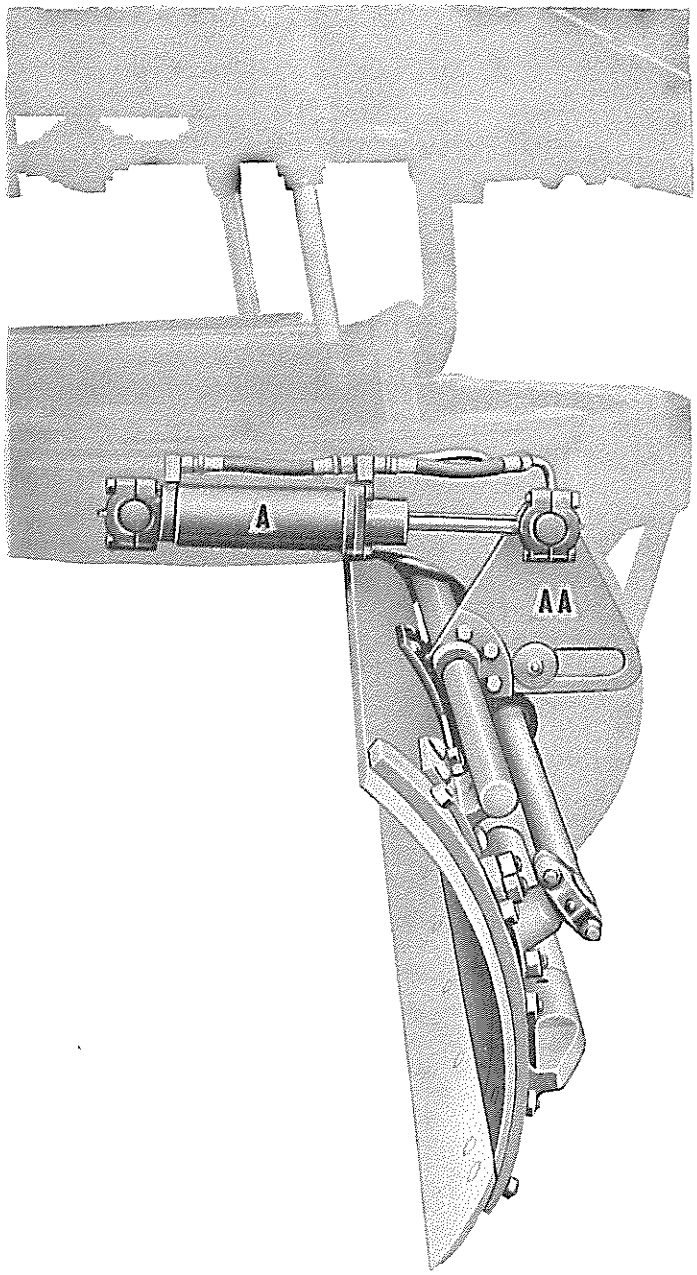
NOTE: Lubricate all grease fittings with multipurpose pressure gun grease ("Lithium" type); two strokes of lubricator every 50 hours of operation. Occasionally hand oil all moving parts not provided with grease fittings.

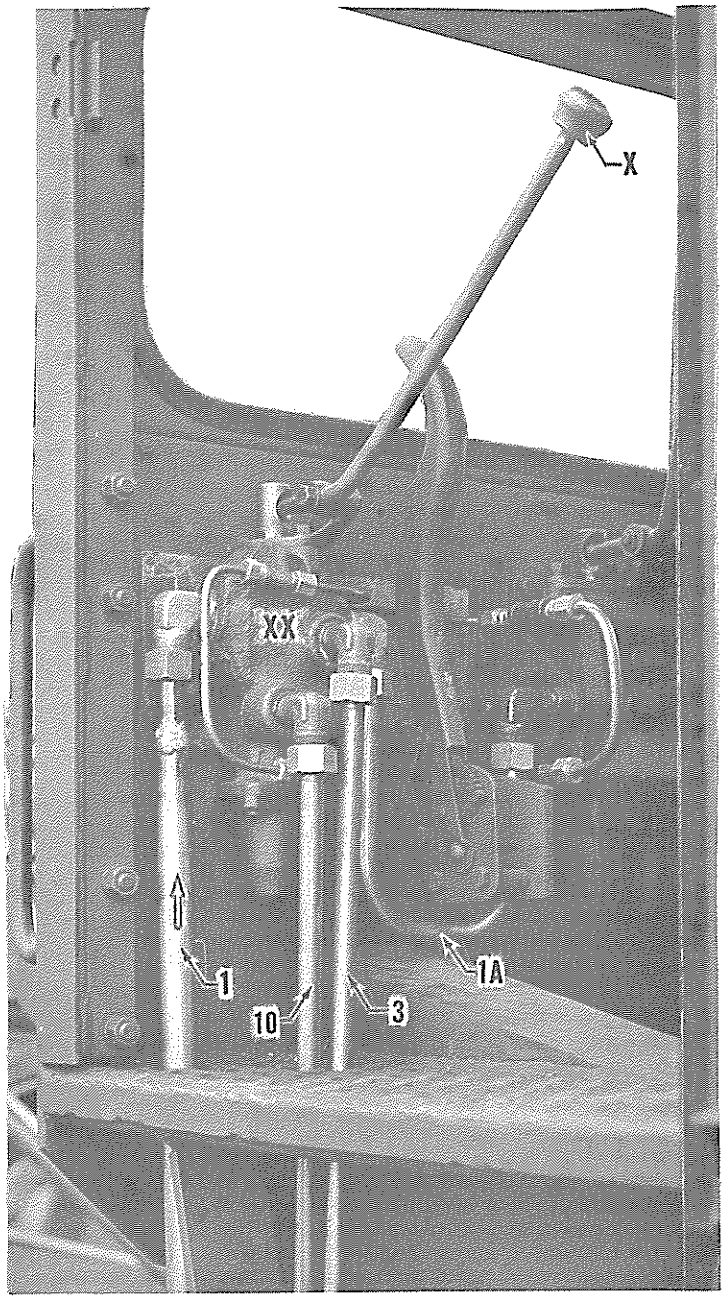


TYPICAL SNOW WING HYDRAULIC SYSTEM



REAR MOUNTED SNOW WING

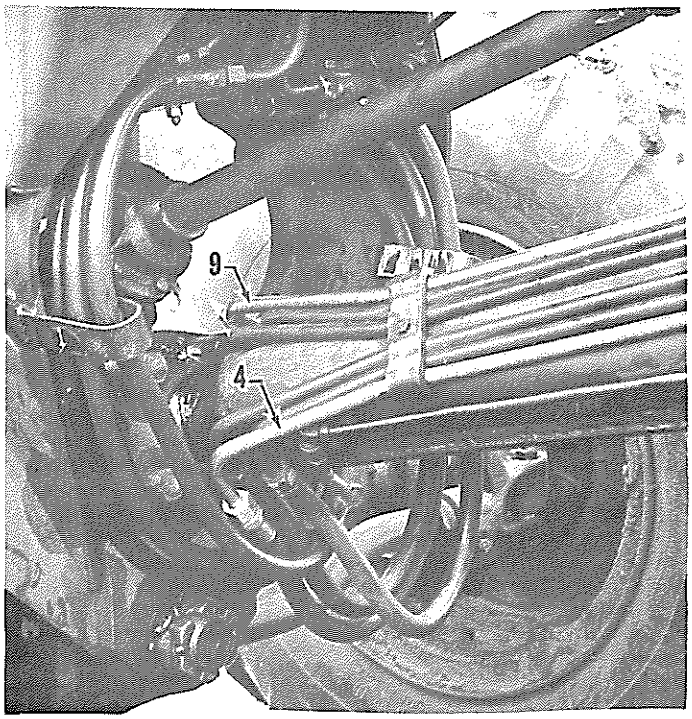




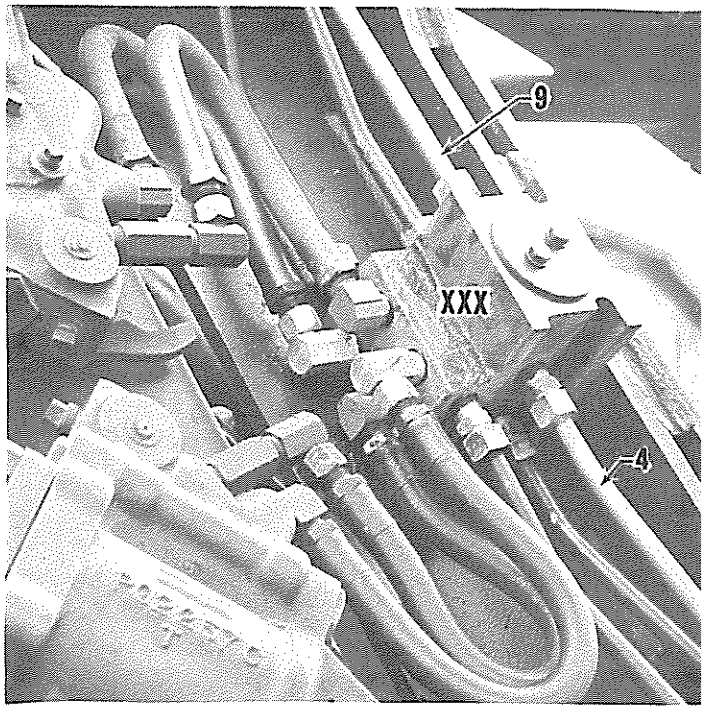
6. A-W POWER TILT MOLDBOARD. (Optional Attachment).

This attachment permits the operator to take full advantage of the various degrees of blade pitch without making manual changes to the tilt links. This is obtained by finger-tip control of the hydraulic lever (X), see upper right photo. Pitch change can be made at any time, with or without a load and with the blade in any working position. This eliminates guesswork when it comes to proper pitch. One angle is used for cleaning ditches, another for cutting sod, perhaps still another for grading. The same applies to oil mix operations. One angle is desired for mixing, one for spreading and perhaps another for the finish pass. For snow removal, the moldboard is tilted back to obtain the proper pitch for rolling or throwing snow. When ice is encountered, the pitch can be changed by tilting the moldboard forward, giving a desirably sharp cutting edge.

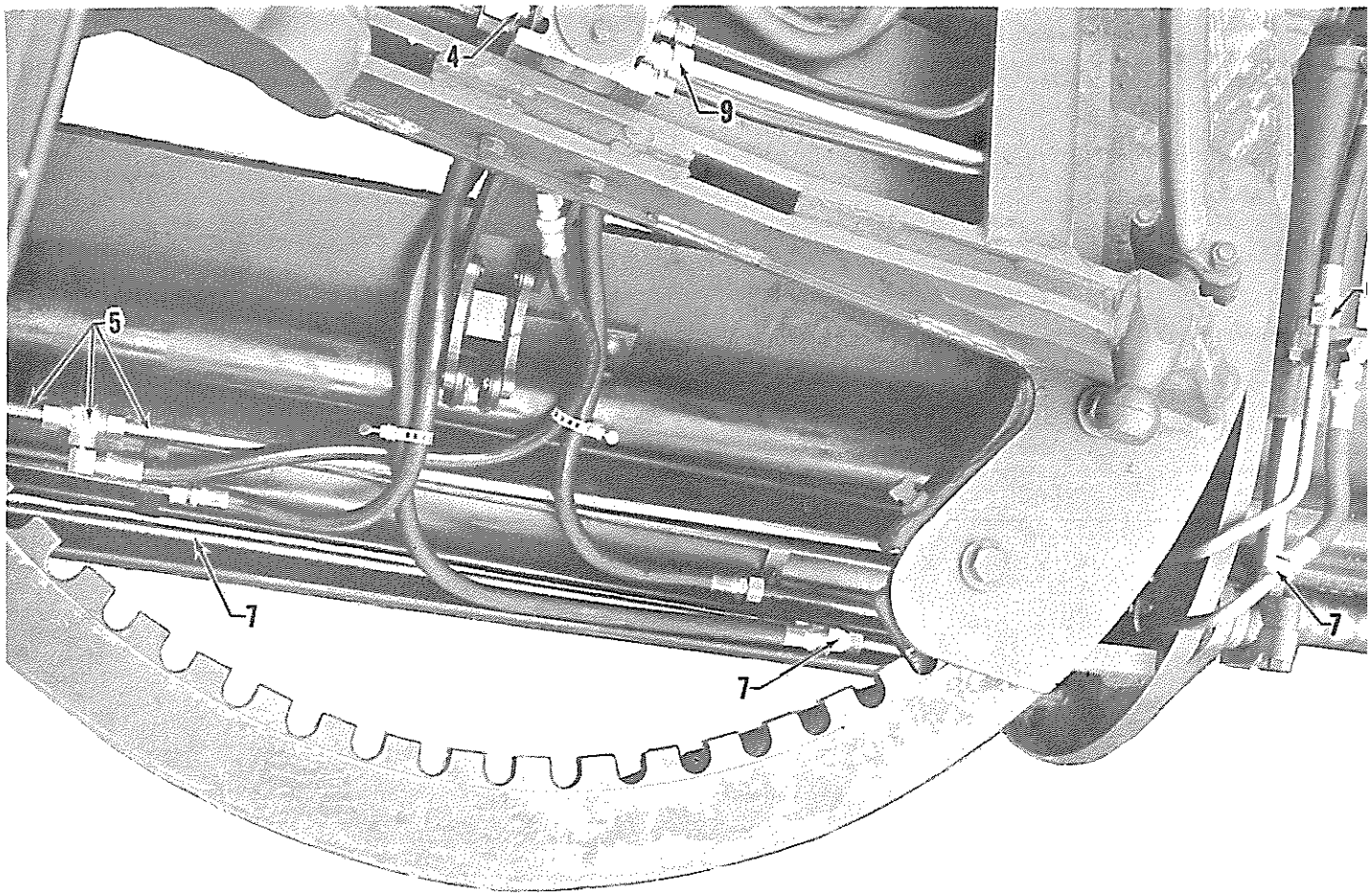
The left photo shows the hydraulic cylinder (A) and linkage (AA) attached to the left side of the circle assembly. (There is a similar group attached to the other side of the circle). The photo shows the moldboard leaned back full distance.



The upper left photo shows lines (4) and (9) attached to the draw bar.

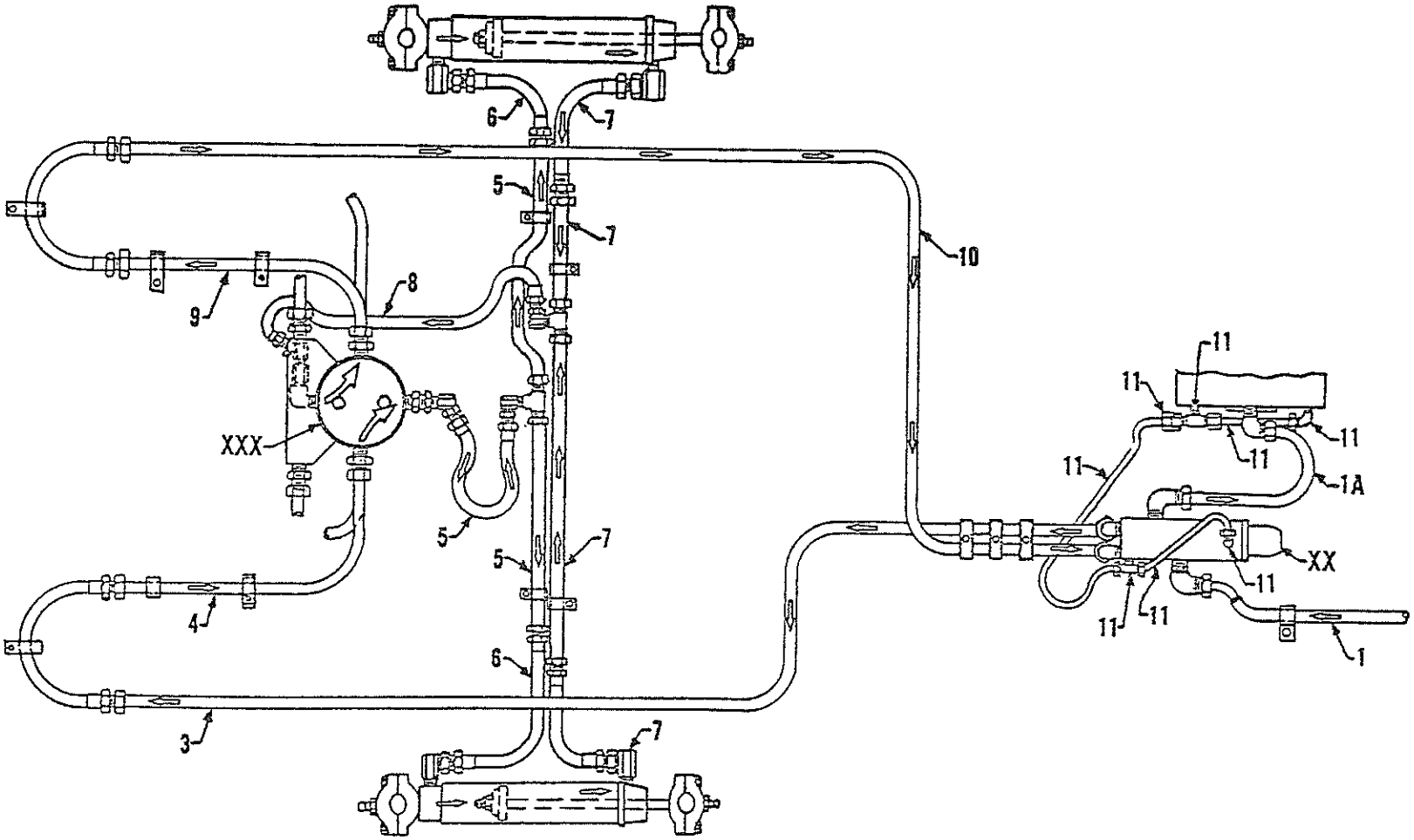


The upper right photo shows the new swive valve (XXX) that must be installed.



The upper photo shows the hydraulic lines (6), and (7).

7. A-W POWER TILT PIPING DIAGRAM.



The attachment consists of 2 hydraulic rams, 1 valve bank (XX), 1 swivel valve (XXX) plus hose, and piping items shown on the upper diagram.

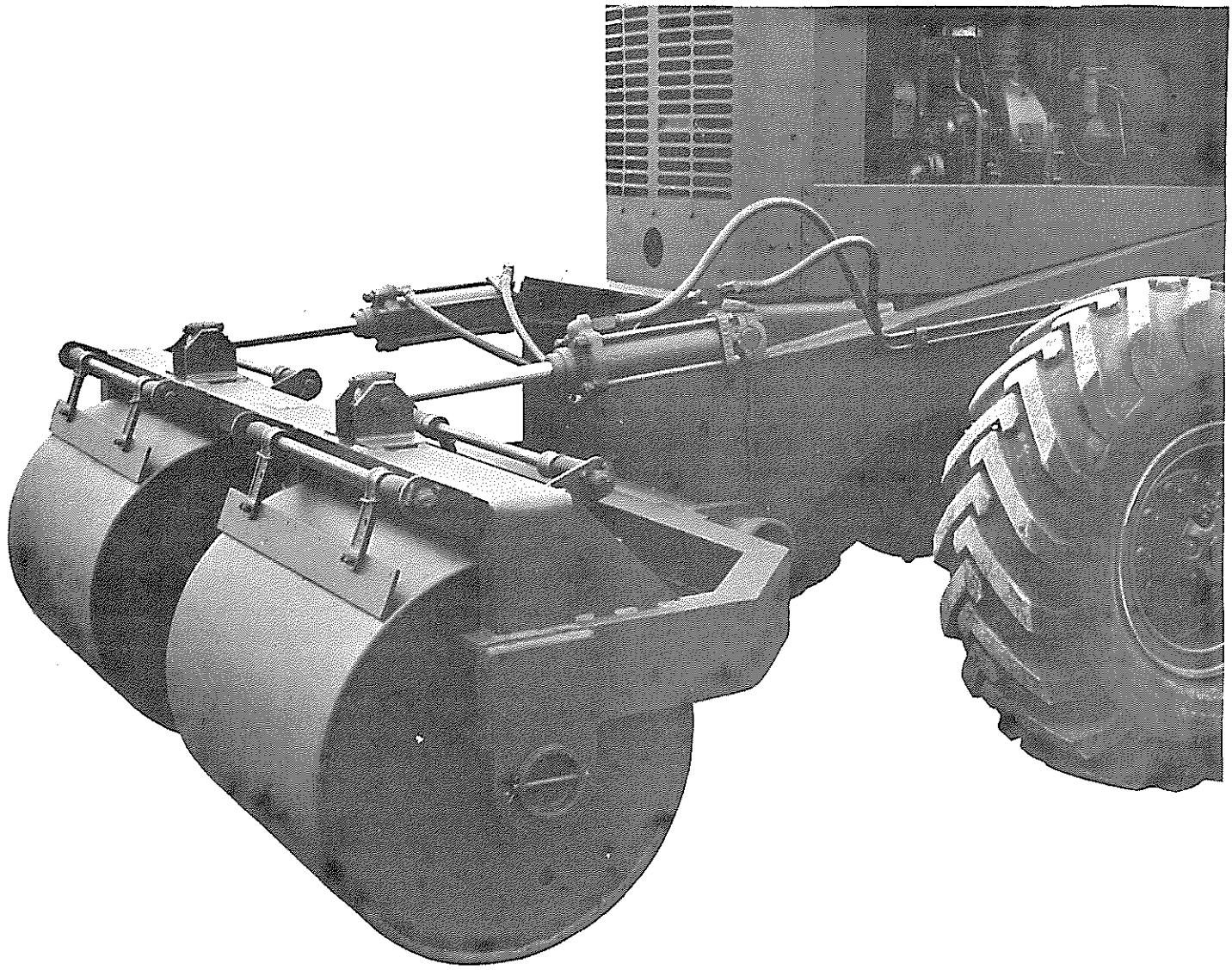
With the engine running and when the control handle (X) (page 16), is in the released (neutral) position the hydraulic oil will flow up pipe (1) (see above) then across the valve (XX) then down pipe (1A) and over to the main "Hydraulic Valve Group".

When the control handle (X) (page 16) is pulled clear back the oil will flow as shown in the above diagram. That is-from pipe (1) through the valve (XX) then through the piping as follows: Lines 3, 4, 5, and 6.

The oil on the right side of the pistons (see above), is pushed out of the cylinder and travels back to the valve (XX) through lines as follows: 7, 8, 9, and 10.

To lean the moldboard forward, push lever (X) (page 16) clear forward. In this case the oil will flow in reverse direction from the valve bank (XX) namely through lines as follows: 10, 9, 8, 7, 6, 5, 4, 3.

All of the small lines and fittings (11) drain all of the seepage oil through the main valve bank and eventually back into the oil reservoir.



8. REAR ROLLER. ("Pacer" model only)

The roller attachment has many uses on light construction and reconstruction jobs and on many materials, including gravel, black-top and soil-cement.

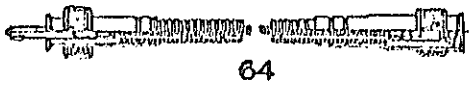
The rolls track behind the wheels, eliminating tire marks and making it possible to roll out to the edge of the material, or close to a curb.

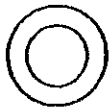
To attach roller, bolt roller mounting plate to grader bumper plate and attach hydraulic hoses. To remove this attachment reverse the procedure.

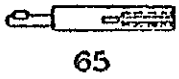
The rolls are spaced in order to roll out the tire marks. In making the first pass over the surface, back onto the work to give the material an initial compression before the tires contact the work. When the grader is reversed, the rolls will iron out wheel marks and leave a smooth surface. Subsequent passes will cover the unrolled strip left between the rolls on the first pass. Variable rear roll compression (from a few hundred pounds, to nearly lifting the rear wheels off the ground utilizing all the rear end grader weight on the rolls) is controlled by the operator with lever on valve in cab.

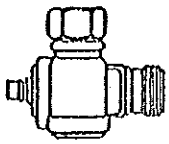
Kerosene or water saturated cocoa mats are sometimes placed on top of the rolls.

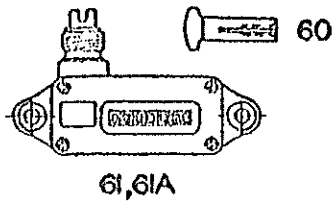
The rear roll bushings are lubricated thru four high pressure fittings located at both ends of each roller. The bronze bearings should be greased (Using high pressure grease) every four hours of operation. Sufficient lubricant must be injected (about 2 teaspoonsful) until it is forced out of the inner and outer ends of both rolls











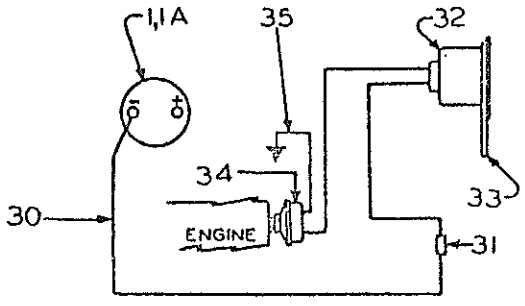
9. ODOMETER. (Special Order)

The odometer attachment is not standard equipment on A-W graders but it is highly recommended as an aid to proper maintenance and care. The use of an odometer will greatly facilitate maintenance of complete machine records.

The odometer is simply installed by removing plug (32), page 19, Section 5, and screwing adapter and washer (63 and 66 above) with drive tip (60) and shaft extension (65) inserted, into the tapped hole in the transfer case.

The front wall of the grader cab has a hole provided through which the adapter is installed.

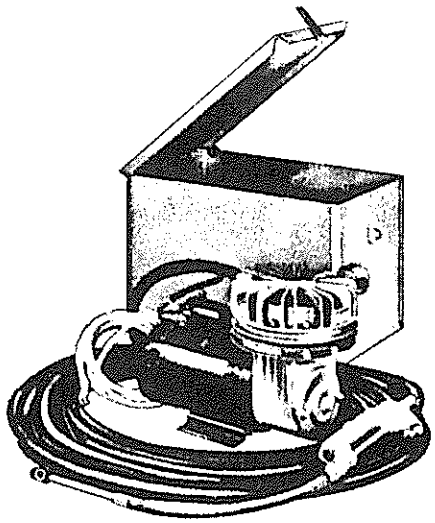
The odometer head is mounted on the left side of the front cab wall and a correct right angle joint (each tire size requires a different angle joint) along with a flexible shaft complete the unit.



Wiring for Hourmeter
(For GM-71 Series Engine)

10. HOURMETER ATTACHMENT.
(Special Order)

With an hourmeter, a check can be kept on the hours the engine has been operating. It makes possible accurate computation of fuel consumption or other operating cost per hour or per job and is especially useful in recording hours of service performed by each engine where several are used.



"All-Purpose" Air Compressor

11. TIRE PUMP. (Special Order)

a. Specifications ("All-Purpose" Compressor).

AIRSEAL: Specially processed heavy neoprene, reinforced with nylon, takes the place of ordinary piston rings.

LUBRICATION: Grease-packed sealed ball bearings. No other lubrication required.

PISTON: High tensile strength aluminum.

OIL-FREE AIR: Absolutely oil-free air at all times. No oil filters or collectors needed in the air line.

RELIEF VALVE: None needed due to patented design, which is the reason why no "All-purpose" compressor can ever explode.

b. Operating instructions.

The compressor supplies air only on demand by firmly squeezing the lever on the tire chuck. Releasing this lever will automatically register the tire pressure on the gage. To deflate the tire, depress the handle to an intermediate position.

Conserve battery power by running the grader engine at a fast idling speed to permit the generator to charge the battery while the compressor is in use.

c. Service Instructions.

If the compressor runs but delivers only a small amount of air, trouble may be due to a broken valve or air seal, or a clogged air filter. Keep filter clean at all times.

To examine valves or air seal - Remove bolts around top of finned head. Remove screws which hold retainer plate and air seal to top of piston. Inlet Valve (Part No. D-10158) is on underside of Compression Plate. Outlet Valve (Part no. D-10775) is on top. These valves may be changed by removing the two screws which fasten them to the Compression Plate.

CAUTION: Always use new head gasket. Be sure all screws and bolts are tightened securely to prevent air leaks.

d. Guarantee.

The Johnson Service Company of Milwaukee, Wisconsin, guarantees its Air Compressors, unconditionally, for a period of 90 days. All units are thoroughly tested and inspected. However, any part or parts proving defective within one year of date of purchase will be replaced without charge.

This guarantee applies to defective material or workmanship. Ordinary wear, accident, mis-use or misapplication are expressly excepted. All repairs and parts under this guarantee are F.O.B., Johnson Service Company, Milwaukee, Wisconsin. No local service or repair charges will be allowed unless permission is granted by the Johnson Service Company of Milwaukee, Wisconsin.

NOTE: The Electric Motor is manufactured by the Electric Auto-Lite Company of Toledo, Ohio. Service and parts can be obtained from any Auto-Lite dealer.