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CARRYDOZER

CHD-24S

OPERATOR'S MANUAL

80-1067

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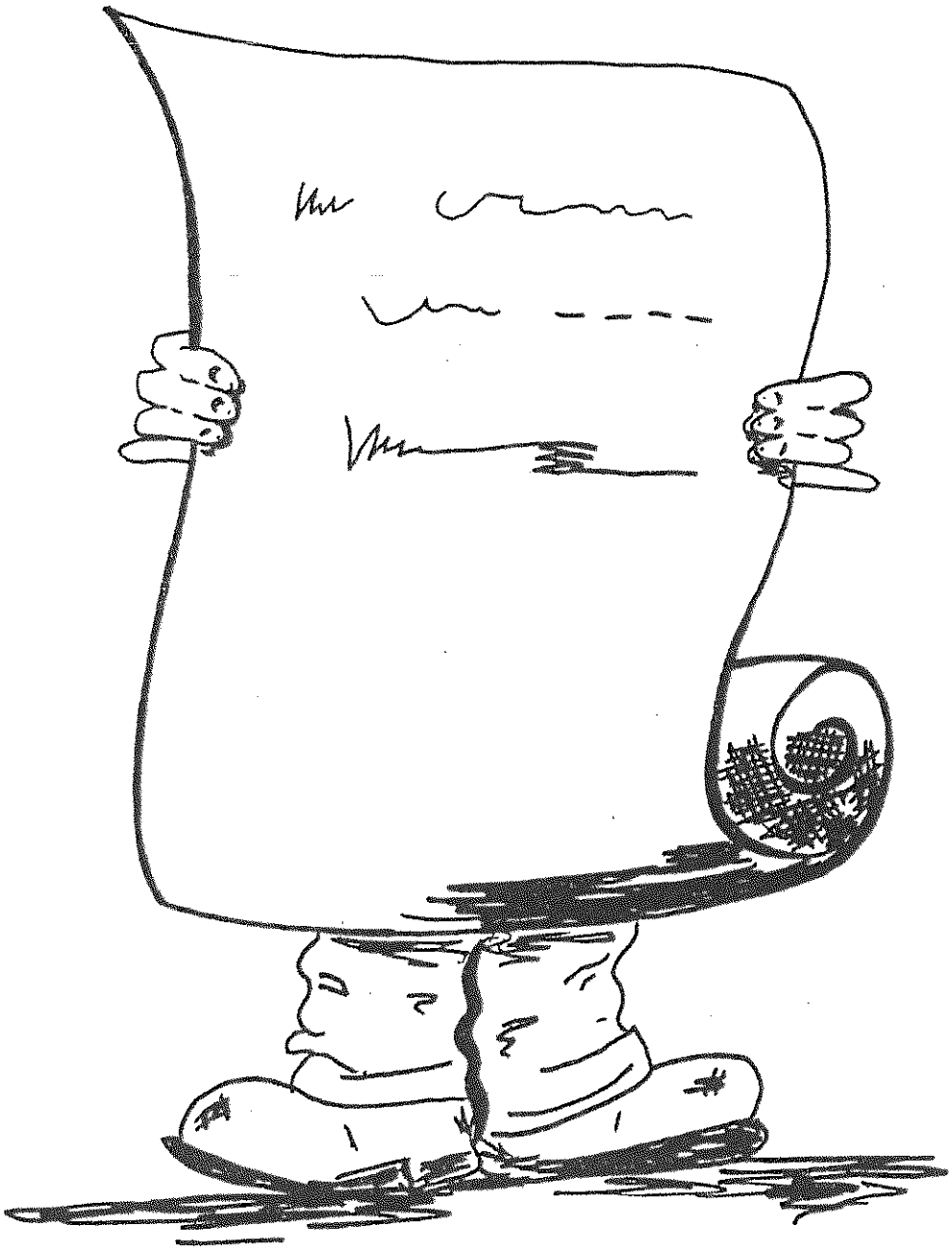
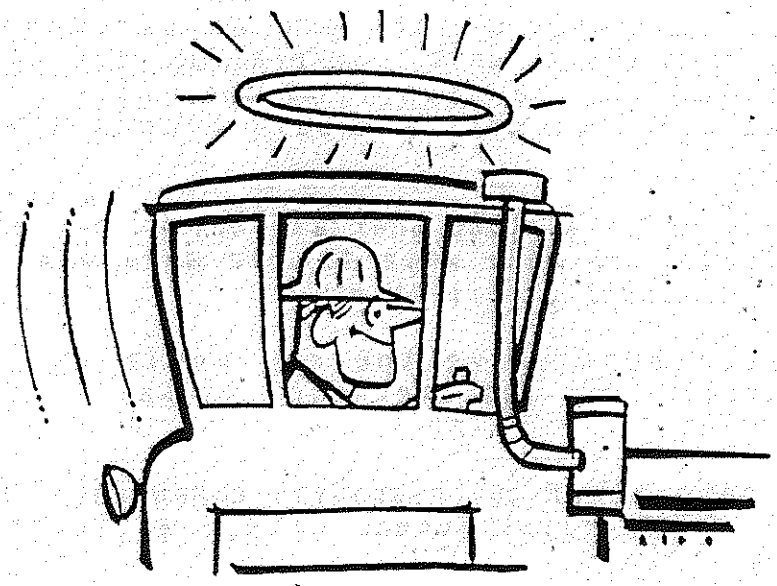
GENERAL INFORMATION





SAFETY IS YOUR BUSINESS

Why? Because SAFETY based on knowledge, technical skill, and years of experience has been carefully built into your WAGNER unit. Time, money and effort have been invested in making your unit a safe product. The dividend received from this investment is YOUR PERSONAL SAFETY.

It should be realized, however, that no power-driven equipment can be any safer than the man who is at the controls. If you, the operator, attempt to clean, oil or adjust a machine while it is in motion, your personal safety will be in danger and our efforts will be in vain.

Due to the size and load capacities of our equipment, we recommend that the following safety precautions be complied with at all times:

1. Give adequate warning to all ground personnel before activating any controls or unit. Several men can stand under our machines and not be seen from the cab - or from the ground, if the position of the wheels blocks the view of their legs.

2. The size of our units dictate that all checks or testing with the engine running be made with two or more men. One man will be at the controls at all times.

3. If the operator must leave the cab while the engine is running, be certain that the emergency is set - these units will roll.

4. Prior to the removal of any hydraulic component - neutralize the pressures. A pin-point stream of hydraulic oil at 1000 psi can penetrate flesh.

5. Do not allow the hydraulic system to support unit components while servicing. Lower the boom to its supports, components at rest or under blocks.

6. We provide steps, ladders and rails, but the operator must provide his two hands when operating to prevent falls.

As an operator, use common sense. Never allow "fatigue" or "haste" to affect your good judgment. Accidents to you can be prevented - but - not without your cooperation.

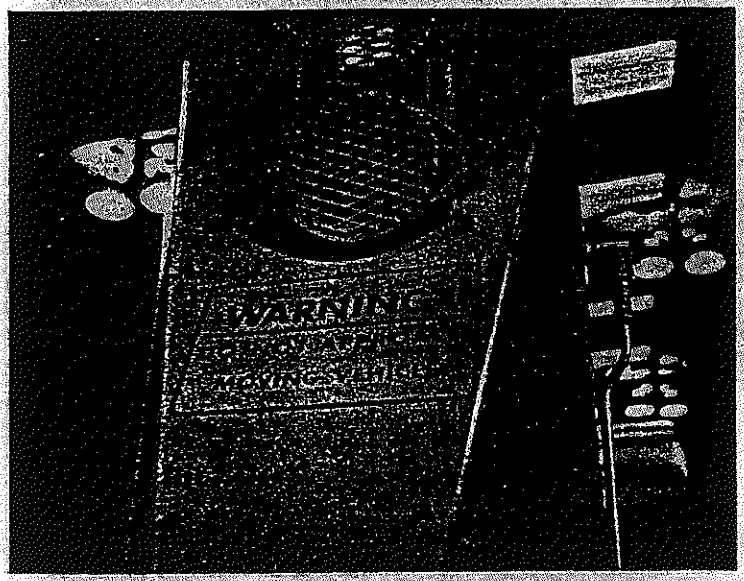


FIGURE 1

FIGURE 1 shows a typical decal on a WAGNER machine. DO NOT paint over - remove or disfigure decals. They serve a specific purpose for the life of the machine.

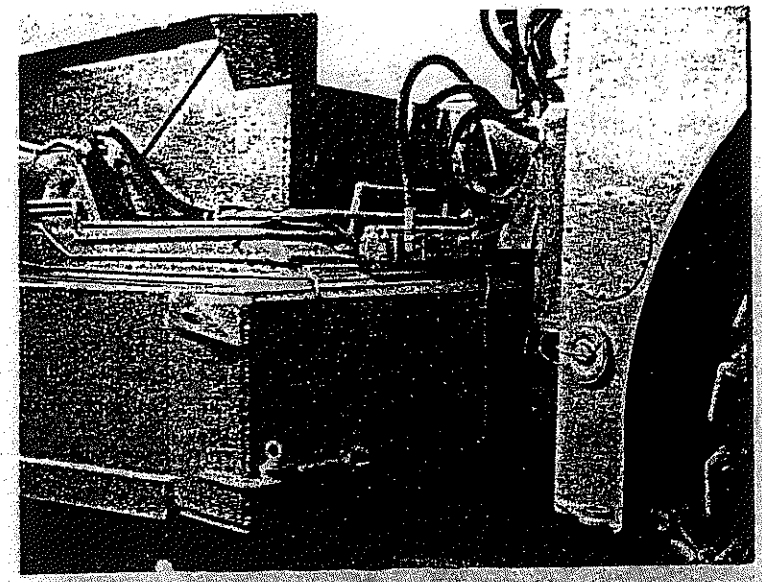


FIGURE 2

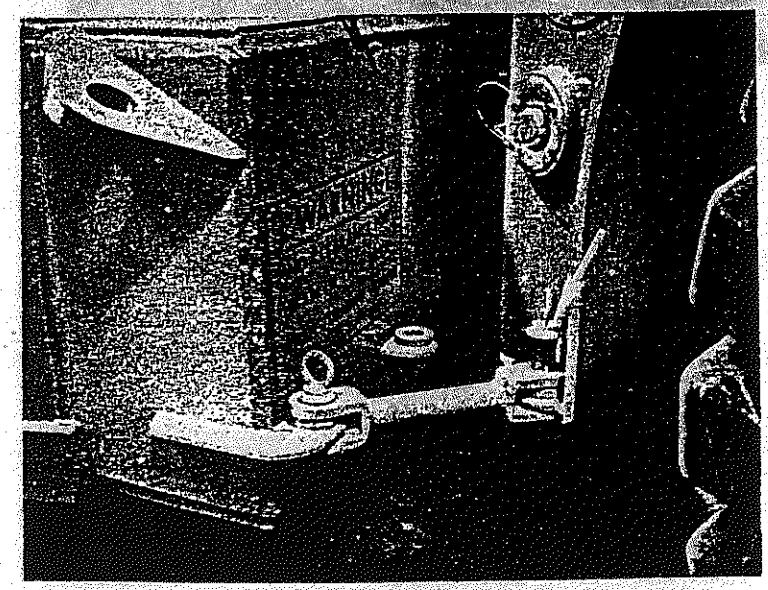


FIGURE 3

FIGURES 2 and 3 depict a bogie safety locking device used on articulating machines. Place the machine on a level surface so that the pin and locking link assembly can be aligned for pin insertion.

DO NOT work in the swivel box areas unless the locking device has been set in the locked position. See FIGURE 3. Lock the left side when working in the right side area. Lock the right side when working in the left side area.

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IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all motorized vehicles. The service procedures recommended by WAGNER in our Service Book and other literature, are effective methods for performing service operations.

The service and operating publications contain warnings against the use of specific methods that could damage the vehicle, render it unsafe or cause personal injury. The warnings are offered to prevent accidents or damage based on our ability to visualize the most likely circumstances that will be encountered and based on any incidents reported to us. WAGNER must consider that persons properly trained for the level of service attempted will be utilized and that these persons must satisfy themselves that neither his safety or the vehicle safety will be jeopardized by the methods used that are not specifically noted.

In the absence of a specific warning, failure to follow industry accepted practices in the maintenance and service of heavy equipment could result in damage or injury. Consult the manuals available, and if in doubt - request help.

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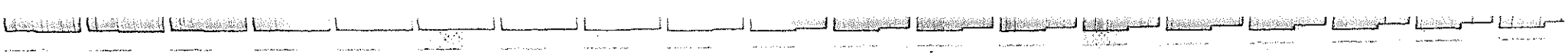
FORM 80-228



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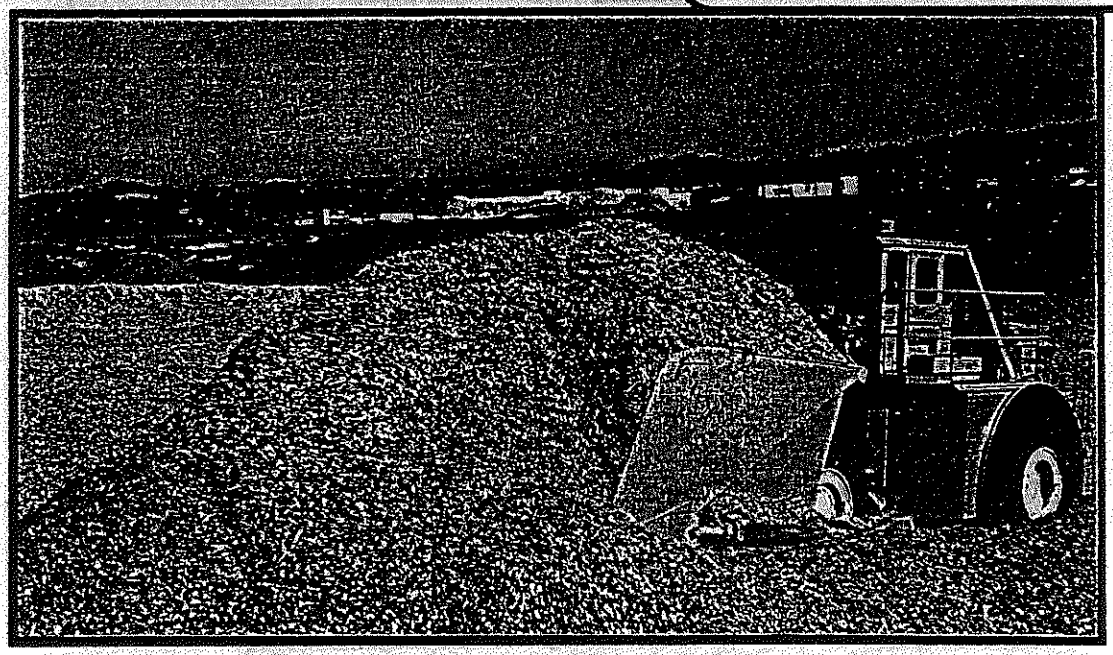
CHD-24S

CHIP CARRYDOZER

SPECIFICATIONS



ENGINE

Make & Model	CUMMINS KT-1150C-450
Max Horsepower	450 @ 2100 RPM
Max Torque	1350 ft/lbs @ 1500 RPM
Bore & Stroke	6.25" x 6"
No. of Cylinders	6
Displacement	1150 Cu In

AIR CLEANER

Donaldson Two Stage Dry Type

ELECTRICAL SYSTEM

Type	12 Volt Neg. Ground/24 Volt Start
Alternator	105 AMP
Circuit Breakers (lights)	30 AMP
Circuit Breakers (access)	20 AMP
Batteries (2)	12 Volt-8D @ 205 AMP Hr. each

TORQUE CONVERTER

CLARK 8000 Series Single Stage, 3 Element - Stall Torque Ratio 2.53:1.

TRANSMISSION

Clark 8000 Series Power Shift - Spur Gear; 4 speeds Forward and Reverse with 1:1 Converter Ratio.

Range	Ratio	Speed (Unladen)	
1.	4.07:1	4.1 mph	6.6 km/h
2.	2.27:1	7.2 mph	11.6 km/h
3.	1.29:1	12.2 mph	19.6 km/h
4.	71:1	21.1 mph	33.9 km/h

AXLES

Make	Clark
Model (Chassis)	75790 w/No-Spin
Model (Bogie)	75790
Type	Planetary
Brakes	S-Cam Air Operated
Brake Size	20" x 7"
Carrier Ratio	5.125:1
Planetary Ratio	4.895:1
Total Reduction	25.087:1

TIRES

Size	29.50 x 29 Radial
Hydroflation: Weight each Tire	2386 Lbs

All Tires are Hydroflated.

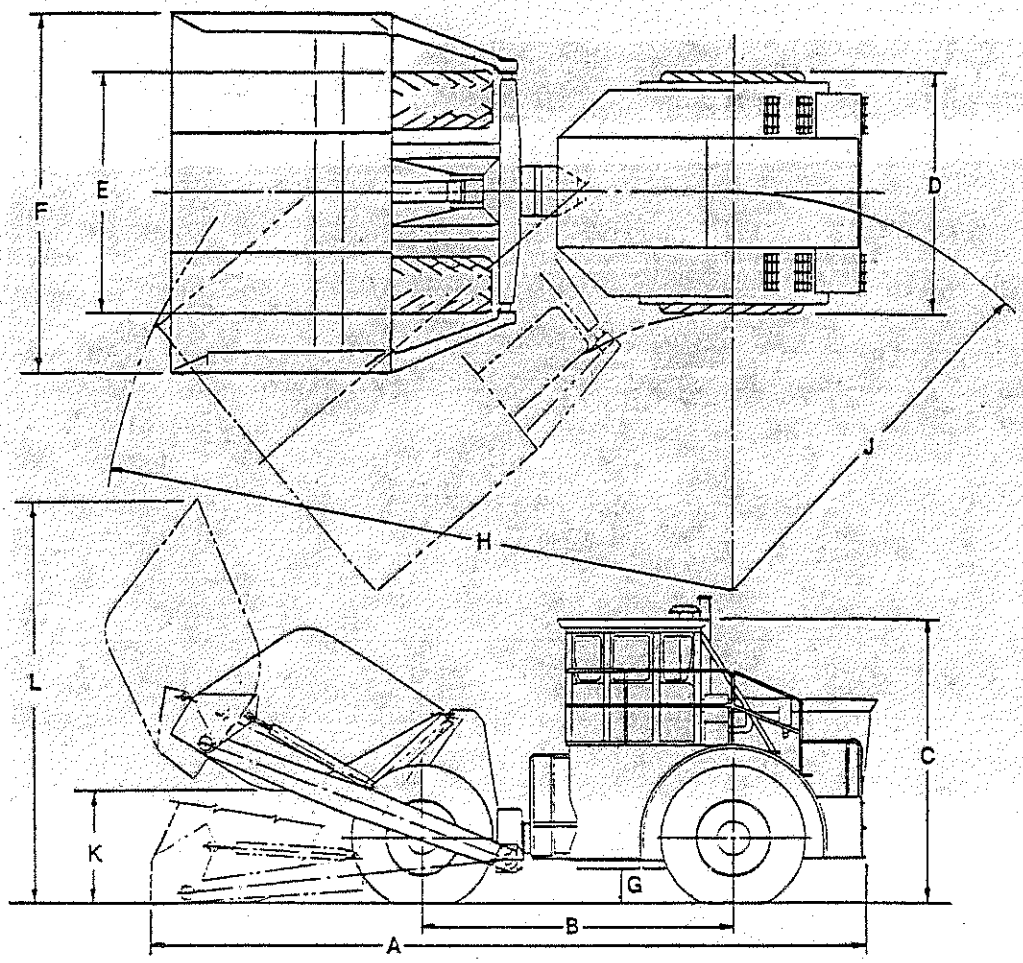
HYDRAULIC SYSTEM

Hydraulic Pump	70 Gal @ 2100 Pump RPM
Steering Cyl.(2)	6" x 32"
Implement Pump	70 Gal @ 2100 Pump RPM
Dump Cyl.(2)	6" x 44"
Hoist Cyl.	10" x 37"
Side-Tilt Cyl.(Optional)	5" x 5"

CAPACITIES

Fuel Tank	220 Gals	833 Liters
Hydraulic Oil	160 Gals	606 Liters
Crankcase w/Filter	13 Gals	49 Liters
Cooling System	22.55 Gals	85 Liters

CHD-24S



DIMENSIONS

A. Overall Length	35'	10"	10922mm
B. Wheelbase	14'	4"	4369mm
C. Cab Height	12'	8"	3861mm
D. Outside Chassis Width (Tires)	10'	10"	3302mm
E. Outside Bogie Width (Tires)	10'	8"	3251mm
F. Bucket Width	14'	7"	4445mm
*F. Bucket Width	17'	0"	5182mm
G. Ground Clearance (Chassis)	2'	4"	711mm
Ground Clearance (Differential)	2	0"	610mm
H. Turning Radius-Outside Bucket	28'	4"	8636mm
*H. Turning Radius-Outside Bucket	29'	4"	8941mm
J. Turning Radius-Centerline Mach.	18'	2"	5537mm
K. Maximum Dump Height	5'	4"	1626mm
L. Maximum O.A. Height in Dump Position	19'	8"	5994mm

WEIGHTS AND FUNCTIONS

Unit Weight/Hydroflation	79,600 lbs	36,107 kg
Bogie End/Hydroflation	41,900 lbs	19,006 kg
Chassis End/Hydroflation	37,700 lbs	17,101 kg
Dump Angle at Maximum Height		54°
Bucket Push & Carry Capacity	80 cu/yd	61.2 cu/m
Bucket Push & Carry Capacity	100 cu/yd	76.5 cu/m
Bucket Lift & Carry Capacity	40 cu/yd	30.6 cu/m
*Bucket Lift & Carry Capacity	50 cu/yd	38.2 cu/m
Articulation		40° each way
Oscillation		15° each way
Maximum Bucket Forward Tip		17°
*Side-Tilt (Optional)	6" each way from Horizontal	

*Optional 100 cu/yd Push & Carry Bucket w/Side Tilt.

OPTIONAL EQUIPMENT: Standard and special options are available. Contact your WAGNER dealer for details

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Telex 261985 ASCWAGNER MARINE

Printed in USA 6/91 Form 85-166

FEATURES

APPLICATION:

The Carrydozer was designed and developed specifically to move material faster, further and at less cost. It is unique in that it can carry a load and doze at the same time, thus its efficiency is greatly enhanced. The weight of the carried load adds to the traction needed to doze a volume comparable to the bucket load.

EASE OF OPERATION:

Bucket controls are all actuated through the right hand lever. Vehicle speeds, forward and reverse, through left hand controls. The location of these controls and the instrument panel affords a natural and effortless operation, thus reducing operator fatigue.

The all weather cab with excellent visibility has tinted safety glass, low noise level sound insulation, wipers, heater and defroster for safe and efficient operation. The integral ROPS cab is standard. Optional features such as air conditioning, cab pressurizer and fire extinguisher system for the operators comfort.

POWER TRAIN:

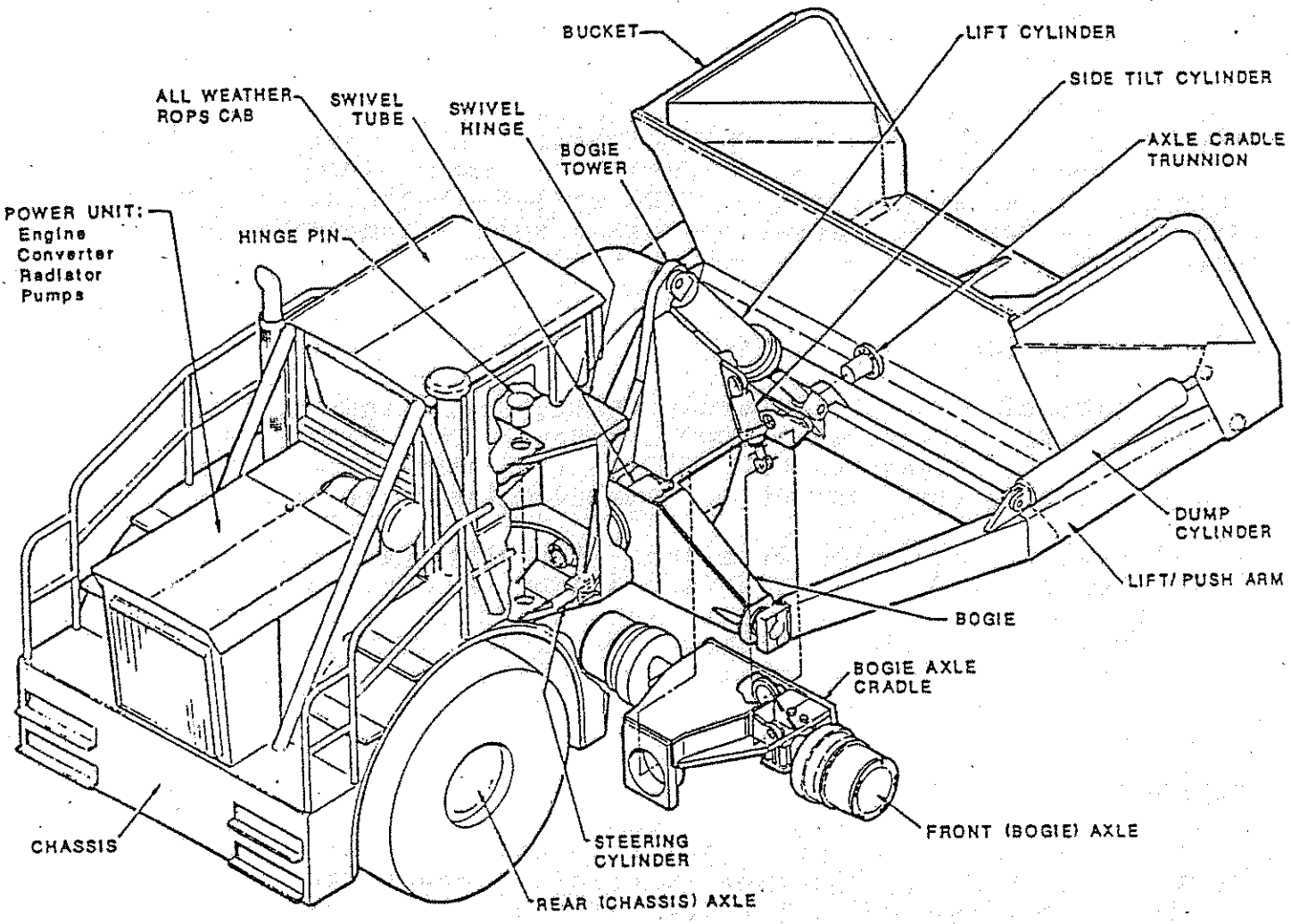
A torque converter and power shift transmission provide (3) or (4) speeds forward and the same in reverse, depending on model. The drive wheel hubs are equipped with planetary drives for a smooth power flow, and a No-Spin differential is installed in the chassis axle. The (4) wheel drive articulated chassis assures stability and constant ground contact.

HYDRAULICS:

All bucket actuations and vehicle steering are by safe and positive hydraulic power. Bucket operation such as dump, raising or lowering, can be individual or in unison.

MAINTENANCE:

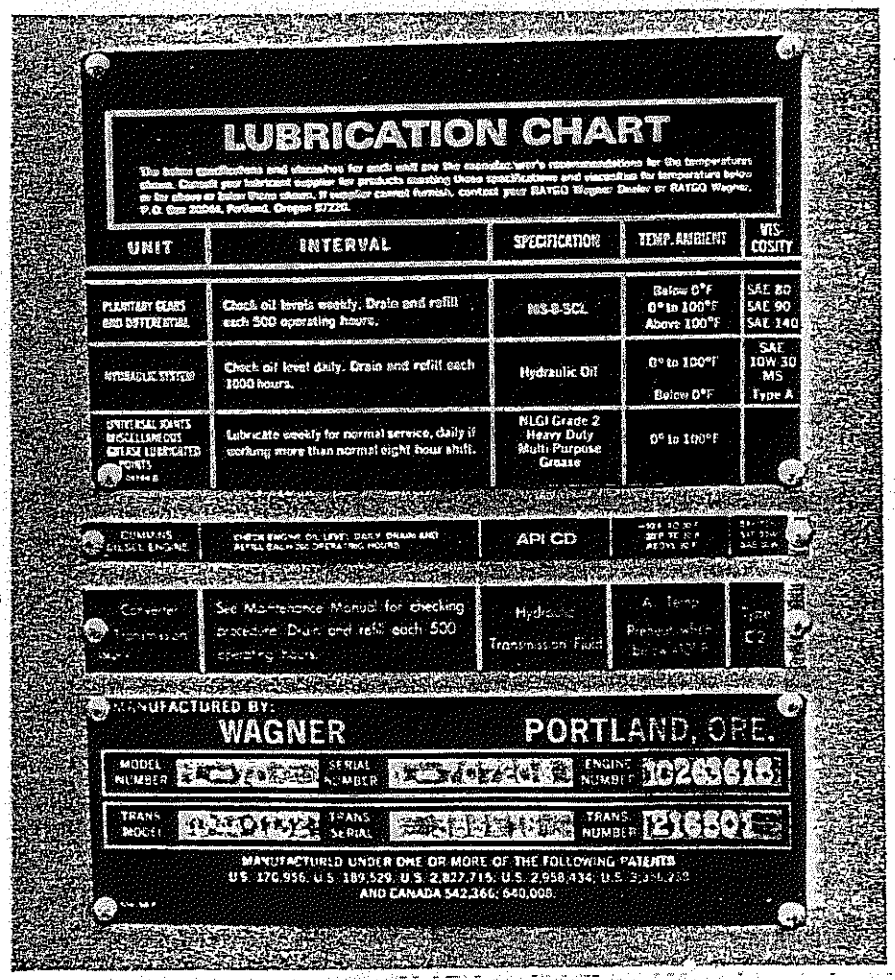
Through years of operation the Carrydozer has proven itself to be a rugged, low maintenance, easy to service machine. As an example, by tilting the hood back, the power unit (radiator, engine and converter), are easily serviced or removed for repair or "Modular Power Pack" replacement.



TYPICAL CARRYDOZER

(CHD-24S SHOWN)

SERIAL NUMBERS



The illustration shows a typical Lubrication, Model and Serial Number Plate Assembly. These plates are securely fastened to the cab cowl on the left side. The lubrication plate lists the time intervals, specifications, temperature limits and viscosity requirements of oils for engine and power train. Also, the same requirements for greases.

THE IMPORTANCE OF THE COMPONENT SERIAL AND MODEL NUMBERS LISTED CANNOT BE OVERSTATED. ALWAYS HAVE THESE NUMBERS AT YOUR FINGER TIPS WHEN REQUESTING PARTS, SERVICE OR OPERATION INFORMATION OF ANY KIND.

It is from these numbers that our Parts and Service Department creates a unit file in which we maintain a complete history of your machine.

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2
OPERATION

INSTRUMENTS
&
CONTROLS

INSTRUMENT PANEL

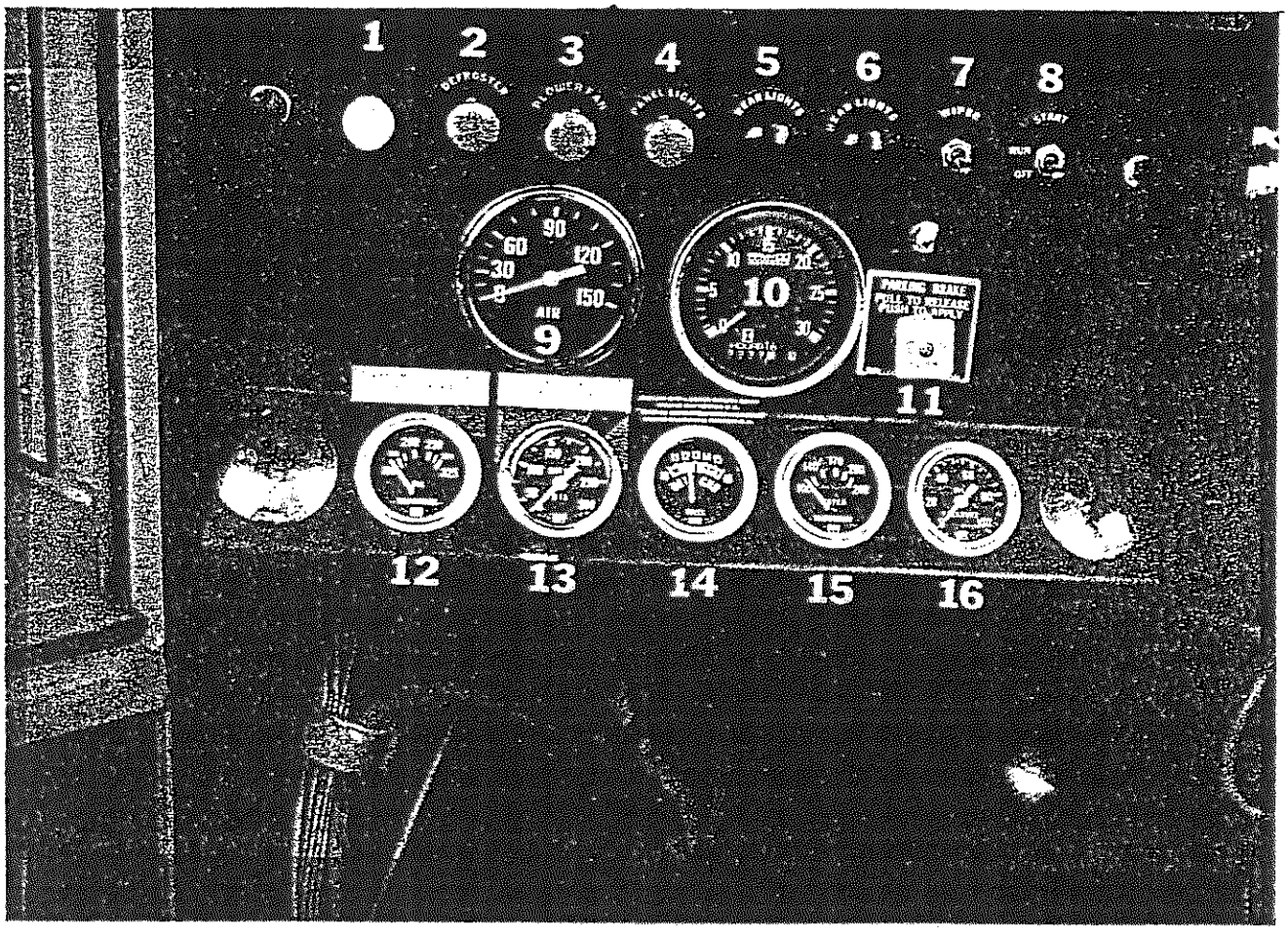


FIGURE 1

INSTRUMENT FUNCTION

FIGURE 1 illustrates a typical Carrydozer instrument panel. Instrument function is as follows:

1. HEATER: Switch for heater fan motor. Variable speed.

2. DEFROSTER: Switch for defroster fan motor. Variable speed.

3. BLOWER FAN: Switch for cab pressurizing fan motor. Variable speed.

4. PANEL LIGHTS: Switch for panel lights.

5. REAR LIGHTS: Toggle switch for cab mounted rear lights.

6. HEAD LIGHTS: Toggle switch for cab mounted head lights.

7. WIPER: Windshield wiper "ON" and "OFF" control valve. Variable speed.

8. STARTER: Diesel engine starter toggle switch.

9. AIR GAUGE: Indicates the amount of pressure in the air reservoir. Operating pressure is 60 + psi. Below 60 psi a red warning light (within the gauge) will come on.

10. RPM: An electrical tachometer indicating engine revolutions per minute. To read, multiply indicated number by 100. Example; indicated 20 x 100 = 2000 RPM. Also, the gauge indicates hours of engine operation.

11. SPRING BRAKE: This is an emergency brake control system operating from the unit air system, but, out of an independent air receiver. When the button is depressed air/over/hydraulic applies the wheel brakes. Pull to release, providing the unit air system is 60 psi or more, otherwise, the brakes will not release. The unit air system pressure must be 60 psi + to override the locked brakes. Prevents unit movement with low air pressure.

12. OIL TEMPERATURE: Converter oil temperature. This gauge should read between 200°F/250°F. A converter "stall condition" will be indicated here with a rise above normal in temperature.

13. DRIVE OIL: Transmission oil pressure. This is the pressure that operates the oil clutches.

14. VOLTMETER: The voltmeter indicates the voltage condition of the battery, whether the alternator is or is not charging. The numbers 10-16 indicate volts, not amperage, and the dial is color coded for easy reference.

15. WATER TEMPERATURE: This gauge indicates engine coolant temperature. Should temperature hold steady at 200°F or above - stop and determine the cause.

16. OIL PRESSURE: Engine lubricating oil pressure. Determines pressure only - not the amount. Should this pressure drop below normal during operation - stop the engine immediately and determine the cause.

REFER TO FIGURE 2:

17. EMERGENCY BRAKE LIGHT: If the key switch is "ON" and the emergency brake is set, this light will be on.

18. TRANSMISSION FORWARD - NEUTRAL AND REVERSE LEVER.

19. TRANSMISSION SPEED RANGE SELECTOR LEVER: Three speeds and neutral.

20. AIR BRAKE PEDAL: Brakes all four drivers simultaneously. The floor mounted engine foot throttle is not shown.

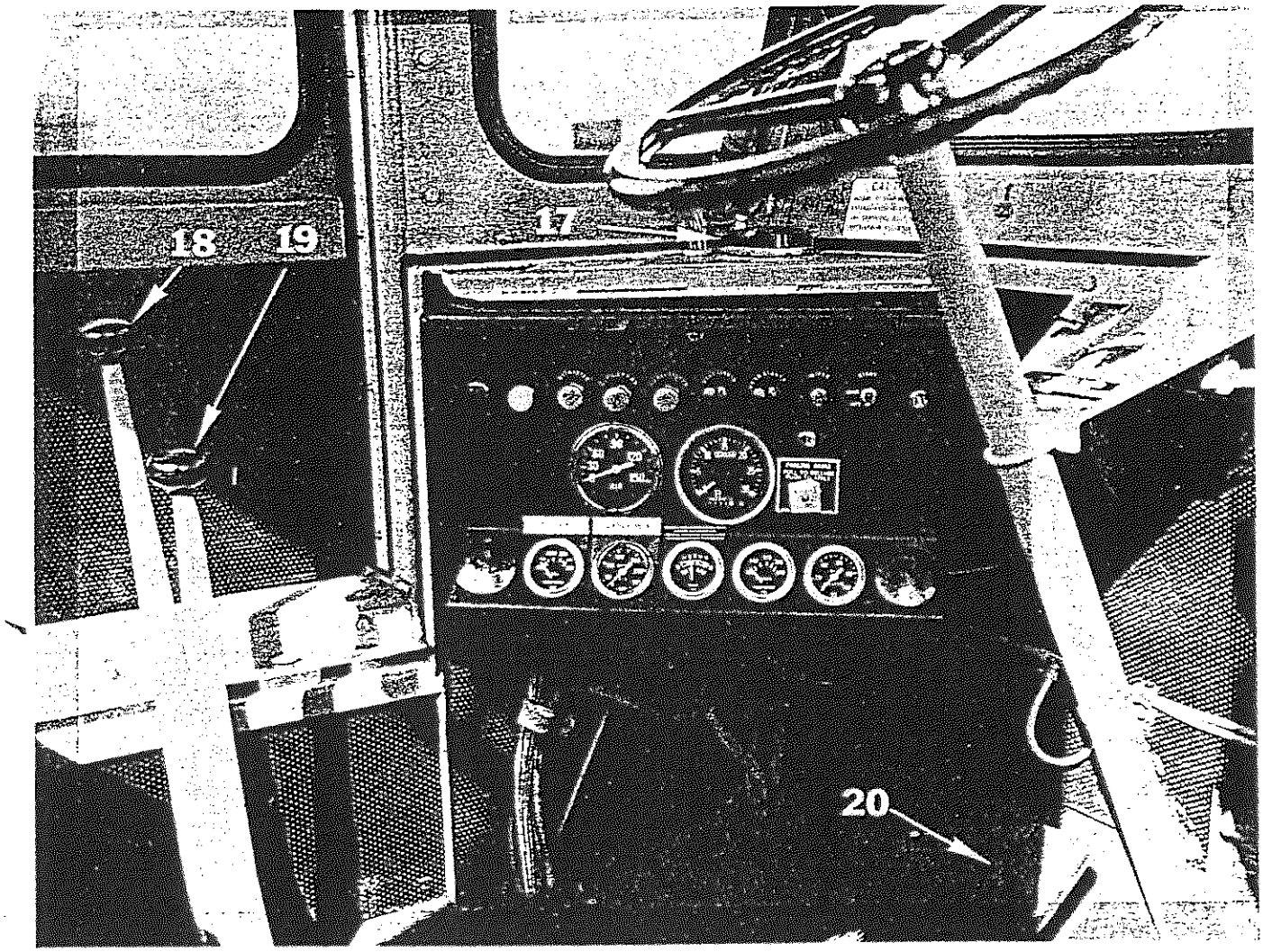


FIGURE 2

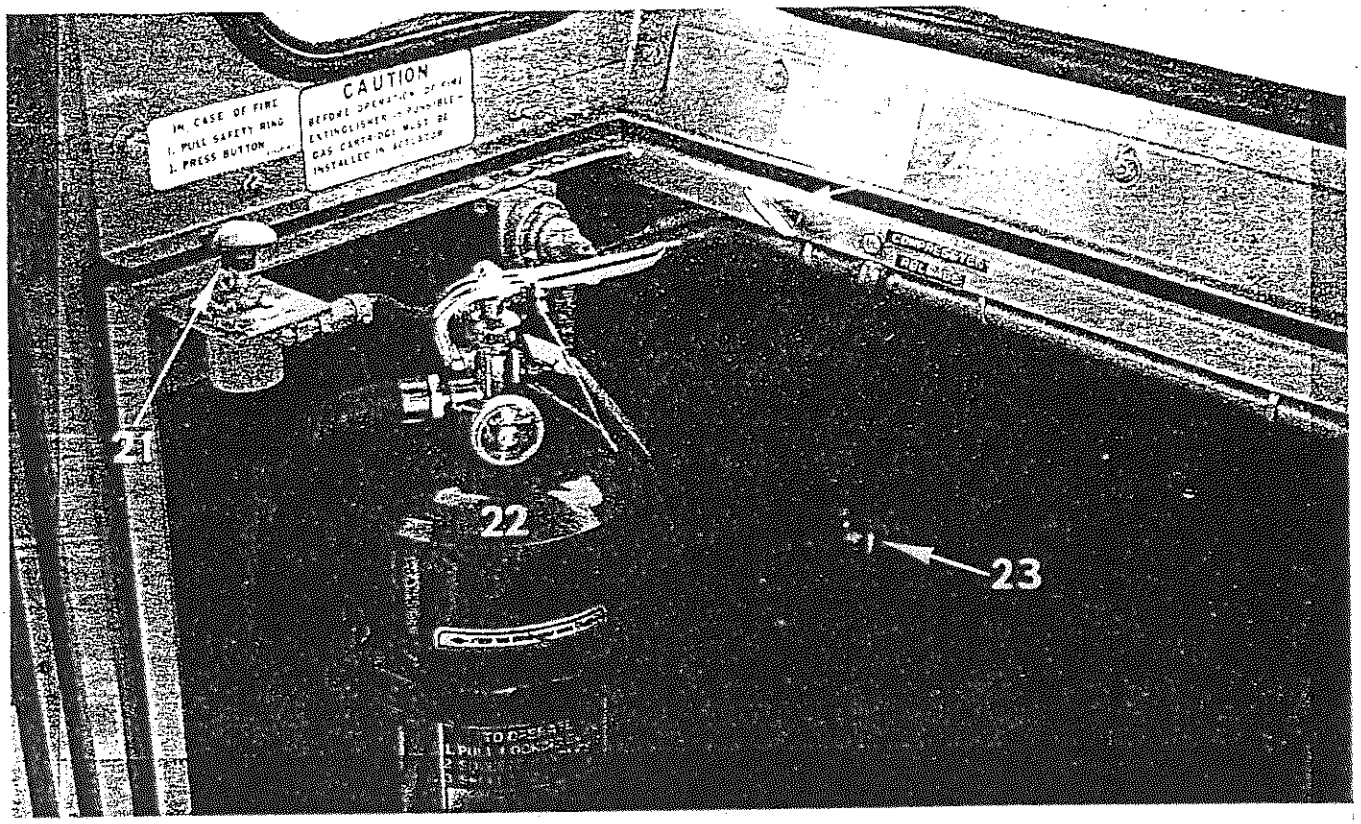


FIGURE 3

REFER TO FIGURE 3:

21. FIRE EXTINGUISHER SYSTEM: Release control for the dry type unit fire extinguisher.

22. PORTABLE FIRE EXTINGUISHER.

23. COMPRESSION RELEASE: Lever to actuate the compression release mechanism. A cold weather starting aid.

24. QUICK START: Manual control for an injection of quick start vapor for cold weather engine operation.

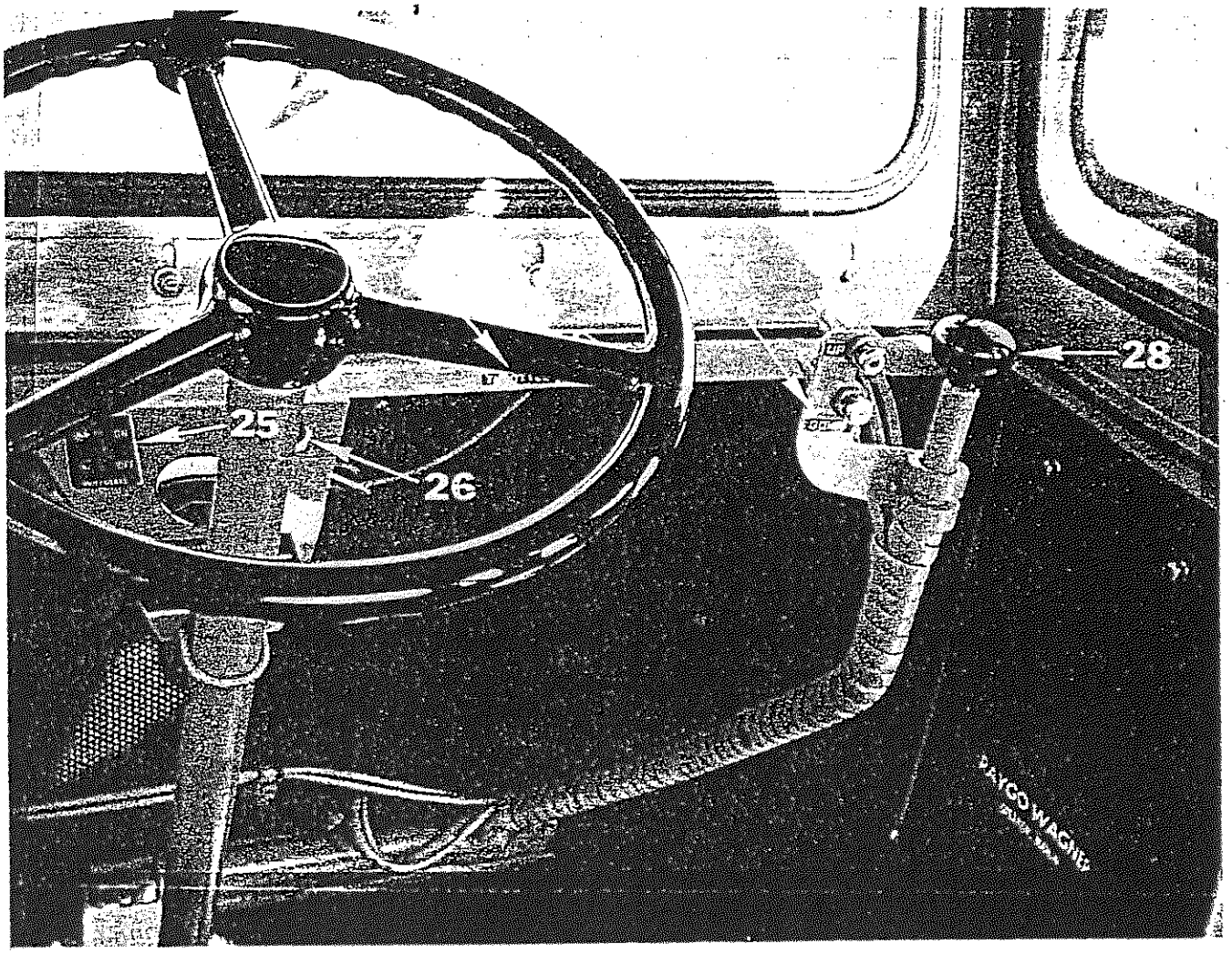


FIGURE 4

REFER TO FIGURE 4:

25. DECLUTCH: A lever to engage or disengage the transmission declutch valve. The declutch operation is explained in detail.

26. HORN BUTTON.

27. THROTTLE: Manual control, pull for RPM increase. Overrides foot throttle. To lock in out position turn throttle clockwise.

28. HOIST LEVER: Push forward to lower the bucket. Pull back to hoist.

29. DOWN BUTTON: Tilts the bucket back. The fill position.

30. UP BUTTON: Tilts the bucket forward. The dump position.

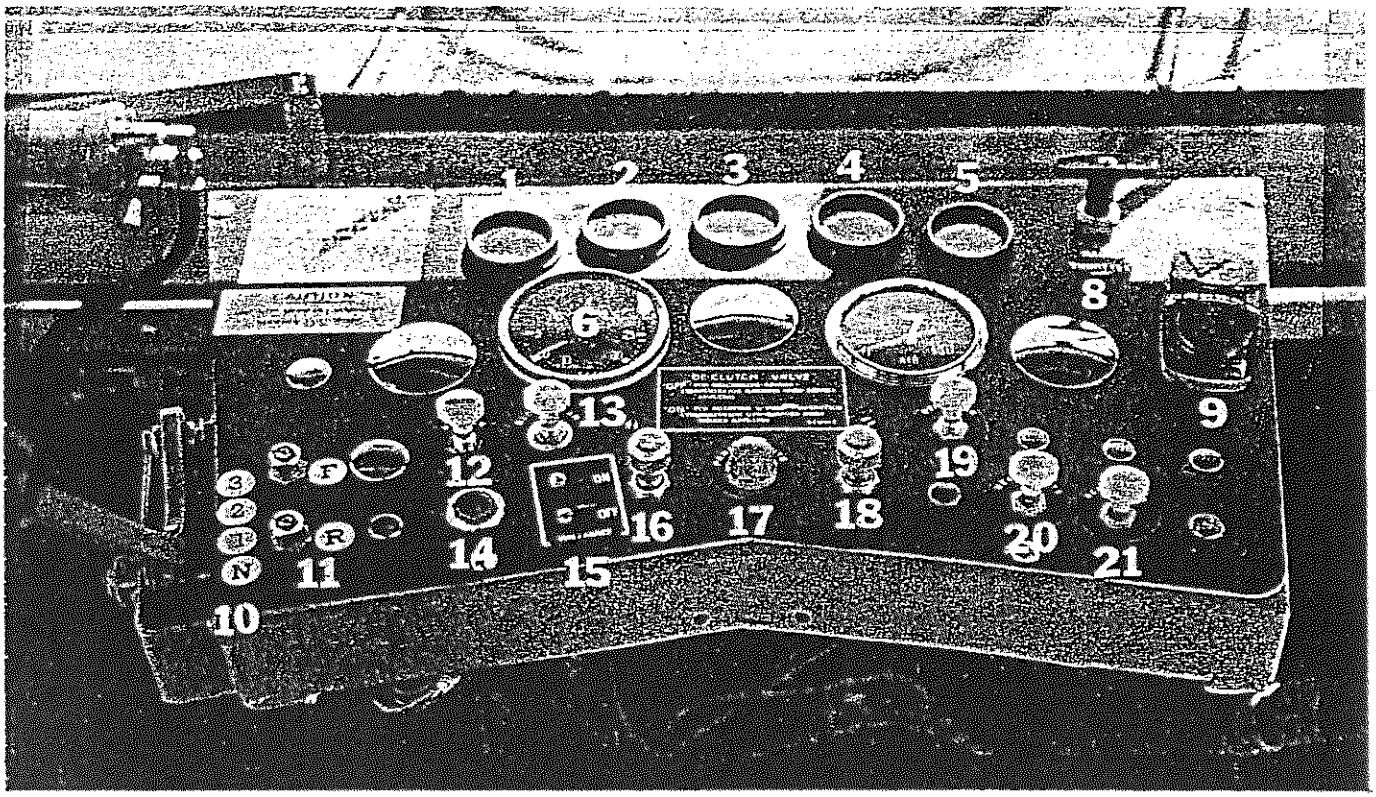


FIGURE 5

As of 1976 the instrument panel was mounted directly in front of the steering wheel rather than the lower left hand corner of the cowl. FIGURE 5 is a typical installation, however, in this illustration the steering wheel and post have been removed to show an unrestricted view. Instrument function is as follows:

1. DRIVE OIL: Transmission oil pressure. This is pressure that operates the transmission oil clutches.

2. OIL TEMPERATURE: Converter oil temperature. This gauge should read between 200°F, and never over 250°F. A converter "stall condition" will be indicated here with a rise above normal in temperature.

3. VOLTMETER: The voltmeter indicates the voltage condition of the battery, whether the alternator is or is not charging. The numbers 10-16 indicate volts, not amperage, and the dial is color coded for easy reference.

4. OIL PRESSURE: Engine lubricating oil pressure. Determines pressure only - not the amount. Should this pressure drop below normal during operation - stop the engine immediately and determine the cause.

5. WATER TEMPERATURE: This gauge indicates engine coolant temperature. Should temperature hold steady at 200°F or above - stop and determine the cause.

6. RPM: An electrical tachometer indicating engine revolutions per minute. To read, multiply indicated number by 100. Example: indicated 20 x 100 = 2000 RPM. Also, the gauge indicates hours of engine operation.

7. AIR GAUGE: Indicates the amount of pressure in the air reservoir. Operating pressure is 60 + psi. Below 60 psi a red warning light (within the gauge) will come on.

8. THROTTLE: Engine hand throttle. Pull to increase RPM. Turn throttle either right or left to lock the control.

9. EMERGENCY BRAKE LIGHT: If the key switch is "ON" and the emergency brake is set, this light will be on.

10. GEAR SHIFT: Transmission gear shift ranges. Can be up-shifted from first through third without reducing RPM and without emgaging neutral. The transmission can be down-shifted in the same manner. However, it is advisable to reduce RPM as you can over-speed the engine. Neutral - first - second and third gears are indicated by; N-1-2-3.

11. FORWARD AND REVERSE CONTROL BUTTONS: Press to engage the transmission into forward or reverse.

12. HEATER: Switch for heater fan motor. Variable speed.

13. BLOWER FAN: Switch for cab pressurizing fan motor. Variable speed. Optional equipment, may or may not be used on your unit.

14. KEY SWITCH: Ignition type key switch that opens or closes the accessory and alternator circuits.

15. DECLUTCH: A lever to engage or disengage the transmission declutch valve. The declutch operation is explained in detail in the Service Section under automatic transmissions.

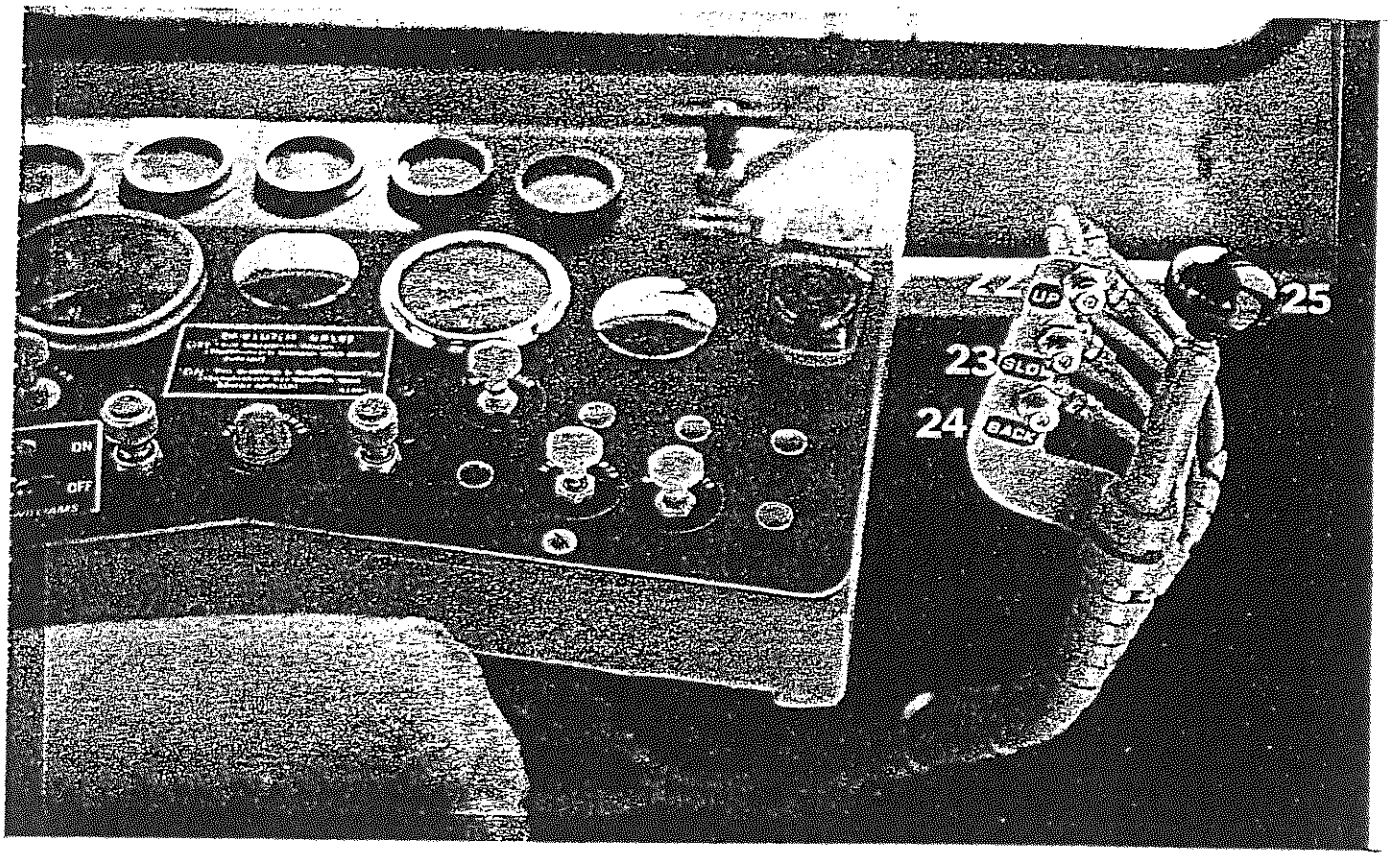


FIGURE 6

16. WIPER: Windshield wiper "ON" and "OFF" control valve. Variable.

17. PANEL LIGHTS: Switch for panel lights.

18. WIPER: Windshield wiper "ON" and "OFF" control valve. Variable.

19. DEFROSTER: Switch for defroster fan motor. Variable speed.

20. HEAD LIGHTS: Toggle switch for cab mounted head lights.

21. REAR LIGHTS: Toggle switch for cab mounted rear lights.

REFER TO FIGURE 6:

22. UP BUTTON: Tilts the bucket forward. The dump position.

23. SLOW BUTTON: Tilts the bucket forward, but, at a slower speed than up button (22).

24. BACK BUTTON: Tilts the bucket back. The fill position.

25. HOIST LEVER: Push forward to lower the bucket. Pull back to raise the bucket.

The following controls are floor mounted:

AIR BRAKE PEDAL: Actuates wheel brakes. Application variable.

THROTTLE PEDAL: Engine foot throttle.

PARKING BRAKE: Lever, floor mounted. Pull up to engage.

There are two seat control levers; one is the forward and back adjustment and one is the swivel lock. Also, the seat can be adjusted to the operators height and weight. The air horn is controlled by a pull chain across the cab front just above eye level. A compression release control is located on the rear cowl. Can be used as a cold weather starting aid or an engine panic stop. All units are equipped with a fire extinguisher. All instrument panels have additional mounting holes (plugged) for switches, controls or gauges as determined by options and engine installations.

CONTROL FUNCTION

The bucket tilt controls are a combination of air over hydraulic. The "UP" and "DOWN" push buttons actuate a slave cylinder which in turn actuates a valve spool in the high pressure hydraulic control valve. The hoist lever is mechanically connected to the hydraulic control valve. The results are an effortless, vibration free, one hand control. FIGURE 1 illustrates the bucket hoist and tilt cylinders. The hydraulic control valve is shown in the upper left hand corner of the illustration. FIGURE 2 shows the bucket in the dump position.

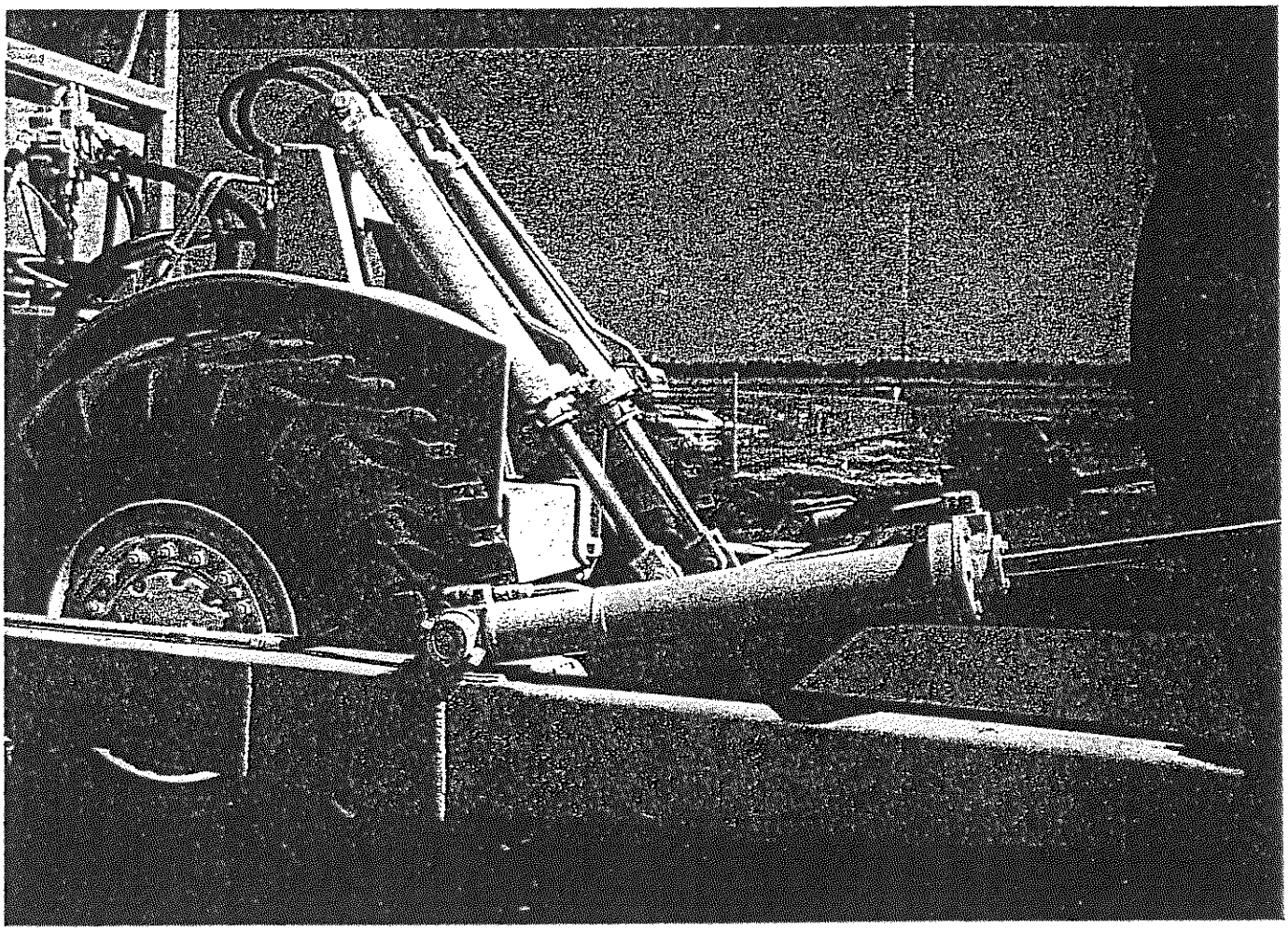


FIGURE 1

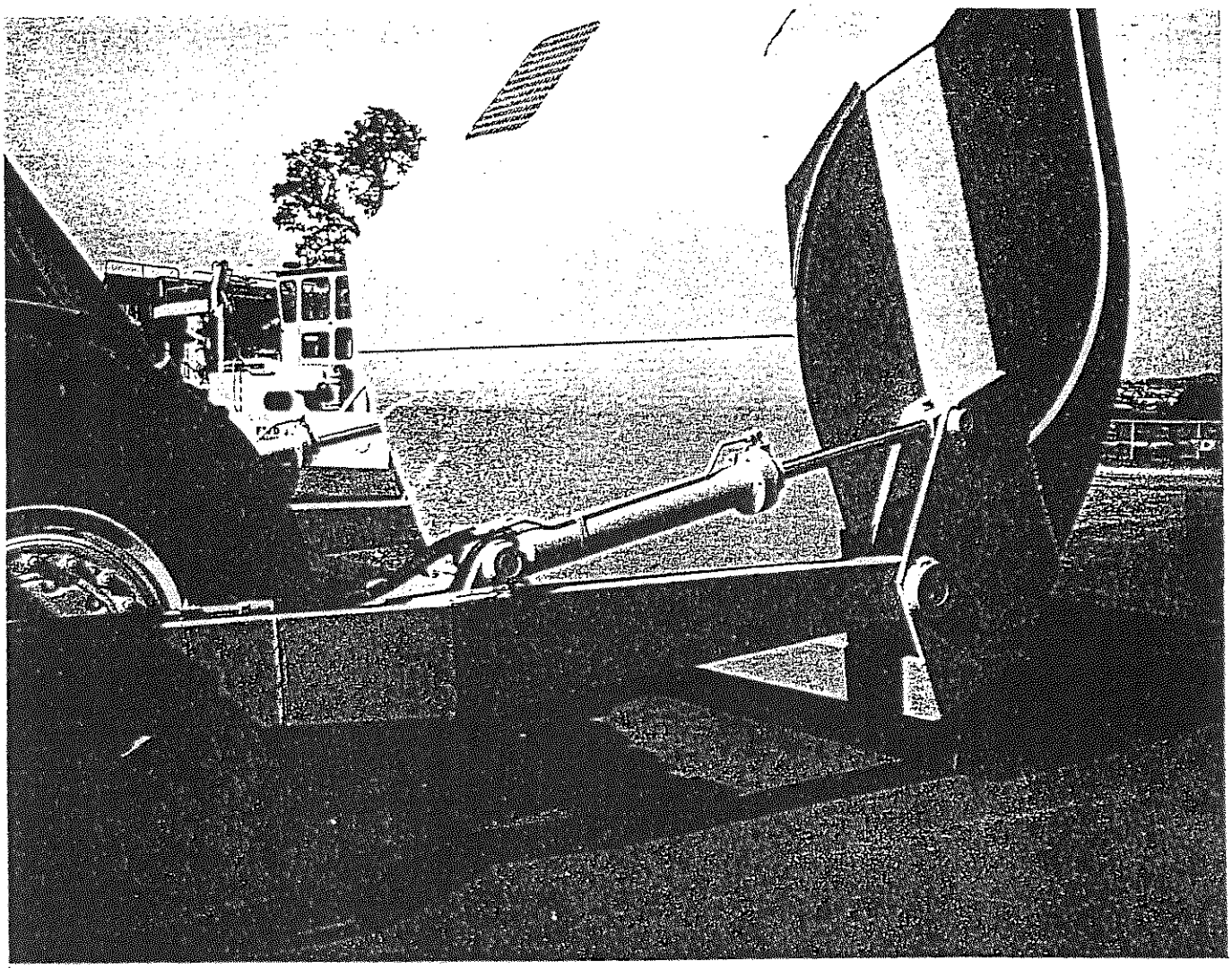


FIGURE 2

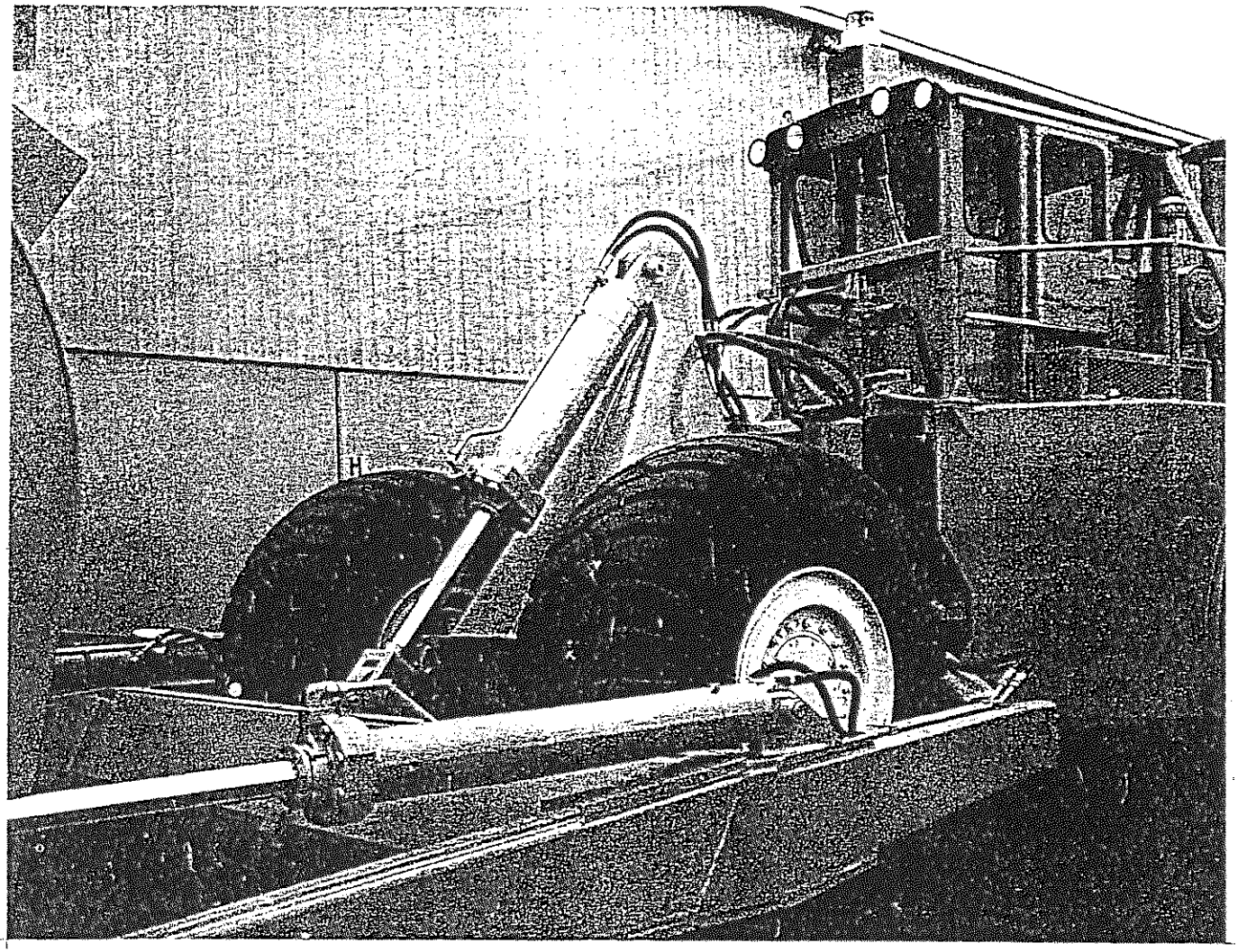


FIGURE 3

FIGURES 3 and 4 illustrate the Single Hoist Cylinder application as compared to the Double Cylinder application shown in FIGURE 1.

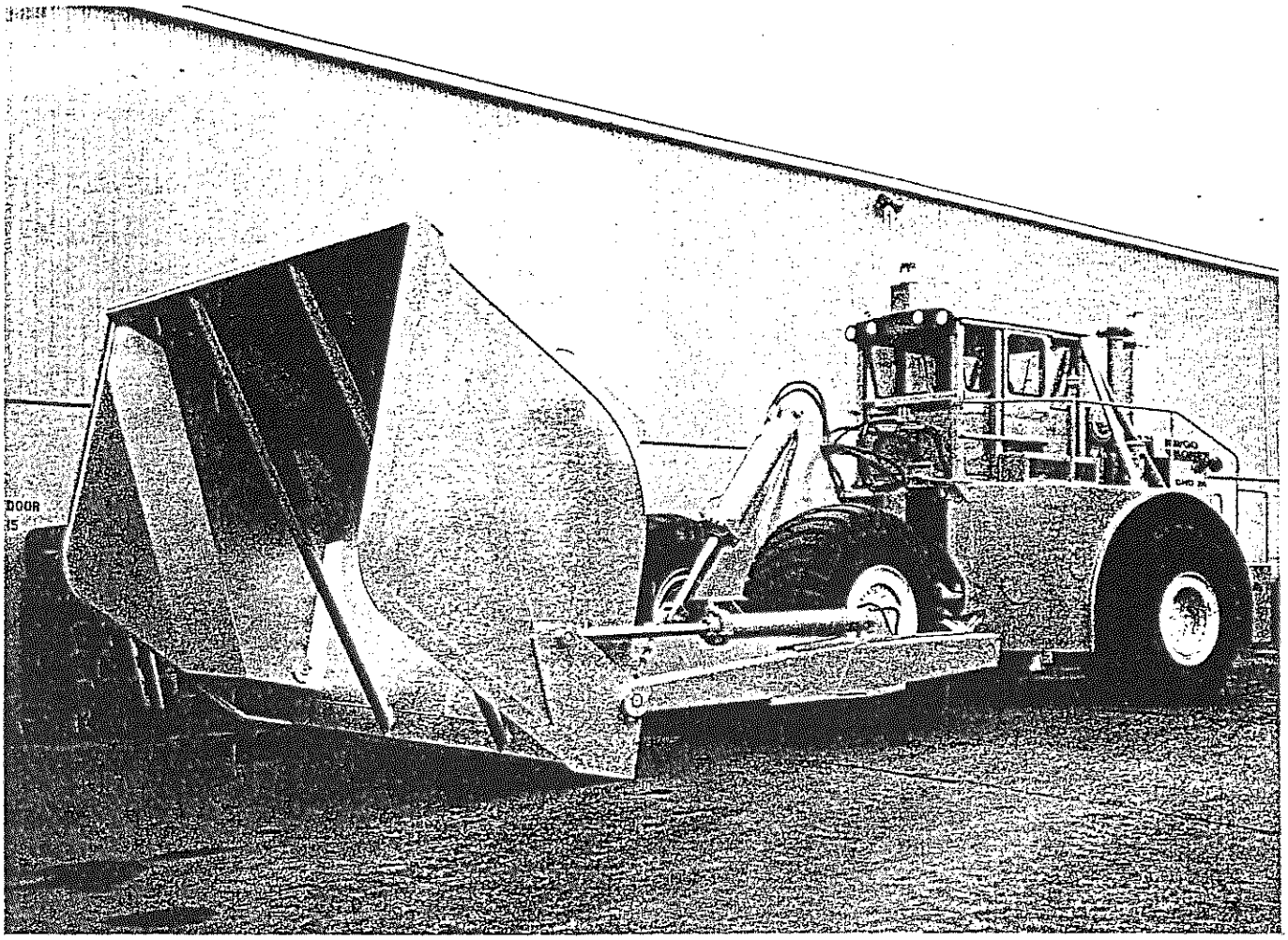


FIGURE 4

GENERAL OPERATING INSTRUTIONS

The WAGNER Carrydozer was developed for fast cycle times in pushing light to medium bulk materials at distances from 200 to 800 plus feet. Cycle times and volumes under 200 feet are limited by the distance required to load the bucket and the time required for bucket roll out and dump.

In comparing the Carrydozer bucket to the conventional straight or "U" type dozer blade, four unique and basic ideas are engineered into the Carrydozer bucket. They are:

1. The bucket retains all of the original material within the limits of the bucket throughout the dozing cycle.

2. The bucket will retain all of the material within the bucket when it becomes necessary to lift the bucket to reduce a spin-out tendency and maintain maximum speed.

3. The bucket in addition to pushing a full load will push half again as much in front of the bucket. Thus producing more volume per hour than the conventional dozer of the same size. This capability is possible because the material weight within the bucket is transferred to the drive wheels, producing maximum traction throughout the dozing cycle.

4. The bucket permits dozing maximum bucket loads around turns without losing the load.

FAMILIARIZE:

During the familiarization period we suggest your passes be made on relatively level terrain. This will acquaint you with the true feel of the controls and machine handling while loading.

Start your pass with the bucket rolled back against the stops. The angle of the cutting bit has been set at the factory for the correct loading angle, or draft.

Position the machine as far back as possible, and headed toward the dump area. This will give you time to fill the bucket and feel the control action without being in a hurry.

As you become familiar with the feel of the controls, and the action of the bucket during different loading conditions, you will recognize the advantages and where to use the procedure of "tilting the bucket forward" to gain additional cutting pressure. We discourage this practice until complete confidence in picking and dozing a load is achieved, simply because the additional control functions detract from the basic moves of picking up and dozing out.

GETTING THE JOB DONE:

Lower the bucket until it is resting flat on the ground. Selecting first gear and forward direction, proceed at about one half (1/2) throttle and observe the material flow into the bucket. At this point if the material appears not to be flowing fast enough, apply slight down pressure which will immediately increase the flow, and the material will appear to "boil". As this occurs, release the down pressure and maintain the boil until the bucket becomes full and the engine seems to lose RPM. Slowly apply throttle to maintain boil, being careful not to spin the wheels. (With a little practice you will be able to perceive this before it occurs). Now you are ready for the feel of "weight transfer" and a real surprise.

Apply slight up pressure, return to neutral as soon as engine RPM's pick up or spin-out is avoided. You will immediately notice an increase of material boiling into the bucket. Maintain this until bucket is full, at which time you can raise bucket to the planing position, adjusting up and down as necessary to maintain load without losing or boiling material. With a little practice on this phase of operation you will discover how easy it is to maintain a smooth work area, which is so important to fast cycle times, particularly on the return runs. Learning to spread to an even smooth depth is perhaps the most difficult phase of operating, but like every other machine you operate, familiararity and understanding along with practice you soon find yourself making all the necessary moves automatically.

Take a good look at the bucket cutting edge. Notice how it projects below the bucket hinge pin as it tilts forward during the dump cycle. First it is ever so slight, continuing to increase at a very fast rate as the bucket rolls out, until the total projection below the bucket hinge pin is about 12" to 18", depending on the model.

With this projection below grade, so to speak, you realize if the bucket is not raised this amount during dump or roll out, you would actually start to dig at a time when you were ready to dump. This, of course, would not only cause you to stall or spin-out, but leave a very rough or washboard dump area, as you attempt to raise the bucket after the digging started.

With this in mind, you know as you start to roll the bucket out to dump you must hoist, or raise the bucket the amount of projection below grade. Because the hoist control and the roll-out control buttons are on the same lever, the dump and hoist function is relatively easy to coordinate at this critical moment.

Here again, the usual "practice makes perfect" cliche is a fact. Understanding this requirement, it soon becomes automatic for perfect dump and grade control. Remember! You only have to

hoist 12" to 18" for clearance when dumping and maintaining grade, however, the thinner you spread the slower you roll out the bucket. This is because dumping the material too fast reduces the tractive weight and more material is dumped in front of the bucket than can be pushed with an empty machine.

Thin spreads require constant practice, and precise control, once achieved, a skill useful for stocking out where compaction is so important.

CONVEYOR CHUTE OPERATION

Side casting, or dozing out from conveyor chutes usually is a matter of moving high volumes of material in a relative short period of time, which requires picking up a full bucket load in a short space, and dozing it out 300 to 800 feet.

Because traction is so important, try to keep loose material from building up in the area where you are dozing and filling the bucket. You can do this by starting back from the base of the pile, lowering the bucket to the mean ground level without digging or picking up material, approach the pile at an angle to penetrate it with approximately one third to one half the width of the bucket. As the bucket fills, and spin-out appears imminent, apply lift or hoist pressure only as needed to prevent tire slippage, and steer slightly away from pile, which will also give additional relief to engine RPM's and tire slippage.

While this type operation makes it difficult to completely fill the off corner, the excess amount in the full corner usually will offset the low corner, so the average volume moved each pass far exceeds the straight or "U" blade type machine. In addition, you must remember the material picked up in the bucket each pass remains there until you selectively dump it. Several passes from each side will aid in obtaining maximum loads, and keeping a smooth level grade.

Continued dozing from one side and the occasional sloughing of the pile will sometimes cause an undersirable slope to the grade. This can easily be straightened out by moving away from the pile approximately one half the machine width for one pass. This allows one half the bucket on the high side to cut the slope out to the lowest level, thus leveling to original grade.

We know of no one who has read, "How To Do" instructions and became an expert in one try, however, we are confident that after you have read these instructions and familiarized yourself with the concepts and capabilities of this unique Carrydozer you will know how to start and then with practice, you can be an efficient operator.

BREAK-IN PERIOD

The initial break-in period for your unit is limited only by the engine break-in period. The hydraulic system is ready for full operation.

The way you operate your new engine during the first 50 to 100 hours service will have an important effect on the life of the engine and components. Its moving parts are closely fitted for long service, and even though most diesel engines are run on a dynamometer for several hours before they leave the factory, an additional period may be required before uniform oil films are established between all mating parts.

Generally speaking, proceed with a new engine as follows:

1. Operate most of the time at one-half to three-quarters throttle. Do not operate at maximum horsepower for more than five or ten minutes at a time.

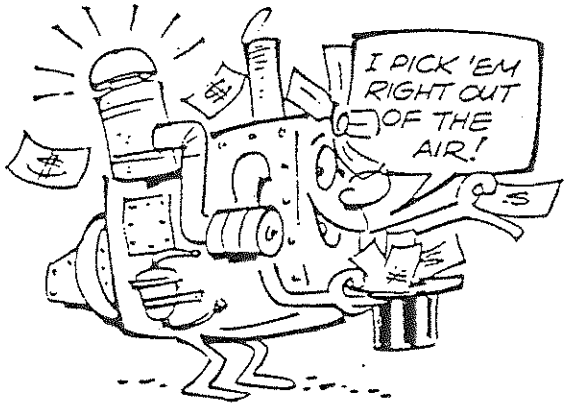
2. Do not idle the engine for long periods; because, this may cause cylinder walls to glaze before the piston rings seat properly, and the engine will continue to use too much lubricating oil.

3. Keep a close watch on your instruments. Back off on the throttle if oil temperature reaches 200°F, or if water temperature exceeds 185°F.

4. Operate in a gear low enough so you can accelerate under any condition.

5. Refer to your engine operation manual for specific information.

The operator of the engine assumes the responsibility of engine care while it is being worked. This is an important job and one that will determine to a large degree the extent of profit from the operation. There are comparatively few rules which the operator must observe to get the best service from your engine. However, if any of these rules are broken, a penalty is certain to follow. The penalty may be in "lack of work" accomplished because of lowered engine efficiency; or, it may be in "down time" and costly "repair bills" resulting from premature engine failure.



Of special interest to Owner/Operators are the various Warranty Programs offered by engine and transmission manufacturers. There are warranties that provide service and parts replacement, as well as extended forms of warranties that protect against basic structural failures. For details on the various programs (current information, forms, etc.), contact your WAGNER dealer in your area. The merits of these programs are well worth the efforts required.

NORMAL & COLD WEATHER ENGINE STARTS

CUMMINS DIESEL - NORMAL START

Before starting the engine or a work shift, it is assumed that the machine has received a normal servicing, therefore, we are ready to start. For a Cummins installation proceed as follows:

1. Sit in your normal operating position and check the seat position for your personal comfort. Adjust as required.

2. Set the emergency brake and see that transmission and controls are in neutral.

3. Give warning that you are going to start the engine. REMEMBER! There is ample space within the engine and transmission compartments for several men, and you cannot see them from the cab.

4. Turn the key switch to ON. The emergency brake light and circuit lights should come ON. The voltmeter and air pressure gauge should give a reading. Normally, the remaining gauges and switches will be OFF.

5. Press the starter button. NOTE: If the engine does not start within a (30) second engagement, allow the starter to cool for (2) minutes before engaging for a restart.

6. When the engine starts, depress the foot throttle to a fast idle (1000) RPM. Then pull the hand throttle up to that point and lock. Release the foot throttle and allow for warm up. Time required depends on the ambient temperature. Generally speaking, run until the engine temperature comes up to at least 130°F. Do not apply full load before the temperature reaches 160°F. REMEMBER! High RPM and full load conditions on cold oils can severely damage engines, pumps and system components.

7. Meanwhile, observe your gauges. Engine and converter oil pressures should rise immediately on engine start. If NO pressure is indicated within (5) seconds - STOP - the engine and investigate. Temperature gauges will rise more slowly. If the air pressure is less than 60 psi the red warning light (not safe to operate) will come on. If the air system is normal you will have 60 psi within a few seconds. The voltmeter should be registering in the "engine running" range. On initial start the exhaust may be white. This condition indicates a low combustion temperature and will clear when the engine comes up to normal heat.

8. When engine temperature and air pressures are in operating range, you are ready to move out.

Stopping procedure for a Cummins Diesel is as follows:

1. Move throttle to idle speed, and let the engine idle for a minimum of (5) minutes in order to normalize internal engine temperatures.

2. Meanwhile, place all controls in neutral and set the emergency brake.

3. Turn the key switch to OFF position. DO NOT use the compression release as an engine shut-down device. Stopping the engine in this manner will result in extensive wear to the valve mechanism.

CUMMINS DIESEL – COLD WEATHER START

In making a cold weather start with a Cummins Diesel, proceed with steps 1-2-3 and 4 as you did in a normal start. For step (5) proceed as follows:

5. Pull OUT the Quick-Start knob for 2 to 3 seconds (this allows the valve chamber to fill).

6. Push IN the Quick-Start knob for 2 to 3 seconds (this allows the valve chamber to empty into the engine intake manifold).

7. Press the starter button. If the engine does not start within (30) seconds, STOP, allow the starter to cool for (2) minutes and repeat steps 5-6 and 7.

In extremely cold weather, (below zero), it may be necessary to double the Quick-Start shots by doing steps (5) and (6) without using the starter. Now repeat steps 5-6 and 7.

The Cummins Diesel has an additional starting aid in its Comoression Release. Objective is to cycle the engine with no compression resistance to reduce the stiffness caused by cold weather. To accomplish this - proceed with steps 1 - 4 as in a normal start. Now, with the compression release engaged (pull-up), cycle the engine with the starter. As to how long and at what ambient temperature, is best determined by the operators experience.

DETROIT DIESEL - NORMAL START

Before starting the engine or a work shift, it is assumed that the machine has received a normal servicing, therefore, we are ready to start. For a Detroit Diesel installation proceed as follows:

1. Sit in your normal operating position and check the seat position for your personal comfort. Adjust as required.

2. Set the emergency brake and see that transmission and controls are in neutral.

3. Give warning that you are going to start the engine. REMEMBER!! There is ample space within the engine and transmission compartments for several men, and you cannot see them from the cab.

4. Check the instrument panel and see that the "PULL-TO-STOP" control knob is down, or in the depressed position.

5. Turn the key switch to ON. The emergency brake light and circuit lights should come ON. The voltmeter and air pressure gauge should give a reading. Normally, the remaining gauges and switches will be OFF.

6. Press the starter button. NOTE: If the engine does not start within a (30) second engagement, allow the starter to cool for (2) minutes before engaging for a restart.

7. When the engine starts, depress the foot throttle to a fast idle (1000) RPM. Then pull the hand throttle up to that point and lock. Release the foot throttle and allow for warm up. Time required depends on the ambient temperature. Generally speaking, run until the engine temperature comes up to at least 130°F. Do not apply full load before the temperature reaches 160°F. REMEMBER! High RPM and full load conditions on cold oils can severely damage engines, pumps and system components.

8. Meanwhile, observe your gauges. Engine and converter oil pressures should rise immediately on engine start. If NO pressure is indicated within (5) seconds - STOP - the engine and investigate. Temperature gauges will rise more slowly. If the air pressure is less than 60 psi the red warning light (not safe to operate) will come on. If the air system is normal you will have 60 psi within a few seconds. The voltmeter should be registering in the "engine running" range. On initial start the exhaust may be white. This condition indicates a low combustion temperature and will clear when the engine comes up to normal heat.

9. When engine temperatures and air pressures are in operating range, you are ready to move out.

Stopping procedure for a Detroit Diesel is as follows:

1. Move throttle to idle speed, and let the engine idle for a minimum of (5) minutes in order to normalize internal engine temperatures.

2. Meanwhile, place all controls in neutral and set the emergency brake.

3. Pull out the "STOP" control to stop the engine.

4. When the engine stops, push the "STOP" control IN AND TURN OFF the key switch.

DETROIT DIESEL - COLD WEATHER START

In making a cold weather start with a Detroit Diesel, proceed with steps 1-2-3 and 4 as you did in a normal start. For step (5) proceed as follows:

5. Pull OUT the Quick-Start knob for 2 to 3 seconds (this allows the valve chamber to fill).

6. Push IN the Quick-Start knob for 2 to 3 seconds (this allows the valve chamber to empty into the engine intake manifold).

7. Press the starter button. If the engine does not start within (30) seconds, STOP, allow the starter to cool for (2) minutes and repeat steps 5-6 and 7.

In extremely cold weather, (below zero), it may be necessary to double the Quick-Start shots by doing steps (5) and (6) without using the starter. Now repeat steps 5-6 and 7.

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HEAVY LIFT VEHICLE START & STOP PROCEDURES

ENGINE PRE-START

(1) Make sure the engine oil and coolant levels have been checked before attempting to start the engine.

(2) Sit in your normal operating position and adjust the seat for your personal comfort.

(3) Check for emergency/parking brake engagement: Pull knob to set the spring applied driveline disc brake. This brake will apply automatically when air pressure drops below 60 psi.

(4) Check for neutral: Place the shift lever at neutral position, "N" on the gear quadrant.

(5) Give warning that you are going to start the engine. Remember, there is ample space within the engine, transmission, and driveline compartments for several men, and you cannot see them from the cab. Be sure the area around the unit is clear of all personnel and obstructions.

(6) Turn the key switch to the "ON" position. The emergency brake light and circuit lights should come on.

ENGINE START-UP

(1) Depress the lock button on start cable knob and pull knob all the way up. (On units with a LOW ENGINE OIL PRESSURE SHUTDOWN system).

(2) Turn the key switch to the start position. NOTE: If engine does not start within 30 seconds, allow the starter to cool for two minutes before re-engagement.

(3) When the engine starts, let it idle. Do not accelerate. Remember, high RPM and full load conditions on cold oil can severely damage the engine, transmission and hydraulic system.

(4) If a rise in oil pressure of the engine or transmission is NOT observed within FIVE seconds, or a rise in air pressure is not seen in TEN seconds, shut down the engine and have maintenance check it out.

(5) After engine is running and engine oil pressure has stabilized, depress the lock button on the start cable knob and push the knob all the way down. (On units equipped with a LOW ENGINE OIL PRESSURE SHUTDOWN system).

CAUTION: Failure to return the cable knob to its original position will cause the low oil pressure shutdown, as well as other safety shutdown devices to malfunction.

(6) Warm the engine at idle until the air pressure reaches at least 60 psi, then recheck that the transmission is in neutral and the parking brake applied. Using the hand throttle, continue to warm the engine at 1000 RPM until the engine temp reaches at least 130°F, and the air pressure rises to 120 psi.

(7) Release the hand throttle. Meanwhile, observe the gauges for proper readings and operation; also, check the operation of all safety equipment and accessories.

(8) Select gear speed, release parking brake and press right floor button for forward movement, or left hand button for reverse.

ENGINE SHUT-DOWN

(1) Move throttle to idle speed, and let the engine idle for a minimum of (5) minutes in order to normalize internal engine temperatures.

(2) Meanwhile, place all controls in neutral and set the emergency brake.

(3) To stop the CUMMINS and CATERPILLAR engine, turn the key switch to "OFF" position. DO NOT use the compression release as an engine shutdown device. Stopping the engine in this manner will result in extensive wear to the valve mechanism. For DETROIT DIESEL, pull the stop control "OUT". When the engine stops, push the stop control "IN" and turn off the key switch.

LET'S MOVE OUT

CHIP & COAL DOZER OPERATION

On occasion and in reference to dozer operating prodedures, a new man may ask - "How do I start"? The following information has been gleaned from experience and we trust that it will be helpful. Basically, the procedures herein do apply to transporting coal or chips, but, in the following text we will use the term "chips" only.

If possible, start your first pass back away from the pile so that you are able to get a level start. Tilt the bucket all the way back until it comes up against the stops. Let the bucket down until it touches the chips and then stop. If you let the bucket rest too heavily on the chips, it will cause the bucket to start digging too rapidly.

While you are learning dozer operation we suggest that you stay in first gear until you feel familiar with the operation of the machine, and how well you are able to keep a level grade. With familiarity you can push into higher gears. If you are starting your push on the crown of a pile (hill), or starting up a pile and your cutting edge is not digging in (or perhaps you want to dig faster), tilt the bucket forward slightly (dump position) to start the cut faster. After the cut has started, roll the bucket back to the stops to slow the cut down and give you more of a planing action, or, you may find that you are digging a deep hole to start off with.

The proper way of filling the bucket is to gradually pick up your load as you move along. Do not try to fill the bucket in one spot, unless you are specifically cutting down one area, or your cutting out of a pile. If you pick up your load gradually you will keep a more level floor and avoid the washboard effect. Once you have started your cut the bucket edge disappears from view, so you will have to go mainly by the feel of the machine and by watching the chips as they fill the bucket. If you see the chips boiling up rapidly in the bucket and you feel the machine starting to pull down; then you will know that you are picking up chips too fast, and that you must bring the hoist up slightly. If you bring the hoist up too high you will have a tendency to start losing your load, thus leaving a hump or pile of chips in front of you. Also, if you notice that your load is beginning to fall you are probably too high, and you are losing your load by going over the top of the chips - hoist down slightly with the lift arms. Once you have your load, it is not necessary to keep digging, as the chips will boil over the back of the bucket resulting in lost motion and horse power. There is a happy point of balance, wherein the bucket does not gain or lose its load as you transport.

When working on an upgrade or pushing a large load you will experience the feel of the tires as they start to break or slip. At this time, let up slightly on the throttle and hoist up slightly to put more weight on the bogie axle (bucket end) to stop the spin-out. Here again, after you regain your footing, hoist back down so as not to lose your load. Generally speaking, hoisting up approximately two inches will transfer enough weight to stop a spin-out.

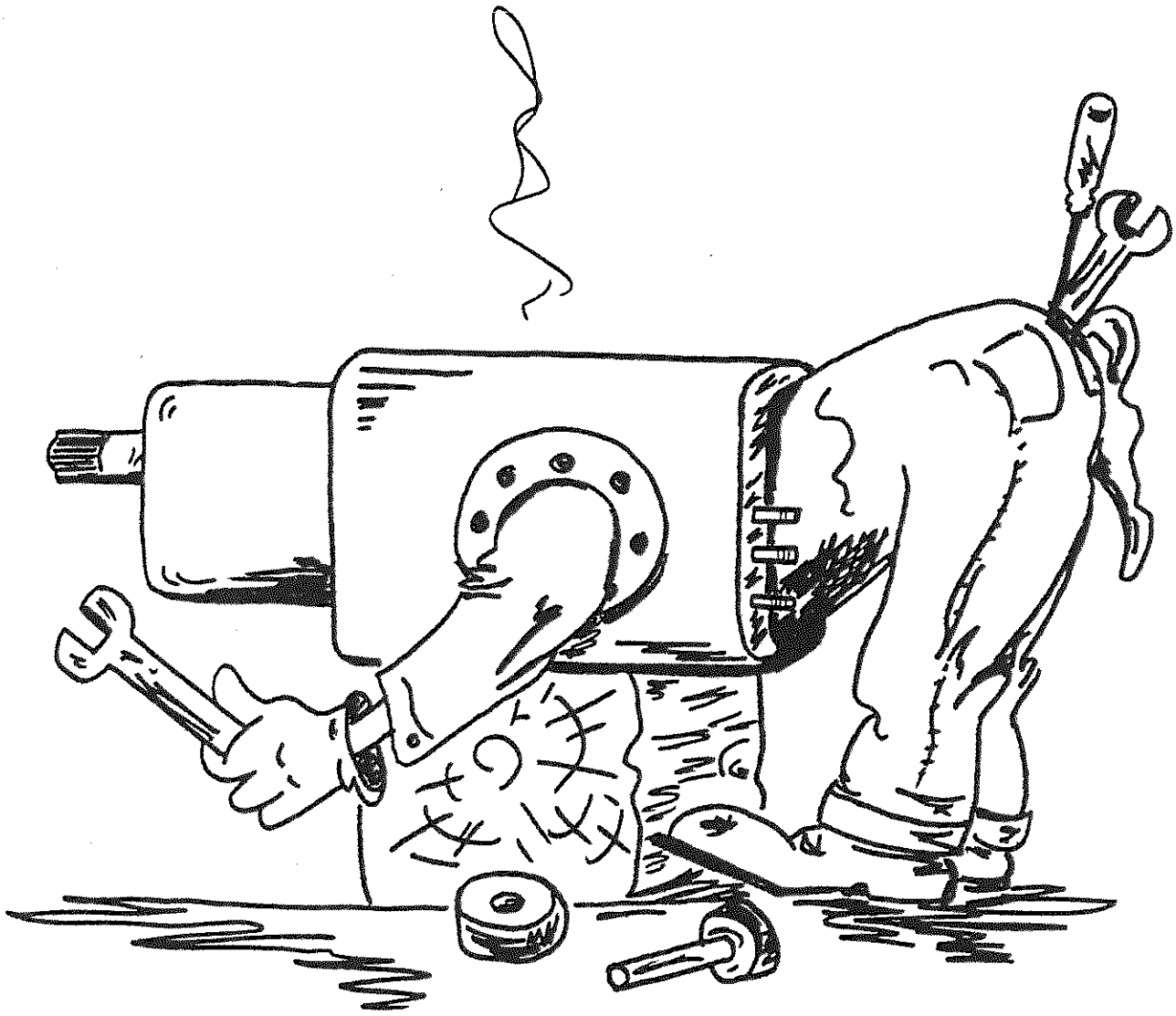
When pushing out of a pile from a truck dump, blower pipe or conveyor, do not try to fill the bucket as you would with a front end loader. The procedure is to shave off the edge of the pile gradually. By the time you get to the end of the pile you will have a load and you can then use the planing action to transport. The size and hardness of the pile will determine the amount of cut to take out. When cutting out of a pile make cuts at different angles, as this action will help break down the pile and make pushing easier. When cutting out of a pile, the pile has a tendency to build up a high face which can be dangerous if it topples. Go in with the bucket high to knock down the face, or, if possible, go around to the opposite side and push the pile over. If this is not done, there is a chance of the pile caving in on top of you. With a roll-over cab you are relatively safe, but pressure could break glass and that can be dangerous.

When you reach your dumping area you should have approximately (30) to (35) feet to dump your bucket before you reach the edge of the pile or hopper. In traveling that distance, hoist up approximately (8) to (10) inches and start dumping. Therefore, when you get to the edge of the pile or hopper, your load is in the full dump position, and you are ready to back away. In addition, when in the full dump position you are quite safe, as the cutting edge of the bucket is no less than (11) feet from the tires, which is quite a safety factor on this operation.

One last message. If you are spreading chips on a pile, hoist up approximately (6) to (8) inches and start tilting the bucket forward, which will spread the chips. The depth of the spread is determined by the height of the hoist while dumping.

3

MAINTENANCE & LUBRICATION



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MAINTENANCE & LUBRICATION

CHD-24S
CD-1000

80-268 (10-89)

C O N T E N T S

GENERAL

The regular care a machine receives by its operators and mechanics is generally rewarded by decreased downtime and greater reliability. With the help of the information in this section, you should be able to maintain your machine at top operating efficiency. The maintenance and lubrication procedures given here can be performed on the job site with a minimum of shop tools.

SAFETY PRECAUTIONS

Before doing any maintenance or lubrication, review the following safety precautions. They're included for your protection.

PERFORM MAINTENANCE ON LEVEL GROUND

The machine should be on level ground and free of traffic lanes whenever possible.

SUPPORT THE BOOM

Before doing any work under a raised boom or bucket, first do the following:

1. Empty the load.
2. Support the boom with a safety stand - don't rely on the hydraulics.
3. Shutdown the engine.
4. Set the parking brake and block the wheels.

INSTALL SWIVEL LOCKING BAR

A swivel locking bar is provided on 4-wheel drive models. Before working in the hinge area of the machine make sure this bar is installed. Place the machine on a level surface so that the locking bar can be aligned for pin insertion.

TAG KEY SWITCH

Before doing maintenance or lubrication remove the key from the switch, or tag the key switch "DO NOT START", to insure that the engine is not started inadvertently.

WHAT IS PREVENTIVE MAINTENANCE

Preventive maintenance is a system that is intended to detect problem areas and prevent equipment failure before trouble can develop to a critical point. The system is based on a series of maintenance checks and servicing points. To be effective, a preventive maintenance program demands strict adherence to a planned schedule of maintenance.

BENEFITS OF PREVENTIVE MAINTENANCE

The time that is diligently expended to make the required periodic checks is a real investment in working equipment and efficient use of manhours. Valuable benefits can be realized; all of which means savings in time and resources.

PREVENTIVE MAINTENANCE:

- IMPROVES EQUIPMENT AVAILABILITY - by minimizing the chances of breakdown.
- REDUCES UNEXPECTED DOWNTIME - crash repairs are expensive and detract from normal scheduled maintenance.
- REDUCES EQUIPMENT ABUSE - provides the abvility to predict component life and helps avoid operating equipment to destruction by replacing parts before they fail.
- ALLOWS PLANNING OF DAILY PRODUCTION - by knowing the condition of available equipment.
- ALLOWS PLANNING OF MAINTENANCE MANHOURS - by distribution of duties and necessary lead time for parts ordering.
- PROVIDES COMPLETE HISTORY OF EQUIPMENT - based on performance, frequency and type of failure and actual manhours expended on maintenance.
- PROMOTES SAFETY - well maintained equipment is more able to operate within its design specifications and react positively to the operator's control.

SHIFT MAINTENANCE

Shift maintenance is where preventive maintenance begins. The operator of the machine normally completes this inspection. It consists of the routine servicing and lubrication of the machines major systems. On a daily basis, the operator is in the best position to identify, remedy and/or record

potential problem areas and is able to quickly recognize any change in the performance of his machine. The comments he records on the shift maintenance report become a valuable tool to the maintenance department, and are an important ingredient to the overall success of a preventive maintenance program.

SHIFT MAINTENANCE CHECKLIST

A recomnmended checklist is given here as an aid in developing a practical shift maintenance program if one has not been developed by your company. a shift maintenance report, based on this checklist should be used to report defects found when making maintenance checks at the beginning of each shift.

Your company may have a different reporting method, however, it is usually a necessary requirement that this form be filled out at the end of each shift. Accurate shift maintenance reports can help your company anticipate maintenance problems and take action to prevent costly failures.

USING THE CHECKLIST

Actual operating environment governs the maintenance schedule. Some checks should be performed more often under heavy dust or other special conditions.

The maintenance schedule checklist is designed as a guide until adequate experience is obtained to establish a schedule to meet your specific operation.

A detailed list of component checks is provided through several check periods; also a suggested schedule basis is given for hours of operation, or calendar of time.

A maintenance schedule should be established using the checklist as a guide; the result will be a maintenance program to fit your specific operation.

OIL ANALYSIS SAMPLING PROGRAM

Use scheduled oil sampling (SOS) to monitor machine condition and maintenance requirements. Oil samples from Engine, Transmission, Axles and Hydraulic System should be taken when the oil is hot and well mixed to ensure an accurate analysis.

Consult your dealer for complete information and assistance in establishing a scheduled oil sampling program for your equipment.

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SHIFT MAINTENANCE CHECKLIST

EVERY 10 HOURS OR DAILY

Note general vehicle condition. Clear away all collected debris — steam clean if necessary. Check for mechanical damage and loose or leaking components. Report faults to maintenance department.

Before Starting Engine - Check The Following:

REF	ITEM	OK	NO	ADD
26	ENGINE (Check oil level - check for leaks)	☐	☐	____
6	FUEL TANK (Drain off moisture & sediment)	☐	☐	____
17	HYDRAULIC TANK (Check oil level - check for leaks)	☐	☐	____
1	RADIATOR (Check coolant level - check for leaks)	☐	☐	____
12	AIR CLEANER (Check indicator - clean or change A/R)	☐	☐	
8	ENGINE BELTS (Check for adjustment and wear)	☐	☐	
27	FUEL FILTER (Drain off water & sediment)	☐	☐	
2	AIR TANKS (Drain off water & sediment)	☐	☐	
1	RADIATOR & OIL COOLER (Are fins clean & unobstructed?)	☐	☐	
28	WHEEL & TIRE ASSEMBLIES (Check condition & pressure)	☐	☐	____
—	LUBRICATE CHASSIS (Refer to Lube Chart)	☐	☐	

After Starting Engine - Check The Following:

11	ENGINE (Does it sound normal?)	☐	☐	
19	INSTRUMENTS (Check for normal readings)	☐	☐	
19	CONTROLS (Check for normal operation)	☐	☐	
13	AIR INTAKE SYSTEM (Check for leaks and damage)	☐	☐	
14	EXHAUST SYSTEM (Check for leaks & excessive smoke)	☐	☐	
18	TRANSMISSION (Check oil level - Check for leaks)	☐	☐	____

Note Anything Abnormal Or In Need Of Repair:

LIGHTS _____ DEFROSTER _____ REVERSE W/HORN _____

HORN _____ WINDSHIELD WIPERS _____ _____

HEATER _____ AIR CONDITIONER _____ _____

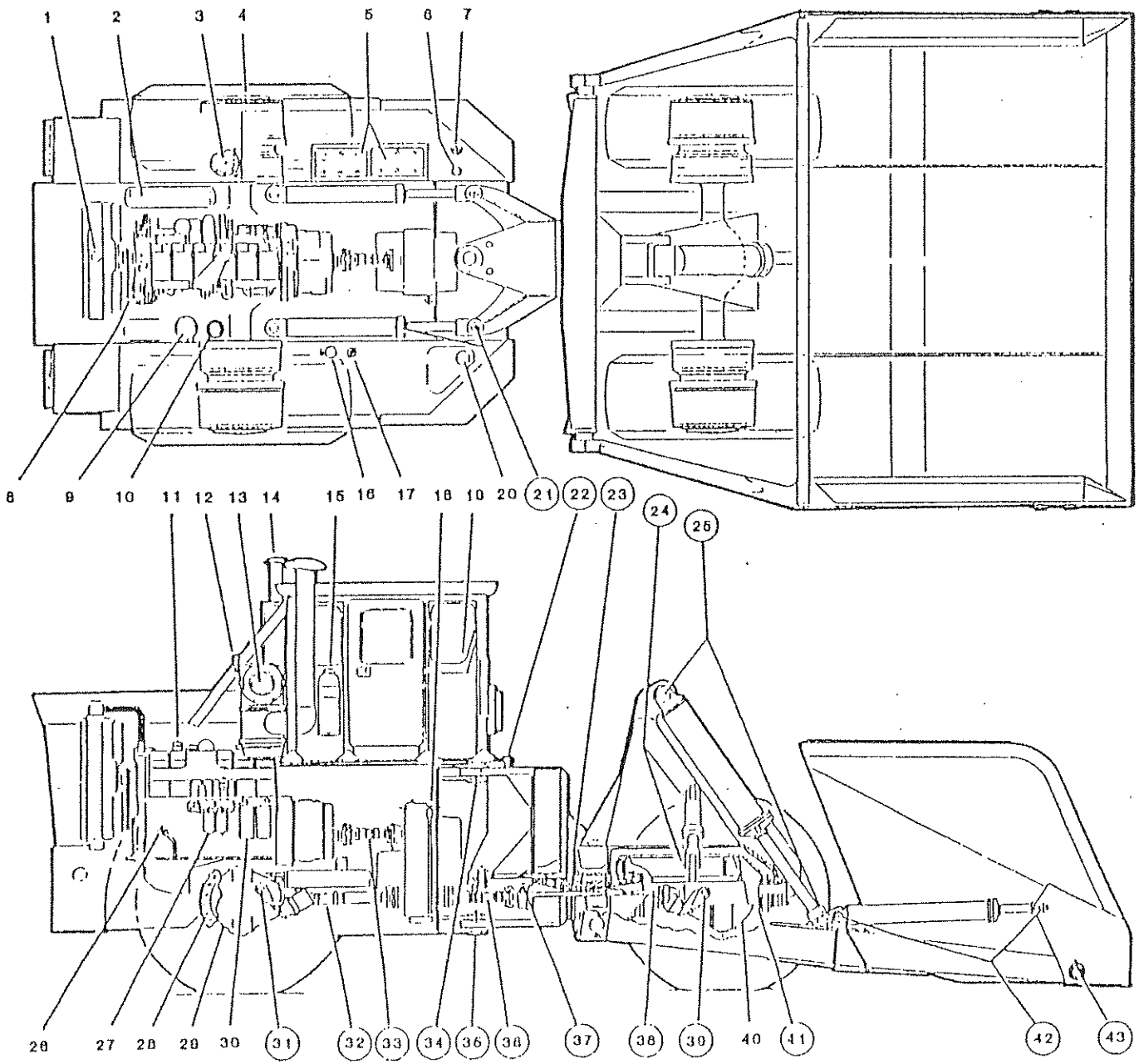
_____

_____

OPERATOR _____ SUPERVISOR _____ DATE _____

MODEL _____ SERIAL NO. _____ HOUR METER _____

LUBRICATION POINTS



10 HOURS		
REF	ITEM	FTGS
(21)	STEERING CYLINDER PINS	4
(25)	HOIST CYLINDER PINS	2
(42)	DUMP CYLINDER PINS	4
(24)	SIDE TILT CYLINDER PINS	2
(43)	LIFT ARM TO BUCKET PINS	2
(34)	HINGE PIN - UPPER	1
(35)	HINGE PIN - LOWER	1

50 HOURS		
(33)	DRIVELINE - CONV TO TRANS*	3
(32)	DRIVELINE - TRANS TO R AXLE*	3
(36)	DRIVELINE - TRANS TO SWIVEL*	3
(38)	DRIVELINE - SWIVEL F AXLE*	2
(37)	DRIVELINE - SUPPORT BEARING	1
(31)	SLACK ADJUST/CAMSHAFT - REAR	6
(39)	SLACK ADJUST/CAMSHAFT - FRONT	6
(23)	SWIVEL BEARING	1
(41)	CRADLE BEARING	1
(22)	STEERING CONTROL LINKAGE	4

* Use Hand Gun or Low Pressure Adapter. Lubricate sparingly.

○ Circled numbers indicate Lubrication points.

NOTE: Due to variations in engine types and models, the indicated locations of engine filters (fuel - oil - coolant) may not be exact. Consult your specific engine Service Manual for exact location.

COMPONENT CAPACITIES & LUBRICANTS
CHD-24S CD-1000

COMPONENT OR SYSTEM	REFILL CAPACITY (APPROX) U.S. GAL	LITERS	LUBRICANT TYPE*
ENGINE CRANKCASE W/FILTERS	13	49	HD ENGINE OIL -EO
FUEL TANK	220	833	DIESEL FUEL -DF
COOLING SYSTEM	23	87	WATER/ANTIFREEZE
HYDRAULIC SYSTEM	160	606	HYDRAULIC OIL -HO
TRANSMISSION & CONVERTER	15	57	TRANSMISSION OIL -TO
DIFFERENTIALS (Each)	16	61	GEAR LUBRICANT -GL
PLANETARY HUBS (Each)	2.5	9.5	GEAR LUBRICANT -GL
CHASSIS GREASE FITTINGS	AS REQUIRED		CHASSIS GREASE -CG

* SEE LUBRICANT SPECIFICATIONS, PAGE 9.

MAINTENANCE SPECIFICATIONS
CHD-24S CD-1000

HYDRAULIC PRESSURE SETTINGS

	MAIN	CIRCUIT
(1) Steering	2050 psi	2500 psi*
(2) Steering pilot Control	150 psi*	
(3) Bucket Dump	2050 psi	2500 psi**
(4) Bucket Hoist	2000 psi	2100 psi
(5) Side Tilt	2050 psi	2500 psi**
(6) Bucket Pilot Controls	450 psi*	

*Pre-set, Non-Adjustable
**Set with Engine at Idle

WHEEL LUGNUT TORQUE

Front & Rear . . . . . 500 Ft/Lbs

TIRE INFLATION PRESSURE

Front & Rear . . . . . 40-45 psi

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MAINTENANCE CHECKLIST

IMPORTANT: Consult engine manufacturer's Maintenance Manual for additional engine related maintenance checks and/or details.

EVERY 50 HOURS OR WEEKLY

1.	REPEAT THE 10 HOUR CHECK	OK_____	NO_____
2.	CHECK FOR FLUID LEAKS - OIL, FUEL, WATER	OK_____	REPAIR_____
3.	CHECK BRAKES FOR ADJUSTMENT & WEAR . . .	OK_____	REPAIR_____
4.	CHECK WHEEL NUTS & STUDS - MECHANICALLY	OK_____	REPAIR_____
5.	CHECK BATTERY ELECTROLYTE	OK_____	ADD_____
6.	LUBRICATE CHASSIS - REFER TO LUBE CHART .	OK_____	NO_____
7.	RECORD ENGINE RPM	HIGH_____	STALL_____
8.	CHECK FOR STRUCTURAL DAMAGE - INSPECT CHASSIS & ATTACHMENTS FOR BENDING, CRACKING, & BROKEN WELDS	OK_____	REPAIR_____

EVERY 250 HOURS OR MONTHLY

1.	REPEAT THE 50 HOUR CHECK	OK_____	NO_____
2.	CHANGE ENGINE OIL & FILTERS*	OK_____	ADDED_____
3.	TAKE ENGINE OIL SAMPLE FOR ANALYSIS*. . .	OK_____	NO_____
4.	CHECK AXLE DIFFERENTIAL OIL LEVEL	OK_____	ADDED_____
5.	CHECK AXLE PLANETARY OIL LEVEL	OK_____	ADDED_____
6.	CHANGE COOLING SYSTEM FILTER	OK_____	REPLACE_____
7.	CHECK ALL HYDRAULIC PRESSURES & RECORD. .	OK_____	NO_____
8.	CHECK FIRE SUPPRESSION SYSTEM	OK_____	NO_____

EVERY 500 HOURS OR QUARTERLY

1.	REPEAT THE 250 HOUR CHECK	OK_____	NO_____
2.	SERVICE FUEL FILTERS	OK_____	REPLACE_____
3.	SERVICE HYDRAULIC FILTERS*	OK_____	REPLACE_____
4.	SERVICE TRANSMISSION FILTERS*	OK_____	REPLACE_____
5.	TAKE OIL SAMPLES FROM TRANSMISSION, AXLE AND HYDRAULIC SYSTEM FOR ANALYSIS* . . .	OK_____	NO_____
6.	INSPECT BRAKE SYSTEM & COMPONENTS	OK_____	REPAIR_____

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MAINTENANCE CHECKLIST

IMPORTANT: Consult engine manufacturer's Maintenance Manual for additional engine related maintenance checks and/or details.

1000 HOURS OR SEMI-ANNUALLY

1.	REPEAT 500 HOUR CHECK	OK_____	NO_____
2.	CHANGE TRANSMISSION OIL & FILTERS* . . .	OK_____	ADDED_____
3.	CLEAN, FLUSH AND INSPECT COOLING SYSTEM	OK_____	ADDED_____
4.	CHECK PINS & BUSHINGS FOR WEAR	OK_____	REPLACE_____

2000 HOURS OR ANNUALLY

1.	REPEAT 1000 HOUR CHECK	OK_____	NO_____
2.	DRAIN, FLUSH & REFILL DIFFERENTIALS*. . .	OK_____	ADDED_____
3.	DRAIN, FLUSH & REFILL PLANETARIES*. . . .	OK_____	ADDED_____
4.	CHANGE HYDRAULIC OIL & FILTERS*	OK_____	ADDED_____

*Normal drain period & filter change intervals are for average environmental and duty-cycle conditions. Severe or sustained high operating temperatures or very dusty atmospheric conditions will cause accelerated deterioration and contamination.

Change intervals should be adjusted according to the results of oil sampling analysis. Consult your dealer for assistance in establishing an oil sampling program for your equipment.

REPAIRS:

PROBLEM:_____

PARTS:_____

_____

HOURS LABOR_____

REPAIRS:

PROBLEM:_____

PARTS:_____

_____

HOURS LABOR_____

OPERATOR:_____

SUPERVISOR:_____

PARTS:_____

MODEL:_____ SERIAL NUMBER:_____ HOUR METER:_____

_____

LUBRICANT SPECIFICATIONS

	MANUFACTURER & SPECIFICATION	RECOMMENDED VISCOSITY	PREVAILING AMBIENT TEMPERATURES (FAHRENHEIT)	(CELSIUS)
ENGINE	CUMMINS	SAE 10W-30	-13°F to 95°F	-25°C to 35°C
	MIL-L-2104D	SAE 15W-40	14°F and ABOVE(Normal)	-10°C and ABOVE(Normal)
	(API CD/SE)	SAE 20W-40	32°F and ABOVE	0°C and ABOVE
	DETROIT DIESEL	SAE 30	BELOW 32°F	BELOW 0°C
	MIL-L-46152	SAE 40	ABOVE 32°F	ABOVE 0°C
	API CC/SF	Note: Multi-grade oils are not recommended in Detroit Diesel Engines.		
	CATERPILLAR	SAE 5W-20	-13°F to 50°F	-25°C to 10°C
	MIL-L-2104D	SAE 10W-30	-4°F to 104°F	-20°C to 40°C
	(API CD or CD/TO-2)	SAE 15W-30	5°F to 122°F(Normal)	-15°C to 50°C(Normal)
TRANSMISSION	CLARK	MIL-L-46167	-65°F to 0°F	-54°C to -18°C
	MIL-L-2104D	SAE 10W	-10°F to 140°F(Normal)	-23°C to -60°C(Normal)
	(API SE) Type C-3	SAE 30	30°F to 140°F	-1°C to 60°C
	ALLISON	SAE 5W-20	BELOW -10°F	BELOW -23°C
		SAE 10W	BELOW 10°F(Normal)	BELOW -12°C(Normal)
	MIL-L-2104D	SAE 15W-40	BELOW 30°F	BELOW -1°C
	(API SE) TYPE C-3	SAE 30	BELOW 35°F	BELOW 2°C
		Note: Preheat transmission fluid to indicated minimum temperature before operating transmission. . . or if preheating equipment is not available, operate transmission in NEUTRAL for minimum of 20 minutes prior to engaging Forward or Reverse ranges.		
	TWIN-DISC	SAE 5W-20	-60°F to 0°F	-51°C to -18°C
	MIL-L-2104D	SAE 10W	-10°F to 140°F(Normal)	-23°C to 60°C(Normal)
	(API SE) TYPE C-3	SAE 30	30°F to 140°F	-1°C to 60°C
AXLE	CLARK	SAE 75W	-40°F to -10°F	-40°C to -23°C
		SAE 75W-80	-40°F to 0°F	-40°C to -18°C
	MIL-L-2105C	SAE 80W-90	-13°F to 100°F(Normal)	-27°C to 37°C(Normal)
	(API GL-5)	SAE 85W-140	ABOVE 10°F	ABOVE -12°C
	BRYAN	SAE 20	BELOW 0°F	BELOW -18°C
	MIL-L-2104C	SAE 30	-20°F to 120°F(Normal)	-29°C to 49°C(Normal)
	(API CD)	SAE 40	ABOVE 100°F	ABOVE 37°C
	RIMPULL	SAE 75W-90	-65°F to 20°F	-54°C to -29°C
	MIL-L-2105C	SAE 80W-90	-20°F and above(Normal)	-29°C and above(Normal)
	(API GL-5)	SAE 120	-90°F to 120°F	-32°C to 49°C
HYDRAULIC	WAGNER	ISO VG32	-10°F to 120°F	-23°C to 49°C
	Premium Grade Hydraulic Oil	Note: Hydraulic Oil must include the following: Anti-Wear Agents; Rust, Foam and Oxidation Inhibiters; High Demulsibility; High Viscosity Index; Cold Weather Properties; Minimum Pour Point of -40°F and Minimum viscosity Index of 140.		
CHASSIS	WAGNER			
	Multipurpose Chassis Grease w/EP & MoS_2	NLGI-1	BELOW 10°F	BELOW -12°C
		NLGI-2	ABOVE 10°F	ABOVE -12°C

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GENERAL MAINTENANCE TIPS

INTRODUCTION

WAGNER originated and manufactures a wide range of heavy lift equipment. Included among many other models are the LUMBERJACK Log Stacker, the CHIP CARRYDOZER and COAL CARRYDOZER, the PORT PACKER and PIGGY PACKER, and the STEEL WORKER.

Each WAGNER machine owned by your employer represents a substantial capital investment, and your management gave it a great deal of thought before making their decision. The WAGNER was selected for its proven record of high availability and for its productivity in your operation. These two points of availability and productivity depend largely on the maintenance crew, and that means you, a good capable mechanic with sound judgment.

WAGNER machines were designed with the mechanic in mind; they are constructed with standard components we are all familiar with. We know that our machine is simply another tool to help get your job done and the prosperity of your operation depends on it doing that job. Because we also know the responsibility of keeping your WAGNER machines working falls on your shoulders, we have prepared this guide to help you meet the challenge.

First, we have to realize that even though these machines are especialy designed for their different jobs, they all share certain systems and needs for basic maintenance, so we are going to take a few minutes to explain some of the basic maintenance procedures common to all these heavy lift machines.

PARTS AND SERVICE DATA

Your best friends in doing basic maintenance are the Parts and Service Manuals that came with your machine, and the Service Bulletins that you receive periodically. These manuals give you the details of each system in your machine including locations of filters, drains and miscellaneous lubrication points. Even though your heavy lift equipment is available with a choice of engines and transmissions, your manual provides the manufacturer's own documents for the exact options you have ordered.

Every machine we produce at WAGNER is treated like it was unique, yet it is a standard production model. The minute it comes off the assembly line, your particular unit becomes the subject of a

complete and running history kept in our files at the factory and at out dealers locations. Every machine has its own file folder describing the entire machine and all its components to help give you fast and accurate parts and service information. To help the dealer give you this special attention, we would like to emphasize that it is vitally important for you to give him the correct model and serial number for your machine when requesting parts or service.

You will find this information in two places; on a plate assembly mounted on the left side of your cab cowl and on the Master Check Sheets of your Parts Manual and Service Manual. Be sure to copy it correctly and keep the information handy to your telephone for ordering from your local dealer. He will provide you with normal and emergency phone numbers.

GENERAL LUBRICATION

Just above the Serial Number Plate you will notice a lubrication plate. It is a handy reminder for the first step of your basic maintenance program: LUBRICATION. And for easy reference we have provided the same information in your Service Manual. When your machine is delivered it has been serviced with top quality lubricants, and any major brand can be depended upon to provide good results. Whatever brand you prefer, be sure that your vendor supplies lubricants with equal specifications. The wrong substitute may cause premature wear throughout your machine.

General lubrication of your WAGNER heavy lift unit is mostly a matter of common sense. Once you become familiar with your unit your good judgment will guide you.

Here are some helpful lubrication tips. First, you should always be safety conscious when lubricating the highest fittings on your machine, such as the Lumberjack's holddown and kickoff arm pivot points. Before lubricating these points, you should lower these high components as close to the ground as they will go. You should also relieve the pressure from these cylinders and the anchor pins by resting the carriage on the ground to allow them to receive adequate grease. When lubing these high points, take care to use the railings provided for you.

You will also notice that several pivot points on your unit may not be equipped with grease fittings such as the throttle linkage ball joints, emergency brake linkage, and so on. To reduce wear, these points should have a drop or two of oil periodically. In all lubrication questions, go back to your lubrication chart in the Service Manual and bulletins for complete details.

FILTER MAINTENANCE

While there is nothing very complicated about general lubrication, filters in particular, tend to be "out of sight, out of mind", and are often overlooked with resulting serious damage. We realize you will not be working under ideal conditions -- so take the precaution of making sure your filters are clear of dirt and possible contamination when changing them. There are five critical filter areas to be concerned with, the hydraulic tank screens, hydraulic return filters, engine oil filters, transmission filters, and finally, the air cleaners. Proper care of all these filters is essential to a good basic maintenance program.

Starting with the hydraulic tank screens, let's see what proper care means. You will find these screens in the hydraulic tank on the right side of your machine under a hinged section of the catwalk. All the oil returning from your unit's hydraulic system passes through these screens and they should be removed and checked every thousand hours.

Maintenance for these screens is done in four steps: First, remove the capscrews from the tank cover. Slide this cover to the rear so you can get at the screens. Second, grasp the lifting bail on the screen and slowly lift it out of the tank. This is the time to visually inspect the screen for contamination or damage to the mesh. Third, clean the screen by removing the inner section, flush it with fuel oil and blow it dry with compressed air. Return the screens to the tank and secure the cover. Make sure you get a tight seal.

Now let's look at the hydraulic return filters. These return filters are the full flow type, located in the return line next to the reservoir. Filter elements should be replaced periodically to prevent clogging. The system itself is designed to protect against the results of clogging, such as pressure build-ups or blowouts that can let all the impurities collected by the filter flow into the reservoir. Even though the bypass valves are meant to protect the system from pressure overloads, they offer no filtration and let all the impurities circulate freely. Therefore, filters should never be allowed to go unchanged beyond their service specifications.

The procedures for changing these filters are: First, place a suitable container under the filter to be changed capable of holding 20 to 25 gallons. Begin by loosening the square head center bolt and allowing the filter shell to drain. Now unscrew the center bolt while holding the filter shell. If you don't hold the shell, gravity will take over when the bolt is loose and

you will get an oil bath. Next, remove the O-ring and top gasket. Set them to one side. Remove and discard the old element. Disassemble the remaining gaskets and spring and thoroughly clean all the parts. Once you have everything clean, begin reassembling the return filter by placing the bottom gasket in position on the center bolt. Then place the center bolt itself in the filter shell. Insert the spring, bottom back-up washer, and bottom gasket, in that order. Insert a dry filter element, place the top gasket and O-ring into place. Carefully position the filter shell into the filter head, and finally, tighten the center bolt with a torque wrench to 20 foot pounds maximum. Before putting the machine back into service again, check the filter can for leaks while the machine is running. Most of the engines in WAGNER machines have a primary lube oil filter. Detroit Diesel engines have their filter mounted on the sidewall next to the engine, and the Cummins and Caterpillar oil filters are mounted on the engines. Procedures for changing all these filters are similar and we will use the Cummins as an example.

First, place a suitable container under the filter shell; remove the drain plug and let the oil flow out. Remove the hex head bolt and pull the shell off. Then remove the old element and discard it. Clean the shell as on other filters, then install a new factory filter element and seals and remount the shell on the engine. Be sure to put the drain plug back in. Finally, torque the hex head bolt to 25 to 35 foot pounds as indicated on the shell.

The Cummins diesel is also equipped with a secondary lube filter element, which is to be changed along with its primary filter. To change this secondary filter, first place a suitable container under the filter shell, remove the drain plug and allow it to drain. Loosen the clamps on top of the filter and remove the top cover. Now, remove the filter tension nut, then the filter element and discard it. Clean the filter shell with fuel oil and wipe it dry. Be sure all foreign material is out of the shell before installing a new element. Now install the new factory element, replace the filter tension nut and install a new gasket where required. Replace the top cover and drain plug and fill the engine with new oil.

It is vitally important to check your oil level twice after changing filter elements. The reason for this is that the new filters will absorb several quarts of oil as soon as you start up the engine and thus lower the oil level. To make sure you have enough oil, start the engine and idle it for 2 to 3 minutes, then shut the engine down and recheck the level. Now go through the check once more, starting the engine and letting it idle and then shutting down to make certain of the oil level. You should also check all oil filters for leaks.

For all engines, check the oil level with the dipstick daily. Drain the crankcase and change the filters every 250 hours for maximum life and efficiency.

The transmission filters on WAGNER machines are full flow with replaceable elements held in the filter shell by a hex head bolt on the bottom. You begin replacement of the elements by placing a suitable container under the filter, removing the hex head bolt and allowing the oil in the shell to drain out. Now remove the filter shell and discard the element. Clean the shell with fuel oil and dry with a cloth or compressed air. Replace the O-ring gaskets in the filter head, install a new element, then press the shell and element assembly into position and tighten the bolt to 55 to 65 foot pounds of torque. Last, start the engine to operate the transmission oil pump so you can check for leaks and check the transmission oil level.

Here are a few general tips for dealing with filters; whenever it is possible, fill the filter shell and new element with clean oil of the proper type to shorten the time it takes to prime the system. When servicing filters, replace any gaskets that show signs of wear. Some gaskets and O-rings can be used only once, due to distortion caused by pressure.

The last type of filter we are going to cover is the air cleaner. If an air cleaner or intake system is clogged and not doing its job, extensive ring and cylinder wear can result under severe conditions in just a few hours. So it is important to see that they are functioning properly. Your own operating schedule and dust conditions will determine how often you should service the air cleaner and intake system. You should make a habit of visually checking the entire intake system for dirt and leaks when servicing the air cleaner. All WAGNER units are equipped with dry type of air cleaners. By using the restriction indicator, sometimes called the service gauge, you can tell at a glance the condition of the filter element. Anytime the service gauge shows red you should investigate the air cleaner. We recommend daily inspections of the air cleaner, but in severe dust conditions, we must emphasize that once a day may not be enough. If you have the Donaldson type air cleaner, the dust cup should be emptied when needed as a normal part of an air filter inspection.

COOLING SYSTEM

Now we can go from filters to some other basic maintenance tasks. The cooling system in todays diesel engines requires little maintenance, and you need to follow only three pointers. One, keep the radiator filled. Be sure you remove the cap only after

the engine has stopped and cooled down. The system is pressurized - and loosening a cap with the engine running could result in burns. Second, keep the water pump belt at its correct tension. Third, keep the radiator core clean and make sure that antifreeze has been installed during freezing weather. You can find more information on engine cooling systems in your Service Manual.

AXLES

The axles of your WAGNER machine should be checked periodically for lubrication in the differentials and planetaries. To do this, slowly roll your machine until the planetary oil level plug is in the proper position and check the oil. Then remove the oil level plug in the differential and check its oil level. Your service manual or the lubrication placard will tell you everything you need to know about oil types, time between changes and so forth.

WHEELS AND TIRES

Next is the wheel and tire maintenance, because they are not usually given the recognition they need; lets see just how important they are from the assembly line on out to your service conditions.

Before the wheels are installed all studs and locknuts on the axle are checked for proper torque. The outside diameter of the pilot hub and bounce ring is miked on each hub and the inside diameter is m ·d on each wheel to insure no more than 10 thousandths to nce overall. That means it can be out no more than 5 thousandt on both sides of the wheel, not 10 thousandths on each side. s is necessary to carry your machines weight properly and eliminate excessive stress on the mounting studs and nuts. Next, the wheels are mounted on their hubs and the nuts torqued up to specifications (found in Service Manual). During final inspection the stud nuts are rechecked for proper torque. It is extremely important that studs not be overtorqued.

When you receive the new unit, it is important to visually check for loose and missing studs or nuts twice every day for the first four or five days of service. Check these studs and nuts for proper torque every 50 hours for the first two weeks. You should always use a torque wrench on these studs and stud nuts, since an overtorqued nut will stretch the stud and eventually break it, or nuts can become stripped.

A torque wrench can avoid the process of one man checking the nut until it moves, the next man tightening it until it moves some more, and finally, the last man ending up with a broken stud and wondering why. Remember, every time you tighten the nut down, it pulls the stud a little bit tighter and stretches it a little bit farther. A stud only has so much give before it breaks, and a torque wrench is the only tool that will let you know for sure what you are doing.

In the event you ever have to remove a wheel, you should center punch a reference mark on it and the hub, so you can remount it in the original position. Be sure both mounting flanges on the hub and wheel are clean so a positive fit can be obtained when remounting. If you ever have to replace an axle hub or wheel, both should be miked as in the factory, even if this requires the rental of inside-outside micrometers. The cost will be more than justified by longer wheel and stud life. Your Service Manual will give you more information on wheel care and inspection.

The tires on our heavy lift machines are designed to operate with a certain sidewall deflection, or bulge. Proper inflation is very important to tire life. An underinflated tire flexes excessively every time you turn the wheel, which generates high internal heat and causes premature failure. Overinflation causes excessive center tread wear. A correctly inflated tire permits all the tread to contact the ground and insures proper operation and maximum life. All your recommended tire pressures are cold readings. Hot pressures, taken while a tire is in use will not give you the proper reading. Maintenance pressure checks should be taken only when the machine has been idle long enough for the tires to cool down to the surrounding temperature.

HYDRAULICS

Lets examine one of the most important systems in any WAGNER heavy lift machine - HYDRAULICS. Your unit employs the most advanced principles of hydraulic engineering. Instead of using the old single function hydraulic circuits -- ones that use a single pump for each separate function and have no way of contributing their spare power to other functions, our system employs three pumps, each having a primary function and one or more secondary functions.

When any pump is not being used for its primary function a control valve diverts the oil to the secondary function instead of just returning it to the reservoir as in the single function system. When all our functions are operating, the power is divided up like this: On Lumberjacks the hydraulics are divided into three basic systems. Whenever a steering pump's power is

not being used for its primary function, it is diverted to the hydraulic system. It has many advantages over the single function system, one, for example, is greater effeciency. Hoisting can be done much faster with the combined power of three pumps than it could with a larger single pump. Also, because of the multiple relief valves in the "power beyond" system, it provides greater protection for pumps, valves and hoses.

For further protection, your unit is equipped with circuit relief valves in the circuits themselves. These also function when the circuit control valves are not being operated. This advanced hydraulic design is not complicated and will be easy to work with by keeping this one principle in mind: Because the circuits are interconnected, any problem that shows up downstream may be caused by a malfunction upstream. Therefore, solving any problem depends on following your checks and pressure settings in a logical sequence beginning upstream at the highest pressure and going downstream t the lowest pressure. Follow the sequence from upstream to ' wnstream and maintenance is easy. Fail to follow it, and you are asking for problems.

The sequence begins at the steering valve, which is all the way upstream on all machines, and then, using the Lumberjack as an example, goes downstream to the hoist and tilt valve, the farthest downstream and the lowest pressure. You can trace the system on all machines by the schematics in your service manual. Be sure to check your service manual for the proper pressure settings on your unit. Keeping this in mind, gather all the tools you will need to test and adjust pressure settings on your machines.

You will need two end wrenches each of 9/16ths, 3/4 and 7/8th inch size. You will also need a medium flat head screwdriver, several rags and the pressure gauge provided with the units tool kit. You should have the gauge calibrated from time to time to maintain its accuracy.

Using the Lumberjack again as our example, testing and adjustment of pressure settings begins by starting up your unit and operating several functions to allow the hydraulic oil to warm up to operating temperature. Relief pressures will not be accurate if adjusted and set while the oil is cold.

We will begin pressure relief setting at the farthest point upstream, that is, at the highest pressure, which is the steering valve. You should first notice that it is operated by a slave cylinder that receives oil from the converter pump. Make sure the slave cylinder is operating, then proceed with setting the pressure relief on the steering valve. First, install a pressure gauge supplied in your units tool kit. Install it on the quick

disconnect. Bottom the steering by removing the slave cylinder from the walking beam. Manually push or pull the walking beam until the steering relief bypasses. With the engine at 1500 RPM adjust the steering relief valve to the pressure specified in your units service manual. The manual will give you proper settings and sequences to follow. Adjustment is made by removing the acorn nut, and loosening the jam nut on the relief adjusting screw, turn it clockwise to increase pressure and counterclockwise to decrease pressure. double check relief settings at maximum RPM. Usually override should be only 50 to 100 psi over normal.

Now we go downstream to the Lumberjacks left holddown and kickoff valve. Install the pressure gauge on the quick disconnect located on top of the valve. Move the kickoff arms to their back position and hold until the relief bypasses. Now with the engine at 1500 RPM, set it to the specified pressure in your manual the same way you did the steering valve.

The right holddown and kickoff valve is adjusted in the same manner. Install the pressure gauge and follow the procedure used for the left hand valve.

At the downstream end of the system you will set the hoist and tilt valve. You will notice that it is not equipped with a quick disconnect. Instead, on top of each junction manifold is a hex plug. While raising the boom, shut down the engine and keep the hoist lever open, this will cause the hoist cylinder to partially cavitate, allowing you to remove the hex plug with no oil present. Now, remove the hex plug from the downside hoist manifold and install a 90 degree O-ring adapter, supplied with your units tool kit. Install a quarter inch hose which has a quick disconnect on the other end, and snap on the pressure gauge. Move the hoist control lever to bring the hoist up or down to its highest or lowest position and hold until the relief bypasses. With the engine at 1500 RPM adjust it to the specified pressure just as you did on the other valves. Remove the pressure gauge and adapter in the same manner as you installed it and no oil will be present.

On units without loadlocks, push the hoist lever forward until the cylinders fully retract and shut the engine off. Remove the gauge plug on the stem end manifold block. CAUTION: DO NOT remove the base end manifold gauge plug with hoist cylinders extended on units without loadlocks or be prepared for an oil bath!

On early units with the air assist system you relieve the pressure by moving the control lever in both directions while the engine is off.

Now, lets move on to the circuit relief pressure checks. All reliefs are preset at the factory, however, they can be set on the machine in the following manner. You must raise the main pressure relief higher than the specified circuit relief setting. Install your pressure gauge. Screw the main relief adjustment clockwise several turns without bottoming in the same manner as described for setting the operating pressures. DO NOT BOTTOM any relief at any time or complete destruction of the pump can result!

There are circuit reliefs on each port of the holddown and kickoff valves and one each on the downside of the hoist and tilt. Operate each function until the main relief bypasses either on the stem or anchor end of each cylinder. Slowly raise the main relief until it no longer reads higher than the specified circuit relief setting which should be about 2300 psi on all circuit relief except the tilt on some models that specifies 950 psi and 1050 psi on base end of cylinder.

If the pressure is not right, adjustments can be made by adjusting the circuit relief valves on both ends of each spool of the kickoff and holddown valves, as you did all the other relief valves, clockwise to increase, counterclockwise to decrease. Parker and Commercial valves use shims to control the pressure bypass. Most thin shims raise or lower pressure about 50 psi and thick shims approximately 300 psi. In an emergency a 1/4" flat washer raises the pressure about 600 psi. You have now completed your pressure settings. Remember, the same basic principles apply to all WAGNER heavy lift machines, whether the Lumberjack or most other members of this large family.

Here are a few tips in case you should run into problems completing these pressure settings; If you should find a valve that will not adjust to the recommended relief pressure, either the relief valve assembly or the pump may be malfunctioning and should be corrected before proceeding further downstream. Make sure your control system is functioning properly. Check for loose oil cylinder clevises, pinched oil lines, sticky valve spools or loose valve tie bolts. You will also find pointers in the Service Manual listed under Pump and Mechanical Problems in Hydraulic Systems.

IN CONCLUSION ---

You have just completed a solid basic maintenance routine. Of course there are many more details you will have to work with to keep your machine in top condition, but this coverage of lubrication, filters, wheel and tire care and hydraulic pressure settings was meant to give you the essentials of a sound day to day maintenance program to be used along with common sense items like daily visual inspection of structure for cracks and broken parts, etc.

By now you realize the help your service manual and bulletins can be to you, but when the problems go beyond regular maintenance and you feel like you are in over your head, remember that you didn't just get a machine for your hard earned money, you also have the service of a strong dealer organization and WAGNER at your disposal twenty-four hours a day. We are no further away than your telephone at any time. Dial our number and you will get the fastest nationwide service there is.

We want the WAGNER heavy lift machine you use to be the best machine there is. Your good judgment and these tips we have just presented can make it the best and keep it that way.

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