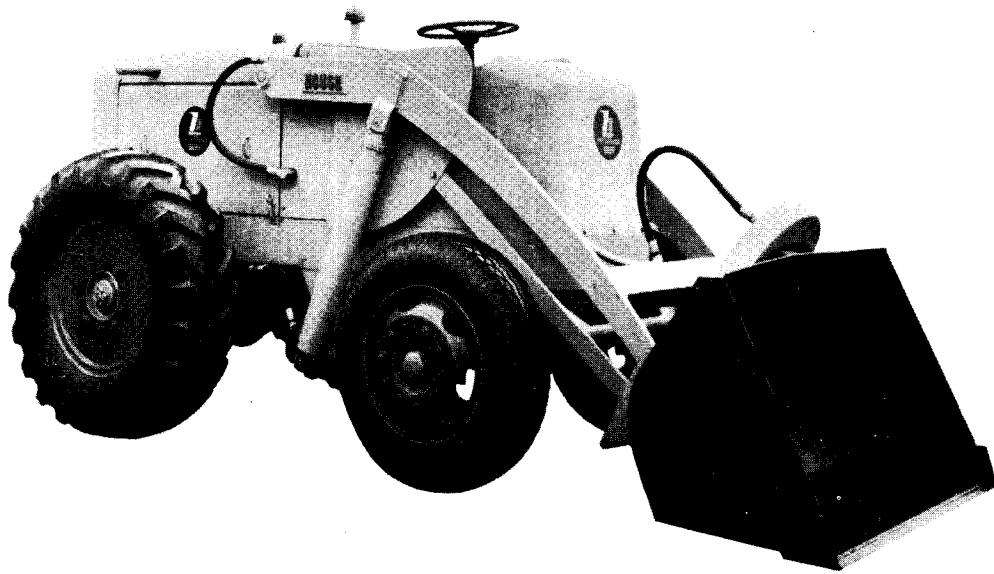


**OPERATING MANUAL**  
**FOR**  
**MODEL HF DIESEL PAYLOADER®**  
**BEGINNING WITH SERIAL NUMBER 83806 D**  
**FORM HF-D-1**



**MANUFACTURED BY**  
**THE FRANK G. HOUGH CO.**  
**LIBERTYVILLE, ILLINOIS**

LITHO. IN U. S. A.

DATE: AUG. 1952

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## TO THE OWNER

It has been our aim to build the most reliable and serviceable shovel on the market.

Hough shovels have, since 1920, built a reputation for dependable and economical service in the material handling field. This "PAYLOADER" includes all these features which have made possible long, dependable service, together with the latest engineering knowledge and design.

The purpose of this manual is to explain maintenance requirements and routine adjustments which are necessary for the most efficient operation of your "PAYLOADER". To protect your "PAYLOADER" investment, study this manual before starting or operating your "PAYLOADER".

If you should need information not given in this manual, or require the services of a trained mechanic, we urge you to use the extensive facilities offered by THE FRANK G. HOUGH CO. "PAYLOADER" dealers. Dealers are kept informed on the best methods of servicing and are equipped to provide prompt, dependable, service in the field or in an up-to-date service shop.

Dealers carry ample stocks of THE FRANK G. HOUGH CO. essential "PAYLOADER" parts.

Listed below you will find the name of THE FRANK G. HOUGH CO. dealer with whom your parts orders should be placed and who should be called upon for any required information concerning proper operating and maintenance procedure.

OUR PAYLOADER DEALER IS:

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When ordering parts always give THE FRANK G. HOUGH CO. "PAYLOADER" dealer both the name and part number of the part required, and also the serial number of the "PAYLOADER".

IT IS THE POLICY OF THE FRANK G. HOUGH CO. TO IMPROVE ITS PRODUCTS WHENEVER POSSIBLE AND PRACTICAL TO DO SO. WE RESERVE THE RIGHT TO MAKE CHANGES OR ADD IMPROVEMENTS AT ANY TIME WITHOUT INCURRING ANY OBLIGATION TO MAKE SUCH CHANGES ON MODELS PREVIOUSLY SOLD:

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## AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway are caused by failure of some individual to follow simple and fundamental safety rules or precautions. For this reason most accidents can be prevented by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment, there are many conditions that can not be completely safe guarded against without interfering with reasonable accessibility and efficient operation.

A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT.

THE COMPLETE OBSERVANCE OF ONE SIMPLE RULE WOULD PREVENT MANY THOUSAND SERIOUS INJURIES EACH YEAR. THAT RULE IS:

*"Never attempt to clean, oil or adjust a machine while it is in motion!"*

"National Safety Council"

## SPECIFICATIONS AND SERVICE DATA

### ENGINE

I.H.C. . . . .	UD-264
No. of Cylinders. . . . .	4
Bore . . . . .	4"
Stroke . . . . .	5-1/4"
Displacement, cu. in. . . . .	264
Engine Speed - Governed. . . . .	1800 R.P.M.

TRANSMISSION: 4 speed forward and reverse transmission.

CLUTCH: 14" spring loaded, foot operated, single disc.

### TIRES:

Front. . . . .	9:00x20 - 10 ply
Rear . . . . .	13:00x24 - 8 ply.

### TIRE PRESSURES:

Front. . . . .	75 lbs. (air)
Rear . . . . .	25 lbs. air and 3/4 full of calcium chloride solution

### DIMENSIONS: STANDARD HF DIESEL.

	HF-D
Total Weight - Empty Bucket - Less Attachments.(approx.) . . . . .	11540 lbs.
Overall Width - At Rear Tires . . . . .	76-1/4"
Overall Length - Bucket in Carry Position . . . . .	16'-1"
Dumping Clearance. . . . .	7'-11"
Reach - at 84" Clearance. . . . .	34"
Ground Clearance. . . . .	11-1/4"
Turning Radius - Tip of Bucket in Carry Position . . . . .	16'-6" Approx.
Digging Depth . . . . .	4"
Angle of Bucket in Carry Position. . . . .	36°
Angle of Bucket in Dump Position (fully raised). . . . .	50°
Height over Muffler . . . . .	7'-3"
Wheelbase. . . . .	68-1/2"
Struck Bucket Capacity - Standard Bucket. . . . .	3/4 cu. yd.
Heaped Bucket Capacity - Standard Bucket . . . . .	1 cu. yd.

### CAPACITIES:

Cooling System . . . . .	28 qts.
Fuel Tank. . . . .	16 gal.
Transmission Grease . . . . .	22 lbs.
Differential Grease. . . . .	5 lbs.
Engine Crank Case with Filter . . . . .	8 qts.
Hydraulic System. . . . .	11-1/2 gal.
Axle Reduction Gear Case (each side) . . . . .	5 lbs.

## PREPARATION OF THE "PAYLOADER" FOR OPERATION

Before operating this "PAYLOADER", even to unload, check the entire unit to make sure nothing has become loose or damaged in transit or storage.

Battery cables have been disconnected at the factory, and the gasoline shut-off cock closed before shipment. Machines sent outside the United States are shipped with a dry battery and the fuel tank and fuel lines, and the cooling system drained at the factory.

**DO NOT ATTEMPT TO START THE ENGINE BEFORE THE FOLLOWING POINTS HAVE BEEN CHECKED OR DAMAGE MAY RESULT:**

Refer to the Lubrication Chart, to locate the following points, and for service instructions.

1. Check the oil level in the Hydraulic System Reservoir to make sure it is up to the petcock. The engine **MUST NOT** be started without oil in the Hydraulic System. Use SAE #10 Motor Oil to refill. Drain the hydraulic system after the first 32 to 48 hours of operation and refill with clean oil.
2. Check the Oil Level in the engine crankcase by removing the oil dip stick from the side of the engine.
3. Check the Oil Level in the transmission to be sure it is to the height of the oil level plug.
4. Check the Oil Level in the differential and both final drive gear cases. Differential oil level plug is located in the rear of the housing. Final drive gear case level plugs are located on the inside surfaces of both rear wheel housings.
5. Check the oil in the air cleaner cup. Clean and refill daily or oftener as required. This is important.
6. Check the Master Brake Cylinder to make sure it is filled with brake fluid. If not fill with Hydraulic Brake Fluid.
7. Be sure all hoses and connections are tight to prevent hydraulic oil from leaking out and to keep air or water from entering the system.
8. Check the Tire Pressures. Be sure they are up to pressures recommended in the Specifications and Service Data Lists.
9. Check the drive axle wheel nuts several times during the first day's operation and thru the first 48 hours of operation. They must be kept forced tight by using a long handled wrench.
10. Be sure the cooling system is full. Use clean soft water, free from alkaline to fill' never at anytime run the engine without the full quantity of cooling fluid in the radiator. Be sure to use a permanent type anti-freeze solution in the cooling system when expecting to operate the "PAYLOADER" in freezing temperatures.
11. Be sure to open the fuel line shut-off cock located on the fuel line at the fuel tank. The fuel tank is mounted under the front cowl. Fill the tank with the proper fuel.
12. Be sure all drain plugs, drain cocks, filler openings and fuel line connections are tight and do not leak.
13. Connect battery cables and check the dash instruments to be sure they function properly. Check the batteries to be sure the plates are covered with water. If not, add distilled water or clean rain water.
14. Grease all lubrication points of the entire unit. Use the lubrication chart in this manual and the Engine Operation manual as a guide. Grease and check the "PAYLOADER" daily (every 8 to 10 hours of operation).
15. Carefully read the instructions as set forth in this manual before attempting to operate the "PAYLOADER". The function and location of hand levers, foot pedals, and other controls differ between various types of similar machines, and their use should be understood by the operator before attempting to start the engine.
16. Do not operate the machine to capacity during the first weekly period of operation (first 36 to 50 hours of actual use). Operate with light loads during this initial break-in period.

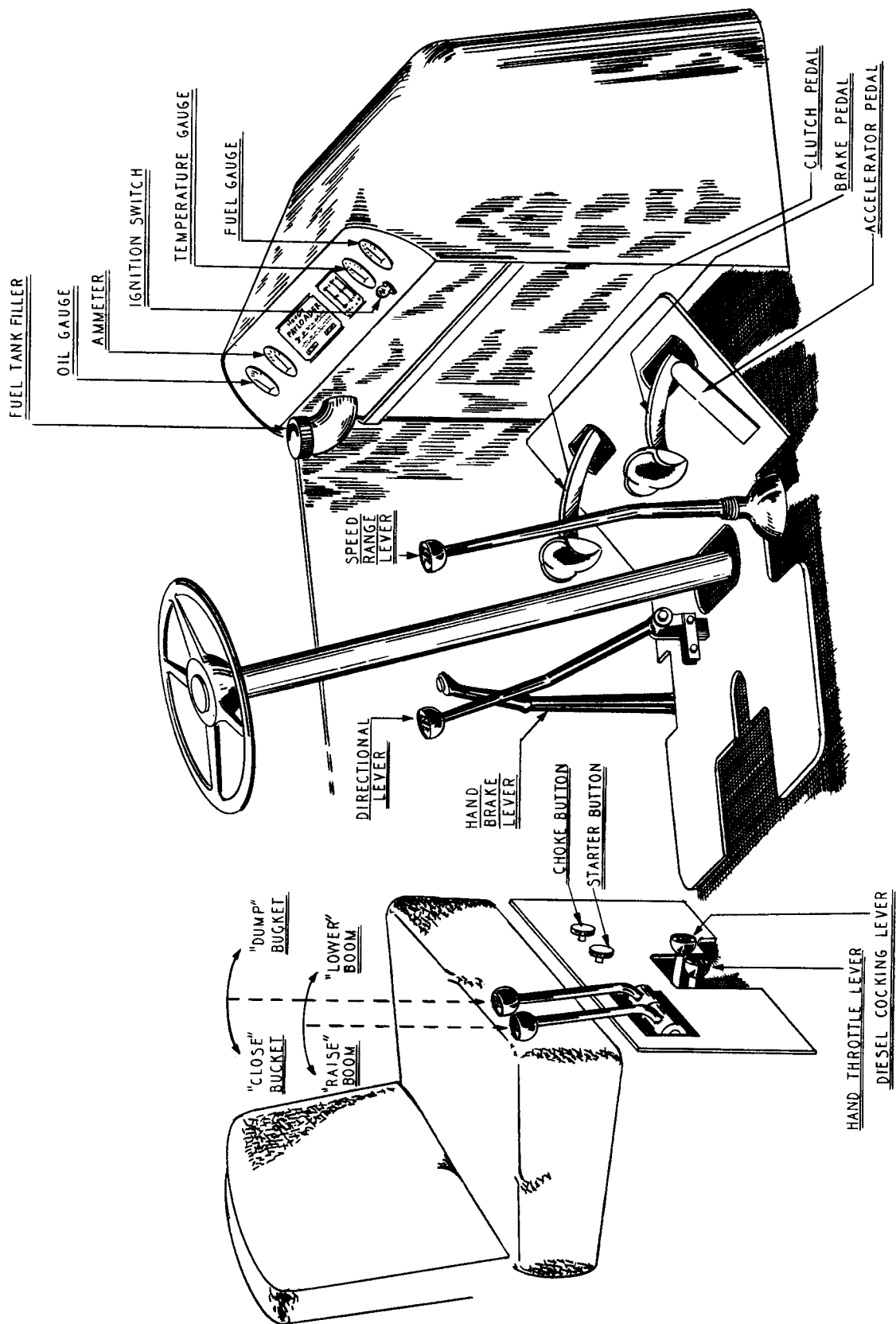


Fig. 2

## OPERATING THE PAYLOADER

The important thing for an operator, learning to use a machine of this type, is to start easily at slow speeds, thus attaining skill gradually. The time used in learning to get the "feel" of a machine will be well spent in preventing possible accidental damage to the machine or operator or to safeguard other personnel.

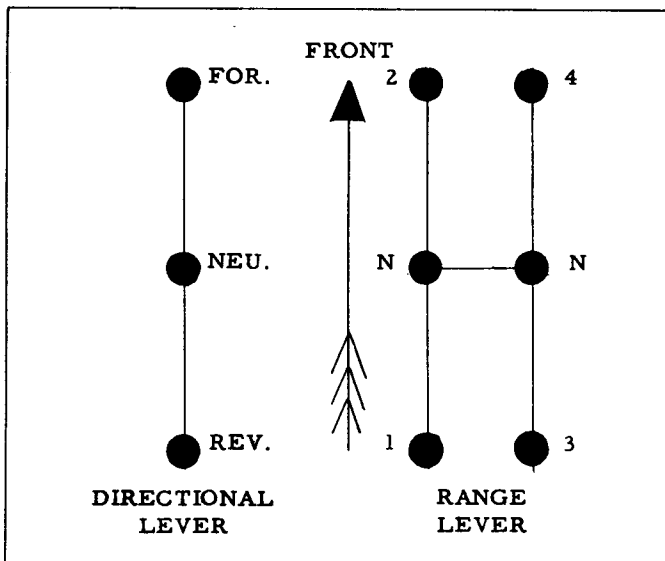
A study of the following pages will acquaint the operator with the various controls of the "PAY-LOADER" and their proper use. Refer to the Operations Control Picture.

This "PAYLOADER" is equipped with a four speed forward and four speed reverse transmission. The speeds and direction of travel is selected by shifting a Range Lever and Directional Lever. Always be sure these levers are in neutral position before starting the engine.

**RANGE LEVER** is located on the right side of the floorboard and has five positions as shown on chart. This lever is in neutral when in vertical position. Shift this lever to the left of the neutral and backward for the lowest speed range. One of the low speed ranges is used for working conditions where more power is needed. One of the high speed ranges is used primarily for transporting loads to various locations. See the Gear Shift Diagram for the speed range positions of this lever.

**DIRECTIONAL LEVER** is located between the steering column and the seat. The "PAYLOADER" will travel forward when this lever is pushed forward or away from the operator. Pull the lever backward toward the operator to move the "PAYLOADER" backward or in reverse.

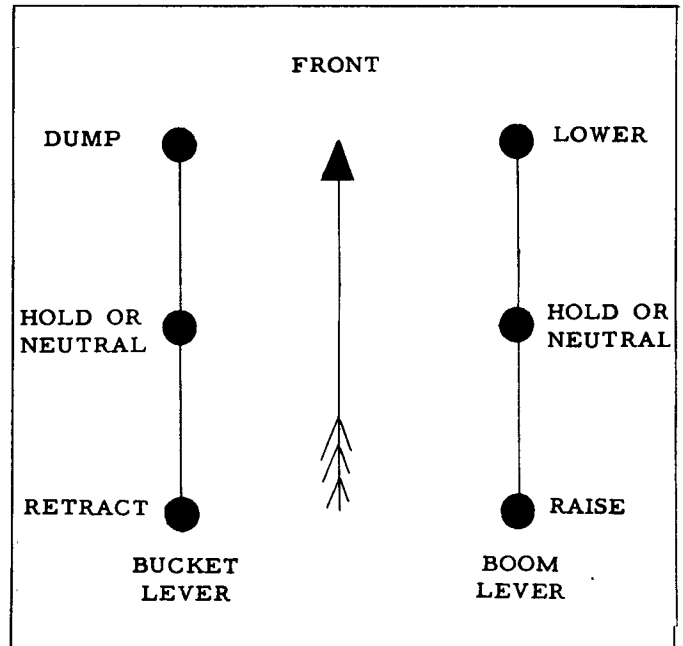
Always depress the clutch when shifting these levers to any of their positions.



GEARSHIFT DIAGRAM

These machines have dual valve control levers, located on the right hand side of the seat. Always be sure these levers are in neutral position before starting the engine.

The longer, outer lever controls the "Raising" and "Lowering" of the bucket and the inner lever controls the "Dumping" action of the bucket.



VALVE LEVER POSITIONS

When moving the longer outer lever the positions can be felt by the operator as the poppets fall in place. Placing this lever in the centralized or neutral position will stop the movement of the boom and "hold" the bucket at any height in its arc of travel.

Pull this lever backward, toward the operator and the booms and bucket will "raise" in proportion to the engine speed.

Push this lever forward, ahead of neutral to "lower" the boom and bucket.

**CAUTION: NEVER REACH BETWEEN THE BOOM AND GUIDE BARS TO OPERATE THESE LEVERS. THE BUCKET MAY BE LOWERED EVEN THOUGH THE ENGINE HAS BEEN SHUT OFF.**

The shorter inner valve control lever is used to "dump" the bucket. Push this lever forward, away from the operator to "dump" the bucket. Merely release pressure on this lever and it will automatically return to neutral, "stopping" the bucket at any point of its dumping arc. Pull the lever backward to "close" or "retract" the bucket. Merely release the lever to

return it to neutral and the bucket will be "held" in the "retracted" position.

### **PARKING BRAKE HAND LEVER:**

The parking brake hand lever is located on the left side of the floor-board. Pull the lever backward to apply braking pressure on the drive shaft brake drums. Press down the top button and push forward to release braking pressure on the drive shaft. This lever is used when parking the "PAYLOADER" on slopes. Do not fail to release this lever before putting the machine in motion.

### **FOOT PEDALS:**

The CLUTCH pedal is located on the left side of the floorboard. When pushed down the transmission is disengaged from the engine. Always keep the clutch pedal depressed when shifting either the range lever or the directional lever. Do not engage the clutch suddenly, thus allowing the "PAYLOADER" to jerk with the load.

**CAUTION: DO NOT DRIVE THE "PAYLOADER" WITH THE FOOT RESTING ON THE CLUTCH PEDAL. THIS WILL CAUSE UNDUE WEAR ON THE CLUTCH FACING AND THROWOUT BEARING.**

The BRAKE pedal is located on the right side at the floorboard and is used to bring the "PAYLOADER" to a stop. Depress the brake firmly when braking. It is good practice to keep the clutch engaged until the "PAYLOADER" has been slowed down and nearly brought to a halt by depressing the brake. Then disengage the clutch and stop the motion of the machine completely. This allows the engine compression to assist the brakes and saves wear on the brake linings.

The ACCELERATOR PEDAL is on the right side of the floorboard. Apply pressure on this pedal to increase the flow of diesel fuel to the engine. Do not use this pedal when starting or running the engine on its gasoline starting cycle since this pedal only operates the diesel fuel pump.

The HAND THROTTLE is the right hand lever protruding from the lower central section of the seat kick plate. When the engine is on diesel fuel, push the lever down to increase engine idle speed. Pull upward to stop the diesel engine by starvation.

The DIESEL COCKING LEVER is just left of the hand throttle. When the engine has been running on gasoline long enough to warm up, push downward in the cocking lever to switch over to diesel operation.

### **DASH INSTRUMENTS:**

IGNITION SWITCH is a key type and controls the electrical current to the dash instruments and to the gasoline starting engine coil. Turn this switch to "on"

position before attempting to start the engine on gasoline. It in no way effects diesel operation. Be sure this switch is in "off" position when the engine is stopped to avoid draining the batteries.

FUEL GAUGE, with its companion tank gauge, registers the fuel level in the fuel tank.

TEMPERATURE GAUGE registers the temperature of the liquid in the cooling system. Temperature may indicate as high as 190° F. when operating in confined quarters.

AMMETER indicates whether the battery is being charged or discharged. The ammeter needle should be in the "Charge" range during operation. If in "Discharge" range continuously, when the engine is running or when the ignition switch is in "off" position, the cause should be investigated to avoid draining the battery.

OIL PRESSURE GAUGE indicates the pounds pressure of the oil circulating through the engine. If this gauge fails to register, stop the engine immediately and determine the cause.

STARTER BUTTON is in the center of the seat kickplate and when pressed in, it completes the electrical circuit between the battery and the starting motor. Release the pressure on this button as soon as the engine starts.

The CHOKE ROD for the gasoline engine is located near the center of the seat kickplate. Pull out this rod to close the choke valve thereby enriching the fuel mixture for easier starting. Open the choke valve by pushing in the rod as soon as the engine starts. Do not run the engine with the choke valve closed. When starting a hot engine, do not use the choke, as it will make starting difficult.

### **STARTING THE ENGINE:**

With the "PAYLOADER" properly inspected and checked as explained in the preceding pages, the engine may be started. Be sure the engine crankcase oil is up to the "full" mark on the oil dipstick and the cooling system is full of cooling fluid. Be sure the hydraulic reservoir contains the correct amount of oil. Be sure the fuel line shut-off cock is open and the fuel tank contains a sufficient supply of fuel.

Be sure to place the speed range lever and the valve control levers in neutral position before attempting to start the engine. Since the hydraulic pump is coupled directly to the engine, the hydraulic hoists may be operated as soon as the engine is started. To start the engine proceed as follows;

1. Place the Cocking lever in the full up position. Place the hand throttle lever in the shut-off position to prevent the cylinders from being flooded with diesel fuel oil while the engine is being run on its gasoline starting cycle.
2. Pull out the choke slightly for easier starting on the gasoline cycle when the engine is cold.



3. Turn the ignition switch key to "on" position.
4. Press the starter button. Release pressure on this button as soon as the engine starts on gasoline.
5. When the engine is running on gasoline, adjust the choke to where it will turn over smoothly, on a less enriched gasoline fuel mixture, without missing.
6. Watch the oil gauge on the dash to be sure it is registering. Allow the engine to run on gasoline for a time, without load, until it becomes warmed up.
7. Note: Do not use the accelerator pedal at any time while the engine is on the gasoline cycle since the pedal only operates the diesel fuel pump. Doing so causes fuel oil to be injected into the cylinders producing a smoky exhaust and causing carbon formation.
8. Allow the engine to warm up by running on its gasoline cycle for about a minute during warm weather or for about 2 or 3 minutes in cold weather. Allow the exhaust to become clear before switching to the diesel cycle.
9. When the engine has become warm enough to run on diesel fuel, push the cocking lever downward, all the way, and immediately depress the foot accelerator pedal slightly. This will feed diesel fuel into the engine.
10. Then adjust the hand throttle lever by pushing it downward to where the engine will run smoothly at desired idle speed.

### STOPPING THE ENGINE:

To stop the diesel engine, merely pull up the hand throttle lever to shut-off position. This will shut off the supply of diesel fuel and stop the engine.

Immediately on stopping the engine, turn the ignition key to "off" position to de-energize the dash gauges. This must be done to avoid draining the batteries.

After the engine has been stopped, be sure all the control levers are in their neutral positions, and have the bucket resting on the ground, before leaving the operators seat.

### DRIVING THE "PAYLOADER":

Skill in the use of the machine is acquired by practice, and by intelligent observation of the operation of the machine. For instance, correct loading of the bucket can be judged by the feel of the operating lever, the sound of the engine, and the speed of the tractor.

1. When the engine has been running long enough to warm up partially, and oil pressure has been built up as indicated on the dash gauge, the "PAY-LOADER" may be put to work.

2. Draw backward on the valve lever controlling the boom to raise the boom and bucket about two or three feet above the ground.
3. Depress the clutch and shift the directional lever and the speed range lever into one of their positions, depending on direction and speed of travel wanted.
4. Release the pressure on the clutch pedal while increasing pressure on the accelerator pedal and drive to the working area.

### LOADING THE BUCKET:

Shift to one of the slow speed ranges for the best average speed when loading the bucket. When stripping, digging a pit or foundation, it is better to take a shallow cut and let the forward movement of the machine fill the bucket. Have the bucket fully closed or retracted and hold the cutting edge at digging level. The operator may manipulate the boom control lever slightly, raising or lowering the bucket, to hold a good grade as the machine travels forward.

When the bucket is full, or the end of the cut is reached, pull backward on the boom lever to raise the bucket out of the cut. As the bucket raises, it will crowd forward into the face of the cut, exclusive of the forward travel of the machine. This is especially noticeable when cutting into a bank or stock pile. The forward movement of the tractor and the bucket tip-back feature will give a scooping action similar to a "dipper stick" shovel as the bucket raises out of the stock pile or face of the bank being cut. As the bucket raises, it tips back to hold a full load with minimum spillage.

### TRANSPORTING LOADS:

When transporting loads, the travel speed of the machine will depend on the length of haul and the kind of surface over which the machine must travel. Rough terrain calls for slow speed.

When the bucket is full, raise the boom to carry the bucket about four (4) feet above the ground. Never transport loads with the bucket fully raised. The nearer the ground the bucket is held the better the stability, especially on side slopes or when turning the machine. Shift the gears into position for speed and direction of travel desired and drive the machine to the dumping location.

### DUMPING THE BUCKET:

When dumping into a truck or bin, raise the bucket so it clears the top edge safely. Move the machine up so the bucket is inside the dumping area. With the boom lever in the hold or neutral position, push forward slowly on the bucket control lever, thus causing the bucket to tip forward and spill its load. The load may be dumped entirely or part at a time by manipulating the bucket lever. Dumping the load slowly will ease the shock of suddenly added weight to the truck body. Releasing pressure on the bucket control lever will allow it to return to neutral, holding the bucket in

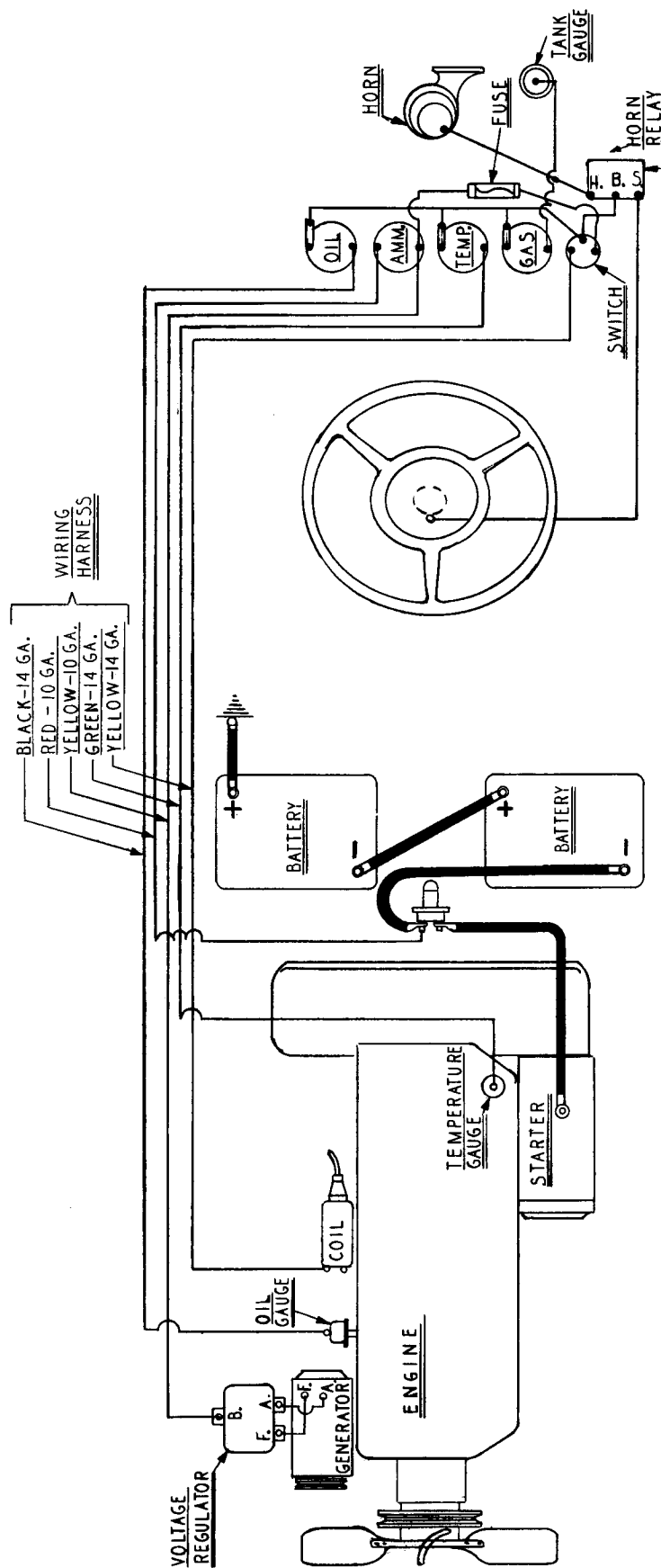


Fig. 3

dumped position. Pull backward on the bucket control lever to return the bucket to closed position before backing the machine away from the dumping area. Back the machine well away from the truck or bin and lower the bucket to carry position (about four (4) feet above the ground) before returning the machine for another load.

### **BACKFILLING AND BULLDOZING:**

The bucket can be removed and replaced with a backfiller blade for bulldozing operations. Use the backfiller blade to spread material, strip, level, or to backfill ditches and foundations. Again, one of the slow speed ranges is best when working with a backfiller blade since backfilling requires more power and slow speed.

The backfiller blade pivots at the same points as on the bucket, and may be dumped and retracted similarly. This feature will be helpful when working wet clay or other sticky material.

### **ROUTINE SERVICE:**

The operator's job does not consist of merely working the "PAYLOADER". The mechanical and operating condition as well as the general appearance and maintenance of the machine is also a part of his responsibility. It is to the operator's advantage to become familiar with the functions of each working part, and a study of the information and suggestions as set forth in this manual will help him to do so.

The operating life of the "PAYLOADER" may be considerably extended if the machine is properly serviced at regular intervals. Often major repairs or shut downs are avoided if the machine is inspected regularly and minor trouble corrected at this time.

Refer to the LUBRICATION CHART for major points requiring periodic service and inspection. Read the instructions as set forth in the maintenance section of this book for points requiring periodic adjustments.

### **COLD WEATHER OPERATION:**

When operating, or storing, the "PAYLOADER" in temperatures of 32° F. (0°C.) or lower, there is danger of the water freezing in the cooling system and an anti-freeze solution must be used. To avoid freeze ups in the cooling system, use a solution of distilled glycerine or ethylene glycol, as they will not damage the radiator, pump, or other parts thru corrosion.

Do not use a calcium chloride solution or any alkaline solution in the cooling system, as they are injurious to metal. Do not use alcohol as an antifreeze solution as it will boil away at average operating temperatures.

If alcohol is used as an anti-freeze solution, use a hydrometer daily to check the strength of the solution, and add an amount of alcohol daily to replace that lost by evaporation, otherwise the engine, the water pump and radiator will be unprotected against damage due to freeze-ups.

There are several standard, reliable, permanent type anti-freeze solutions on the market which may be used in the cooling system. They should be added to the radiator according to the manufacturers instructions found on the container. See Specification Data list for cooling system capacities.

**NOTE:** Never pour cold water in a hot engine, as the sudden contraction may result in a cracked engine block.

### **DRAINING THE COOLING SYSTEM:**

To drain the cooling system first remove the radiator cap, then open the radiator drain cock and the engine block drain cock. The radiator cap is a pressure type and must be removed to permit draining.

The cooling system should be flushed out seasonally, before adding anti-freeze solution and when draining out the anti-freeze solution, to avoid accumulations of dirt and gum in the radiator tubes.

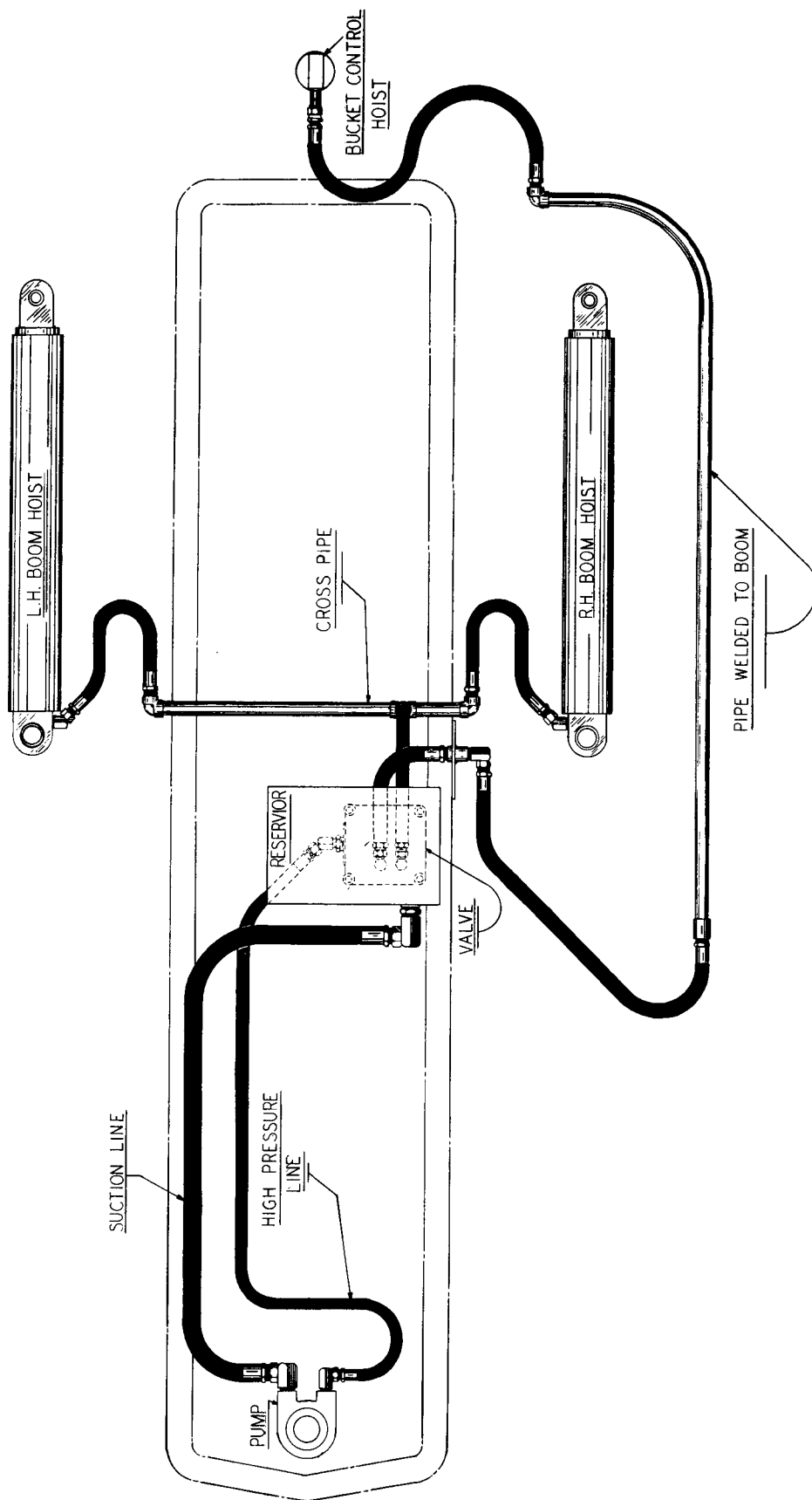


Fig. 4

## MAINTENANCE SECTION

Regardless of the care used in the design and construction of anytype of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation. The complete observance of one simple rule would prevent serious injuries each year. That rule is --

**"NEVER ATTEMPT TO CLEAN, OIL OR ADJUST A MACHINE WHILE IT IS IN MOTION."**

-- National Safety Council --

**NEVER WORK UNDER THE BOOMS OR BUCKET UNLESS THEY ARE BLOCKED AND CANNOT BE LOWERED ACCIDENTLY.**

The following paragraphs are not intended to cover all repair problems that may confront the operator. They are merely intended to assist the mechanic or operator in routine adjustments and maintenance which may be done in the field for the most efficient operation of the machine.

For major repairs, refer your problems to THE FRANK G. HOUGH CO. DISTRIBUTOR to obtain the services of a trained mechanic.

### HYDRAULIC SYSTEM - CARE OF:

The hydraulic system consists of an oil reservoir, a pump, a control valve, two boom hoists, one bucket control cylinder, and the connecting hoses and fittings.

The pump draws oil from the reservoir thru the suction line, and forces it under pressure into the control valve which regulates the flow of oil to the hoists. The valve is manually controlled by the Operator by means of valve control levers.

The pump is protected against severe overloads by a pressure relief built into the valve.

1. Check the oil level in the reservoir daily. The level should be up to the oil level petcock. The bucket should be fully retracted and resting on the ground when checking the oil level. Low oil level will cause cavitation, and the unit will operate in a slow, jerky manner and the pump will howl. The oil level must be to petcock level to maintain a sufficient amount of oil to displace the hoist plungers and supply constant lubrication to the pump.
2. Check the hoses and connections daily to prevent oil from leaking out and air or water from being sucked into the system.

NOTE: Air may be sucked into the system thru a faulty connection, although oil will not leak out. Air or water in the system will cause the oil to foam and interfere

with the smooth action of the boom and bucket. The unit will be noisy and the pump will howl.

3. The very small amounts of water in the system thru condensation will evaporate when the oil becomes warm by operation. However, water sucked into the system must be removed by draining the system. Moisture causes excessive foaming of the oil and causes damage to all parts of the system. Foaming oil will cause the unit to chatter and be noisy, since the pump cannot deliver a steady volume of oil. Drain the system thoroughly to remove moisture.
4. Drain the hydraulic system only after the "PAY-LOADER" has been operated for a time and while the oil is still warm. Warm oil will drain more freely and carry more impurities out with it.
5. Drain the oil from the system, clean the reservoir, and refill the system with a good grade of SAE-10 Motor Oil after the first 32 to 48 hours of actual operation. Thereafter, drain the system and clean it every 1000 hours, or oftener if working conditions are unusually dirty and dusty.  
  
In hot weather or where the "PAYLOADER" will operate in temperatures above 90° F., it may improve the operation by refilling the system with a good, clean grade of SAE-20 Motor Oil. Do not use SAE-20 oil in moderate temperatures.
6. Check the hydraulic pressure relief valve setting at each monthly inspection period. Keep the hydraulic relief valve set properly as instructed, to maintain the hydraulic oil pressure within the limits specified. SEE "VALVE PRESSURE RELIEF."  
  
Correct hydraulic oil pressure is an aid to efficient operation of the machine.
7. Use a good clean grade of white lead, Aviation Permatex or insoluble plastic seal, on the male threads only, when reconnecting a fitting or joint. Do not allow the thread sealer to enter the valves or pumps.
8. The system must be "bled" or purged of air after any work has been done on it, or after it has been drained. Air in the system will retard the operation of the hoists.

### DRAINING THE HYDRAULIC SYSTEM:

NOTE: DRAIN IMMEDIATELY AFTER THE "PAYLOADER" HAS BEEN OPERATED FOR A TIME AND WHILE THE OIL IS STILL WARM. WARM OIL WILL CARRY MORE DIRT AND SLUDGE WITH IT.

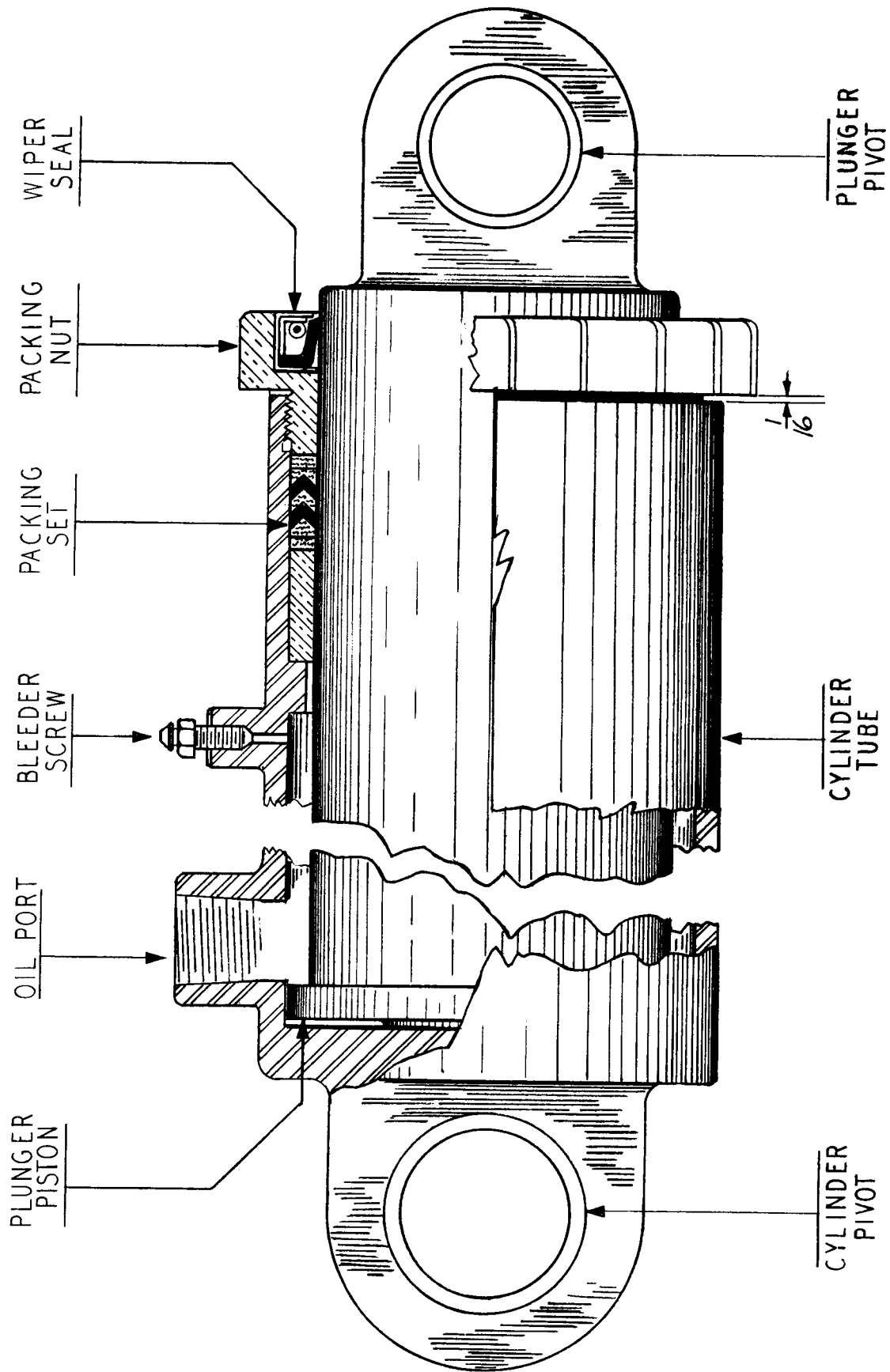


Fig. 5

To drain the entire hydraulic system, proceed as outlined.

1. Raise the boom to full height with the bucket in dumped position. Block or chain the booms up in the raised position so they cannot fall when the oil drains from the hoist cylinders. Then shut off the engine.
2. Place a 15 gallon container near the reservoir drain plug, procure a funnel and hose to direct the oil from the reservoir into the container, then remove the drain plug.  
  
The drain plug is a magnetic type and must be thoroughly cleaned before replacing.
3. After the reservoir has drained, break the hose connections at the pump to drain the pump and pump hoses.
4. Break the boom hoist hoses at the frame to drain the boom hoist cylinders.
5. Break the boom pipe hose connection at the frame to drain the bucket control cylinder and the boom pipe.
6. Remove the reservoir clean-out cover, and remove the cap from the reservoir breather and wash it in gasoline to clean the air passages.
7. Flush and clean all sludge and dirt from the bottom of the reservoir, being careful not to force sludge or dirt into the valve. If the reservoir is very dirty, or if dirt is forced into the valve, it must be removed and the valve washed out in clean gasoline.
8. After the system has been drained and cleaned, replace the drain plug and the valve and remake all broken connections. Be sure the connections are tight and do not leak oil or suck air. See "CARE OF THE HYDRAULIC SYSTEM."
9. Refill the system to the top of the reservoir with a good grade of SAE 10 Motor Oil.
10. Start the engine; allow it to operate at idle speed until it partially warms up, and giving it time to pump oil into the cylinders. Operate the bucket cylinder thru its dumping cycle several times. remove the blocks or chains holding the boom in raised position. Do not stand or work under the bucket when the blocking is removed. Operate the boom by raising and lowering it several times; then allow the bucket to rest, fully closed, on the ground and shut off the engine.
11. Inspect all connections and the drain plug for leaks at this time.
12. After all work has been completed, refill the reservoir to the petcock level. This is necessary as oil will have been pumped into the hoist cylinders and hoses, thereby reducing the oil level in the reservoir.

13. Replace the clean-out cover and the breather cap. Be sure the cover gasket is in place and the breather is clean.
14. After the system has been drained and refilled, or any work done on it, the system must be "bled" or purged of air.

#### **BLEEDING THE SYSTEM:**

1. Start the engine, raise the bucket to nearly full height, slowly open the bleeder screws in the upper end of the boom hoist cylinders. Operate the bucket thru its dumping cycle slowly several times.
2. As soon as air bubbles cease to escape from around the bleeder screws, tighten the screws securely. Clean the hoist cylinders of oil that escaped thru the bleeder screws.

#### **HYDRAULIC HOIST CYLINDERS:**

The Hydraulic Cylinders are so constructed that no adjustments are necessary other than to tighten the packing if oil escapes excessively.

**IMPORTANT: ADJUST THE PACKING, BY TURNING THE PACKING NUT, SO A SLIGHT FILM OF OIL ADHERES TO THE PLUNGER AT ALL TIMES, AS IT EMERGES FROM THE CYLINDER.**

This compensates for packing wear and allows the wiper seal to remove dirt and other foreign matter from the plunger as it is drawn into the cylinder.

The hydraulic hoist packing is the chevron type and is made up in sets of special rings. When the packing and wiper seals become worn, as evidenced by oil escaping excessively, they must be replaced.

#### **BOOM HOIST PACKING:**

1. To replace the boom hoist cylinder packing, have the bucket resting on the ground, place the valve levers in neutral position to close off the reservoir oil from the hoist, and shut off the engine.
2. Disconnect the hose to the hoist cylinder and cork the opening on the valve side. The oil in the hoist will drain out when the line is disconnected from the hoist.
3. Remove the hoist upper pivot pin to free the cylinder from the boom bar. Support the cylinder to hold it from falling when the pivot pin has been removed.
4. Attach a chain hoist or crane to the boom to raise it slightly to allow the cylinder to swing downward and rest on the front axle bar.

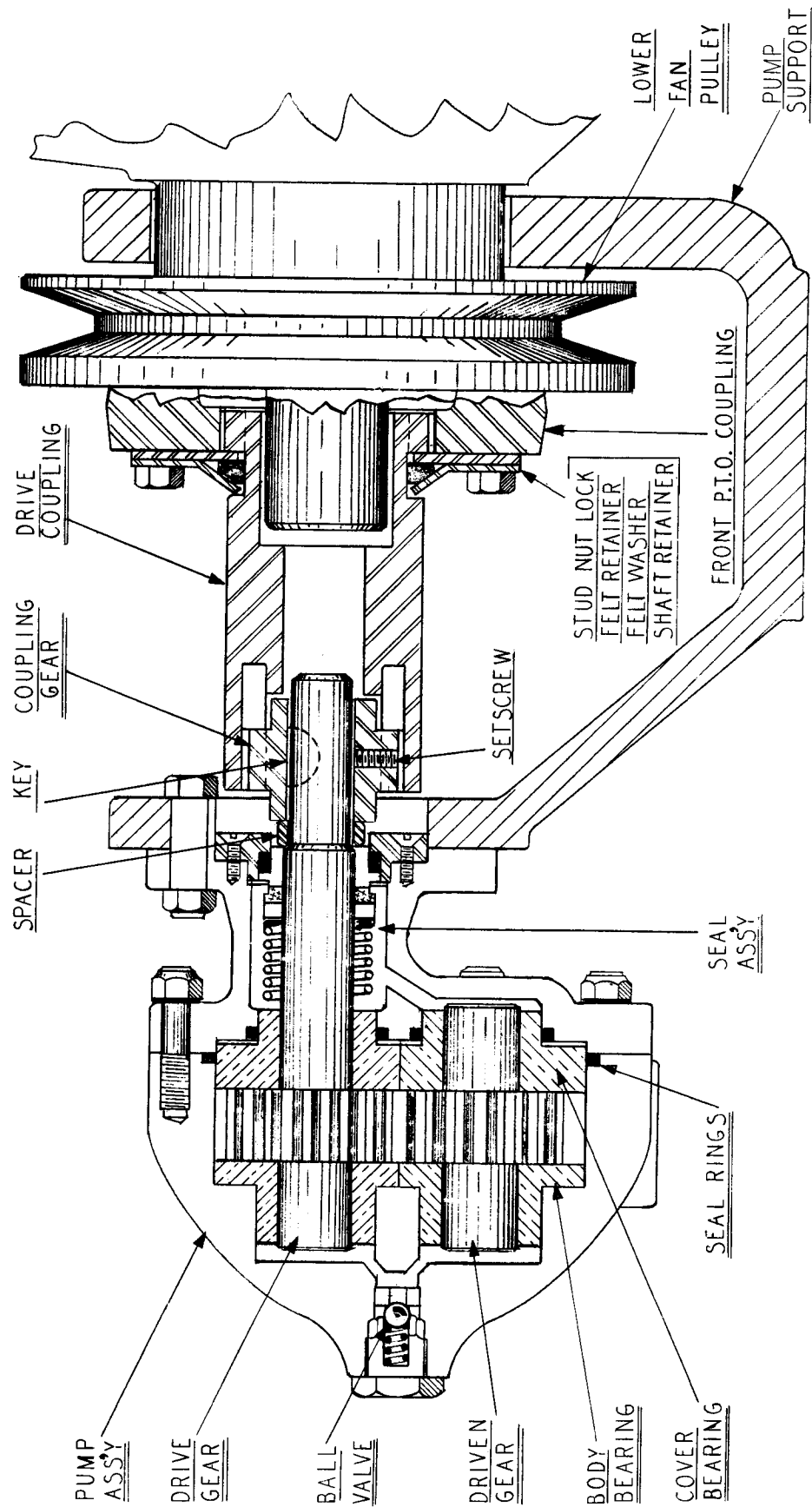


Fig. 6



5. Unscrew the packing nut out of the cylinder. Using an ice pick or similar tool, remove the worn packing paying attention to the way the old packing rings were arranged. Be careful not to mar or scratch the plunger surface with the pick.

Clean out the packing recess thoroughly before inserting the new rings.

6. Insert the new packing by first placing one of the flat sided rings in the bottom of the recess, flat side down. Tamp it firmly but gently in place with a blunt instrument. Be careful not to damage the rings while placing them in the recess. Be careful not to scratch or mar the plunger rod when tamping in the rings. Insert the "V" rings on the first ring, then add a flat ring on top.

**NOTE:** If any of the rings are damaged when being placed in the recess, discard them for another. A damaged ring will not seat properly and will permit oil to escape.

If the new packing is coated with wax, it must be removed by light scraping and then powdered with graphite. If a ring is damaged by scraping, it must be discarded. Leather rings may be soaked in hot oil to soften them.

7. When the packing has been assembled properly and the nut pulled down snugly, a light film of oil should adhere to the plunger as it is drawn from the cylinder at all times. Adjust the packing nut from time to time to maintain this condition.
8. Raise the cylinder and lower the boom to reinsert the upper pivot pin to connect the hoist to the boom. Reconnect the hose to the cylinder being sure to remove the plug placed in the hose to hold the oil. Make the connection tight.
9. Start the engine, raise and lower the boom several times, then shut off the engine with the bucket resting on the ground.
10. Inspect the connections for leaks. Add oil to the reservoir to bring the oil level up to the petcock to replace the oil lost from the cylinder. Then "bleed" the system of air.

## BUCKET CONTROL CYLINDER

The packing is replaced in the bucket control cylinder similar to the boom hoist. The pivot pins must be removed to free the cylinder from the bucket and carrier. Disconnect the hose and unscrew the pipe nipple from the cylinder plunger end. Then remove the plunger shield to expose the packing nut. Unscrew the packing nut and follow the procedure outlined for the boom hoist packing replacement.

## HYDRAULIC OIL RESERVOIR:

The oil reservoir is located just in back of the operator's seat and up under the engine hood. The oil level must be maintained up to the petcock level when the bucket is resting on the ground. This will insure a quantity of oil sufficient to displace the cylinder plungers in order to raise the boom and bucket.

There are no adjustments on the reservoir; however, it should be drained, cleaned of dirt and sludge, and refilled with clean oil every 1000 hours. The tank breather should be washed out with clean gasoline periodically. Remove the hand hold cover to inspect the vents in the breather pipe.

To remove the reservoir, first remove the engine hood. Drain the reservoir, and then disconnect the hoses and the control rods. Remove the bolts holding the reservoir to the frame and lift out the reservoir along with the valve which is bolted to the underside of the reservoir.

## HYDRAULIC PUMP: For Hoist Cylinders.

The pump is coupled directly to the engine crankshaft and must not be operated without sufficient oil circulating thru the hydraulic system to provide constant lubrication in the pump gears. The pump draws oil from the reservoir and forces it, under pressure, into the valve.

The pump is a gear type, assembled for counter-clockwise rotation viewing the head end. There are no adjustments to be made on the pump.

If the pump does not develop sufficient pressure, and the cause cannot be determined, see THE FRANK G. HOUGH CO. DISTRIBUTOR for details on the repair or replacement of the pump.

## PUMP REMOVAL.

To remove the hydraulic pump from the engine, unfasten the engine hood top at the grille casting. Then unfasten all but one of the bolts holding the grille casting to the frame. Swing the grille casting out, away from the engine allowing the grille to pivot on the remaining unfastened bolt. The hood top can be permitted to rest on the engine.

Disconnect the hoses at the pump. **NOTE:** if it is desired to merely loosen the pump for fan belt removal, the hoses can remain on the pump undisturbed.

Remove the bolts holding the pump to its support bracket and draw the pump backward, away from the engine. The pump drive coupling will slide apart as the pump is drawn backward and downward.

Care must be used when swinging the grille casting outward on its pivotal bolt. It may be a good idea to use a chain hoist to assist in supporting the weight of the grille casting during this period.

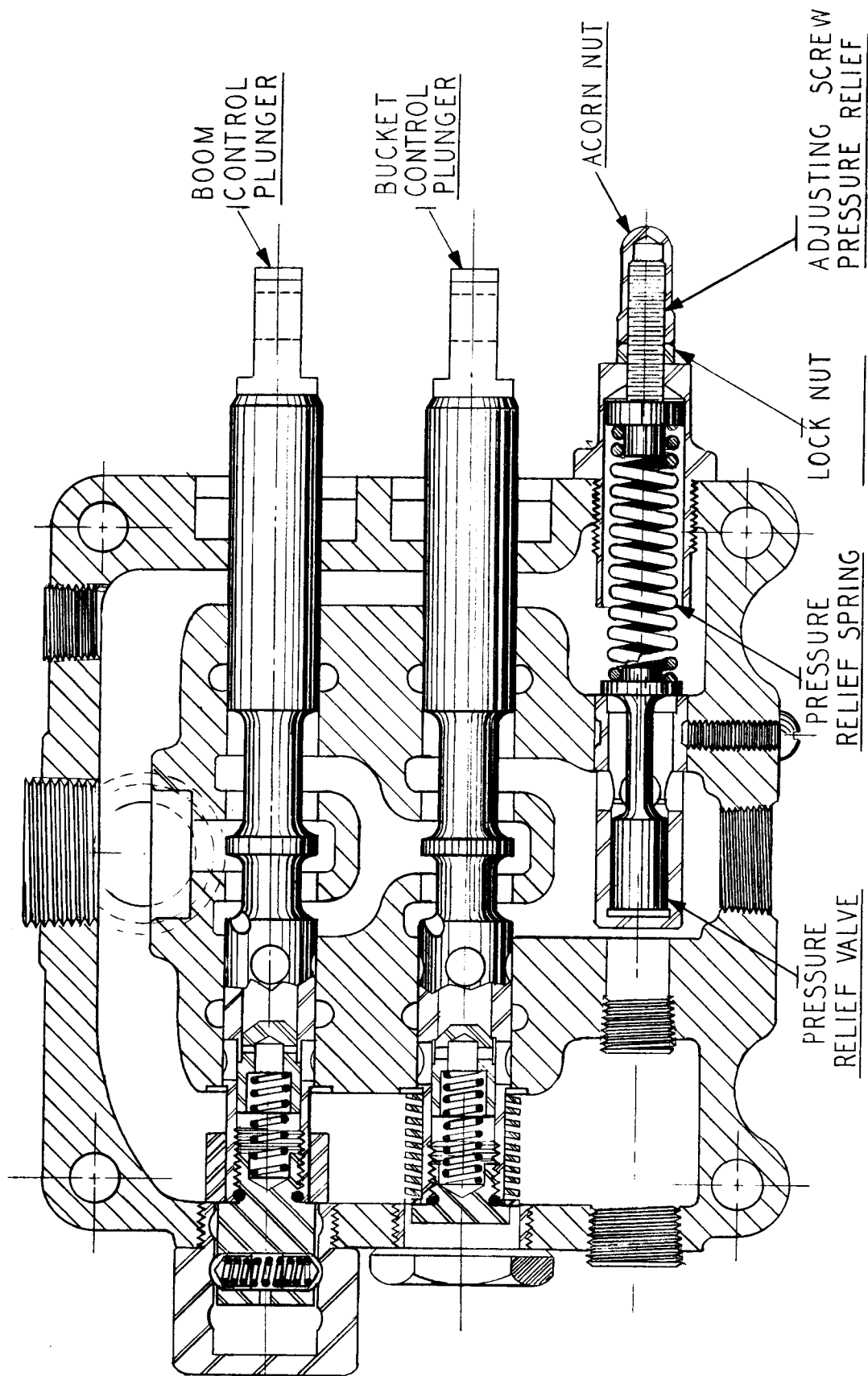


Fig. 7

Be sure to lubricate the pump coupling with a good grade of high temperature grease before reassembling the pump to its support bracket.

### PUMP DISASSEMBLY:

The manufacturer does not normally recommend replacement of the gears or bearings in the field; however, springs, seals, or the ball valve may be replaced. To inspect and replace the pump drive shaft seal, remove the pump from the machine. Remove the coupling and drive key from the end of the pump drive shaft. Remove the four counter sunk head screws holding the seal retainer ring to the pump cover. There are two threaded holes in the retainer ring to assist in removing the ring. Turn two of the countersunk head screws into these holes until they bear on the pump body. This will tend to push the ring out. Care must be used in taking out this ring, since the seal springs exert considerable pressure against the inside of the seal and ring, and may cause the ring to pop out suddenly as it is being loosened. When the retainer ring is removed, the pump shaft seal and spring assembly will be exposed and may be removed.

To inspect the bore valve ball seat and ball, remove the hex head retainer from the pump body. The gasket, spring and ball may then be taken from the valve bore of the body. The ball seat is a press fit in the valve bore and should not be replaced unless damaged. If the ball seat is only slightly scratched, place the ball in the seat and tap the ball with a soft hammer or mallet. To remove the seat, thread a suitable pipe tap into the seat and heat the body to 200°F. The seat can then be pulled out, using the tap as a puller.

Before removing the pump cover from the pump body to inspect and replace gears, bushings or seals, put match marks opposite each other on both parts so they can be reassembled for correct rotation. Then remove the bolts holding the cover to the body to expose the gears and bushings. These gears and bushings are fitted to the pump body at the time of manufacture and should only be replaced as matched sets and fitted by a trained mechanic.

### HYDRAULIC VALVE:

The hydraulic valve receives oil under pressure from the pump and directs it to the hoists. When the valve plungers are in "Hold" position, the oil already in the hoists is retained therein, but oil from the pump flows thru the valve back to the reservoir. In "Raise" and "Close" positions, the oil from the pump is directed into the respective hoist cylinders. In "Lower" or "Dump" positions the oil returns from the hoist cylinders, thru the valve and into the reservoir along with oil coming from the pump.

Remove the valve from the oil reservoir and wash it out with clean gasoline every 1000 hours of operation. Whenever the oil in the reservoir is very dirty, or dirt is forced into the valve when cleaning the reservoir, the valve must be removed and washed out.

Springs and seals may be replaced when necessary, but the manufacturer does not recommend re-

placement of the plungers, as they have been fitted to the body at the factory to maintain close tolerances.

### VALVE REMOVAL:

The hydraulic valve is mounted to the underside of the reservoir. To remove the valve, proceed as follows:

1. Drain the oil reservoir. It is not necessary to drain the entire system.
2. Disconnect the hoses from the valve. Disconnect the valve control rods at the valve.
3. Unscrew the capscrews holding the valve to the valve mounting plate, and the valve will come away from the reservoir.
4. Note the "O" ring oil seal at the valve discharge opening into the reservoir. This ring must be in good condition, otherwise discard it for a new ring. Be sure to replace this "O" ring carefully when reassembling the valve to the reservoir to avoid pinching the ring because of a poor seat.
5. After the valve is rebolted to the reservoir, connect the hoses. Refer to the hydraulic diagram to note the proper connection points. Be sure the connections are tight and will not leak oil. Refill the reservoir with the proper oil to the petcock level.

Start the engine and operate the hoists several times. Then shut off the engine with the bucket on the ground. Inspect the connection points, then recheck the oil level in the reservoir, and "bleed" the system of air.

### THE VALVE PRESSURE RELIEF:

To safeguard the pump, the relief valve pressure must be set at not more than 1250 lbs. oil pressure.

To adjust the relief pressure, insert a gauge of at least 2500 lbs. capacity into the high pressure line to the bucket hoist cylinder by means of a pipe tee. Start the engine keeping it at idle throttle, and raise the boom high enough to clear the ground when operating the bucket through its dumping cycles. Remove the acorn nut from the right side of the valve. Operate the bucket by alternately dumping and retracting the bucket while opening the engine throttle gradually. Note the oil pressure indicated and do not allow it to exceed 1250 lbs. Adjust the screw found under the acorn nut. Turning it clockwise increases the pressure. Turning it counterclockwise decreases pressure.

When the valve is set at 1250 lbs. relief pressure, at full open throttle with the bucket being operated in its dumping cycle, the screw may be locked with the jam nut and the acorn nut replaced.

### THE ENGINE:

Refer to International Harvester Operation & Maintenance manual for UD 264 engines. Engine re-

pair, maintenance and operation is thoroughly discussed in the engine manual, which should be read and studied to avoid damage.

## ENGINE REMOVAL:

1. To remove the engine, first remove the hood sides, then remove the muffler, air-cleaner stack cap and the reservoir breather. Disconnect the gasoline fuel line at the gas tank and remove the engine hood top.
2. Remove the radiator grille casting and remove the radiator. There are four bolts securing the grille casting to the frame. They can be reached by extending the arm backward between the engine and the frame side channels. To remove the radiator, first drain the cooling system, then disconnect the water hoses. Unfasten the radiator support bracket at the frame.
3. Disconnect the pump hoses at the pump and cork the hoses. Unbolt the pump and remove it from the machine.
4. Disconnect the battery ground strap to prevent short circuiting the high voltage electrical system. Then disconnect the wiring and cables at the engine. See the engine manual paragraphs pertaining to the electrical system. This is important.
5. Unfasten the choke rod, accelerator rod, cocking control rod, hand throttle rod and the clutch control rod of the engine.
6. Disconnect the fuel lines at the engine.
7. Separate the upper universal drive shaft at the clutch shaft yoke. Merely remove the bolts holding the center cross bearing to the yoke and tap apart. These bolts must be pulled up to correct torque reading when reassembling the drive shaft. See "Drive Shafts".
8. The engine is mounted on four (4) pads, two at the fly wheel housing and two at the fan pulley end. Remove these bolts and pads to free the engine. Using chain slings and a crane the engine may now be lifted from the machine.

## FAN BELT REMOVAL:

Untimely shutdowns or damaged radiators may be avoided by frequent replacement of the fan belt. The fan belt should be inspected at each monthly service period and replaced if it shows signs of deterioration. If the machine is laid up for a time, it is good practice to ease the fan belt tension. Belts will deteriorate if allowed to remain taut for prolonged periods when not subjected to normal action. This applies to the generator belt as well.

To replace a worn fan belt, proceed as follows:

1. Loosen the hydraulic pump and move it backward, away from the engine. By turning the pump while

holding it downward, it will come well away from its mounting bracket. It is not necessary to disconnect the hoses from the pump.

2. Loosen the internal gear shaft from the crankshaft fan pulley and move the shaft backward, away from the machine. It will have to pass into the pump bracket hole as far as the shaft can be moved.
3. Loosen the flange at the upper fan pulley to relieve the belt tension. Then slip the fan belt from around the lower pulley, pass the belt thru the space between the coupling shaft and the lower pulley, then out and over the fan blades.
4. It is good practice to inspect the generator belt at this time and replace it if there are signs of wear, since the fan belt must be removed before the generator belt can be taken from the machine.
5. Note: In operating conditions which enhance rapid deterioration of the fan belt, it is suggested that two belts be placed around the pump coupling shaft. One of these two belts can be placed around the fan pulleys, being used, while the other belt can be tied back, out of way, and held in readiness as a spare. Then when the first fan belt deteriorates, it can be cut away and the spare belt placed on the pulleys quickly. This will save time in replacing a fan belt.
6. When the new fan belt, or generator belt has been installed, adjust the belts to proper tension. Never adjust a belt so tight that it feels stiff and taut. Adjust the belts so they can be flexed sideways, by hand.

## OIL FILTER:

The purpose of the crankcase oil filter is to retard dilution of the engine oil by harmful substances, and to remove abrasive particles which may have gotten into the oil.

Whenever the crankcase oil is changed, the filter should be serviced as well. Clean the filter container of sediment and renew the filter element when changing the crankcase oil.

Read and follow the instructions on the box containing the new element when replacing a used element.

After replacing a filter element, tighten the cover securely, start the engine, and let it operate about 10 minutes to fully saturate the new filter element. Then shut off the engine and inspect the filter cover for leaks.

Always check the crankcase oil level after a new element has become saturated with oil, since oil drawn into and retained in the filter will reduce the oil level in the crankcase.

## AIR-CLEANER SERVICE:

A regularly serviced and properly working air cleaner contributes considerably to the long life of an engine. Surprising amounts of foreign particles are present in most atmospheres, and the abrasive action of such dust and dirt particles causes rapid wear on the valves, bearings, and cylinder walls when it is carried into the engine. The purpose of the pre-cleaner is to collect grit and dirt before it reaches the engine. Thus the cleaner itself must be cleaned as often as dirt accumulations start to build up. Sometimes the cleaner must be cleaned and the oil in it changed several times a day if conditions are especially bad. Daily servicing of the air cleaner is important. To service, wash out the oil cup in clean gasoline and refill the cup to the oil level bead with clean oil of the same grade as is being used in the engine crankcase.

Examine the air cleaner tube periodically for leaks. Poor connections or minute leaks can permit the passage of abrasive dust more freely than a poorly serviced air cleaner and will surely offset any effort to maintain an efficient air cleaner.

## CLUTCH:

The clutch is a spring loaded, dry disc, foot operated type. The importance of proper use of the clutch pedal during Loader operation will save considerable wear on the clutch release bearing and the clutch disc. "Riding" the clutch causes rapid wear on the clutch release bearing, and the tendency to "feather" the clutch results in premature wear on the clutch disc. The clutch pedal should never be depressed except during the time required to shift gears.

The clutch release fingers are adjusted and locked at the factory and are NOT to be adjusted to compensate for facing wear. An adjustment for facing wear and free pedal play is provided in the clutch operating rod.

The clutch pedal must have 2 and 2-1/2 inches of free play. Clutch wear decreases this clearance. It is imperative that the pedal be readjusted at frequent intervals to obtain this clearance.

Free pedal play is the amount of movement of the clutch pedal before the clutch release bearing contacts the clutch release levers or fingers.

### CLUTCH PEDAL ADJUSTMENT: SEE FIG. 8

To readjust the clutch pedal remove the clevis pin and turn the clevis to lengthen the clutch control rod until the necessary free movement of the clutch pedal is obtained. It may be necessary to adjust the clevis several times before the proper free movement is reached.

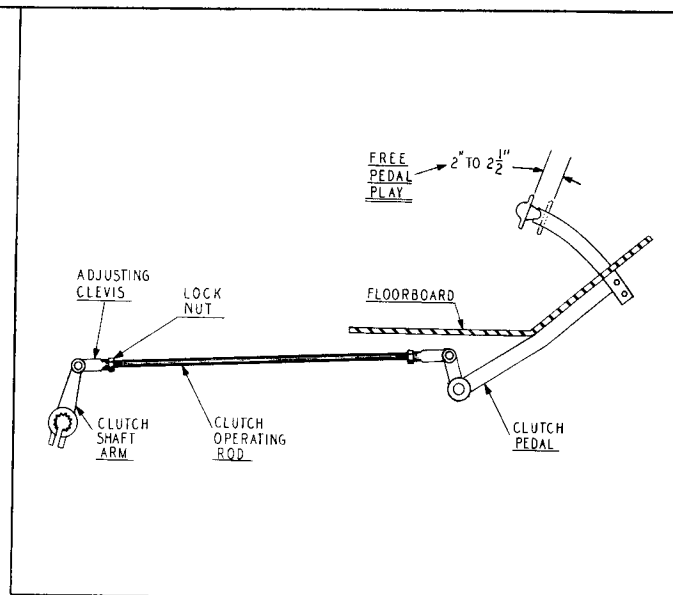


Fig. 8

Be sure to tighten the adjusting nut against the clevis end to lock it in place.

## CLUTCH AND POWER TAKE-OFF REMOVAL:

To remove the power take-off housing and the clutch follow the suggestions as listed in the following outline.

1. From underneath the machine break the upper drive shaft at the clutch by removing the capscrews holding the center cross bearings to the yokes.
2. Remove the clutch pedal return spring and disconnect the clutch operating rod from the clutch shifter lever at the clutch housing.
3. Place the valve control levers in neutral. The hose nearest the power take-off housing must be turned outward against its neighboring hose by turning the hose fitting at the valve.
4. Remove the "U" clamps bolted to the lower frame channels so the boom hoist cross pipe can be moved forward and down.
5. Remove the capscrews fastening the power take-off housing to the flywheel housing. Pry the P.T.O. housing away from the flywheel housing and lower it to the floor under the machine. The clutch will now be exposed. The power take-off shaft, with the release bearing and sleeve will be withdrawn with the housing.

When the clutch has been removed, inspect the clutch pilot bearing in the flywheel. Be sure this bearing is in good condition, if not replace it with a new one.

Before installing a new clutch inspect the pressure plate, release levers and other parts to be sure they are not worn, damaged or distorted. Worn or

distorted parts will prevent complete use of the clutch and will result in shorter clutch life.

When installing the clutch to the flywheel, make sure the cover plate will fit freely before inserting the driven disc. Then follow the procedure suggested below.

1. Install the driven disc assembly to the flywheel.
2. Bolt the clutch assembly to the flywheel by turning in each bolt finger tight. Insert a spare splined pilot shaft through the clutch to hold the driven disc hub on center, while bolting the clutch in place. Use care to avoid bending or misalignment of the disc to prevent clutch "drag".
3. With the driven disc in line with pilot bearing and the clutch assembly, the bolts into the flywheel may be tightened by alternately drawing up opposite bolts, until the clutch is securely and evenly fastened. Then the spare splined shaft may be withdrawn.
4. Bring the power take-off housing into position carefully, so that the power take-off shaft can be slipped gently into place thru the clutch, the disc and the pilot bearing without bending, or otherwise disturbing the alignment of the assembly.
5. Bolt the housing securely in place, replace the clutch operating rod to the clutch arm and reassemble the drive shaft. Be sure to adjust the clutch pedal free travel after installation of the clutch is complete.

#### DRIVE SHAFTS:

The drive shafts are Mechanics double universal joints of roller bearing design with each bearing retainer held in place by an integral key and pilot and two capscrews. The roller bearings are protected by a cork dirt seal which is held in place by a steel retainer ring. The cork seal and its retainer act as grease seals to keep lubrication in the bearings and prevent dirt from entering.

There are no adjustments to be made on the drive shafts except to keep them lubricated and to check the bolts to see that they remain tight. Always tighten the capscrews at the upper joint to 20 to 30 ft. lbs. and those of the lower joint to 45 to 55 ft. lbs. using a torque wrench.

To "break" or separate the joint, remove the capscrews and the lock holding the center cross bearings to the yoke and tap apart.

Service these joints periodically as instructed in the Lubrication Chart.

#### TRANSMISSION:

This is a four speed forward and four speed reverse transmission completely equipped with anti-

friction bearings. For major repairs to the transmission consult THE FRANK G. HOUGH CO. DISTRIBUTOR for the services of a trained mechanic.

Be sure to check and service the transmission regularly as specified in the Lubrication Chart.

To remove the transmission proceed as follows:

1. Fashion a "vee" shaped clamp with legs extending outward from the end of each leg. Drill a 9/16 diameter hole in the legs to match two of the diagonally opposite bolts holding the reverse shifter housing to the top of the transmission. Bend the vee clamp from 1/8 thick steel strip by 1" wide stock. Remove two diagonally spaced capscrews from the reverse shifter shaft housing and mount the clamp upright in these holes.
2. Disconnect the directional lever linkage from the transmission reverse shifter shaft.
3. From underneath the machine, remove the cotter pins and pivot pins connecting the speed range shifter rails to the transmission.
4. Separate the two drive shafts by removing the capscrews holding the transmission shaft yokes to the center cross of the upper and lower universal joint.
5. Connect the crane hook to the "vee" clamp to hold the transmission in place, remove the bolts holding the transmission mounting brackets to the frame, one on each side. Remove the left side bracket from the transmission to allow greater clearance to lower the transmission to the floor under the machine.
6. By twisting the transmission sideways, it can now be lowered to the floor and pulled out from underneath the machine.
7. Reassemble in reverse order of removal.

#### DRIVE AXLE:

Service the drive axle periodically as specified in the lubrication chart. The differential carrier and each wheel housing must be serviced independently of each other. There is no provision made in the axle to permit oil to pass from the differential carrier to either of the final drive wheel housings. Oil filler plugs are located at three points, one in each of the wheel housings and one for the differential housings.

To remove the drive axle as a unit, disconnect the brake fluid lines at the wheels. Break the universal joint by removing the bolts holding the yoke to the centercross bearings. Remove the bolts holding the axle housing to the frame. Hoist up the machine high enough so the axle will clear the counterweight casting under the frame. Block the machine in this position securely and roll the axle out from under the machine.

**NOTE:** Check the drive axle wheel nuts periodically. These nuts should be forced tight, using a long handled wrench. If the nuts work loose, damage to the hub and axle result.

## **BRAKES: "BLEEDING"**

The foot brakes are hydraulically operated, internal expanding, two shoe type in both rear wheels.

The hydraulic brake system must be "bled" whenever air gets in the system through a leak or when a line has been disconnected. Air trapped in the system gives a "spongy" feel to the brake pedal and, being compressible, does not allow pressure applied to the brake pedal to be transmitted solidly through the lines to the brakes. The system must be free of air at all times.

To bleed the brakes proceed as follows:

1. The longest fluid line from the master cylinder should be bled first. Proper sequence is bleeding the left wheel and then the right.
2. Carefully clean off all dirt from around the master cylinder filler plug, remove the plug, and fill the master cylinder with hydraulic brake fluid.
3. Have one man slowly pump the brake pedal while another man opens the breather screw each time the pedal is pushed down and closes the screw just before the brake pedal is returned upward. Opening the breather screw when the pedal is depressed forces air and fluid from the line. Closing the breather screw when the pedal is released prevents air from being sucked back into the line.
4. Continue the slow pumping of the brake pedal and alternately opening and closing the breather screw until air bubbles are no longer seen escaping with the fluid from the line. Be careful not to pump all the fluid from the master cylinder. Refill as necessary until the line is free of air.
5. Tighten valve, and repeat the operation on the right wheel.
6. Refill master cylinder when both wheels have been bled and replace the plug.

## **BRAKE: ADJUSTING**

Inspect the brake linings periodically for wear.

To adjust lining clearance, proceed as follows:

1. Jack up the rear axle and remove the wheel.
2. Remove the 5/16 bolt to loosen the inspection cover on the brake drum.
3. Use a .010 feeler gauge thru the slot in the brake drum until .010 clearance is obtained on the top and bottom of the front shoe. It is necessary to

turn the anchor screw to adjust the shoe. Loosen the anchor screw lock nut to turn.

4. Turn the brake drum slot to opposite shoe and adjust top and bottom until .010 clearance is obtained. Note there are two anchor screws, one for each shoe. When adjustment is correct, the brake shoes will impose no "drag" on the drum as the wheel is turned.
5. Lock the anchor screw when adjustment is satisfactory and try the feeler gauge in top and bottom of each shoe again to make sure the adjustment was not upset when locking the anchor screws. Replace the wheel.
6. Repeat above on the other wheel.

## **PEDAL ADJUSTMENT - BRAKES:**

Free pedal play must be apparent at the top of the stroke of the brake pedal, so that approximately 1/8" clearance is maintained between the master cylinder plunger and the end of its actuating rod. See Fig. 9.

Lack of free pedal play results in the master cylinder plunger being depressed, causing undue wear on the brake lining. Free pedal play is the amount of movement of the pedal before the actuating rod contacts the cylinder plunger. To obtain the correct amount of free brake pedal play, adjust the operating rod clevis at the brake pedal.

It is good practice to overhaul the master brake cylinder and wheel cylinders whenever the brakes are relined.

## **HAND BRAKE ADJUSTMENT:**

The hand brake operates independently of the foot brakes. Pulling backward on the hand brake lever causes an inner and an outer brake shoe to grip a small drum on the lower drive shaft. The hand brake drum is integral with the drive shaft axle yoke.

Adjustment for lining clearance of these shoes can only be made by turning the nut at the brake shoe lever arm.

## **STEERING ADJUSTMENTS:**

### **LUBRICATION OF STEERING GEAR:**

The steering gear is filled at the factory with a special steering gear lubricant developed for both summer and winter operation. Seasonal change of lubricant and draining of gear case is not necessary.

Gear would be kept filled to level of filler plug with correct lubricant. Add GMC #4567-M Lubricant to keep full.

### **STEERING GEAR ADJUSTMENT:**

Correct steering gear adjustment is very important. There are only two adjustments to be made, but the following procedure must be adhered to, step by step. See picture Steering Gear Adjustment.

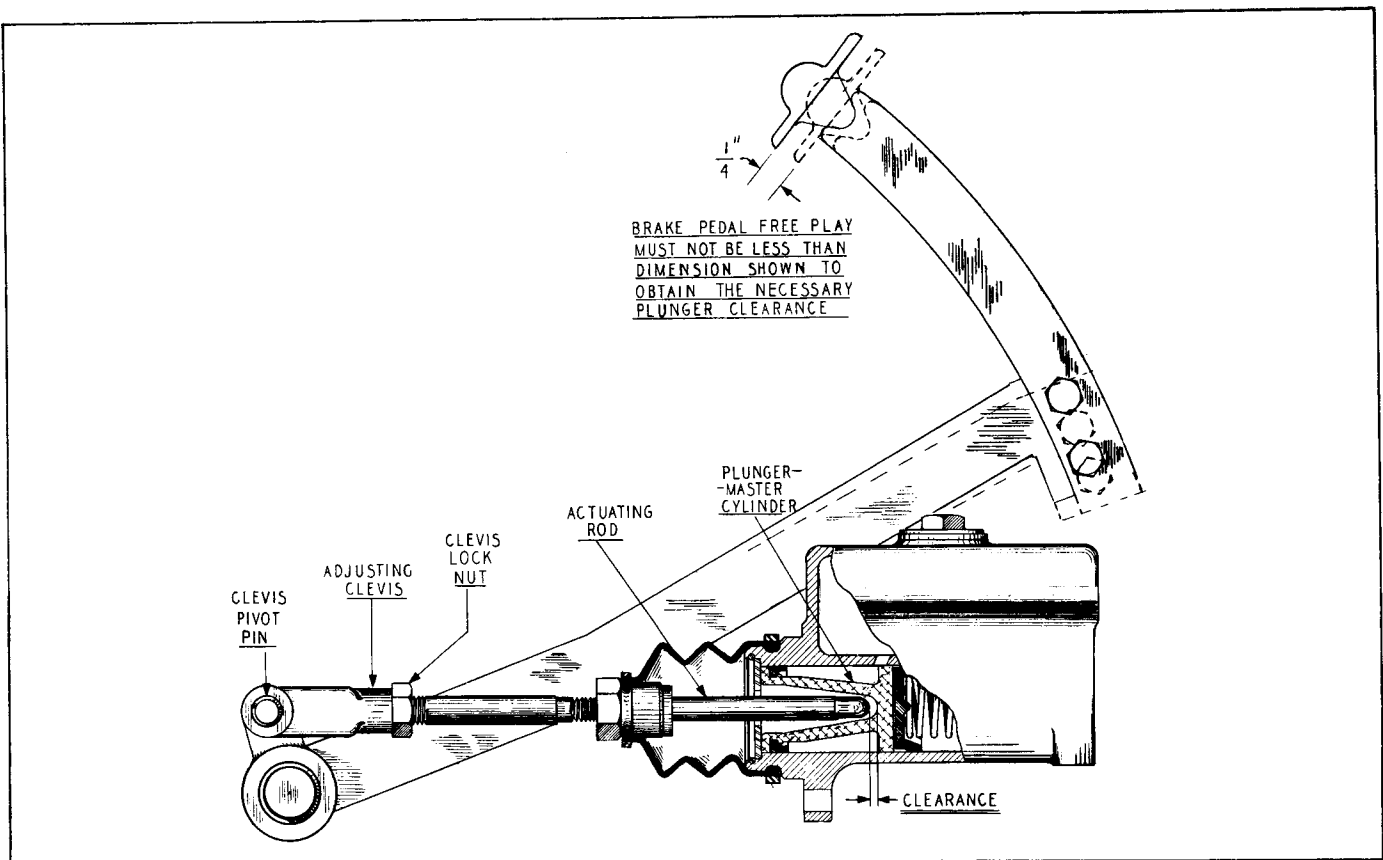


Fig. 9

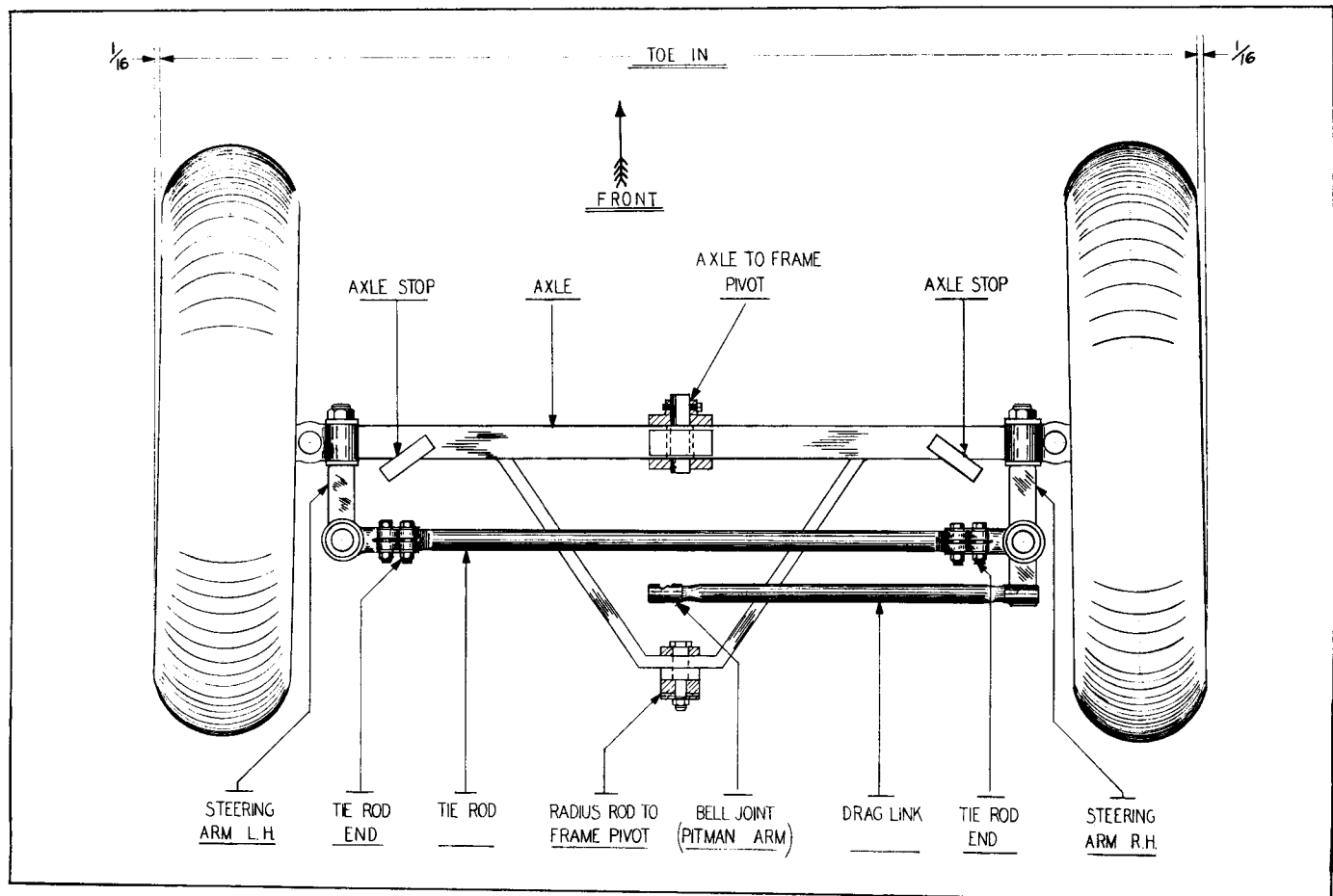
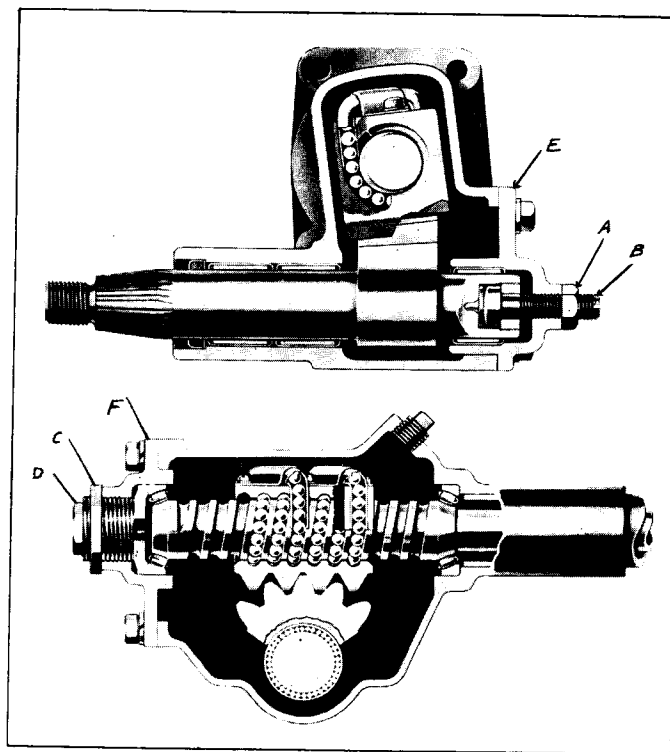


Fig. 10





### STEERING GEAR ADJUSTMENT

1. Disconnect drag link from pitman arm, taking care to note relative position of drag link to pitman arm, before disturbing them.
2. Disconnect upper steering column brace to make sure there is no bind in the column due to anchorage.
3. Loosen locknut "A", then turn lash adjuster "B" a few turns counterclockwise. This relieves the load upon the screw bearings imposed by the rack and sector teeth. Turn steering wheel GENTLY in one direction until stopped by gear, then back one turn. Do not turn steering wheel hard against stops when gear is disconnected. Damage to ball guides may result.
4. Measure the pull at the rim of the wheel which is required to keep the wheel in motion. This pull can be measured by attaching a spring scale to the rim of the wheel with a piece of cord, then pulling on the spring scale to turn the wheel. The line of the scale should be kept tangent to the rim of the wheel. The proper value of the pull at the wheel rim under these conditions is 1-1/2 to 2 lbs. If the actual value does not lie between these limits specified, adjustment of the screw bearings is necessary.
5. To adjust screw bearings, loosen locknut "C" and turn screw bearings adjuster "D" clockwise until there is no perceptible end play in screw. Check pull at wheel rim as above, readjusting, if necessary, to obtain proper pull. Set up lock nut "C", and recheck pull, as it must lie within the specified limits AFTER the locknut is set up. If gear feels "lumpy" after adjustment of screw bearings, there is probably damage in the bearings due to

severe impact or to improper adjustment, and the gear must be torn down for replacement of damaged parts.

6. After proper adjustment of screw bearings is obtained, and all mounting bolts securely tightened, adjust lash adjuster "B". First turn steering wheel GENTLY from one stop all the way to the other, carefully counting the total number of turns. Then turn wheel back exactly half way to center position. Mark wheel at top or bottom center with piece of tape. Turn lash adjuster "B" clockwise to take out all lash in gear teeth, and tighten locknut "A". Check pull at wheel rim as before, taking the highest reading of the spring scale as the wheel is turned through center position. Proper value of pull is 2-1/2 to 3 lbs. Readjust, if necessary, to obtain proper pull. Set up locknut "A" as it must lie within the limits specified AFTER the locknut is set up.
7. Reassemble steering connecting rod to pitman arm.

### TOE-IN ADJUSTMENT: STEERING WHEELS

The steering arrangement is a single tie rod type and the tractor steering wheel toe-in should be adjusted to best suit the kind of service to which the machine is normally subjected.

For continuous work requiring short hauls, where the machine will operate as much in reverse gear as in forward gear, the steering axle wheels toe-in may be adjusted to "0" inches so all four wheels are in line.

For work which includes long hauls in forward gear or for highway transportation, the steering axle wheels should be adjusted to 1/16" toe-in for each steering axle wheel, or approximately 1/8 inch total for both wheels.

To adjust the toe-in, loosen the nuts clamping the tie rod end to the tie rod. Turn the tie rod so the toe-in is adjusted toward the front of the machine to dimensions as instructed. Have the machine standing level when measuring the amount of toe-in. When the adjustment is correct, lock the tie rod ends to the rod by tightening the nuts.

Check the toe-in at each monthly inspection period to maintain the correct adjustment. This is an aid to longer tire service.

### TURNING RADIUS ADJUSTMENT:

To safeguard the steering gear from excessive strain when turning, stop blocks are provided on the axle bar to limit the turning arc of the tractor wheels. Be sure the machine is standing level, when adjusting the turning radius.

Care must be exercised in locating a new pitman arm. Under no circumstances should the pitman arm

be so located on the serrated pitman shaft so that the turning of the front wheels is stopped by resistance within the steering gear, before being halted by the axle stop blocks. When the pitman arm is correctly located on the steering gear shaft, the total turns of the steering gear are "centered" with the turning arc of the tractor wheels.

If the pitman arm is about to be removed for some reason, put match marks on the arm and the shaft so the arm can be relocated in its original position.

To install a new pitman arm, proceed as follows:

1. With the machine standing level, check and adjust for correct axle wheel toe-in. Place the axle wheels in the straight-away position.
2. Connect the drag link to the steering arm ball and connect the pitman arm to the drag link, but do not connect the pitman arm to the steering gear.
3. From within the operator's seat turn the steering hand wheel gently to the right all the way until stopped by resistance within the gear. Place a chalk mark or piece of string on the rim of the wheel.
4. Now, carefully counting the number of revolutions, turn the hand wheel gently all the way to the left until stopped by resistance within the gear.
5. Then turn the hand wheel back toward the right, exactly one-half the number of total turns. This should place the pitman gear in its "central" position.
6. With the axle wheels in straight-away position, the steering hand wheel centered and the pitman arm connected to the drag link, the pitman arm may now be attached to the serrated shaft of the steering gear.
7. Place a jack under the steering axle radius rod pivot and jack up the end of the machine high enough to allow the axle wheels to oscillate up and down fully, and at the same time permit them to rotate thru their full turning arc.
8. Tilt the right wheel upward and hold it up against the frame stop. Swing the axle wheels as in making a right turn. The spindle arm should rest against the axle stop block when the wheels are in this position. Repeat this procedure on the left axle wheel and check to be sure the turning arc in a left turn is stopped by the left spindle arm resting against the axle stop block.

If the pitman arm has been properly installed on the steering gear, the turning arc of the axle wheels will be stopped by the axle blocks instead of resistance within the gear.

9. It may be possible that thru use and wear on the

assembly, the axle stops are not longer adequate. In this event the length of the axle stops must be increased so they stop the turn on the axle wheels before resistance within the gear itself stops the turning of the axle wheels.

10. If the turning arc is stopped by the steering gear mechanism instead of the axle stop blocks, the bearings, the ball nut, and ball guide within the gear may be damaged.

It is good practice to check the turning radius adjustment at each monthly inspection period. To check, raise the steering end of the machine, tilt the axle to one side, and turn the wheels for both a right turn and a left turn, checking contact with the axle stop blocks. Then tilt the axle to the opposite side and again check the contact with the axle blocks for both right and left turn.

## TIRE PRESSURES:

Front tires are 9.00 x 20 - 10 ply. The front tires should be inflated to 75 pounds air pressure.

Rear tires are 13.00 x 24 - 8 ply and should be three-fourths (3/4) full of calcium chloride solution with 25 pounds air pressure.

## CALCIUM CHLORIDE - TIRES

Secure a "bleeder" adapter from an authorized tire dealer to allow air in the tire to escape when being replaced by liquid. Jack up the "PAYLOADER" and turn the tire so the valve stem is on top. Turn out the valve core, screw in the adapter and attach the water hose to the adapter. Place the container holding the calcium chloride solution somewhat higher than the tire (about 5 or 6 feet). Put the solution in the tire tube by using a hand pump or by using compressed air and a pressure tank filled with liquid. Fill the tube until the liquid level is slightly below the valve stem level. Remove the hose and adapter, replace the valve core and inflate the tire with air until the tire gauge registers 25 pounds.

To make the proper calcium chloride solution for one tire, be sure to put 38 gallons of water in the container first. Then add 120 pounds of calcium chloride. Stir the solution until thoroughly mixed and allow to cool before using.

NOTE: Calcium chloride solution is injurious to metal and should never be used in the cooling system.

## BUCKET CUTTING EDGE

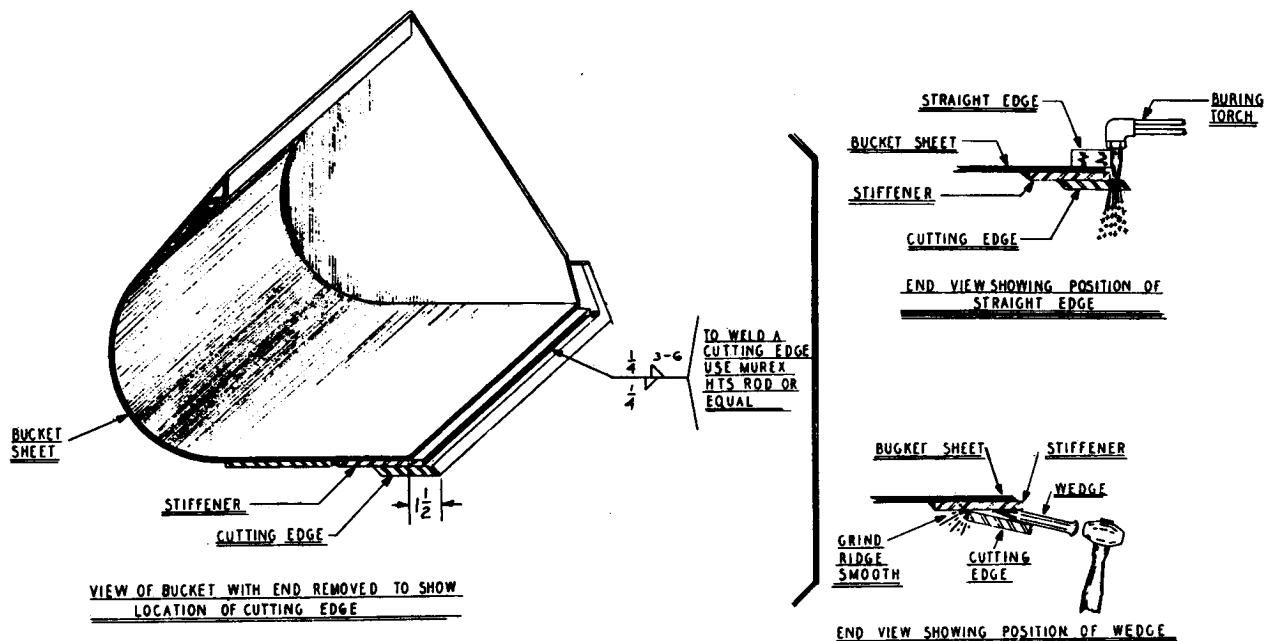
TO REPLACE THE CUTTING EDGE FOLLOW THE PROCEDURE OUTLINED BELOW:

1. Lay a straight edge in the bucket to line up with the front edge of the stiffner and clamp it in place. If there is no stiffner on the bottom of the bucket, line the straight edge with the front edge of the bucket sheet.

2. Guide the burning torch along the straight edge to cut through the cutting edge and the weld along the front edge.
3. Follow a similar method for the upright ends of the cutting edge. Burn through the width of the cutting edge at the bends. Burn off the top weld of the ends with a gouging tip.
4. Drive a cold chisel or wedge between the stiffener and the cutting edge to break the back weld. Force the chisel between the bucket sides and the side portion of the cutting edge to remove the remaining ends.
5. Clamp the new cutting edge in place, 1-1/2 inch beyond the edge of the bucket sheet as shown in the picture. Tack weld only the ends of the cutting edge to the bucket to hold it in place and remove the clamps. Before finish welding the edge to the sheet, bow the cutting edge and bucket sheet upwards 1/4" for every 4 feet of bucket length.

An 84 inch bucket would be bowed upward approx. 1/2 inch. This must be done to overcome weld pull which will draw the edge in a downward bow. To bow the bucket upward, place blocks in the corners of the bucket, lay a stout bar on the blocks so it lays parallel to the outer edge of the bucket sheet. By means of a "C" clamp, draw the center of the cutting edge and the bucket sheet upward, against the bar. Then proceed to finish weld the cutting edge.

6. Back step a continuous 1/4 fillet weld on the front, joining the cutting edge to the stiffener and to the bucket sides. If the bucket has no stiffener, weld the edge to the bucket sheet. Join the back edge to the stiffener or bucket sheet with 1/4 fillet welds 3 inches long on 6 inch centers. Use "Murex" 7/32 HTS rods or equal at no more than 200 amperes. Try to get most of the weld penetration into the bucket sheet so as not to upset the temper of the cutting edge.



METHOD OF CUTTING EDGE REPLACEMENT

Fig.11  
METHOD OF CUTTING EDGE REPLACEMENT

## LUBRICATION & SERVICE POINTS SEE FIG. 12

Items included in this list are major points requiring periodic routine service. Servicing the various items as instructed here, and according to the schedule arranged, will direct the operator's attention to major points of the machine at specific intervals. Thus possible trouble may be detected while it is still of a minor nature.

Before servicing, always wipe the dirt from around the grease fittings, cups, or plugs, to prevent grit, dirt, or other foreign matter from entering. Refer to the lubrication chart to locate the following points. See Fig. 12.

**GREASE DAILY** - (Every 8 to 10 hours of operation).  
Service Items 1 thru 22 with a good grade of general purpose pressure gun grease. Give 2 or 3 shots daily to force out old grease and dirt.

1. Bucket Cylinder - Upper & Lower Pins .2 Points
2. Boom to Carrier - 1 Each, R.H. & L.H.  
Sides . . . . .2 Points
3. Hinge Pin - Guide to Carrier, 3 Each,  
R.H. & L.H. Sides . . . . .6 Points
4. Boom Hoist to Boom - 1 Each, R.H. &  
L.H. Sides . . . . .2 Points
5. Boom Hoist to Frame - 1 Each, R.H. &  
L.H. Sides . . . . .2 Points
6. Boom to Frame - 1 Each, R.H. & L.H.  
Sides . . . . .2 Points
7. Guide to Frame - 1 Each, R.H. & L.H.  
Sides . . . . .2 Points
8. Valve Control Levers - R.H. Side of  
Seat . . . . .2 Points
9. Foot Pedals - Brake & Clutch - 1 Each,  
R.H. & L.H. Floorboard . . . . .2 Points
10. Directional Lever - Center Floorboard .1 Point
11. Range Lever Housing - Under R.H.  
Side Floorboard . . . . .1 Point
12. Accelerator Cross Rod Bearing - 1  
Each - R.H. & L.H. Floorboard . . . .2 Points
13. Hand Throttle - Diesel - Center of  
Seat Kick Plate . . . . .1 Point
14. Cocking Lever - Diesel - Center of  
Seat Kick Plate . . . . .1 Point
15. Water Pump - Lower fitting on the  
fan hub. -Lubricate sparingly with  
water pump grease. Over - lubri-  
cation will clog the system - Give  
not over two shots. . . . .1 Point
16. Clutch Cross Shaft - 1 Each on R.H.  
& L.H. Side of Clutch Housing . . . .2 Points
17. Bell Crank - Hand Brake Rod - L.H.  
Side of Frame. . . . .1 Point
18. King Pin - Front Wheels - 2 Each  
R.H. & L.H. - Steering Spindle. . . .4 Points
19. Tie Rod Ends - 1 Each R.H. & L.H.  
Ends . . . . .2 Points
20. Drag Link - 1 Each - R.H. & L.H.  
End of Rod . . . . .2 Points

21. Axle Pivot - Front Bolster, Front  
End of Frame . . . . .1 Point
22. Axle Pivot - Radius Rod - Front  
End of Frame . . . . .1 Point

**SERVICE DAILY** - (Every 8 to 10 hours of operation).  
Check and service Items 23 thru 34 as instructed,  
daily or oftener as required.

23. Engine Oil Level Dipstick - check the crankcase  
oil level daily, or oftener as required. Add oil to  
keep the level up to the full mark on the dipstick.  
See Item 39.
24. Air Cleaner Cup - Clean and refill daily, or  
oftener if required. To service, remove the cup  
and wash out in clean gasoline; then refill to the  
oil level bead with the same grade of oil as is  
used in the crankcase. The air cleaner must be  
kept clean - this is important.
25. Hydraulic Oil Reservoir - Check the hydraulic  
oil level in the oil reservoir daily. Add oil to  
keep it full to the petcock level. The engine must  
be shut off and the bucket resting on the ground  
when checking the oil level in the reservoir. See  
Item 49.
26. Radiator Filler Cap - Keep the radiator filled  
with clean soft water, free from alkaline. Never  
at any time run the engine without the full quantity  
of cooling fluid in the cooling system. Add a per-  
manent type anti-freeze solution when operating  
in freezing temperatures of 32° or lower.
27. Radiator Drain Cocks - To drain the radiator,  
remove the radiator cap, as it is a pressure type;  
then open both the radiator and the engine block  
drain cocks to drain the fluid from the cooling  
system.
28. Fuel Tank Filler Diesel Fuel - Fill with engine  
fuel here. Be sure the fuel is clean and handled  
in a clean container.
29. Fuel Line Shut-off Cock Diesel Fuel - It is good  
practice to close the fuel line shut-off cock when  
leaving the machine stand idle over night or  
longer.
30. Gas Fuel Tank Filler - Fill with gasoline for gas  
starting cycle. Be sure the gasoline is handled in  
a clean container.
31. Gas Line Shut-off Cock - It is good practice to  
close this cock when leaving the machine stand  
idle over night or longer.
32. Fuel Injection Pump Filler - Left side of engine.  
Check daily to be sure the oil level in this pump  
is maintained to height of the oil level cock. Use  
the same grade of oil as used in the engine crank-  
case.

33. Fuel Injection Pump Oil Level Cock - Left side of engine. Check oil level daily.
34. Fan Hub Bearing - Left side of engine, just above water pump fitting. Give one or two strokes with pressure gun grease. Lubricate sparingly. If lubricant oozes out of fan hub, stop the application of the grease gun.

**LUBRICATE WEEKLY** - (Every 40 to 60 hours of operation). Check and service Items 35 thru 42 as instructed, weekly or oftener as required.

35. Clutch Release Bearing - Throwout - 1 point, L.H. side of power take-off housing. Use the best obtainable grade of a high temperature lubricant, such as "LUBRICO M-24" or equal. Give one or two shots weekly using a hand gun. Never over-lubricate this bearing.
36. Pilot Bearing - 1 point thru P.T.O. shaft yoke - Use the best obtainable grade of a high temperature lubricant such as "LUBRICO M-24" or equal. Give one or two shots weekly, using a hand gun. Never over-lubricate this bearing.
37. Power Take-off Housing Front Bearings - Center of power take-off housing - 1 point. Use the best obtainable grade of a high temperature lubricant such as "LUBRICO M-24" or equal. Give one or two shots weekly, using a hand gun.
38. Generator - 2 cups - Give 2 or 3 drops of light lubricating oil to each cup weekly.
39. Crankcase Filler Pipe - Drain and refill the engine crankcase weekly or oftener as required, with a good grade of clean oil. Refer to the I.H.C. Engine Manual for engine maintenance requirements. In general, use SAE-30 motor oil when operating in hot summer temperatures. Use SAE 20 motor oil when operating in moderate temperatures. Use SAE 10 motor oil when operating in cold, winter temperatures. It must be remembered that oil specification of various oil companies may differ, although the oils are designated by the same SAE number. Consult the sales department of a reliable oil manufacturer to obtain assistance in selecting the proper type and grade of engine oil.
40. Crankcase Drain Plug - Remove the plug to drain the crankcase oil from the engine. Be sure to replace the plug securely after draining.
41. Crankcase Oil Filter - located on the right hand side of the engine. Drain, clean the container, and insert a new filtering element weekly, or when changing the engine crankcase oil. Follow instructions printed on the box containing the new element when replacing a used element. Be sure the filter cover gasket is in place and the cover securely tightened after replacing the element. Then start the engine and let it run at idle speed for about 10 minutes to fully saturate the new element with oil. Then shut off the engine and recheck the oil level in the engine crankcase as

it will have been lowered by oil being retained in the filter container and element. Add oil to bring the oil level up to the full mark on the crankcase oil level dipstick. Then inspect the filter for oil leaks due to a faulty gasket, loose cover, or poor connections.

42. Fuel Injection Pump Drain - Drain and refill the fuel injection pump weekly or oftener as required whenever the crankcase oil is changed. Refer to I.H.C. Owners Manual of the UD264 Engine for important points on service maintenance of the diesel fuel system.

**SERVICE WEEKLY OR AS SPECIFIED** - (Every 40 to 50 hours of operating). Items 43 thru 48 Check these Items weekly, service monthly as instructed.

43. Transmission Filler and Oil Level Plug - Front of Transmission case. Keep the transmission housing oil level up to the height of the oil level plug. Use SAE 140 transmission oil when operating in summer temperatures and SAE 90 transmission oil when operating in winter temperatures.

Check the oil level weekly. Drain and refill monthly.

44. Transmission Drain Plug - Underside of housing. Remove this plug to drain the transmission housing oil. Clean the plug before replacing.
45. Drive Axle Differential Filler and Oil Level Plug - Located on the side of differential carrier housing. Keep the oil level up to the height of the oil level plug. Use SAE 140 differential gear oil when operating in summer temperatures, and SAE 90 oil when operating in winter temperatures. Check the oil level weekly. Drain and refill monthly.
46. Differential Drain Plug - Located on the underside of the housing. Remove this plug to drain the differential carrier housing. Clean the plug before replacing it. Always clean the housing breathers when draining the oil.
47. Final Drive Filler & Oil Level Plugs - Located on the inside surface of the right hand and left hand drive wheel gear housings. Keep the oil level in each drive wheel gear housing up to the level of these plugs. Use SAE 140 when operating in summer temperatures and SAE 90 oil when operating in winter temperatures. Check weekly. Drain and refill monthly.
48. Final Drive Drain Plugs - Located on the underside of each drive wheel gear housing. Remove these plugs to drain the wheel gear housings. Clean the plug before replacing. Always clean the housing breathers when changing the oil.

**SERVICE PERIODICALLY** - Service Items 49 thru 57 every 1000 hours, or as instructed.

49. Hydraulic Oil Reservoir Filler & Breather. Drain, clean and refill the hydraulic system every

1000 hours of operation. After draining, refill the reservoir, start the engine to pump oil into the cylinders, then shut off the engine with the bucket on the ground and add oil in the reservoir to bring the level up to the oil level petcock. Check the connections for leaks.

50. Hydraulic Oil Reservoir Drain Plug - Remove to drain the reservoir. This is a magnetic plug and must be cleaned before replacing. Wash out the breather vents when draining the oil. Drain after operating the machine, while the oil is warm. SEE "Draining the Hydraulic System."

51. Hydraulic Hoist Bleeder Screws - Located on each boom hoist cylinder. Unscrew the bleeder screws to "bleed" the system of air after draining and refilling the reservoir, or after any work has been done on the hydraulic system. This is necessary since air will be trapped in the lines, causing the hoist to chatter and operate in a slow jerky manner. SEE "Bleeding the System"

52. Master Brake Cylinder - Keep full with hydraulic brake fluid.

53. Battery - It is good practice to check the battery at each monthly inspection period, or oftener, if operating in hot temperatures. Add distilled water or clean rain water to keep the plates covered.

54. Steering Axle Wheel Hubs - Repack monthly. Use a good grade of wheel bearing grease.

55. UNIVERSAL DRIVE SHAFTS: There are two universal joint drive shafts, one from the engine to the transmission, and one from the transmission to the axle. Be sure to wipe the dirt from around the grease fittings before applying the grease gun. Dirt forced into these joints will shorten their period of usefulness considerably. Apply a general purpose lubricant sparingly with a hand gun every 1000 hours of operation.. 5 Points

NOTE: To prevent damaging the cork grease seals by gun pressure and to guard against dirt being forced into these joints, it is recommended that the joint be disassembled and greased by hand, instead of using the grease gun. It is a simple operation to disassemble these joints, and a little care will add considerably to their life. Replace all faulty cork seals as they will allow grease to escape and dirt and grit to enter.

56. STEERING GEAR FILLER PIPE: Keep full of lubricant to the height of the filler pipe cap. Use G.M.C. #4567M steering gear lubricant or equal - summer or winter.

57. The cooling system should be flushed out and re-filled seasonally, before adding anti-freeze solution, and when draining out the anti-freeze, to avoid accumulations of dirt and gum in the water passages.

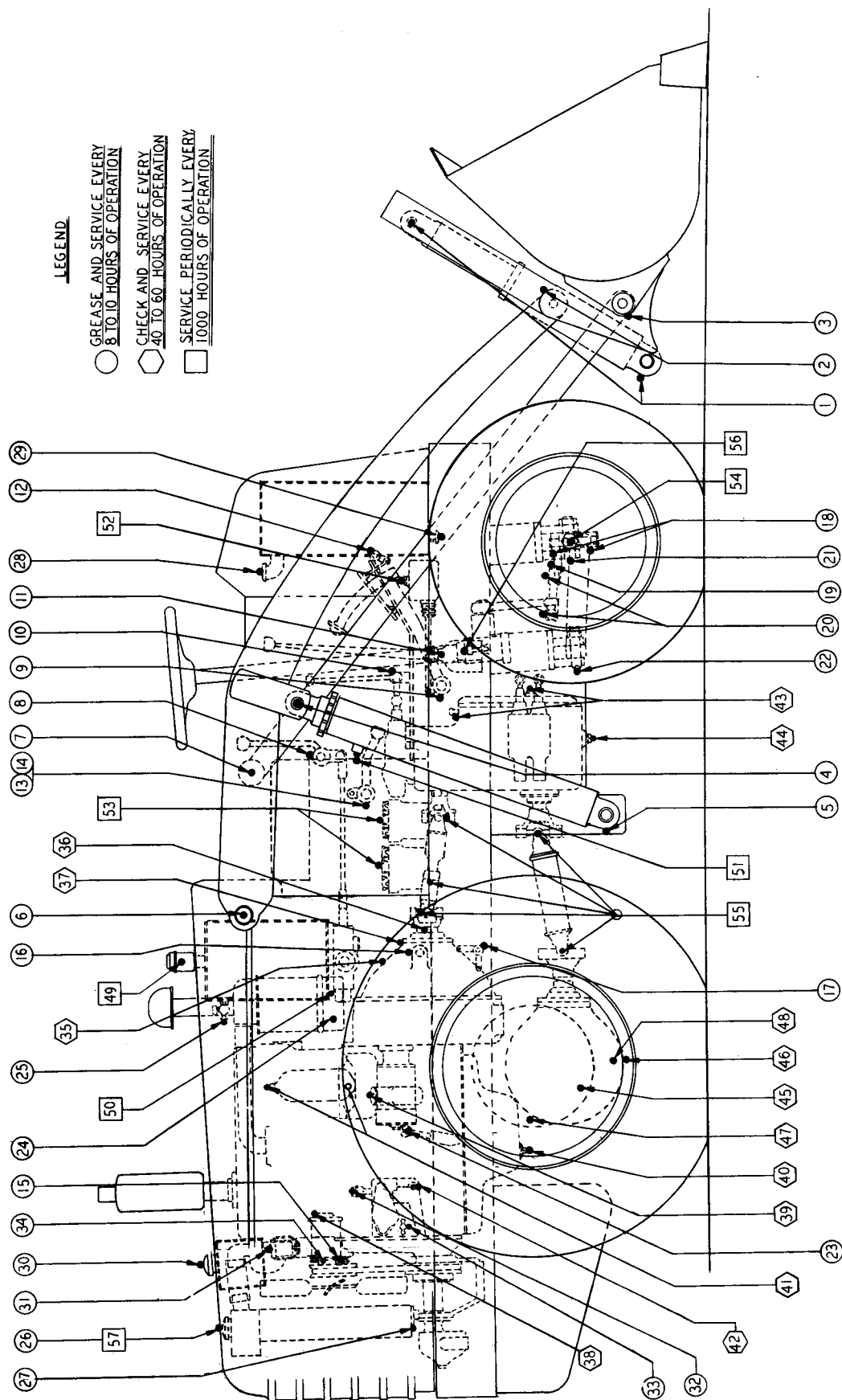


Fig. 12