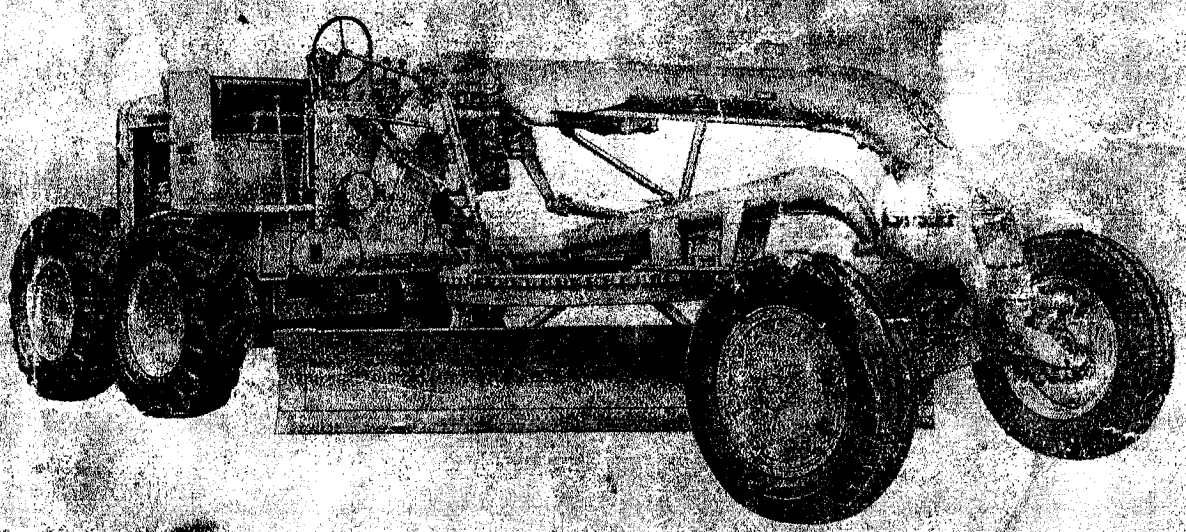
OPERATORS MANUAL
FOR
MODELS AD 30 & AD 40
MOTOR GRADERS



ALLIS-CHALMERS MFG. CO.
TRACTOR DIVISION
MILWAUKEE, WISCONSIN, U. S. A.

LITHO. IN U. S. A.

FORM 1

FOREWORD

This book is written for the purpose of giving the operator essential information regarding the day-to-day care, lubrication and adjustment of the grader. Economical operation will be ensured if these instructions are followed.

The instructions given in this book cover the operation of the "Allis-Chalmers" Models AD-30 and AD-40 Motor Graders. A close adherence to these instructions will result in many hours of trouble-free operation and a longer operating life for the unit.

Many owners of "Allis-Chalmers" equipment employ the Dealer's Service Department for all work other than routine care and adjustments. This practice is encouraged as our dealers are kept well informed by the factory regarding advanced methods of servicing "Allis-Chalmers" products, and are equipped to render satisfactory service.

All photographs shown throughout this manual are of the Model AD-40 Motor Grader, unless otherwise stated. (Model AD-30 Motor Grader similar.)

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GENERAL DESCRIPTION

The "Allis-Chalmers" AD Motor Graders are available in two models: The AD-30 Motor Grader, a 22,700 pound unit, and the AD-40 Motor Grader, a 23,000 pound unit. These graders are designed for use in construction and maintenance of roads, general grading, and snow removal. The main frame is of tubular construction to provide the utmost strength and rigidity and to provide unobstructed vision for the operator.

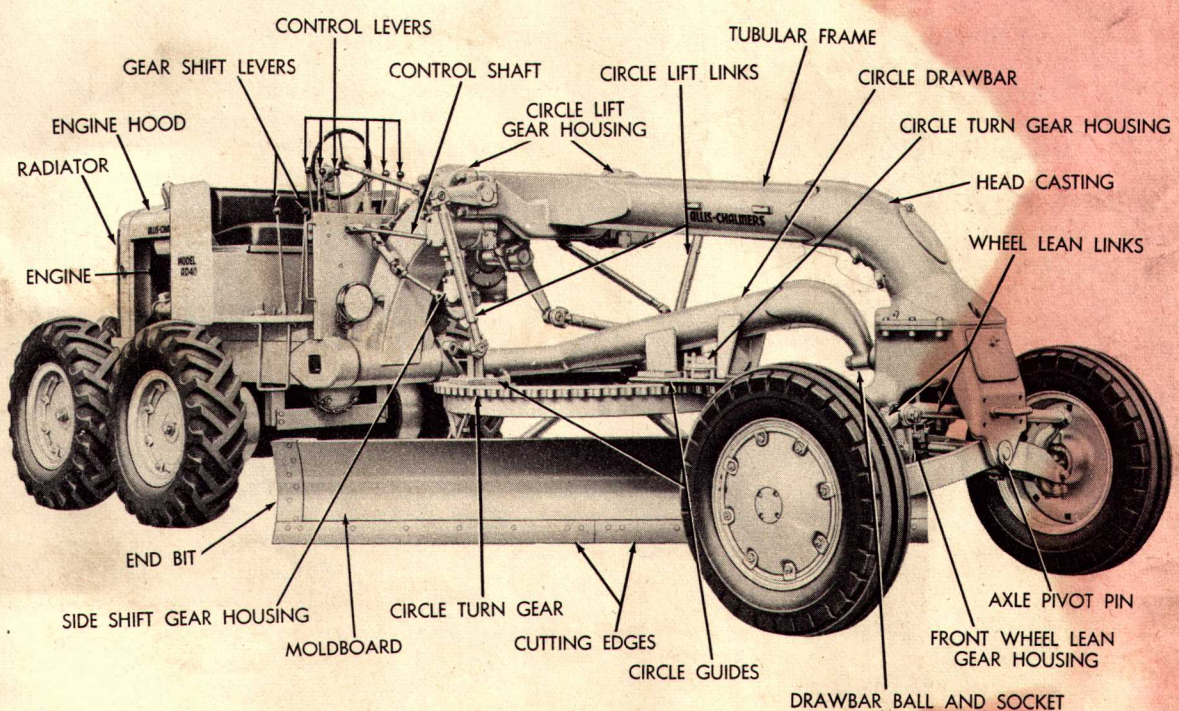
The Model AD-30 is powered with a 3 cylinder, 2 cycle Diesel Engine and the Model AD-40 is powered with a 4 cylinder, 2 cycle Diesel Engine. Power from the engine is transmitted through the engine clutch to the transmission and from the transmission to the tandem drive shafts. The tandem wheels are driven by heavy roller chains which connect the sprockets on the wheel shafts with the sprockets on the tandem drive shafts.

The rear wheels of the tandem drives are equipped with hydraulic brakes. A lever controlled, disc type, mechanical brake assembled to the transmission, is provided for a parking brake.

The transmission on each model is controlled by two gear shift levers which provide 6 forward and 3 reverse speeds. At full governed engine speed of 1600 r.p.m., the forward speeds on each model range from 2.37 to 16.64 m.p.h. and the reverse speeds range from 2.82 to 6.13 m.p.h.

A mechanical control box with six control levers for operating the moldboard, front wheel lean, and scarifier or snow plow is located directly in front of the operator. The moldboard can be rotated a full 360 degrees, thereby allowing work to be done with the machine traveling backward as well as forward. The moldboard can be tilted to several different pitch positions to obtain the desired rolling or cutting action and can also be shifted out to either side for cutting ditches or sloping banks. The front wheels can be leaned 25.5 degrees to right or left to counteract side draft. A HYDRAGUIDE* steering system is provided for steering the grader. The arched front axle permits the handling of heavy windrows of dirt, gravel, or oil mix material. Provision is made for mounting and operating special equipment such as a scarifier or snow plow.

*HYDRAGUIDE is a trademark of Gemmer Mfg. Co.



GENERAL SPECIFICATIONS
(Standard Machine)

GENERAL	AD-30	AD-40
Weight - Approximate	22,700 lbs.	23,000 lbs.
(with Scarifier)	24,050 lbs.	24,350 lbs.
Weight on Front Wheels	6,375 lbs.	6,460 lbs.
Weight on Rear Wheels	16,325 lbs.	16,540 lbs.
Blade Pressure	10,560 lbs.	10,700 lbs.
(with Scarifier)	12,540 lbs.	12,700 lbs.
Overall Length	25'-7-3/8"	25'-7-3/8"
Overall Width	7'-7-3/4"	7'-7-3/4"
Overall Height	7'-8-3/4"	7'-8-3/4"
(with Cab)	10'-5-1/2"	10'-5-1/2"
Wheelbase	18'-9"	18'-9"
Tread Width		
Front (9.00 x 24 Tires)	6'-7'1/2"	6'-7-1/2"
Rear (13.00 x 24 Tires)	6'-6-1/2"	6'-6-1/2"
Tires		
Front	9.00 x 24	9.00 x 24
Rear	13.00 x 24	13.00 x 24
Turning Radius	40'-0"	40'-0"
Front Axle Clearance at Center	23-5/8"	23-5/8"
Clearance under Circle	28-3/4"	28-3/4"
Types of Controls	Mechanical	Mechanical
Wheel Brakes	Hydraulic	Hydraulic
ENGINE:		
Make	General Motors	General Motors
Type	2-Cycle Diesel	2-Cycle Diesel
Number of Cylinders	3	4
Bore and Stroke	4-1/4 x 5"	4-1/4 x 5"
Piston Displacement	212 cu. in.	284 cu. in.
Full Governed Speed (under full load)	1600 r.p.m.	1600 r.p.m.

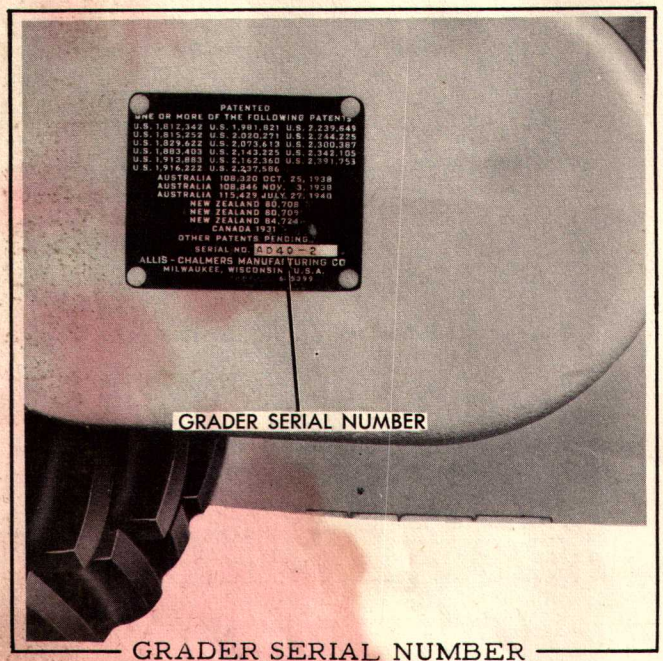
ENGINE (Continued):	AD-30	AD-40
Fuel Used	Nos. 1 or 2 Diesel	Nos. 1 or 2 Diesel
Fuel Injection System	Unit Injectors	Unit Injectors
R.P.M.		
Full Load	1600	1600
High Idle	1725-1750	1725-1750
Low Idle	500+ or -15	500+ or -15
Lubrication	Pressure	Pressure
ROAD SPEEDS (1600 R.P.M.):		
First Gear	2.37	2.37
Second Gear	3.54	3.54
Third Gear	5.15	5.15
Fourth Gear	7.62	7.62
Fifth Gear	11.41	11.41
Sixth Gear	16.64	16.64
First Reverse Gear	2.82	2.82
Second Reverse Gear	4.21	4.21
Third Reverse Gear	6.13	6.13
CAPACITIES (FUEL, OIL & COOLANT - U.S. STANDARD MEASURE) (APPROX.)		
Fuel Tank	66 gal.	66 gal.
Cooling System	6 gal.	6-1/2 gal.
Engine Crankcase	4 gal.	4 gal.
Air Cleaner	2-1/2 qts.	4-1/2 qts.
Transmission	2 gal.	2 gal.
Rear Axle Housing		
Center Compartment	5 gal.	5 gal.
End Compartments (each)	5 qts.	5 qts.
Tandem Cases (each)	5-1/4 gal.	5-1/4 gal.
Hydraulic Booster System	3 qts.	3 qts.
Power Take-Off Chain Drive Housing	1 pt.	1 pt.
Control Gear Box	1-1/2 gal.	1-1/2 gal.
Side Shift Gear Housing	7 pts.	7 pts.
Moldboard Lift Gear Housing (each)	7 pts.	7 pts.
Circle Turn Gear Housing	3 qts.	3 qts.
Front Wheel Lean Gear Housing	3 qts.	3 qts.

The Allis-Chalmers Manufacturing Company reserves the right to make changes in the above specifications or to add improvements at any time without notice or obligation.

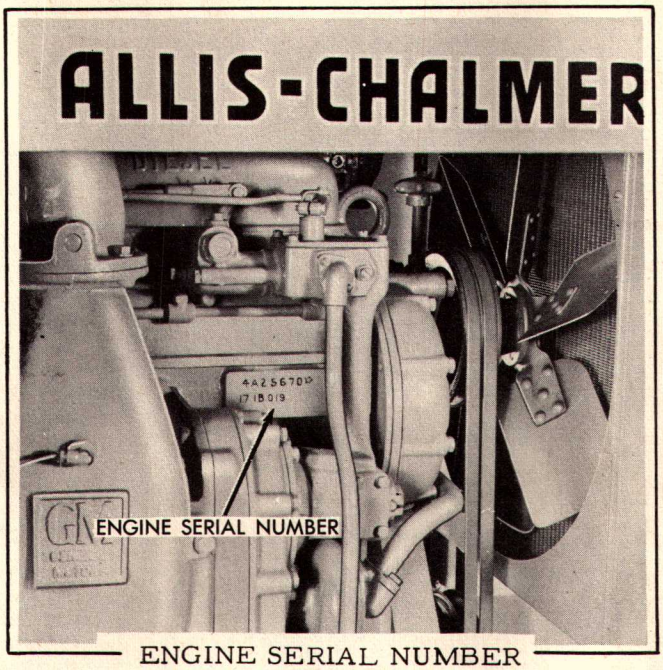
GRADER AND ENGINE SERIAL NUMBERS

On all parts orders and in all correspondence relative to the grader, it is necessary that both grader and engine serial numbers be given. This will properly identify the particular machine and will insure obtaining the correct replacement parts for it.

The Grader Serial Number is stamped on a plate located on the right side of the main frame behind step (Fig. 2). The Engine Serial Number is stamped in the cylinder block behind the governor control housing (Fig. 3).



GRADER SERIAL NUMBER
FIG. 2



ENGINE SERIAL NUMBER
FIG. 3

SPECIFICATIONS OF LUBRICANTS

A. ENGINE CRANKCASE LUBRICANT

USE NON-CORROSIVE DIESEL ENGINE LUBRICATING OIL CONTAINING ADDITIVES WHICH WILL PREVENT SLUDGE OR GUM DEPOSITS. UNDER NO CIRCUMSTANCES SHOULD A CORROSIVE DIESEL ENGINE LUBRICATING OIL EVER BE USED.

Use oils with the following viscosity:

ATMOSPHERIC TEMPERATURE	VISCOSITY
Above 32° F. 0° F. to 32° F. 0° F. and below.	Use SAE 30 Use SAE 20W Use SAE 10W

Manufacturers of lubricants recognize the importance of the qualities required for use in "Allis-Chalmers" equipment and are co-operating fully to ensure the use of only those oils which fulfill these requirements. The oil distributor and oil manufacturer are to be held responsible for the results obtained from their products.

The outstanding lubricating requirements for efficient operation of the engine are: The maintaining of piston rings in a clean, free condition; absence of hard carbon and "varnish" deposits on or within engine parts; the prevention of bearing corrosion and the promotion of general cleanliness within the engine.

Proper operation and maintenance of the engine is necessary to obtain the desired results from the lubricating oil. Operating and maintenance factors can be effectively controlled by the engine user.

B. WORM GEAR HOUSING LUBRICANT

Use an SAE 90 viscosity EXTREME PRESSURE gear lubricant of the NON-CORROSIVE type in all the worm gear housings.

C. POWER CONTROL BOX AND CHAIN DRIVE HOUSING LUBRICANT

Use an SAE 30 viscosity oil of good quality in the power control box and chain drive housing.

D. TRANSMISSION AND DRIVE HOUSING LUBRICANT

Lubricate the transmission, rear axle housing, and tandem drive housings, with a good grade motor oil purchased from a reputable oil company.

Use oils with the following viscosity:

ATMOSPHERIC TEMPERATURE	VISCOSITY
Above 32°F. 32°F. & below.	Use SAE 50. Use SAE 30.

E. PRESSURE GUN LUBRICANT

Use a ball and roller bearing lubricant with a minimum melting point of 300°F. This lubricant should be in a viscosity range so as to ensure easy handling in the pressure gun at prevailing temperature. The ball and roller bearing lubricant must be water proof.

F. STEERING HYDRAULIC SYSTEM

Use SAE 10 viscosity oil of good quality in the steering hydraulic system.

G. HYDRAULIC BRAKE MASTER CYLINDER

Use a good grade of hydraulic brake fluid in the hydraulic brake system.

SPECIFICATIONS OF FUEL OIL

Use No. 1 Diesel Fuel Oil purchased from a reputable oil company. In warm weather, No. 2 Diesel Fuel Oil may be used. This fuel must be within the classification limits as established by the American Society for Testing Material, Tentative Diesel Fuel Oil Specifications (ASTM-D-975).

For longer engine life and better performance, fuel oil requirements must comply with four basic qualifications:

1. Physical cleanliness.
2. Absence of chemical contamination.
3. Proper burning characteristics.
4. Cold starting ability.

Physical cleanliness means freedom from water, dirt, and other incombustible ingredients. Since all present day high-speed engine fuels are completely distilled, they leave the refinery in clean condition. Transport and subsequent storage account for the addition of most foreign matter found in the fuel.

Of the chemical contamination, the most objectionable are free sulphur and gum, which, even in relatively small quantities are largely responsible for harmful internal engine deposits. The fuel must also be free from alkali and mineral acids.

Proper burning characteristics are dependent upon ignition quality and volatility.

All fuels meeting the requirements of the No. 1-D and the lighter types of fuel in the No. 2-D grade of the ASTM-D-975 Diesel Fuel Oil Specifications are satisfactory. The volatile grade (ASTM No. 1-D) is recommended for all types of service where frequent speed and load changes occur, while fuel in the heavier grade (ASTM No. 2-D) may be used with sustained high loads. However, prolonged use of fuel oils combining low ignition quality (less than 45 Cetane Number) with high boiling temperature (more than 675°F. end point) should be avoided, particularly in cold weather.

CAUTION: The sulphur content of Diesel fuel oil should be as low as possible. For normal temperature conditions, the fuel oil should contain less than 0.5% sulphur. For cold weather operation, fuel oils with less than 0.3% sulphur are preferable.

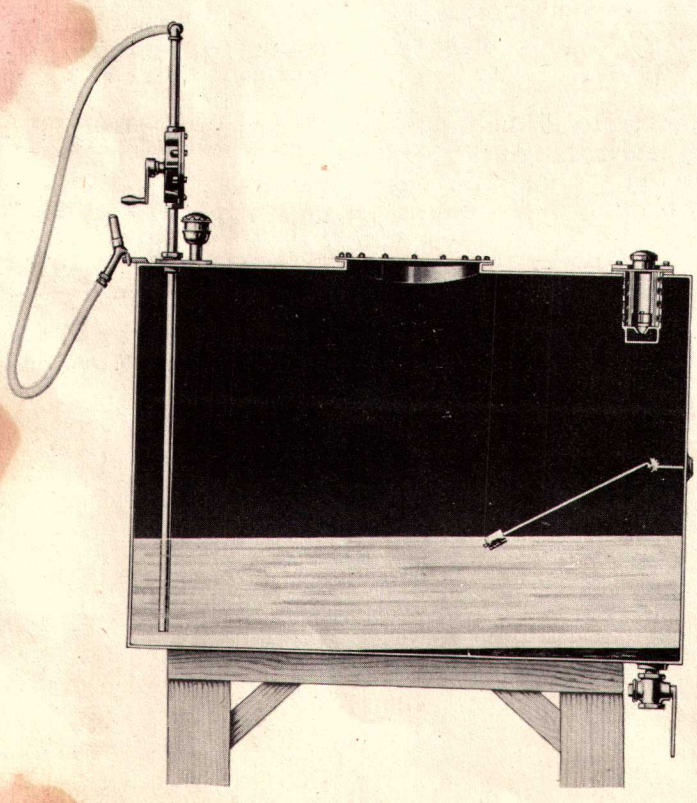


FIG. 4 FUEL STORAGE TANK

FUEL STORAGE

The importance of proper storage of fuel cannot be too strongly stressed. Storage tanks, drums, or service tanks must be free from rust, scale, sediment or any other foreign matter which will contaminate the fuel. Contaminated fuel will clog the filters and eventually damage the fuel pump and injectors.

A portable storage tank provides the best method for storing fuel on the job. In a tank, the sediment and water can easily be drained and the fuel can be pumped into the tractor fuel tank with a minimum of handling. Consult your nearest "Allis-Chalmers" Dealer for details about this type of storage tank. Since condensation will occur in the tank, it is very important that a sediment sump be provided in the bottom of the storage tank where the water and settlings can be drained daily.

Fuel should be allowed to settle at least 48 hours in the storage container before it is put in the fuel tank of the grader. It is advisable to use a pump and draw the fuel from the tank or barrel rather than to drain it from the bottom of the container by means of a faucet or through the bung hole.

Where conditions are such that drums must be used to supply fuel, it is advisable to have enough drums to allow sufficient time for the fuel to settle. The fuel thus left in a number of drums can be collected into one drum and used after the usual time allowed for settling. In this manner, the sediment and foreign matter will be disposed of and no fuel will be wasted. Whenever drums are used for storage, they should be covered or placed under shelter so that the fuel will not become contaminated by water which will enter through the filler plugs when it rains, even though the plugs are tight.

The fuel tank of the grader should be filled at the end of the day's run rather than in the morning. This will reduce the water content, as a full tank is less subject to condensation. The fuel tank is provided with a sediment sump and drain cock.

PERIODIC LUBRICATION AND PREVENTIVE MAINTENANCE

Lubrication is an essential part of preventive maintenance, controlling to a great extent the useful life of the grader. Different lubricants are needed and some units in the grader require more frequent lubrication than others. Therefore it is important that the instructions regarding types of lubricants and the frequency of their application, as given in this section, be explicitly followed. Periodic lubrication of the moving parts reduce to a minimum the possibility of mechanical failures.

To prevent minor irregularities from developing into serious conditions that might involve shut-down and major repair, several other services are recommended at the same intervals as the periodic lubrication. The purpose of these services or inspections, which require only a few minutes, is to assure uninterrupted operation of the grader by revealing the need for adjustment caused by normal wear. The need for some minor adjustment, if neglected, could result in failure and shut-down.

Refer to the lubrication and service chart and supplementary illustrations for location of the various units to be serviced. Instructions on lubrication and service intervals are given on the chart.

ROUTINE SERVICE

For your convenience, listed below are the lubrication points, service items, and check points to be made at each of the intervals (10-75-200-1000 hours) shown on the lubrication and service chart. Reference figures given below are on the chart.

10 HOUR SERVICE
(Shown in "RED" on Chart)

Lubricate

Front Wheel Spindles (Fig. B)
Front Wheel Lean Links (Fig. B)
Steering Gear Drag Links (Fig. A)
Front Wheel Lean Knuckle Pivot Bolt (Fig. A)
Front Axle Pivot Pin (Fig. B)
Drawbar Ball and Socket (Fig. A)
Moldboard Lift Links (Fig. D)
Side Shift Link (Fig. D)
Side Shift Shaft Bearings (Fig. D & E)
Steering Shaft Bearing (Fig. R)
Tandem Case Pivot Bearing (Fig. N)
Circle Turn Control Shaft (Fig. D)
Moldboard Lift Shaft Bearing (Fig. D)

(Graders Equipped with Scarifier)

Scarifier Lift Links (Fig. U)
Scarifier Reduction Gear Shaft Bearing (Fig. U)

Check

Crankcase Oil Level (Fig. Q)
Engine Cooling System Level (Fig. Q)

Service

Air Cleaner (Fig. M)
Air Pre-Cleaner (Fig. M)
Fuel Tank Sediment Sump (Fig. J)
First Stage Fuel Filter (Fig. T)
Second Stage Fuel Filter (Fig. T)

75 HOUR SERVICE
(Shown in "GREEN" on Chart)

Lubricate

Clutch Shaft Bearing (Fig. J)
Clutch Throwout Bearing (Fig. J)
Front Wheel Lean Gear Shaft (Fig. A)
Circle Turn Gear Shaft (Fig. F)

(Graders Equipped with Scarifier)

Scarifier Control Shaft Bearing (Fig. D)
Scarifier Worm Gear Shaft (Fig. U)

Check

Hydraulic Brake Master Cylinder Fluid Level (Fig. P)
Steering Reservoir Tank Oil Level (Fig. G)
Batteries (Water Level and Specific Gravity) (Fig. S)

Service

Engine Crankcase (Change Oil) (Fig. I)
Engine Lubricating Oil Filter (Change Element) (Fig. J)

200 HOUR SERVICE
(Shown in "BLUE" on Chart)

Lubricate

Power Take-off Shaft Housing (Fig. H)
Power Take-off Drive Assembly (Fig. L)
Brake Lever Pivot Pin (Fig. G)
Engine Fan (Fig. L)
Generator (Fig. L)

Check

Transmission Oil Level (Fig. H)
Rear Axle Oil Level (Center and End Compartments) (Fig. I)
Tandem Drive Case Oil Level (Right and Left) (Fig. N)
Power Control Box Oil Level (Fig. R)
Power Take-off Chain Drive Housing Oil Level (Fig. G)
Moldboard Lift Gear Housing Oil Level (Right and Left) (Fig. D)
Side Shift Gear Housing Oil Level (Fig. E)
Front Wheel Lean Gear Housing Oil Level (Fig. C)
Circle Turn Gear Housing Oil Level (Fig. F)

(Graders Equipped with Scarifier)

Scarifier Worm Gear Housing Oil Level (Fig. U)

1000 HOUR SERVICE
(Shown in "BROWN" on Chart)

Lubricate

Tandem Wheel Shaft Outer Bearing (Right and Left) (Fig. O)
Front Wheel Bearings (Right and Left) - Repack (Fig. B)
Clutch Shaft Universal Joint (Fig. K)
Transmission - Change Oil (Fig. G)
Rear Axle (Center and End Compartments) - Change Oil (Fig. I)
Tandem Drive Case (Right and Left) - Change Oil (Fig. N)
Power Control Box - Change Oil (Fig. R)
Power Take-Off Chain Drive Housing - Change Oil (Fig. G)
Moldboard Lift Gear Housing (Right and Left) - Change Oil (Fig. D)
Side Shift Gear Housing - Change Oil (Fig. E)
Front Wheel Lean Gear Housing - Change Oil (Fig. C)
Circle Turn Gear Housing - Change Oil (Fig. F)

(Graders Equipped with Scarifier)

Scarifier Worm Gear Housing - Change Oil (Fig. U)

PERIODIC SERVICE
(Shown in "BLACK" on Chart)

Lubricate

Clutch Shaft Pilot Bearing (In Engine Flywheel) - Repack at Disassembly
Front Wheel Lean Chain Housing (Fig. B) - Repack at Disassembly
Scarifier Reduction Gear Housing (Fig. U) Repack at Disassembly
Tandem Wheel Shaft Inner Bearings - Repack at Disassembly

Service

First and Second Stage Fuel Filters - Remove old elements, clean shells, and install new elements. Refer to "FUEL SYSTEM".

Engine Cooling System - Drain, flush, and refill. Clean exterior of radiator core and check system for leaks. Refer to "ENGINE COOLING SYSTEM".

Check with Dealer regarding periodic oil change in Steering Hydraulic System.

PREPARING GRADER FOR USE

Make a complete inspection of the machine to make sure no parts have been lost or damaged while in transit or storage.

Fill fuel tank with the correct grade of fuel oil. Refer to "Specifications of Fuel Oil". Use care to prevent the entrance of dirt or foreign material while filling tank.

Check oil levels in engine crankcase, transmission, rear axle housings, tandem drive cases, control box, steering hydraulic system, and all worm gear housings, (refer to "Lubrication Chart").

Check level of brake fluid in hydraulic brake master cylinder. (Refer to "Wheel Brakes".)

Lubricate all points indicated on the lubrication chart where fittings are provided for use of pressure grease gun. Make sure the oil in the air cleaner cup is at the prescribed level. (Refer to "Air Cleaner Service".)

Make sure all the tires are properly inflated. (Refer to "Wheels and Tires".)

Fill the cooling system with clean water which is free from lime or alkali. IMPORTANT: Open the vent cock located in the top of the thermostat housing, then fill the system through the radiator until coolant flows from the thermostat vent cock. This allows air trapped in the cylinder block to escape. Close the vent cock and complete the filling of the system.

Operate the grader under light loads for the first 60 hours. Change oil in the engine crankcase after the first 30 hours. Bring engine temperature to the normal range of 160°F. as soon as possible after each starting period and maintain this temperature as closely as possible. Operating the engine with temperature below this range will result in incomplete combustion of fuel and higher fuel consumption with less power, and will cause harmful gummy deposits within the engine. Maintaining the correct engine temperature depends mostly on proper functioning of the thermostat. If the engine temperature remains consistently below normal, the thermostat should be removed and inspected. If the thermostat is corroded and stuck or if the bellows of the unit leaks, install a new unit.

When operating in cold weather, provide a cover for the radiator and for the sides of the engine compartment if the thermostat proves inadequate to maintain the normal operating temperature of 160° to 185°F.

Since all operating parts are tight and stiff when new, careful inspection should be made during the first few hours of operation to make sure these parts are lubricated properly and excessive heating is not taking place. Make a complete inspection of the machine while servicing it at the end of the first 10 hour operating period to detect loose bolts. Tighten wheel and rim nuts. Check adjustments of clutch and brake pedals, adjustment of engine controls, exhaust valves, and timing and equalizing of fuel injectors. Refer to pertinent sections of this book for adjustment procedure.

Tighten wheel and rim nuts again at the end of 60 hours.

OPERATING CONTROLS AND INSTRUMENTS

The operator of the grader must familiarize himself with the various controls and instruments provided for its proper operation. Although many of these controls are similar to those of other motor graders, there are important differences, and it is not wise, regardless of previous experience, to operate the machine before fully understanding the purpose of each control and instrument.

A. OPERATING CONTROLS

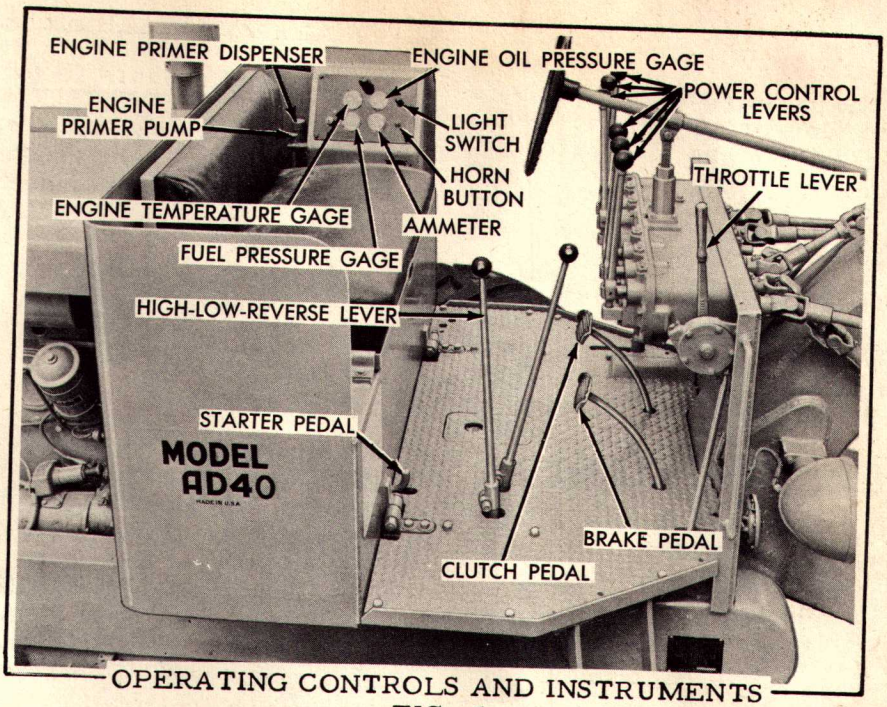
1. Throttle and Engine Shut-Off Lever.

This lever is used to regulate the engine speed, also to stop the engine. When the lever is pushed all the way forward, the fuel and air supply to the engine is cut off and the engine will stop. Pulling the lever part way back opens the air valve and fuel shut-off. After engine is started, pulling the lever further back increases the engine speed.

2. Starter Pedal

Press down on starter pedal with heel of the foot to engage the starter pinion with the flywheel ring gear and to operate the starter switch. Each time the starter pedal is depressed it must be allowed to return to its original position (all the way up), and starter given time to cease spinning before the starter can again be used. Otherwise the starter will run but will not turn the engine.

NOTE: If the engine does not start in less than one-half minute, allow the starter to cool for 2 minutes before it is used again. Refer to "Starting Engine".



OPERATING CONTROLS AND INSTRUMENTS
FIG. 5

3. Clutch Pedal

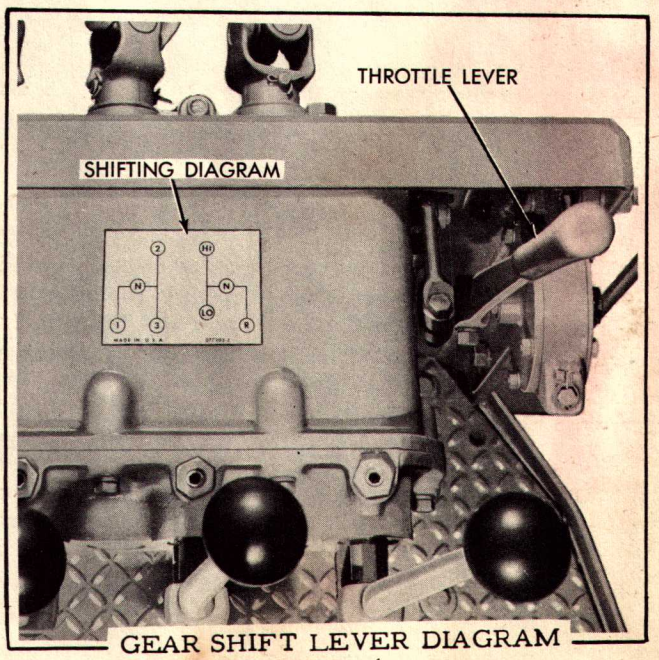
The clutch pedal controls the clutch which transmits the power from the engine to the transmission. Press the clutch pedal down far enough to completely disengage the clutch when shifting gears and also before bringing the grader to a complete stop.

4. Gear Shift Levers

The left-hand lever is the speed selector lever, the right-hand lever is the high-low-reverse lever. Each lever has three positions in addition to a neutral position (see Chart). The high-low-reverse lever is shifted into the "LOW" position when the 1st, 2nd, or 3rd forward speeds are desired, shifted into "HIGH" for the 4th, 5th, and 6th forward speeds, and shifted into "REVERSE" for the three reverse speeds. The speed selector lever is then used to select any of the three speeds in each of the above speed ranges. The machine will not move when either of the two levers is in its neutral position. The following chart gives the position for the gear shift levers for each of the six forward and three reverse speeds.

GEAR SHIFT LEVER DIAGRAM

SPEED	HIGH-LOW-REVERSE LEVER	SPEED SELECTOR LEVER
First	Low	1
Second	Low	2
Third	Low	3
Fourth	High	1
Fifth	High	2
Sixth	High	3
Reverse		
First	Reverse	1
Second	Reverse	2
Third	Reverse	3



GEAR SHIFT LEVER DIAGRAM
FIG. 6

5. Brake Pedal

Press down on the brake pedal to apply the wheel brakes to slow or stop the grader. Disengage the clutch before the grader is brought to a complete stop.

6. Parking Brake Lever

The parking brake lever operates a brake mounted to the front end of the transmission. Pull the lever back to engage the brake when the machine is parked. DO NOT USE THIS BRAKE FOR STOPPING THE GRADER.

7. Cold Weather Engine Primer Dispenser

The dispenser, located at left rear corner of seat cushion, is used to hold and to puncture a capsule containing the fluid used for cold weather starting.

8. Cold Weather Engine Primer Pump

The pump, located adjacent to the capsule dispenser, is used to draw the starting fluid from the dispenser and force it through a small nozzle into the air inlet housing of the blower. Refer to "Starting Engine" for full instructions on the use of the primer pump.

9. Horn Button

Press in on button to operate the horn.

10. Light Switch

Pull out on switch knob to turn lights on. When switch is pulled out to first stop, the head light beams are directed down. When pulled all the way out, the light beams are thrown out ahead of the machine.

11. Steering Wheel

Turn wheel to right or left to steer the grader.

12. Power Control Levers

The six levers on the control box operate jaw clutches that engage gears in the control box to turn the control rods leading to the worm and gear assemblies on the grader. The two outer levers raise and lower the circle and moldboard, the center lever on left of steering wheel turns the circle, the inner lever on left side of steering wheel raises and lowers the scarifier, the inner lever on right side of steering wheel leans the front wheels, and the center lever on right side shifts the circle to right or left.

B. OPERATING INSTRUMENTS

1. Engine Oil Pressure Gage

This gage indicates the pressure at which the oil is circulated through the engine. At full throttle, this pressure should be between 25 and 35 pounds at normal engine operating temperature.
CAUTION: If no pressure registers on gage the engine must be stopped immediately and the cause determined.

2. Fuel Pressure

This gage indicates the pressure at which the fuel oil is circulated through the fuel system. Under normal conditions with the engine operating at full governed speed, this pressure should be from 25 to 60 pounds. DO NOT OPERATE ENGINE WITH FUEL PRESSURE ABOVE OR BELOW THIS RANGE. Investigate for clogged filters, clogged or leaking fuel lines or connections, or improper operation of fuel pump and fuel pump pressure relief valve.

3. Engine Temperature Gage

This gage registers the engine temperature which should be maintained between 160° and 185°F. at all times.

4. Ammeter

The ammeter registers the amount of charging current being delivered to the batteries. When batteries are fully charged, the ammeter will register nearly zero through the action of the generator regulator except for a short time after the starter has been used. When batteries are in a discharged condition, the ammeter should register from 4 to 8 amperes until the batteries approach a charged condition.

5. Hour Meter (Special Equipment)

The hour meter, mounted on a bracket attached to right rear of seat back is a spring driven, electrically wound, clock. This clock records the number of hours the engine has operated. The switch, controlled by the engine oil pressure, closes the clock-winding circuit whenever the oil pressure is above 3 pounds. Therefore, the clock cannot wind when the engine is not running. The clock may continue to run as much as 3 minutes after the engine stops or until the spring has exhausted its energy. The clock has been adjusted to run a little slow to compensate for this overrun.

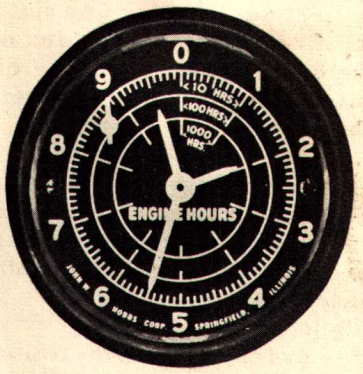
All hands move clockwise. The small indicator (upper left) visibly turns when meter is recording. These meters record up to 10,000 hours and repeat. The four figures of the hours of operation are read from the three hands as follows:

Use number passed on thousand hour (inner) track here. 1955

Use number passed on hundred hour (middle) track here.

Use number passed on ten hour (outer) track here.

Use number of marks passed beyond last figure on ten hour track here.



HOUR METER
FIG. 7

STARTING AND STOPPING OF ENGINE

A. STARTING ENGINE

Before the engine is started, the operator must check the following points on the grader:

1. Inspect the fuel supply.
2. Inspect the crankcase oil level.
3. Inspect the water or anti-freeze solution in the cooling system.
4. Inspect the entire unit for loose bolts and nuts. This is especially necessary when repairs have been made since the previous operating period.
5. Place the gear shift levers in their neutral positions and pull throttle lever back as far as it will go (wide open).
6. Press down on the starter pedal. Each time the starter pedal is depressed it must be allowed to return to its original position (all the way up) and starter given time to stop spinning before it can again be used.
   CAUTION: If the engine does not start within 30 seconds, allow the starter to cool for 2 minutes before using it again.
7. As soon as the engine begins to run, close the throttle to about 3/4 engine speed and allow the engine to warm up.
8. Check the engine oil pressure. At full governed speed and with the engine heated to normal operating temperature, the oil pressure should be between 25 and 35 pounds on the gage. If the oil is cold, no pressure may register for about 15 seconds after the engine starts, but if the pressure does not then rise to normal or above, the engine must be stopped immediately and the cause determined.

Check the fuel pressure. At full governed speed, the fuel pressure indicated on gage should be between 25 and 60 pounds. DO NOT OPERATE ENGINE WITH FUEL PRESSURE ABOVE OR BELOW THIS RANGE.

Open the throttle to meet the operating conditions.

In cold weather, when it is necessary to use a starting aid in starting the engine, proceed as stated above in the first five operations, then proceed as follows:

a. Unscrew the upper chamber of the fluid dispenser.

b. Place a capsule of fluid, small or large size depending upon air temperature and requirements established by trial, in the lower chamber or body of the dispenser. In extremely low temperatures, one large and one small capsule may be necessary.

c. Pull the plunger to the top of upper chamber and screw the chamber tightly onto dispenser body.

d. Push plunger to bottom, thus puncturing capsule and releasing fluid so it can be picked up by the primer pump.

e. Depress starter pedal to crank engine. and at the same time use primer pump

to pump fluid into the air system until engine starts and runs normally on regular fuel. Use capsules only of the size required to start the engine and pump until all fluid has been injected into the engine.

f. While engine is warming up, unscrew the upper chamber of the dispenser and remove the empty capsule. Screw the upper chamber back onto the dispenser body.

g. After the engine starts, follow instructions beginning with step 7 above. Refer to "Cold Weather Engine Primer" for complete information on this unit.

CAUTION: The starting fluid container in the capsule is essentially ethyl ether, highly inflammable and should be treated with the same caution as high octane gasoline. Gelatine capsules dissolve in water and soften at high temperatures. Therefore, the following precautions must be taken:

1. Avoid breathing large quantities of the fumes from fluid.
2. Avoid cutting of hand on barbs of puncturing plunger.
3. Avoid proximity of fluid and capsules to open flames, sparks, or hot surfaces.
4. Avoid contact of capsules with water.
5. Avoid subjection of capsules to high temperatures (above approximately 120°F.).

B. STOPPING THE ENGINE

Close throttle, and after engine has slowed down to idling speed, push the throttle lever all the way forward. Cover exhaust pipe at end of each day's operation to prevent rain from entering while grader is idle.

AVOID UNNECESSARY ENGINE IDLING

Prolonged engine idling will result in the temperature of the engine coolant falling below the specified operating range of 160 to 185°F. Low operating engine temperatures cause the development of several conditions detrimental to engine operation and life. Incomplete combustion of fuel in a cold engine causes crankcase dilution and forms lacquer or tar-like deposits on valves, pistons, rings, etc. It also causes rapid accumulation of sludge within the engine.

Since starting the engine is accomplished with no more effort than starting the average automobile engine, there should be no reason for prolonged engine idling. Stop the engine, as you would your automobile engine, when prolonged idling periods would otherwise occur.

DRIVING INSTRUCTIONS

The driving controls, which consist of the throttle, clutch and brake pedals, gear shift levers, and steering wheel, are used in operating the grader.

To provide ease of steering, a HYDRAGUIDE* system is incorporated into the design. In the event of a hydraulic system failure, or if it is necessary at any time to steer the grader without the engine in operation, the grader can be steered mechanically by using the steering wheel in the conventional manner.

The gears can be shifted all the way through the six forward speeds or the three reverse speeds with the machine in motion by disengaging the clutch and shifting from one gear to another. However, when the grader is working, the machine should be started in the gear necessary to move the load.

When starting the machine, depress the clutch pedal and shift to the desired gear, then open the throttle to meet the operating requirements and release the clutch pedal slowly and smoothly so the load will be picked up by the engine without a sudden jerk.

Do not slip the clutch in an effort to pull an over-load. Avoid unnecessary wear on the clutch by shifting to a lower gear. DO NOT "RIDE" THE CLUTCH PEDAL WHEN OPERATING THE GRADER.

*HYDRAGUIDE is a trademark of Gemmer Mfg. Co.

INFORMATION ON GRADER OPERATION

A. GENERAL

Always operate the grader in a gear low enough to permit the engine to operate at full speed. This will not only ensure the most power from the engine but will also allow the engine to operate at normal temperature at its highest efficiency. Start into a cut with the gears shifted into the speed range that will permit completing the cut without further shifting, thus avoiding unnecessary wear on the clutch facings.

Keep the grader directly above the work as much as possible. This will prevent side draft with its resultant loss of power and will also prevent unnecessary side stress on the various parts affected. When necessary to work with the moldboard shifted out to the side, lean the front wheels enough to counteract the resulting side draft.

If a deep cutting action is desired, tilt the top of the moldboard back by means of the pitch links to change the pitch of the blade. Less pressure will then be required on the control levers to force the blade into the ground. If a rolling action is desired, as when mixing oil with gravel, tilt the top of the moldboard forward. This will cause the material to roll and mix more thoroughly before it passes out the "heel" end of the moldboard.

When the moldboard is shifted out to the side, as necessary for sloping banks or some ditching operations, both lift arm cranks should be turned to point toward that side. When so turned, undue strain on the worm gear and lift arm on the inner side of the grader will be prevented. When either lift crank is turned to the inside (toward main frame) the use of that control lever is reversed, that is, the lever is pushed forward to raise the moldboard, and pulled back to lower the moldboard.

Do not attempt to turn the circle while one end of the moldboard is under heavy load, however, this can be done in light maintenance work.

B. CARE OF CIRCLE

The face of the circle is painted at the factory to prevent rusting. The paint should be removed before the grader is put into operation. Do not use oil or grease on the circle face as this will mix with dirt and cause hard "caking". If lubrication is desired, frequent application of fuel oil will prove the most satisfactory; this will also prevent mud or snow from freezing to the circle when operating in cold weather.

Do not attempt to remove frozen mud or snow from the circle or gears by turning the circle with the power from the engine as damage to the gears may result. Apply heat to loosen material frozen to these parts.

C. MOLDBOARD PITCH ADJUSTMENT

Lower the moldboard to the ground to change the pitch. Loosen the moldboard pivot bolts, remove the bolts from the pitch links, then move the grader forward or backward until the moldboard has the desired pitch position. Install and tighten the pitch link bolts, then tighten the pivot bolts.

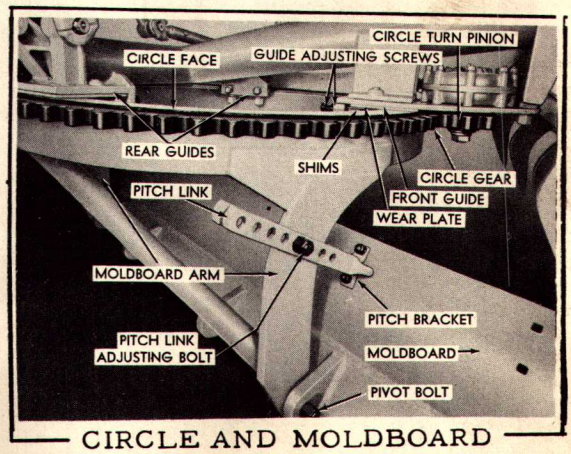
D. OFFSET MOLDBOARD

The moldboard may be shifted on the moldboard arms 18" to the right or left when operations require it.

CIRCLE AND MOLDBOARD

Shift the moldboard out to the side as far as possible in the direction the moldboard is to be changed and lower it to the ground. Place a block under one of the brackets to keep moldboard from tipping, then remove the moldboard pivot bolts and pitch bracket bolts. After these bolts have been removed, move the grader back until the moldboard arms will clear the brackets on the back of the moldboard, then shift the circle to the position where the arms can be connected to the desired brackets on the moldboard.

Install the pivot bolts on bottom of moldboard and connect the pitch brackets in the new position on moldboard. Tighten the pivot bolts after the pitch brackets and links are connected.



CIRCLE AND MOLDBOARD
FIG. 8

E. MOLDBOARD CUTTING EDGES AND END BITS

The moldboard cutting edges should be removed and sharpened when the edges become blunt. New cutting edges should be installed before the old ones are worn to the point where further use would cause wear on the main structure of the moldboard. The end bits are also replaceable and should be sharpened or replaced when it becomes necessary.

F. SCARIFIER (SPECIAL EQUIPMENT)

When the scarifier is not in use, carry it raised to its extreme height. To provide 360° rotation of the moldboard, remove the scarifier teeth. They may be carried elsewhere on the grader. When the moldboard is moved out to the side for sloping banks, the scarifier lift crank arms should be moved forward from their vertical position, to prevent the circle striking the scarifier lift links.

When operating the scarifier, lower it so the lift crank arms move in the rear arc towards the operator. In this manner, the least amount of pressure is required on the control lever and strain imposed on the worm gear assembly to force the teeth into the ground is reduced.

COLD WEATHER OPERATION

When atmospheric temperatures drop to the freezing point or below, the engine crankcase must be drained and refilled with oil of lighter viscosity and the air cleaner will also require lighter oil (refer to "Specifications of Lubricants"). The cooling system must be checked for leaks and filled with an anti-freeze solution to protect it from freezing (refer to "Engine Cooling System"). All leaking or damaged hoses and gaskets must be replaced, all leaks corrected, and all connections tightened to prevent loss of the anti-freeze solution.

Test and prepare the "Cold Weather Engine Primer" for use as soon as lowering atmospheric temperatures indicate aid in engine starting will be required.

Provide covers for the radiator and sides of the engine compartment, if the thermostat proves inadequate to maintain operating temperature of 160° to 185° F. If the engine is operated below this range, sludge will build up in the engine, engine efficiency will drop and conditions may develop to cause damage to the engine parts.

Dependable starting of a diesel engine by any means can be obtained only with adequate cranking speed. For this reason, it is necessary that the batteries, cables, generator and generator regulator be inspected and put in first-class condition at the onset of cold weather. If the grader is to be operated in Arctic temperatures, consult your nearest authorized dealer or write the factory for information regarding availability of special cold weather equipment.

COLD WEATHER ENGINE PRIMER

A. PURPOSE

In warm weather, sufficient heat is generated by the compression of the air in the cylinders to ignite the fuel and start the engine within a very short cranking period. However, in cold weather, the "drag" caused by cold oil between the pistons and cylinder walls and in the bearings reduces the cranking speed of the engine. A large part of the heat generated by compression of the air is absorbed by the pistons and cylinder walls. This heat loss and reduced cranking speed may result in the temperature of the air in the cylinders being too low to ignite the fuel. A starting aid must then be used in starting the engine.

B. DESCRIPTION

The cold weather engine primer consists of a dispenser assembly, which holds and punctures a capsule containing ethyl ether fluid, a primer pump to force the fluid through a small nozzle into the air inlet housing on the engine blower, a primer elbow assembly, and the necessary lines to complete the system. The primer pump and dispenser are located at the left rear corner of the seat cushion. The vaporized starting fluid is forced through the primer elbow assembly into the air inlet housing, where it is picked up by the engine blower and is blown into the cylinders. Since the fluid is highly combustible, it is easily ignited by compression in the cylinders. The engine will start quickly at low ambient temperatures with the aid of the primer if the starter will crank the engine even at a very low cranking speed. The starting fluid capsules, available in 7 c.c. and 17 c.c. sizes, can be obtained from "Allis-Chalmers" Dealers. Refer to "Starting and Stopping the Engine" for full instructions on the use of the Cold Weather Engine Primer.

C. COLD WEATHER ENGINE PRIMER TROUBLE SHOOTING

If the engine is cranked with the throttle wide open and does not start after two or three strokes of the primer pump, it is advisable to stop cranking and inspect the primer system for possible causes of failure:

1. Primer Elbow Assembly Clogged.

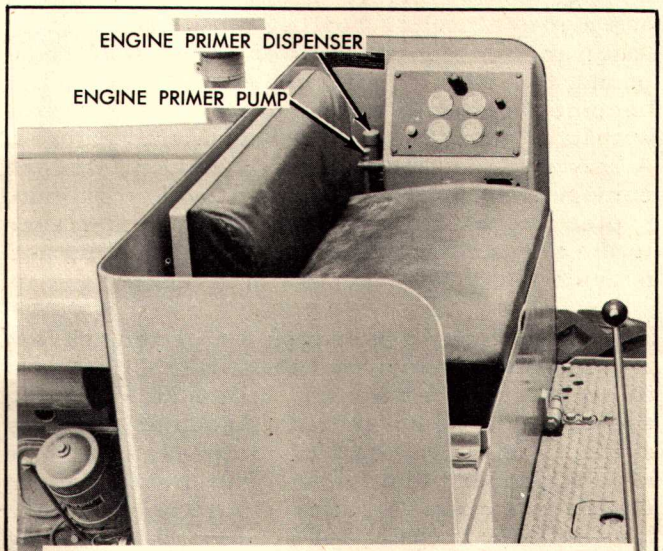
This condition will usually be indicated by excessive resistance on the primer pump. A partially clogged primer elbow assembly will prevent the delivery of sufficient starting fluid to the air inlet system. To clean the primer elbow assembly, remove the assembly from the air inlet housing and remove the small nozzle from the primer elbow assembly. Remove and clean the nozzle swirl pin and open the hole in the end of the nozzle, if clogged.

CAUTION: Do not enlarge the hole in the end of the nozzle.

After cleaning, re-assemble the primer elbow assembly and install the assembly in the air inlet housing.

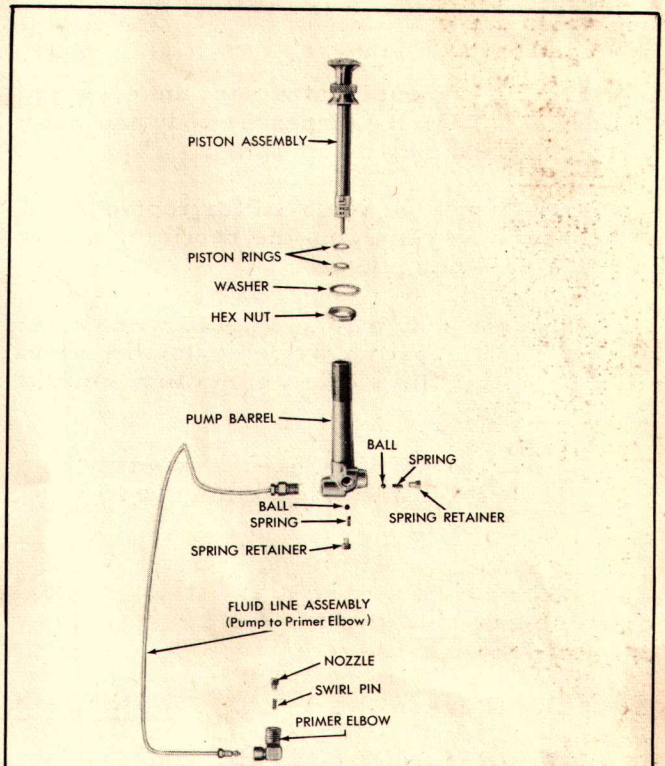
2. Inoperative Primer Pump

Failure of the primer pump to function properly may be due to worn or damaged packing rings, a clogged dispenser filter screen, clogged fluid lines or "frozen" or worn check valve balls. The packing rings on the plunger are made of a special rubber composition and must be replaced by duplicate parts if worn or damaged.



COLD WEATHER ENGINE PRIMER PUMP AND DISPENSER LOCATION
FIG. 9

To replace the packing rings, remove the knurled nut (under knob) from the pump barrel and withdraw the piston assembly from the barrel. Remove the packing rings from the grooves of the piston assembly and install new rings. Lubricate the rings and piston with light engine oil and install the piston assembly in the pump.



PRIMER PUMP AND PRIMER ELBOW DETAILS
FIG. 10

3. Ball Check Valves

The two spring loaded ball check valves, located on the inlet and outlet openings of the pump, are provided to close the pump openings at the proper time. When the pump piston is pulled out (suction stroke, drawing fluid from dispenser) the ball check valve at the inlet port opens, allowing the fluid to be drawn from the dispenser. When the pump piston is pushed in (delivery stroke, supplying fluid to the primer elbow assembly), the ball check valve at the outlet port opens, allowing the pump to force the fluid to the primer elbow assembly.

Worn or "frozen" ball check valves or broken springs will prevent the pump from operating properly. When this occurs, remove the spring retainers, springs, and balls from the inlet and outlet ports of the pump. Inspect the balls, ball seats, and springs for wear or damage. Clean the pump body and all its components thoroughly and reassemble, using new parts where necessary.

4. Clogged Dispenser Strainer.

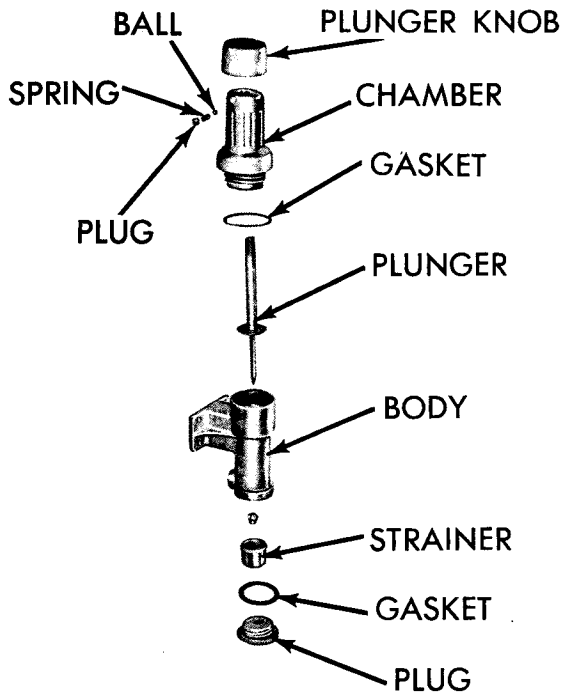
The strainer is bolted to the strainer plug, screwed into the bottom of the dispenser body. If the gelatine capsules are not removed soon after puncturing, the gelatine will melt and plug the strainer screen in the bottom of the dispenser body.

To clean the dispenser strainer, unscrew the strainer plug from the dispenser body and wash the strainer and plug in hot water.

The strainer may be removed for replacement if necessary by removing the retaining screw from the strainer plug.

The dispenser body may be washed without removing it from position by removing the upper chamber, the fluid line connector, and the strainer plug.

Re-assemble the dispenser assembly by a direct reversal of the disassembly procedure.



PRIMER DISPENSER DETAILS
FIG. 11

ENGINE COOLING SYSTEM

A. DESCRIPTION OF SYSTEM

The cooling system consists of the water pump, radiator, oil cooler, thermostat, cooling fan and water passages in cylinder block and head. The pump draws the water from the bottom of the radiator, through the oil cooler housing, and circulates it through the water passages in the engine. The water is discharged from the cylinder head into the water outlet manifold on cylinder head, passes through the thermostat and is conducted through the upper radiator hose to the upper part of radiator. The water is cooled as it passes from top to bottom of radiator by air drawn through the radiator core by the cooling fan.

The thermostat, located in the housing on fan end of water outlet manifold, operates automatically to maintain normal operating temperatures (160° to 185° F).

B. GENERAL MAINTENANCE

Keep cooling system filled with clean water that is free from lime or alkali. The use of water containing lime can result in the lime depositing in the cylinder head and block, causing hot spots in engine and eventually restricting the water passages. Alkali in the water will cause a corrosive action detrimental to the engine.

In cold weather, use an ethylene glycol anti-freeze solution in the system to protect it against damage from freezing. This type of anti-freeze has a much higher boiling point than water. After any addition of water or anti-freeze compound, test solution after the added quantity has become thoroughly mixed to make sure it will withstand prevailing or anticipated temperatures. A mixture of 60% ethylene glycol anti-freeze compound and 40% water will provide maximum protection; the use of more than 60% anti-freeze in the solution will raise the freezing point and provide less protection against freezing.

Keep radiator air passages free from leaves, trash, and other material that will restrict flow of air through the radiator. All leaks in cooling system must be corrected as soon as they are evident and drive belts of cooling fan must be kept in proper adjustment. The most efficient engine operation is obtained with temperature held within a range of 160° to 185° F. Operating the engine with temperature below this range will result in incomplete combustion of fuel, higher fuel consumption with less power, and will also cause harmful deposits within the engine.

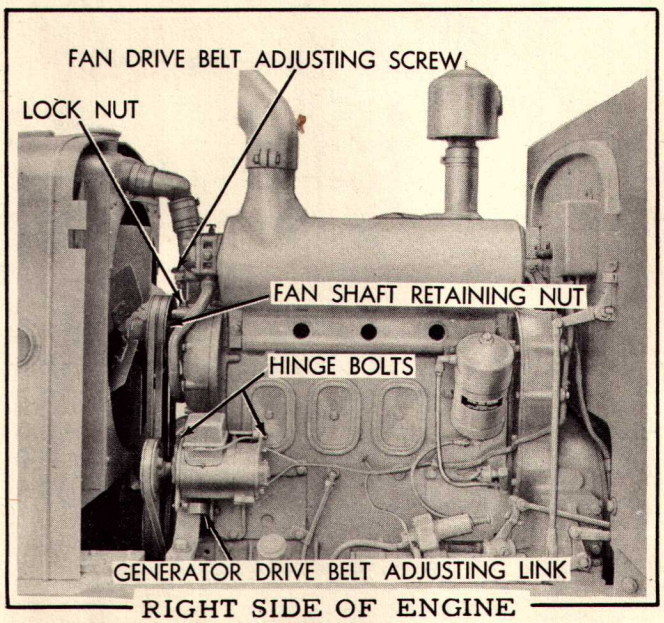
Maintaining the correct engine temperature depends mostly on proper functioning of the thermostat. If engine temperature remains consistently below normal, the thermostat should be removed and inspected. If thermostat is corroded and stuck or if bellows of unit leaks, install new unit.

C. FAN BELT ADJUSTMENT

The fan belts are correctly adjusted when one side of the belts can be pressed inward approximately 1-1/4 inches at a point half-way between the two pulleys.

Loosen the large nut at the front end of the fan shaft, also the lock nut on the adjusting screw (Fig. 12) to adjust the belts. Turn the hand screw clockwise to tighten the belts or counter-clockwise to loosen them. When the belts have been adjusted, tighten the large nut securely, then tighten the top lock nut.

CAUTION: Fan bearing failure will develop when fan belts are set too tight.



RIGHT SIDE OF ENGINE
FIG. 12

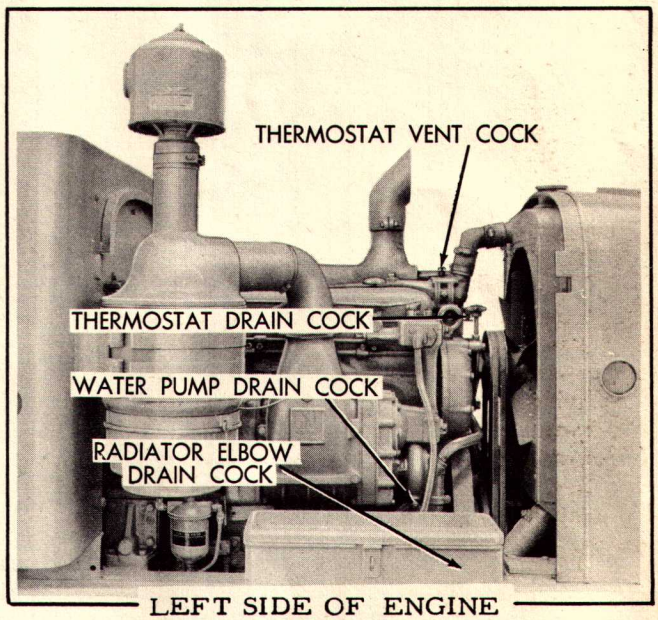
D. FILLING COOLING SYSTEM

Fill cooling system through radiator, after closing the three (3) drain cocks, one located in bottom of water pump, one in lower radiator hose elbow, and one in the bottom of the thermostat housing.

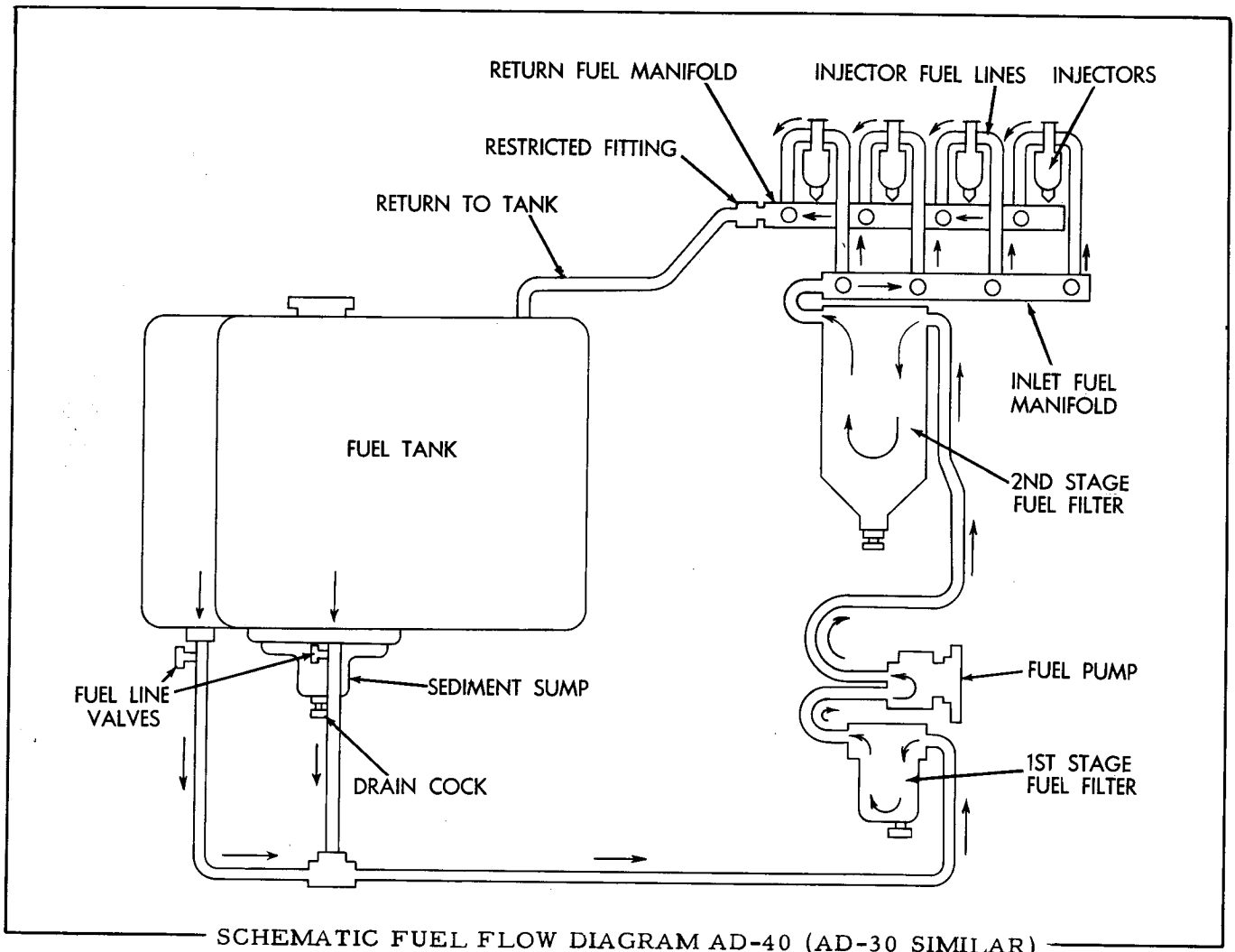
IMPORTANT: Open the vent cock located in the top of the thermostat housing, then fill the system through the radiator until coolant flows from the thermostat vent cock. This allows air trapped in the cylinder block to escape. Close the vent cock and complete the filling of the system.

E. DRAINING COOLING SYSTEM

Open the drain cocks in the water pump and in the lower radiator hose elbow. Open the drain cock in the bottom of the thermostat housing, then open the vent cock in the top of the thermostat housing.



LEFT SIDE OF ENGINE
FIG. 13



SCHEMATIC FUEL FLOW DIAGRAM AD-40 (AD-30 SIMILAR)
FIG. 14

A. DESCRIPTION OF SYSTEM

The engine fuel system consists of the fuel tank under the seat, first stage fuel filter assembly, fuel pump at front of blower, second stage fuel filter above pump, and the injectors and fuel lines. The fuel is drawn from the bottom of the fuel tank and through the first stage fuel filter assembly by the fuel pump.

The pump then circulates this fuel under pressure through the second stage fuel filter and inlet fuel manifold on side of cylinder head and through the injectors. As the fuel enters each injector it passes through a small porous metal filter in the injector body. The portion of the fuel required by the engine is injected into the cylinders by the injectors, the surplus fuel leaves each injector through another porous metal filter and enters the return fuel manifold and returns to the fuel tank. A pressure of 25 to 60 pounds is maintained within the fuel system by a restricted fitting in the fuel oil return line.

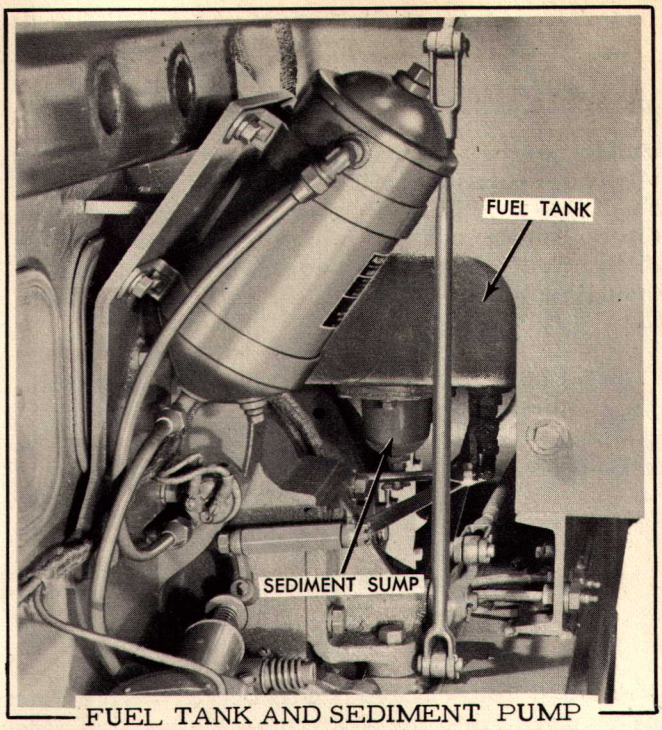
The continuous circulation of the fuel helps cool the injectors and eliminates the possibility of air pockets in the system.

B. FUEL TANK AND SEDIMENT SUMP

A sediment sump is provided on the bottom of tank to allow sediment and water to collect and be drained. The valve in the sump should be opened daily, before the start of the sump should be opened daily, before the start of the day's operation in warm weather and shortly after the end of the day's work in freezing weather. Close valve when clean fuel runs out. If an accumulation of rust and scale in tank is evident, drain tank, remove sump, and flush tank.

C. FUEL FILTERS

The fuel filter assemblies consist of a shell containing a replaceable element. A drain cock is provided in the bottom of the filter shell for draining the filter. Open the filter drain cock daily, before the start of the day's operation in

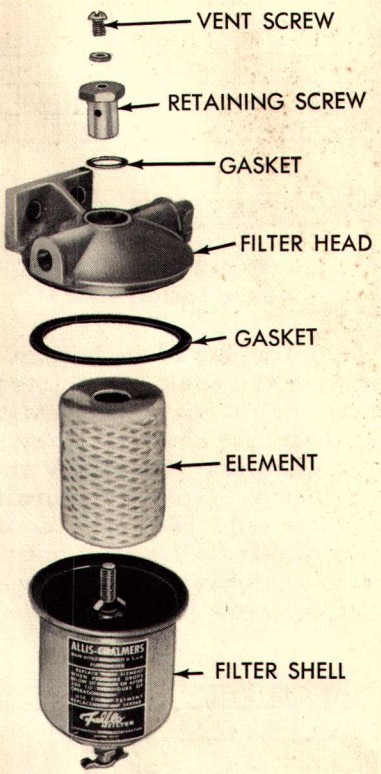


FUEL TANK AND SEDIMENT PUMP
FIG. 15

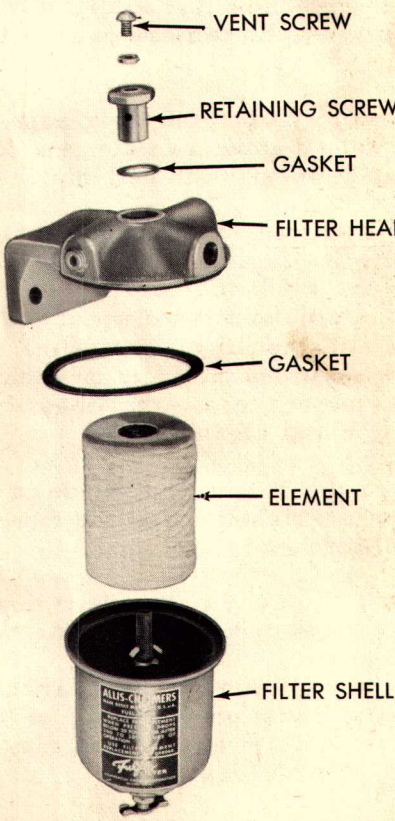
warm weather or shortly after the day's operation in freezing weather and allow water or sediment to drain. Close the drain cock when clean fuel runs out. A new element must be installed when the fuel pressure drops to 20 - 25 pounds or after every 300 to 500 hours of operation.

D. TO CHANGE THE FILTER ELEMENT

1. Close both fuel line valves at the bottom of the fuel tank.
2. Remove the filter shell by removing the retaining screw from the top of the filter head.
3. Remove and discard the gasket and element.
4. Wash the shell.
5. Install the new element in position in the filter shell and place the new gasket in position under the filter head. Place the shell in position under the head and install and tighten the retaining screw.
6. Loosen the small vent screw in the top of the retaining screw. Open the fuel line valves under the tank. When fuel is seen emerging from around the vent screw in the first stage filter, tighten the vent screw. Start the engine and when fuel oil is seen emerging from around the vent screw in the top of the second stage filter, tighten the vent screw.



FIRST STAGE FUEL FILTER DETAILS
FIG. 16



SECOND STAGE FUEL FILTER DETAILS
FIG. 17

7. With engine running, check for leaks around the filter heads and from the fuel lines.

NOTE: The service for both the first and second stage filters is the same. The only difference being in the size and windings of the elements and in the openings in filter head.

E. "LUBER-FINER"† FILTER

On graders equipped with "LUBER-FINER"† Filters, service as follows:

Remove the drain plug in the bottom of the filter housing, before the engine is started at the beginning of the day's operation in warm weather or shortly after the end of the day's operation in freezing weather, and allow the water or sediment to drain. Replace the drain plug when clean fuel runs out. Remove and discard the old element and install a new one after every 300 to 500 hours of operation or when the fuel pressure drops below 20 to 25 pounds per square inch.

F. TO CHANGE THE "LUBER-FINER"† FUEL FILTER ELEMENT

1. Close the fuel shut-off valves at bottom of fuel tank.

2. Remove drain plug from bottom of filter housing and allow fuel to drain from filter. Then, remove lid capscrews and lift lid from housing.

3. Unscrew T-handle hold-down assembly from center tube and remove element from filter housing by lifting with pull-out bail.

4. Clean the filter housing thoroughly and replace drain plug.

5. Install a new Dieselpak element and top gasket in the filter housing. To assure leak-proof sealing, examine the seats on each end of the filter element to see that they are in good condition and clean.

6. Replace the T-handle hold-down assembly and tighten firmly. Fill the filter housing with clean fuel oil.

7. Replace the lid on the filter housing and tighten capscrews evenly and securely.

8. Open the fuel shut-off valves at the fuel tank and remove vent plug from top of filter housing. Then start engine and run until fuel emerges from vent plug.

9. Install vent plug and check for leaks at filter lid, vent plug, and drain plug.

CAUTION: Use only Dieselpak elements in "LUBER-FINER"† Filters.

G. CHECKING OF FUEL SUPPLY SYSTEM

Under normal conditions at full throttle, 25 to 60 pounds pressure will be indicated on the gage. Fuel pressure below normal, uneven running of the engine, excessive vibration, stalling when idling and a loss of power are indications of insufficient fuel supply to the injectors. Check for the following:

(a) Air being drawn into system on suction side of the pump.

(b) Clogged fuel filter elements.

(c) Partially clogged fuel lines.

(d) Clogged injector fuel filters.

(e) Inoperative fuel pump.

Pressure below normal will occur when air is being drawn into the system on the suction side of the pump, when filters or lines are clogged, or when the fuel pump is worn or damaged.

Pressure above normal will occur when the restricted fitting in the fuel return line clogs or when the pressure relief valve in fuel pump fails to open.

To check the flow of fuel through the system, remove return line from engine fuel return manifold. With the engine operating at full throttle, the system will be functioning properly when a full stream of fuel with considerable force is observed returning from the engine fuel return manifold. If only a small stream is observed, all the causes listed above must be checked and eliminated in turn.

1. Check for Clogged Fuel Filter Elements and Admission of Air into System

To check for air being drawn into the system, with the engine running, loosen vent screw in the top of the second stage filter head. If air is entering into the fuel system, foam or bubbles will be observed in the fuel that emerges from around the loosened vent screw. Correct by tightening any loose fuel lines and filter connections or by replacing any damaged parts. Test for smooth engine operation and full flow of fuel.

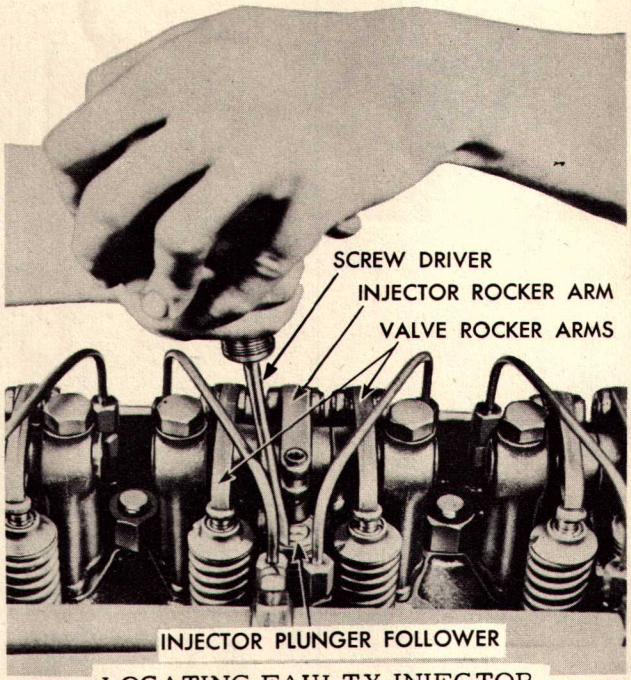
If the fuel lines or filters are clogged, clean the first stage or second stage filter or both, install new elements and blow out the lines while they are disconnected. This should eliminate the difficulty. Check for full flow of fuel after engine is again started.

†"LUBER-FINER" is a trademark of Luber-Finer Inc.

2. Check for Clogged Injector Filters

If engine still runs "ragged" with suitable fuel return, the injector filters for one or more cylinders may be clogged. Locate the faulty injector as follows:

Run engine at idling speed and cut out each injector in turn by holding injector follower down with screwdriver or small block of wood.



LOCATING FAULTY INJECTOR
FIG. 18

CAUTION: Do not allow screw driver to slip off follower as damage to valve assemblies can easily result. A decrease in engine speed with follower held down will indicate that the injector for that cylinder is functioning properly. If engine speed does not decrease, the injector is inoperative and should be removed for further inspection.

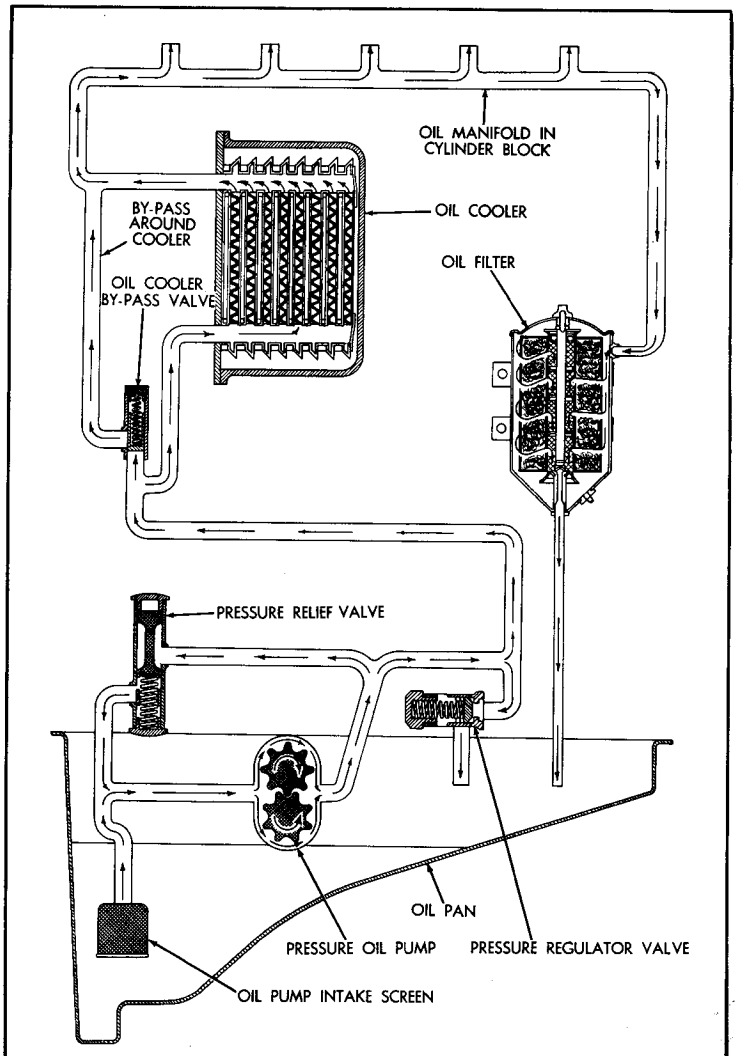
Stop engine and remove the fuel feed line that connects the injector to the return fuel manifold. Hold finger over injector fuel outlet and crank engine with starter. If fuel gushes from injector while starter is cranking engine, an ample fuel supply is indicated.

3. Check for Inoperative Pump

If all the possible causes for insufficient supply of fuel, as explained in above paragraphs, have been eliminated, the fuel pump will be considered inoperative and must be removed and repaired or replaced.

4. Excesively High Fuel Pressure

A relief valve is installed in the fuel pump to prevent high fuel pressure. However, if clogging in the fuel system occurs or the relief valve sticks, high pressure will develop and will be indicated on the fuel pressure gage. If pressure above normal range registers on the gage, the valve in the fuel pump should be inspected, the second stage fuel filter, the restricted fitting in the fuel return line at front end of return manifold (Fig. 14), and all fuel lines should be inspected for clogged passages. Continued operation with excessively high pressure (over 60 pounds) may result in damage to the fuel system.



SCHEMATIC LUBRICATION DIAGRAM SHOWING OIL FLOW THROUGH ENGINE AD-40 (AD-30 SIMILAR)
FIG. 19

A. DESCRIPTION OF SYSTEM

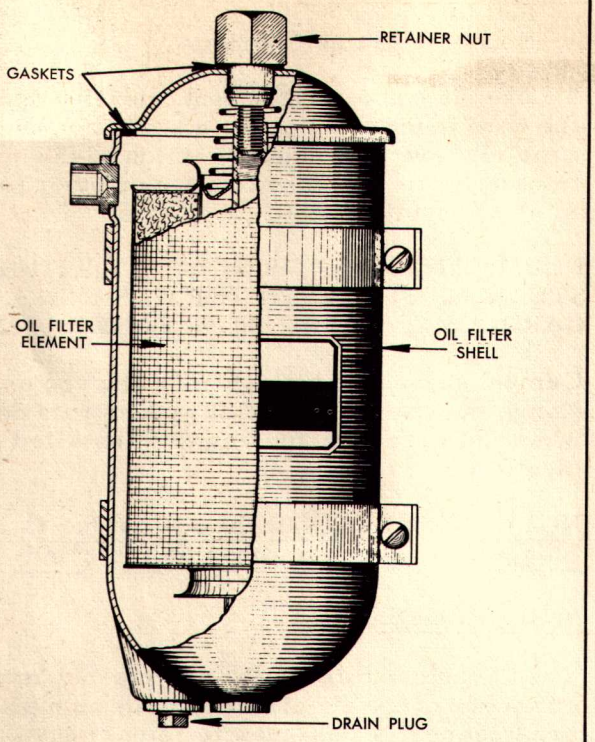
The engine lubrication system, schematically shown in Fig. 19, consists of a gear driven oil pump with Relief (safety) Valve, Oil Cooler with By-Pass Valve, Oil Filter, and Pressure Regulator Valve.

The oil pump is provided with a spring-loaded integral plunger type relief (safety) valve located in the pump body which limits the pump discharge pressure to approximately 100 pounds per square inch.

Oil is discharged from the pump, passes through the oil cooler and into the main oil gallery in the cylinder block, where it is distributed to the various engine bearings. A spring loaded by-pass valve in the oil cooler adapter, by-passes the oil around the cooler when clogging of the cooler element occurs or when the oil pressure drop through the cooler exceeds 40 pounds. Stabilized lubricating oil pressure is maintained within the engine at all times, regardless of oil temperature, by means of a Pressure Regulator Valve located in the oil gallery at the lower fan end of cylinder block. When the oil pressure at the valve exceeds 45 pounds, the regulator valve opens. Impurities in the oil are removed by the use of a by-pass type filter with a replaceable element which is introduced directly into the lubricating system. A portion of the lubricating oil passes through this filter and returns to the engine crankcase.

B. LUBRICATING OIL FILTER

The lubricating oil filter containing a replaceable element is mounted on the right side of the engine. A drain plug in the bottom of the filter shell allows draining of the filter for replacement of the element. A new element must be



LUBRICATING OIL FILTER
FIG. 20

installed each time the oil in the crankcase is changed.

C. TO CHANGE FILTER ELEMENT

1. Remove the drain plug in bottom of filter shell and drain the filter.

2. Remove the filter cover and lift out the filter element.

3. Wash the filter shell and replace the drain plug.

4. Place new element in shell and place spring on top of element.

5. Install a new cover gasket (furnished with kit) in cover and install cover.

6. Tighten the cover retainer nut securely.

7. Start the engine and check for oil leakage around filter cover and retainer nut.

D. "LUBER-FINER"† FILTER

On Graders equipped with "LUBER-FINER"† Filters the elements must be changed at each oil change. To change the element, proceed as follows:

1. Remove drain plug from bottom of filter housing and allow oil to drain from filter. Then remove the lid capscrews and lift lid from housing.

2. Unscrew T-handle hold-down assembly from center tube and remove element from filter housing by lifting with pull-out bail.

3. Clean filter housing thoroughly and replace drain plug.

4. Install a new Dieselpak element and top gasket in filter housing. To assure leak proof sealing, examine the seats on each end of the filter element to see that they are in good condition and clean.

5. Replace T-handle hold-down assembly and tighten firmly.

6. Replace lid on filter housing and tighten capscrews evenly.

7. Fill crankcase to proper level with prescribed lubricating oil and have approximately an additional 2 gallons on hand.

8. Remove vent plug from top of filter housing.

9. Start engine and keep it at low idle. As soon as engine starts, slowly add 1-1/2 gallons of crankcase lubricant to the crankcase.

10. Run engine until oil emerges from vent plug then install vent plug securely. Check for leaks around filter top, drain plug and vent plug.

11. Check oil level and fill crankcase to "full" on bayonet gage.

CAUTION: Use only Dieselpak elements in the "LUBER-FINER"† Filters.

E. OIL COOLER

The oil cooler consists of a multiple plate, corrosion resistant cooling core contained in a cast iron housing and is located under the water pump on the left side of the engine. Water drawn through the cooler housing by the water pump regulates the oil temperature during the time the oil travels through the small passages within the cooling core. The hot oil enters the cooling core at the bottom, flows through the inside passages, and is discharged at the top into a gallery in the cylinder block.

To ensure engine lubrication in the event the cooler core becomes clogged, a by-pass valve located in the oil cooler adapter, by-passes the oil around the cooler and directly to the oil gallery in the cylinder block. If proper lubricating oil maintenance procedure is followed, the cooler will function efficiently. However, if oil is allowed to become laden with impurities, they will deposit in the cooler and cause restriction or clogging of the oil passages in the cooler core.

Clogging of the cooler is usually indicated by a drop in oil pressure. If this occurs, the oil cooler core must be cleaned or a new one installed, to avoid excessive heating of the oil.

To remove the cooler core, disconnect the hoses and pipes from the cooler housing, remove the attaching capscrews and remove the housing and element. Scrape all of the old gasket from the oil cooler.

F. CLEANING OIL COOLER

Cleaning of the core requires the use of special solvents. The following solvents have been found effective when used according to the manufacturer's directions:

Excello Floor Cleaning Compound
Turco Cleaning Compound
No. 70 Stripper
Mixture of 3 parts Oakite No. 7 and 5 parts fuel oil.
Bendix Cleaning Compound

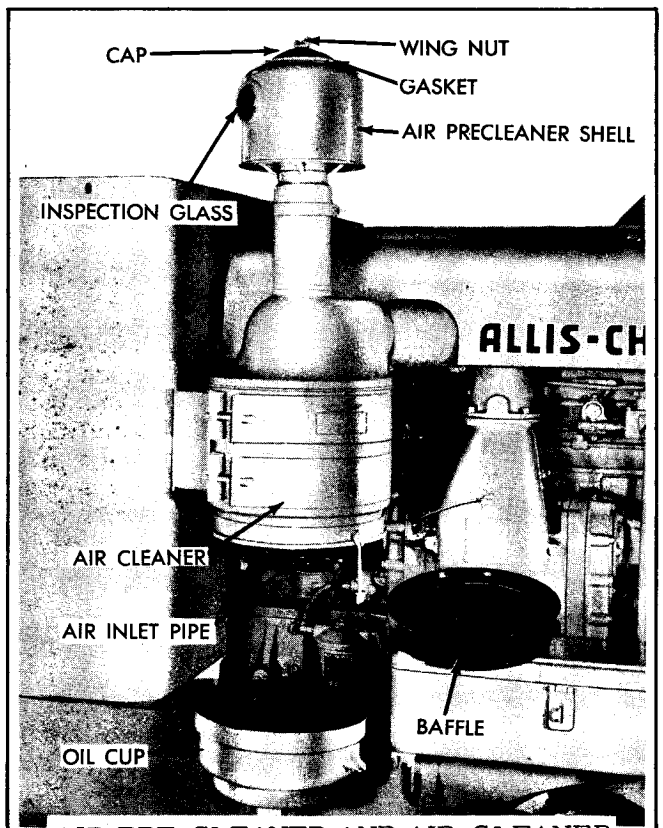
To use the last named solvent, merely submerse the core in the solution for a sufficient length of time to allow the chemical action of the solvent to dissolve or loosen the sludge or other foreign matter from the cooler.

FLUSH THE CORE THOROUGHLY WITH LIVE STEAM OR SPIRITS AFTER CLEANING, REGARDLESS OF TYPE OF CLEANER USED.

Cement gaskets to both sides of the cooler core flange and coat both sides of gaskets with cement when the core and housing are installed after cleaning.

NOTE: If the core of the oil cooler is badly clogged, a new core must be installed.

AIR PRE-CLEANER AND AIR CLEANER



AIR PRE-CLEANER AND AIR CLEANER
FIG. 21

A. DESCRIPTION AND PURPOSE

The life of the engine depends largely upon the efficiency of the air pre-cleaner and air cleaner. Fast wear on cylinder liners, pistons and rings will result if these cleaners are not kept in good condition and properly serviced.

The air enters through the pre-cleaner mounted on the top of the air cleaner extension pipe. The pre-cleaner is designed to impart a swirling motion to the air. This causes the heavy particles of dirt in the air to be thrown to the outside of the bowl and deposited therein. Approximately 85% of the dirt in the air is thus removed. The pre-cleaner should be emptied whenever the dirt level reaches half-way up on inspection glass.

After passing through the pre-cleaner the air enters the air cleaner through the pipe that extends down through the center of the air cleaner body. An oil cup filled to a specified level with engine oil is suspended on the lower end of the air cleaner body.

As the air is drawn through the cleaner, a portion of this oil is whipped up into screen mats in the main body of the cleaner. Dust still remaining in the air collects on these oily mats as the air passes through them. The oil, dripping back into cup, carries this dust with it to deposit it in the cup. Thus, only clean air enters the blower for delivery to the cylinders. The oil cup must be removed daily and the accumulation of dirt washed out. A broken hose, loose hose clamp, damaged blower gasket or leak of any kind that allows air to enter the cylinders without first passing through the cleaners will defeat their purpose. Therefore, extreme care should be taken to prevent leaks.

Periodic inspection of the above parts and of the air cleaner body for dents, cracks, loosened solder connections, etc., should be made frequently. If any of the above mentioned conditions are found, they must be corrected immediately.

B. AIR PRE-CLEANER SERVICE

Empty the pre-cleaner whenever the dirt level rises half-way up on inspection glass. Remove and clean as follows:

1. Unscrew wing nut, lift off cap, and remove shell.

2. Shake dirt out of shell and wipe inside of shell with a dry cloth. Make sure fins of pre-cleaner body are not bent, damaged, or clogged.

3. Wipe dust off cap gasket and cap, then re-assemble. Replace gasket if not in good condition. Tighten wing nut with fingers. Do not use wrench.

C. AIR CLEANER SERVICE

The filtering oil in the cup must be inspected daily or more often when operating under extremely dusty conditions. Keep filled with clean oil to level mark on baffle plate. Empty and wash the cup whenever the oil becomes discolored, then refill with clean oil.

Use same viscosity of oil as is used in the engine at prevailing temperature.

NOTE: SOME DIESEL LUBRICATING OILS MAY FOAM WHEN USED IN THE AIR CLEANER. DO NOT USE AN OIL THAT FOAMS AS IT REDUCES AIR CLEANER EFFICIENCY AND IN SOME CASES ALLOWS THE OIL TO BE PULLED OVER INTO THE ENGINE, CAUSING SERIOUS DAMAGE.

Service the air cleaner as follows:

1. Remove the oil cup from bottom of cleaner body. Remove baffle from the cup and empty oil from cup.

2. Wash all parts of the cup thoroughly with clean solvent or fuel oil. Remove the pre-cleaner assembly from the top of the air cleaner and swab out the inside of the air-intake pipe that extends from the pre-cleaner to the oil cup. Re-install the pre-cleaner assembly.

3. Install baffle in cup and fill cup to prescribed level with clean oil. The cup of the cleaner should be filled to the full mark on baffle plate.

4. Install cup on bottom of cleaner body. Check clamps on hose between the air intake elbow and air cleaner body and make certain that they are tight and that the hose is not crimped allowing air to enter without passing through the air cleaner.

ELECTRICAL SYSTEM

A. DESCRIPTION OF SYSTEM

The electrical system includes the starter, generator, generator regulator, batteries and wiring and is a 12-volt system throughout.

Current is supplied by two 6-volt, wet cell storage batteries carried in a compartment at the rear end of the main frame (Fig. 22).

Electrical energy drained from the batteries through the operation of the electrical equipment is replaced by the generator. The output of the generator is controlled by the generator regulator to prevent overcharging of the batteries.

B. GENERATOR, GENERATOR REGULATOR, AND STARTER

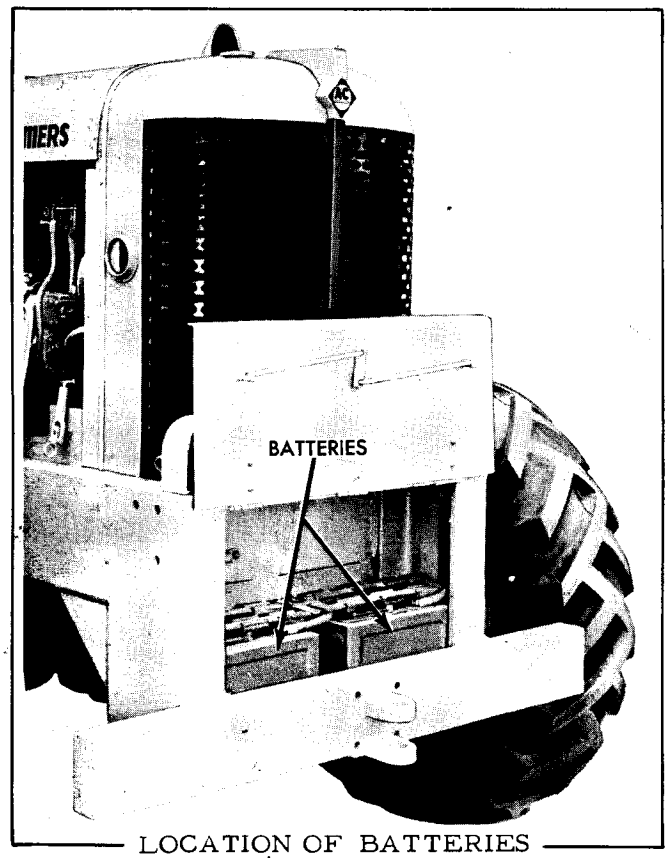
The generator and regulator are set to charge batteries at the rate of 4 to 8 amperes. Under normal conditions the ammeter should indicate this rate of charge for a short time after starting engine or until the generator replaces the energy drained from the batteries during cranking; then it will show little or no charge. This is sufficient to keep the batteries fully charged under normal conditions. It is important that the generator be maintained in good condition so that the batteries will be kept charged and provide the necessary cranking speed for starting engine. This is especially important in cold weather when battery efficiency drops in proportion to the drop in temperature. Any authorized United Motor Service Station is equipped to rebuild or test the generator, regulator, or starter when these units require service.

C. GENERATOR BELT ADJUSTMENT

The generator drive belt is correctly adjusted when the top side of the belt can be pressed down approximately 1" at a point half-way between the two pulleys. A loose belt will result in slippage, and a tight belt will cause bearing failure and undue wear on the belt. To adjust, loosen the capscrew in the adjusting link (Fig. 12) and the hinge bolts, then move the generator in or out until the correct tension is obtained. Tighten the capscrew and the generator hinge bolts.

D. BATTERIES

Check level of electrolyte in batteries every 75 hours; maintain the level of the solution 3/8" above plates by addition of clean distilled water. Keep battery and cable terminals tight and clean. If corrosion occurs, clean the battery posts and terminals with a strong soda solution and coat terminals lightly with vaseline before connecting them again. The vaseline will prevent further corrosion.



LOCATION OF BATTERIES
FIG. 22

When air temperature is below the freezing point, special attention should be given to hydrometer readings of the batteries. The electrolyte in fully charged batteries will have a hydrometer reading of 1.280 to 1.300 specific gravity when corrected to 77°F. Specific gravity readings without correction for temperature are practically meaningless. For each 30 degrees that the temperature of the electrolyte is above 77°F., add 10 points to the hydrometer reading and for each 30° below 77°F., subtract 10 points to get the true specific gravity. For example, if the hydrometer reading is 1.250 and the electrolyte temperature is 17°F. (60 degrees below 77°F.) 1.250 minus 20 points will be 1.230 - the true specific gravity.

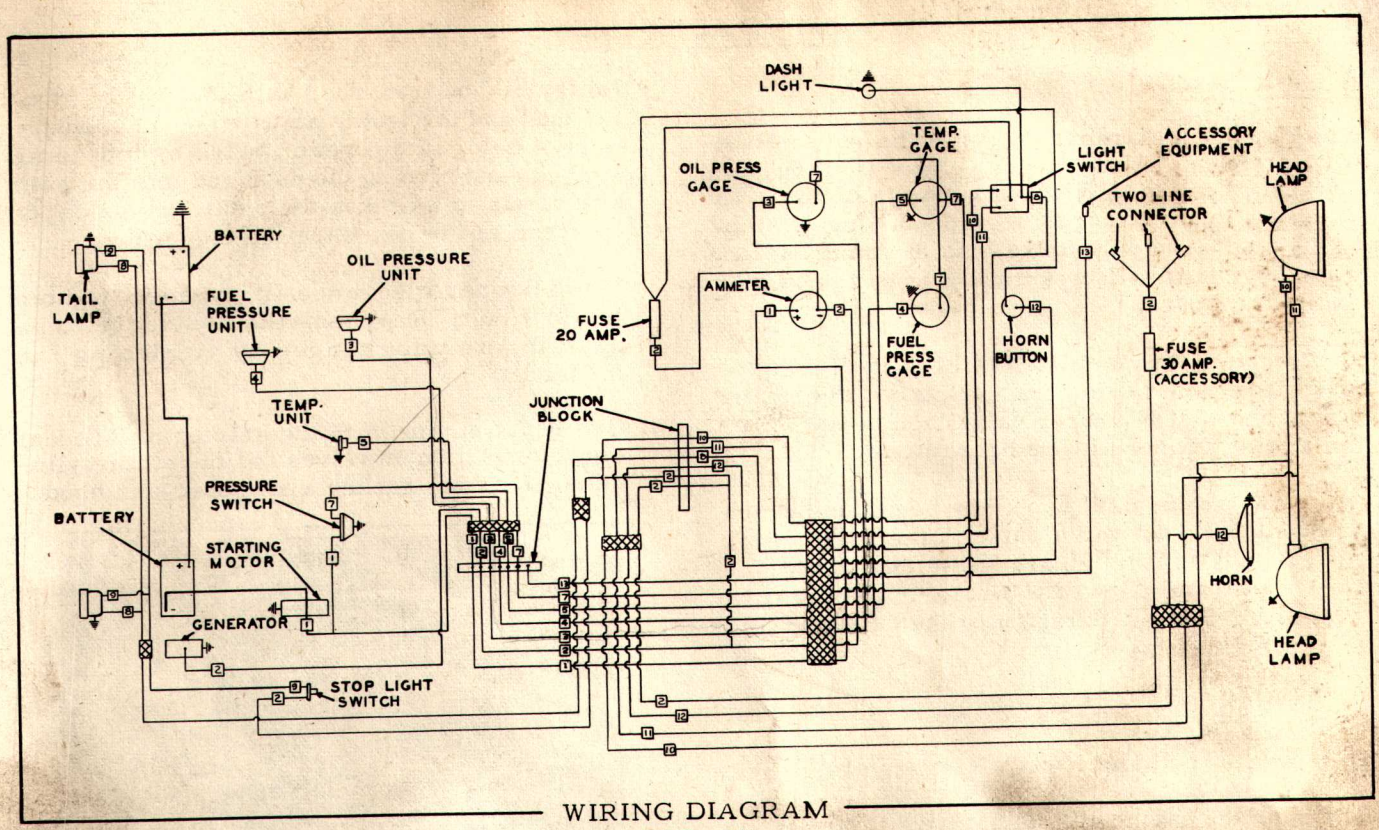
If corrected readings are below 1.240, the batteries are not receiving sufficient charge. This might indicate that the generator or regulator requires attention. If these units prove satisfactory, inspect for short circuits, loose connections or corroded connections. In zero weather there is danger of batteries freezing if specific gravity is below 1.175; a battery with a specific gravity of 1.225 will freeze at -35°F.

During freezing weather, any addition of water to cells should be made after engine is started at the beginning of an operating period to make certain that the water and electrolyte solution will be thoroughly mixed; otherwise it may freeze. Filler caps must be kept tight at all times and the tops of batteries kept clean and dry.

E. WIRING

Heavy cables connect the batteries and starter; wires assembled in harnesses connect the remaining electrical units. A 20-ampere fuse, located in back of the instrument panel, protects the electrical system from damage in the event of short circuits. An additional 30 ampere fuse located in wiring harness on right side of the front panel, is provided for protection of accessory equipment. The main wiring harness and engine wiring harness are connected by an electrical junction block bolted to rear of seat frame. The use of this block facilitates the disconnection and connection of wires for removal and installation of the engine or other major assemblies of the grader.

Inspect the wiring frequently to detect loose connections or frayed insulation. Tighten any loose connections and wrap any frayed spots on wires with friction tape to prevent short circuits. When replacing broken or defective wires, refer to wiring diagram (Fig. 23).



WIRING DIAGRAM
FIG. 23

VALVE ADJUSTMENT

A. GENERAL

The correct clearance between the ends of the valve stems and the rocker arms is very important in a Diesel Engine because of the high compression pressures developed. Insufficient valve clearance will cause loss of compression, misfiring, and will eventually burn the valves and valve seats.

Too much clearance will result in faulty engine operation and rapid wear on valve operating mechanism. The proper valve lash is .009" with the engine at operating temperature.

After any mechanical work has been done which would disturb the valve setting, the valves may be set "cold" to .012" clearance so that the engine may be run and allowed to warm up to operating temperature in preparation to the final correct valve adjustment.

B. TO ADJUST VALVES

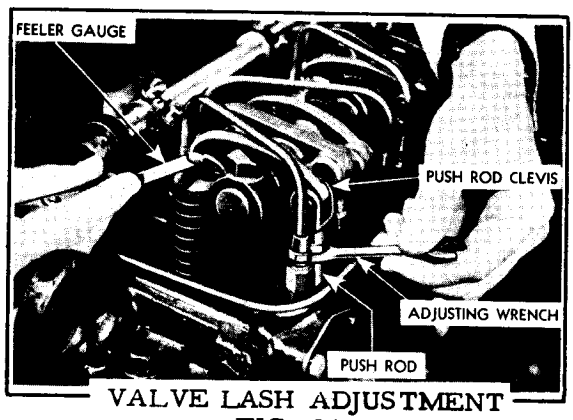
1. Remove hood and rocker arm cover.

2. Crank the engine with the starter until the injector rocker arm for one cylinder is down and injector plunger is at bottom of its stroke. The valves for that cylinder will then be closed and the valve rocker arms will be raised off the valve stems.

3. Check clearance between valve stems and rocker arms (Fig. 24). When adjusted properly a .009" thickness gage should pass between them with a slight drag when the engine is at normal operating temperature. With the the engine at ambient temperature, the .012" feeler ribbon furnished with the tool kit may be used and the valves adjusted to .012" clearance - cold. Adjust each valve by loosening lock nut and turning the push rod into the push rod clevis to increase the clearance or out of the push rod to decrease the clearance.

   When proper clearance is obtained, tighten the lock nut. Re-check the clearance to be sure it was not changed by tightening the lock nut.

4. Crank the engine with the starter and repeat above operation on valves for the other cylinders. Replace rocker arm cover and hood.



VALVE LASH ADJUSTMENT
FIG. 24

CAUTION: If for any reason a push rod is disconnected from a rocker arm, be sure, when it is reinstalled that the upper end of the rod is flush with the inside of clevis yoke before engine is turned. If it is not, it is possible that the valve will be opened too far and the piston will strike the valve and damage valve and piston.

A. GENERAL

Timing of each injector consists of properly locating the top of the plunger follower in relation to the injector body so that the fuel will be injected into the cylinder at the proper time.

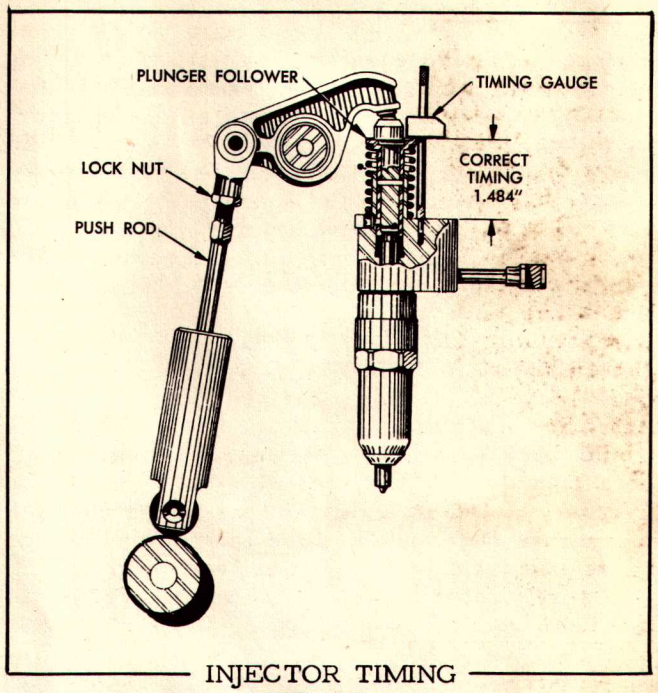
B. TO TIME INJECTOR

1. Remove the engine hood and rocker arm cover.

2. Rotate engine with starter until the two valve rocker arms for the same cylinder are down and valves are fully opened.

3. Place timing gage in hole in injector body; be sure shoulder at bottom end of gage rests on injector body and is not held up by copper washers under fuel connectors or by dirt in hole. Turn the gage so that the extended head (flat portion) of gage is toward the injector follower.

4. Loosen push rod lock nut and turn the push rod into the push rod clevis to raise the follower or out of the push rod clevis to lower the follower until the proper timing is obtained. When the injector is properly timed, the bottom (flat part) of the gage head will just pass over the top of the injector follower guide. The timing gage must be held perpendicular to the top surface of injector body while performing this adjustment.



INJECTOR TIMING
FIG. 25

5. Tighten the lock nut and re-check to be sure timing was not changed by tightening the lock nut. Replace rocker arm cover and hood.

INJECTOR EQUALIZING

A. GENERAL

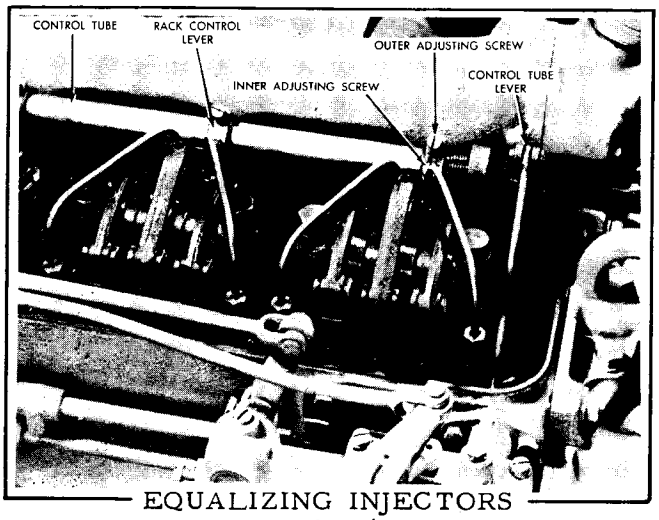
Equalizing of the injectors consists of adjusting the injector rack control levers so that an equal amount of fuel is delivered to each cylinder. The greatest amount of fuel will be injected into the cylinder when the injector racks are moved all the way in and no fuel can be injected into the cylinder when the racks are moved all the way out. The engine will run unevenly or detonate (knock) if the injectors are not equalized.

B. TO EQUALIZE THE INJECTORS

1. Remove hood and rocker arm cover.

2. Be sure injectors are properly timed.

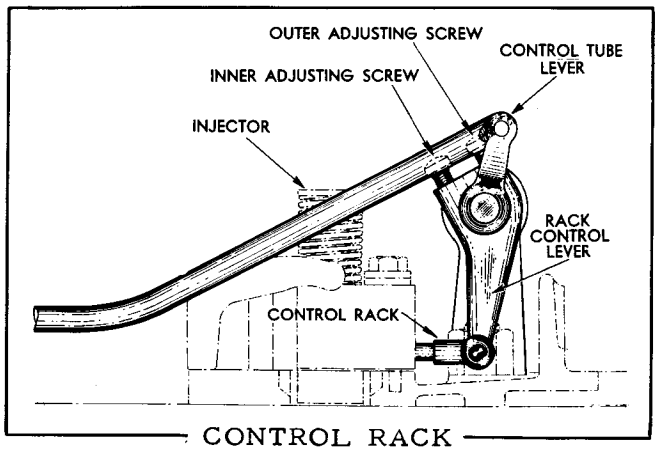
3. Loosen both adjusting screws on all the rack control levers. Be sure the screws do not bind, that the levers are free on the rack control tube, and the tube rotates freely in bearings at ends of tube.



EQUALIZING INJECTORS
FIG. 26

4. Pull throttle lever all the way back (wide open).

5. Push control tube lever toward water manifold as far as possible and hold firmly in that position.



CONTROL RACK
FIG. 27

6. Use a medium sized screwdriver and turn down inner adjusting screw on No. 1 rack control lever until No. 1 control rack moves in as far as it will go. At this point a slight pressure will be felt on the control tube lever. Roll the screwdriver back and forth with the finger tips to set the screw at the exact point where pressure starts (control rack just "bottoming" in injector - full open position).

7. Repeat this process on remaining control racks. Still holding the control tube lever firmly, as in paragraph 5, check each control rack to see that none have been missed in making the adjustments and that each rack is gently held in the full open position.

8. Now tighten each outer adjusting screw to lock the rack control levers in place on the control tube. This will also move the injector racks outward a few thousandths of an inch to prevent "bottoming" of the injector racks in the injectors during full load operation of the engine.

9. Replace rocker arm cover and hood.

ENGINE CONTROL ADJUSTMENTS

A. GENERAL

The throttle control lever is used to regulate the engine speed and to operate the governor fuel shut-off lever and the engine air shut-off valve in the blower air inlet elbow.

When the throttle lever is pushed all the way forward the air valve in the blower air intake elbow should be closed and the governor fuel shut-off lever should be closed (back towards radiator as far as possible).. Pulling the throttle control lever back to the point where resistance is felt, opens the air shut-off valve and moves the governor fuel shut-off lever to its open position. The engine will run at idling speed with the throttle control lever in this position. Pulling the lever farther back increases the engine speed.

Before any change is made in the adjustment of these controls, inspect all the linkage from the throttle lever to the governor to make sure irregularities in operation are not caused by bent or misaligned rods.

Lubricate all points so that the moving parts all work freely.

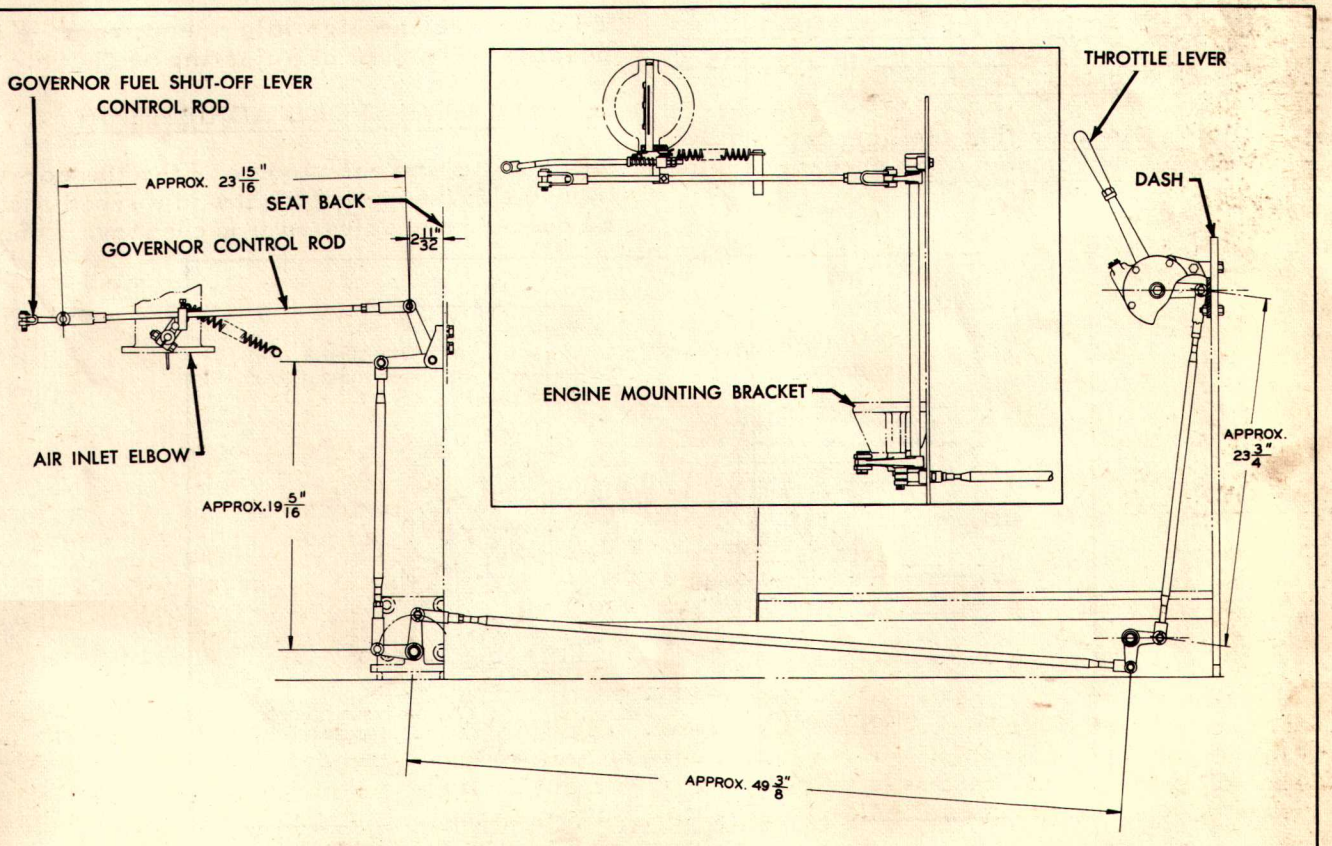
B. CHECK AND RE-ADJUST AS FOLLOWS:

1. Pull the throttle control lever back to the position necessary to open the air shut-off valve and the fuel shut-off lever. Control linkage leads down from the throttle control lever, passes under the driver's platform and up the back of the seat frame to a control shaft. A rod connects a lever on the control shaft with the variable speed control lever on the governor. Refer to Fig. 28 and check to make certain that the vertical control rod at the rear of seat measures approximately 19-5/16" between the lower and upper yoke pins. If not, adjust to obtain the specified measurement.

2. Pull the throttle control lever all the way back (wide open position). This should pull the governor variable speed control lever as far forward as possible (against its stop in the governor housing). If it does not, hold the variable speed lever forward as far as it will go (against its stop in the governor housing), and adjust the linkage on the end of the governor control rod as necessary.

3. Set the throttle control lever in the position necessary to open air shut-off valve, remove the pin connecting the control rod to the governor fuel shut-off lever, then check to see if the control rod is adjusted properly to pull the lever forward as far as it will go (against its stop located on under side of governor cover). If it does not, hold the lever forward as far as it will go and adjust the nuts on the end of the control rod to line up the holes for the connecting pins. In the event that the fuel shut-off lever is found to have moved on the shaft, loosen the clamping screw in the fuel shut-off lever and position the lever on shaft so that the connecting pin hole in the lever lines up with the pin hole in the control rod. Make certain that the shaft is turned forward against stop (underside of governor cover) when positioning the fuel shut-off lever.

4. The engine air shut-off valve in the blower air inlet elbow is closed by a lug on the governor control rod contacting a lug on the air shut-off valve lever and moving it back when the throttle lever is pushed all the way forward (off position). The air shut-off valve is turned and held open when the throttle lever is pulled back (run position) by a spring connected to the air valve lever. Since this action is quite positive, periodic lubrication of the air valve shaft with light engine oil will ensure its proper action and prevent binding.



ENGINE CONTROLS
FIG. 28

GOVERNOR ADJUSTMENT

A. GENERAL

The governor is adjusted at the factory to provide full governed speeds (under load) of 1600 r.p.m. and an idling speed of 500 r.p.m. These engine speeds should be maintained. If the engine speed is irregular or varies from the above, check the fuel system and other engine adjustments before changing the governor setting as the governor very seldom gets out of working order.

B. CHECKING ENGINE SPEED

Operate engine until normal operating temperature 160° to 185° F. is indicated on temperature gage. Hold a tachometer against the front end of crankshaft in center of crankshaft pulley. With throttle control lever set as far forward as possible without stopping engine (idling position) and the engine clutch disengaged, the engine speed should be 500 r.p.m. With the throttle control lever all the way back (wide open), and the engine clutch disengaged, the engine speed should be 1725 to 1750 r.p.m.

NOTE: If equipment on the grader prevents the use of a tachometer at end of crankshaft, remove the small cover plate at front end of generator and hold the tachometer against end of armature shaft. The generator runs at 1.65 times engine speed. Therefore, generator speeds of approximately 825 r.p.m. and 2845 r.p.m. will correspond with engine speeds of 500 r.p.m. and 1725 r.p.m.

CAUTION: Be sure that the generator drive belt is properly adjusted when checking engine speed at the generator.

C. HIGH IDLE SPEED ADJUSTMENT

NOTE: In most cases, the cause for the engine not reaching the proper high idle speed (1725 r.p.m.) will be found due to loose, or incorrectly adjusted throttle linkage and not due to the governor being out of adjustment. For this reason, before changing the adjustment of the governor, check the following:

Be sure that the governor fuel shut-off lever on the governor control housing moves to its open position (as far forward as it will go) when the engine throttle is placed into running position.

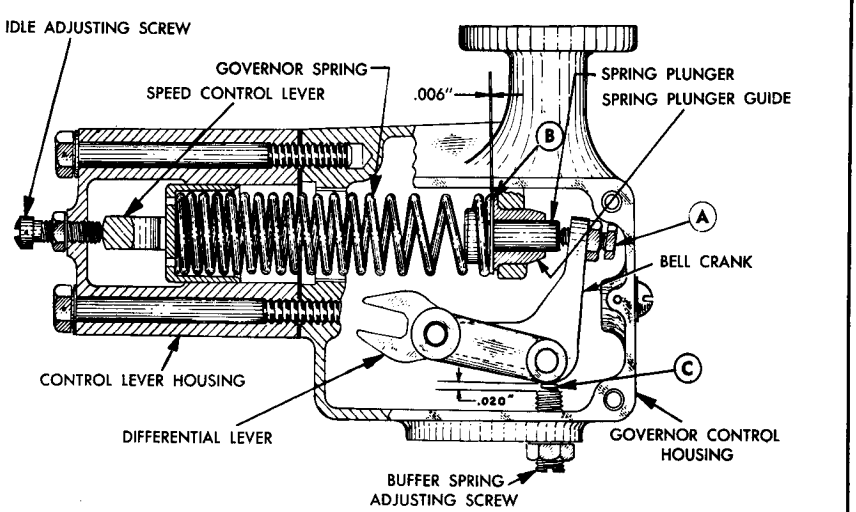
If the injectors have been properly timed and equalized and all adjustments and inspections listed above have been made and the engine still fails to attain its proper high idle speed of 1725 r.p.m. (2845 r.p.m. of generator), addition of adjusting washers between the variable speed spring and the spring retainer will be required.

The adjusting washers are installed by removing the variable speed spring housing from the governor control housing, lifting the spring from the spring retainer and inserting additional adjusting washers in the spring retainer. Each .010" thick washer will increase the high idle engine speed approximately 20 r.p.m.

To decrease the high idle speed, remove the necessary amount of adjusting washers.

D. LOW IDLE SPEED ADJUSTMENT

After adjusting the governor for the correct high idle engine speed, the low idle speed should be checked and adjusted if necessary. Loosen



GOVERNOR ADJUSTMENT
FIG. 29

the lock nut on the buffer spring adjusting screw and back the screw out (away from the differential lever) so that there is approximately 1/8" clearance between the spring and the differential lever. With the throttle control lever in "low idle" position, loosen the lock nut on the idle adjusting screw and turn the screw in to raise the low idle speed or out to lower the low idle speed. Tighten the lock nut when the correct low idle speed is obtained.

With the engine running at low idle, turn the buffer spring adjusting screw in until a very slight increase (not to exceed an increase of 20 r.p.m.) in the low idle speed is noted, then tighten the adjusting screw lock nut.

E. SPRING PLUNGER GAP ADJUSTMENT

A clearance of .006" must be maintained between the variable spring plunger and guide (Fig. 29). To adjust, remove the governor control housing cover and pull throttle lever half way back. Loosen the lock nut on the adjusting screw and turn the screw in or out until a .006" gap is obtained between the spring plunger and guide. Tighten the lock nut after proper adjustment has been made and replace the cover.

CLUTCH LINKAGE ADJUSTMENT

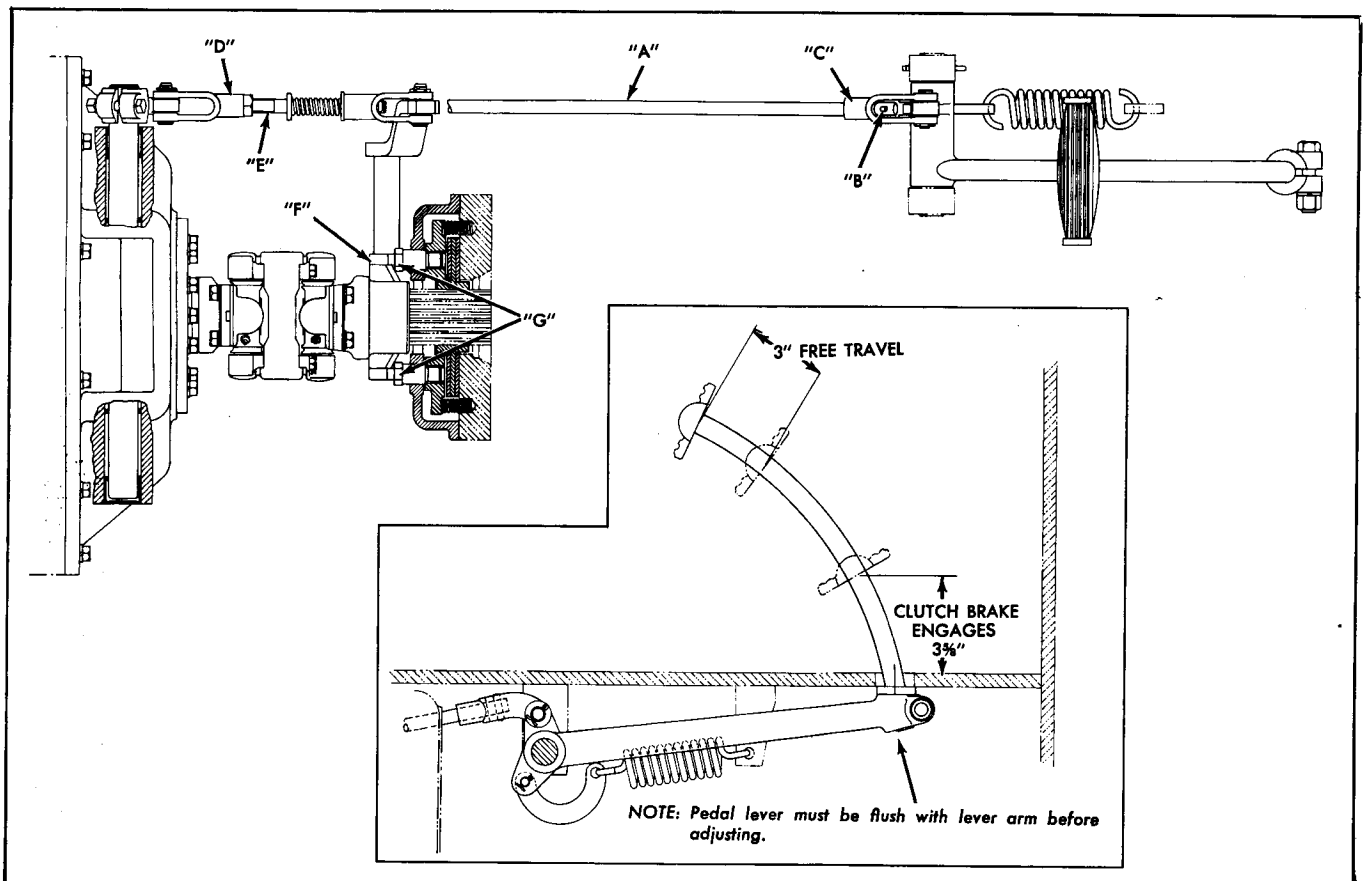
A. GENERAL

No adjustment is required within the clutch, however, as wear occurs on the clutch facings, the pedal linkage must be adjusted to maintain adequate free travel of the pedal. This is necessary to insure full engagement of the clutch and to prevent clutch slippage. The linkage is adjusted at the factory to provide 3" free pedal travel. Whenever this decreases to 1", adjustment must be made to restore the original 3" free travel. This is done by adjustment of the clutch linkage.

B. CLUTCH LINKAGE ADJUSTMENT

CAUTION: Before adjusting the clutch linkage, make certain that the lower end of the clutch pedal lever is flush with the bottom of the lever arm, this is necessary to obtain the proper adjustment.

1. Disconnect the rear end of the clutch control rod "A" from the clutch release lever.
2. Press the clutch pedal down 3" from its raised position and hold it in that position.
3. Loosen the lock nut on rear of clutch control rod and adjust the rod length by means of the yoke so that when the rod is reconnected, the pin "B" at the front end of the rod "A" contacts the sliding yoke "C". Tighten lock nut and secure yoke pin with cotter pin.
4. Adjust the clutch brake each time the clutch linkage is adjusted (see "Clutch Brake Adjustment").



CLUTCH AND CLUTCH BRAKE LINKAGE ADJUSTMENT
FIG. 30

CLUTCH BRAKE ADJUSTMENT

A. DESCRIPTION

The clutch brake is carried on the top transmission shaft with the clutch and is operated by the clutch pedal. Its purpose is to stop rotation of the transmission gears when the clutch is disengaged to shift gears. The lined brake disc, which is splined to the shaft, is engaged between a sliding pressure plate and a back plate bolted to the rear of the transmission case. The brake is applied during the last 3-5/8" of travel of the clutch pedal. Excessive pressure against the brake is prevented by the use of a spring on control rod "E". Two springs are provided to release the clutch brake when the clutch pedal is released.

B. SERVICE

The clutch brake must be adjusted each time that the engine clutch linkage is adjusted, as the engine clutch linkage operates both the clutch brake and the engine clutch.

C. CLUTCH BRAKE LINKAGE ADJUSTMENT

CAUTION: Before adjusting the clutch brake linkage, make certain that the lower end of the clutch pedal lever is flush with the bottom of the lever arm. This is necessary to obtain the proper adjustment.

1. Adjust the clutch linkage to provide 3" free travel on the clutch pedal, then push the pedal down to 3-5/8" above the floor plate.

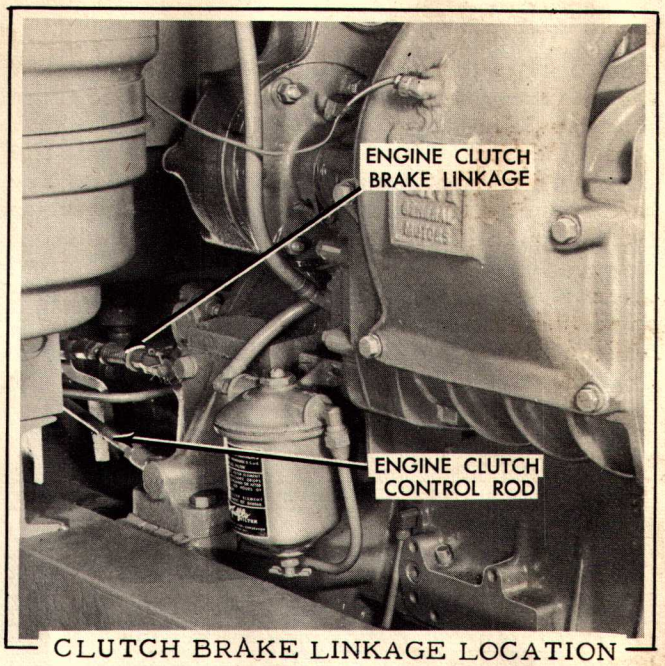
2. Hold the pedal in this position by wedging a stick of wood between the pedal arm and the hole in the floor board or in any other manner.

3. Loosen jam nut on control rod "E" and remove yoke pin from yoke "D". Adjust yoke "D" on rod "E" until clutch brake yoke "F" just contacts studs "G".

4. Install yoke pin in yoke "D" and tighten jam nut.

D. WASHING ENGINE CLUTCH

Oil leaks or over-lubrication of the clutch shifting bearing may cause the clutch facings to become coated with oil or grease. This will cause the clutch to slip even though it is properly adjusted. In this event, the clutch must be washed.



CLUTCH BRAKE LINKAGE LOCATION
FIG. 31

Install the clutch housing drain plug in the front of the flywheel housing and remove the engine clutch inspection cover.

Pour cleaning solvent into the housing until the level is approximately 1-1/4" below the clutch shaft. Re-install the inspection cover and operate the engine at low idle for approximately 5 minutes with the clutch disengaged. Drain the solvent and if it is excessively "oily", refill the housing and repeat the process.

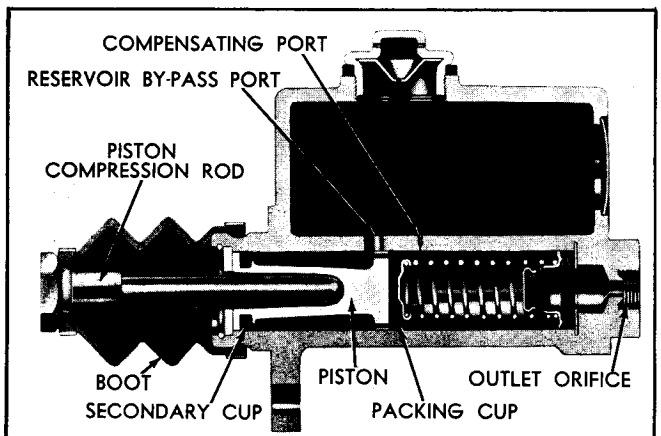
CAUTION: LUBRICATE THE CLUTCH THROWOUT BEARING, AND THE CLUTCH SHAFT BEARING THOROUGHLY AFTER THE CLUTCH HAS BEEN WASHED AND THE HOUSING DRAINED AS THE LUBRICANT MAY HAVE BEEN WASHED FROM THESE PARTS DURING THE WASHING PROCESS.

Operate the grader with a light load in low gear for a short period until the clutch dries to prevent slippage due to the presence of solvent on the clutch parts.

A. GENERAL

The graders are equipped with hydraulic brakes mounted on the rear tandem wheels. The front tandem wheels are affected the same as the rear wheels when the brakes are applied, since the driving chains of the front and rear wheels are connected to a common sprocket. Pressing down on the brake pedal, pumps hydraulic fluid from a compensating type master cylinder (located near the engine starting motor), to a hydraulic brake actuating cylinder in each rear tandem wheel. The wheel brake cylinders spread the brake shoes in each wheel and move them out into contact with the brake drums.

The master cylinder is also the fluid reservoir. The level of the fluid in the master cylinder should be maintained 1/2" below top of reservoir. Remove plug in top of reservoir to add fluid. CAUTION: Always wipe dirt from filler plug and from top of cylinder around plug before plug is removed to prevent entrance of dirt into reservoir. It is important that the proper fluid level be maintained, as air will be pumped into the system if the fluid supply becomes inadequate. This will result in a "spongy" brake action and will require "bleeding" the system to remove the air from the cylinders and pipes (see "Bleeding Brake System").



HYDRAULIC MASTER CYLINDER
FIG. 32

B. BRAKE PEDAL ADJUSTMENT

When properly adjusted, the brake pedal has 1/2" to 3/4" free travel before brake application pressure starts. This free travel is necessary to allow the piston in the master cylinder (Fig. 32) to return all the way to its "OFF" position. If no free travel were allowed, the port hole in the master cylinder which allows any excess of fluid in the system to by-pass from the cylinder into the fluid reservoir might by blocked by the piston cup and the compensating action of the cylinder would be destroyed.

This adjustment was made at the factory and further adjustment is seldom required unless excessive wear on the brake pedal shaft and linkage occurs. This can be prevented by periodic lubrication of these parts. When necessary, the free travel of the pedal can be adjusted by shortening or lengthening the rod that leads from the pedal arm to the master cylinder. Lubricate the pedal shaft linkage if the pedal does not return sharply to the "OFF" position.

As normal wear occurs on the brake linings, the pedal will go further down before the brakes are engaged, and will eventually strike the floor. Before this point of wear is reached, the brake shoes should be adjusted to compensate for this wear.

C. ADJUSTMENT TO COMPENSATE FOR BRAKE LINING WEAR

1. Check wheel shaft bearing adjustment and brake pedal linkage adjustment. Make any correction necessary before adjusting the brake shoes.

2. Check anchor pin jam nuts (Fig. 34) with a 16-inch wrench to make sure they are tight. If anchor pin jam nuts are loose, re-set anchor pins according to instructions under "Major Adjustments".

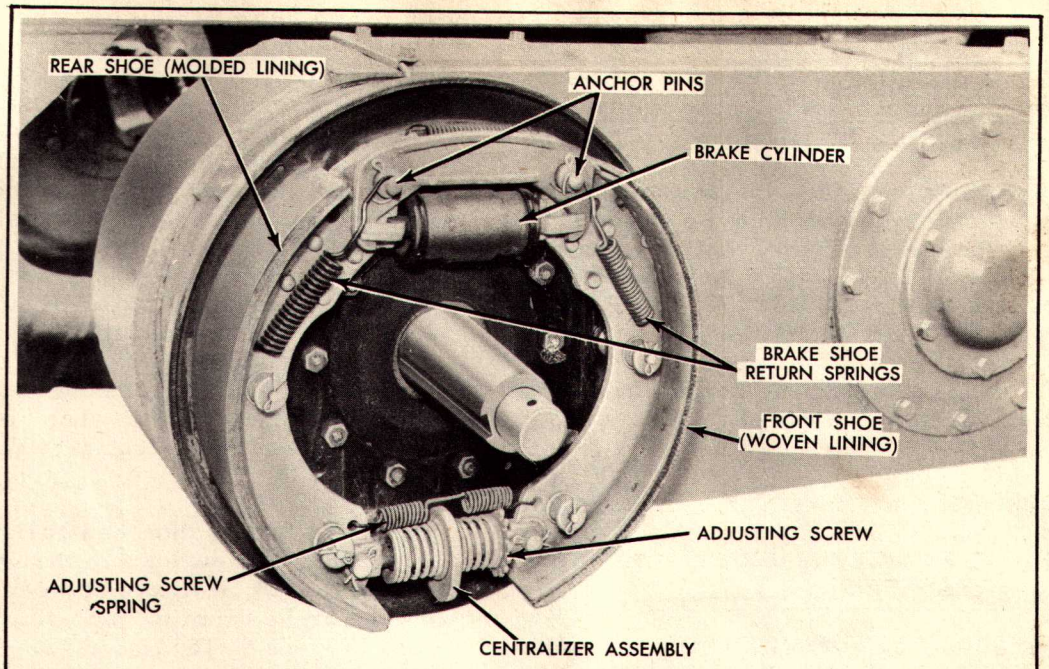
3. Swing covers back off brake adjusting holes and the two lower feeler gage holes in flange of backing plate (Fig. 34). Measure clearance between brake drum and brake shoe lining by inserting ribbon feeler gage through each of two lower feeler gage holes. A running clearance of .020" is required. Expand the lower ends of the shoes to move them closer to drum by inserting a screw-driver, or tool similar to the one shown in Fig. 35, through the adjusting holes and turning up on screws.

4. If there is insufficient pedal reserve after completing the above adjustment, adjust the shoe centralizer as follows:

   (a) Loosen the centralizer mounting bolt nuts (Fig. 36) until they are just free of lockwasher tension so that the centralizer can float freely.

   (b) Expand the adjusting ends of the shoes (lower ends) until they are tight against drum. Tap backing plate near centralizer with a light hammer to insure centralizer taking correct position, then tighten mounting bolts.

   (c) Reset shoes for .020" running clearance with drum as in paragraph 3, Topic C.



HYDRAULIC BRAKE ASSEMBLY
FIG. 33

5. Swing hole covers back over holes when adjustment has been completed.

D. MAJOR ADJUSTMENTS

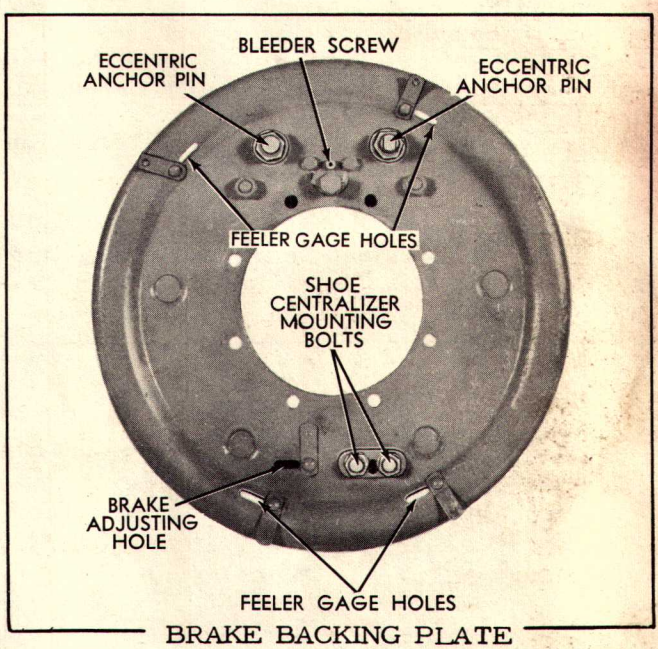
The following adjustments are necessary when minor adjustments fail to give satisfactory results or when replacing brake shoe and lining assemblies.

1. Jack up rear ends of tandem cases and remove hub and drum assemblies for inspection of drums, linings, and brake operating mechanism.

2. Check linings for wear and loose rivets. Remove any metal or other foreign particles which may be imbedded in the braking surface of the linings. Linings soaked with hydraulic brake fluid must be replaced. Brake fluid leaks at the wheel cylinders must be corrected by replacing or reconditioning the cylinders.

   If shoes are to be removed, use a clamp to prevent the wheel brake cylinder pistons being forced out of the wheel brake cylinders by an accidental movement of the brake pedal. Piston ejection would cause loss of fluid and allow air to enter the system, necessitating the bleeding of the system to remove all air.

3. Inspect drum braking surfaces and smooth or rebore drums if necessary. If drums are rebored, remove only sufficient metal to provide a smooth surface. If too much metal is removed, the drum may be weakened to the point where excessive wear on the lining and erratic braking will result.



BRAKE BACKING PLATE
FIG. 34

4. Clean brake shoes and brake backing plates thoroughly with a steel brush. All brake shoe bearing surfaces must be thoroughly cleaned, and a thin coat of lubricant applied to the linkage.

5. Inspect bolts that hold backing plates; tighten if loose.

6. When connecting the centralizer mechanism to a pair of relined shoes, be sure that the adjusting screw notched wheel is at the right-hand shoe when the shoes are assembled to each brake backing plate. Release the adjusting screw several notches to provide

clearance for installation in the brake drum.

NOTE: When installing new shoes, it may be necessary to turn eccentric anchor pins to allow shoe clearance for drum installation.

7. Clean drum braking surface with clean alcohol, carbon tetrachloride, or lacquer thinner. Correct any looseness in wheel shaft bearings. AFTER INSTALLING HUB AND DRUM ASSEMBLIES, REPEAT THE FOLLOWING OPERATIONS AT EACH WHEEL:

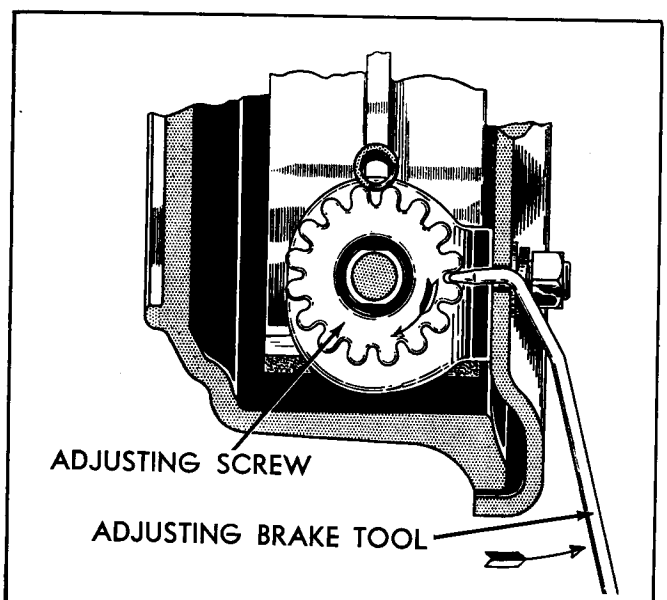
8. Uncover the brake adjusting holes and the four feeler gage holes in each brake backing plate (Fig. 34).

9. Be sure that the shoe centralizer mounting bolt nuts (Figs. 34 and 36) are loosened just free of the lockwasher tension so that the centralizer can move freely.

10. Turn the adjusting screw (moving handle of tool or screw driver in and up as shown in Fig. 35) until the lower ends of the brake shoe linings are expanded tightly against the drum.

11. Tap the backing plate near the centralizer mounting nuts with a light hammer to insure the centralizer (Fig. 36) taking correct position between the shoe ends. Tighten the centralizer mounting bolt nuts.

12. Back off the adjusting screw until a clearance of .020" is obtained between the adjusting ends of the shoe linings (lower ends) and the brake drum.

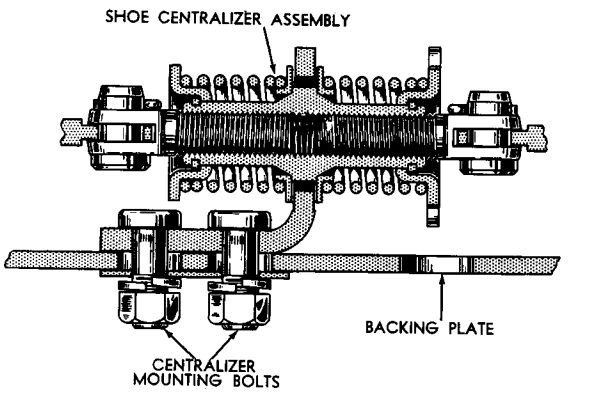


ADJUSTING SCREW-SECTIONAL
FIG. 35

13. Check the clearance between the anchor ends of the shoe linings (upper ends) and the brake drum; this clearance should be .008". Adjust the eccentric anchor pins (Fig. 34) to obtain this clearance. To adjust the eccentric anchor pins, loosen each anchor pin jam nut about one turn, turn each eccentric anchor pin in the direction required to obtain the correct clearance of .008" between the upper ends of the shoe linings and the brake drum, then hold the anchor pins from turning and tighten the anchor pin jam nuts securely with a 16-inch wrench. Recheck for .008" clearance after tightening the anchor pin jam nuts.
NOTE: It may be necessary to turn the adjusting screw (Fig. 35) when resetting the anchor pins for the correct clearance of .008".

14. Reset the brake shoe centralizer and readjust the adjusting ends of the shoes (lower ends) for .020" clearance between the linings and the brake drum by repeating the operations in steps 9, 10, 11 and 12.

15. Test the grader for proper brake action after assembly has been completed.



BRAKE SHOE CENTRALIZER DETAILS
FIG. 36

E. BLEEDING BRAKE SYSTEM

Bleeding of the brake system will be required if -

1. Any part of the hydraulic system has been broken or disconnected.
2. Air has been drawn into any part of the system.
3. Adequate fluid supply has not been maintained.
4. Brakes have been adjusted too tight causing overheating and boiling or gassing of the brake fluid.
5. Brake pedal action is "spongy", indicating air in system. To bleed the hydraulic system, bleed one wheel cylinder at a time as follows:

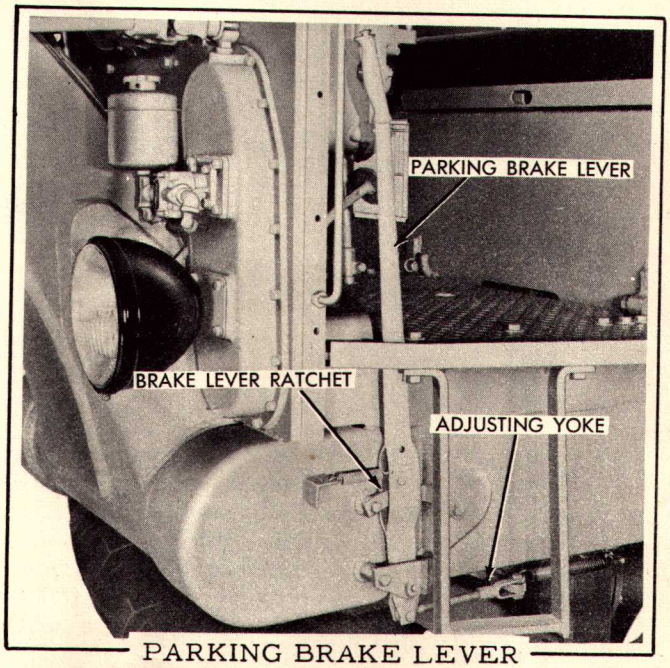
(a) Loosen the wheel cylinder bleeder valve (Fig. 34) about 3/4 of a turn and slip the end of the bleeding hose, included in tool kit, over the end of the bleeder valve. Place the other end of the bleeder hose in a clean cup size container. Fill the brake master cylinder reservoir with clean brake fluid.

(b) Depress the brake pedal slowly by hand. After each down stroke, allow the pedal retracting spring to return pedal SLOWLY to its raised position. This produces a pumping action which forces the fluid through the tubing and out at wheel brake cylinder, expelling with it any air that may be present in the line. Keep master cylinder reservoir at least half full at all times.

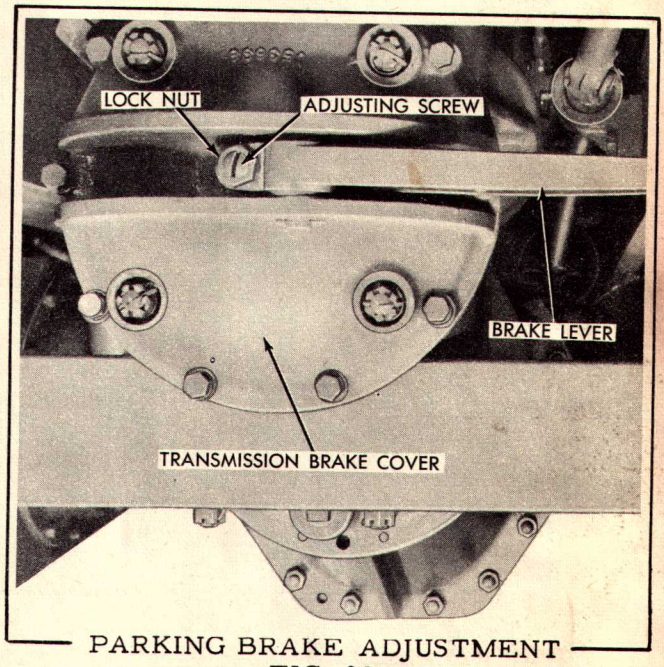
(c) Watch flow of fluid from hose, the end of which should be kept below surface of fluid, when all air bubbles cease to appear and fluid stream is a solid mass, tighten the bleeder valve.

NOTE: When bleeding the brake system, it is almost essential that two persons perform the above operations, as one is needed to watch the flow of brake fluid from the bleeder hose and the other is needed to depress the brake pedal and to keep fluid in the master cylinder reservoir. Fluid withdrawn in the bleeding operation should not be used again. Fill master cylinder reservoir to proper level after both wheel cylinders have been bled.

PARKING BRAKE ADJUSTMENT



PARKING BRAKE LEVER
FIG. 37



PARKING BRAKE ADJUSTMENT
FIG. 38

A. GENERAL

The parking brake should be adjusted so that, when the hand lever is pulled back, the brake will be fully engaged and will prevent the grader from rolling; the adjustment must also allow for the brake to be fully released when the lever is all the way forward.

B. TO ADJUST THE PARKING BRAKE

1. Loosen lock nut on adjusting screw (Fig. 37).

2. With hand lever forward as far as it will go (released position), turn adjusting screw in with a screw driver until the outer pressure plate just contacts the brake disc, then back the adjusting screw out 1/2 turn.

3. Hold the adjusting screw from turning and tighten the lock nut.

4. Operate the grader for a short period and check to be sure the brake does not drag or heat up. If necessary, back the adjusting screw out farther to give the brake additional clearance.

A. GENERAL

Slack in the steering mechanism of the grader may be caused by play in the ball joint to which the inner ends of drag links are connected, or by loose bearings or worn parts in the steering mechanism.

B. ADJUSTMENT

Remove play in the ball joint and drag links by removing shims from between the ball joint caps to eliminate the play. Since the ball may be worn so it is slightly out of round, it is important that the wheels be turned both ways against stops to make sure binding does not occur at any point due to the removal of too many shims. Adjust any loose bearings and replace any worn parts if necessary.

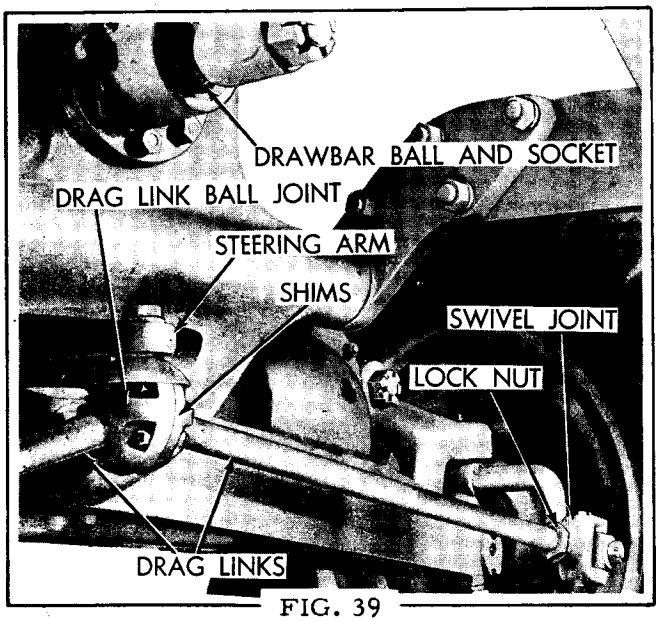


FIG. 39

C. CHECKING HYDRAULIC SYSTEM

The adjustment of the hydraulic steering mechanism is made at the factory and re-adjustment in the field should not be necessary. If the steering mechanism fails to function properly, the hydraulic system should be checked in the order named as follows:

1. Check the oil level in the oil reservoir tank. The oil level should be maintained approximately 1-1/2" to 2" below the bottom of tank filler neck.

2. Visually inspect all line and tube connections for leaks. Connections inside the tubular frame of the grader are accessible by removing the two covers on front of the tubular main frame. Tighten any leaking connections found.

3. Inspect the hydraulic system oil delivery pump for proper functioning of the pump. This is done by removing the discharge (outer) line from the pump and starting the engine. If a steady stream of oil emerges from the discharge opening of the pump, the pump is functioning properly. If no oil emerges from the discharge opening, the pump should be removed from the power take-off chain cover and inspected for a sheared key in the pump drive adapter. If the woodruff key, the pump drive shaft, and the pump drive adapter are in good condition, replacement of the pump will be necessary.

   CAUTION: It is important to eliminate all air from the hydraulic steering system. Air can enter the system by allowing the oil level in the hydraulic oil reservoir tank to become extremely low due to improper servicing or leakage, by disconnecting the lines in the system, and when filling the system after draining. It is important that all air be "bled" from the system to prevent steering wheel "kick-back".

D. BLEEDING THE HYDRAULIC SYSTEM

1. Fill the hydraulic oil reservoir tank 3/4 full with the specified oil and reinstall the reservoir tank cap.

2. Raise the front wheels of the grader so that they are free of the ground and no load is imposed on them. This can be done by moving the moldboard to right angle position with the grader frame and exerting down pressure on the moldboard with engine power until the front wheels are raised free of contact with the ground.

3. With the engine operating at half throttle, turn the steering wheel back and forth slowly to its maximum positions about 20 times and intermittently checking and adding oil if necessary to maintain the 3/4 full level in the oil reservoir tank.

4. After all air has been "bled" from the system, which will be indicated when foam and bubbles are no longer visible in the reservoir tank, stop the engine and fill the reservoir tank to the level of 1-1/2" to 2" below bottom of the filler neck in the reservoir tank.

5. Start the engine, lower the front wheels to the ground, and check the performance of the steering system. Check for oil leaks and correct if any are found.

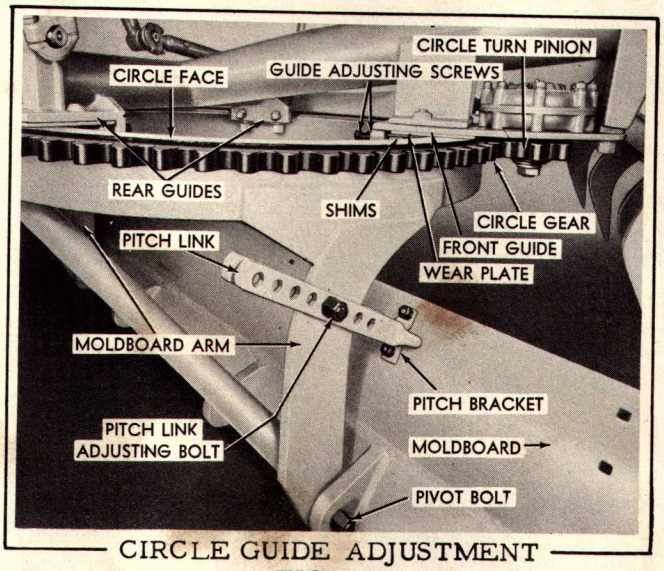
BALL AND SOCKET JOINT ADJUSTMENT

Shims are provided under the caps of all the ball and socket joints on the ends of the lift links and the side shift link (refer to Fig. 41). Wear at these joints can be taken up by removing the required number of shims.

Always remove an equal number of shims from each side of the joint; do not remove too many as this would cause binding in the joint.

Wear on the drawbar ball and socket at the front end of the drawbar can be taken up in the same manner by removing shims under the ball socket cap (Refer to Fig. 39).

CIRCLE GUIDE ADJUSTMENT



CIRCLE GUIDE ADJUSTMENT
FIG. 40

A. GENERAL

A clearance of 1/16" must be maintained between the face of the circle and the circle guide wear plates and between the rear guides and inner circumference of the circle. Shims and adjusting screws (Fig. 40) are provided for making adjustment when the clearance becomes excessive through normal wear.

B. VERTICAL ADJUSTMENT

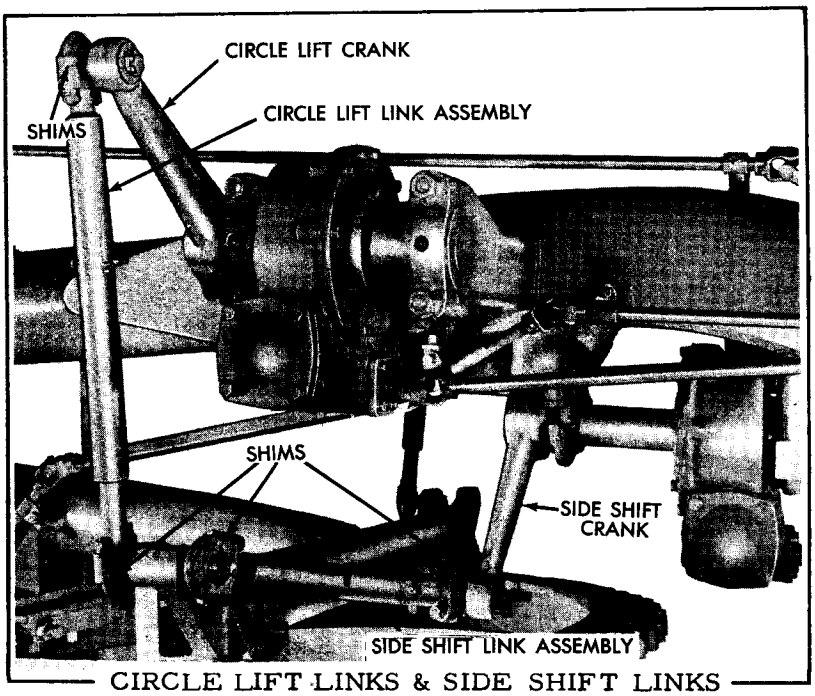
Eliminate excessive play between the face of the circle and wear plates by the removal of shims between the wear plates and circle guides. Each shim is 1/32" thick. Rotate the circle a full 360° after the shims have been removed and guide bolts tightened to make sure 1/16" clearance at tightest point still remains and circle turns freely in guides. Make the adjustment on one guide at a time.

C. HORIZONTAL ADJUSTMENT

After the vertical adjustment of the circle has been made, loosen the lock nuts on the adjusting screws of front and rear guides. Loosen the adjusting screws in rear guides, also loosen the guide bolts, then tighten the adjusting screws in the front guides to force the circle forward as far as possible without causing a bind between the circle turn pinion and circle gear. Rotate the circle a full 360° to be sure no bind occurs at any point.

After the front guide has been adjusted, adjust the rear guides to provide 1/16" clearance between the inner circumference of the circle and each of the two guides. Tighten all guide bolts and lock nuts and check again to make sure there is a free running fit between circle turn gear and pinion.

WORM GEAR CASES



CIRCLE LIFT LINKS & SIDE SHIFT LINKS
FIG. 41

The adjustments of the bearings and of the worm gears in the circle side shift and the two moldboard lift cases are properly set at the factory by use of shims between the bearing retaining covers and the gear housings. No further adjustment in the field should be necessary. However if these cases are removed from the grader frame for any reason, when reinstalling the cases on the grader frame sufficient shims should be used to provide 1/32" clearance between the gear shaft support bearings and the caps attaching the cases to the grader frame.

Excessive end play of the worm shaft in the circle turn, front wheel lean, and the scarifier control cases may result in their "creeping" from set positions when under load during operation. Adjustment of the worm shaft bearings by means of set screws at the end of the worm shafts will correct this condition. Loosen the lock nut on the set screw to be adjusted, turn the set screw in as tightly as possible using a wrench with a 12" handle, then back the set screw out 1/16 turn and tighten the lock nut.

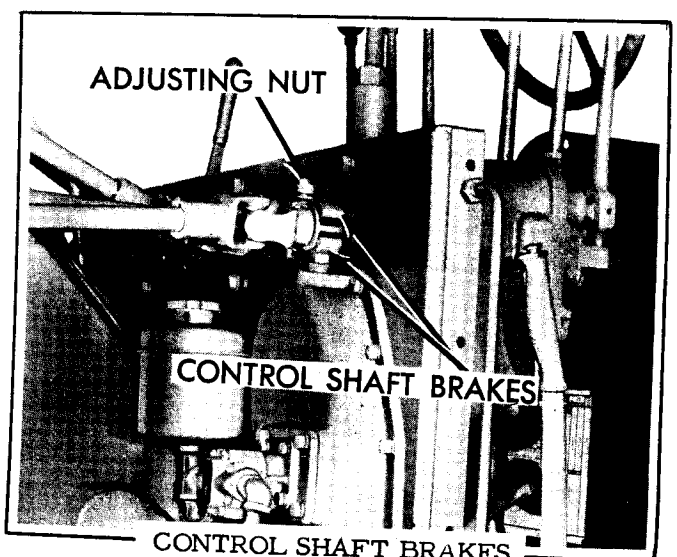
CONTROL SHAFT BRAKE ADJUSTMENT

A. GENERAL

The control shaft brakes (Fig. 42) are correctly adjusted when they are tight enough to prevent the shafts from turning while the levers are in their neutral position, but not tight enough to cause a heavy drag on the shafts when the controls are used.

B. ADJUSTMENT

Adjust the brakes for proper tension by means of the adjusting nuts. Tightening the nuts increases the tension.



CONTROL SHAFT BRAKES
FIG. 42

POWER TAKE-OFF CHAIN ADJUSTMENT

A. GENERAL

The chain used to drive the power control box assembly and the pump for the hydraulic steering system can be adjusted if necessary by turning the eccentric adjustment of the lower sprocket drive assembly. The chain is properly adjusted when the straight side of the chain can be pushed in 3/4" to 1" at a point halfway between the upper and the lower sprockets.

B. ADJUSTMENT

1. Remove the drain plug in chain drive housing and drain the oil from the housing.

2. Remove the capscrews attaching the left headlight and remove the headlight.

3. Disconnect the lines from the pump and the oil reservoir for the hydraulic steering system and remove the pump from the chain drive housing.

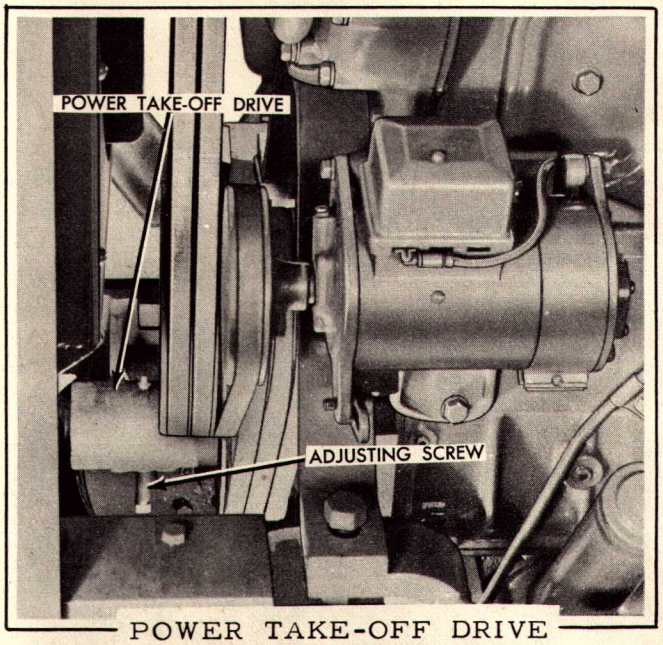
4. Remove the chain drive housing and loosen the three nuts attaching the retaining ring to the front panel of the grader. Turn the lower sprocket drive housing clockwise to tighten the chain as necessary.

   CAUTION: Use care when turning the drive housing to prevent damage to the gasket used between it and the front panel of the grader.

5. Reassemble by direct reversal of the removal procedure. Fill the chain drive housing to the correct level with the specified lubricant.

6. Fill the oil reservoir tank to the proper level with the specified lubricant.
   CAUTION: After filling the oil reservoir tank, it is important that all air is eliminated from the system. Bleed the system as outlined in "STEERING MECHANISM ADJUSTMENT", paragraph D.

POWER TAKE-OFF DRIVE BELT ADJUSTMENT



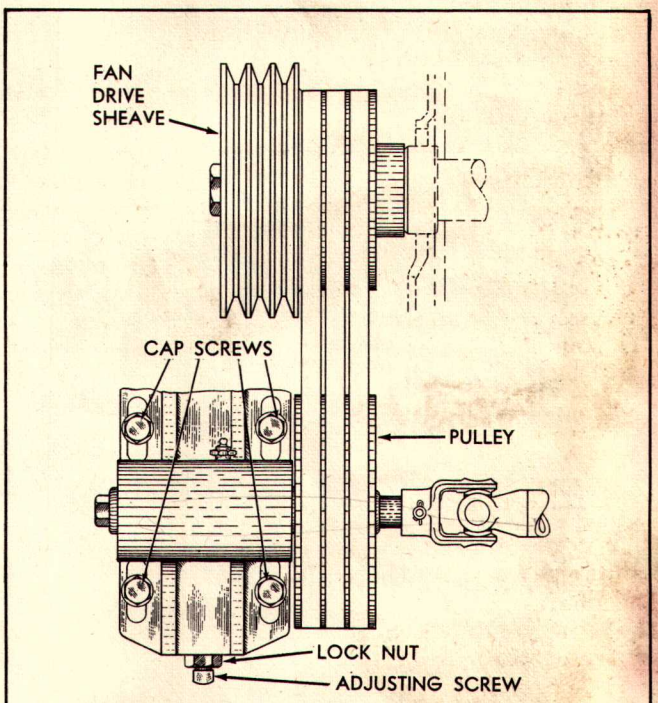
POWER TAKE-OFF DRIVE
FIG. 43

A. GENERAL

The power take-off drive belts are correctly adjusted when one side of the belts can be pushed in 1" toward the other side with finger pressure, at a point halfway between the two pulleys.

B. ADJUSTMENT

To tighten the belts, loosen the four capscrews that attach the housing to the frame, then loosen



BELT ADJUSTMENT
FIG. 44

the lock nut on the adjusting screw and turn the adjusting screw in to tighten or out to loosen the belts until the correct adjustment is obtained. Tighten lock nut, then square the housing with the grader frame, and tighten the four capscrews. Recheck the belt tension after the capscrews have been tightened.

TANDEM DRIVE CHAIN ADJUSTMENT

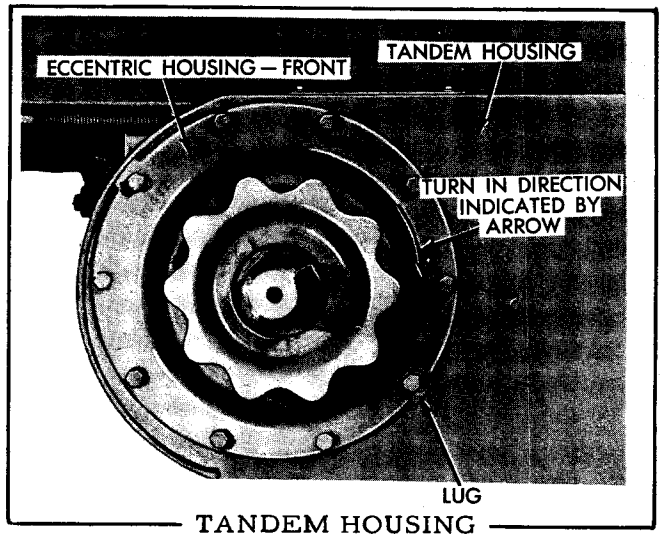
A. GENERAL

Adjustment of the tandem drive chains will not be required unless they become loose enough to drag on the bottom of the drive housings. They should then be adjusted to allow approximately 1" slack, measured halfway between the sprockets.

B. ADJUSTMENT

1. Drain the oil from the housings, remove the wheels and tandem stops, and loosen the inner and outer eccentric housings.

2. Rotate the inner and outer eccentric housings an equal distance by driving against the lugs on the housings, turning the top of each toward the rear axle at center of tandem housing. Line up the holes in the eccentric housings with the nearest capscrew holes in the tandem housings after the 1" slack in chain is obtained and install the capscrews.
   CAUTION: The lugs on inner and outer housings must be directly opposite each other for the sprocket shaft to be in proper alignment.

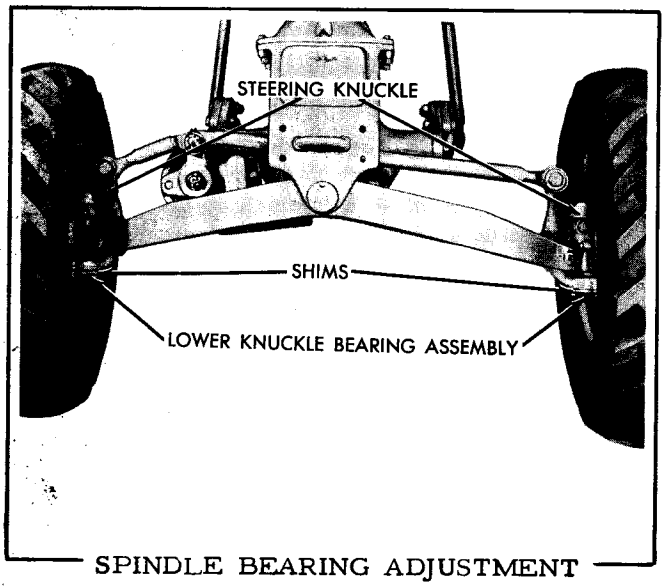


TANDEM HOUSING
FIG. 45

3. The brake backing plate must be removed and turned to its original position with relation to the tandem housing when adjustment is made on the rear tandem driving chain.

4. Install the tandem stops in their original position with relation to the tandem case and grader frame.

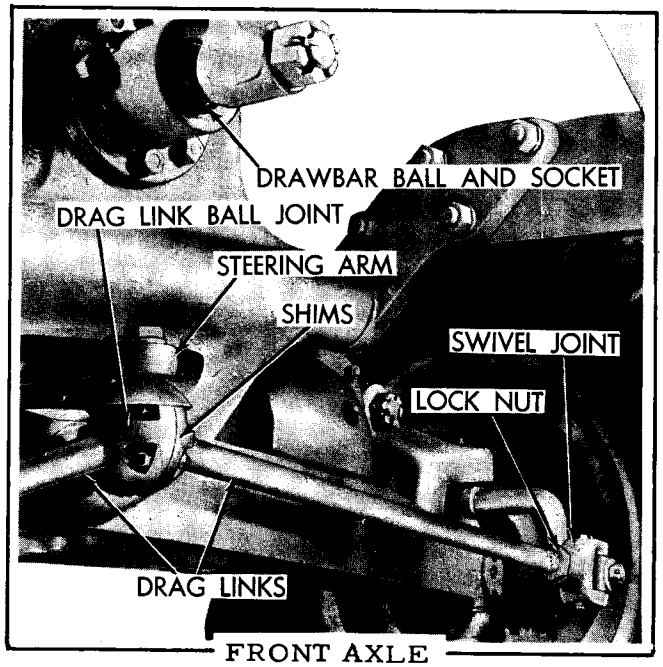
WHEELS AND TIRES



SPINDLE BEARING ADJUSTMENT
FIG. 46

A. FRONT WHEEL BEARING ADJUSTMENT

Adjust the front wheel bearings by tightening the nut on the outer end of the spindle to draw the bearings up tight, then back the nut off 1/6 turn (to next cotter pin slot) and install cotter pin.



FRONT AXLE
FIG. 47

B. FRONT WHEEL SPINDLE BEARING ADJUSTMENT

A tapered roller bearing is used in the upper end of each front wheel lean knuckle; the lower

end of the spindle is supported by needle bearings. Periodic inspection must be made to determine if vertical "end-play" of the spindle exists due to normal wear. Damage to the oil seals will result if excessive "end play" exists. To check for "end-play", raise each wheel off the ground, then insert a bar under the spindle stop bolt and pry up on spindle. Eliminate any "end-play" by removing shims at bottom of knuckle. The bearing should have a free rolling fit when adjustment is completed.

C. FRONT WHEEL ALIGNMENT

The caster and camber of the front wheels are set at the factory and do not require field adjustment. One inch "toe-in" is required on the front wheels. To check for proper "toe-in", measure the distance between the tire rims ahead and back of the front axle. These measurements must be made at the spindle height. The distance between the rims at the front must be 1" less than at the rear.

To adjust the "toe-in", turn the steering wheel so that the rear end of the steering gear arm is located at the center line of the grader frame. Loosen the lock nuts on the swivel joints at the outer ends of the drag links. Each drag link must be turned an equal number of turns when adjusting to maintain the proper steering radius in either direction. Turn the drag links farther into the swivel joints to decrease the "toe-in", turn them farther out to increase the "toe-in". The grader must be moved a short distance each time before checking for correct adjustment, Tighten the lock nuts when the correct "toe-in" has been obtained.

NOTE: The right hand drag link is longer than the left hand drag link due to the steering assembly being mounted to the left of the center line of the grader, therefore, do not attempt to adjust the drag links so that they are of equal length.

D. FRONT WHEEL SPINDLE STOP ADJUSTMENT

Adjustable stops are provided to prevent shock loading of the steering mechanism when the front wheels are turned in their extreme positions. These four (4) stops consist of capscrews and jam nuts. One capscrew and one jam nut is installed at the front and rear of each spindle.

To adjust the spindle stops proceed as follows:

1. Make sure that the front wheels are vertical; (not in lean position), and that the "toe-in" is properly set.

2. Loosen the jam nuts on the spindles and turn capscrews into spindles as far as possible so that the heads of the capscrews will not contact the front wheel lean knuckles when adjustment is being made.

3. Turn the steering wheel to the right and measure the distance between the center of the lubricating fitting in the right hand drag link swivel pin and the rear face of the front axle. Turn steering wheel to obtain a measurement of 3-3/4 inches at this point.

4. After the correct distance has been obtained, turn the right rear and the left front capscrews until the heads of the capscrews contact the wheel lean knuckles, then lock in position with the jam nuts.

5. Turn the steering wheel to the left to obtain the proper measurement for the left turn stops as in Step 3, above.

6. After the correct measurement has been obtained, turn the left rear and the right front capscrews until the heads of the capscrews contact the wheel lean knuckles. Lock in position with the jam nuts.

7. If proper adjustment has been made, the heads of the right rear and left front capscrews will act as stops when the steering wheel is turned to the extreme right position and the heads of the left rear and right front capscrews will act as stops when the steering wheel is turned to the extreme left position.

D. TIRES

Keep tires free from oil and grease and remove stones that become lodged in the treads. Proper inflation and immediate repair of cuts will materially prolong their life. The correct inflation pressures for the various sizes of tires that may be used on the machine are as follows:

STANDARD MACHINE

Tire Size	Ply	Pressure
9.00 x 24	10	40 (F)
13.00 x 24	8	25 (F&R)

MACHINE EQUIPPED WITH SNOW PLOW

Tire Size	Ply	Pressure
9.00 x 24	10	50 (F)
13.00 x 24	8	25 (F&R)

MACHINE EQUIPPED SCARIFIER

Tire Size	Ply	Pressure
9.00 x 24	10	40 (F)
13.00 x 24	8	20 (F) 25 (R)

F - Denotes Front R - Denotes Rear

MAXIMUM PRESSURE PERMISSIBLE

Tire Size	Ply	Pressure
9.00	10	50
13.00	8	25

Calcium chloride solution may be added in the four rear tires of the grader to gain additional weight if desired. This liquid ballast affords increased traction and tends to stabilize the machine.

The grader may be ordered from the factory with this solution added in the tires as special equipment, or the solution may be added by most tire companies as their service stations are equipped with the necessary facilities for adding the solution. The tubes of the tires are equipped with the proper valves for insertion of the solution.

When the grader is ordered from the factory with the solution installed as special equipment, each rear tire contains a total of approximately 450 pounds of 27% calcium chloride solution. The solution will form a slush at approximately -20° F. but the tires will be comparatively safe until slush freezes and becomes a solid mass which will not move inside the tires. Ordinarily, high pressures do not develop as the result of slush forming inside the tires, and a vehicle will be safe to operate until complete freezing has been effected. The operation of the tires tends to warm up the solution and raise the temperature inside the tires, even though much lower outside temperature prevails.

When replacing a valve core when the tires contain this solution, turn the wheel so the valve is at the top and raise the end of tandem case to take the weight off the wheel before removing valve core; this will prevent loss of the liquid solution.

CAUTION: Ordinary tire gages may be damaged by action of liquid solution in tires. Always use a tire inflation gage which has a "pump-out" feature. This permits flushing and oiling to keep the gage in good condition when testing liquid ballast tires.

PREPARATION OF GRADER FOR STORAGE

When it is necessary to store the grader during the winter or slack seasons, make a complete inspection of the machine for loose or damaged parts and make necessary repairs. Drain engine crankcase and all other oil compartments; flush and refill with new oil. Protect fuel injection system by draining fuel tank; then pour about ten gallons of a mixture of 40% mineral seal oil and 60% perfection kerosene in the tank and run the engine for 15 minutes so that this fuel is completely circulated through the fuel system. This will leave the fuel system and injectors filled with the mixture which will guard against corrosion or gumming of the working parts. Major oil companies can supply this storage fuel mixture.

After the grader is stored, fill the tank with regular diesel fuel to minimize condensation in tank.

NOTE: This storage fuel need not be drained when grader is again placed in service.

Drain the cooling system or fill it with an anti-freeze solution that will withstand the lowest anticipated temperature.

Remove the batteries, clean them and store in a cool, dry place. Test them once a month to prevent their freezing, recharge them if the specific gravity falls below 1250.

Block up under the axles to take the weight of the grader off the tires. Coat the moldboard with heavy grease to prevent its rusting. Cover the exhaust pipe.

SPECIAL EQUIPMENT

Special equipment is the term used to designate equipment that is not included on the standard grader but which may be ordered at additional cost and either installed at the factory when purchasing the grader or installed in the field.

All items of special equipment when ordered for field installation are shipped complete with the necessary parts for installation. Instructions for their installation are included. Consult your nearest "Allis-Chalmers" Dealer for further information. The following items of special equipment are available:

A. SCARIFIER

A complete "V-Type" adjustable block scarifier having a 46" swath and containing 11 teeth with removable tips.

B. CAB

The cab is an all steel enclosure with safety glass throughout and includes front and rear adjustable windshields.

C. WINDSHIELD WIPER

This wiper is an electrically operated unit mounted above the windshield inside the cab.

D. DEFROSTER FAN

The defroster fan is an electrically driven swivel type unit mounted in the cab.

E. CAB HEATER

The cab heater is of the hot water type and is mounted in the cab.

F. REAR FLOOD LIGHT

The rear flood light, complete with mounting bracket, is mounted at the rear of grader.

G. HOUR METER

The hour meter is a spring driven and electrically wound unit. This clock records the number of hours the engine has operated.

H. ODOMETER

The odometer is a gear driven device which registers the miles or kilometers which the grader has operated.

I. RADIATOR CURTAIN

The fabric radiator curtain, complete with mountings, is of the adjustable type and is for use when needed in cold weather.

J. HOOD SIDE PLATES

The hood side plates, containing louvers, are of the hook and snap on type and are used to keep debris out of the engine compartment and also for use in cold weather.

K. ELECTRIC TIRE PUMP

This pump can be connected into the grader electrical system and is used to inflate the grader tires when needed.

L. HEAVY DUTY FILTER GROUP

This group consists of two large capacity filters, one for the engine lubrication system and one for the engine fuel system. If this group is installed in the field, mounting brackets for these filters must be ordered additionally as the brackets are not included in the filter group.

AVOID ACCIDENTS

MOST ACCIDENTS, WHETHER THEY OCCUR IN INDUSTRY, ON THE FARM, AT HOME OR ON THE HIGHWAY, ARE CAUSED BY THE 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 CANNOT BE COMPLETELY SAFEGUARDED 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