

REAR AXLE  
(Group 280039)

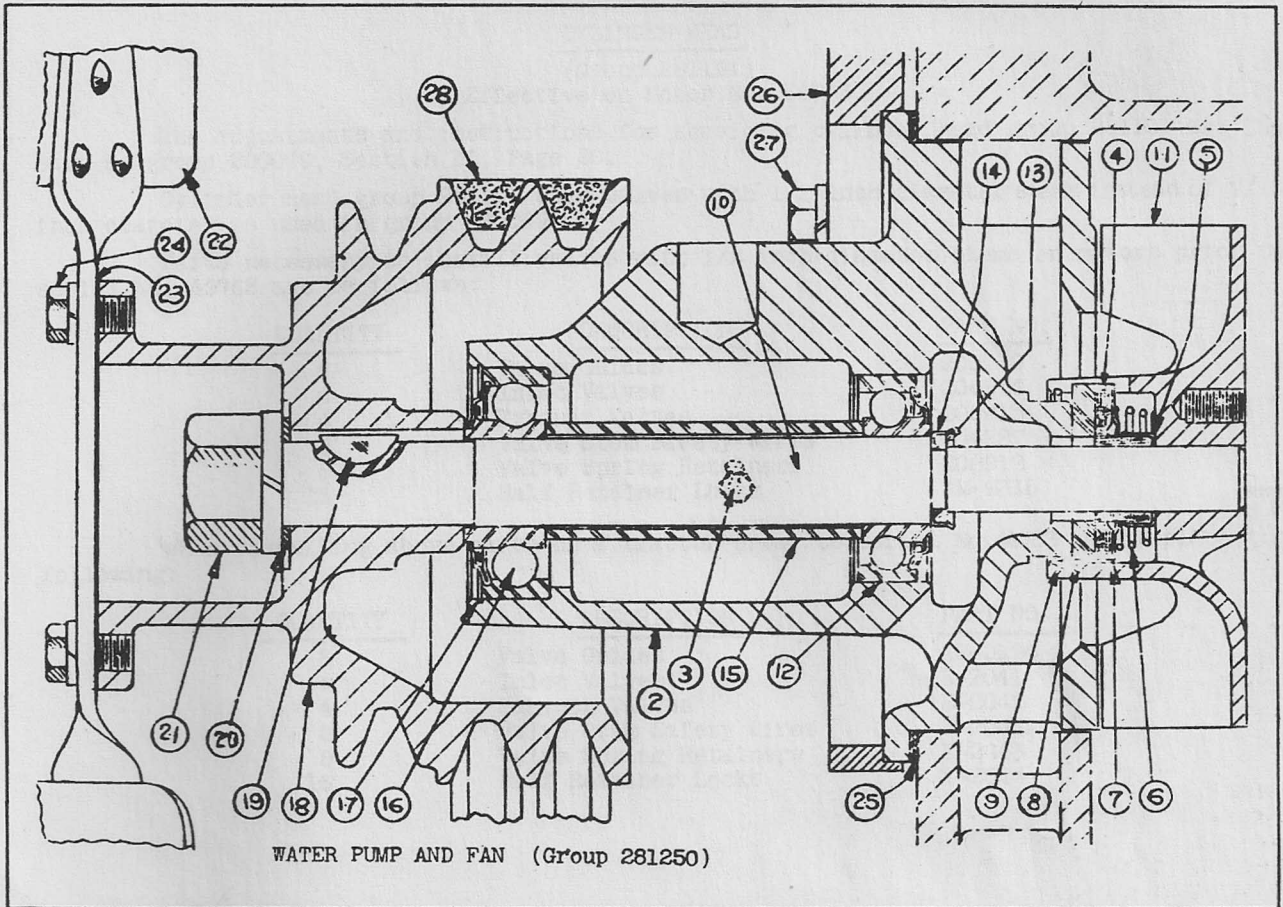
The rear axle (1) is splined on the inner end and fits into the differential side gear. It is carried on the outer end by taper roller bearings (2) held in position by bearing case (10) and cover (18). Collar (3) fits snugly over shaft and against bearing. Cork rings (19) fit over collar (3) and in a recess in case cover (18) and are held in place by cover plate (21). Between bearing case (10) and cover (18) are shims (24) to allow for bearing adjustment. To tighten bearings, remove necessary shims. This allows bearing case cover (18) to force outside cup in and consequently removes play. This bearing should be adjusted to free rolling, no end play and no binding.

To remove the rear axle, remove rear wheel which is held on by bolt (5) and fits on taper shaft and key (9). After wheel is removed, remove capscrews (22) and the axle can be taken out.

When replacing cork rings (19), thoroughly saturate them with oil and be sure collar (3) is smooth, free of rust or burrs, to prevent damage to cork rings.

After replacing rear drive wheel, be sure that bolt (5) is drawn tight and that capscrew (7) in retaining washer (4) is resting firmly against axle to prevent bolt (5) from loosening.

Lubrication-- rear axle bearings are lubricated by the oil supply from the differential and are also lubricated through zerk fitting (16) which is located on the rear of bearing case (10). Zerk fitting (16) should be lubricated daily, as the pressure gun grease acts as a seal against oil leakage at cork rings (19) or dirt and grit entering at the same point.



WATER PUMP AND FAN (Group 281250)

Effective on Motor #49712

The water pump is a packingless type mounted on two ball bearings which require a semi-fluid lubricant. For each ten hours of operation, force lubricant into fitting (3) until a small amount is forced out of the 1/16" hole which is located on pump body.

Fan belt adjustment is made by loosening four capscrews (27) in the water pump clamp ring. Insert a 5/8" bar in one of the three holes drilled in bosses of water pump housing and turn body in a counter-clockwise direction to tighten. Adjust fan belts so there is from one to one and a half inches of slack midway between pulleys.

The water pump contains a self adjusting water seal assembly which consists of a carbon washer (9) held against machined face of pump body by spring (6). Water is prevented from leaking past the pump shaft by a flexible seal (4) which fits tightly against carbon washer and around pump shaft (10).

To dismantle pump, remove it from motor. The impeller is a press fit on shaft and should be removed by using a puller. By removing snap ring (9); carbon washer (8), flexible seal (4), spring guide (7), spring (6) and seal clamp ring (5) can be removed. If water pump has been leaking, replace any of the above parts which show evidence of being faulty.

To remove bearings (16) and (12), and pump shaft (10), remove nut (21) and pull the fan pulley from shaft. After removing snap ring (17) the pump shaft and bearings can be driven out at the fan pulley end.

To reassemble the pump, reverse the above procedure. Note: To obtain the correct location of the impeller on the shaft, first install shaft (10) and bearings (16) and (12) in pump body; place snap ring (17) in place and attach fan pulley. Locate water seal assembly in impeller (11) using snap ring (9) to hold seal assembly in place. Impeller can then be pressed on shaft leaving 1/32" clearance between the impeller and pump body.

CYLINDER HEAD

(Group 281191)

Effective on Motor No. 49763

The adjustments and instructions for servicing cylinder head group 281191 are the same as group 280049, Section II, Page 20.

Cylinder head group 281191 uses valves with 1/2 inch diameter stems instead of 7/16 inch diameter as used in group 280049.

Parts necessary to install valves with 1/2 inch diameter stems on motors prior to serial No. 49763 are as follows:

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
8	Valve Guides	208950
4	Inlet Valves	208914
4	Exhaust Valves	208913
8	Valve Stem Safety Wires	204227
8	Valve Spring Retainers	208912
16	Half Retainer Locks	AM-9316

When installing above parts on a tractor prior to serial No. 49763 they replace the following:

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
8	Valve Guides	AM-9194
4	Inlet Valves	E-2041
4	Exhaust Valves	E-2042
8	Valve Stem Safety Wires	E-2044A
8	Valve Spring Retainers	E-2043
16	Half Retainer Locks	E-2044

MODEL "U" TRACTOR INDEX

SUBJECT	SEC.	PAGE	PAGE	PAGE	PAGE	PAGE
AIR CLEANER	U	1	4	26		
BELT PULLEY	U	2	4	6	39	
BREATHER ENGINE	U	1	4	14		
BREATHER TRANSMISSION	U	4				
CAMSHAFT	U	1	10			
CAMSHAFT BEARINGS	U	1	10			
CARBURETOR	U	1	22	23		
CARE & OPERATION	U	3	4	5	6	
CLEANING RADIATOR	U	6	27			
CLUTCH						
Adjustment	U	2	6	30		
Lubrication	U	3	31			
Removal	U	30				
Repair	U	31				
COMPRESSION	U	13				
CONNECTING RODS	U	1	5	12		
COOLING SYSTEM	U	1	6	27		
CRANKSHAFT	U	1	11			
Oil Seals	U	11				
Main Bearings	U	1	5	9		
CYLINDER HEAD	U	14				
CYLINDER LINERS	U	9				
DIAGNOSIS, HINTS FOR	GENERAL,	32				
DIFFERENTIAL	U	2	37			
DRAINING COOLING SYSTEM	U	6	9	27		
ENGINE BLOCK	U	9				
FAN BELT	U	1	6	7		
FRONT WHEELS & AXLE	U	2	4	6	28	
FITTING PISTON PINS	U	1	12			
FLYWHEEL	U	11				
FUEL	U	1	4	21	22	
GEAR SHIFT	U	3	4	32		
GOVERNOR						
Adjustment	U	5	17			
Construction	U	17				
Removal	U	17				
Type	U	1	5	17		
LINERS, CYLINDER	U	9				
MAGNETO RV4	U	2	18			
MAGNETO FM	GENERAL,	14				
MANIFOLDS	U	4	21	22		
OIL FILTER	U	4	25			
OIL LINES	U	25				
OIL PRESSURE	U	1	3	9	25	
OIL PUMP	U	20				
OIL RELIEF VALVE	U	1	9	25		
PISTON	U	1	13			
PISTON PIN	U	1	12	13		
PISTON RINGS	U	1	13			
POWER TAKE-OFF	U	2	40			
PUSH ROD ATTACHMENT	U	1	5	15		
RADIATOR	U	1	6	27		
REAR AXLE	U	2	37			
SPARK PLUGS	U	2				
SPECIFICATIONS	U	1	2			
STARTING ENGINE	U	3				
STARTING TRACTOR	U	3				
STEERING GEAR	U	4	29			
	A	21	22			

U

MODEL "U" TRACTOR INDEX (Cont'd)

<u>SUBJECT</u>	<u>SEC.</u>	<u>PAGE</u>	<u>PAGE</u>	<u>PAGE</u>	<u>PAGE</u>
TEMPERATURE	U	4			
TIMING IGNITION	U	2	11	18	
TIMING VALVES	U	1	10	11	
TRANSMISSION					
Bevel Pinion	U	2	35		
Cross Shaft	U	2	36		
Lubrication	U	4			
Spline Shaft	U	2	34		
Reverse Shaft	U	2	33		
VALVES					
Adjustment	U	1	5	15	
Guides	U	1	14		
Grinding	U	5	15		
Inserts	U	5	15		
Lubrication	U	14			
Springs	U	1	15		
WATER PUMP & FAN	U	1	3	7	

ALLIS-CHALMERS MODEL "U" TRACTOR 12000 AND UP LUBRICATION - pressure type

ENGINE

DATA

Capacity - 9-1/2 qts.  
Filter - own  
Renewable element

MANIFOLDS

First type - change location of exhaust pipe for different grade of fuels  
Second type - turn manifold cover for different grade of fuels

OIL PRESSURE

15 lbs. at full governed speed and normal operating temperatures  
Adjustment - shim behind relief valve spring  
Free length of spring - 2-5/16"  
Pump - gear type

SUMMER OIL - S.A.E. #40  
WINTER OIL - SAA.E. #30 or lighter - it must flow at prevailing temperatures

PISTONS

Material - alloy C.I. tin finish  
Clearance - first land .014" to .016"; second land .010" to .012"; third land .010" to .012"; skirt .0025" to .004"

PISTON PIN

Fit in piston - .0005"  
Fit in rod - .001" to .002"  
Size - 1-5/16"  
Type bushing - split graphite bronze

PISTON RINGS

Gap - .015"  
Land clearance - .0015"  
Rings per piston  
Compression 2 width 5/32"  
Scraper 1 width 5/32"  
Oil 1 width 1/4"

VALVES AND TAPPETS

Dia. Exhaust - 1-25/32"  
Dia. Intake - 2-1/32"  
Stem Dia. - .3715  
Seat angle - 30 degrees  
Seat width - 1/16"  
Tappet type - Cylindrical  
Clearance with motor hot - Intake - .010"  
Exhaust - .012"

Inlet opens - 10 degrees after top center, closes 35 degrees after lower center  
Exhaust opens - 40 degrees before lower center, closes 10 degrees after top center

GUIDES - removable - yes

Guide in. dia. .3745 to .3755  
Guide depth 11/16" from face of head

SPRINGS

Pressure 36 + 3 lbs. valve closed or compressed to 1-3/4"  
67 ± 4 lbs. valve open or compressed to 1-5/16" free length 2-3/8"

1

AIR CLEANER

Type - Oil bath

BREATHER

Wire mesh-on cylinder head cover

CAMSHAFT

Drive -- gear  
Valve timing -- flywheel marked for #1 EX. and IN. valve opening  
Bearing -- 3 steel back babbitt lined  
End thrust taken on thrust plate front bearing  
Bearing clearance -- .002" to .0035"

CONNECTING ROD

Bearing die cast; dia. - 2-3/8"  
End clearance .005" to .011"  
Dia. clearance - .001" to .003"

COOLING SYSTEM

Capacity -- 6 gals.  
Pump drive -- belt  
Belt size -- 7/8" wide - 17/32" deep  
42 degree angle -- 48-1/2" long  
Pump bushing in. dia. -- 1.001"  
Belt adjustment -- movable collar on pulley  
Pump adjustment -- automatic

CRANKSHAFT

No. of bearings - 3  
Bearing dia. and length  
Front - 2-1/2" x 2-1/2"  
Center and rear - 2-1/2" x 2-3/4"  
Material - steel backed babbitt lined  
Dia. clearance - .001" to .003"  
End thrust taken on rear bearing  
End clearance - .003" to .007"

FUEL SYSTEM

Carburetor - Zenith K5AC  
Size - 1-1/4"  
Type - up draft; single  
Adjustment - Main jet out for richer mixture; idle jet in for richer mixture  
Fuel delivery - gravity  
Tank capacity - 24 gals.

GOVERNOR - own

Variable speed type  
Adjustment - nuts on governor link

LINERS-CYLINDERS - removable

## CHASSIS

### FRONT AXLE

Camber - 30 degrees  
Toe-in - 1/4 to 1/2 inch  
Spindle pin bushing dia. 1.002"  
Spindle arm bushing dia. .753"

### FRONT WHEELS

Bearings - taper roller  
Adjustment - nut on end of spindle  
Size - steel 28" by 6"  
rubber 6.00" by 6"

### REAR AXLE

Type - live  
Bearing - double roller outside end  
Lubrication - from rear axle housing  
Adjustment - free rolling - by shims  
Grease retainer - cork seal  
Wheel - spline  
Size-steel 45" by 11-1/8"  
Lugs - 5" high by 3-1/2"  
No. per wheel - 22  
Air tires - 11.25" - 28" std.

### BRAKES

Type - hand operated  
Lining - woven  
Lining size - 3/16" by 2" by 22-3/16"  
Location - contracting on pulley on left  
hand end of cross shaft  
Adjustment - nut  
Surface 59.7 Sq. in.

### CLUTCH

Type - single plate spring loaded dry disc  
Dia. - 12"  
Facing type - woven  
Facing size and quantity - 6-1/8" and  
6-5/32" thick  
Spring pressure - 190 to 200 lbs. when com-  
pressed to 13/16" in length  
Adjustment - from top 1/4" clearance  
between throwout bearing and release  
levers

### THROWOUT BEARING

Ball thrust

### PILOT BEARING

Ball - automatic lubricated by wick in  
crankshaft

### SPEEDS

First - - 2.5  
Second - - 3.25  
Third - - 4.5  
Fourth speed locked unless air  
tired - - 10.75  
Reverse- - 2.87  
Gear ratio engine to drive wheels  
First - - 64 to 1  
Second - - 45.3 to 1  
Third - - 30.1 to 1  
Fourth - - 15 to 1  
Reverse- - 56 to 1

## DIFFERENTIAL

Location rear axle housing  
Bearings taper roller  
Adjustment - right hand bearing  
Lubricant - capacity with transmission  
12 gals.

### TRANSMISSION

Clutch shaft bearing - ball  
Spline shaft bearings - taper roller nut  
adjustment front and rear  
Cross shaft - taper roller bearing shim  
adjustment  
Bevel gear bearings - ball - shim adjust-  
ment at rear  
Reverse shaft bearing - bushing rear to  
1.625"  
Lubrication capacity with differential -  
12 gals.

### STEERING

Type - first type  
Worm and nut - adjustment of end play, nut  
Cross shaft adjustment - screw  
Second type - cam and lever  
Adjustment column end play - shims  
Cross shaft adjustment - screw  
Lubricant - steering gear lubricant

### BELT PULLEY

Type - clutch  
Bearings - pinion shaft - ball  
Adjustment shims under outside cover  
Idler gear - Hyatt Roller - no adjustment  
Pulley shaft - taper roller - adjustment  
shims under outside cover  
Size - dia. 10" face 7-1/2"  
R.P.M. - 250 - 300 low idle  
1095 - full load  
1220 - 1240 high idle  
Belt ft. per minute - 2870  
P.L.T.O. - type - clutch  
1-3/8" - 6B spline  
R.P.M. - 530  
Location - 3-3/4" to right of center line  
of tractor  
Height - 20-3/4" from ground  
Relation to hitch pin - 5" to rear  
Bearings - taper roller adjustment shims  
rear cover

### ELECTRICAL DATA

#### Magneto

Type - make - high tension  
Rotation - clockwise  
Fairbanks Morse - flange mounted  
Automatic impulse - yes  
Lag - 30°  
Advance - 32°  
Lubrication - sealed  
Breaker points - opening .012 to .015  
Spark plugs - opening .030 to .035  
Size - 7/8"

## CARE AND OPERATION OF MODEL "U" TRACTOR

### WHEN TRACTOR IS DELIVERED

Before starting a new tractor inspect it thoroughly and see that no parts have been removed from it, or any adjustments tampered with since the tractor left the factory.

### BEFORE STARTING THE ENGINE

Inspect oil level in engine oil sump. For correct level and viscosity see heading "Engine" under "Lubrication".

Inspect oil in air cleaner cup. Refer to air cleaner instructions.

Fill cooling system with clean water.

Check all points of lubrication and grease those equipped with grease gun fittings.

If gasoline is being used for fuel, fill the large tank with it. If low grade fuel, such as distillate or tractor fuel is to be used, fill the large tank with the low grade fuel and the small tank with gasoline.

### STARTING THE ENGINE

Place the gear shift lever in neutral position. If in cold weather, lock the clutch pedal in forward position. If gasoline is to be used, open valve under large tank. If low grade fuel is to be used, be sure the valve under large tank is closed and open the valve under the small tank. Open throttle one-third way. Turn ignition switch to the "ON" position. Pull the choke rod forward and crank engine over to compression strokes by LIFTING the crank. Release the choke rod. Engine should now start readily when cranked. However, if the weather is cool, more choking may be necessary. CAUTION:- Do not spin motor. To do so may disengage the automatic impulse coupling and allow motor to kick.

When the engine is started, see that the oil gauge is registering pressure. Do not operate the engine unless oil gauge registers.

NOTE:- After the first few hours of operation, tighten all nuts, bolts and cap screws that hold together parts having asbestos lined copper gaskets between them. This applies especially to cylinder head stud nuts. When cylinder head stud nuts are tightened the cylinder head gasket is compressed and causes the valve clearance to be taken up. After the cylinder head stud nuts are tightened, be sure to adjust the valve clearance.

### STARTING THE TRACTOR

With the engine running, press forward on the clutch pedal. Allow a few seconds for the gears to stop, then move the gear shift lever to the desired speed position, which is as follows: to central position and forward, reverse; central and back, low; to extreme right and back, second; to extreme right and forward, third; to extreme left and back, fourth. Release the clutch pedal slow-

ly to avoid a sudden jerk in starting, but have throttle far enough open to avoid stalling the motor.

### LUBRICATION

ENGINE: Maintain oil level in oil sump to the full mark on oil gauge rod.

Use only pure mineral oils of the following S.A.E. viscosity numbers:

Summer - No. 40

Winter - No. 30

For extremely cold temperatures, a mineral oil that will flow freely at prevailing temperatures should be used.

If gasoline or other fuels of similar qualities are being used drain oil sump and refill with fresh oil of the proper quality and viscosity after each 60 hours operation.

If low grade fuel such as distillate or tractor fuel is being used, drain the oil down to the drain cock, located on side of oil sump, after each 10 hours of operation and refill to the full mark on gauge rod with fresh oil. After each 30 hours of operation, drain oil sump completely and refill with fresh oil.

Use only oil of high quality of the proper viscosity. The best assurance of securing such oil is to purchase the better grade manufactured by a dependable oil company who has established a national reputation for quality products and whose success depends upon maintaining such quality.

Look at the oil pressure gauge at regular intervals to make sure oil is being circulated by the oil pump. The gauge should register approximately 15 pounds when engine is running at normal governed speed and is heated to running temperature.

The governor, timing gears, clutch pilot bearing and rocker arm assembly are lubricated from the oil sump supply and need no outside attention.

WATER PUMP AND FAN: Fill oil reservoir, located on top of water pump body daily with a light motor oil. The reservoir holds approximately one-fourth pint. Also lubricate through grease gun fitting on side of water pump body with two or three strokes of the grease gun for each 30 hours of operation.

CLUTCH: Lubricate throwout bearing each 30 hours of operation with two or three strokes of the grease gun. The grease fitting is accessible through an opening in left side of clutch housing. Do not over-lubricate this point as the excess grease may work upon the clutch plate and cause clutch to slip or become sluggish in action.

The clutch fork shaft bearings are also equipped with grease gun fittings and should receive two or three strokes of the grease gun daily (Refer to items 19 group 280184).

Lubricate clutch pedal bearing daily through fitting on bottom of pedal.



### FUEL FILTER

GEAR SHIFT LEVER SHAFT: Lubricate daily through fitting on top of shaft housing. (Refer to item 42 group 280076).

TRANSMISSION AND DIFFERENTIAL: These two units are lubricated from the oil supply carried in the transmission case and filled through the opening covered by the breather cap located on the transmission case cover. Keep filled to the level of the top pipe plug located on the left-hand side of transmission case. The capacity is approximately 12 gallons and only oils of the proper body to meet prevailing temperatures should ever be used.

For Summer use S.A.E. 160  
For Winter use S.A.E. 90

When operating in extremely cold weather light motor oil should be added to the transmission oil supply to thin the heavy oil and insure proper circulation and lubrication.

NOTE: Keep transmission case breather cap clean by washing in gasoline and saturating with lubricating oil before replacing.

FRONT WHEELS: Lubricate daily with grease gun until grease is forced out at inner end of hub.

STEERING SPINDLES: Lubricate all fittings with two or three strokes of the grease gun daily.

STEERING BALL JOINTS: Keep packed in grease.

STEERING GEAR HOUSING: Lubricate daily with grease gun through fitting located on top of housing.

BELT PULLEY: Lubricate through fitting located on pulley shaft outer bearing cover, daily, with two or three strokes of grease gun when using pulley.

### FUEL

When burning low grade fuels certain precautions are necessary to prevent excessive dilution of the lubricating oil.

Always select the best grade of fuel obtainable, such as No. 1 distillate or fuel having similar power qualities and with a gravity as near to 39.1 as possible.

Cover radiator to let engine warm up thoroughly on gasoline. Never turn on the low grade fuel until the temperature of the cooling system is near the boiling point, and when operating in cold weather, keep sufficient cover on the radiator front to maintain this temperature.

Always turn off low grade fuel and switch to gasoline before engine is stopped so that carburetor will contain gasoline when engine is again started.

When the tractor leaves the factory the exhaust pipe is set at the front end of the manifold which is the proper location when burning gasoline. When low grade fuel is to be used, the exhaust pipe should be changed to the center outlet of manifold and the plate taken from the center outlet moved to front end.

A fuel filter is located just below the fuel tank and should be cleaned at regular intervals. Remove the glass bowl and screen, and wash out any sediment or water that may have accumulated.

### AIR CLEANER

Instructions as to care of the air cleaner are given on the air cleaner body. Follow these instructions carefully. Be sure the oil cup is filled to the level of the bead stamped on the side of the cup. Used crank case oil is satisfactory if thin and clean. The use of heavy oil in the cup will result in a restriction of air to the carburetor, resulting in an over-rich mixture and excessive dilution of the lubricating oil. Inspect after each 10 hours of operation, and if the oil is heavy with dirt, or if the cup contains a layer of sediment, drain and refill with fresh oil.

Inspect the hose connection on air inlet frequently and keep it tight and in good condition.

### BREATHER

The crankcase breather cap, located on top of the cylinder head cover, should be inspected daily. It must not be allowed to become clogged with dirt as pressure will be created in crankcase, causing oil leaks at main bearings, magneto shaft and other points. Wash breather cap in gasoline, dip in lubricating oil and replace after throwing off excess oil.

### OIL FILTER

The oil filter is a highly efficient unit for the purpose of filtering abrasive particles from the engine crankcase oil supply. This naturally adds life to the many moving parts that are dependent upon this supply for lubrication.

The filtering element consists of a metal can packed with a special long thread filtering yarn. The oil is forced through a tube to the top of the oil filter element and is filtered as it passes down through the filtering yarn.

When gasoline is being used for fuel it is necessary to replace the filtering element and its container, (item 9 group 280532), after each 200 to 400 hours of operation, but if low grade fuel is being used, it is necessary to replace this element after each 100 to 200 hours of operation.

The replacement container is supplied, packed with the necessary quantity of filtering yarn and has a wood stick in the center to keep the hole in filtering yarn open so that the oil tube which extends up in the element can enter freely. This wood stick should be removed with a twisting motion before attempting to install the element.

A new element can be purchased from any Allis-Chalmers dealer for a few cents.

It is very important to replace the above element as directed as this unit will aid in keeping the crankcase oil clean and add many hours of carefree service to the life of the motor.

**CAUTION:** Do not attempt to remove and wash the filtering yarn or use any material in container except that as furnished as regular equipment.

Install only new container, packed, as is supplied by the Allis-Chalmers Manufacturing Company for the protection of the motor.

#### OIL PUMP

The oil pump requires very little attention. It is of the geared type driven by a gear which meshes with the crank shaft timing gear. It is considered good practice to clean the oil pump screen each season. This can be done by removing the oil sump bottom cover.

#### GOVERNOR

The governor is of the variable speed fly weight type, mounted on the magneto shaft and is completely sealed from dust and dirt.

To adjust engine governed speed, remove cylinder block side cover, (Item 18 group 280523), located on right hand side of engine block, loosen lock nut and turn adjusting nut on governor rod to right to increase and left to decrease speed. The normal governed full load engine speed is 1200 R.P.M.

#### MAIN BEARING ADJUSTMENT

The main bearings are of the bronze back type, and due to the large size of the bearings and to the type of lubrication used, they seldom need adjusting. However, shims are provided so that adjustment can be made if it becomes necessary.

Never adjust a bearing too tight. They must have .002 inch diametrical clearance. The maximum end play for crank shaft is 1/32 inch. When adjusting the bearings always remove the same number of shims from each side. Always replace the bearing cap in its original position so that crankshaft will not be forced out of alignment.

#### CONNECTING ROD ADJUSTMENT

Shims are provided in the connecting rods for bearing adjustment. The connecting rod bearings should have not less than .002 inch diametrical clearance. End play should not exceed .010 inch.

When adjusting rod bearings, remove the same number of shims from each side and replace the cap on its original rod and in its original position.

When coupling up the rods, be sure the

nuts are drawn tight and are locked with the proper size cotter keys.

#### CYLINDER LINERS, PISTONS AND RINGS

The engine has renewable cylinder liners which makes reboring unnecessary.

Oversize pistons and rings are not supplied. If wear on the cylinder liners is sufficient to require oversize pistons and rings a new motor assembly, consisting of liners, pistons, rings, etc., should be installed.

The old liners can be readily removed from the top of the engine block by the use of a suitable puller.

When installing new liners, they should be forced straight down in the bore of the block to prevent possible damage to the rubber packing rings.

Always use new packing rings when installing liners, as the danger of a water leak at this point is too great to risk their use the second time.

#### VALVE CLEARANCE AND VALVES

Correct clearance between the valve stems and rocker arms should be maintained at all times.

To adjust clearance, turn engine with crank until valve closes and push rod is at its lowest position. Loosen valve adjusting screw lock nut and turn screw until there is .010 inch clearance between inlet valve stems and rocker arms and .012 inch clearance for exhaust valves with engine at normal operating temperature. Use a thickness gauge for making this measurement. Tighten lock nut and recheck.

Lack of compression because of leaky valves may be caused by either insufficient clearance between rocker arms and valve stems, by the collection of carbon at the valve seats or by carbon or a gummy substance on the valve stems preventing the closing of the valves.

If, when cranking the motor over, there is a lack of resistance on one or more cylinders at the compression stroke, the pistons and rings being in good condition and there is sufficient clearance between the rocker arms and valve stems, it indicates that the valves need regrinding.

Because of the hardened steel exhaust valve seat inserts in the exhaust valve positions, it is recommended that the valves be refaced on a machine made for this purpose and the seats be reground with a high speed valve seat grinder.

As a final operation, the valves and seats may be polished by lapping them in with a small amount of valve grinding compound. In this manner a perfect seat can be obtained which will give many hours of satisfactory service.